DISCRETE SEMICONDUCTORS

PowerMOS Transistors

BOOK SC13 1991

Philips Semiconductors

PHILIPS

PowerMOS transistors

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* Preliminary device data: please refer to separate section.

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* Preliminary device data: please refer to separate section.

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* Preliminary device data: please refer to separate section.

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BUK471-100B*	MOSFET N	SOT186A	520
BUK472-60A*	MOSFET N	SOT186A	525
BUK472-60B*	MOSFET N	SOT186A	525
BUK472-100A*	MOSFET N	SOT186A	530
BUK472-100B*	MOSFET N	SOT186A	530
BUK473-60A*	MOSFET N	SOT186A	535
BUK473-60B*	MOSFET N	SOT186A	535
BUK473-100A*	MOSFET N	SOT186A	540
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BUK474-400A*	MOSFET N	SOT186A	550
BUK474-400B*	MOSFET N	SOT186A	550
BUK474-500A*	MOSFET N	SOT186A	555
BUK474-500B*	MOSFET N	SOT186A	555
BUK474-600A*	MOSFET N	SOT186A	560
BUK474-600B*	MOSFET N	SOT186A	560
BUK474-800A*	MOSFET N	SOT186A	565
BUK474-800B*	MOSFET N	SOT186A	565
BUK475-60A*	MOSFET N	SOT186A	570
BUK475-60B*	MOSFET N	SOT186A	570
BUK475-100A*	MOSFET N	SOT186A	575
BUK475-100B*	MOSFET N	SOT186A	575
BUK475-200A*	MOSFET N	SOT186A	580
BUK475-200B*	MOSFET N	SOT186A	580
BUK475-400A*	MOSFET N	SOT186A	585
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* Preliminary device data: please refer to separate section.

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BUK475-600B*	MOSFET N	SOT186A	595
BUK476-800A*	MOSFET N	SOT186A	600
BUK476-800B*	MOSFET N	SOT186A	600
BUK476-1000A*	MOSFET N	SOT186A	605
BUK476-1000B*	MOSFET N	SOT186A	605
BUK539-60A*	L^2FET	SOT93	610
BUK541-60A*	L^2FET	SOT186	615
BUK541-60B*	L^2FET	SOT186	615
BUK541-100A	L^2FET	SOT186	351
BUK541-100B	L^2FET	SOT186	351
BUK542-60A	L^2FET	SOT186	356
BUK542-60B	L^2FET	SOT186	356
BUK542-100A	L^2FET	SOT186	361
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BUK543-60A	L^2FET	SOT186	366
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BUK543-100A	L^2FET	SOT186	371
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BUK545-200A	L^2FET	SOT186	386
BUK545-200B	L^2FET	SOT186	386
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BUK551-60B*	L^2FET	TO220AB	620
BUK551-100A	L^2FET	TO220AB	391
BUK551-100B	L^2FET	TO220AB	391
BUK552-60A	L^2FET	TO220AB	396
BUK552-60B	L^2FET	TO220AB	396
BUK552-100A	L^2FET	TO220AB	401
BUK552-100B	L^2FET	TO220AB	401

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* Preliminary device data: please refer to separate section.

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BUK553-100A	L^2FET	TO220AB	411
BUK553-100B	L^2FET	TO220AB	411
BUK554-200A	L^2FET	TO220AB	416
BUK554-200B	L^2FET	TO220AB	416
BUK555-60A	L^2FET	TO220AB	421
BUK555-60B	L^2FET	TO220AB	421
BUK555-100A	L^2FET	TO220AB	426
BUK555-100B	L^2FET	TO220AB	426
BUK555-200A	L^2FET	TO220AB	431
BUK555-200B	L^2FET	TO220AB	431
BUK556-60A*	L^2FET	TO220AB	625
BUK571-60A*	L^2FET	SOT186A	630
BUK571-60B*	L^2FET	SOT186A	630
BUK571-100A*	L^2FET	SOT186A	635
BUK571-100B*	L^2FET	SOT186A	635
BUK572-60A*	L^2FET	SOT186A	640
BUK572-60B*	L^2FET	SOT186A	640
BUK572-100A*	L^2FET	SOT186A	645
BUK572-100B*	L^2FET	SOT186A	645
BUK573-60A*	L^2FET	SOT186A	650
BUK573-60B*	L^2FET	SOT186A	650
BUK573-100A*	L^2FET	SOT186A	655
BUK573-100B*	L^2FET	SOT186A	655
BUK575-60A*	L^2FET	SOT186A	660
BUK575-60B*	L^2FET	SOT186A	660
BUK575-100A*	L^2FET	SOT186A	665
BUK575-100B*	L^2FET	SOT186A	665
BUK575-200A*	L^2FET	SOT186A	670
BUK575-200B*	L^2FET	SOT186A	670
BUK617-500AE	FREDFET	SOT227B	436
BUK617-500BE	FREDFET	SOT227B	436
BUK627-500A	FREDFET	SOT199	441
BUK627-500B	FREDFET	SOT199	441

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* Preliminary device data: please refer to separate section.

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BUK637-400B	FREDFET	SOT93	447
BUK637-500A	FREDFET	SOT93	452
BUK637-500B	FREDFET	SOT93	452
BUK638-500A	FREDFET	SOT93	457
BUK638-500B	FREDFET	SOT93	457
BUK638-800A*	FREDFET	SOT93	675
BUK638-800B*	FREDFET	SOT93	675
BUK638-1000A*	FREDFET	SOT93	680
BUK638-1000B*	FREDFET	SOT93	680
BUK655-500A	FREDFET	TO220AB	462
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BUK657-400A	FREDFET	TO220AB	467
BUK657-400B	FREDFET	TO220AB	467
BUK657-500A	FREDFET	TO220AB	472
BUK657-500B	FREDFET	TO220AB	472
BUK793-60A*	SENSORFET	SOT263	683
BUK795-60A*	SENSORFET	SOT263	689
BUK993-60A*	L^2SENSORFET	SOT263	695
BUK995-60A*	L^2SENSORFET	SOT263	701

Notes

* Preliminary device data: please refer to separate section.

Selection guide

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
60	0.013	50	50	230	BUK439-60A	MOSFET N	SOT93
60	0.015	50	50	230	BUK539-60A	L^2FET	SOT93
60	0.026	25	50	150	BUK556-60A	L^2FET	TO220AB
60	0.028	29	52	150	BUK456-60A	MOSFET N	TO220AB
60	0.028	29	50	125	BUK436-60A	MOSFET N	SOT93
60	0.028	29	30	45	BUK426-60A	MOSFET N	SOT199
60	0.03	29	51	150	BUK456-60B	MOSFET N	TO220AB
60	0.03	29	30	45	BUK426-60B	MOSFET N	SOT199
60	0.033	29	46	125	BUK436-60B	MOSFET N	SOT93
60	0.038	20	41	125	BUK455-60A	MOSFET N	TO220AB
60	0.038	20	21	30	BUK475-60A	MOSFET N	SOT186A
60	0.038	20	21	30	BUK445-60A	MOSFET N	SOT186
60	0.042	20	39	125	BUK555-60A	L^2FET	TO220AB
60	0.042	20	20	30	BUK575-60A	L^2FET	SOT186A
60	0.042	20	20	30	BUK545-60A	L^2FET	SOT186
60	0.045	20	38	125	BUK795-60A	SENSORFET	SOT263
60	0.045	20	38	125	BUK455-60B	MOSFET N	TO220AB
60	0.045	20	20	30	BUK445-60B	MOSFET N	SOT186
60	0.045	20	20	30	BUK475-60B	MOSFET N	SOT186A
60	0.055	20	35	125	BUK555-60B	L^2FET	TO220AB
60	0.055	20	34	125	BUK995-60A	L^2SENSORFET	SOT263
60	0.055	20	18	30	BUK575-60B	L^2FET	SOT186A
60	0.055	20	18	30	BUK545-60B	L^2FET	SOT186
60	0.08	10	22	75	BUK453-60A	MOSFET N	TO220AB
60	0.08	9	13	25	BUK473-60A	MOSFET N	SOT186A
60	0.08	9	13	25	BUK443-60A	MOSFET N	SOT186
60	0.085	10	21	75	BUK553-60A	L^2FET	TO220AB
60	0.085	10	13	25	BUK573-60A	L^2FET	SOT186A
60	0.085	10	13	25	BUK543-60A	L^2FET	SOT186
60	0.1	10	20	75	BUK553-60B	L^2FET	TO220AB
60	0.1	10	20	75	BUK793-60A	SENSORFET	SOT263
60	0.1	10	20	75	BUK453-60B	MOSFET N	TO220AB
60	0.1	10	12	25	BUK543-60B	L^2FET	SOT186
60	0.1	9	12	25	BUK443-60B	MOSFET N	SOT186
60	0.1	9	12	25	BUK473-60B	MOSFET N	SOT186A
60	0.1	10	12	25	BUK573-60B	L^2FET	SOT186A
60	0.12	10	18	75	BUK993-60A	L^2SENSORFET	SOT263

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
60	0.13	8.5	15	60	BUK452-60A	MOSFET N	TO220AB
60	0.13	8.5	10	22	BUK472-60A	MOSFET N	SOT186A
60	0.13	8.5	10	22	BUK442-60A	MOSFET N	SOT186
60	0.15	8.5	9.2	22	BUK542-60A	L^2FET	SOT186
60	0.15	8.5	9.2	22	BUK472-60B	MOSFET N	SOT186A
60	0.15	8.5	9.2	22	BUK572-60A	L^2FET	SOT186A
60	0.15	8.5	9.2	22	BUK442-60B	MOSFET N	SOT186
60	0.15	8.5	14	60	BUK552-60A	L^2FET	TO220AB
60	0.15	8.5	14	60	BUK452-60B	MOSFET N	TO220AB
60	0.18	8.5	8.4	22	BUK572-60B	L^2FET	SOT186A
60	0.18	8.5	8.4	22	BUK542-60B	L^2FET	SOT186
60	0.18	8.5	13	60	BUK552-60B	L^2FET	TO220AB
60	0.4	4.0	5.0	20	BUK471-60A	MOSFET N	SOT186A
60	0.4	4.0	5.0	40	BUK451-60A	MOSFET N	TO220AB
60	0.4	4.0	5.0	20	BUK441-60A	MOSFET N	SOT186
60	0.4	4.0	5.0	40	BUK551-60A	L^2FET	TO220AB
60	0.4	4	5.0	20	BUK541-60A	L^2FET	SOT186
60	0.4	4.0	5.0	20	BUK571-60A	L^2FET	SOT186A
60	0.5	4.0	5.0	40	BUK451-60B	MOSFET N	TO220AB
60	0.5	4.0	5.0	40	BUK551-60B	L^2FET	TO220AB
60	0.5	4.0	4.8	20	BUK571-60B	L^2FET	SOT186A
60	0.5	4.0	4.8	20	BUK441-60B	MOSFET N	SOT186
60	0.5	4.0	4.8	20	BUK471-60B	MOSFET N	SOT186A
60	0.5	4.0	4.8	20	BUK541-60B	L^2FET	SOT186

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
100	0.013	55	110	310	BUK416-100AE	MOSFET N	SOT227B
100	0.016	55	100	310	BUK416-100BE	MOSFET N	SOT227B
100	0.057	15	34	150	BUK456-100A	MOSFET N	TO220AB
100	0.057	15	33	125	BUK436-100A	MOSFET N	SOT93
100	0.057	15	20	45	BUK426-100A	MOSFET N	SOT199
100	0.065	15	32	150	BUK456-100B	MOSFET N	TO220AB
100	0.065	15	31	125	BUK436-100B	MOSFET N	SOT93
100	0.065	15	19	45	BUK426-100B	MOSFET N	SOT199
100	0.08	13	26	125	BUK455-100A	MOSFET N	TO220AB
100	0.08	13	14	30	BUK475-100A	MOSFET N	SOT186A
100	0.08	13	14	30	BUK445-100A	MOSFET N	SOT186
100	0.085	13	25	125	BUK555-100A	L^2FET	TO220AB
100	0.085	13	13	30	BUK545-100A	L^2FET	SOT186
100	0.085	13	13	30	BUK575-100A	L^2FET	SOT186A
100	0.1	13	23	125	BUK455-100B	MOSFET N	TO220AB
100	0.1	13	12	30	BUK475-100B	MOSFET N	SOT186A
100	0.1	13	12	30	BUK445-100B	MOSFET N	SOT186
100	0.11	13	22	125	BUK555-100B	L^2FET	TO220AB
100	0.11	13	12	30	BUK545-100B	L^2FET	SOT186
100	0.11	13	12	30	BUK575-100B	L^2FET	SOT186A
100	0.16	5	9	25	BUK443-100A	MOSFET N	SOT186
100	0.16	5	9	25	BUK473-100A	MOSFET N	SOT186A
100	0.16	5	14	75	BUK453-100A	MOSFET N	TO220AB
100	0.18	5	8.3	25	BUK573-100A	L^2FET	SOT186A
100	0.18	5	8.3	25	BUK543-100A	L^2FET	SOT186
100	0.18	6.5	13	75	BUK553-100A	L^2FET	TO220AB
100	0.2	5	8	25	BUK473-100B	MOSFET N	SOT186A
100	0.2	5	8	25	BUK443-100B	MOSFET N	SOT186
100	0.2	5	13	75	BUK453-100B	MOSFET N	TO220AB
100	0.22	5	7.5	25	BUK543-100B	L^2FET	SOT186
100	0.22	5	7.5	25	BUK573-100B	L^2FET	SOT186A
100	0.22	6.5	12	75	BUK553-100B	L^2FET	TO220AB
100	0.25	5.5	6.6	22	BUK442-100A	MOSFET N	SOT186
100	0.25	5.5	6.6	22	BUK472-100A	MOSFET N	SOT186A
100	0.25	5.5	11	60	BUK452-100A	MOSFET N	TO220AB
100	0.28	5.5	6.3	22	BUK572-100A	L^2FET	SOT186A
100	0.28	5.5	6.3	22	BUK542-100A	L^2FET	SOT186

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
100	0.28	5.5	10	60	BUK552-100A	L^2FET	TO220AB
100	0.3	5.5	6.1	22	BUK442-100B	MOSFET N	SOT186
100	0.3	5.5	6.1	22	BUK472-100B	MOSFET N	SOT186A
100	0.3	5.5	10	60	BUK452-100B	MOSFET N	TO220AB
100	0.35	5.5	8.5	60	BUK552-100B	L^2FET	TO220AB
100	0.35	5.5	5.6	22	BUK542-100B	L^2FET	SOT186
100	0.35	5.5	5.6	22	BUK572-100B	L^2FET	SOT186A
100	0.85	2.5	3.0	20	BUK441-100A	MOSFET N	SOT186
100	0.85	2.5	3.0	40	BUK451-100A	MOSFET N	TO220AB
100	0.85	2.5	3.0	20	BUK571-100A	L^2FET	SOT186A
100	0.85	2.5	3.0	20	BUK471-100A	MOSFET N	SOT186A
100	0.85	2.5	3.0	40	BUK551-100A	L^2FET	TO220AB
100	0.85	2.5	3.0	20	BUK541-100A	L^2FET	SOT186
100	1.1	2.5	3.0	20	BUK541-100B	L^2FET	SOT186
100	1.1	2.5	3.0	40	BUK451-100B	MOSFET N	TO220AB
100	1.1	2.5	3.0	40	BUK551-100B	L^2FET	TO220AB
100	1.1	2.5	3.0	20	BUK471-100B	MOSFET N	SOT186A
100	1.1	2.5	3.0	20	BUK571-100B	L^2FET	SOT186A
100	1.1	2.5	3.0	20	BUK441-100B	MOSFET N	SOT186

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
200	0.035	32	63	310	BUK416-200AE	MOSFET N	SOT227B
200	0.045	32	55	310	BUK416-200BE	MOSFET N	SOT227B
200	0.16	10	19	150	BUK456-200A	MOSFET N	TO220AB
200	0.16	10	19	125	BUK436-200A	MOSFET N	SOT93
200	0.16	10	11	45	BUK426-200A	MOSFET N	SOT199
200	0.2	10	17	125	BUK436-200B	MOSFET N	SOT93
200	0.2	10	17	150	BUK456-200B	MOSFET N	TO220AB
200	0.2	10	10	45	BUK426-200B	MOSFET N	SOT199
200	0.23	7	7.6	30	BUK545-200A	L^2FET	SOT186
200	0.23	7	7.6	30	BUK575-200A	L^2FET	SOT186A
200	0.23	7	7.6	30	BUK475-200A	MOSFET N	SOT186A
200	0.23	7	7.6	30	BUK445-200A	MOSFET N	SOT186
200	0.23	7	14	125	BUK555-200A	L^2FET	TO220AB
200	0.23	7	14	125	BUK455-200A	MOSFET N	TO220AB
200	0.28	7	7	30	BUK545-200B	L^2FET	SOT186
200	0.28	7	7	30	BUK445-200B	MOSFET N	SOT186
200	0.28	7	7	30	BUK575-200B	L^2FET	SOT186A
200	0.28	7	7	30	BUK475-200B	MOSFET N	SOT186A
200	0.28	7	13	125	BUK555-200B	L^2FET	TO220AB
200	0.28	7	13	125	BUK455-200B	MOSFET N	TO220AB
200	0.4	3.5	9.2	90	BUK454-200A	MOSFET N	TO220AB
200	0.4	3.5	9.2	90	BUK554-200A	L^2FET	TO220AB
200	0.4	3.5	5.3	25	BUK474-200A	MOSFET N	SOT186A
200	0.4	3.5	5.3	25	BUK444-200A	MOSFET N	SOT186
200	0.5	3.5	8.2	90	BUK554-200B	L^2FET	TO220AB
200	0.5	3.5	8.2	90	BUK454-200B	MOSFET N	TO220AB
200	0.5	3.5	4.7	25	BUK474-200B	MOSFET N	SOT186A
200	0.5	3.5	4.7	25	BUK444-200B	MOSFET N	SOT186

PowerMOS transistors

Selection guide

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
400	0.4	6.5	6.9	45	BUK427-400A	MOSFET N	SOT199
400	0.4	6.5	14	180	BUK437-400A	MOSFET N	SOT93
400	0.4	6.5	13	150	BUK457-400A	MOSFET N	TO220AB
400	0.5	6.5	6.2	45	BUK427-400B	MOSFET N	SOT199
400	0.5	6.5	14	180	BUK637-400A	FREDFET	SOT93
400	0.5	6.5	13	150	BUK657-400A	FREDFET	TO220AB
400	0.5	6.5	12	180	BUK437-400B	MOSFET N	SOT93
400	0.5	6.5	11	150	BUK457-400B	MOSFET N	TO220AB
400	0.6	6.5	12	180	BUK637-400B	FREDFET	SOT93
400	0.6	6.5	11	150	BUK657-400B	FREDFET	TO220AB
400	0.8	2.5	7.3	100	BUK455-400A	MOSFET N	TO220AB
400	0.8	2.5	4.0	30	BUK475-400A	MOSFET N	SOT186A
400	0.8	2.5	4	30	BUK445-400A	MOSFET N	SOT186
400	1	2.5	6.5	100	BUK455-400B	MOSFET N	TO220AB
400	1	2.5	3.8	30	BUK445-400B	MOSFET N	SOT186
400	1.0	2.5	3.8	30	BUK475-400B	MOSFET N	SOT186A
400	1.5	1.5	4.6	75	BUK454-400A	MOSFET N	TO220AB
400	1.5	1.5	2.7	25	BUK444-400A	MOSFET N	SOT186
400	1.5	1.5	2.7	25	BUK474-400A	MOSFET N	SOT186A
400	1.8	1.5	4.2	75	BUK454-400B	MOSFET N	TO220AB
400	1.8	1.5	2.4	25	BUK444-400B	MOSFET N	SOT186
400	1.8	1.5	2.4	25	BUK474-400B	MOSFET N	SOT186A

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
500	0.13	16	32	310	BUK417-500AE	MOSFET N	SOT227B
500	0.15	16	29	310	BUK617-500AE	FREDFET	SOT227B
500	0.16	16	28	310	BUK417-500BE	MOSFET N	SOT227B
500	0.18	16	27	310	BUK617-500BE	FREDFET	SOT227B
500	0.4	8	6.8	45	BUK428-500A	MOSFET N	SOT199
500	0.4	8	15	220	BUK438-500A	MOSFET N	SOT93
500	0.46	8	14.6	220	BUK638-500A	FREDFET	SOT93
500	0.5	8	6.1	45	BUK428-500B	MOSFET N	SOT199
500	0.5	8	13.5	220	BUK438-500B	MOSFET N	SOT93
500	0.6	6.5	5.6	45	BUK427-500A	MOSFET N	SOT199
500	0.6	8	13	220	BUK638-500B	FREDFET	SOT93
500	0.6	6.5	11	180	BUK437-500A	MOSFET N	SOT93
500	0.6	6.5	10	150	BUK457-500A	MOSFET N	TO220AB
500	0.65	6.5	5.6	45	BUK627-500A	FREDFET	SOT199
500	0.65	6.5	11	180	BUK637-500A	FREDFET	SOT93
500	0.65	6.5	10	150	BUK657-500A	FREDFET	TO220AB
500	0.8	6.5	9	150	BUK457-500B	MOSFET N	TO220AB
500	0.8	6.5	9	150	BUK657-500B	FREDFET	TO220AB
500	0.8	6.5	4.8	45	BUK627-500B	FREDFET	SOT199
500	0.8	6.5	4.8	45	BUK427-500B	MOSFET N	SOT199
500	0.8	6.5	10	180	BUK637-500B	FREDFET	SOT93
500	0.8	6.5	10	180	BUK437-500B	MOSFET N	SOT93
500	1.3	2.5	5.7	100	BUK455-500A	MOSFET N	TO220AB
500	1.3	2.5	5.7	100	BUK655-500A	FREDFET	TO220AB
500	1.3	2.5	3.1	30	BUK445-500A	MOSFET N	SOT186
500	1.3	2.5	3.1	30	BUK475-500A	MOSFET N	SOT186A
500	1.5	2.5	5.3	100	BUK655-500B	FREDFET	TO220AB
500	1.5	2.5	5.3	100	BUK455-500B	MOSFET N	TO220AB
500	1.5	2.5	2.9	30	BUK475-500B	MOSFET N	SOT186A
500	1.5	2.5	2.9	30	BUK445-500B	MOSFET N	SOT186
500	2.3	1.5	3.7	75	BUK454-500A	MOSFET N	TO220AB
500	2.3	1.2	2.1	25	BUK444-500A	MOSFET N	SOT186
500	2.3	1.2	2.1	25	BUK474-500A	MOSFET N	SOT186A
500	2.8	1.5	3.3	75	BUK454-500B	MOSFET N	TO220AB
500	2.8	1.2	1.9	25	BUK444-500B	MOSFET N	SOT186
500	2.8	1.2	1.9	25	BUK474-500B	MOSFET N	SOT186A
500	6	0.6	1.7	50	BUK453-500A	MOSFET N	TO220AB

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V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
500	7	0.6	1.6	50	BUK453-500B	MOSFET N	TO220AB
600	1	6.5	9	180	BUK437-600A	MOSFET N	SOT93
600	1	6.5	4.3	45	BUK427-600A	MOSFET N	SOT199
600	1.2	6.5	7.8	180	BUK437-600B	MOSFET N	SOT93
600	1.2	6.5	7.1	150	BUK457-600B	MOSFET N	TO220AB
600	1.2	6.5	3.9	45	BUK427-600B	MOSFET N	SOT199
600	2	2.5	4.5	100	BUK455-600A	MOSFET N	TO220AB
600	2.0	2.5	2.5	30	BUK445-600A	MOSFET N	SOT186
600	2.0	2.5	2.5	20	BUK475-600A	MOSFET N	SOT186A
600	2.5	2.5	4	100	BUK455-600B	MOSFET N	TO220AB
600	2.5	2.5	2.2	30	BUK475-600B	MOSFET N	SOT186A
600	2.5	2.5	2.2	30	BUK445-600B	MOSFET N	SOT186
600	4	1.2	2.8	75	BUK454-600A	MOSFET N	TO220AB
600	4	1.2	1.6	25	BUK444-600A	MOSFET N	SOT186
600	4.0	1.2	1.6	25	BUK474-600A	MOSFET N	SOT186A
600	4.5	1.2	2.6	75	BUK454-600B	MOSFET N	TO220AB
600	4.5	1.2	1.5	25	BUK474-600B	MOSFET N	SOT186A
600	4.5	1.2	1.5	25	BUK444-600B	MOSFET N	SOT186

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
800	1.5	4	7.6	220	BUK438-800A	MOSFET N	SOT93
800	1.5	4.0	3.4	45	BUK428-800A	MOSFET N	SOT199
800	1.8	4	7.3	220	BUK638-800A	FREDFET	SOT93
800	2.0	4	6.6	220	BUK438-800B	MOSFET N	SOT93
800	2.0	4.0	3.0	45	BUK428-800B	MOSFET N	SOT199
800	2.4	4	6.3	220	BUK638-800B	FREDFET	SOT93
800	3	1.5	4	125	BUK436-800A	MOSFET N	SOT93
800	3	1.5	4	125	BUK456-800A	MOSFET N	TO220AB
800	3	1.5	2.4	45	BUK426-800A	MOSFET N	SOT199
800	3	1.5	2.0	30	BUK476-800A	MOSFET N	SOT186A
800	3	1.5	2	30	BUK446-800A	MOSFET N	SOT186
800	4	1.5	3.5	125	BUK456-800B	MOSFET N	TO220AB
800	4	1.5	3.5	125	BUK436-800B	MOSFET N	SOT93
800	4	1.5	2.1	45	BUK426-800B	MOSFET N	SOT199
800	4	1.5	1.7	30	BUK476-800B	MOSFET N	SOT186A
800	4	1.5	1.7	30	BUK446-800B	MOSFET N	SOT186
800	·6	1	2.4	100	BUK454-800A	MOSFET N	TO220AB
800	6	1.0	1.4	30	BUK444-800A	MOSFET N	SOT186
800	6.0	1.0	1.4	30	BUK474-800A	MOSFET N	SOT186A
800	8	1	2.0	100	BUK454-800B	MOSFET N	TO220AB
800	8	1	1.2	30	BUK444-800B	MOSFET N	SOT186
800	8.0	1.0	1.2	30	BUK474-800B	MOSFET N	SOT186A

V_{DS} (V)	$R_{DS(ON)}$ (Ω)	@I_D (A)	I_D (A)	P_D (W)	TYPE NUMBER	TECHNOLOGY	ENVELOPE
1000	0.8	7.5	12.2	310	BUK416-1000AE	MOSFET N	SOT227B
1000	1.0	7.5	10.9	310	BUK416-1000BE	MOSFET N	SOT227B
1000	2.0	3.5	6.5	220	BUK438-1000A	MOSFET N	SOT93
1000	2.0	3.5	2.9	45	BUK428-1000A	MOSFET N	SOT199
1000	2.4	3.5	6.2	220	BUK638-1000A	FREDFET	SOT93
1000	2.6	3.5	5.7	220	BUK438-1000B	MOSFET N	SOT93
1000	2.6	3.5	2.6	45	BUK428-1000B	MOSFET N	SOT199
1000	3.0	3.5	5.6	220	BUK638-1000B	FREDFET	SOT93
1000	4	1.5	3.5	125	BUK436-1000A	MOSFET N	SOT93
1000	4	1.5	3.5	125	BUK456-1000A	MOSFET N	TO220AB
1000	4	1.5	2.1	45	BUK426-1000A	MOSFET N	SOT199
1000	4	1.5	1.7	30	BUK476-1000A	MOSFET N	SOT186A
1000	4	1.5	1.7	30	BUK446-1000A	MOSFET N	SOT186
1000	5	1.5	3.1	125	BUK456-1000B	MOSFET N	TO220AB
1000	5	1.5	3.1	125	BUK436-1000B	MOSFET N	SOT93
1000	5	1.5	1.9	45	BUK426-1000B	MOSFET N	SOT199
1000	5	1.5	1.5	30	BUK446-1000B	MOSFET N	SOT186
1000	5	1.5	1.5	30	BUK476-1000B	MOSFET N	SOT186A

Introduction

INTRODUCTION

TYPE NUMBERS

Philips Power MOSFETs and related products are all covered by the Pro-Electron type numbering system, the whole BUK series having been reserved for Philips Components.

The type numbers are made up as follows:

BUK followed by a 3-digit code and a hyphen followed by a voltage and a single or two letter suffix.

The 3-digit type codes have been chosen to a definite scheme. The first digit according to technology, the second digit according to outline, and the third digit according to approximate chip size. The overall scheme is shown in the following table. Items in parentheses have not yet been released. They are included to indicate future possible use.

DIGIT	1st	2nd	3rd
CODE	**TECHNOLOGY**	**OUTLINE**	**CHIP SIZE (mm^2)**
0	(-)	(-)	(-)
1	(HSIPS)	SOT227	2
2	(-)	SOT199	4
3	(-)	SOT93	6
4	NMOSFET	SOT186	8
5	L^2FET	TO220AB	14
6	FREDFET	(SOT82)	20
7	SENSORFET	(SOT186A)	25
8	(IGBT)	(SOT223)	36
9	L^2SENSORFET	SOT263	42

The voltage code is an integer of two to four digits corresponding to the component's main voltage rating V_{DS}.

The suffix is usually just one letter, either A or B. These indicate two grades of $R_{DS(ON)}$ from the same basic product. A second letter suffix is be used for ISOTOP modules to indicate the number of chips within the outline. 'A' indicating one chip, 'B' indicating two chips and so on.

EXAMPLE

BUK543-60A is Logic Level Fet in SOT186 outline, with a 6 mm^2 chip, 60 V rating V_{DS} and top-grade $R_{DS(ON)}$.

FEATURES

HIGHER MAXIMUM JUNCTION TEMPERATURE

All the low voltage types (up to 200V) in TO220AB outline are now published with Tj max 175 °C

LOGIC LEVEL GATE

A range of products is introduced with logic level gates. These can be fully switched on with only 5 V gate drive, a level compatible with being controlled by standard integrated circuits.

FREDFETS

A range of products is introduced with integral fast reverse recovery diode. These offer superior switching performance in inductive load applications such as motor-control in which the body-drain diode is often forced to conduct.

RUGGEDNESS

Some of the products in this book are already published with an avalanche energy rating, for unclamped inductive load turn-off. Those types not yet featuring this in the data will also be assigned an energy rating in the near future. The types that already have this published are 100% tested on an unclamped inductive switching gear.

APPLICATIONS

Application information for Power MOSFET as well as other Philips power products is published in a separate handbook.

FUTURE PRODUCTS

Philips Components are working intensively on bringing new products to the market in PowerMOS and related technologies. These products will include the following technologies:

SENSORFETS

N-channel PowerMOS transistors with integrated zero-loss current sensing in 5-terminal outline similar to TO220 (SOT263). Logic level types as well as standard gate drive types. Preliminary data is included for four types.

IGBTS

Insulated Gate Bipolar Transistors are under development. These will have lower on-state dissipation than ordinary Power MOSFETs with the same chip area and voltage rating.

HSIPS

Monolithic High Side Intelligent Power Switches are being developed which will have overload protection and status indication. These are intended for automotive applications.

NAKED CHIP DATA

Philips Components PowerMOS transistors are already available as naked chips for mounting in hybrid applications. Data for these and other Philips power semiconductors are contained in a separate chip data handbook.

MOS HANDLING

- The input (gate-source) must be protected against voltages at ± 30 V for power transistors. Even short-term voltages in excess of this level can destroy transistors.
- MOSFETs have to be protected against electrostatic charges. The general handling regulation for electrostatic-discharge sensitive devices (ESDs) should be observed. This sensitivity of the devices increases with decreasing chip area and the resulting smaller input capacitance C_{iss}.
- The transistors are packed in anti-static containers to protect them against electrostatic charge during shipping. When PowerMOS transistors are assembled, the same regulations should be observed as those which generally apply to MOS devices.
- In circuit design, it should be observed that the transistor is not operated with open-circuit terminals.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

Definitions of terms used

Electronic device.

An electronic tube or valve, transistor or other semiconductor device.

Note:
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic.

A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for state or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device.

An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating.

A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note:
Limiting conditions may be either maxima or minima.

Rating system.

The set of principles upon which ratings are established and which determine their interpretation.

Note:
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

Absolute maximum rating system

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

Design maximum rating system

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

PowerMOS transistors

Introduction

The values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

Design centre rating system

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in the average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices. The equipment manufacturer should design so that initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the state normal supply voltage.

LETTER SYMBOLS FOR CURRENTS, VOLTAGES, POWER AND RESISTANCE.

The basic letters to be used are:

I, i = current;	V, v = voltage;
t = time;	T = temperature;
Q = charge;	P, p = power;
R, r = resistance;	C = capacitance;

L = inductance.

Lowercase basic letters shall be used for the representatation of instantaneous values which vary with time.
In all other instances uppercase letters shall be used.

Subscript(s)	Meaning(s)
amb	ambient
(AV), (av)	average value
(BO)	breakover
(BR)	breakdown
case	case
C	controllable, collector terminal
D, d	forward off-state, non-triggered (gate voltage or current), Drain terminal
F, f	forward, fall
G, g	gate terminal
H	holding
I, i	input
J, j	junction
L	latching
M, m	peak or crest value
min	minimum
O, o	output, open circuit
(OV)	overload
P, p	pulse (on) on-state
Q, q	turn-off
R, r	as first subscript: reverse, rise
	as second subscript: repetitive, recovery
(RMS), (rms)	RMS value
S, s	as first subscript: storage, stray, series, source switching
	as second subscript: non-repetitive
stg	storage
T, t	forward on-state, triggered (gate voltage or current)
th	thermal
(TO)	threshold
tot	total
W	working
Z	reference or regulator (i.e. zener)

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	

Pro electron type designation code for semiconductor devices

Pro electron type designation code for semiconductor devices

Basic type number

This type designation code applies to discrete semiconductor devices - as opposed to integrated circuits -, multiples of such devices, semiconductor chips and darlington transistors.

A basic type number consists of two letters followed by a serial number.

FIRST LETTER

The first letter gives information about the material for the active part of the device.

A germanium or other material with band gap of 0.6 to 1.0 eV
B silicon or other material with band gap 1.0 to 1.3 eV
C gallium-arsenide or other material with band gap 1.3 eV or more
R compound materials (e.g. cadmium-sulphide)

SECOND LETTER

The second letter indicates the function for which the device is primarily designed (see note 1). The same letter could be used for multi-chip devices with similar elements.

A	diode	:	signal, low power (see note 2)
B	diode	:	variable capacitance
C	transistor	:	low power, audio frequency
D	transistor	:	power, audio frequency
E	diode	:	tunnel
F	transistor	:	low power, high frequency
G	multiple of dissimilar devices; miscellaneous devices	:	(see note 3)
H	diode	:	magnetic sensitive
L	transistor	:	power, high frequency
N	photo coupler	:	
P	radiation detector	:	high sensitive phototransistor, solar-cell (see note 3)
Q	radiation generator	:	light-emitting diode LED; laser (see note 3)
R	control or switching device	:	low power (see note 3); e.g. thyristors, diacs, triacs, unijunction transistors UJT, programmable unijunction transistors PUT, silicon bidirectional switch SBS, opto-triacs, etc.
S	transistor	:	low power switching
T	control or switching device	:	power (see note 3); e.g. thyristors, triacs
U	transistor	:	power switching
W	surface acoustic wave device	:	
X	diode	:	multiplier; e.g. varactor, step recovery
Y	diode	:	rectifying, booster
Z	diode	:	voltage reference or regulator, transient voltage suppressor diode (see note 3)

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment (see note 4). One letter (Z, Y, X etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/ professional equipment (see note 4). This letter has no fixed meaning, with the following exceptions:

A : for triacs after second letter 'R' or 'T'
F : for emitters and receivers in fibre-optic communication after second letter 'G', 'P' or 'Q' (see note 5)
L : for lasers in non-fibre-optic applications, after second letter 'G' or 'Q' (see note 5)
O : for opto-triacs after second letter 'R'
T : for 3-state bicolour LEDs after second letter 'Q'
W : for transient voltage suppressor diodes after second letter 'Z'

Pro electron type designation code for semiconductor devices

TYPE DESIGNATION

EXAMPLES OF BASIC TYPE NUMBERS

AA112 : germanium, low-power signal diode (consumer type)
ACY32 : germanium,, low-power AF transistor (industrial type)
BD232 : silicon, power AF transistor (consumer type)
CQY17 : GaAs, light-emitting diode (industrial type)
RPY84 : CdS, photo-conductive cell (industrial type)

Version letter(s)

One or two letters may be added to the basic type number to indicate a minor variant of the basic type either electrically or mechanically. The letters never have a fixed meaning, except:

letter 'R' indicating reverse polarity
letter 'W' for surface mounted devices (SMD).

Suffix

Sub-classification can be used for devices supplied in a wide range of variants called associated types.

The following sub-coding suffixes are in use:

VOLTAGE REFERENCE AND VOLTAGE REGULATOR DIODES

One letter and one number, preceded by a hyphen (-). The letter, if required, indicates the nominal tolerance of the zener voltage

A : 1% (according to IEC 63: series E96)
B : 2% (according to IEC 63: series E48)
C : 5% (according to IEC 63: series E24)
D : 10% (according to IEC 63: series E12)
E : 20% (according to IEC 63: series E6)

In the event of a 3% nominal tolerance the letter 'F' will be used.

The number denotes the typical operating (zener) voltage related to the nominal current rating for the whole range. The letter 'V' is used instead of the decimal point.

Example : BZY74-C6V3 or -C10.

TRANSIENT VOLTAGE SUPPRESSOR DIODES

One number, precede by a hyphen (-). The number indicates the maximum recommended continuous reversed (stand-off) voltage V_R. The letter 'V' is used instead of a decimal point.

Example : BZW70-9V1 or -39.

The letter 'B' may be used immediately after the last number to indicate bidirectional suppressor diodes.

Example : BZW10-15B.

CONVENTIONAL AND CONTROLLED AVALANCHE RECTIFIER DIODES AND THYRISTORS

One number, preceded by a hyphen (-). The number indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower./ Reversed polarity with respect to the case is indicated by letter 'R', immediately after the number.

Example : BYT-100 or -100R.

RADIATION DETECTORS

One number, preceded by a hyphen (-). The number indicates the depletion layer in µm. The resolution is indicated by a version letter.

Example : BPX10-2A.

ARRAY OF RADIATION DETECTORS AND GENERATORS

One number preceded by a hyphen. The number indicates how many basic devices are assembled into the array.

Example : BPW50-6, BPW50-9, BPW50-12.

RADIATION GENERATORS

One number, preceded by a hyphen (-). The number indicates the luminance intensity range in milli-candela (mcd).

Example : CQY54-1.

HIGH FREQUENCY POWER TRANSISTORS

One number, preceded by a hyphen (-). The number indicates the supply voltage.

Example : BLU80-24.

SEMICONDUCTOR POWER DEVICES

Under consideration.

Colour codes for small signal diodes

PREFIX			SERIAL NUMBER VERSION LETTER (if any)	
METHOD 1 2 broad bands		**METHOD II Body colour**	**METHOD I: narrow band METHOD II: one broad band followed by narrow band(s)**	
AA - brown	Z - white		0 - black	
BA - red	Y - grey	BAY - grey	1 - brown	A - brown
	X - black	BAX - black	2 - red	B - red
	W - blue	BAW - blue	3 - orange	C - orange
	V - green	BAV - green	4 - yellow	D - yellow
	T - yellow	BAT - yellow	5 - green	E - green
	S - orange	BAS - orange	6 - blue	F - blue
			7 - violet	G - violet
			8 - grey	H - grey
			9 - white	I - white

The cathode side is indicated by the broad band(s).

Notes

1. Low-power type = $R_{th\ j\text{-}c}$ > 15 K/W.
   Power type = $R_{th\ j\text{-}c}$ < 15 K/W.
2. See Pro Electron colour for small signal diodes.
3. With special third letter (see 'serial number' section).
4. When the supply of these serial numbers is exhausted, the serial number may be expanded to three figures (industrial types) and four figures (consumer types).
5. In the case of second letter 'G', the first letter should be defined in accordance with the material of the main optical device.

Product device data

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK416-100AE/BE
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in ISOTOP envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

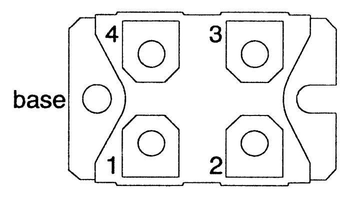
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK416	-100AE	-100BE	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	110	100	A
P_{tot}	Total power dissipation	310	310	W
$R_{DS(ON)}$	Drain-source on-state resistance	13.0	16.0	mΩ

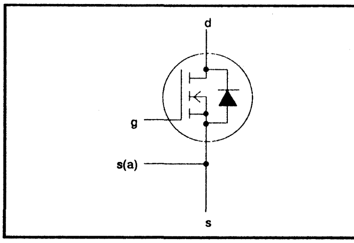
PINNING - SOT227B

PIN	DESCRIPTION
1	source
2	gate
3	drain
4	ancillary source
base	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100AE	-100BE	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	110	100	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	70	60	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	440	400	A
$I_{S(A)M}$	Ancillary Source current (pulse peak value)		-	5.0		A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	310		W
T_{stg}	Storage temperature	-	- 40	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base		$R_{th\ j\text{-}mb}$ = 0.40 K/W
From mounting base to heatsink	with heatsink compound	$R_{th\ mb\text{-}hs}$ = 0.05 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.0 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.5	5.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	200	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK416-100AE**	-	11.0	13.0	mΩ
		I_D = 55 A **BUK416-100BE**	-	14.0	16.0	mΩ

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 10 V; I_D = 55 A	50.0	70.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	7.5	10.0	nF
C_{oss}	Output capacitance		-	2.3	3.0	nF
C_{rss}	Feedback capacitance		-	0.65	1.0	nF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	100	150	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	150	250	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	750	1000	ns
t_f	Turn-off fall time	Resistive Load	-	250	350	ns
$t_{d\ on}$	Turn-on delay time	V_{DD} = 50 V; I_D = 110 A;	-	40	80	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{gen} = 3.3 Ω	-	200	300	ns
$t_{d\ off}$	Turn-off delay time	Resistive Load	-	150	200	ns
t_f	Turn-off fall time		-	70	100	ns
L_d	Internal drain inductance	Measured from contact screw on terminal 3 to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from contact screw on terminal 1 to source bond pad	-	5	-	nH

ISOLATION

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	R.M.S. voltage from terminals to mounting base	Sinusoidal voltage waveform; f = 50 - 60 Hz	-	-	2500	V
C_{isol}	Capacitance from T3 to mounting base	f = 1 MHz	-	45	-	pF

PowerMOS transistor BUK416-100AE/BE

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	110	A
I_{DRM}	Pulsed reverse drain current	-	-	-	440	A
V_{SD}	Diode forward voltage	I_F = 110 A ;V_{GS} = 0 V	-	1.1	1.7	V
t_{rr}	Reverse recovery time	I_F = 110A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	10	-	µC

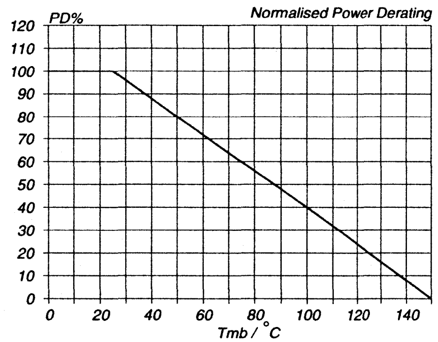


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,˚C}$ = f(T_{mb})

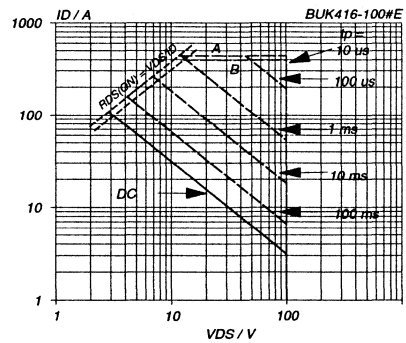


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

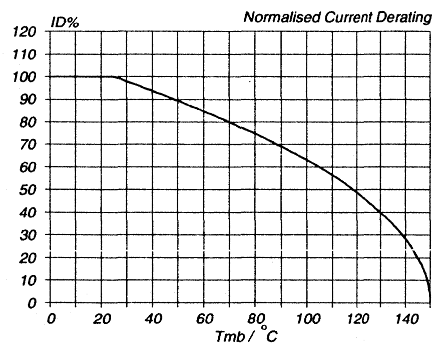


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,˚C}$ = f(T_{mb}); conditions: V_{GS} ≥ 10 V

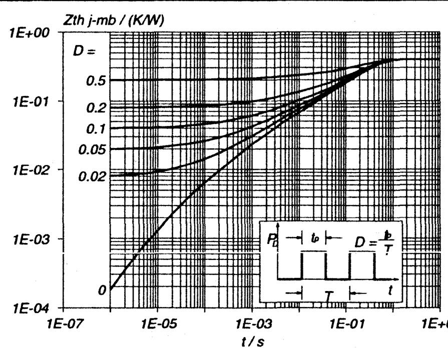


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb}$ = f(t); parameter D = t_p/T

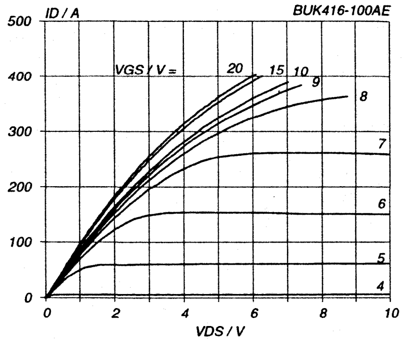


Fig.5. Typical output characteristics, $T_j = 25$ °C. $I_D = f(V_{DS})$; parameter V_{GS}

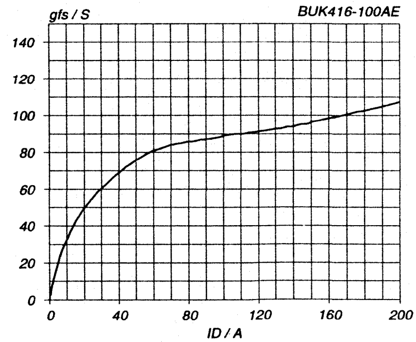


Fig.8. Typical transconductance, $T_j = 25$ °C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 10$ V

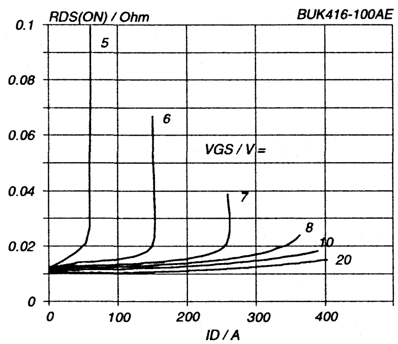


Fig.6. Typical on-state resistance, $T_j = 25$ °C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

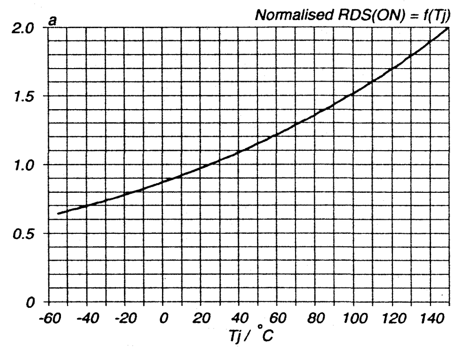


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 55$ A; $V_{GS} = 10$ V

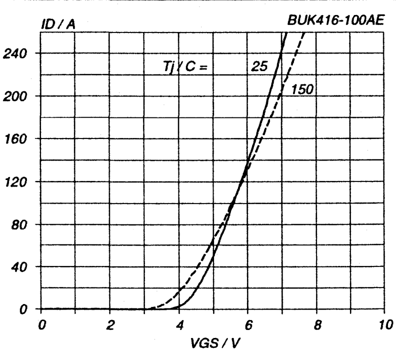


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 10$ V; parameter T_j

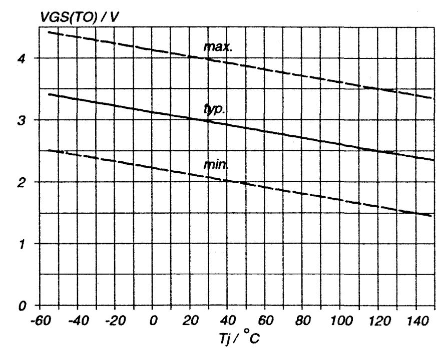


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

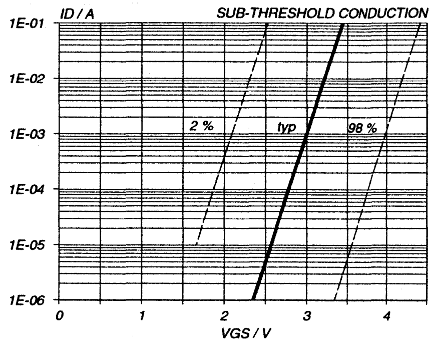


Fig. 11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

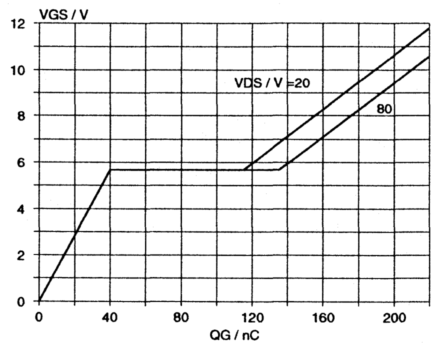


Fig. 13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 110$ A; parameter V_{DS}

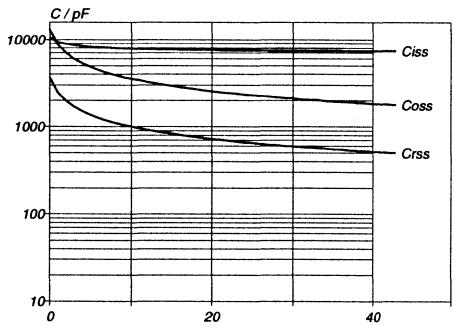


Fig. 12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

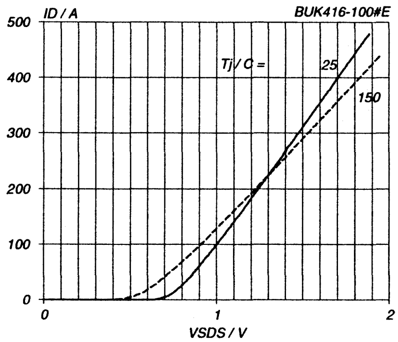


Fig. 14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK416-200AE/BE
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in ISOTOP envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

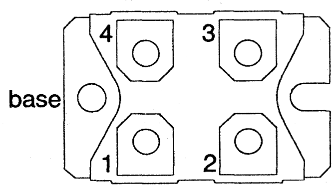
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK416	-200AE	-200BE	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	63	55	A
P_{tot}	Total power dissipation	310	310	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.035	0.045	Ω

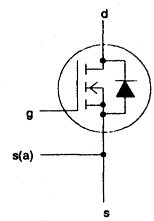
PINNING - SOT227B

PIN	DESCRIPTION
1	source
2	gate
3	drain
4	ancillary source
base	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200AE	-200BE	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	63	55	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	40	35	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	250	220	A
$I_{S(A)M}$	Ancillary Source current (pulse peak value)		-	5.0		A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	310		W
T_{stg}	Storage temperature	-	- 40	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base		$R_{th\ j\text{-}mb}$ = 0.40 K/W
From mounting base to heatsink	with heatsink compound	$R_{th\ mb\text{-}hs}$ = 0.05 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.0 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.5	5.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	200	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK416-200AE**	-	30	35	mΩ
		I_D = 32 A **BUK416-200BE**	-	35	45	mΩ

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 15 V; I_D = 32 A	30.0	55.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	7.5	10.0	nF
C_{oss}	Output capacitance		-	1.5	2.0	nF
C_{rss}	Feedback capacitance		-	0.30	0.5	nF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	100	150	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	150	250	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	750	1000	ns
t_f	Turn-off fall time	Resistive Load	-	200	280	ns
$t_{d\ on}$	Turn-on delay time	V_{DD} = 50 V; I_D = 63 A;	-	40	80	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{gen} = 3.3 Ω	-	200	300	ns
$t_{d\ off}$	Turn-off delay time	Resistive Load	-	150	200	ns
t_f	Turn-off fall time		-	60	90	ns
L_d	Internal drain inductance	Measured from contact screw on terminal 3 to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from contact screw on terminal 1 to source bond pad	-	5	-	nH

ISOLATION

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	R.M.S. voltage from terminals to mounting base	Sinusoidal voltage waveform; f = 50 - 60 Hz	-	-	2500	V
C_{isol}	Capacitance from T3 to mounting base	f = 1 MHz	-	45	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	63	A
I_{DRM}	Pulsed reverse drain current	-	-	-	250	A
V_{SD}	Diode forward voltage	I_F = 63 A ;V_{GS} = 0 V	-	1.0	1.7	V
t_{rr}	Reverse recovery time	I_F = 63 A; -dI_F/dt = 100 A/µs;	-	650	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	14	-	µC

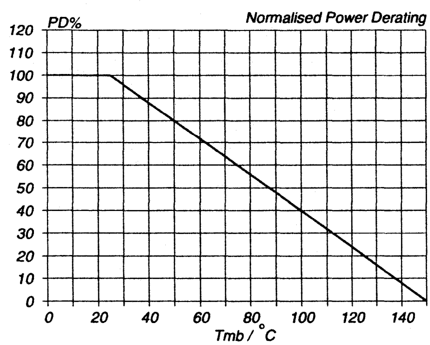


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,˚C}$ = f(T_{mb})

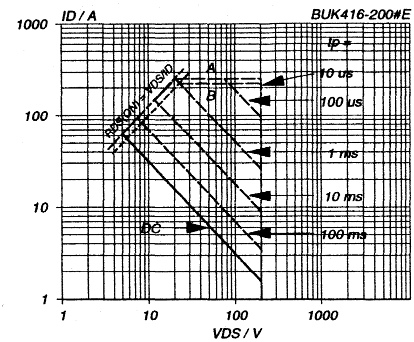


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

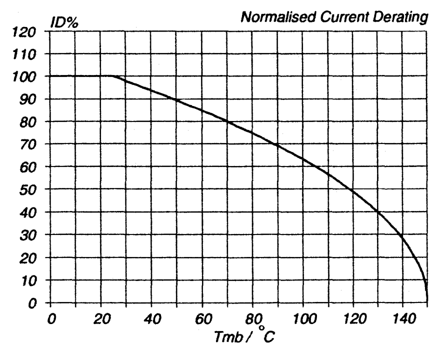


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,˚C}$ = f(T_{mb}); conditions: V_{GS} ≥ 10 V

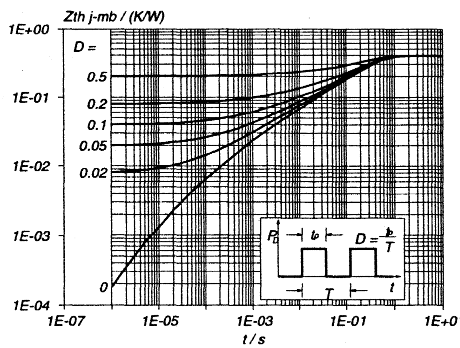


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb}$ = f(t); parameter D = t_p/T

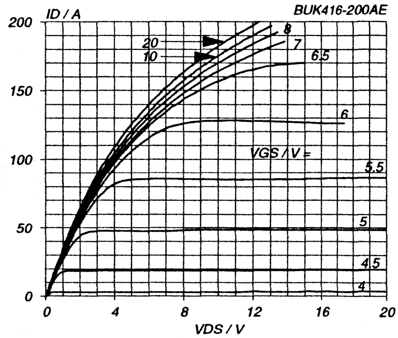


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

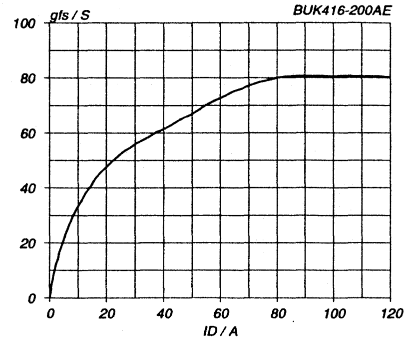


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 15$ V

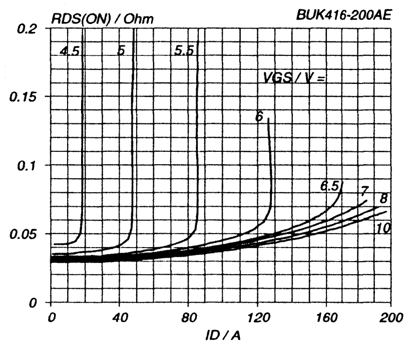


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

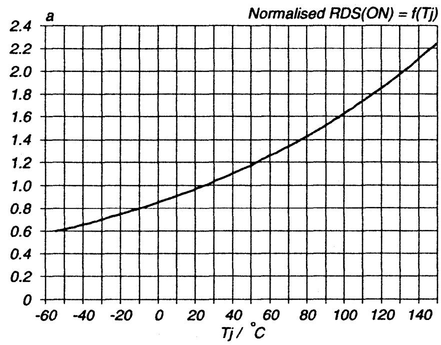


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 32$ A; $V_{GS} = 10$ V

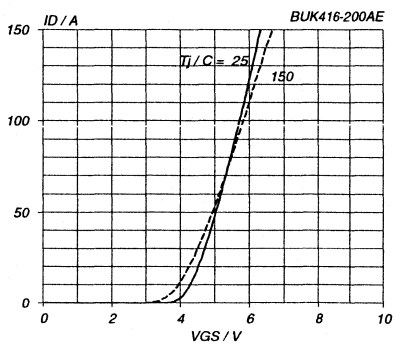


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 10$ V; parameter T_j

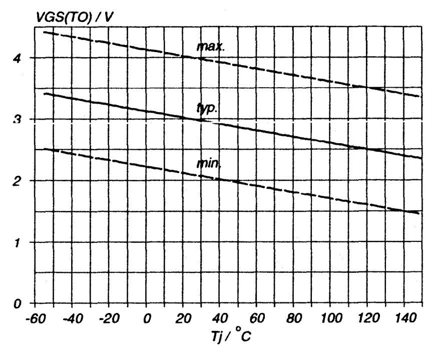


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

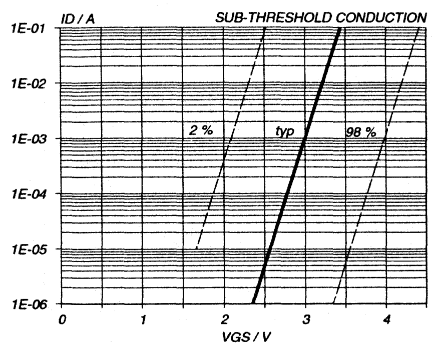


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

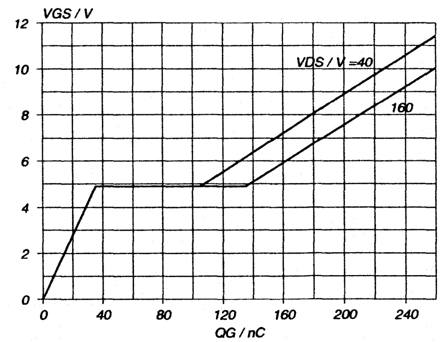


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 63$ A; parameter V_{DS}

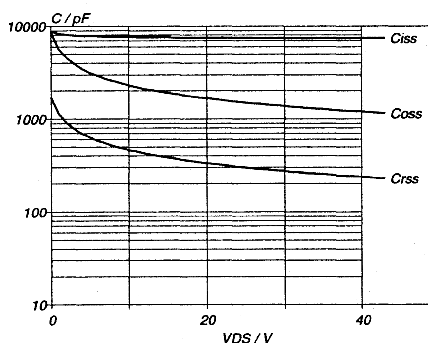


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

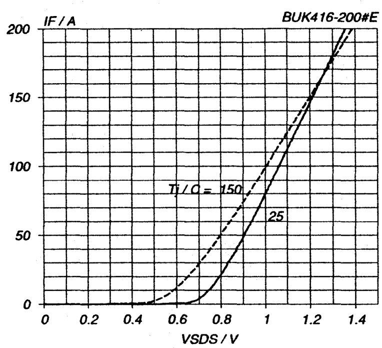


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK417-500AE/BE
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in ISOTOP envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

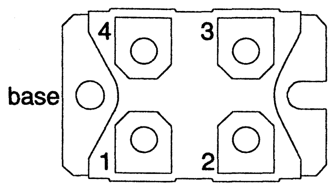
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK417	-500AE	-500BE	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	32	28	A
P_{tot}	Total power dissipation	310	310	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.13	0.16	Ω

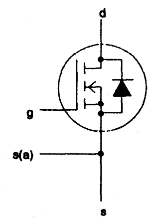
PINNING - SOT227B

PIN	DESCRIPTION
1	source
2	gate
3	drain
4	ancillary source
base	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500AE	-500BE	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	32	28	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	20	18	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	128	112	A
$I_{S(A)M}$	Ancillary source current (pulse peak value)		-	5.0		A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	310		W
T_{stg}	Storage temperature	-	- 40	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to mounting base From mounting base to heatsink	with heatsink compound	$R_{th\ j-mb}$ = 0.40 K/W $R_{th\ mb-hs}$ = 0.05 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.0 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	20	100	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.5	5.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	200	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK417-500AE**	-	0.11	0.13	Ω
		I_D = 16 A **BUK417-500BE**	-	0.14	0.16	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 16 A	15.0	30.0	-	S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Feedback capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	- - -	7.5 0.85 350	9.0 1.35 600	nF nF pF
$t_{d\ on}$ t_r $t_{d\ off}$ t_f	Turn-on delay time Turn-on rise time Turn-off delay time Turn-off fall time	V_{DD} = 30 V; I_D = 2.8 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω Resistive Load	- - - -	80 200 1100 250	120 300 1350 350	ns ns ns ns
$t_{d\ on}$ t_r $t_{d\ off}$ t_f	Turn-on delay time Turn-on rise time Turn-off delay time Turn-off fall time	V_{DD} = 250 V; I_D = 32 A; V_{GS} = 10 V; R_{gen} = 3.3 Ω Resistive Load	- - - -	40 70 300 100	80 100 350 150	ns ns ns ns
L_d	Internal drain inductance	Measured from contact screw on terminal 3 to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from contact screw on terminal 1 to source bond pad	-	5	-	nH

ISOLATION

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	R.M.S. voltage from terminals to mounting base	Sinusoidal voltage waveform; f = 50 - 60 Hz	-	-	2500	V
C_{isol}	Capacitance from T3 to mounting base	f = 1 MHz	-	45	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	32	A
I_{DRM}	Pulsed reverse drain current	-	-	-	128	A
V_{SD}	Diode forward voltage	I_F = 32 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 32 A; -dI_F/dt = 100 A/µs;	-	0.6	-	µs
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

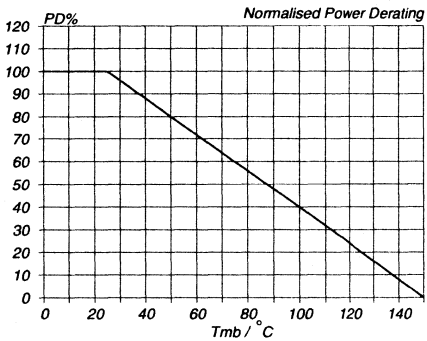


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

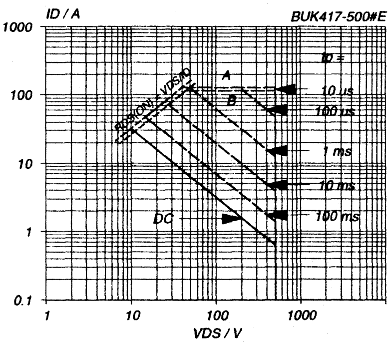


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

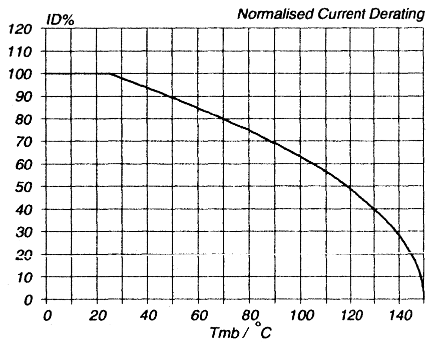


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

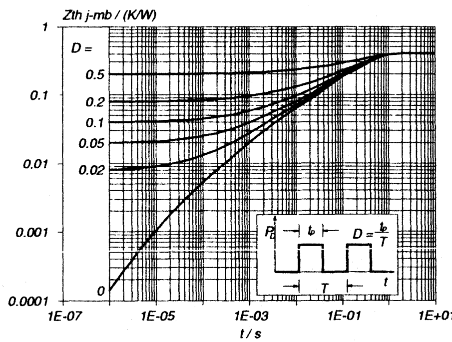


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor BUK417-500AE/BE

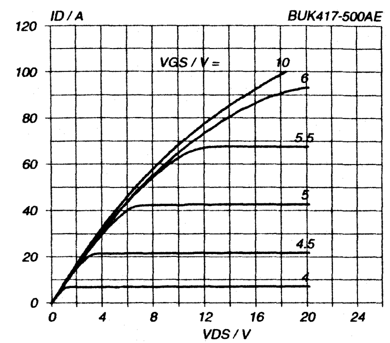


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

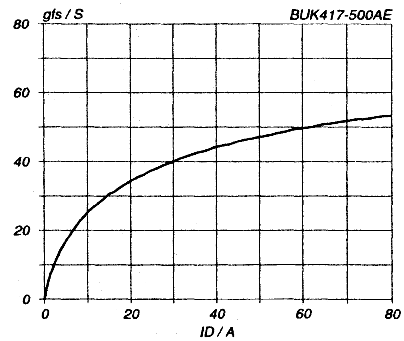


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

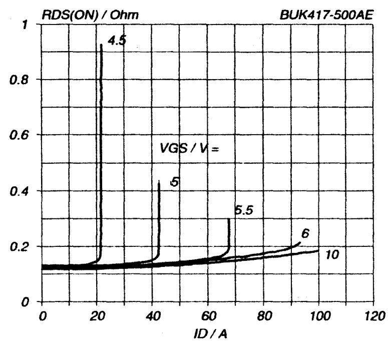


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

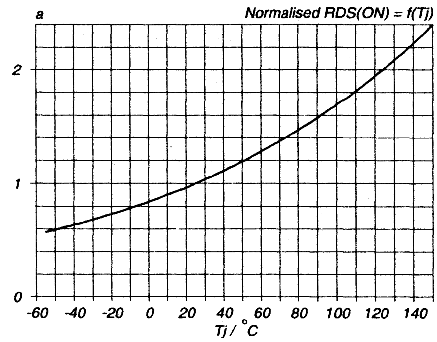


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; $I_D = 16$ A; $V_{GS} = 10$ V

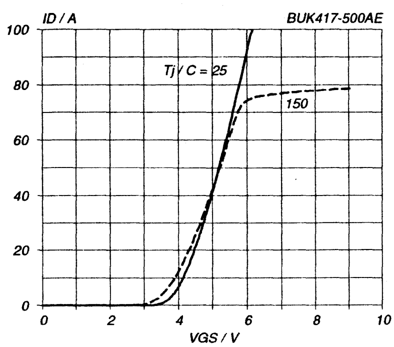


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

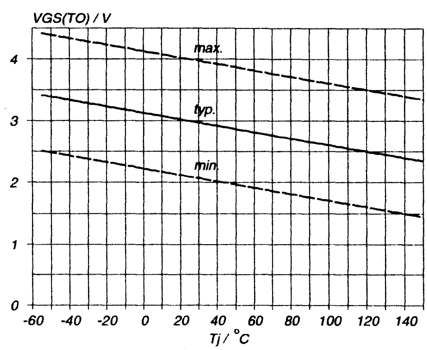


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

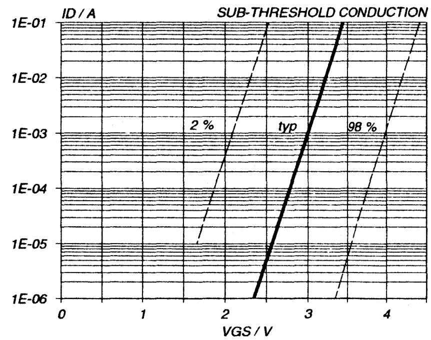


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

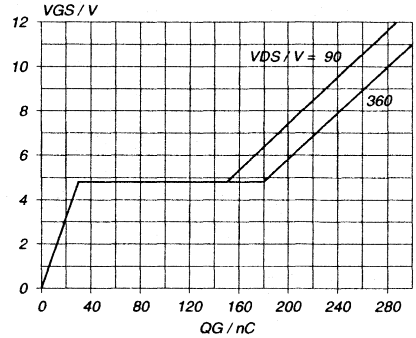


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 32$ A; parameter V_{DS}

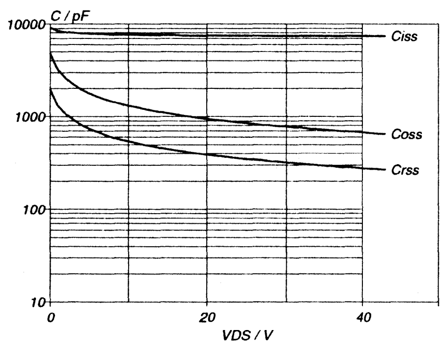


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

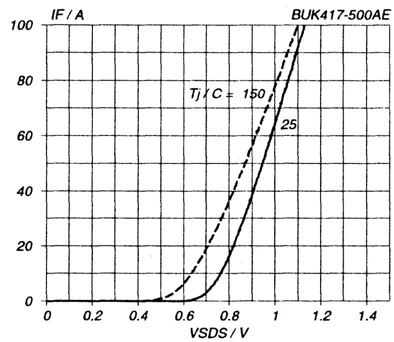


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK426-50A/B	

BUK426-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

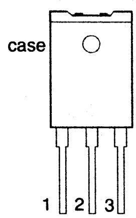
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK426	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	30	30	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.028	0.03	Ω

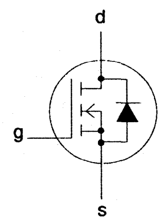
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{hs} = 25 °C	-	30	30	A
I_D	Drain current (DC)	T_{hs} = 100 °C	-	19	19	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 °C	-	120	120	A
P_{tot}	Total power dissipation	T_{hs} = 25 °C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j\text{-}hs}$ = 2.8 K/W $R_{th\ j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 29 A **BUK426-60A**	-	0.024	0.028	Ω
		BUK426-60B	-	0.027	0.03	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 29 A	17	22	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	800	1000	pF
C_{rss}	Feedback capacitance		-	270	400	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	70	100	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 50 Ω;	-	170	220	ns
t_f	Turn-off fall time	R_{gen} = 50 Ω	-	120	160	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	30	A
I_{DRM}	Pulsed reverse drain current	-	-	-	120	A
V_{SD}	Diode forward voltage	I_F = 30 A ; V_{GS} = 0 V	-	1.4	1.7	V
t_{rr}	Reverse recovery time	I_F = 30 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.4	-	µC

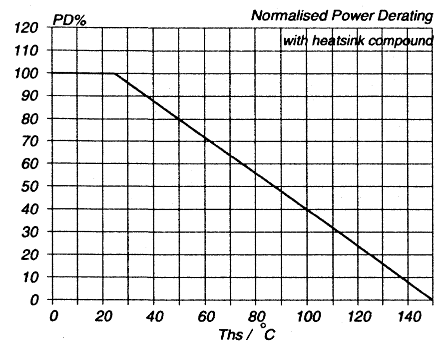


Fig.1. Normalised power dissipation.
PD% = $100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

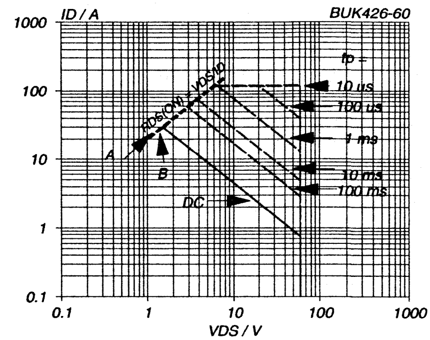


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = $f(V_{DS})$; I_{DM} single pulse; parameter t_p

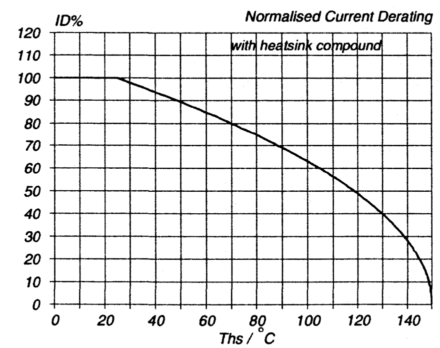


Fig.2. Normalised continuous drain current.
ID% = $100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

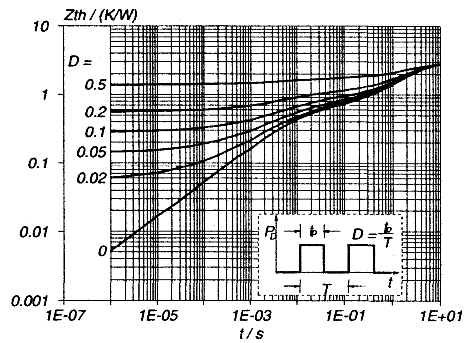


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

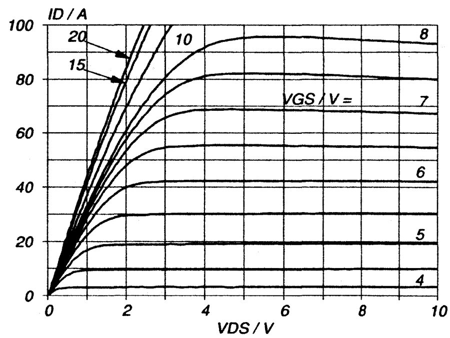


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

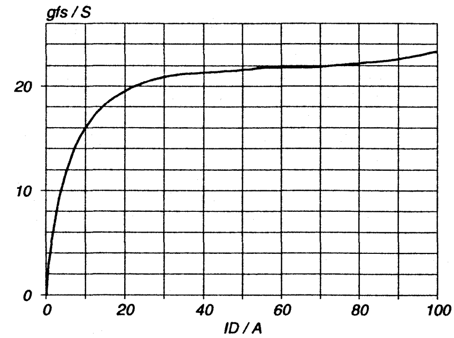


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

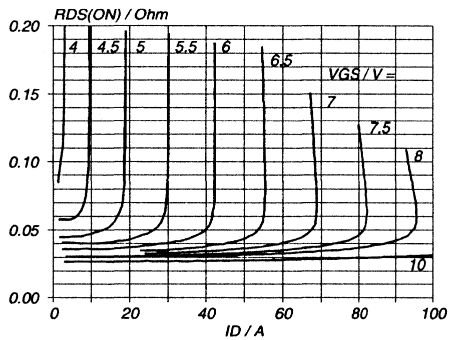


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

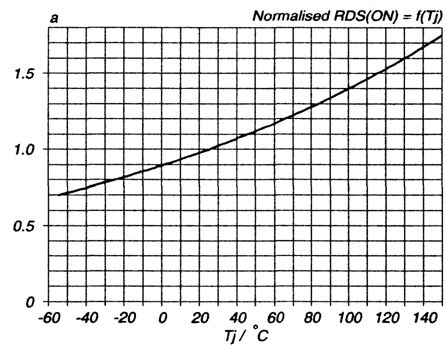


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 29 A; V_{GS} = 10 V

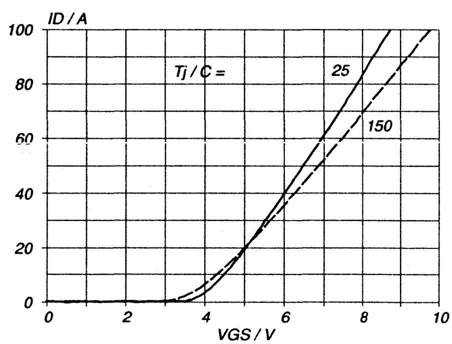


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

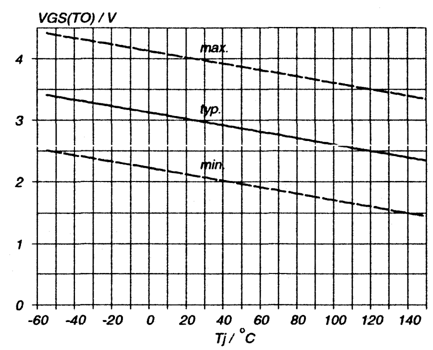


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

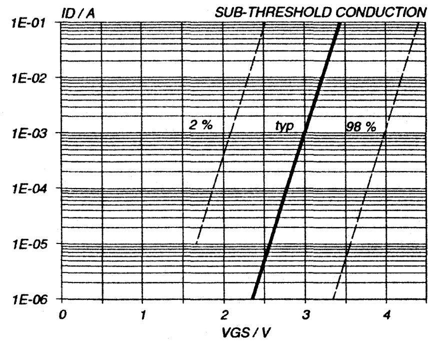


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

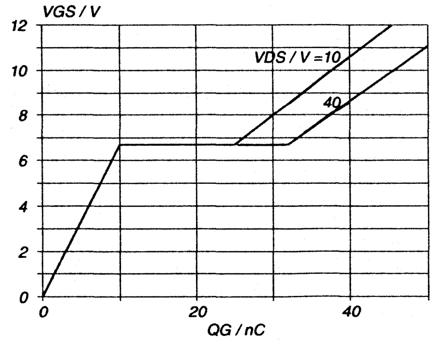


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 50$ A; parameter V_{DS}

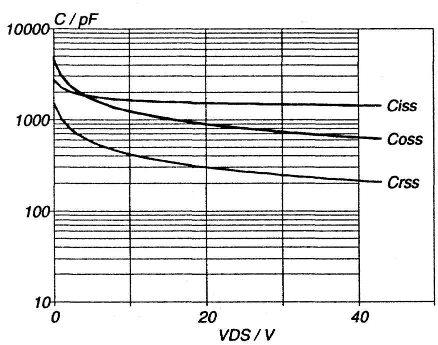


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

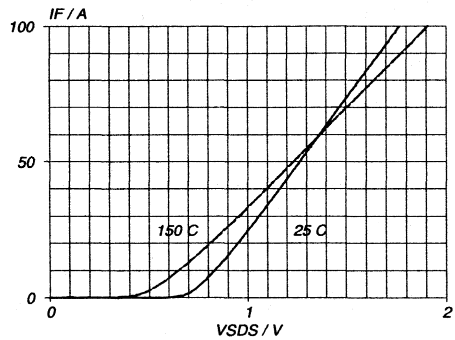


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK426-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

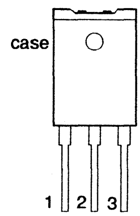
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK426	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	20	19	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.057	0.065	Ω

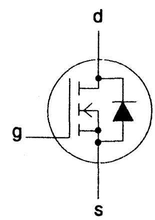
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	**-100B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	20	19	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	12	12	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	80	76	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j\text{-}hs}$ = 2.8 K/W $R_{th\ j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK426-100A** I_D = 15 A **BUK426-100B**	- -	0.052 0.06	0.057 0.065	Ω Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 15 A	12	16	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	450	600	pF
C_{rss}	Feedback capacitance		-	130	200	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω;	-	150	200	ns
t_f	Turn-off fall time	R_{GS} = 50 Ω	-	65	85	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

PowerMOS transistor BUK426-100A/B

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	20	A
I_{DRM}	Pulsed reverse drain current	-	-	-	80	A
V_{SD}	Diode forward voltage	I_F = 20 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 20 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.0	-	µC

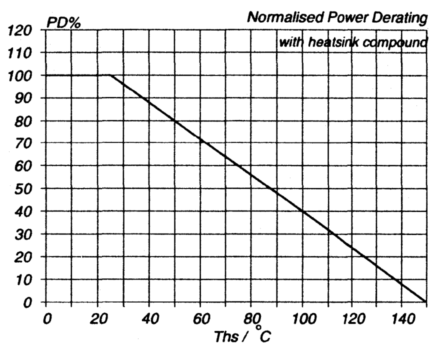


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{hs})$

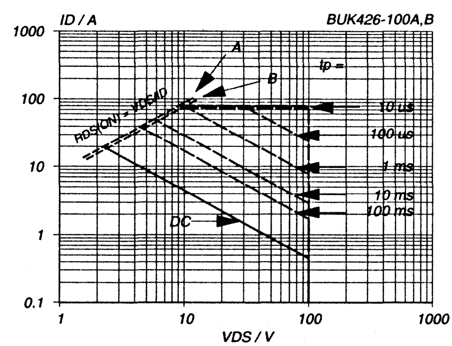


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

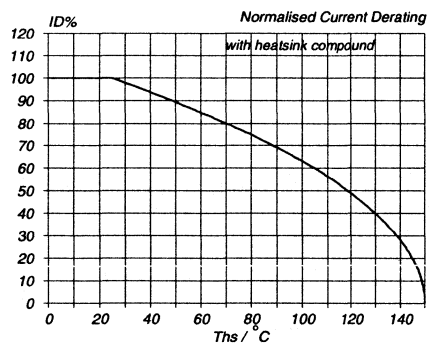


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

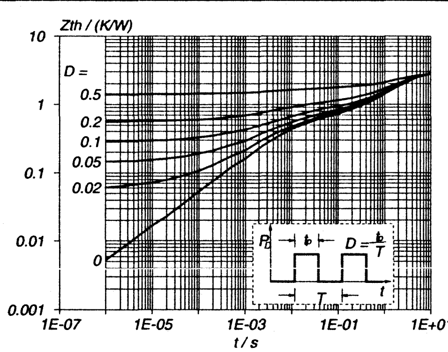


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor

BUK426-100A/B

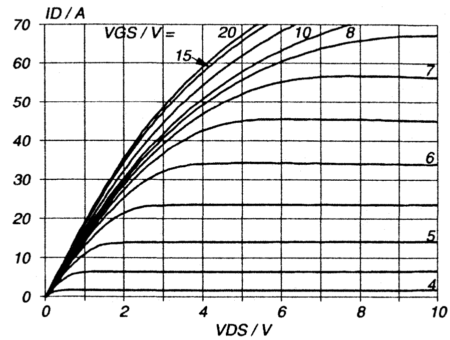


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

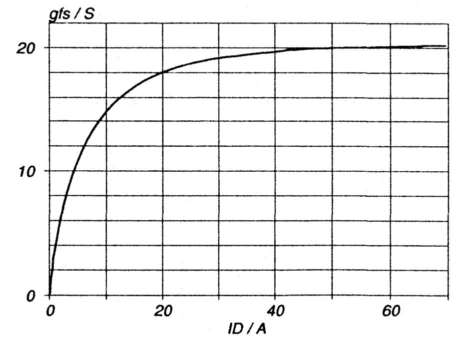


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

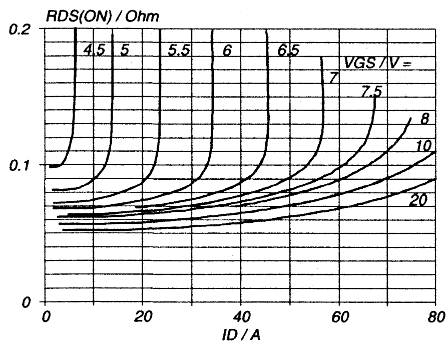


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

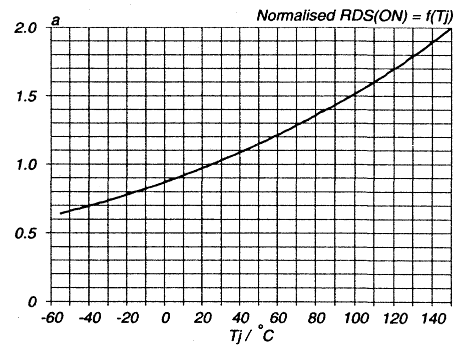


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 15$ A; $V_{GS} = 10$ V

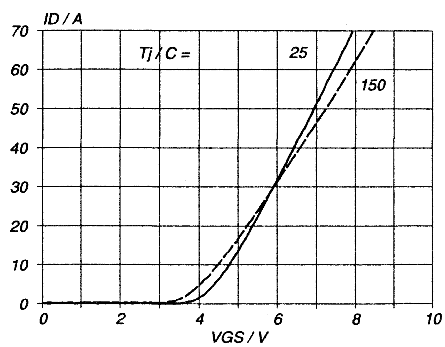


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

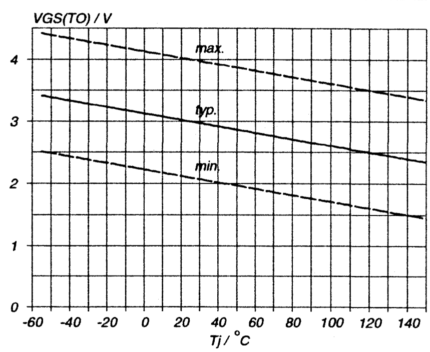


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

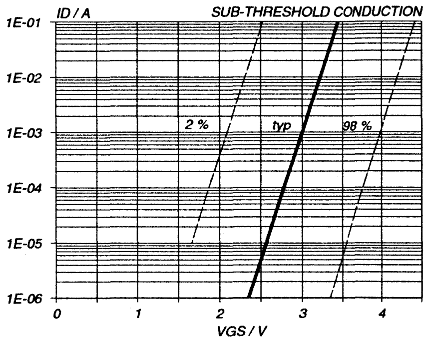


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

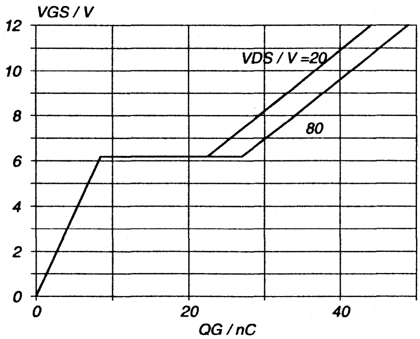


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 33$ A; parameter V_{DS}

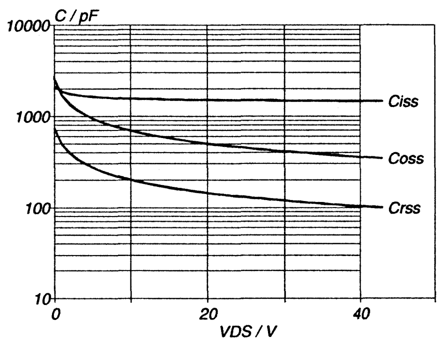


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

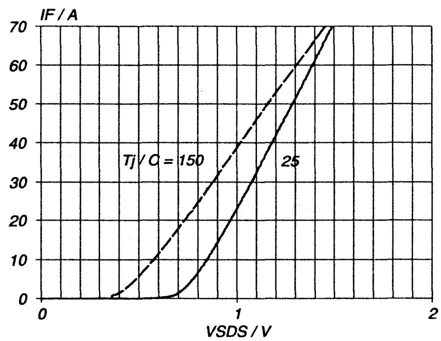


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK426-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

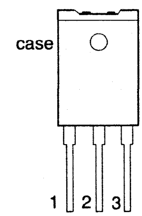
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK426	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	11	10	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.16	0.2	Ω

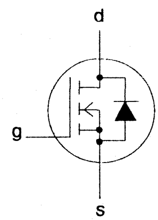
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	**-200B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	11	10	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	7	6.3	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	44	40	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j\text{-}hs}$ = 2.8 K/W $R_{th\ j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 10 A **BUK426-200A**	-	0.15	0.16	Ω
		BUK426-200B	-	0.17	0.20	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	8.5	16	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	300	400	pF
C_{rss}	Feedback capacitance		-	60	100	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω;	-	145	185	ns
t_f	Turn-off fall time	R_{GS} = 50 Ω	-	50	70	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

PowerMOS transistor BUK426-200A/B

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	11	A
I_{DRM}	Pulsed reverse drain current	-	-	-	44	A
V_{SD}	Diode forward voltage	I_F = 11 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 11 A; -dI_F/dt = 100 A/µs;	-	180	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	2.5	-	µC

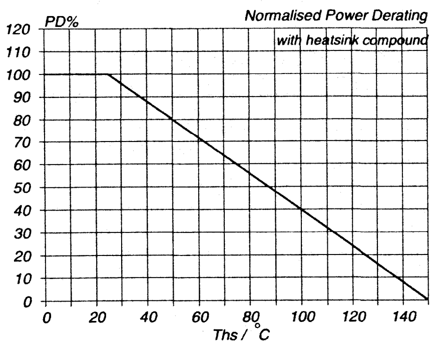


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

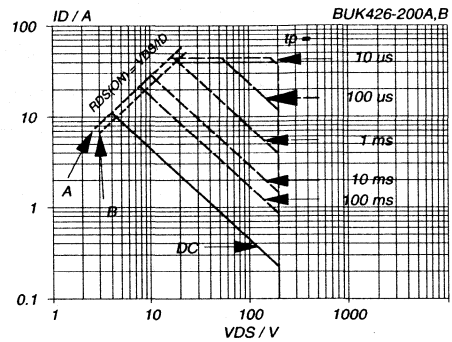


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

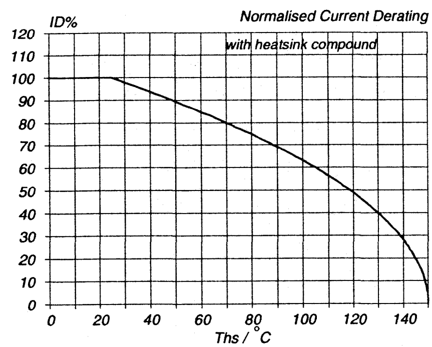


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

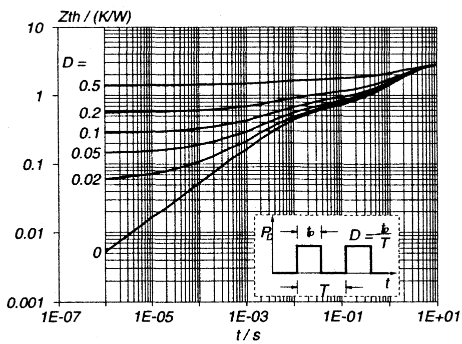


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

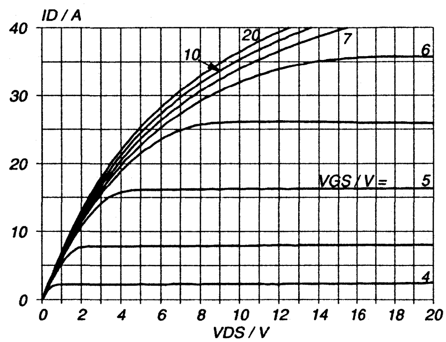


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

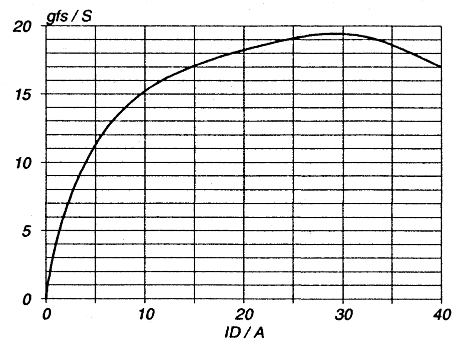


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

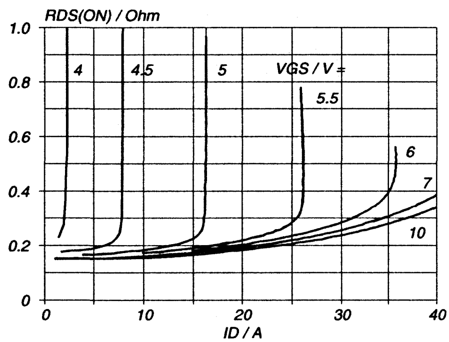


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

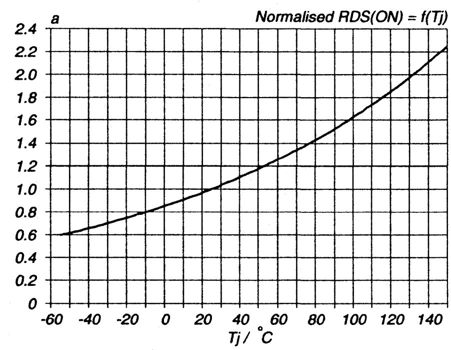


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 10$ A; $V_{GS} = 10$ V

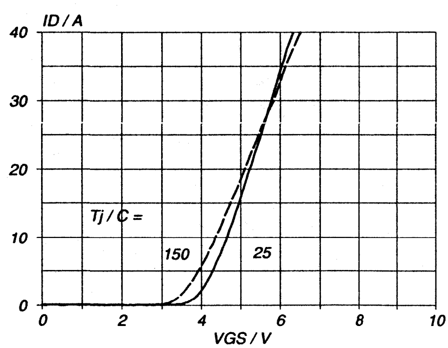


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

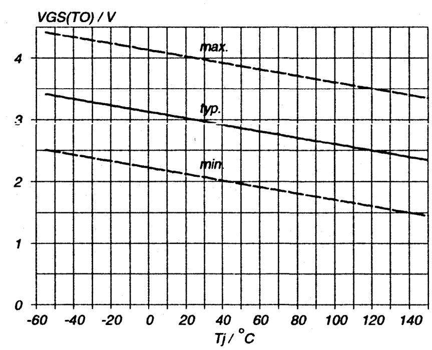


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

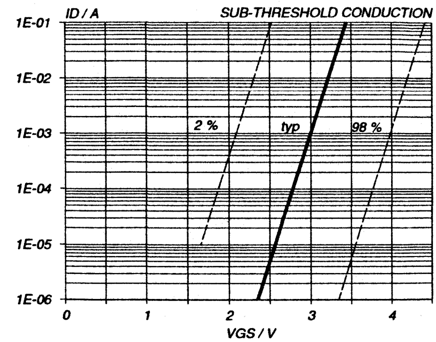


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

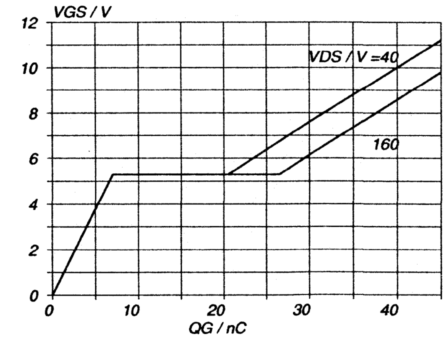


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 19$ A; parameter V_{DS}

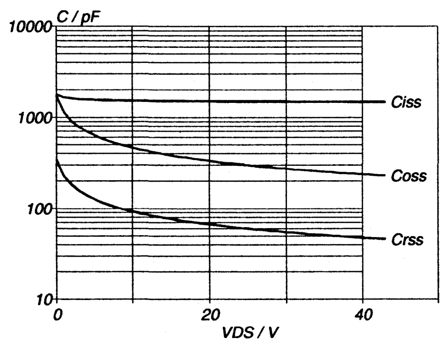


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

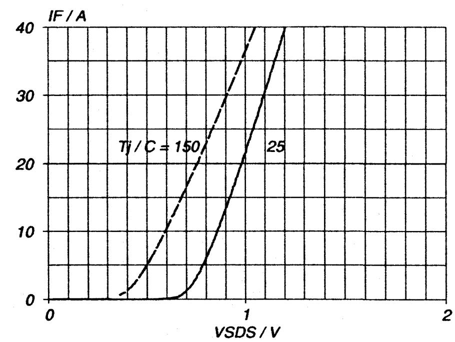


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK426-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

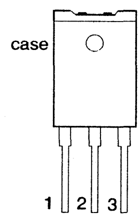
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK426	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	2.4	2.1	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	3	4	Ω

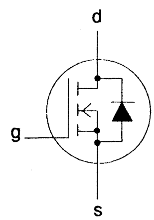
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.4	2.1	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.5	1.3	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	10	8.4	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j\text{-}hs}$ = 2.8 K/W $R_{th\ j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK426-800A**	-	2.7	3.0	Ω
		I_D = 1.5 A **BUK426-800B**	-	3.5	4.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

PowerMOS transistor BUK426-800A/B

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.4	A
I_{DRM}	Pulsed reverse drain current	-	-	-	10	A
V_{SD}	Diode forward voltage	I_F = 2.4 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.4 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

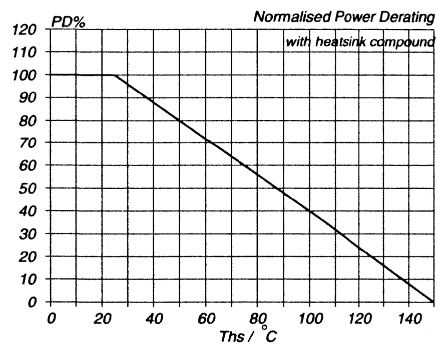


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

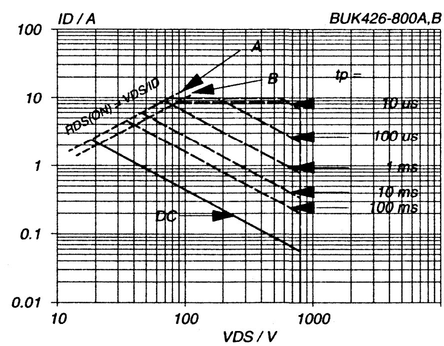


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

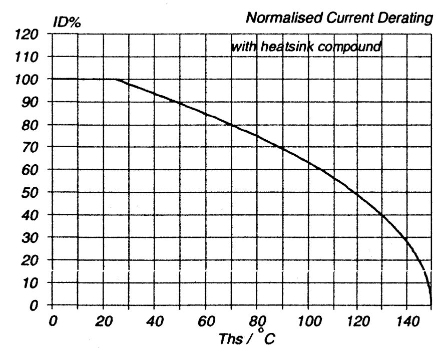


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

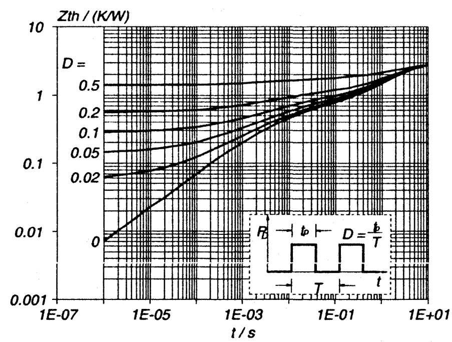


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

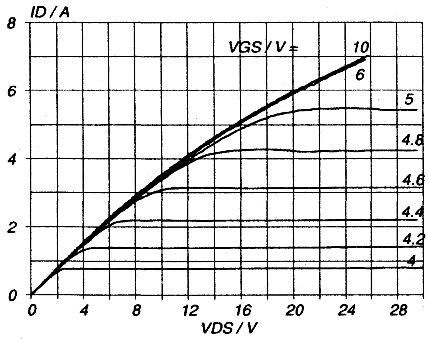


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

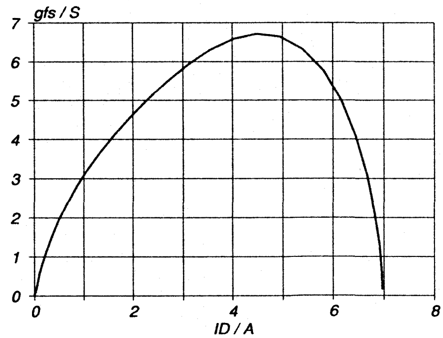


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

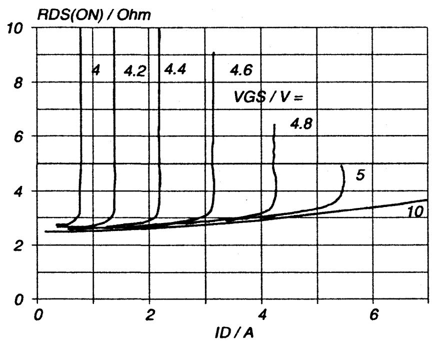


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

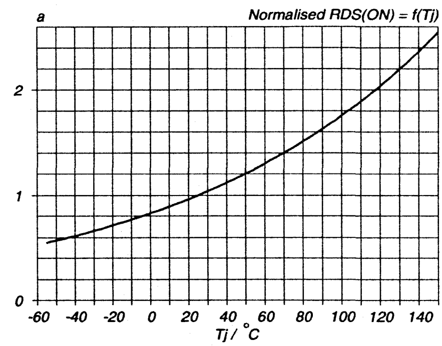


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

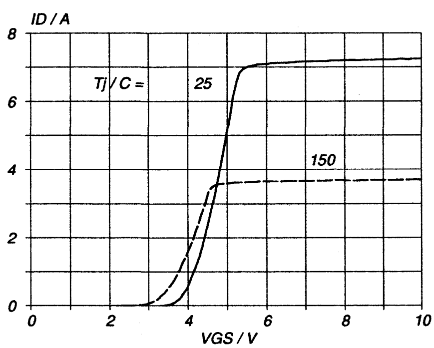


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

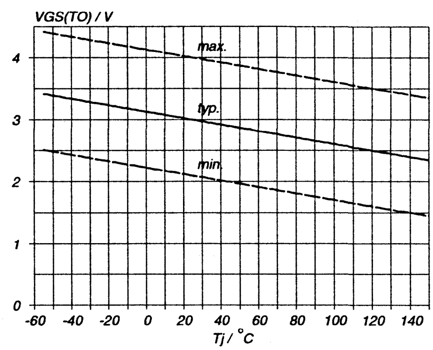


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK426-800A/B

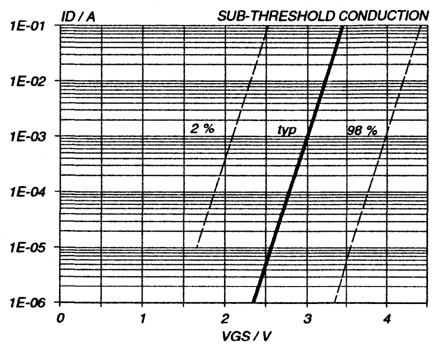


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

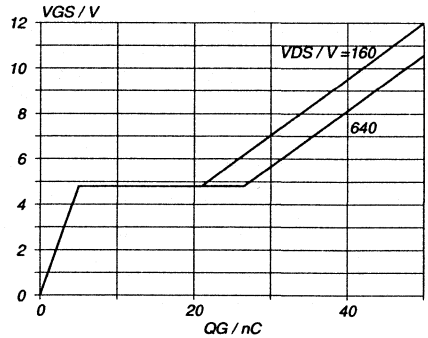


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4$ A; parameter V_{DS}

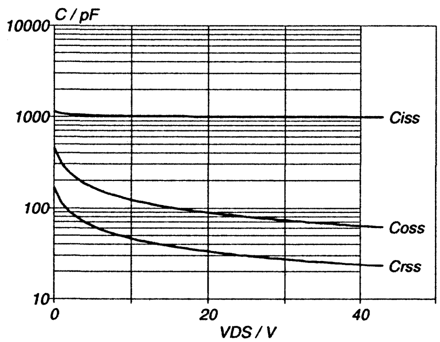


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

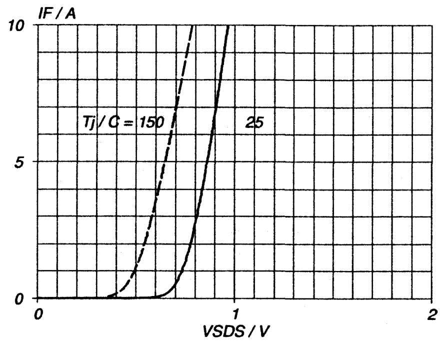


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK426-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

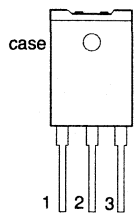
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK426	**-1000A**	**-1000B**	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	2.1	1.9	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	4	5	Ω

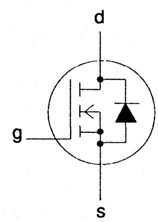
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	**-1000B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.1	1.9	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.3	1.2	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	8.4	8	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 2.8 K/W
From junction to ambient	-	$R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK426-1000A**	-	3.5	4.0	Ω
		I_D = 1.5 A **BUK426-1000B**	-	4.5	5.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.1	A
I_{DRM}	Pulsed reverse drain current	-	-	-	8.4	A
V_{SD}	Diode forward voltage	I_F = 2.1 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.1 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

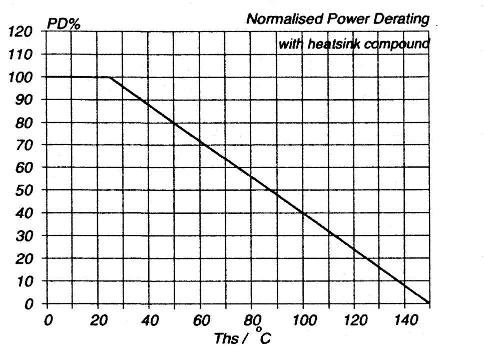


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

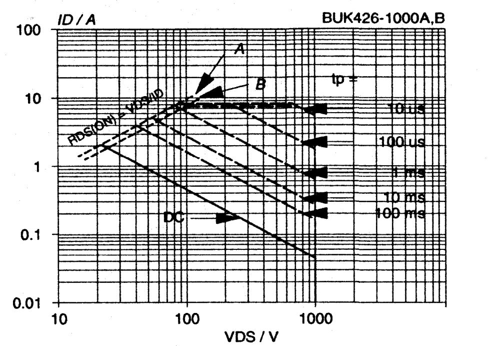


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

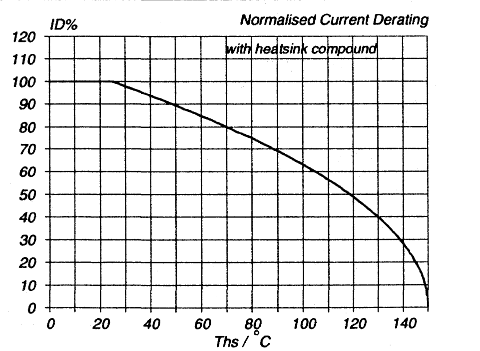


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

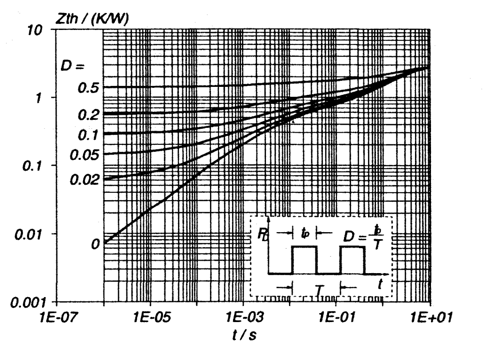


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

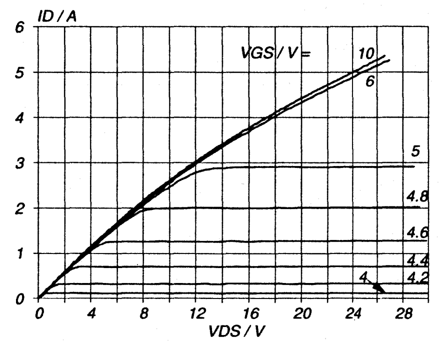


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

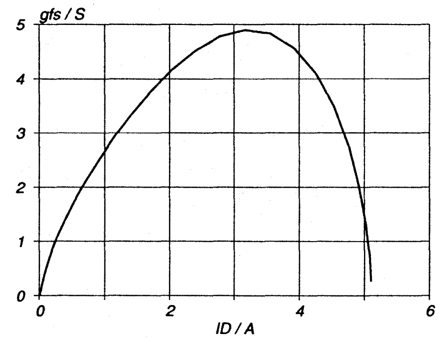


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

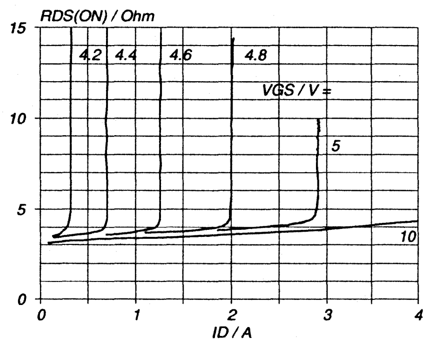


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

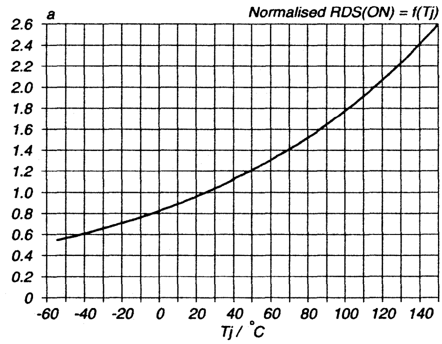


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

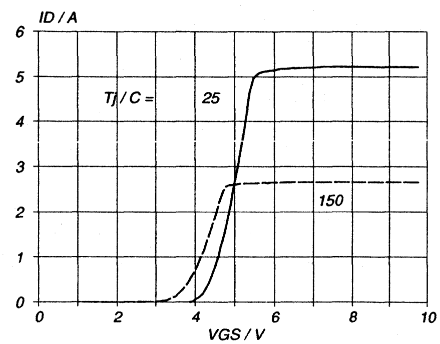


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

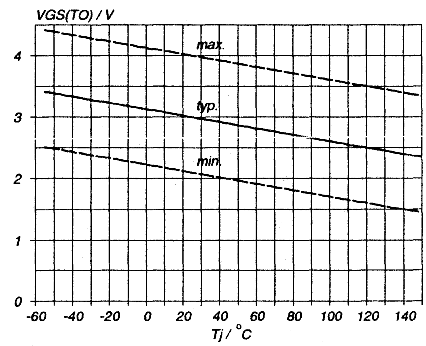


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

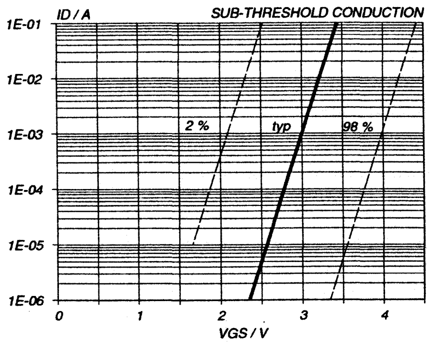


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

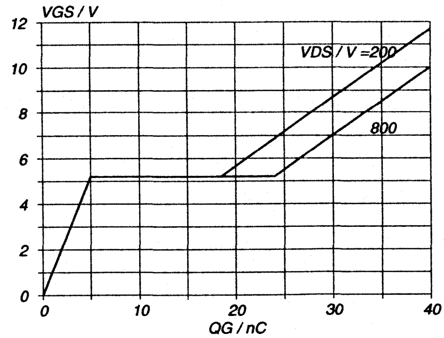


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.5$ A; parameter V_{DS}

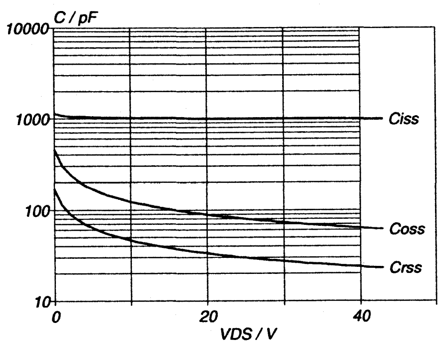


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

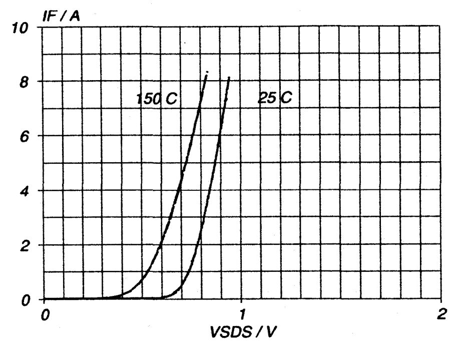


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK427-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

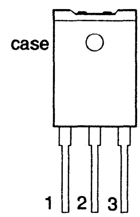
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK427	**-400A**	**-400B**	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	6.9	6.2	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

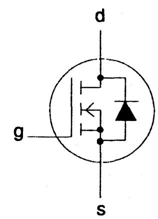
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	**-400B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	6.9	6.2	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	4.3	3.9	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	28	25	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\,j\text{-}hs}$ = 2.8 K/W $R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK427-400A**	-	0.35	0.4	Ω
		BUK427-400B	-	0.45	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.9	A
I_{DRM}	Pulsed reverse drain current	-	-	-	28	A
V_{SD}	Diode forward voltage	I_F = 6.9 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 6.9 A; -dI_F/dt = 100 A/µs; V_{GS} = 0 V; V_R = 100 V	-	500	-	ns
Q_{rr}	Reverse recovery charge		-	6.0	-	µC

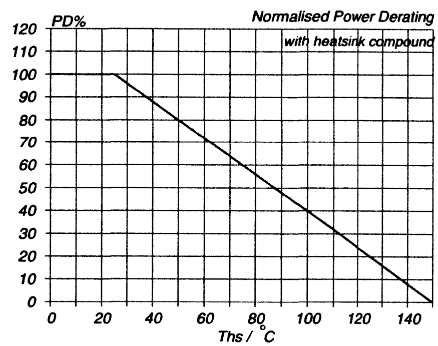


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

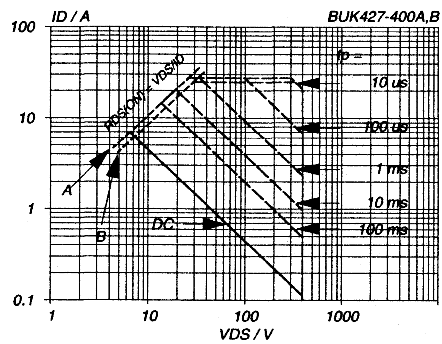


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

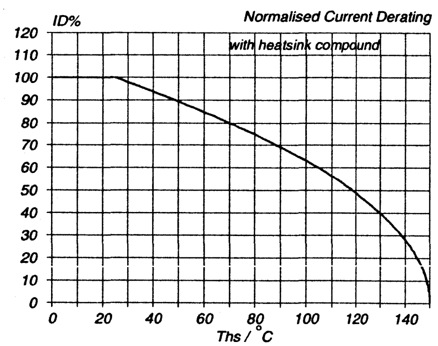


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

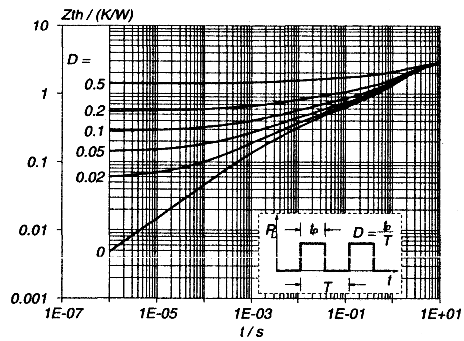


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

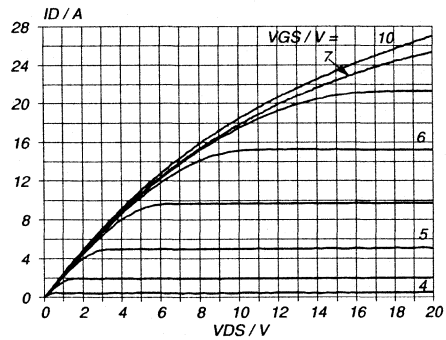


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

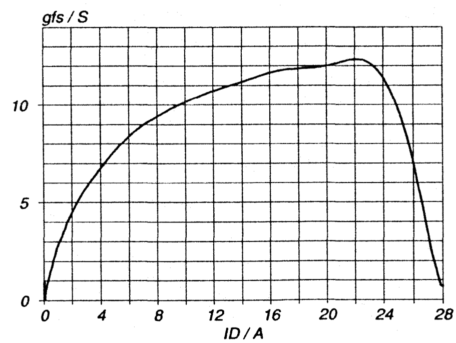


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

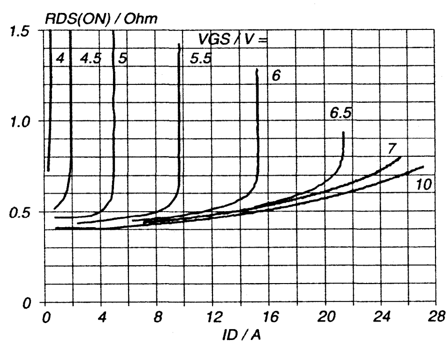


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

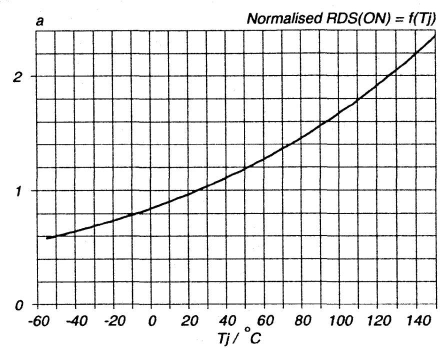


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 6.5 A; V_{GS} = 10 V

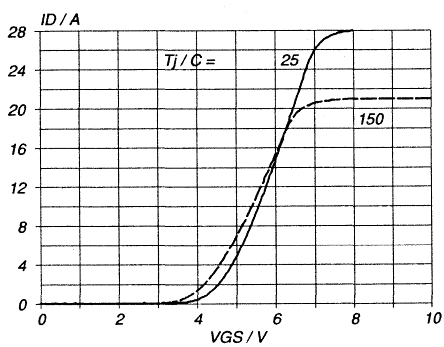


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

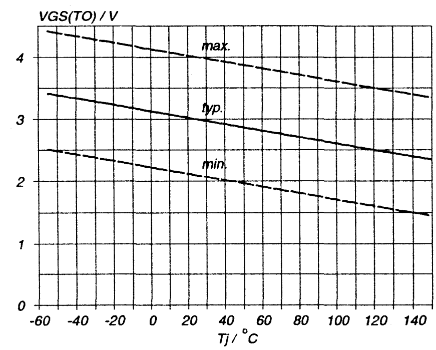


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

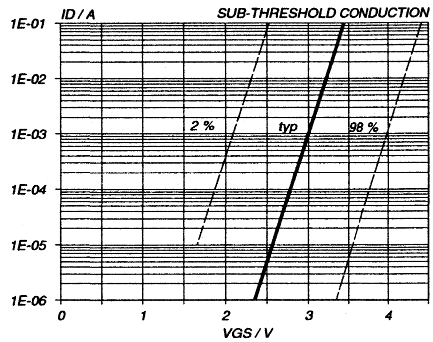


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

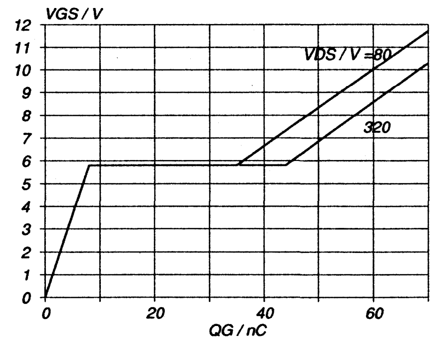


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

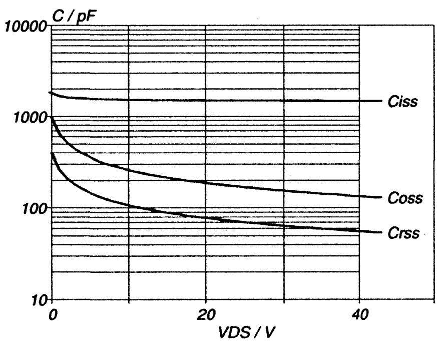


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

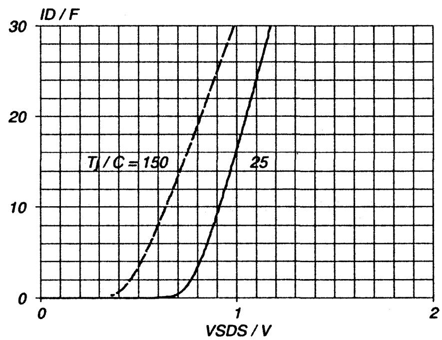


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK427-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

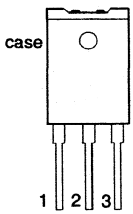
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK427	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	5.6	4.8	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.6	0.8	Ω

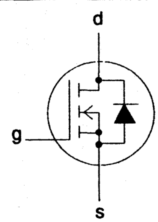
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	5.6	4.8	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	3.5	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	22	19.2	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 2.8 K/W
From junction to ambient	-	$R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK427-500A**	-	0.55	0.6	Ω
		I_D = 6.5 A **BUK427-500B**	-	0.7	0.8	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	22	A
V_{SD}	Diode forward voltage	I_F = 5.6 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 5.6 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; V_{DD} ≤ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	500	mJ

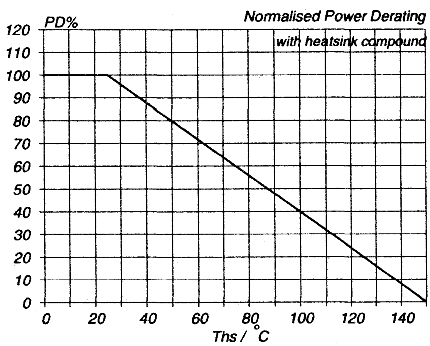


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

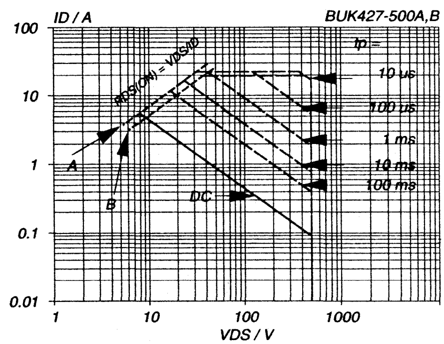


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

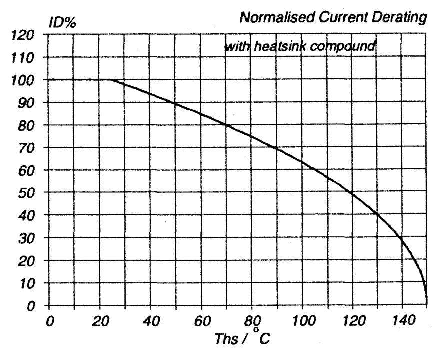


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

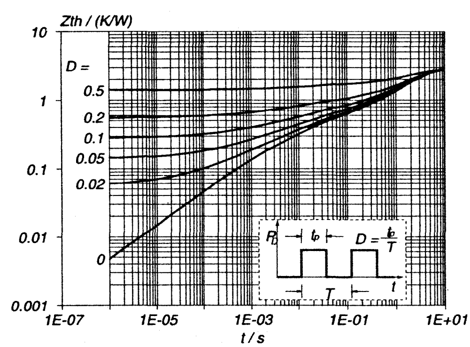


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

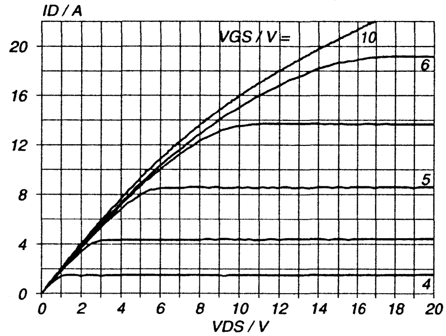


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

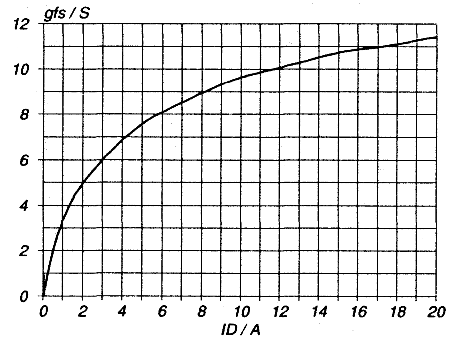


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

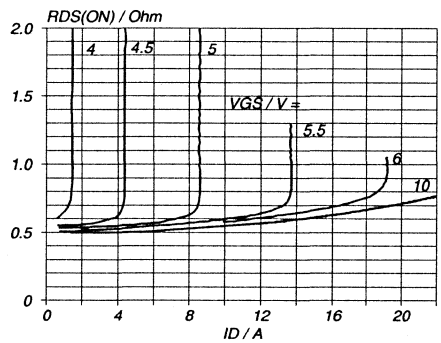


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

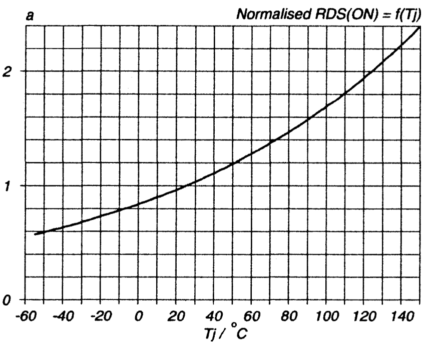


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 6.5 A; V_{GS} = 10 V

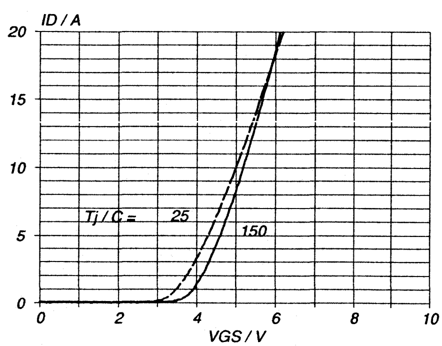


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

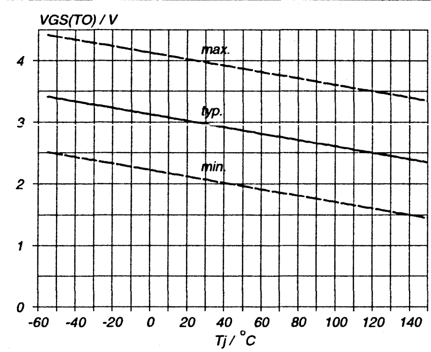


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

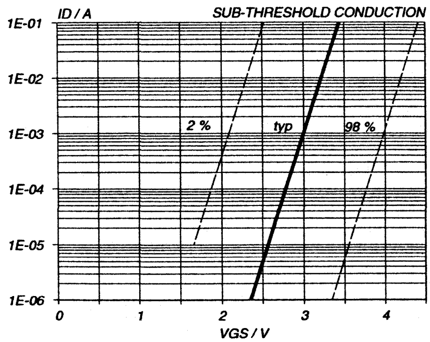


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

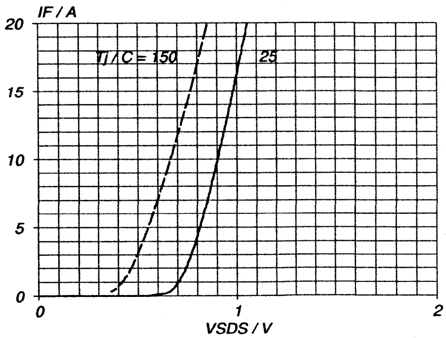


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

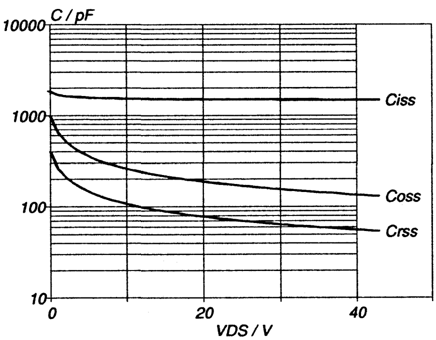


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

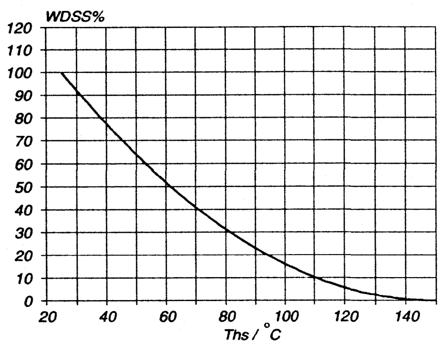


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 11$ A

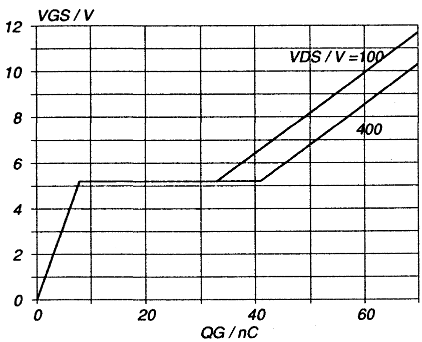


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

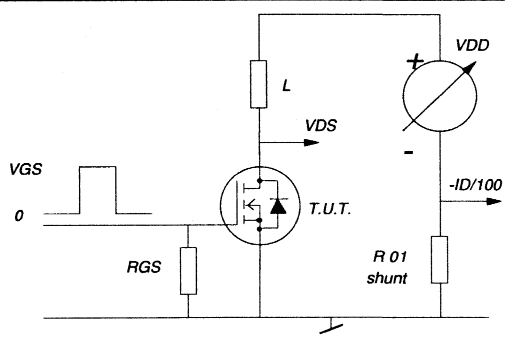


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK427-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

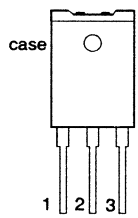
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK427	-600A	-600B	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	4.3	3.9	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.0	1.2	Ω

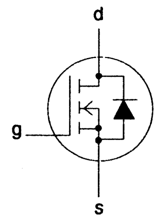
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	-600B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	4.3	3.9	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2.7	2.5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	17.2	15.6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\,j\text{-}hs}$ = 2.8 K/W $R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK427-600A**	-	0.85	1.0	Ω
		BUK427-600B	-	1.0	1.2	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	17.2	A
V_{SD}	Diode forward voltage	I_F = 4.3 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 4.3 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

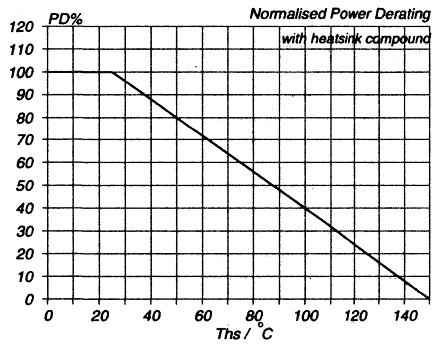


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

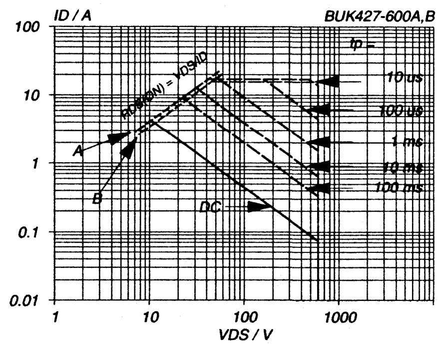


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

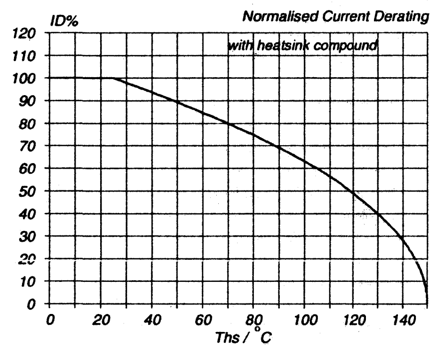


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

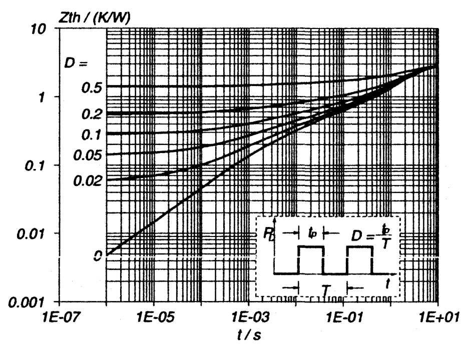


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor

BUK427-600A/B

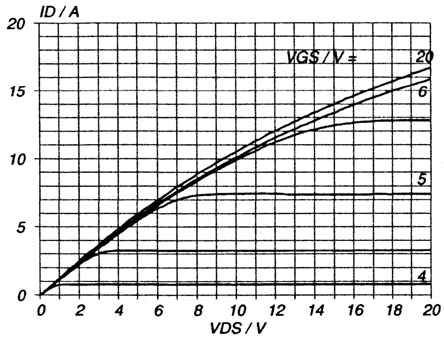


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

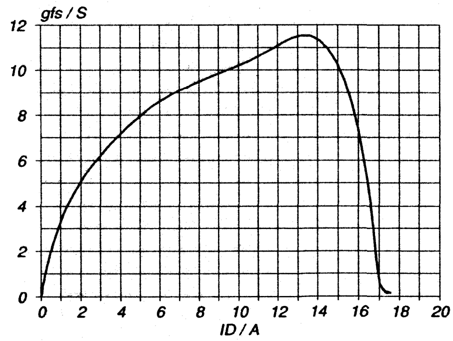


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

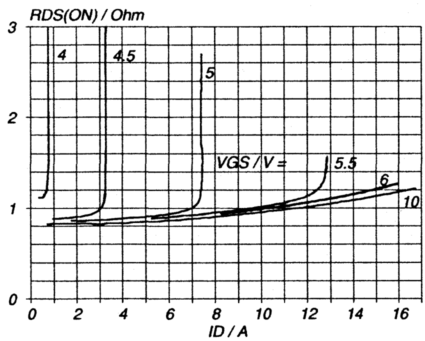


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

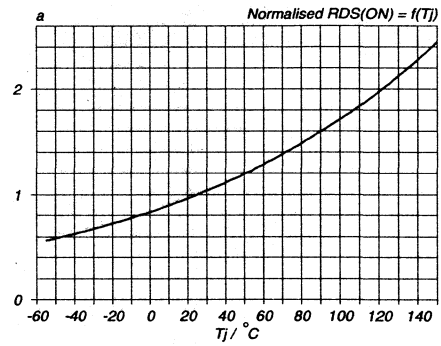


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

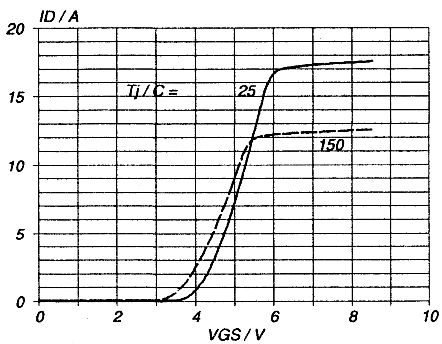


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

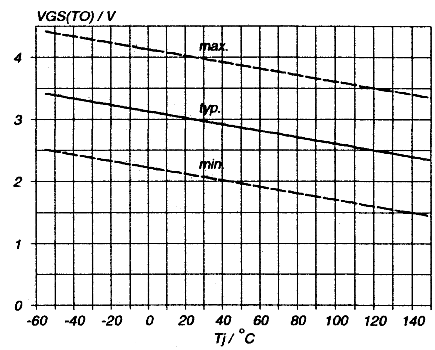


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK427-600A/B

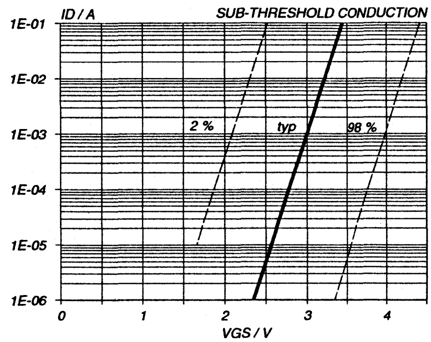


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

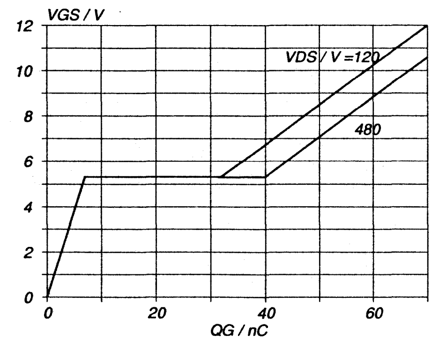


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 9$ A; parameter V_{DS}

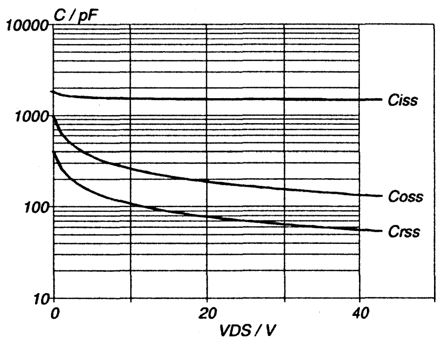


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

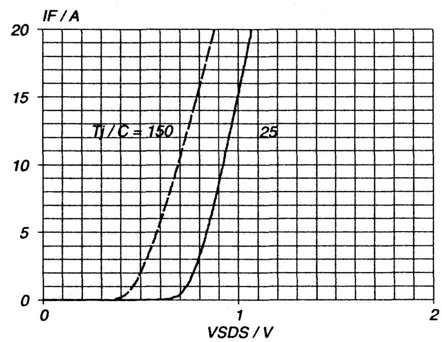


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK428-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

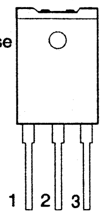
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK428	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	6.8	6.1	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

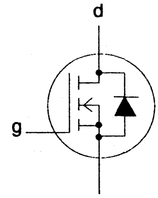
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	6.8	6.1	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	4.3	3.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	27	24	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor BUK428-500A/B

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}hs}$ = 2.8 K/W $R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 8 A **BUK428-500A**	-	0.35	0.4	Ω
		BUK428-500B	-	0.4	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8 A	9.0	14.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	2400	2800	pF
C_{oss}	Output capacitance		-	270	420	pF
C_{rss}	Feedback capacitance		-	110	200	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	30	60	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	90	130	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	300	400	ns
t_f	Turn-off fall time		-	110	140	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.8	A
I_{DRM}	Pulsed reverse drain current	-	-	-	27	A
V_{SD}	Diode forward voltage	I_F = 6.8 A ;V_{GS} = 0 V	-	0.9	1.2	V
t_{rr}	Reverse recovery time	I_F = 6.8 A; -dI_F/dt = 100 A/µs;	-	800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	9.0	-	µC

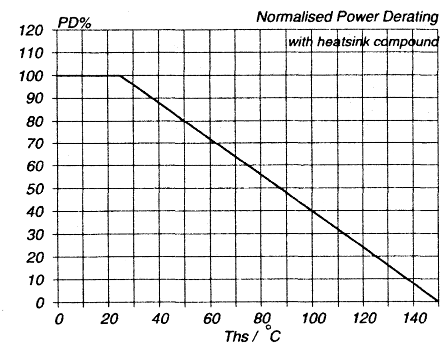


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

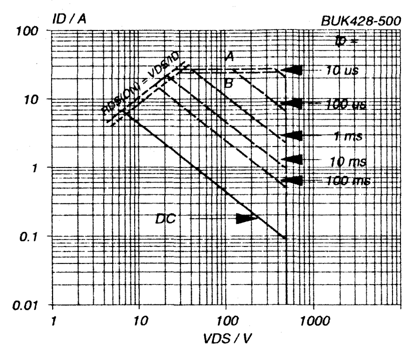


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

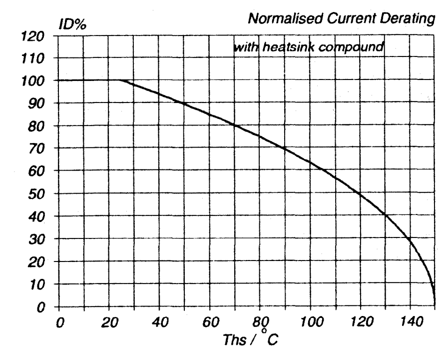


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

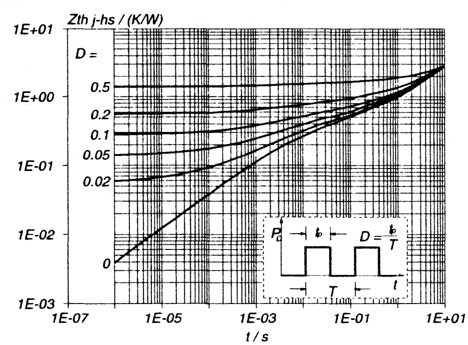


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

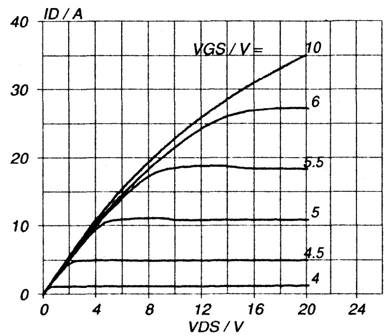


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

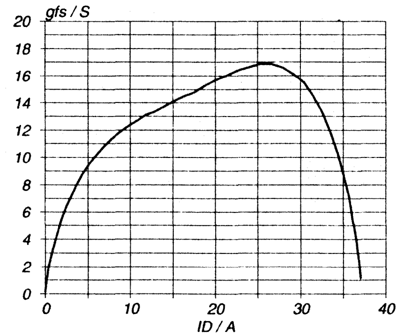


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

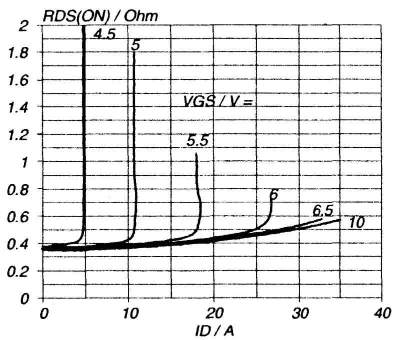


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

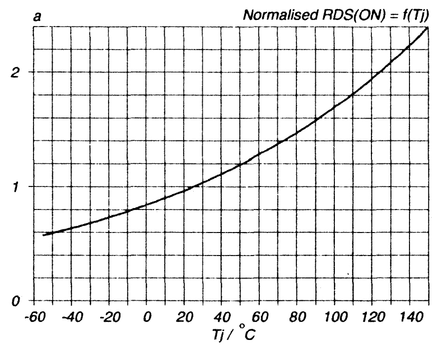


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 8$ A; $V_{GS} = 10$ V

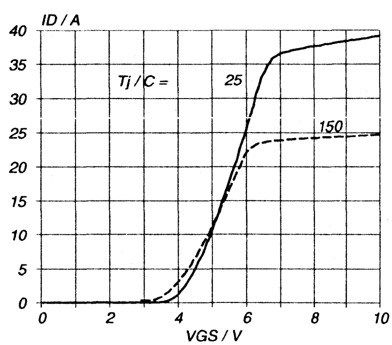


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

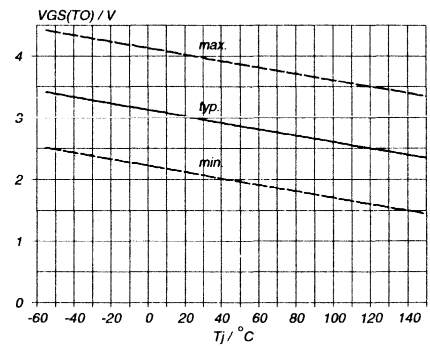


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

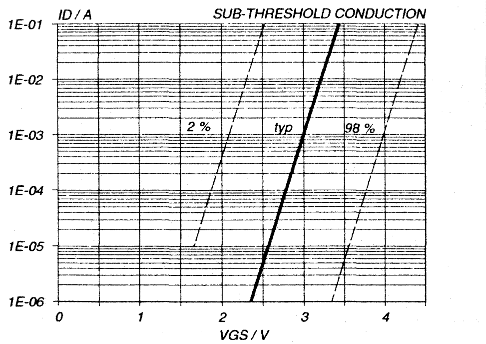


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

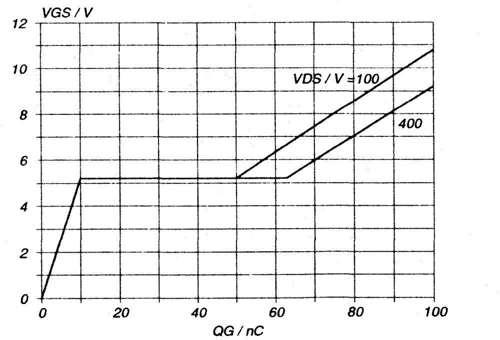


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 15$ A; parameter V_{DS}

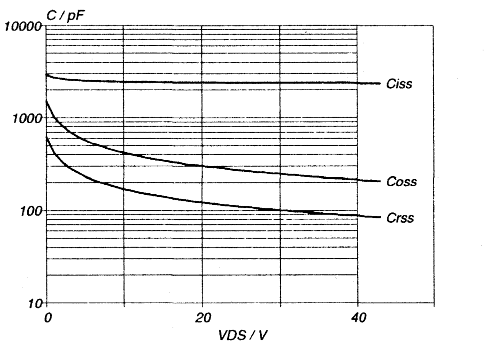


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

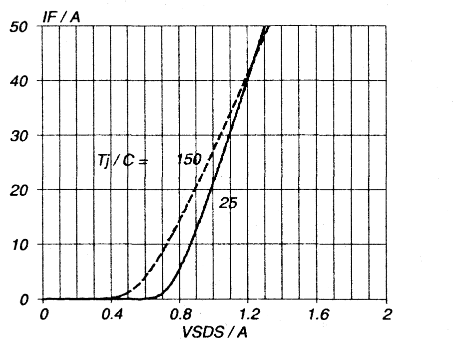


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK436-50A/B	

BUK436-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

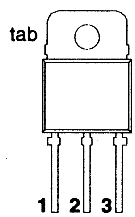
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK436	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	50	46	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.028	0.033	Ω

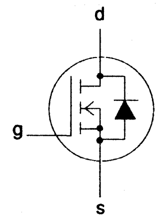
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	50	46	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	32	29	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	200	184	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.0 K/W $R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK436-60A**	-	0.025	0.028	Ω
		I_D = 29 A **BUK436-60B**	-	0.03	0.033	Ω

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 29 A	17	22	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	800	1000	pF
C_{rss}	Feedback capacitance		-	270	400	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	70	100	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 50 Ω;	-	170	220	ns
t_f	Turn-off fall time	R_{gen} = 50 Ω	-	120	160	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	50	A
I_{DRM}	Pulsed reverse drain current	-	-	-	200	A
V_{SD}	Diode forward voltage	I_F = 50 A ; V_{GS} = 0 V	-	1.9	2.4	V
t_{rr}	Reverse recovery time	I_F = 50 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.4	-	µC

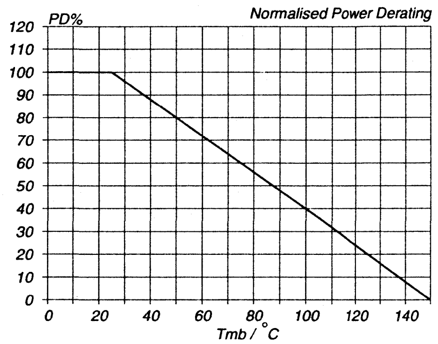


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

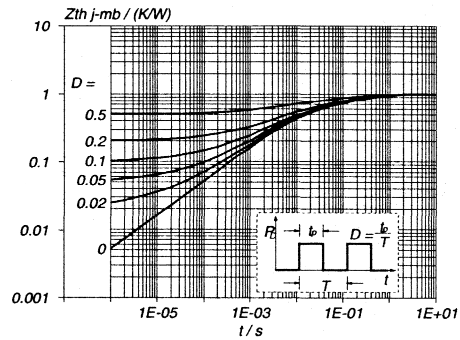


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

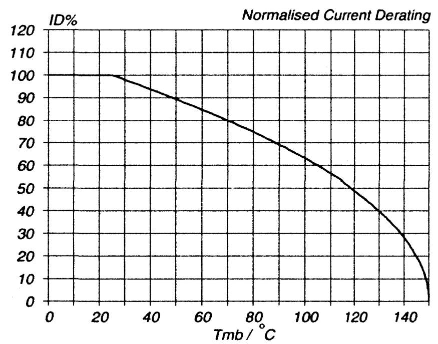


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

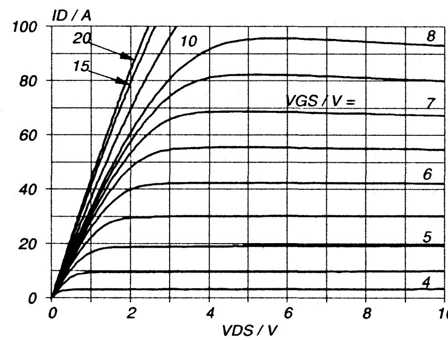


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

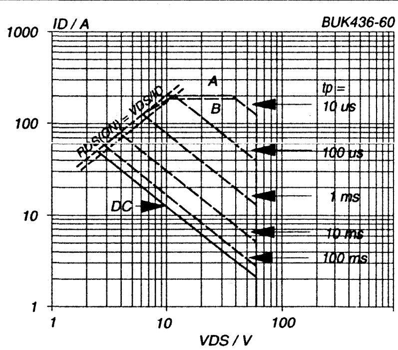


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

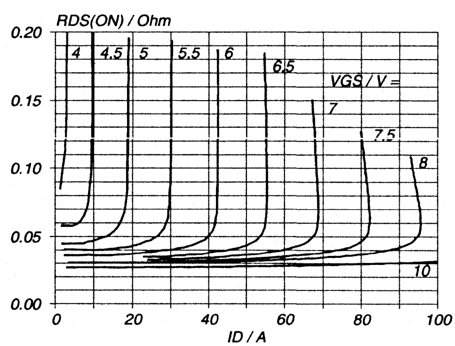


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

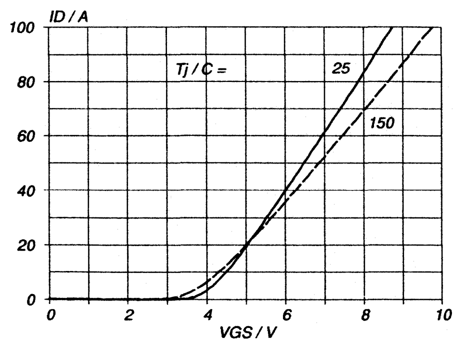


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

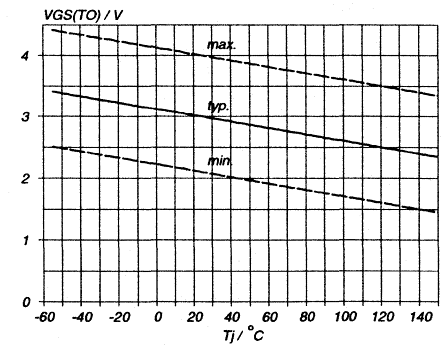


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

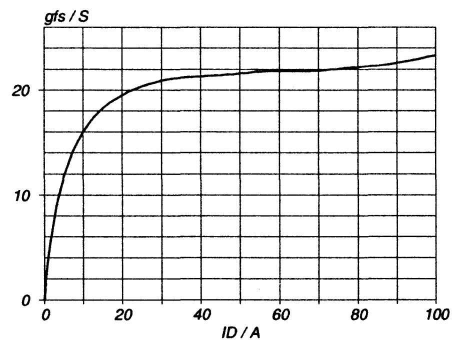


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

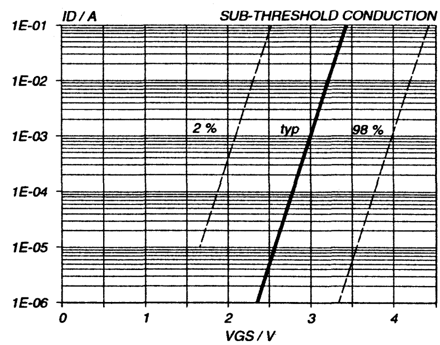


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

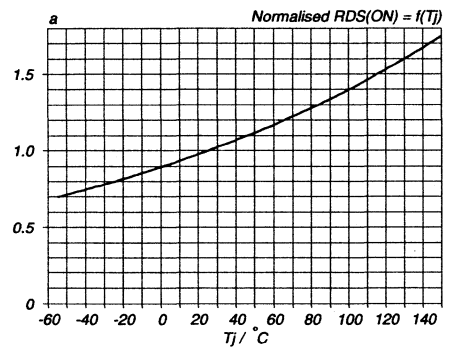


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 29$ A; $V_{GS} = 10$ V

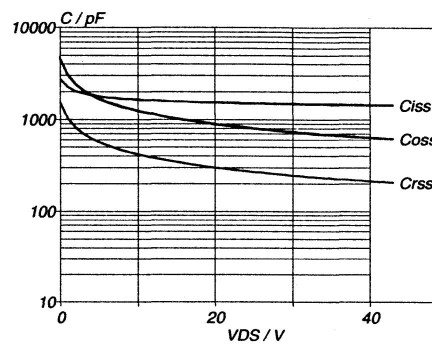


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

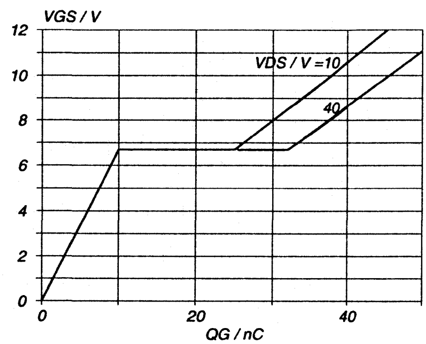


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 50$ A; parameter V_{DS}

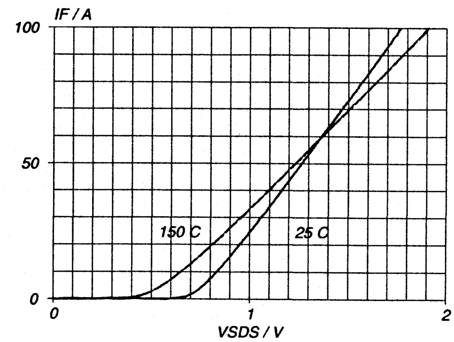


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK436-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

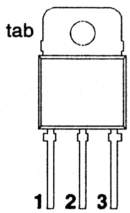
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK436	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	33	31	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.057	0.065	Ω

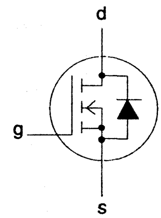
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	**-100B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	33	31	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	20	19	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	132	124	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j-mb}$ = 1.0 K/W $R_{th\ j-a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK436-100A**	-	0.052	0.057	Ω
		I_D = 15 A **BUK436-100B**	-	0.06	0.065	Ω

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 15 A	12	16	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	450	600	pF
C_{rss}	Feedback capacitance		-	130	200	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω;	-	150	200	ns
t_f	Turn-off fall time	R_{GS} = 50 Ω	-	65	85	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	33	A
I_{DRM}	Pulsed reverse drain current	-	-	-	132	A
V_{SD}	Diode forward voltage	I_F = 33 A ; V_{GS} = 0 V	-	1.4	1.7	V
t_{rr}	Reverse recovery time	I_F = 33 A; -dI_F/dt = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.0	-	µC

PowerMOS transistor BUK436-100A/B

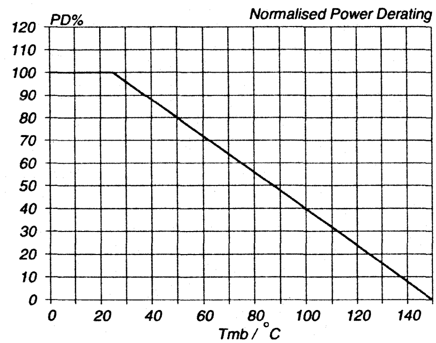


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

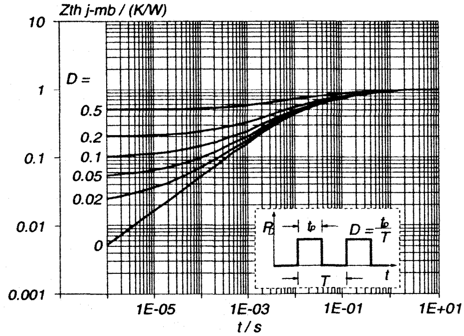


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

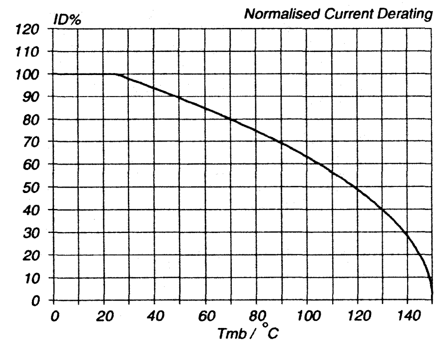


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

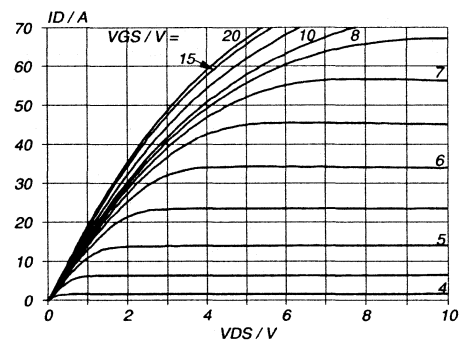


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

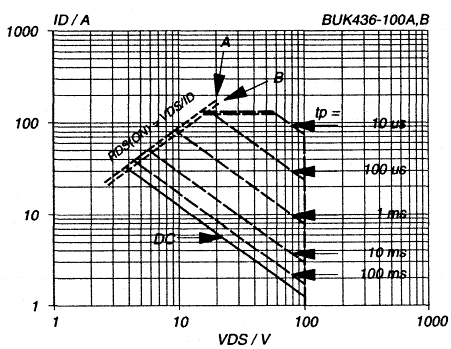


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

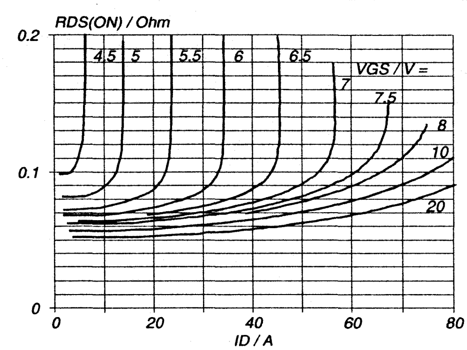


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

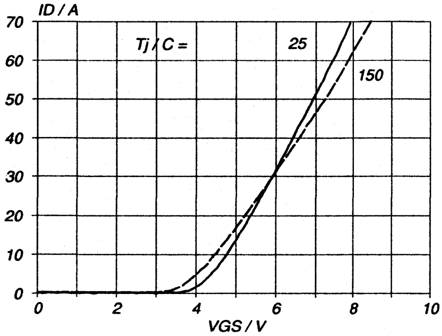


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

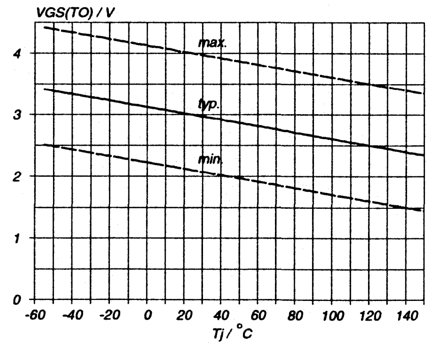


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

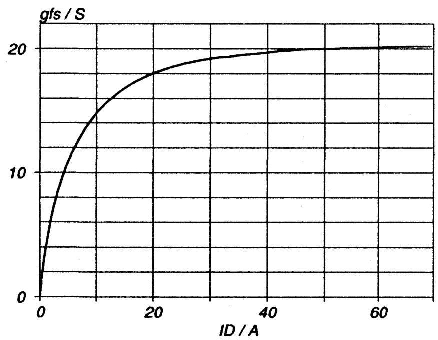


Fig.8. Typical transconductance, T_j = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

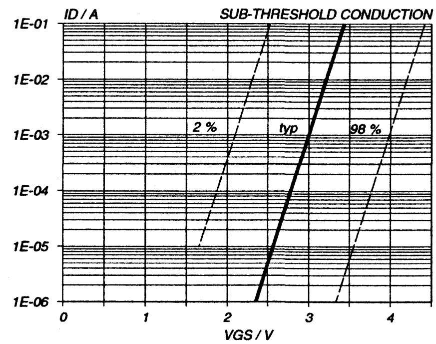


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 °C; $V_{DS} = V_{GS}$

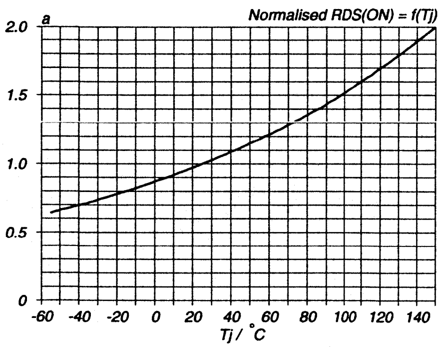


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; I_D = 15 A; V_{GS} = 10 V

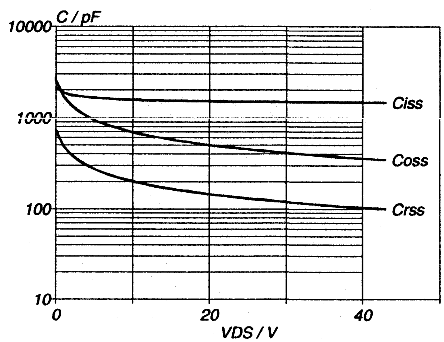


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

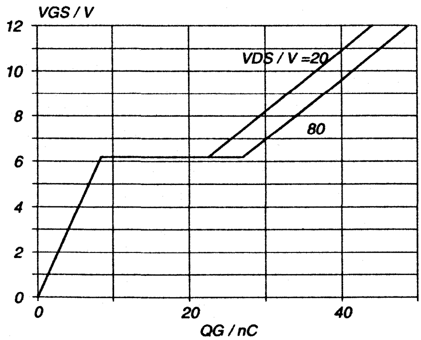


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 33$ A; parameter V_{DS}

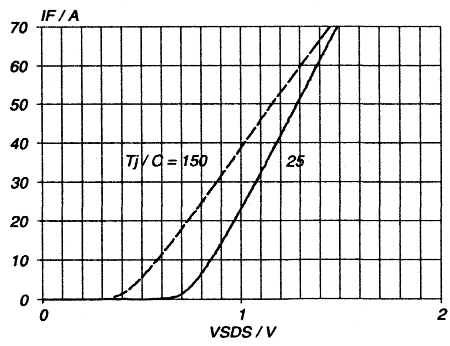


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK436-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

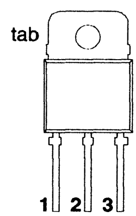
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK436	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	19	17	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.16	0.2	Ω

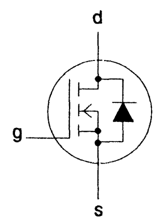
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	**-200B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	19	17	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	12	11	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	76	68	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.0 K/W $R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK436-200A**	-	0.15	0.16	Ω
		I_D = 10 A **BUK436-200B**	-	0.17	0.20	Ω

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	8.5	16	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	300	400	pF
C_{rss}	Feedback capacitance		-	60	100	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω;	-	145	185	ns
t_f	Turn-off fall time	R_{GS} = 50 Ω	-	50	70	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	19	A
I_{DRM}	Pulsed reverse drain current	-	-	-	76	A
V_{SD}	Diode forward voltage	I_F = 19 A ; V_{GS} = 0 V	-	1.0	1.7	V
t_{rr}	Reverse recovery time	I_F = 19 A; -dI_F/dt = 100 A/µs;	-	180	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	2.5	-	µC

PowerMOS transistor

BUK436-200A/B

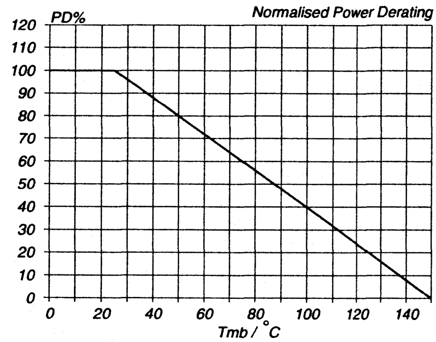


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

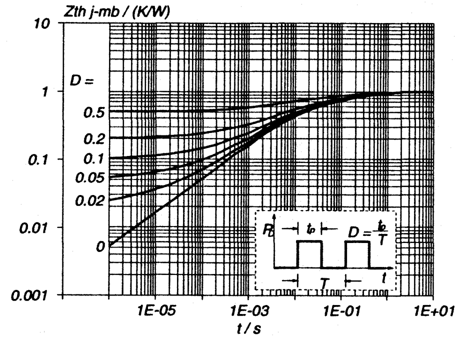


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

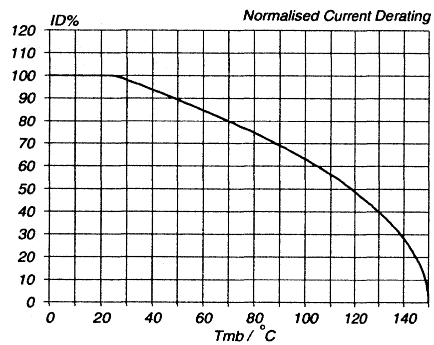


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

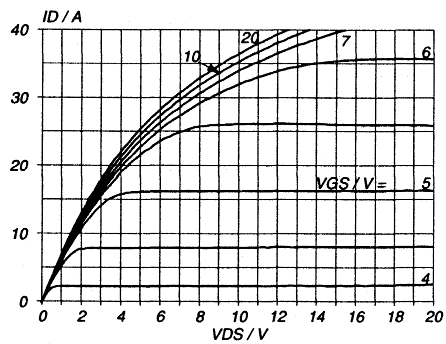


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

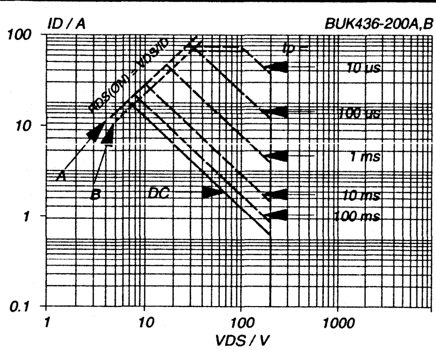


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

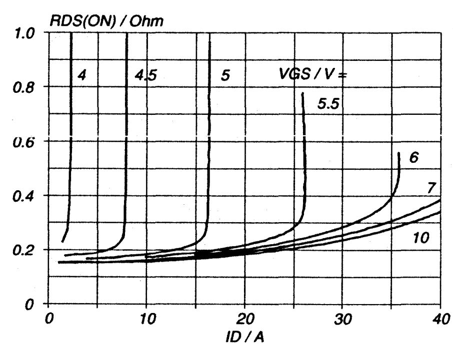


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

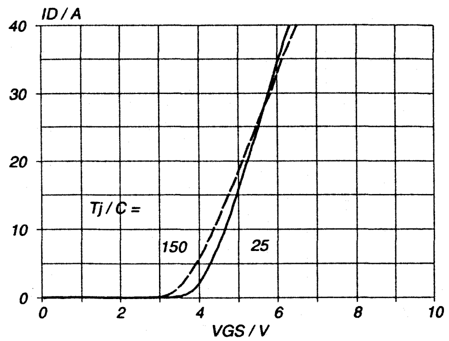


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

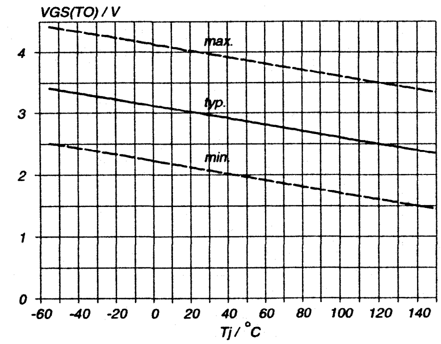


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

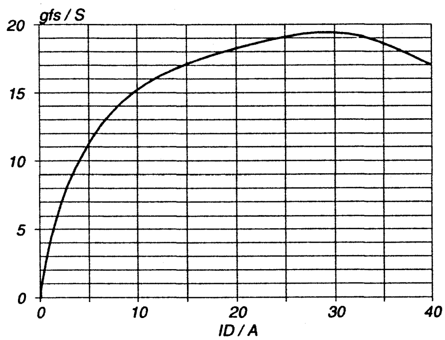


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

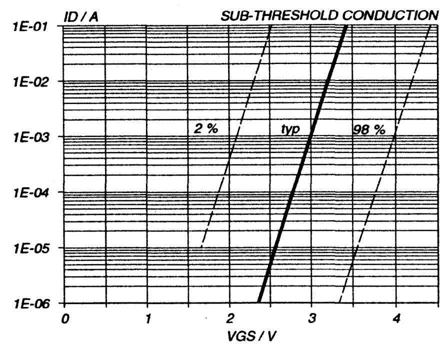


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

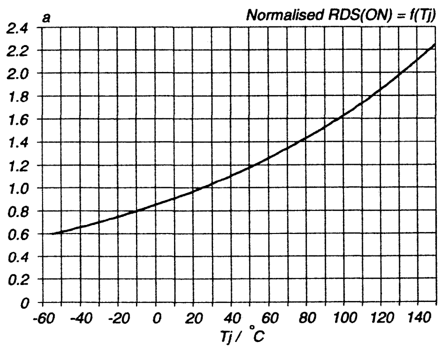


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 10$ A; $V_{GS} = 10$ V

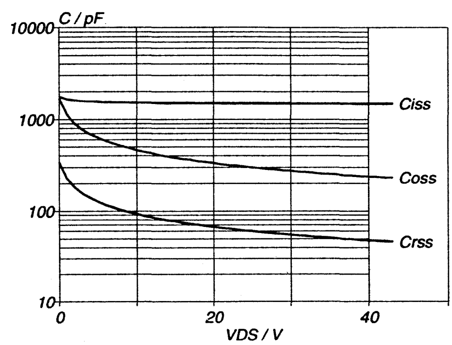


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

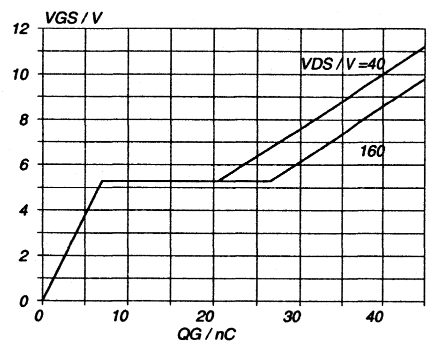


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 19$ A; parameter V_{DS}

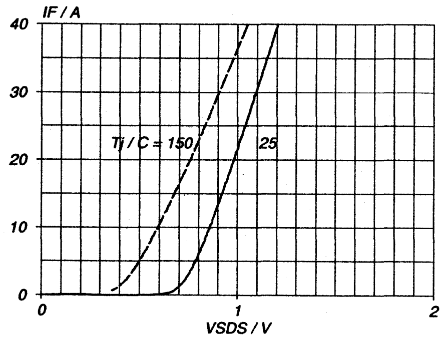


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK436-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

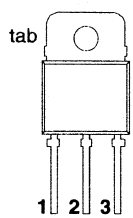
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK436	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	4	3.5	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	3	4	Ω

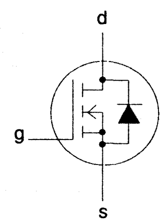
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	4.0	3.5	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	2.5	2.2	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	16	14	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.0 K/W $R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK436-800A**	-	2.7	3.0	Ω
		I_D = 1.5 A **BUK436-800B**	-	3.5	4.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	16	A
V_{SD}	Diode forward voltage	I_F = 4.0 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 4.0 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

PowerMOS transistor BUK436-800A/B

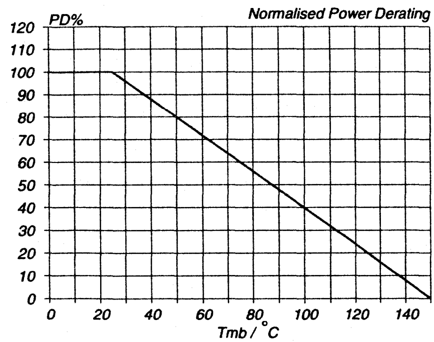


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

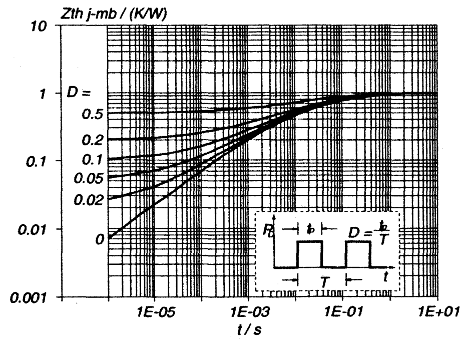


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

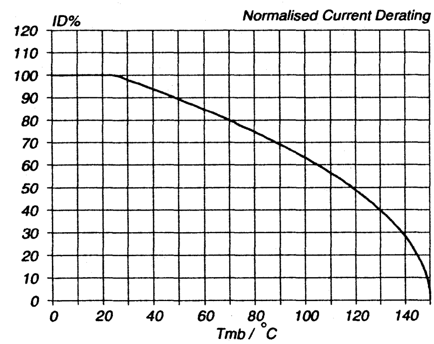


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

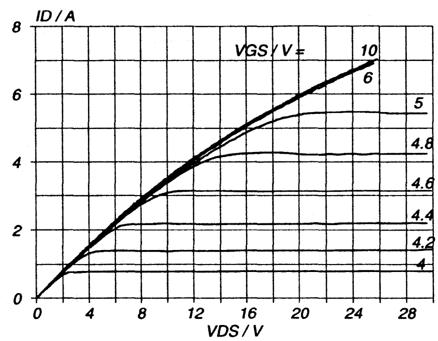


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

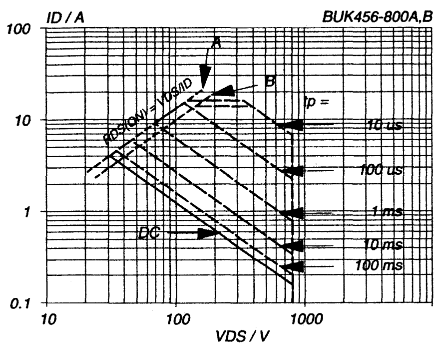


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

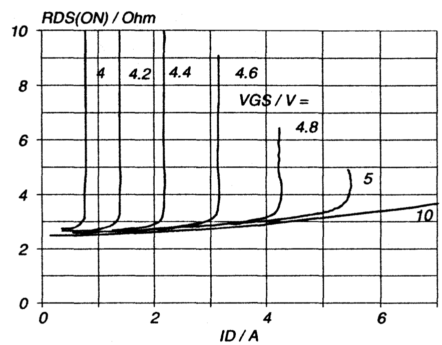


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK436-800A/B

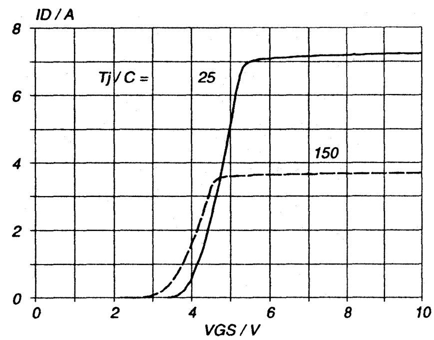


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

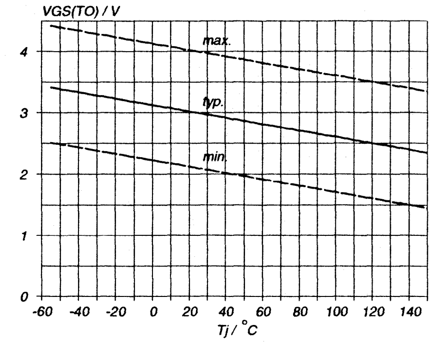


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

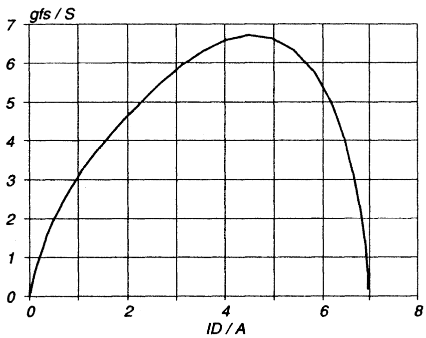


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

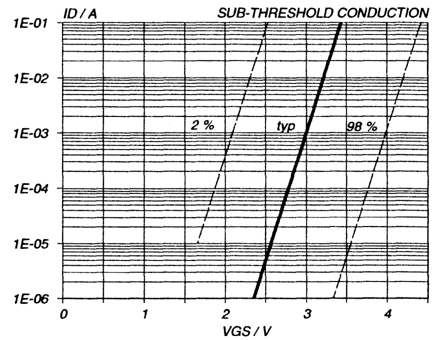


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

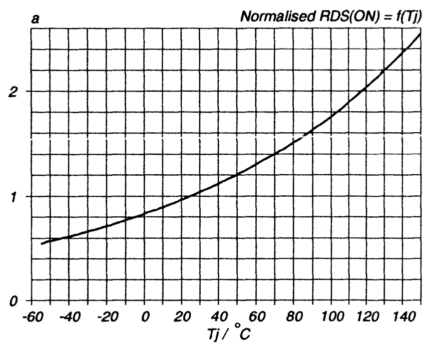


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 1.5 A; V_{GS} = 10 V

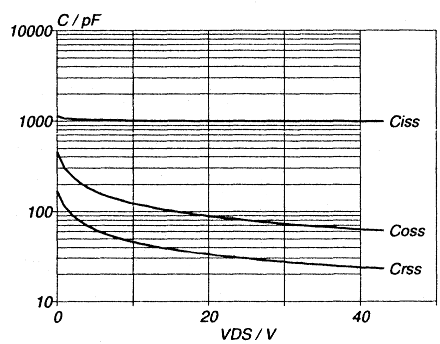


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

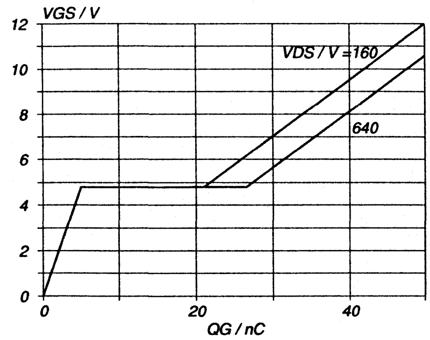


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4$ A; parameter V_{DS}

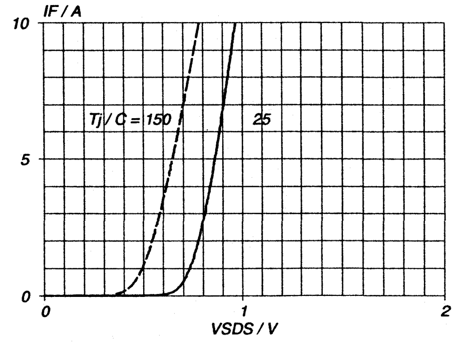


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK436-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

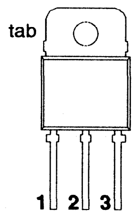
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK436	**-1000A**	**-1000B**	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	3.5	3.1	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	4	5	Ω

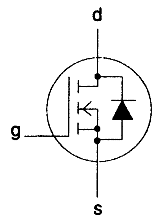
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	**-1000B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	3.5	3.1	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	2.2	2.0	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	14	12	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.0 K/W $R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK436-1000A**	-	3.5	4.0	Ω
		I_D = 1.5 A **BUK436-1000B**	-	4.5	5.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	14	A
V_{SD}	Diode forward voltage	I_F = 3.5 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 3.5 A; -dI_F/dt = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

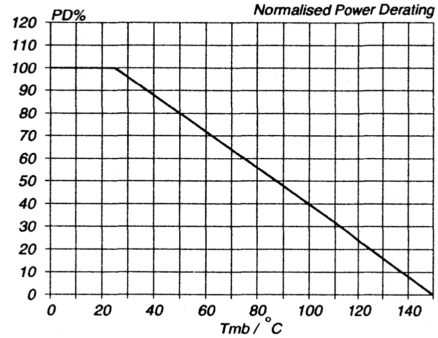


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

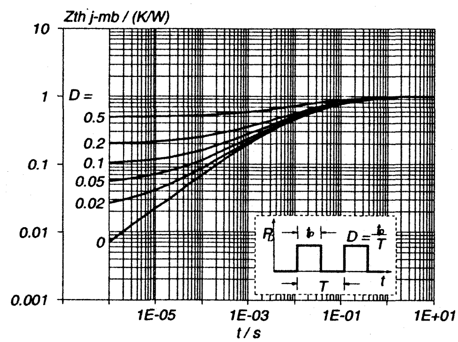


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

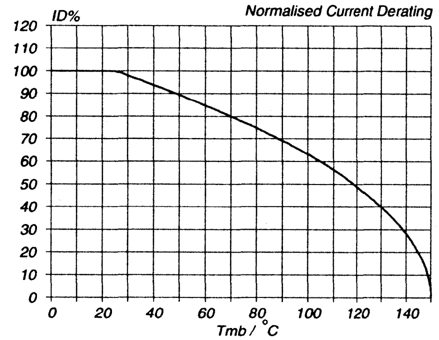


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

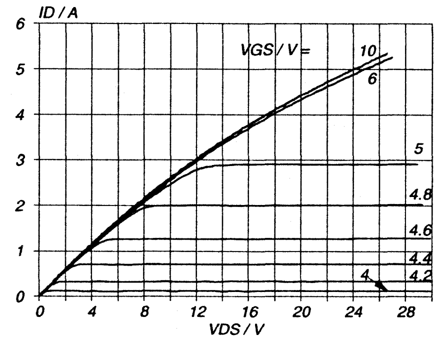


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

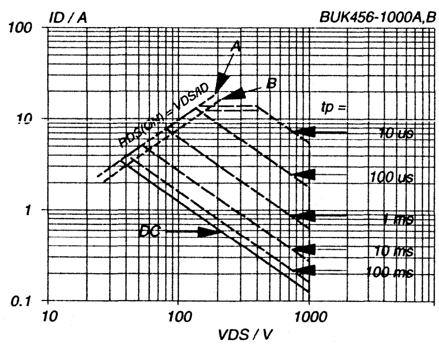


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

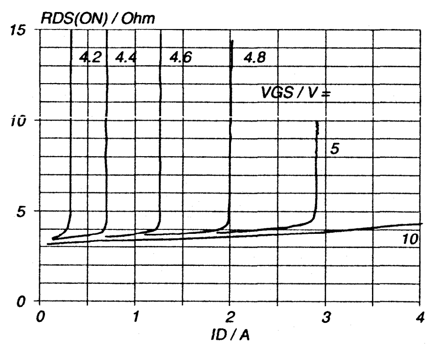


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor

BUK436-1000A/B

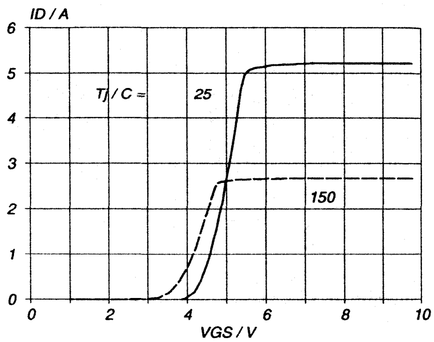


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

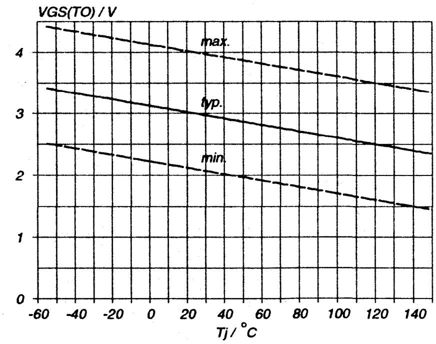


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

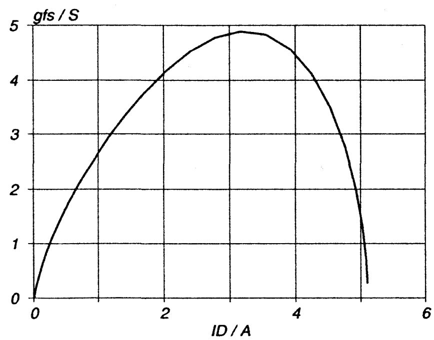


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

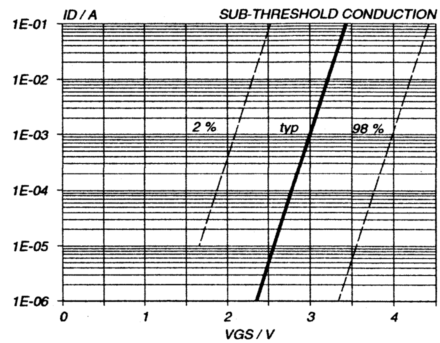


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

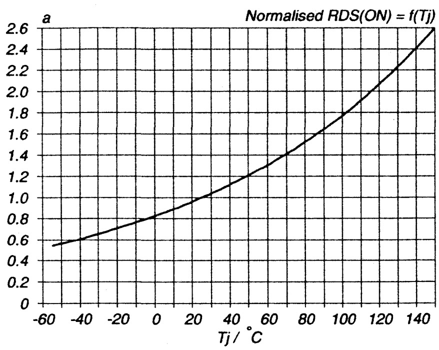


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

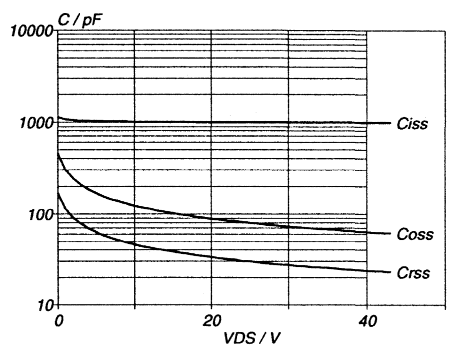


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

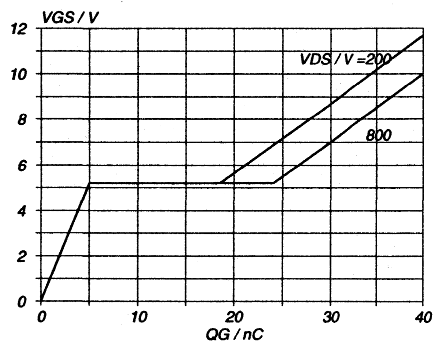


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.5$ A; parameter V_{DS}

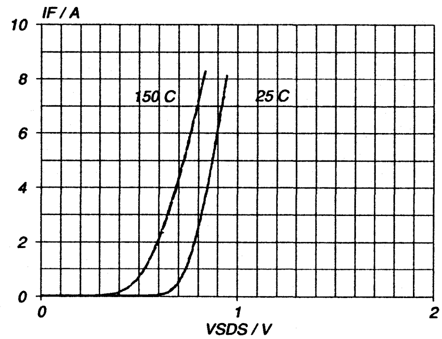


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK437-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

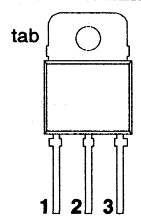
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK437	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	14	12	A
P_{tot}	Total power dissipation	180	180	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

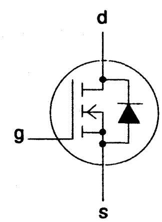
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<tr><th>SYMBOL</th><th>PARAMETER</th><th>CONDITIONS</th><th>MIN.</th><th colspan="2">MAX.</th><th>UNIT</th></tr>
<tr><td>V_{DS}</td><td>Drain-source voltage</td><td>-</td><td>-</td><td colspan="2">400</td><td>V</td></tr>
<tr><td>V_{DGR}</td><td>Drain-gate voltage</td><td>R_{GS} = 20 kΩ</td><td>-</td><td colspan="2">400</td><td>V</td></tr>
<tr><td>$\pm V_{GS}$</td><td>Gate-source voltage</td><td>-</td><td>-</td><td colspan="2">30</td><td>V</td></tr>
<tr><td></td><td></td><td></td><td></td><td>-400A</td><td>-400B</td><td></td></tr>
<tr><td>I_D</td><td>Drain current (DC)</td><td>T_{mb} = 25 ˚C</td><td>-</td><td>14</td><td>12</td><td>A</td></tr>
<tr><td>I_D</td><td>Drain current (DC)</td><td>T_{mb} = 100 ˚C</td><td>-</td><td>8.8</td><td>7.6</td><td>A</td></tr>
<tr><td>I_{DM}</td><td>Drain current (pulse peak value)</td><td>T_{mb} = 25 ˚C</td><td>-</td><td>56</td><td>48</td><td>A</td></tr>
<tr><td>P_{tot}</td><td>Total power dissipation</td><td>T_{mb} = 25 ˚C</td><td>-</td><td colspan="2">180</td><td>W</td></tr>
<tr><td>T_{stg}</td><td>Storage temperature</td><td>-</td><td>- 55</td><td colspan="2">150</td><td>˚C</td></tr>
<tr><td>T_j</td><td>Junction Temperature</td><td>-</td><td>-</td><td colspan="2">150</td><td>˚C</td></tr>
</table>

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 0.69 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK437-400A**	-	0.35	0.4	Ω
		BUK437-400B	-	0.45	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 14 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

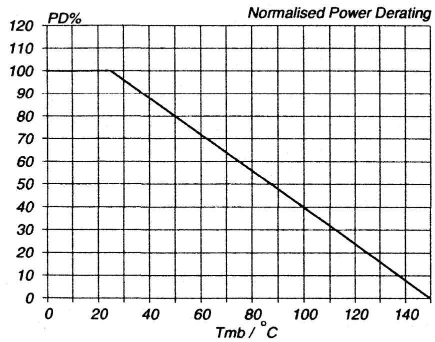


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

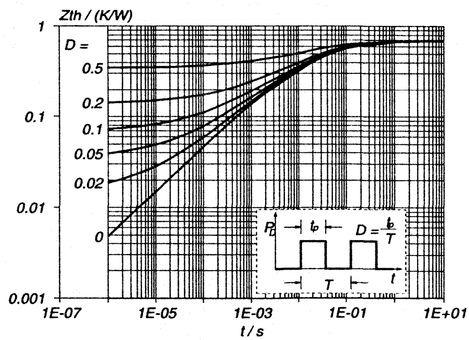


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

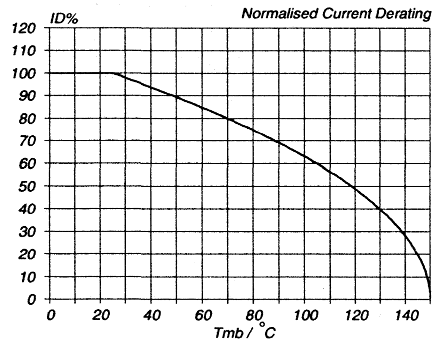


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

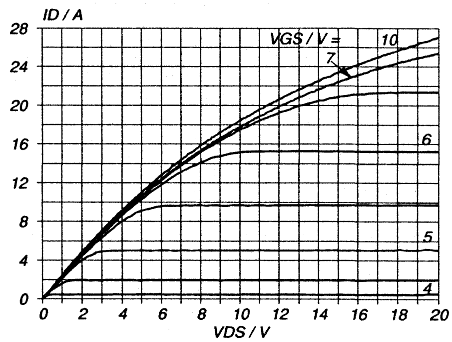


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

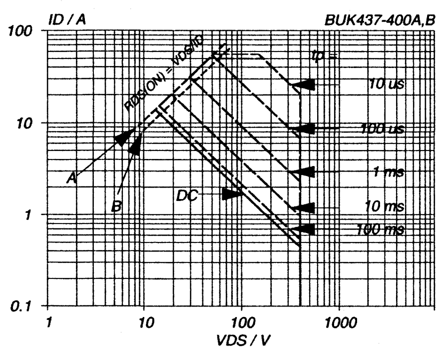


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

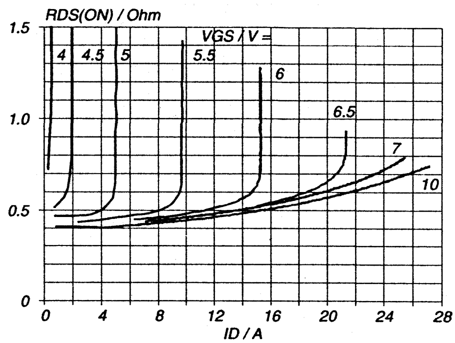


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

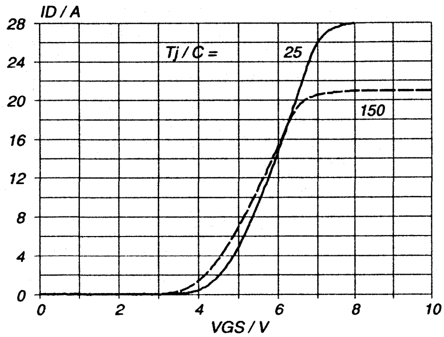


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

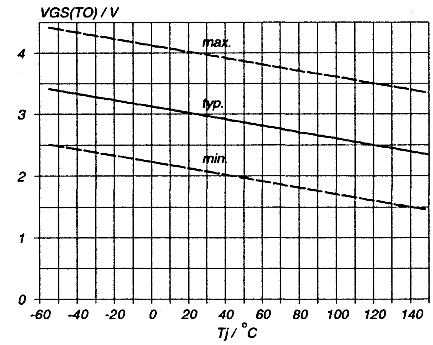


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

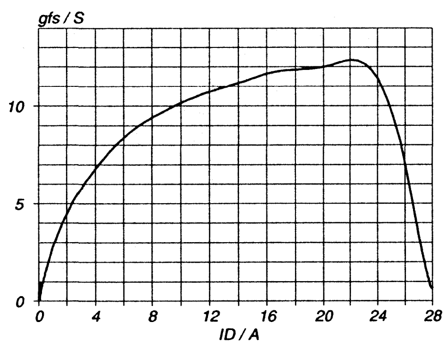


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

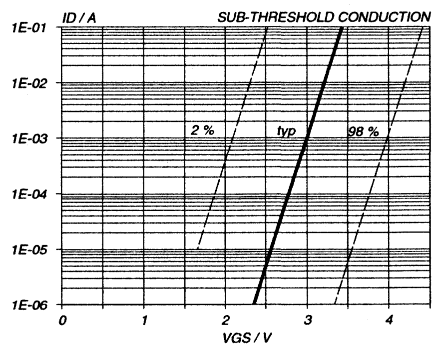


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

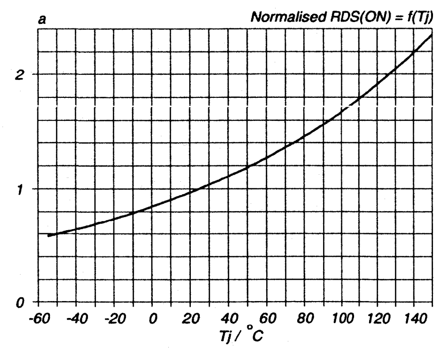


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; I_D = 6.5 A; V_{GS} = 10 V

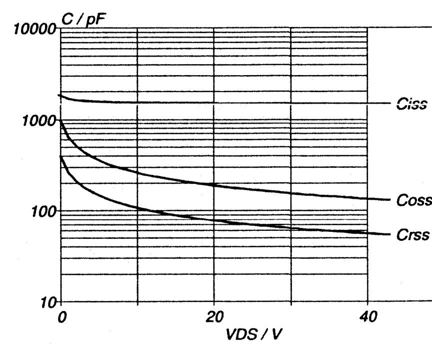


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

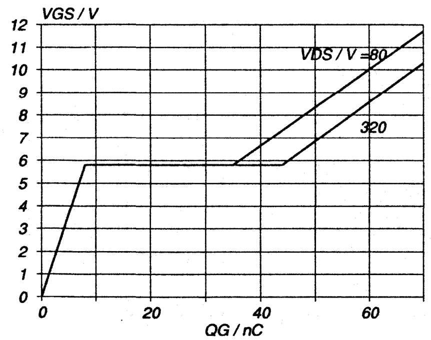


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

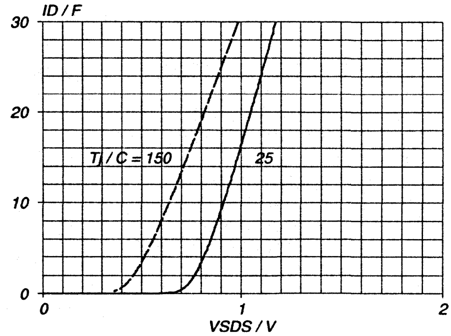


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK437-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

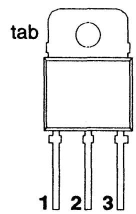
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK437	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	11	10	A
P_{tot}	Total power dissipation	180	180	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.6	0.8	Ω

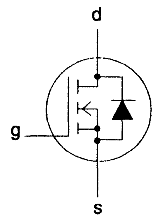
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	11	10	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	7.0	6.3	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	44	40	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	180		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 0.69 K/W $R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK437-500A**	-	0.55	0.6	Ω
		I_D = 6.5 A **BUK437-500B**	-	0.7	0.8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	11	A
I_{DRM}	Pulsed reverse drain current	-	-	-	44	A
V_{SD}	Diode forward voltage	I_F = 11 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 11 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

PowerMOS transistor | BUK437-500A/B

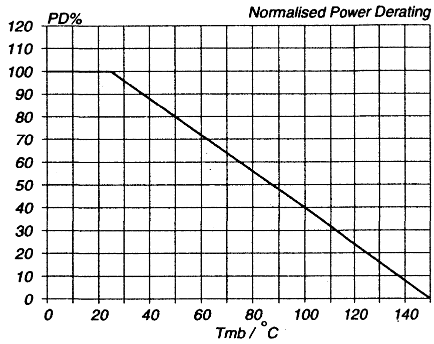


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

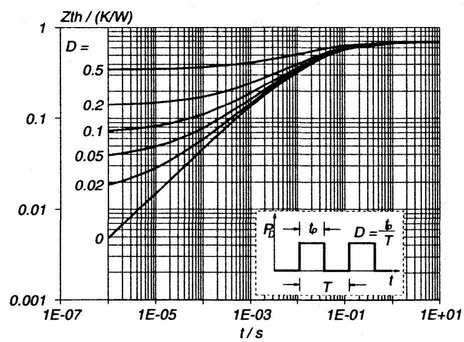


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

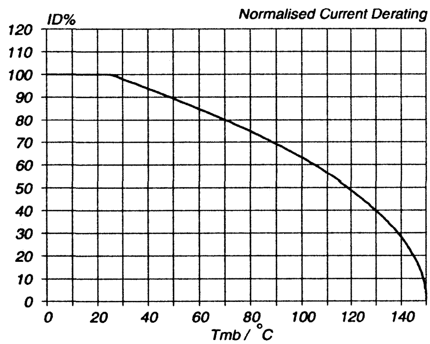


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

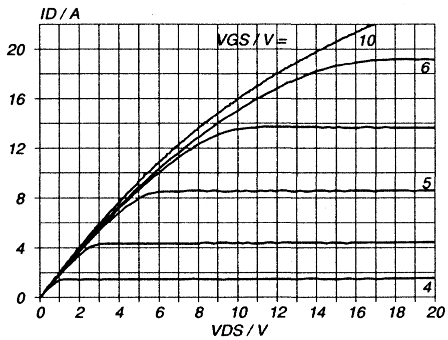


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

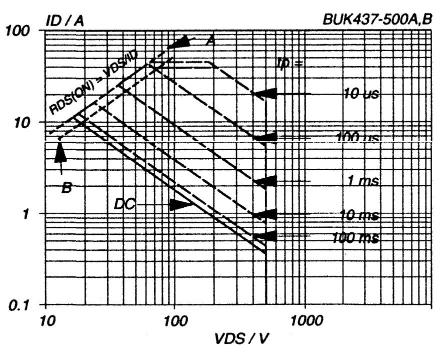


Fig.3. Safe operating area. $T_{mb} = 25$ ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

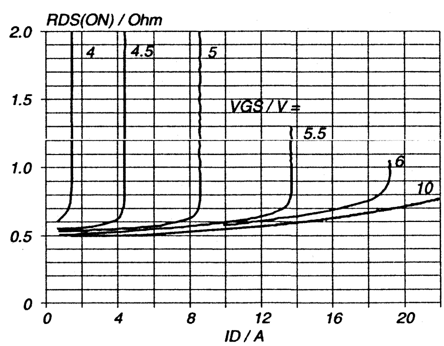


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

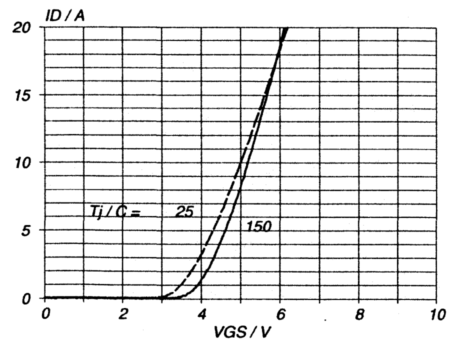


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

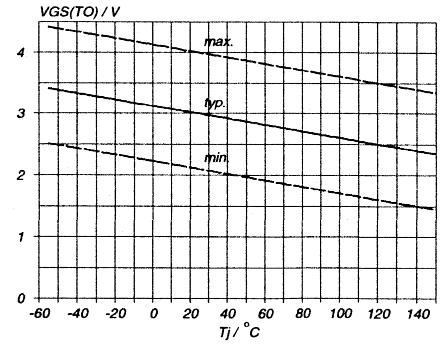


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

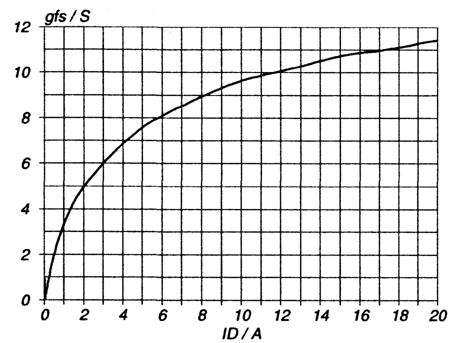


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

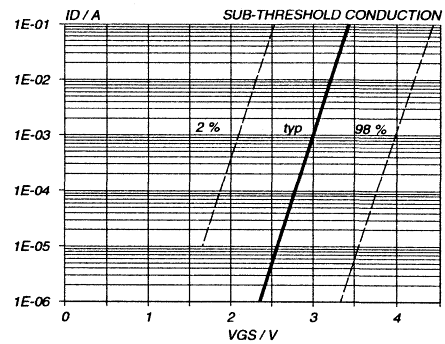


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

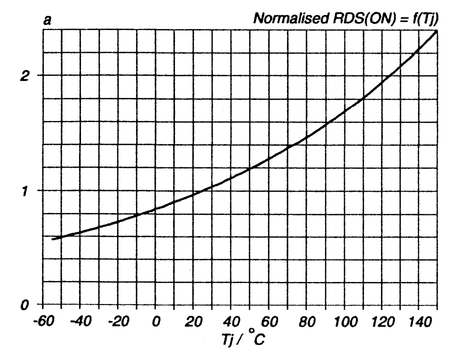


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

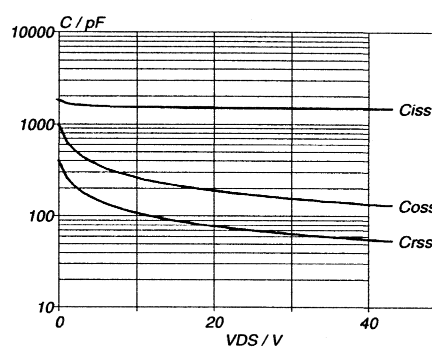


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

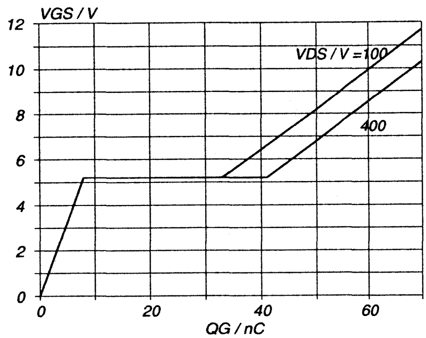


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

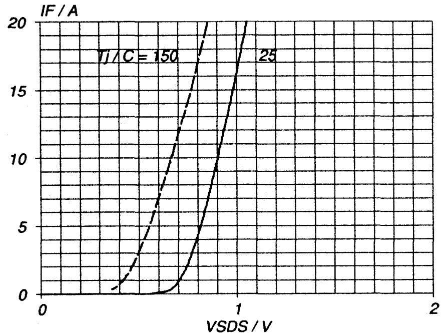


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK437-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

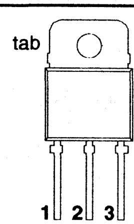
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK437	-600A	-600B	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	9	7.8	A
P_{tot}	Total power dissipation	180	180	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.0	1.2	Ω

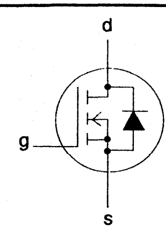
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	-600B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	9	7.8	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	5.7	5.0	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	36	31	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	180		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 0.69 K/W $R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK437-600A**	-	0.85	1.0	Ω
		BUK437-600B	-	1.0	1.2	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9	A
I_{DRM}	Pulsed reverse drain current	-	-	-	36	A
V_{SD}	Diode forward voltage	I_F = 9 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 9 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

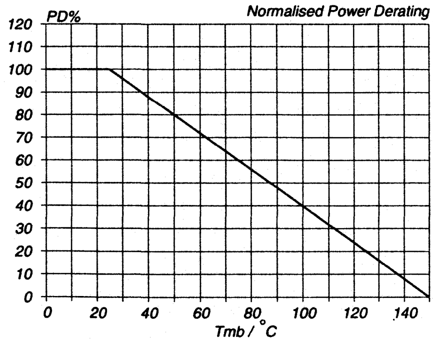


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

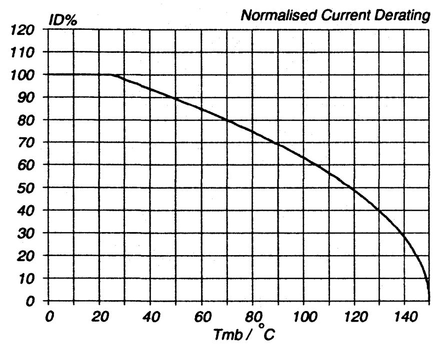


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

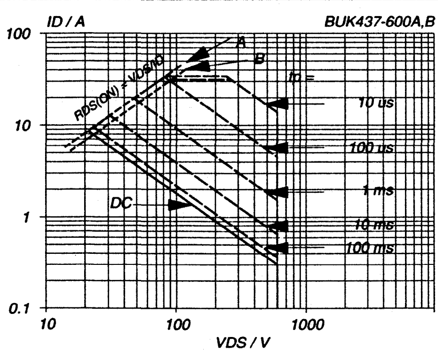


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

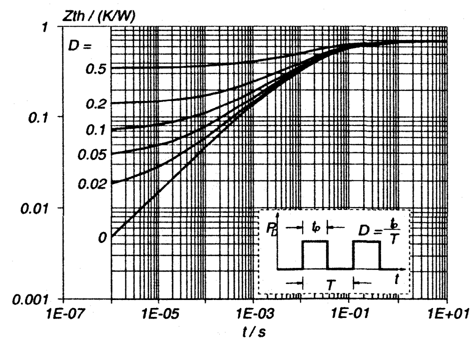


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

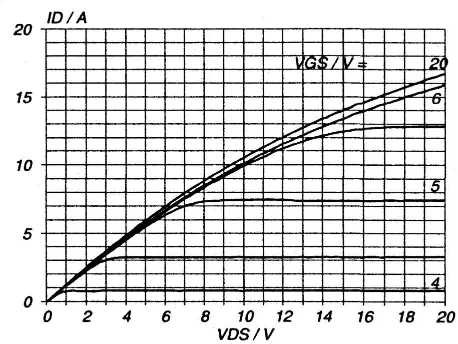


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

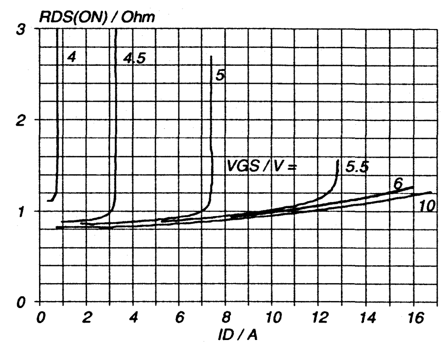


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK437-600A/B

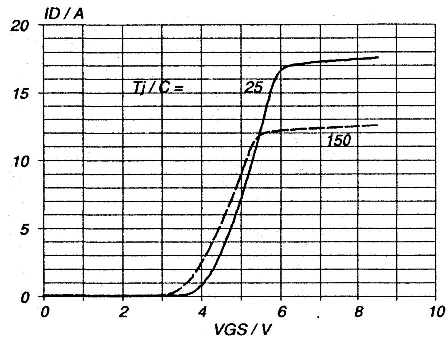


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

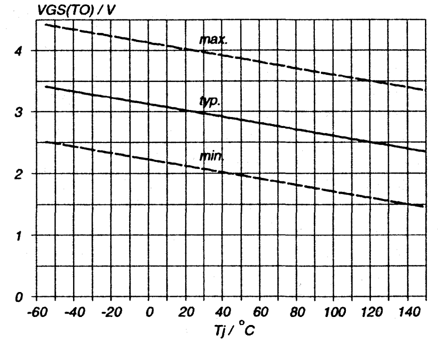


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

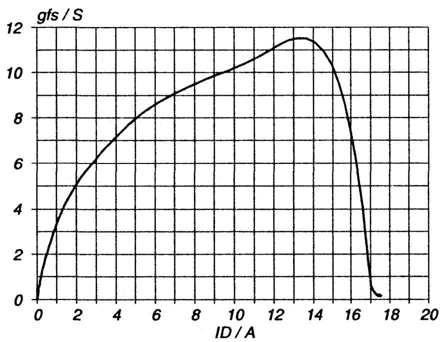


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

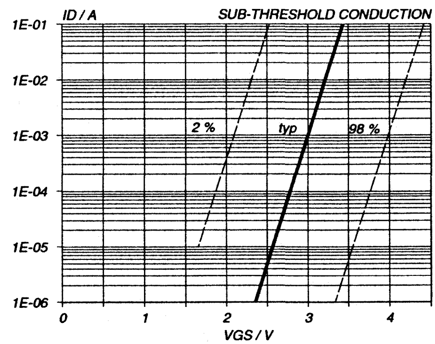


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

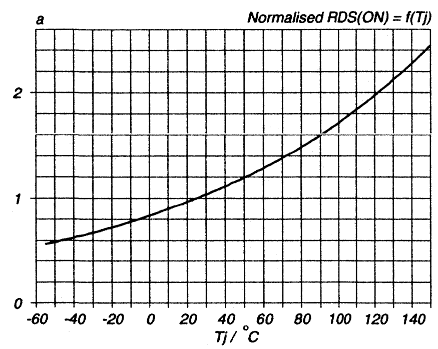


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

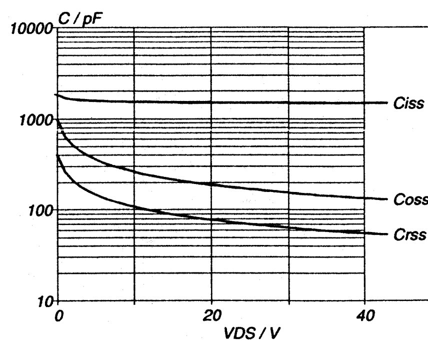


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

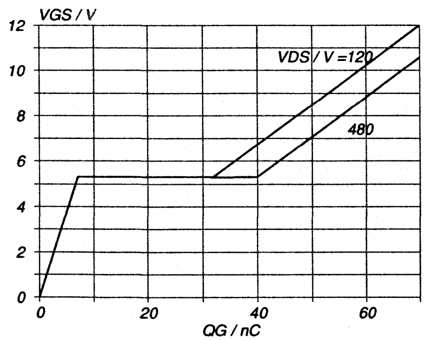


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 9$ A; parameter V_{DS}

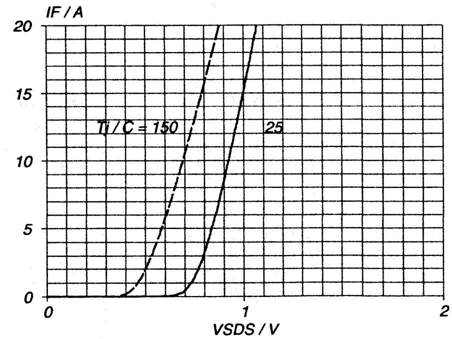


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK438-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

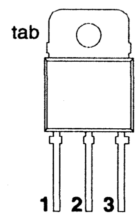
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK438	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	15	13.5	A
P_{tot}	Total power dissipation	220	220	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

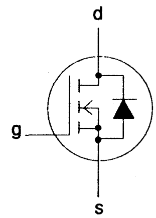
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	15	13.5	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	9.5	8.5	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	60	54	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	220		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 0.57 K/W $R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK438-500A**	-	0.35	0.4	Ω
		I_D = 8 A **BUK438-500B**	-	0.4	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8 A	9.0	12.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	2400	2800	pF
C_{oss}	Output capacitance		-	270	420	pF
C_{rss}	Feedback capacitance		-	110	200	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	30	60	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	90	130	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	300	400	ns
t_f	Turn-off fall time		-	110	140	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	15	A
I_{DRM}	Pulsed reverse drain current	-	-	-	60	A
V_{SD}	Diode forward voltage	I_F = 15 A ;V_{GS} = 0 V	-	1.0	1.4	V
t_{rr}	Reverse recovery time	I_F = 15 A; -dI_F/dt = 100 A/µs;	-	800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	9.0	-	µC

PowerMOS transistor

BUK438-500A/B

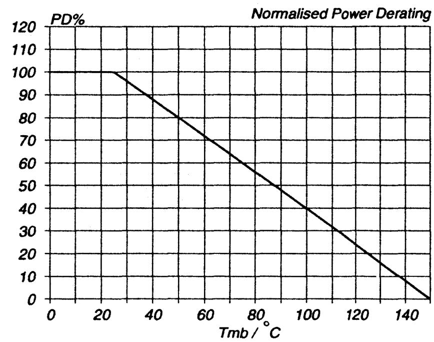


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

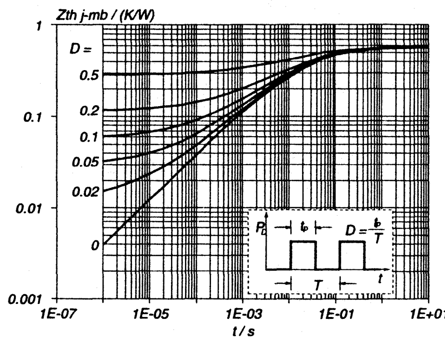


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

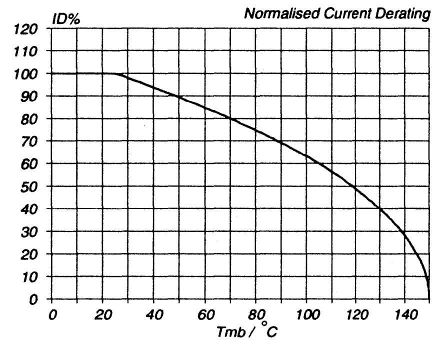


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

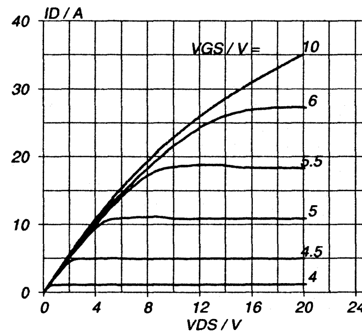


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

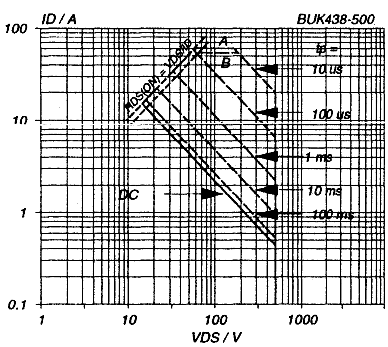


Fig.3. Safe operating area. $T_{mb} = 25$ ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

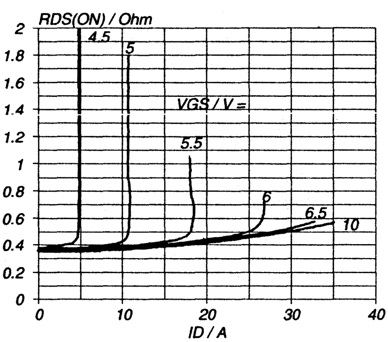


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

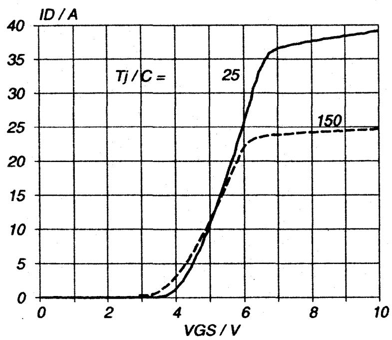


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

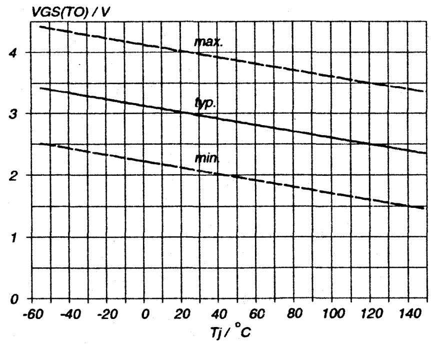


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

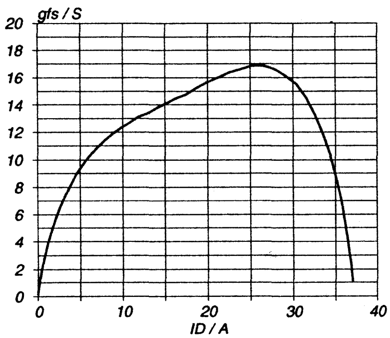


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

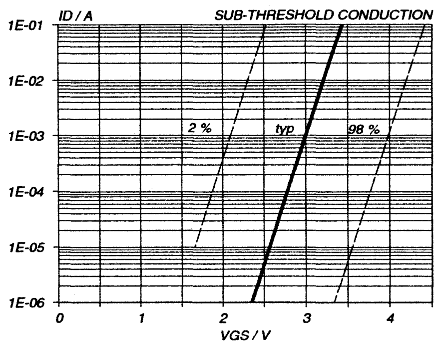


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

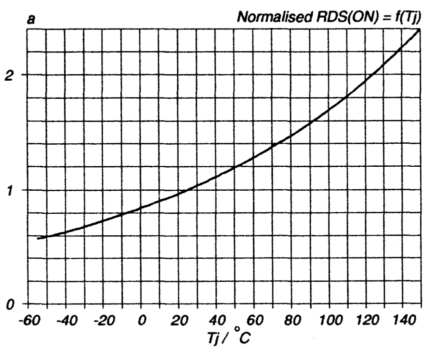


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 8$ A; $V_{GS} = 10$ V

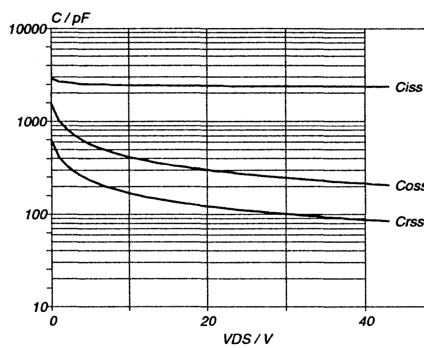


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

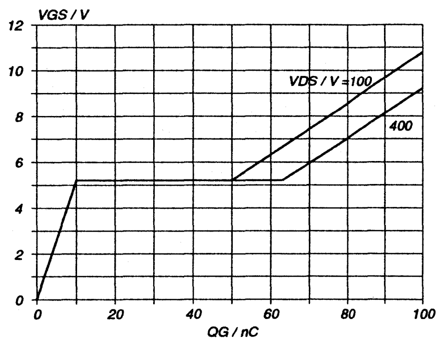


Fig. 13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: I_D = 15 A; parameter V_{DS}

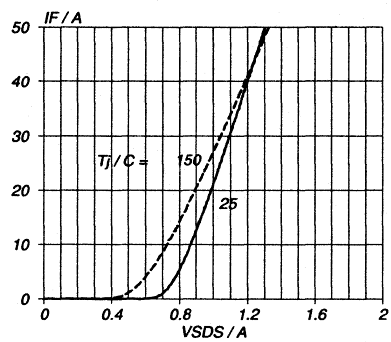


Fig. 14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK438-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

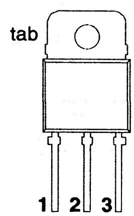
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK438	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	7.6	6.6	A
P_{tot}	Total power dissipation	220	220	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.5	2.0	Ω

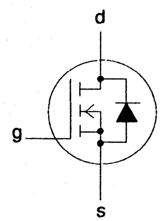
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	7.6	6.6	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	4.8	4.1	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	30	26	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	220		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb} = 0.57$ K/W $R_{th\,j\text{-}a} = 45$ K/W

STATIC CHARACTERISTICS

$T_{mb} = 25$ ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0$ V; $I_D = 0.25$ mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$; $I_D = 1$ mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 800$ V; $V_{GS} = 0$ V; $T_j = 25$ ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 800$ V; $V_{GS} = 0$ V; $T_j = 125$ ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	$V_{GS} = \pm30$ V; $V_{DS} = 0$ V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 4.0$ A **BUK438-800A**	-	1.2	1.5	Ω
		BUK438-800B	-	1.6	2.0	Ω

DYNAMIC CHARACTERISTICS

$T_{mb} = 25$ ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25$ V; $I_D = 4.0$ A	3.0	7.5	-	S
C_{iss}	Input capacitance	$V_{GS} = 0$ V; $V_{DS} = 25$ V; f = 1 MHz	-	2000	3000	pF
C_{oss}	Output capacitance		-	200	300	pF
C_{rss}	Feedback capacitance		-	100	200	pF
$t_{d\,on}$	Turn-on delay time	$V_{DD} = 30$ V; $I_D = 2.6$ A;	-	40	90	ns
t_r	Turn-on rise time	$V_{GS} = 10$ V; $R_{GS} = 50$ Ω;	-	100	140	ns
$t_{d\,off}$	Turn-off delay time	$R_{gen} = 50$ Ω	-	300	430	ns
t_f	Turn-off fall time		-	100	140	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

$T_{mb} = 25$ ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	30	A
V_{SD}	Diode forward voltage	$I_F = 7.6$ A ;$V_{GS} = 0$ V	-	0.9	1.3	V
t_{rr}	Reverse recovery time	$I_F = 7.6$ A; $-dI_F/dt = 100$ A/µs;	-	1.5	-	µs
Q_{rr}	Reverse recovery charge	$V_{GS} = 0$ V; $V_R = 100$ V	-	20	-	µC

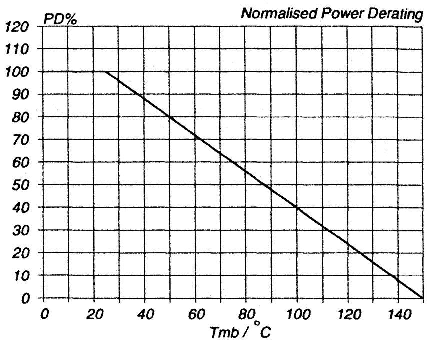


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

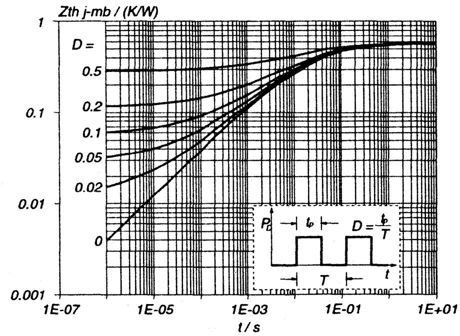


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

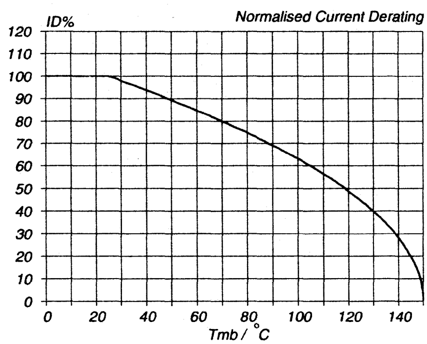


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

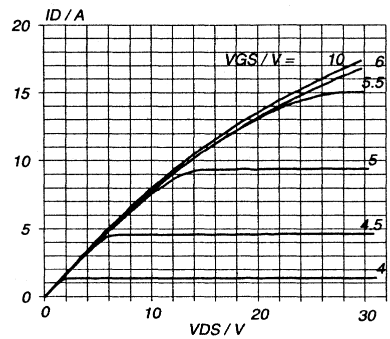


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

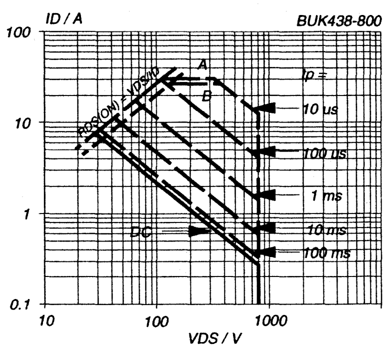


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

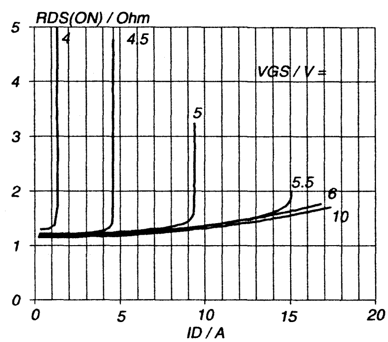


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK438-800A/B

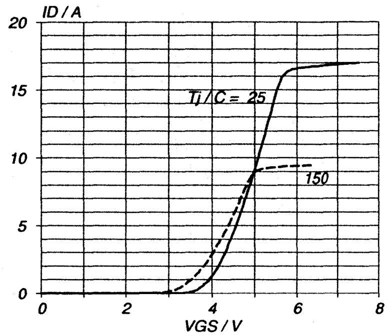


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

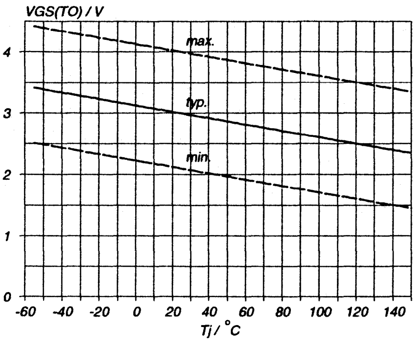


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

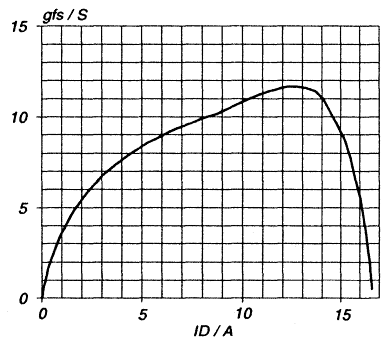


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

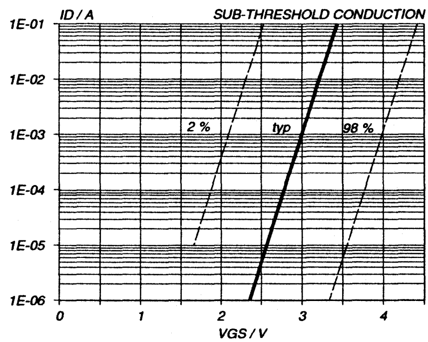


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

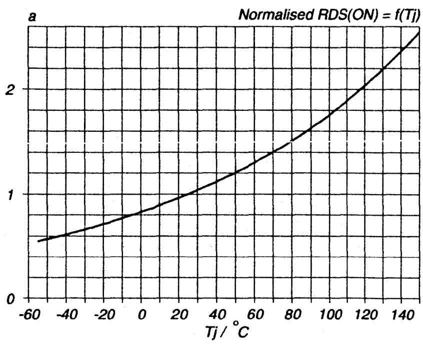


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; I_D = 4 A; V_{GS} = 10 V

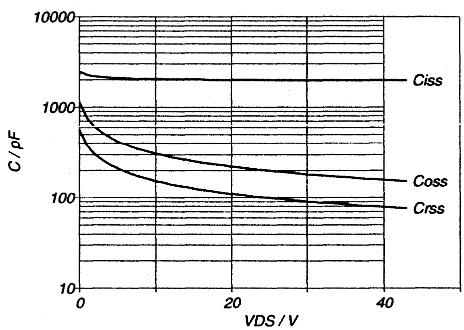


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

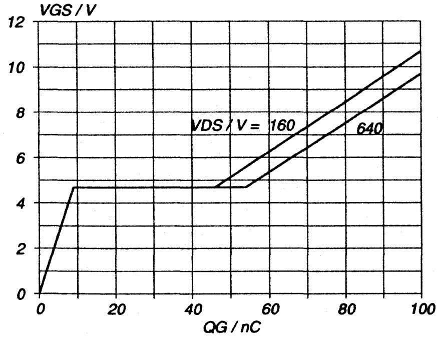


Fig.13. Typical turn-on gate-charge characteristics. $V_{GS} = f(Q_G)$; conditions: $I_D = 7.6$ A; parameter V_{DS}

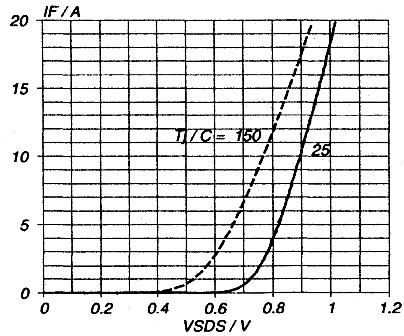


Fig.14. Typical reverse diode current. $I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK441-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

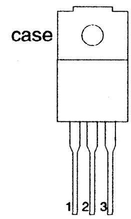
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK441	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	3.0	3.0	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.85	1.1	Ω

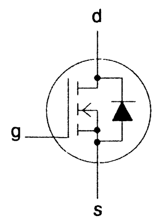
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	3.0	3.0	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2.2	1.9	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	13	11	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 6.25 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 2.5 A **BUK441-100A**	-	0.75	0.85	Ω
		BUK441-100B	-	0.90	1.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	1.3	1.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	45	60	pF
C_{rss}	Feedback capacitance		-	16	25	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	4	6	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	15	25	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	10	20	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 3.0 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

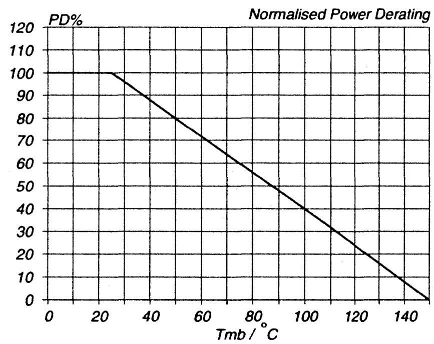


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

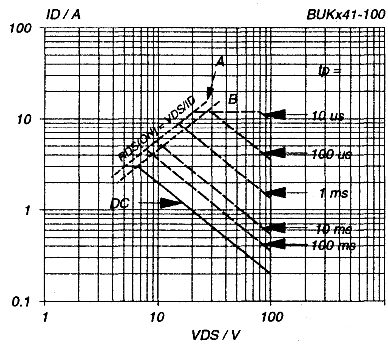


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

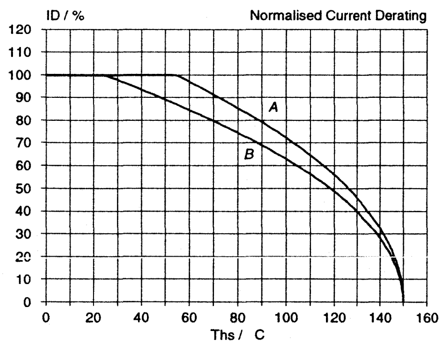


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

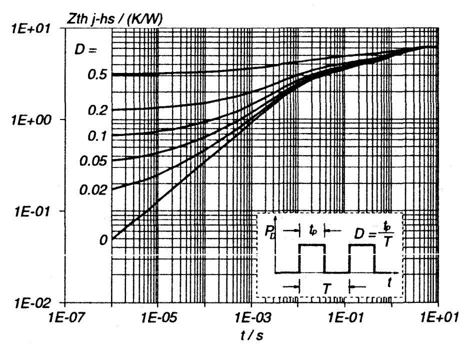


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor

BUK441-100A/B

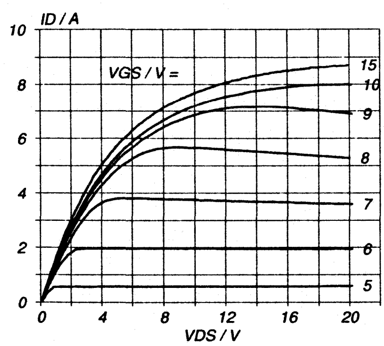


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

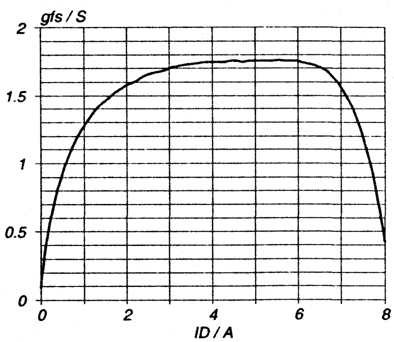


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

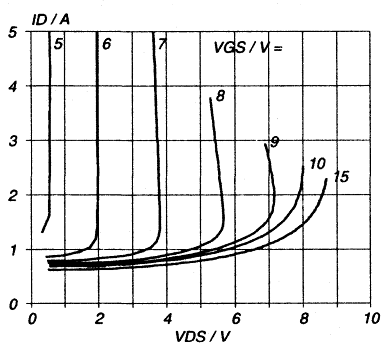


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

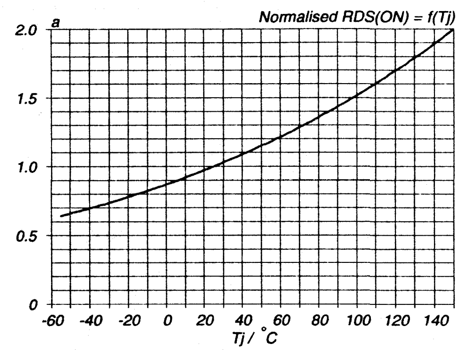


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 5$ V

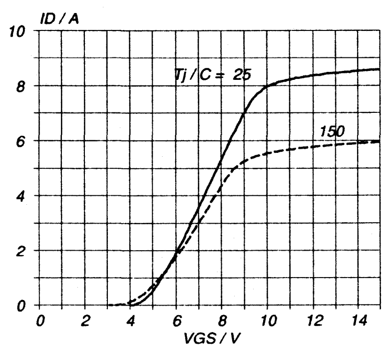


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

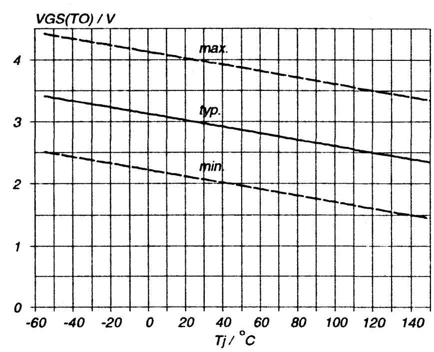


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK441-100A/B

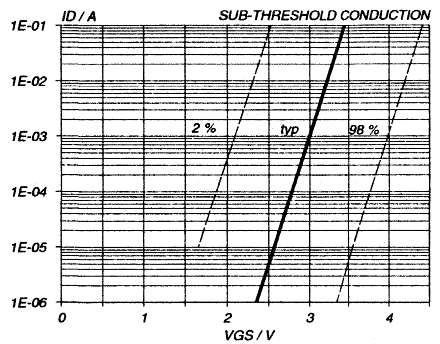


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

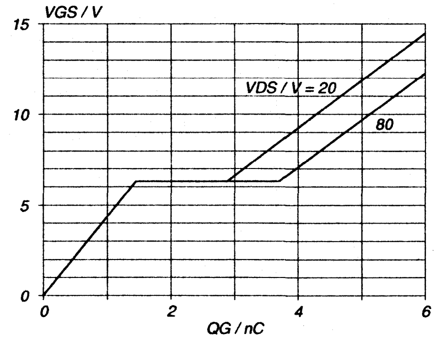


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3$ A; parameter V_{DS}

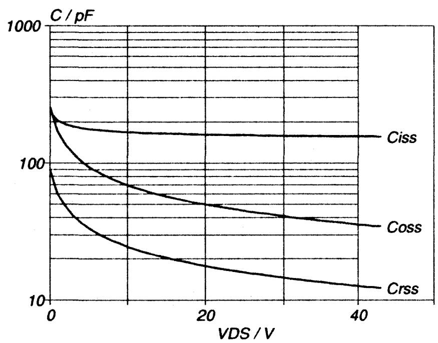


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

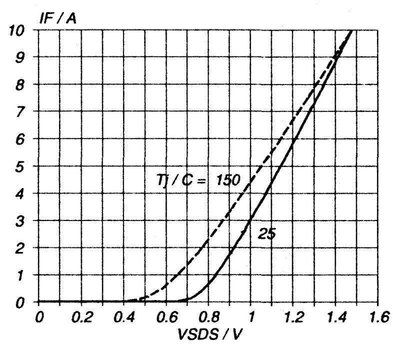


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK442-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

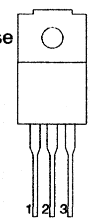
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK442	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	6.6	6.1	A
P_{tot}	Total power dissipation	22	22	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.25	0.3	Ω

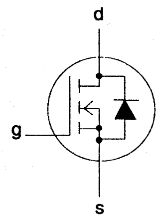
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	6.6	6.1	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	4.1	3.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	26	24	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5.68 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK442-100A**	-	0.22	0.25	Ω
		I_D = 5.5 A **BUK442-100B**	-	0.25	0.3	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5.5 A	3	4.2	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	90	120	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	9	14	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	30	45	ns
t_f	Turn-off fall time		-	20	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	26	A
V_{SD}	Diode forward voltage	I_F = 6.6 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 6.6 A; -dI_F/dt = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.30	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 11 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	35	mJ

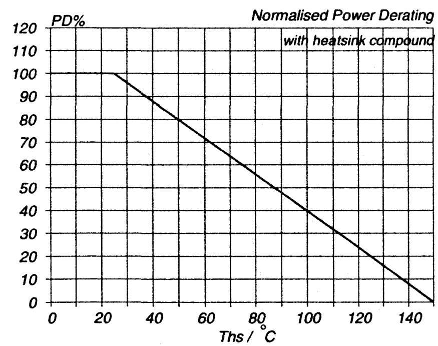


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,˚C}$ = f(T_{hs})

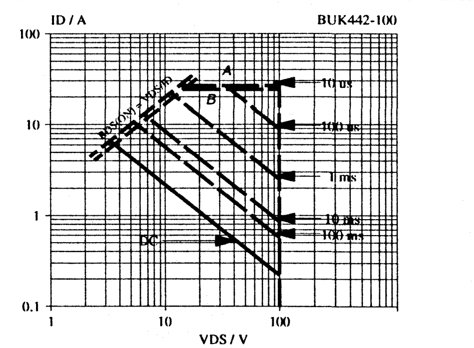


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

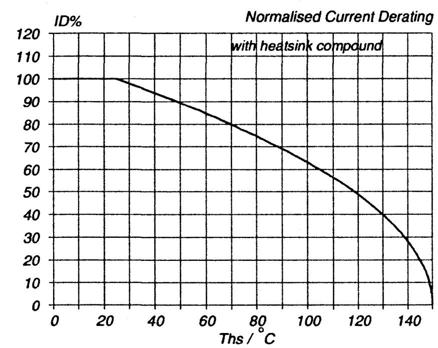


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,˚C}$ = f(T_{hs}); conditions: $V_{GS} \geq$ 10 V

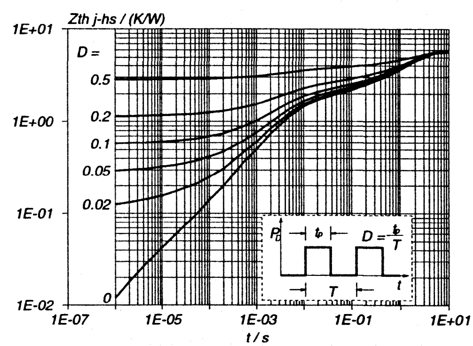


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter D = t_p/T

PowerMOS transistor BUK442-100A/B

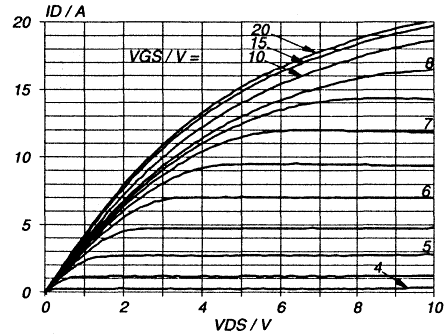


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

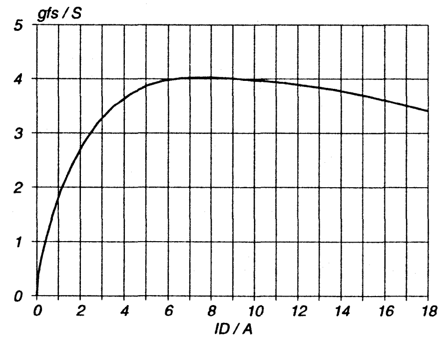


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

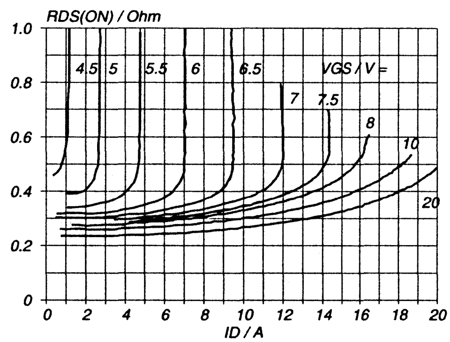


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

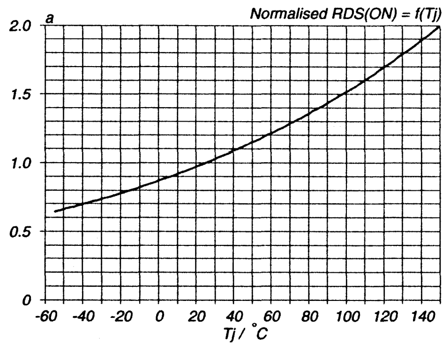


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 5.5 A; V_{GS} = 10 V

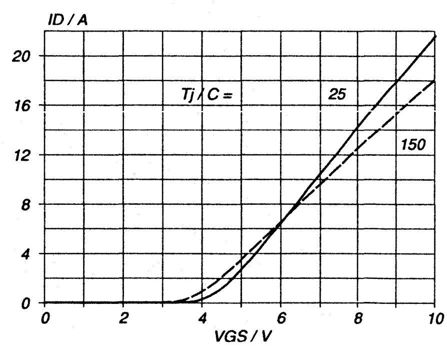


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

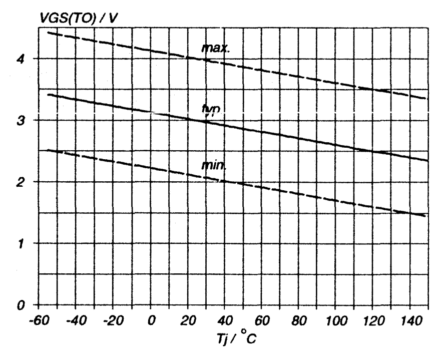


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

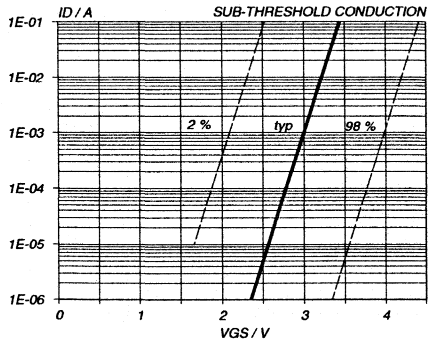


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

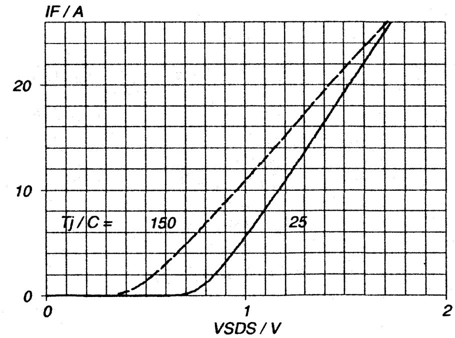


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

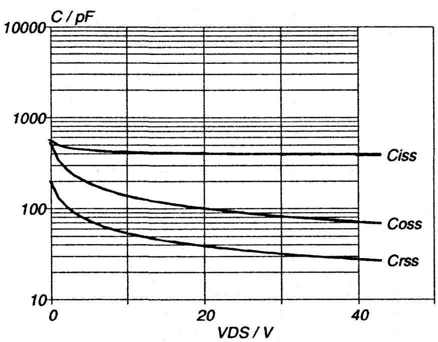


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

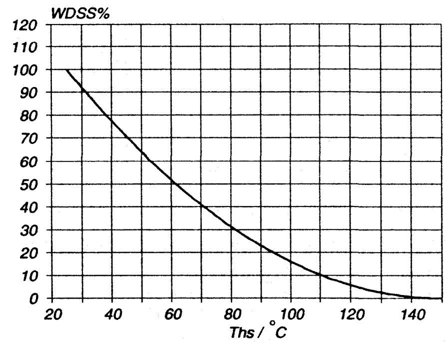


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 11$ A

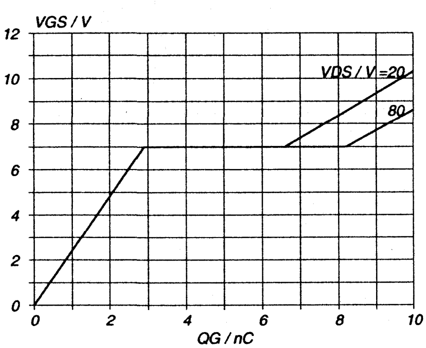


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

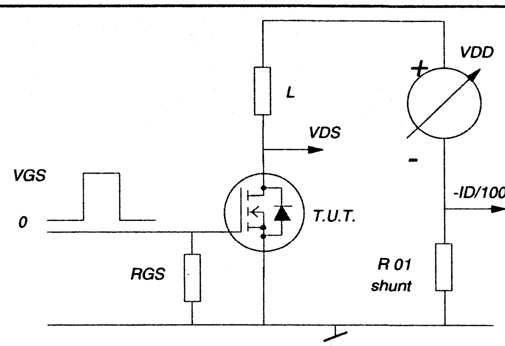


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK443-50A/B	

BUK443-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

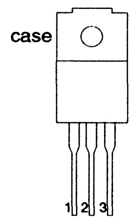
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK443	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.08	0.1	Ω

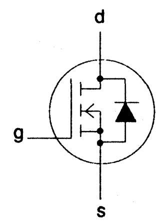
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	13	12	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	8.2	7.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	52	48	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK443-60A**	-	0.065	0.08	Ω
		I_D = 9 A **BUK443-60B**	-	0.08	0.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 9 A	4.5	6.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	650	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	120	160	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	35	55	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	60	90	ns
t_f	Turn-off fall time		-	55	80	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 13 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 22 A ; V_{DD} ≤ 25 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	50	mJ

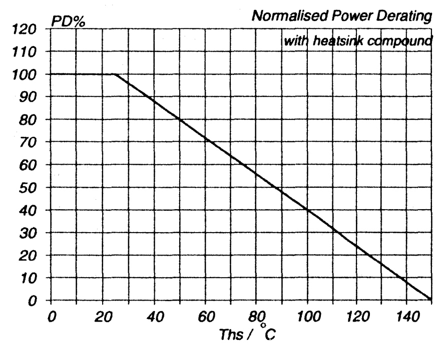


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

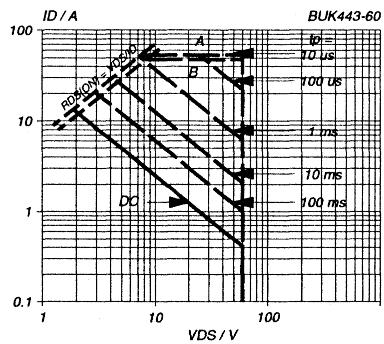


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

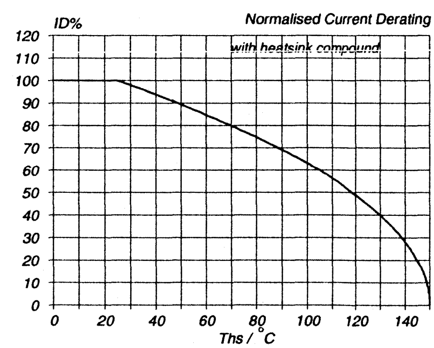


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

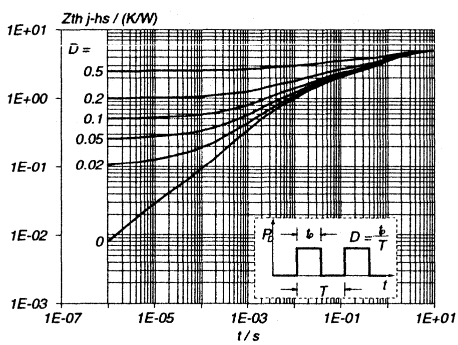


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

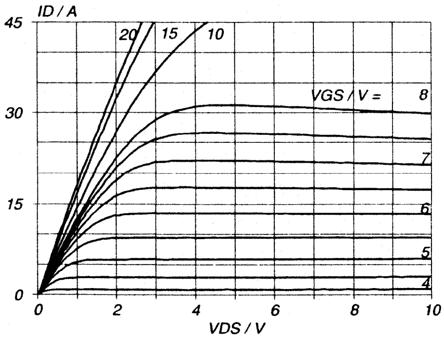


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

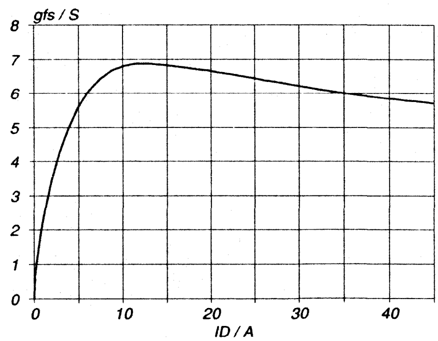


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

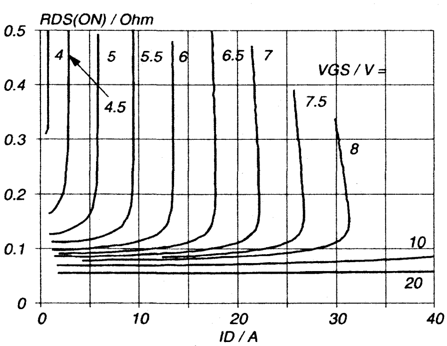


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

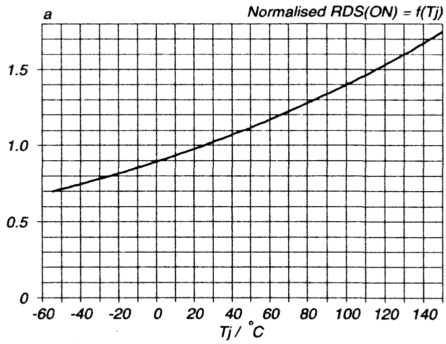


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 9$ A; $V_{GS} = 10$ V

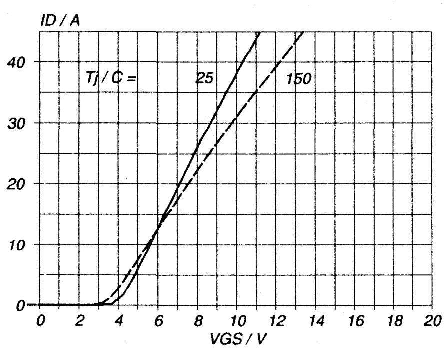


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

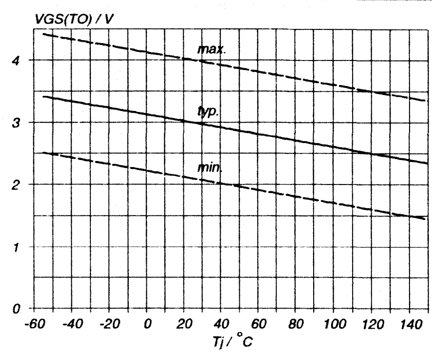


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK443-60A/B

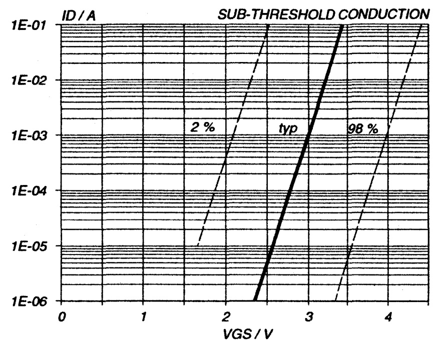


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

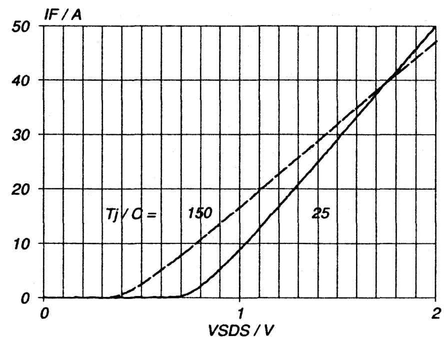


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

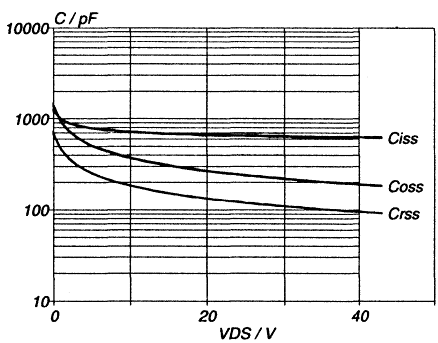


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

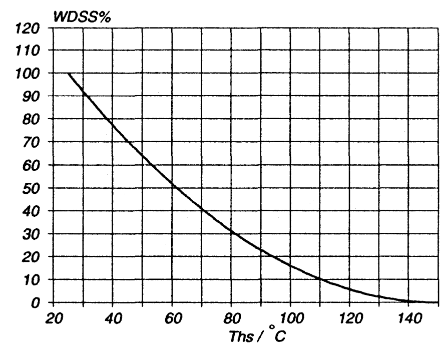


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 22$ A

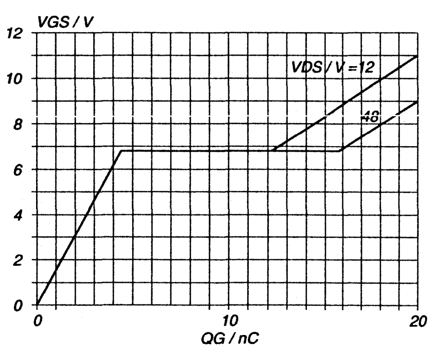


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 22$ A; parameter V_{DS}

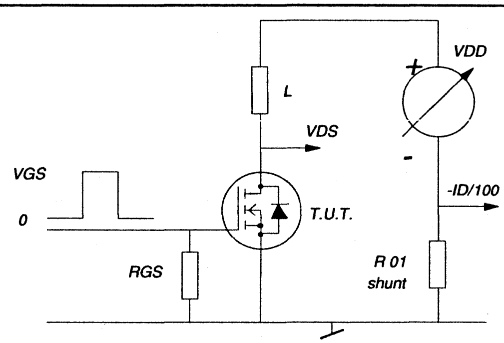


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK443-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

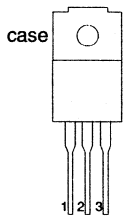
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK443	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	9	8	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.16	0.2	Ω

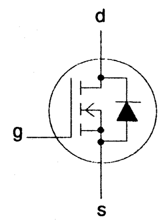
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	9	8	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	5.7	5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	36	32	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK443-100A**	-	0.15	0.16	Ω
		I_D = 5 A **BUK443-100B**	-	0.17	0.2	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5 A	4.0	5.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	660	825	pF
C_{oss}	Output capacitance		-	140	200	pF
C_{rss}	Feedback capacitance		-	60	100	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	60	90	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9	A
I_{DRM}	Pulsed reverse drain current	-	-	-	36	A
V_{SD}	Diode forward voltage	I_F = 9 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 9 A; -dI_F/dt = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.5	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	70	mJ

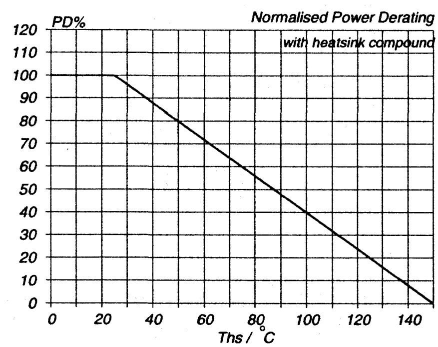


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

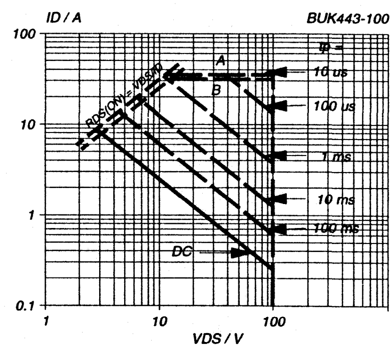


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

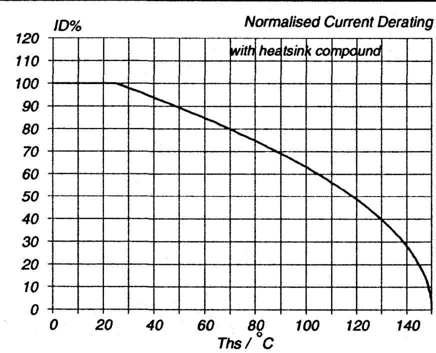


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq$ 10 V

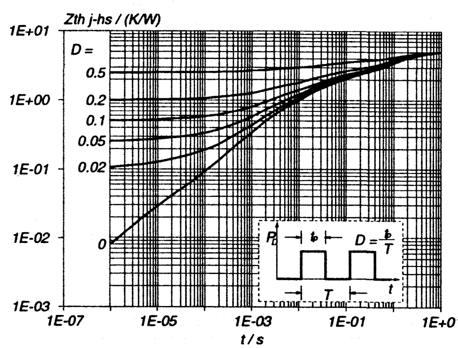


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

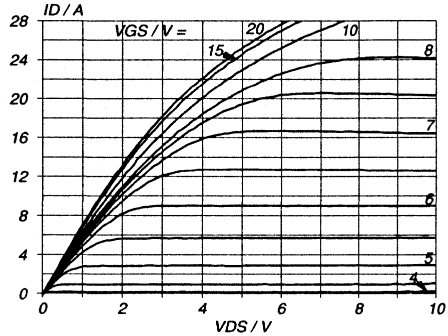


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

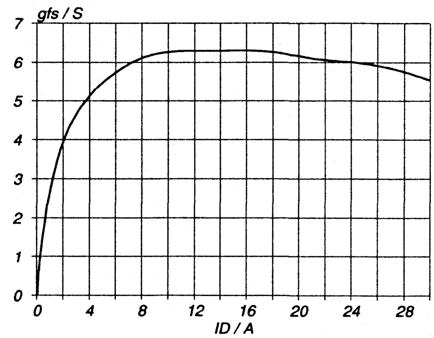


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

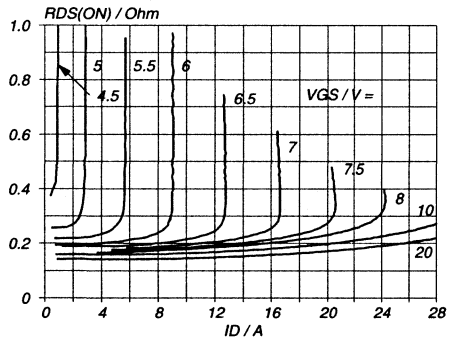


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

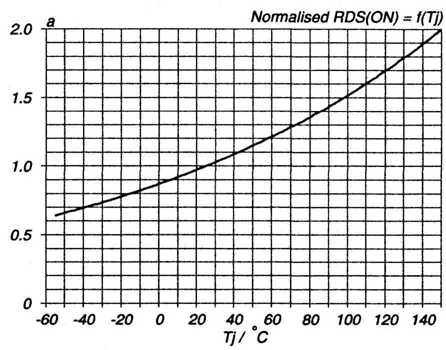


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 5$ A; $V_{GS} = 10$ V

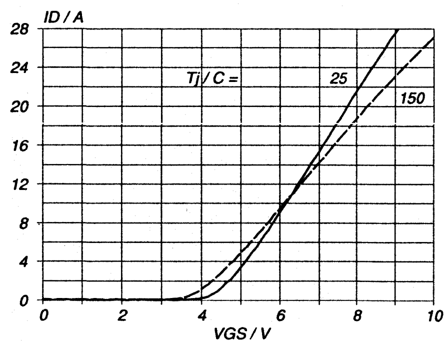


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

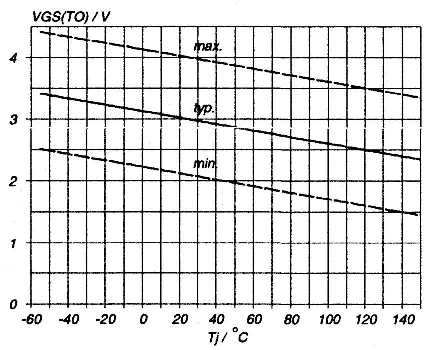


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK443-100A/B

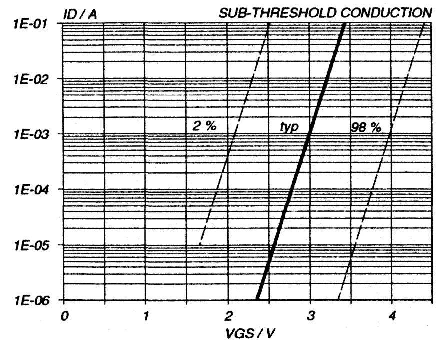


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

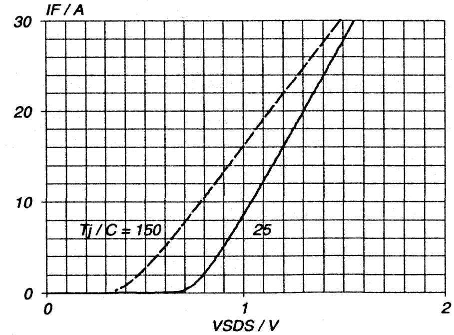


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

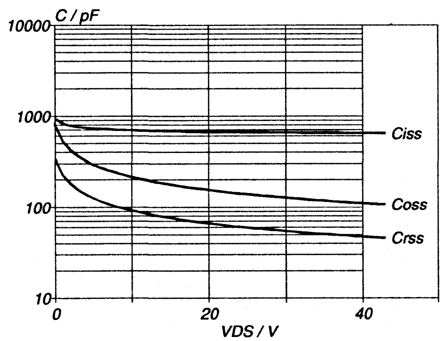


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

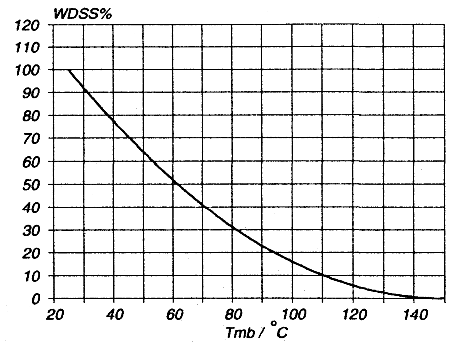


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

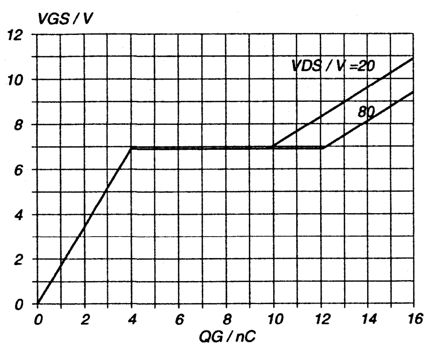


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

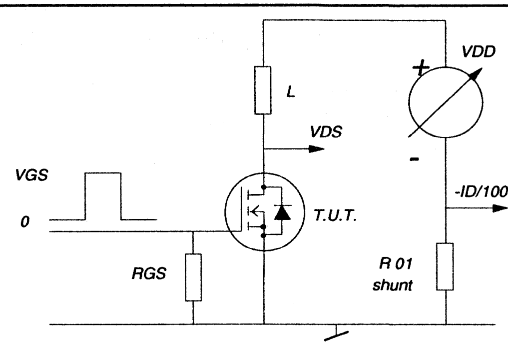


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK444-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

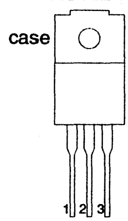
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK444	-200A	-200B	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	5.3	4.7	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

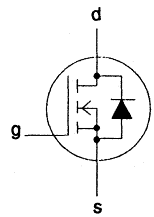
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	-200B	
I_D	Drain current (DC)	T_{hs} = 25 °C	-	5.3	4.7	A
I_D	Drain current (DC)	T_{hs} = 100 °C	-	3.3	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 °C	-	21	19	A
P_{tot}	Total power dissipation	T_{hs} = 25 °C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK444-200A**	-	0.35	0.4	Ω
		I_D = 3.5 A **BUK444-200B**	-	0.4	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	3.5	5.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	850	pF
C_{oss}	Output capacitance		-	100	160	pF
C_{rss}	Feedback capacitance		-	50	80	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	12	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	70	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	120	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	21	A
V_{SD}	Diode forward voltage	I_F = 5.3 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 5.3 A; $-dI_F/dt$ = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.9	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 9 A ; V_{DD} ≤ 100 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	50	mJ

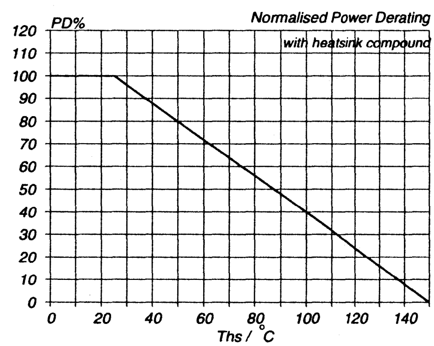


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

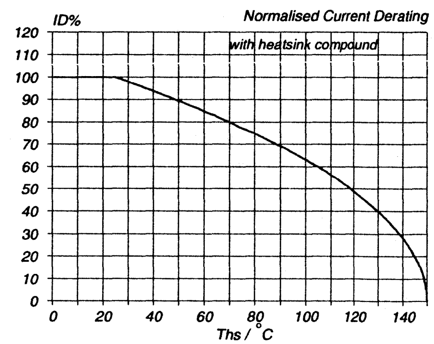


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

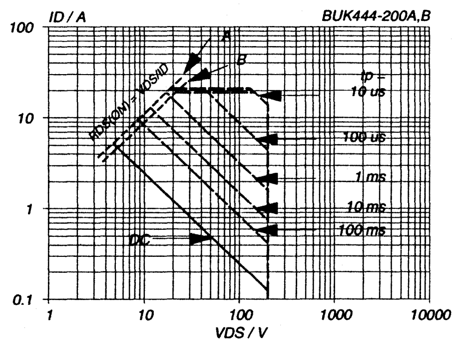


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

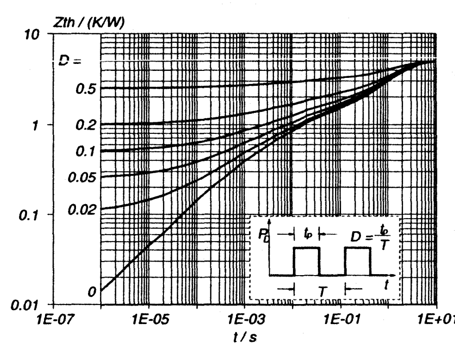


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

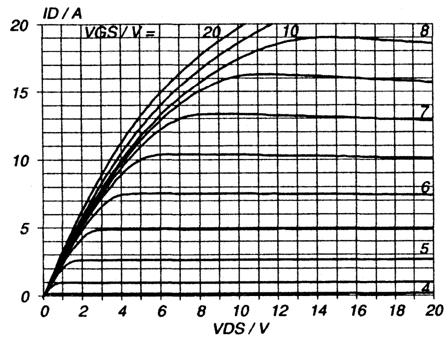


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

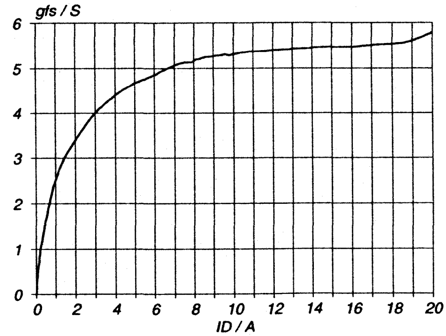


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

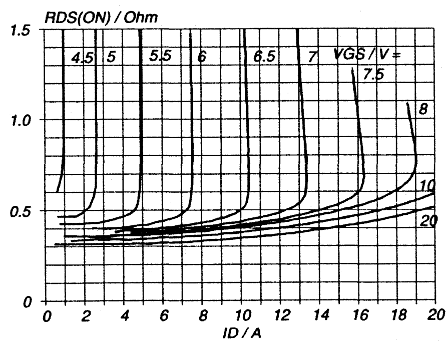


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

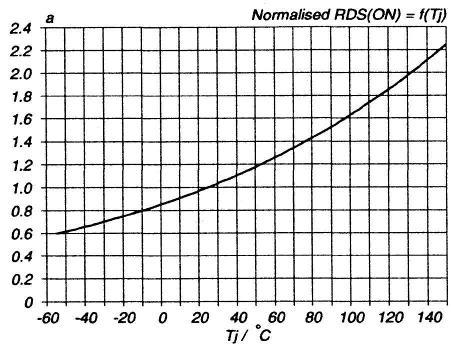


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 3.5$ A; $V_{GS} = 10$ V

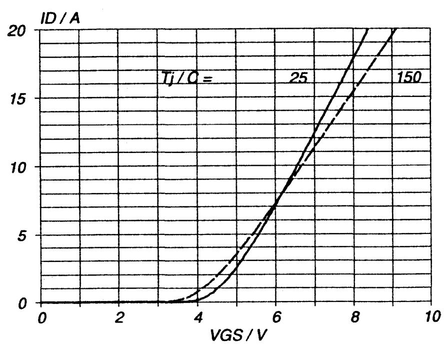


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

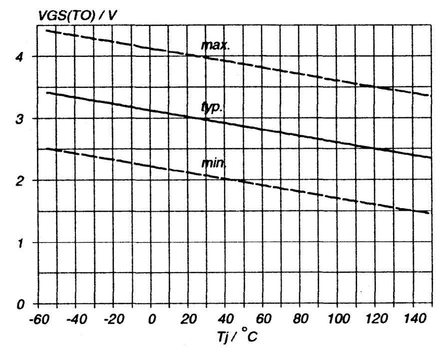


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

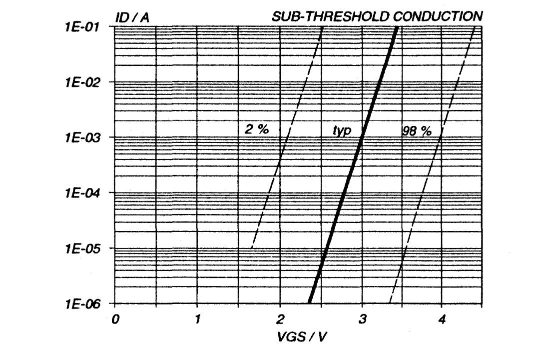


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

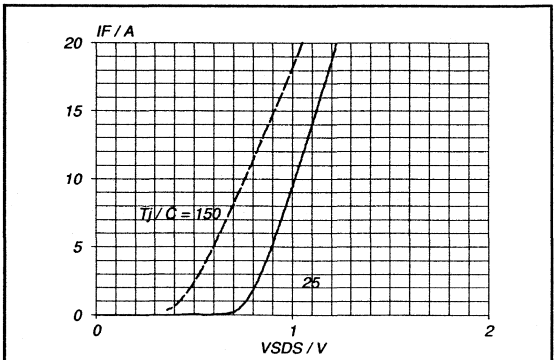


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

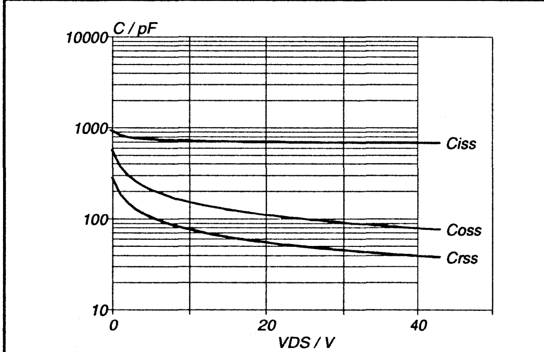


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

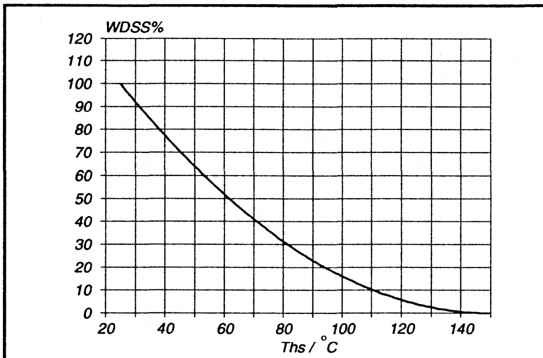


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 9$ A

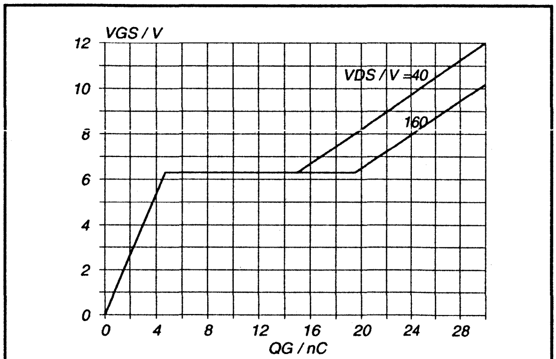


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 9$ A; parameter V_{DS}

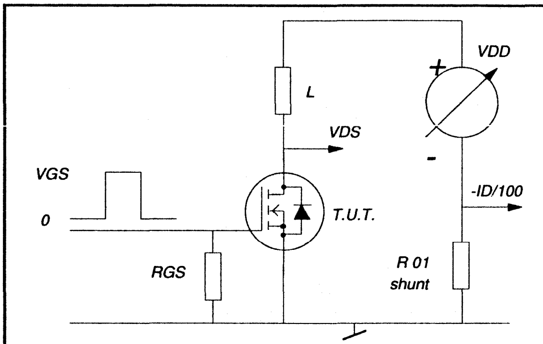


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK444-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

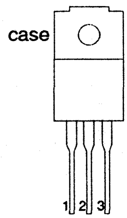
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK444	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	2.7	2.4	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.5	1.8	Ω

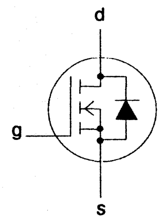
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	-400B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.7	2.4	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.7	1.5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	11	9.6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j-hs}$ = 5 K/W $R_{th\,j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.5 A **BUK444-400A**	-	1.3	1.5	Ω
		BUK444-400B	-	1.6	1.8	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	2.1	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	360	500	pF
C_{oss}	Output capacitance		-	60	80	pF
C_{rss}	Feedback capacitance		-	25	60	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	15	20	ns
t_r	Turn-on rise time		-	40	60	ns
$t_{d\,off}$	Turn-off delay time		-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	11	A
V_{SD}	Diode forward voltage	I_F = 2.7 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 2.7 A; -dI_F/dt = 100 A/µs;	-	260	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.5	-	µC

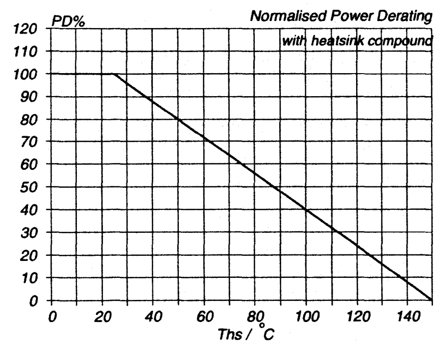


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\ 25\ ˚C}$ = f(T_{hs})

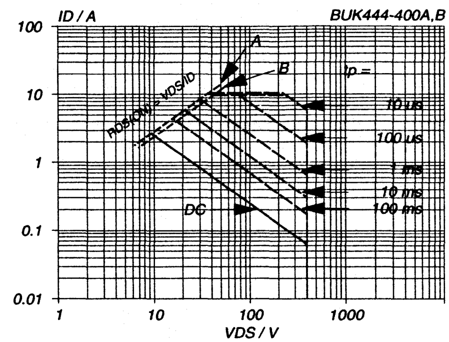


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

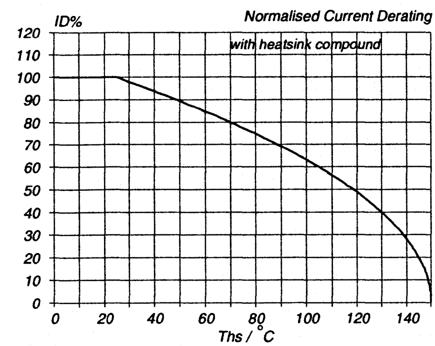


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\ 25\ ˚C}$ = f(T_{hs}); conditions: V_{GS} ≥ 10 V

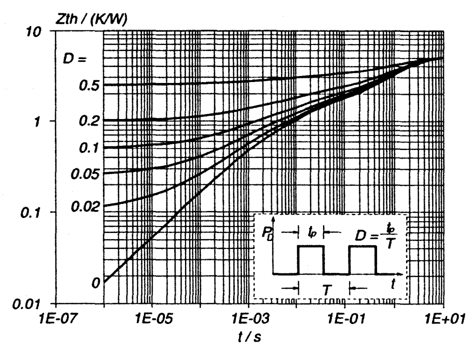


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}hs}$ = f(t); parameter D = t_p/T

PowerMOS transistor BUK444-400A/B

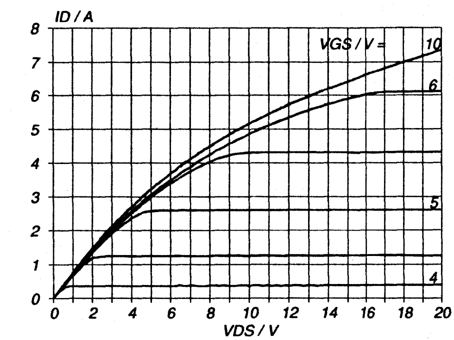


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

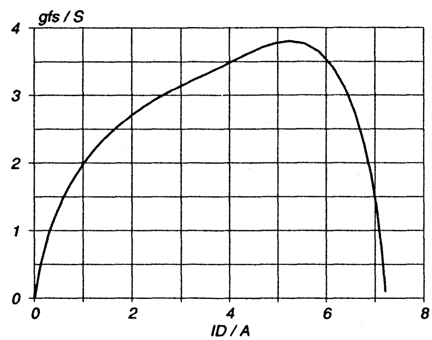


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

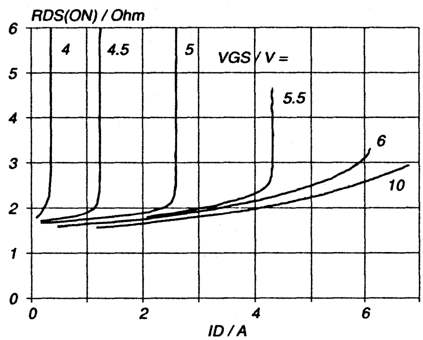


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

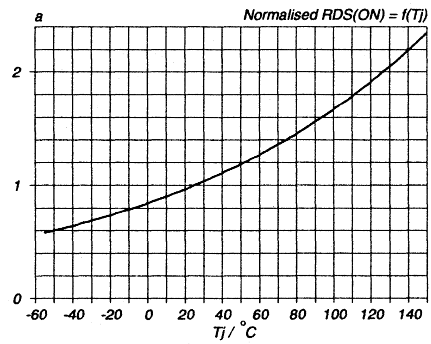


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 1.5 A; V_{GS} = 10 V

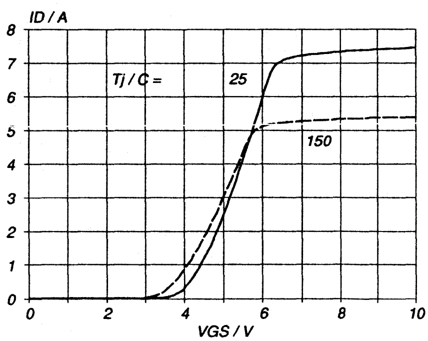


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

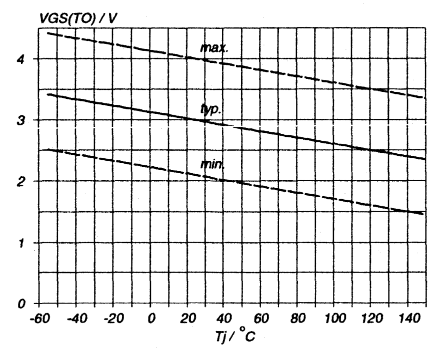


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

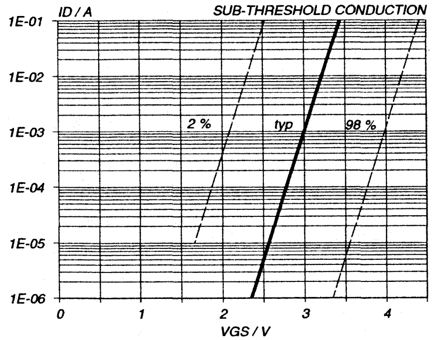


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

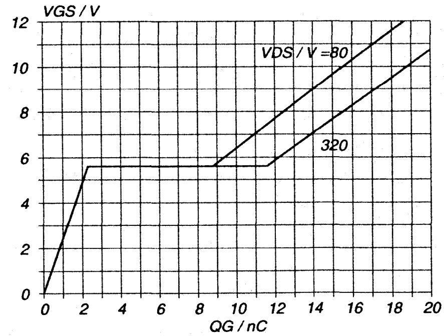


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.6$ A; parameter V_{DS}

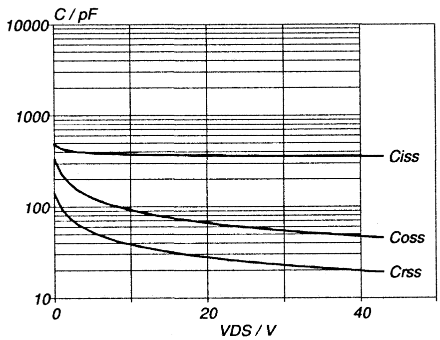


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

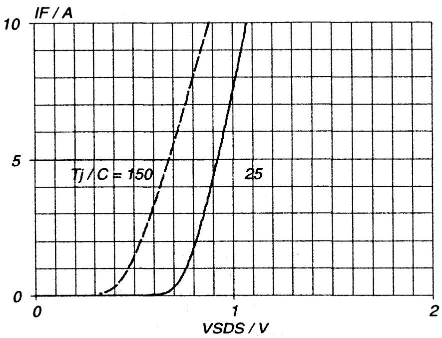


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK444-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

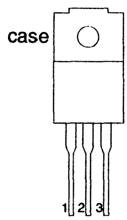
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK444	**-500A**	**-500B**	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	2.1	1.9	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.3	2.8	Ω

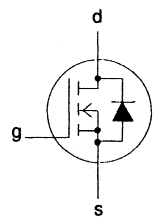
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	**-500B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.1	1.9	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.3	1.2	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	8.4	7.6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK444-500A**	-	2.0	2.3	Ω
		I_D = 1.2 A **BUK444-500B**	-	2.4	2.8	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.2 A	1.9	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	55	80	pF
C_{rss}	Feedback capacitance		-	20	55	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.1	A
I_{DRM}	Pulsed reverse drain current	-	-	-	8.4	A
V_{SD}	Diode forward voltage	I_F = 2.1 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.1 A; $-dI_F/dt$ = 100 A/µs;	-	270	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.0	-	µC

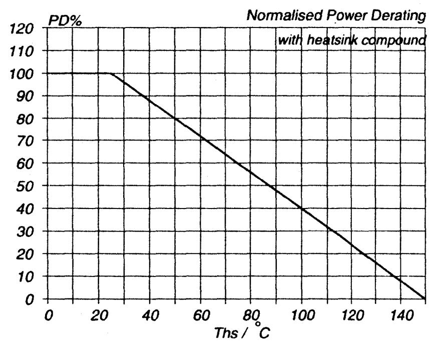


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

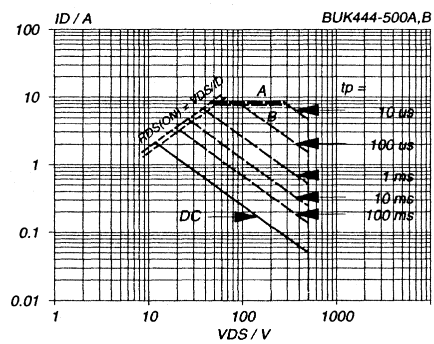


Fig.3. Safe operating area. T_{hs} = 25 °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

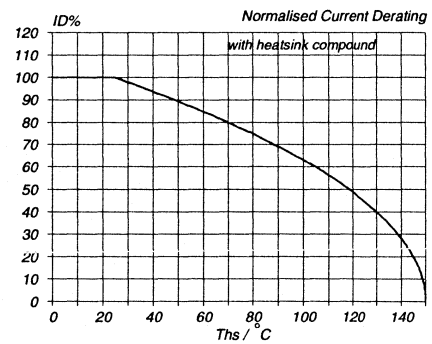


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

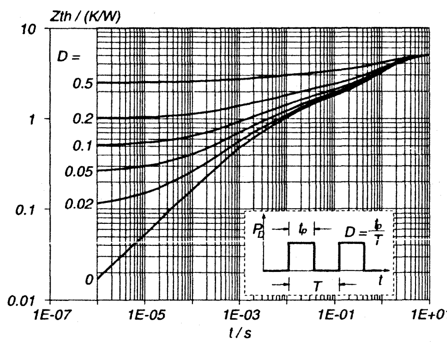


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

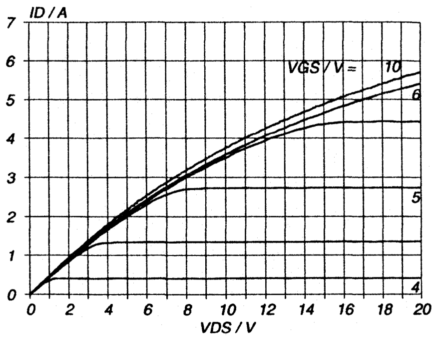


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

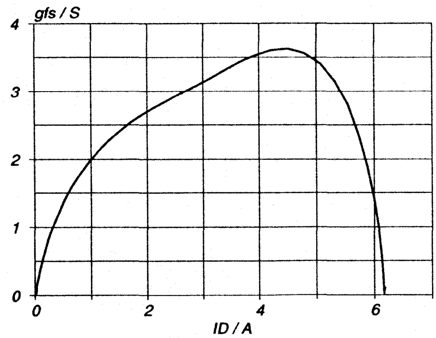


Fig.8. Typical transconductance, $T_j = 25\ ^\circ C$.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

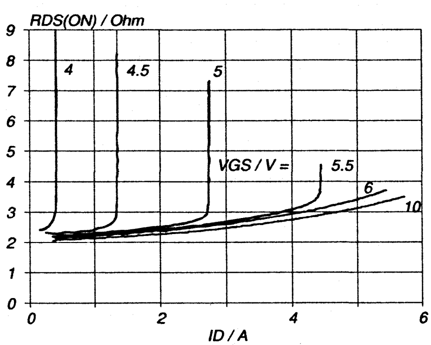


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

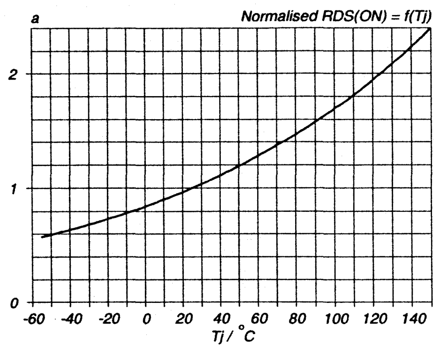


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

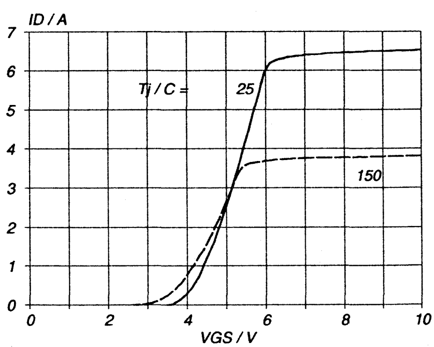


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

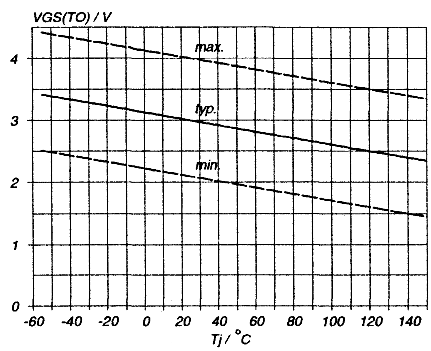


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

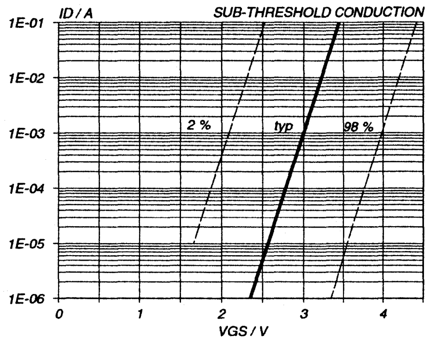


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

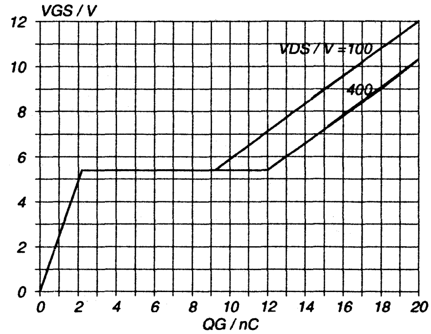


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.7$ A; parameter V_{DS}

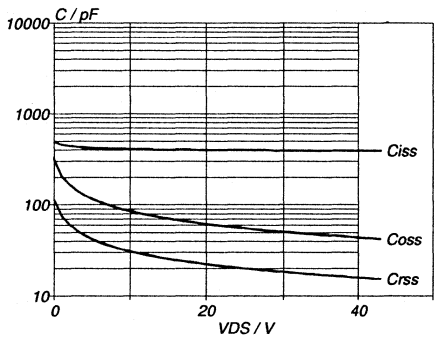


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

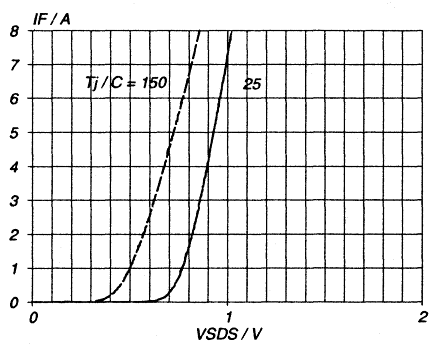


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK444-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

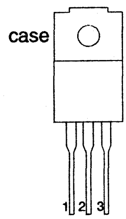
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK444	-600A	-600B	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	1.6	1.5	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	4.0	4.5	Ω

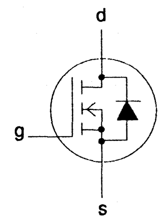
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	-600B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	1.6	1.5	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.0	0.95	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	6.4	6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK444-600A**	-	3.8	4.0	Ω
		I_D = 1.2 A **BUK444-600B**	-	4.0	4.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.2 A	1.9	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	300	500	pF
C_{oss}	Output capacitance		-	50	80	pF
C_{rss}	Feedback capacitance		-	30	55	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.1 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	6.4	A
V_{SD}	Diode forward voltage	I_F = 1.6 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.6 A; $-dI_F/dt$ = 100 A/µs;	-	280	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	1.5	-	µC

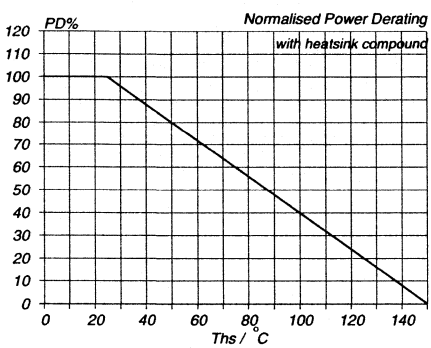


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

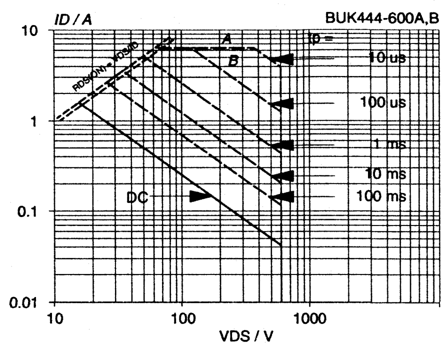


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

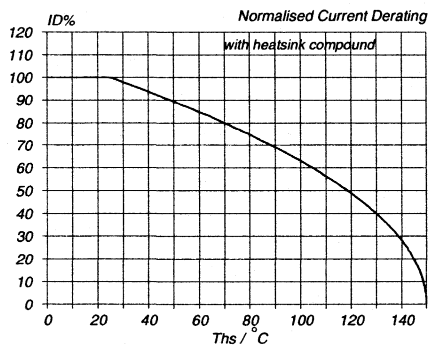


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

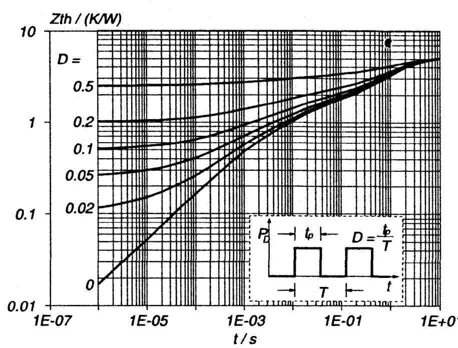


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

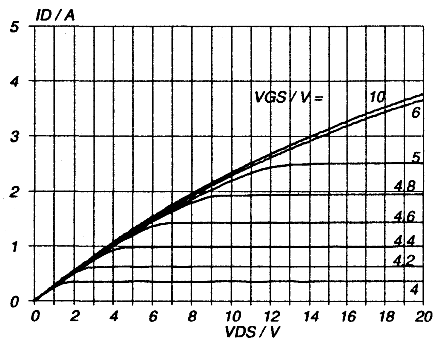


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

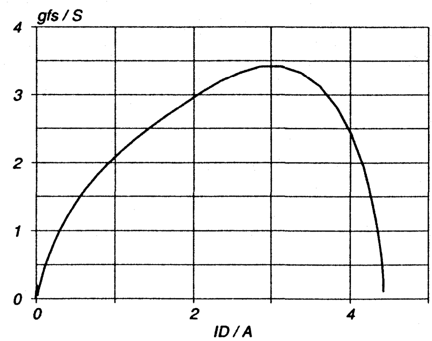


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

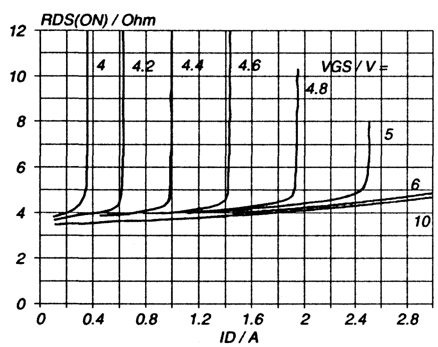


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

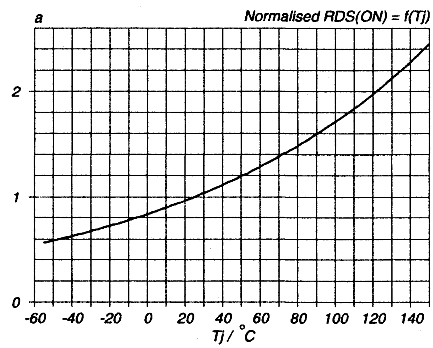


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 1.2$ A; $V_{GS} = 10$ V

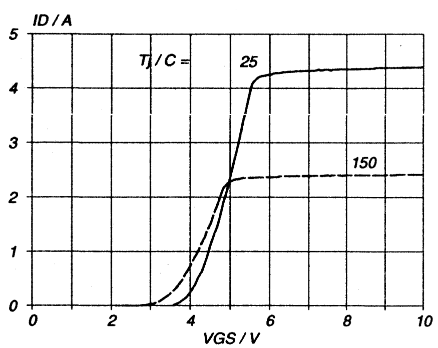


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

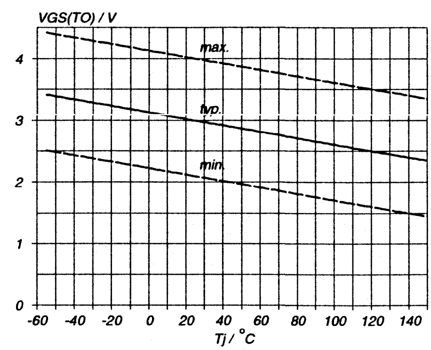


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

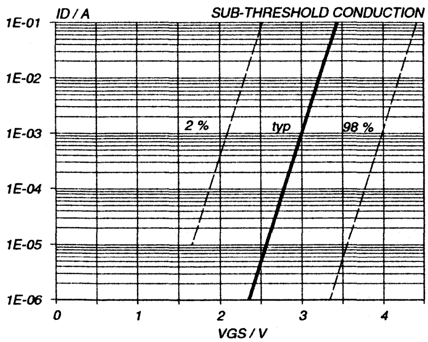


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

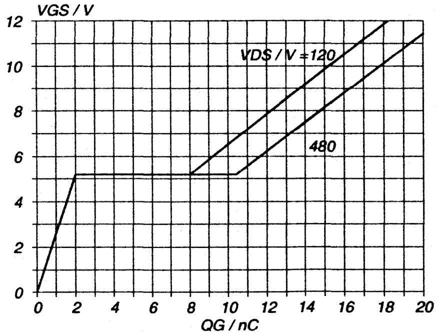


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 2.8$ A; parameter V_{DS}

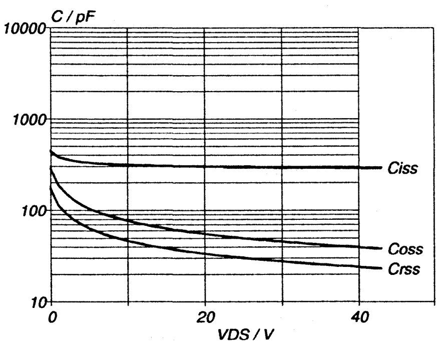


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

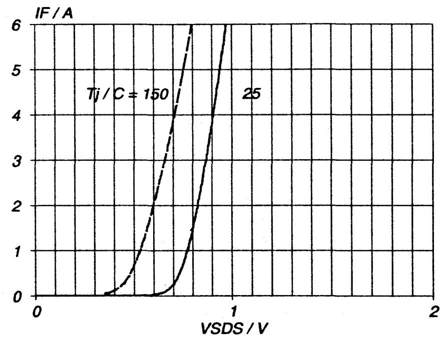


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK444-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

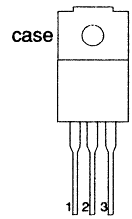
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK444	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	1.4	1.2	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	6.0	8.0	Ω

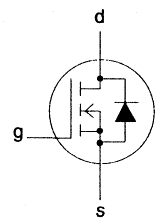
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{hs} = 25 °C	-	1.4	1.2	A
I_D	Drain current (DC)	T_{hs} = 100 °C	-	0.9	0.75	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 °C	-	5.6	4.8	A
P_{tot}	Total power dissipation	T_{hs} = 25 °C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

PowerMOS transistor BUK444-800A/B

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j\text{-}hs}$ = 4.17 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	μA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK444-800A**	-	5.0	6.0	Ω
		I_D = 1.0 A **BUK444-800B**	-	6.0	8.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.0 A	1.0	2.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	450	750	pF
C_{oss}	Output capacitance		-	42	70	pF
C_{rss}	Feedback capacitance		-	15	30	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 1.9 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.4	A
I_{DRM}	Pulsed reverse drain current	-	-	-	5.6	A
V_{SD}	Diode forward voltage	I_F = 1.4 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.4 A; $-dI_F/dt$ = 100 A/µs;	-	230	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	1.9	-	µC

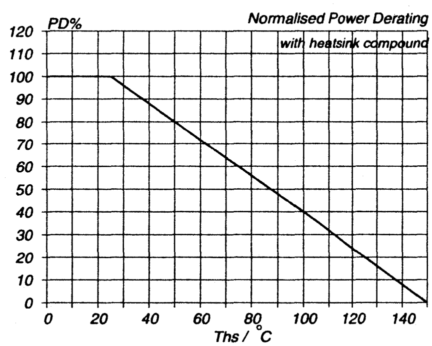


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

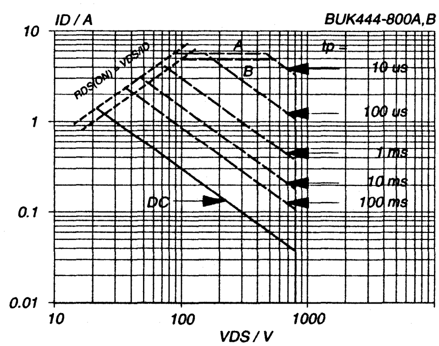


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

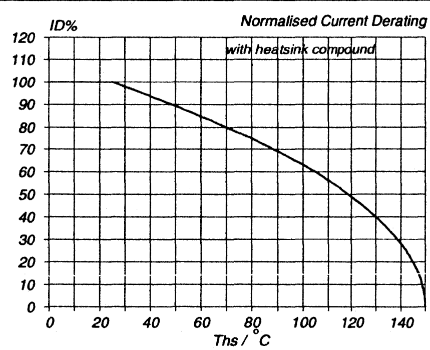


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

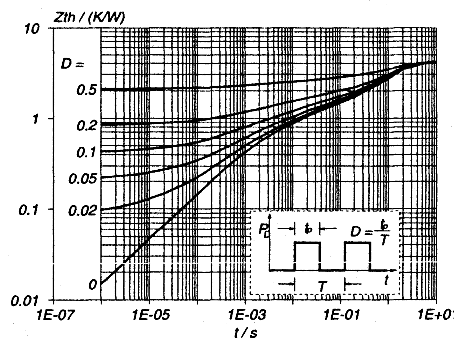


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

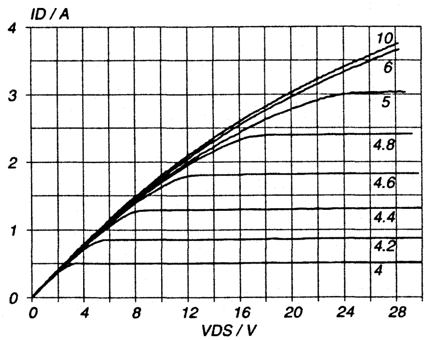


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

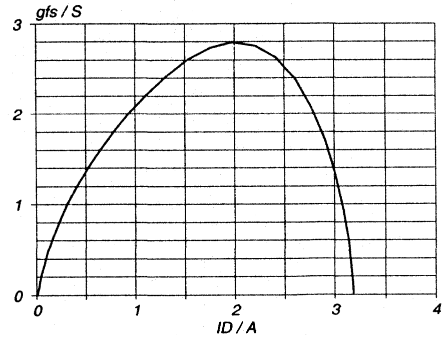


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

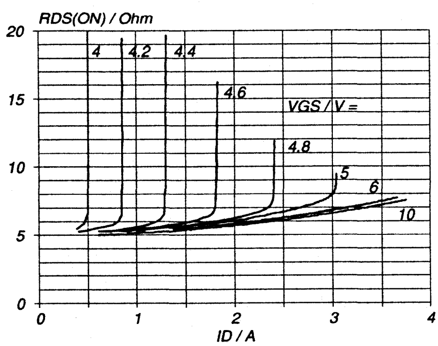


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

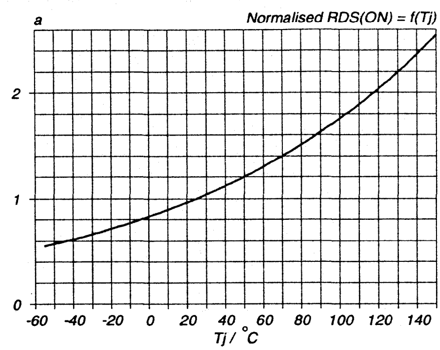


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 1.0 A; V_{GS} = 10 V

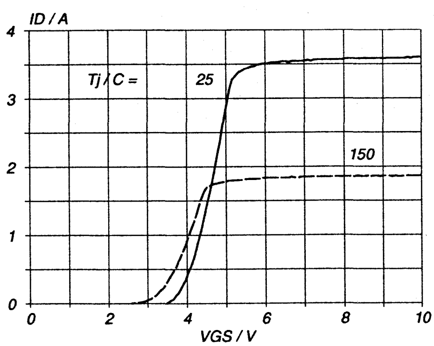


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

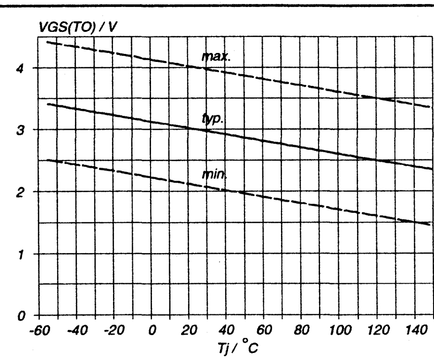


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK444-800A/B

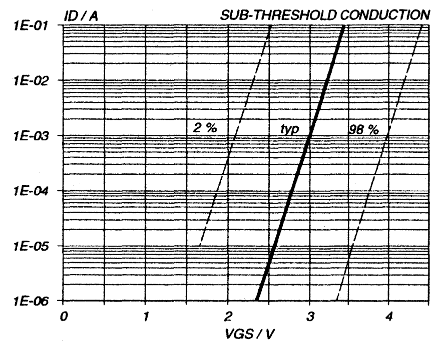


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

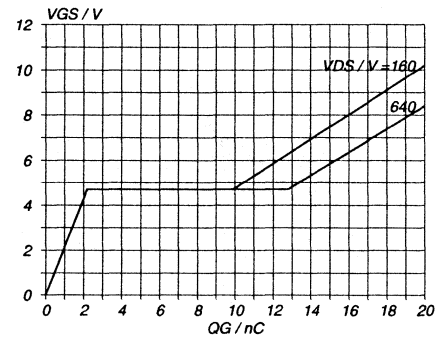


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 2.4$ A; parameter V_{DS}

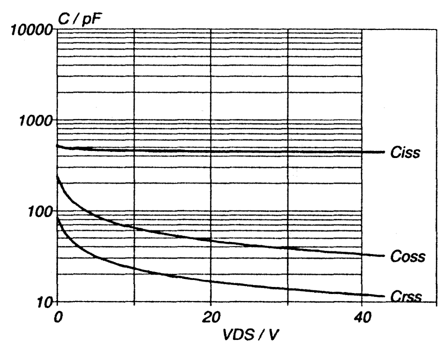


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

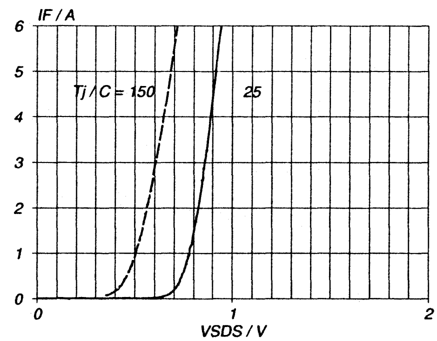


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK445-50A/B	

BUK445-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

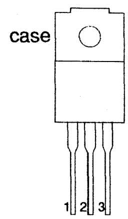
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK445	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	21	20	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.038	0.045	Ω

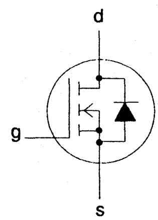
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	21	20	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	13	12.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	84	80	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-		150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.17 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 20 A **BUK445-60A**	-	0.03	0.038	Ω
		BUK445-60B	-	0.04	0.045	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	8	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	560	750	pF
C_{rss}	Feedback capacitance		-	300	400	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	25	40	ns
t_r	Turn-on rise time		-	60	90	ns
$t_{d\,off}$	Turn-off delay time		-	125	160	ns
t_f	Turn-off fall time		-	100	130	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	21	A
I_{DRM}	Pulsed reverse drain current	-	-	-	84	A
V_{SD}	Diode forward voltage	I_F = 21 A ; V_{GS} = 0 V	-	1.4	1.8	V
t_{rr}	Reverse recovery time	I_F = 21 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 41 A ; V_{DD} ≤ 25 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

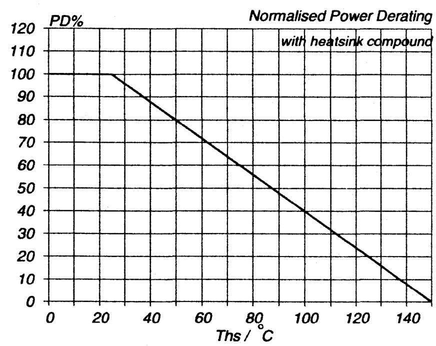


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

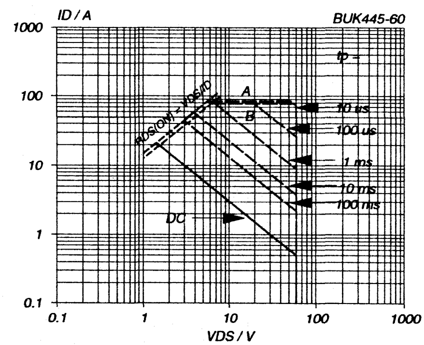


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

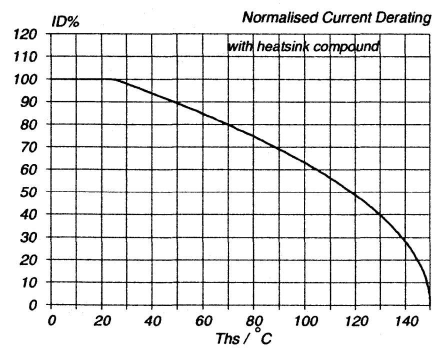


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

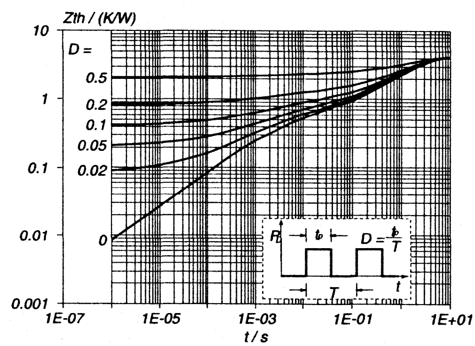


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

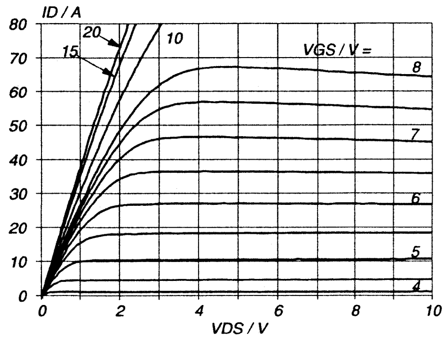


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

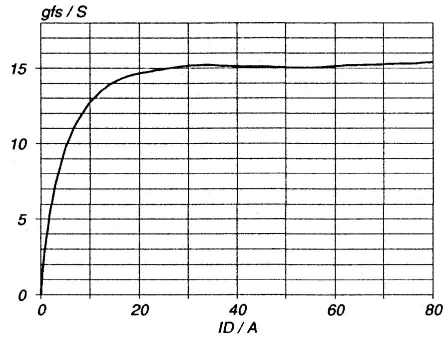


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

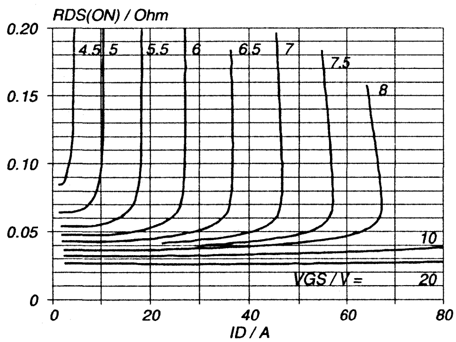


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

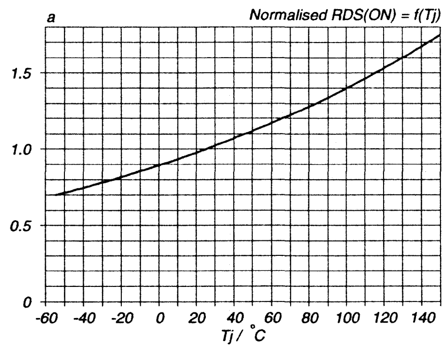


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 20$ A; $V_{GS} = 10$ V

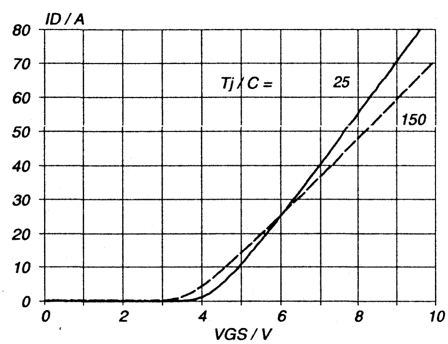


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

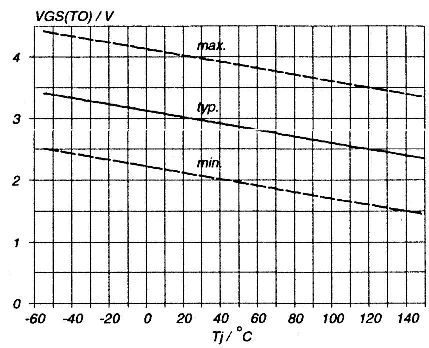


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK445-60A/B

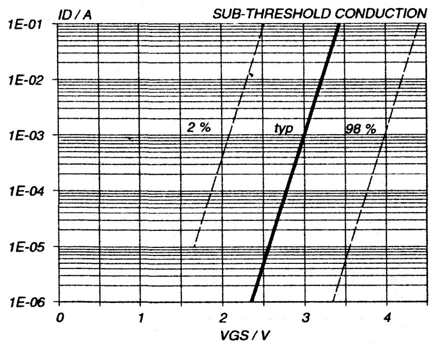


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

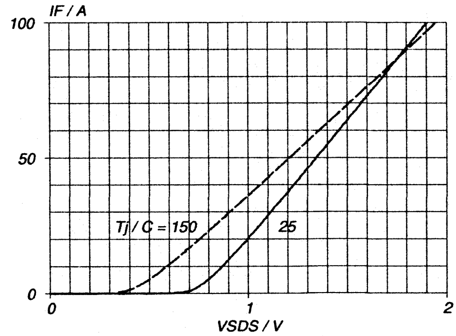


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

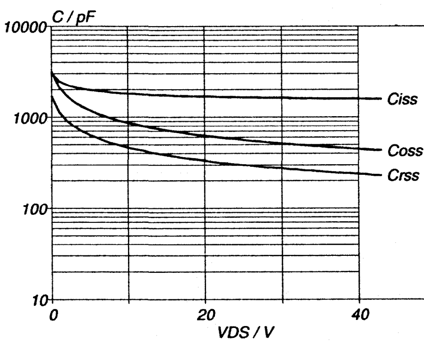


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

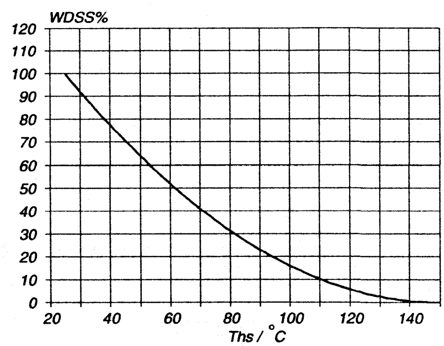


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 41$ A

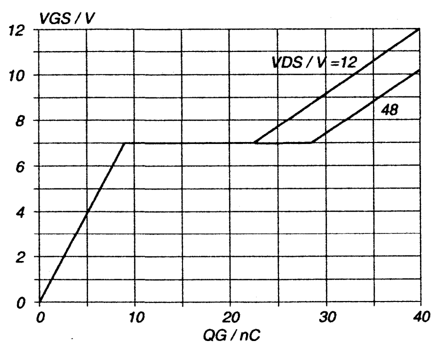


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 41$ A; parameter V_{DS}

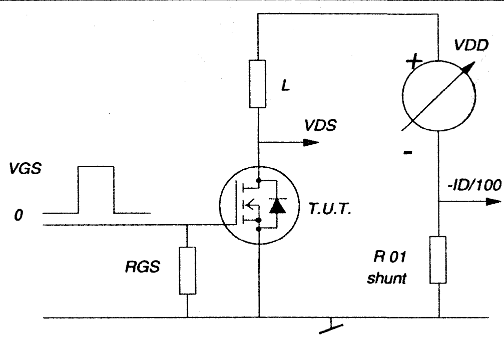


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK445-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

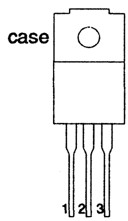
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK445	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	14	12	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.08	0.1	Ω

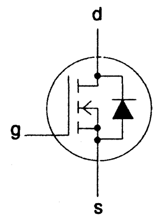
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	14	12	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	8.7	7.5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	56	48	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j-hs}$ = 4.17 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK445-100A**	-	0.07	0.08	Ω
		I_D = 13 A **BUK445-100B**	-	0.08	0.1	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 13 A	7.0	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	350	500	pF
C_{rss}	Feedback capacitance		-	100	150	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	15	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	160	ns
t_f	Turn-off fall time		-	50	80	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 14 A; -dI_F/dt = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.70	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 26 A ; V_{DD} ≤ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

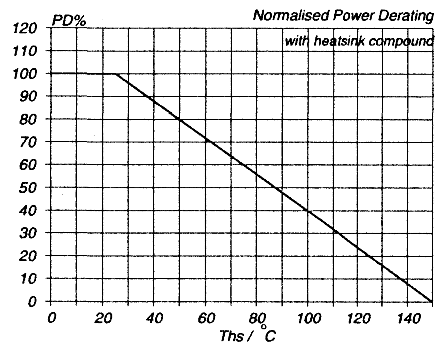


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,˚C}$ = f(T_{hs})

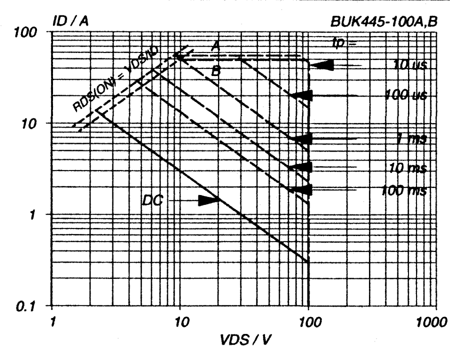


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

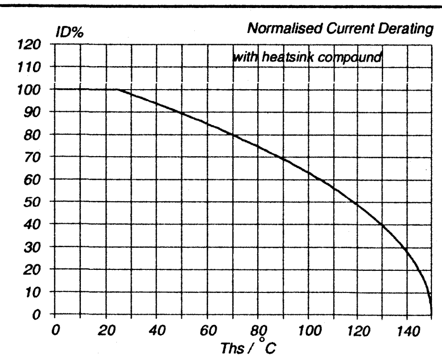


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,˚C}$ = f(T_{hs}); conditions: V_{GS} ≥ 10 V

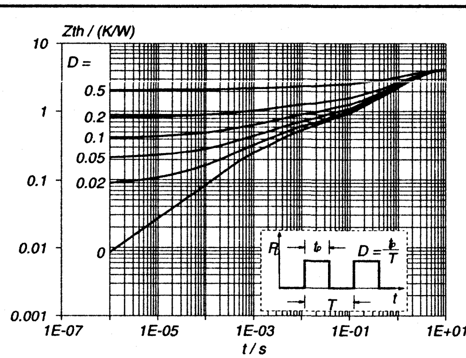


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter D = t_p/T

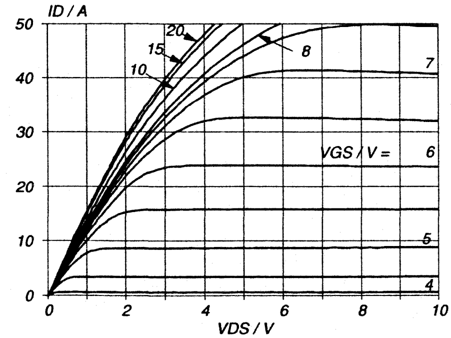


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

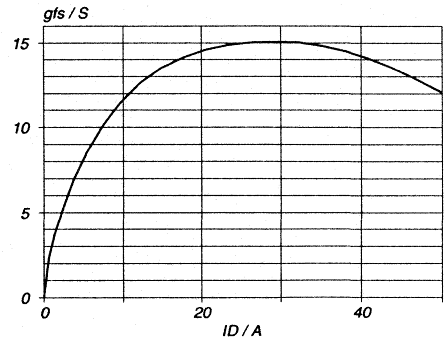


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

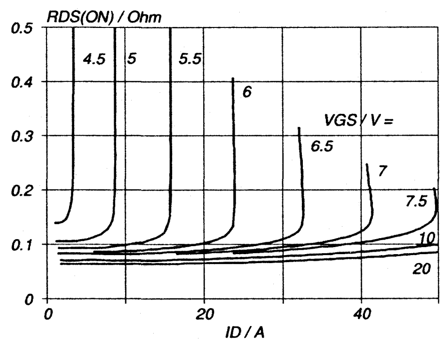


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

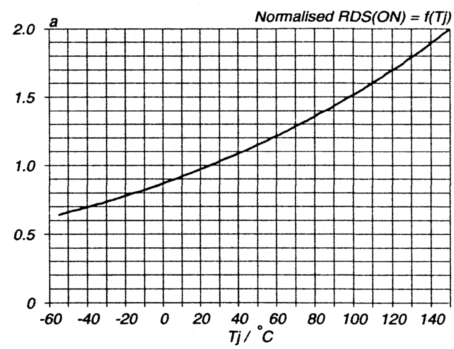


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 13$ A; $V_{GS} = 10$ V

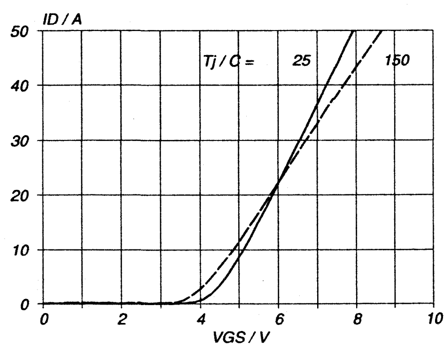


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

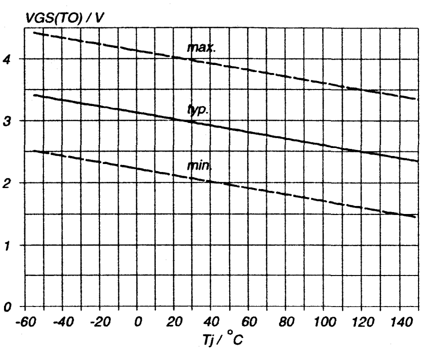


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

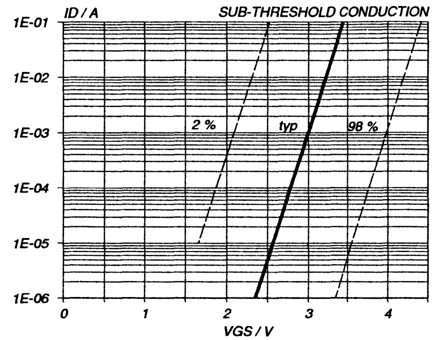


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

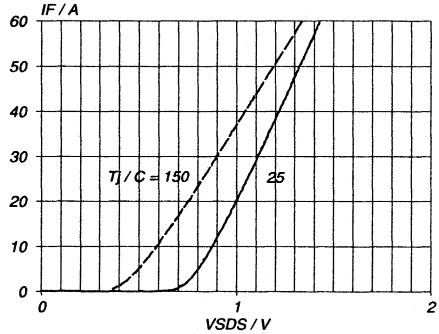


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

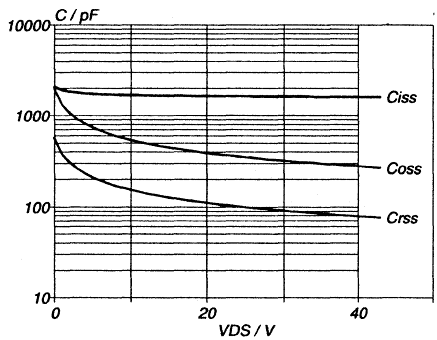


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

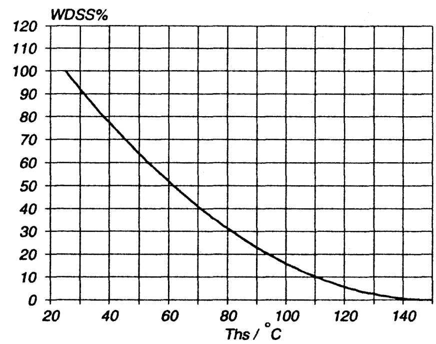


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 26$ A

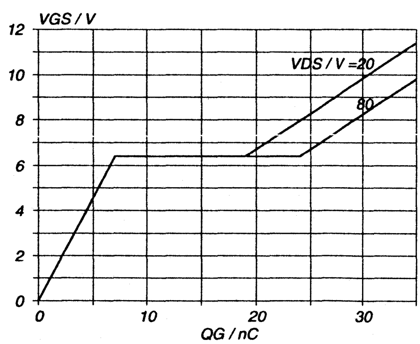


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 26$ A; parameter V_{DS}

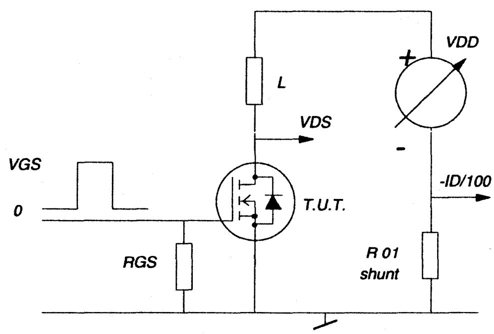


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK445-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

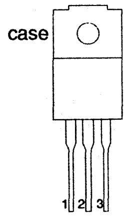
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK445	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	7.6	7	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.23	0.28	Ω

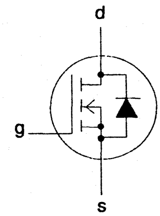
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	**-200B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	7.6	7	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	4.8	4.4	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	30	28	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j-hs}$ = 4.17 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK445-200A**	-	0.2	0.23	Ω
		I_D = 7 A **BUK445-200B**	-	0.22	0.28	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7 A	6	8.4	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1400	1750	pF
C_{oss}	Output capacitance		-	190	250	pF
C_{rss}	Feedback capacitance		-	55	80	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	18	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	35	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	85	120	ns
t_f	Turn-off fall time		-	35	50	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	30	A
V_{SD}	Diode forward voltage	I_F = 7.6 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 7.6 A; -dI_F/dt = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.3	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; V_{DD} ≤ 100 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

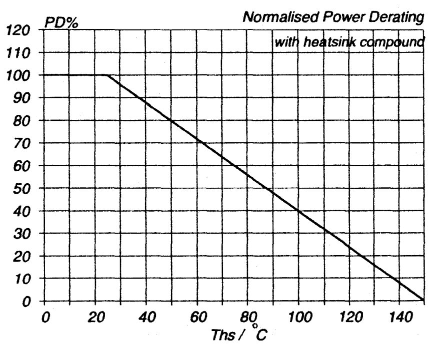


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,˚C}$ = f(T_{hs})

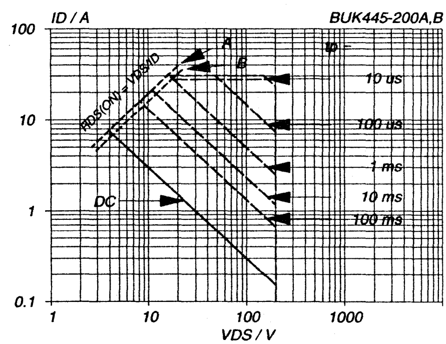


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

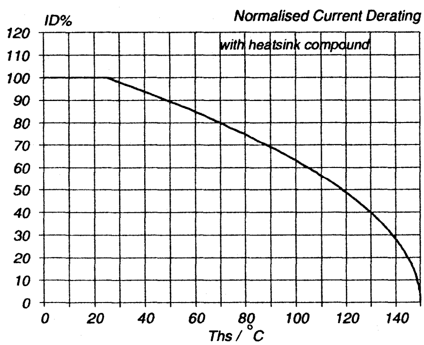


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,˚C}$ = f(T_{hs}); conditions: V_{GS} ≥ 10 V

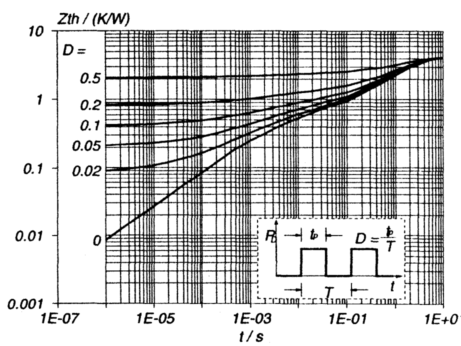


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs}$ = f(t); parameter D = t_p/T

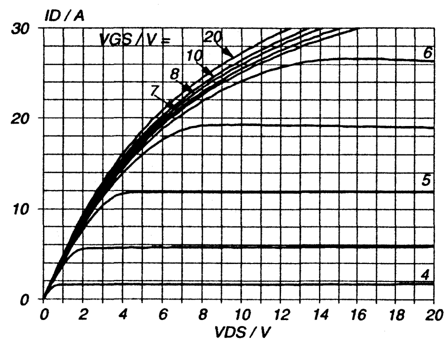


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

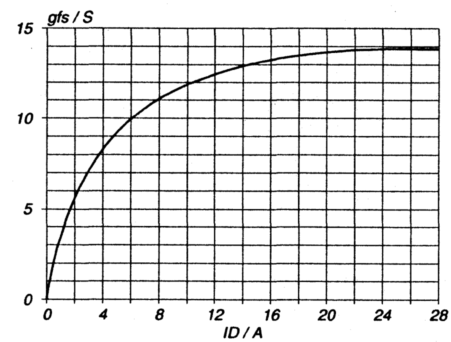


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

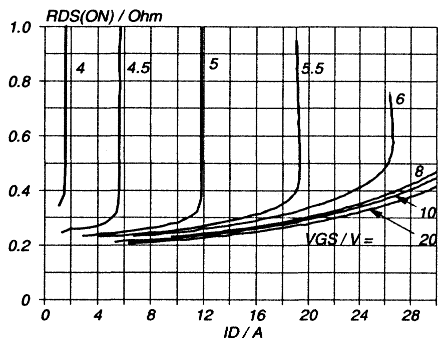


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

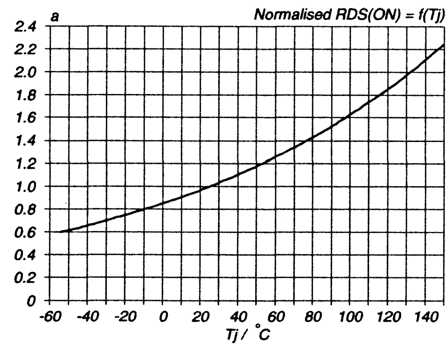


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 7$ A; $V_{GS} = 10$ V

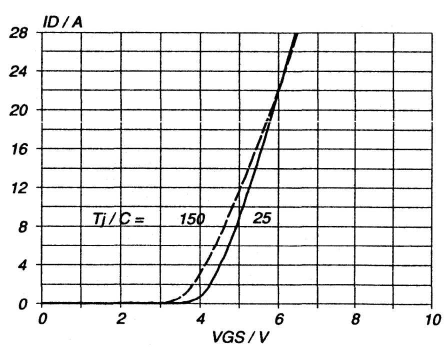


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

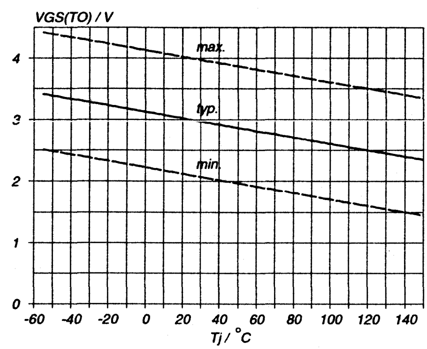


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor | BUK445-200A/B

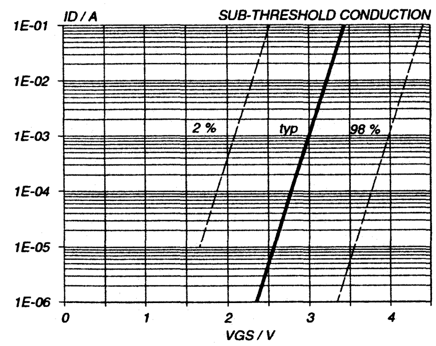


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

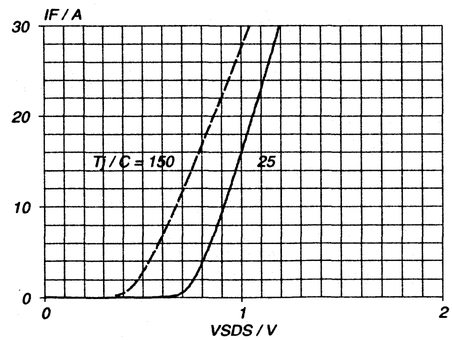


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

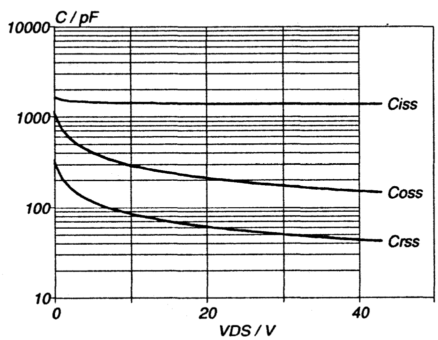


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

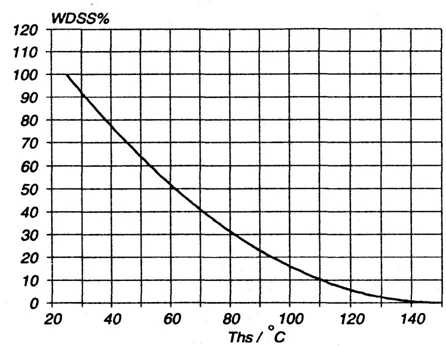


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

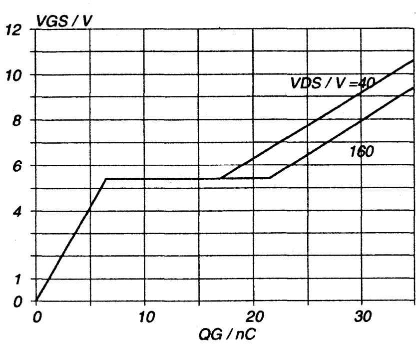


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

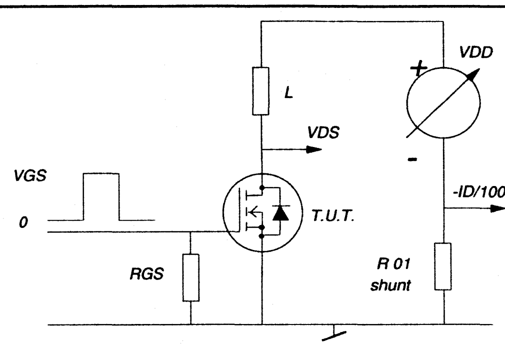


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK445-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

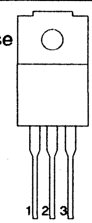
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK445	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	4.0	3.8	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.8	1.0	Ω

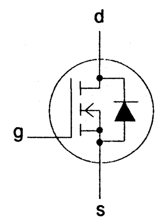
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION

case


SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	-400B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	4.0	3.6	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2.5	2.3	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	16	14	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.1 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK445-400A**	-	0.7	0.8	Ω
		I_D = 2.5 A **BUK445-400B**	-	0.9	1.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	3.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	120	180	pF
C_{rss}	Feedback capacitance		-	50	70	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.7 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	120	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	16	A
V_{SD}	Diode forward voltage	I_F = 4 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 4 A; $-dI_F/dt$ = 100 A/µs;	-	1000	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	5.0	-	µC

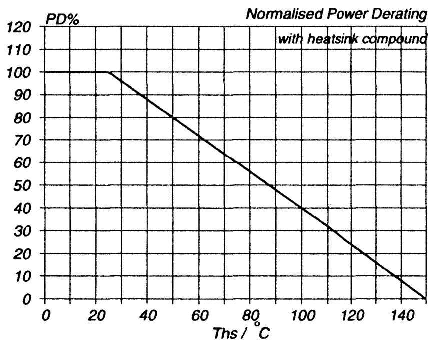


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{hs})$

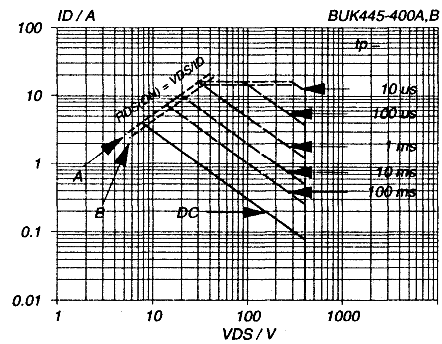


Fig.3. Safe operating area. T_{hs} = 25 °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

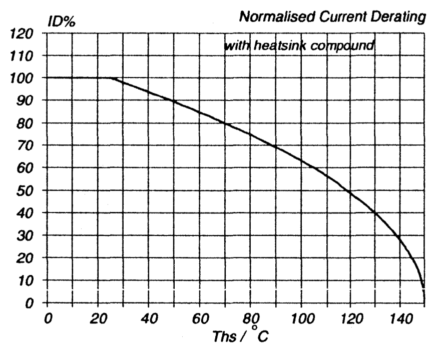


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

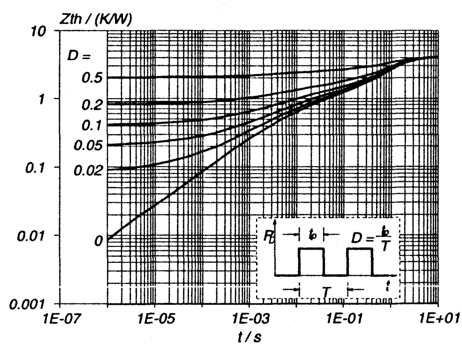


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor BUK445-400A/B

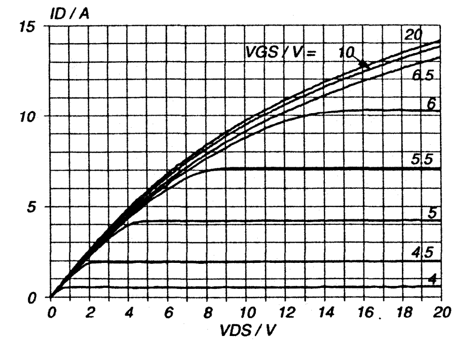


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

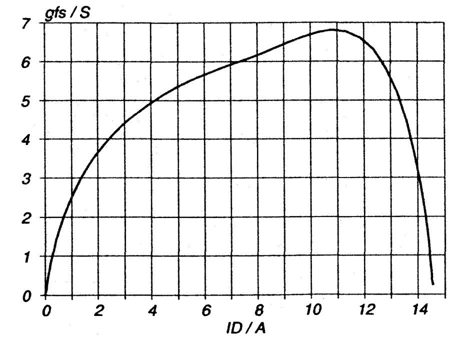


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

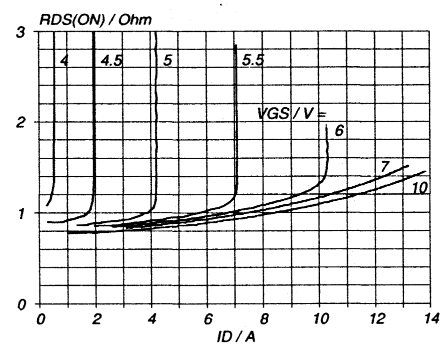


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

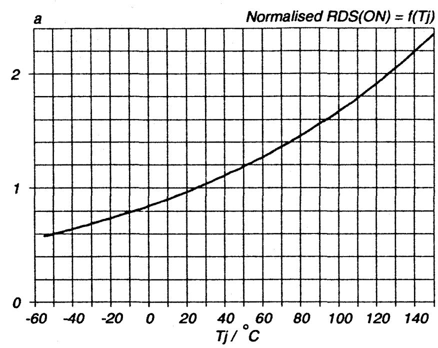


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

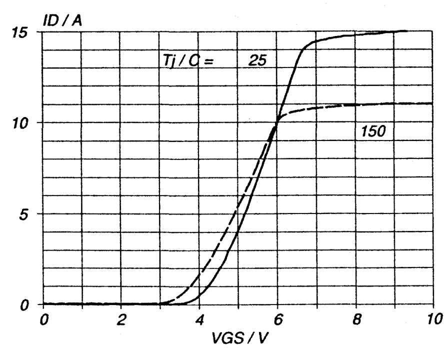


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

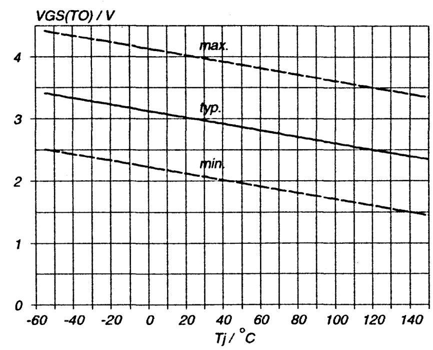


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

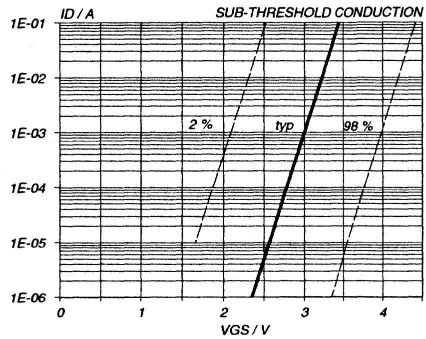


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

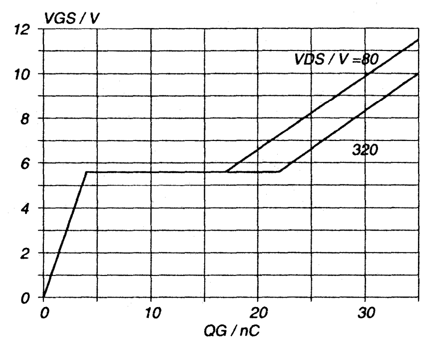


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 6.5$ A; parameter V_{DS}

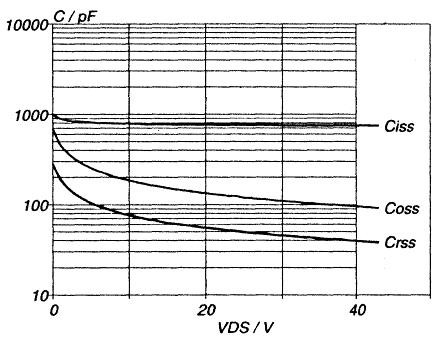


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

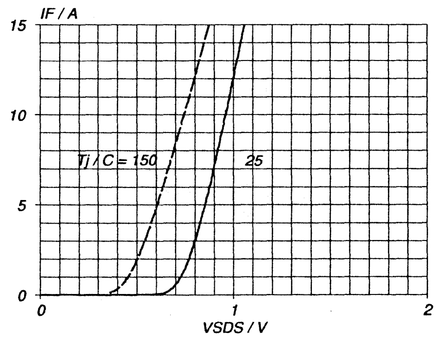


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK445-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

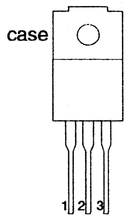
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK445	**-500A**	**-500B**	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	3.1	2.9	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.3	1.5	Ω

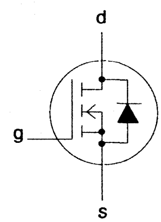
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	**-500B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	3.1	2.9	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2	1.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	12	12	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor BUK445-500A/B

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.1 K/W
From junction to ambient		$R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK445-500A**	-	1.2	1.3	Ω
		I_D = 2.5 A **BUK445-500B**	-	1.4	1.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	3.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	10	45	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.1	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.1 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 3.1 A; $-dI_F/dt$ = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

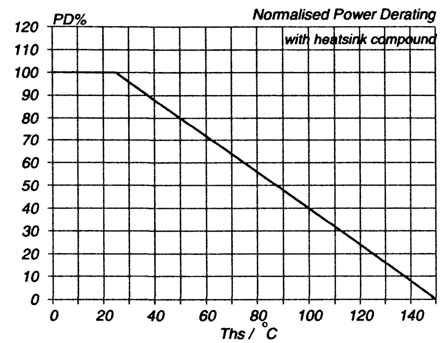


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

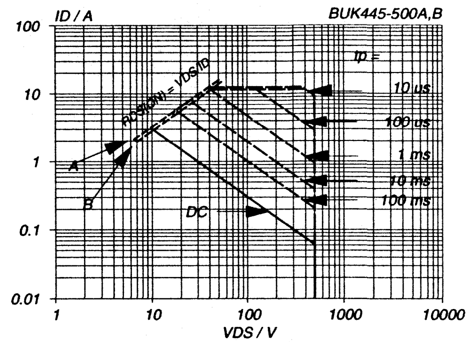


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

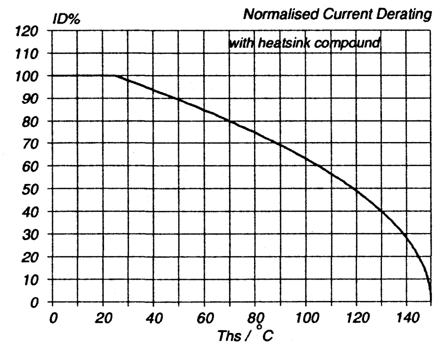


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

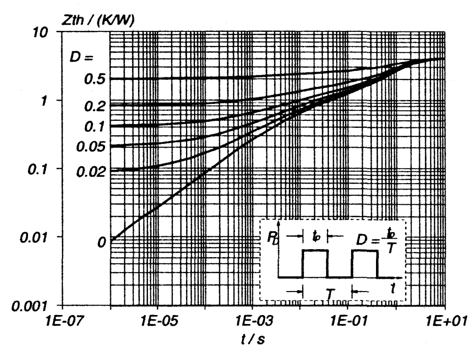


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor BUK445-500A/B

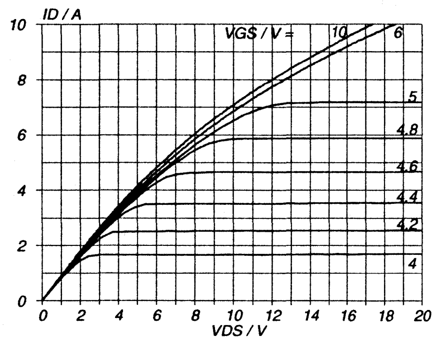


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

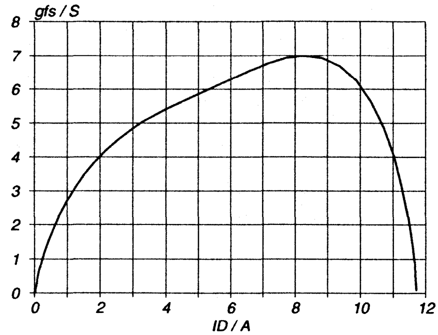


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

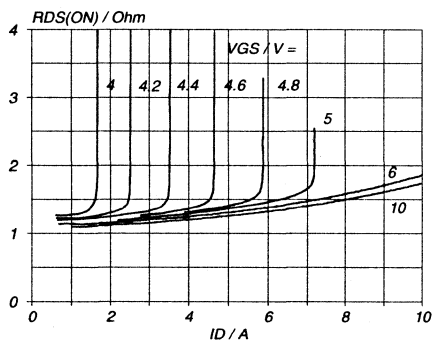


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

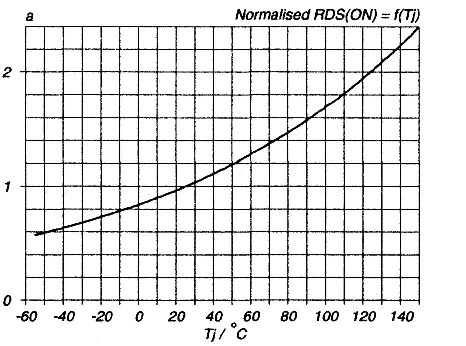


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

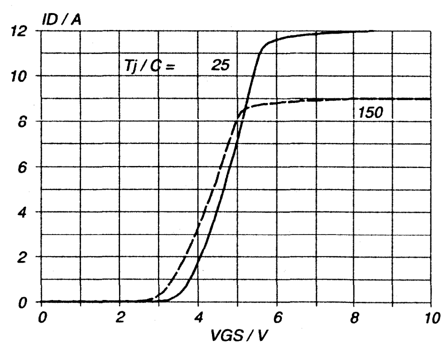


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

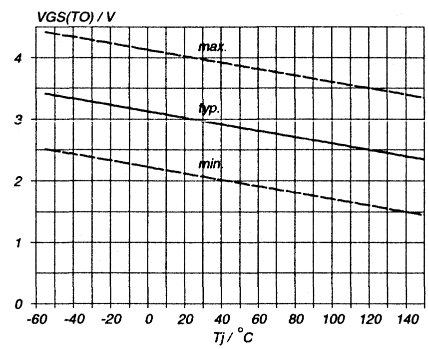


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

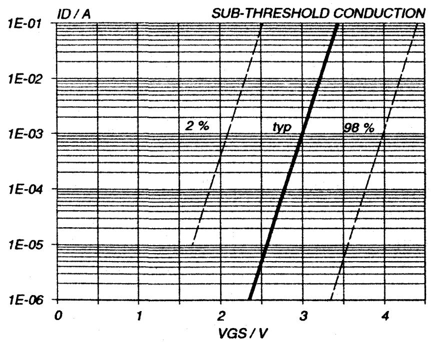


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

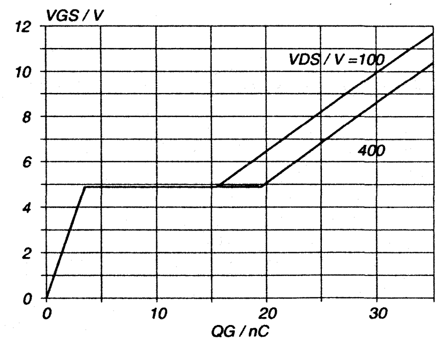


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5.7$ A; parameter V_{DS}

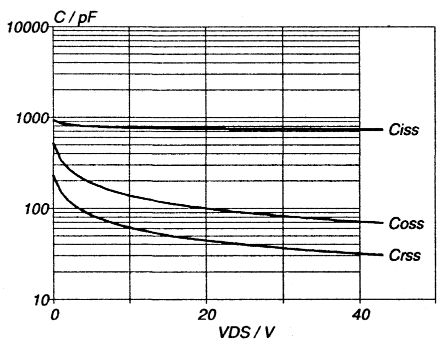


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

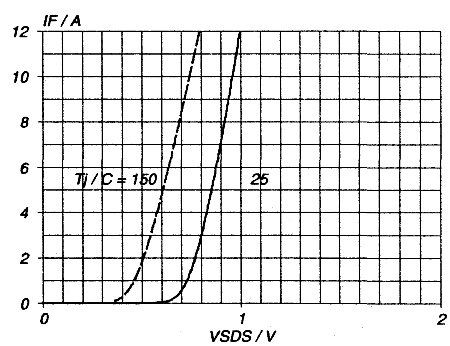


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK445-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

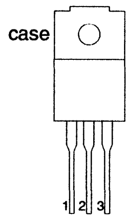
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK445	-600A	-600B	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	2.5	2.2	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.0	2.5	Ω

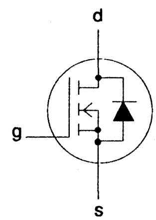
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	-600B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.5	2.2	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.6	1.4	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	10	8.8	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.1 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK445-600A**	-	1.7	2.0	Ω
		I_D = 2.5 A **BUK445-600B**	-	2.1	2.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	2.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	10	45	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	10	A
V_{SD}	Diode forward voltage	I_F = 2.5 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 2.5 A; $-dI_F/dt$ = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

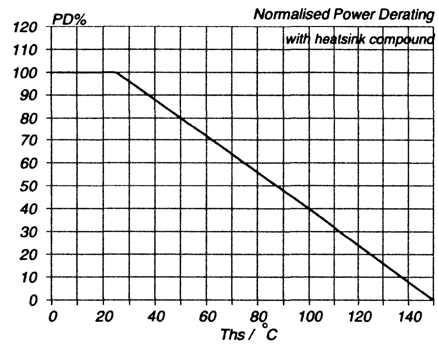


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\ 25\ ˚C} = f(T_{hs})$

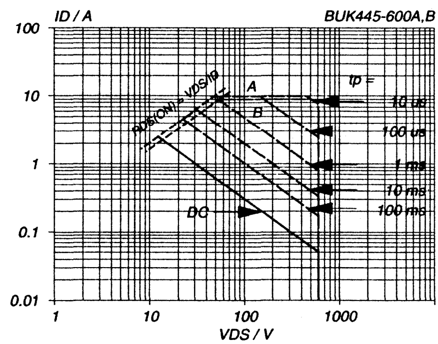


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

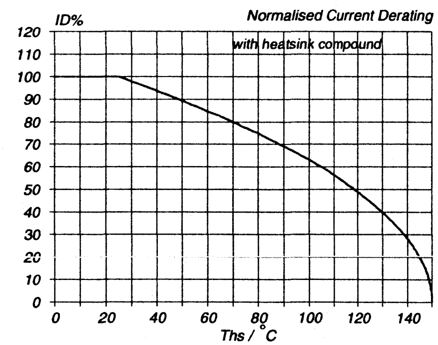


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\ 25\ ˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

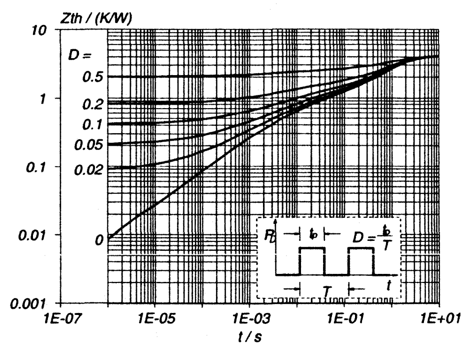


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}hs} = f(t)$; parameter $D = t_p/T$

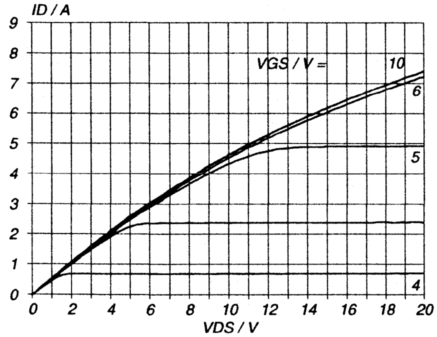


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

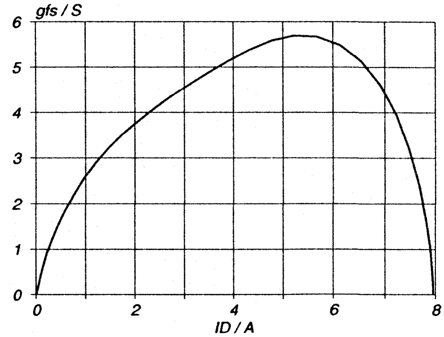


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

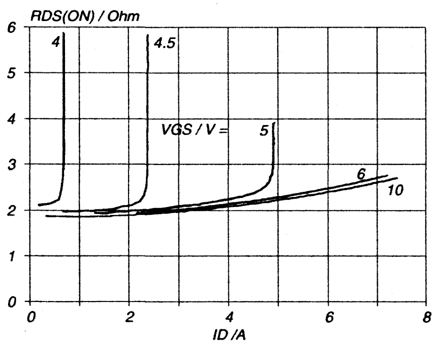


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

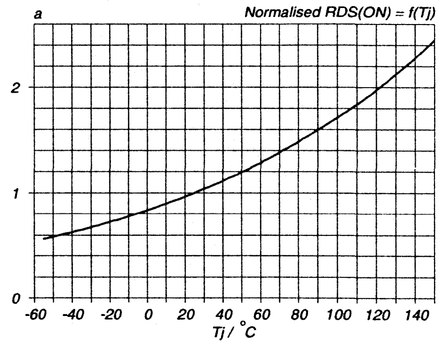


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

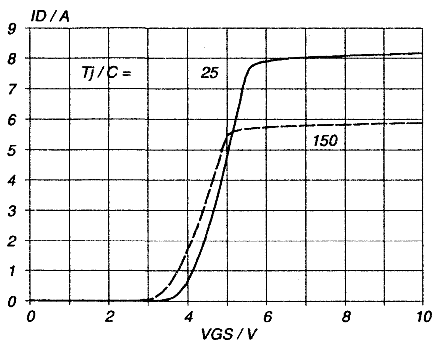


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

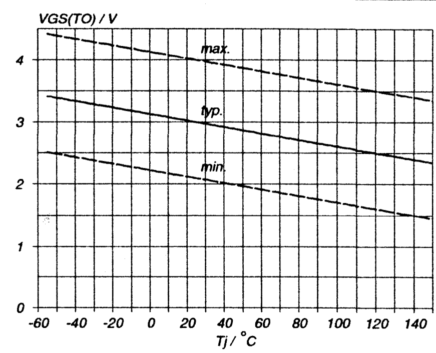


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

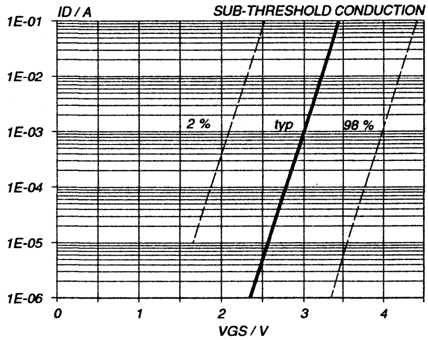


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

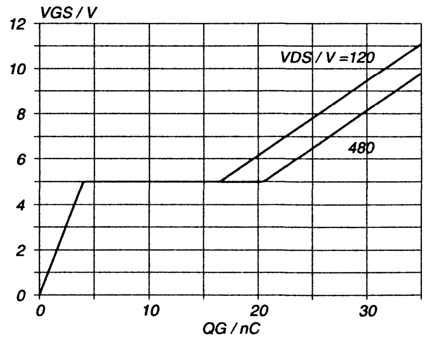


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.5$ A; parameter V_{DS}

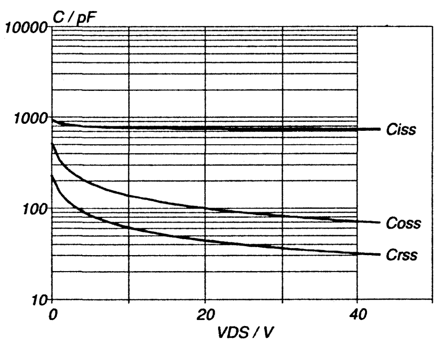


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

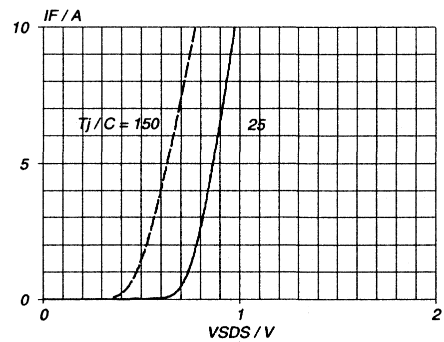


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK446-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

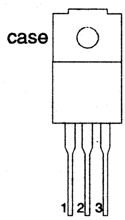
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK446	**-800A**	**-800B**	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	2.0	1.7	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	3	4	Ω

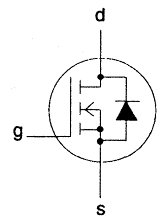
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	**-800B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.0	1.7	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.3	1.1	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	8	6.8	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j-hs}$ = 4.16 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.5 A **BUK446-800A**	-	2.7	3.0	Ω
		BUK446-800B	-	3.5	4.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	8	A
V_{SD}	Diode forward voltage	I_F = 2.0 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.0 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

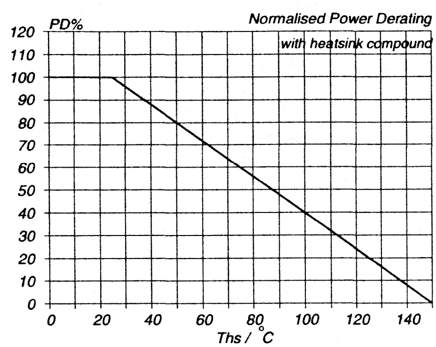


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{hs})$

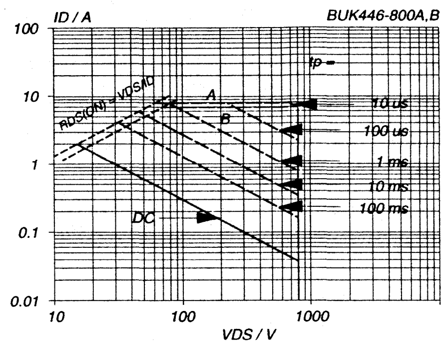


Fig.3. Safe operating area. T_{hs} = 25 ˚C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

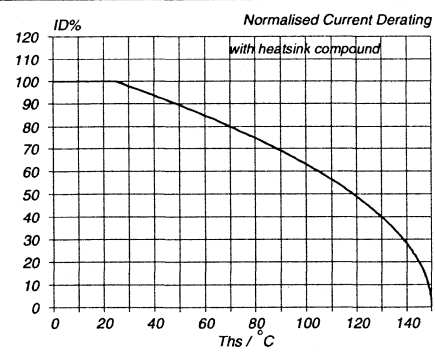


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

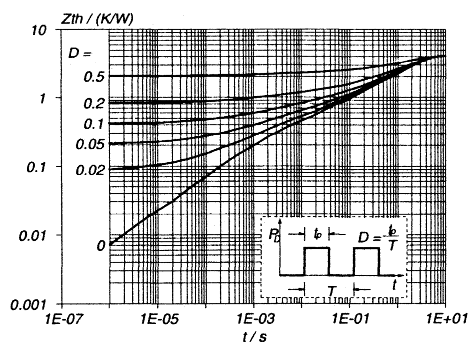


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

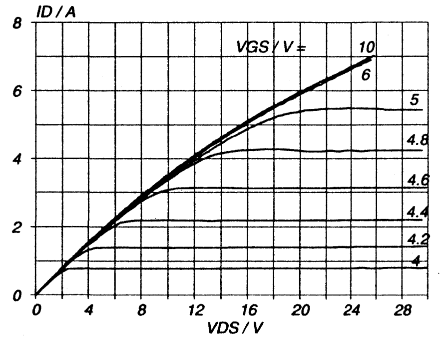


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

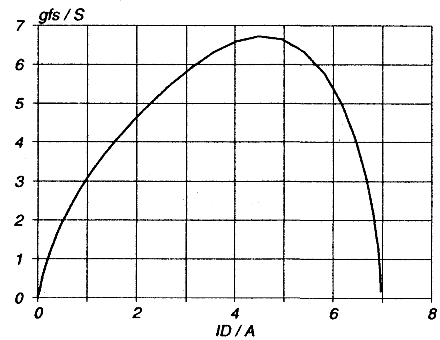


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

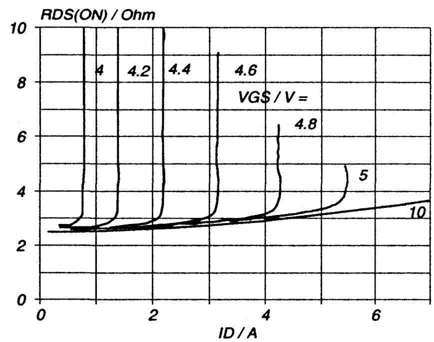


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

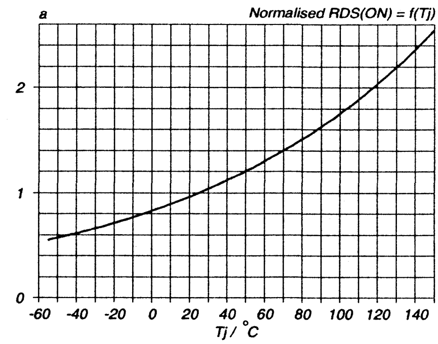


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; I_D = 1.5 A; V_{GS} = 10 V

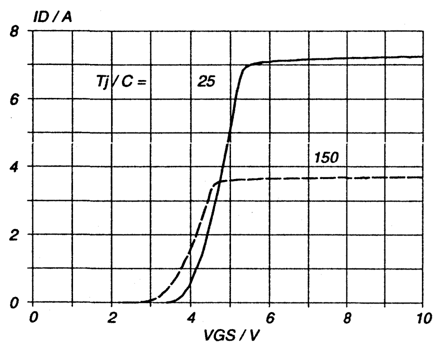


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

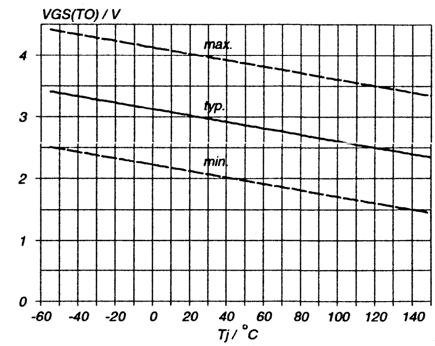


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

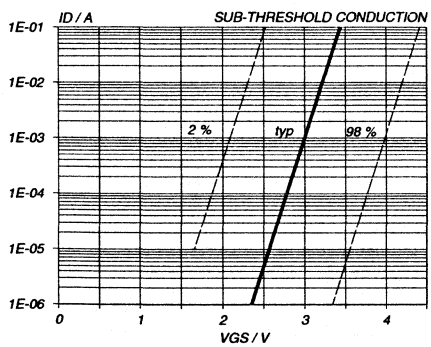


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

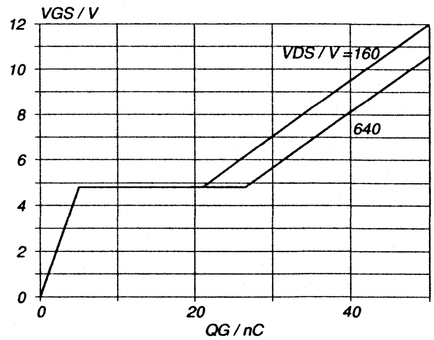


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4$ A; parameter V_{DS}

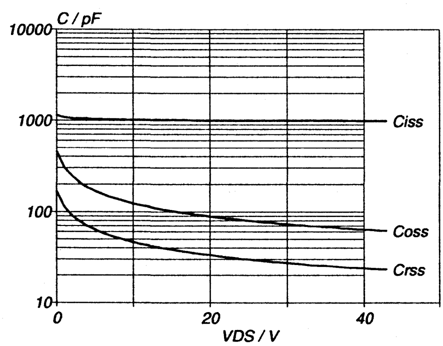


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

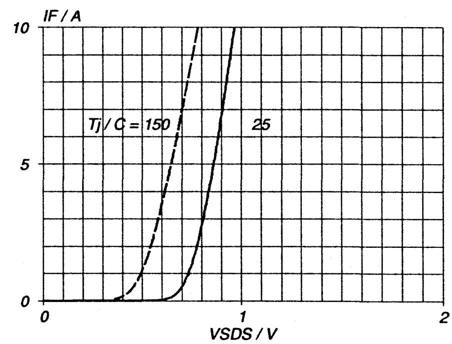


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK446-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

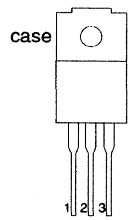
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK446	-1000A	-1000B	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	1.7	1.5	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	4	5	Ω

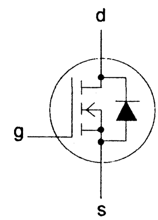
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	-1000B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	1.7	1.5	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.1	1.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	6.8	6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j-hs}$ = 4.16 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.5 A **BUK446-1000A**	-	3.5	4.0	Ω
		BUK446-1000B	-	4.5	5.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	10	25	ns
t_r	Turn-on rise time		-	25	40	ns
$t_{d\ off}$	Turn-off delay time		-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	6.8	A
V_{SD}	Diode forward voltage	I_F = 1.7 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.7 A; -dI_F/dt = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

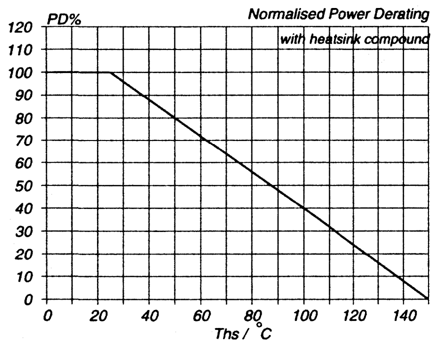


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

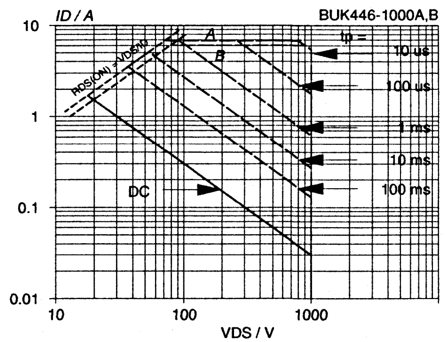


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

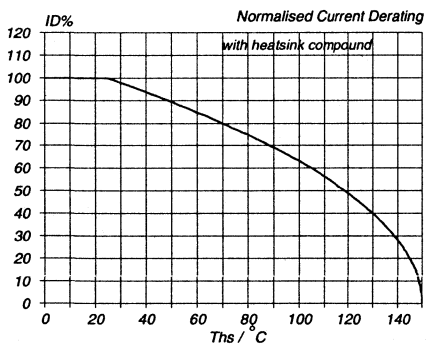


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

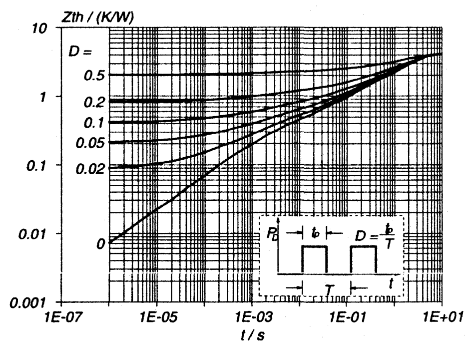


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

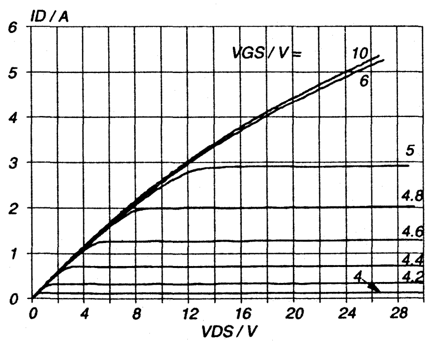


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

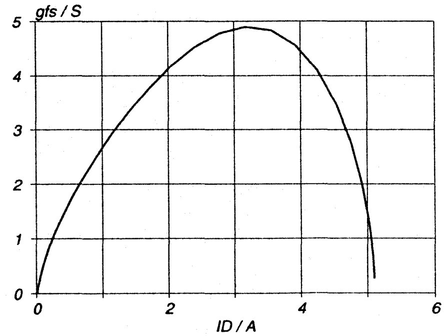


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

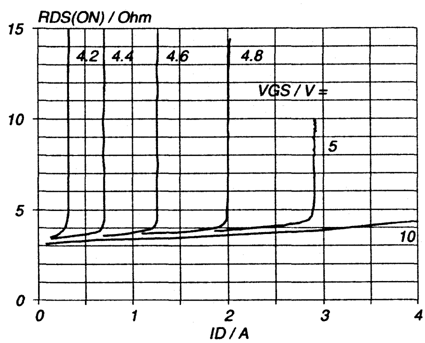


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

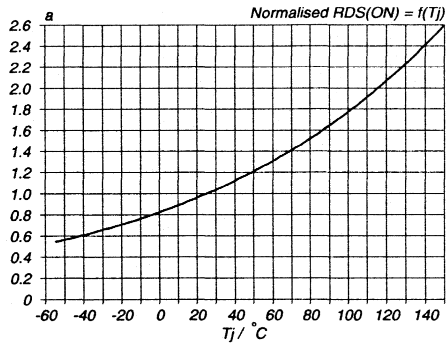


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

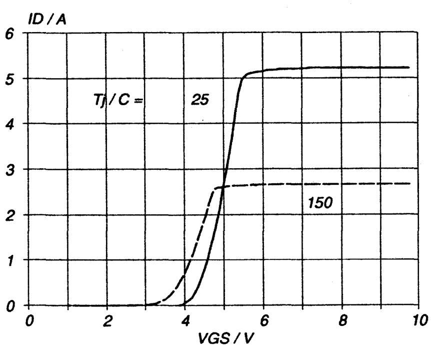


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

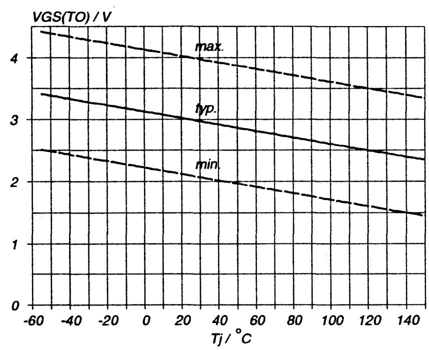


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK446-1000A/B

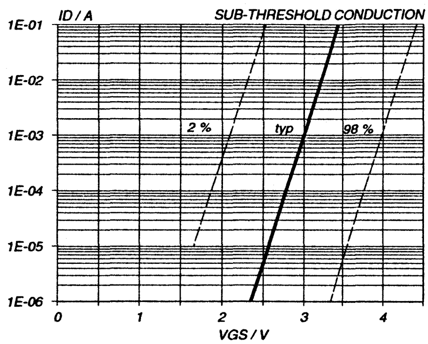


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

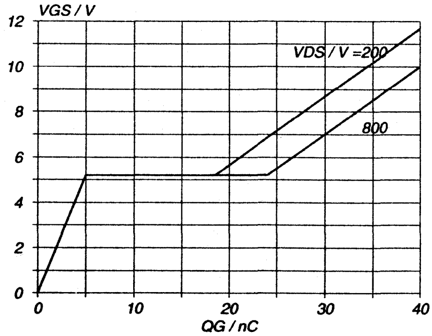


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.5$ A; parameter V_{DS}

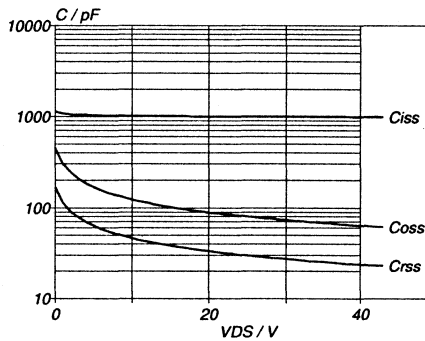


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

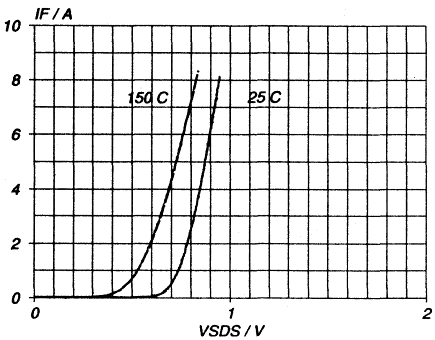


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK452-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

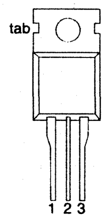
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK452	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	15	14	A
P_{tot}	Total power dissipation	60	60	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.13	0.15	Ω

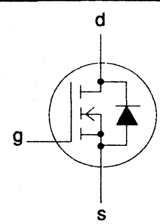
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX. -60A	MAX. -60B	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	15	14	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	11	10	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	60	56	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	60		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 2.5 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK452-60A**	-	0.11	0.13	Ω
		I_D = 8.5 A **BUK452-60B**	-	0.13	0.15	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8.5 A	3.5	4.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	150	200	pF
C_{rss}	Feedback capacitance		-	70	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	8	14	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	45	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	30	45	ns
t_f	Turn-off fall time		-	30	45	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	15	A
I_{DRM}	Pulsed reverse drain current	-	-	-	60	A
V_{SD}	Diode forward voltage	I_F = 15 A ; V_{GS} = 0 V	-	1.4	1.7	V
t_{rr}	Reverse recovery time	I_F = 15 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.18	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 15 A ; $V_{DD} \leq$ 30 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	30	mJ

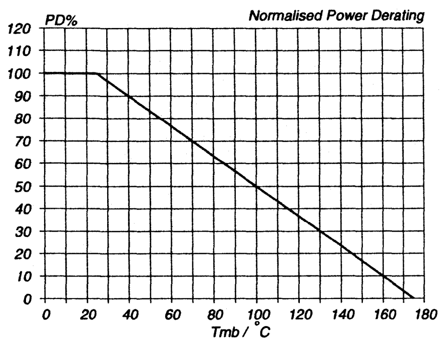


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,^\circ C}$ = f(T_{mb})

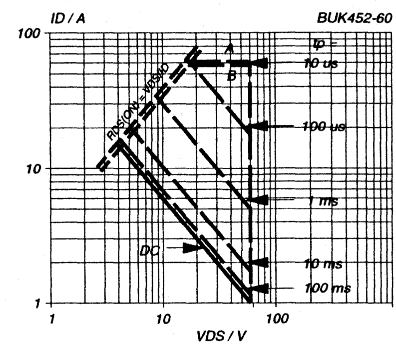


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

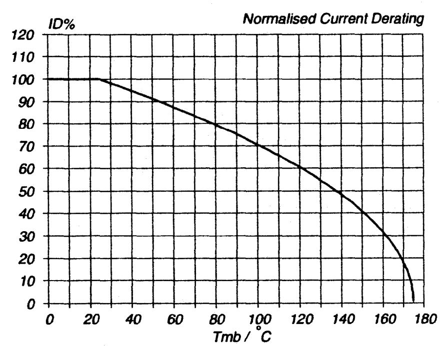


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,^\circ C}$ = f(T_{mb}); conditions: $V_{GS} \geq$ 10 V

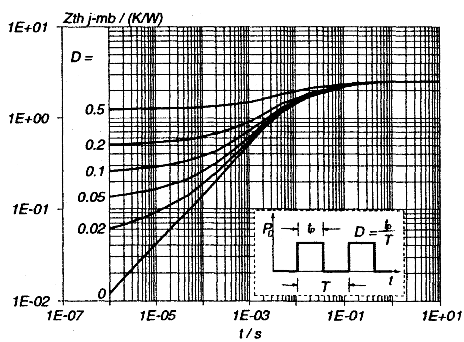


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb}$ = f(t); parameter D = t_p/T

PowerMOS transistor BUK452-60A/B

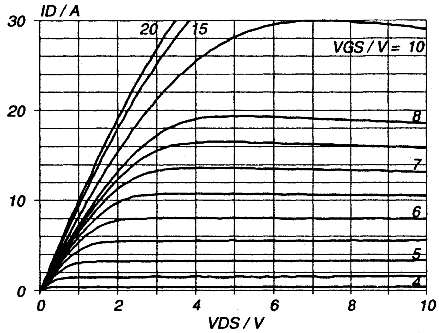


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

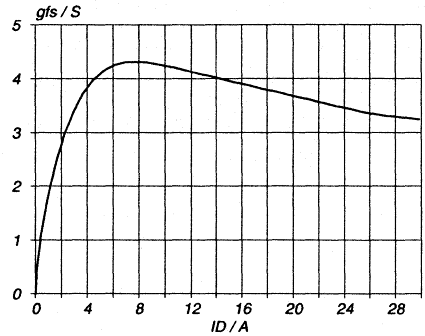


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

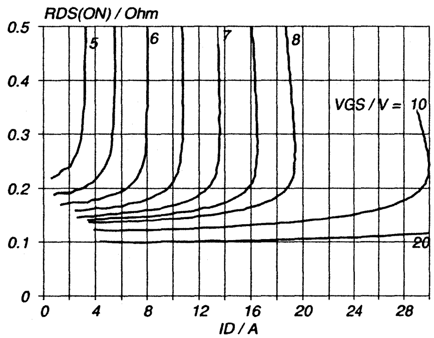


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

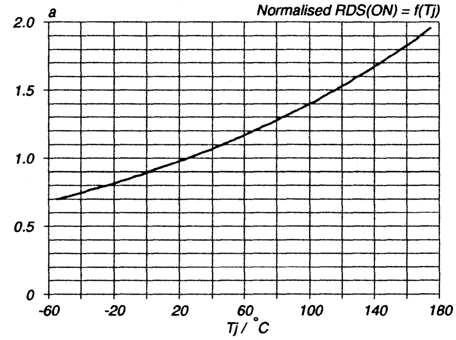


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 8.5$ A; $V_{GS} = 10$ V

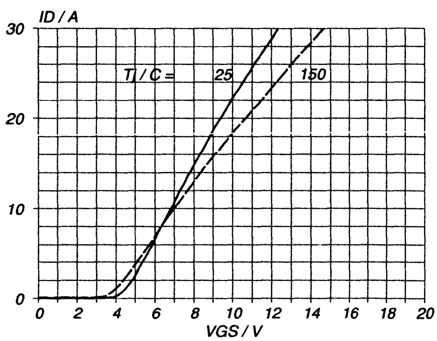


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

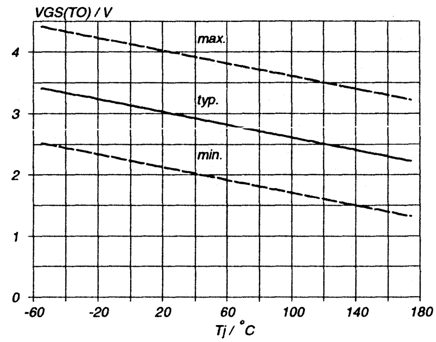


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

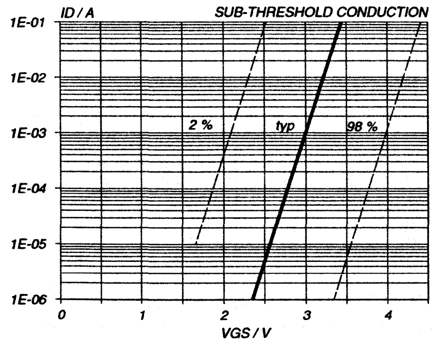


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

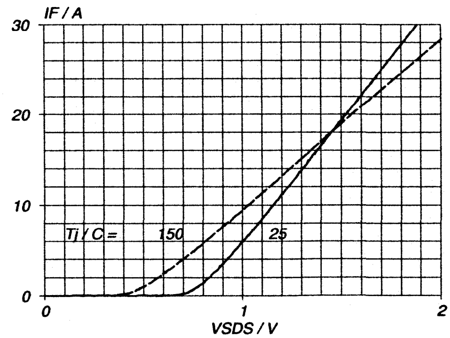


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

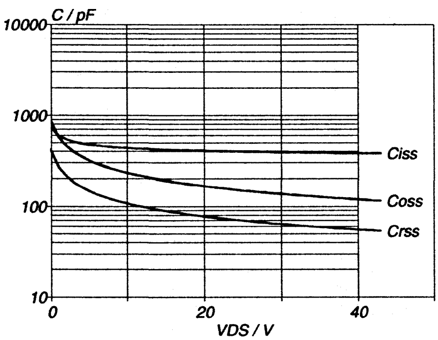


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

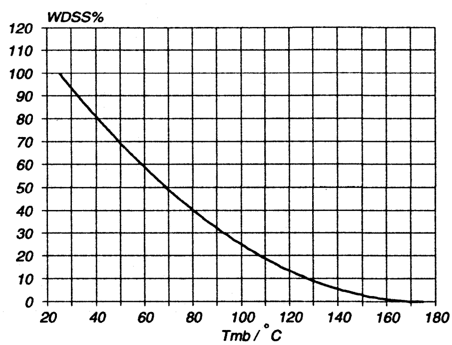


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 15$ A

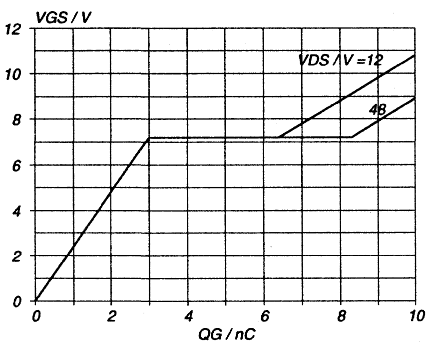


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 15$ A; parameter V_{DS}

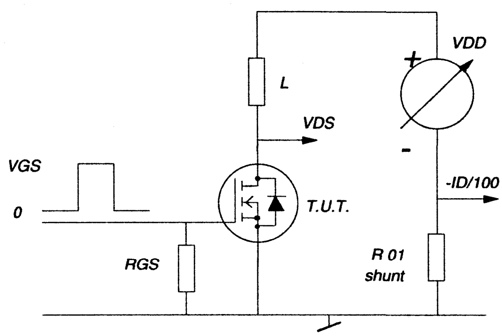


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK452-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

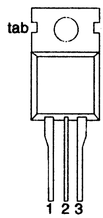
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK452	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	11	10	A
P_{tot}	Total power dissipation	60	60	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.25	0.3	Ω

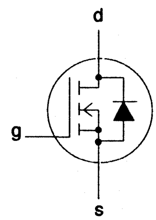
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	11	10	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	7.7	7	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	44	40	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	60		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 2.5 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 5.5 A **BUK452-100A**	-	0.22	0.25	Ω
		BUK452-100B	-	0.25	0.3	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5.5 A	3	4.2	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	90	120	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	9	14	ns
t_r	Turn-on rise time		-	25	40	ns
$t_{d\,off}$	Turn-off delay time		-	30	45	ns
t_f	Turn-off fall time		-	20	40	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	11	A
I_{DRM}	Pulsed reverse drain current	-	-	-	44	A
V_{SD}	Diode forward voltage	I_F = 11 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 11 A; $-dI_F/dt$ = 100 A/µs; V_{GS} = 0 V; V_R = 30 V	-	90	-	ns
Q_{rr}	Reverse recovery charge		-	0.35	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 11 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	35	mJ

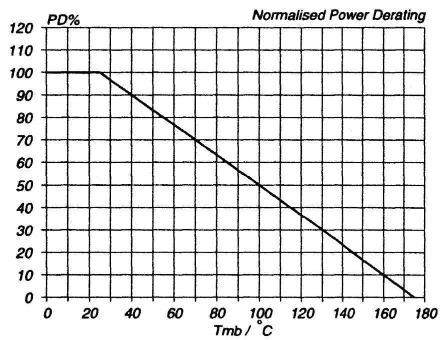


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

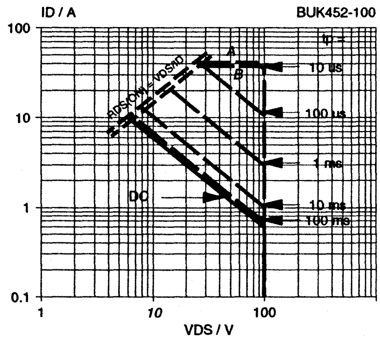


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

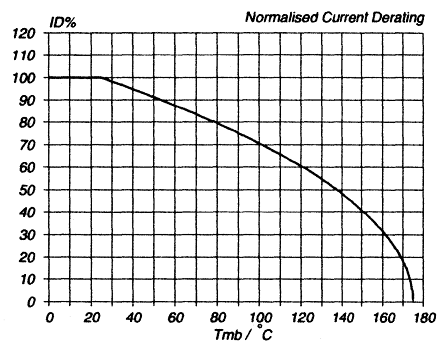


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

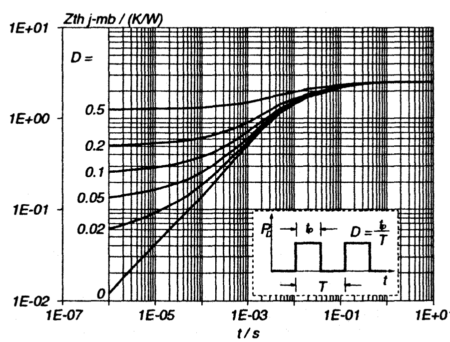


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

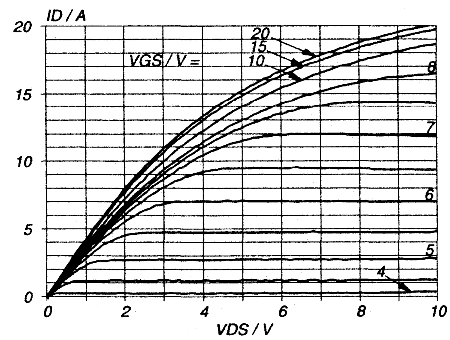


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

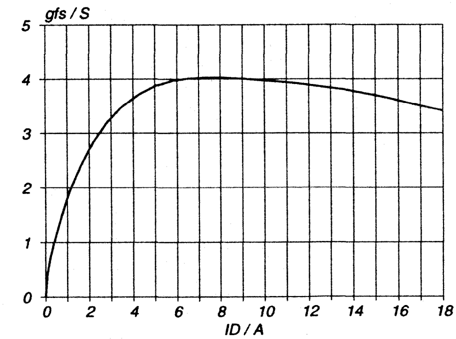


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

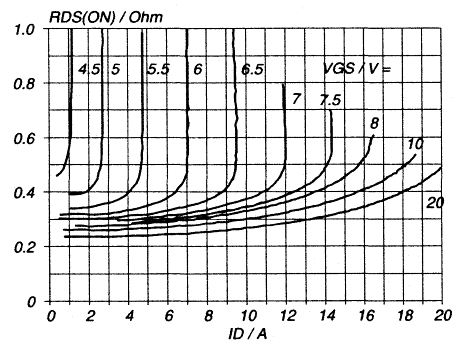


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

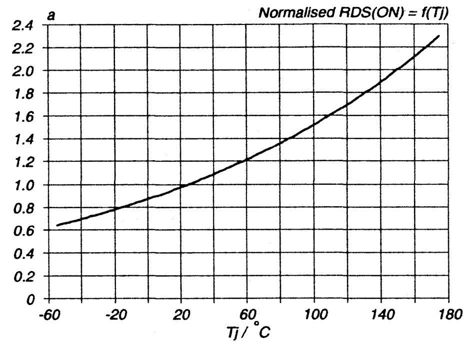


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 5.5$ A; $V_{GS} = 10$ V

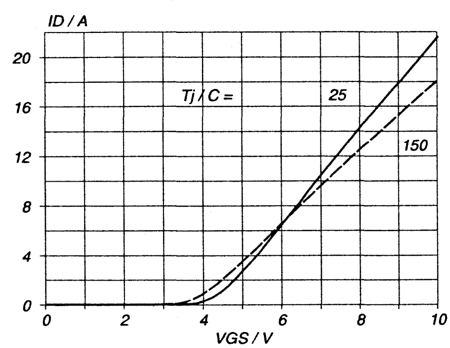


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

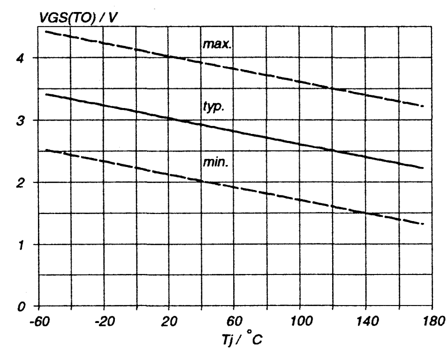


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK452-100A/B

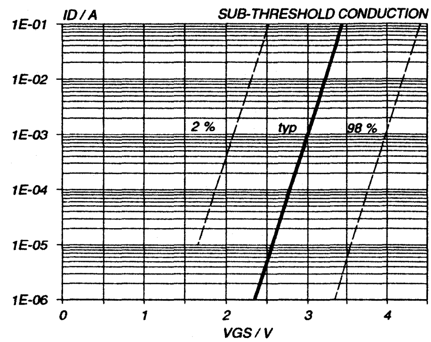


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

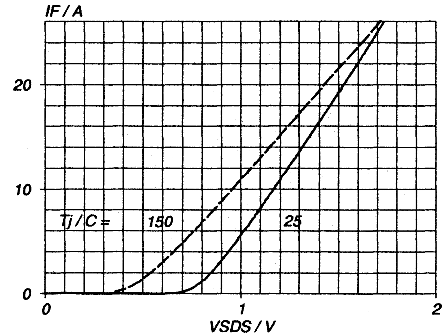


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

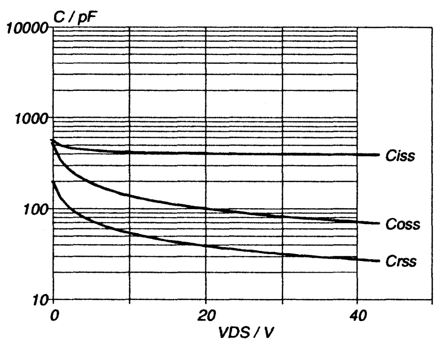


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

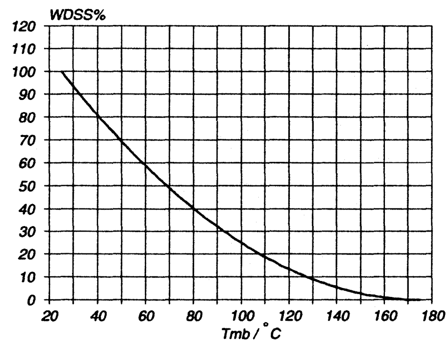


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 11$ A

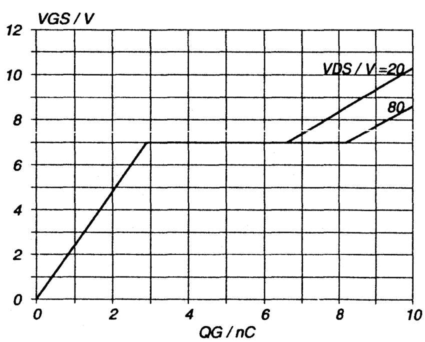


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

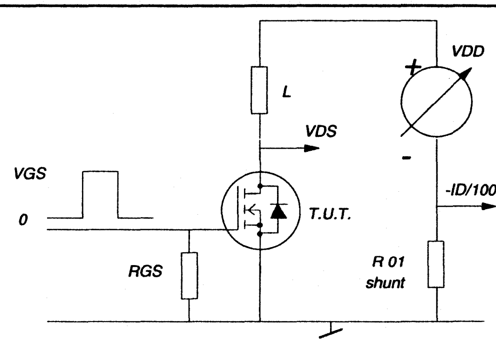


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK453-50A/B	

BUK453-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

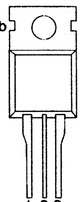
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK453	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	22	20	A
P_{tot}	Total power dissipation	75	75	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.08	0.10	Ω

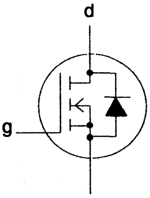
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	22	20	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	15	14	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	88	80	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 2 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA		2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C		-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 10 A	**BUK453-60A**	-	0.07	0.08	Ω
			BUK453-60B	-	0.08	0.10	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	4.5	6.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	650	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	120	160	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	35	55	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	60	90	ns
t_f	Turn-off fall time		-	55	80	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	22	A
I_{DRM}	Pulsed reverse drain current	-	-	-	88	A
V_{SD}	Diode forward voltage	I_F = 22 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 22 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 22 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	50	mJ

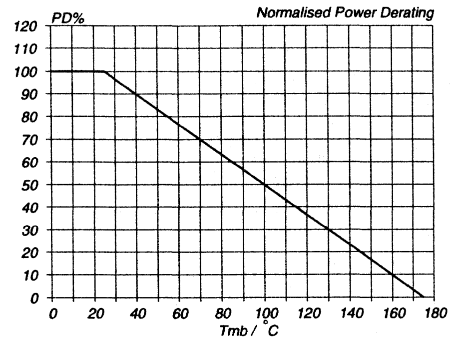


Fig.1. Normalised power dissipation.
PD% = $100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

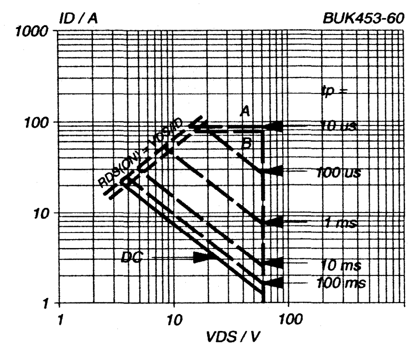


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

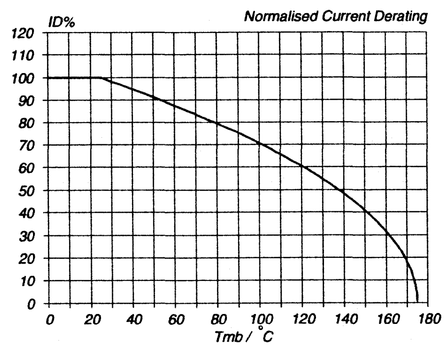


Fig.2. Normalised continuous drain current.
ID% = $100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

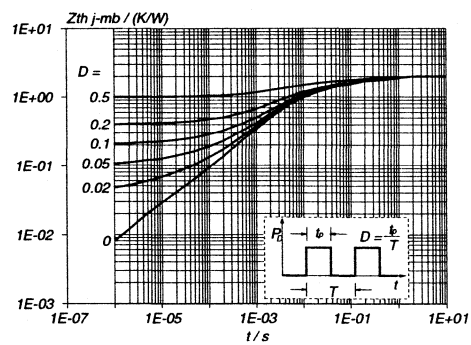


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

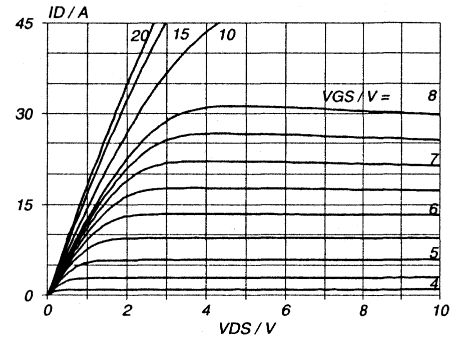


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

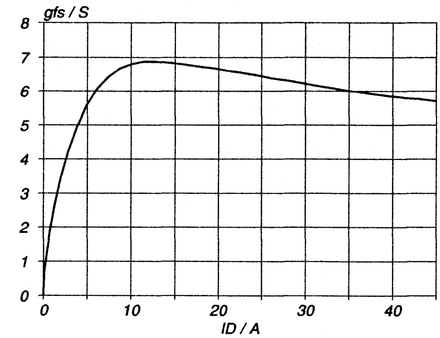


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

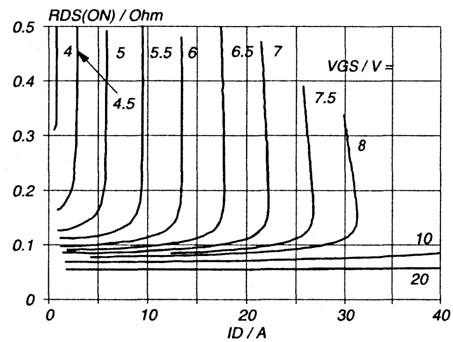


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

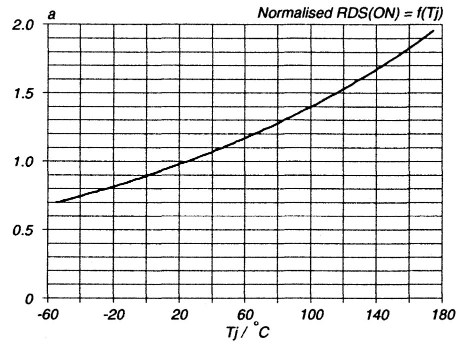


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 10 A; V_{GS} = 10 V

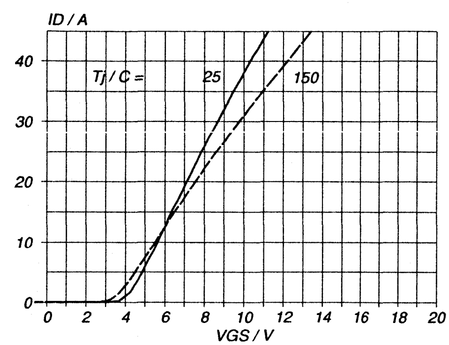


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

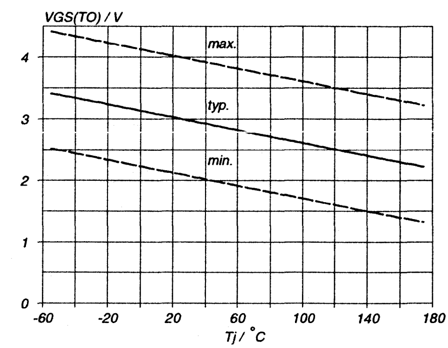


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

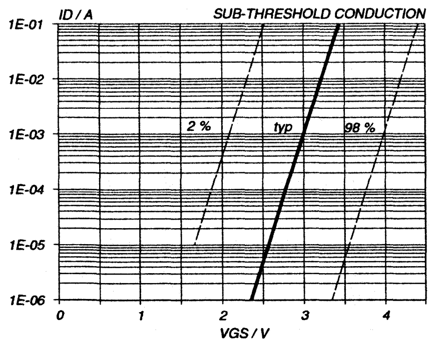


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^{\circ}C$; $V_{DS} = V_{GS}$

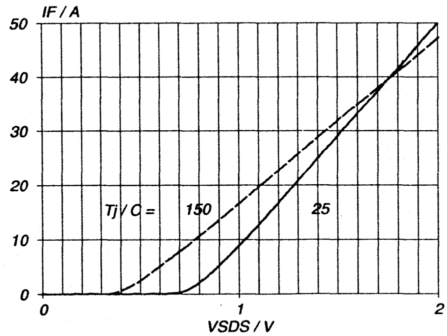


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

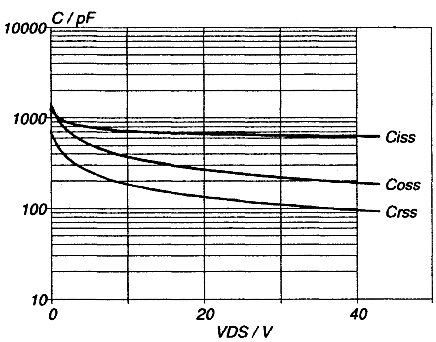


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

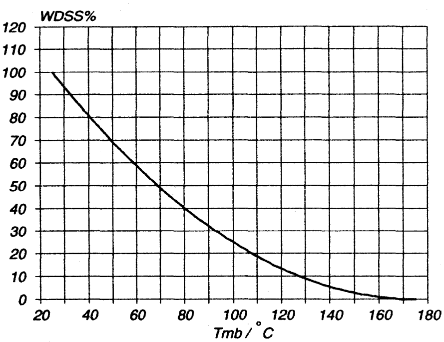


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 22$ A

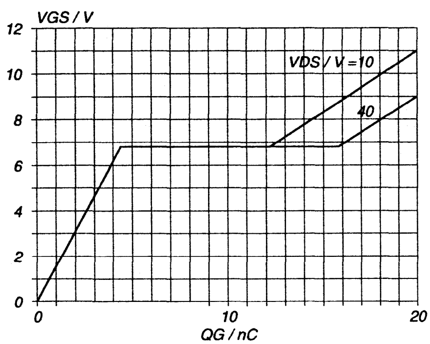


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 22$ A; parameter V_{DS}

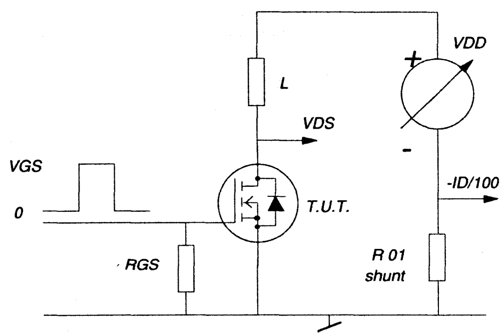


Fig.16. Avalanche energy test circuit.

$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK453-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

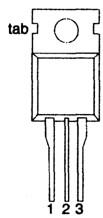
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK453	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	14	13	A
P_{tot}	Total power dissipation	75	75	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.16	0.20	Ω

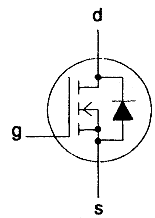
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	**-100B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	14	13	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	10	9	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	56	52	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 2 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 5 A **BUK453-100A**	-	0.15	0.16	Ω
		BUK453-100B	-	0.15	0.20	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5 A	4.0	5.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	660	825	pF
C_{oss}	Output capacitance		-	140	200	pF
C_{rss}	Feedback capacitance		-	60	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	60	90	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 14 A; $-dI_F/dt$ = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.6	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	70	mJ

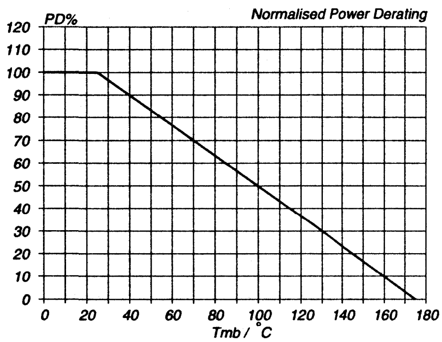


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

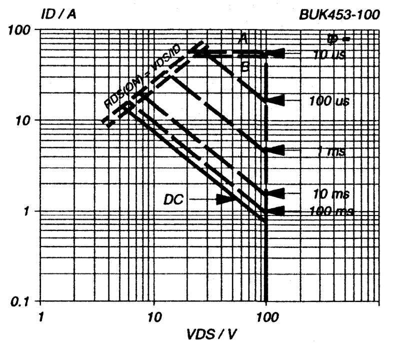


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

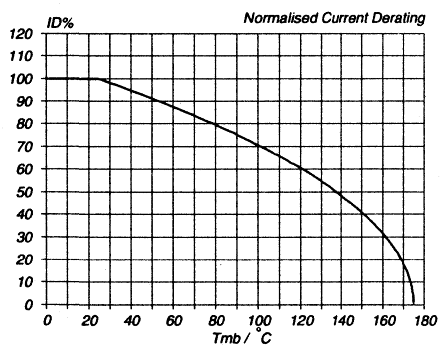


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

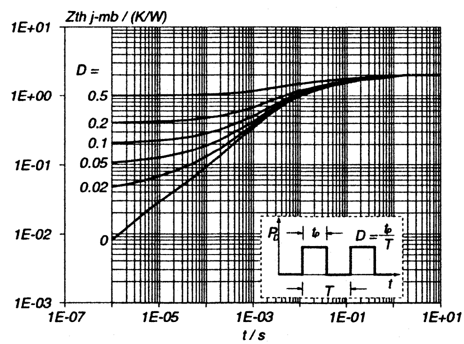


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

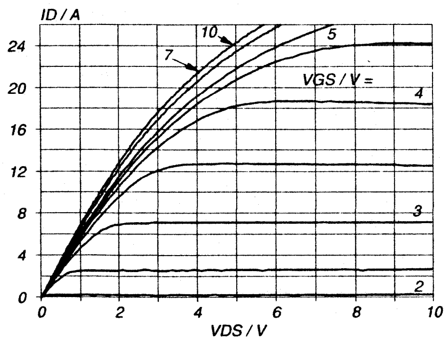


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

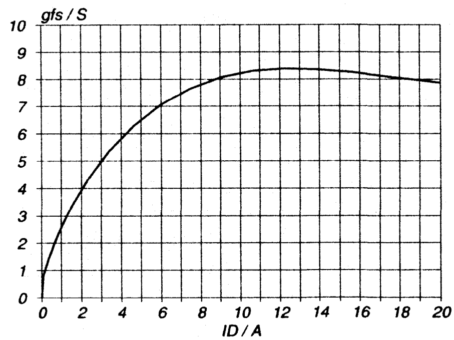


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

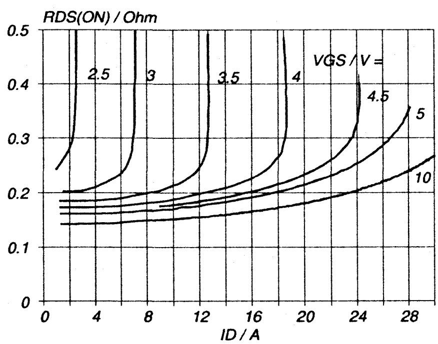


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

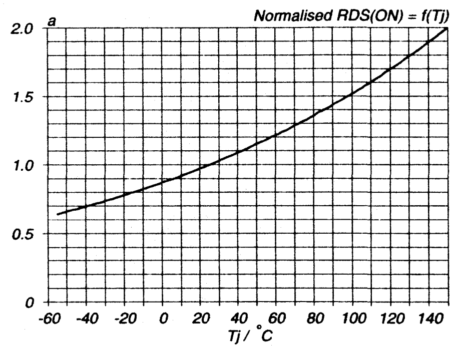


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 5$ A; $V_{GS} = 5$ V

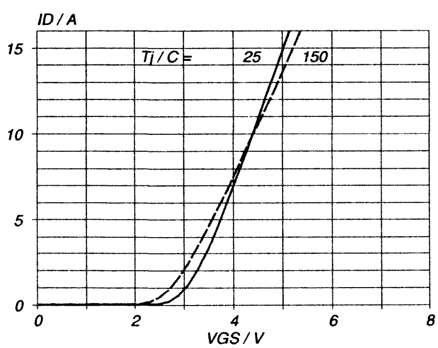


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

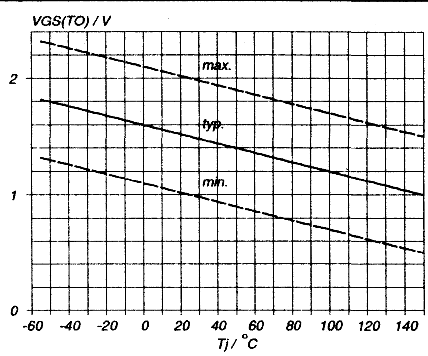


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

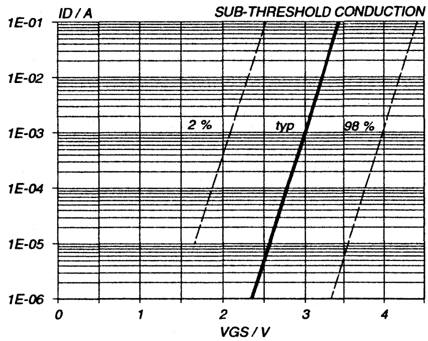


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

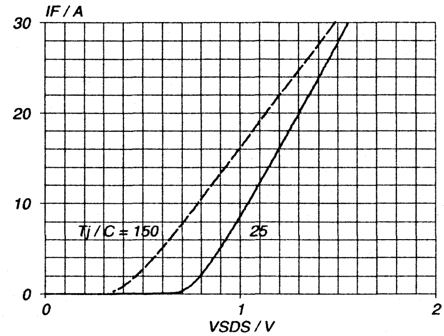


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

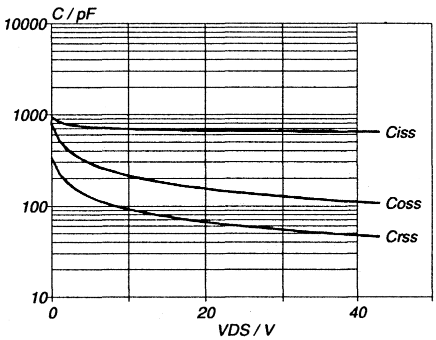


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

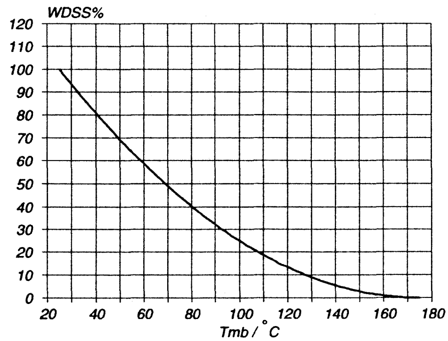


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 14$ A

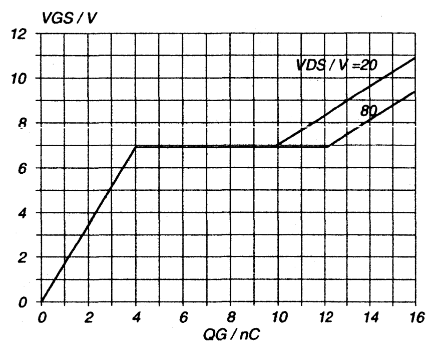


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

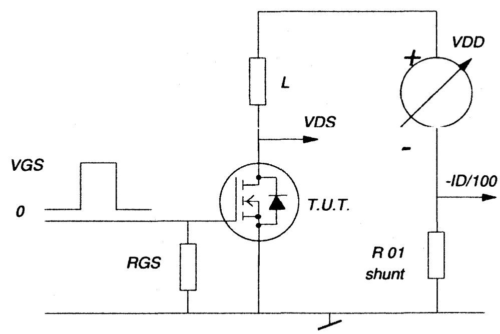


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK453-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

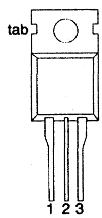
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK453	**-500A**	**-500B**	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	1.7	1.6	A
P_{tot}	Total power dissipation	50	50	W
$R_{DS(ON)}$	Drain-source on-state resistance	6.0	7.0	Ω

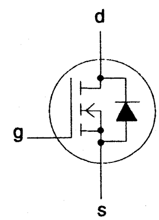
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	**-500B**	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	1.7	1.6	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	1.2	1.1	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	6.8	6.4	A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	50		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 2.5 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 0.6 A **BUK453-500A**	-	5.4	6.0	Ω
		BUK453-500B	-	6.0	7.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 0.6 A	0.7	1.1	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	230	300	pF
C_{oss}	Output capacitance		-	35	50	pF
C_{rss}	Feedback capacitance		-	14	30	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 1.8 A;	-	10	15	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	30	45	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	30	40	ns
t_f	Turn-off fall time		-	20	30	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	6.8	A
V_{SD}	Diode forward voltage	I_F = 1.7 A ; V_{GS} = 0 V	-	0.8	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.7 A; $-dI_F/dt$ = 100 A/µs;	-	350	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.5	-	µC

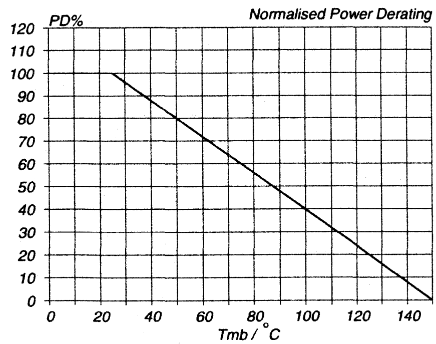


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

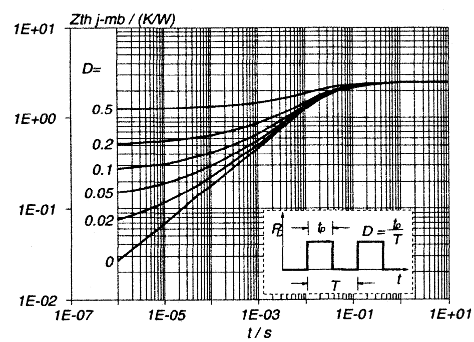


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

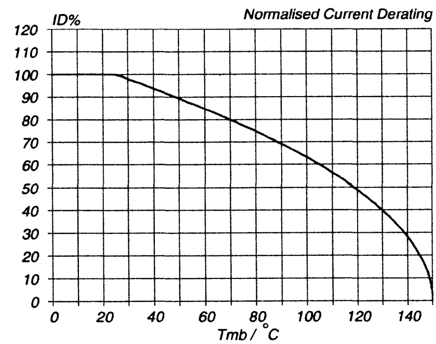


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

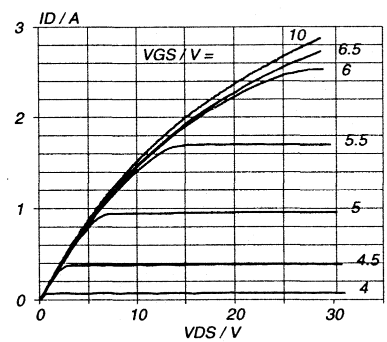


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

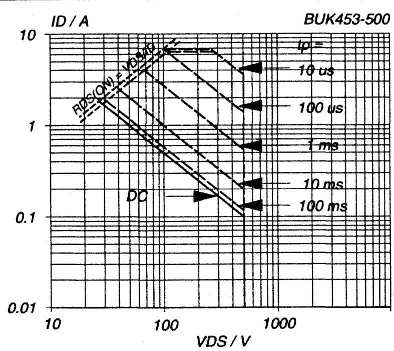


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

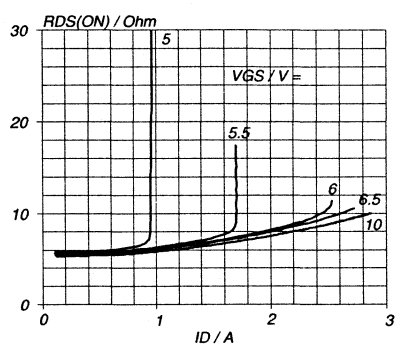


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor

BUK453-500A/B

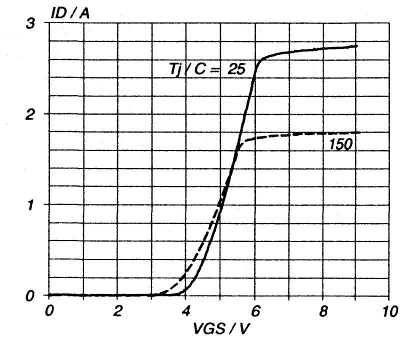


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

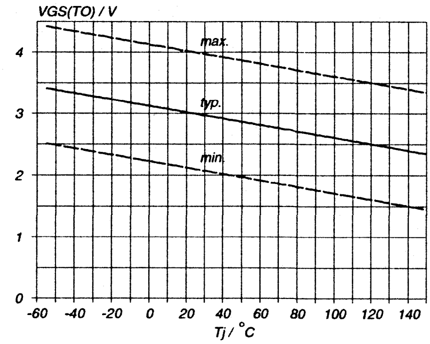


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

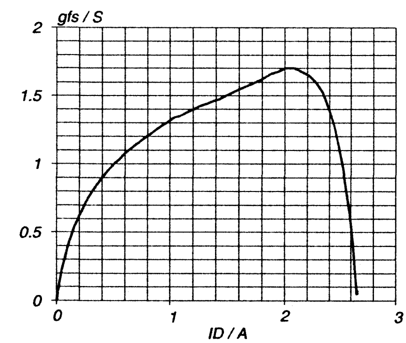


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

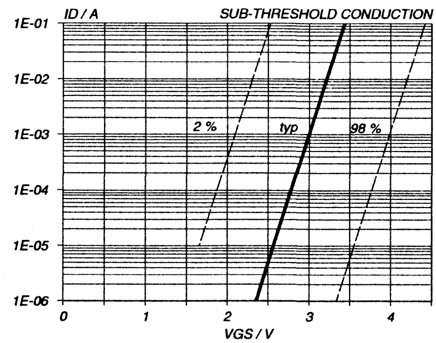


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

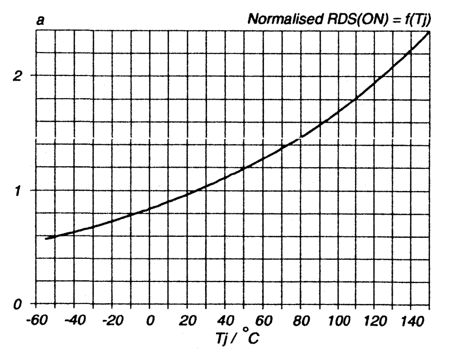


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; $I_D = 0.6$ A; $V_{GS} = 10$ V

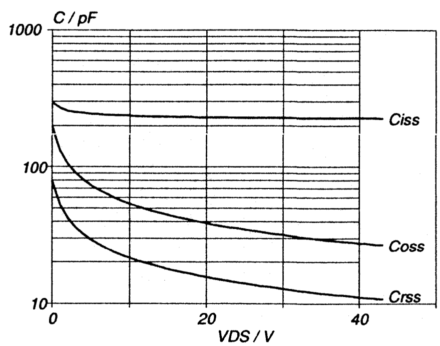


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

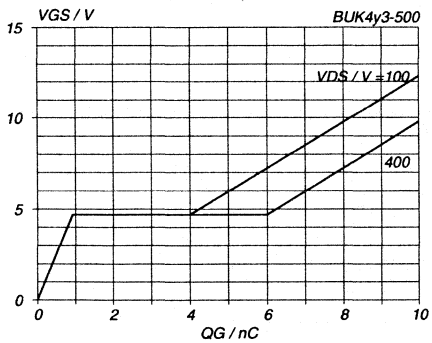


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 1.7$ A; parameter V_{DS}

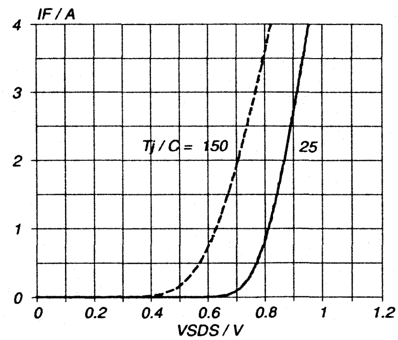


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 454-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

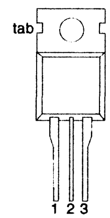
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK454	-200A	-200B	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	9.2	8.2	A
P_{tot}	Total power dissipation	90	90	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

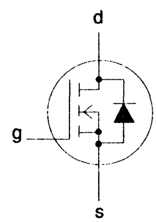
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	-200B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	9.2	8.2	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	6.5	5.8	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	36	33	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	90		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.67 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 3.5 A **BUK454-200A**	-	0.35	0.4	Ω
		BUK454-200B	-	0.4	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	3.5	5.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	850	pF
C_{oss}	Output capacitance		-	100	160	pF
C_{rss}	Feedback capacitance		-	50	80	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	12	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	70	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	120	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9.2	A
I_{DRM}	Pulsed reverse drain current	-	-	-	36	A
V_{SD}	Diode forward voltage	I_F = 9.2 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 9.2 A; $-dI_F/dt$ = 100 A/µs;	-	200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	0.6	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 9 A ; $V_{DD} \leq$ 100 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	50	mJ

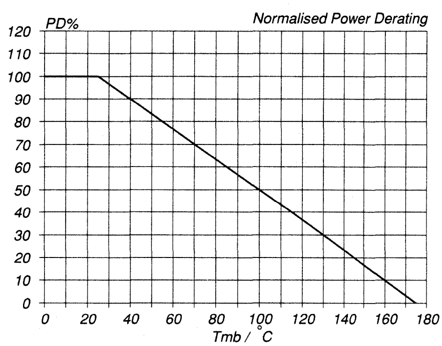


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

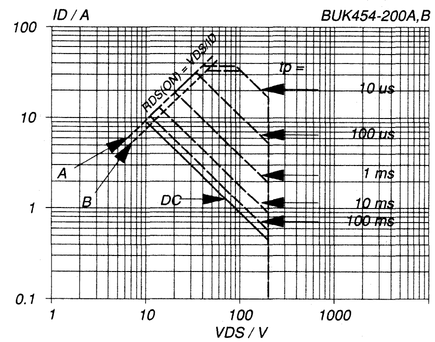


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

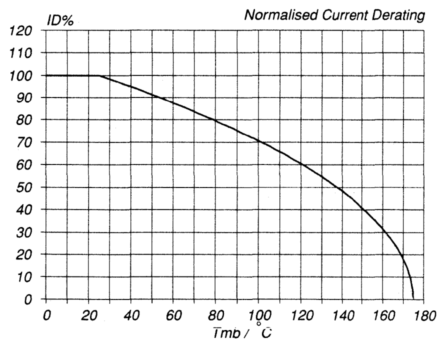


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq$ 10 V

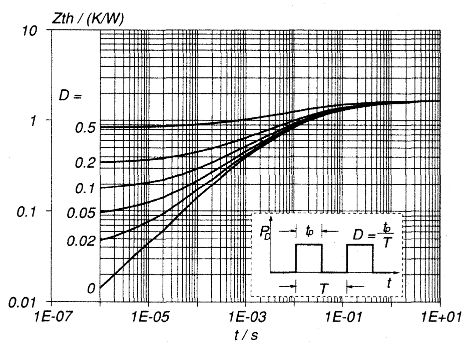


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

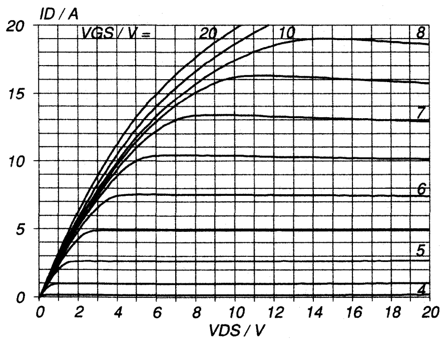


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

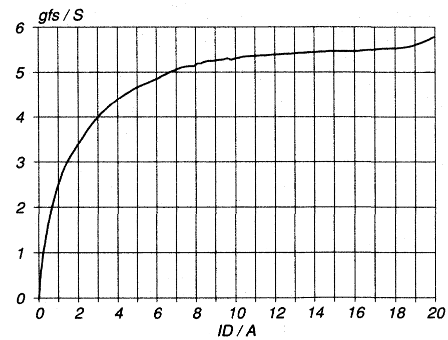


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

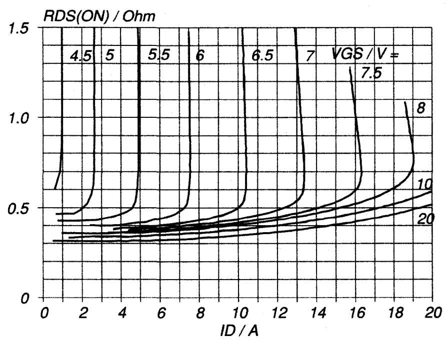


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

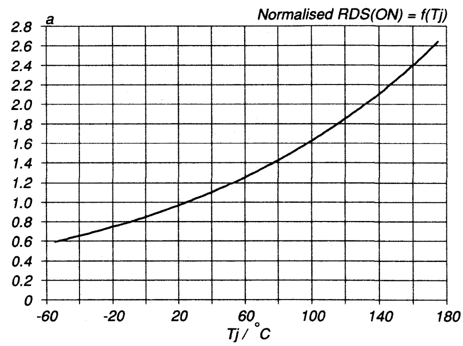


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 3.5$ A; $V_{GS} = 10$ V

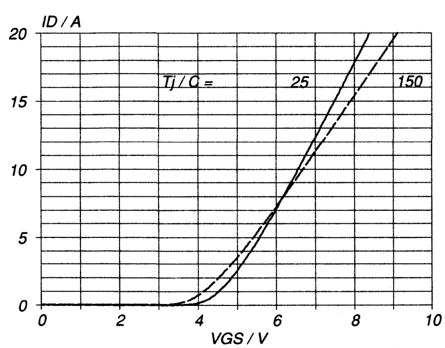


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

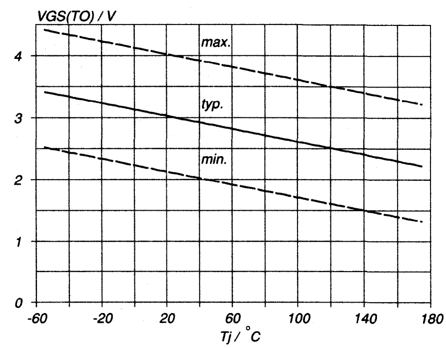


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK 454-200A/B

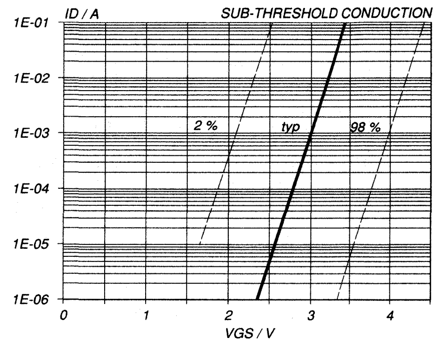


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

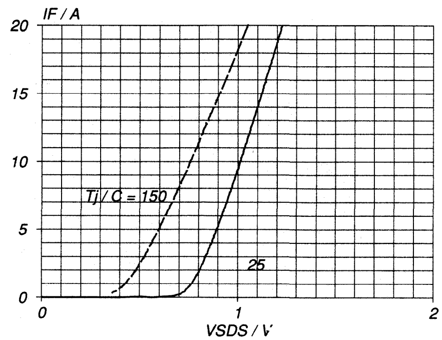


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

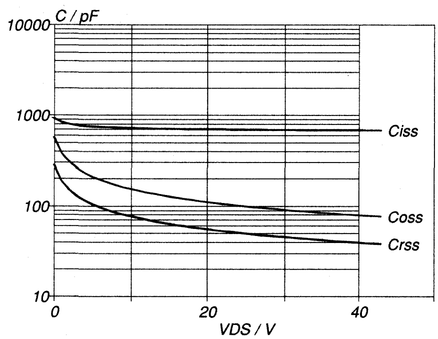


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

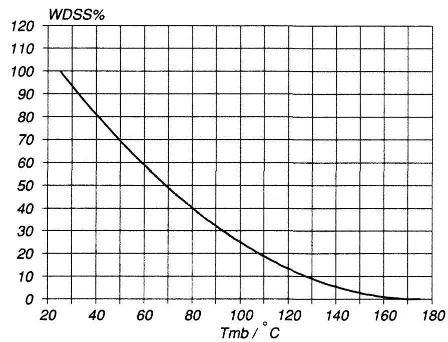


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 9$ A

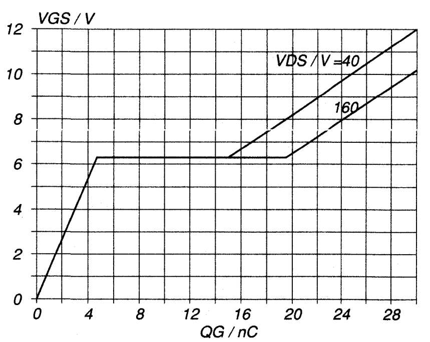


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 9$ A; parameter V_{DS}

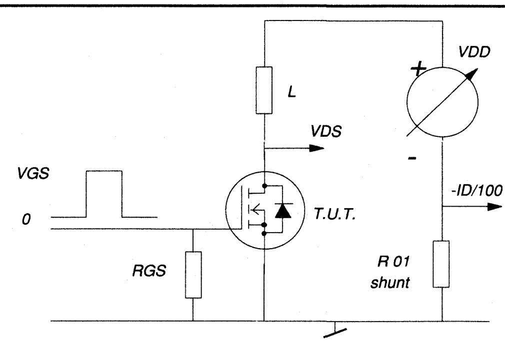


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 454-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

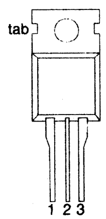
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK454	**-400A**	**-400B**	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	4.6	4.2	A
P_{tot}	Total power dissipation	75	75	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.5	1.8	Ω

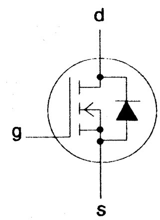
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	**-400B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	4.6	4.2	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	2.9	2.6	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	18	17	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 1.67 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK454-400A**	-	1.3	1.5	Ω
		I_D = 1.5 A **BUK454-400B**	-	1.5	1.8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	2.1	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	360	500	pF
C_{oss}	Output capacitance		-	60	80	pF
C_{rss}	Feedback capacitance		-	25	60	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	18	A
V_{SD}	Diode forward voltage	I_F = 4.6 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 4.6 A; -dI_F/dt = 100 A/µs;	-	300	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.5	-	µC

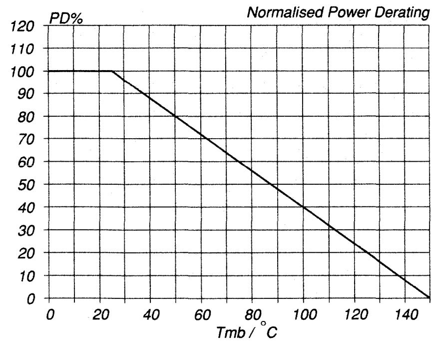


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

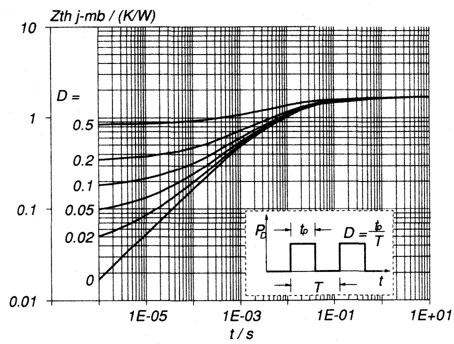


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

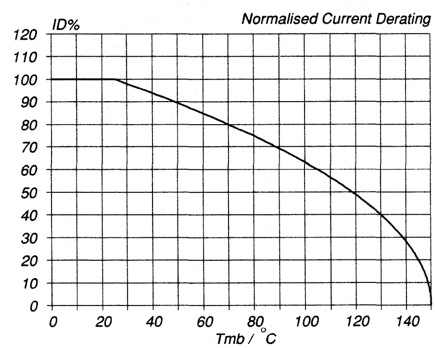


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

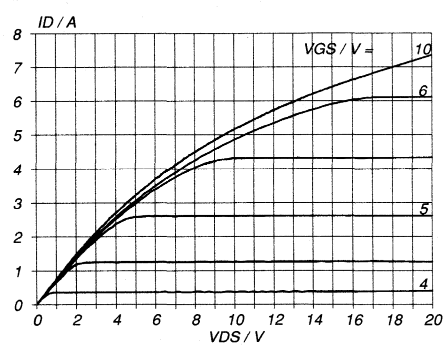


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

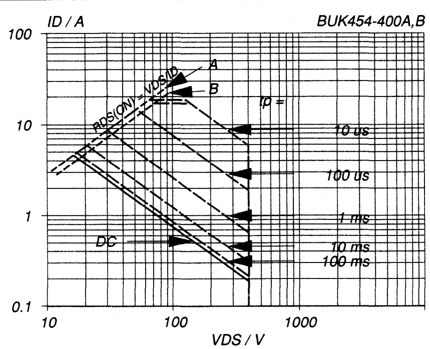


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

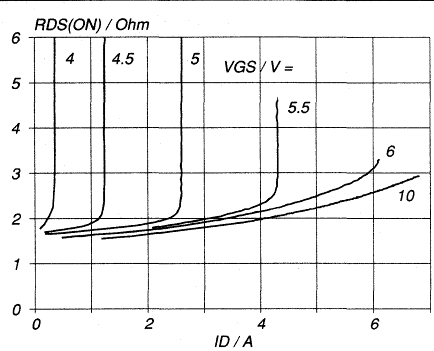


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor — BUK 454-400A/B

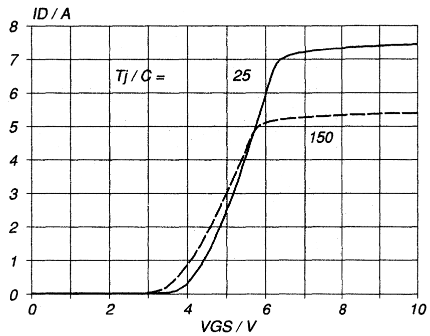


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

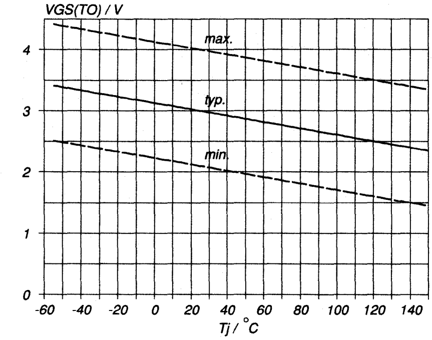


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

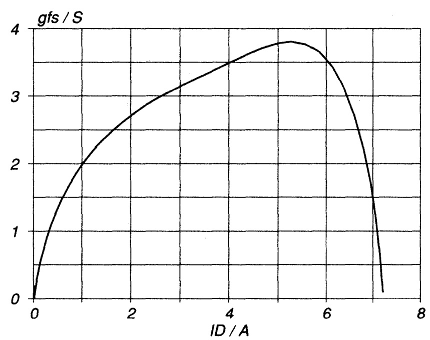


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

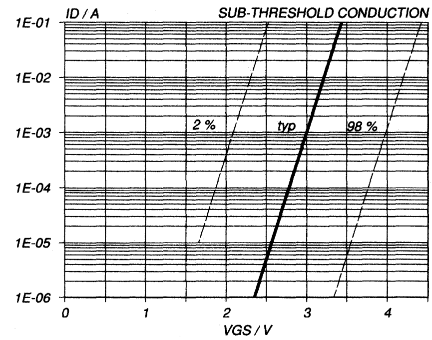


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

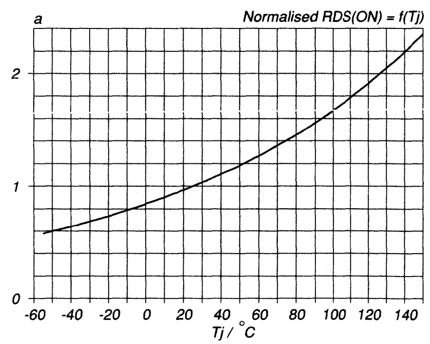


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 1.5 A; V_{GS} = 10 V

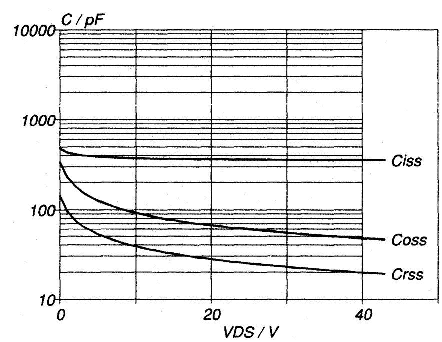


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

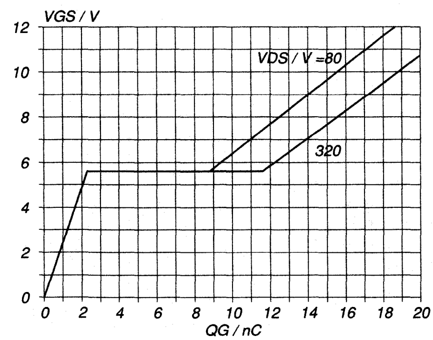


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.6$ A; parameter V_{DS}

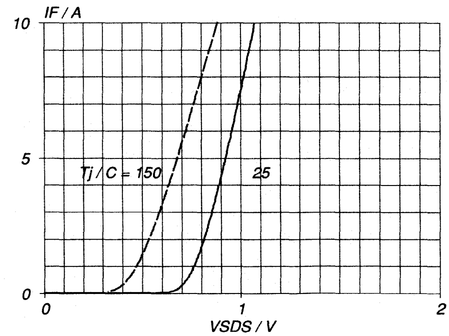


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 454-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

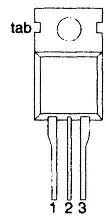
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK454	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	3.7	3.3	A
P_{tot}	Total power dissipation	75	75	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.3	2.8	Ω

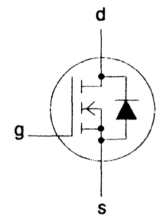
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	3.7	3.3	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	2.3	2.1	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	15	13	A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	75		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.67 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK454-500A**	-	2.0	2.3	Ω
		I_D = 1.5 A **BUK454-500B**	-	2.3	2.8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	1.9	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	55	80	pF
C_{rss}	Feedback capacitance		-	20	55	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	15	A
V_{SD}	Diode forward voltage	I_F = 3.7 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 3.7 A; $-dI_F/dt$ = 100 A/µs;	-	350	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	3.5	-	µC

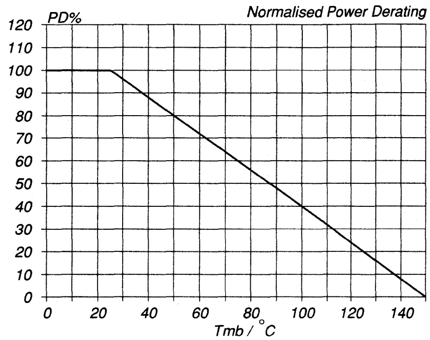


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{mb})$

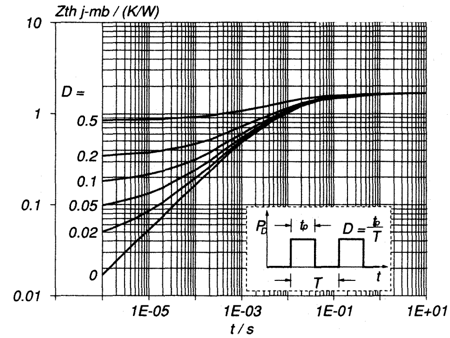


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

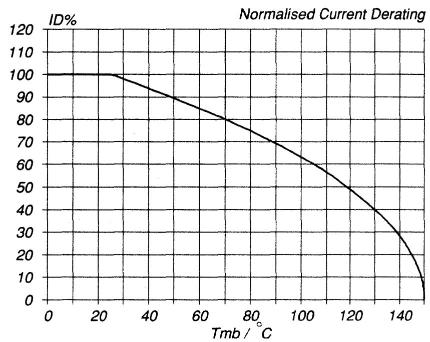


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

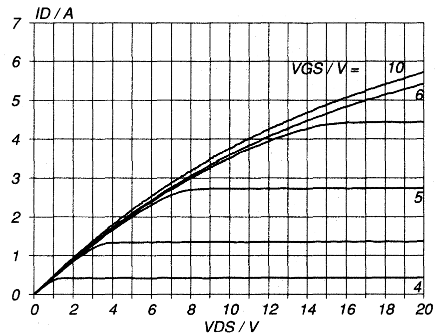


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

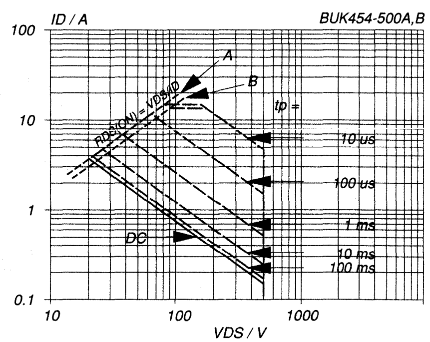


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

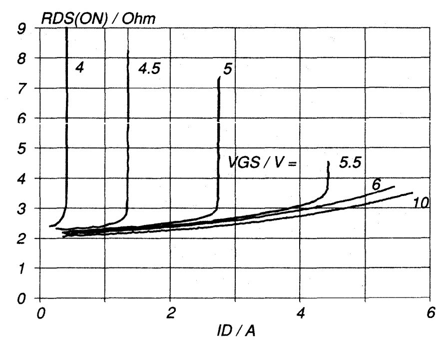


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK 454-500A/B

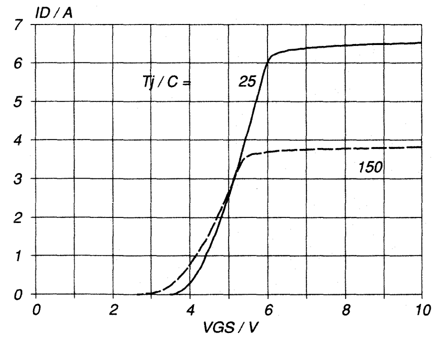


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

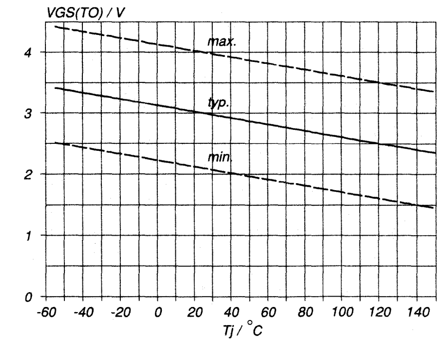


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

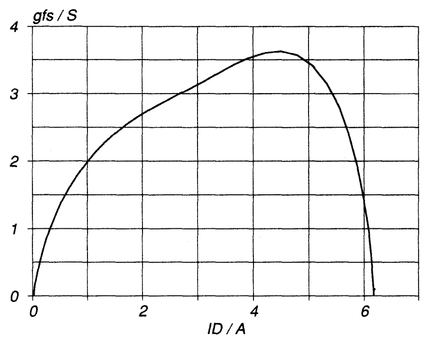


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

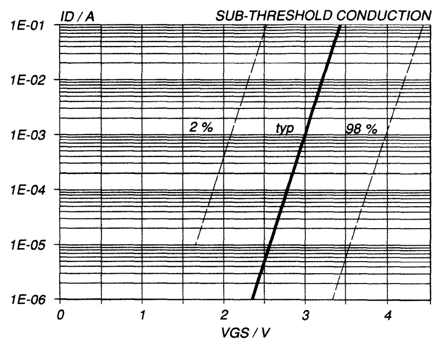


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

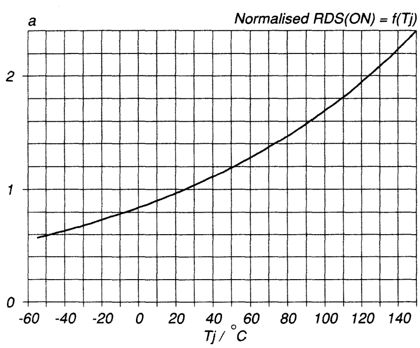


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 1.5 A; V_{GS} = 10 V

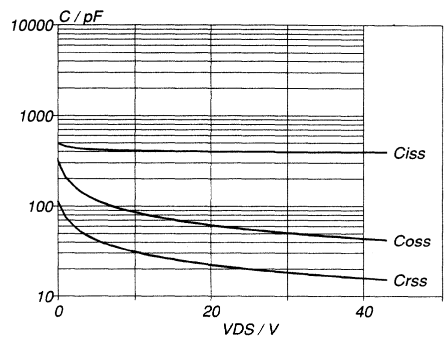


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

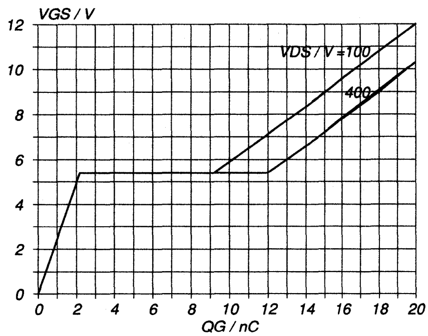


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.7$ A; parameter V_{DS}

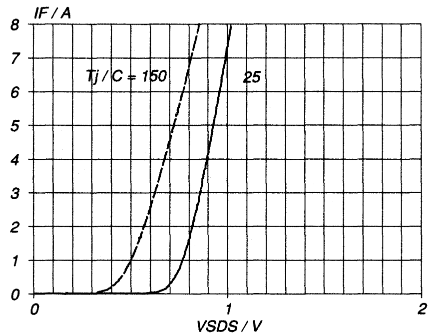


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 454-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

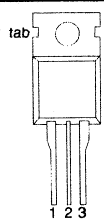
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK454	**-600A**	**-600B**	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	2.8	2.6	A
P_{tot}	Total power dissipation	75	75	W
$R_{DS(ON)}$	Drain-source on-state resistance	4.0	4.5	Ω

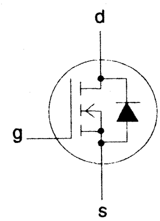
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	**-600B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	2.8	2.6	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	1.8	1.6	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	11.2	10.4	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.67 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK454-600A**	-	3.8	4.0	Ω
		I_D = 1.2 A **BUK454-600B**	-	4.0	4.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.2 A	1.9	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	300	500	pF
C_{oss}	Output capacitance		-	50	80	pF
C_{rss}	Feedback capacitance		-	30	55	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.1 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.8	A
I_{DRM}	Pulsed reverse drain current	-	-	-	11.2	A
V_{SD}	Diode forward voltage	I_F = 2.8 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.8 A; $-dI_F/dt$ = 100 A/µs;	-	350	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	3.5	-	µC

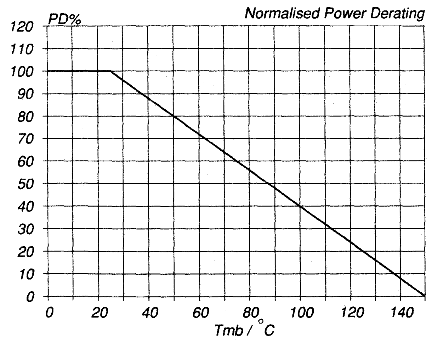


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

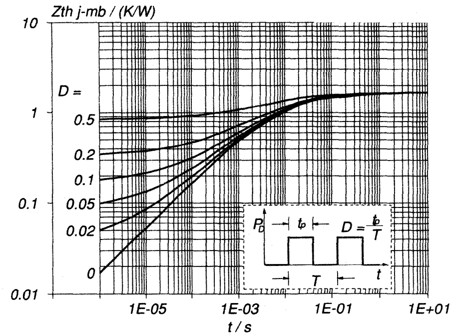


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

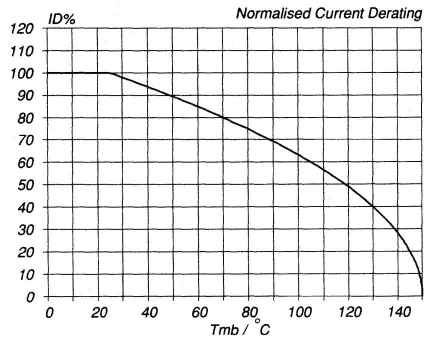


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

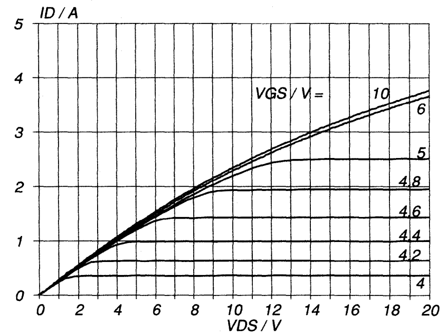


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

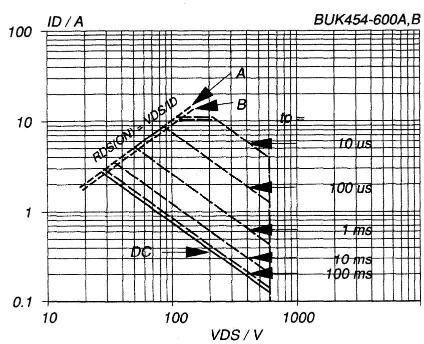


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

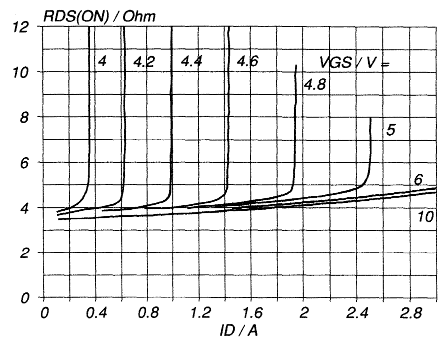


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

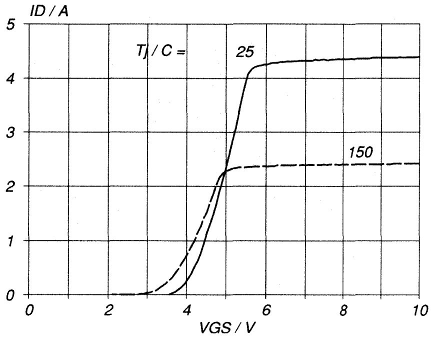


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

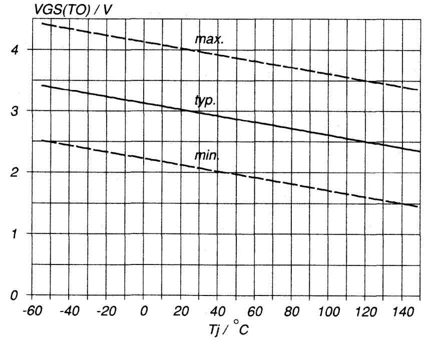


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

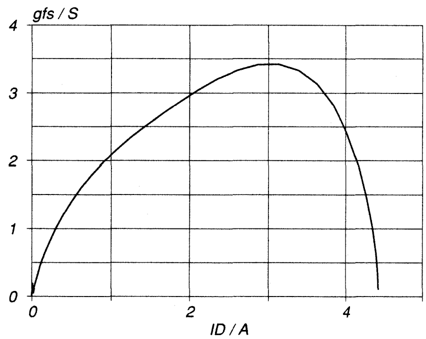


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

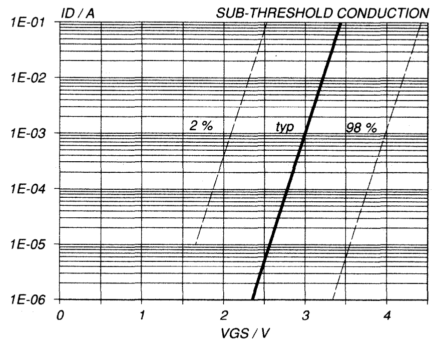


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

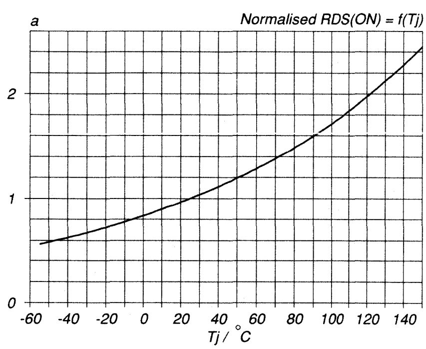


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; I_D = 1.2 A; V_{GS} = 10 V

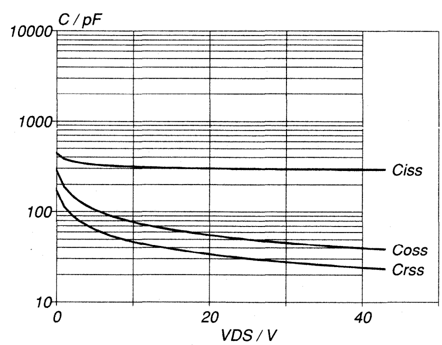


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

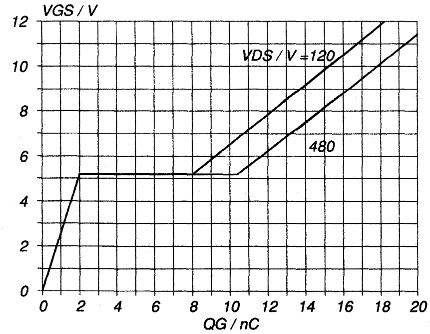


Fig. 13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 2.8$ A; parameter V_{DS}

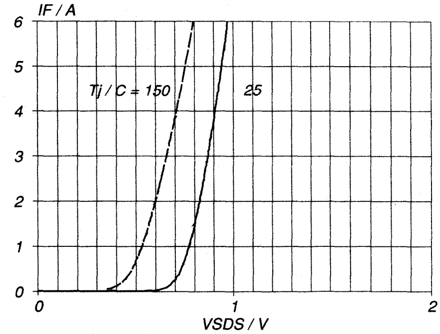


Fig. 14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 454-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

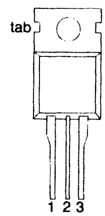
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK454	**-800A**	**-800B**	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	2.4	2.0	A
P_{tot}	Total power dissipation	85	85	W
$R_{DS(ON)}$	Drain-source on-state resistance	6	8	Ω

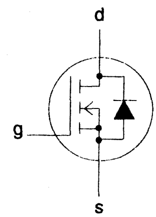
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	**-800B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	2.4	2.0	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	1.5	1.25	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	9.5	8	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	85		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.47 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK454-800A**	-	5	6	Ω
		I_D = 1.0 A **BUK454-800B**	-	6	8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.0 A	1.0	2.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	450	750	pF
C_{oss}	Output capacitance		-	42	70	pF
C_{rss}	Feedback capacitance		-	15	30	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 1.9 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	10	A
V_{SD}	Diode forward voltage	I_F = 2.6 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.6 A; $-dI_F/dt$ = 100 A/µs;	-	230	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	1.9	-	µC

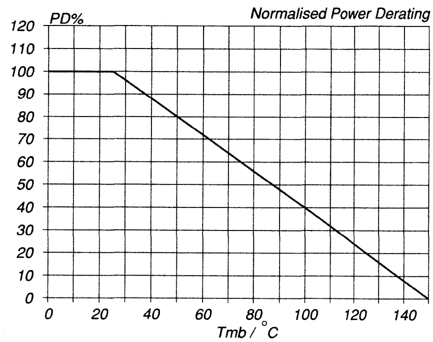


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

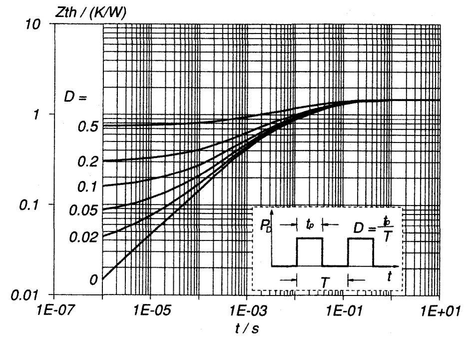


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

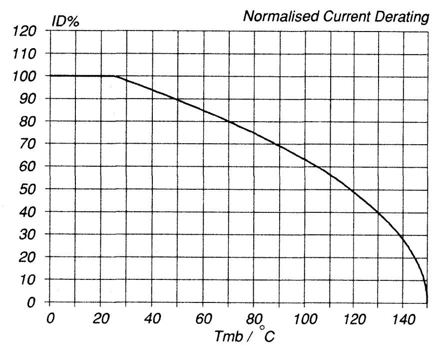


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

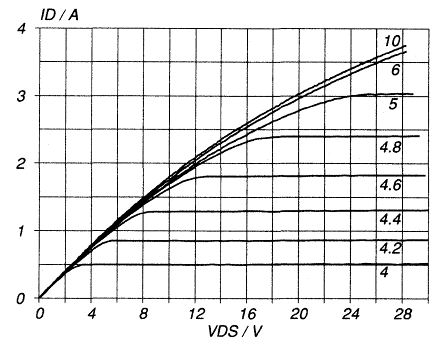


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

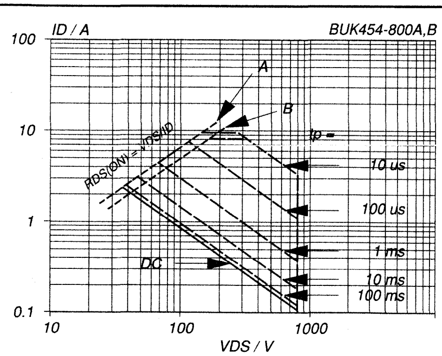


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

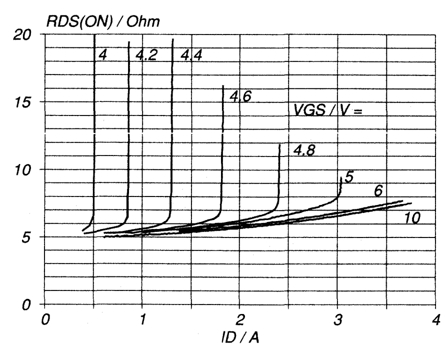


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

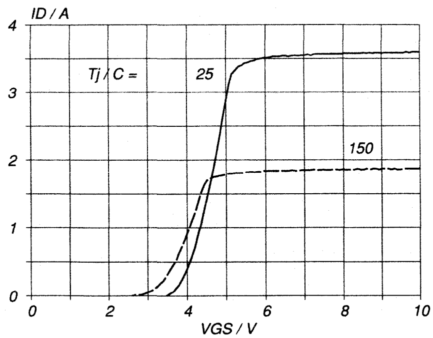


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

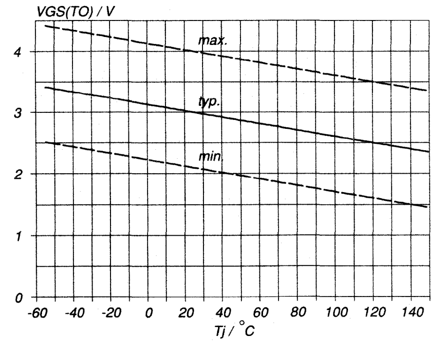


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

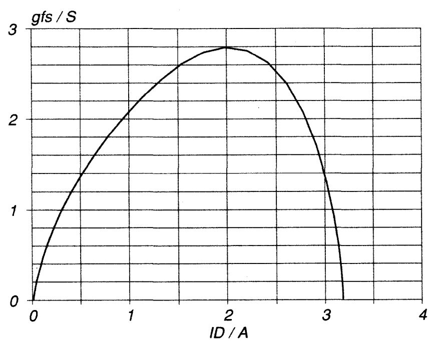


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

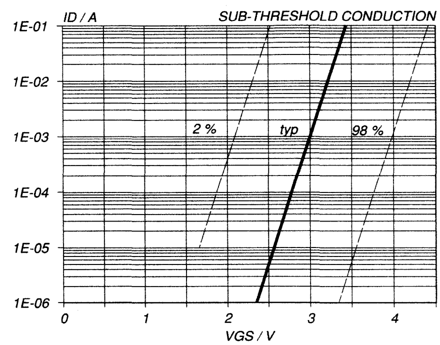


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

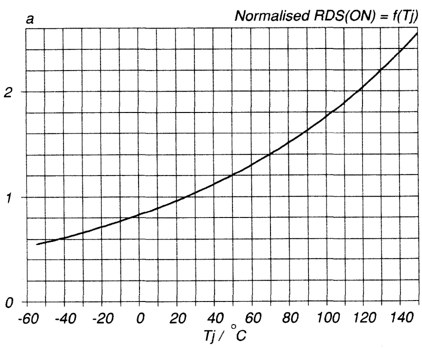


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 1.0$ A; $V_{GS} = 10$ V

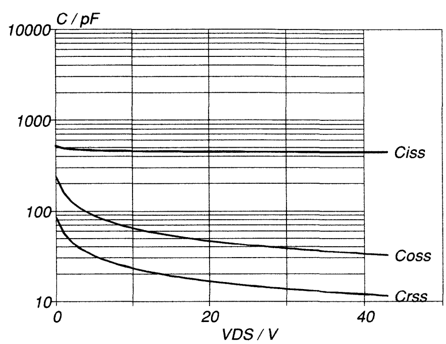


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

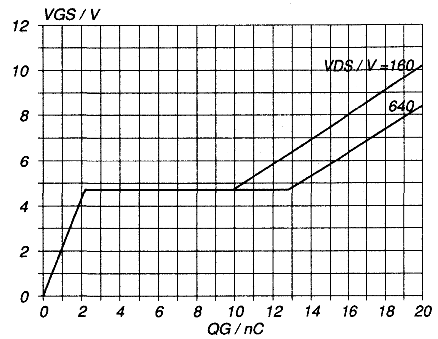


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 2.4$ A; parameter V_{DS}

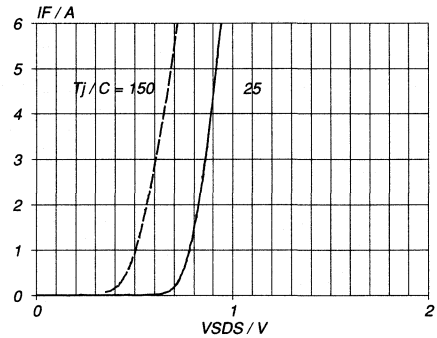


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991
Replaces BUK455-50A/B	

BUK 455-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

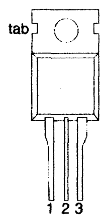
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	41	38	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.038	0.045	Ω

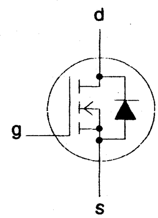
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	41	38	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	29	27	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	164	152	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 1.2 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 20 A **BUK455-60A**	-	0.03	0.038	Ω
		BUK455-60B	-	0.04	0.045	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	8	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	560	750	pF
C_{rss}	Feedback capacitance		-	300	400	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	125	160	ns
t_f	Turn-off fall time		-	100	130	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	41	A
I_{DRM}	Pulsed reverse drain current	-	-	-	164	A
V_{SD}	Diode forward voltage	I_F = 41 A ; V_{GS} = 0 V	-	1.4	2.0	V
t_{rr}	Reverse recovery time	I_F = 41 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.30	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 41 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

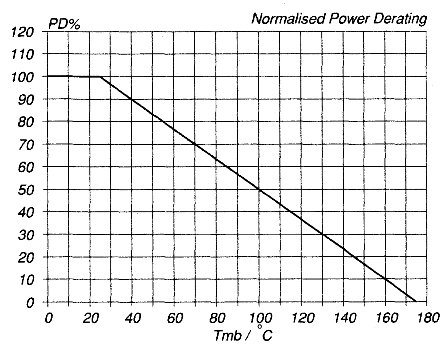


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$

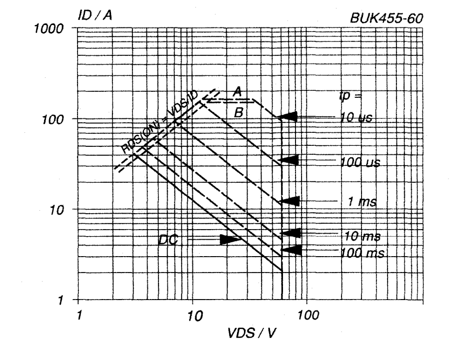


Fig.3. Safe operating area. T_{mb} = 25 °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

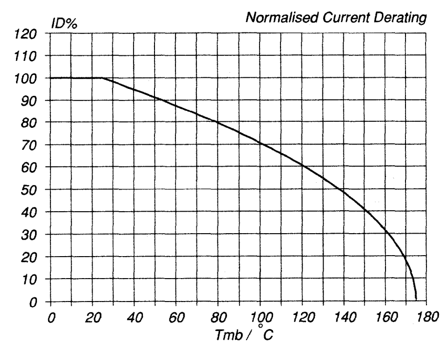


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq$ 10 V

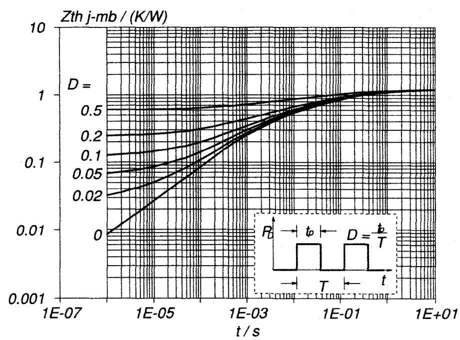


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

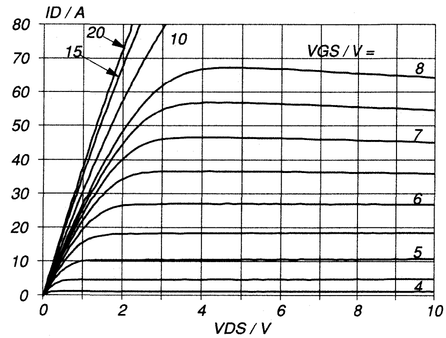


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

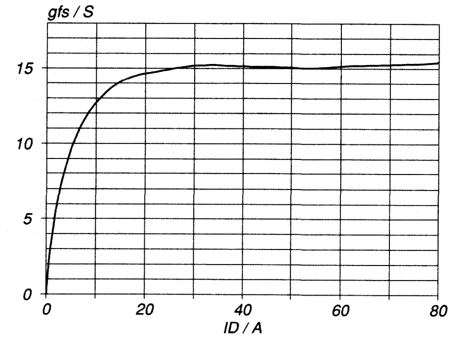


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

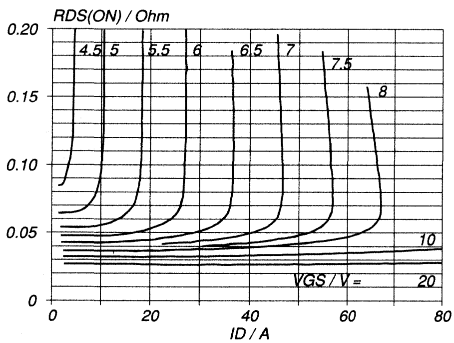


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

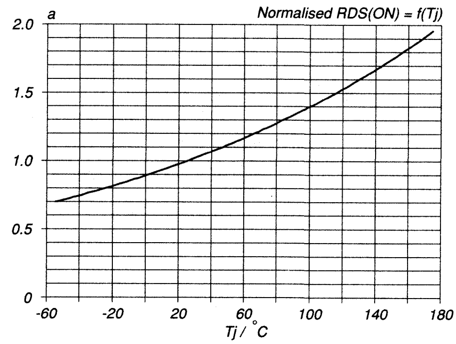


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; I_D = 20 A; V_{GS} = 10 V

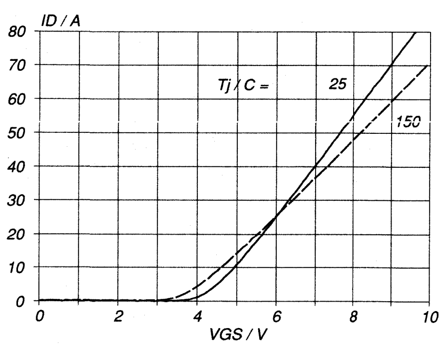


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

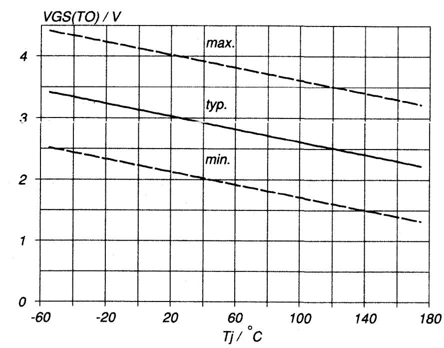


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK455-60A/B

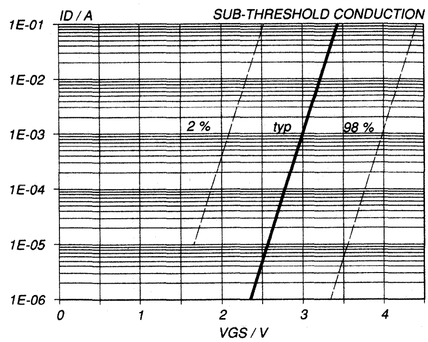


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

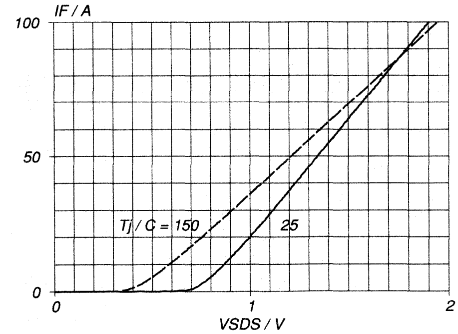


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

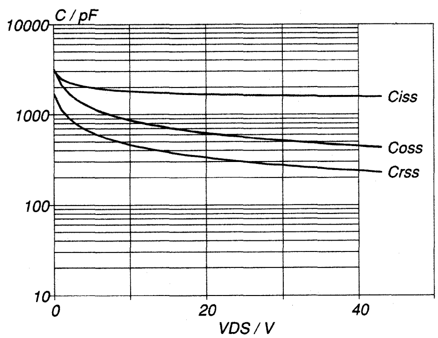


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

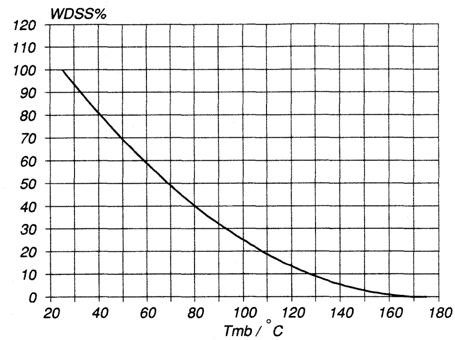


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 41$ A

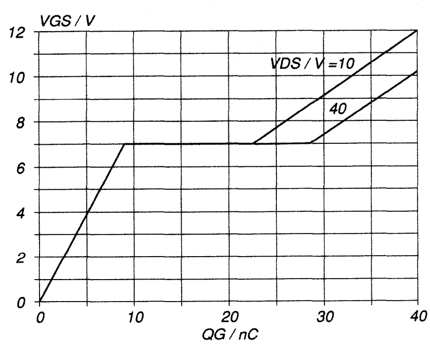


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 41$ A; parameter V_{DS}

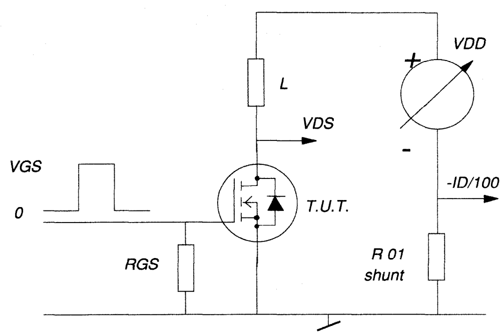


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 455-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

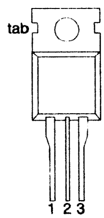
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	26	23	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.08	0.1	Ω

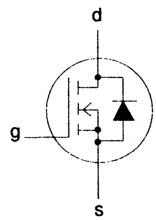
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	**-100B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	26	23	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	18	16	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	104	92	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 1.2 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK455-100A**	-	0.07	0.08	Ω
		I_D = 13 A **BUK455-100B**	-	0.08	0.1	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 13 A	7.0	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	350	500	pF
C_{rss}	Feedback capacitance		-	100	150	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	15	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	160	ns
t_f	Turn-off fall time		-	50	80	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	26	A
I_{DRM}	Pulsed reverse drain current	-	-	-	104	A
V_{SD}	Diode forward voltage	I_F = 26 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 26 A; $-dI_F/dt$ = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.8	-	µC

PowerMOS transistor | BUK 455-100A/B

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 26 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

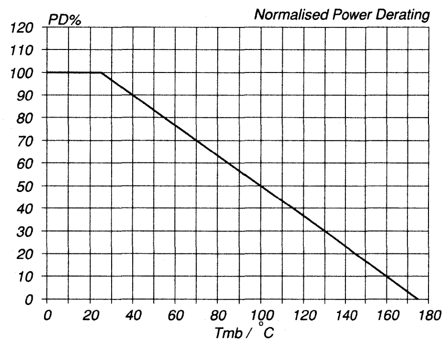


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,˚C} = f(T_{mb})$

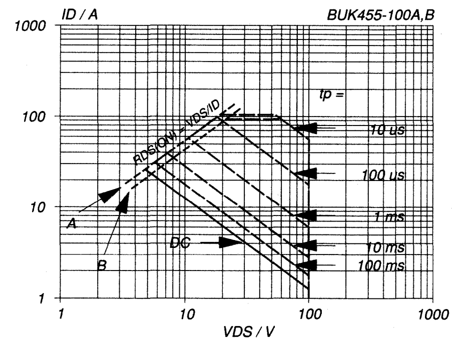


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

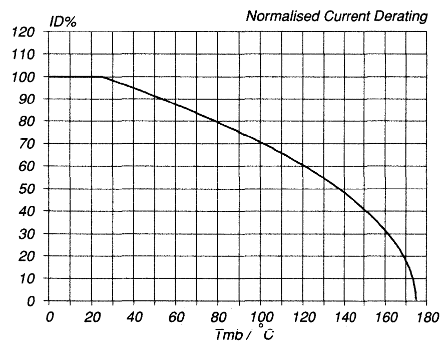


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq$ 10 V

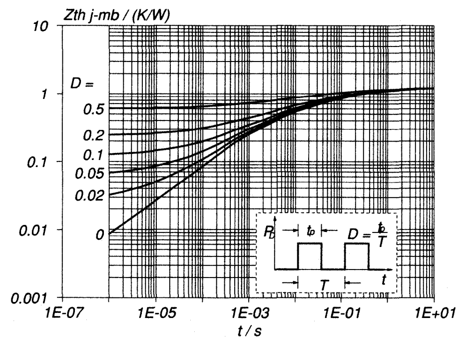


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

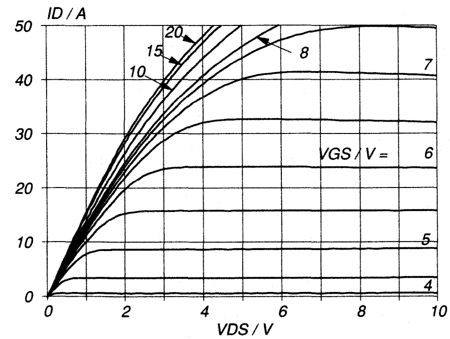


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

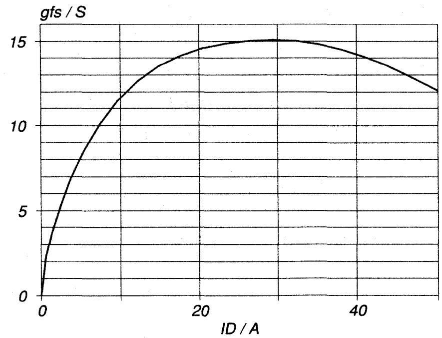


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

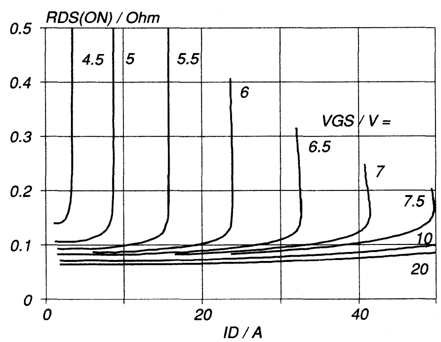


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

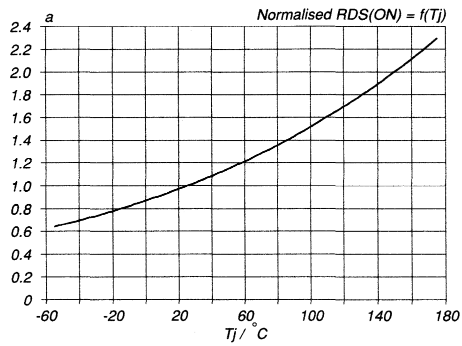


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; I_D = 13 A; V_{GS} = 10 V

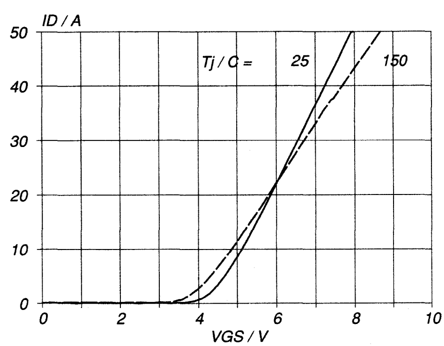


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

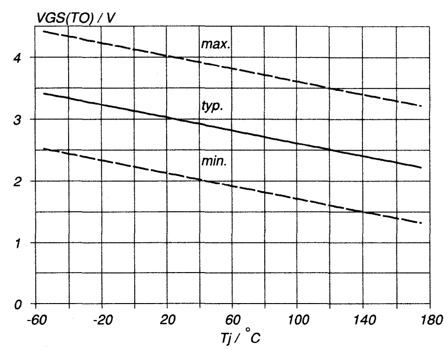


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

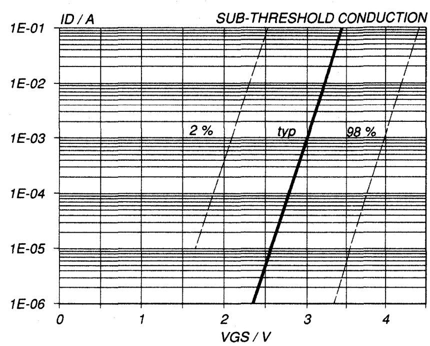


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

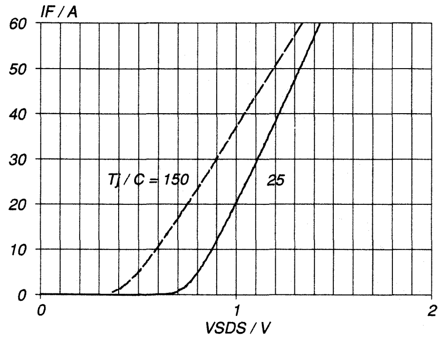


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

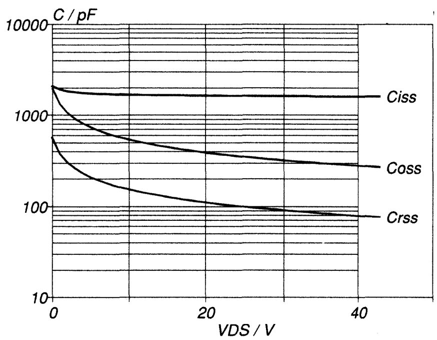


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

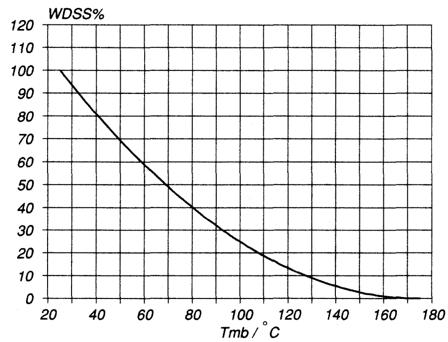


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 26$ A

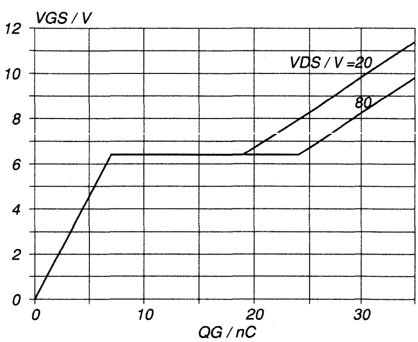


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 26$ A; parameter V_{DS}

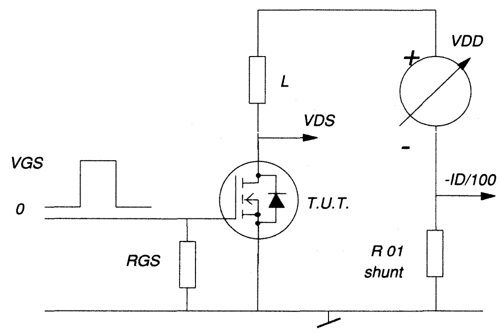


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 455-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

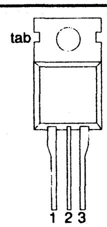
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	14	13	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.23	0.28	Ω

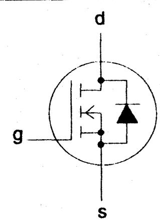
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	**-200B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	14	13	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	10	9	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	56	52	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 1.2 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK455-200A**	-	0.2	0.23	Ω
		I_D = 7 A **BUK455-200B**	-	0.22	0.28	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7 A	6	8.4	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1400	1750	pF
C_{oss}	Output capacitance		-	190	250	pF
C_{rss}	Feedback capacitance		-	55	80	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	18	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	35	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	85	120	ns
t_f	Turn-off fall time		-	35	50	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 14 A; $-dI_F/dt$ = 100 A/µs;	-	180	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.8	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 100 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

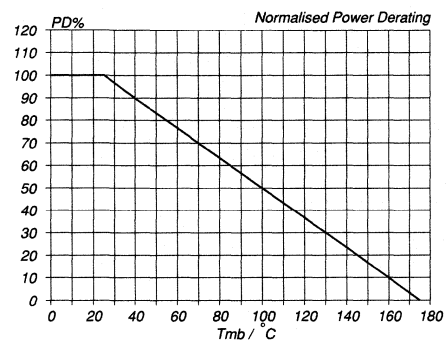


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

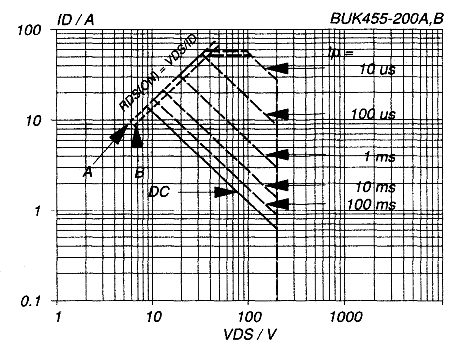


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

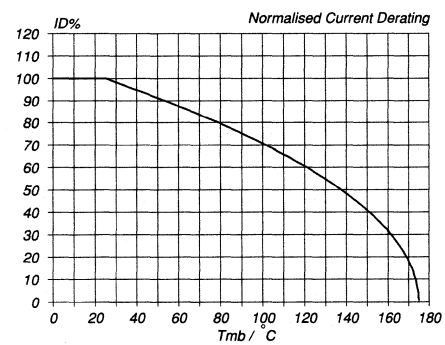


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

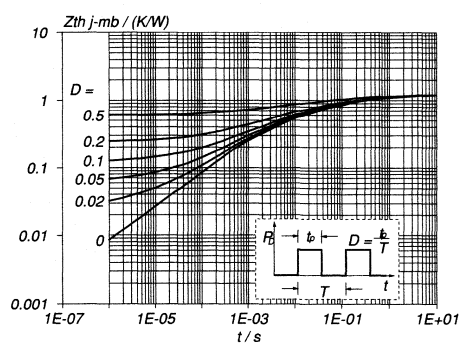


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

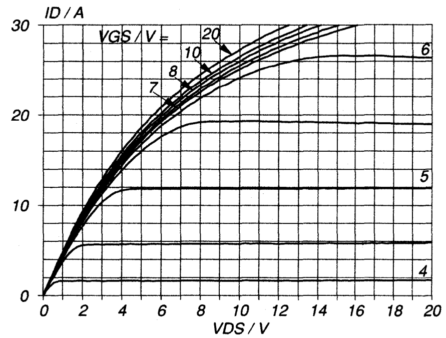


Fig.5. Typical output characteristics, T_j = 25 °C.
$I_D = f(V_{DS})$; parameter V_{GS}

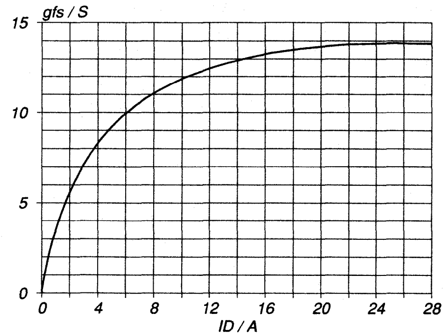


Fig.8. Typical transconductance, T_j = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

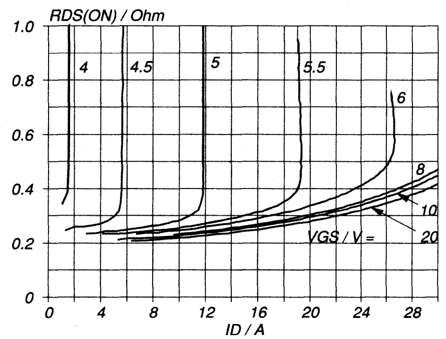


Fig.6. Typical on-state resistance, T_j = 25 °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

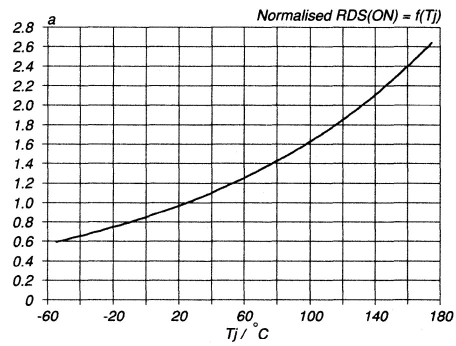


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; I_D = 7 A; V_{GS} = 10 V

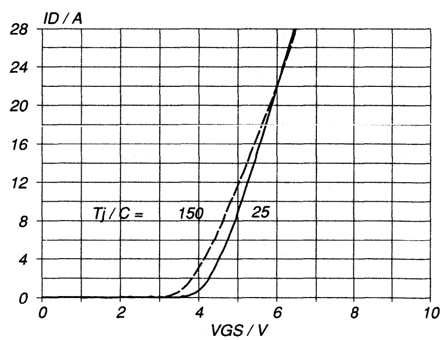


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

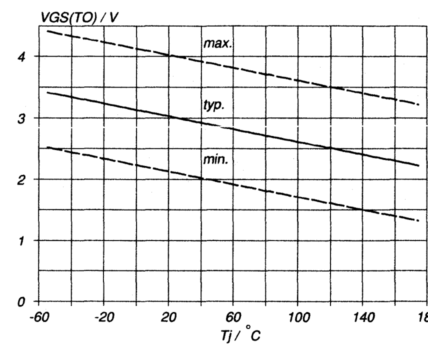


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

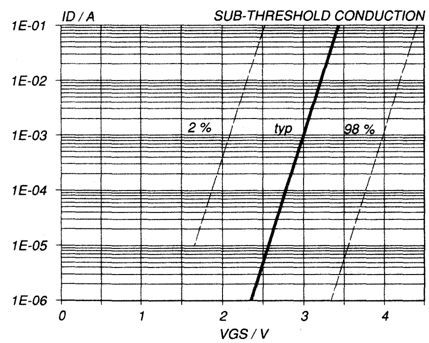


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

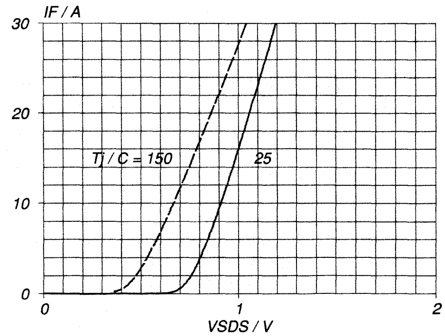


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

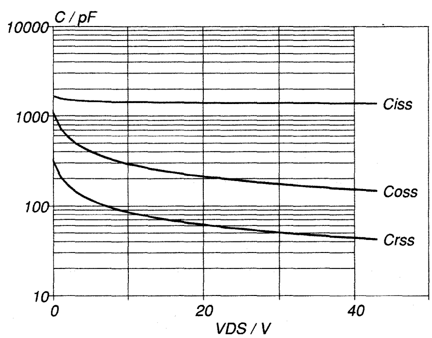


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

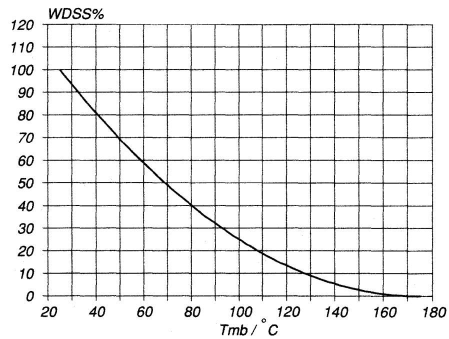


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 14$ A

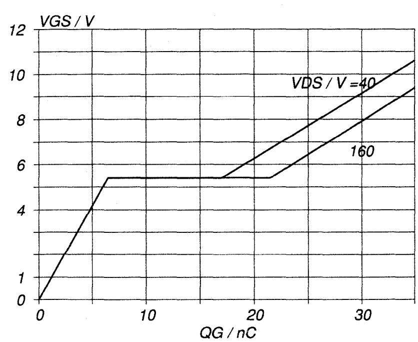


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

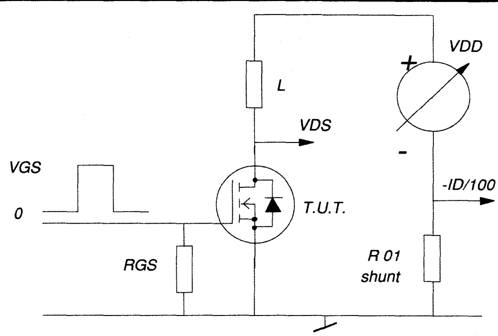


Fig.16. Avalanche energy test circuit.

$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 455-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

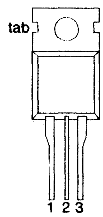
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	7.3	6.5	A
P_{tot}	Total power dissipation	100	100	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.8	1.0	Ω

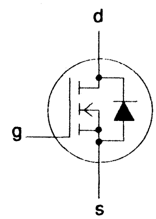
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	-400B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	7.3	6.5	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	4.6	4.1	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	29	26	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	100		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.25 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK455-400A**	-	0.7	0.8	Ω
		I_D = 2.5 A **BUK455-400B**	-	0.9	1.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	3.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	120	180	pF
C_{rss}	Feedback capacitance		-	50	70	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.7 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	120	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	29	A
V_{SD}	Diode forward voltage	I_F = 7.3 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 7.3 A; $-dI_F/dt$ = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

PowerMOS transistor

BUK455-400A/B

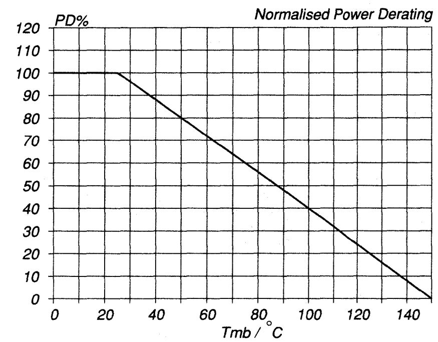


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

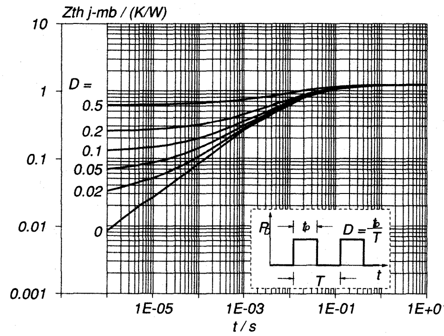


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

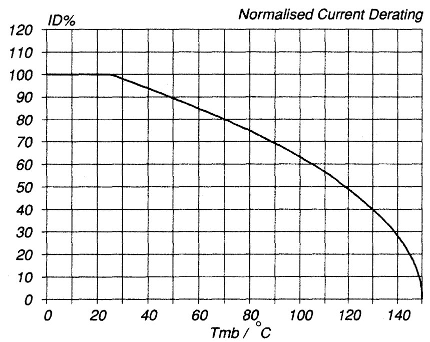


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

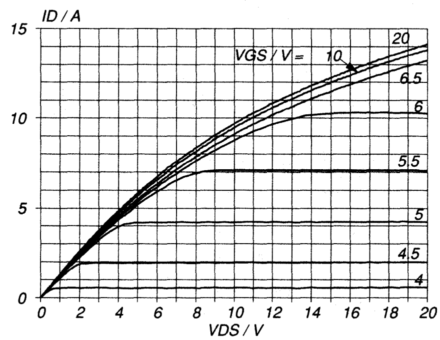


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

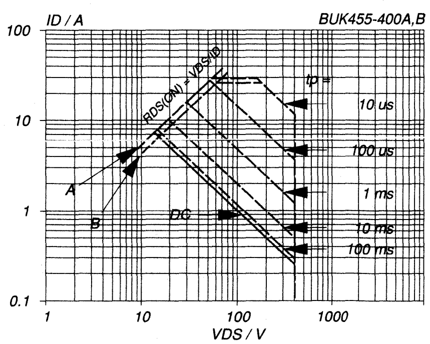


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

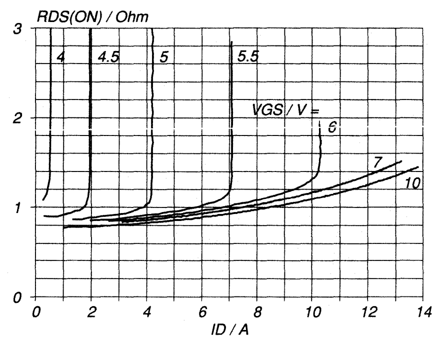


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK455-400A/B

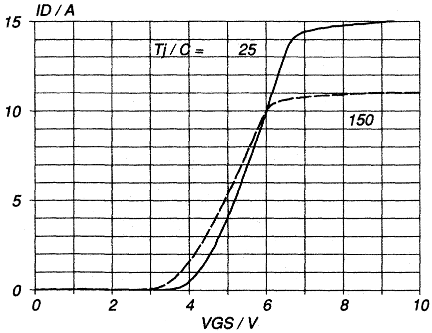


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

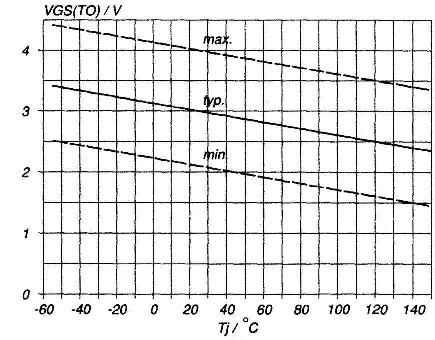


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

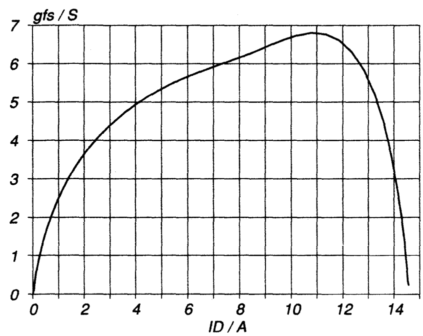


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

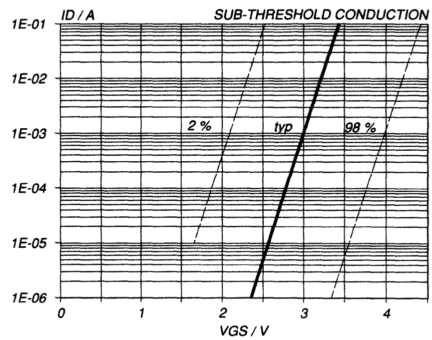


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

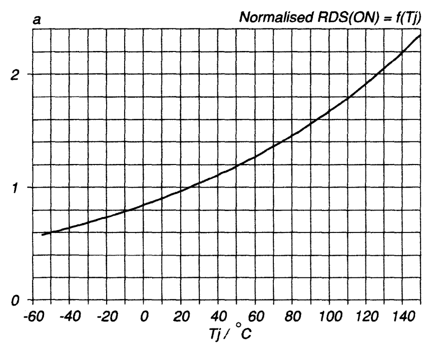


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

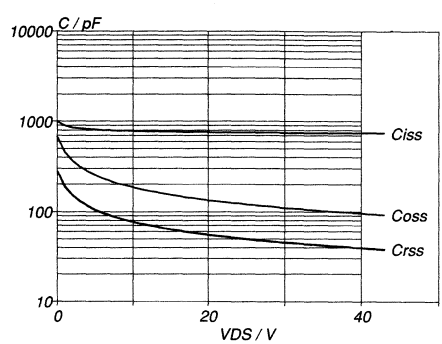


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

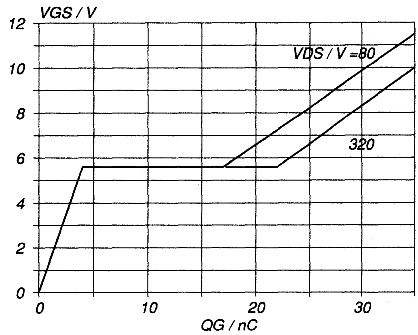


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 6.5$ A; parameter V_{DS}

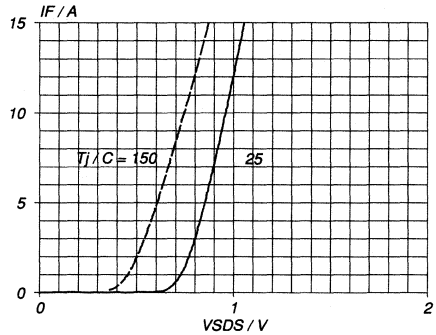


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991

BUK 455-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

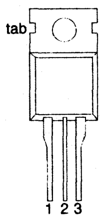
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	5.7	5.3	A
P_{tot}	Total power dissipation	100	100	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.3	1.5	Ω

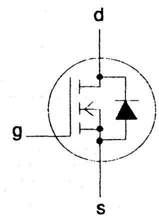
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	5.7	5.3	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	3.6	3.3	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	23	21	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	100		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.25 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK455-500A**	-	1.2	1.3	Ω
		I_D = 2.5 A **BUK455-500B**	-	1.4	1.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	3.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	10	45	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	23	A
V_{SD}	Diode forward voltage	I_F = 5.7 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.7 A; -dI_F/dt = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

PowerMOS transistor BUK455-500A/B

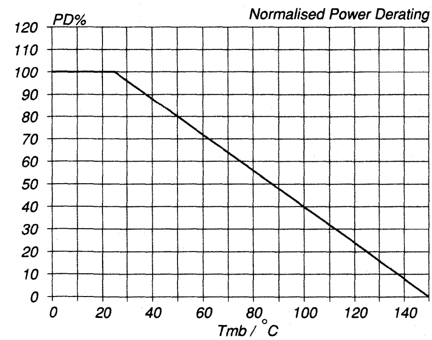


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$

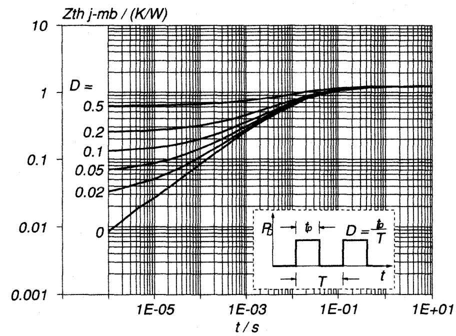


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

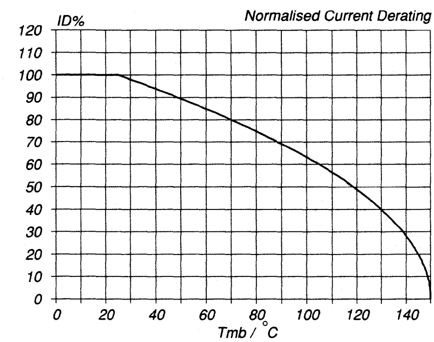


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

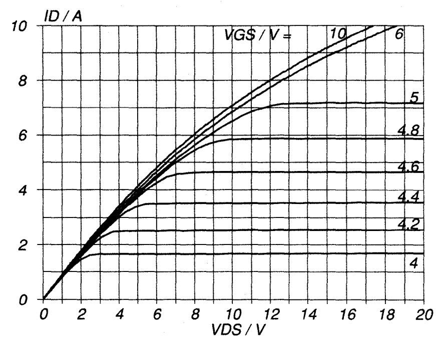


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

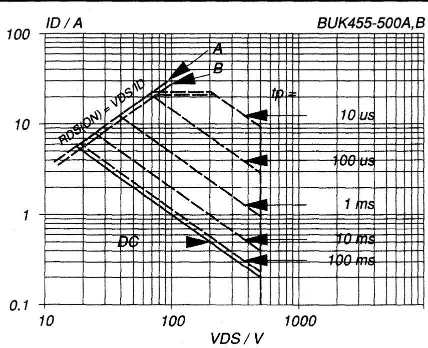


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

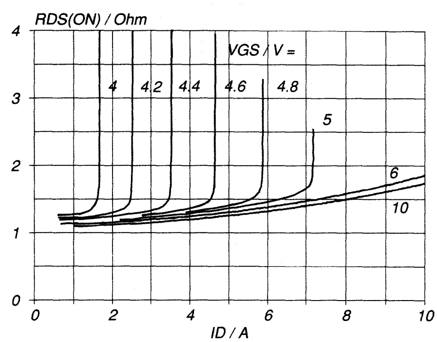


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK455-500A/B

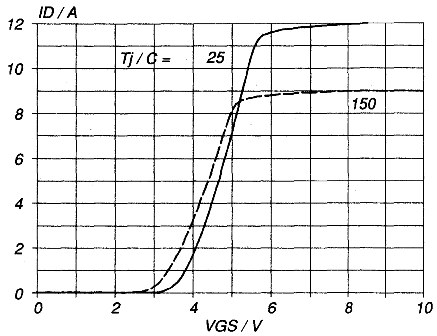


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

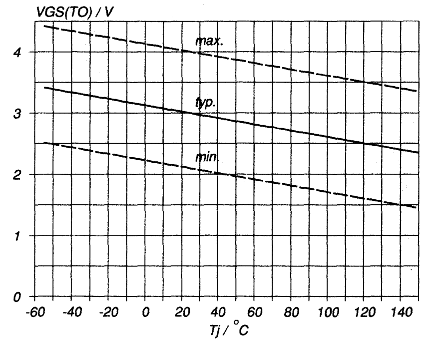


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

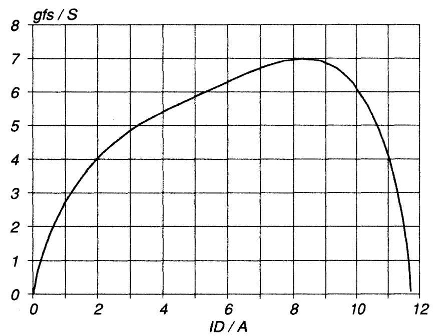


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

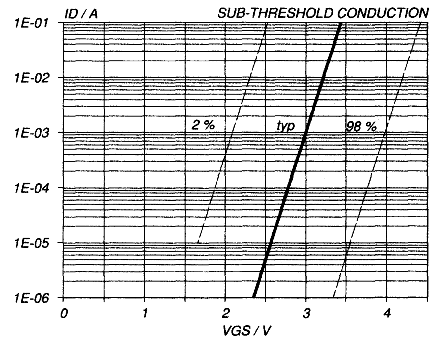


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

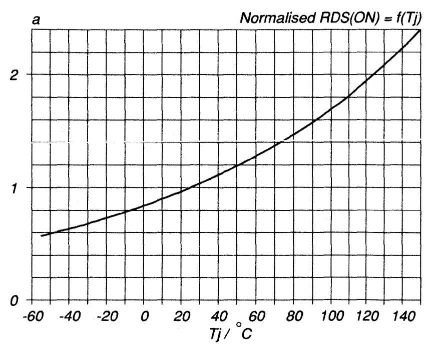


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; I_D = 2.5 A; V_{GS} = 10 V

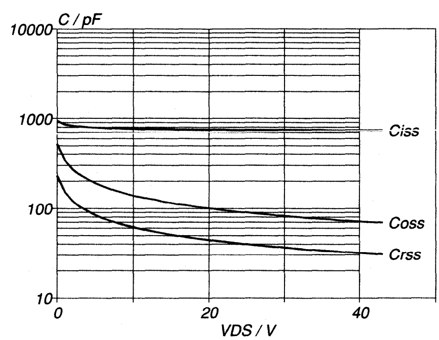


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

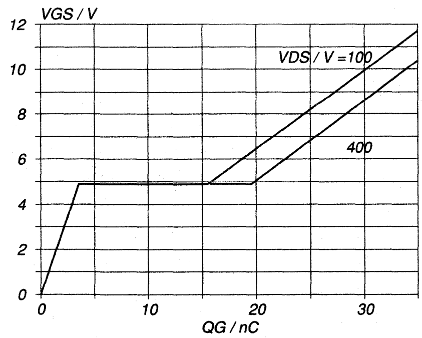


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5.7$ A; parameter V_{DS}

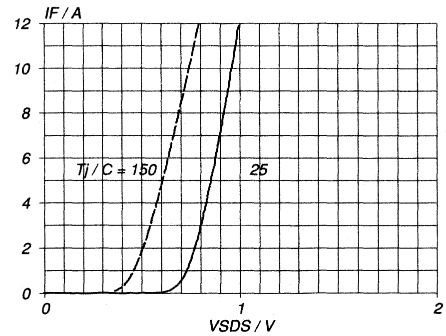


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 455-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

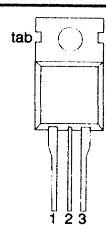
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	**-600A**	**-600B**	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	4.5	4.0	A
P_{tot}	Total power dissipation	100	100	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.0	2.5	Ω

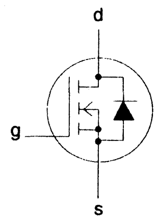
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	**-600B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	4.5	4.0	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	2.8	2.5	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	18	16	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	100		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.25 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 2.5 A **BUK455-600A**	-	1.7	2.0	Ω
		BUK455-600B	-	2.1	2.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	2.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	10	45	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	18	A
V_{SD}	Diode forward voltage	I_F = 4.5 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 4.5 A; $-dI_F/dt$ = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

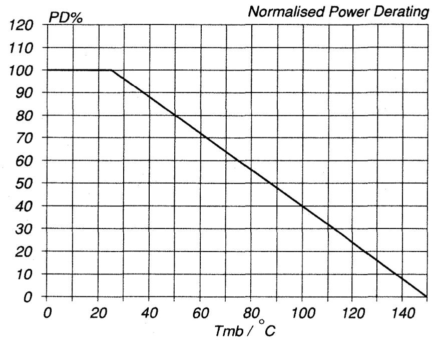


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{mb})$

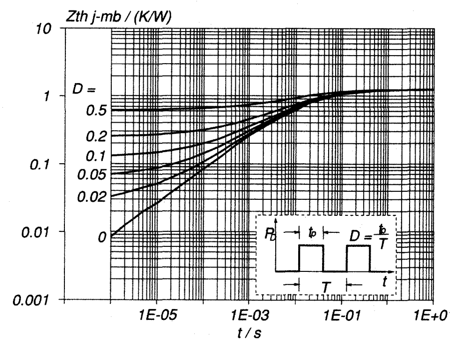


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

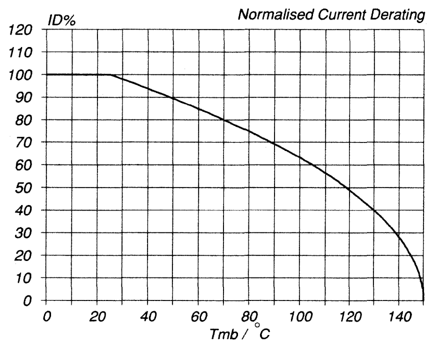


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

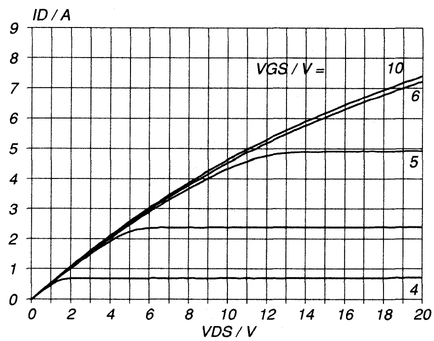


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

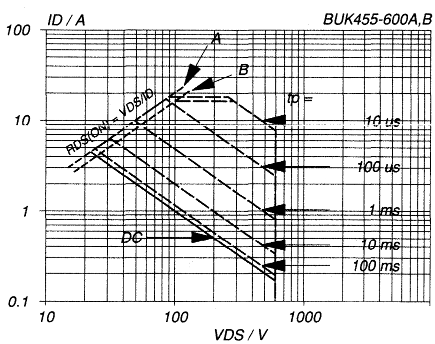


Fig.3. Safe operating area. $T_{mb} = 25$ ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

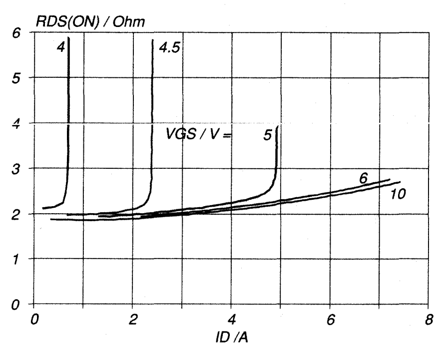


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

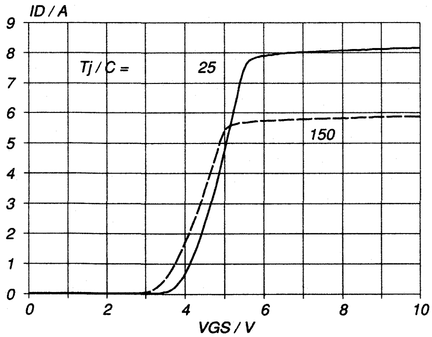


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

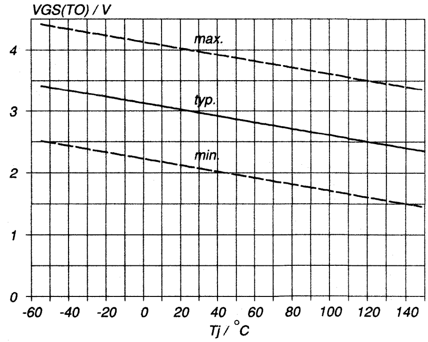


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

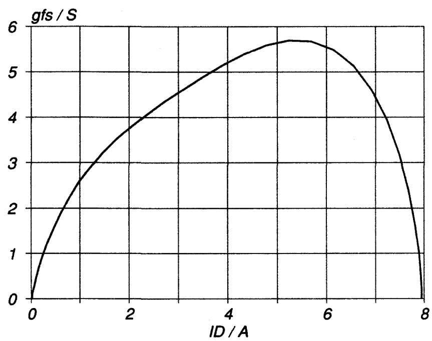


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

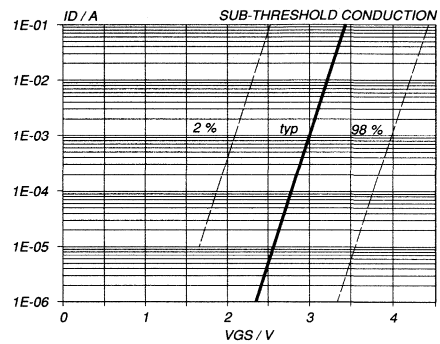


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

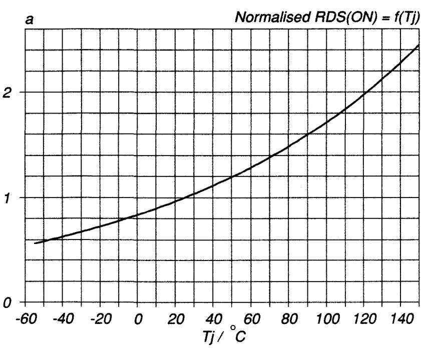


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

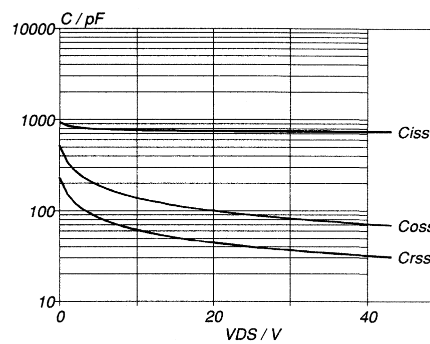


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

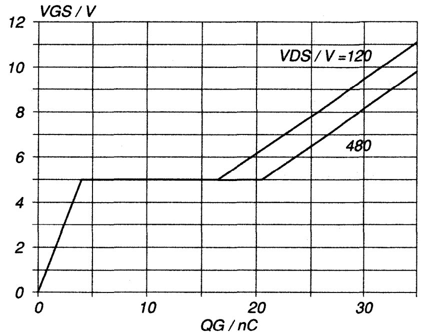


Fig. 13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.5$ A; parameter V_{DS}

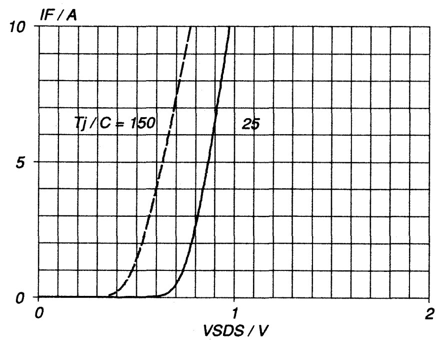


Fig. 14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product Specification
date of issue	March 1991
Replaces BUK 456-50A/B	

BUK 456-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

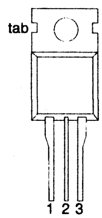
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK456	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	52	51	A
P_{tot}	Total power dissipation	150	150	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.028	0.03	Ω

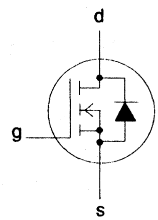
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	52	51	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	36	36	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	208	200	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.0 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK456-60A**	-	0.024	0.028	Ω
		I_D = 29 A **BUK456-60B**	-	0.027	0.030	Ω

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 29 A	17	22	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	800	1000	pF
C_{rss}	Feedback capacitance		-	270	400	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	70	100	ns
$t_{d\,off}$	Turn-off delay time	R_{GS} = 50 Ω;	-	170	220	ns
t_f	Turn-off fall time	R_{gen} = 50 Ω	-	120	160	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	52	A
I_{DRM}	Pulsed reverse drain current	-	-	-	208	A
V_{SD}	Diode forward voltage	I_F = 52 A ; V_{GS} = 0 V	-	1.8	2.5	V
t_{rr}	Reverse recovery time	I_F = 52 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.4	-	µC

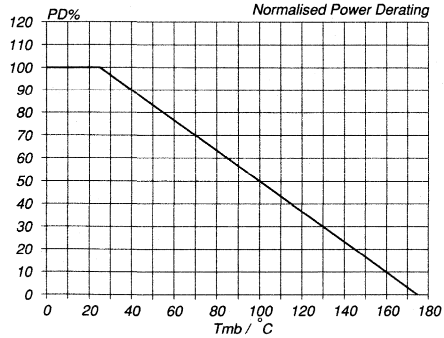


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

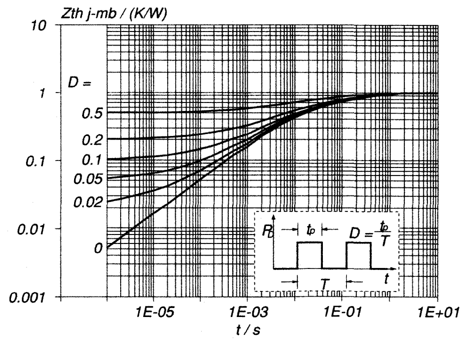


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

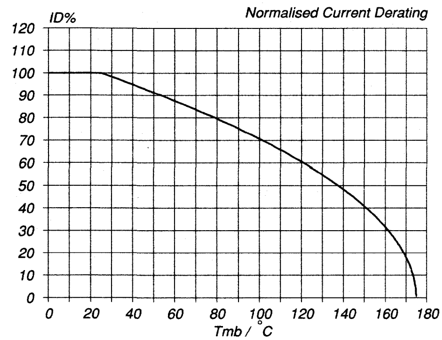


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

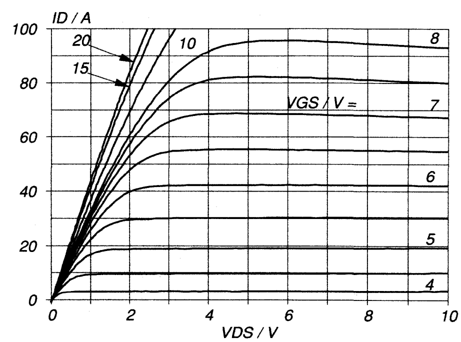


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

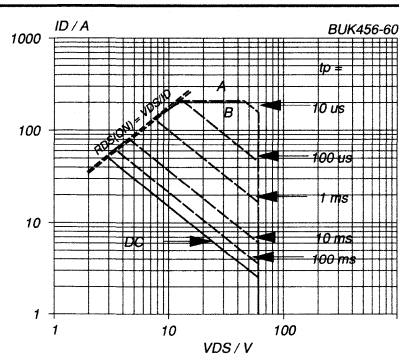


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

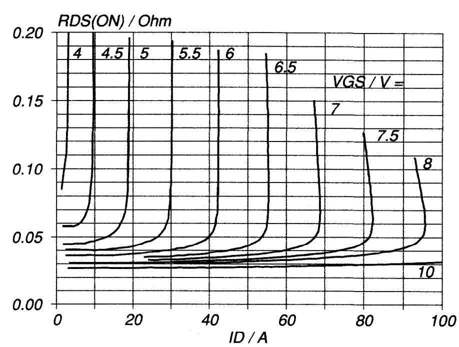


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor

BUK456-60A/B

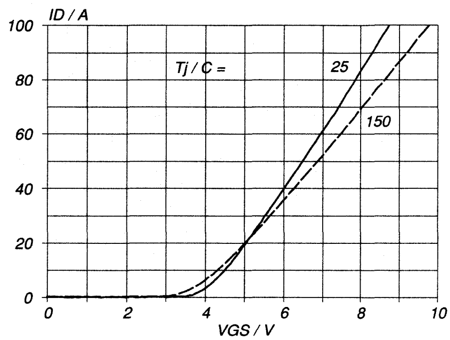


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

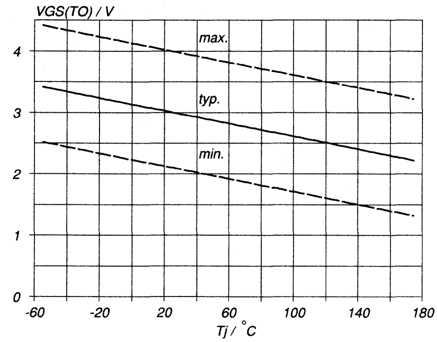


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

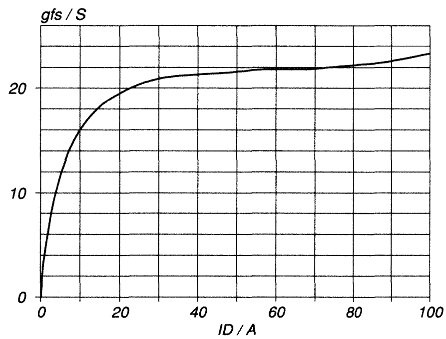


Fig.8. Typical transconductance, T_j = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

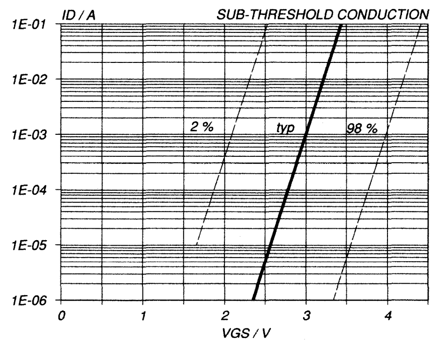


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 °C; $V_{DS} = V_{GS}$

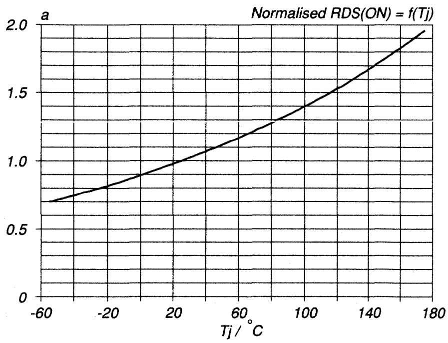


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; I_D = 29 A; V_{GS} = 10 V

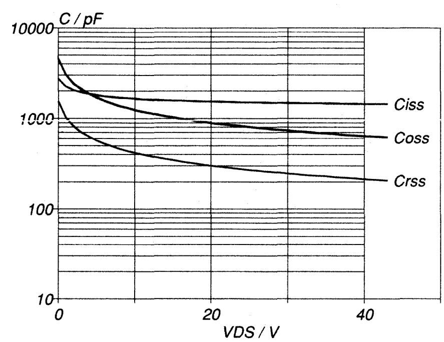


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

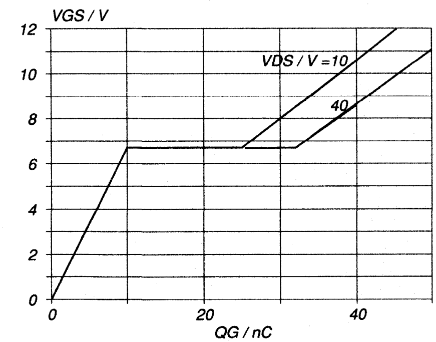


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: I_D = 52 A; parameter V_{DS}

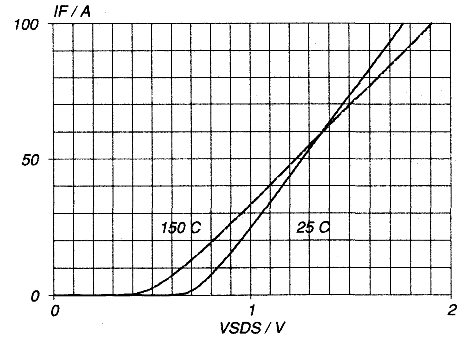


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 456-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

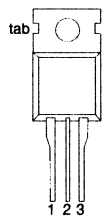
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK456	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	34	32	A
P_{tot}	Total power dissipation	150	150	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.057	0.065	Ω

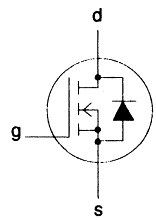
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	**-100B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	34	32	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	24	22	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	136	128	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.0 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 15 A **BUK456-100A**	-	0.052	0.057	Ω
		BUK456-100B	-	0.06	0.065	Ω

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 15 A	12	16	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	450	600	pF
C_{rss}	Feedback capacitance		-	130	200	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	40	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω;	-	150	200	ns
t_f	Turn-off fall time	R_{GS} = 50 Ω	-	65	85	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	34	A
I_{DRM}	Pulsed reverse drain current	-	-	-	136	A
V_{SD}	Diode forward voltage	I_F = 34 A ; V_{GS} = 0 V	-	1.8	2.5	V
t_{rr}	Reverse recovery time	I_F = 34 A; -dI_F/dt = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.0	-	µC

PowerMOS transistor BUK456-100A/B

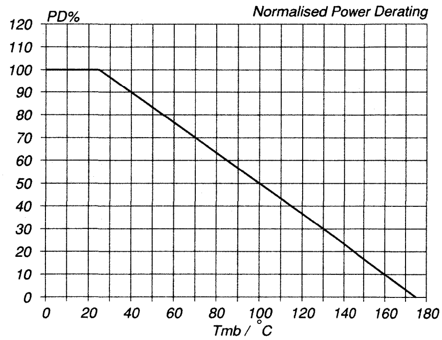


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\ 25\ ^\circ C} = f(T_{mb})$

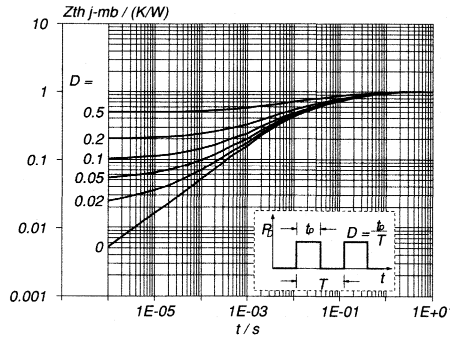


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}mb} = f(t)$; parameter $D = t_p/T$

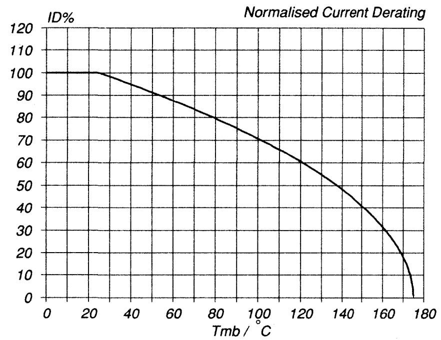


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\ 25\ ^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

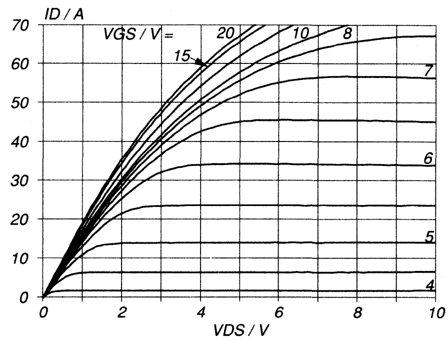


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

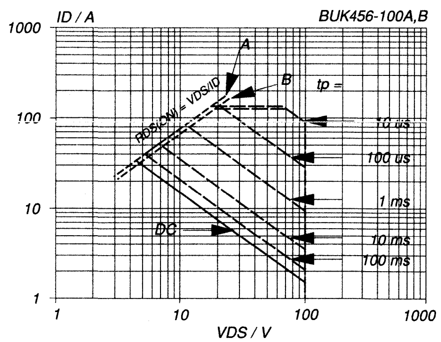


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

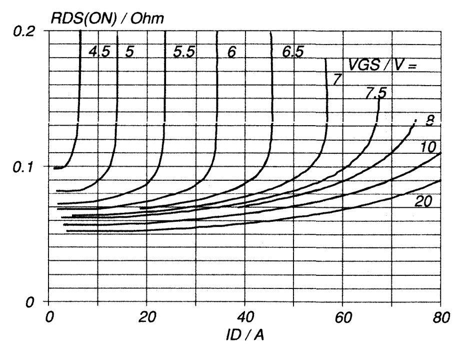


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

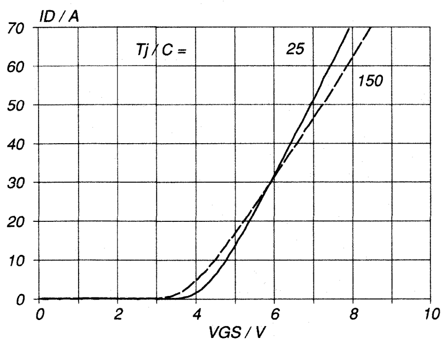


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

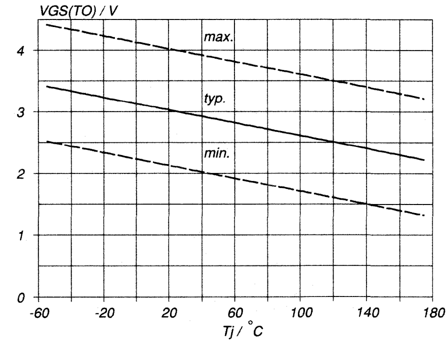


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

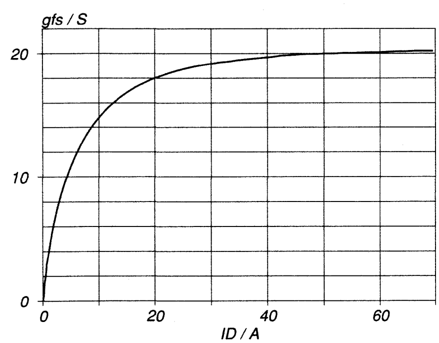


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

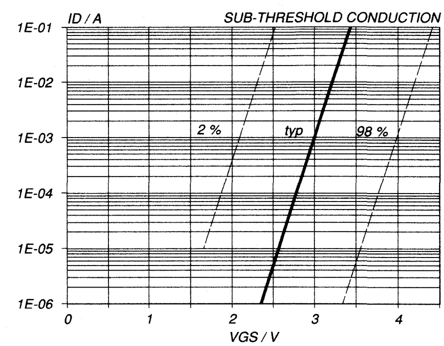


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

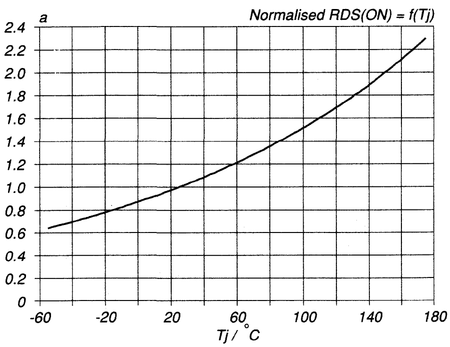


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 15$ A; $V_{GS} = 10$ V

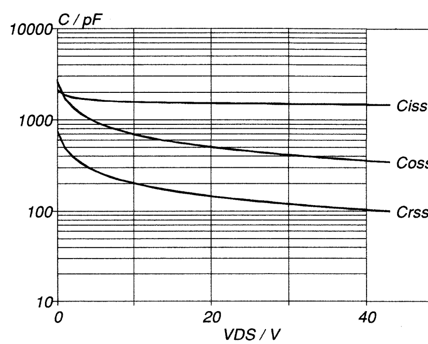


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

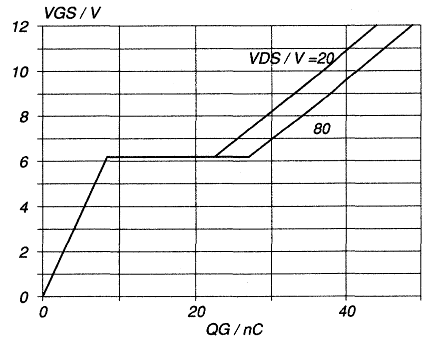


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: I_D = 34 A; parameter V_{DS}

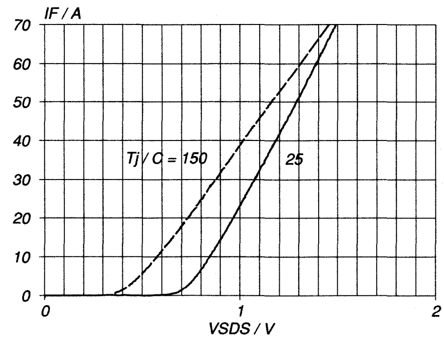


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 456-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

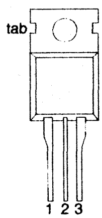
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK456	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	19	17	A
P_{tot}	Total power dissipation	150	150	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.16	0.2	Ω

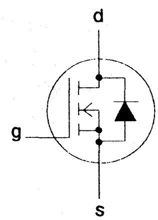
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	**-200B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	19	17	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	13	12	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	76	68	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.0 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK456-200A**	-	0.15	0.16	Ω
		I_D = 10 A **BUK456-200B**	-	0.18	0.20	Ω

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	8.5	16	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	2000	pF
C_{oss}	Output capacitance		-	300	400	pF
C_{rss}	Feedback capacitance		-	60	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	40	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω;	-	145	185	ns
t_f	Turn-off fall time	R_{GS} = 50 Ω	-	50	70	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	19	A
I_{DRM}	Pulsed reverse drain current	-	-	-	76	A
V_{SD}	Diode forward voltage	I_F = 19 A ; V_{GS} = 0 V	-	1.0	1.7	V
t_{rr}	Reverse recovery time	I_F = 19 A; $-dI_F/dt$ = 100 A/µs;	-	180	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	2.5	-	µC

PowerMOS transistor

BUK456-200A/B

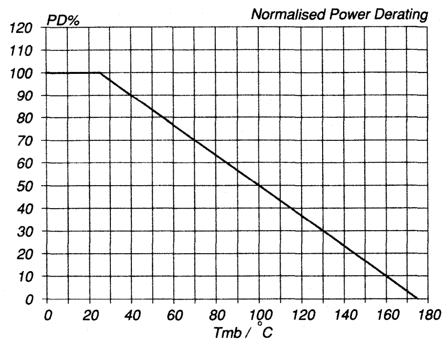


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

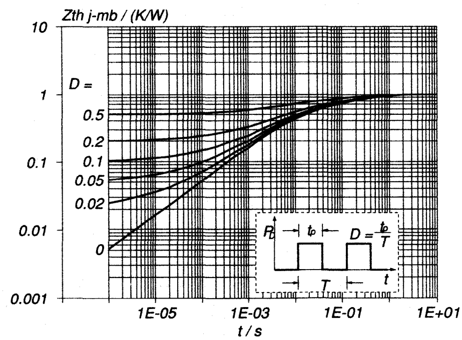


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

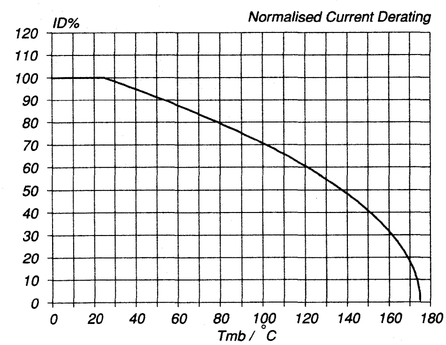


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

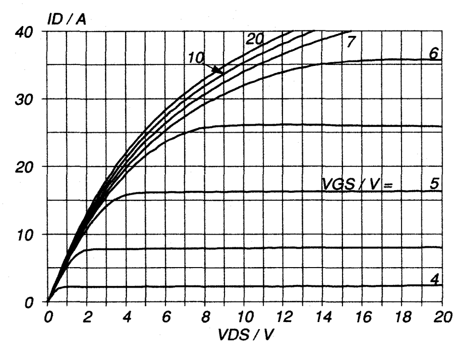


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

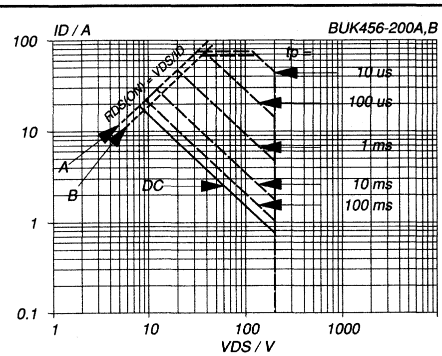


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

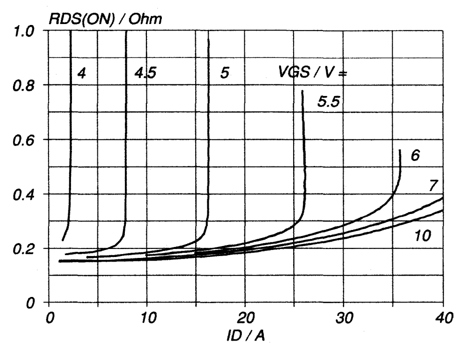


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

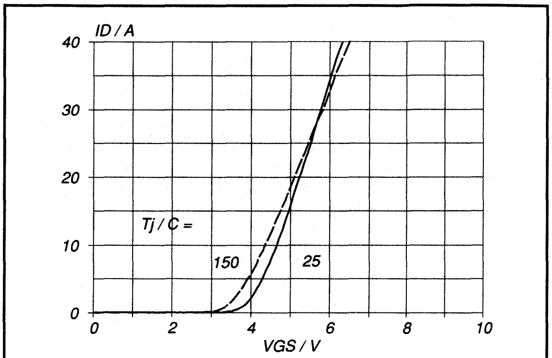


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

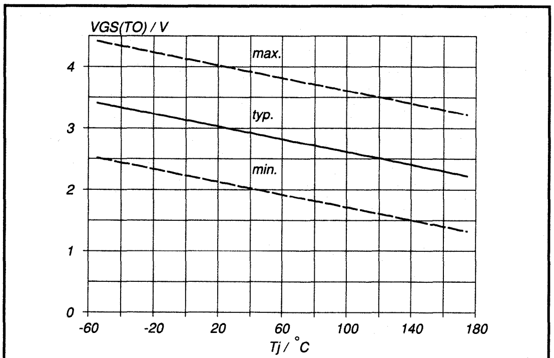


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

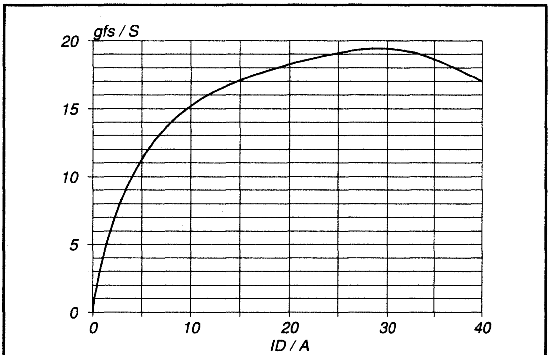


Fig.8. Typical transconductance, T_j = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

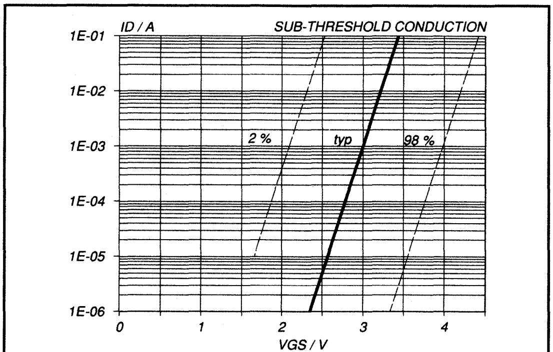


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 °C; $V_{DS} = V_{GS}$

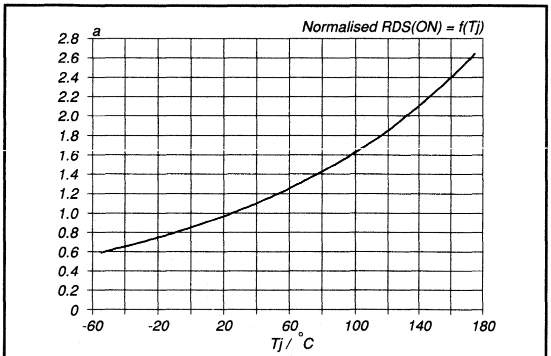


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; I_D = 10 A; V_{GS} = 10 V

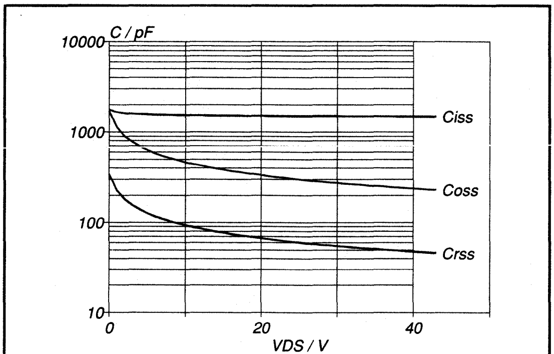


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

PowerMOS transistor BUK456-200A/B

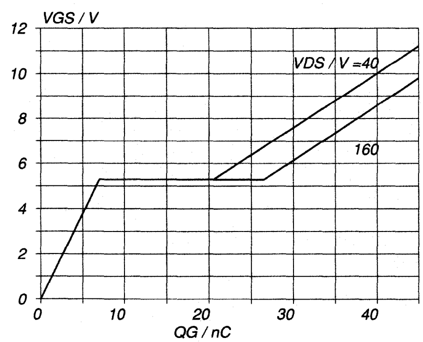


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: I_D = 19 A; parameter V_{DS}

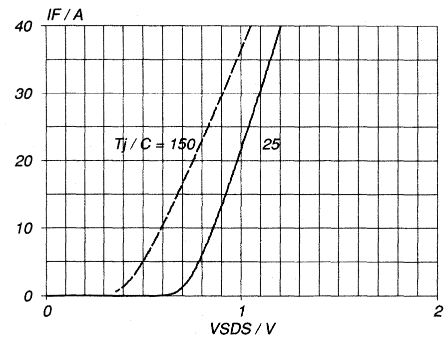


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 456-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

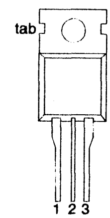
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK456	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	4	3.5	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	3	4	Ω

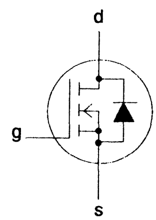
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	4.0	3.5	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	2.5	2.2	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	16	14	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.0 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK456-800A**	-	2.7	3.0	Ω
		I_D = 1.5 A **BUK456-800B**	-	3.5	4.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	16	A
V_{SD}	Diode forward voltage	I_F = 4.0 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 4.0 A; -dI_F/dt = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

PowerMOS transistor BUK456-800A/B

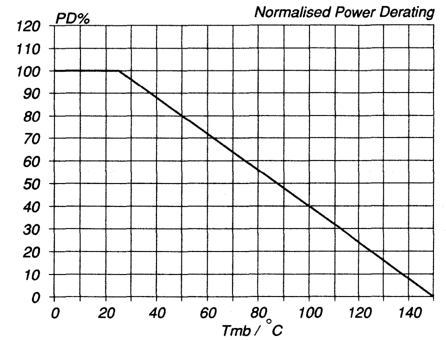


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

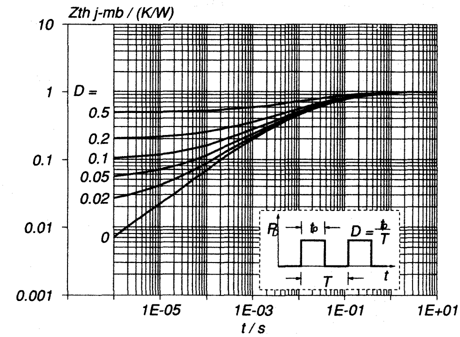


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

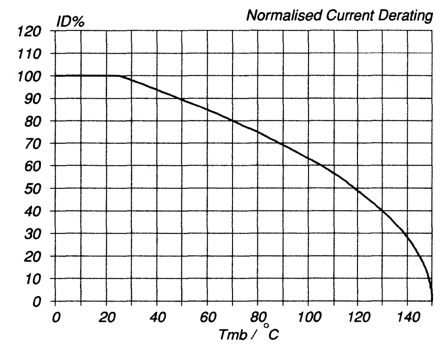


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

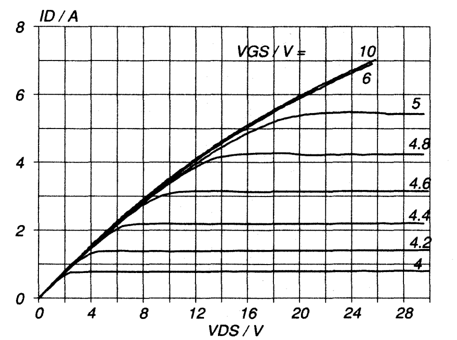


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

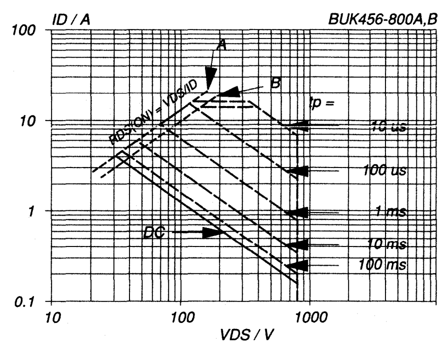


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

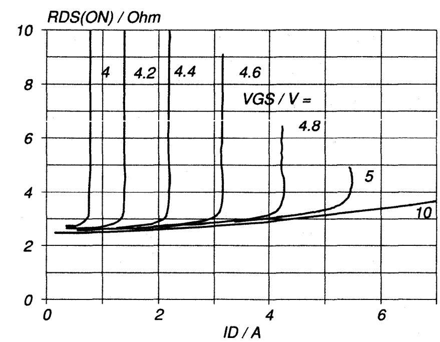


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

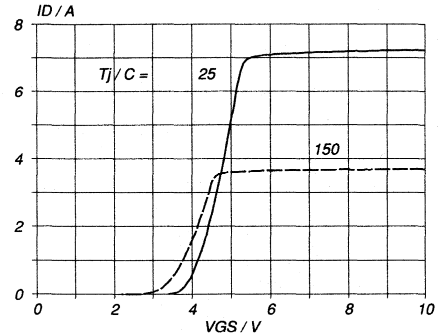


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

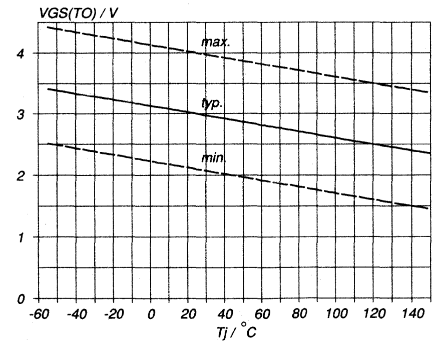


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

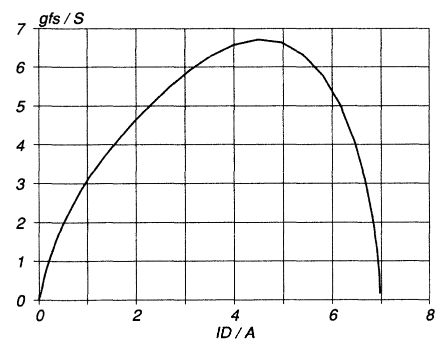


Fig.8. Typical transconductance, T_j = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

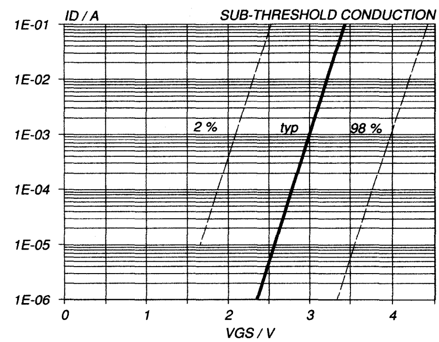


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 °C; $V_{DS} = V_{GS}$

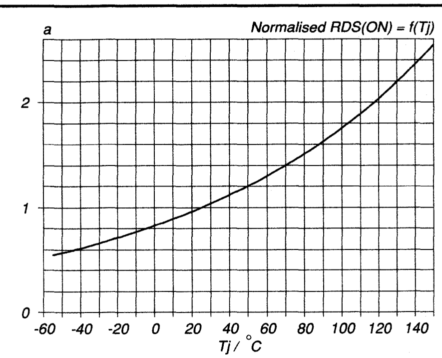


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; I_D = 1.5 A; V_{GS} = 10 V

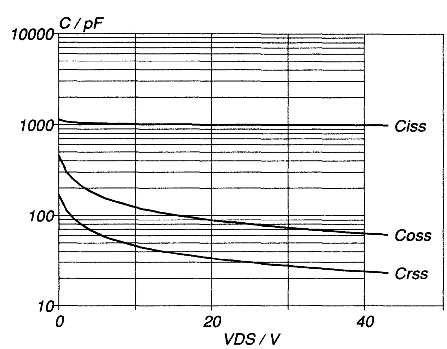


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

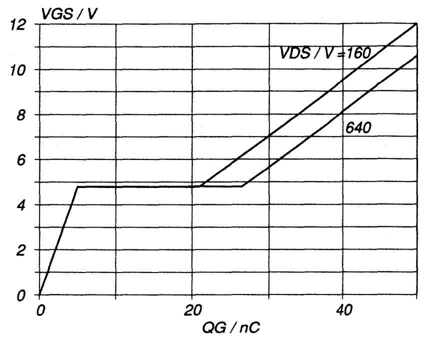


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4$ A; parameter V_{DS}

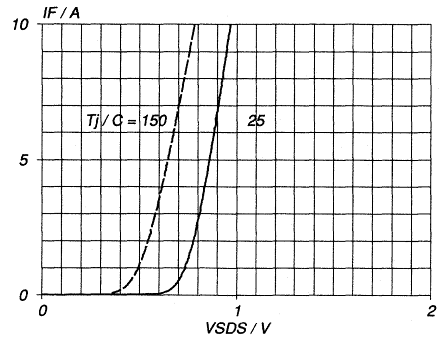


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 456-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

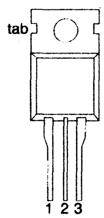
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK456	-1000A	-1000B	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	3.5	3.1	A
P_{tot}	Total power dissipation	125	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	4	5	Ω

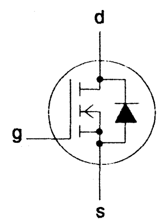
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	-1000B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	3.5	3.1	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	2.2	2.0	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	14	12	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j-mb}$ = 1.0 K/W $R_{th\ j-a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK456-1000A**	-	3.5	4.0	Ω
		I_D = 1.5 A **BUK456-1000B**	-	4.5	5.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	14	A
V_{SD}	Diode forward voltage	I_F = 3.5 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 3.5 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

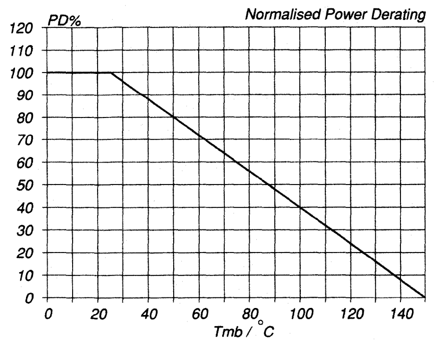


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

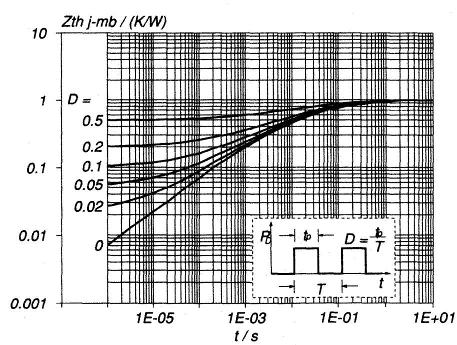


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

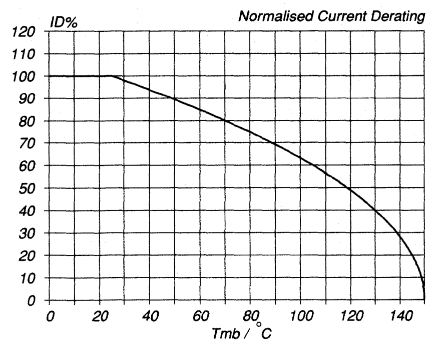


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

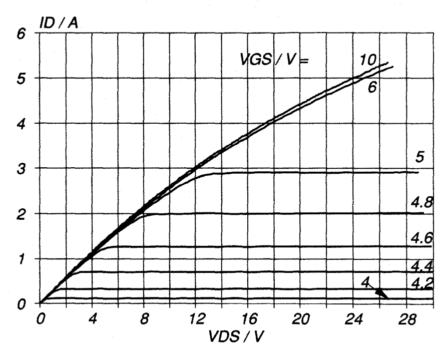


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

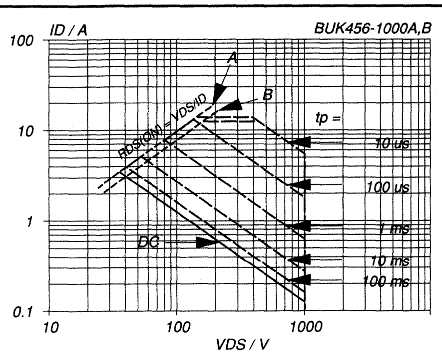


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

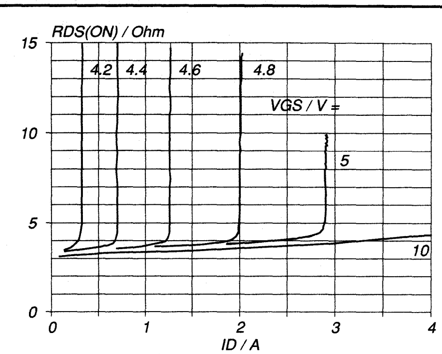


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor BUK456-1000A/B

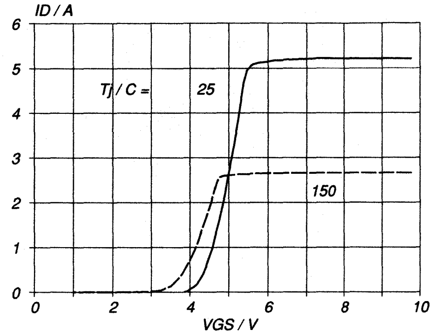


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

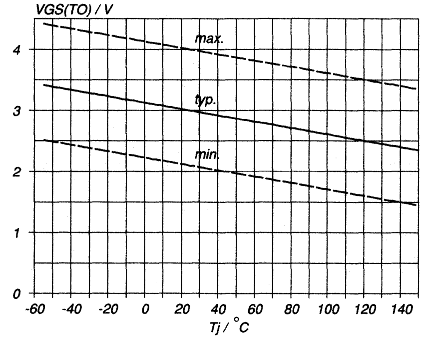


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

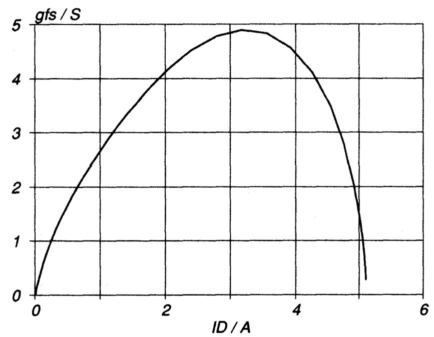


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

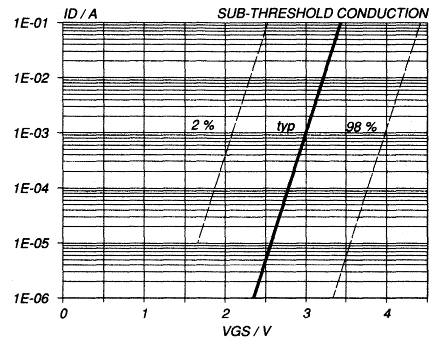


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

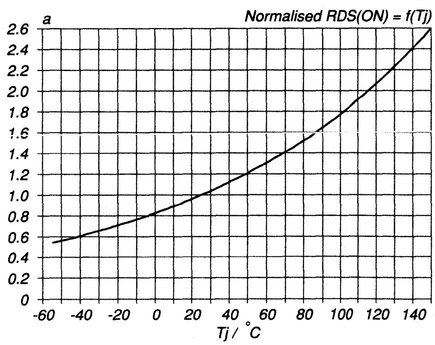


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

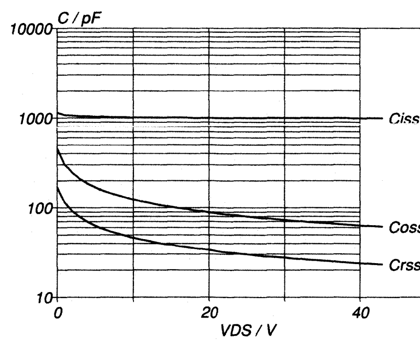


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

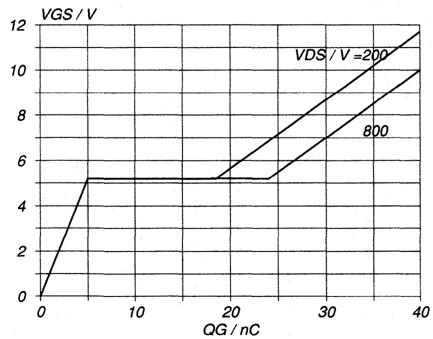


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.5$ A; parameter V_{DS}

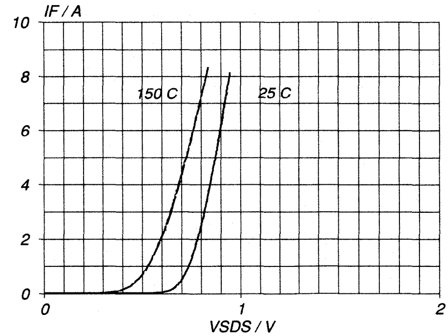


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK457-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

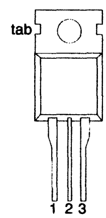
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK457	**-400A**	**-400B**	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	13	11	A
P_{tot}	Total power dissipation	150	150	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

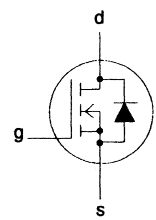
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	**-400B**	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	13	11	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	8.2	7	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	52	44	A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	150		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 0.83 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK457-400A**	-	0.35	0.4	Ω
		I_D = 6.5 A **BUK457-400B**	-	0.45	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 13 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

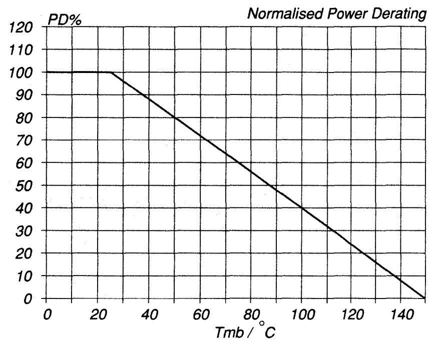


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

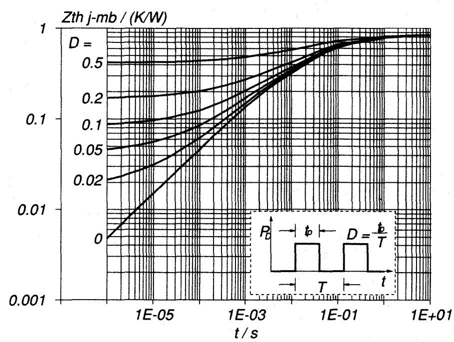


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

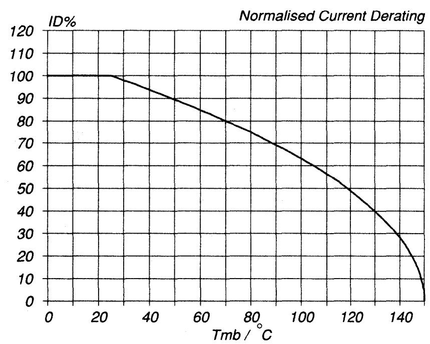


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

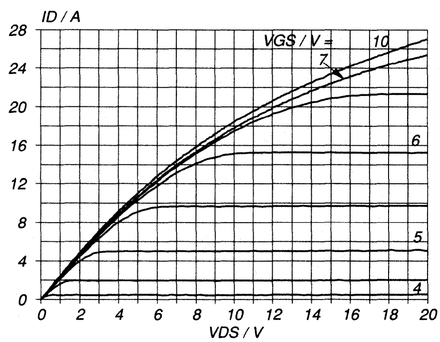


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

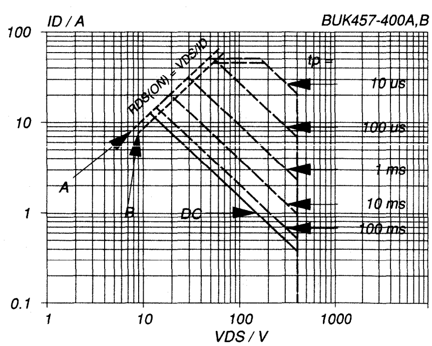


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

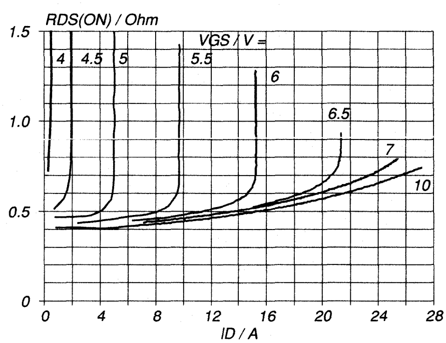


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

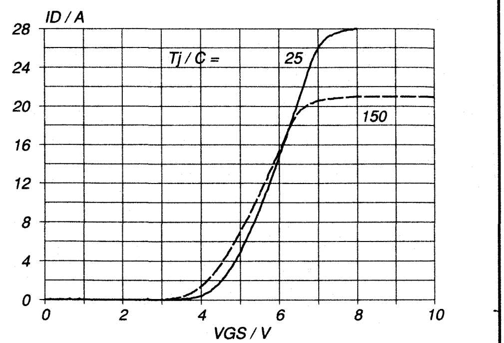


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

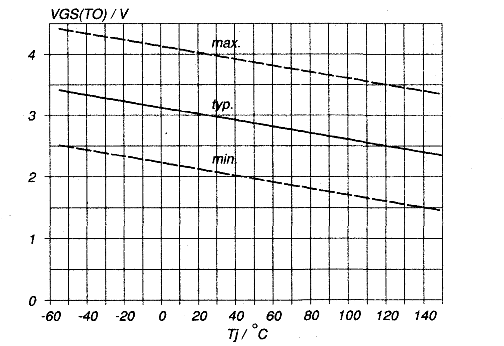


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

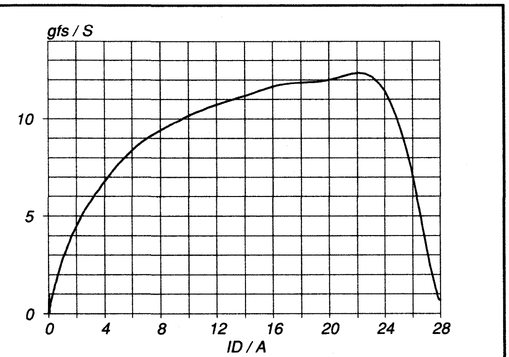


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

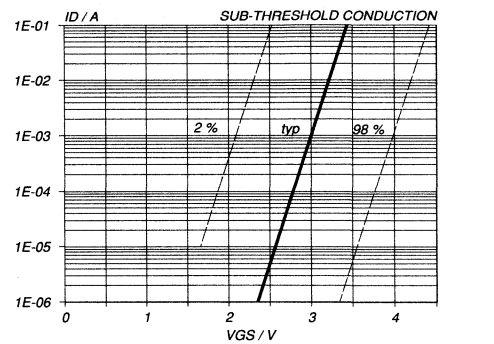


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

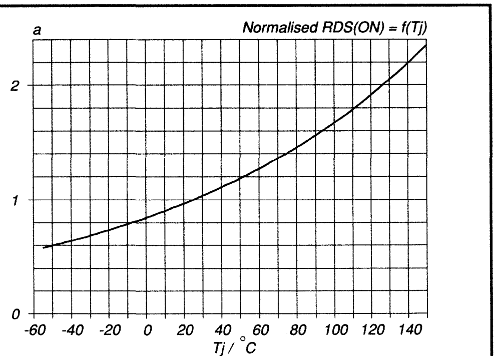


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

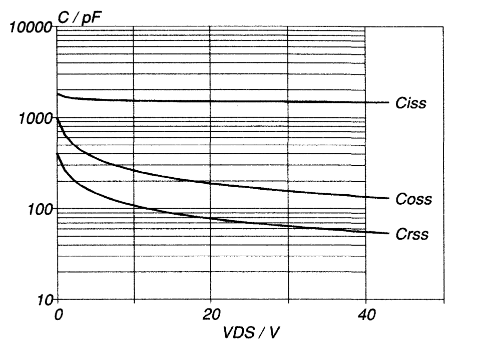


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

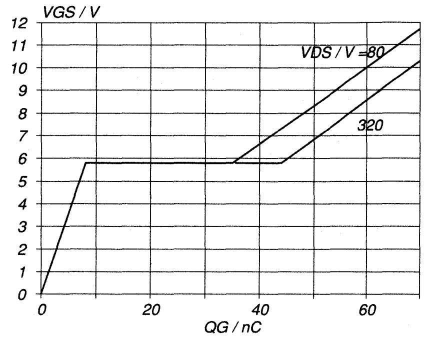


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: I_D = 13 A; parameter V_{DS}

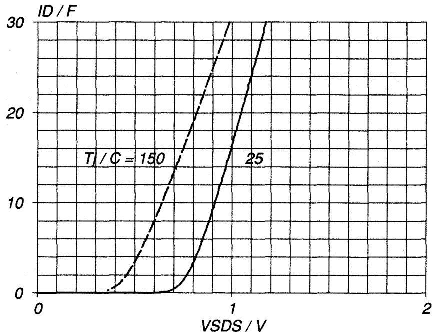


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK457-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

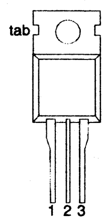
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK457	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	10	9	A
P_{tot}	Total power dissipation	150	150	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.6	0.8	Ω

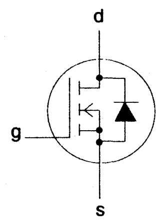
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	10	9	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	6.3	5.7	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	40	36	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 0.83 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK457-500A**	-	0.55	0.6	Ω
		I_D = 6.5 A **BUK457-500B**	-	0.7	0.8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	10	A
I_{DRM}	Pulsed reverse drain current	-	-	-	40	A
V_{SD}	Diode forward voltage	I_F = 10 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 10 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; $V_{DD} \leq$ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	500	mJ

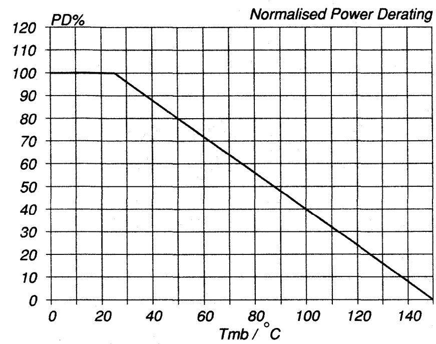


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

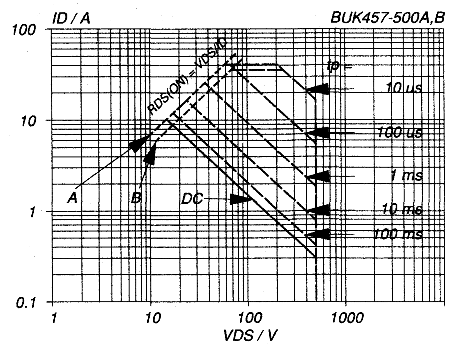


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

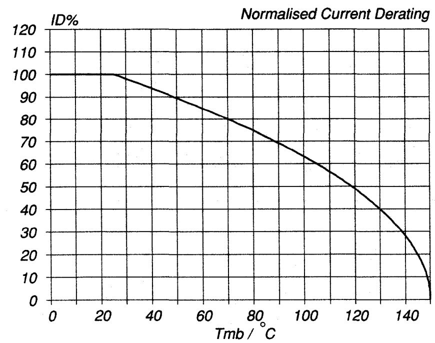


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq$ 10 V

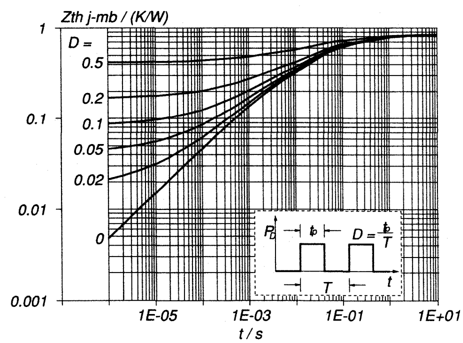


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor

BUK457-500A/B

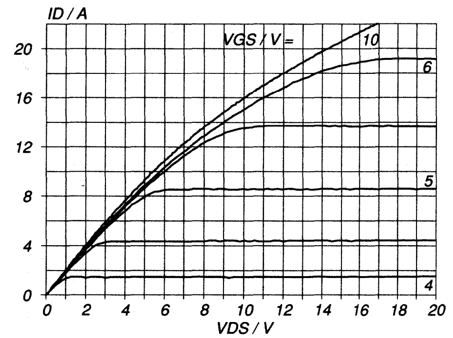


Fig.5. Typical output characteristics, T_j = 25 ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

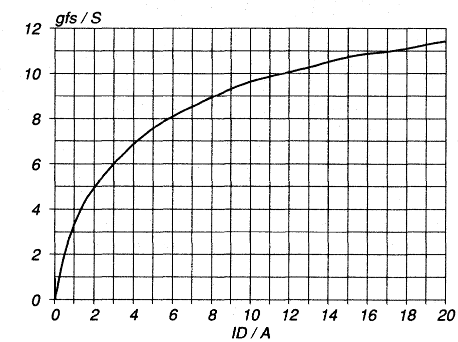


Fig.8. Typical transconductance, T_j = 25 ˚C. $g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

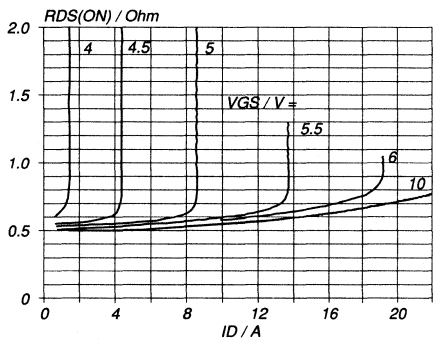


Fig.6. Typical on-state resistance, T_j = 25 ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

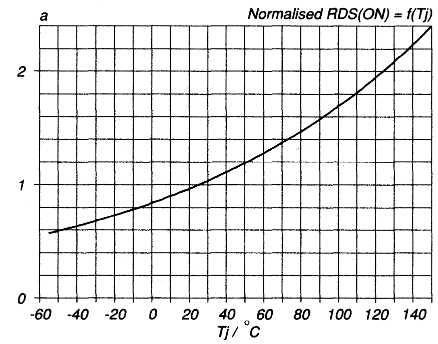


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 6.5 A; V_{GS} = 10 V

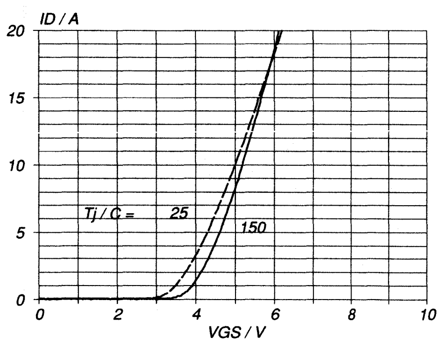


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

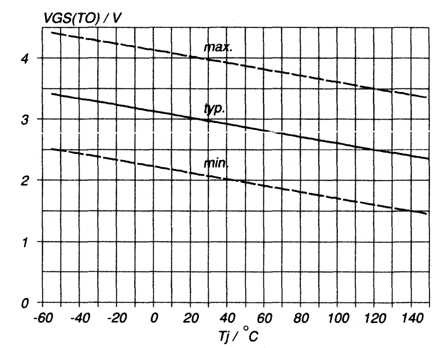


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

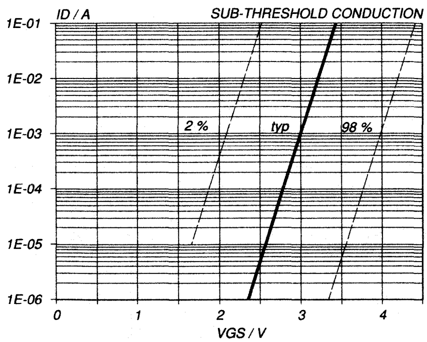


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

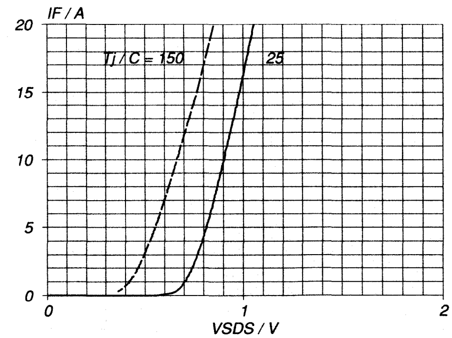


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

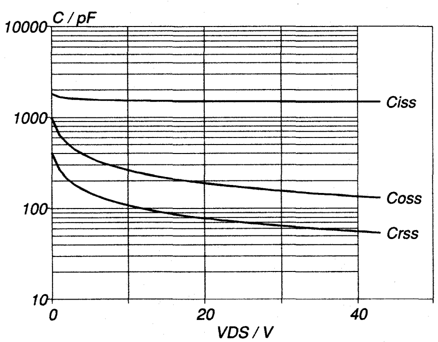


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

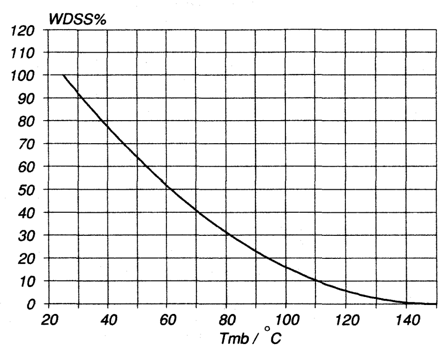


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 10$ A

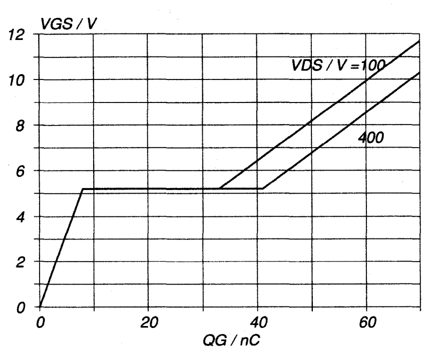


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 10$ A; parameter V_{DS}

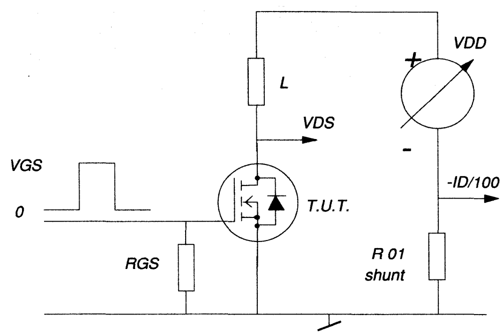


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK457-600B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

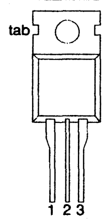
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	600	V
I_D	Drain current (DC)	7.1	A
P_{tot}	Total power dissipation	150	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.2	Ω

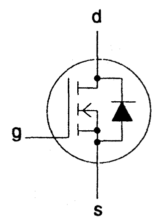
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	600	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600	V
$\pm V_{GS}$	Gate-source voltage	-	-	30	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	7.1	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	4.5	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	28	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150	W
T_{stg}	Storage temperature	-	- 55	150	˚C
T_j	Junction Temperature	-	-	150	˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 0.83 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A	-	1.0	1.2	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	8	A
I_{DRM}	Pulsed reverse drain current	-	-	-	32	A
V_{SD}	Diode forward voltage	I_F = 8 A ;V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 8 A; -dI_F/dt = 100 A/µs;	-	500	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

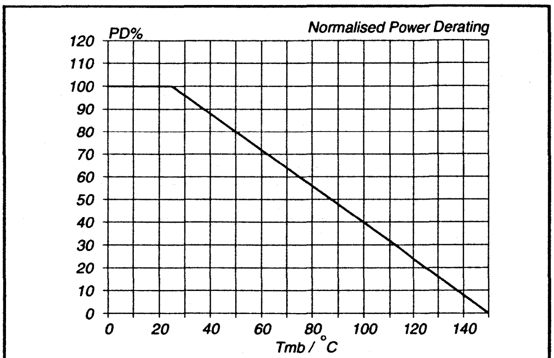


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

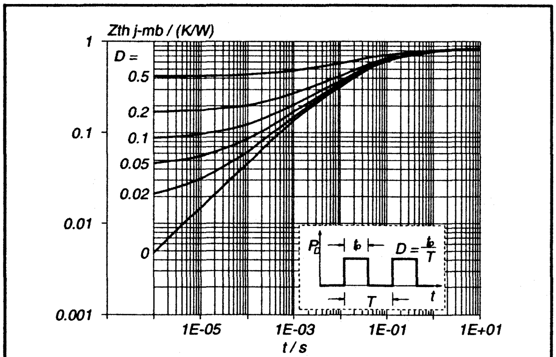


Fig.4. Transient thermal impedance.
$Z_{th\,j-mb} = f(t)$; parameter $D = t_p/T$

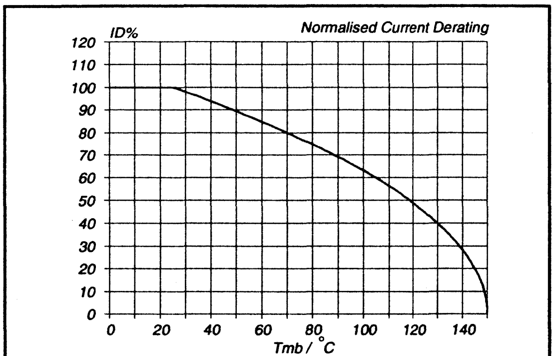


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

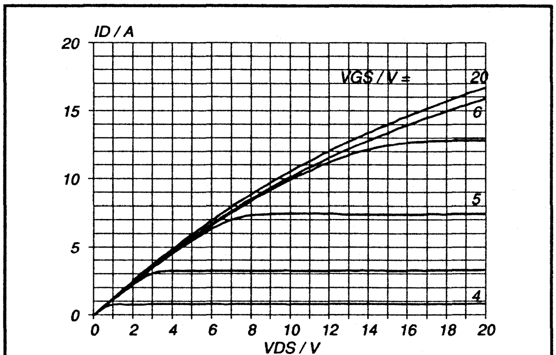


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

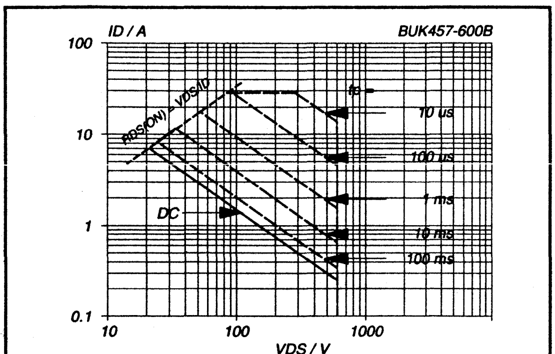


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

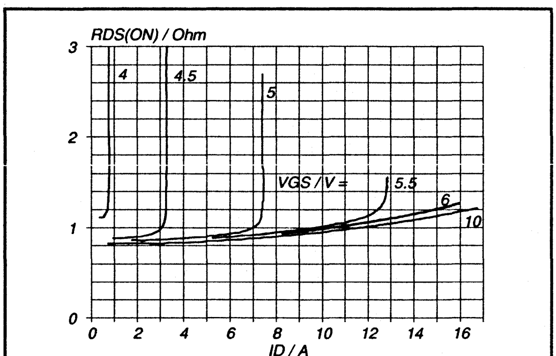


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

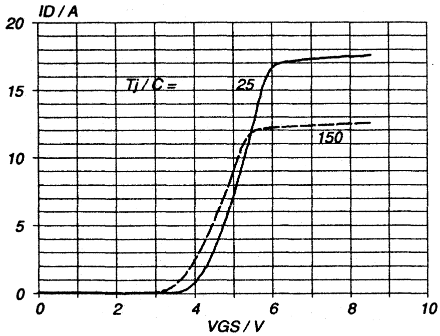


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

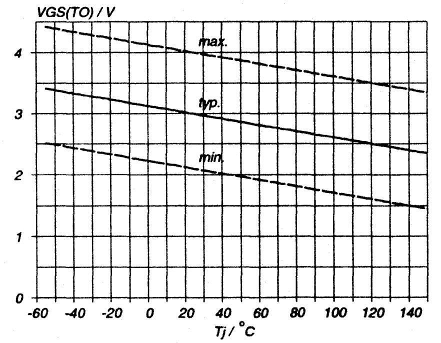


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

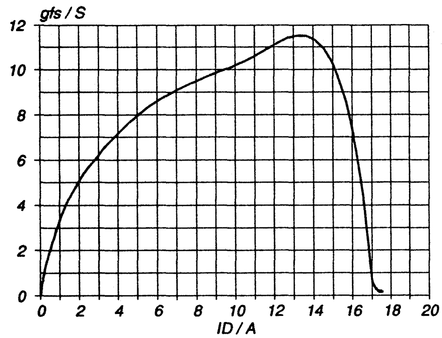


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

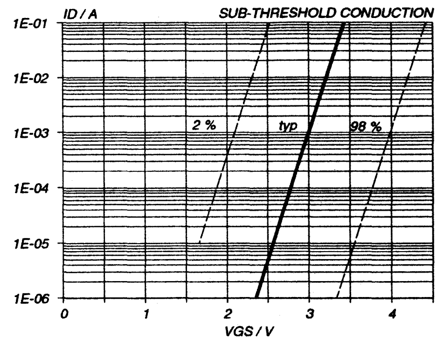


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

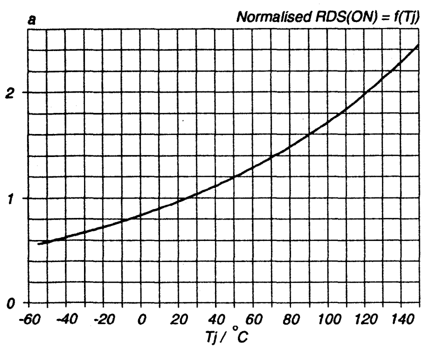


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

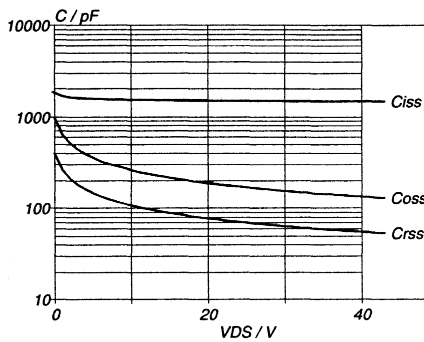


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

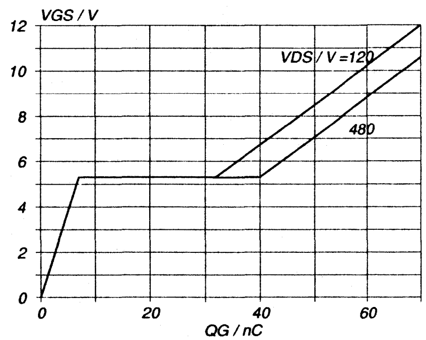


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: I_D = 8 A; parameter V_{DS}

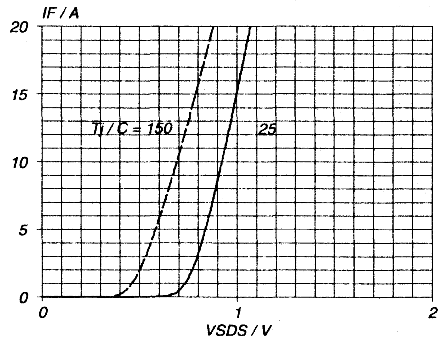


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK541-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

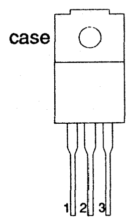
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK541	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	3.0	3.0	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.85	1.1	Ω

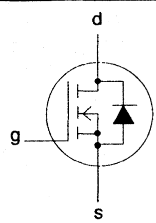
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	**-100B**	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	3.0	3.0	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	2.2	1.9	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	12	12	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 6.25 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 2.5 A **BUK541-100A**	-	0.75	0.85	Ω
		BUK541-100B	-	0.90	1.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	1.8	2.2	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	200	300	pF
C_{oss}	Output capacitance		-	45	60	pF
C_{rss}	Feedback capacitance		-	16	25	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	6	10	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	30	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	20	30	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.0 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 3.0 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 3.0 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	10	mJ

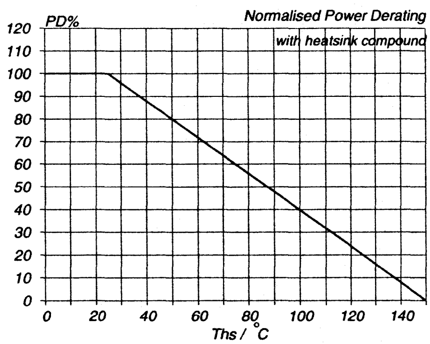


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

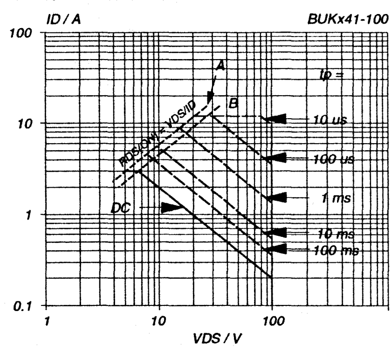


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

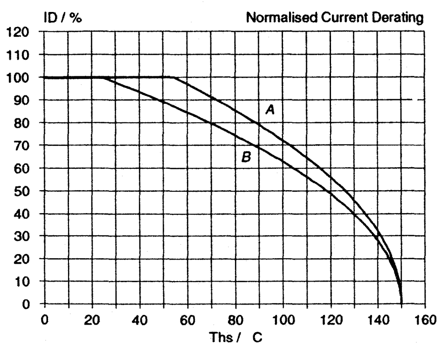


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

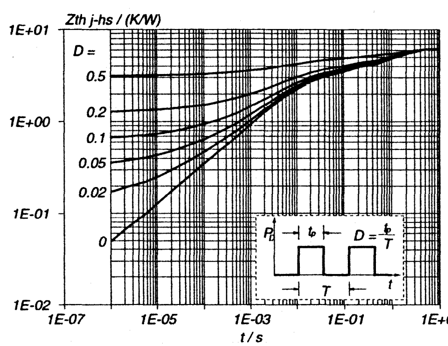


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK541-100A/B

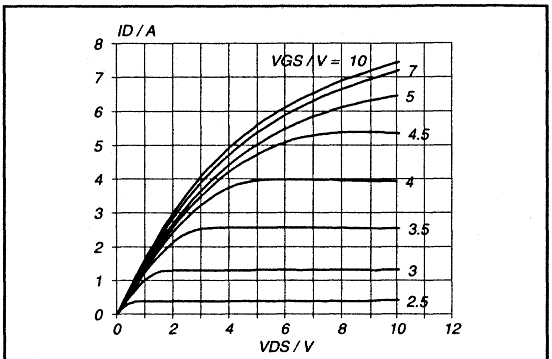


Fig.5. Typical output characteristics, $T_j = 25$ ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

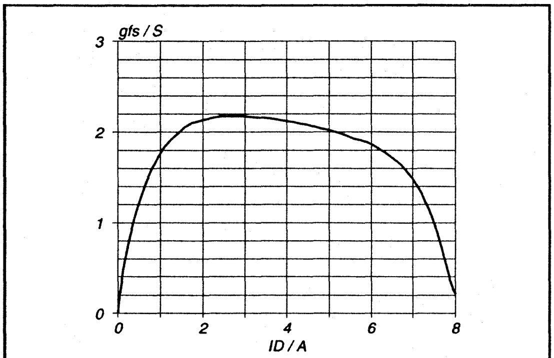


Fig.8. Typical transconductance, $T_j = 25$ ˚C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

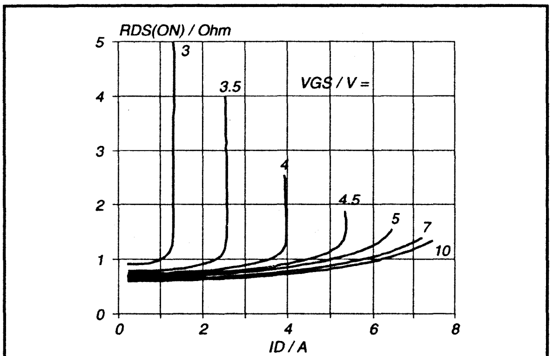


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

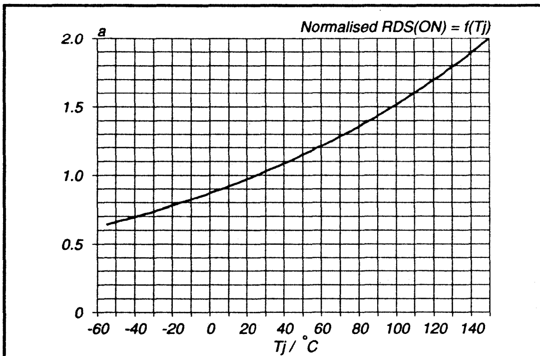


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 4.0$ A; $V_{GS} = 5$ V

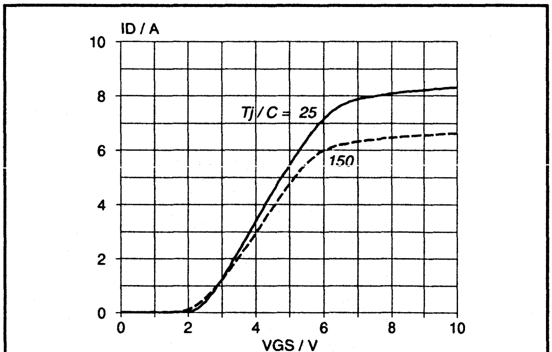


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

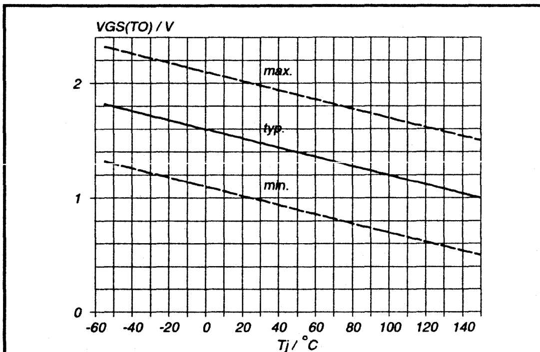


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor
Logic level FET

BUK541-100A/B

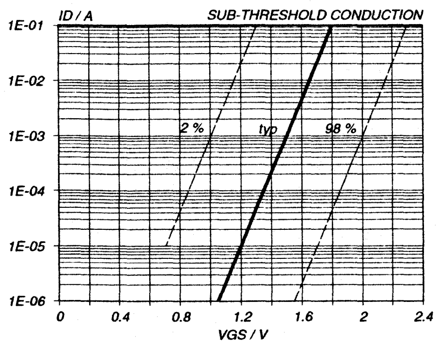


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

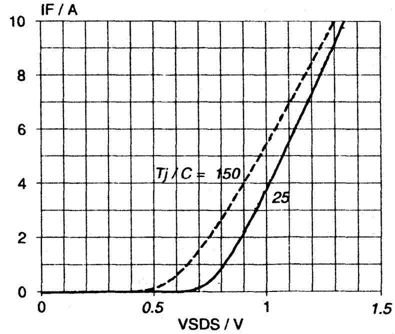


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

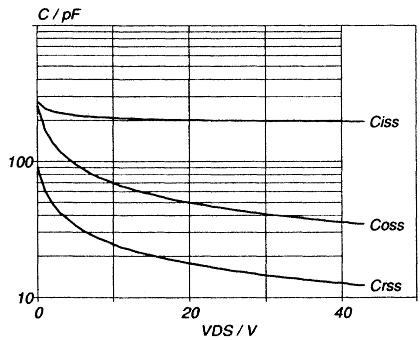


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

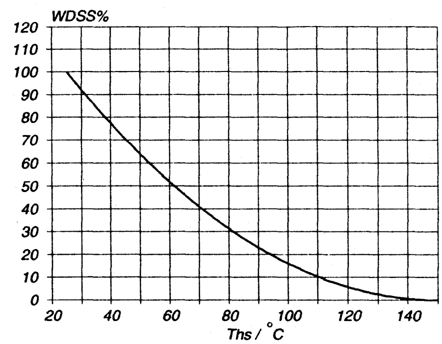


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 3$ A

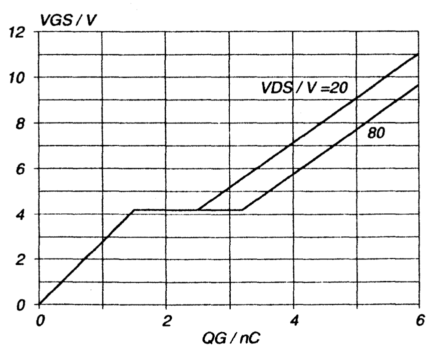


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3$ A; parameter V_{DS}

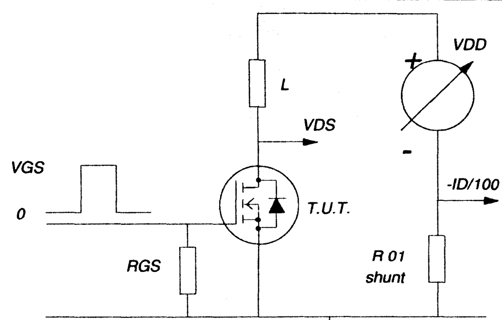


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK542-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

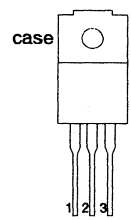
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK542	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	9.2	8.4	A
P_{tot}	Total power dissipation	22	22	W
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.15	0.18	Ω

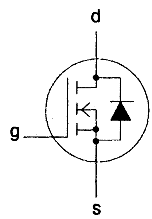
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	9.2	8.4	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	5.8	5.3	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	37	33	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor Logic level FET

BUK542-60A/B

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5.68 K/W
From junction to ambient		$R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA		1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C		-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V;	**BUK542-60A**	-	0.12	0.15	Ω
		I_D = 8.5 A	**BUK542-60B**	-	0.15	0.18	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8.5 A	5	6.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	600	pF
C_{oss}	Output capacitance		-	150	200	pF
C_{rss}	Feedback capacitance		-	65	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	12	18	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	60	80	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	70	ns
t_f	Turn-off fall time		-	45	70	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9.2	A
I_{DRM}	Pulsed reverse drain current	-	-	-	37	A
V_{SD}	Diode forward voltage	I_F = 9.2 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 9.2 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	30	mJ

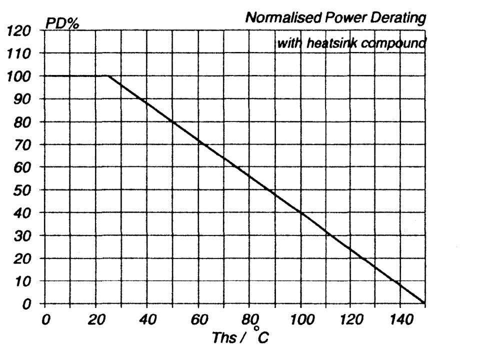


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

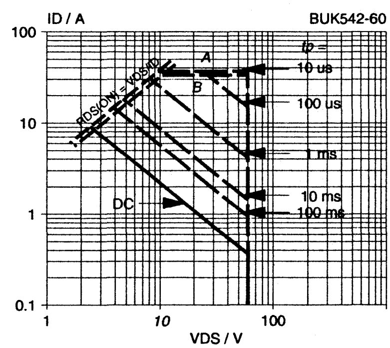


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

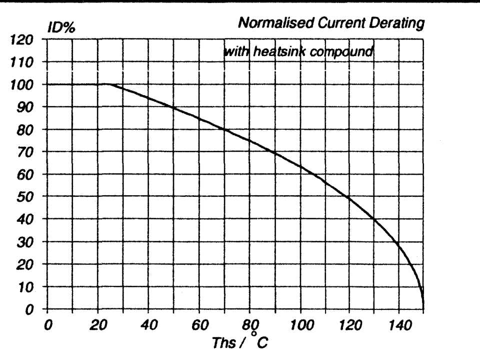


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

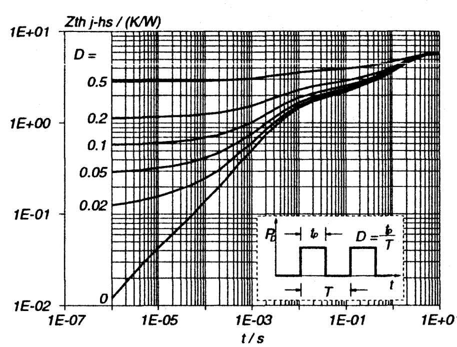


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK542-60A/B

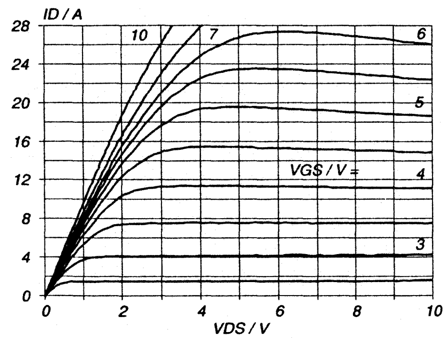


Fig.5. Typical output characteristics, $T_j = 25$ ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

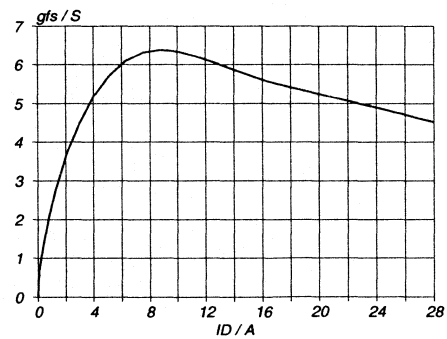


Fig.8. Typical transconductance, $T_j = 25$ ˚C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

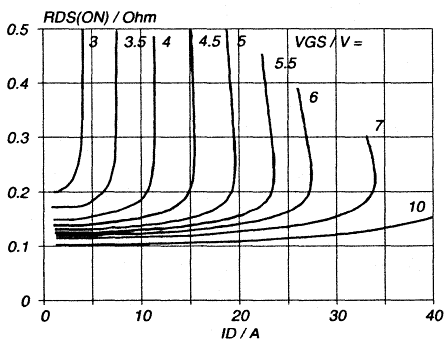


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

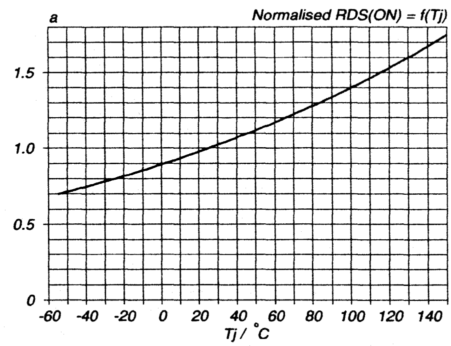


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 8.5$ A; $V_{GS} = 5$ V

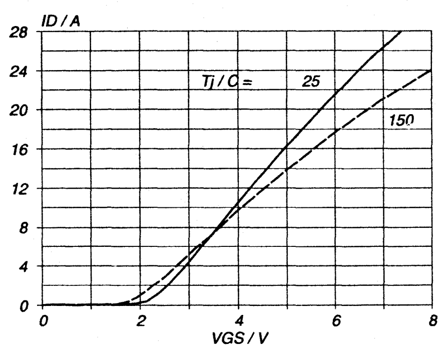


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

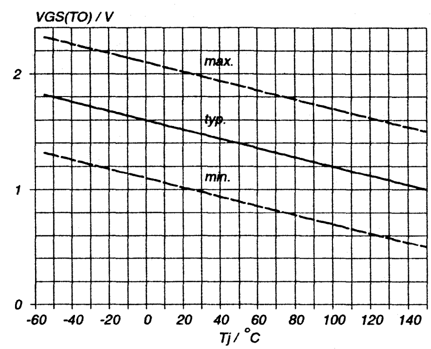


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor Logic level FET

BUK542-60A/B

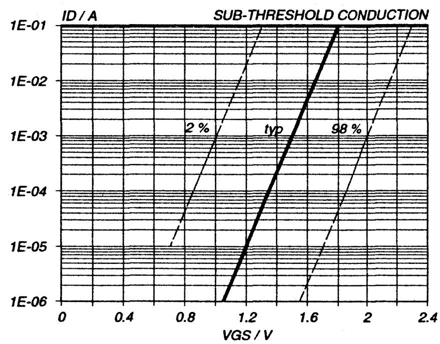


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

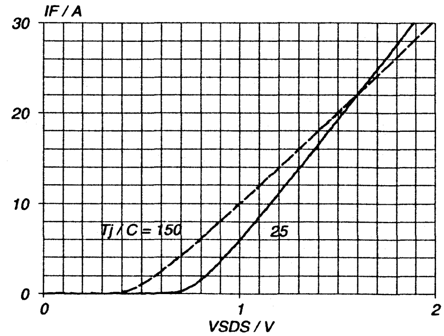


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

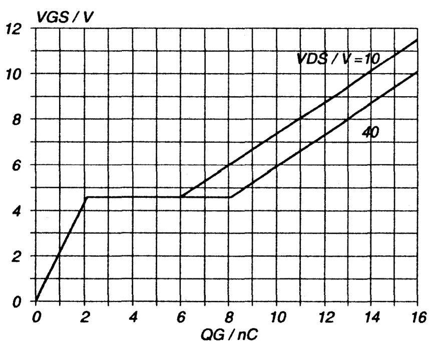


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

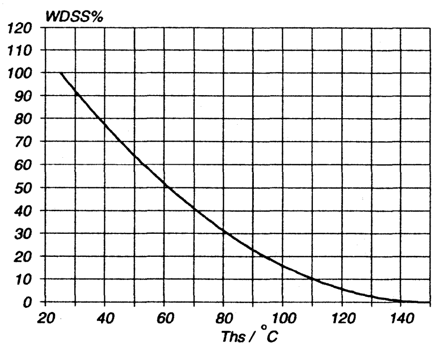


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

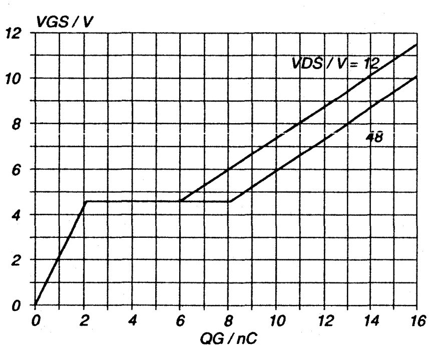


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

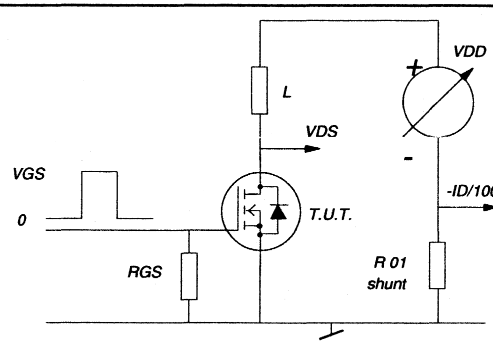


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK542-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

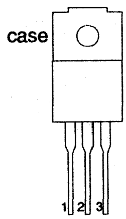
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK542	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	6.3	5.6	A
P_{tot}	Total power dissipation	22	22	W
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.28	0.35	Ω

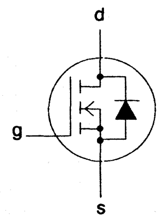
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<tr><th>SYMBOL</th><th>PARAMETER</th><th>CONDITIONS</th><th>MIN.</th><th colspan="2">MAX.</th><th>UNIT</th></tr>
<tr><td>V_{DS}</td><td>Drain-source voltage</td><td>-</td><td>-</td><td colspan="2">100</td><td>V</td></tr>
<tr><td>V_{DGR}</td><td>Drain-gate voltage</td><td>R_{GS} = 20 kΩ</td><td>-</td><td colspan="2">100</td><td>V</td></tr>
<tr><td>$\pm V_{GS}$</td><td>Gate-source voltage</td><td>-</td><td>-</td><td colspan="2">15</td><td>V</td></tr>
<tr><td>$\pm V_{GSM}$</td><td>Non-repetitive gate-source voltage</td><td>$t_p \leq 50$ µs</td><td>-</td><td colspan="2">20</td><td>V</td></tr>
<tr><td></td><td></td><td></td><td></td><td>-100A</td><td>-100B</td><td></td></tr>
<tr><td>I_D</td><td>Drain current (DC)</td><td>T_{hs} = 25 ˚C</td><td>-</td><td>6.3</td><td>5.6</td><td>A</td></tr>
<tr><td>I_D</td><td>Drain current (DC)</td><td>T_{hs} = 100 ˚C</td><td>-</td><td>4</td><td>3.5</td><td>A</td></tr>
<tr><td>I_{DM}</td><td>Drain current (pulse peak value)</td><td>T_{hs} = 25 ˚C</td><td>-</td><td>25</td><td>22</td><td>A</td></tr>
<tr><td>P_{tot}</td><td>Total power dissipation</td><td>T_{hs} = 25 ˚C</td><td>-</td><td colspan="2">22</td><td>W</td></tr>
<tr><td>T_{stg}</td><td>Storage temperature</td><td>-</td><td>- 55</td><td colspan="2">150</td><td>˚C</td></tr>
<tr><td>T_j</td><td>Junction Temperature</td><td>-</td><td>-</td><td colspan="2">150</td><td>˚C</td></tr>
</table>

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5.68 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA		1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C		-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V;	**BUK542-100A**	-	0.25	0.28	Ω
		I_D = 5.5 A	**BUK542-100B**	-	0.3	0.35	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5.5 A	4.5	6	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	600	pF
C_{oss}	Output capacitance		-	90	120	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	12	18	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	70	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	70	ns
t_f	Turn-off fall time		-	30	45	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	25	A
V_{SD}	Diode forward voltage	I_F = 6.3 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 6.3 A; -dI_F/dt = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.30	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	30	mJ

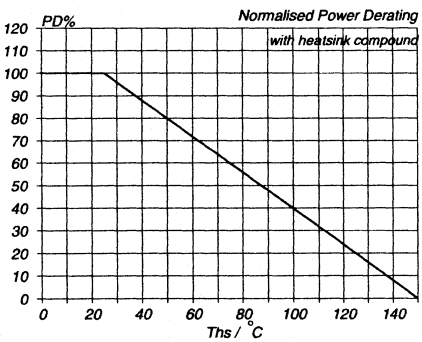


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,°C}$ = f(T_{hs})

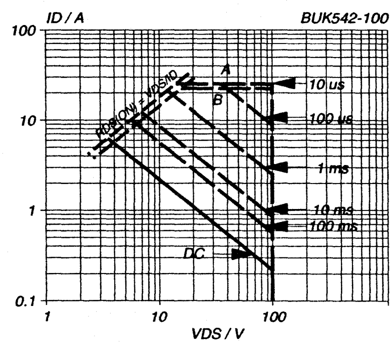


Fig.3. Safe operating area. T_{hs} = 25 °C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

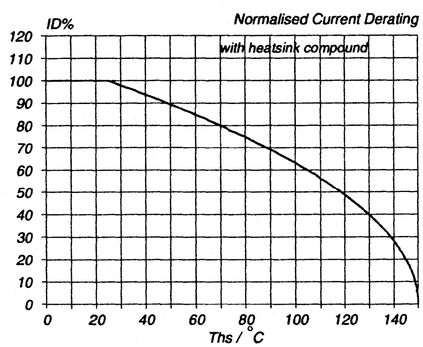


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,°C}$ = f(T_{hs}); conditions: $V_{GS} \geq$ 5 V

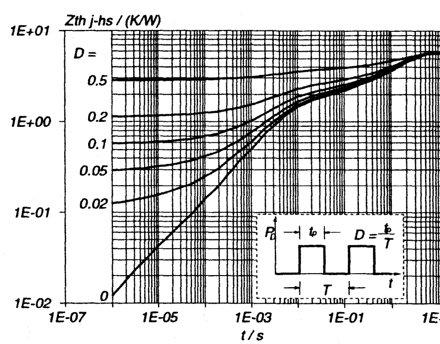


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter D = t_p/T

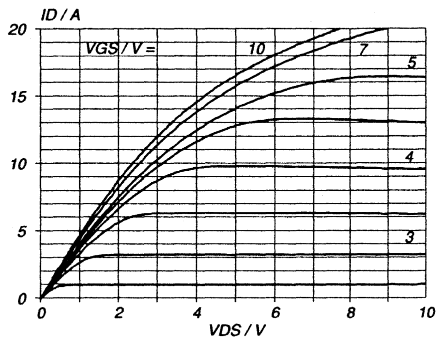


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

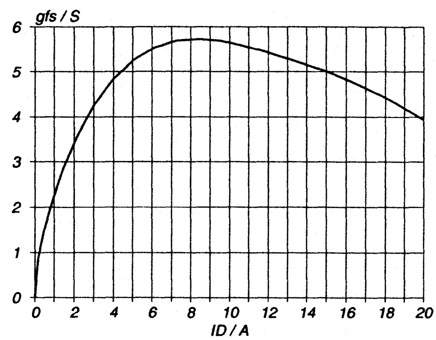


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

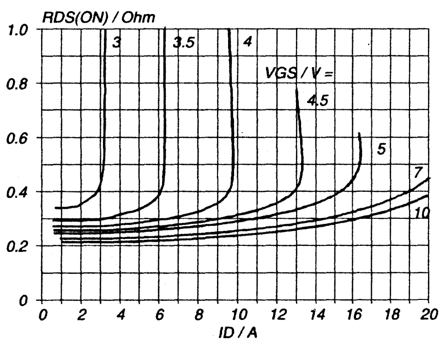


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

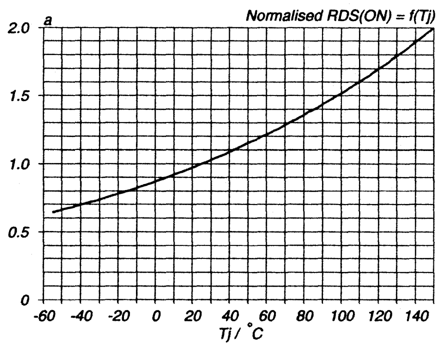


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 5.5$ A; $V_{GS} = 5$ V

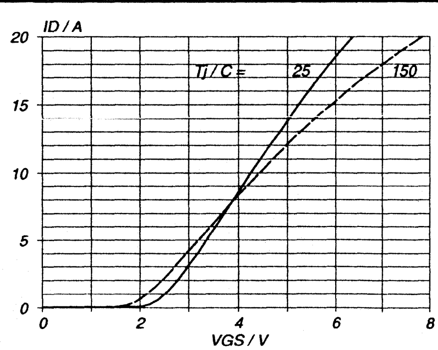


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

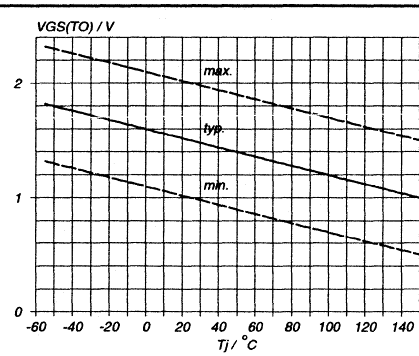


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor Logic level FET

BUK542-100A/B

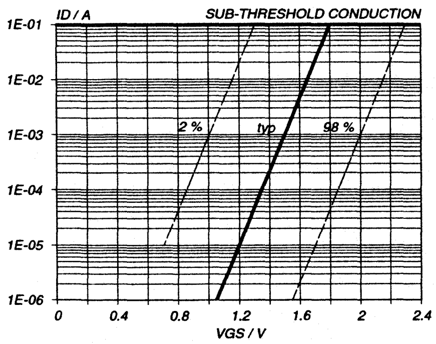


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

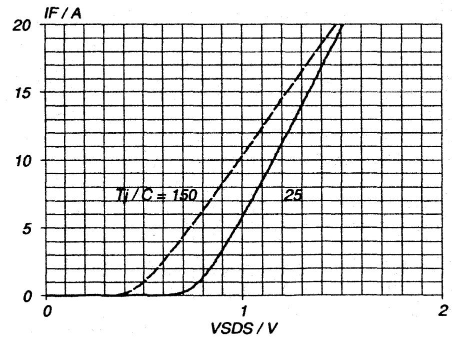


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

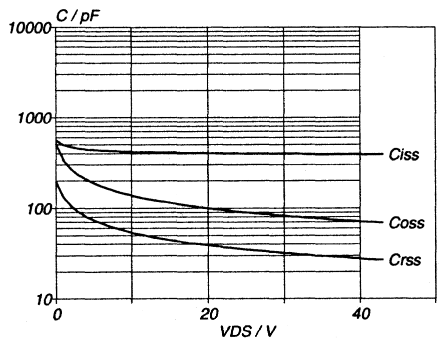


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

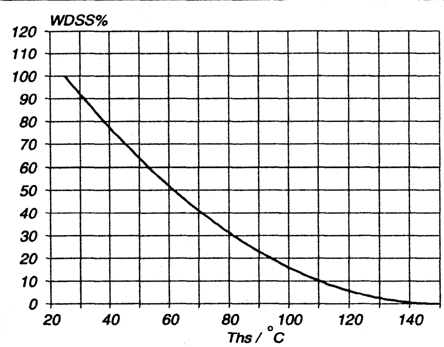


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 10$ A

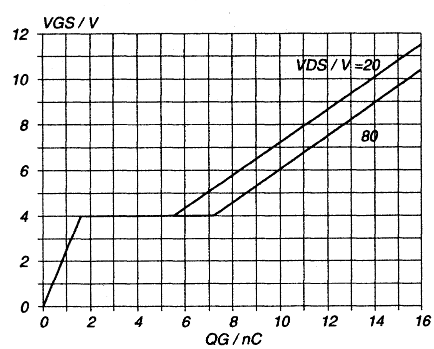


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 10$ A; parameter V_{DS}

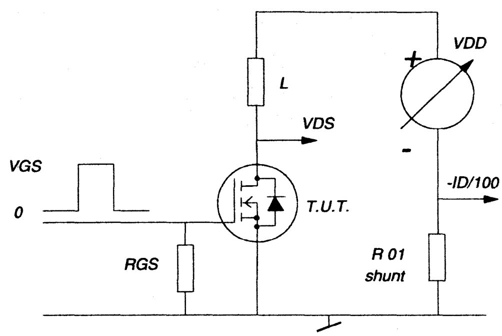


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK543-50A/B	

BUK543-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

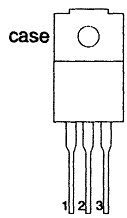
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK543	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} 5 V	0.085	0.1	Ω

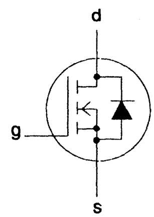
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	13	12	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	8.2	7.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	52	48	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK543-60A**	-	0.075	0.085	Ω
		I_D = 10 A **BUK543-60B**	-	0.08	0.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	7	10	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	130	160	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	95	120	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	110	ns
t_f	Turn-off fall time		-	65	85	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 13 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 20 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	45	mJ

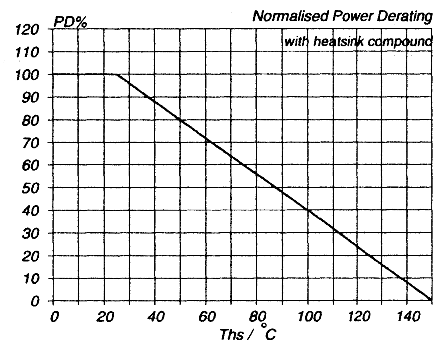


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

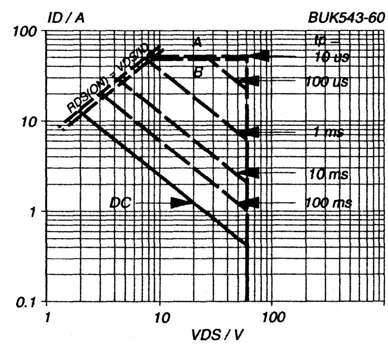


*Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p*

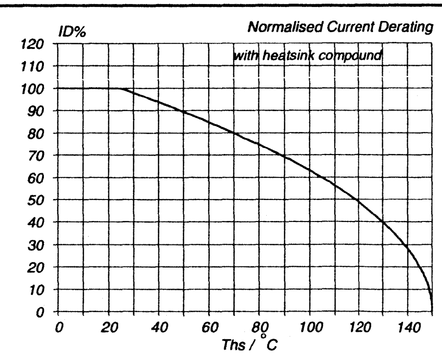


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

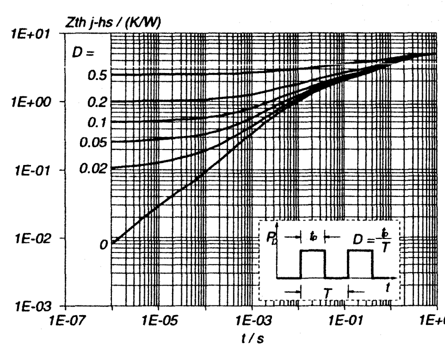


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

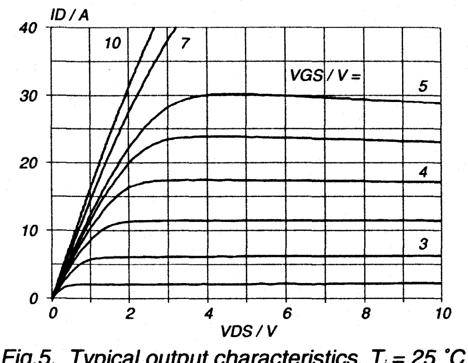


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

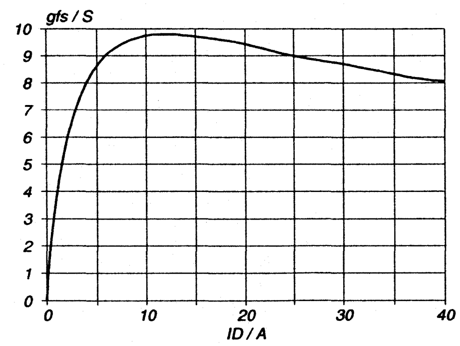


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

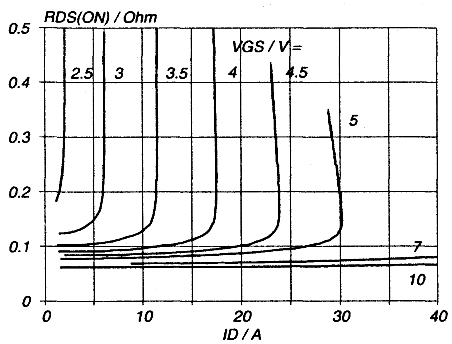


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

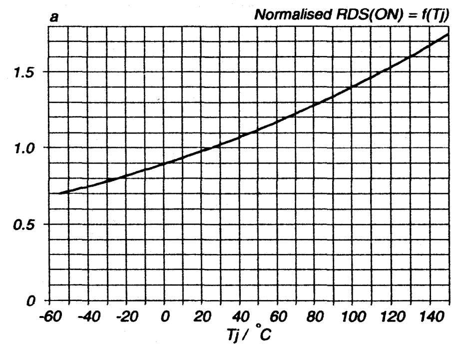


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 10$ A; $V_{GS} = 5$ V

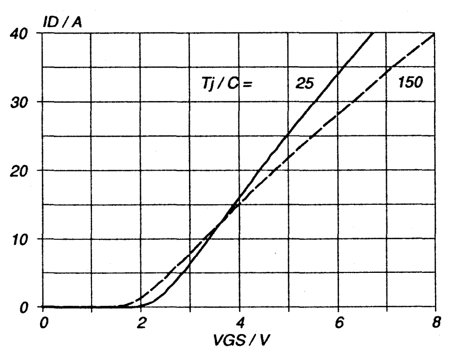


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

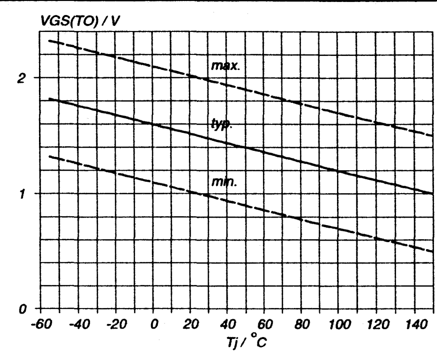


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

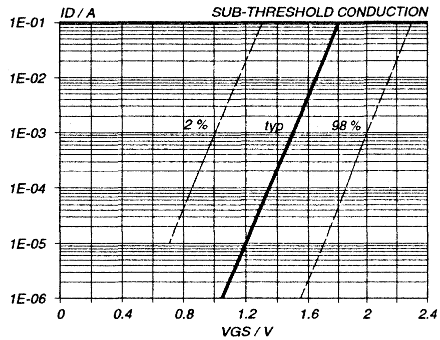


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

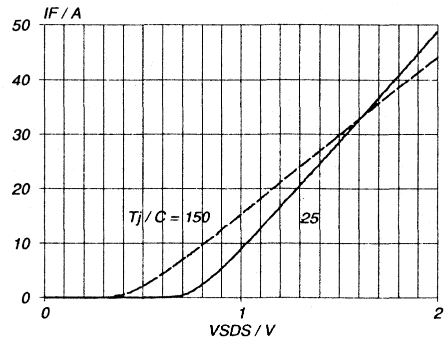


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

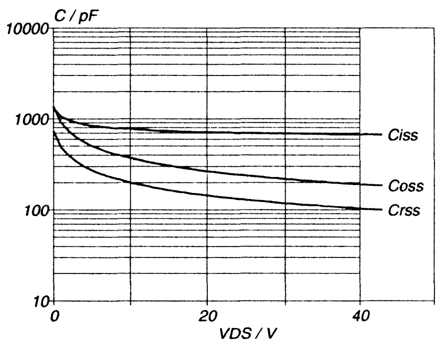


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

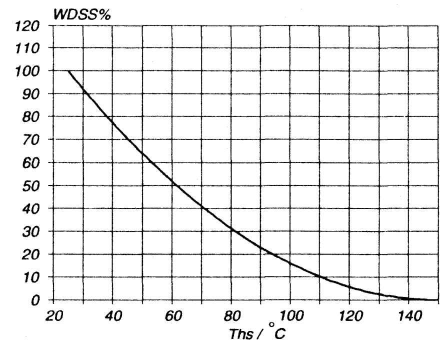


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 20$ A

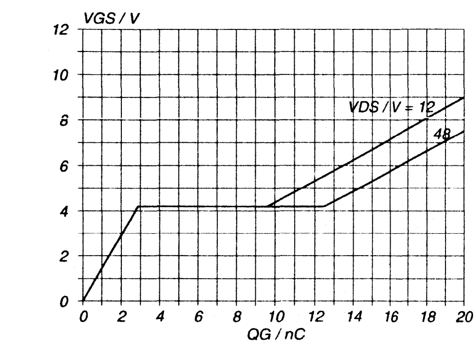


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 20$ A; parameter V_{DS}

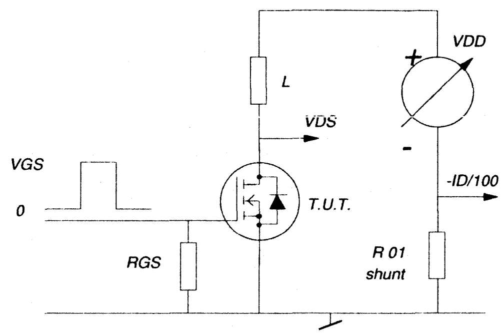


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK543-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

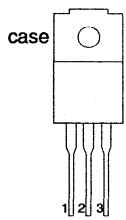
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK543	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	8.3	7.5	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.18	0.22	Ω

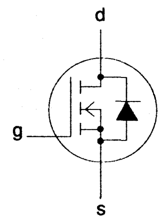
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	8.3	7.5	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	5.2	4.7	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	33	30	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK543-100A**	-	0.17	0.18	Ω
		I_D = 5 A **BUK543-100B**	-	0.20	0.22	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5 A	6.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	620	825	pF
C_{oss}	Output capacitance		-	180	250	pF
C_{rss}	Feedback capacitance		-	90	120	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	90	115	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	8.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	33	A
V_{SD}	Diode forward voltage	I_F = 8.3 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 8.3 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.5	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 13 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	70	mJ

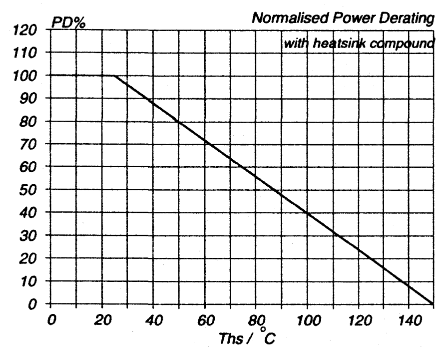


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

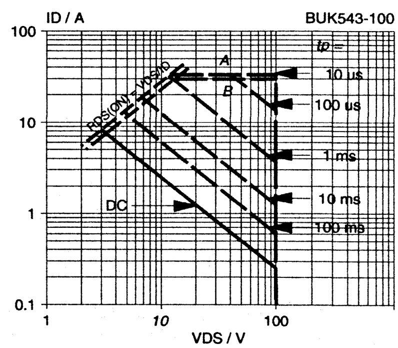


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

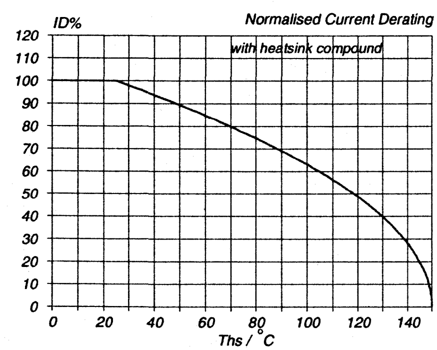


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

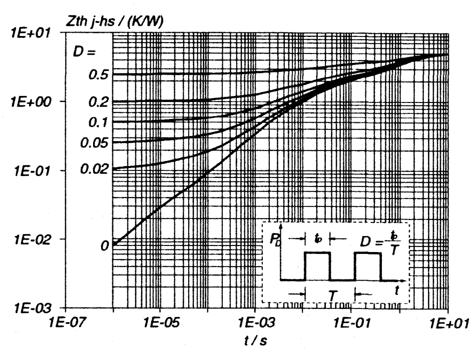


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK543-100A/B

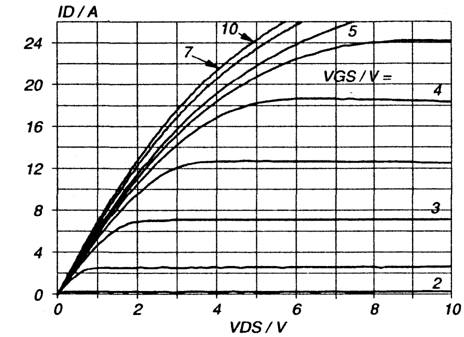


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

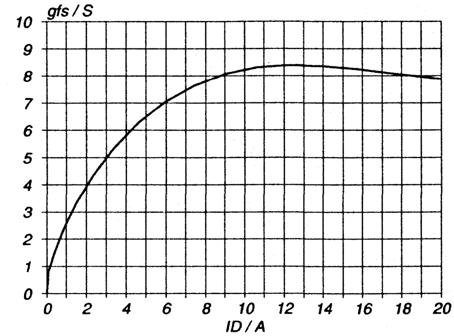


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

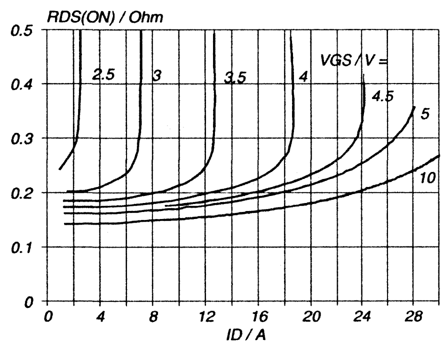


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

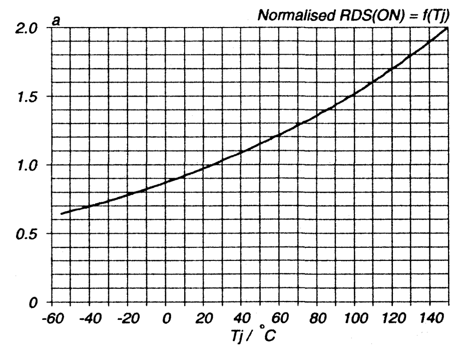


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 6.5 A; V_{GS} = 5 V

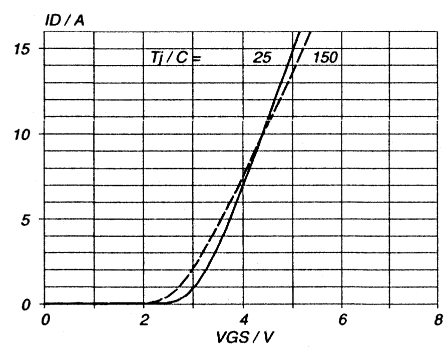


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

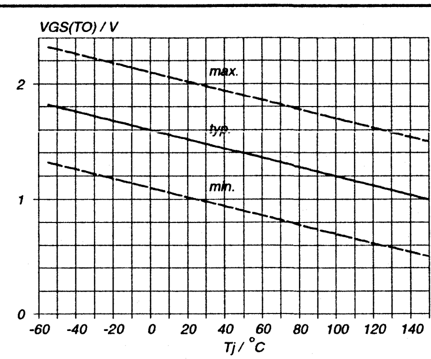


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

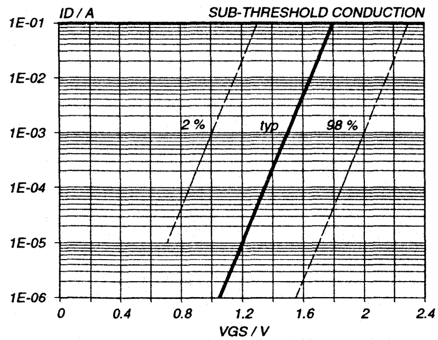


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

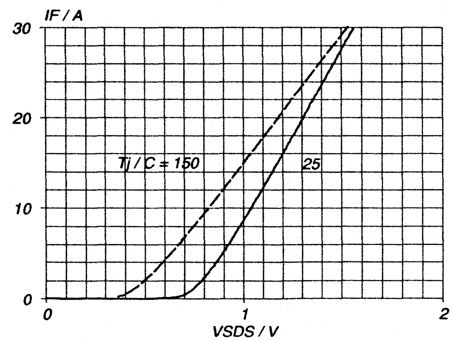


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

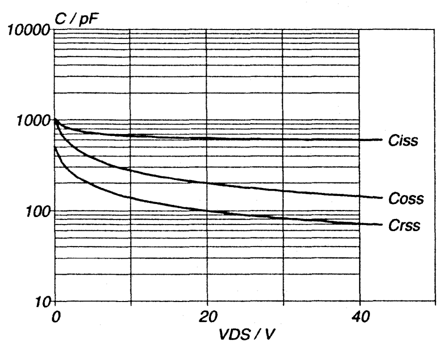


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

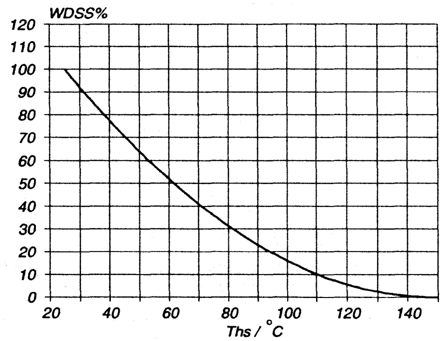


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 13$ A

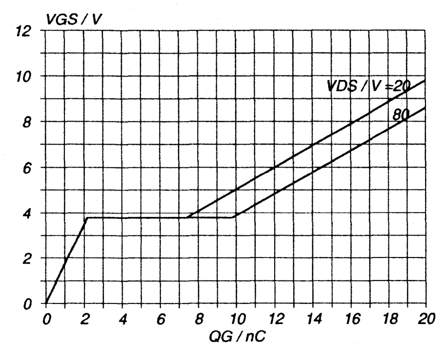


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 13$ A; parameter V_{DS}

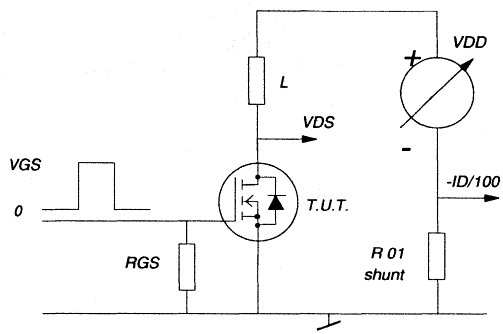


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK545-50A/B	

BUK545-60A/B
PowerMOS transistor Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

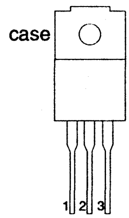
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK545	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	20	18	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.042	0.055	Ω

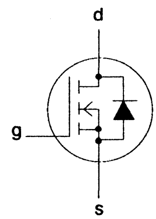
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	**-60B**	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	20	18	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	13	11	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	80	72	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.17 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 20 A **BUK545-60A**	-	0.035	0.042	Ω
		BUK545-60B	-	0.045	0.055	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	11	20	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1450	1750	pF
C_{oss}	Output capacitance		-	500	600	pF
C_{rss}	Feedback capacitance		-	220	275	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 5 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	25	40	ns
t_r	Turn-on rise time		-	120	150	ns
$t_{d\ off}$	Turn-off delay time		-	160	220	ns
t_f	Turn-off fall time		-	110	145	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	20	A
I_{DRM}	Pulsed reverse drain current	-	-	-	80	A
V_{SD}	Diode forward voltage	I_F = 20 A ; V_{GS} = 0 V	-	1.4	2.0	V
t_{rr}	Reverse recovery time	I_F = 20 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 39 A ; V_{DD} ≤ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	90	mJ

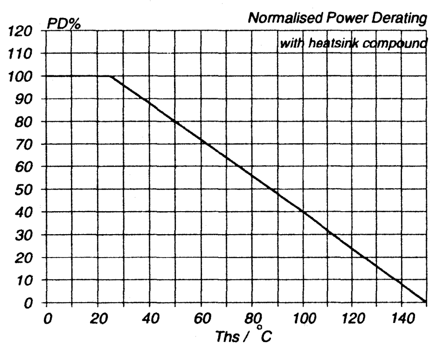


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

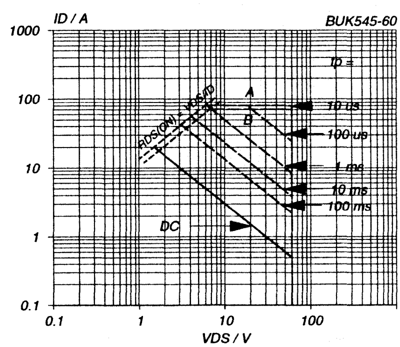


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

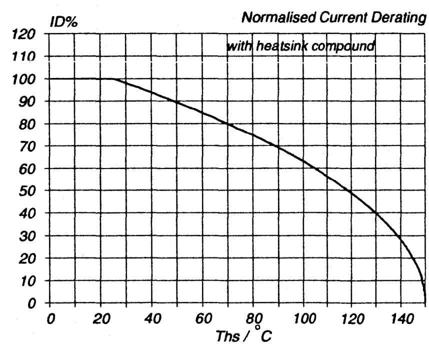


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

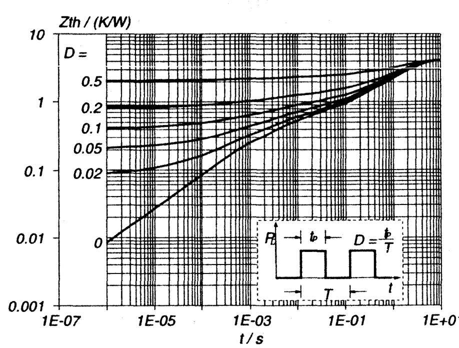


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

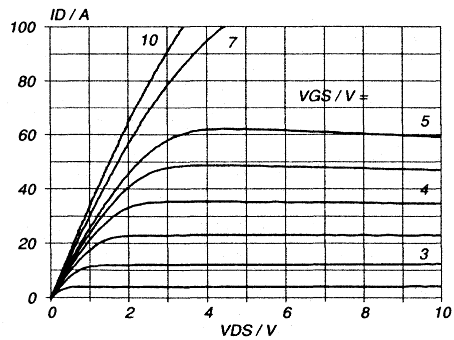


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

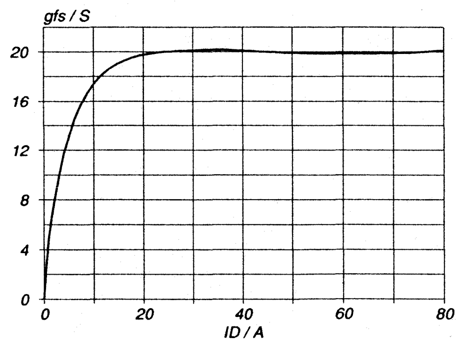


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

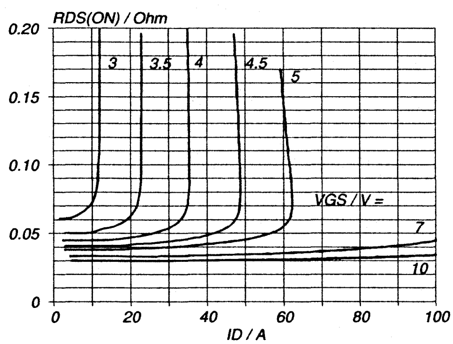


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

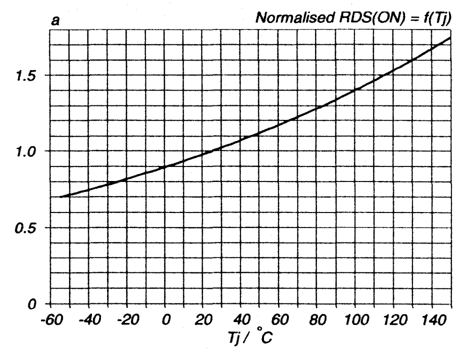


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 20$ A; $V_{GS} = 5$ V

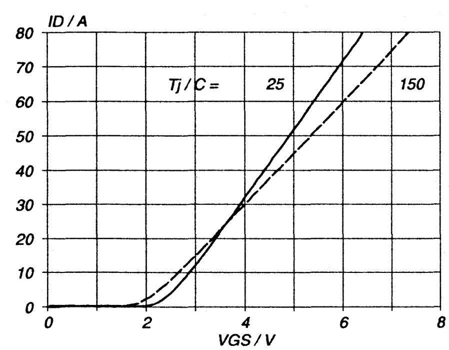


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

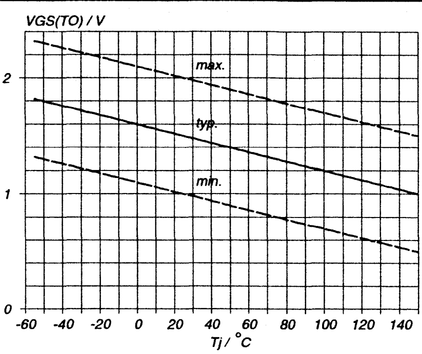


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

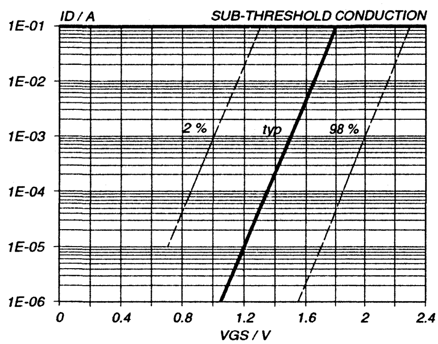


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

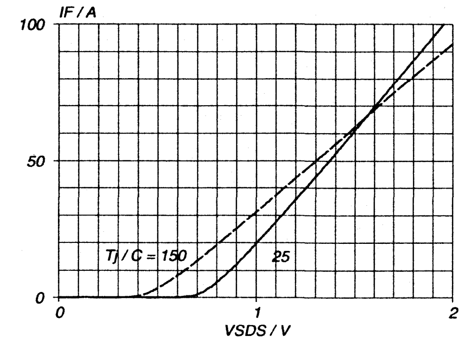


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

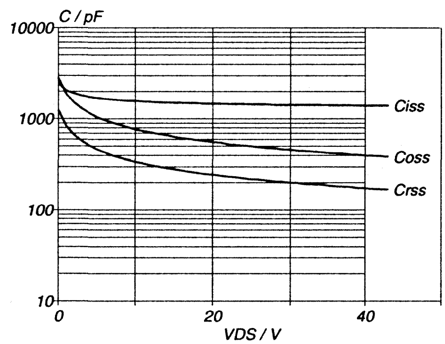


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

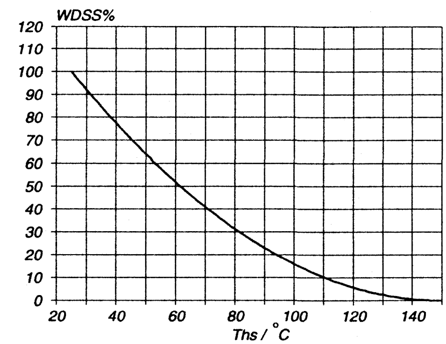


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 39$ A

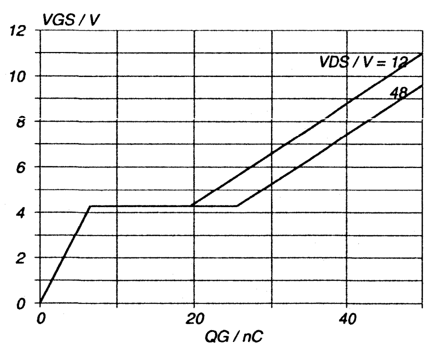


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 39$ A; parameter V_{DS}

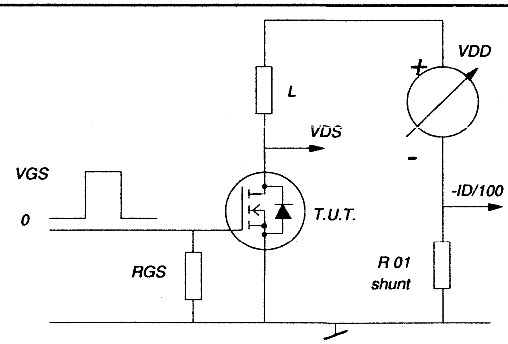


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK545-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

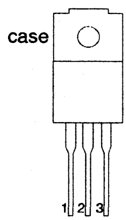
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK545	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.085	0.11	Ω

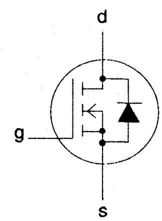
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	**-100B**	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	13	12	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	8.2	7.5	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	52	48	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j-hs}$ = 4.17 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK545-100A**	-	0.075	0.085	Ω
		I_D = 13 A **BUK545-100B**	-	0.09	0.11	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 13 A	10	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1450	1750	pF
C_{oss}	Output capacitance		-	280	350	pF
C_{rss}	Feedback capacitance		-	100	150	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	65	85	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	135	180	ns
t_f	Turn-off fall time		-	80	110	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 13 A; $-dI_F/dt$ = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.70	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 25 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	140	mJ

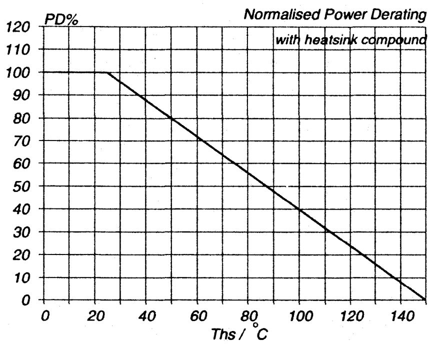


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

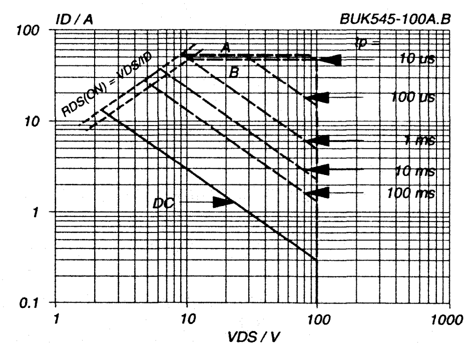


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

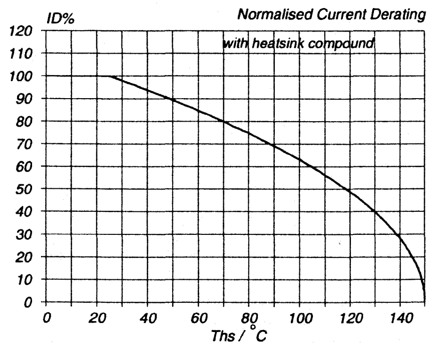


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

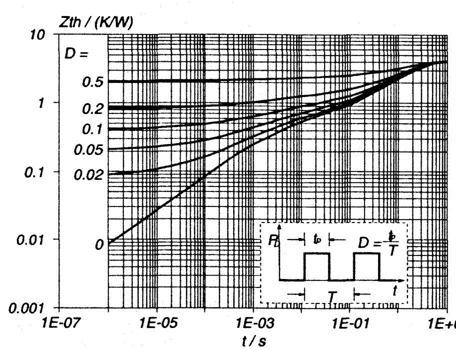


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

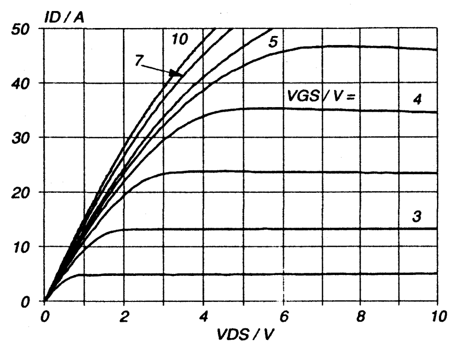


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

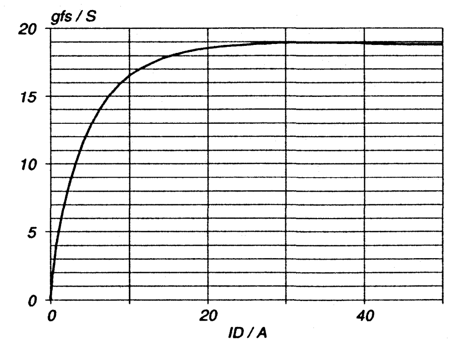


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

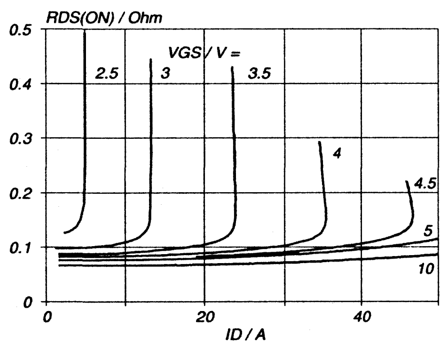


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

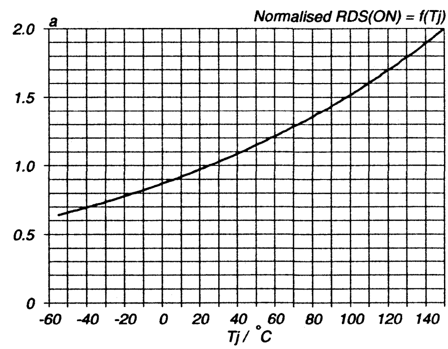


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 13$ A; $V_{GS} = 5$ V

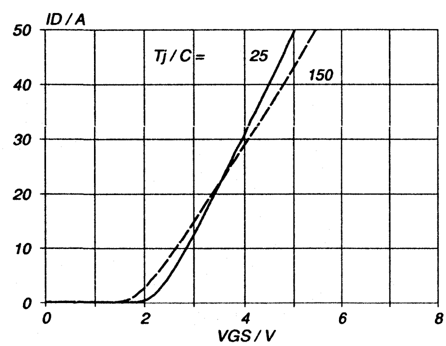


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

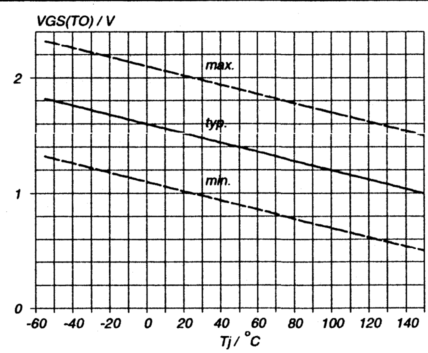


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

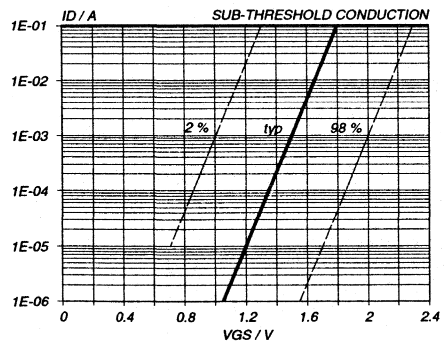


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

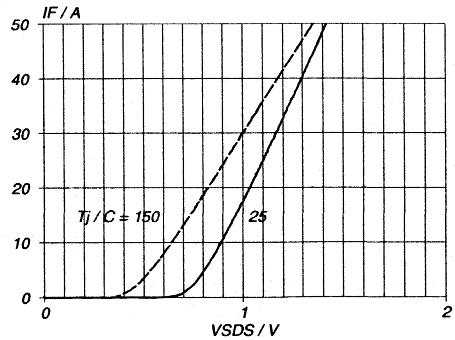


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

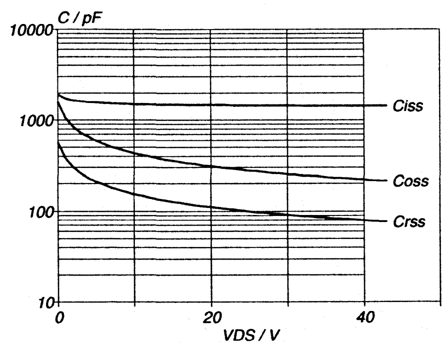


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

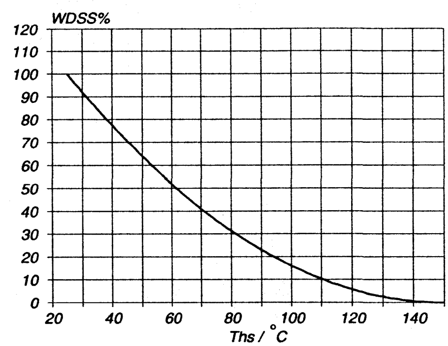


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 25$ A

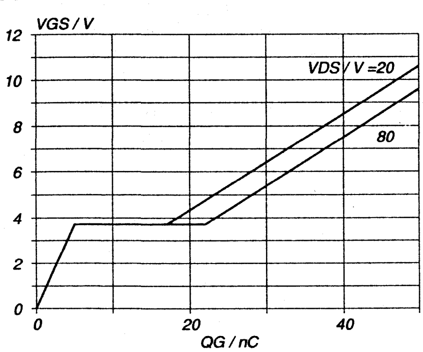


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 25$ A; parameter V_{DS}

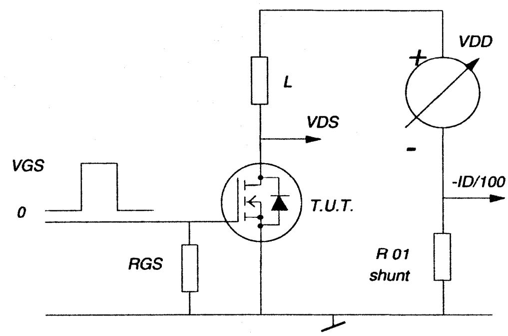


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK545-200A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

QUICK REFERENCE DATA

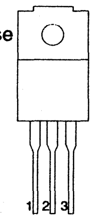
SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK545	-200A	-200B	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	7.6	7	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.23	0.28	Ω

PINNING - SOT186

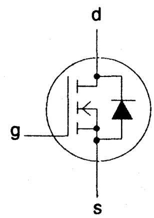
PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION

case



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-200A	-200B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	7.6	7	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	4.8	4.4	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	30	28	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.17 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK545-200A**	-	0.2	0.23	Ω
		I_D = 7 A **BUK545-200B**	-	0.24	0.28	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7 A	8.0	15	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1600	2000	pF
C_{oss}	Output capacitance		-	180	250	pF
C_{rss}	Feedback capacitance		-	55	80	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	75	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	140	180	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	30	A
V_{SD}	Diode forward voltage	I_F = 7.6 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 7.6 A; $-dI_F/dt$ = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.3	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 100 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	100	mJ

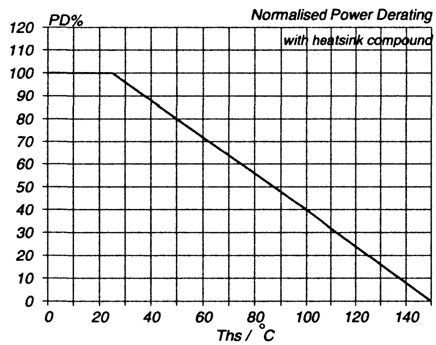


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

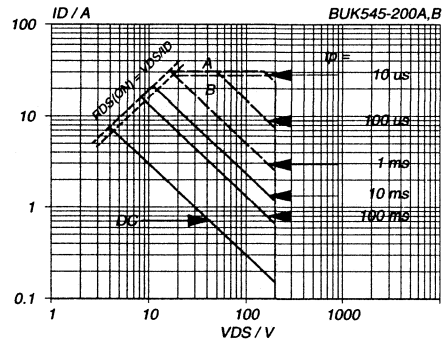


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

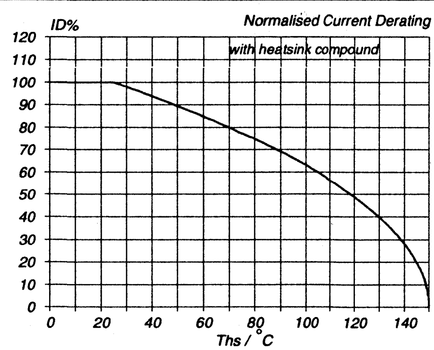


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

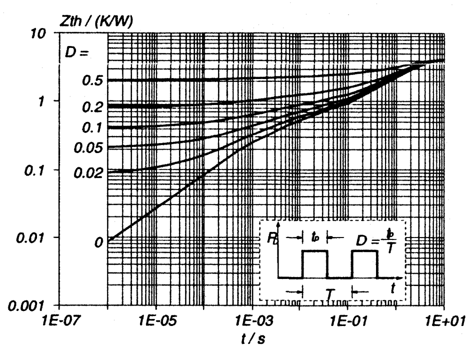


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

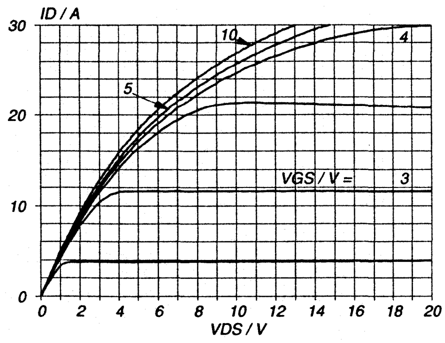


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

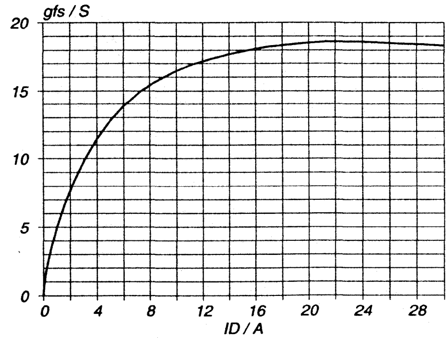


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

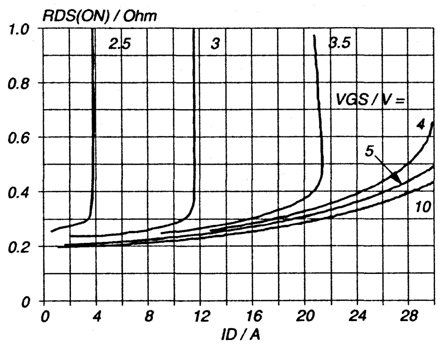


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

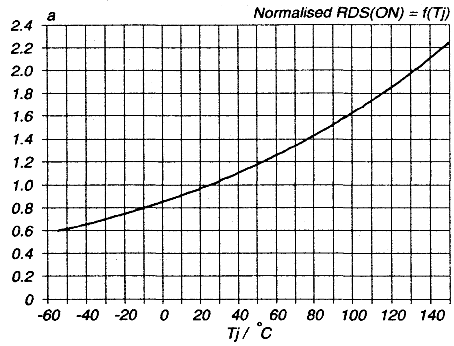


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 7$ A; $V_{GS} = 5$ V

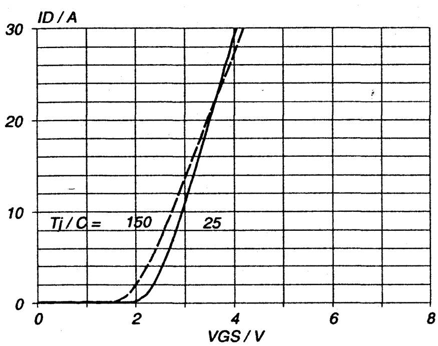


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

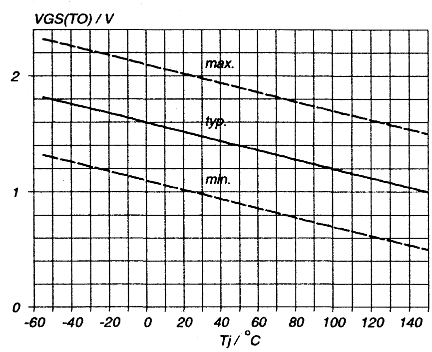


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

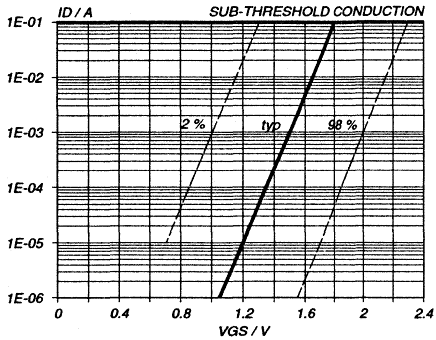


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

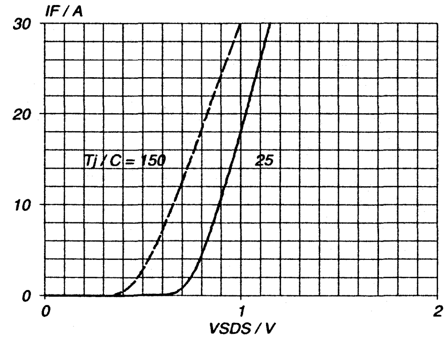


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

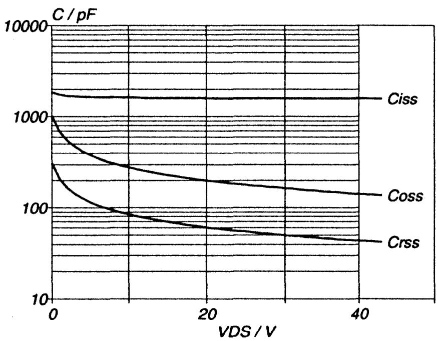


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

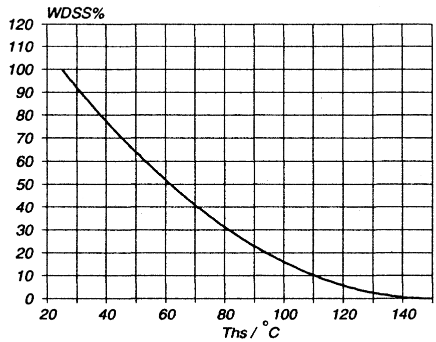


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

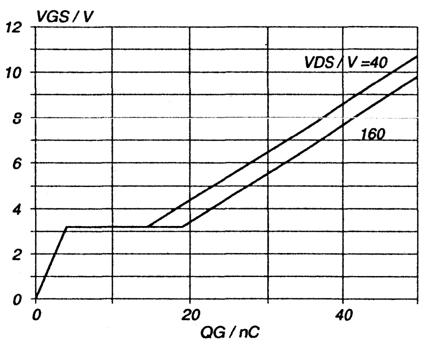


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

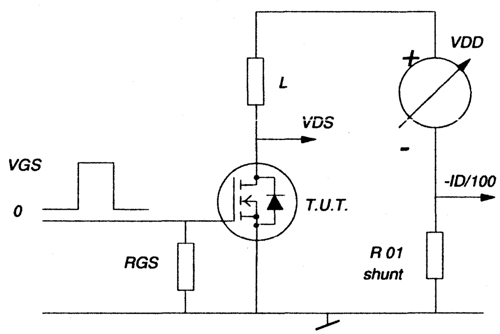


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 551-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

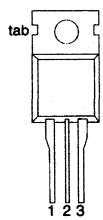
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK551	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	3.0	3.0	A
P_{tot}	Total power dissipation	40	40	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.85	1.1	Ω

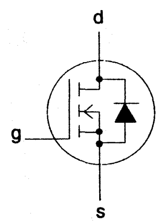
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	-100B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	3.0	3.0	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	3.0	2.8	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	12	12	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	40		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 3.75 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK551-100A**	-	0.75	0.85	Ω
		I_D = 2.5 A **BUK551-100B**	-	0.90	1.10	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	1.8	2.2	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	200	300	pF
C_{oss}	Output capacitance		-	45	60	pF
C_{rss}	Feedback capacitance		-	16	25	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	6	10	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	30	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	20	30	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.0 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 3.0 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 3.0 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	10	mJ

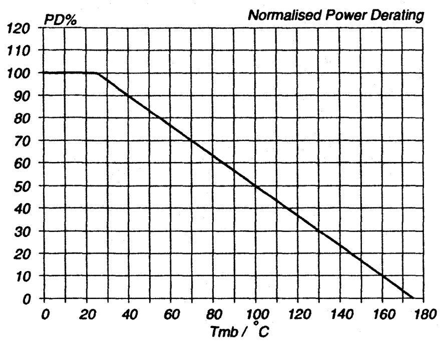


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

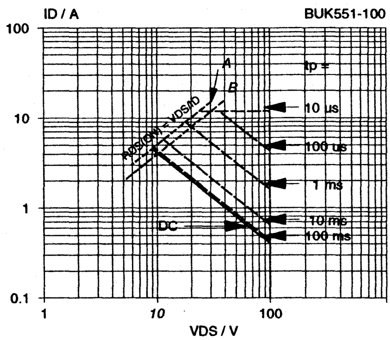


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

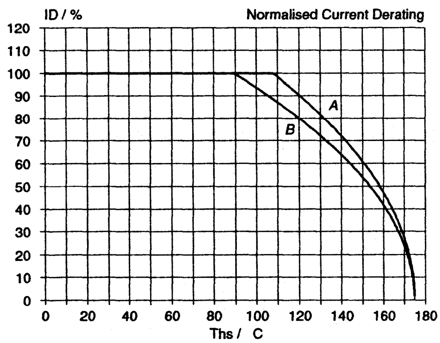


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

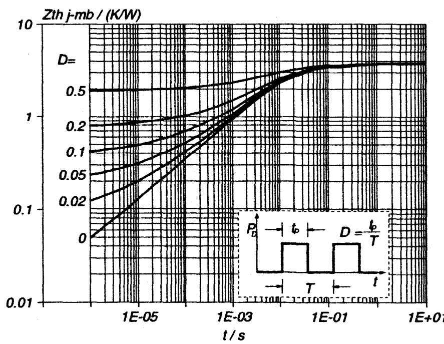


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor
Logic level FET

BUK551-100A/B

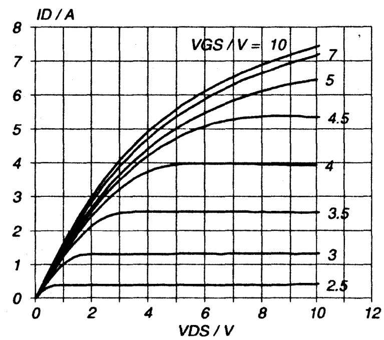


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

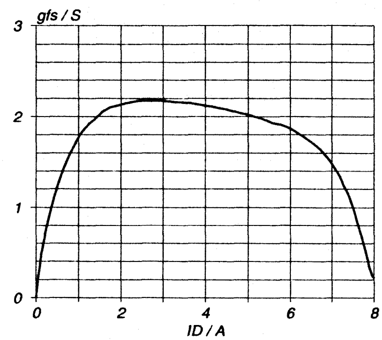


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

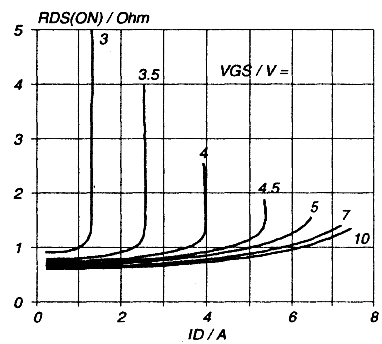


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

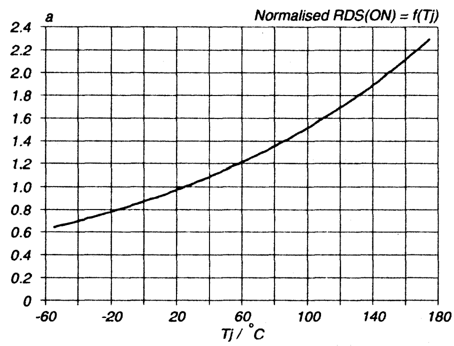


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 5$ V

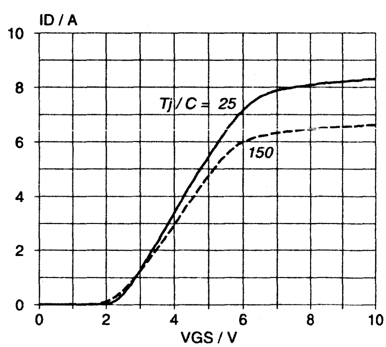


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$: conditions: $V_{DS} = 25$ V; parameter T_j

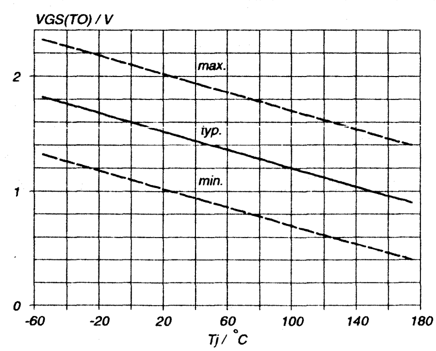


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

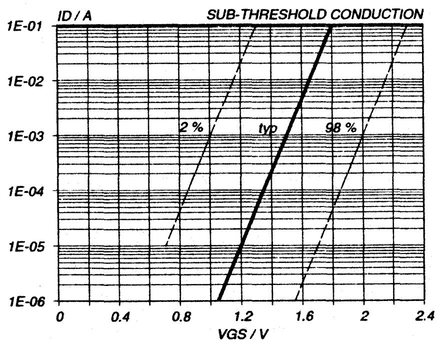


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

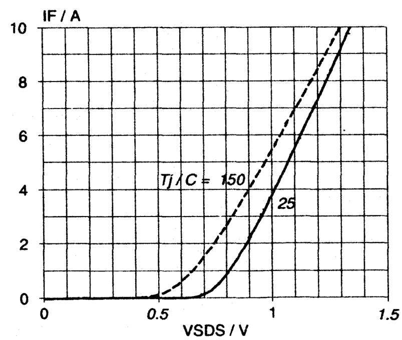


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

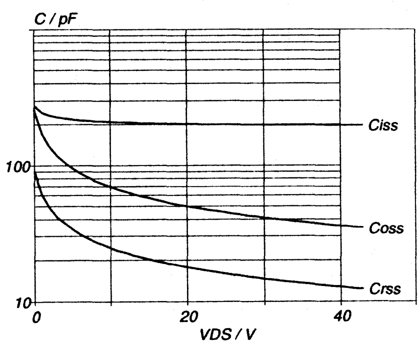


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

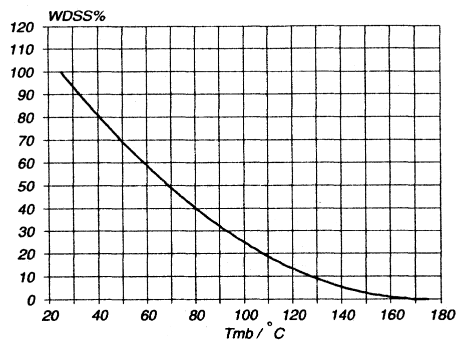


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 3$ A

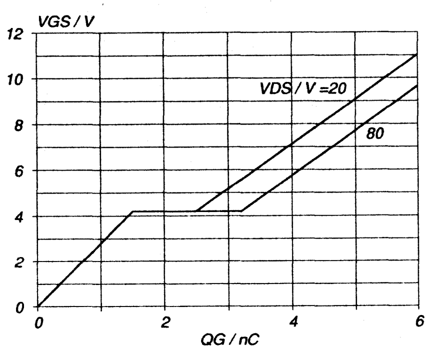


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3$ A; parameter V_{DS}

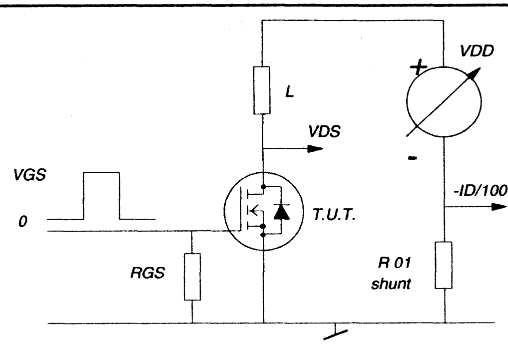


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 552-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

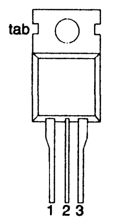
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK552	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	14	13	A
P_{tot}	Total power dissipation	60	60	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.15	0.18	Ω

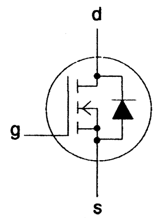
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	14	13	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	10	9	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	56	52	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	60		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 2.5 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 8.5 A **BUK552-60A**	-	0.12	0.15	Ω
		BUK552-60B	-	0.15	0.18	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8.5 A	5	6.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	600	pF
C_{oss}	Output capacitance		-	150	200	pF
C_{rss}	Feedback capacitance		-	65	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 5 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	12	18	ns
t_r	Turn-on rise time		-	60	80	ns
$t_{d\,off}$	Turn-off delay time		-	50	70	ns
t_f	Turn-off fall time		-	45	70	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 14 A; $-dI_F/dt$ = 100 A/µs; V_{GS} = 0 V; V_R = 30 V	-	60	-	ns
Q_{rr}	Reverse recovery charge		-	0.18	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	30	mJ

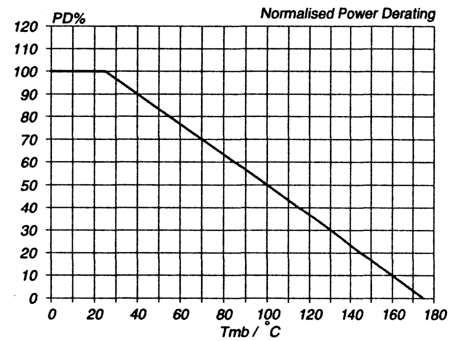


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{mb})$

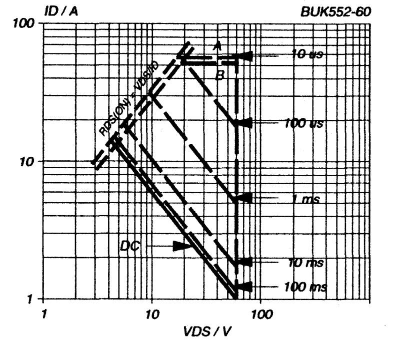


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

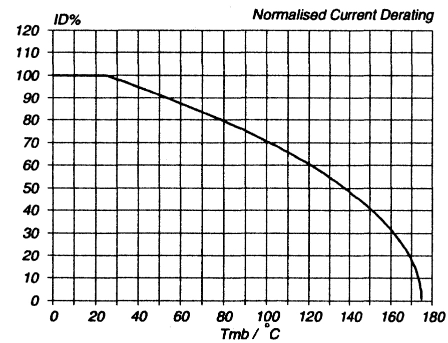


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

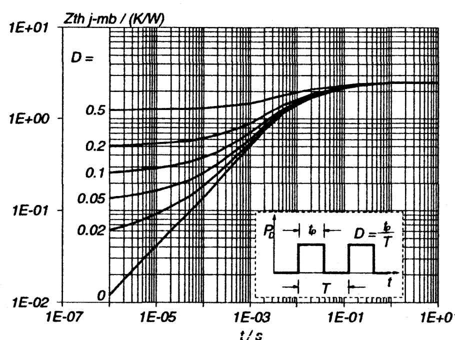


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

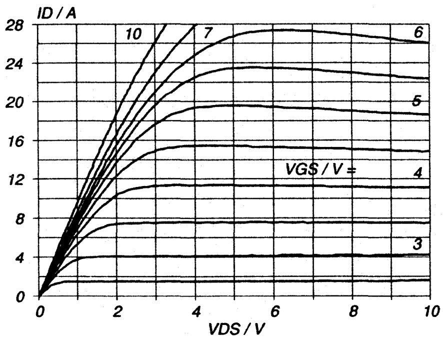


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

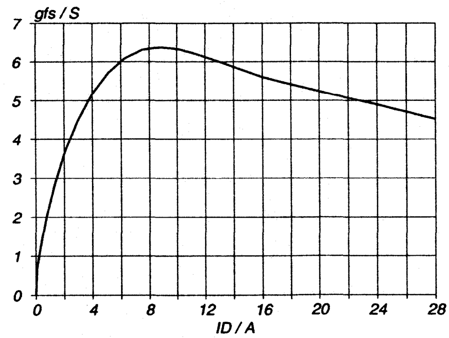


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

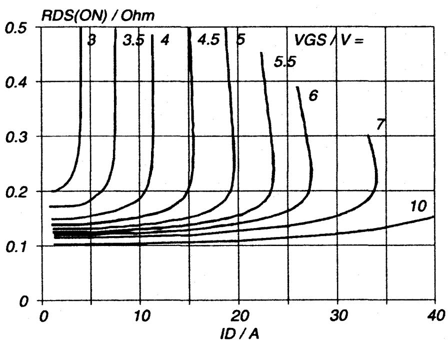


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

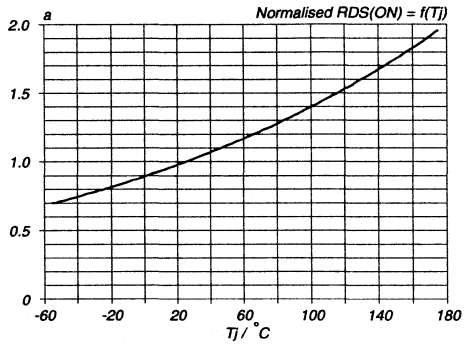


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 8.5$ A; $V_{GS} = 5$ V

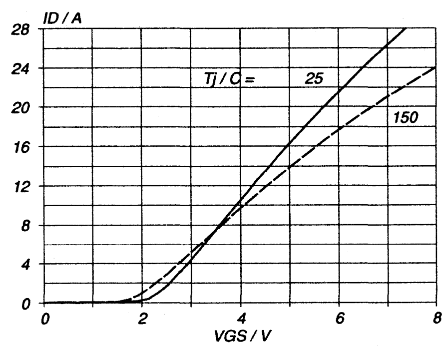


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

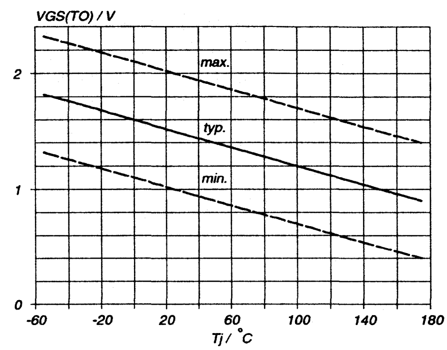


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor Logic level FET

BUK552-60A/B

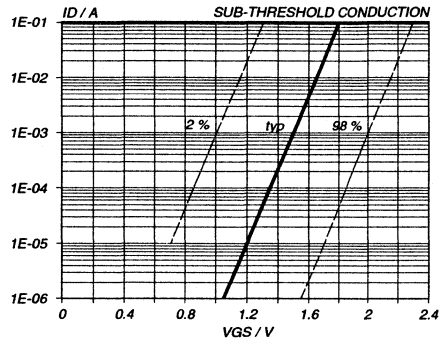


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

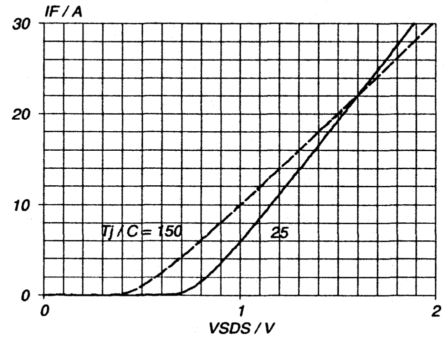


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

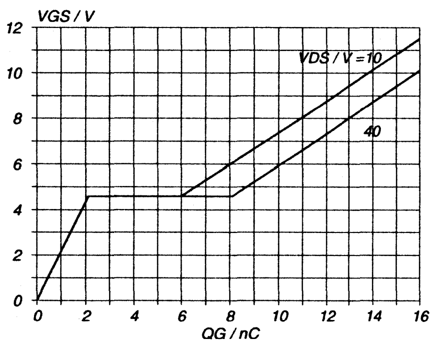


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

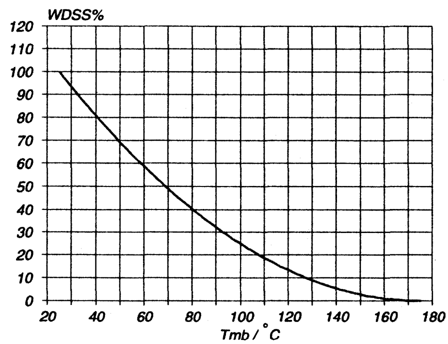


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 14$ A

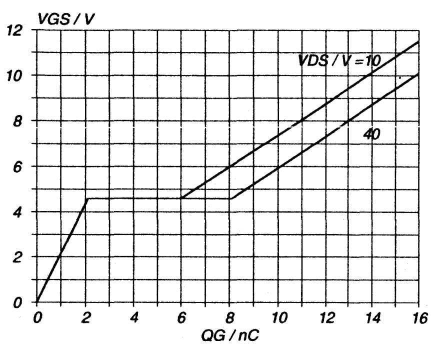


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

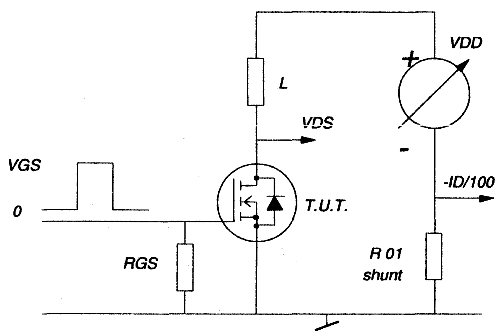


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK 552-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

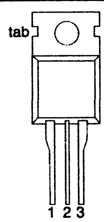
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK552	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	10	8.5	A
P_{tot}	Total power dissipation	60	60	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.28	0.35	Ω

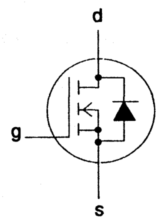
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	-100B	
I_D	Drain current (DC)	$T_{mb} = 25$ ˚C	-	10	8.5	A
I_D	Drain current (DC)	$T_{mb} = 100$ ˚C	-	7	6	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25$ ˚C	-	40	34	A
P_{tot}	Total power dissipation	$T_{mb} = 25$ ˚C	-	60		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j-mb}$ = 2.5 K/W $R_{th\ j-a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK552-100A**	-	0.25	0.28	Ω
		I_D = 5.5 A **BUK552-100B**	-	0.3	0.35	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5.5 A	4.5	6	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	600	pF
C_{oss}	Output capacitance		-	90	120	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	12	18	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	70	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	70	ns
t_f	Turn-off fall time		-	30	45	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	10	A
I_{DRM}	Pulsed reverse drain current	-	-	-	40	A
V_{SD}	Diode forward voltage	I_F = 10 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 10 A; $-dI_F/dt$ = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.35	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	30	mJ

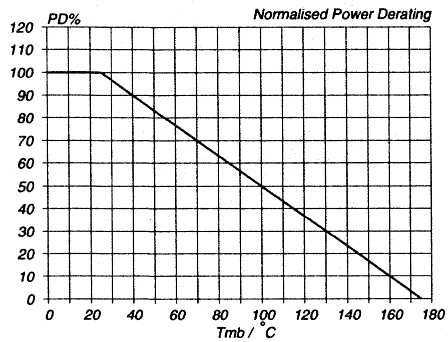


Fig.1. Normalised power dissipation.
PD% = $100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

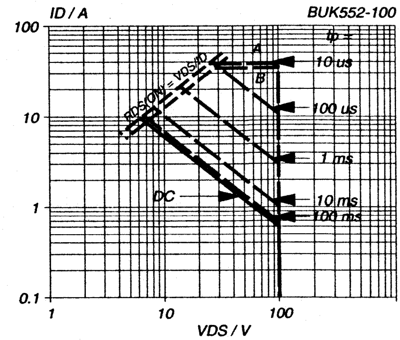


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

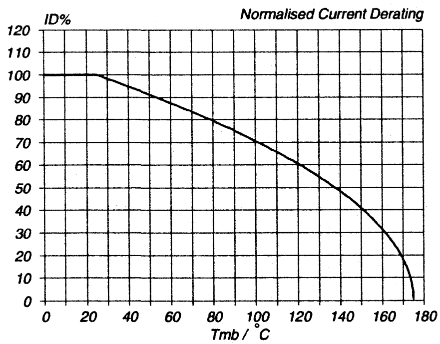


Fig.2. Normalised continuous drain current.
ID% = $100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

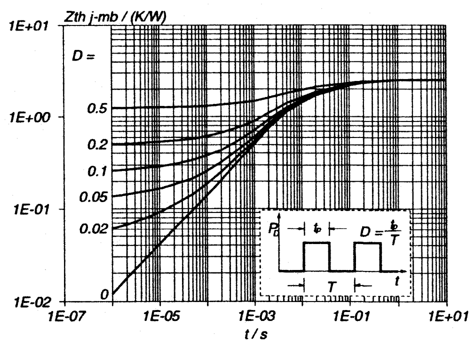


Fig.4. Transient thermal impedance.
$Z_{th\,j-mb} = f(t)$; parameter $D = t_p/T$

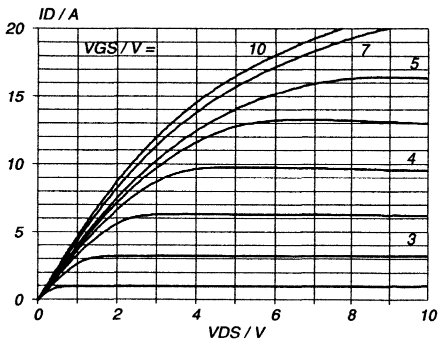


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

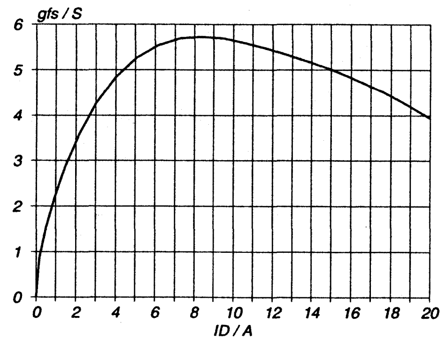


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

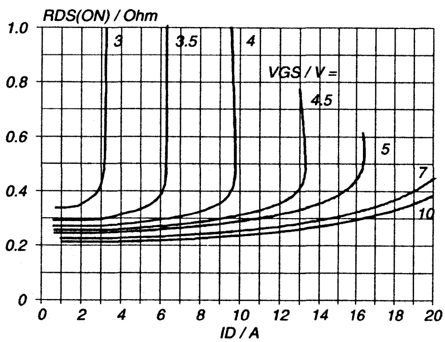


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

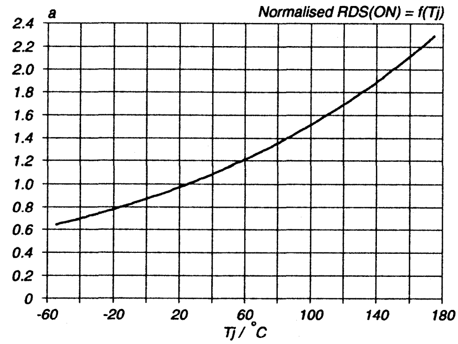


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 5.5$ A; $V_{GS} = 5$ V

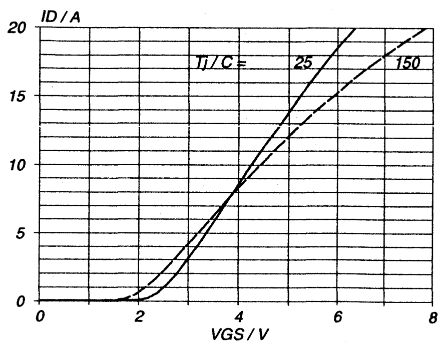


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

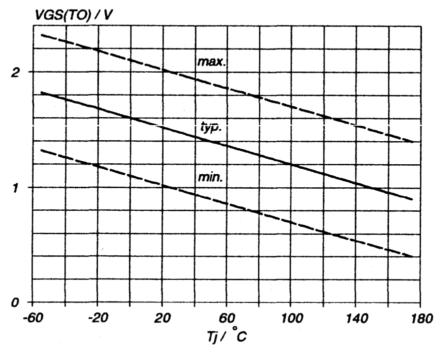


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor Logic level FET

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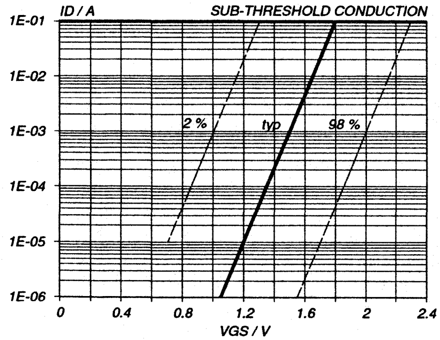


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

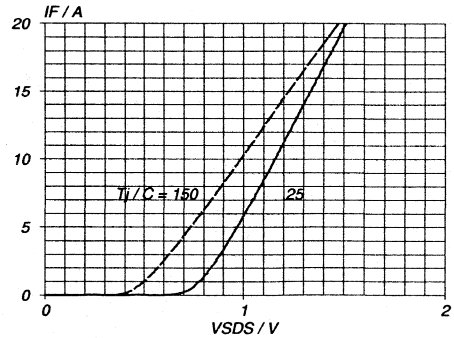


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

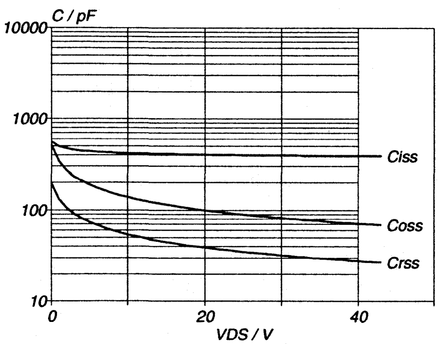


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

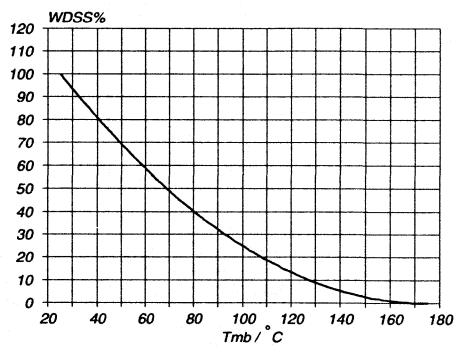


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 10$ A

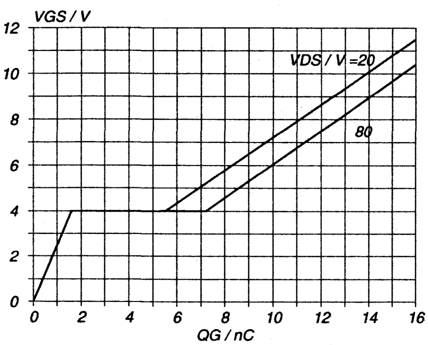


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 10$ A; parameter V_{DS}

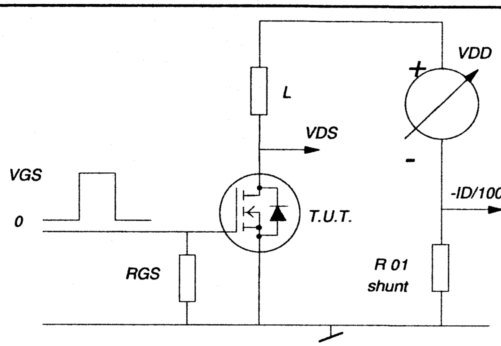


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK553-50A/B	

BUK553-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

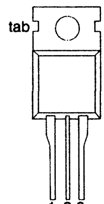
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK553	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	21	20	A
P_{tot}	Total power dissipation	75	75	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.085	0.10	Ω

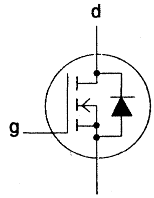
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	21	20	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	15	14	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	84	80	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 2 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 10 A **BUK553-60A**	-	0.075	0.085	Ω
		BUK553-60B	-	0.08	0.10	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	7	10	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	130	160	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	95	120	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	110	ns
t_f	Turn-off fall time		-	65	85	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	21	A
I_{DRM}	Pulsed reverse drain current	-	-	-	84	A
V_{SD}	Diode forward voltage	I_F = 21 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 21 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

PowerMOS transistor Logic level FET

BUK553-60A/B

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 20 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	45	mJ

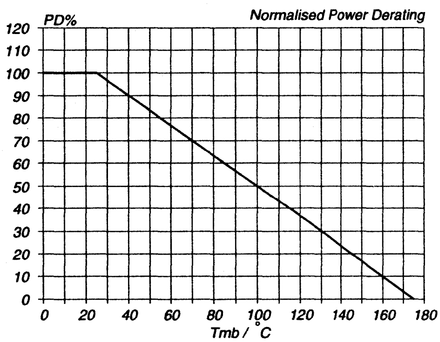


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

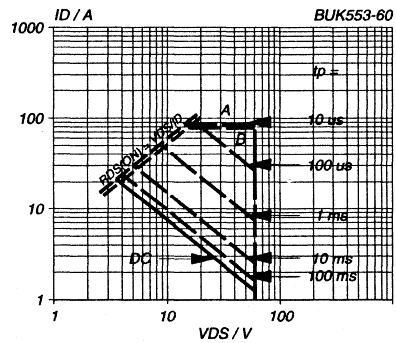


Fig.3. Safe operating area. T_{mb} = 25 ˚C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

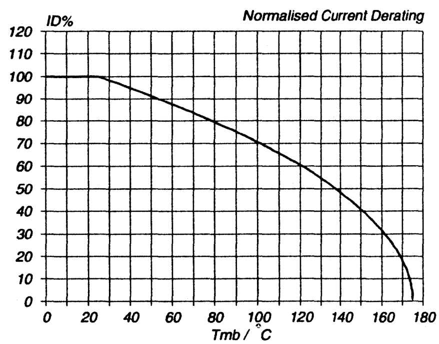


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

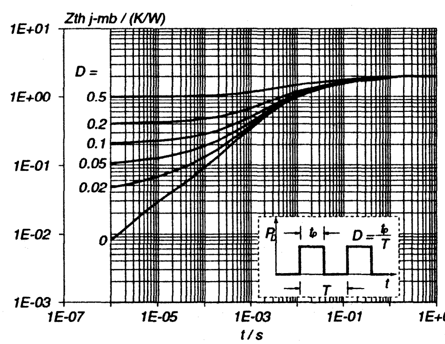


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

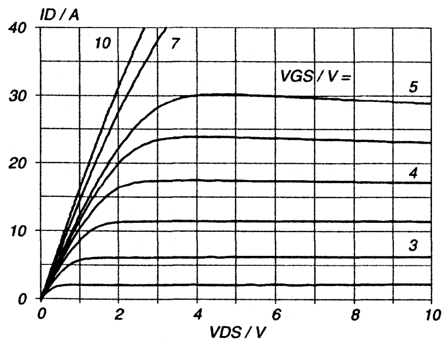


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

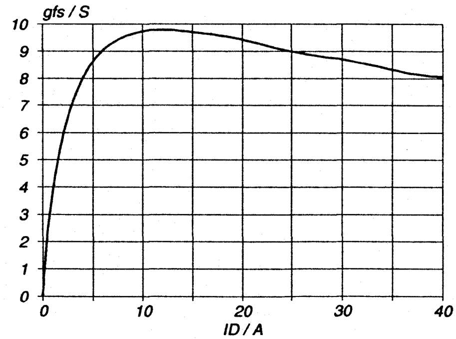


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

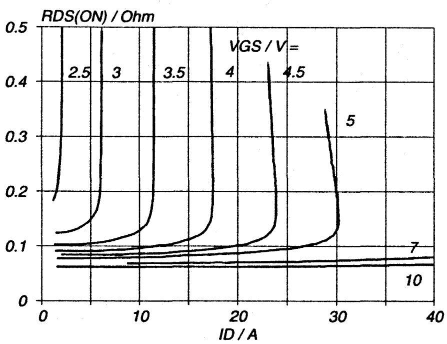


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

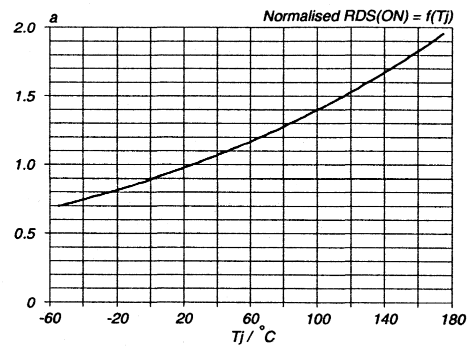


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; $I_D = 10$ A; $V_{GS} = 5$ V

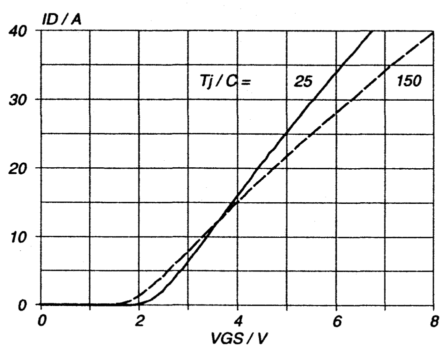


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

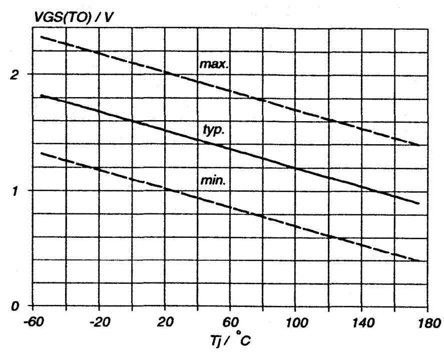


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

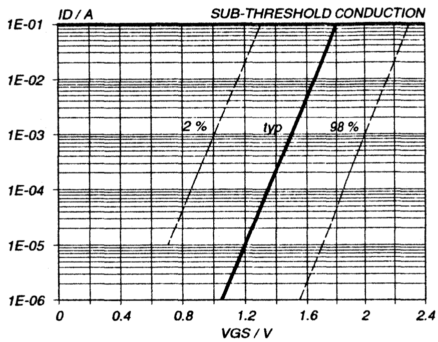


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

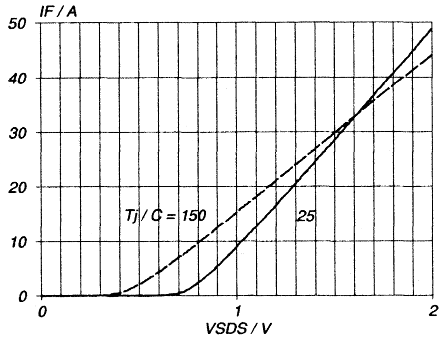


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

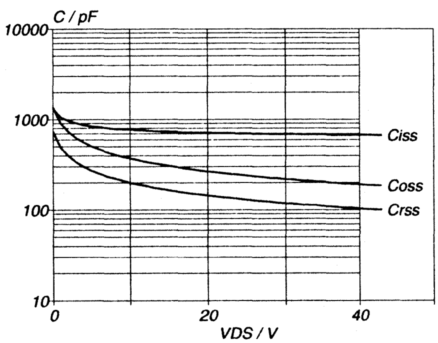


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

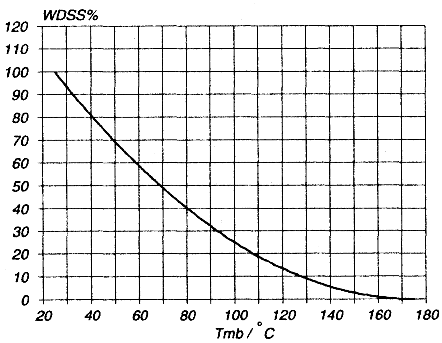


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 20$ A

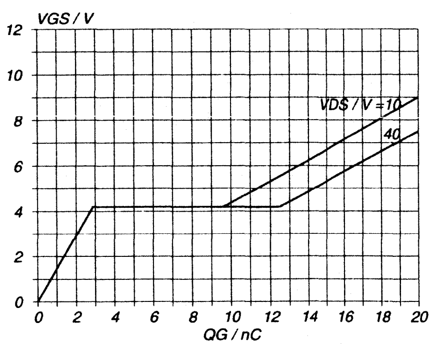


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 20$ A; parameter V_{DS}

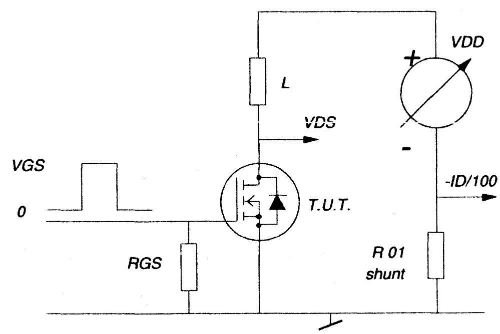


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK553-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

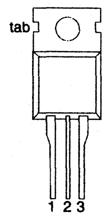
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK553	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	75	75	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.18	0.22	Ω

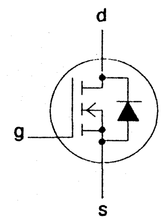
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	**-100B**	
I_D	Drain current (DC)	$T_{mb} = 25$ ˚C	-	13	12	A
I_D	Drain current (DC)	$T_{mb} = 100$ ˚C	-	9	8.5	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25$ ˚C	-	52	48	A
P_{tot}	Total power dissipation	$T_{mb} = 25$ ˚C	-	75		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

PowerMOS transistor Logic level FET

BUK553-100A/B

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 2 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK553-100A**	-	0.17	0.18	Ω
		I_D = 6.5 A **BUK553-100B**	-	0.20	0.22	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	6.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	620	825	pF
C_{oss}	Output capacitance		-	180	250	pF
C_{rss}	Feedback capacitance		-	90	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	90	115	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 13 A; $-dI_F/dt$ = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.6	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 13 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	70	mJ

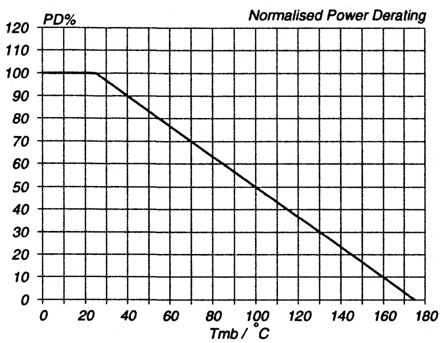


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

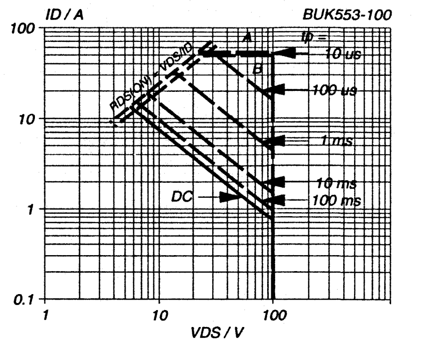


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

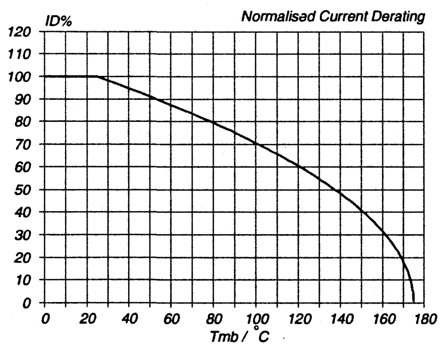


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

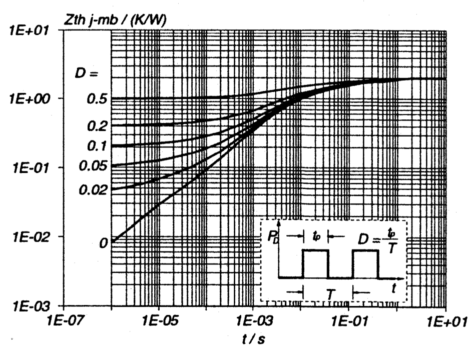


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

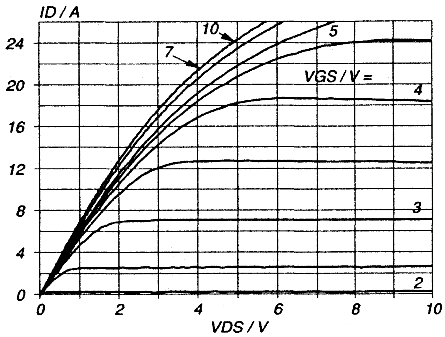


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

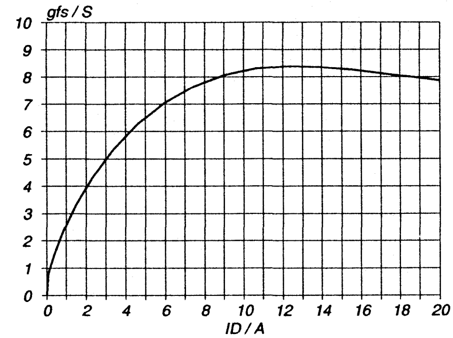


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

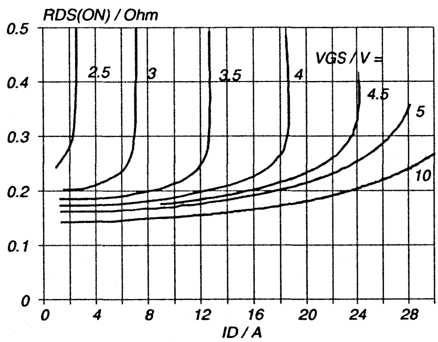


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

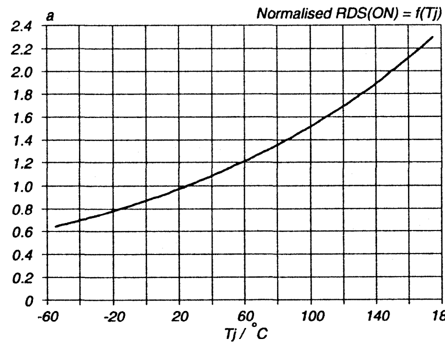


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 5$ V

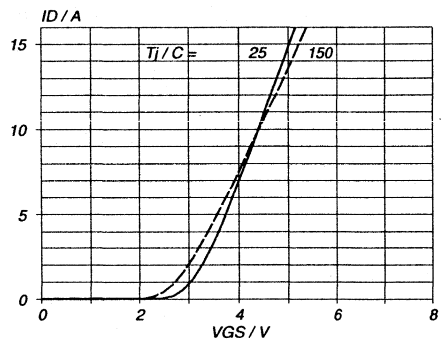


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

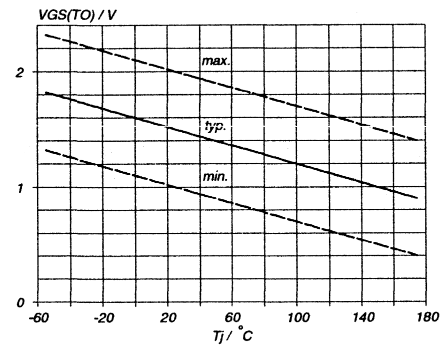


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

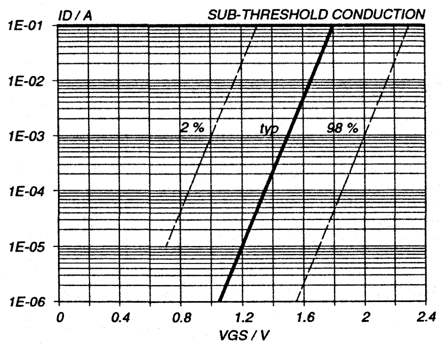


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

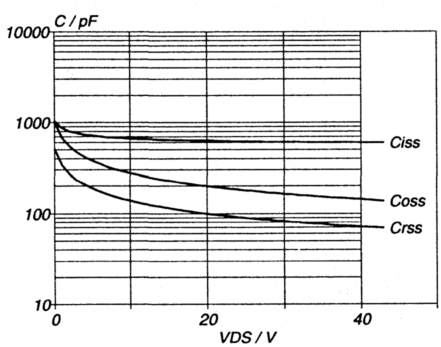


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

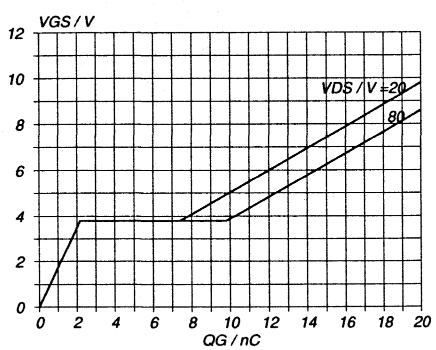


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 13$ A; parameter V_{DS}

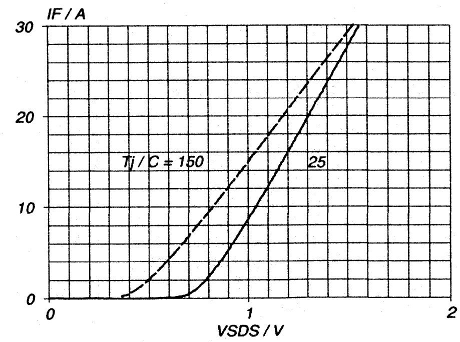


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

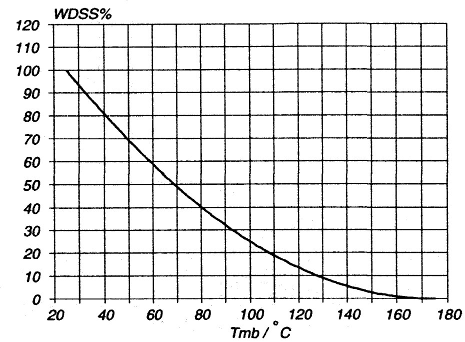


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 13$ A

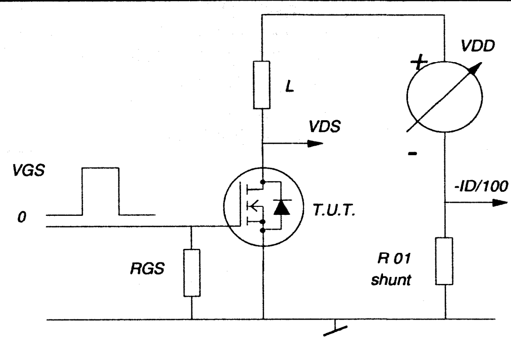


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK554-200A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

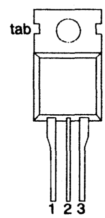
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK554	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	9.2	8.2	A
P_{tot}	Total power dissipation	90	90	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.4	0.5	Ω

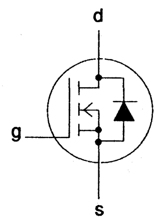
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-200A	**-200B**	
I_D	Drain current (DC)	$T_{mb} = 25$ ˚C	-	9.2	8.2	A
I_D	Drain current (DC)	$T_{mb} = 100$ ˚C	-	6.5	5.8	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25$ ˚C	-	36	33	A
P_{tot}	Total power dissipation	$T_{mb} = 25$ ˚C	-	90		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.67 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK554-200A**	-	0.35	0.4	Ω
		I_D = 3.5 A **BUK554-200B**	-	0.4	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	3.5	6.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	800	1000	pF
C_{oss}	Output capacitance		-	120	160	pF
C_{rss}	Feedback capacitance		-	65	90	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	16	30	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	75	110	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	120	180	ns
t_f	Turn-off fall time		-	50	75	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9.2	A
I_{DRM}	Pulsed reverse drain current	-	-	-	36	A
V_{SD}	Diode forward voltage	I_F = 9.2 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 9.2 A; $-dI_F/dt$ = 100 A/µs;	-	200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	0.6	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 9 A ; $V_{DD} \leq$ 100 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	50	mJ

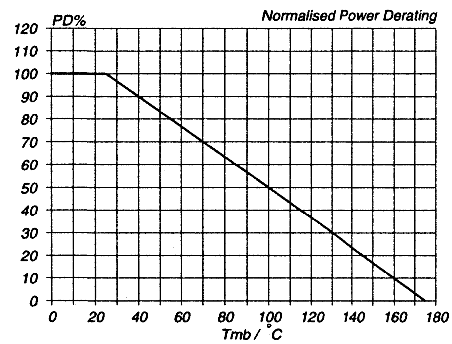


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

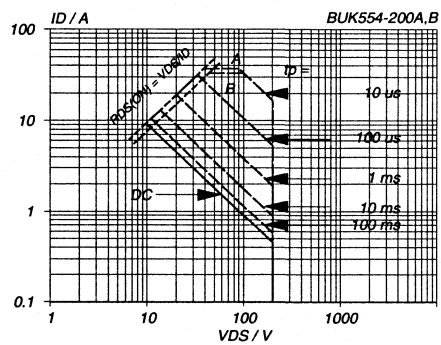


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

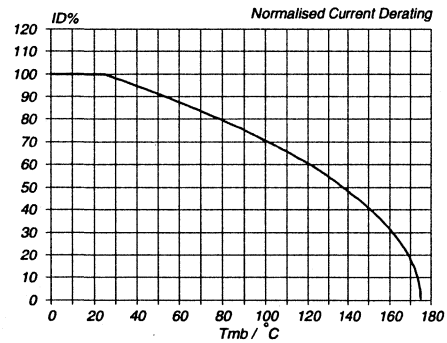


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

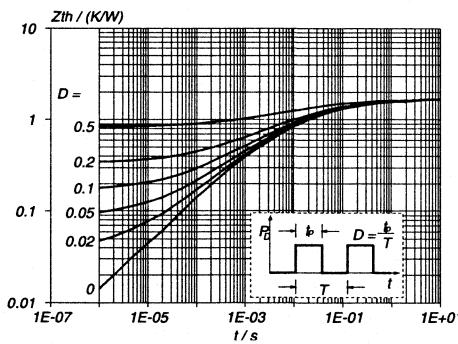


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK554-200A/B

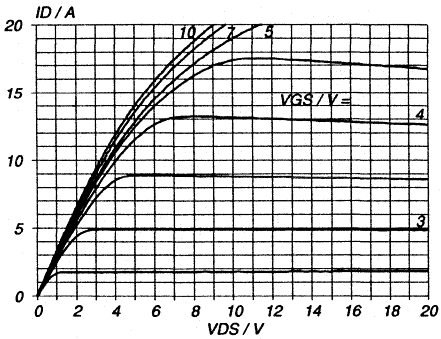


Fig.5. Typical output characteristics, $T_j = 25$ ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

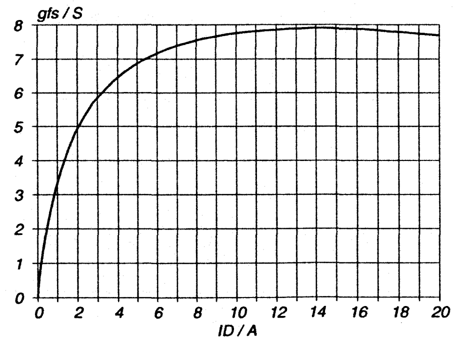


Fig.8. Typical transconductance, $T_j = 25$ ˚C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

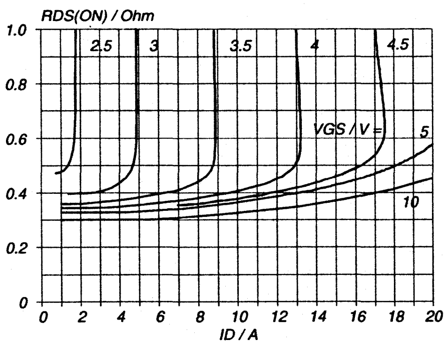


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

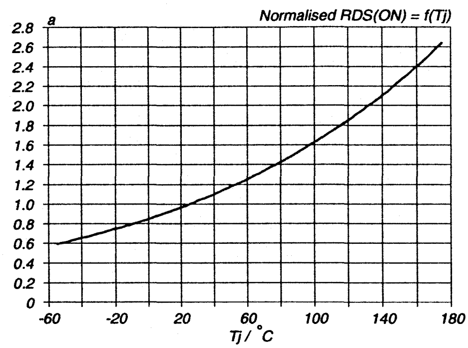


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 3.5$ A; $V_{GS} = 5$ V

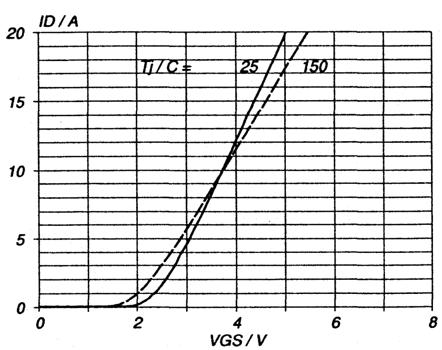


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

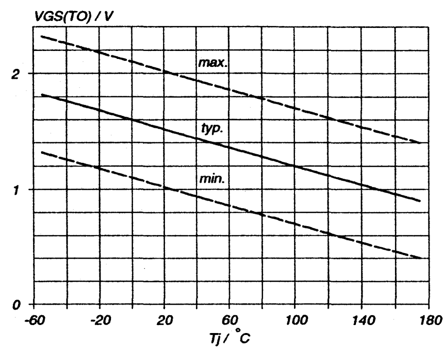


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

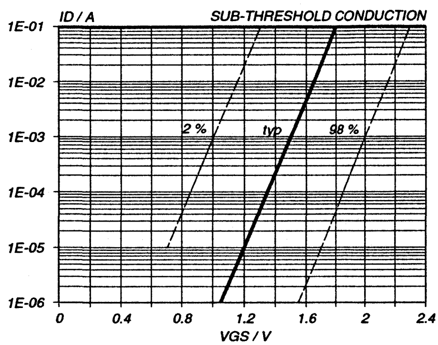


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

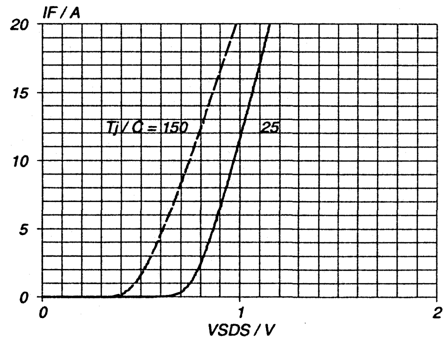


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

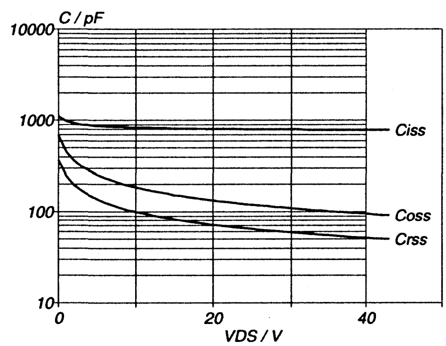


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

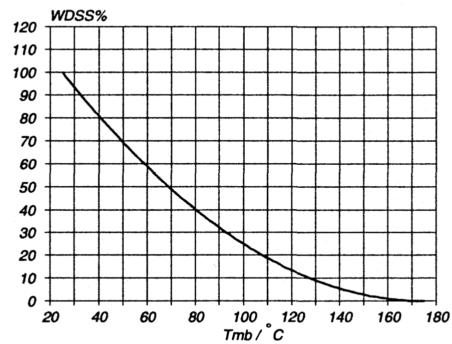


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 9$ A

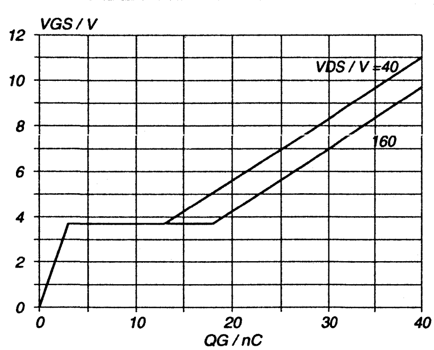


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 9.2$ A; parameter V_{DS}

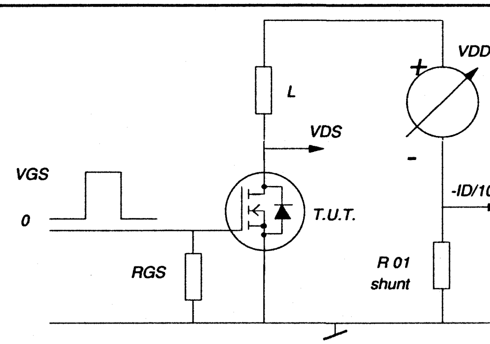


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991
Replaces BUK555-50A/B	

BUK555-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

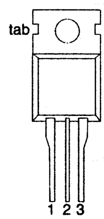
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK555	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	39	35	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.042	0.055	Ω

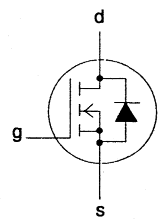
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	$T_{mb} =$ 25 ˚C	-	39	35	A
I_D	Drain current (DC)	$T_{mb} =$ 100 ˚C	-	28	25	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} =$ 25 ˚C	-	156	140	A
P_{tot}	Total power dissipation	$T_{mb} =$ 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.2 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK555-60A**	-	0.035	0.042	Ω
		I_D = 20 A **BUK555-60B**	-	0.045	0.055	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	11	20	-	S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Feedback capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	- - -	1450 500 220	1750 600 275	pF pF pF
$t_{d\ on}$ t_r $t_{d\ off}$ t_f	Turn-on delay time Turn-on rise time Turn-off delay time Turn-off fall time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 5 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	- - - -	25 120 160 110	40 150 220 145	ns ns ns ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	39	A
I_{DRM}	Pulsed reverse drain current	-	-	-	156	A
V_{SD}	Diode forward voltage	I_F = 39 A ; V_{GS} = 0 V	-	1.4	2.0	V
t_{rr} Q_{rr}	Reverse recovery time Reverse recovery charge	I_F = 39 A; -dI_F/dt = 100 A/µs; V_{GS} = 0 V; V_R = 30 V	- -	60 0.30	- -	ns µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 39 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	90	mJ

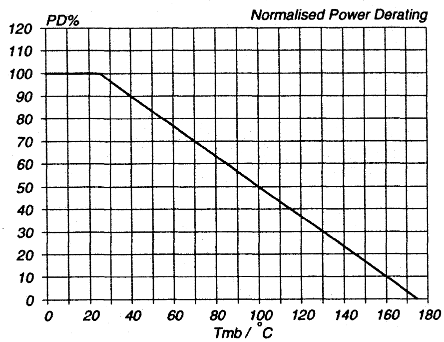


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

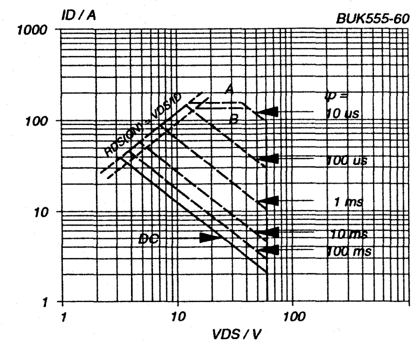


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

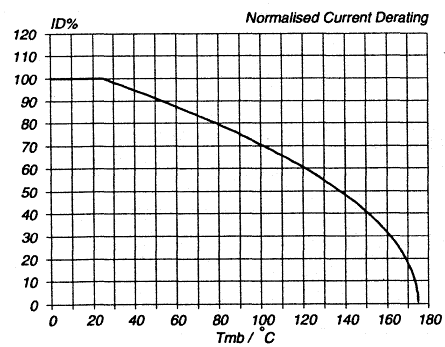


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

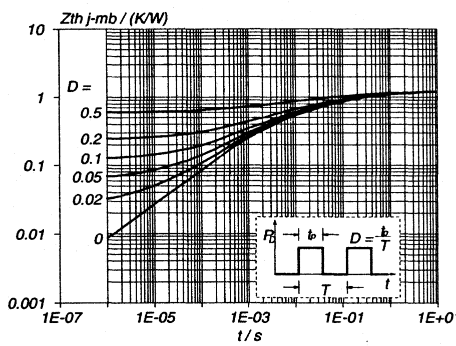


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK555-60A/B

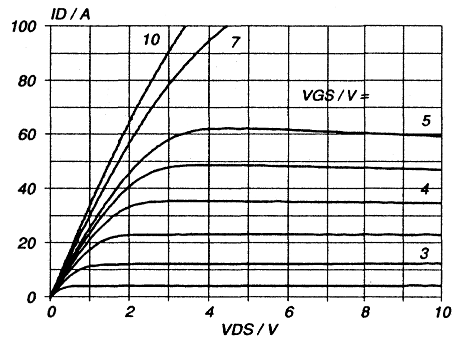


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

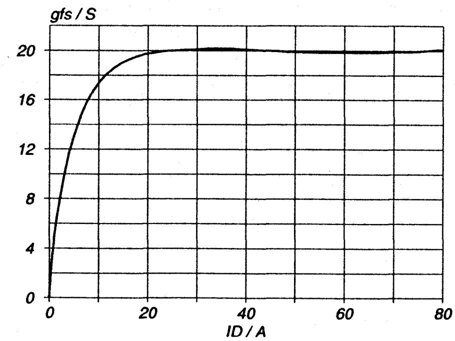


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

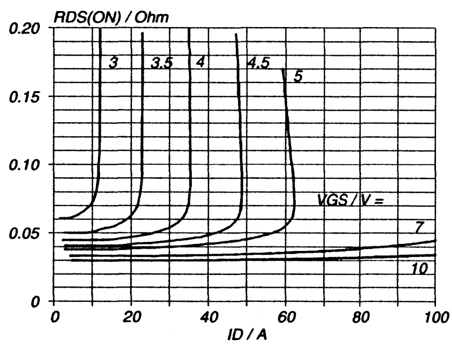


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

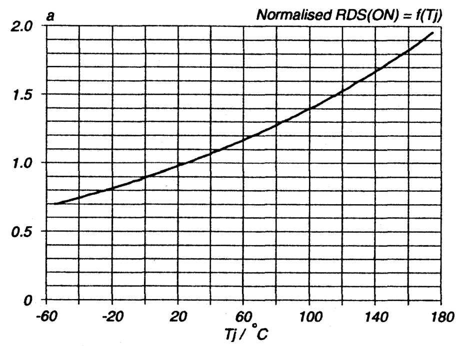


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 20$ A; $V_{GS} = 5$ V

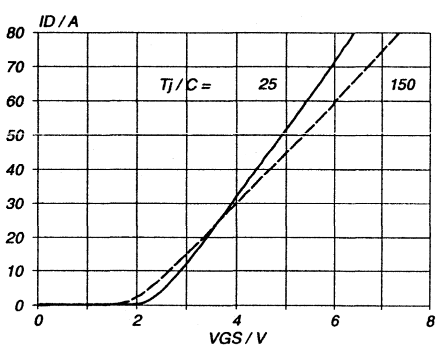


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

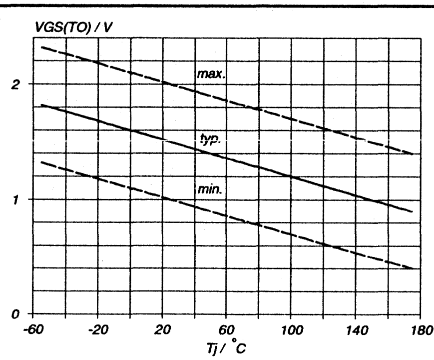


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

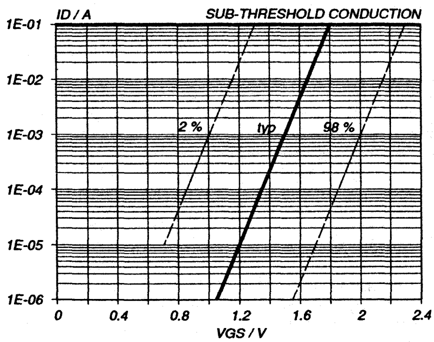


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

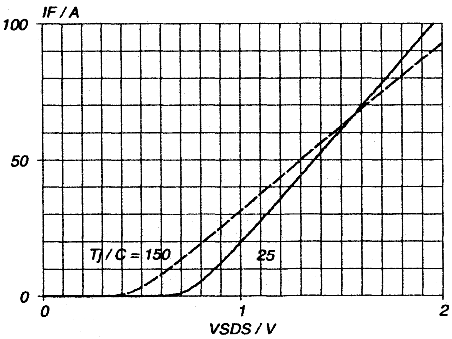


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

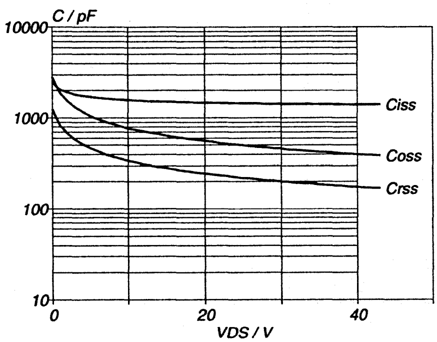


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

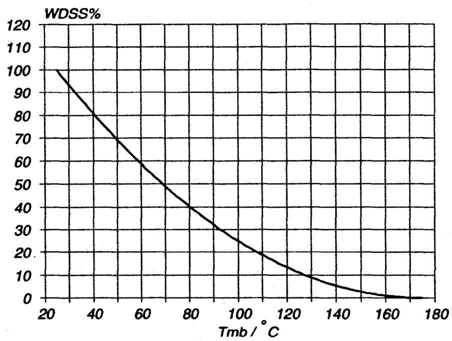


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 39$ A

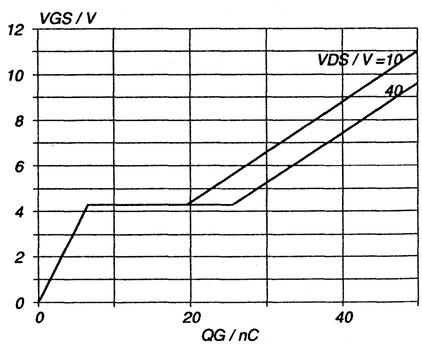


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 39$ A; parameter V_{DS}

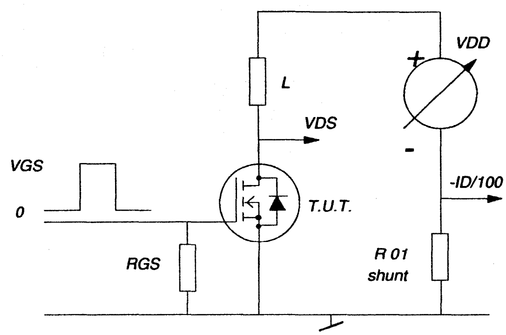


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK555-100A/B
PowerMOS transistor Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

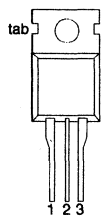
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK555	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	25	22	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.085	0.11	Ω

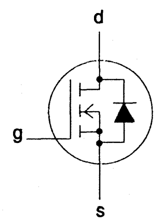
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	**-100B**	
I_D	Drain current (DC)	$T_{mb} = 25$ ˚C	-	25	22	A
I_D	Drain current (DC)	$T_{mb} = 100$ ˚C	-	18	15	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25$ ˚C	-	100	88	A
P_{tot}	Total power dissipation	$T_{mb} = 25$ ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 1.2 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK555-100A**	-	0.075	0.085	Ω
		I_D = 13 A **BUK555-100B**	-	0.09	0.11	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 13 A	10	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1450	1750	pF
C_{oss}	Output capacitance		-	280	350	pF
C_{rss}	Feedback capacitance		-	100	150	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	65	85	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	135	180	ns
t_f	Turn-off fall time		-	80	110	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	25	A
I_{DRM}	Pulsed reverse drain current	-	-	-	100	A
V_{SD}	Diode forward voltage	I_F = 25 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 25 A; $-dI_F/dt$ = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.8	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 25 A ; $V_{DD} \le$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	140	mJ

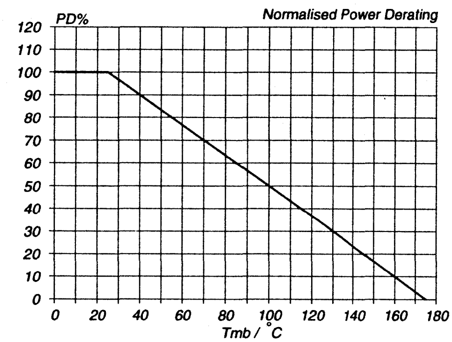


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

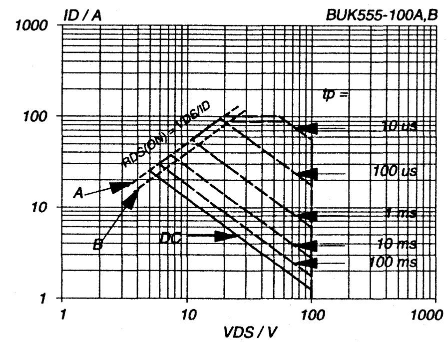


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

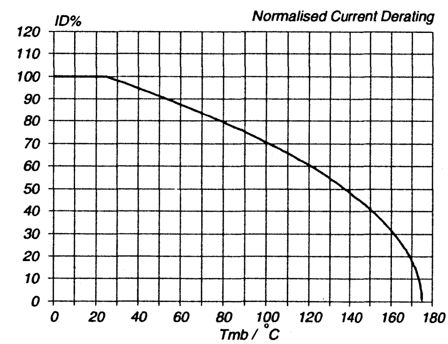


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \ge 5$ V

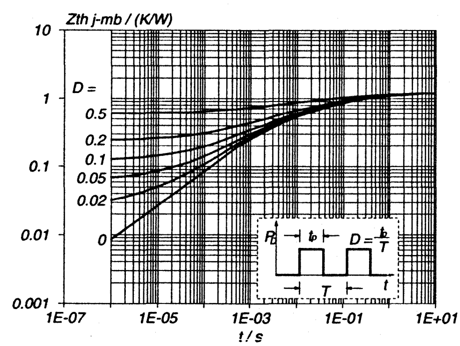


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

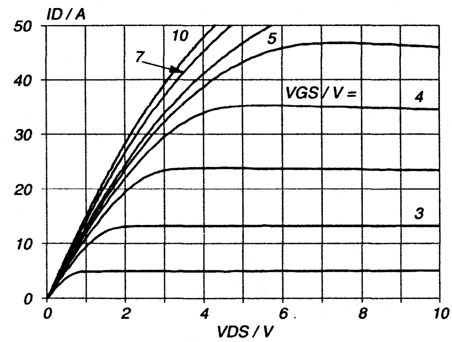


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

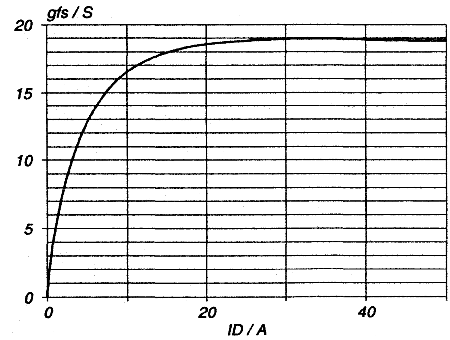


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

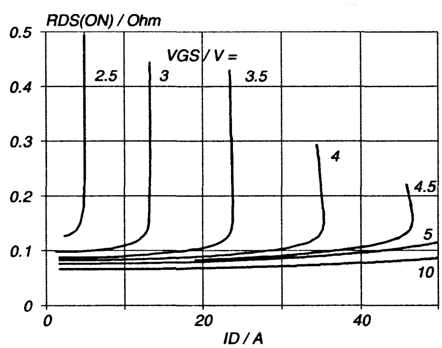


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

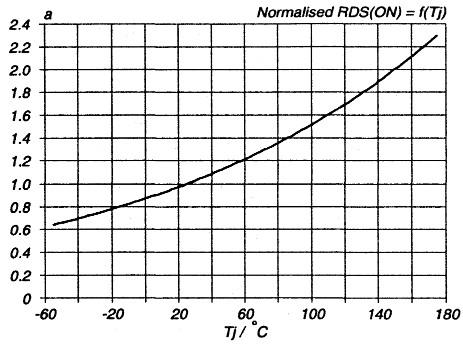


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 13$ A; $V_{GS} = 5$ V

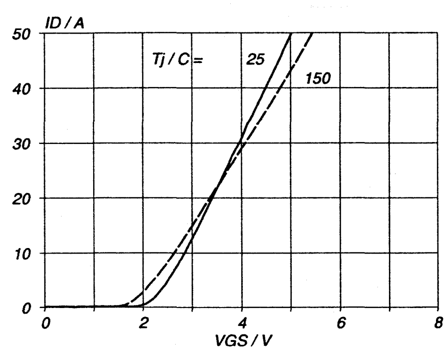


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

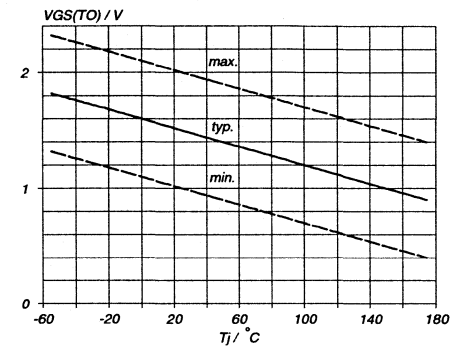


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

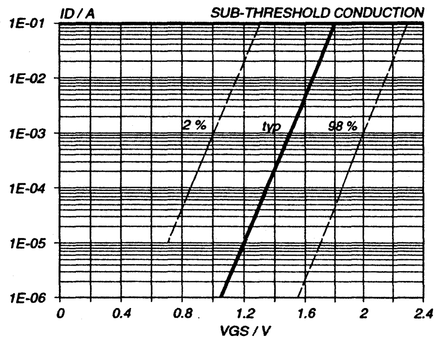


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

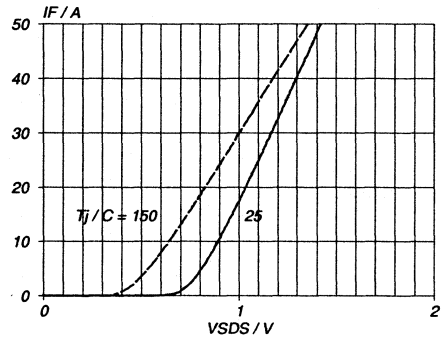


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

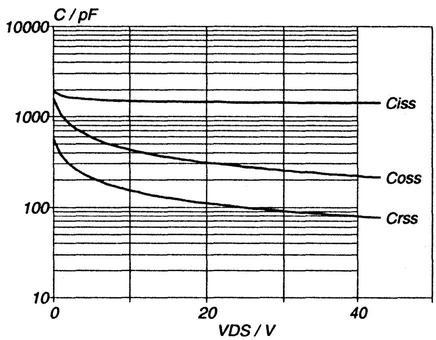


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

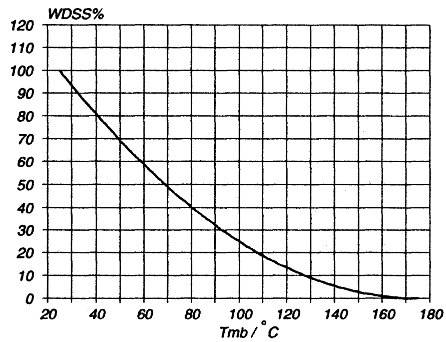


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 25$ A

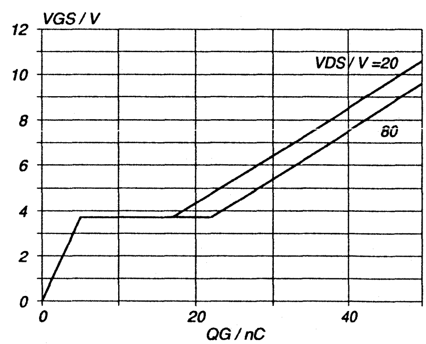


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 25$ A; parameter V_{DS}

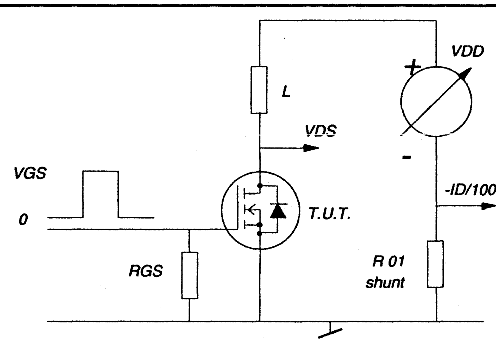


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK555-200A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

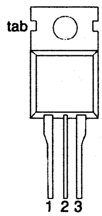
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK555	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	14	13	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.23	0.28	Ω

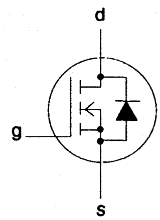
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-200A	**-200B**	
I_D	Drain current (DC)	$T_{mb} = 25$ ˚C	-	14	13	A
I_D	Drain current (DC)	$T_{mb} = 100$ ˚C	-	10	9.2	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25$ ˚C	-	56	52	A
P_{tot}	Total power dissipation	$T_{mb} = 25$ ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.2 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK555-200A**	-	0.2	0.23	Ω
		I_D = 7 A **BUK555-200B**	-	0.24	0.28	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7 A	8.0	15	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1600	2000	pF
C_{oss}	Output capacitance		-	180	250	pF
C_{rss}	Feedback capacitance		-	55	80	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	75	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	140	180	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 14 A; -dI_F/dt = 100 A/µs;	-	200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 100 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	100	mJ

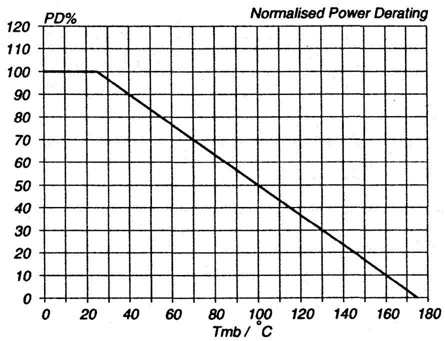


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$

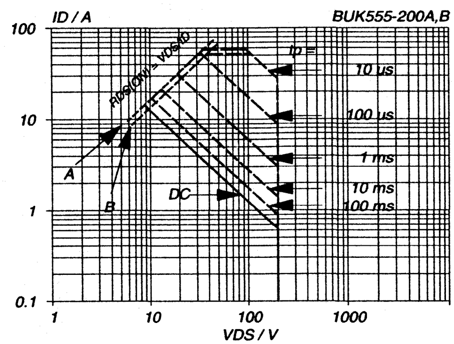


Fig.3. Safe operating area. T_{mb} = 25 °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

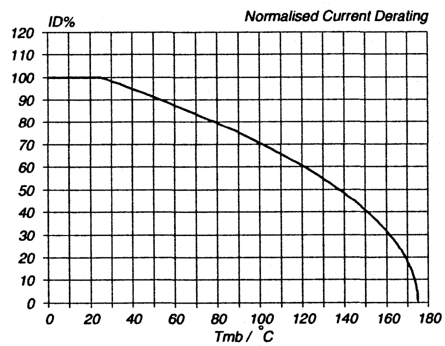


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

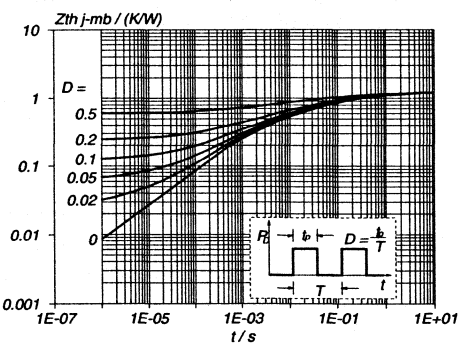


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK555-200A/B

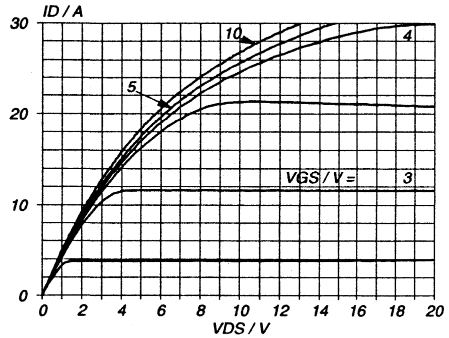


Fig.5. Typical output characteristics, $T_j = 25$ ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

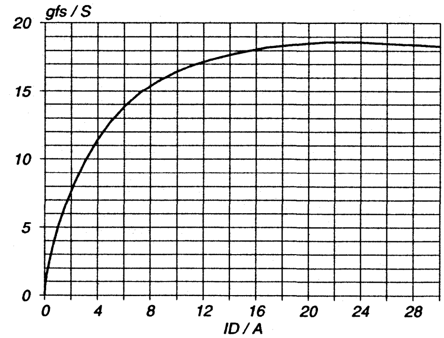


Fig.8. Typical transconductance, $T_j = 25$ ˚C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

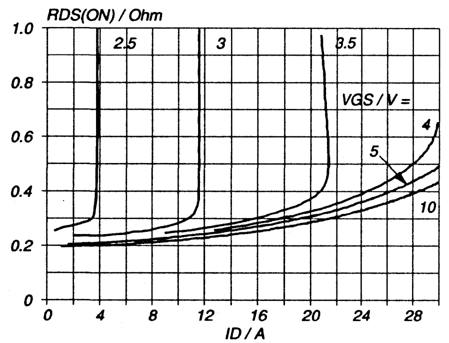


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

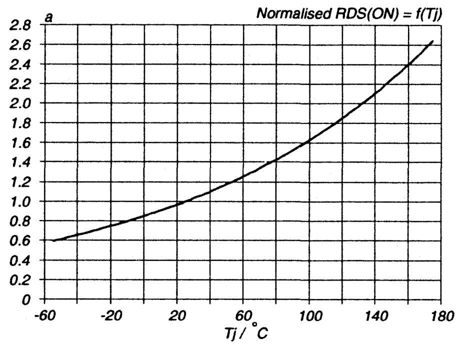


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 7$ A; $V_{GS} = 5$ V

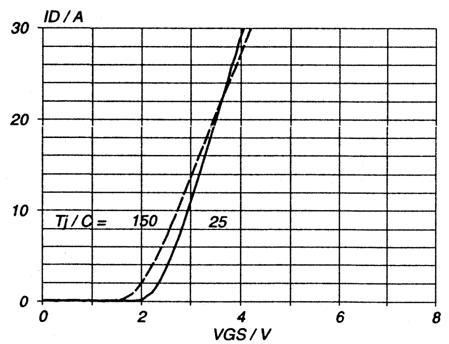


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

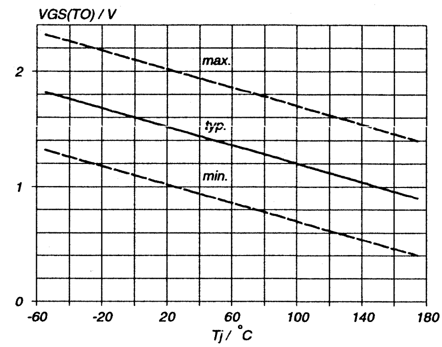


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

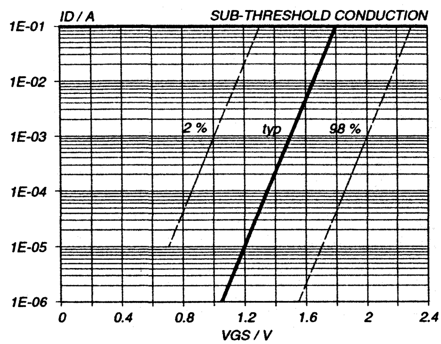


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

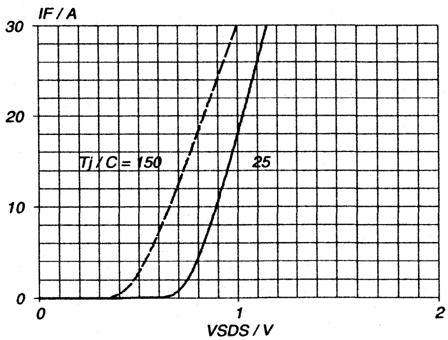


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

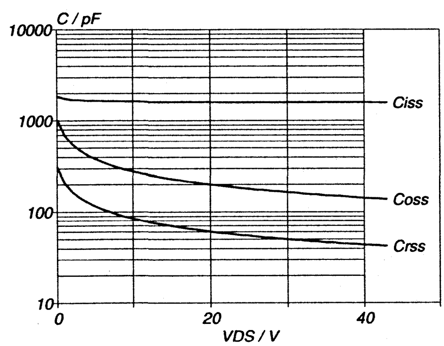


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

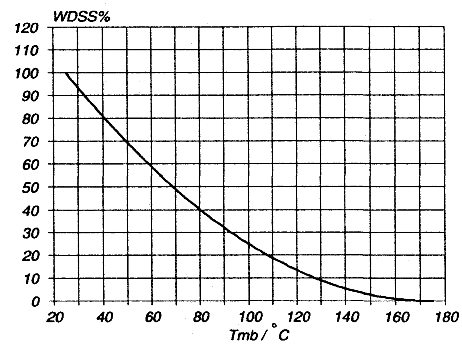


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 14$ A

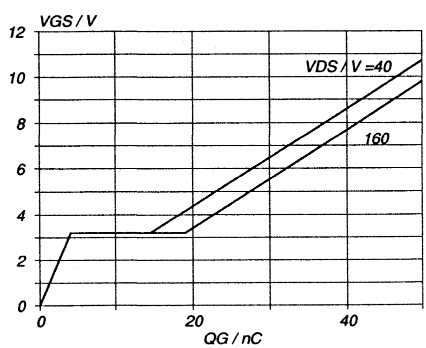


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

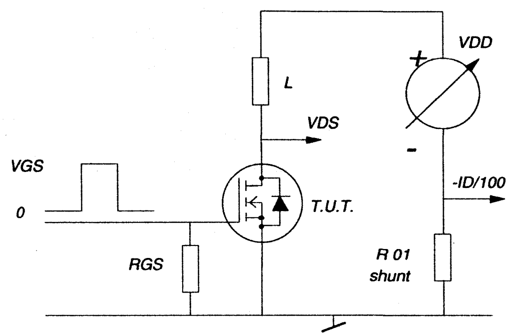


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK617-500AE/BE
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in ISOTOP envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations where faster recovery characteristics simplify design for inductive loads.

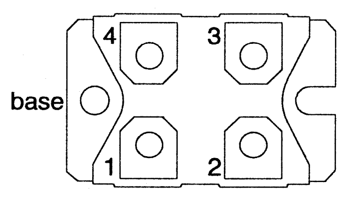
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK617	-500AE	-500BE	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	29	27	A
P_{tot}	Total power dissipation	310	310	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.15	0.18	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

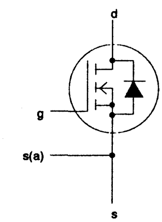
PINNING - SOT227B

PIN	DESCRIPTION
1	source
2	gate
3	drain
4	ancillary source
base	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500AE	-500BE	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	29	27	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	19	17	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	116	108	A
$I_{S(A)M}$	Ancillary Source current (pulse peak value)		-	5.0		A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	310		W
T_{stg}	Storage temperature	-	- 40	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From mounting base to heatsink	with heatsink compound	$R_{th\,j-mb}$ = 0.40 K/W $R_{th\,mb-hs}$ = 0.05 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.0 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	20	200	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.5	5.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	200	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK617-500AE**	-	0.13	0.15	Ω
		I_D = 16 A **BUK617-500BE**	-	0.15	0.18	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 16 A	15.0	30.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	7.5	9.0	nF
C_{oss}	Output capacitance		-	0.85	1.35	nF
C_{rss}	Feedback capacitance		-	0.35	0.60	nF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	80	120	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	200	250	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	1100	1350	ns
t_f	Turn-off fall time	Resistive Load	-	250	350	ns
$t_{d\,on}$	Turn-on delay time	V_{DD} = 250 V; I_D = 29 A;	-	40	80	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{gen} = 3.3 Ω;	-	70	100	ns
$t_{d\,off}$	Turn-off delay time	Resistive Load	-	300	350	ns
t_f	Turn-off fall time		-	100	150	ns
L_d	Internal drain inductance	Measured from contact screw on terminal 3 to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from contact screw on terminal 1 to source bond pad	-	5	-	nH

ISOLATION

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	R.M.S. voltage from terminals to mounting base	Sinusoidal voltage waveform; f = 50 - 60 Hz	-	-	2500	V
C_{isol}	Capacitance from T3 to mounting base	f = 1 MHz	-	45	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	29	A
I_{DRM}	Pulsed reverse drain current	-		-	-	116	A
V_{SD}	Diode forward voltage	I_F = 29 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 29 A;	T_j = 25 ˚C	-	200	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	300	400	ns
Q_{rr}	Reverse recovery charge	200 A/μs;	T_j = 25 ˚C	-	2.0	4.0	μC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	7.0	10.0	μC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	35	45	A

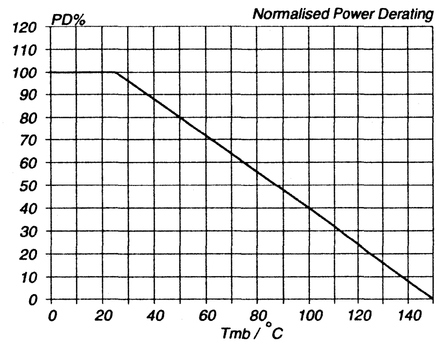


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\ 25\ ˚C}$ = f(T_{mb})

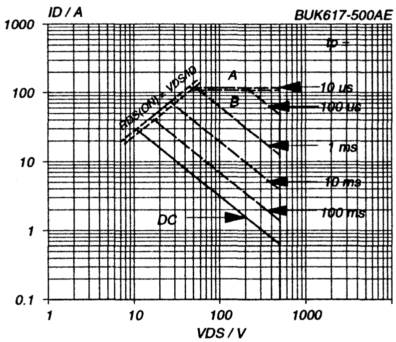


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

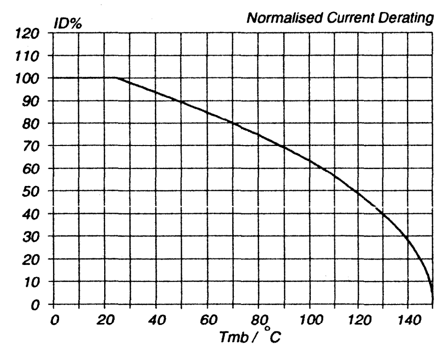


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\ 25\ ˚C}$ = f(T_{mb}); conditions: $V_{GS} \geq$ 10 V

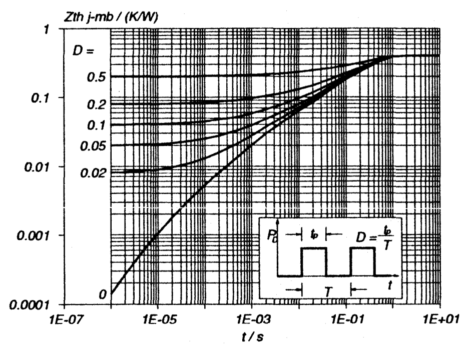


Fig.4. Transient thermal impedance.
$Z_{th\ j-mb}$ = f(t); parameter D = t_p/T

PowerMOS transistor
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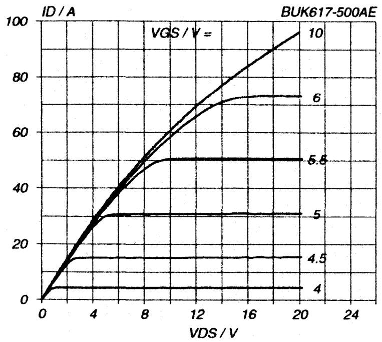


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

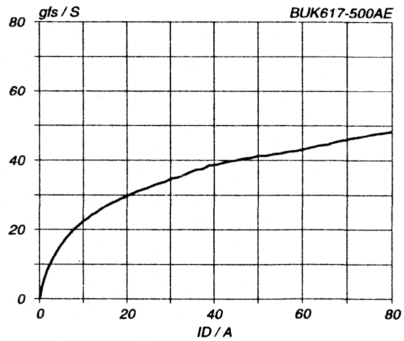


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

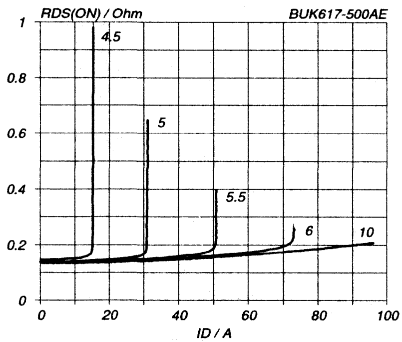


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

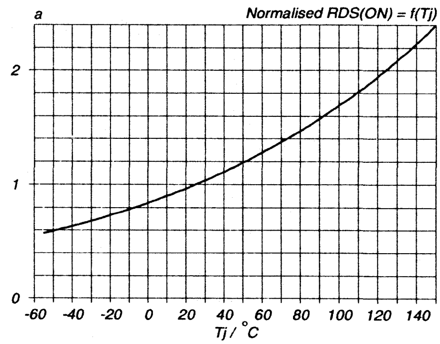


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 16$ A; $V_{GS} = 10$ V

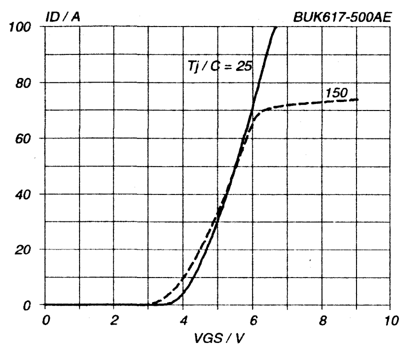


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

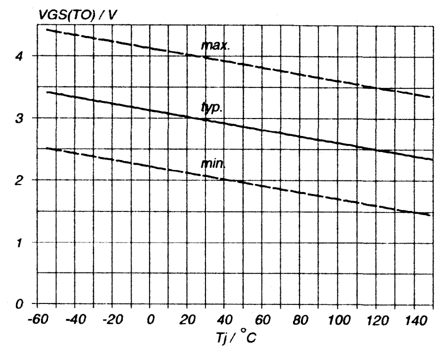


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

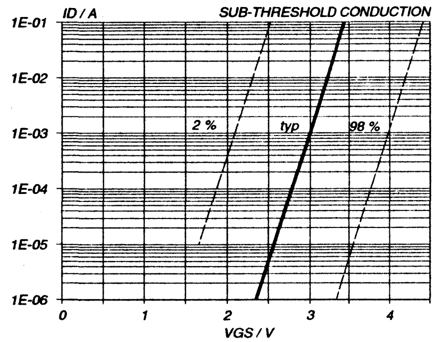


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

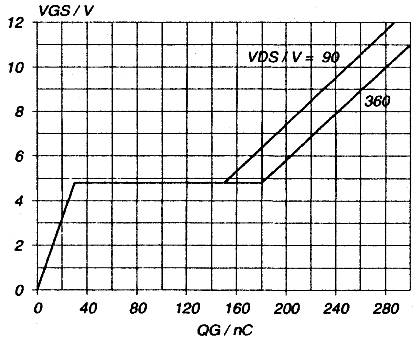


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 29$ A; parameter V_{DS}

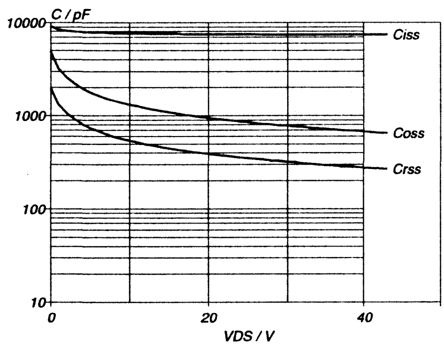


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

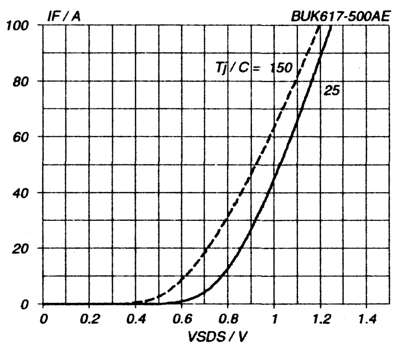


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK627-500A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full pack envelope. FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

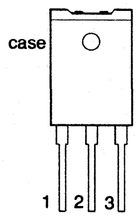
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK627	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	5.6	4.8	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.65	0.8	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

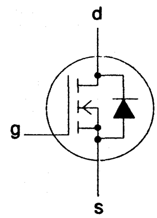
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	5.6	4.8	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	3.5	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	22	19.2	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 2.8 K/W
From junction to ambient	-	$R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK627-500A**	-	0.6	0.65	Ω
		BUK627-500B	-	0.7	0.8	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	5.6	A
I_{DRM}	Pulsed reverse drain current	-		-	-	22	A
V_{SD}	Diode forward voltage	I_F = 5.6 A;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.6 A;	T_j = 25 ˚C	-	180	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	220	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	0.65	1.2	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	2.6	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	15	-	A

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; $V_{DD} \leq$ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	500	mJ

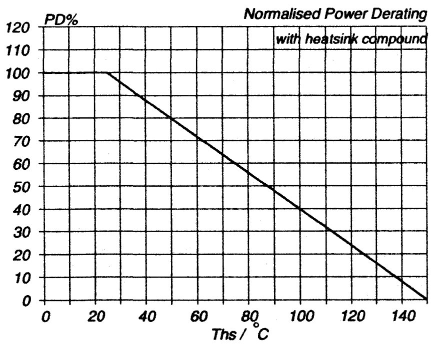


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{hs})$

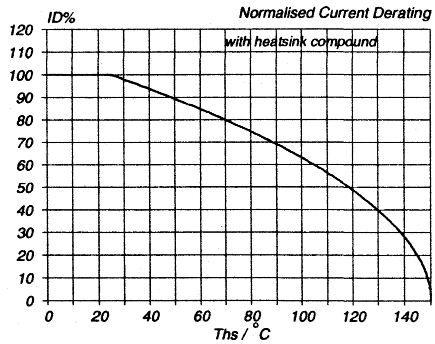


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

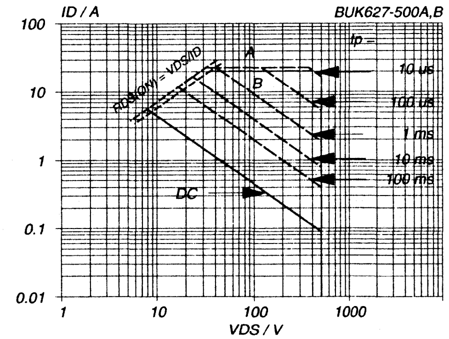


Fig.3. Safe operating area. $T_{hs} = 25$ ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

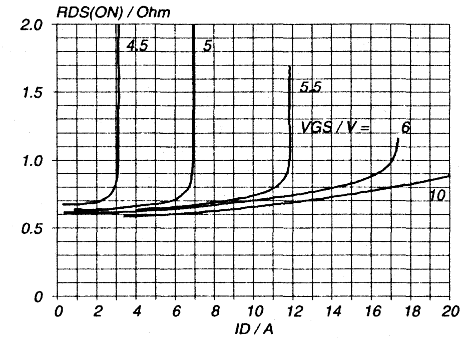


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

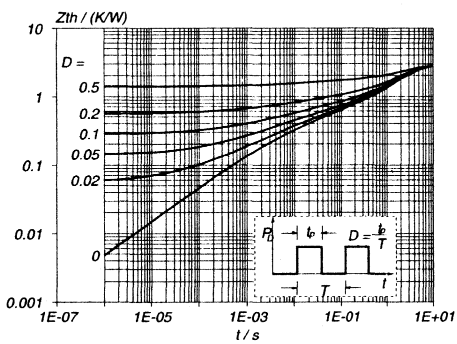


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

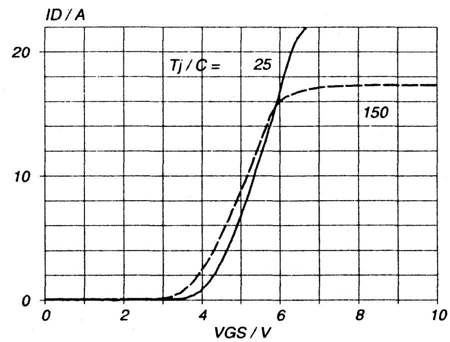


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

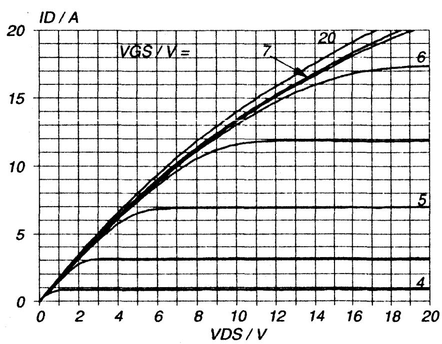


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

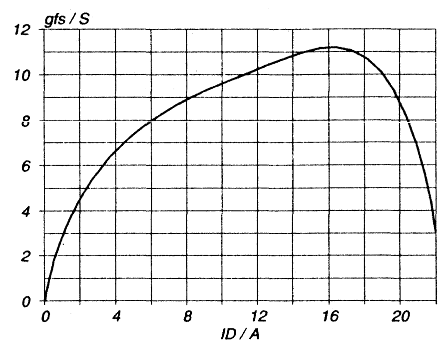


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

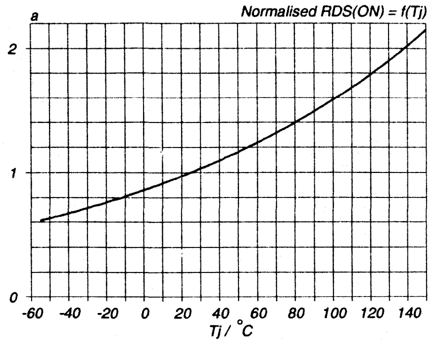


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

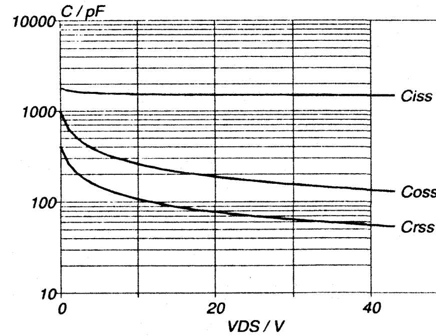


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

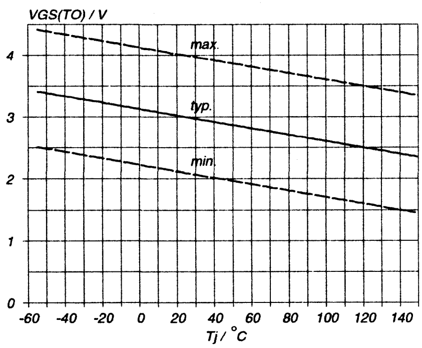


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

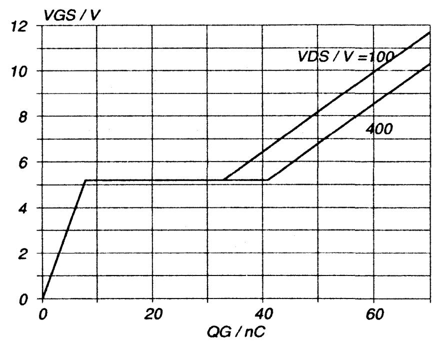


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

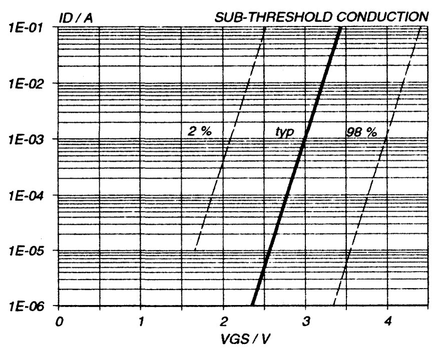


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

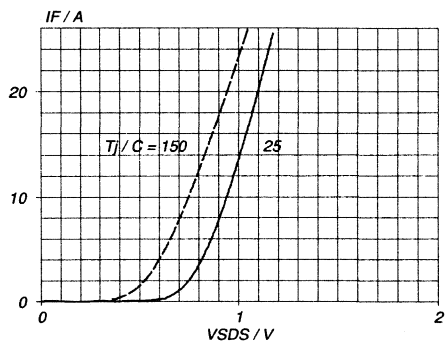


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

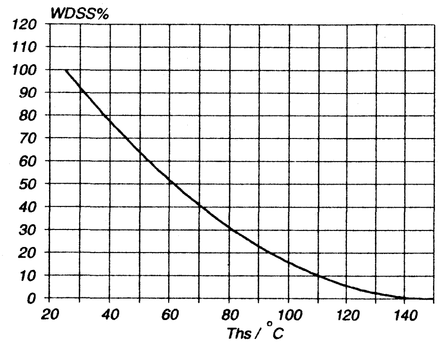


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 10$ A

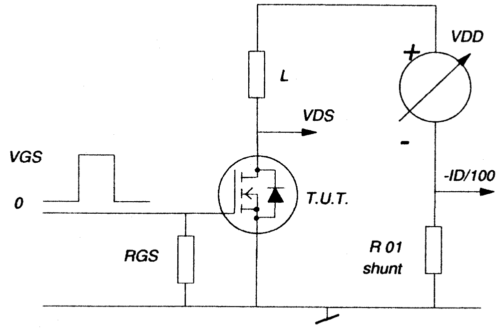


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK637-400A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

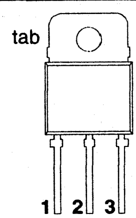
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK637	**-400A**	**-400B**	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	14	12	A
P_{tot}	Total power dissipation	180	180	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.5	0.6	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

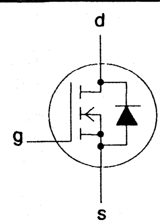
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	**-400B**	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	14	12	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	8.8	7.6	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	56	48	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	180		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 0.69 K/W $R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK637-400A**	-	0.4	0.5	Ω
		BUK637-400B	-	0.5	0.6	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	14	A
I_{DRM}	Pulsed reverse drain current	-		-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 14 A;	T_j = 25 ˚C	-	180	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	220	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	0.65	1.2	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	2.6	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	15	-	A

PowerMOS transistor
Fast recovery diode FET

BUK637-400A/B

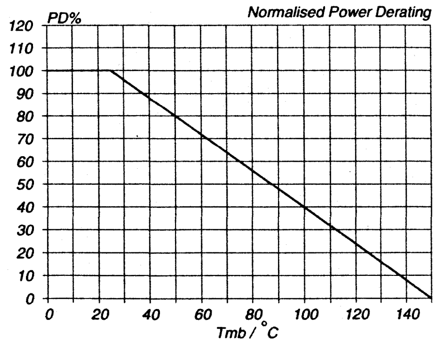


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

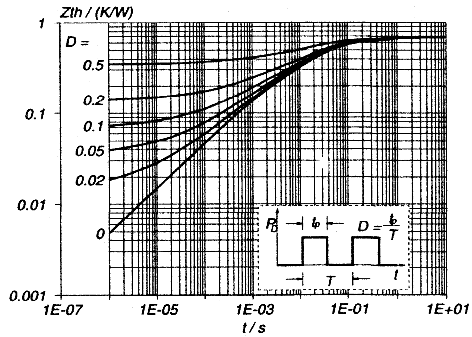


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

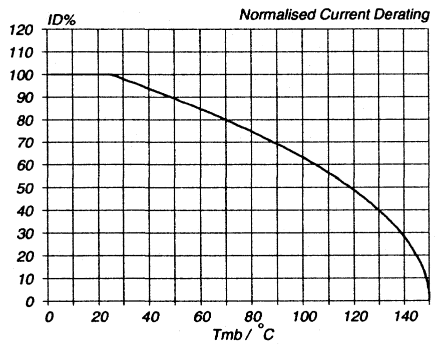


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

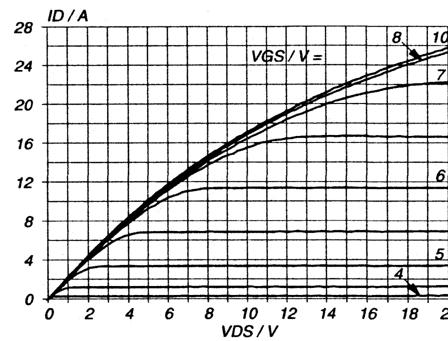


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

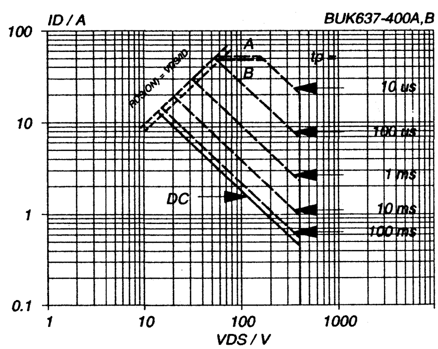


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

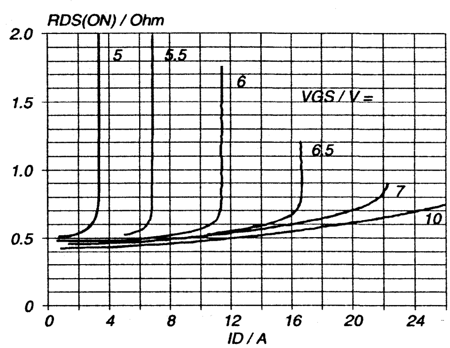


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

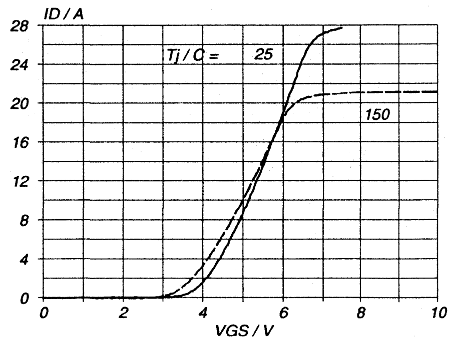


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

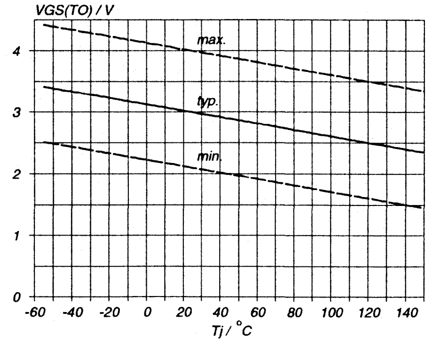


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

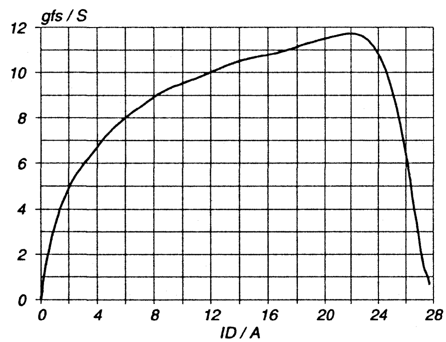


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

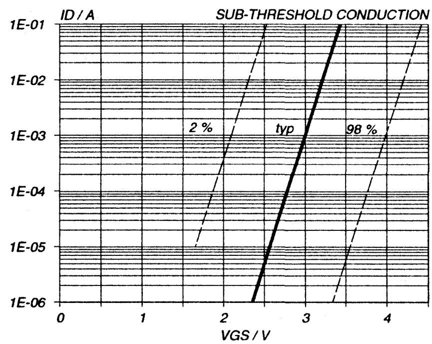


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

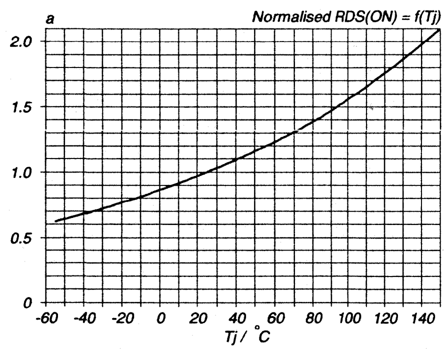


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

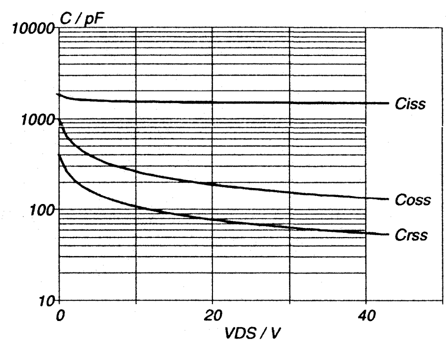


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

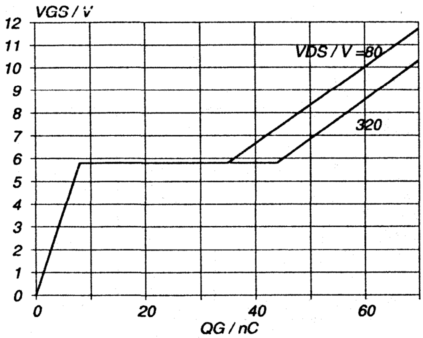


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

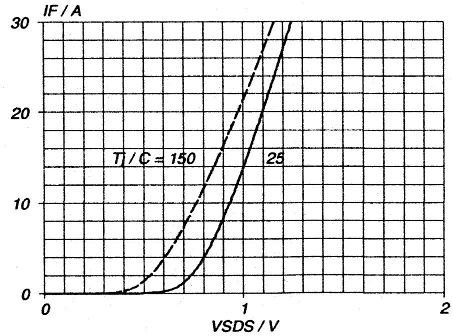


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK637-500A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

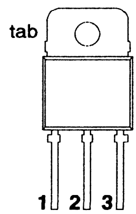
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK637	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	11	10	A
P_{tot}	Total power dissipation	180	180	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.65	0.8	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

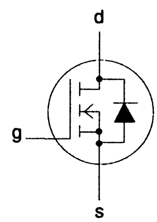
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	11	10	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	7.0	6.3	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	44	40	A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	180		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 0.69 K/W $R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK637-500A**	-	0.6	0.65	Ω
		I_D = 6.5 A **BUK637-500B**	-	0.7	0.8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	11	A
I_{DRM}	Pulsed reverse drain current	-		-	-	44	A
V_{SD}	Diode forward voltage	I_F = 11 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 11 A;	T_j = 25 ˚C	-	180	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	220	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	0.65	1.2	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	2.6	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	15	-	A

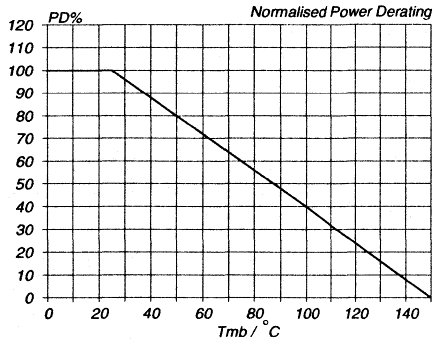


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

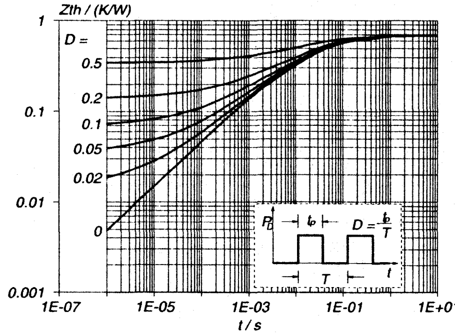


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

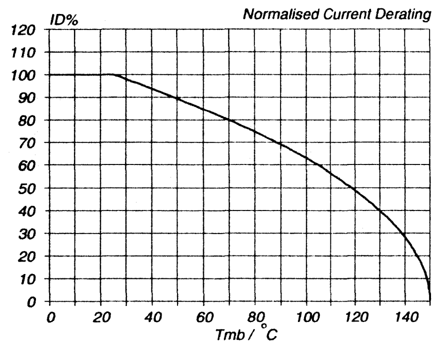


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

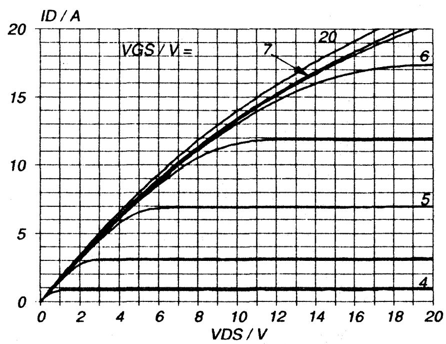


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

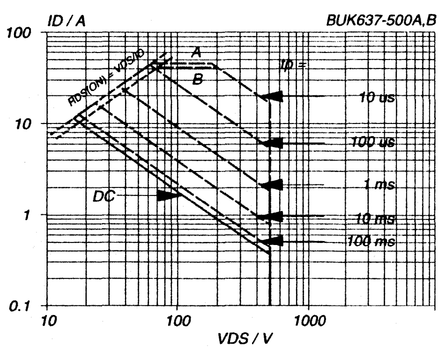


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

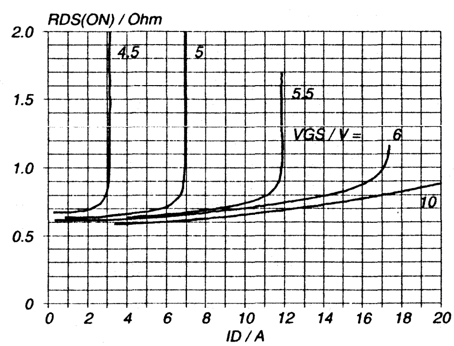


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

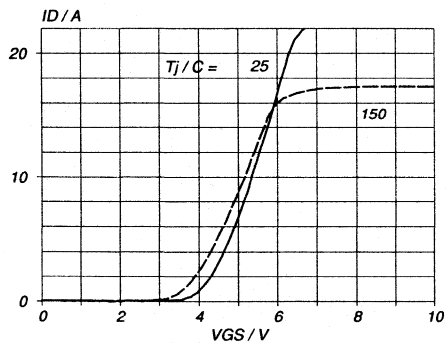


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

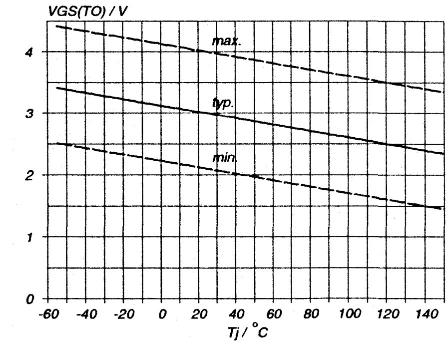


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

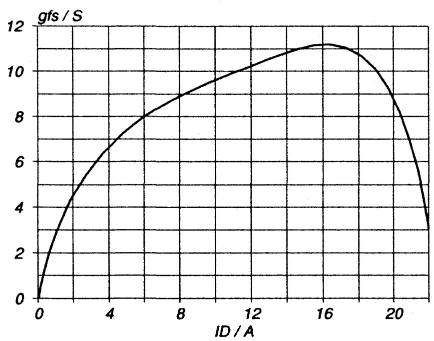


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

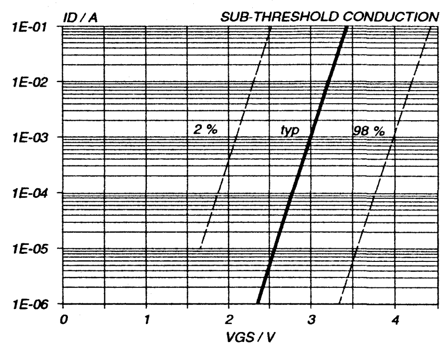


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

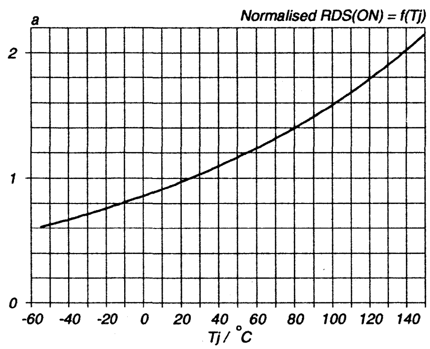


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 6.5 A; V_{GS} = 10 V

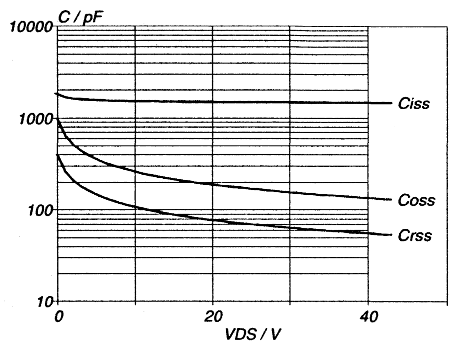


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

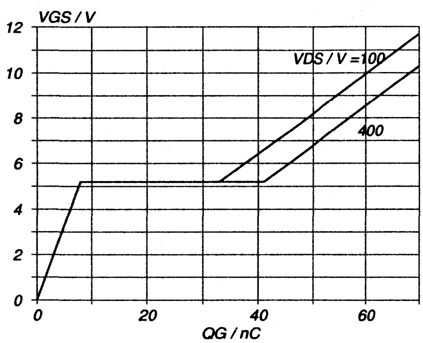


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

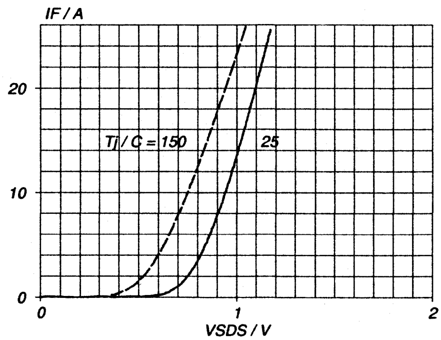


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK638-500A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

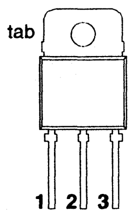
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK638	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	14.6	13	A
P_{tot}	Total power dissipation	220	220	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.48	0.6	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

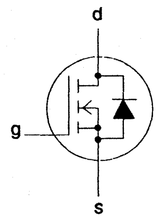
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	14.6	13	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	9.2	8.2	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	58	52	A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	220		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 0.57 K/W $R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 8 A **BUK638-500A**	-	0.4	0.48	Ω
		BUK638-500B	-	0.5	0.6	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8 A	5.0	10.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	2400	2800	pF
C_{oss}	Output capacitance		-	270	420	pF
C_{rss}	Feedback capacitance		-	110	200	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	30	60	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	90	130	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	300	400	ns
t_f	Turn-off fall time		-	110	140	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	58	A
V_{SD}	Diode forward voltage	I_F = 14.6 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 14.6 A; T_j = 25 ˚C	-	200	250	ns
		$-dI_F/dt$ = T_j = 125 ˚C	-	250	350	ns
Q_{rr}	Reverse recovery charge	100 A/µs; T_j = 25 ˚C	-	1.3	2.0	µC
		V_{GS} = 0 V; T_j = 125 ˚C	-	3.5	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V T_j = 125 ˚C	-	15	-	A

PowerMOS transistor
Fast recovery diode FET

BUK638-500A/B

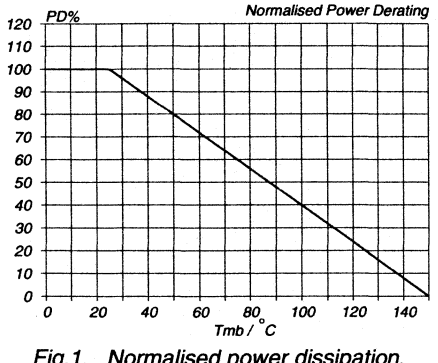


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$

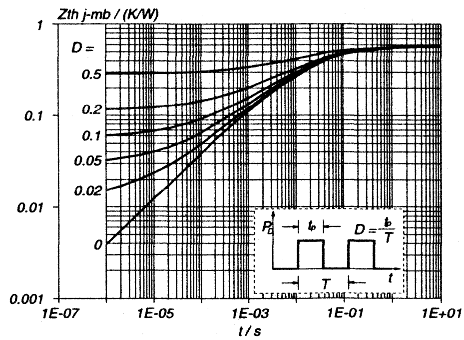


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

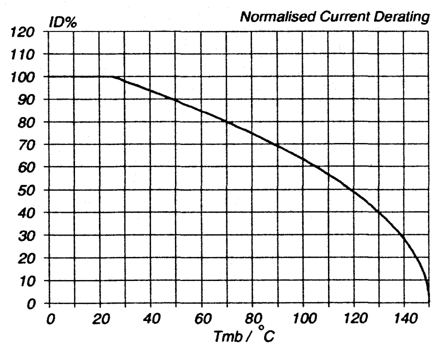


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

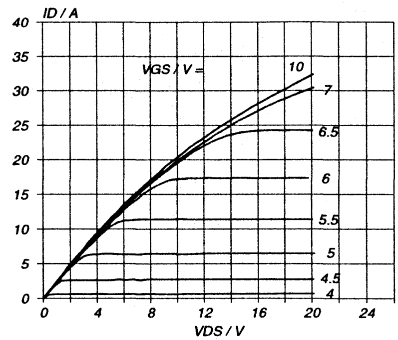


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

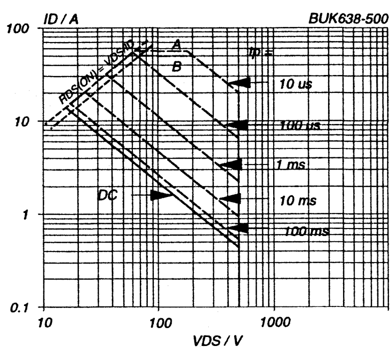


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

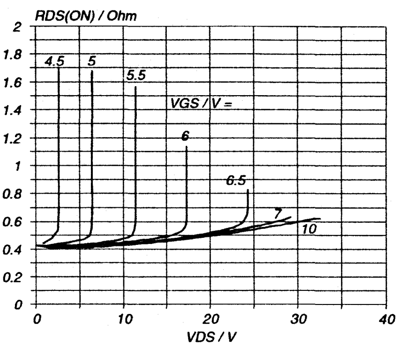


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

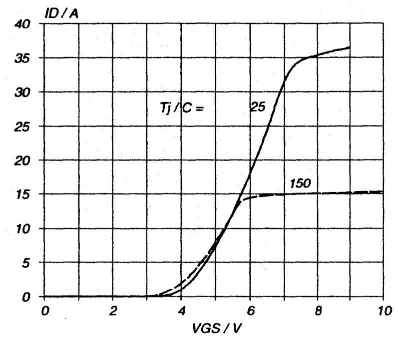


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

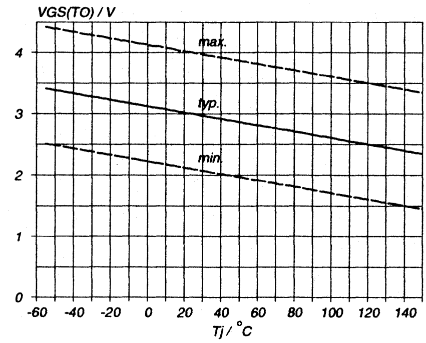


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

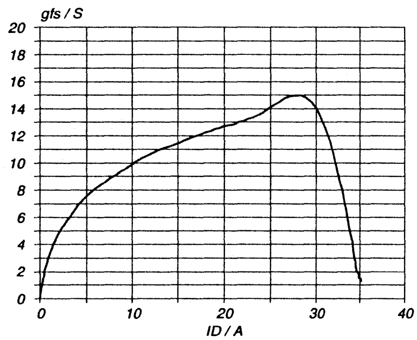


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

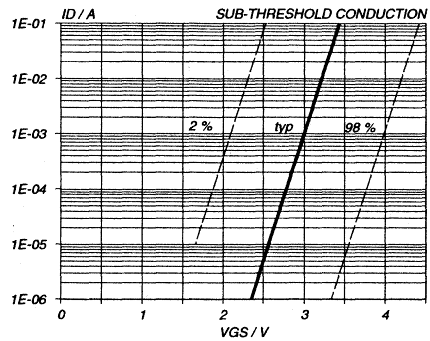


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

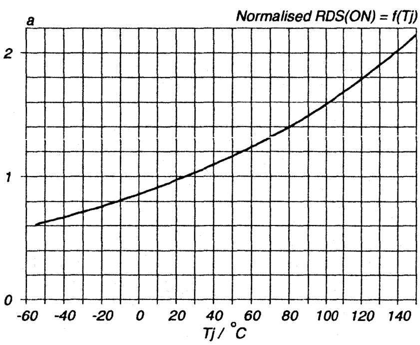


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 8 A; V_{GS} = 10 V

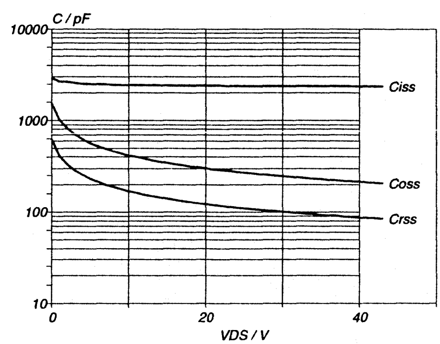


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

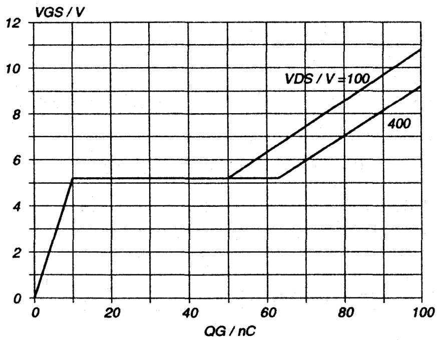


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

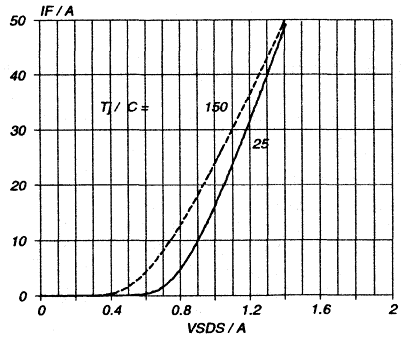


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK655-500A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

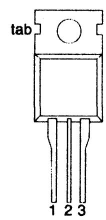
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK655	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	5.7	5.3	A
P_{tot}	Total power dissipation	100	100	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.3	1.5	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

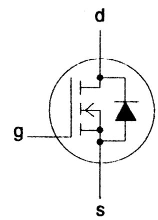
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	5.7	5.3	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	3.6	3.3	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	23	21	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	100		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 1.25 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 2.5 A; **BUK655-500A**	-	1.2	1.3	Ω
		BUK655-500B	-	1.4	1.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	2.3	3.1	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	10	45	ns
t_r	Turn-on rise time		-	45	60	ns
$t_{d\ off}$	Turn-off delay time		-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	5.7	A
I_{DRM}	Pulsed reverse drain current	-		-	-	23	A
V_{SD}	Diode forward voltage	I_F = 5.7 A;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.7 A;	T_j = 25 ˚C	-	180	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	220	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	0.65	1.2	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	2.6	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	15	-	A

PowerMOS transistor
Fast recovery diode FET

BUK655-500A/B

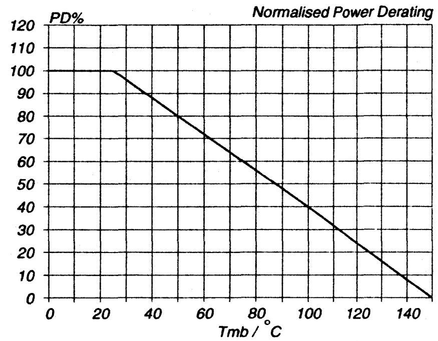


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$

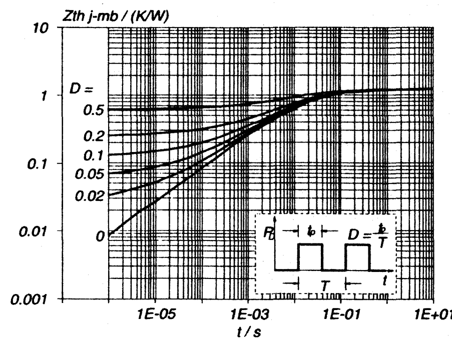


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

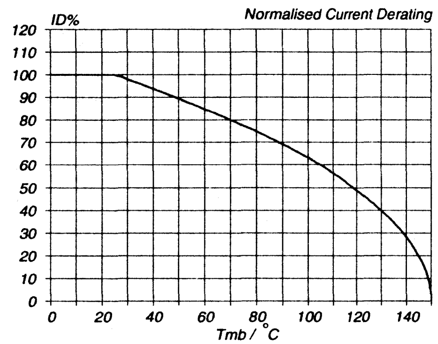


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

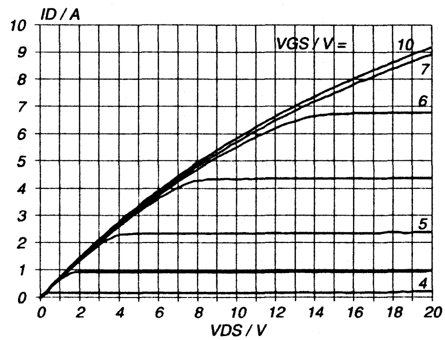


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

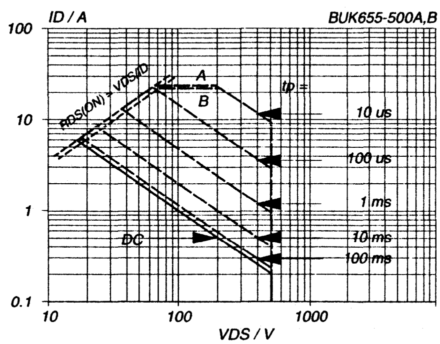


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

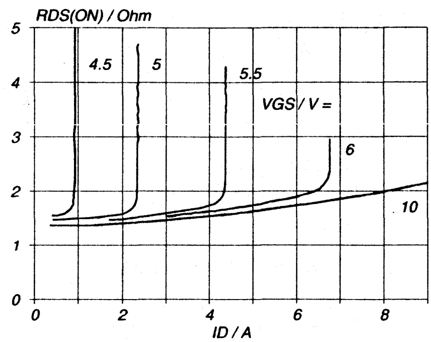


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor
Fast recovery diode FET

BUK655-500A/B

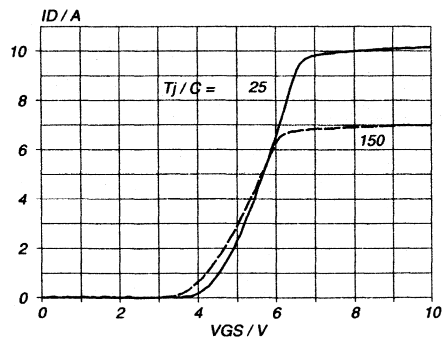


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

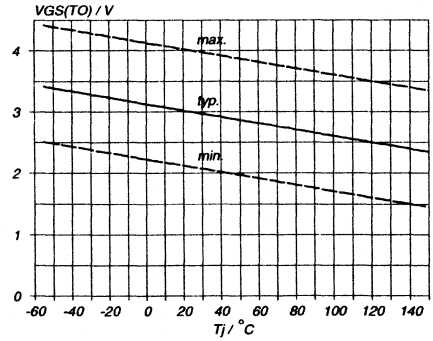


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

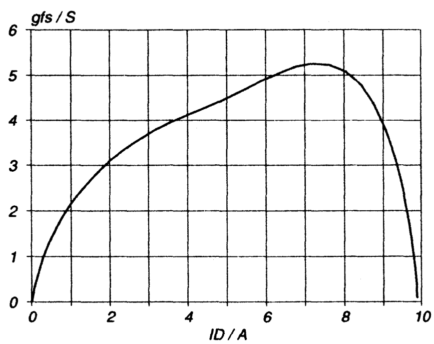


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

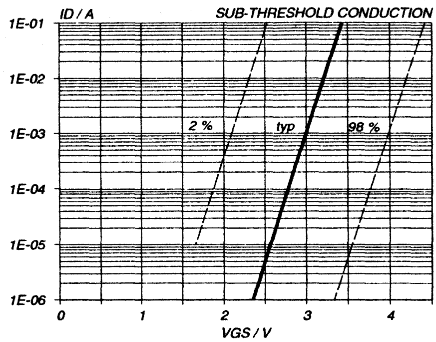


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

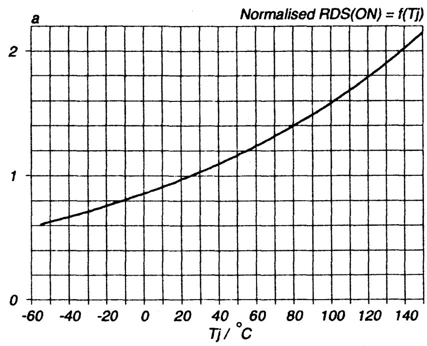


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; I_D = 2.5 A; V_{GS} = 10 V

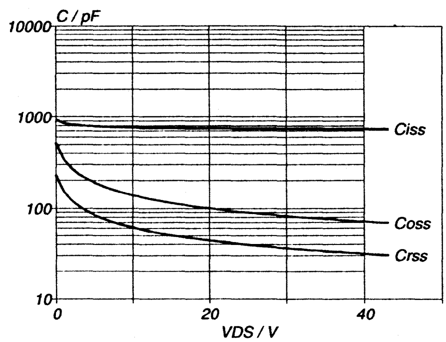


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

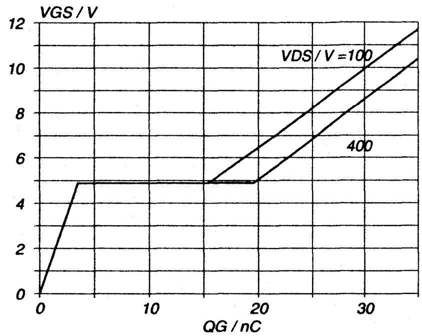


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5.7$ A; parameter V_{DS}

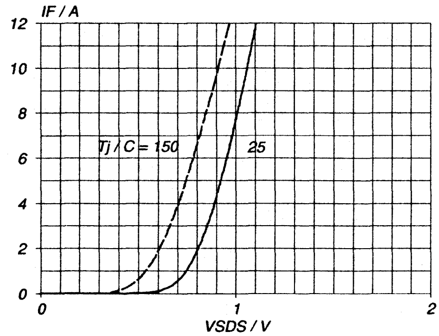


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK657-400A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

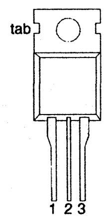
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK657	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	13	11	A
P_{tot}	Total power dissipation	150	150	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.5	0.6	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

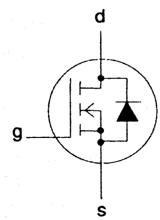
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	-400B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	13	11	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	8.2	7	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	52	44	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 0.83 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA		2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C		-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V;	**BUK657-400A**	-	0.4	0.5	Ω
		I_D = 6.5 A	**BUK657-400B**	-	0.5	0.6	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	13	A
I_{DRM}	Pulsed reverse drain current	-		-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 13 A;	T_j = 25 ˚C	-	180	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	220	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	0.65	1.2	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	2.6	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	15	-	A

PowerMOS transistor
Fast recovery diode FET

BUK657-400A/B

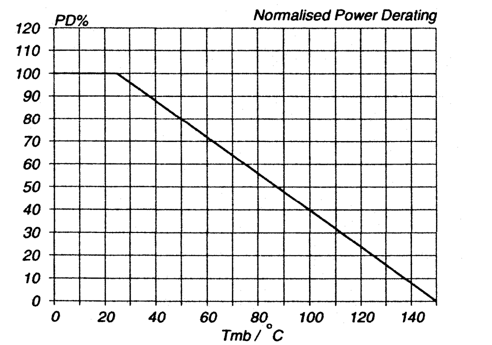


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$

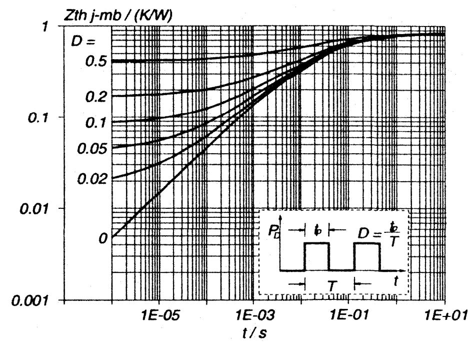


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

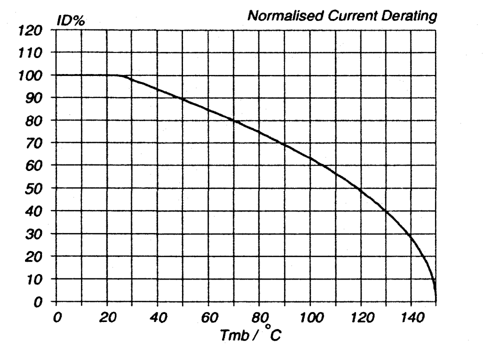


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

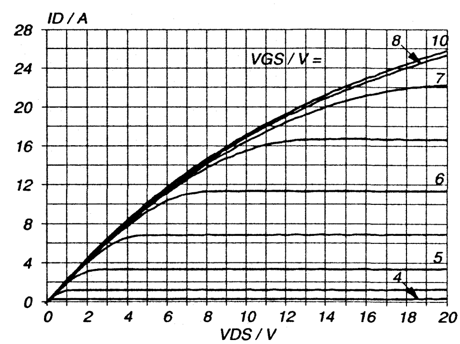


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

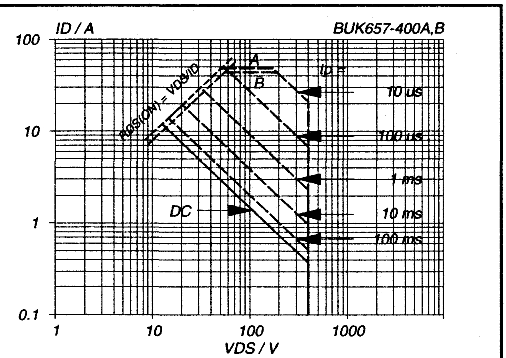


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

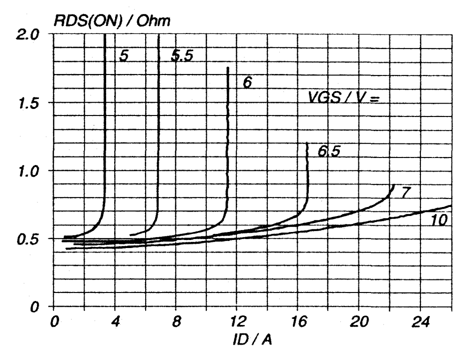


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

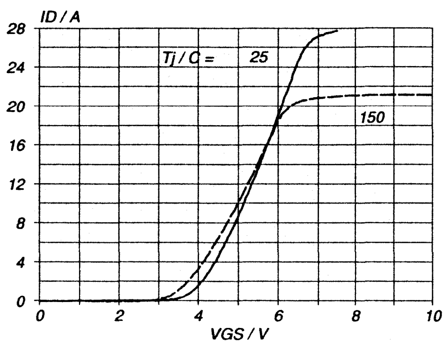


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

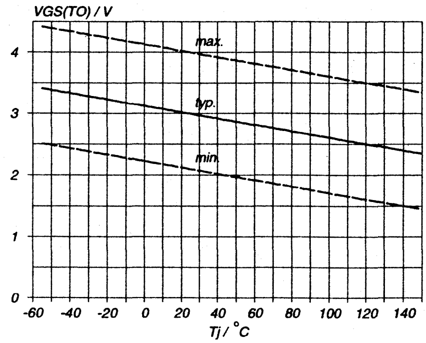


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

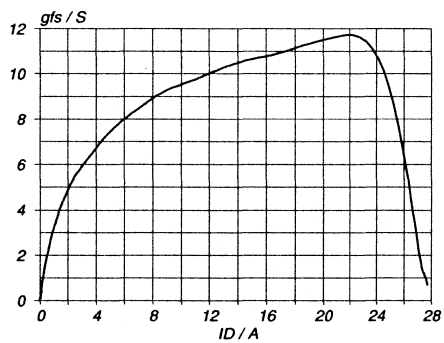


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

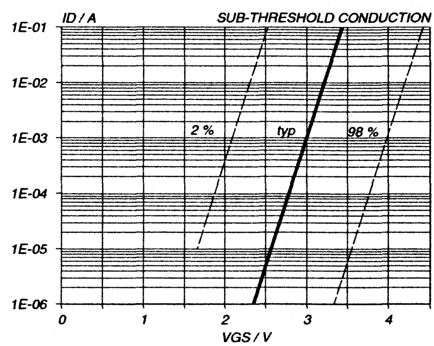


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

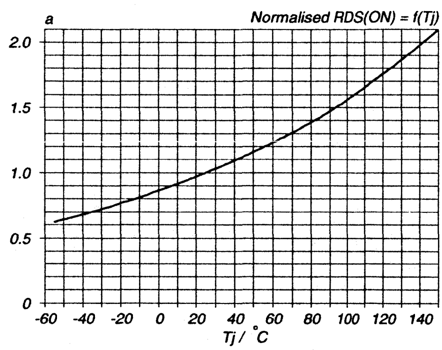


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

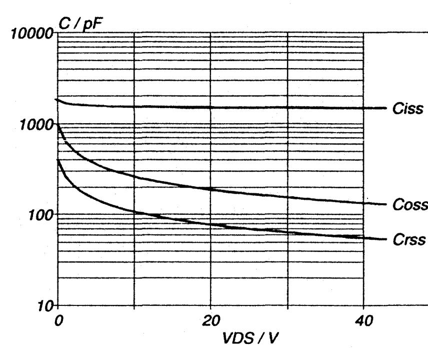


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

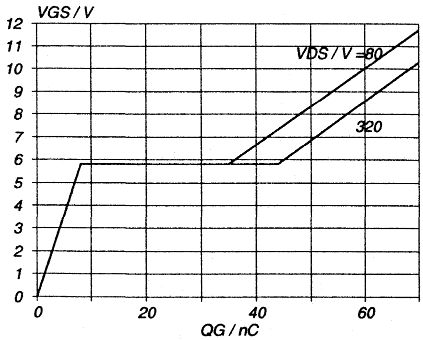


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 13$ A; parameter V_{DS}

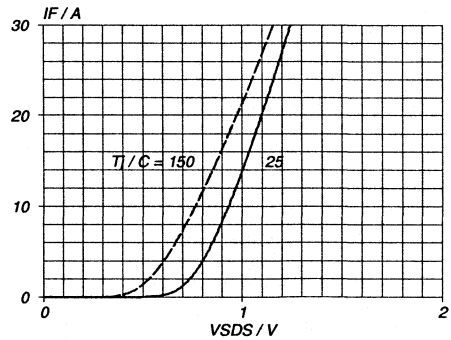


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Product specification
date of issue	March 1991

BUK657-500A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

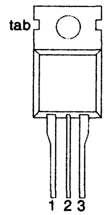
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK657	**-500A**	**-500B**	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	10	9	A
P_{tot}	Total power dissipation	150	150	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.65	0.8	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

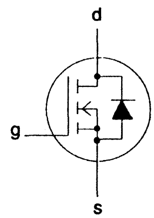
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	10	9	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	6.3	5.7	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	40	36	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 0.83 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 6.5 A **BUK657-500A**	-	0.6	0.65	Ω
		BUK657-500B	-	0.7	0.8	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 6.5 A	5.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1500	1800	pF
C_{oss}	Output capacitance		-	170	270	pF
C_{rss}	Feedback capacitance		-	70	120	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	20	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	200	250	ns
t_f	Turn-off fall time		-	75	90	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	10	A
I_{DRM}	Pulsed reverse drain current	-		-	-	40	A
V_{SD}	Diode forward voltage	I_F = 10 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 10 A;	T_j = 25 ˚C	-	180	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	220	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	0.65	1.2	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	2.6	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	15	-	A

PowerMOS transistor Fast recovery diode FET

BUK657-500A/B

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; $V_{DD} \leq$ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	500	mJ

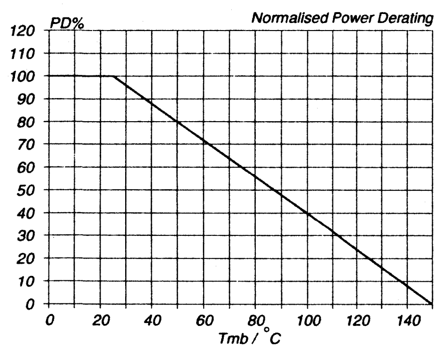


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

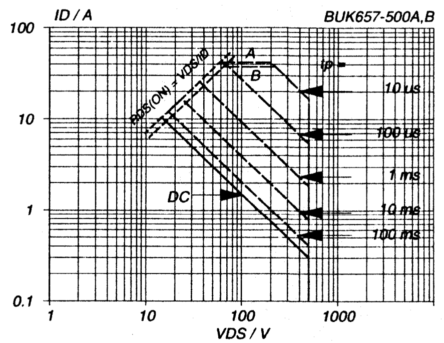


Fig.3. Safe operating area. T_{mb} = 25 ˚C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

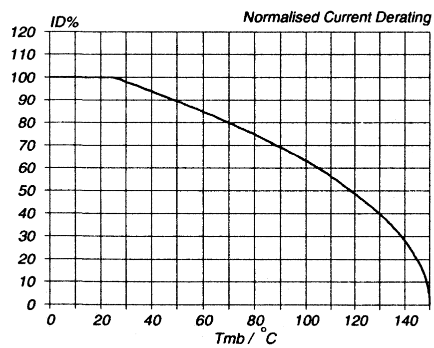


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

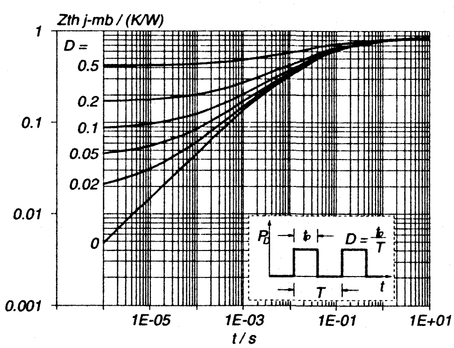


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

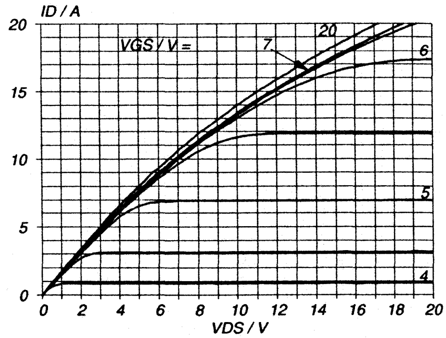


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

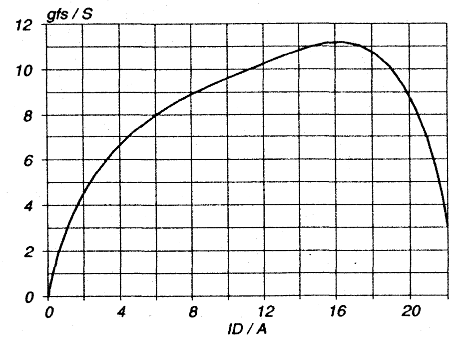


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

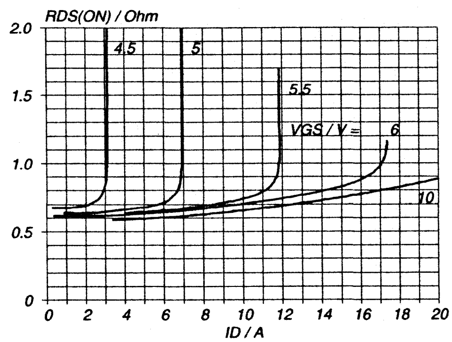


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

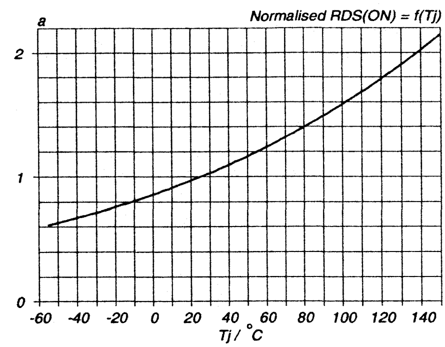


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ V

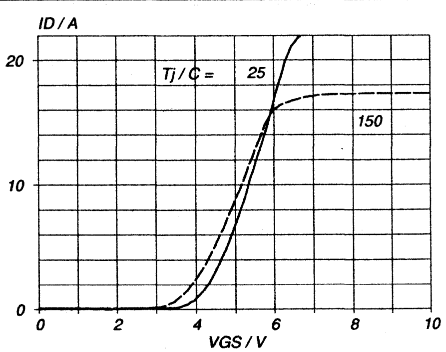


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

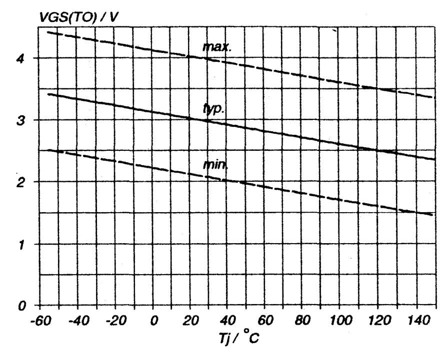


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

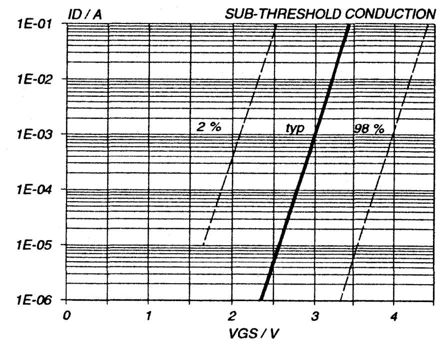


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

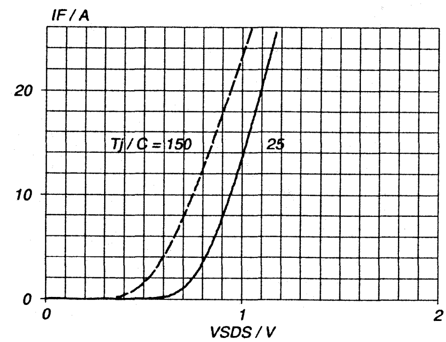


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

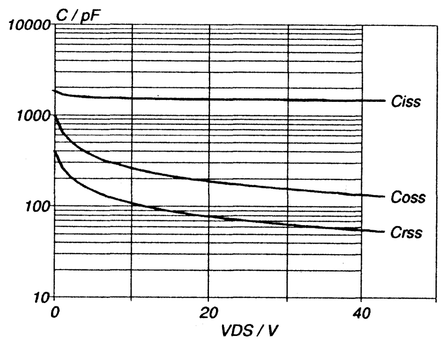


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

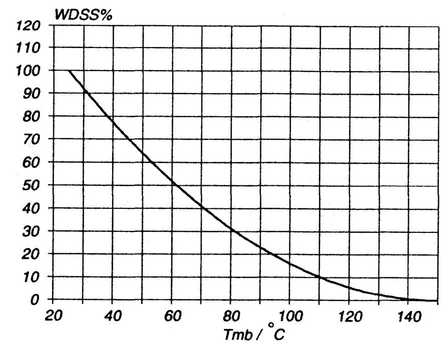


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 10$ A

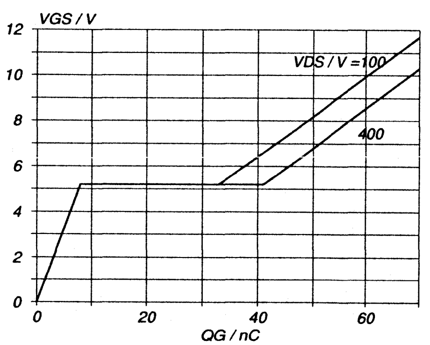


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 10$ A; parameter V_{DS}

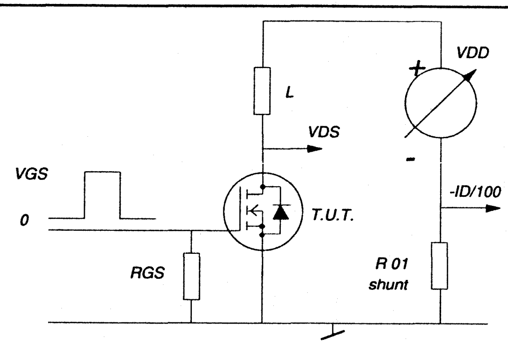


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Preliminary device data

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK416-1000AE/BE
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in ISOTOP envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

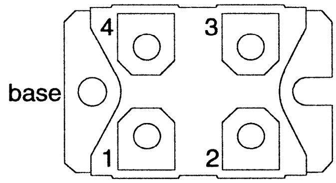
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK416	-1000AE	-1000BE	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	12.2	10.9	A
P_{tot}	Total power dissipation	310	310	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.8	1.0	Ω

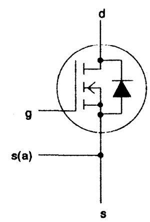
PINNING - SOT227B

PIN	DESCRIPTION
1	source
2	gate
3	drain
4	ancillary source
base	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000AE	-1000BE	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	12.2	10.9	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	7.8	6.9	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	49	44	A
$I_{S(A)M}$	Ancillary Source current (pulse peak value)		-	5.0		A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	310		W
T_{stg}	Storage temperature	-	- 40	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base From mounting base to heatsink	with heatsink compound	$R_{th\ j\text{-}mb}$ = 0.40 K/W $R_{th\ mb\text{-}hs}$ = 0.05 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.0 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	10	100	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	1.0	5.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	200	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 7.5 A **BUK416-1000AE**	-	0.7	0.8	Ω
		BUK416-1000BE	-	0.9	1.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7.5 A	10	20	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	5.0	6.25	nF
C_{oss}	Output capacitance		-	0.40	0.60	nF
C_{rss}	Feedback capacitance		-	0.15	0.25	nF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	50	125	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	125	200	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	650	800	ns
t_f	Turn-off fall time	Resistive Load	-	200	300	ns
$t_{d\ on}$	Turn-on delay time	V_{DD} = 50 V; I_D = 12.2 A;	-	25	-	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{gen} = 3.3 Ω	-	150	-	ns
$t_{d\ off}$	Turn-off delay time	Resistive Load	-	150	-	ns
t_f	Turn-off fall time		-	70	-	ns
L_d	Internal drain inductance	Measured from contact screw on terminal 3 to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from contact screw on terminal 1 to source bond pad	-	5	-	nH

ISOLATION

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	R.M.S. voltage from terminals to mounting base	Sinusoidal voltage waveform; f = 50 - 60 Hz	-	-	2500	V
C_{isol}	Capacitance from T3 to mounting base	f = 1 MHz	-	45	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	12.2	A
I_{DRM}	Pulsed reverse drain current	-	-	-	49	A
V_{SD}	Diode forward voltage	I_F = 12.2 A ;V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 12.2A; -dI_F/dt = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 200 V	-	40	-	µC

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK428-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

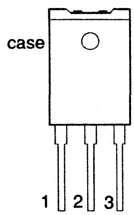
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK428	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	3.4	3.0	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.5	2.0	Ω

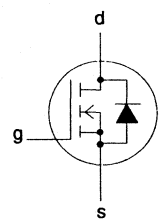
PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	3.4	3.0	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2.2	1.9	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	14	12	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\,j\text{-}hs}$ = 2.8 K/W $R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK428-800A**	-	1.3	1.5	Ω
		I_D = 4.0 A **BUK428-800B**	-	1.7	2.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	3.0	6.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	3000	3500	pF
C_{oss}	Output capacitance		-	350	400	pF
C_{rss}	Feedback capacitance		-	150	250	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	60	90	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	100	140	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	350	430	ns
t_f	Turn-off fall time		-	100	140	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.4	A
I_{DRM}	Pulsed reverse drain current	-	-	-	14	A
V_{SD}	Diode forward voltage	I_F = 3.4 A ;V_{GS} = 0 V	-	0.9	1.3	V
t_{rr}	Reverse recovery time	I_F = 3.4 A; -dI_F/dt = 100 A/µs;	-	1.5	-	µs
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 7.6 A ; V_{DD} ≤ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	750	mJ

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK428-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

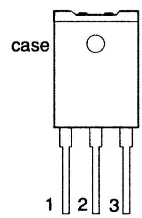
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK428	**-1000A**	**-1000B**	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	2.9	2.6	A
P_{tot}	Total power dissipation	45	45	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.0	2.6	Ω

PINNING - SOT199

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



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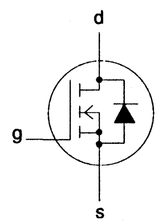


LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	**-1000B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.9	2.6	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.9	1.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	12	10	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	45		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 2.8 K/W
From junction to ambient	-	$R_{th\,j\text{-}a}$ = 35 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK428-1000A**	-	1.8	2.0	Ω
		I_D = 3.5 A **BUK428-1000B**	-	2.2	2.6	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	2.5	5.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	3000	3500	pF
C_{oss}	Output capacitance		-	300	350	pF
C_{rss}	Feedback capacitance		-	150	250	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	60	90	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	100	140	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	350	430	ns
t_f	Turn-off fall time		-	100	140	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65 % ; clean and dustfree	-	-	2500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	22	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.9	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 2.9 A ;V_{GS} = 0 V	-	0.9	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.9 A; -dI_F/dt = 100 A/µs;	-	1.5	-	µs
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 6.5 A ; V_{DD} ≤ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	750	mJ

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK438-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

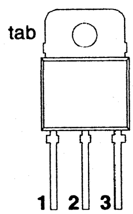
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK438	-1000A	-1000B	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	6.5	5.7	A
P_{tot}	Total power dissipation	220	220	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.0	2.6	Ω

PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



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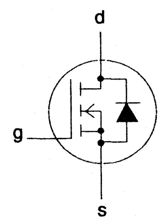


LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	-1000B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	6.5	5.7	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	4.1	3.6	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	26	23	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	220		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 0.57 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	5	50	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK438-1000A**	-	1.8	2.0	Ω
		I_D = 3.5 A **BUK438-1000B**	-	2.2	2.6	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	2.5	5.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	3000	3500	pF
C_{oss}	Output capacitance		-	300	350	pF
C_{rss}	Feedback capacitance		-	150	250	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	60	90	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	100	140	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	350	430	ns
t_f	Turn-off fall time		-	100	140	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	26	A
V_{SD}	Diode forward voltage	I_F = 6.5 A ;V_{GS} = 0 V	-	0.9	1.3	V
t_{rr}	Reverse recovery time	I_F = 6.5 A; $-dI_F/dt$ = 100 A/µs;	-	1.5	-	µs
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	20	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 6.5 A ; $V_{DD} \leq$ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	750	mJ

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK439-60A
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

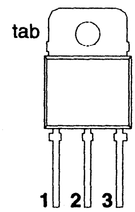
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	50	A
P_{tot}	Total power dissipation	230	W
$R_{DS(ON)}$	Drain-source on-state resistance	13.0	mΩ

PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



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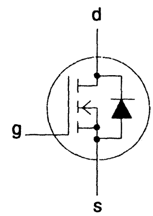


LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	30	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	50	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	50	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	400	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	230	W
T_{stg}	Storage temperature	-	- 55	150	˚C
T_j	Junction Temperature	-	-	150	˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 0.54 K/W $R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 50 A	-	11.0	13.0	mΩ

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 50 A	30	42	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	5000	6500	pF
C_{oss}	Output capacitance		-	2000	2500	pF
C_{rss}	Feedback capacitance		-	1000	1500	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	70	120	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	250	350	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 50 Ω;	-	400	500	ns
t_f	Turn-off fall time	R_{gen} = 50 Ω	-	400	500	ns
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 50 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 4.7 Ω;	-	40	60	ns
t_f	Turn-off fall time	R_{gen} = 4.7 Ω	-	50	80	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	50	A
I_{DRM}	Pulsed reverse drain current	-	-	-	400	A
V_{SD}	Diode forward voltage	I_F = 50 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 50 A; $-dI_F/dt$ = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.6	-	µC

PowerMOS transistor | BUK439-60A

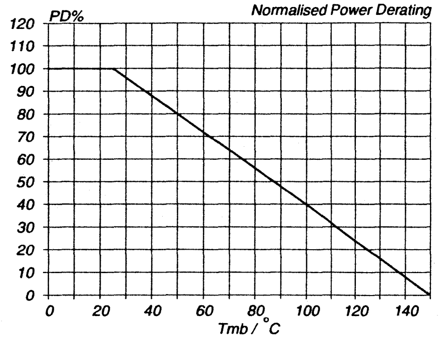


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

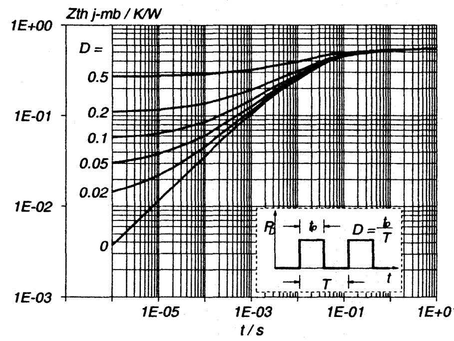


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

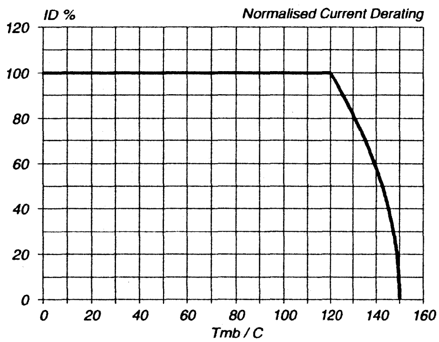


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

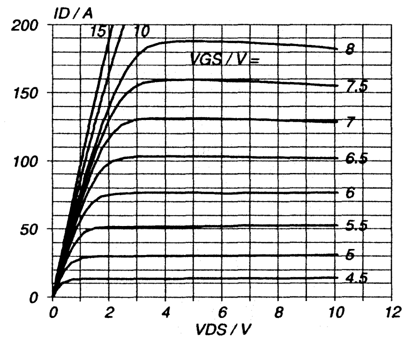


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

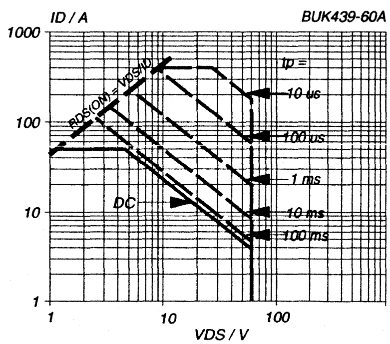


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

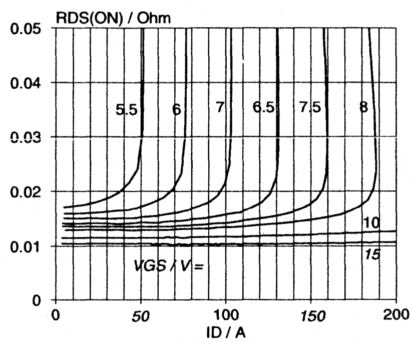


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

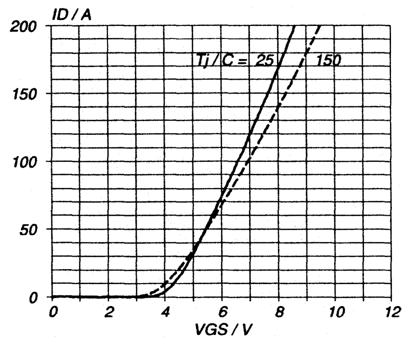


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

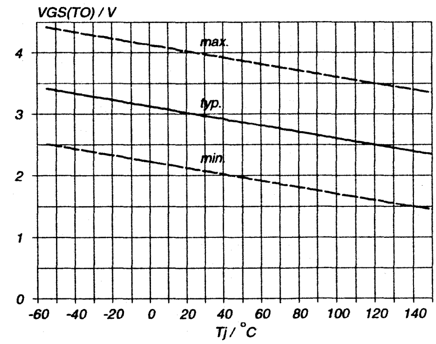


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

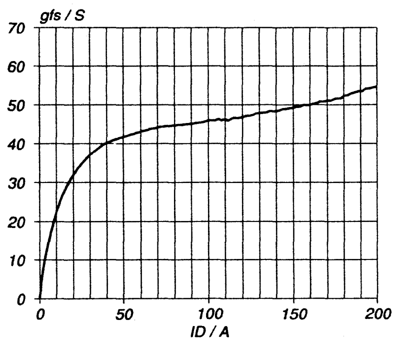


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 15$ V

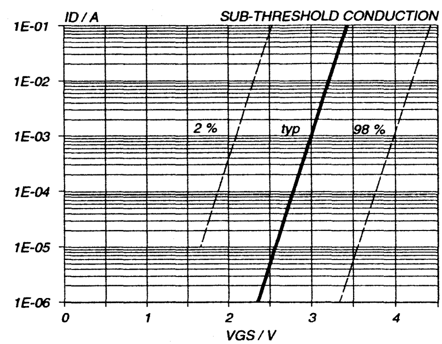


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

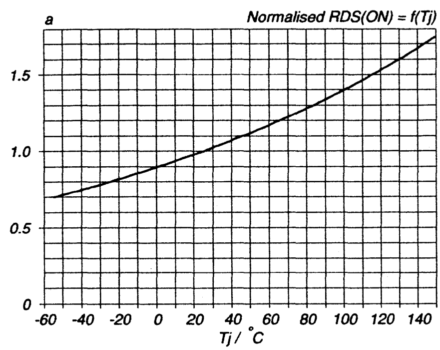


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 50$ A; $V_{GS} = 10$ V

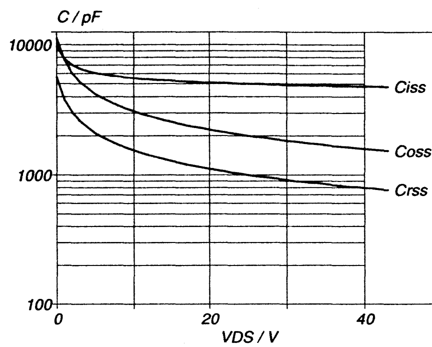


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

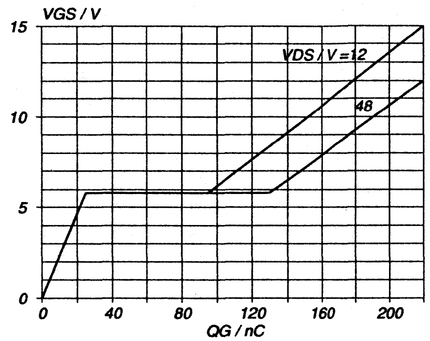


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 50$ A; parameter V_{DS}

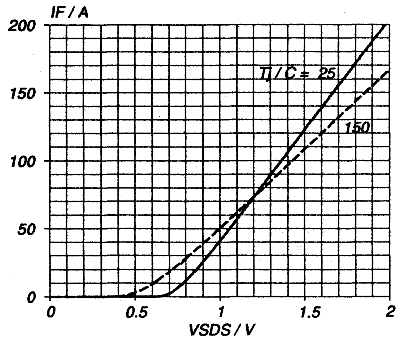


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK441-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

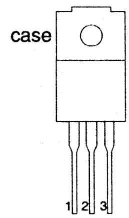
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK441	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	4.8	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

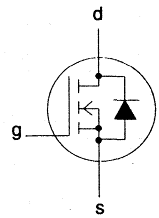
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	5.0	4.8	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	3.4	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	20	19	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs} = 6.25$ K/W $R_{th\ j\text{-}a} = 55$ K/W

STATIC CHARACTERISTICS

$T_{hs} = 25$ °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0$ V; $I_D = 0.25$ mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$; $I_D = 1$ mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 60$ V; $V_{GS} = 0$ V; $T_j = 25$ °C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 60$ V; $V_{GS} = 0$ V; $T_j = 125$ °C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	$V_{GS} = \pm 30$ V; $V_{DS} = 0$ V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 4.0$ A **BUK441-60A**	-	0.25	0.4	Ω
		BUK441-60B	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

$T_{hs} = 25$ °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25$ V; $I_D = 4.0$ A	1.5	1.9	-	S
C_{iss}	Input capacitance	$V_{GS} = 0$ V; $V_{DS} = 25$ V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	$V_{DD} = 30$ V; $I_D = 3$ A;	-	4	6	ns
t_r	Turn-on rise time	$V_{GS} = 10$ V; $R_{GS} = 50$ Ω;	-	15	25	ns
$t_{d\ off}$	Turn-off delay time	$R_{gen} = 50$ Ω	-	10	20	ns
t_f	Turn-off fall time		-	15	25	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

$T_{hs} = 25$ °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

PowerMOS transistor BUK441-60A/B

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

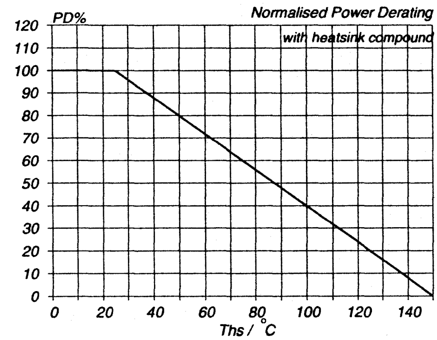


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

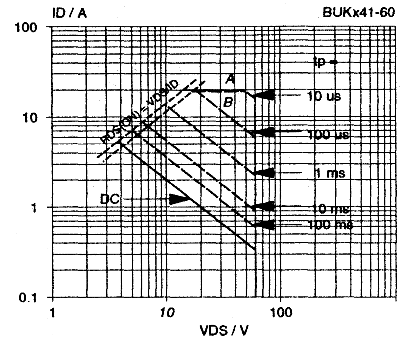


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

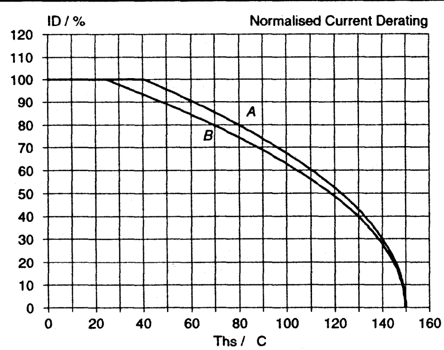


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

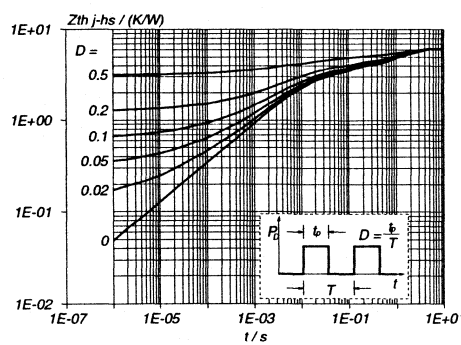


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

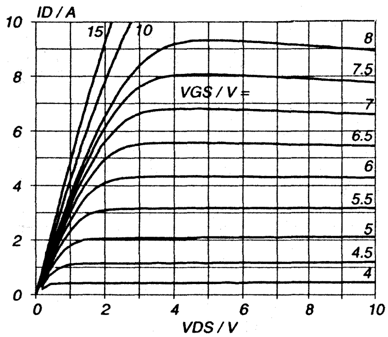


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

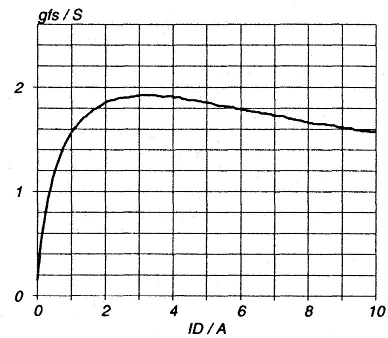


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

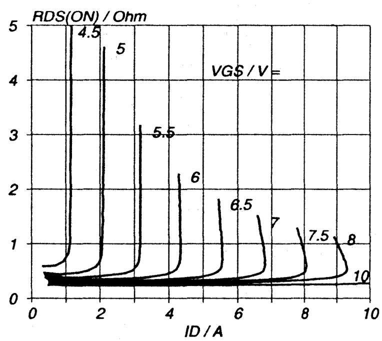


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

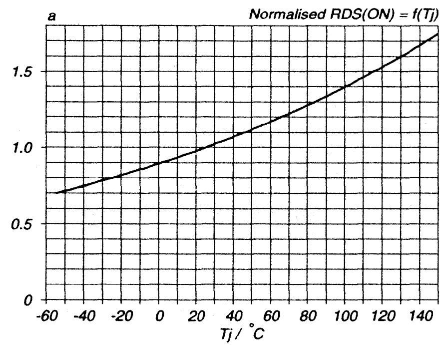


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 4.0$ A; $V_{GS} = 5$ V

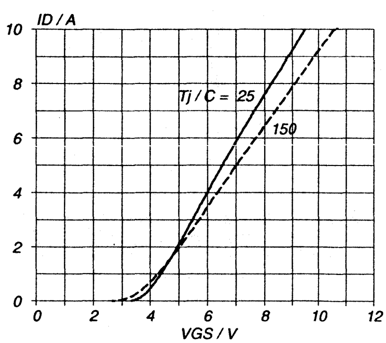


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

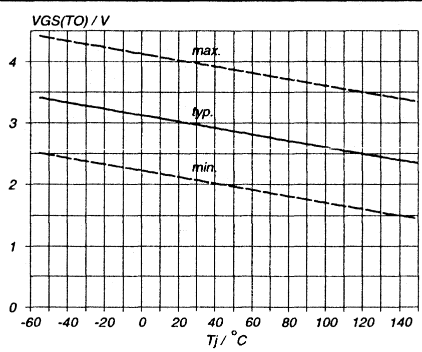


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

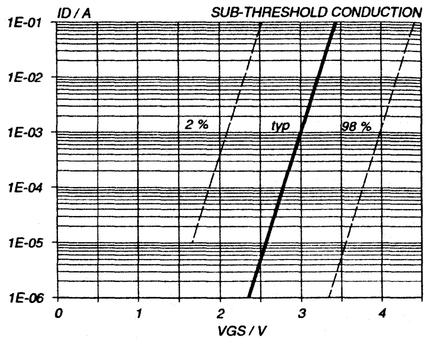


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

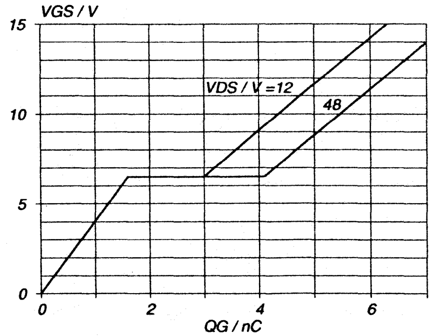


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}

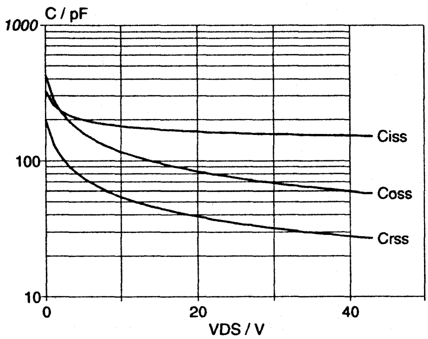


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

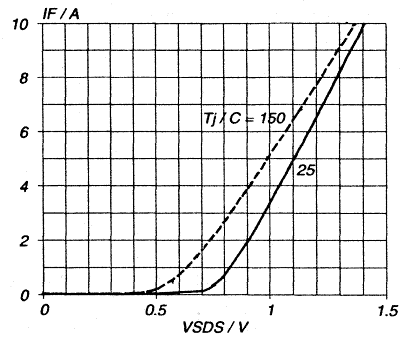


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK442-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

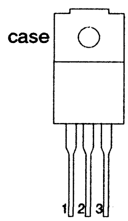
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK442	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	10	9.2	A
P_{tot}	Total power dissipation	22	22	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.13	0.15	Ω

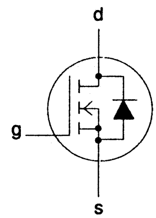
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	10	9.2	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	6.3	5.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	40	37	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor BUK442-60A/B

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j-hs}$ = 5.68 K/W $R_{th\,j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK442-60A**	-	0.11	0.13	Ω
		I_D = 8.5 A **BUK442-60B**	-	0.13	0.15	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8.5 A	3.5	4.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	150	200	pF
C_{rss}	Feedback capacitance		-	70	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	8	14	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	45	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	30	45	ns
t_f	Turn-off fall time		-	30	45	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	10	A
I_{DRM}	Pulsed reverse drain current	-	-	-	40	A
V_{SD}	Diode forward voltage	I_F = 10 A ; V_{GS} = 0 V	-	1.4	1.7	V
t_{rr}	Reverse recovery time	I_F = 10 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 15 A ; V_{DD} ≤ 30 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	30	mJ

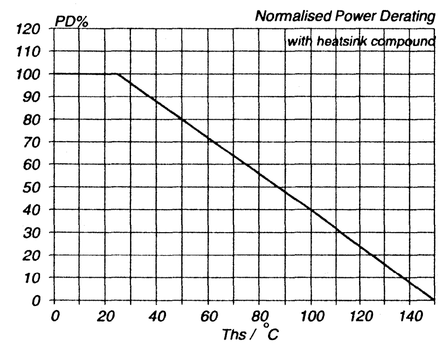


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

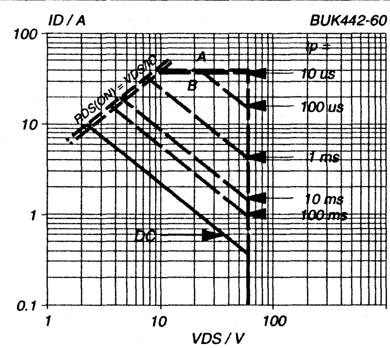


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

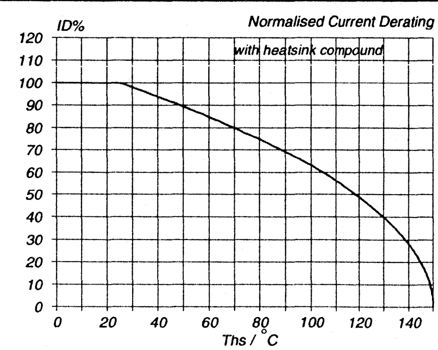


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

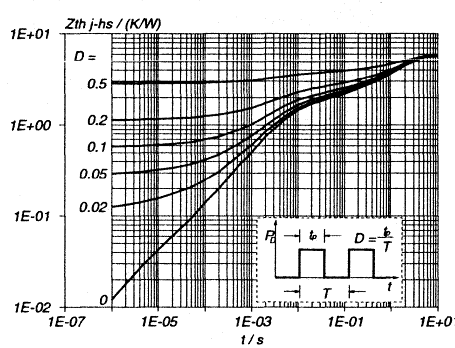


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

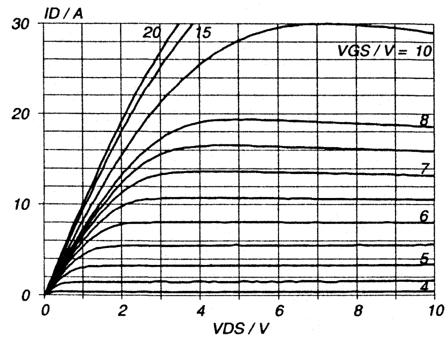


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

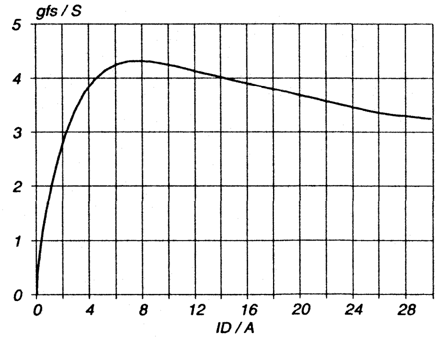


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

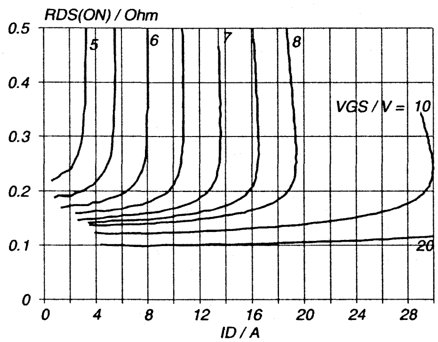


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

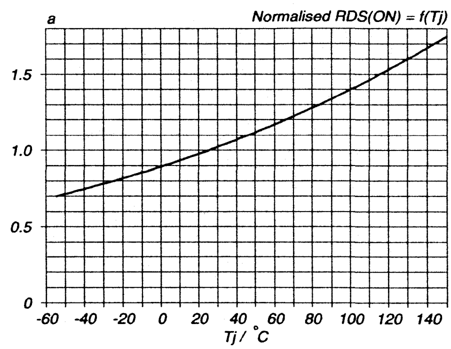


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; I_D = 8.5 A; V_{GS} = 10 V

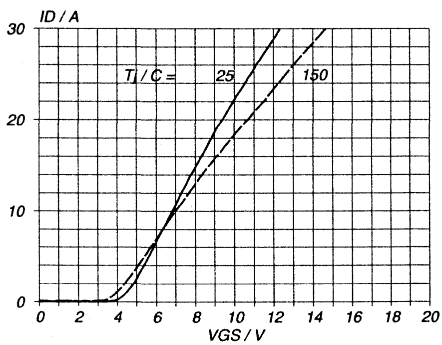


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

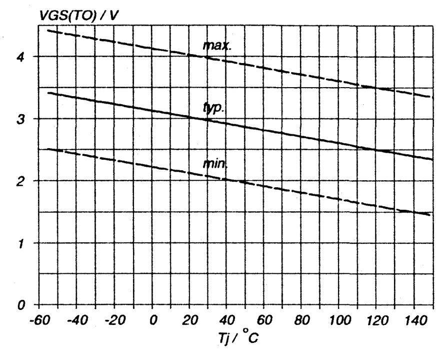


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

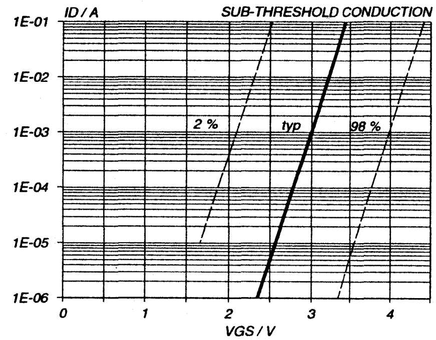


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

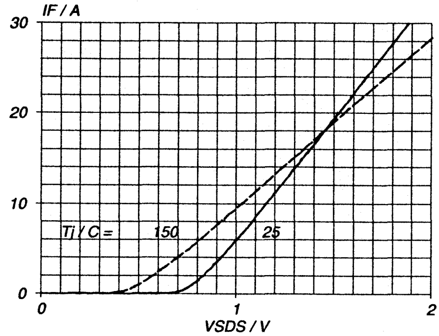


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

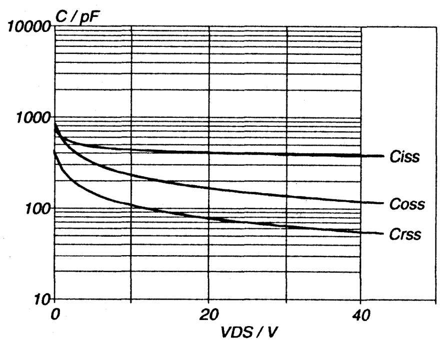


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

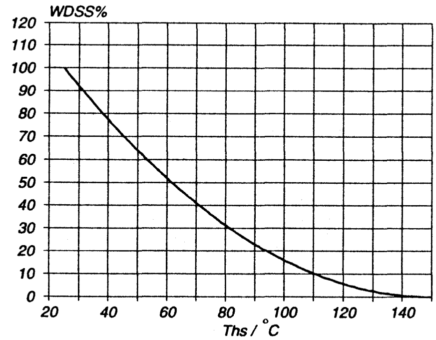


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 15$ A

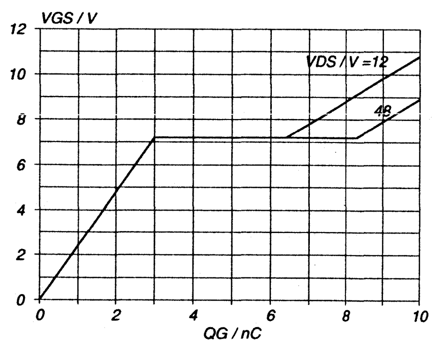


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 15$ A; parameter V_{DS}

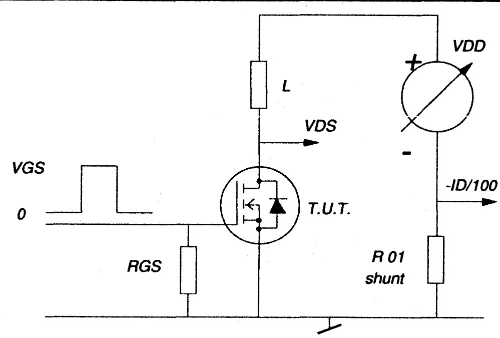


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK451-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

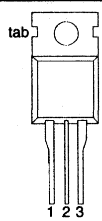
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK451	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	5.0	A
P_{tot}	Total power dissipation	40	40	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

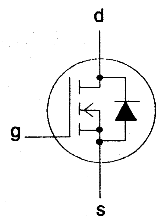
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	5.0	5.0	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	5.0	4.8	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	20	20	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	40		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 3.75 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$; I_D = 1 mA		2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C		-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 4.0 A	**BUK451-60A**	-	0.25	0.4	Ω
			BUK451-60B	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	1.5	1.9	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	4	6	ns
t_r	Turn-on rise time		-	15	25	ns
$t_{d\,off}$	Turn-off delay time		-	10	20	ns
t_f	Turn-off fall time		-	15	25	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; $-dI_F/dt$ = 100 A/µs; V_{GS} = 0 V; V_R = 30 V	-	60	-	ns
Q_{rr}	Reverse recovery charge		-	0.15	-	µC

PowerMOS transistor

BUK451-60A/B

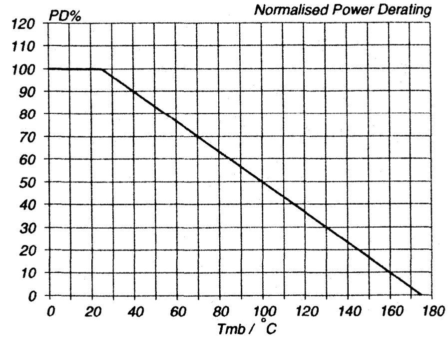


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\ 25\ ^\circ C} = f(T_{mb})$

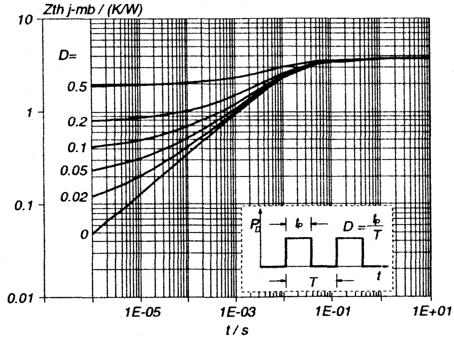


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}mb} = f(t)$; parameter $D = t_p/T$

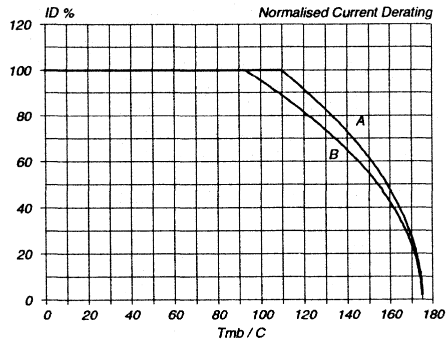


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\ 25\ ^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

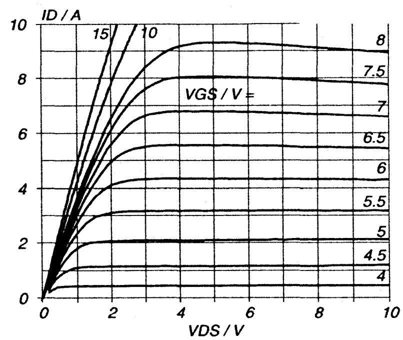


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

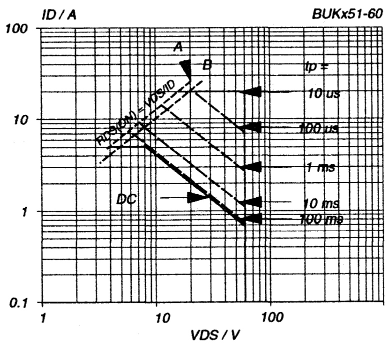


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

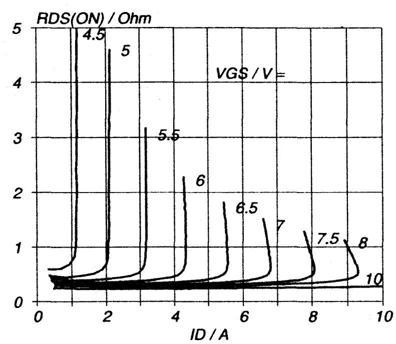


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor

BUK451-60A/B

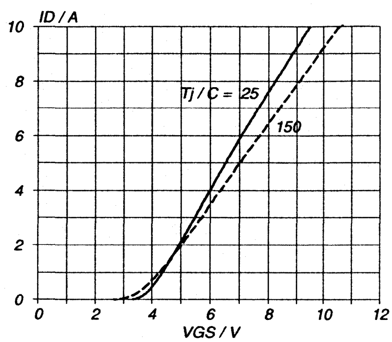


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

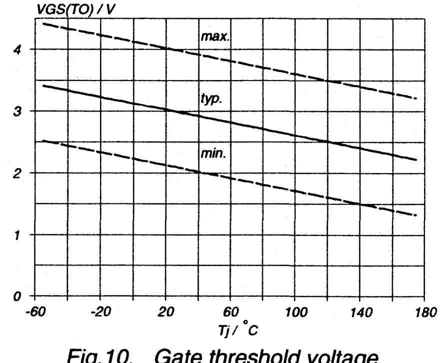


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

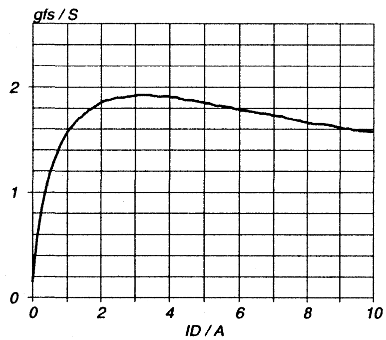


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

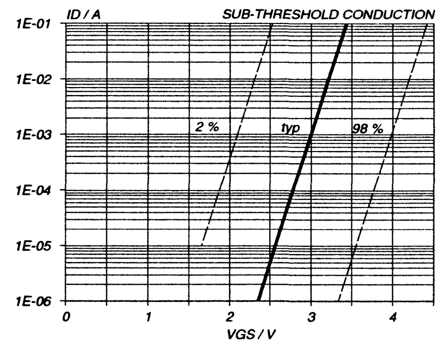


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

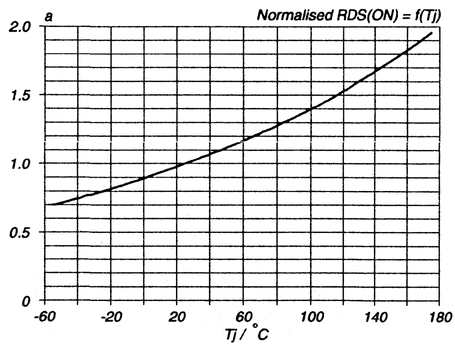


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 4.0$ A; $V_{GS} = 5$ V

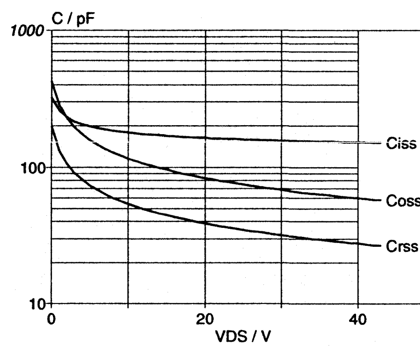


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

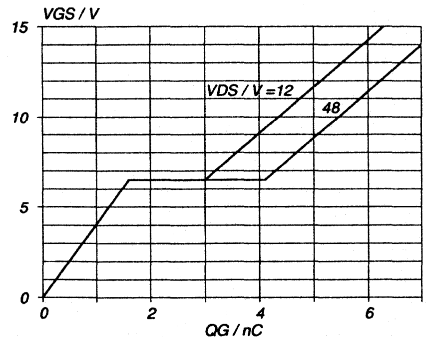


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}

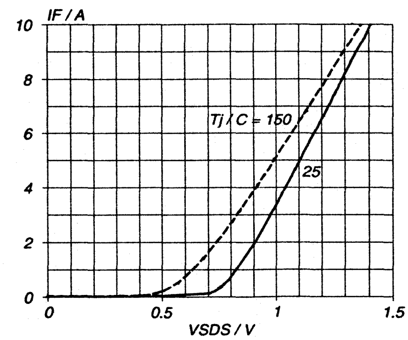


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK451-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

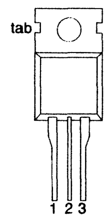
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK451	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	3.0	3.0	A
P_{tot}	Total power dissipation	40	40	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.85	1.1	Ω

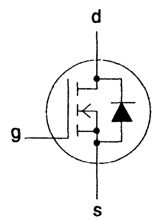
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	3.0	3.0	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	3.0	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	12	12	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	40		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 3.75 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK451-100A**	-	0.75	0.85	Ω
		I_D = 2.5 A **BUK451-100B**	-	0.90	1.10	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	1.3	1.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	45	60	pF
C_{rss}	Feedback capacitance		-	16	25	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	4	6	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	15	25	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	10	20	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.0 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 3.0 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

PowerMOS transistor

BUK451-100A/B

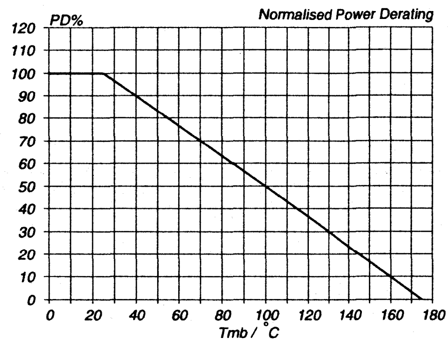


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{mb})$

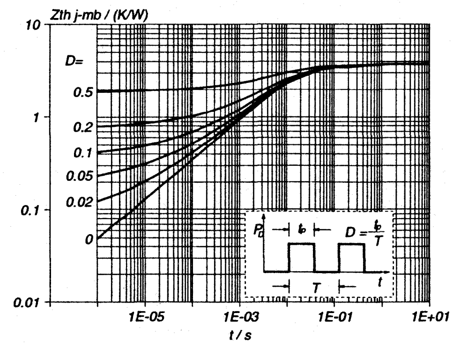


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

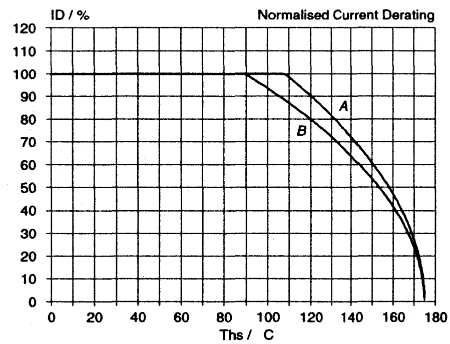


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

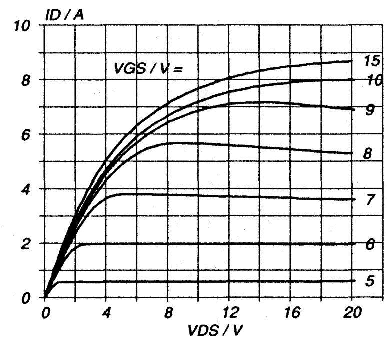


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

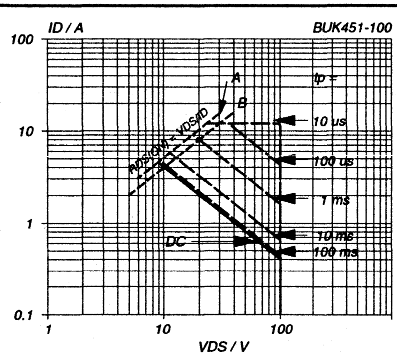


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

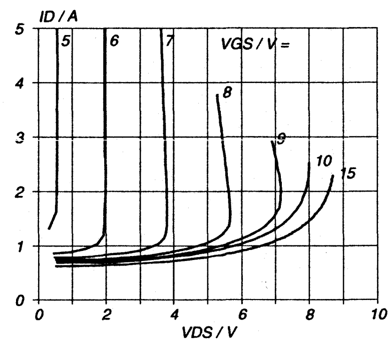


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

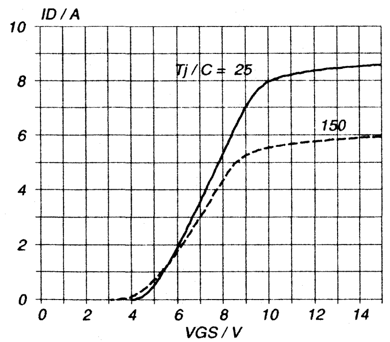


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

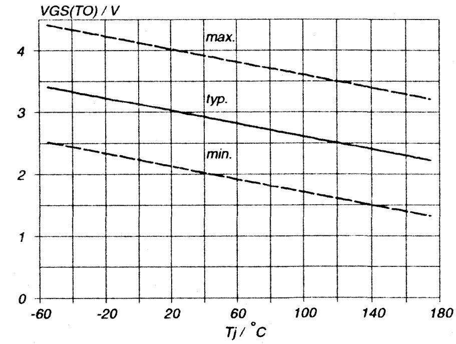


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

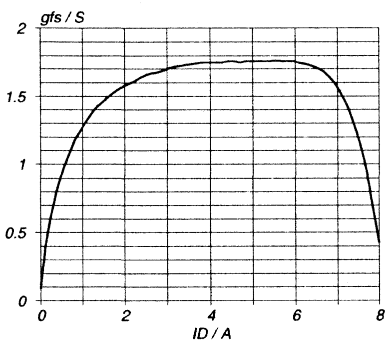


Fig.8. Typical transconductance, T_j = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

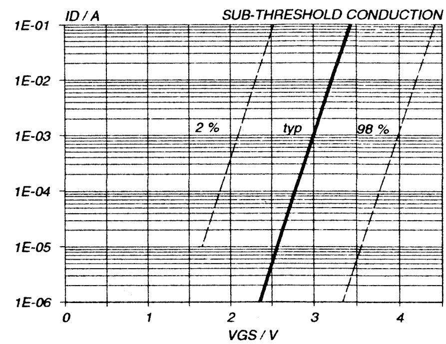


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 °C; $V_{DS} = V_{GS}$

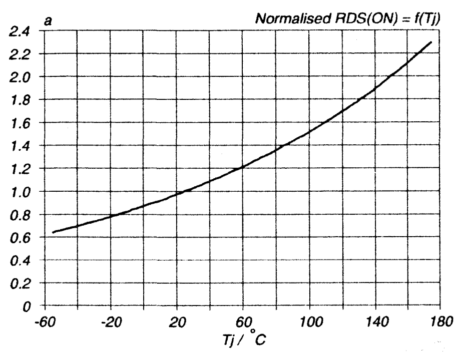


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 2.5 A; V_{GS} = 5 V

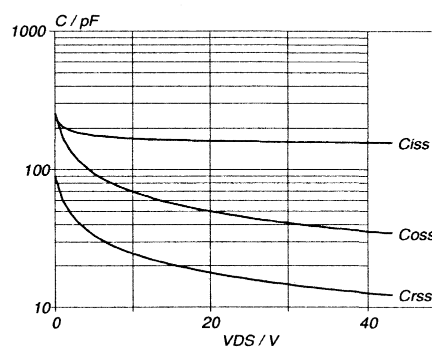


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

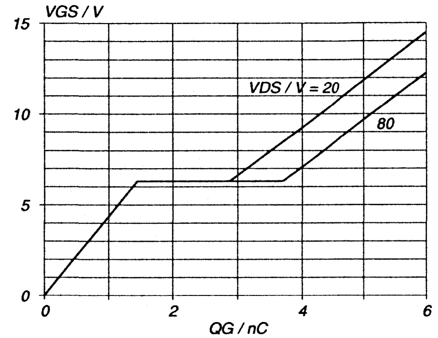


Fig.13. Typical turn-on gate-charge characteristics. $V_{GS} = f(Q_G)$; conditions: $I_D = 3$ A; parameter V_{DS}

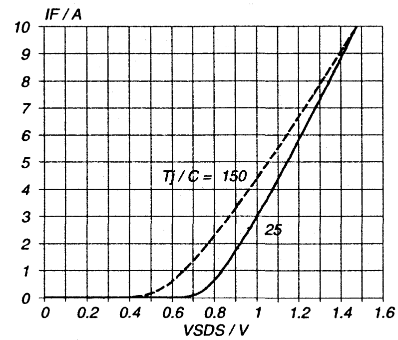


Fig.14. Typical reverse diode current. $I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK441-60A/B	

BUK471-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

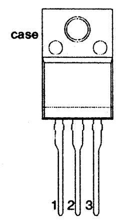
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK471	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	4.8	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

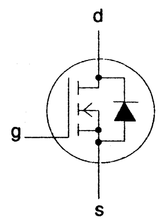
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	5.0	4.8	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	3.4	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	20	19	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 6.25 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 4.0 A **BUK471-60A**	-	0.25	0.4	Ω
		BUK471-60B	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	1.5	1.9	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	4	6	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	15	25	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	15	25	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

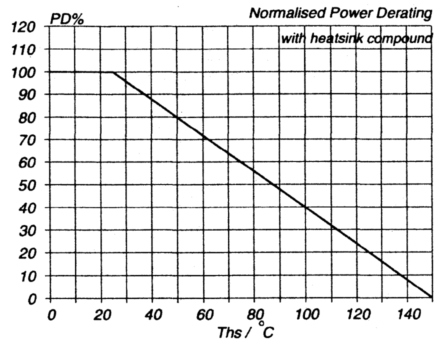


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

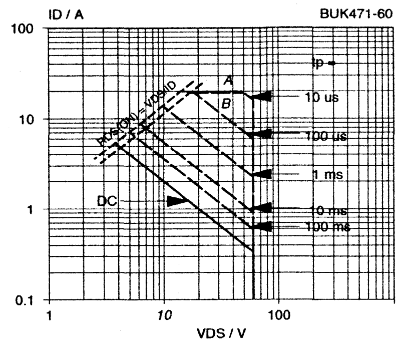


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

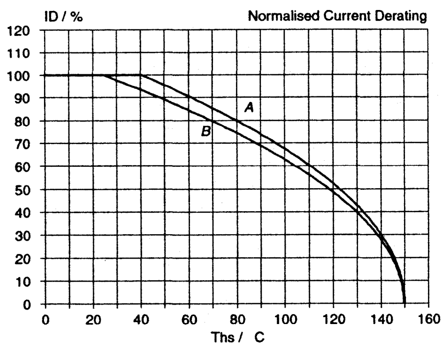


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

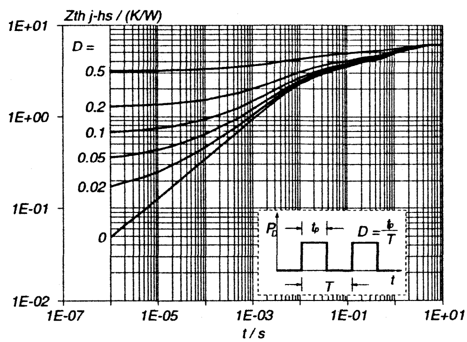


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

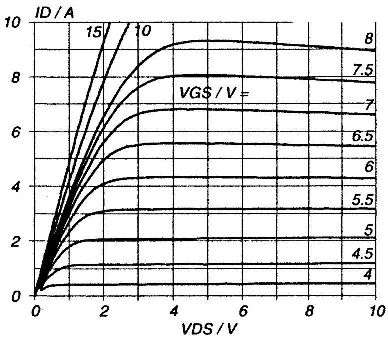


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

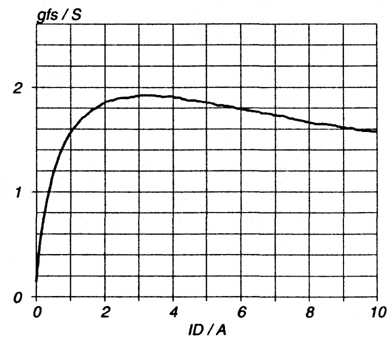


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

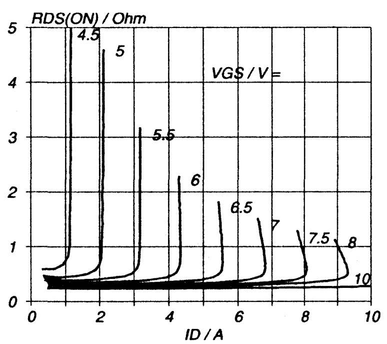


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

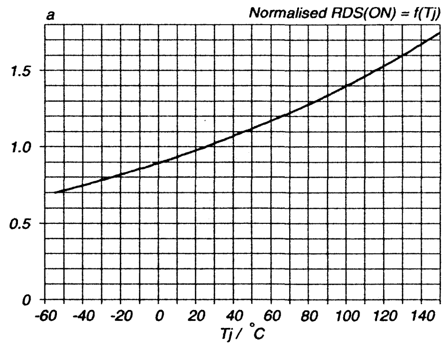


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 4.0$ A; $V_{GS} = 5$ V

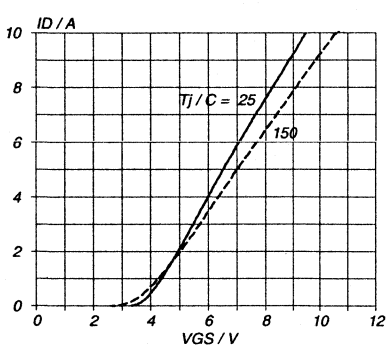


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

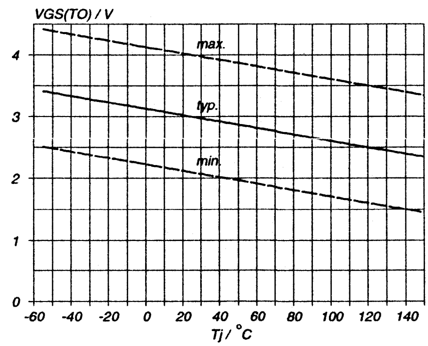


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor | BUK471-60A/B

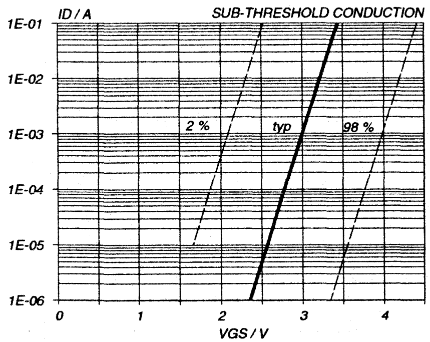


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

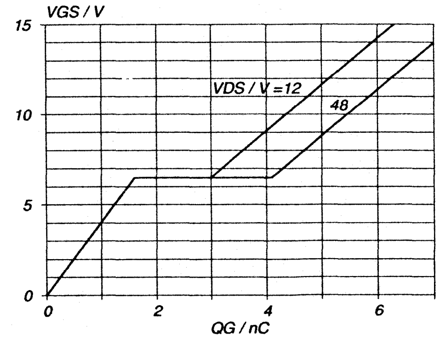


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}

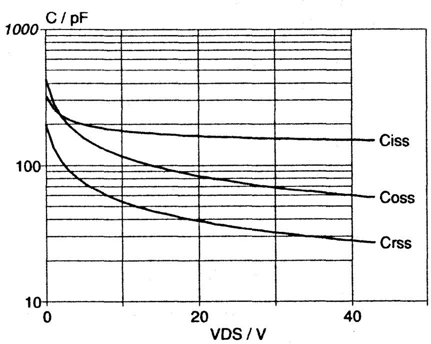


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

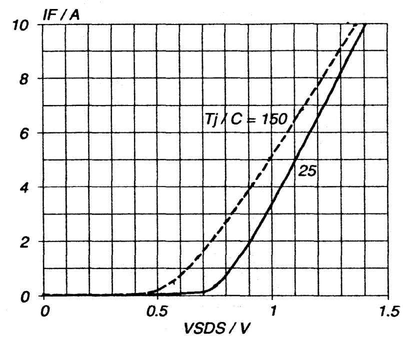


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK441-100A/B	

BUK471-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

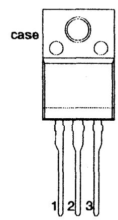
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK471	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	3.0	3.0	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.85	1.1	Ω

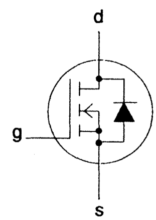
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	**-100B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	3.0	3.0	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2.2	1.9	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	13	11	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 6.25 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK471-100A**	-	0.75	0.85	Ω
		I_D = 2.5 A **BUK471-100B**	-	0.90	1.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	1.3	1.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	45	60	pF
C_{rss}	Feedback capacitance		-	16	25	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	4	6	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	15	25	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	10	20	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 3.0 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

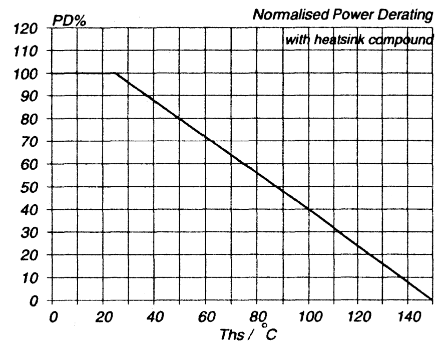


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,˚C}$ = f(T_{hs})

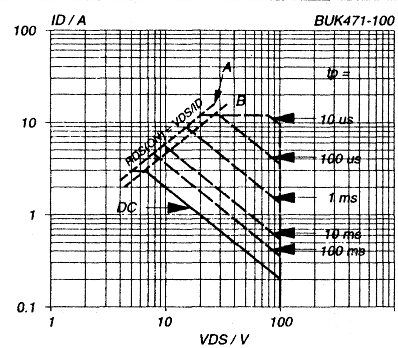


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

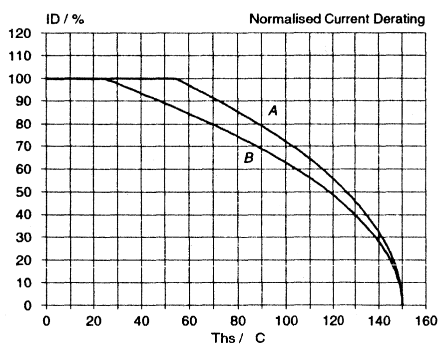


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,˚C}$ = f(T_{hs}); conditions: $V_{GS} \geq$ 5 V

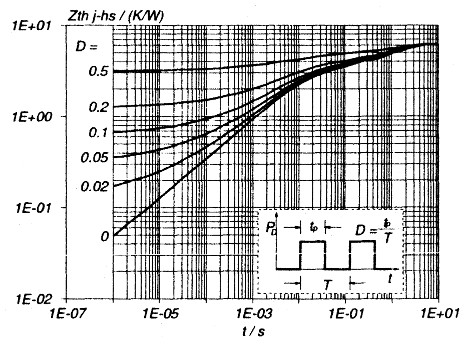


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter D = t_p/T

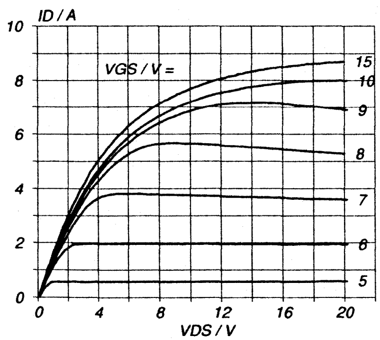


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

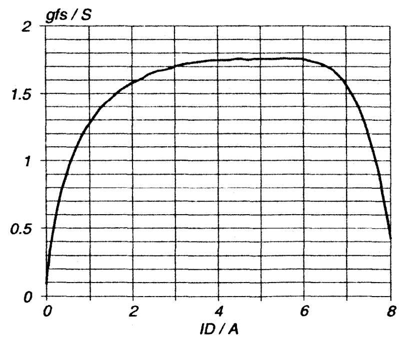


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

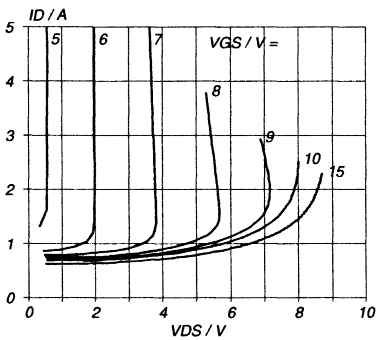


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

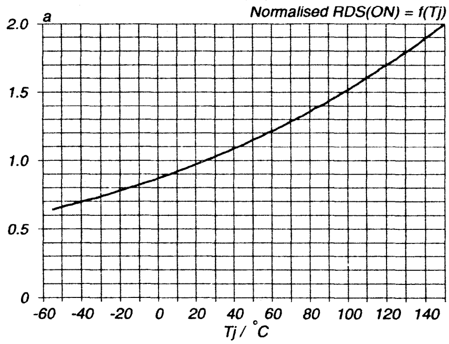


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 5$ V

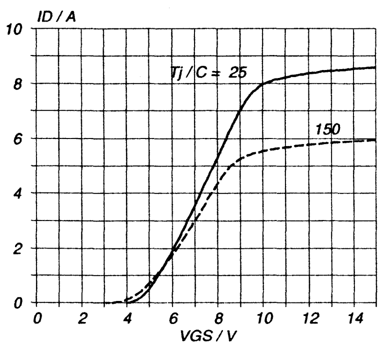


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

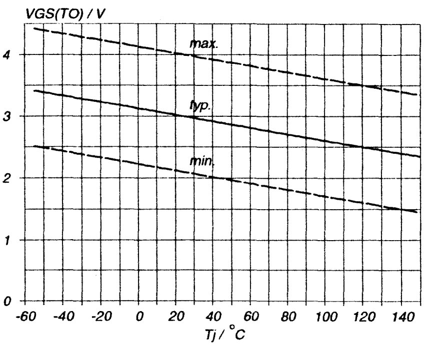


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

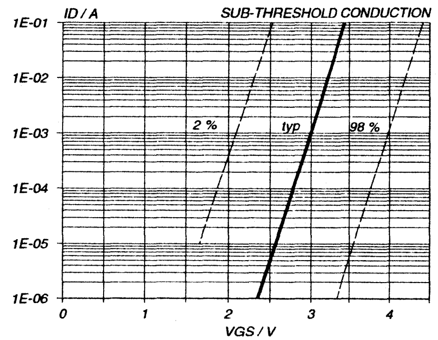


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

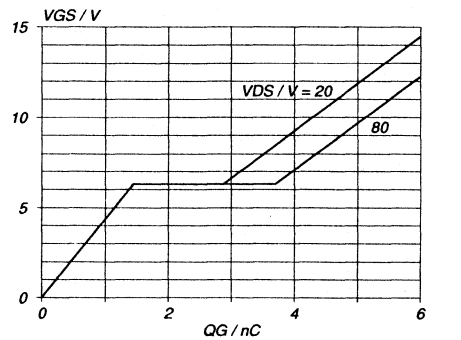


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3$ A; parameter V_{DS}

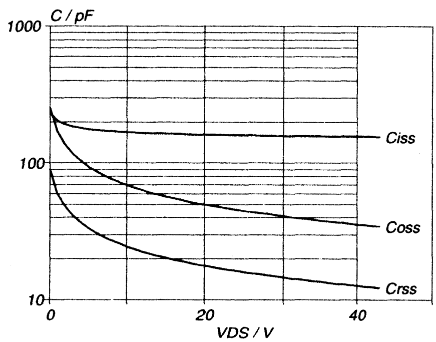


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

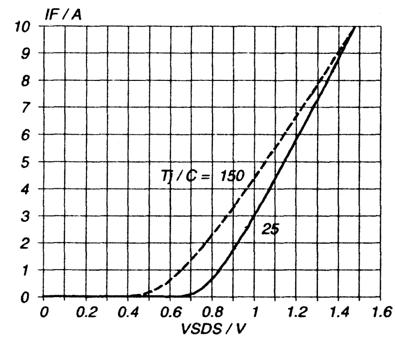


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK442-60A/B	

BUK472-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

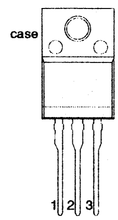
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK472	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	10	9.2	A
P_{tot}	Total power dissipation	22	22	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.13	0.15	Ω

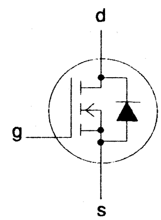
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	10	9.2	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	6.3	5.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	40	37	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5.68 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA		2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C		-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V;	**BUK472-60A**	-	0.11	0.13	Ω
		I_D = 8.5 A	**BUK472-60B**	-	0.13	0.15	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8.5 A	3.5	4.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	150	200	pF
C_{rss}	Feedback capacitance		-	70	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	8	14	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	45	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	30	45	ns
t_f	Turn-off fall time		-	30	45	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	10	A
I_{DRM}	Pulsed reverse drain current	-	-	-	40	A
V_{SD}	Diode forward voltage	I_F = 10 A ; V_{GS} = 0 V	-	1.4	1.7	V
t_{rr}	Reverse recovery time	I_F = 10 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 15 A ; $V_{DD} \leq$ 30 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	30	mJ

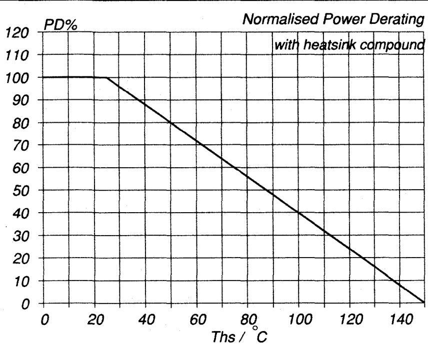


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,˚C}$ = f(T_{hs})

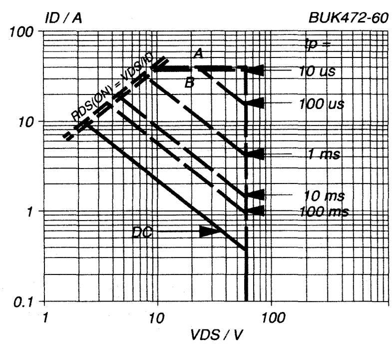


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

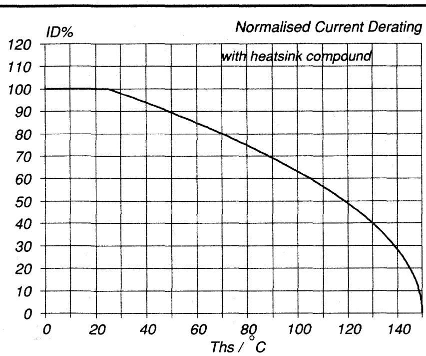


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,˚C}$ = f(T_{hs}); conditions: $V_{GS} \geq$ 10 V

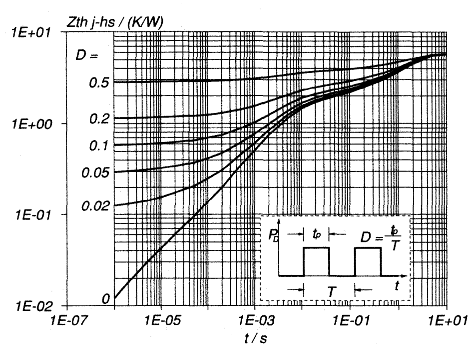


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter D = t_p/T

PowerMOS transistor BUK472-60A/B

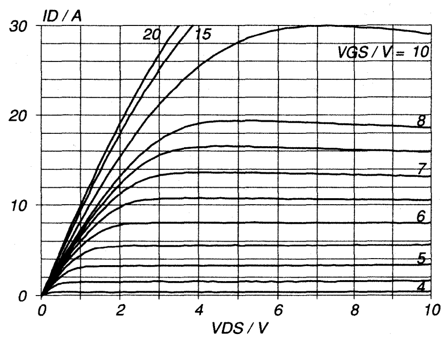


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

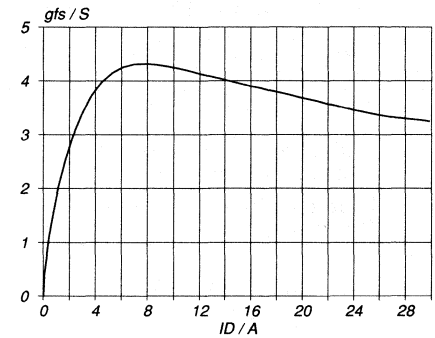


Fig.8. Typical transconductance, $T_j = 25\ ^\circ C$.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

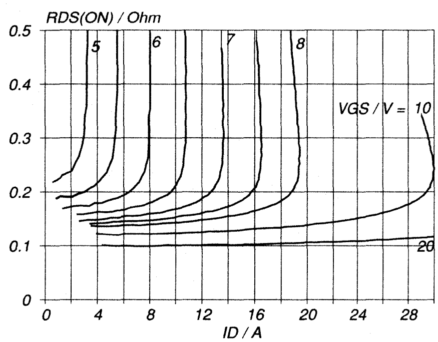


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

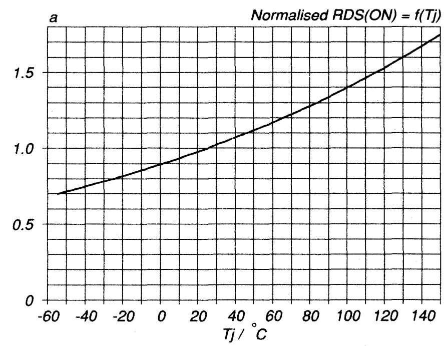


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 8.5$ A; $V_{GS} = 10$ V

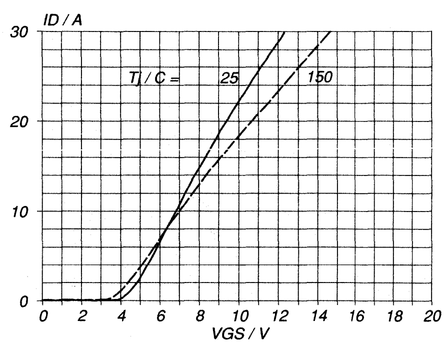


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

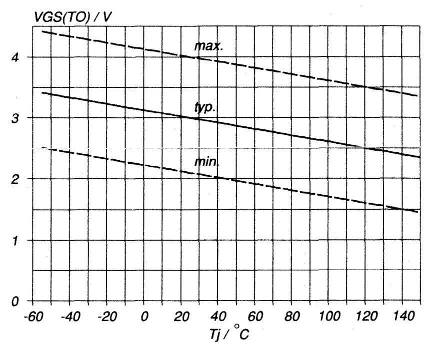


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK472-60A/B

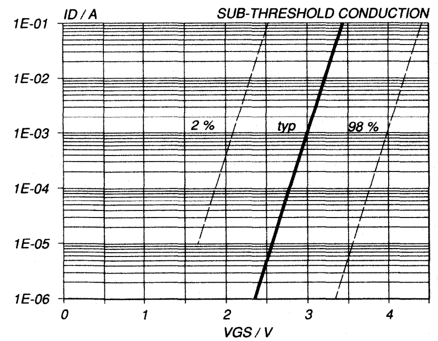


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

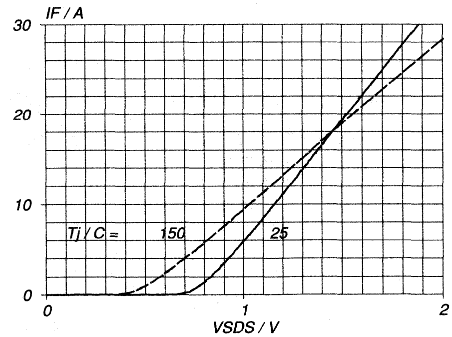


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

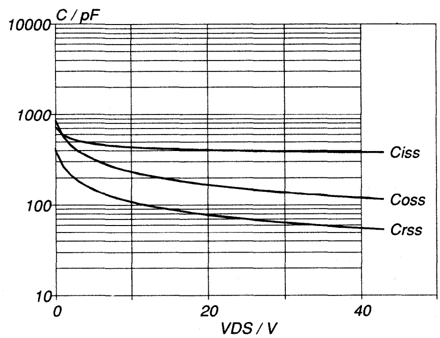


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

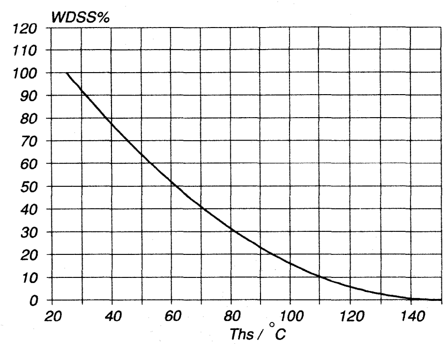


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 15$ A

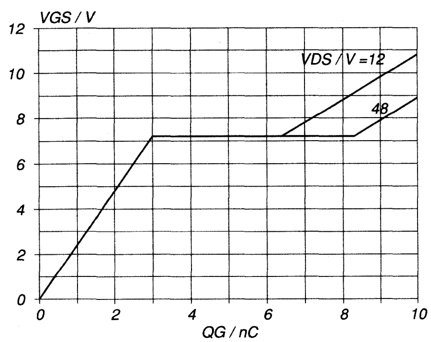


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 15$ A; parameter V_{DS}

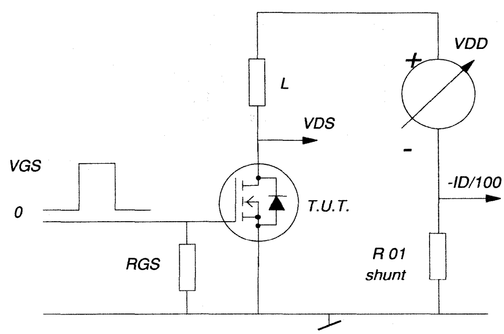


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK442-100A/B	

BUK472-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

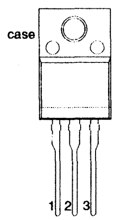
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK472	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	6.6	6.1	A
P_{tot}	Total power dissipation	22	22	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.25	0.3	Ω

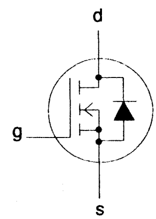
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	6.6	6.1	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	4.1	3.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	26	24	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5.68 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK472-100A**	-	0.22	0.25	Ω
		I_D = 5.5 A **BUK472-100B**	-	0.25	0.3	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5.5 A	3	4.2	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	90	120	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	9	14	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	30	45	ns
t_f	Turn-off fall time		-	20	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	26	A
V_{SD}	Diode forward voltage	I_F = 6.6 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 6.6 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.30	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 11 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	35	mJ

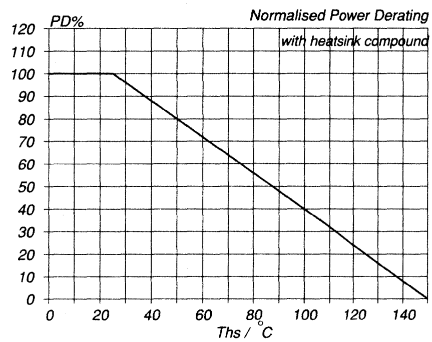


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

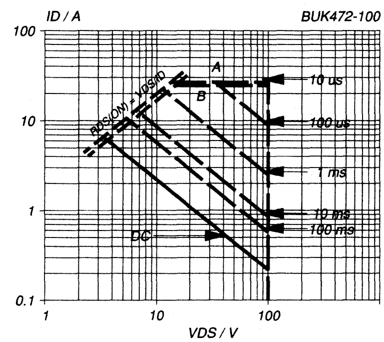


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

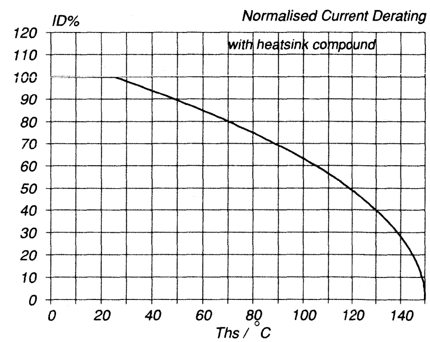


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

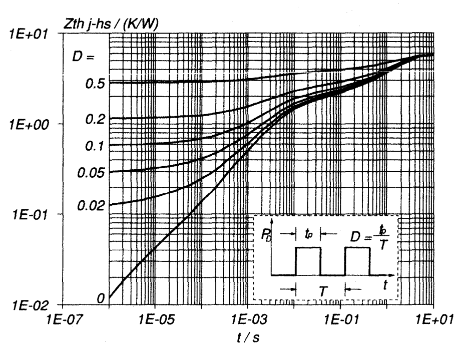


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor BUK472-100A/B

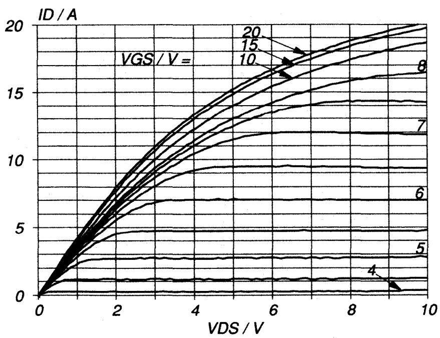


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

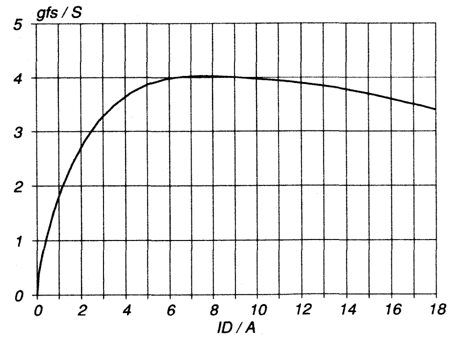


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

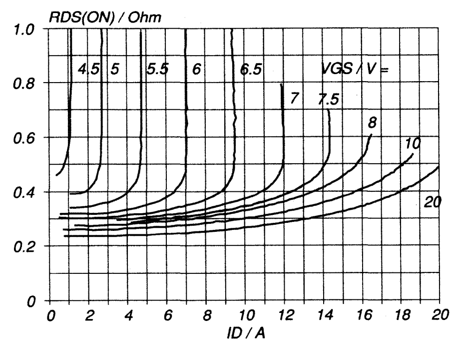


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

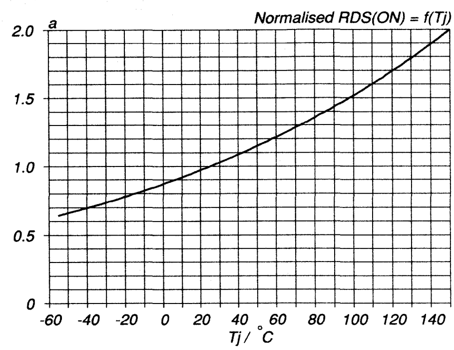


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; $I_D = 5.5$ A; $V_{GS} = 10$ V

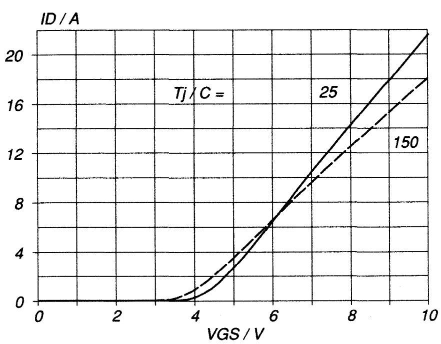


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

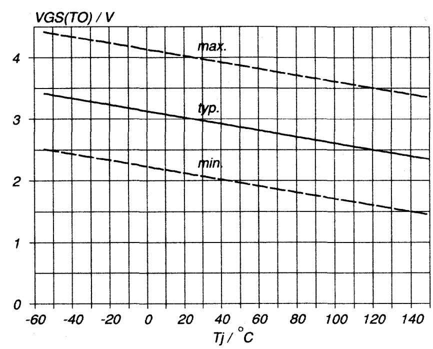


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

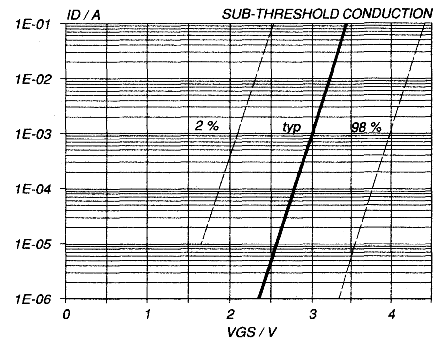


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

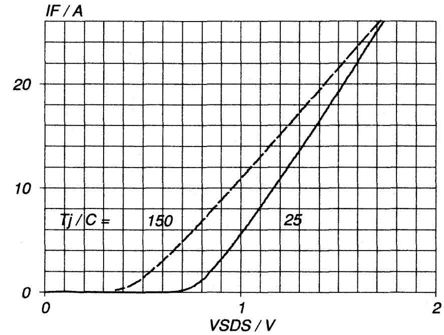


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

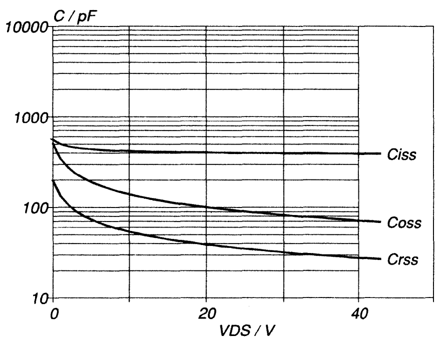


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

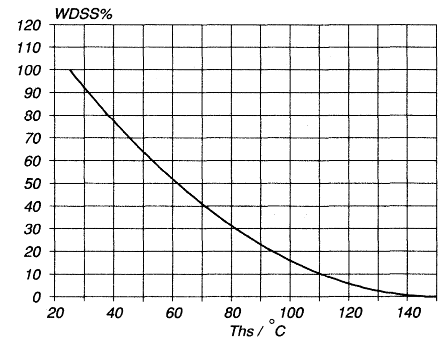


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 11$ A

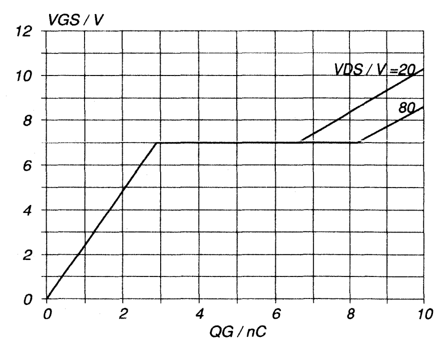


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 11$ A; parameter V_{DS}

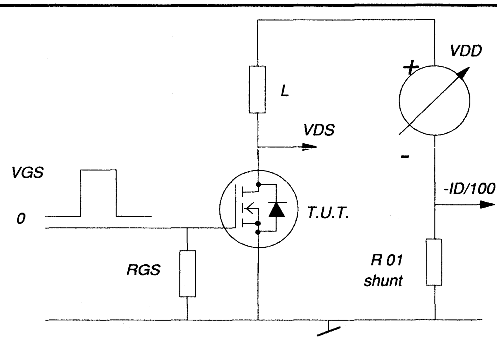


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK443-50A/B	

BUK473-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

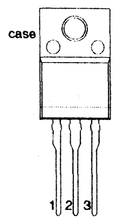
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK473	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.08	0.1	Ω

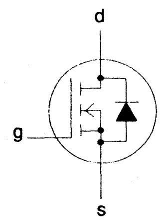
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 °C	-	13	12	A
I_D	Drain current (DC)	T_{hs} = 100 °C	-	8.2	7.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 °C	-	52	48	A
P_{tot}	Total power dissipation	T_{hs} = 25 °C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK473-60A**	-	0.065	0.08	Ω
		I_D = 9 A **BUK473-60B**	-	0.08	0.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 9 A	4.5	6.5	-	S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Feedback capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	- - -	650 240 120	825 350 160	pF pF pF
$t_{d\ on}$ t_r $t_{d\ off}$ t_f	Turn-on delay time Turn-on rise time Turn-off delay time Turn-off fall time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	- - - -	10 35 60 55	20 55 90 80	ns ns ns ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 13 A; $-dI_F/dt$ = 100 A/μs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	μC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 22 A ; $V_{DD} \le 25$ V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	50	mJ

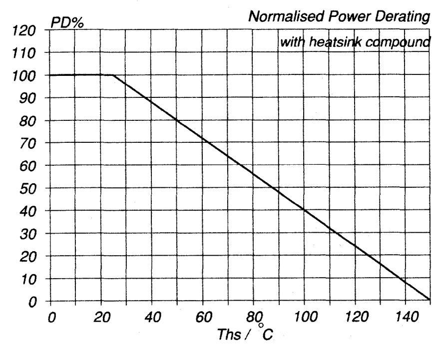


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

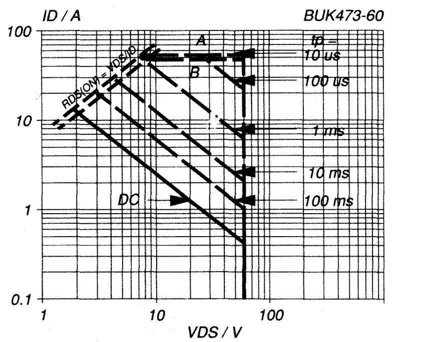


Fig.3. Safe operating area. T_{hs} = 25 ˚C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

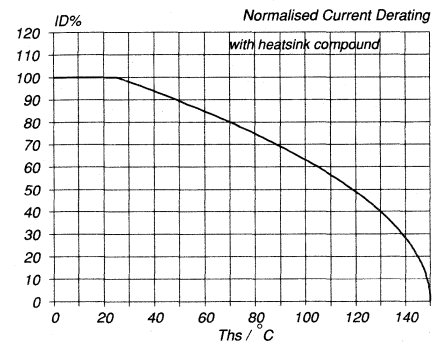


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \ge 10$ V

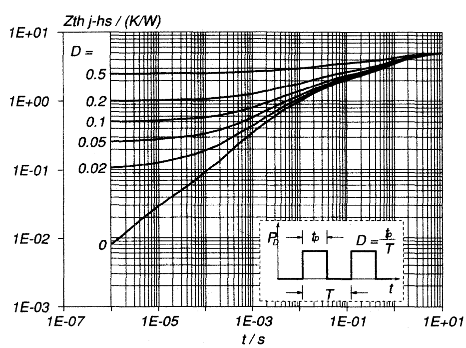


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

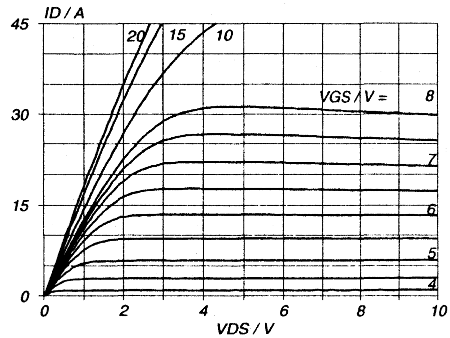


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

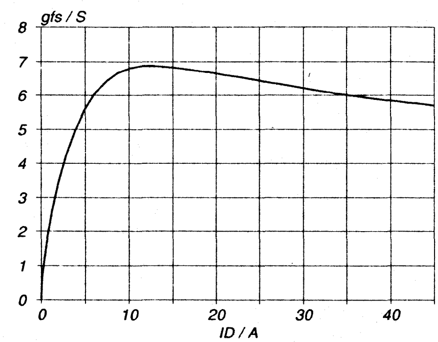


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

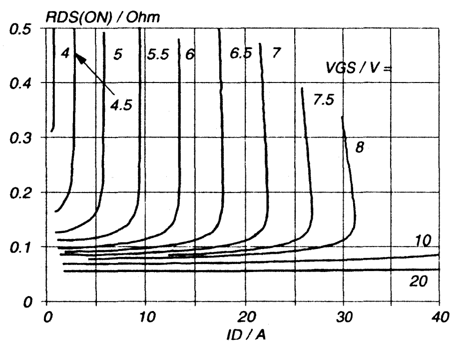


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

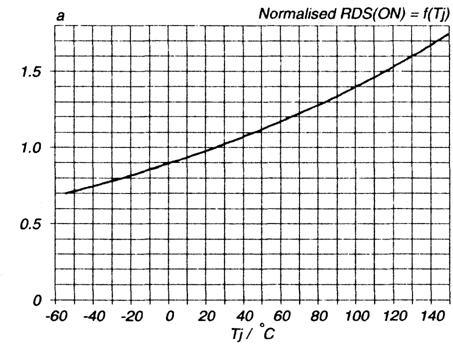


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; $I_D = 9$ A; $V_{GS} = 10$ V

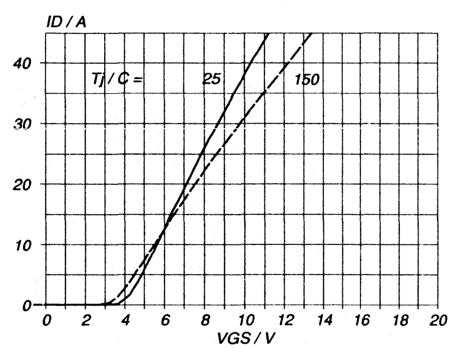


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

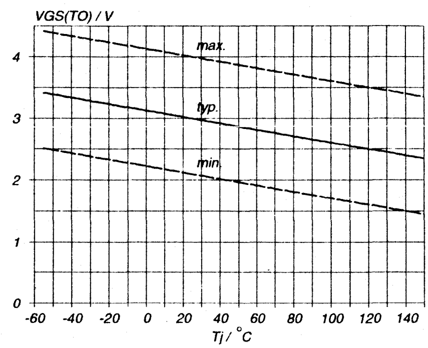


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

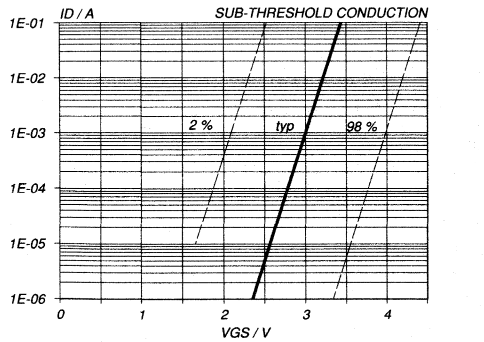


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

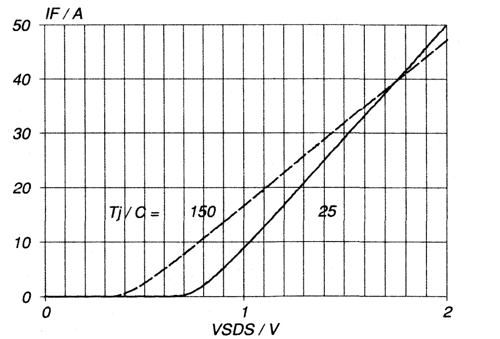


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

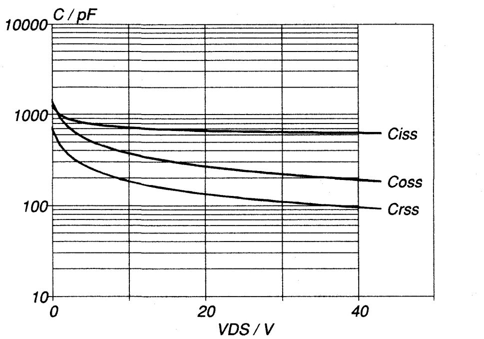


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

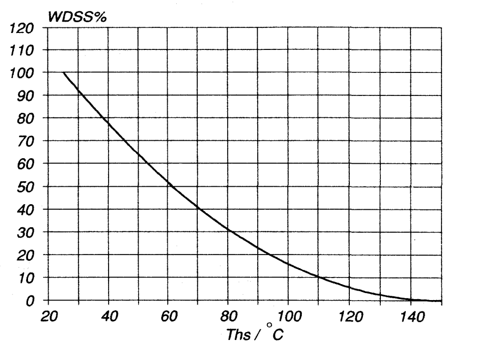


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 22$ A

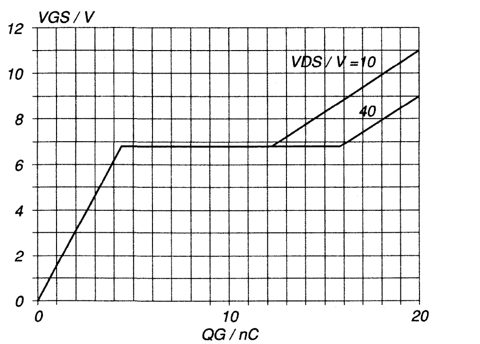


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 22$ A; parameter V_{DS}

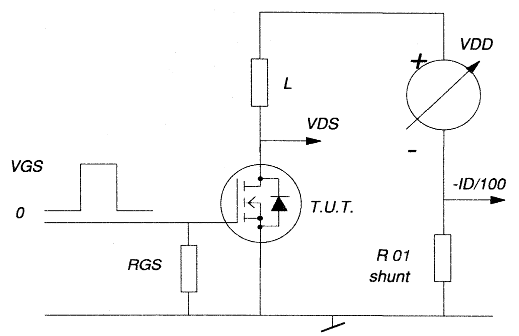


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK443-100A/B	

BUK473-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

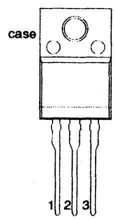
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK473	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	9	8	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.16	0.2	Ω

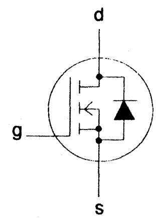
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	9	8	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	5.7	5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	36	32	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK473-100A**	-	0.15	0.16	Ω
		I_D = 5 A **BUK473-100B**	-	0.17	0.2	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5 A	4.0	5.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	660	825	pF
C_{oss}	Output capacitance		-	140	200	pF
C_{rss}	Feedback capacitance		-	60	100	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	60	90	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9	A
I_{DRM}	Pulsed reverse drain current	-	-	-	36	A
V_{SD}	Diode forward voltage	I_F = 9 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 9 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.5	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; V_{DD} ≤ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	70	mJ

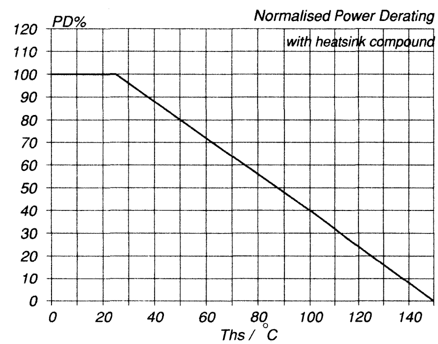


Fig.1. Normalised power dissipation.
PD% = $100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

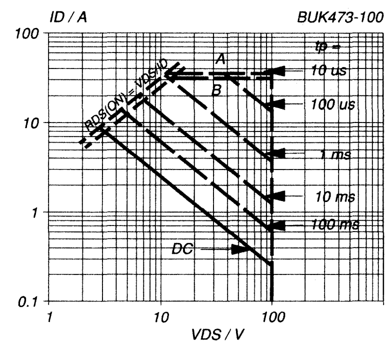


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

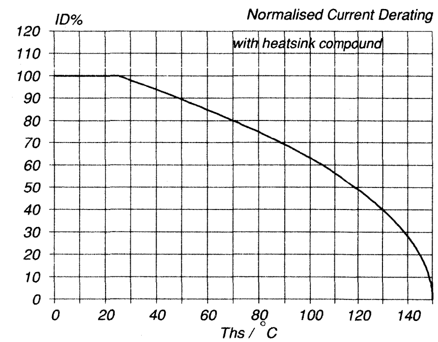


Fig.2. Normalised continuous drain current.
ID% = $100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

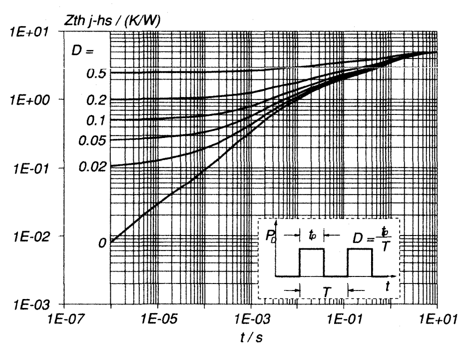


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor

BUK473-100A/B

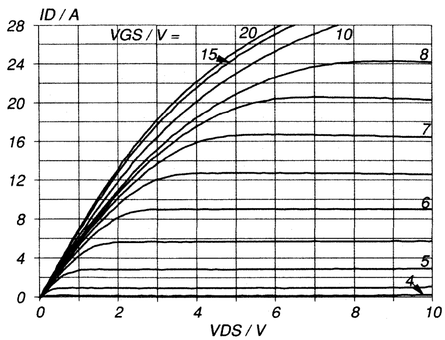


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

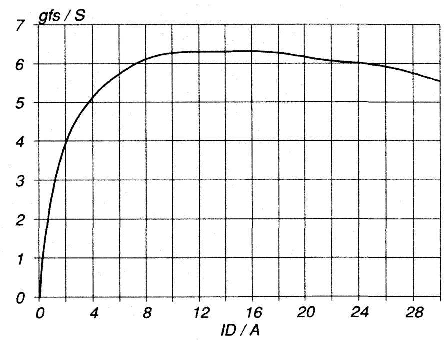


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

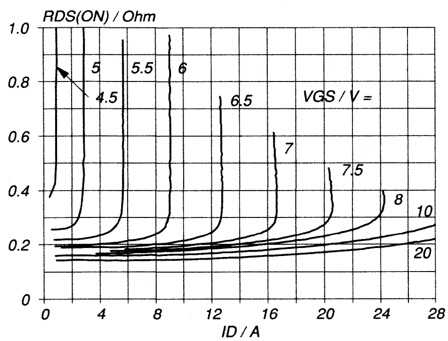


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

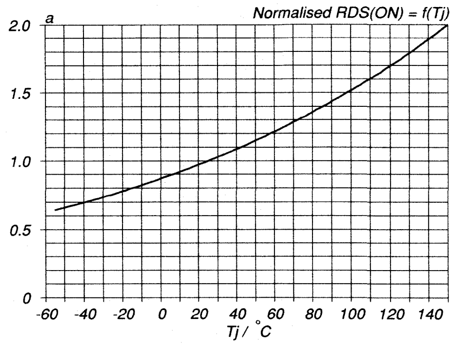


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 5$ A; $V_{GS} = 10$ V

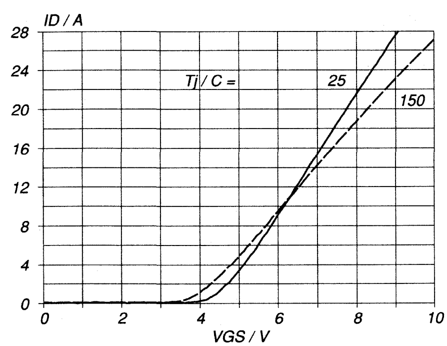


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

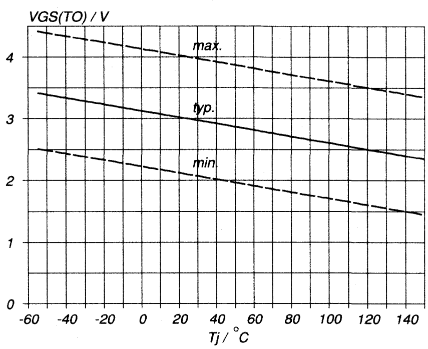


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK473-100A/B

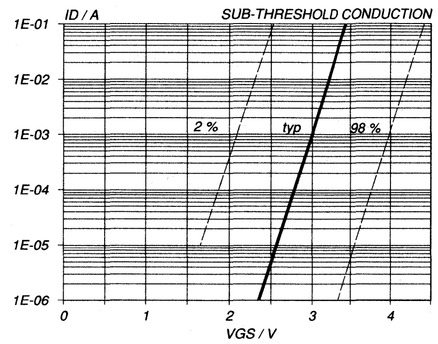


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

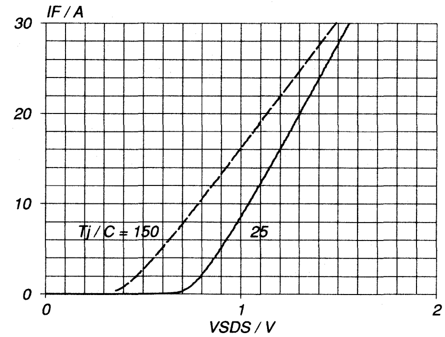


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

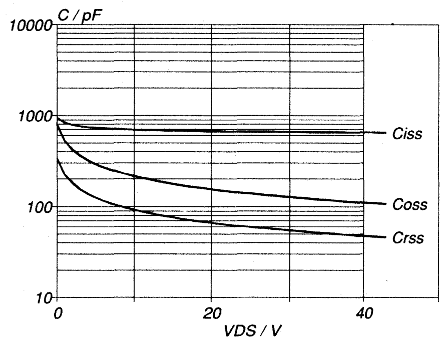


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

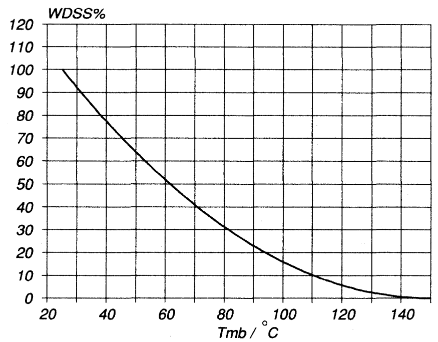


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

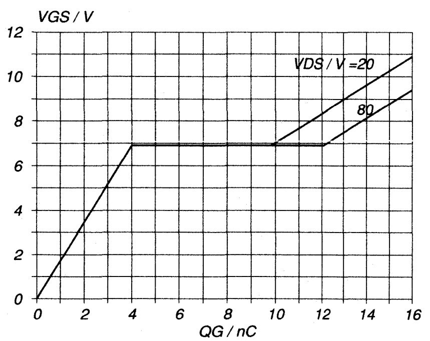


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

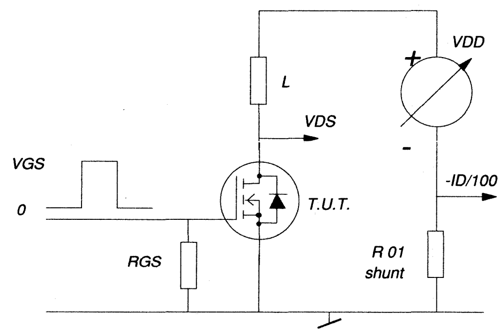


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK444-200A/B	

BUK474-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

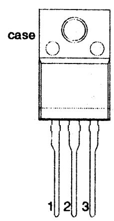
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK474	-200A	-200B	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	5.3	4.7	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

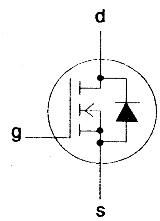
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	-200B	
I_D	Drain current (DC)	T_{hs} = 25 °C	-	5.3	4.7	A
I_D	Drain current (DC)	T_{hs} = 100 °C	-	3.3	3.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 °C	-	21	19	A
P_{tot}	Total power dissipation	T_{hs} = 25 °C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j-hs}$ = 5 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK474-200A**	-	0.35	0.4	Ω
		I_D = 3.5 A **BUK474-200B**	-	0.4	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	3.5	5.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	850	pF
C_{oss}	Output capacitance		-	100	160	pF
C_{rss}	Feedback capacitance		-	50	80	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.9 A;	-	12	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	70	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	120	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	21	A
V_{SD}	Diode forward voltage	I_F = 5.3 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 5.3 A; -dI_F/dt = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.9	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 9 A ; V_{DD} ≤ 100 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	50	mJ

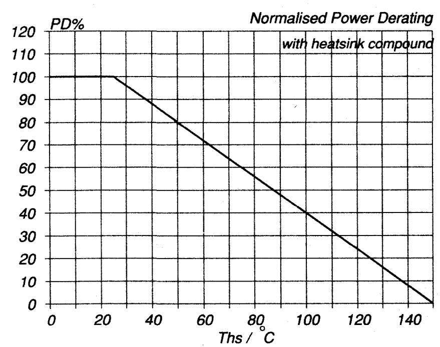


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

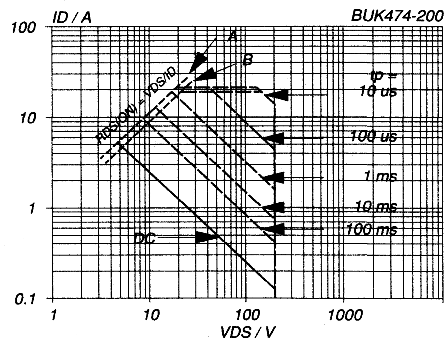


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

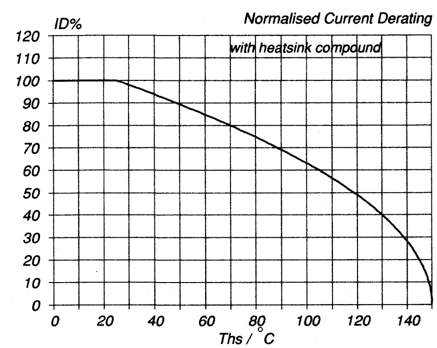


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

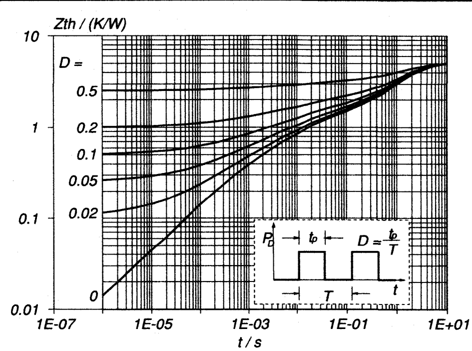


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

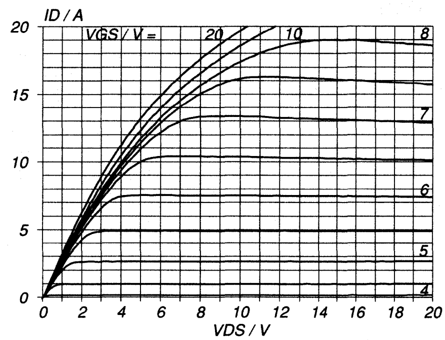


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

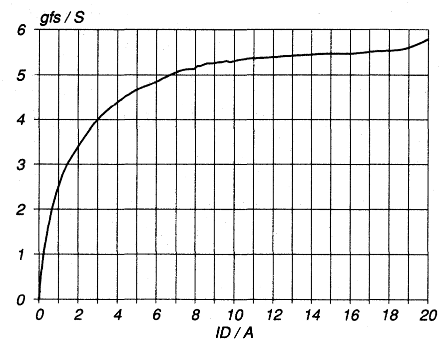


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

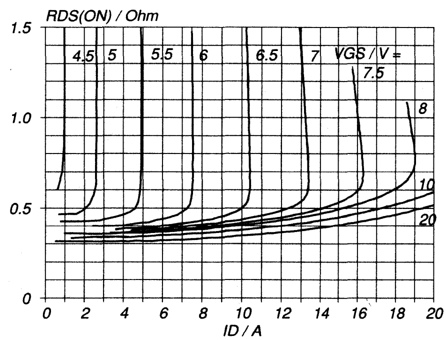


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

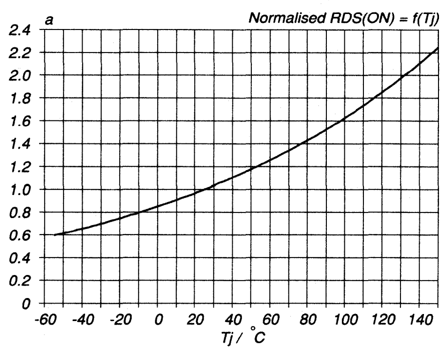


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 3.5 A; V_{GS} = 10 V

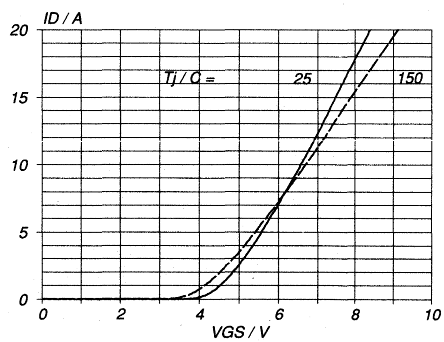


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

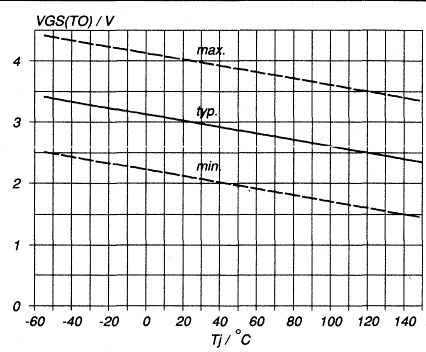


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

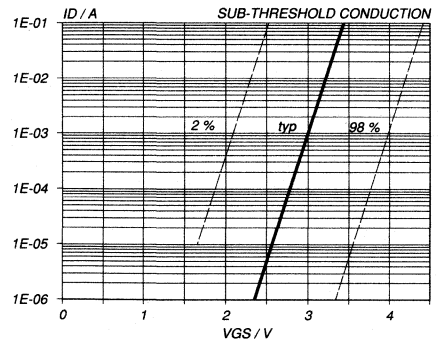


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

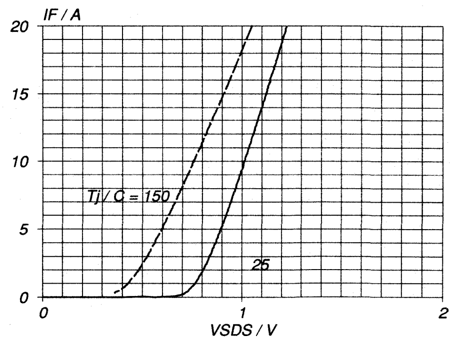


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

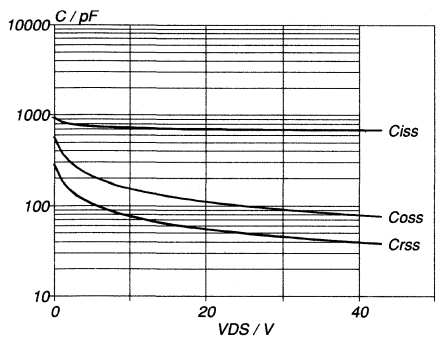


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

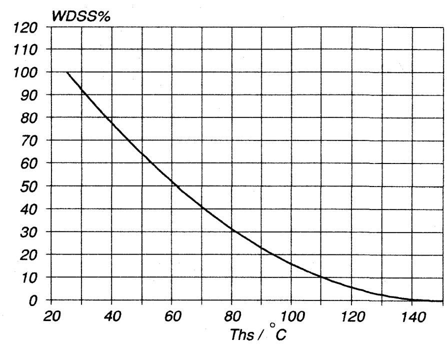


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 9$ A

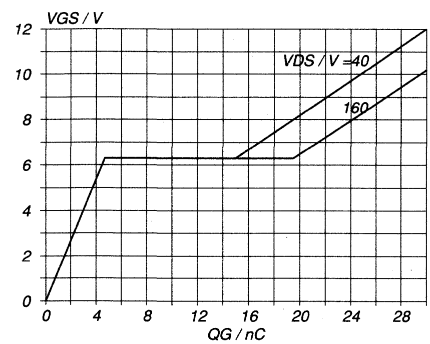


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 9$ A; parameter V_{DS}

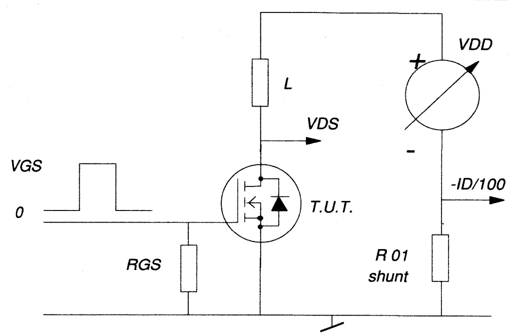


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK444-400A/B	

BUK474-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

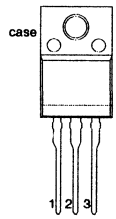
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK474	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	2.7	2.4	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.5	1.8	Ω

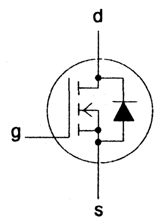
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	-400B	
I_D	Drain current (DC)	T_{hs} = 25 °C	-	2.7	2.4	A
I_D	Drain current (DC)	T_{hs} = 100 °C	-	1.7	1.5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 °C	-	11	9.6	A
P_{tot}	Total power dissipation	T_{hs} = 25 °C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.5 A **BUK474-400A**	-	1.3	1.5	Ω
		BUK474-400B	-	1.6	1.8	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	2.1	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	360	500	pF
C_{oss}	Output capacitance		-	60	80	pF
C_{rss}	Feedback capacitance		-	25	60	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	11	A
V_{SD}	Diode forward voltage	I_F = 2.7 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 2.7 A; $-dI_F/dt$ = 100 A/µs;	-	260	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.5	-	µC

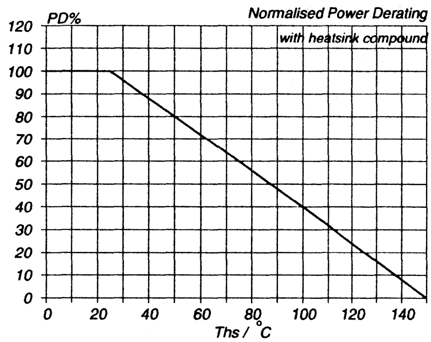


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^{\circ}C} = f(T_{hs})$

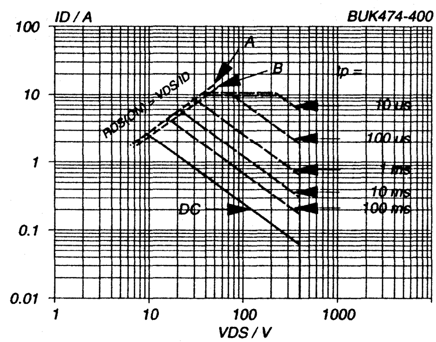


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

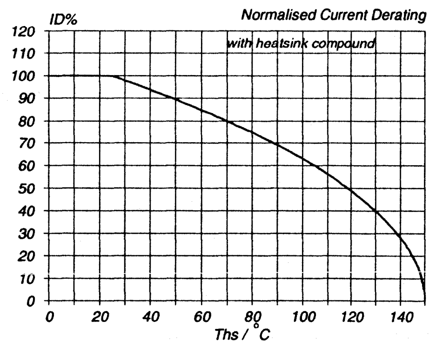


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^{\circ}C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

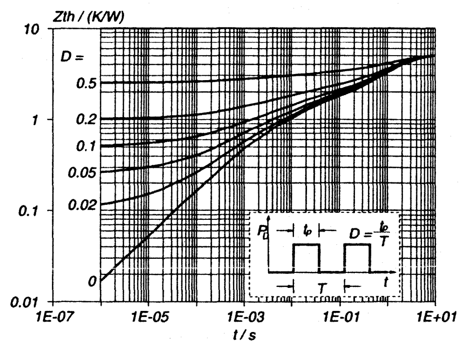


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

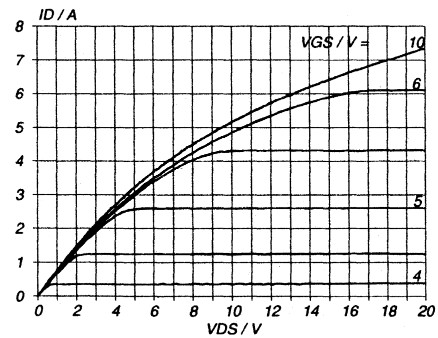


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

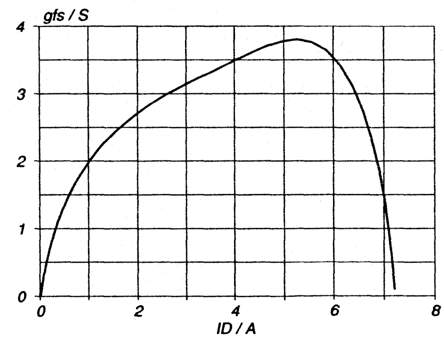


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

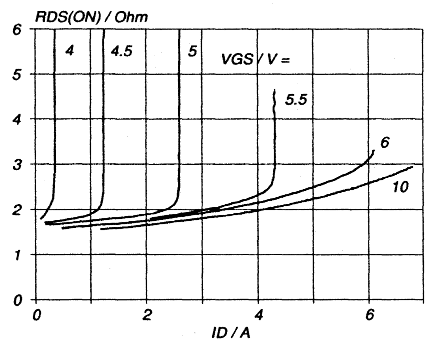


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

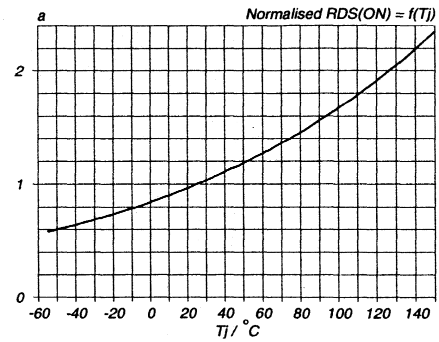


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

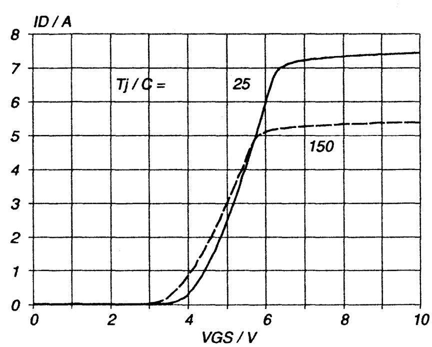


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

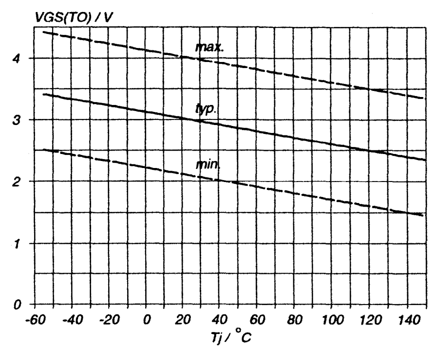


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK474-400A/B

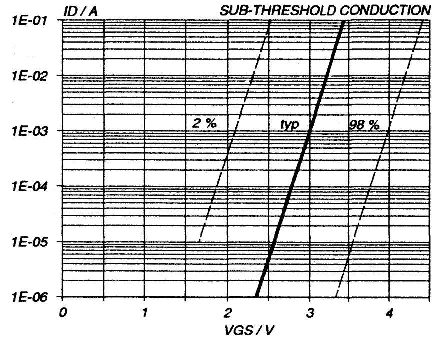


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

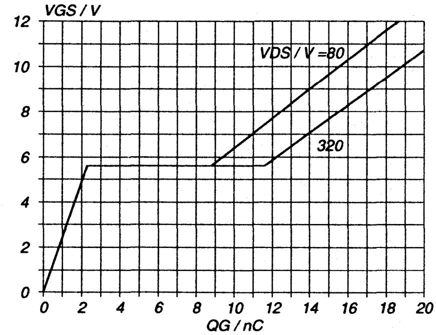


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.6$ A; parameter V_{DS}

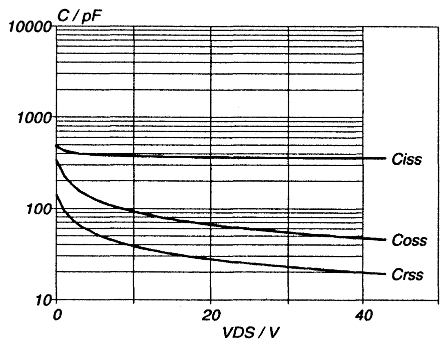


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

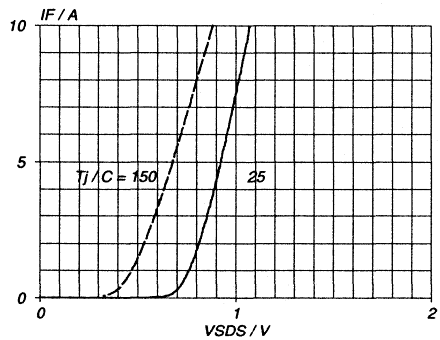


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK444-500A/B	

BUK474-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

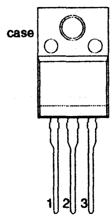
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK474	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	2.1	1.9	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.3	2.8	Ω

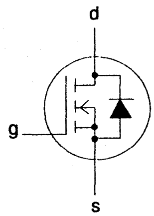
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.1	1.9	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.3	1.2	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	8.4	7.6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA		500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA		2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C		-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C		-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V		-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.2 A	**BUK474-500A**	-	2.0	2.3	Ω
			BUK474-500B	-	2.4	2.8	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.2 A	1.9	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	500	pF
C_{oss}	Output capacitance		-	55	80	pF
C_{rss}	Feedback capacitance		-	20	55	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	15	20	ns
t_r	Turn-on rise time		-	40	60	ns
$t_{d\,off}$	Turn-off delay time		-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.1	A
I_{DRM}	Pulsed reverse drain current	-	-	-	8.4	A
V_{SD}	Diode forward voltage	I_F = 2.1 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.1 A; $-dI_F/dt$ = 100 A/µs;	-	270	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	2.0	-	µC

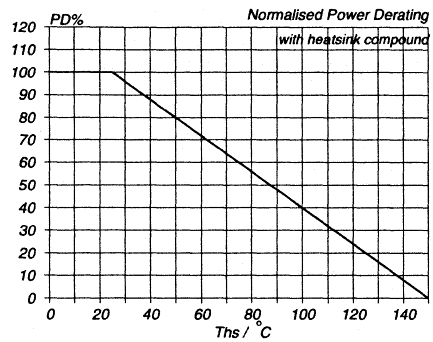


Fig.1. Normalised power dissipation.
PD% = $100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

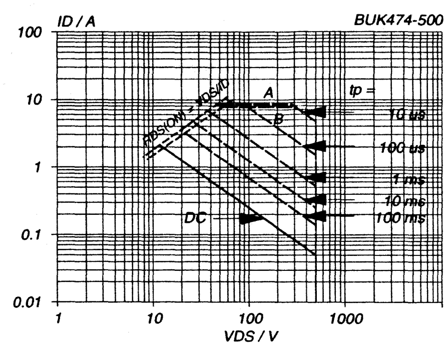


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

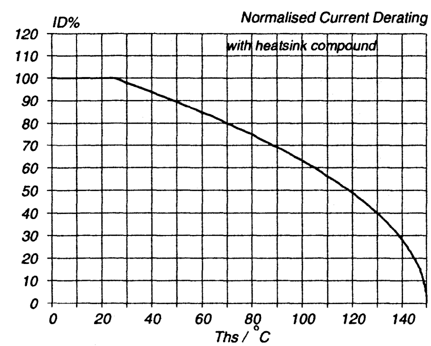


Fig.2. Normalised continuous drain current.
ID% = $100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

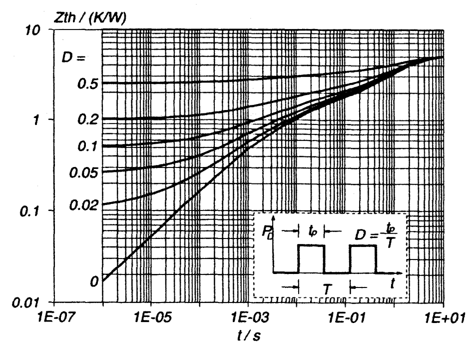


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

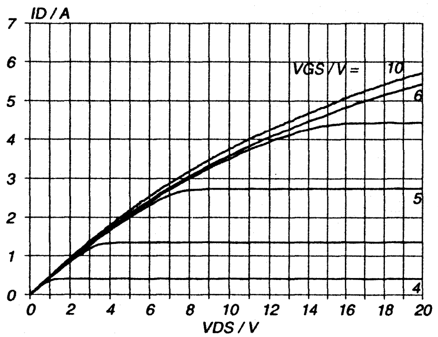


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

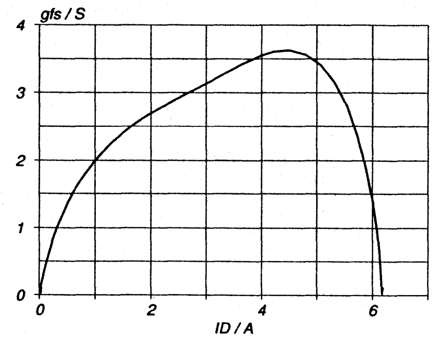


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

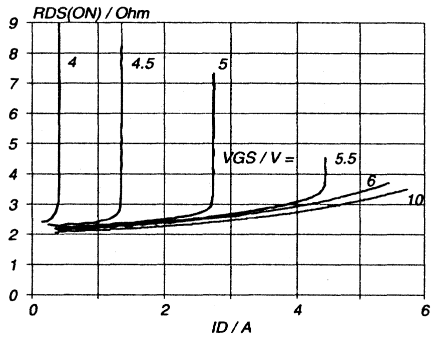


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

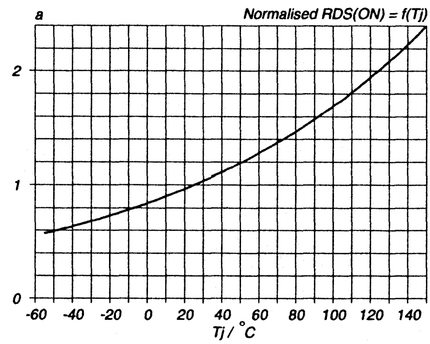


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

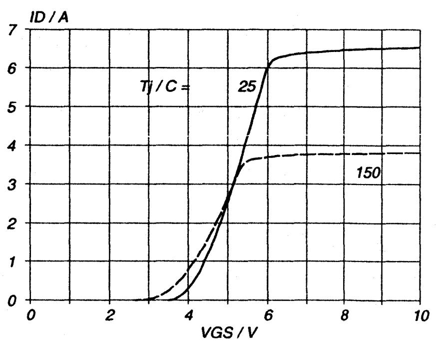


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

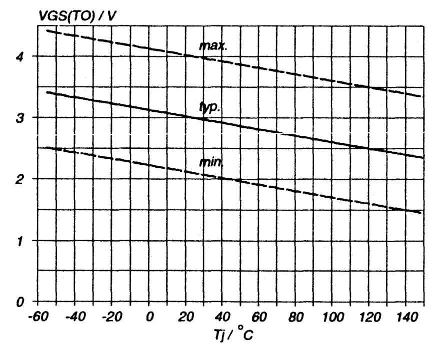


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

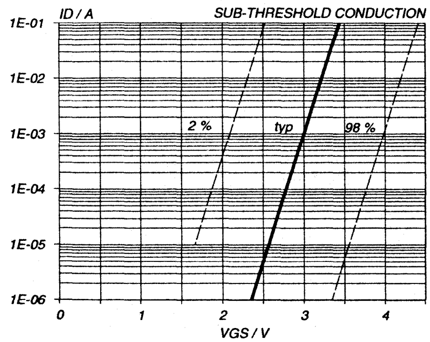


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

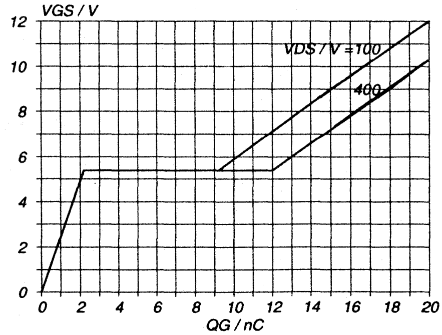


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.7$ A; parameter V_{DS}

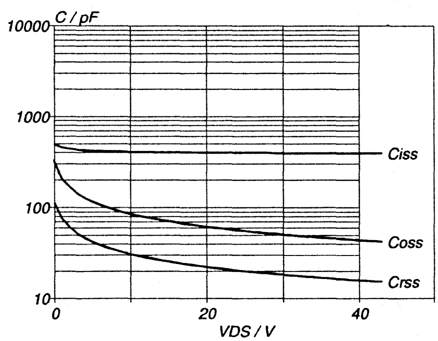


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

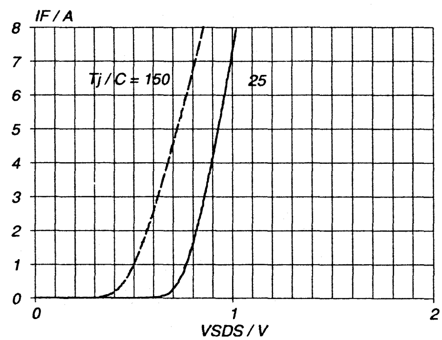


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK444-600A/B	

BUK474-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

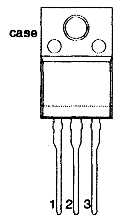
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK474	-600A	-600B	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	1.6	1.5	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance	4.0	4.5	Ω

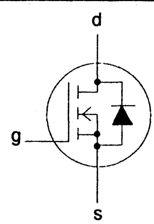
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	-600B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	1.6	1.5	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.0	0.95	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	6.4	6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j-hs}$ = 5 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.2 A **BUK474-600A**	-	3.8	4.0	Ω
		BUK474-600B	-	4.0	4.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.2 A	1.9	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	300	500	pF
C_{oss}	Output capacitance		-	50	80	pF
C_{rss}	Feedback capacitance		-	30	55	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.1 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	40	60	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	6.4	A
V_{SD}	Diode forward voltage	I_F = 1.6 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.6 A; $-dI_F/dt$ = 100 A/µs;	-	280	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	1.5	-	µC

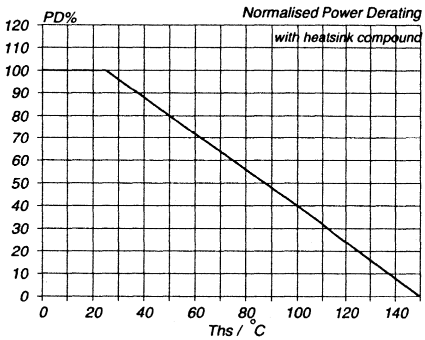


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,˚C}$ = f(T_{hs})

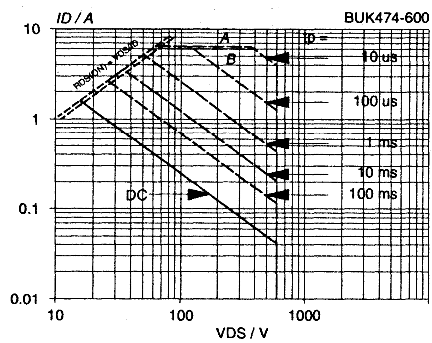


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

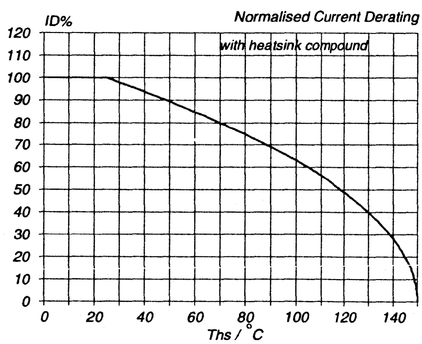


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,˚C}$ = f(T_{hs}); conditions: $V_{GS} \geq$ 10 V

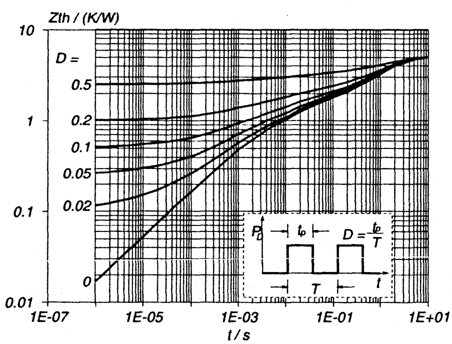


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs}$ = f(t); parameter D = t_p/T

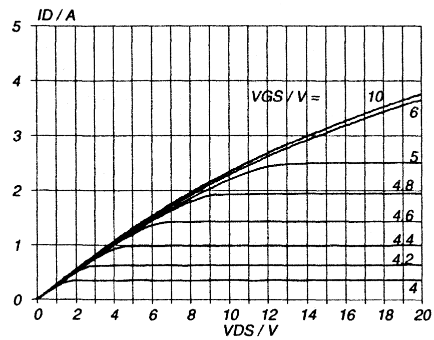


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

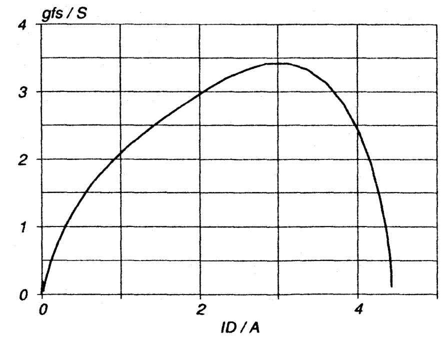


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

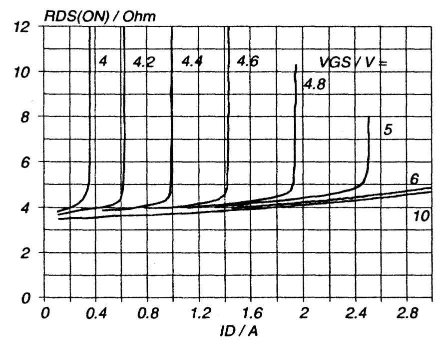


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

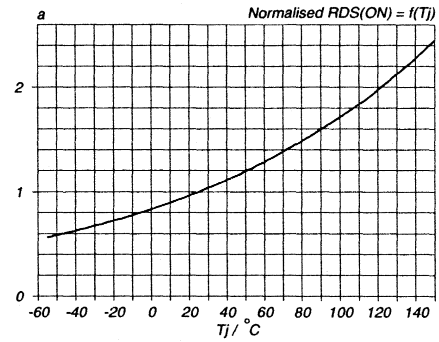


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 1.2$ A; $V_{GS} = 10$ V

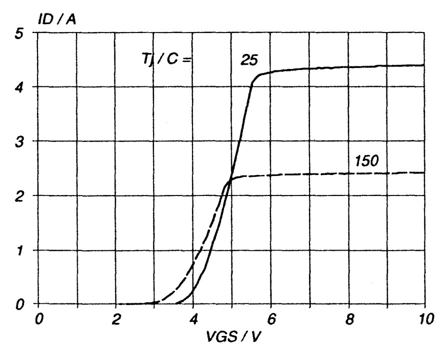


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

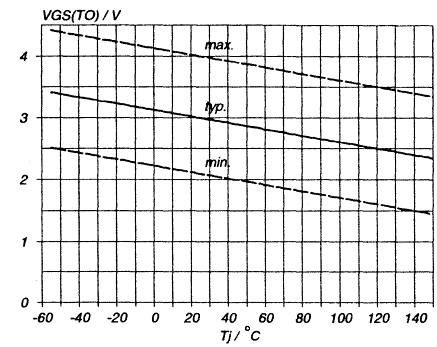


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

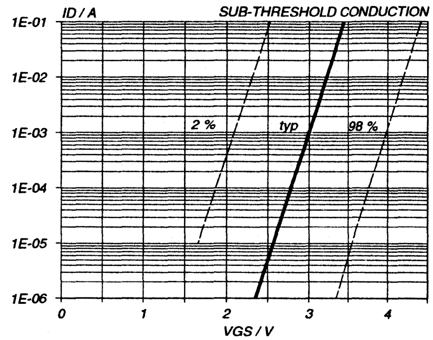


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

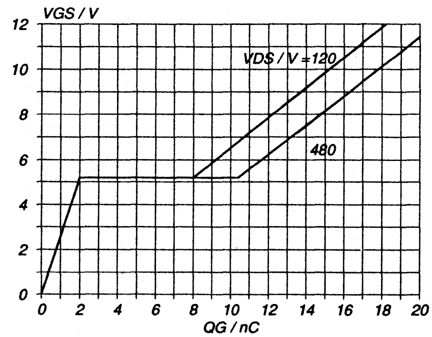


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 2.8$ A; parameter V_{DS}

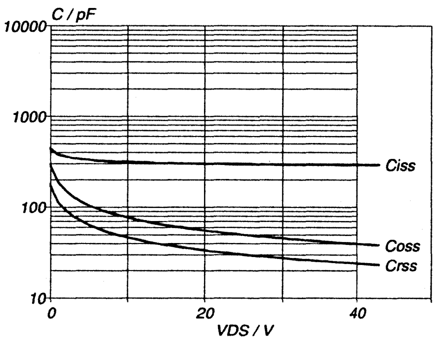


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

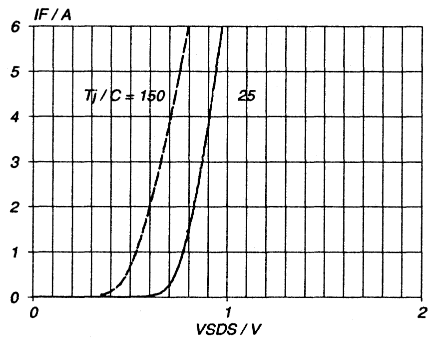


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK444-800A/B	

BUK474-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

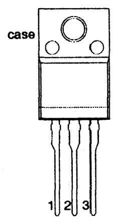
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK474	**-800A**	**-800B**	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	1.4	1.2	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	6.0	8.0	Ω

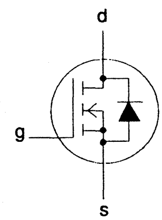
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	**-800B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	1.4	1.2	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	0.9	0.75	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	5.6	4.8	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.17 K/W
From junction to ambient	-	$R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK474-800A**	-	5.0	6.0	Ω
		I_D = 1.0 A **BUK474-800B**	-	6.0	8.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.0 A	1.0	2.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	450	750	pF
C_{oss}	Output capacitance		-	42	70	pF
C_{rss}	Feedback capacitance		-	15	30	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 1.9 A;	-	15	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	65	ns
t_f	Turn-off fall time		-	30	40	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.4	A
I_{DRM}	Pulsed reverse drain current	-	-	-	5.6	A
V_{SD}	Diode forward voltage	I_F = 1.4 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.4 A; $-dI_F/dt$ = 100 A/µs;	-	230	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	1.9	-	µC

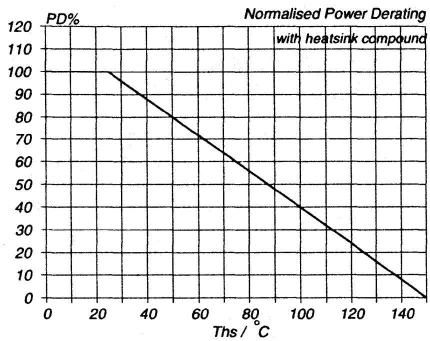


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

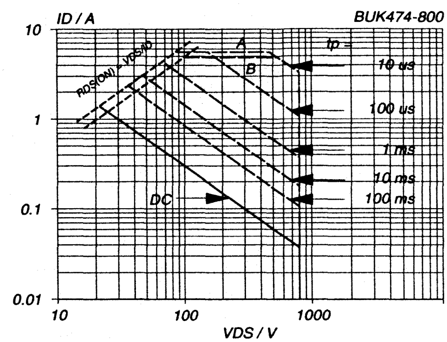


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

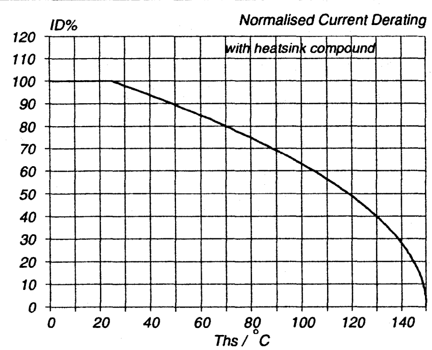


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

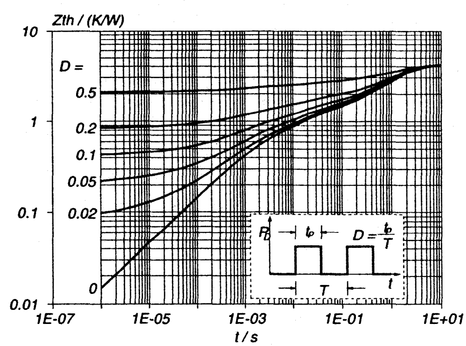


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

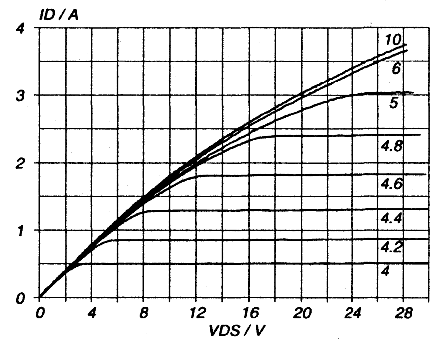


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

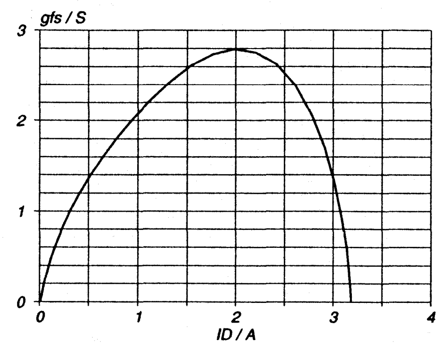


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

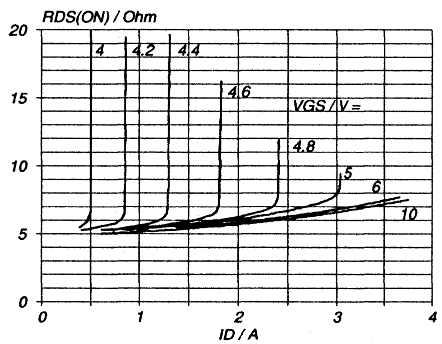


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

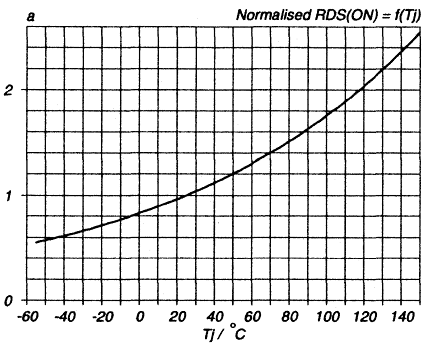


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 1.0$ A; $V_{GS} = 10$ V

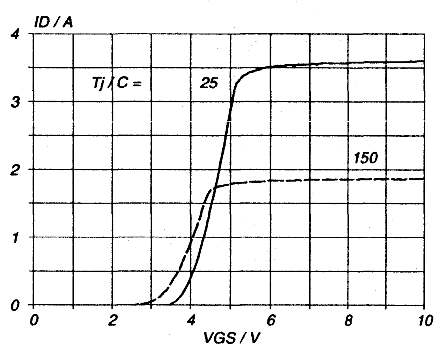


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

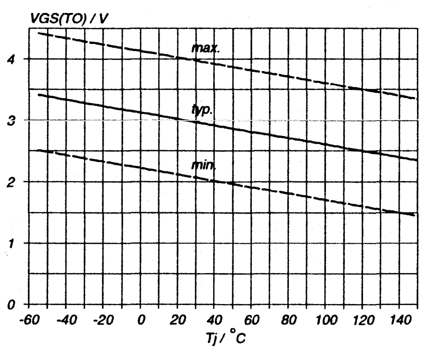


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

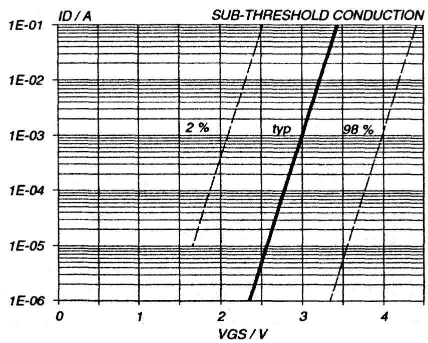


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

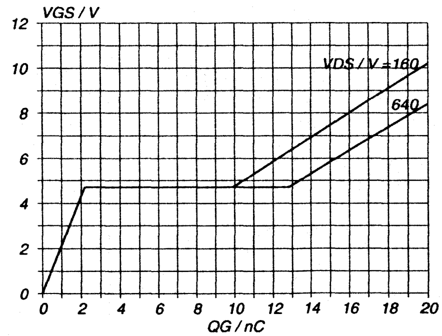


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 2.4$ A; parameter V_{DS}

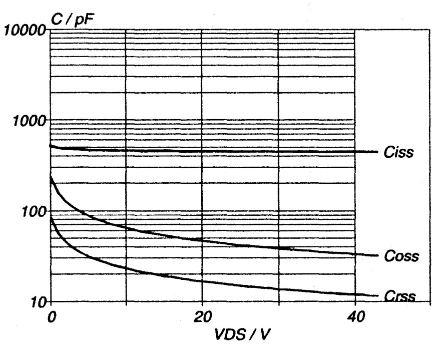


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

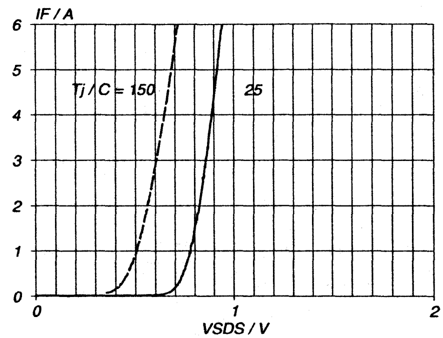


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK445-50A/B	

BUK 475-60A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

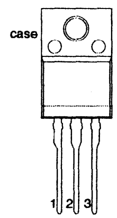
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK475	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	21	20	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.038	0.045	Ω

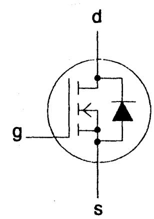
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	21	20	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	13	12.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	84	80	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.17 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK475-60A**	-	0.03	0.038	Ω
		I_D = 20 A **BUK475-60B**	-	0.04	0.045	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	8	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	560	750	pF
C_{rss}	Feedback capacitance		-	300	400	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	125	160	ns
t_f	Turn-off fall time		-	100	130	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	21	A
I_{DRM}	Pulsed reverse drain current	-	-	-	84	A
V_{SD}	Diode forward voltage	I_F = 21 A ; V_{GS} = 0 V	-	1.4	1.8	V
t_{rr}	Reverse recovery time	I_F = 21 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 41 A ; V_{DD} ≤ 25 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

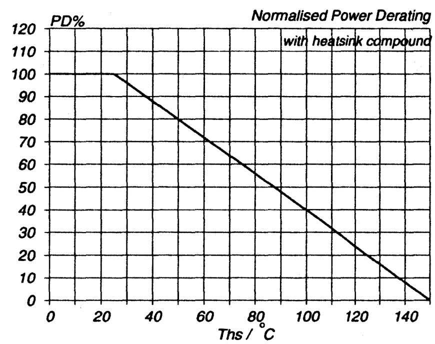


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

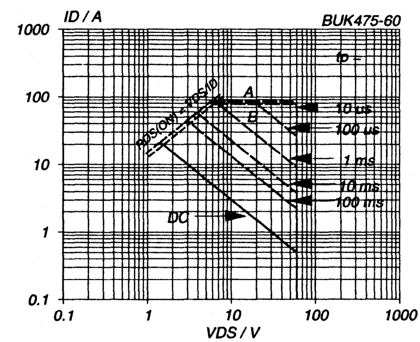


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

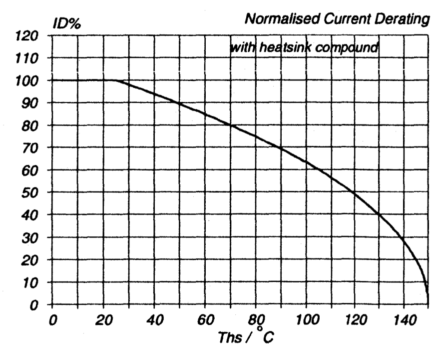


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: V_{GS} ≥ 10 V

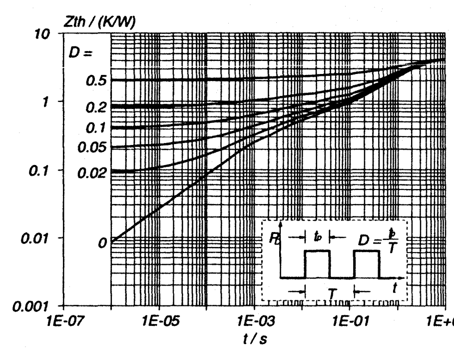


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter $D = t_p/T$

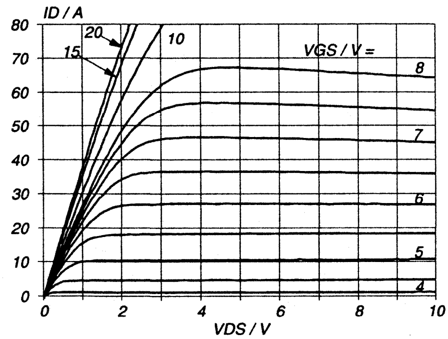


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

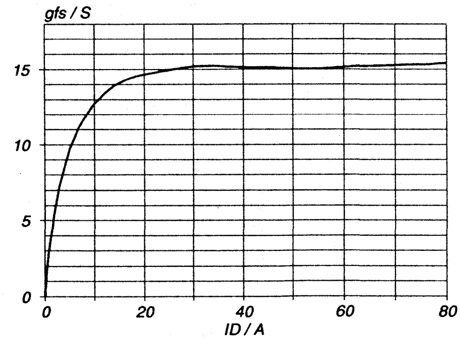


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

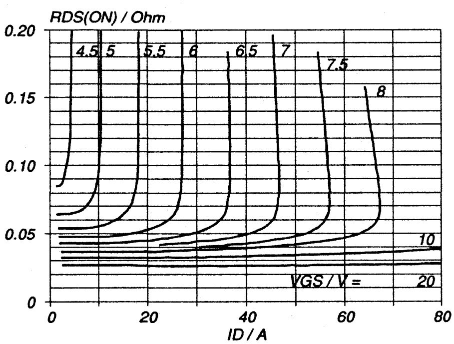


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

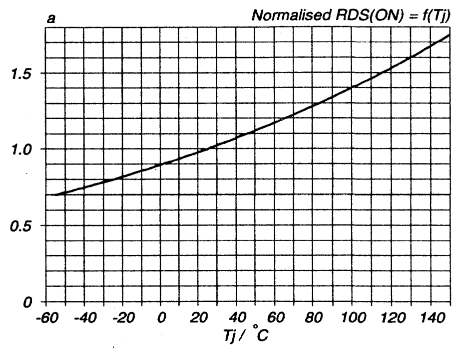


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 20$ A; $V_{GS} = 10$ V

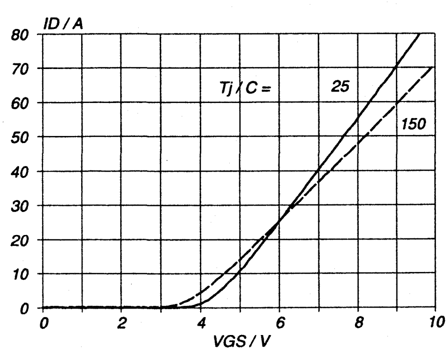


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

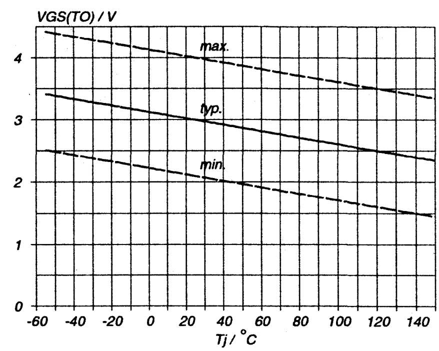


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

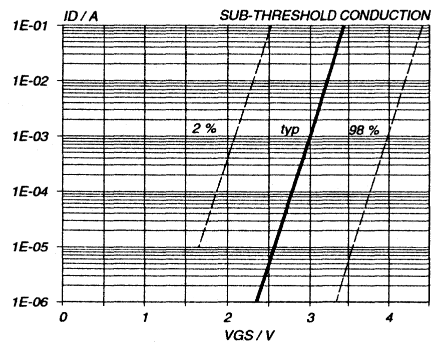


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

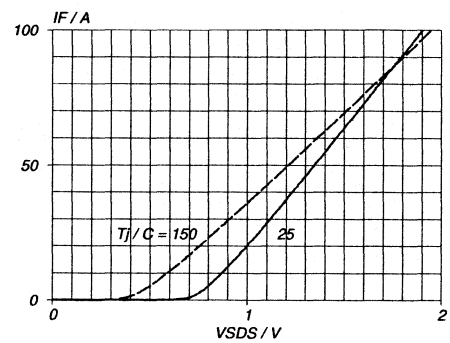


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

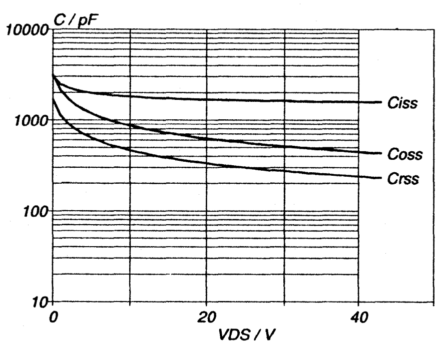


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

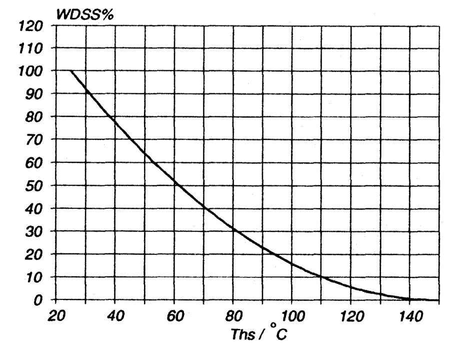


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 41$ A

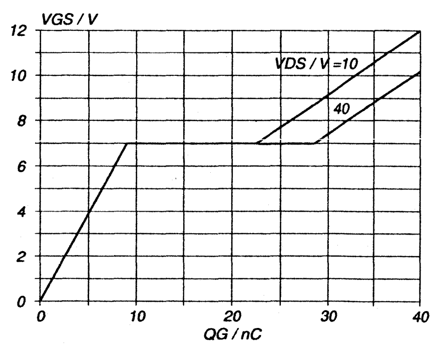


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 41$ A; parameter V_{DS}

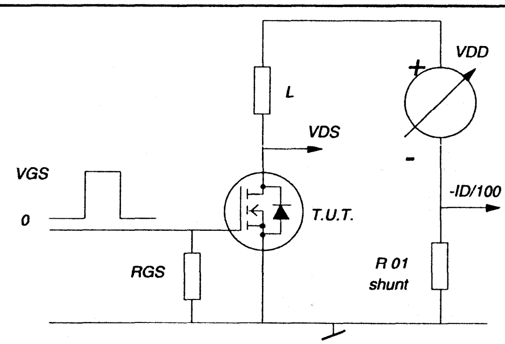


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK445-100A/B	

BUK475-100A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

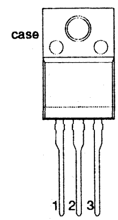
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK475	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	14	12	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.08	0.1	Ω

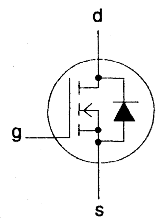
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-100A	-100B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	14	12	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	8.7	7.5	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	56	48	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.17 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 13 A **BUK475-100A**	-	0.07	0.08	Ω
		BUK475-100B	-	0.08	0.1	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 13 A	7.0	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	350	500	pF
C_{rss}	Feedback capacitance		-	100	150	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	15	30	ns
t_r	Turn-on rise time		-	25	40	ns
$t_{d\ off}$	Turn-off delay time		-	100	160	ns
t_f	Turn-off fall time		-	50	80	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	-	-	-	56	A
V_{SD}	Diode forward voltage	I_F = 14 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 14 A; -dI_F/dt = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.70	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 26 A ; V_{DD} ≤ 50 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

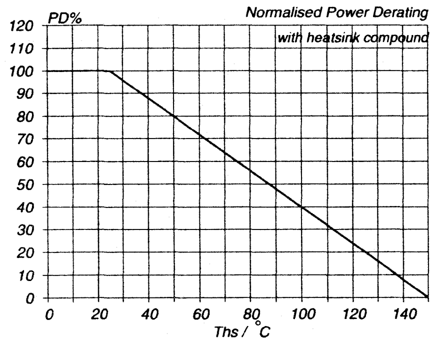


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

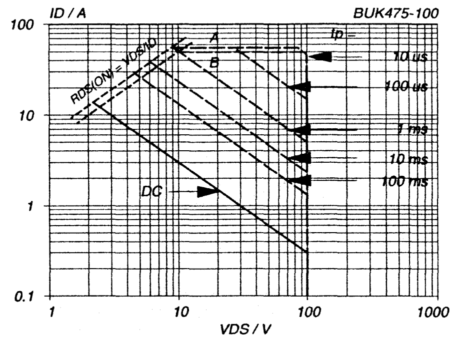


Fig.3. Safe operating area. T_{hs} = 25 ˚C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

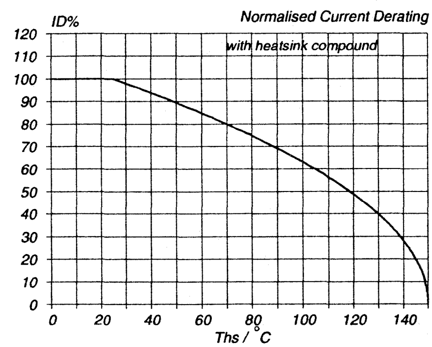


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

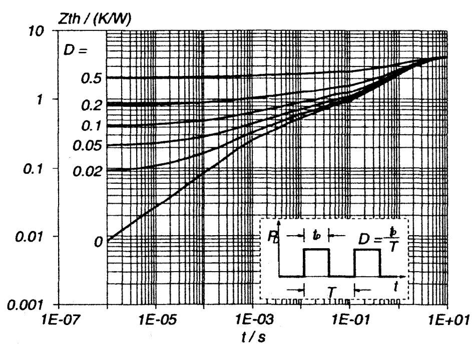


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor

BUK475-100A/B

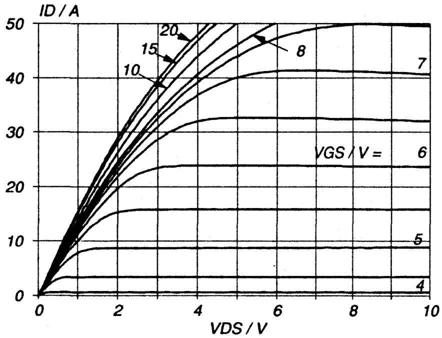


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

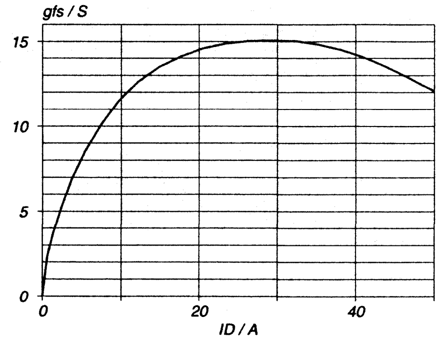


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

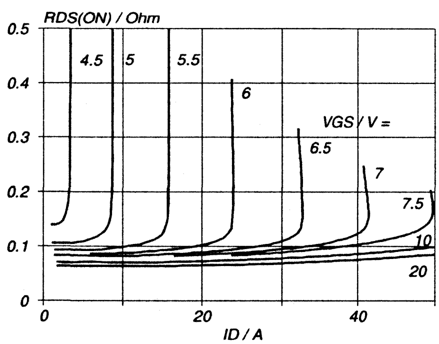


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

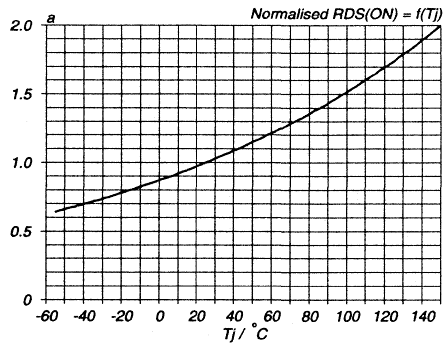


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 13$ A; $V_{GS} = 10$ V

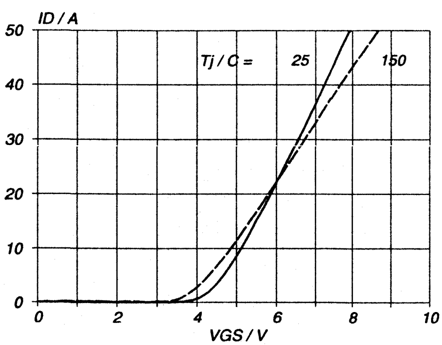


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

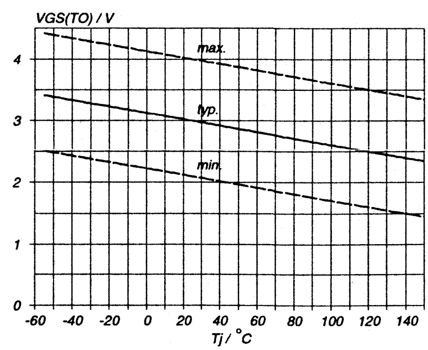


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

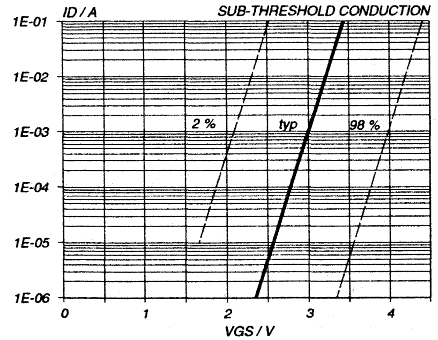


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

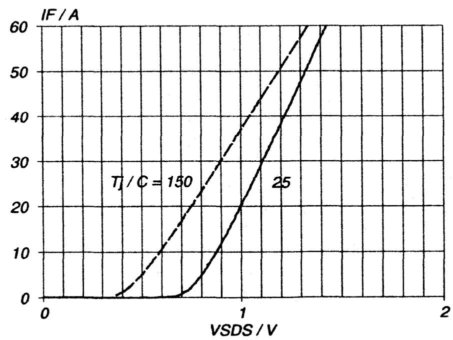


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

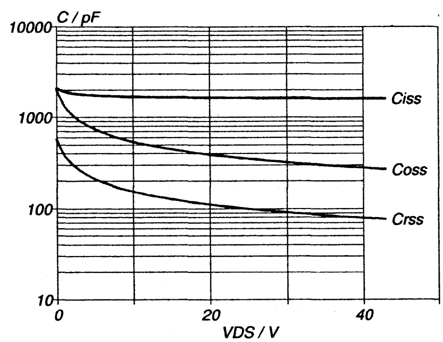


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

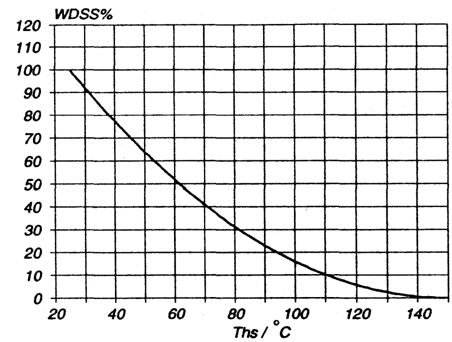


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 26$ A

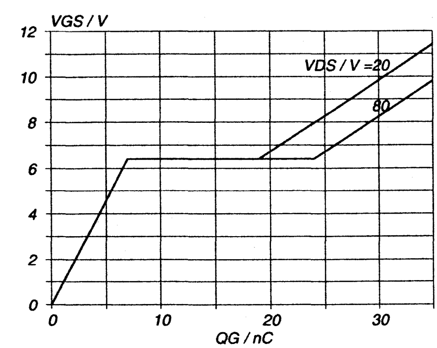


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 26$ A; parameter V_{DS}

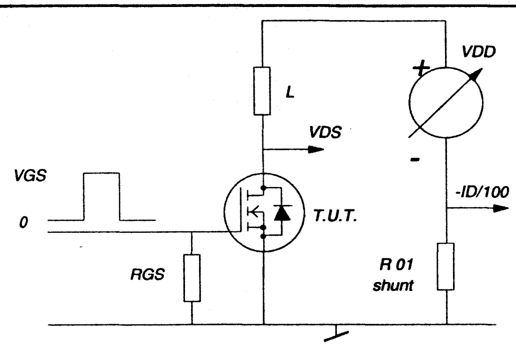


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK445-200A/B	

BUK 475-200A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

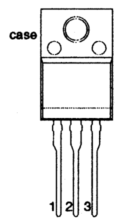
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK475	-200A	-200B	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	7.6	7	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.23	0.28	Ω

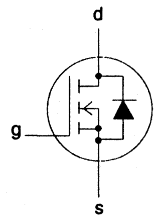
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-200A	-200B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	7.6	7	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	4.8	4.4	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	30	28	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.17 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 7 A **BUK475-200A**	-	0.2	0.23	Ω
		BUK475-200B	-	0.22	0.28	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7 A	6	8.4	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1400	1750	pF
C_{oss}	Output capacitance		-	190	250	pF
C_{rss}	Feedback capacitance		-	55	80	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	18	30	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	35	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	85	120	ns
t_f	Turn-off fall time		-	35	50	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	30	A
V_{SD}	Diode forward voltage	I_F = 7.6 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 7.6 A; $-dI_F/dt$ = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.3	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; V_{DD} ≤ 100 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

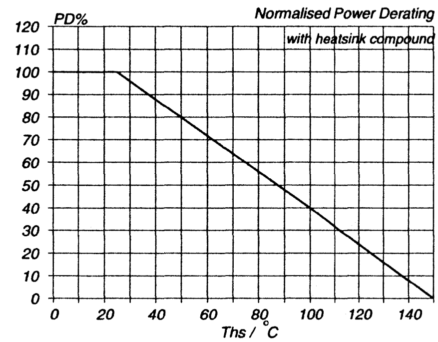


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

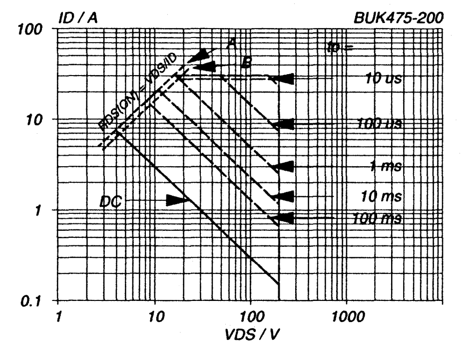


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

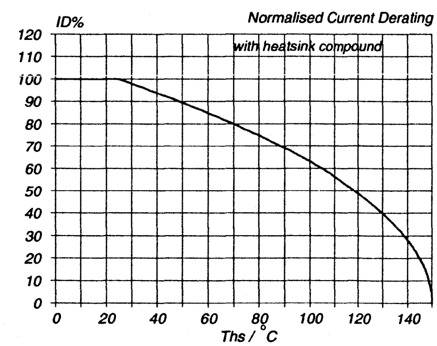


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

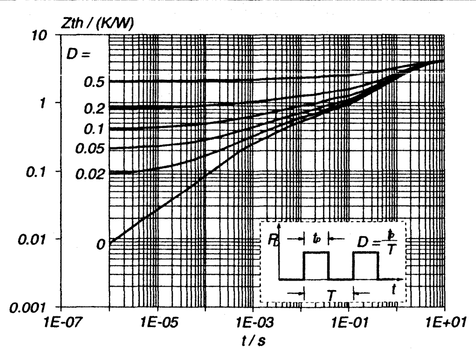


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

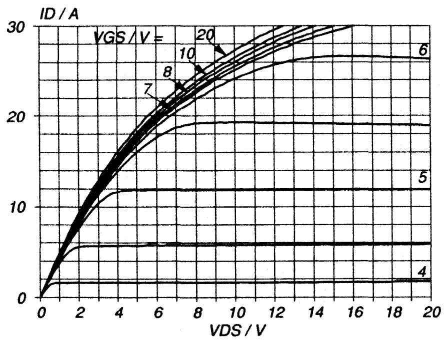


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

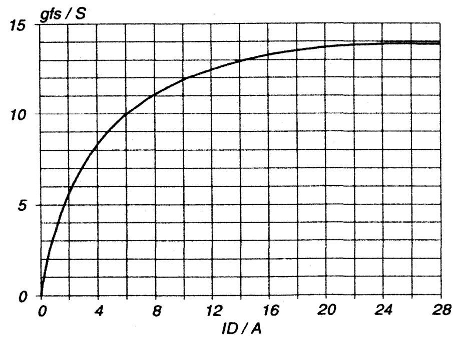


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

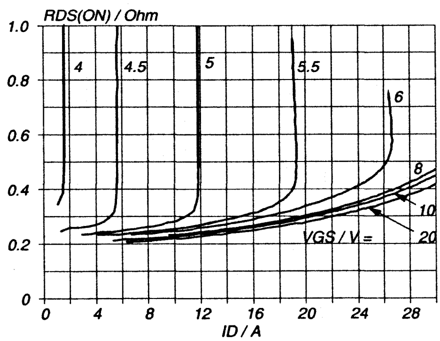


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

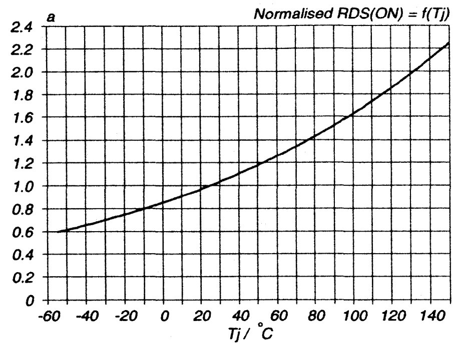


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; $I_D = 7$ A; $V_{GS} = 10$ V

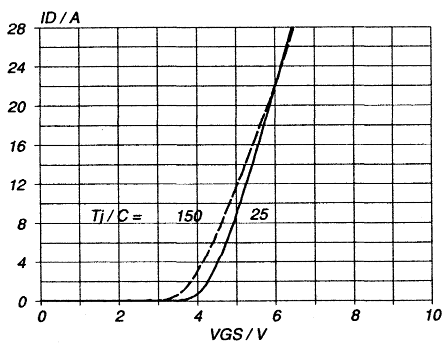


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

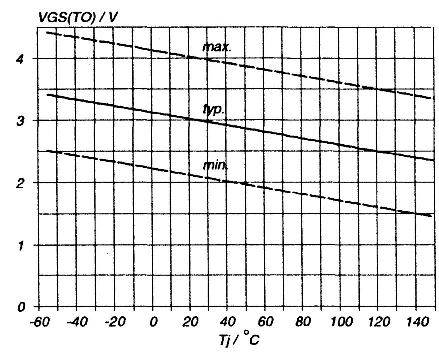


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor BUK475-200A/B

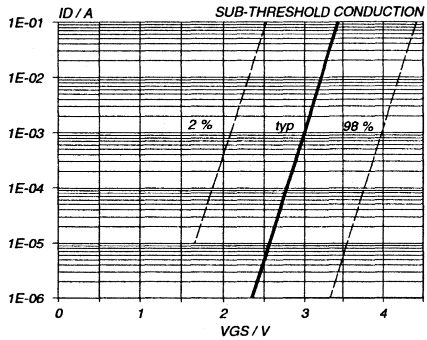


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

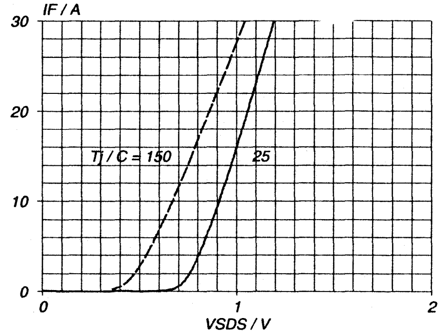


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

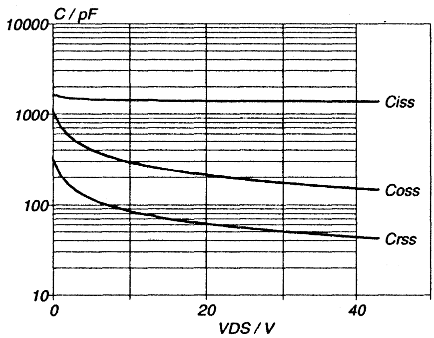


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

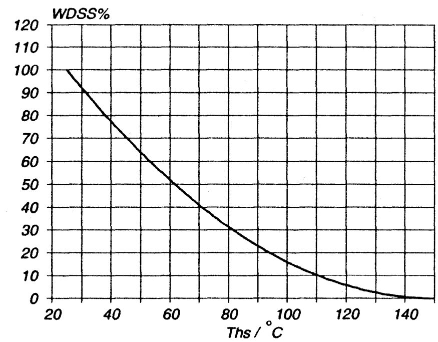


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

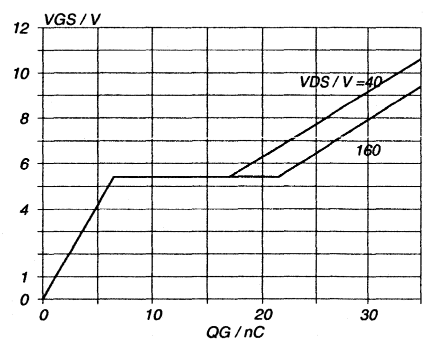


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

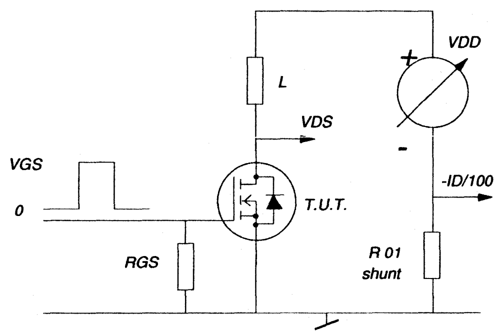


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK445-400A/B	

BUK 475-400A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

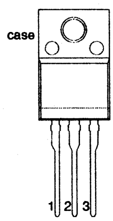
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK475	-400A	-400B	
V_{DS}	Drain-source voltage	400	400	V
I_D	Drain current (DC)	4.0	3.8	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.8	1.0	Ω

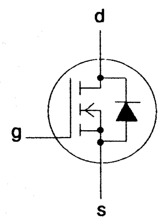
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	400		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	400		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-400A	-400B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	4.0	3.6	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2.5	2.3	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	16	14	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.1 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	400	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 400 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK475-400A**	-	0.7	0.8	Ω
		I_D = 2.5 A **BUK475-400B**	-	0.9	1.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	3.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	120	180	pF
C_{rss}	Feedback capacitance		-	50	70	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.7 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	120	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	4.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	16	A
V_{SD}	Diode forward voltage	I_F = 4 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 4 A; $-dI_F/dt$ = 100 A/µs;	-	1000	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	5.0	-	µC

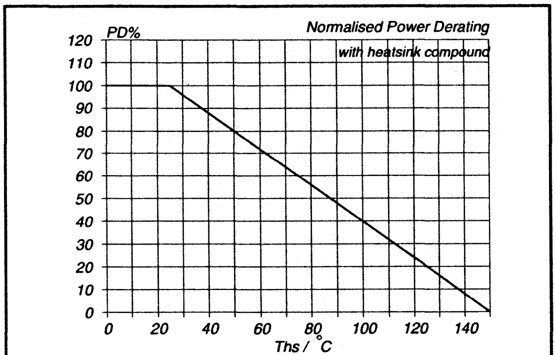


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

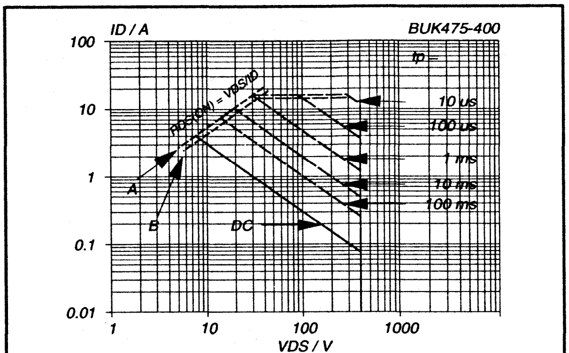


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

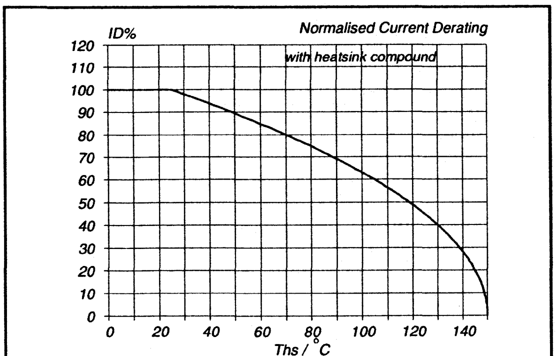


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

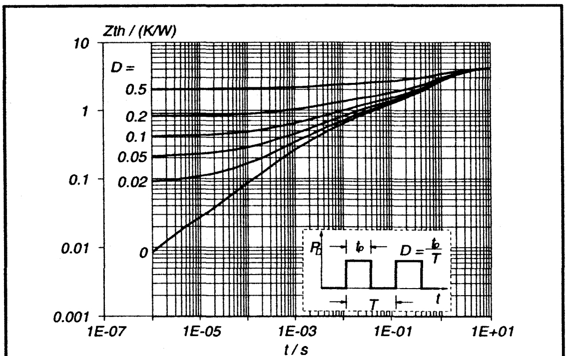


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

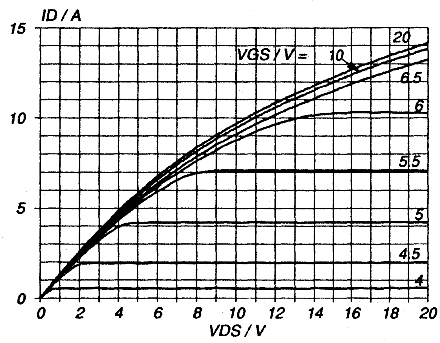


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

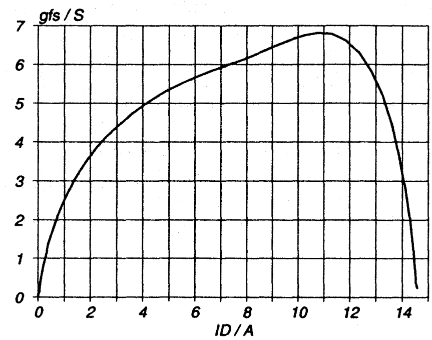


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

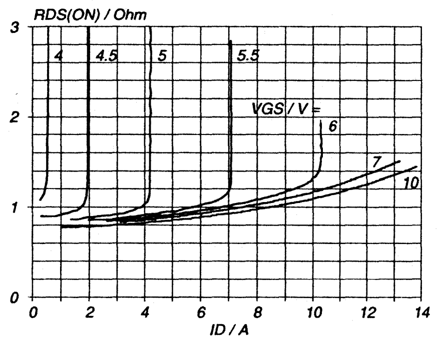


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

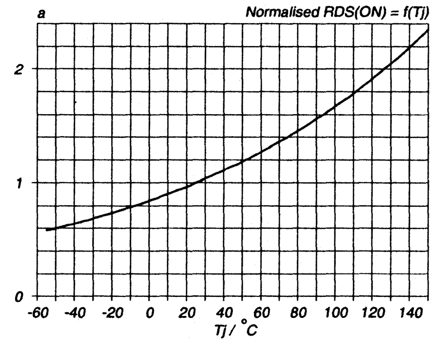


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

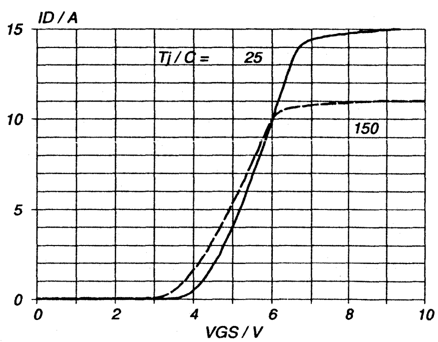


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

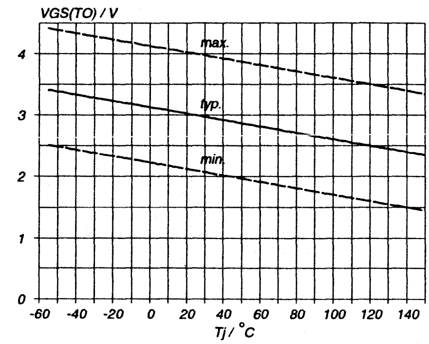


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

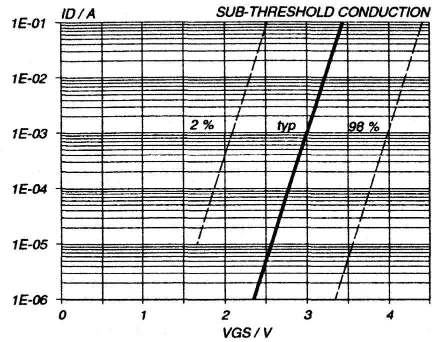


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

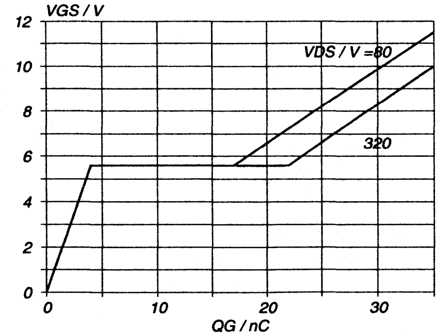


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 6.5$ A; parameter V_{DS}

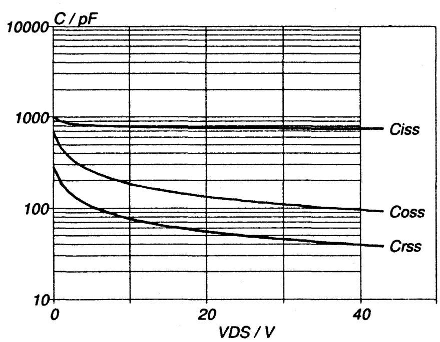


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

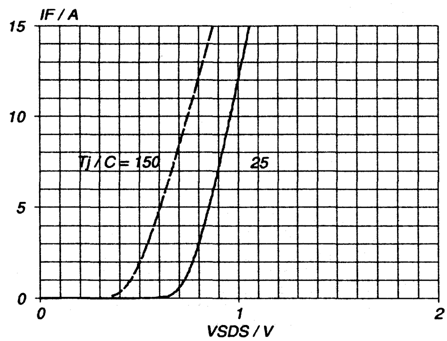


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK445-500A/B	

BUK 475-500A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

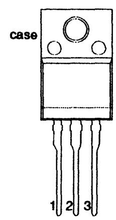
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK475	-500A	-500B	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	3.1	2.9	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.3	1.5	Ω

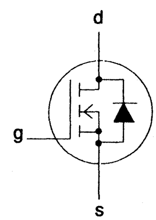
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500A	-500B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	3.1	2.9	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	2	1.8	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	12	12	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.1 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 2.5 A **BUK475-500A**	-	1.2	1.3	Ω
		BUK475-500B	-	1.4	1.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	3.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	10	45	ns
t_r	Turn-on rise time		-	45	60	ns
$t_{d\ off}$	Turn-off delay time		-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.1	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.1 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 3.1 A; $-dI_F/dt$ = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

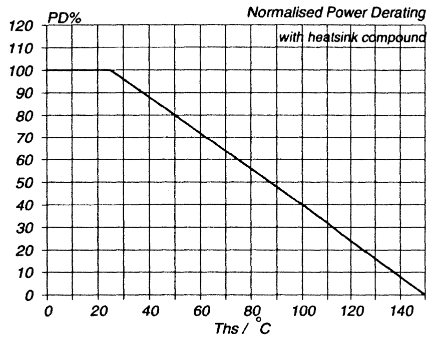


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

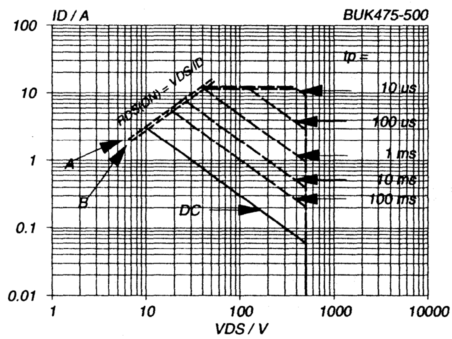


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

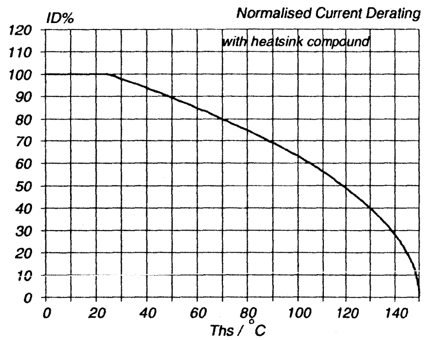


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

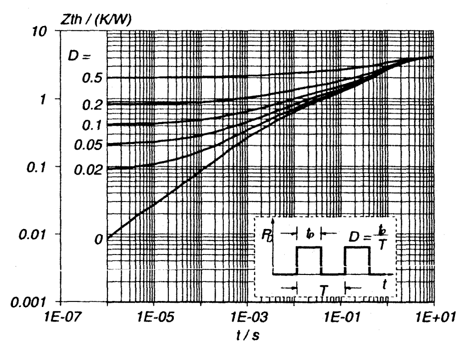


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

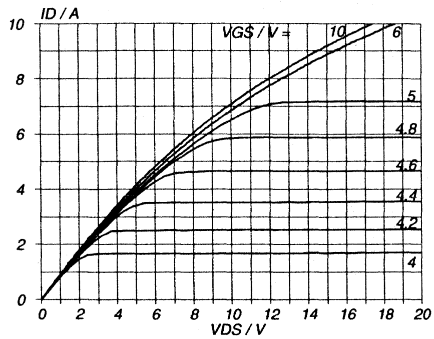


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

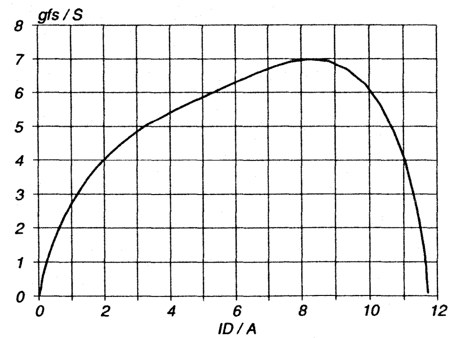


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

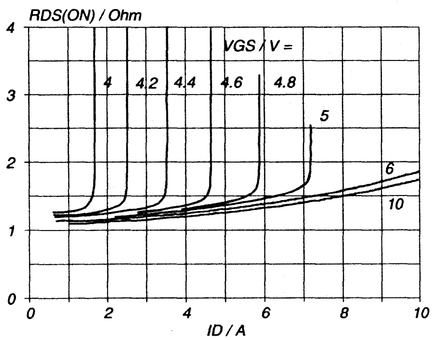


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

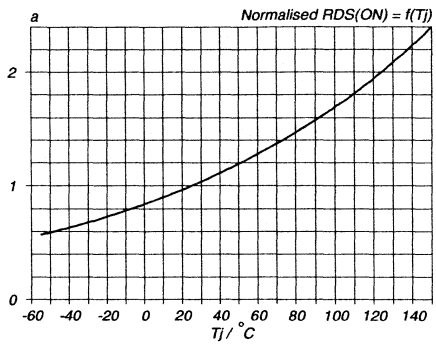


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 2.5 A; V_{GS} = 10 V

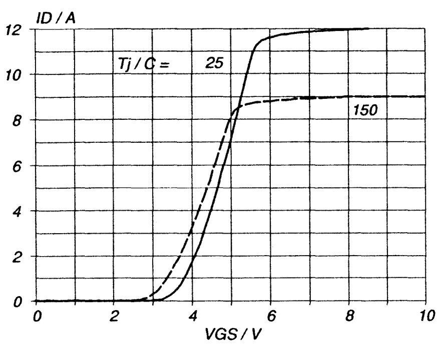


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

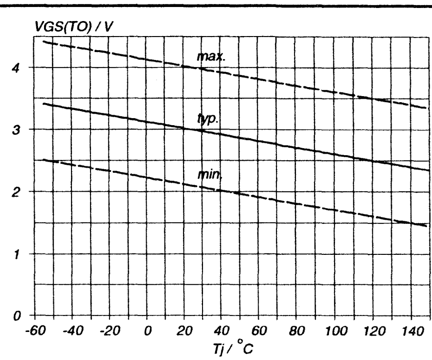


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

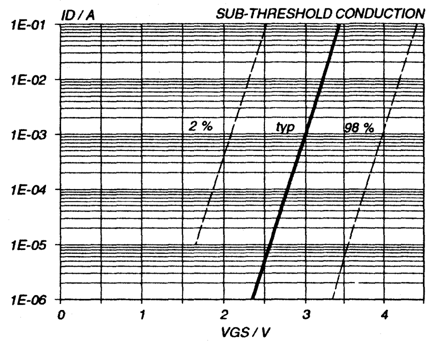


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

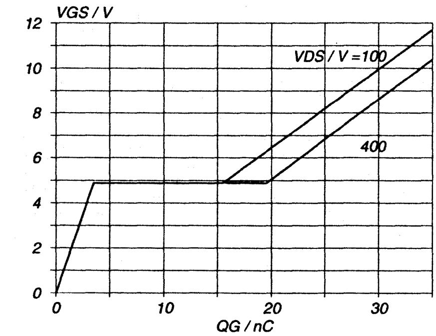


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5.7$ A; parameter V_{DS}

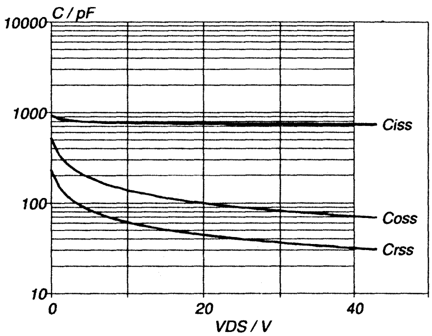


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

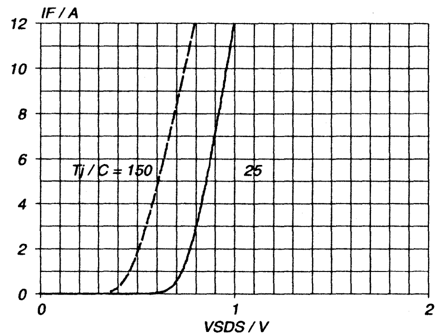


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK445-600A/B	

BUK 475-600A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

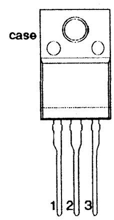
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK475	-600A	-600B	
V_{DS}	Drain-source voltage	600	600	V
I_D	Drain current (DC)	2.5	2.2	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.0	2.5	Ω

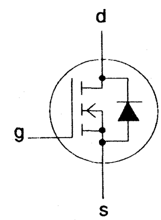
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	600		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	600		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-600A	-600B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.5	2.2	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.6	1.4	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	10	8.8	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.1 K/W
From junction to ambient		$R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	600	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK475-600A**	-	1.7	2.0	Ω
		I_D = 2.5 A **BUK475-600B**	-	2.1	2.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	2.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	10	45	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	10	A
V_{SD}	Diode forward voltage	I_F = 2.5 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 2.5 A; -dI_F/dt = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

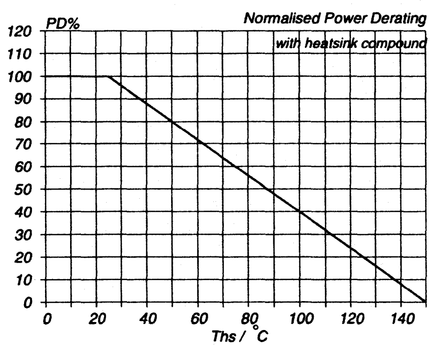


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\ 25\ ˚C}$ = f(T_{hs})

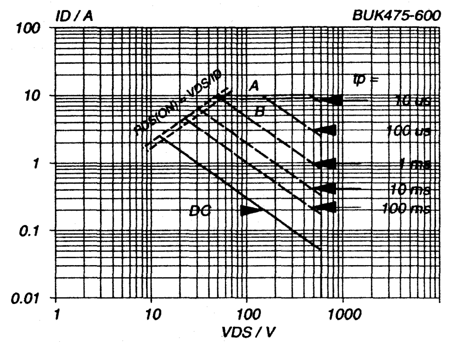


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

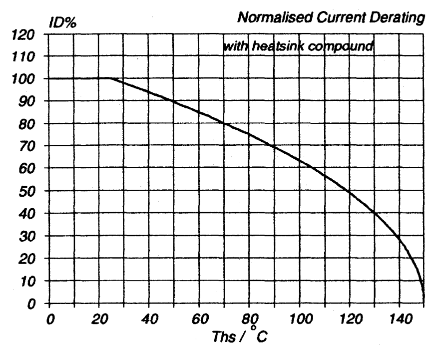


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\ 25\ ˚C}$ = f(T_{hs}); conditions: V_{GS} ≥ 10 V

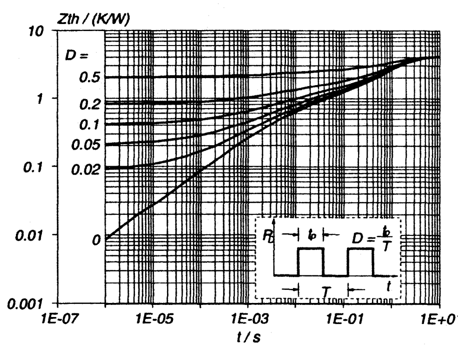


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}hs}$ = f(t); parameter D = t_p/T

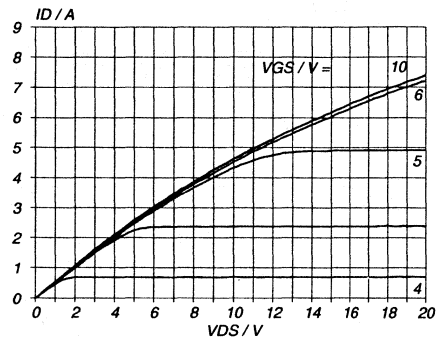


Fig.5. Typical output characteristics, $T_j = 25$ ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

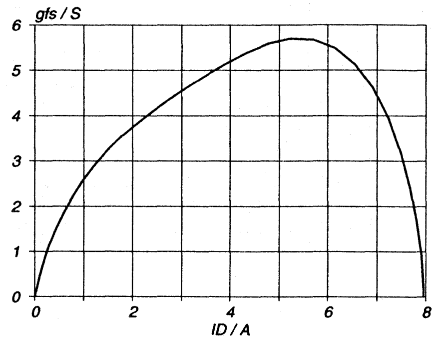


Fig.8. Typical transconductance, $T_j = 25$ ˚C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

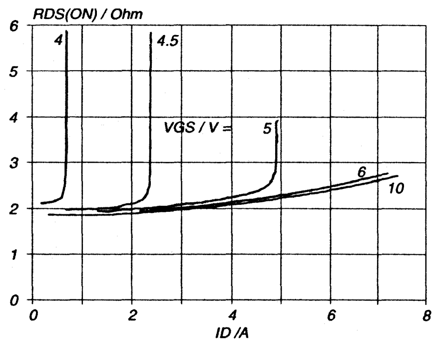


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

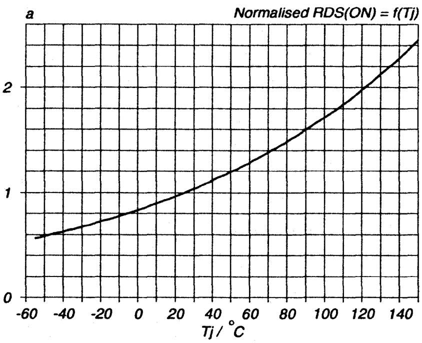


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V

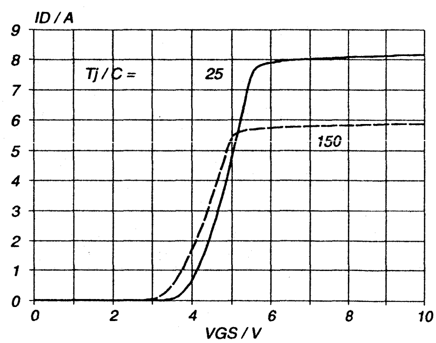


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

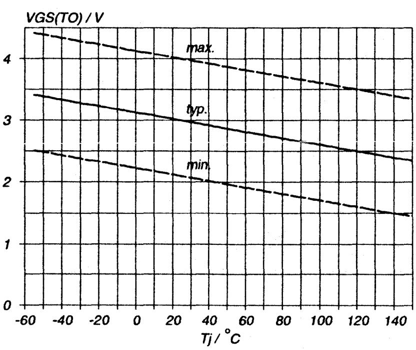


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

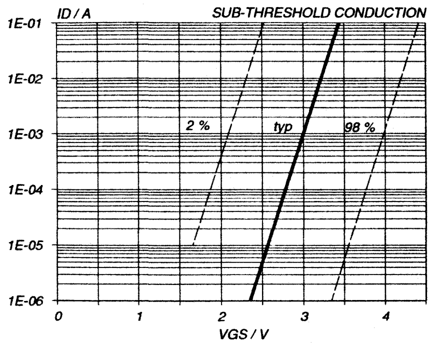


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

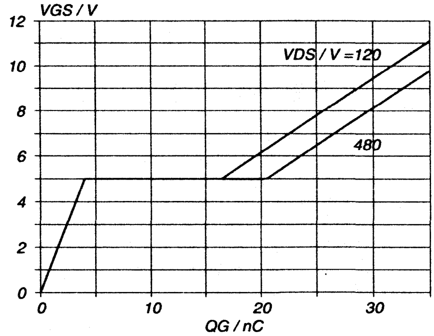


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.5$ A; parameter V_{DS}

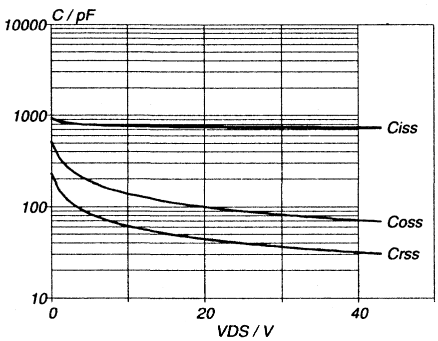


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

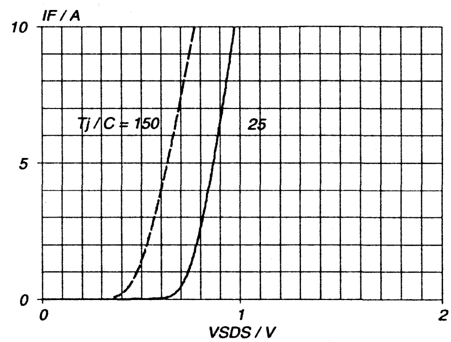


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK446-800A/B	

BUK 476-800A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

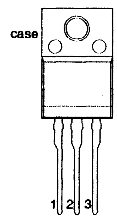
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK476	**-800A**	**-800B**	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	2.0	1.7	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	3	4	Ω

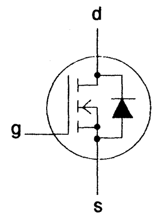
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	**-800B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	2.0	1.7	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.3	1.1	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	8	6.8	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound -	$R_{th\ j-hs}$ = 4.16 K/W $R_{th\ j-a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK476-800A**	-	2.7	3.0	Ω
		I_D = 1.5 A **BUK476-800B**	-	3.5	4.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A;	-	10	25	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	25	40	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	8	A
V_{SD}	Diode forward voltage	I_F = 2.0 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 2.0 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

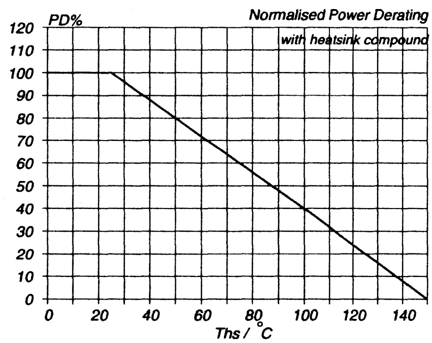


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,˚C}$ = f(T_{hs})

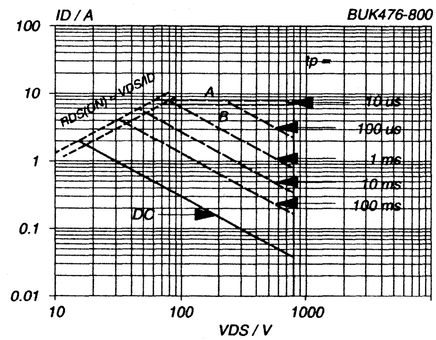


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

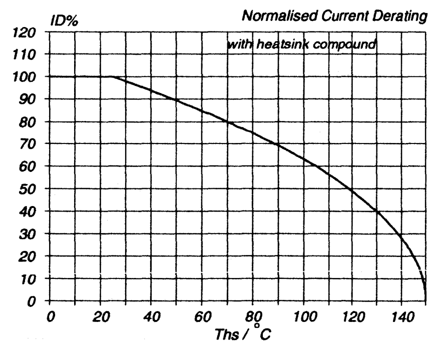


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,˚C}$ = f(T_{hs}); conditions: V_{GS} ≥ 10 V

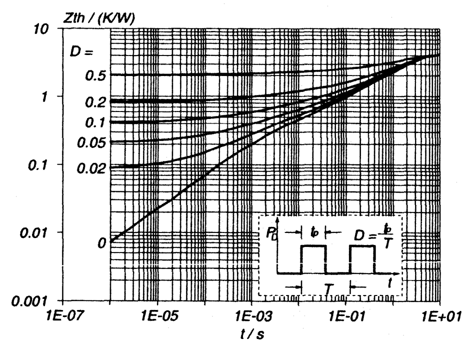


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs}$ = f(t); parameter D = t_p/T

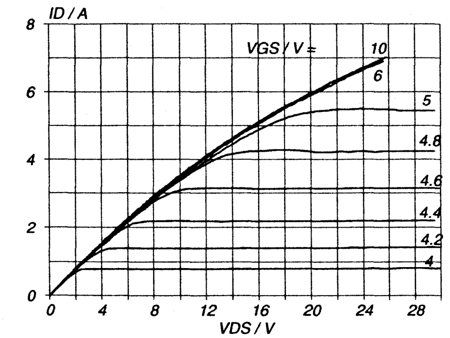


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

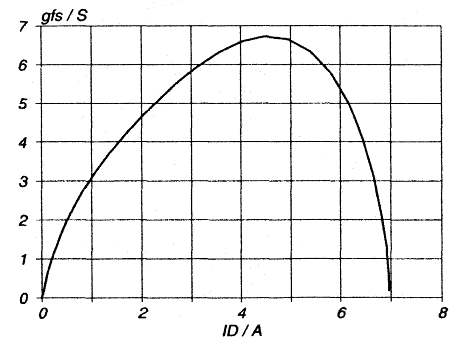


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

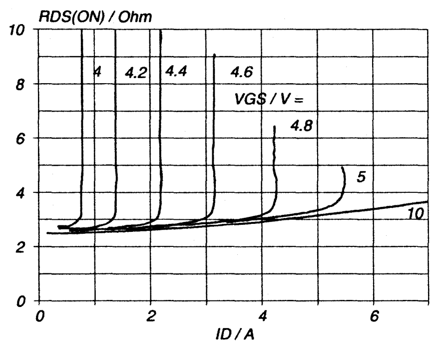


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

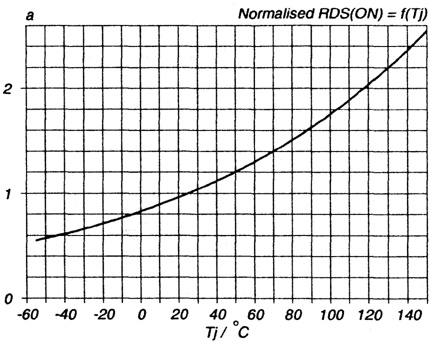


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

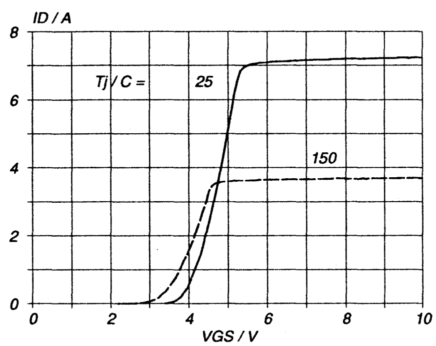


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

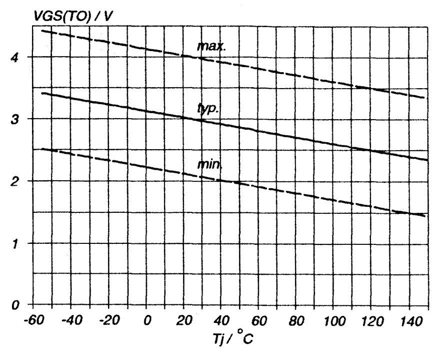


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

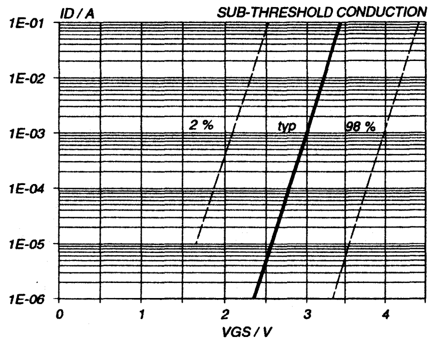


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

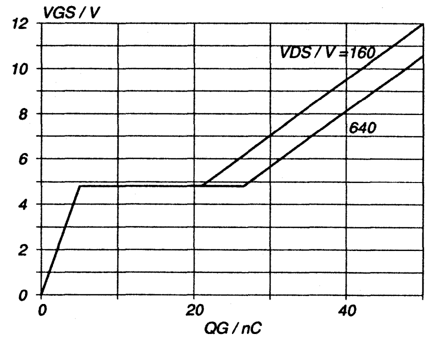


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 4$ A; parameter V_{DS}

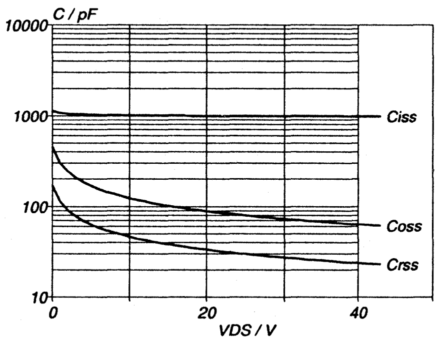


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

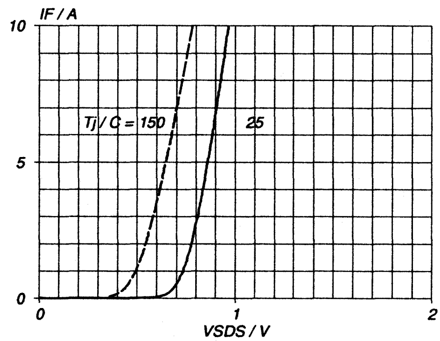


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK446-1000A/B	

BUK 476-1000A/B
PowerMOS transistor

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

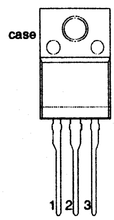
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK476	**-1000A**	**-1000B**	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	1.7	1.5	A
P_{tot}	Total power dissipation	30	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	4	5	Ω

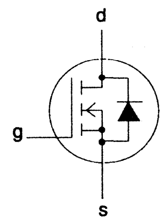
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	**-1000B**	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	1.7	1.5	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	1.1	1.0	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	6.8	6	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.16 K/W
From junction to ambient	-	$R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 1.5 A **BUK476-1000A**	-	3.5	4.0	Ω
		BUK476-1000B	-	4.5	5.0	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 1.5 A	3.0	4.3	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1000	1250	pF
C_{oss}	Output capacitance		-	80	120	pF
C_{rss}	Feedback capacitance		-	30	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	10	25	ns
t_r	Turn-on rise time		-	25	40	ns
$t_{d\ off}$	Turn-off delay time		-	130	150	ns
t_f	Turn-off fall time		-	40	60	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	1.7	A
I_{DRM}	Pulsed reverse drain current	-	-	-	6.8	A
V_{SD}	Diode forward voltage	I_F = 1.7 A ; V_{GS} = 0 V	-	1.0	1.3	V
t_{rr}	Reverse recovery time	I_F = 1.7 A; $-dI_F/dt$ = 100 A/µs;	-	1800	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	12	-	µC

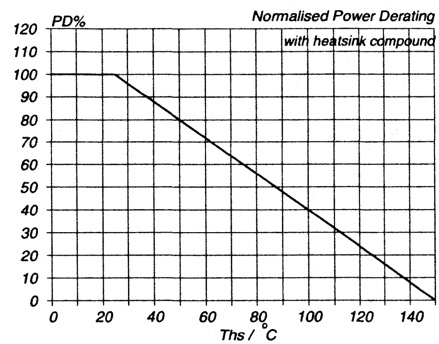


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

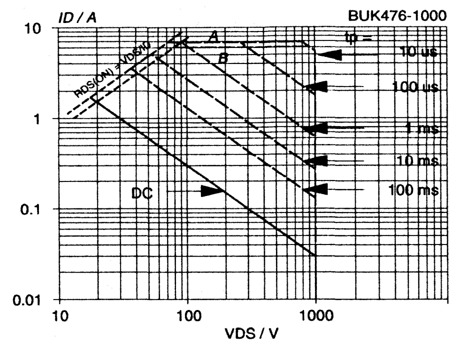


Fig.3. Safe operating area. T_{hs} = 25 ˚C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

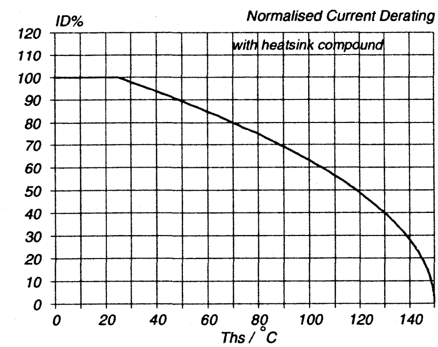


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V

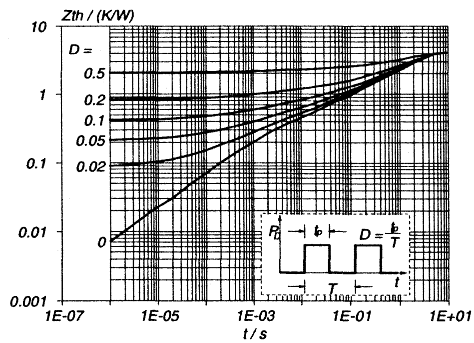


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor BUK476-1000A/B

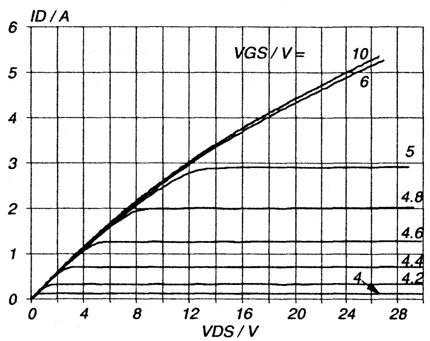


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

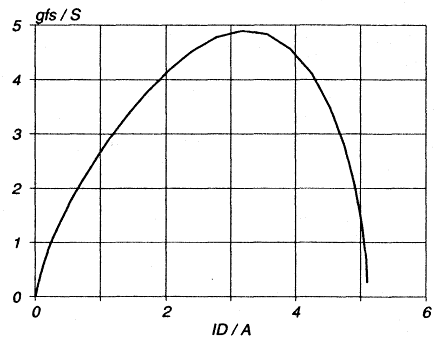


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

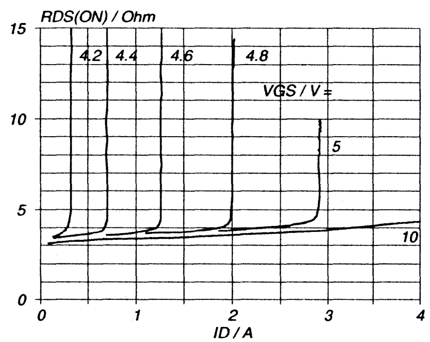


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

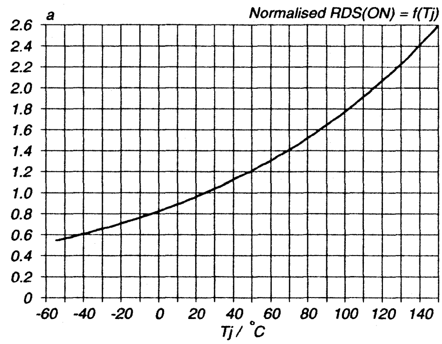


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 1.5$ A; $V_{GS} = 10$ V

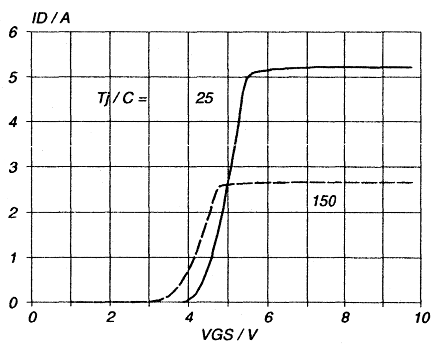


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

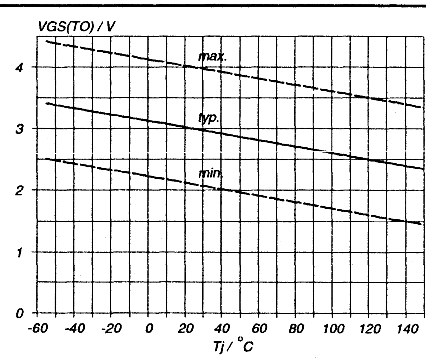


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

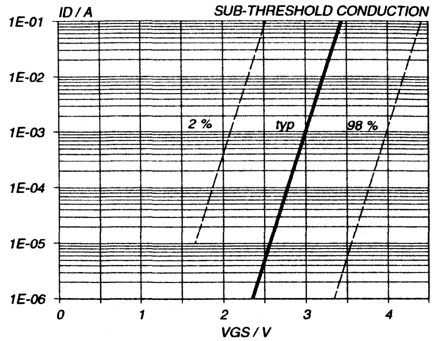


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

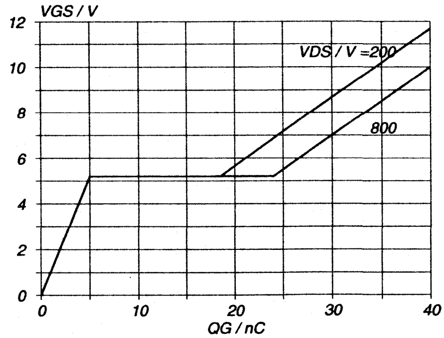


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3.5$ A; parameter V_{DS}

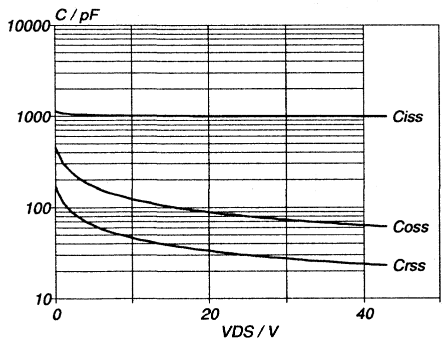


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

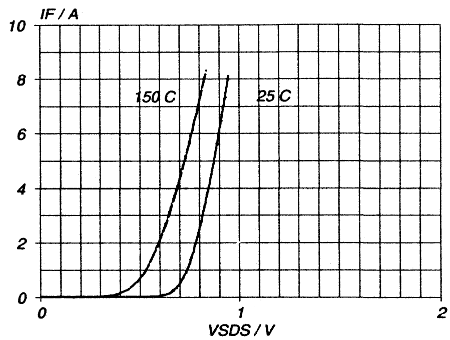


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK 539-60A
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

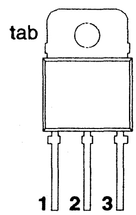
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	50	A
P_{tot}	Total power dissipation	230	W
$R_{DS(ON)}$	Drain-source on-state resistance V_{GS} = 5 V	15.0	mΩ

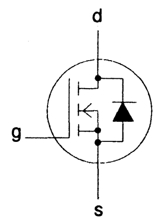
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	15	V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	50	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	50	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	400	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	230	W
T_{stg}	Storage temperature	-	- 55	150	˚C
T_j	Junction Temperature	-	-	150	˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 0.54 K/W $R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 50 A	-	12.0	15.0	mΩ

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 50 A	40	60	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	5800	7100	pF
C_{oss}	Output capacitance		-	2000	2500	pF
C_{rss}	Feedback capacitance		-	1000	1500	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	70	120	ns
t_r	Turn-on rise time	V_{GS} = 5 V;	-	250	350	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 50 Ω;	-	600	750	ns
t_f	Turn-off fall time	R_{gen} = 50 Ω	-	400	500	ns
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 50 A;	-	15	25	ns
t_r	Turn-on rise time	V_{GS} = 5 V;	-	100	130	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 4.7 Ω;	-	60	100	ns
t_f	Turn-off fall time	R_{gen} = 4.7 Ω	-	80	120	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	50	A
I_{DRM}	Pulsed reverse drain current	-	-	-	400	A
V_{SD}	Diode forward voltage	I_F = 50 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 50 A; -dI_F/dt = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.6	-	µC

PowerMOS transistor
Logic level FET

BUK539-60A

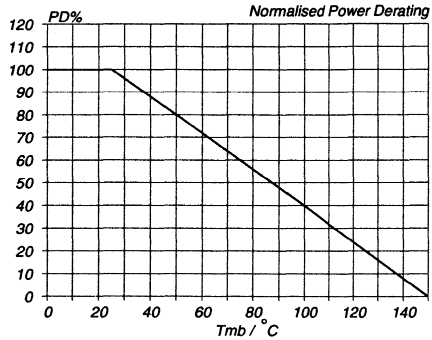


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

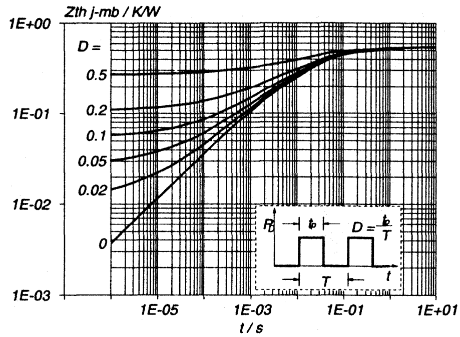


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

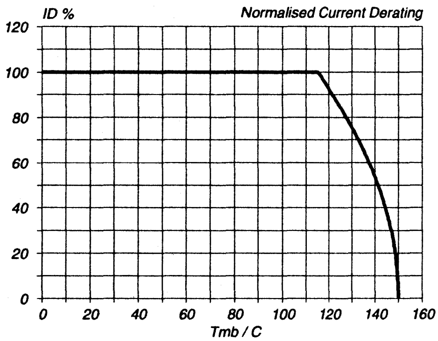


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

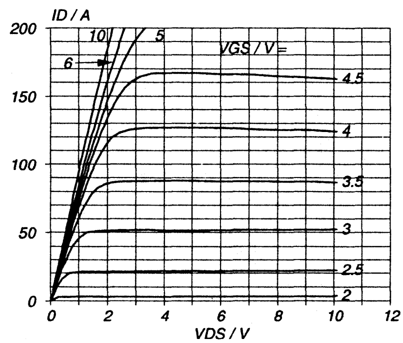


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

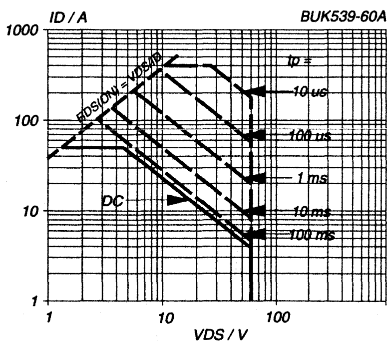


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

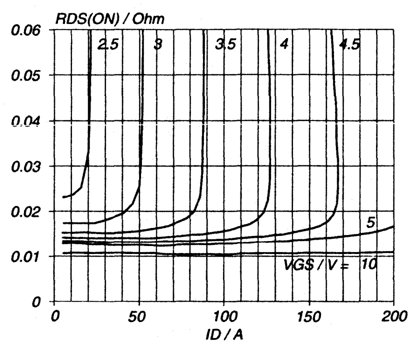


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

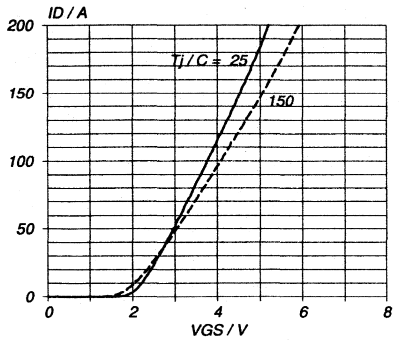


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

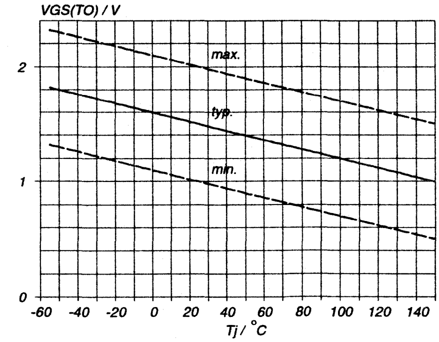


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

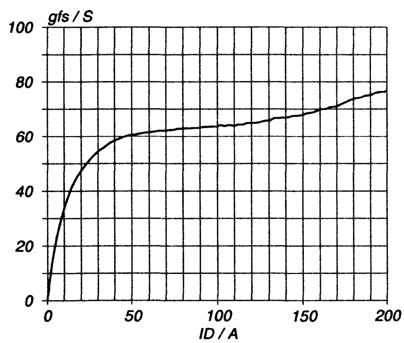


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 15 V

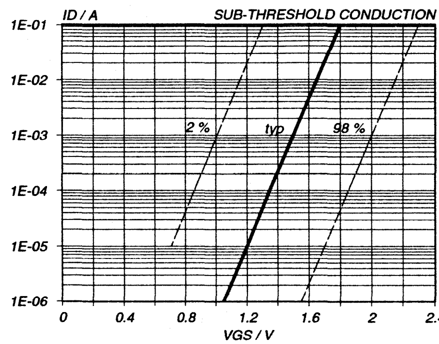


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

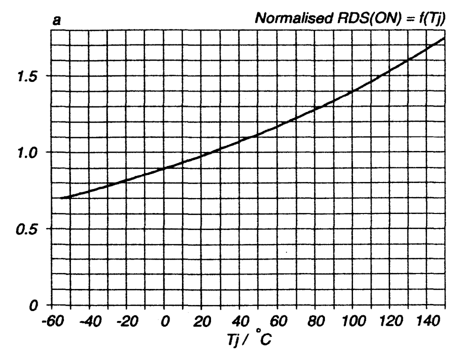


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 50 A; V_{GS} = 5 V

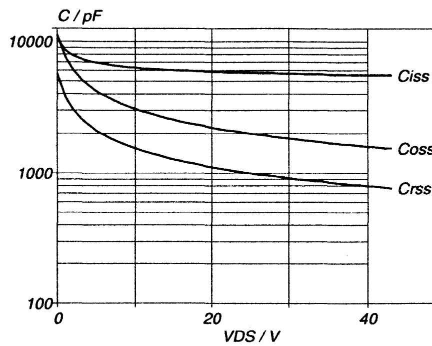


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

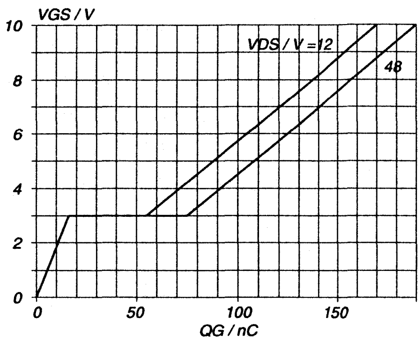


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 50$ A; parameter V_{DS}

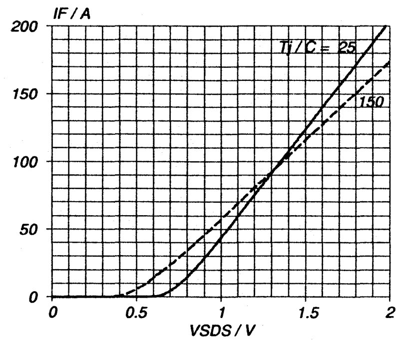


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK541-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

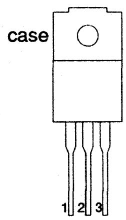
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK541	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	4.8	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.4	0.5	Ω

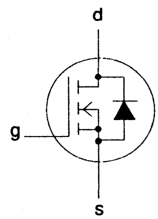
PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	5.0	4.8	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	3.4	3.0	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	20	20	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 6.25 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK541-60A**	-	0.28	0.4	Ω
		I_D = 4.0 A **BUK541-60B**	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	2.0	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	200	300	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	6	10	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	30	45	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	15	25	ns
t_f	Turn-off fall time		-	25	35	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

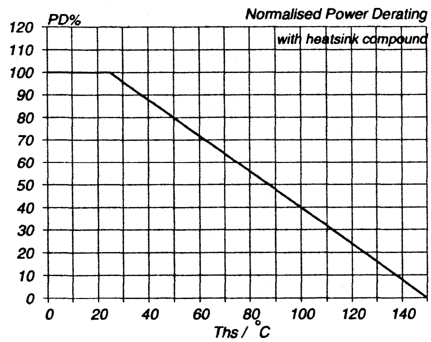


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

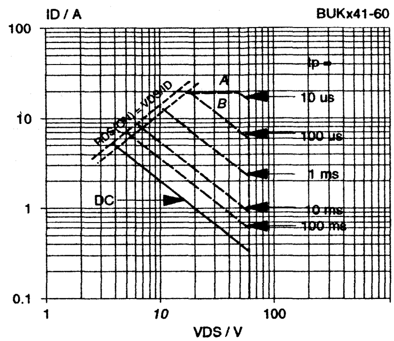


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

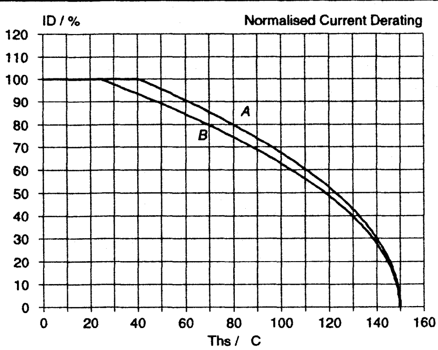


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

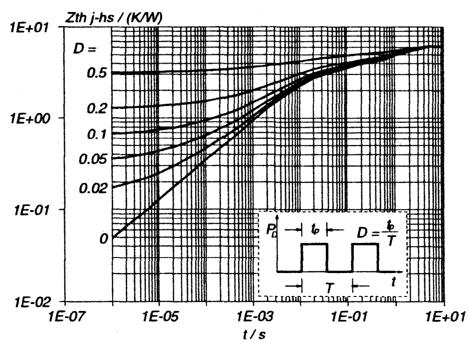


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

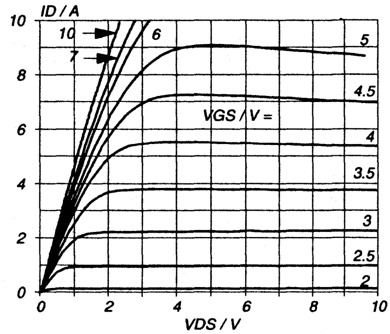


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

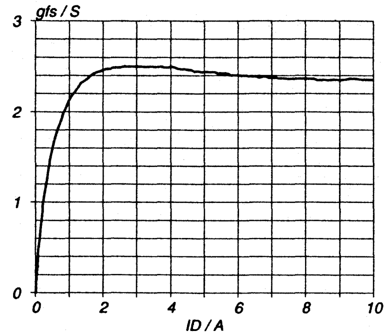


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

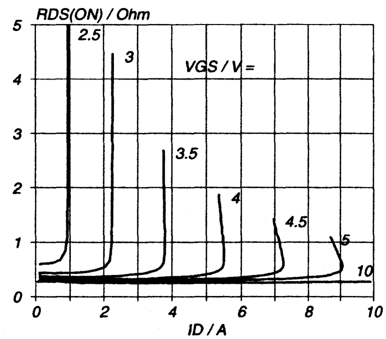


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

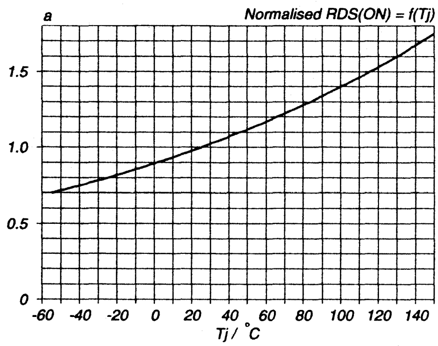


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 4.0$ A; $V_{GS} = 5$ V

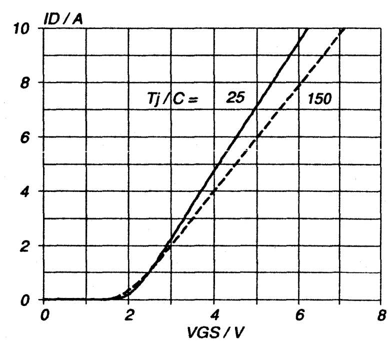


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

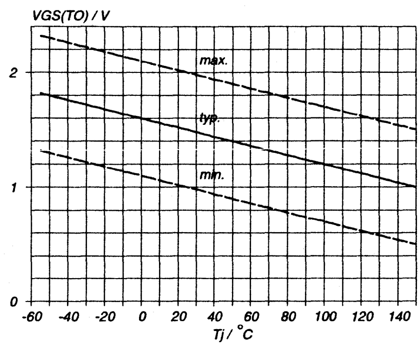


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

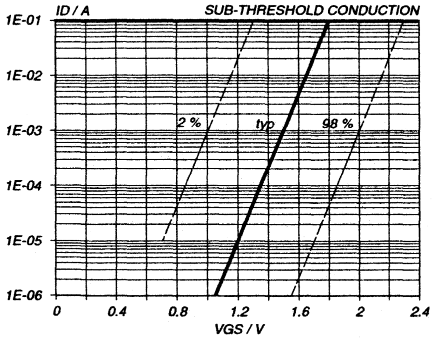


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

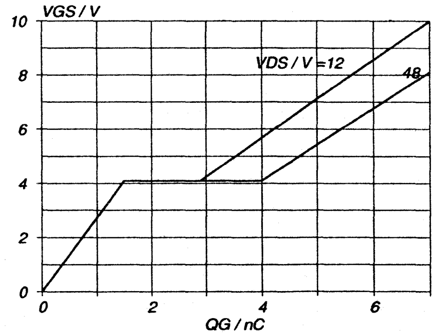


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}

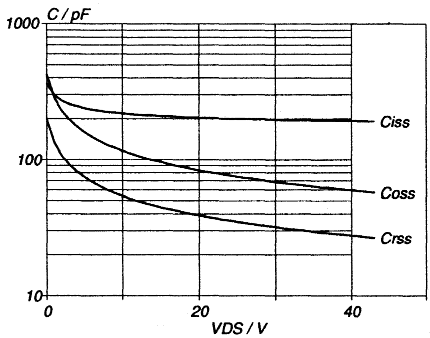


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

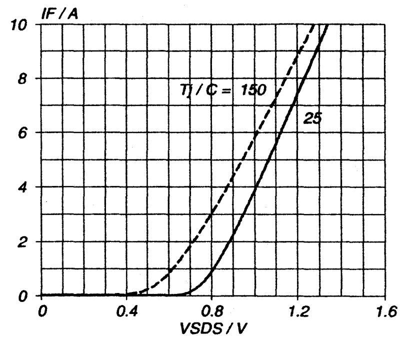


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK551-60A/B
PowerMOS transistor Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

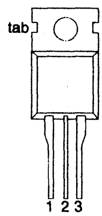
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK551	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	5.0	A
P_{tot}	Total power dissipation	40	40	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.4	0.5	Ω

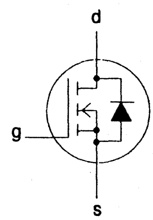
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	5.0	5.0	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	5.0	4.8	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	20	20	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	40		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 3.75 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK551-60A**	-	0.28	0.4	Ω
		I_D = 4.0 A **BUK551-60B**	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	2.0	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	200	300	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	6	10	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	30	45	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	15	25	ns
t_f	Turn-off fall time		-	25	35	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

PowerMOS transistor Logic level FET

BUK551-60A/B

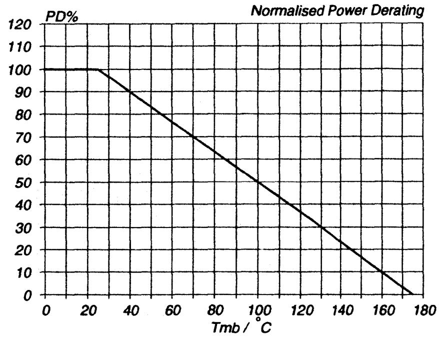


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

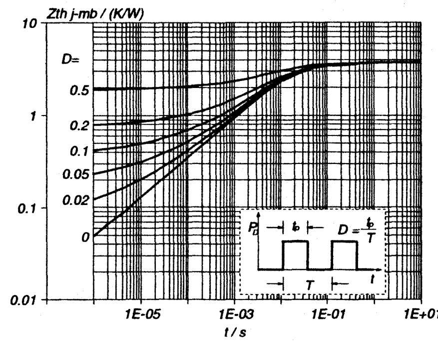


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

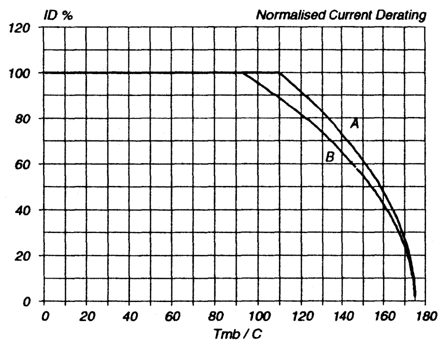


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

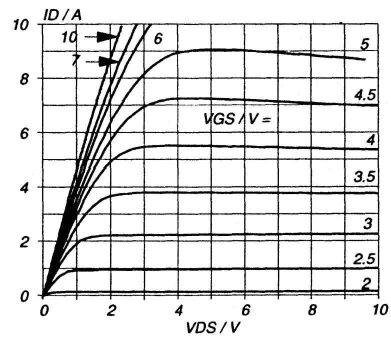


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

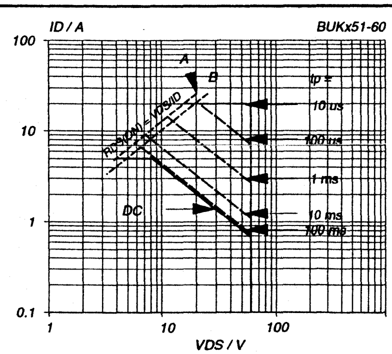


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

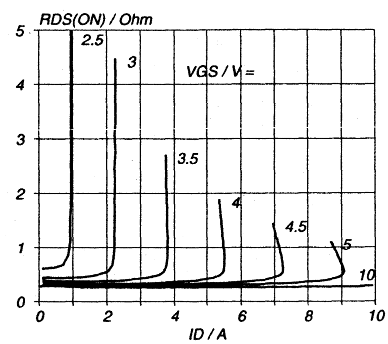


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

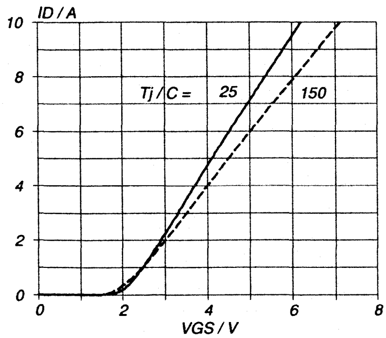


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

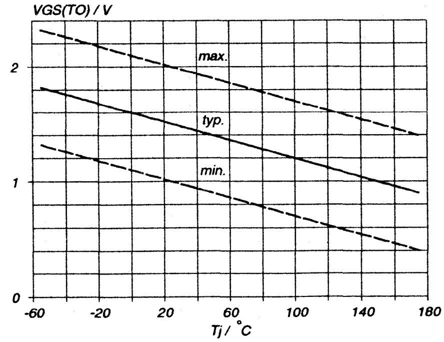


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

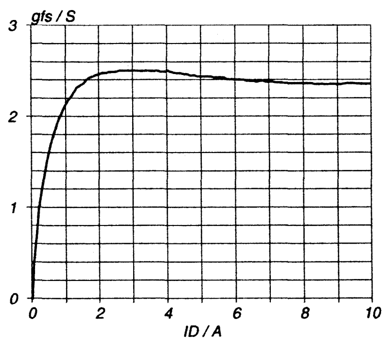


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

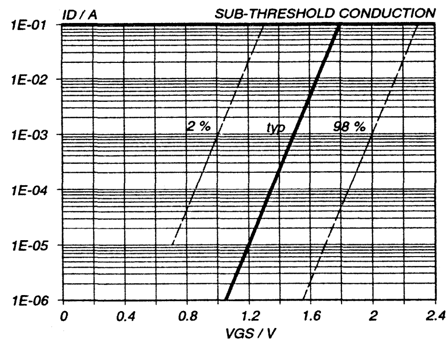


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

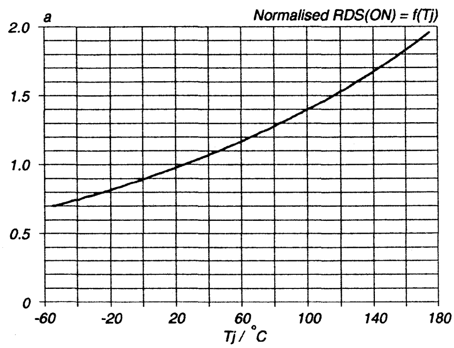


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 4.0$ A; $V_{GS} = 5$ V

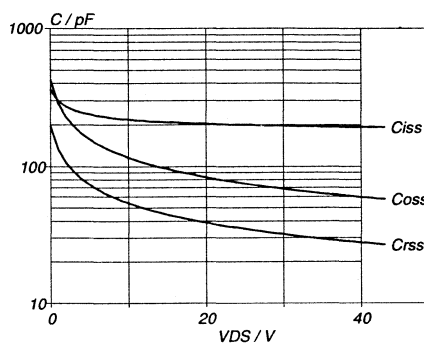


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

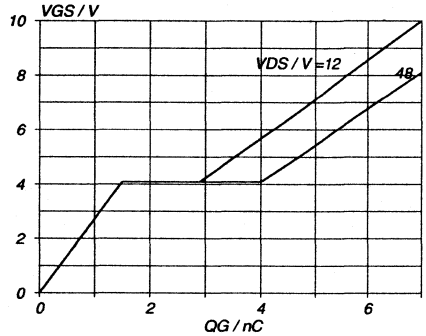


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}

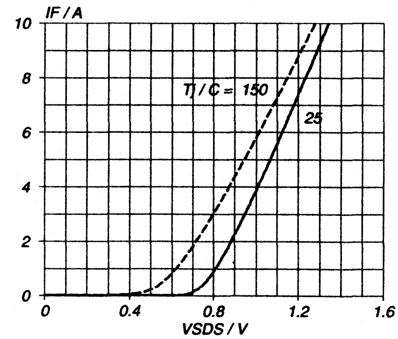


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK556-60A
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope. The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

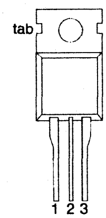
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	50	A
P_{tot}	Total power dissipation	150	W
$R_{DS(ON)}$	Drain-source on-state resistance V_{GS} = 5 V	26	mΩ

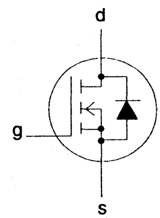
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	15	V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	50	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	38	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	200	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	150	W
T_{stg}	Storage temperature	-	- 55	175	˚C
T_j	Junction Temperature	-	-	175	˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.0 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 25 A	-	20	26	mΩ

DYNAMIC CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 25 A	17	30	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	2200	2800	pF
C_{oss}	Output capacitance		-	700	1000	pF
C_{rss}	Feedback capacitance		-	280	400	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	40	50	ns
t_r	Turn-on rise time	V_{GS} = 5 V;	-	150	250	ns
$t_{d\ off}$	Turn-off delay time	R_{GS} = 50 Ω;	-	350	450	ns
t_f	Turn-off fall time	R_{gen} = 50 Ω	-	190	250	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

Tmb = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	50	A
I_{DRM}	Pulsed reverse drain current	-	-	-	200	A
V_{SD}	Diode forward voltage	I_F = 50 A ; V_{GS} = 0 V	-	1.1	2.0	V
t_{rr}	Reverse recovery time	I_F = 50 A; -dI_F/dt = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.4	-	µC

PowerMOS transistor
Logic level FET

BUK556-60A

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 25 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	150	mJ

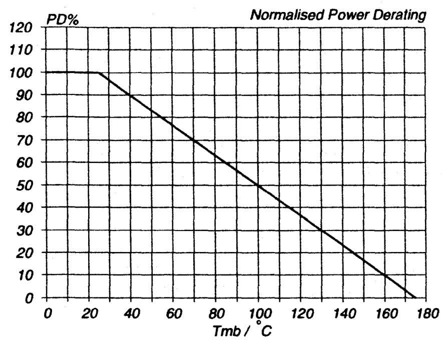


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

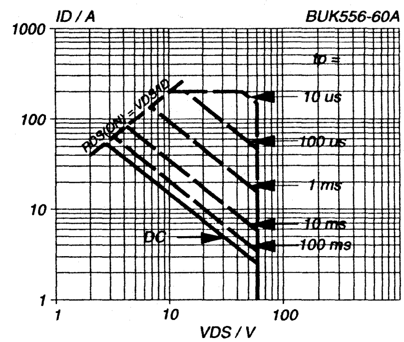


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

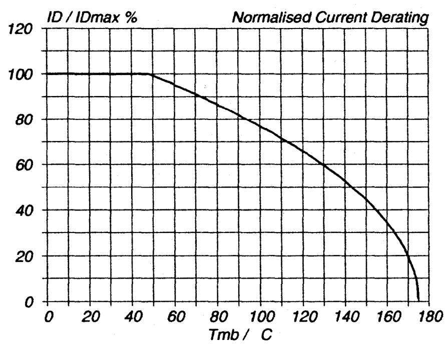


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

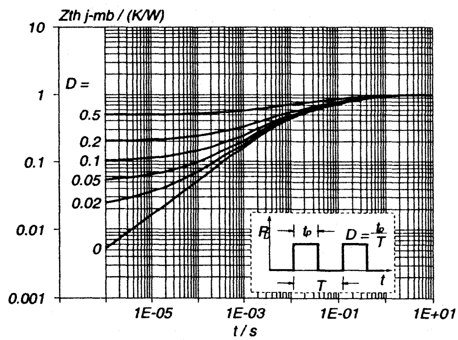


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

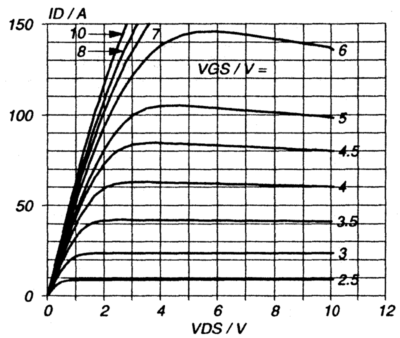


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

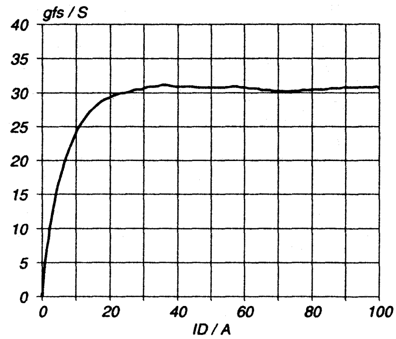


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 15$ V

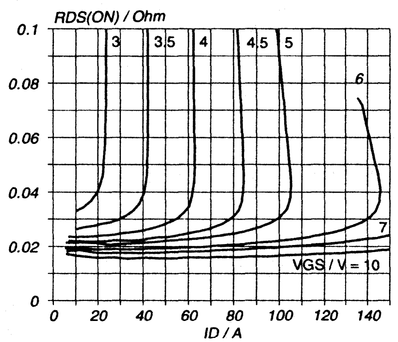


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

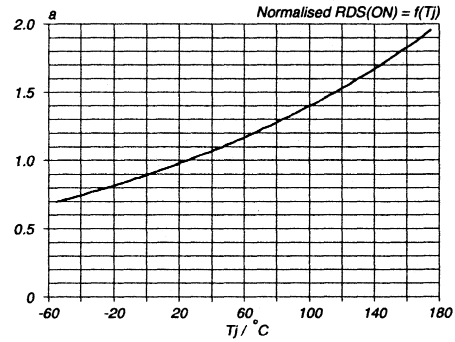


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,˚C} = f(T_j)$; $I_D = 25$ A; $V_{GS} = 5$ V

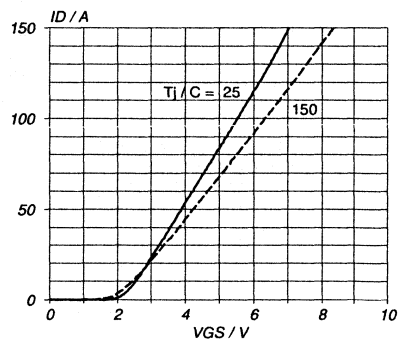


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

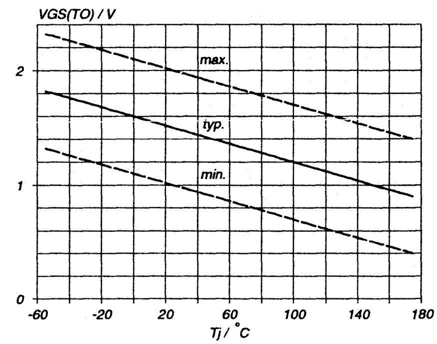


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor
Logic level FET

BUK556-60A

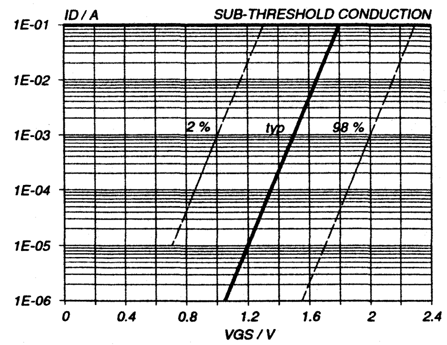


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

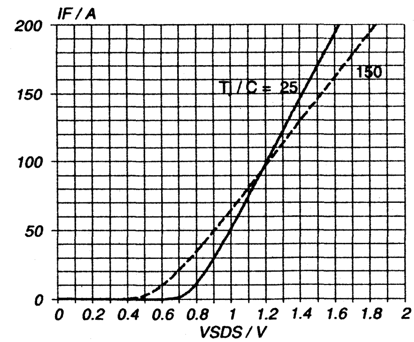


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

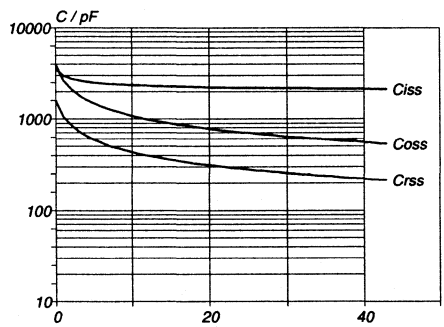


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

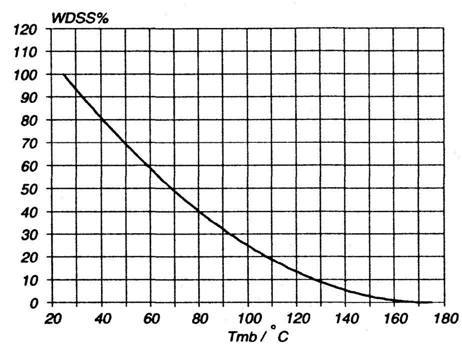


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 50$ A

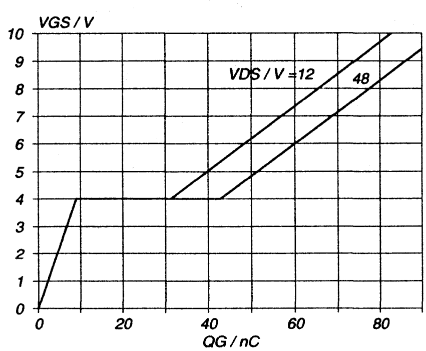


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 50$ A; parameter V_{DS}

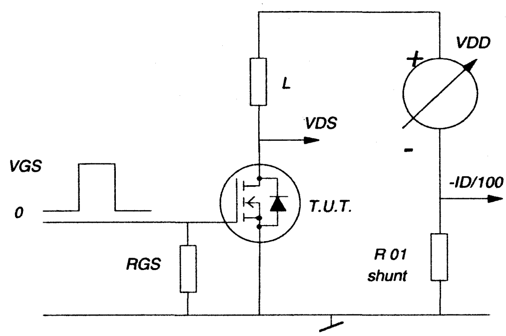


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK541-60A/B	

BUK571-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

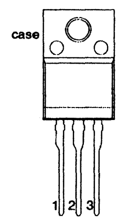
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK571	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	4.8	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.4	0.5	Ω

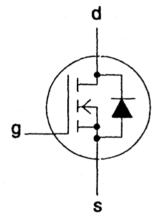
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	5.0	4.8	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	3.4	3.0	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	20	20	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 6.25 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK571-60A**	-	0.28	0.4	Ω
		I_D = 4.0 A **BUK571-60B**	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	2.0	2.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	200	300	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	6	10	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	30	45	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	15	25	ns
t_f	Turn-off fall time		-	25	35	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 5.0 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	10.0	mJ

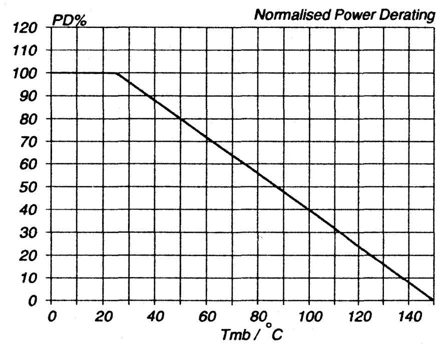


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\,25\,˚C}$ = f(T_{mb})

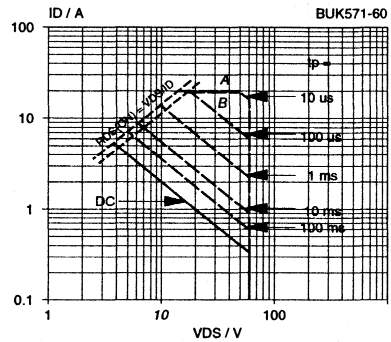


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

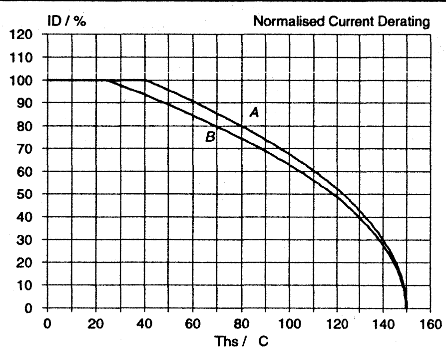


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\,25\,˚C}$ = f(T_{mb}); conditions: $V_{GS} \geq$ 5 V

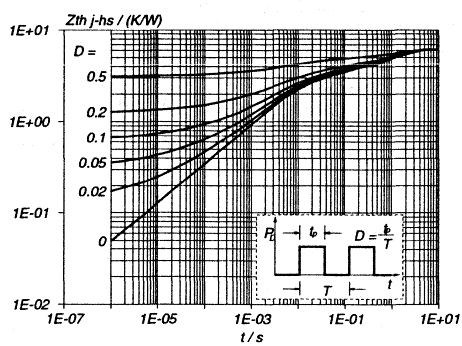


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb}$ = f(t); parameter D = t_p/T

PowerMOS transistor Logic level FET

BUK571-60A/B

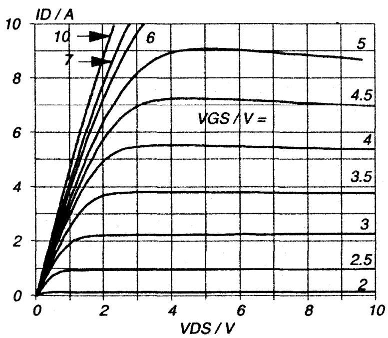


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

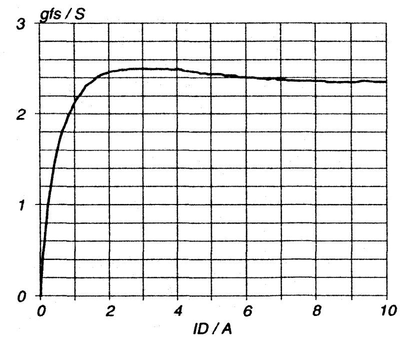


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

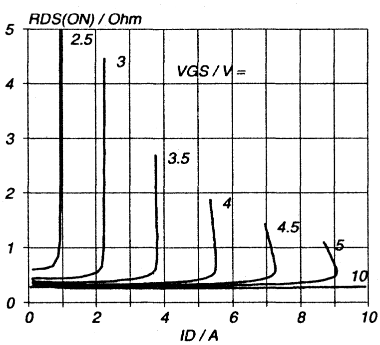


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

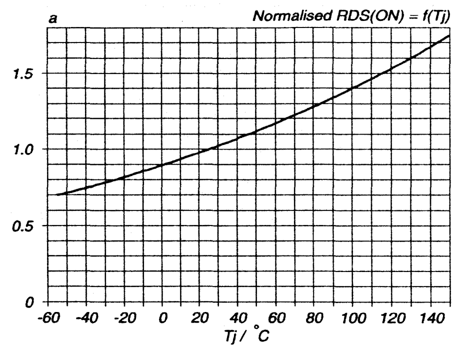


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 4.0 A; V_{GS} = 5 V

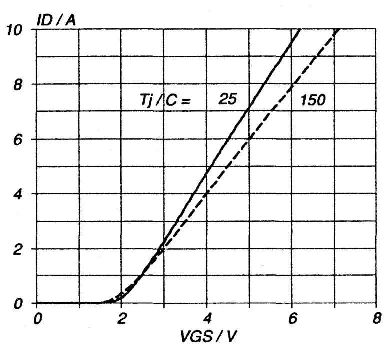


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

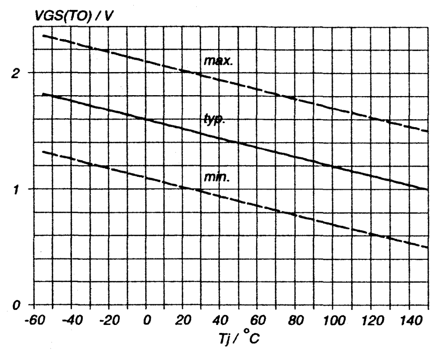


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

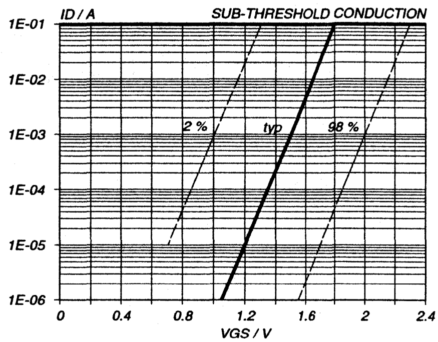


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

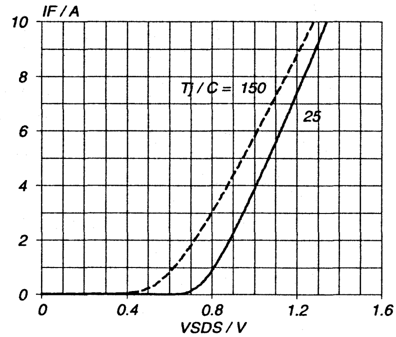


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

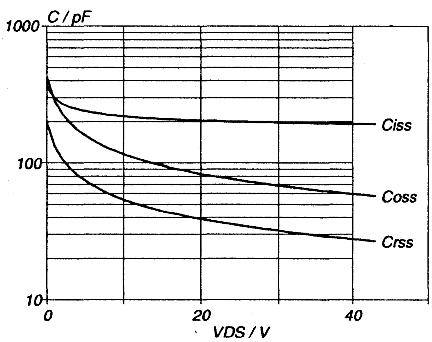


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

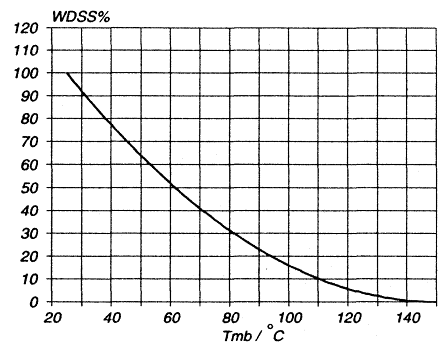


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 5$ A

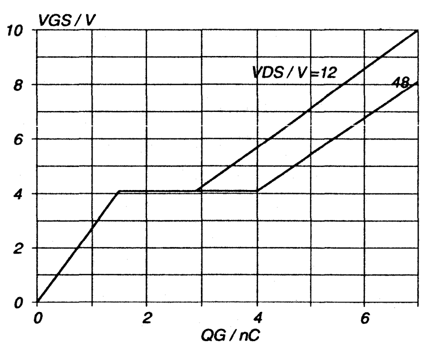


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}

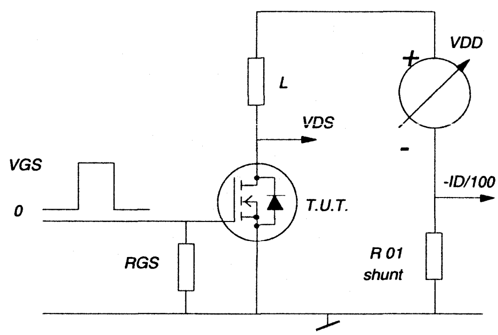


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK541-100A/B	

BUK571-100A/B
PowerMOS transistor Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

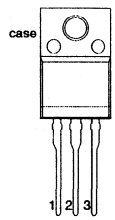
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK571	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	3.0	3.0	A
P_{tot}	Total power dissipation	20	20	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.85	1.1	Ω

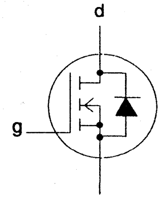
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	-100B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	3.0	3.0	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	2.2	1.9	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	12	12	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	20		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 6.25 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK571-100A**	-	0.75	0.85	Ω
		I_D = 2.5 A **BUK571-100B**	-	0.90	1.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	1.8	2.2	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	200	300	pF
C_{oss}	Output capacitance		-	45	60	pF
C_{rss}	Feedback capacitance		-	16	25	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	6	10	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	30	40	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	20	30	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	3.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	12	A
V_{SD}	Diode forward voltage	I_F = 3.0 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 3.0 A; $-dI_F/dt$ = 100 A/µs;	-	100	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 3.0 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	10	mJ

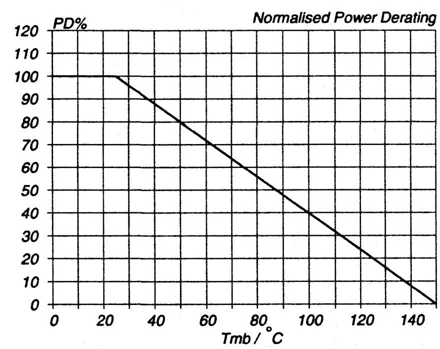


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{mb})$

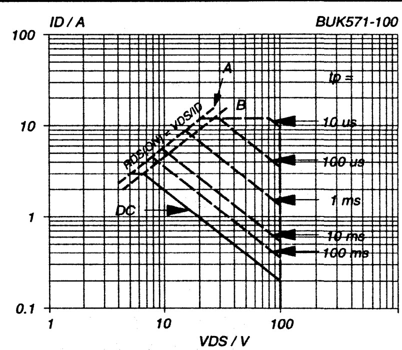


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

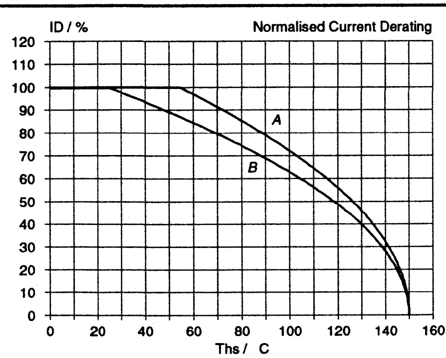


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

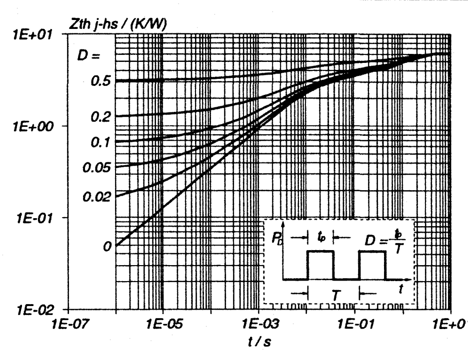


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

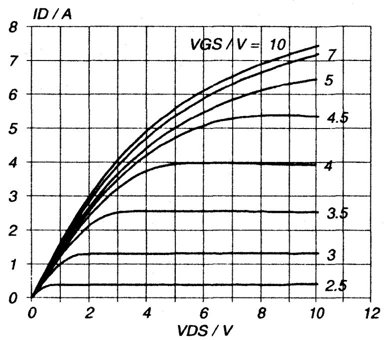


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

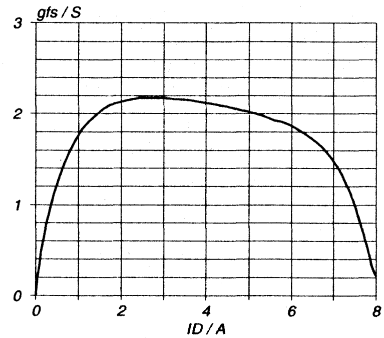


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

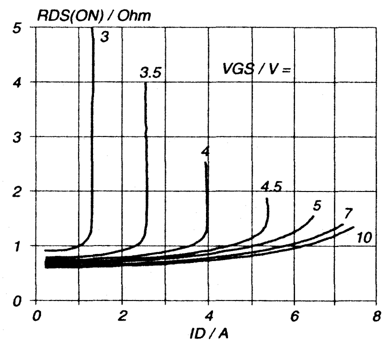


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

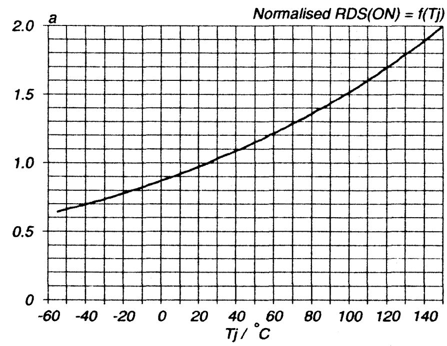


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; I_D = 2.5 A; V_{GS} = 5 V

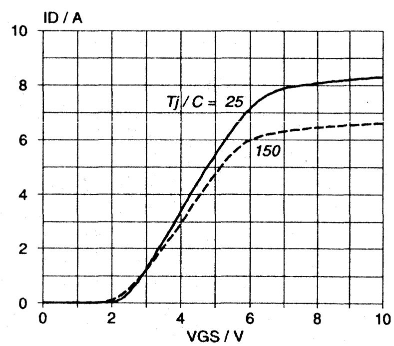


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

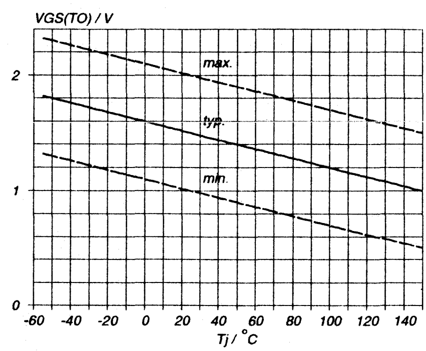


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

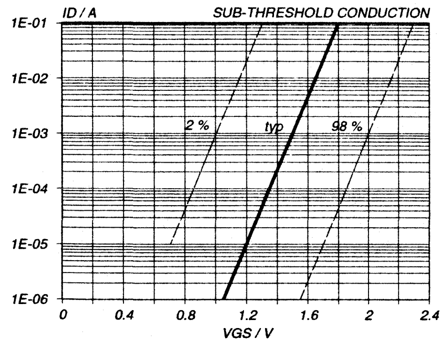


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

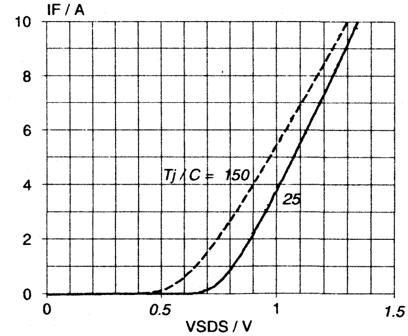


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

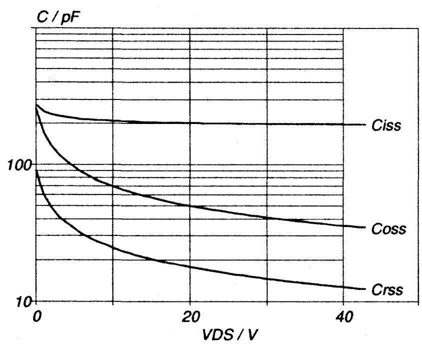


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

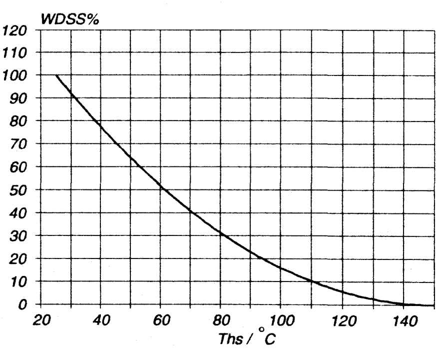


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 3$ A

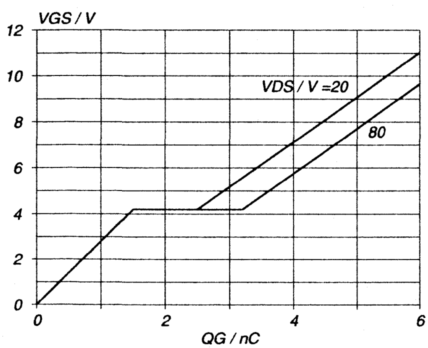


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 3$ A; parameter V_{DS}

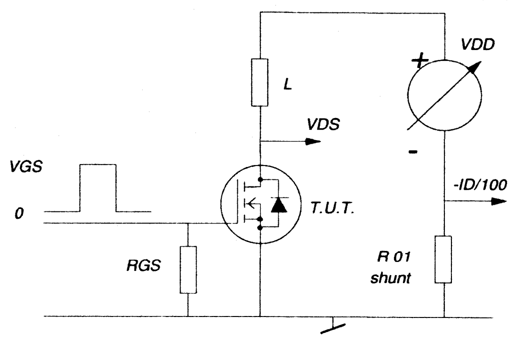


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK542-60A/B	

BUK572-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

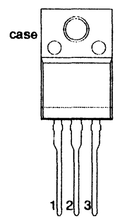
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK572	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	9.2	8.4	A
P_{tot}	Total power dissipation	22	22	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.15	0.18	Ω

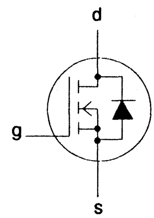
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	9.2	8.4	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	5.8	5.3	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	37	33	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 5.68 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 8.5 A **BUK572-60A**	-	0.12	0.15	Ω
		BUK572-60B	-	0.15	0.18	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 8.5 A	5	6.7	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	600	pF
C_{oss}	Output capacitance		-	150	200	pF
C_{rss}	Feedback capacitance		-	65	100	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	12	18	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	60	80	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	70	ns
t_f	Turn-off fall time		-	45	70	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	9.2	A
I_{DRM}	Pulsed reverse drain current	-	-	-	37	A
V_{SD}	Diode forward voltage	I_F = 9.2 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 9.2 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	30	mJ

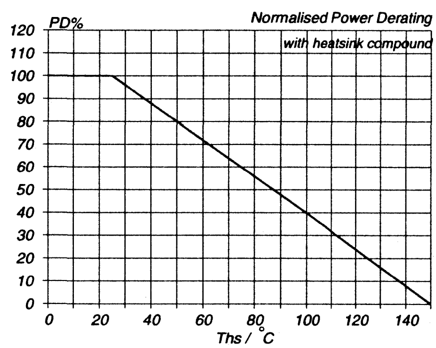


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

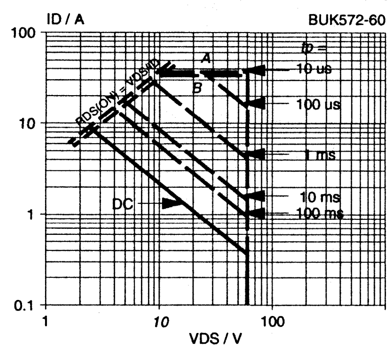


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

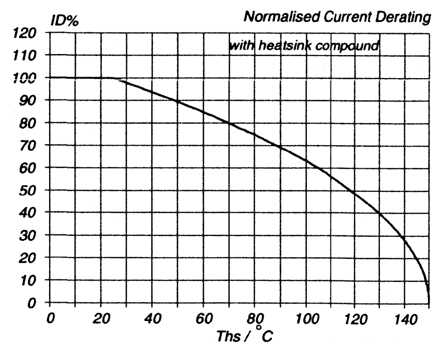


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

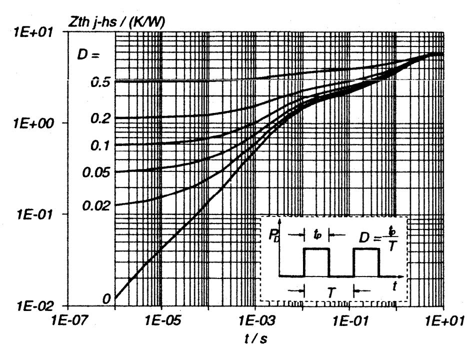


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor
Logic level FET

BUK572-60A/B

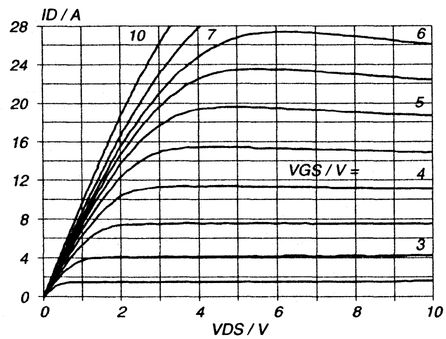


Fig.5. Typical output characteristics, $T_j = 25$ °C. $I_D = f(V_{DS})$; parameter V_{GS}

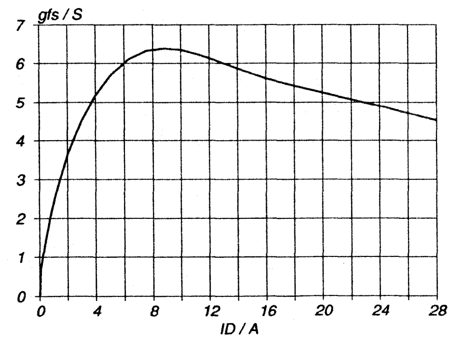


Fig.8. Typical transconductance, $T_j = 25$ °C. $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

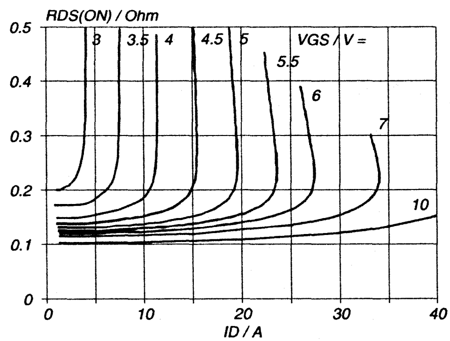


Fig.6. Typical on-state resistance, $T_j = 25$ °C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

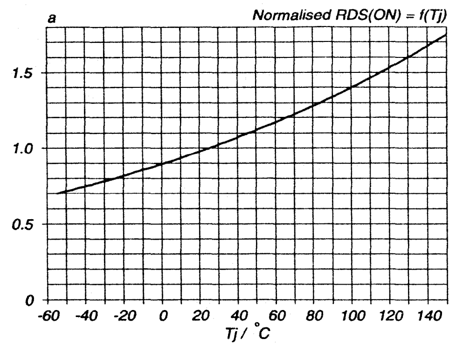


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 8.5$ A; $V_{GS} = 5$ V

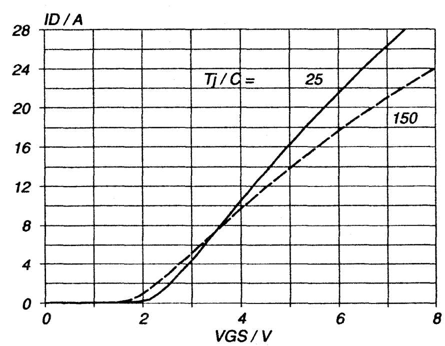


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

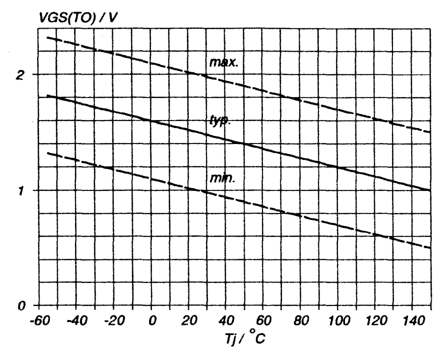


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor
Logic level FET

BUK572-60A/B

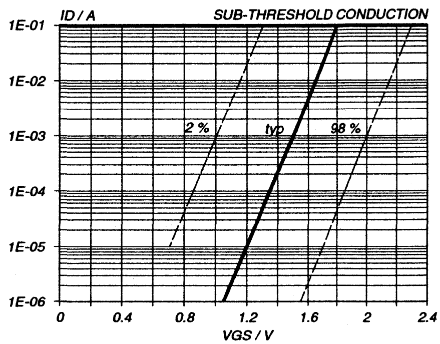


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25\ ^\circ C$; $V_{DS} = V_{GS}$

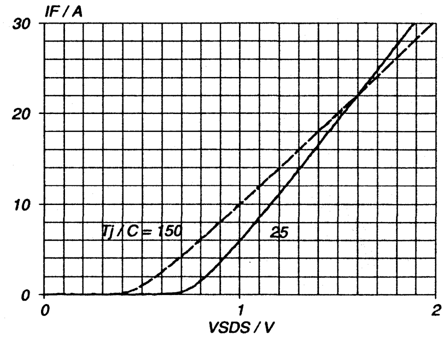


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

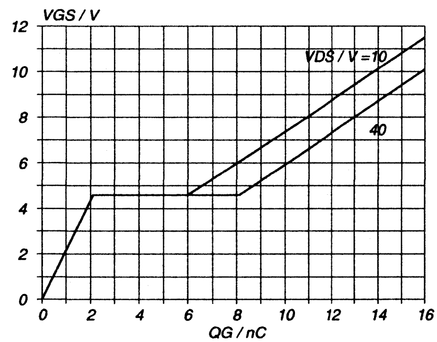


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

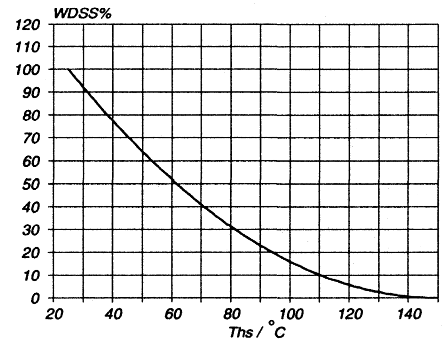


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

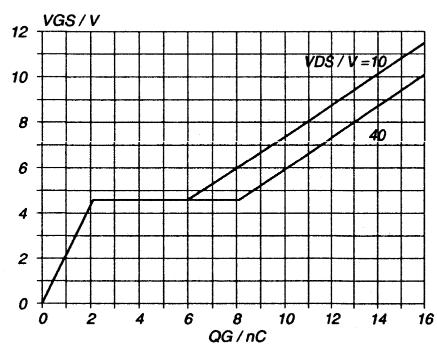


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

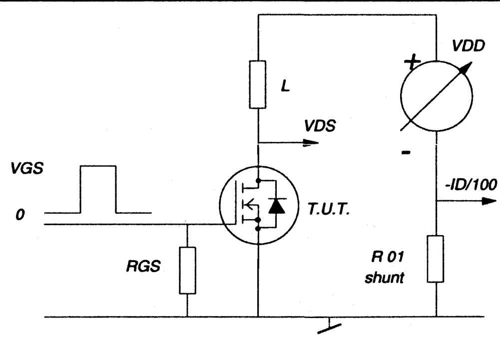


Fig.16. Avalanche energy test circuit.

$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK542-100A/B	

BUK572-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

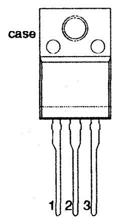
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK572	**-100A**	**-100B**	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	6.3	5.6	A
P_{tot}	Total power dissipation	22	22	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.28	0.35	Ω

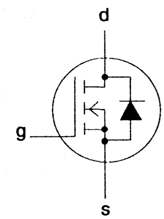
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	**-100B**	
I_D	Drain current (DC)	$T_{hs} = 25$ °C	-	6.3	5.6	A
I_D	Drain current (DC)	$T_{hs} = 100$ °C	-	4	3.5	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ °C	-	25	22	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ °C	-	22		W
T_{stg}	Storage temperature	-	- 55	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5.68 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 5.5 A **BUK572-100A**	-	0.25	0.28	Ω
		BUK572-100B	-	0.3	0.35	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5.5 A	4.5	6	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	400	600	pF
C_{oss}	Output capacitance		-	90	120	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	12	18	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	70	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	50	70	ns
t_f	Turn-off fall time		-	30	45	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	6.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	25	A
V_{SD}	Diode forward voltage	I_F = 6.3 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 6.3 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.30	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 10 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	30	mJ

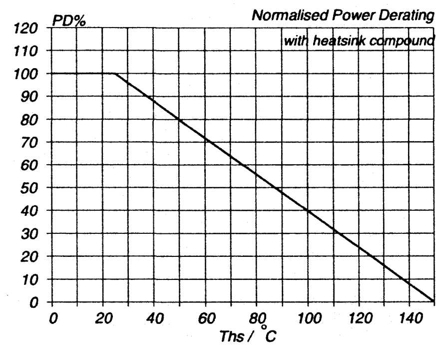


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

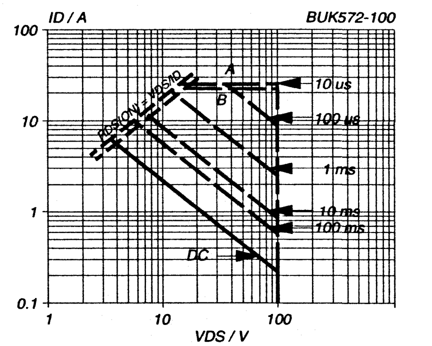


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

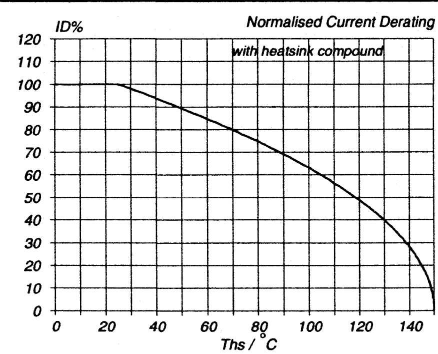


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq$ 5 V

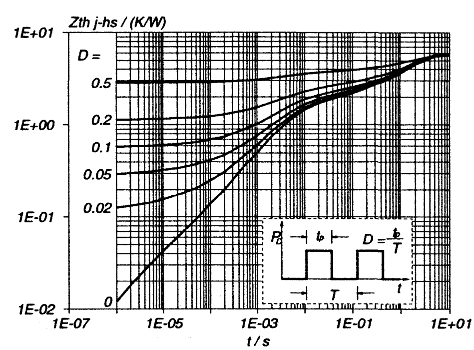


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

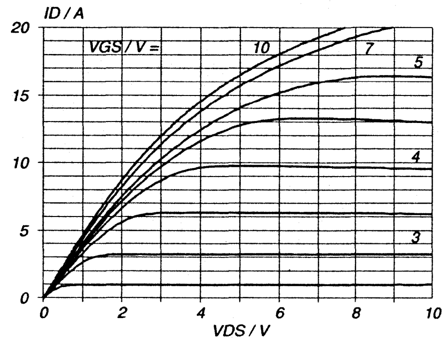


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

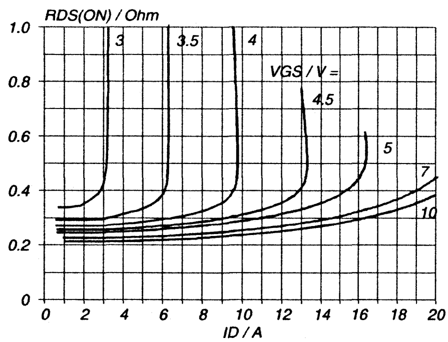


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

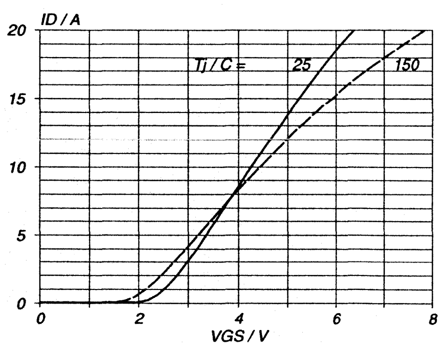


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

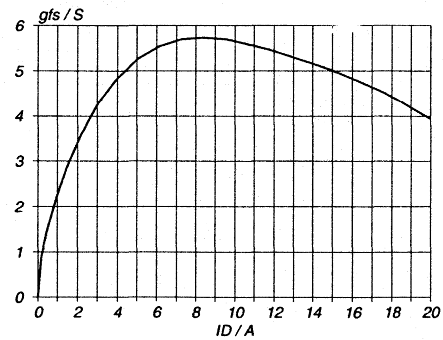


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

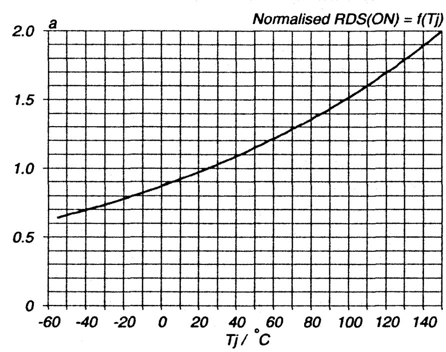


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 5.5$ A; $V_{GS} = 5$ V

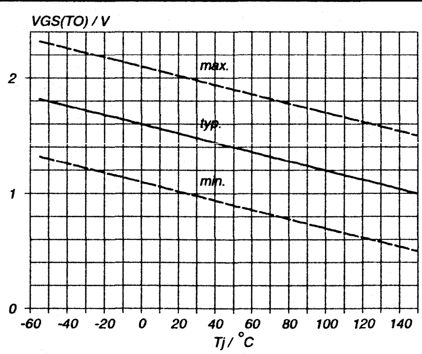


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

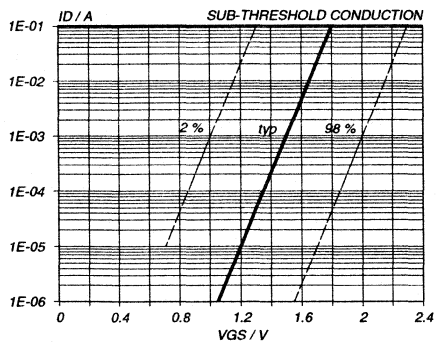


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

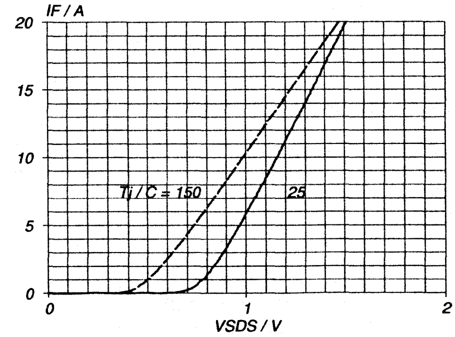


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

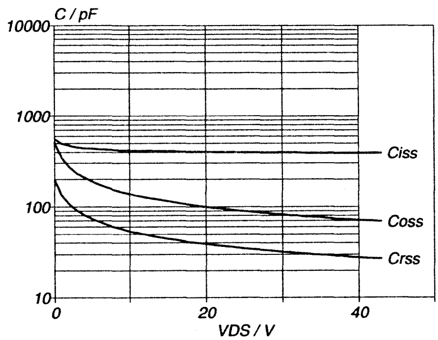


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

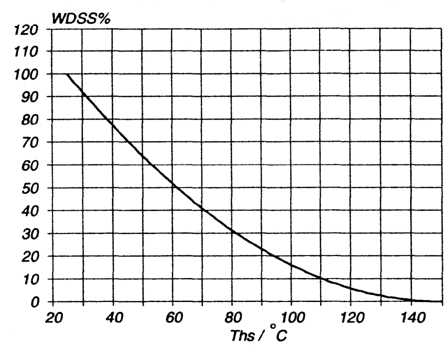


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 10$ A

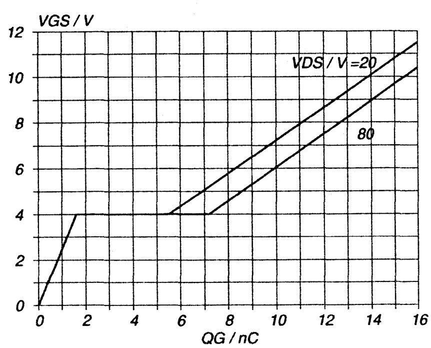


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 10$ A; parameter V_{DS}

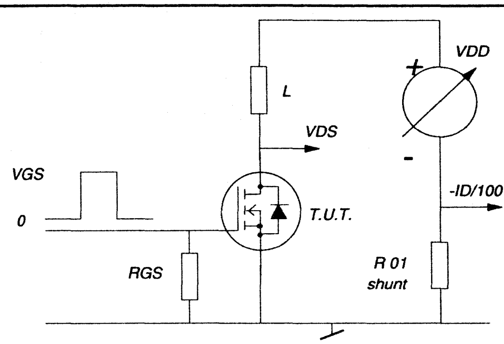


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK543-50A/B	

BUK573-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

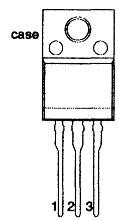
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK573	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} 5 V	0.085	0.1	Ω

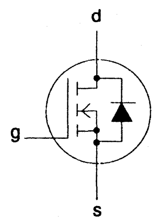
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	13	12	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	8.2	7.6	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	52	48	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor
Logic level FET

BUK573-60A/B

THERMAL RESISTANCES

From junction to heatsink	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5 K/W
From junction to ambient		$R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 10 A **BUK573-60A**	-	0.075	0.085	Ω
		BUK573-60B	-	0.08	0.10	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	7	10	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	130	160	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	95	120	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	110	ns
t_f	Turn-off fall time		-	65	85	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 13 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.20	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 20 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	45	mJ

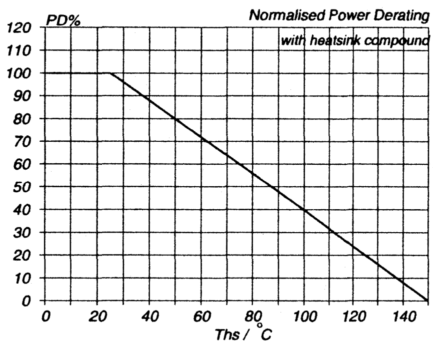


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

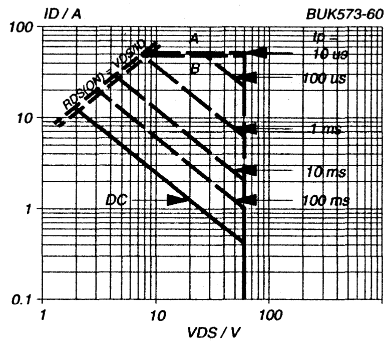


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

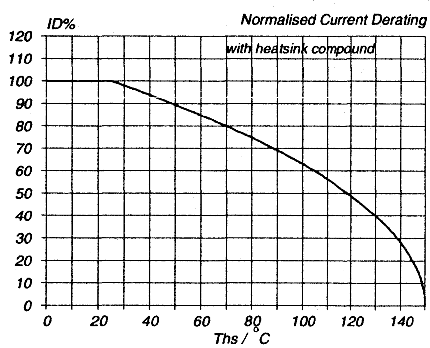


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

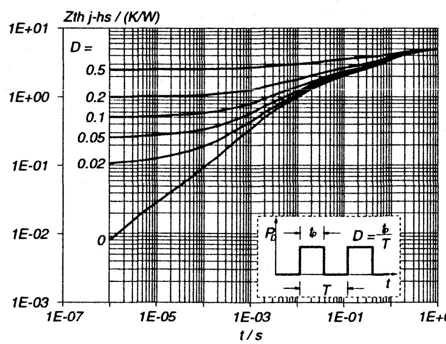


Fig.4. Transient thermal impedance.
$Z_{th\,j-hs} = f(t)$; parameter $D = t_p/T$

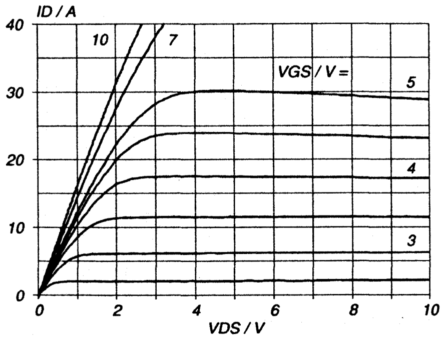


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

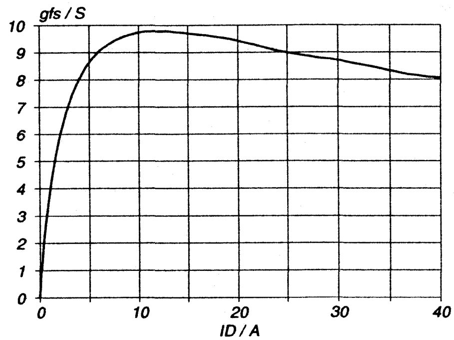


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

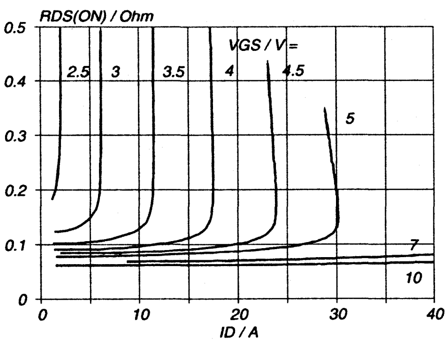


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

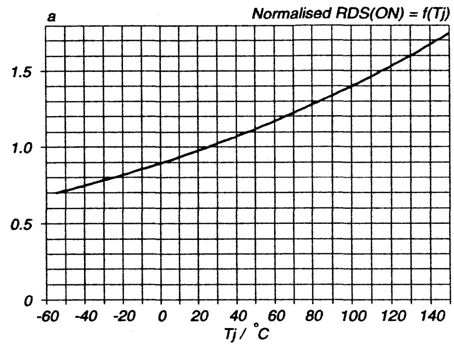


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ °C} = f(T_j)$; $I_D = 10$ A; $V_{GS} = 5$ V

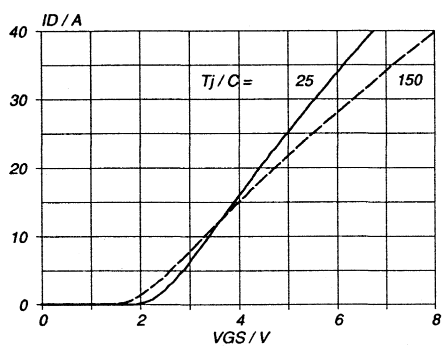


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

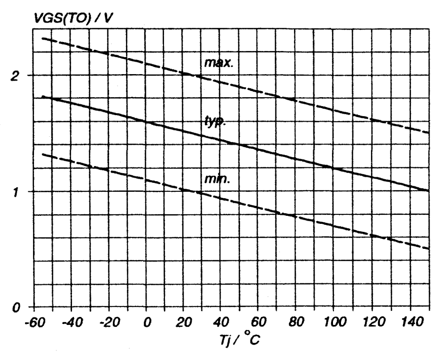


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

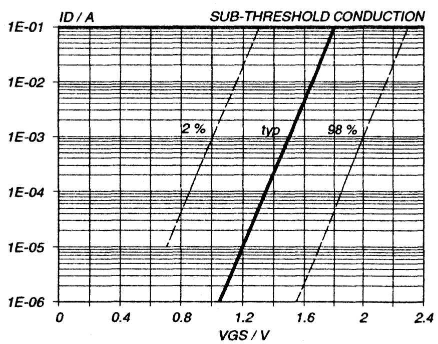


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

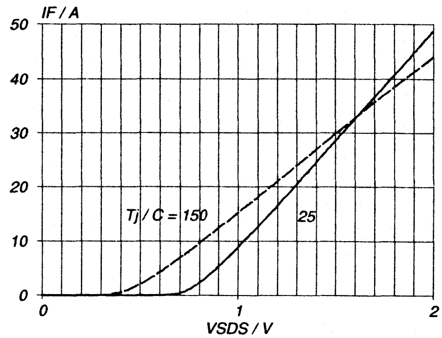


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

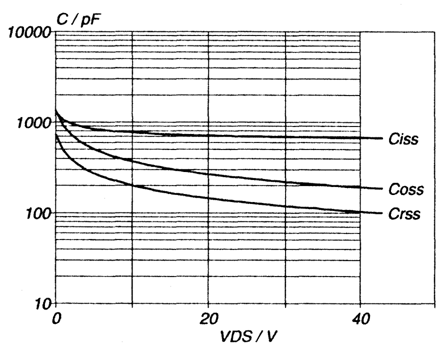


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

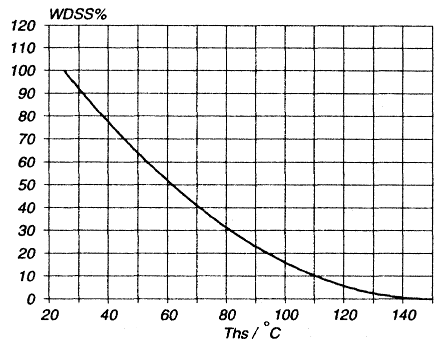


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 20$ A

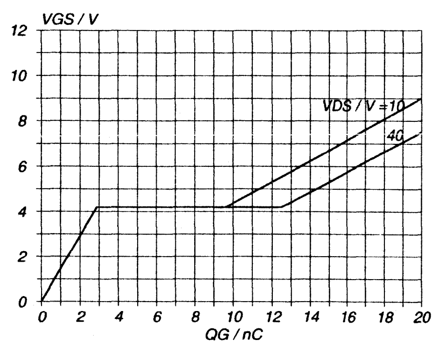


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 20$ A; parameter V_{DS}

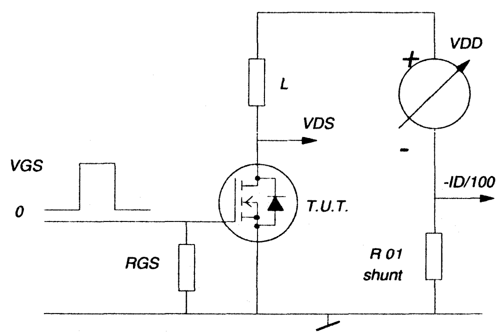


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK543-100A/B	

BUK573-100A/B
PowerMOS transistor Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

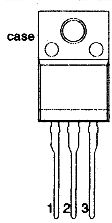
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK573	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	8.3	7.5	A
P_{tot}	Total power dissipation	25	25	W
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.18	0.22	Ω

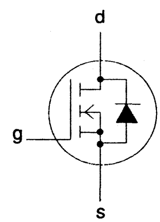
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	-100B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	8.3	7.5	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	5.2	4.7	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	33	30	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	25		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor Logic level FET

BUK573-100A/B

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 5 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK573-100A**	-	0.17	0.18	Ω
		I_D = 5 A **BUK573-100B**	-	0.20	0.22	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 5 A	6.0	8.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	620	825	pF
C_{oss}	Output capacitance		-	180	250	pF
C_{rss}	Feedback capacitance		-	90	120	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	90	115	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

PowerMOS transistor
Logic level FET

BUK573-100A/B

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	8.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	33	A
V_{SD}	Diode forward voltage	I_F = 8.3 A ; V_{GS} = 0 V	-	1.1	1.3	V
t_{rr}	Reverse recovery time	I_F = 8.3 A; $-dI_F/dt$ = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.5	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 13 A ; $V_{DD} \leq$ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	70	mJ

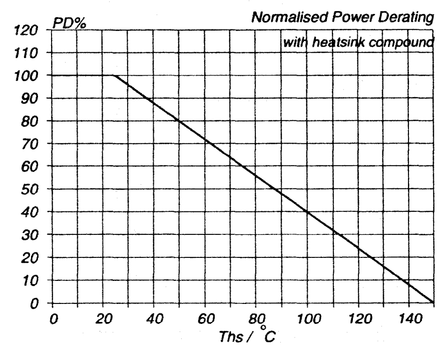


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

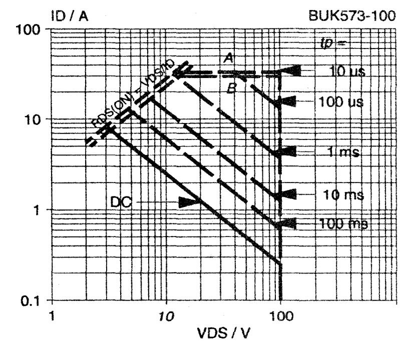


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

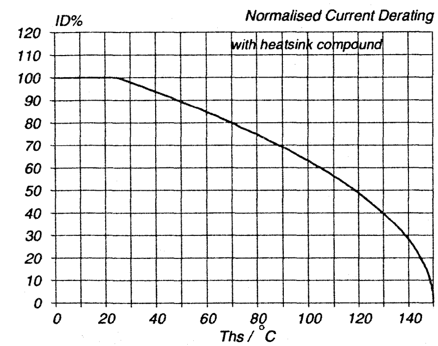


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

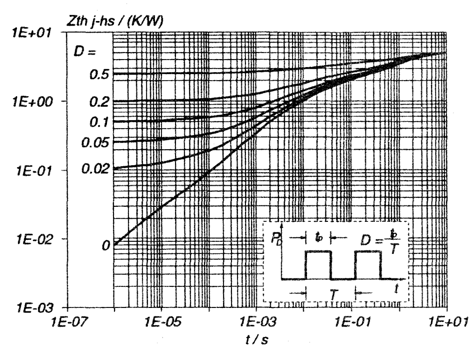


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

PowerMOS transistor Logic level FET

BUK573-100A/B

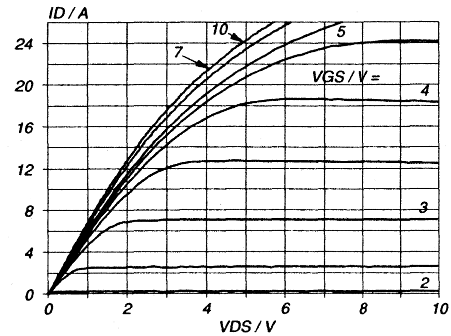


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

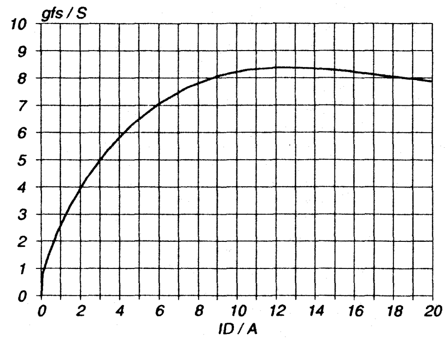


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

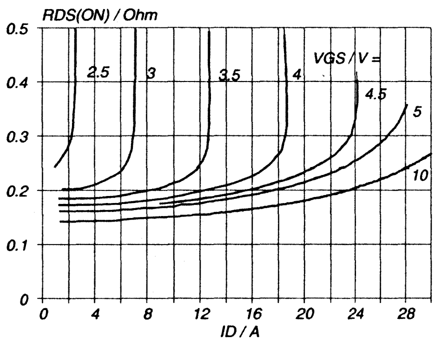


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

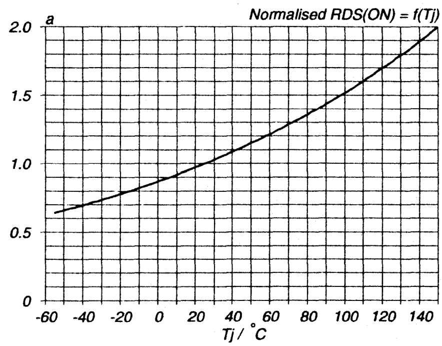


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 5$ A; $V_{GS} = 5$ V

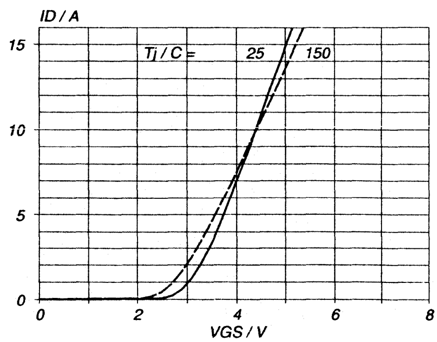


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

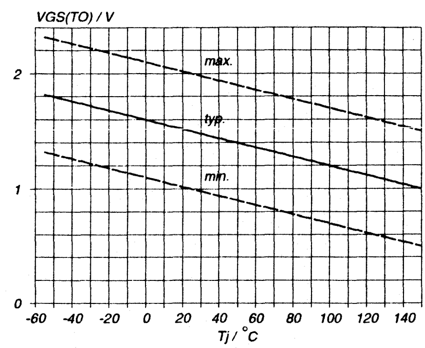


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

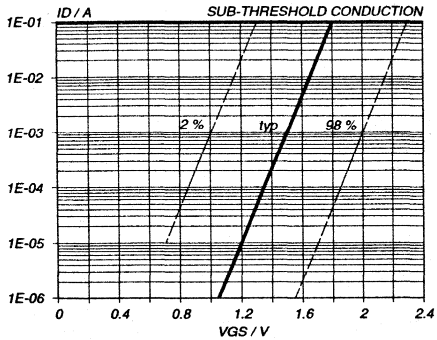


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

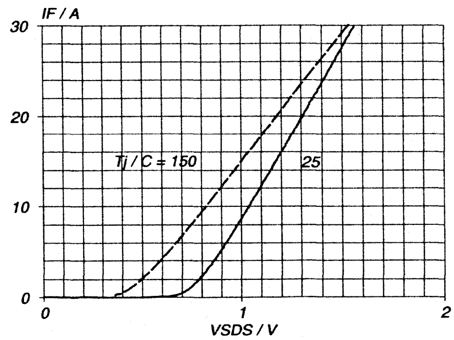


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

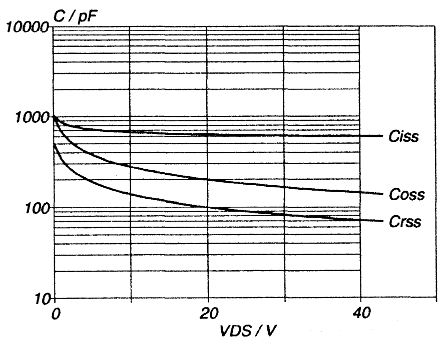


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

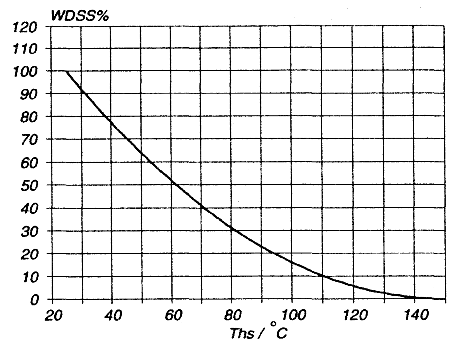


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 13$ A

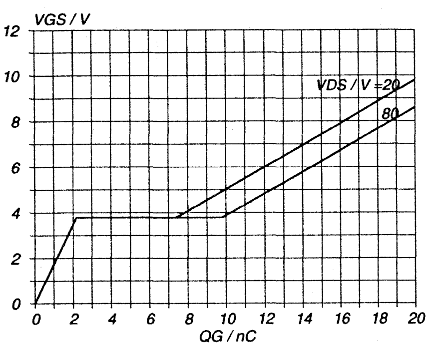


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 13$ A; parameter V_{DS}

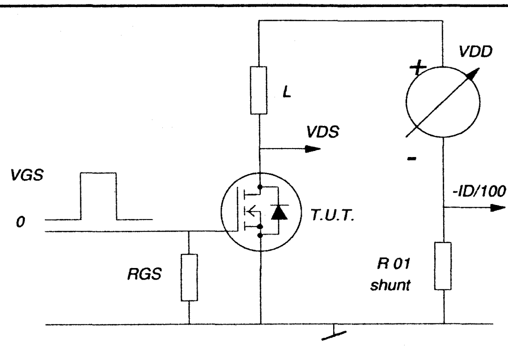


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK545-50A/B	

BUK575-60A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

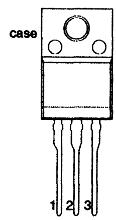
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK575	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	20	18	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; V_{GS} = 5 V	0.042	0.055	Ω

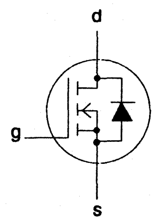
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-60A	-60B	
I_D	Drain current (DC)	T_{hs} = 25 ˚C	-	20	18	A
I_D	Drain current (DC)	T_{hs} = 100 ˚C	-	13	11	A
I_{DM}	Drain current (pulse peak value)	T_{hs} = 25 ˚C	-	80	72	A
P_{tot}	Total power dissipation	T_{hs} = 25 ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j\text{-}hs}$ = 4.17 K/W $R_{th\ j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK575-60A**	-	0.035	0.042	Ω
		I_D = 20 A **BUK575-60B**	-	0.045	0.055	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	11	20	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1450	1750	pF
C_{oss}	Output capacitance		-	500	600	pF
C_{rss}	Feedback capacitance		-	220	275	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	120	150	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	160	220	ns
t_f	Turn-off fall time		-	110	145	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	20	A
I_{DRM}	Pulsed reverse drain current	-	-	-	80	A
V_{SD}	Diode forward voltage	I_F = 20 A ; V_{GS} = 0 V	-	1.4	2.0	V
t_{rr}	Reverse recovery time	I_F = 20 A; $-dI_F/dt$ = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.25	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 39 A ; $V_{DD} \leq$ 25 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	90	mJ

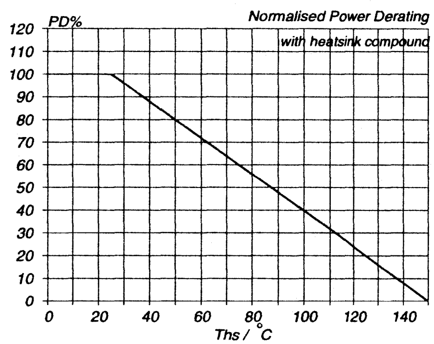


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{hs})$

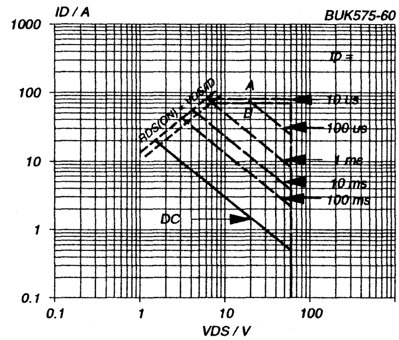


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

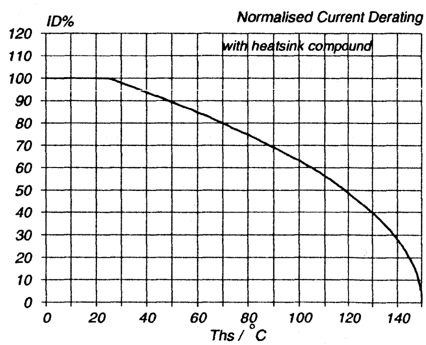


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

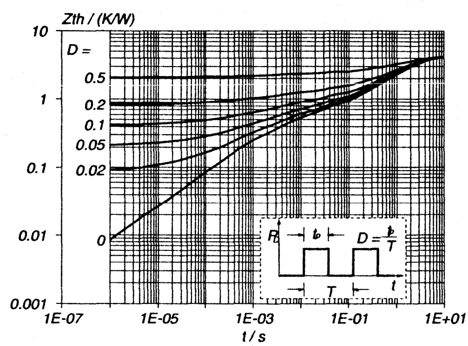


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

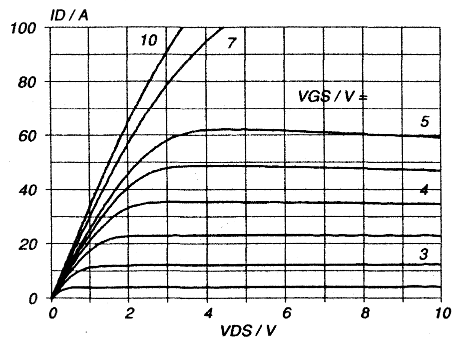


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

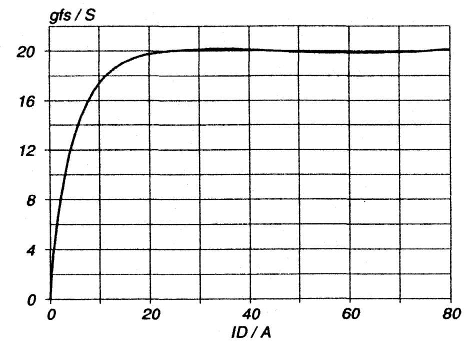


Fig.8. Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

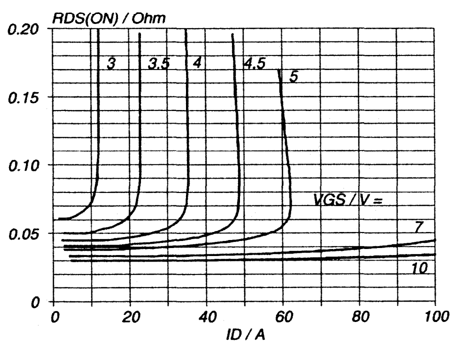


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

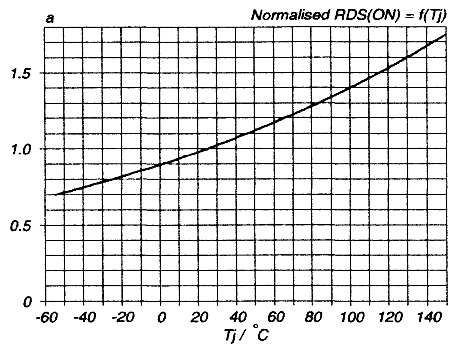


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; $I_D = 20$ A; $V_{GS} = 5$ V

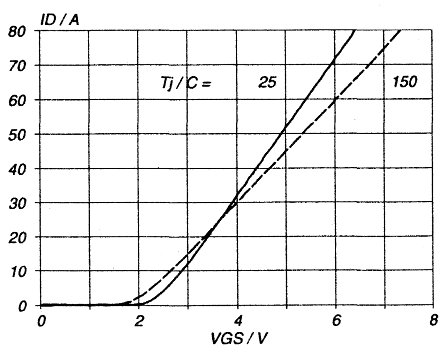


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

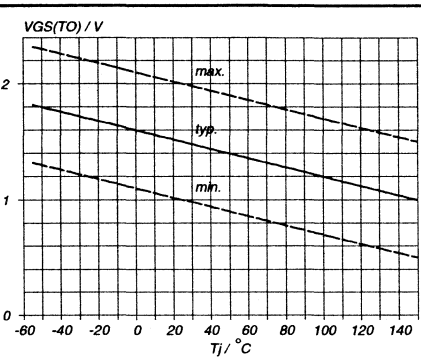


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor
Logic level FET

BUK575-60A/B

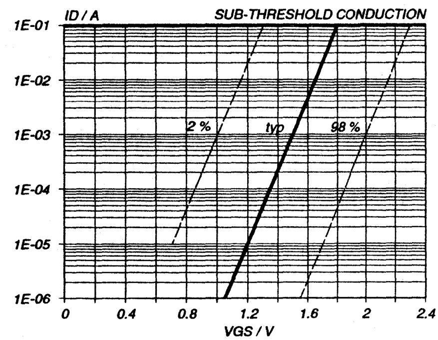


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

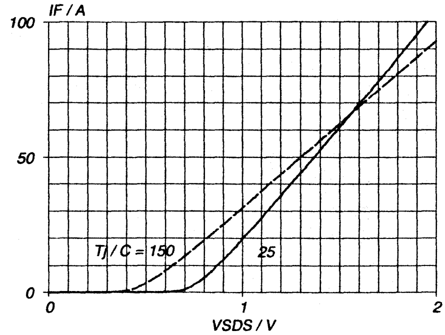


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

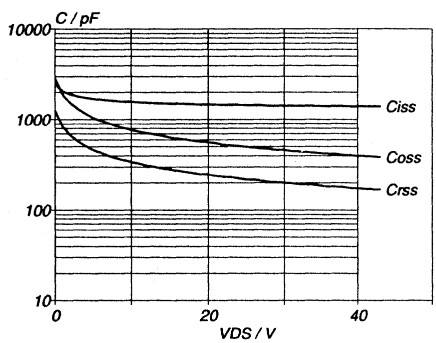


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

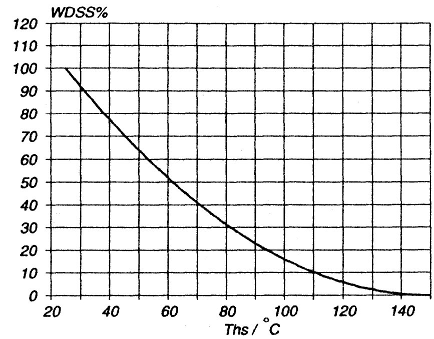


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 39$ A

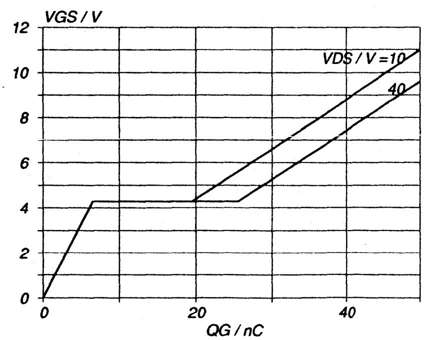


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 39$ A; parameter V_{DS}

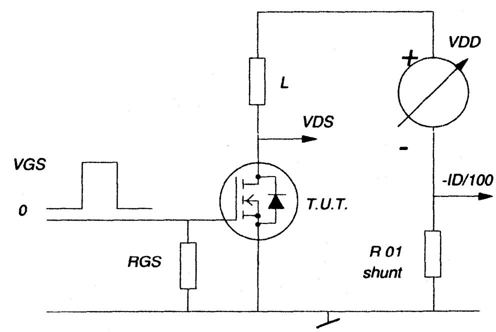


Fig.16. Avalanche energy test circuit.

$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK545-100A/B	

BUK575-100A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

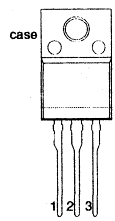
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK575	-100A	-100B	
V_{DS}	Drain-source voltage	100	100	V
I_D	Drain current (DC)	13	12	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.085	0.11	Ω

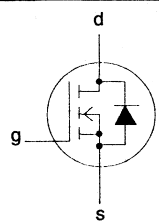
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	100		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	100		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-100A	-100B	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	13	12	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	8.2	7.5	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	52	48	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.17 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	100	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 100 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; **BUK575-100A**	-	0.075	0.085	Ω
		I_D = 13 A **BUK575-100B**	-	0.09	0.11	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 13 A	10	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1450	1750	pF
C_{oss}	Output capacitance		-	280	350	pF
C_{rss}	Feedback capacitance		-	100	150	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	65	85	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	135	180	ns
t_f	Turn-off fall time		-	80	110	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	I_F = 13 A ; V_{GS} = 0 V	-	1.3	1.7	V
t_{rr}	Reverse recovery time	I_F = 13 A; -dI_F/dt = 100 A/µs;	-	90	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.70	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 25 A ; V_{DD} ≤ 50 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	140	mJ

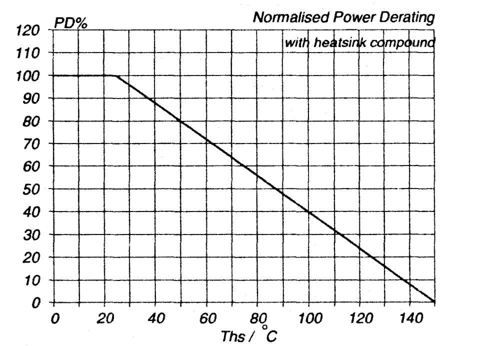


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{hs})$

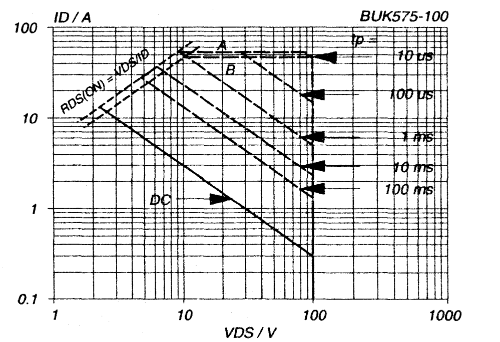


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

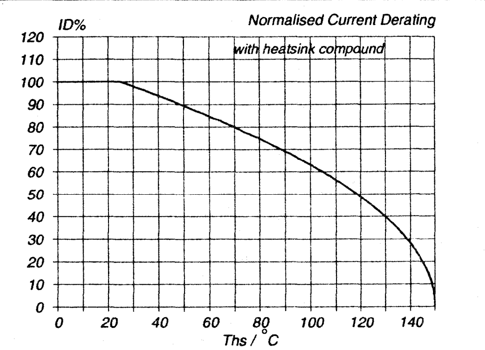


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

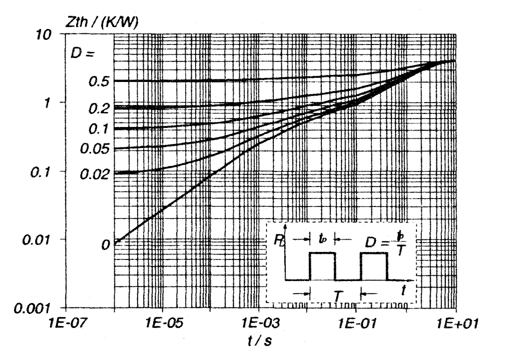


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

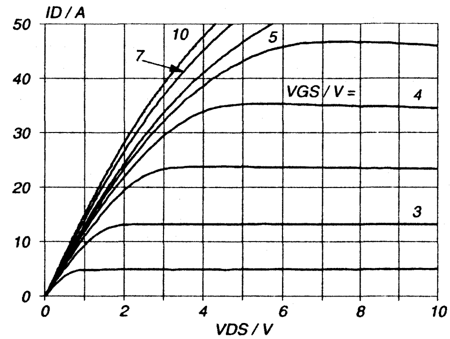


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

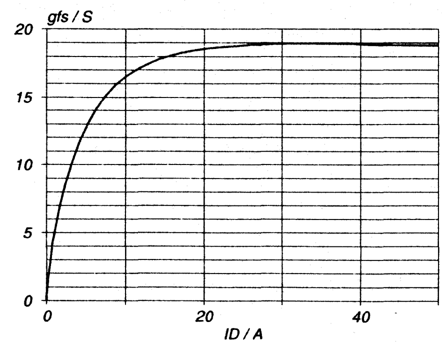


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

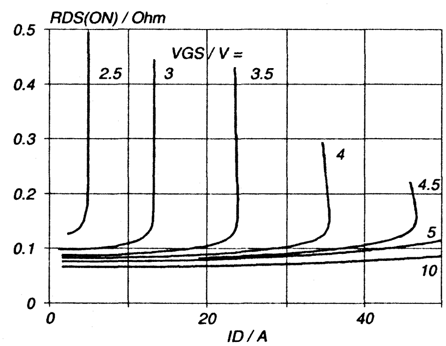


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

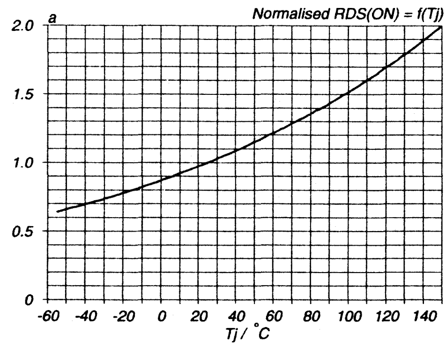


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 13$ A; $V_{GS} = 5$ V

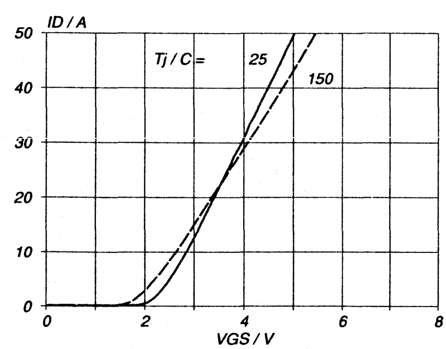


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

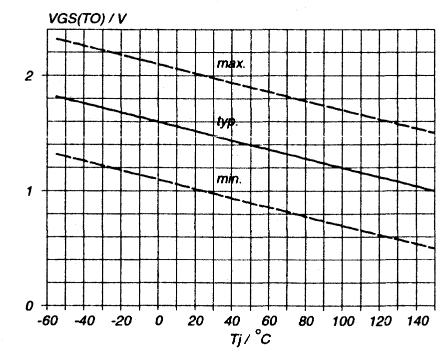


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

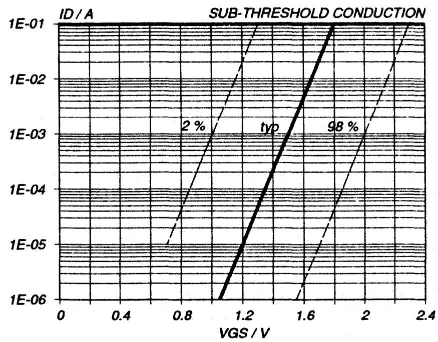


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ ˚C; $V_{DS} = V_{GS}$

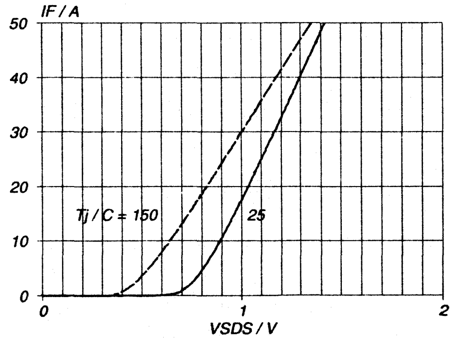


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

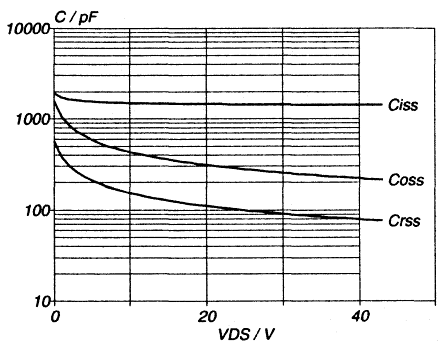


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

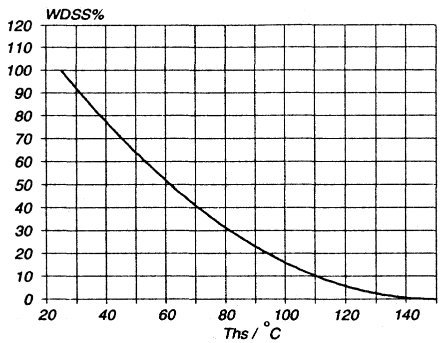


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 25$ A

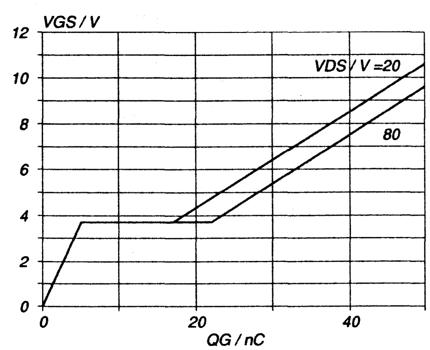


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 25$ A; parameter V_{DS}

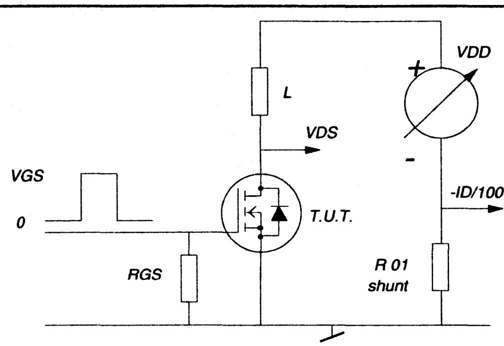


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991
Replaces BUK545-200A/B	

BUK575-200A/B
PowerMOS transistor
Logic level FET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic full-pack envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

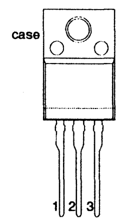
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK575	**-200A**	**-200B**	
V_{DS}	Drain-source voltage	200	200	V
I_D	Drain current (DC)	7.6	7	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	˚C
$R_{DS(ON)}$	Drain-source on-state resistance; $V_{GS} = 5$ V	0.23	0.28	Ω

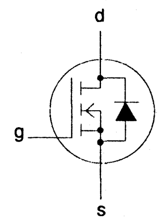
PINNING - SOT186A

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	200		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20$ kΩ	-	200		V
$\pm V_{GS}$	Gate-source voltage	-	-	15		V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20		V
				-200A	**-200B**	
I_D	Drain current (DC)	$T_{hs} = 25$ ˚C	-	7.6	7	A
I_D	Drain current (DC)	$T_{hs} = 100$ ˚C	-	4.8	4.4	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25$ ˚C	-	30	28	A
P_{tot}	Total power dissipation	$T_{hs} = 25$ ˚C	-	30		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\,j\text{-}hs}$ = 4.17 K/W $R_{th\,j\text{-}a}$ = 55 K/W

STATIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 200 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 7 A **BUK575-200A**	-	0.2	0.23	Ω
		BUK575-200B	-	0.24	0.28	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 7 A	8.0	15	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1600	2000	pF
C_{oss}	Output capacitance		-	180	250	pF
C_{rss}	Feedback capacitance		-	55	80	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 5 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	-	25	40	ns
t_r	Turn-on rise time		-	45	75	ns
$t_{d\,off}$	Turn-off delay time		-	140	180	ns
t_f	Turn-off fall time		-	40	55	ns
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

ISOLATION

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol(rms)}$	R.M.S. isolation voltage from all three terminals to external heatsink	f = 50-60 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree	-	-	2500	V_{RMS}
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	10	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.6	A
I_{DRM}	Pulsed reverse drain current	-	-	-	30	A
V_{SD}	Diode forward voltage	I_F = 7.6 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 7.6 A; $-dI_F/dt$ = 100 A/µs;	-	150	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	1.3	-	µC

AVALANCHE LIMITING VALUE

T_{hs} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 14 A ; $V_{DD} \leq$ 100 V ; V_{GS} = 5 V ; R_{GS} = 50 Ω	-	-	100	mJ

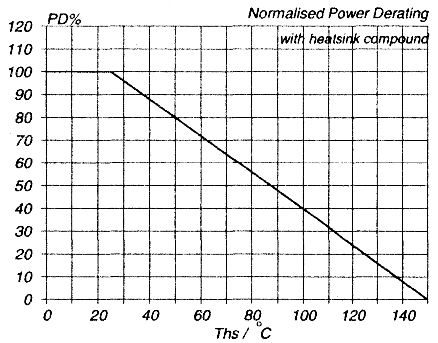


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,˚C} = f(T_{hs})$

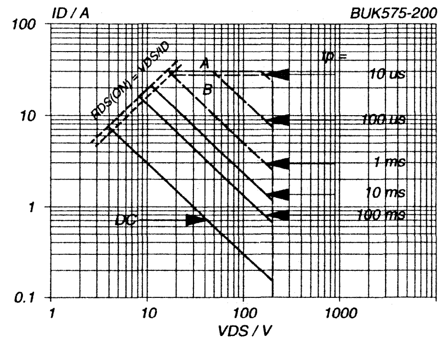


Fig.3. Safe operating area. T_{hs} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

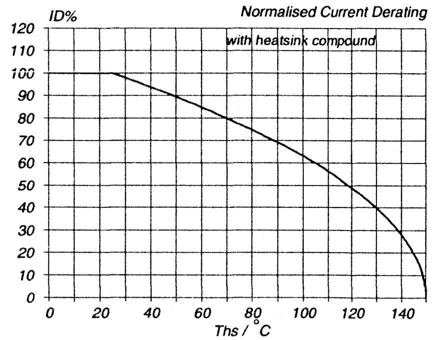


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,˚C} = f(T_{hs})$; conditions: $V_{GS} \geq 5$ V

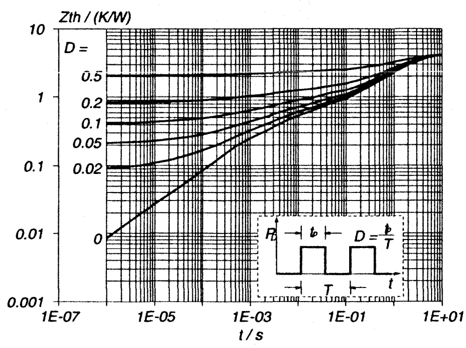


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$

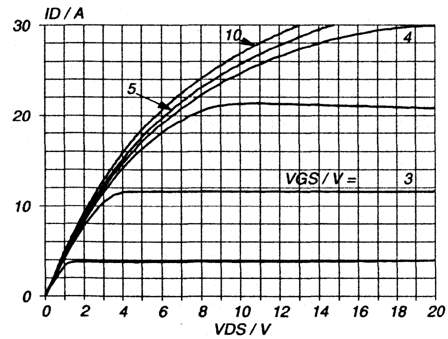


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

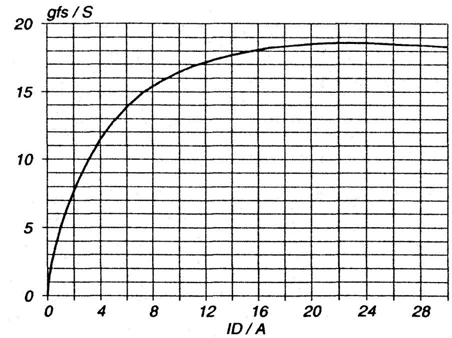


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

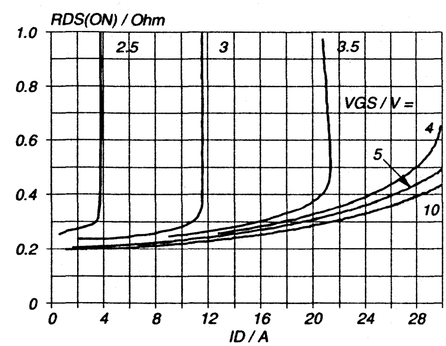


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

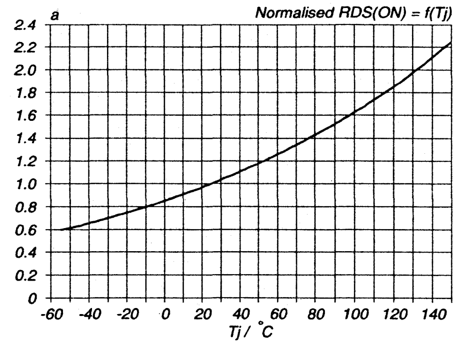


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; $I_D = 7$ A; $V_{GS} = 5$ V

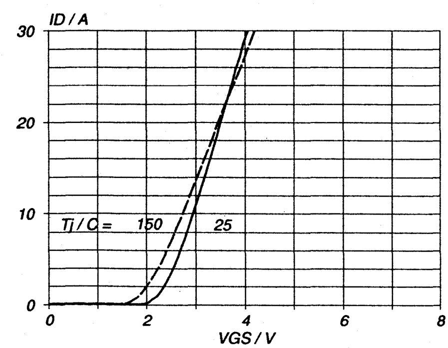


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

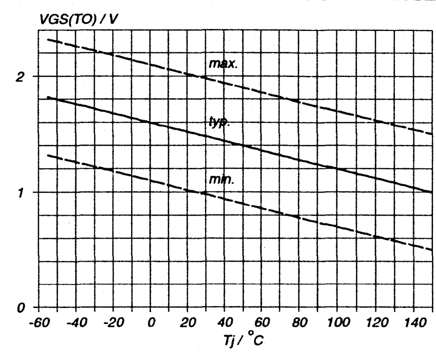


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor Logic level FET

BUK575-200A/B

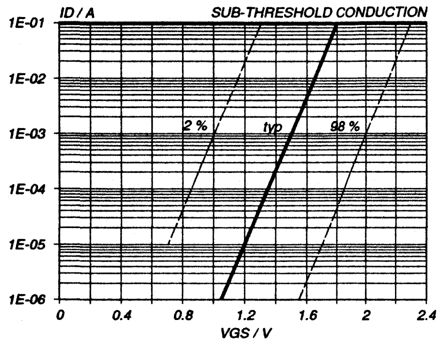


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

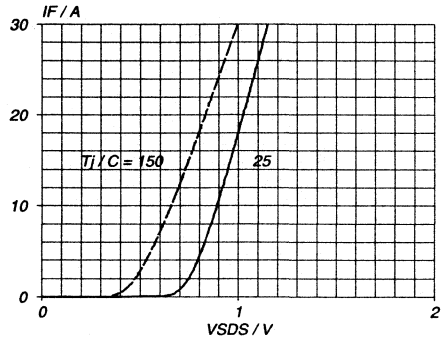


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

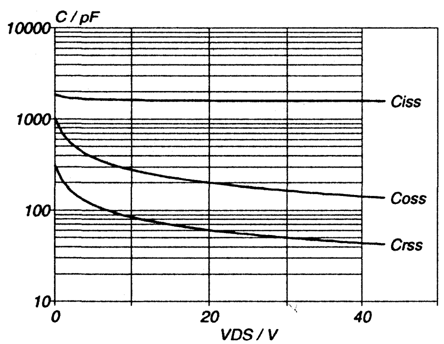


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

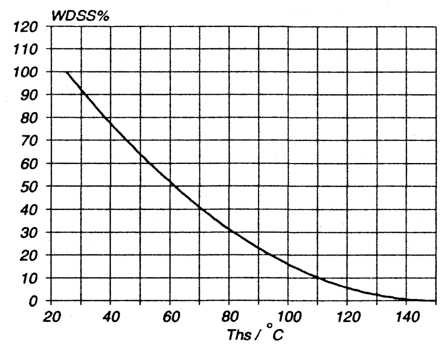


Fig.15. Normalised avalanche energy rating.
$W_{DSS}\% = f(T_{hs})$; conditions: $I_D = 14$ A

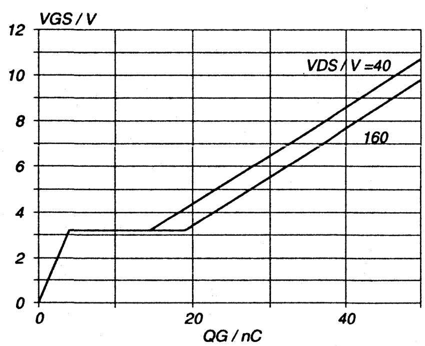


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 14$ A; parameter V_{DS}

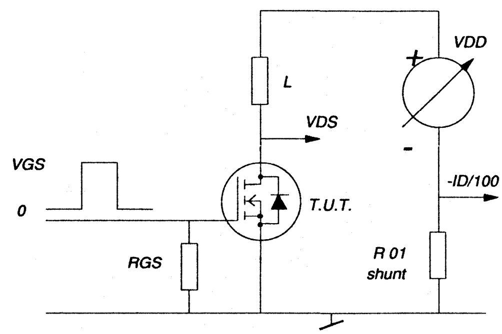


Fig.16. Avalanche energy test circuit.
$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK638-800A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

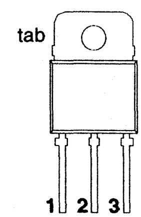
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK638	-800A	-800B	
V_{DS}	Drain-source voltage	800	800	V
I_D	Drain current (DC)	7.3	6.3	A
P_{tot}	Total power dissipation	220	220	W
$R_{DS(ON)}$	Drain-source on-state resistance	1.8	2.4	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

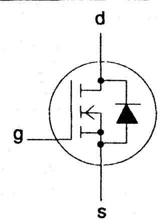
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	800		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	800		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-800A	-800B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	7.3	6.3	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	4.6	4.0	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	29	25	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	220		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor Fast recovery diode FET

BUK638-800A/B

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 0.57 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	800	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j = 25 ˚C	-	20	200	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 800 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 4.0 A **BUK638-800A**	-	1.5	1.8	Ω
		BUK638-800B	-	1.8	2.4	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	3.0	6.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	2000	3000	pF
C_{oss}	Output capacitance		-	200	300	pF
C_{rss}	Feedback capacitance		-	100	200	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	60	90	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	100	140	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	350	430	ns
t_f	Turn-off fall time		-	100	140	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	7.3	A
I_{DRM}	Pulsed reverse drain current	-	-	-	29	A
V_{SD}	Diode forward voltage	I_F = 7.3 A ; V_{GS} = 0 V	-	1.0	1.5	V
t_{rr}	Reverse recovery time	I_F = 7.3 A; T_j = 25 ˚C	-	200	250	ns
		$-dI_F/dt$ = T_j = 125 ˚C	-	250	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs; T_j = 25 ˚C	-	1.3	2.0	µC
		V_{GS} = 0 V; T_j = 125 ˚C	-	2.5	4.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V T_j = 125 ˚C	-	12.0	-	A

PowerMOS transistor
Fast recovery diode FET

BUK638-800A/B

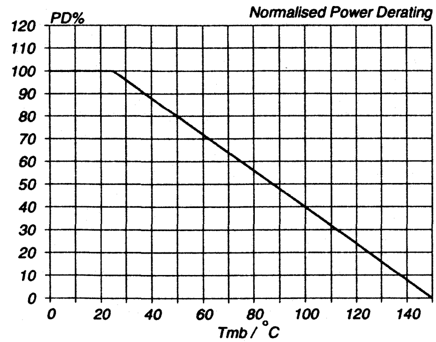


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

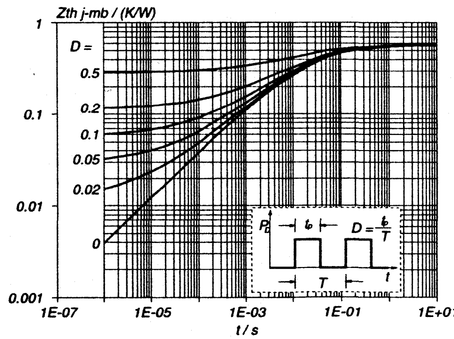


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

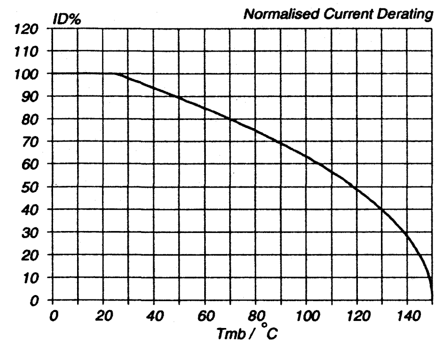


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

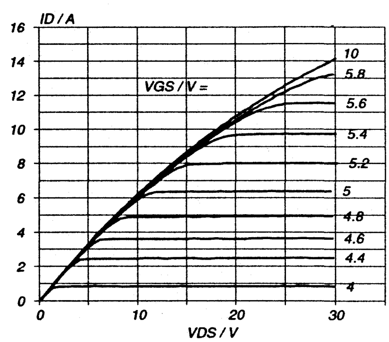


Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}

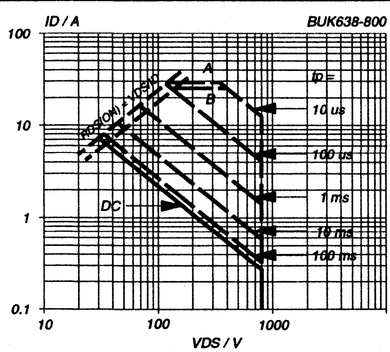


Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

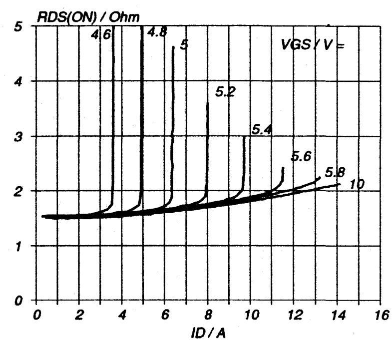


Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

PowerMOS transistor
Fast recovery diode FET

BUK638-800A/B

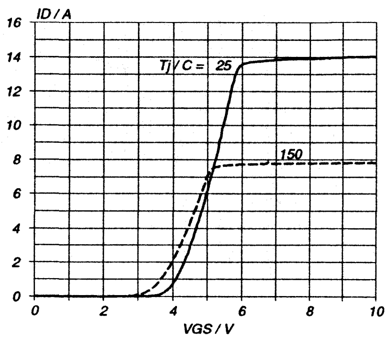


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

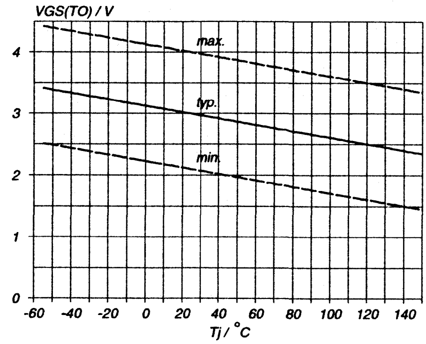


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

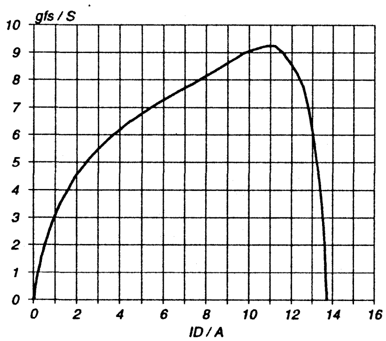


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

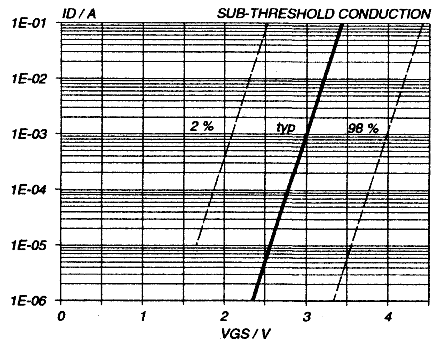


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

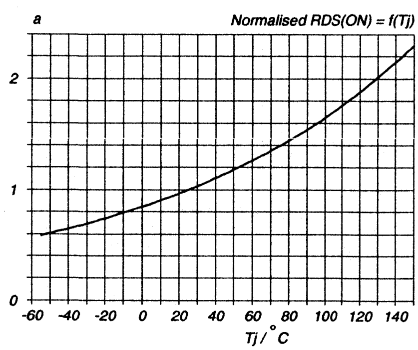


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 4 A; V_{GS} = 10 V

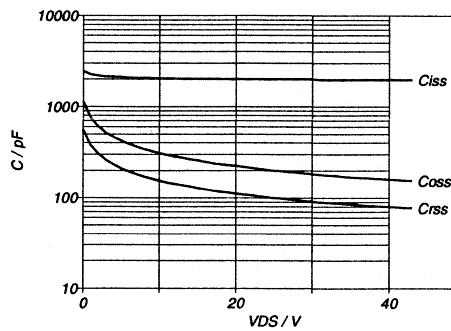


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

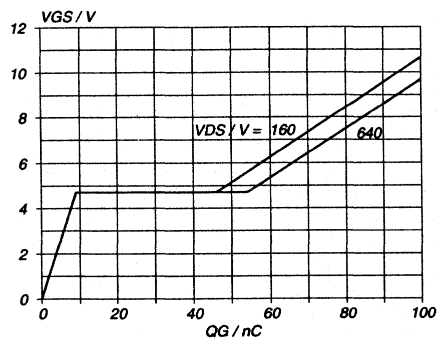


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 7.3$ A; parameter V_{DS}

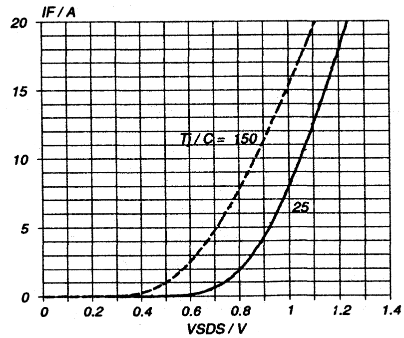


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK638-1000A/B
PowerMOS transistor
Fast recovery diode FET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

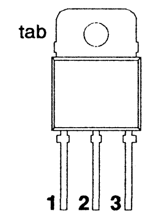
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK638	-1000A	-1000B	
V_{DS}	Drain-source voltage	1000	1000	V
I_D	Drain current (DC)	6.2	5.6	A
P_{tot}	Total power dissipation	220	220	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.4	3.0	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

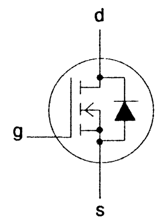
PINNING - SOT93

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	1000		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	1000		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-1000A	-1000B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	6.2	5.6	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	3.9	3.5	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	25	22	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	220		W
T_{stg}	Storage temperature	-	- 55	150		˚C
T_j	Junction Temperature	-	-	150		˚C

PowerMOS transistor Fast recovery diode FET

BUK638-1000A/B

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j\text{-}mb}$ = 0.57 K/W
From junction to ambient	$R_{th\ j\text{-}a}$ = 45 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	1000	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 ˚C	-	20	200	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK638-1000A**	-	2.0	2.4	Ω
		I_D = 3.5 A **BUK638-1000B**	-	2.5	3.0	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 3.5 A	1.5	3.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	3000	3500	pF
C_{oss}	Output capacitance		-	300	350	pF
C_{rss}	Feedback capacitance		-	150	250	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.5 A;	-	60	90	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	100	140	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	350	430	ns
t_f	Turn-off fall time		-	100	140	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	12.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	6.2	A
I_{DRM}	Pulsed reverse drain current	-		-	-	25	A
V_{SD}	Diode forward voltage	I_F = 6.2 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 6.2 A;	T_j = 25 ˚C	-	200	250	ns
		$-dI_F/dt$ =	T_j = 125 ˚C	-	250	300	ns
Q_{rr}	Reverse recovery charge	100 A/µs;	T_j = 25 ˚C	-	1.3	2.0	µC
		V_{GS} = 0 V;	T_j = 125 ˚C	-	3.5	5.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j = 125 ˚C	-	7.0	-	A

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 6.2 A ; $V_{DD} \leq$ 250 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	750	mJ

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK793-60A
PowerMOS transistor SensorFET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a 5 pin plastic envelope.
The measure pin provides on-state current measurement without extra insertion losses by means of integral current sensing cells and ancillary source kelvin pin. It is suitable for a wide variety of linear and switching applications.

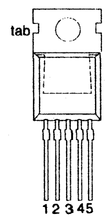
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	20	A
P_{tot}	Total power dissipation	75	W
T_j	Junction temperature	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.1	Ω
$\pm\Delta I_D/I_M$	Measure ratio tolerance	5	%

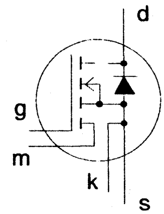
PINNING - SOT263

PIN	DESCRIPTION
1	gate
2	measure
3	drain
4	kelvin source
5	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)
V_{MK} = 0 V unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	30	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	20	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	14	A
I_{DM}	Drain current (pulse peak value)	$T_j \leq T_j$max	-	80	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75	W
T_{stg}	Storage temperature	-	- 55	175	˚C
T_j	Junction Temperature	-	-	175	˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j-mb}$ = 2 K/W
From junction to ambient	$R_{th\ j-a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 10 A	-	0.07	0.1	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	4.5	6.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	650	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	120	160	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	10	20	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	35	55	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	60	90	ns
t_f	Turn-off fall time		-	55	80	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

MEASURE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_M	Continuous measure current	-	-	-	10	mA
I_{MM}	Pulsed measure current	-	-	-	40	mA
$\pm V_{MK}$	Measure to kelvin voltage	V_{GS} = 0 V; V_{DS} = 0 V	-	-	30	V
$R_{DM(ON)}$	Drain-measure on-state resistance	I_D = 6 mA; V_{GM} = 10 V; I_S = 0 A	-	80	120	Ω
I_D/I_M	Drain to measure current ratio	I_D = 10 A; V_{GS} = 10 V; V_{MK} = 0 V	1490	1570	1650	-
C_{moss}	Output capacitance of measure cells	V_{MK} = 0 V; V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	9	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	20	A
I_{DRM}	Pulsed reverse drain current	-	-	-	80	A
V_{SD}	Diode forward voltage	I_F = 20 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 20 A; $-dI_F/dt$ = 100 A/µs;	-	120	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

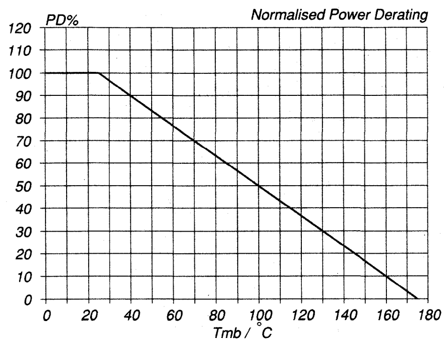


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

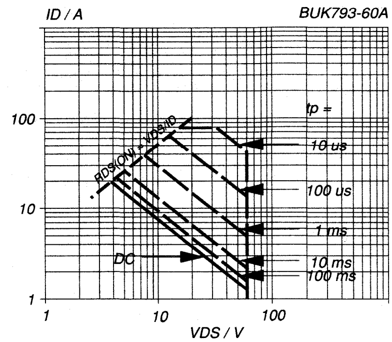


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

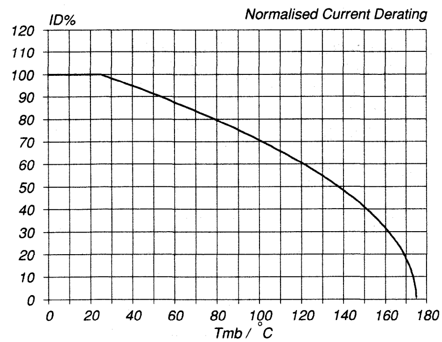


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

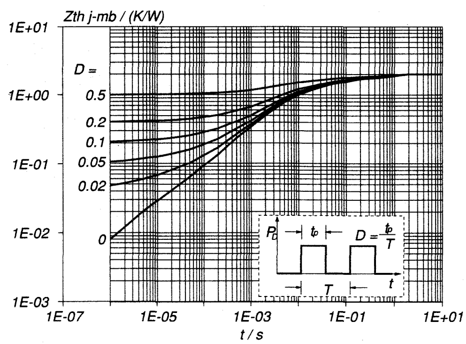


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

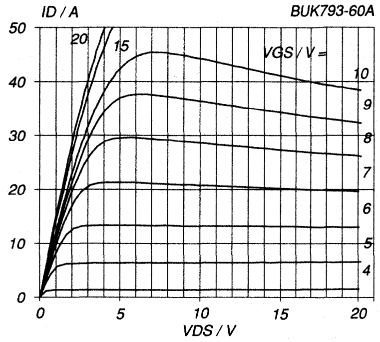


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

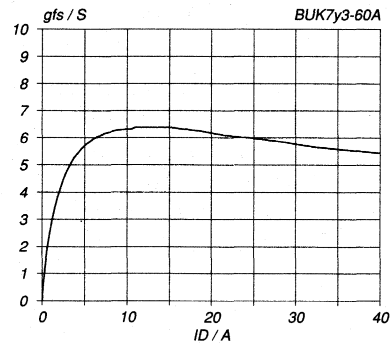


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

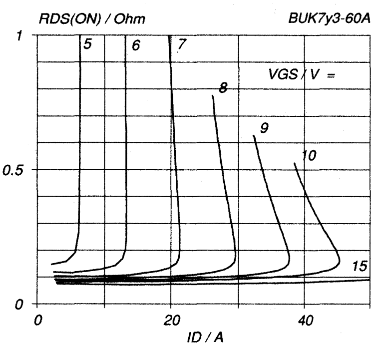


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

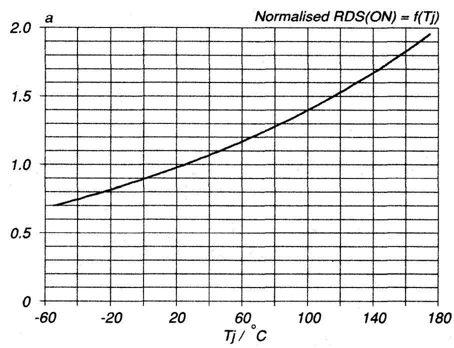


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ˚C} = f(T_j)$; I_D = 10 A; V_{GS} = 10 V

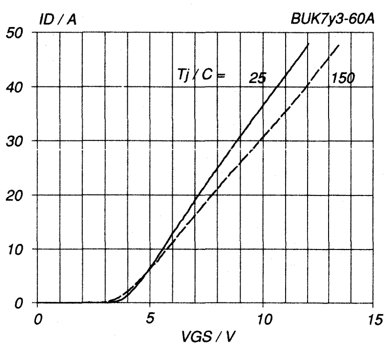


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

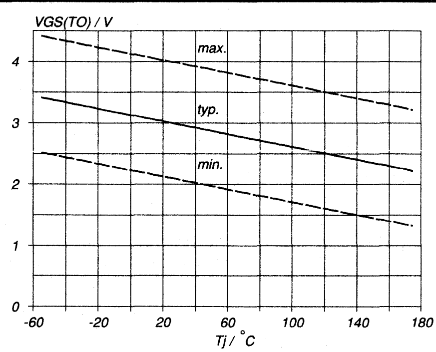


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

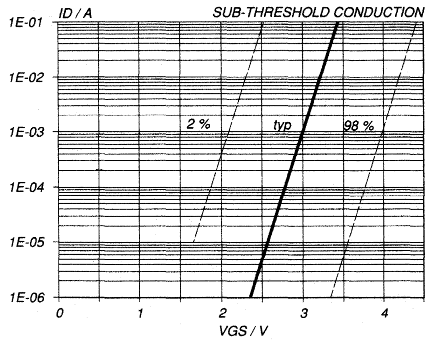


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

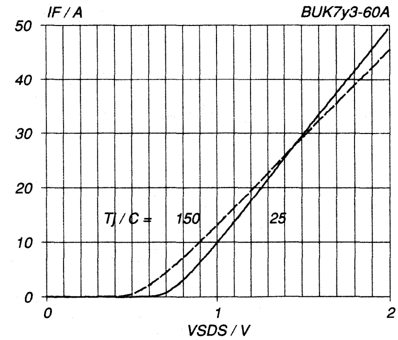


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

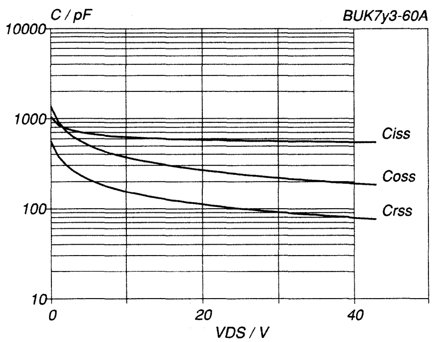


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

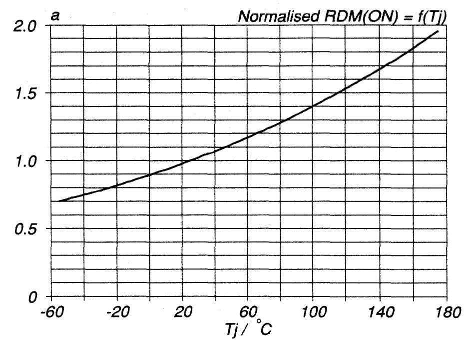


Fig.15. Normalised drain-measure resistance.
$a = R_{DM(ON)}/R_{DM(ON)25\,°C} = f(T_j)$; $I_D = 6$ mA; $V_{GS} = 10$ V

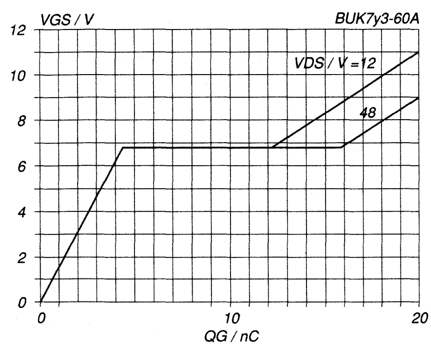


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 20$ A; parameter V_{DS}

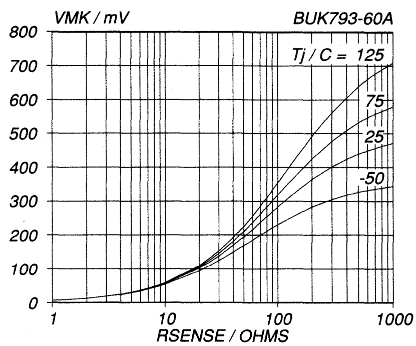


Fig.16. Typical measure voltage. parameter T_j
$V_{MK} = f$ (Rsense); conditions: $I_D = 10$ A; $V_{GS} = 10$ V

PowerMOS transistor
BUK793-60A

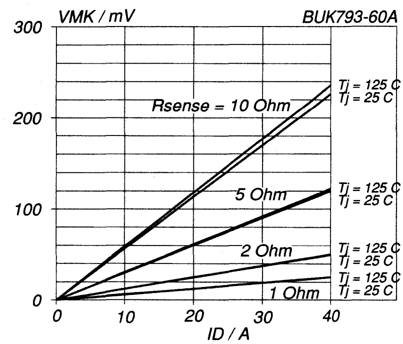


Fig.17. Typical measure voltage. $V_{MK} = f\ (I_D)$
conditions: $V_{GS} = 10$ V; parameter Rsense

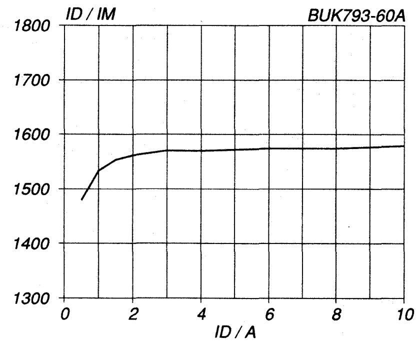


Fig.20. Typical measure ratio. $I_D/I_M = f\ (I_D)$
conditions: $V_{GS} = 10$ V; $T_j = 25$°C

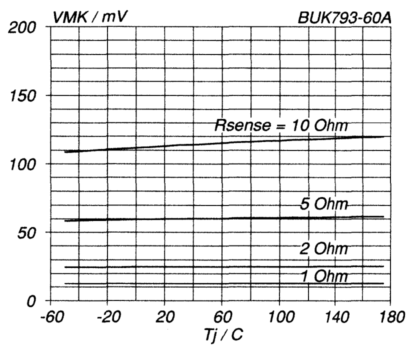


Fig.18. Typical measure voltage. $V_{MK} = f\ (T_j)$
conditions: $I_D = 20$ A; $V_{GS} = 10$ V; parameter Rsense

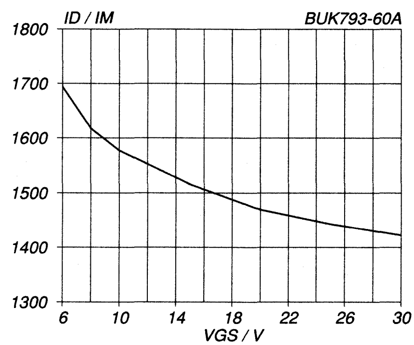


Fig.21. Typical measure ratio. $I_D/I_M = f\ (V_{GS})$
conditions: $I_D = 10$ A; $T_j = 25$°C

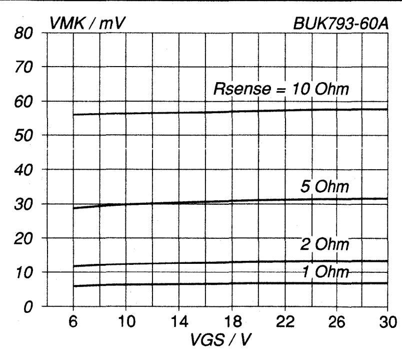


Fig.19. Typical measure voltage. $V_{MK} = f\ (V_{GS})$
conditions: $I_D = 10$ A; $T_j = 25$°C; parameter Rsense

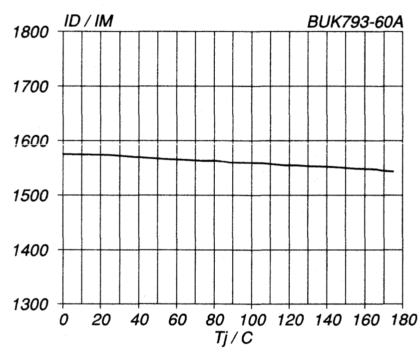


Fig.22. Typical measure ratio. $I_D/I_M = f\ (T_j)$
conditions: $I_D = 10$ A; $V_{GS} = 10$ V

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK795-60A
PowerMOS transistor SensorFET

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a 5 pin plastic envelope.
The measure pin provides on-state current measurement without extra insertion losses by means of integral current sensing cells and ancillary source kelvin pin. It is suitable for a wide variety of linear and switching applications.

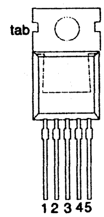
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	38	A
P_{tot}	Total power dissipation	125	W
T_j	Junction temperature	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.045	Ω
$\pm\Delta I_D/I_M$	Measure ratio tolerance	5	%

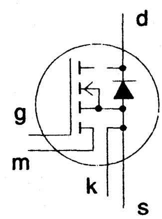
PINNING - SOT263

PIN	DESCRIPTION
1	gate
2	measure
3	drain
4	kelvin source
5	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)
V_{MK} = 0 V unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	30	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	38	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	27	A
I_{DM}	Drain current (pulse peak value)	$T_j \leq T_j$max	-	152	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125	W
T_{stg}	Storage temperature	-	- 55	175	˚C
T_j	Junction Temperature	-	-	175	˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\ j\text{-}mb}$ = 1.2 K/W $R_{th\ j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 20 A	-	0.035	0.045	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	8	14	-	S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Feedback capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	- - -	1650 560 300	2000 750 400	pF pF pF
$t_{d\ on}$ t_r $t_{d\ off}$ t_f	Turn-on delay time Turn-on rise time Turn-off delay time Turn-off fall time	V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	- - - -	25 60 125 100	40 90 160 130	ns ns ns ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

MEASURE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_M	Continuous measure current	-	-	-	20	mA
I_{MM}	Pulsed measure current	-	-	-	80	mA
$\pm V_{MK}$	Measure to kelvin voltage	V_{GS} = 0 V; V_{DS} = 0 V	-	-	30	V
$R_{DM(ON)}$	Drain-measure on-state resistance	I_D = 10 mA; V_{GM} = 10 V; I_S = 0 A	-	35	50	Ω
I_D/I_M	Drain to measure current ratio	I_D = 20 A; V_{GS} = 10 V; V_{MK} = 0 V	1560	1645	1730	-
C_{moss}	Output capacitance of measure cells	V_{MK} = 0 V; V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	21	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	38	A
I_{DRM}	Pulsed reverse drain current	-	-	-	152	A
V_{SD}	Diode forward voltage	I_F = 38 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 38 A; $-dI_F/dt$ = 100 A/µs;	-	250	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.3	-	µC

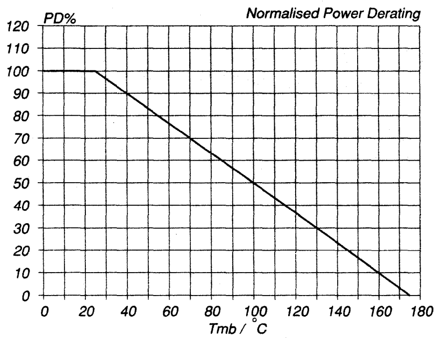


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

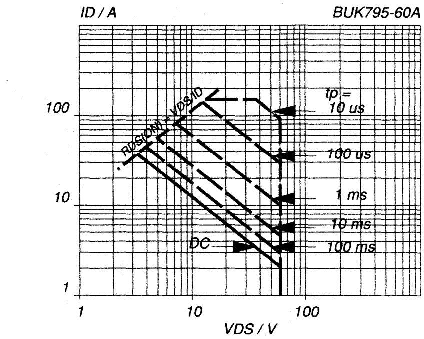


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = $f(V_{DS})$; I_{DM} single pulse; parameter t_p

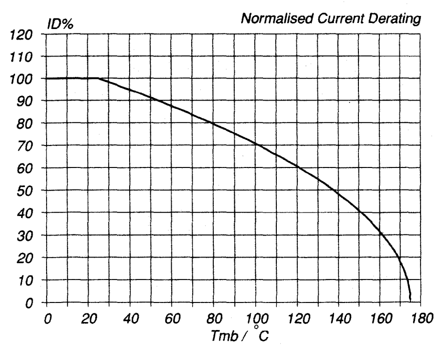


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

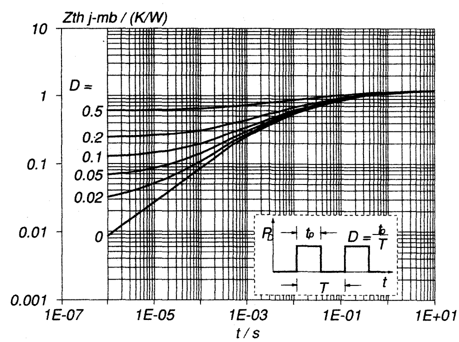


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

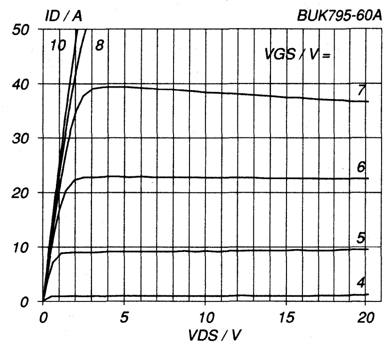


Fig.5. Typical output characteristics, $T_j = 25$ ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

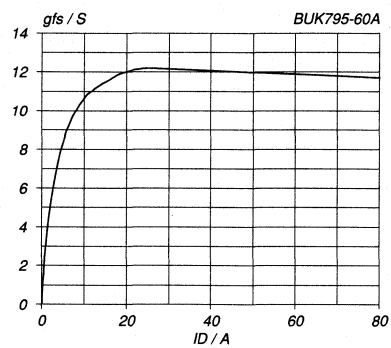


Fig.8. Typical transconductance, $T_j = 25$ ˚C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V

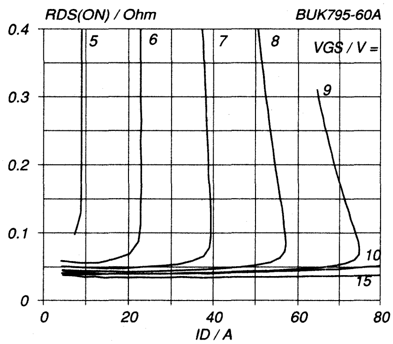


Fig.6. Typical on-state resistance, $T_j = 25$ ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

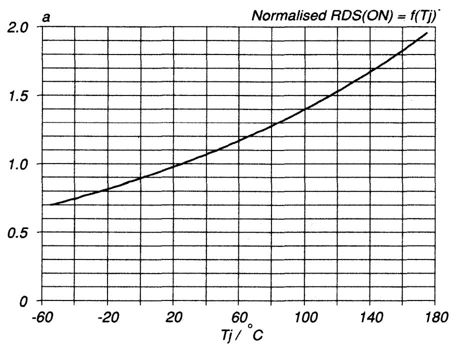


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; $I_D = 20$ A; $V_{GS} = 10$ V

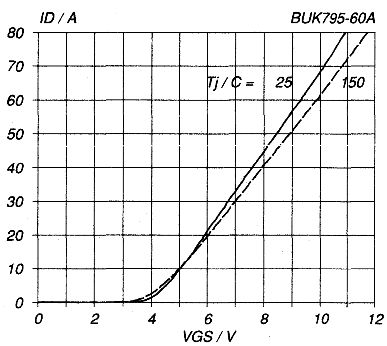


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j

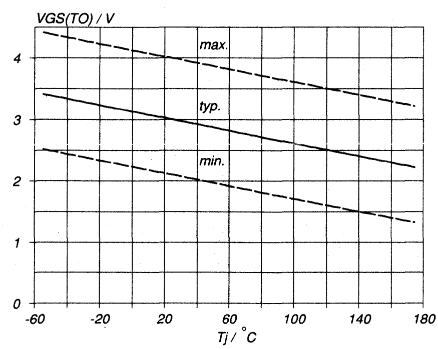


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

PowerMOS transistor

BUK795-60A

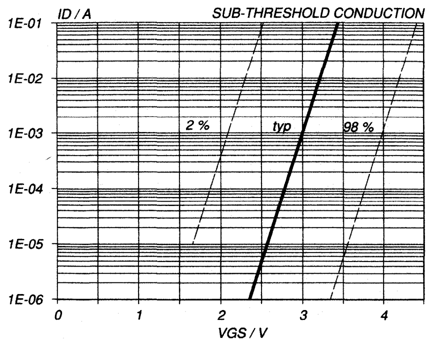


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

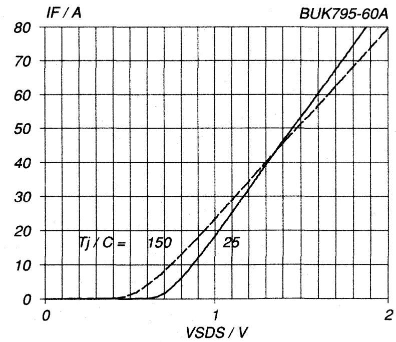


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

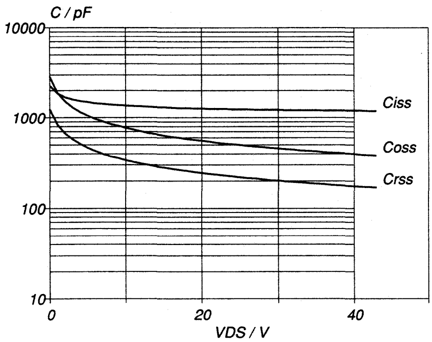


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

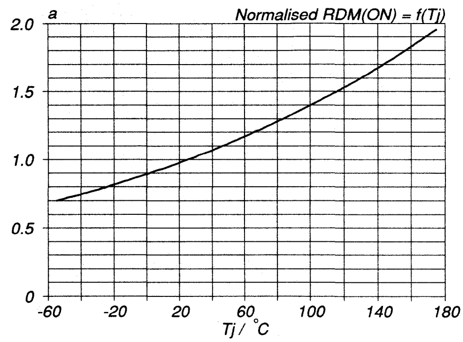


Fig.15. Normalised drain-measure resistance.
$a = R_{DM(ON)}/R_{DM(ON)25\,°C} = f(T_j)$; $I_D = 10$ mA; $V_{GS} = 10$ V

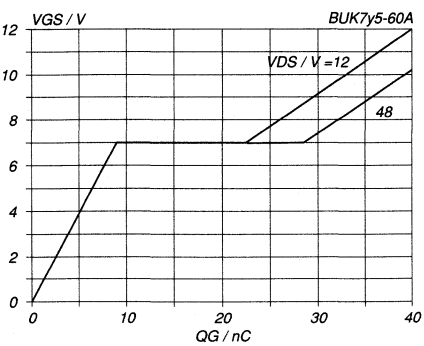


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 38$ A; parameter V_{DS}

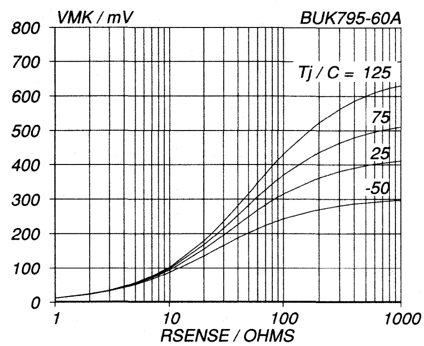


Fig.16. Typical measure voltage. $V_{MK} = f$ (Rsense)
conditions: $I_D = 20$ A; $V_{GS} = 10$ V; parameter T_j

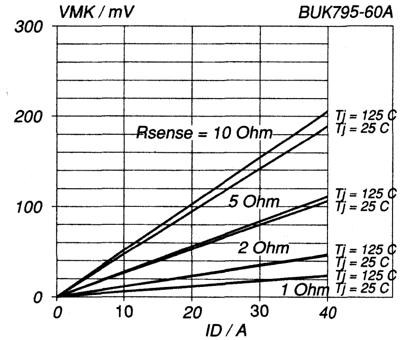


Fig.17. Typical measure voltage. $V_{MK} = f\ (I_D)$
conditions: $V_{GS} = 10$ V; parameter Rsense

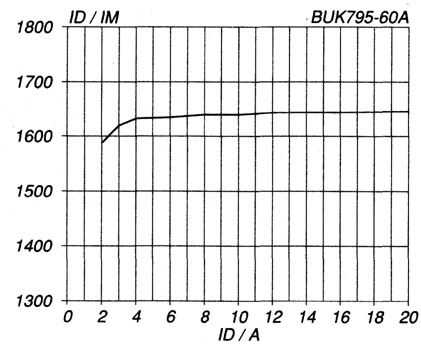


Fig.20. Typical measure ratio. $I_D/I_M = f\ (I_D)$
conditions: $V_{GS} = 10$ V; $T_j = 25\,^{\circ}C$

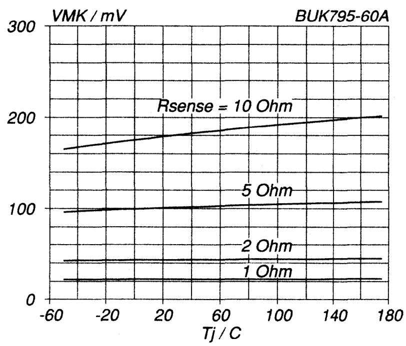


Fig.18. Typical measure voltage. $V_{MK} = f\ (T_j)$
conditions: $I_D = 40$ A; $V_{GS} = 10$ V; parameter Rsense

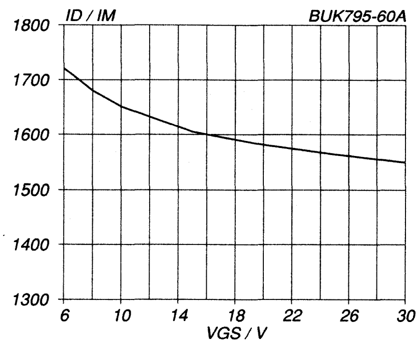


Fig.21. Typical measure ratio. $I_D/I_M = f\ (V_{GS})$
conditions: $I_D = 20$ A; $T_j = 25\,^{\circ}C$

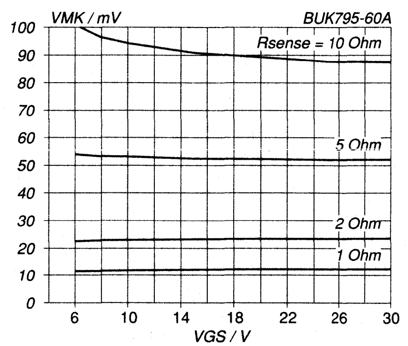


Fig.19. Typical measure voltage. $V_{MK} = f\ (V_{GS})$
conditions: $I_D = 20$ A; $T_j = 25\,^{\circ}C$; parameter Rsense

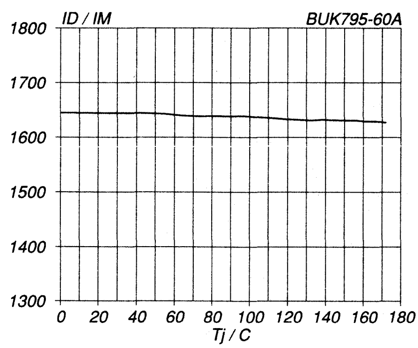


Fig.22. Typical measure ratio. $I_D/I_M = f\ (T_j)$
conditions: $I_D = 20$ A; $V_{GS} = 10$ V

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK993-60A
PowerMOS transistor
Logic Level SensorFET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a 5 pin plastic envelope.
The measure pin provides on-state current measurement without extra insertion losses by means of integral current sensing cells and ancillary source kelvin pin. It is suitable for a wide variety of linear and switching applications.

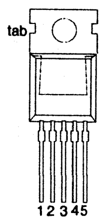
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	18	A
P_{tot}	Total power dissipation	75	W
T_j	Junction temperature	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.12	Ω
$\pm\Delta I_D/I_M$	Measure ratio tolerance	5	%

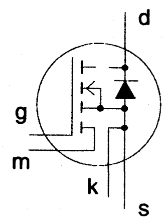
PINNING - SOT263

PIN	DESCRIPTION
1	gate
2	measure
3	drain
4	kelvin source
5	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)
V_{MK} = 0 V unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	15	V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	$t_p \leq 50$ µs	-	20	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	18	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	14	A
I_{DM}	Drain current (pulse peak value)	$T_j \leq T_j$max	-	72	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	75	W
T_{stg}	Storage temperature	-	- 55	175	˚C
T_j	Junction Temperature	-	-	175	˚C

THERMAL RESISTANCES

From junction to mounting base From junction to ambient	$R_{th\,j\text{-}mb}$ = 2 K/W $R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 10 A	-	0.08	0.12	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 10 A	7	10	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	700	825	pF
C_{oss}	Output capacitance		-	240	350	pF
C_{rss}	Feedback capacitance		-	130	160	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	20	30	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	95	120	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	80	110	ns
t_f	Turn-off fall time		-	65	85	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

MEASURE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_M	Continuous measure current	-	-	-	10	mA
I_{MM}	Pulsed measure current	-	-	-	40	mA
$\pm V_{MK}$	Measure to kelvin voltage	V_{GS} = 0 V; V_{DS} = 0 V	-	-	30	V
$R_{DM(ON)}$	Drain-measure on-state resistance	I_D = 6 mA; V_{GM} = 5 V; I_S = 0 A	-	80	120	Ω
I_D/I_M	Drain to measure current ratio	I_D = 10 A; V_{GS} = 5 V; V_{MK} = 0 V	1530	1610	1690	-
C_{moss}	Output capacitance of measure cells	V_{MK} = 0 V; V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	9	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 °C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	18	A
I_{DRM}	Pulsed reverse drain current	-	-	-	72	A
V_{SD}	Diode forward voltage	I_F = 18 A ; V_{GS} = 0 V	-	1.2	1.5	V
t_{rr}	Reverse recovery time	I_F = 18 A; $-dI_F/dt$ = 100 A/µs;	-	70	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	µC

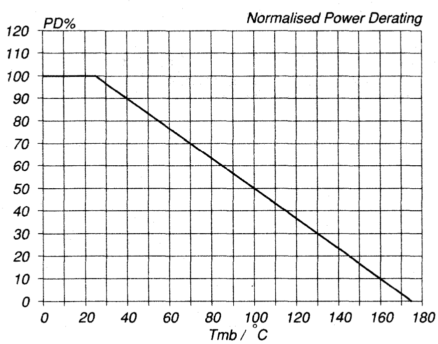


Fig.1. Normalised power dissipation. $PD\% = 100 \cdot P_D/P_{D\,25\,^\circ C} = f(T_{mb})$

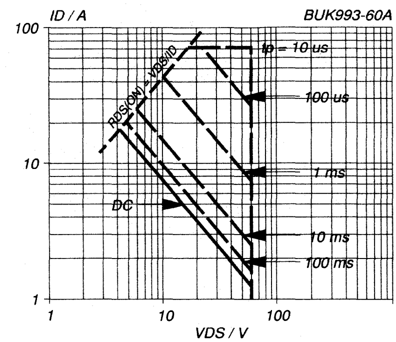


Fig.3. Safe operating area. T_{mb} = 25 °C I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

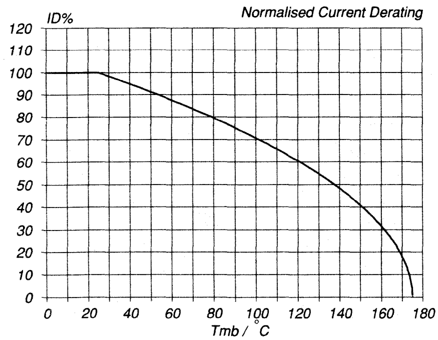


Fig.2. Normalised continuous drain current. $ID\% = 100 \cdot I_D/I_{D\,25\,^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V

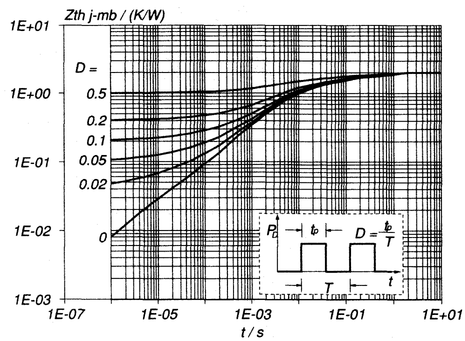


Fig.4. Transient thermal impedance. $Z_{th\,j\text{-}mb} = f(t)$; parameter $D = t_p/T$

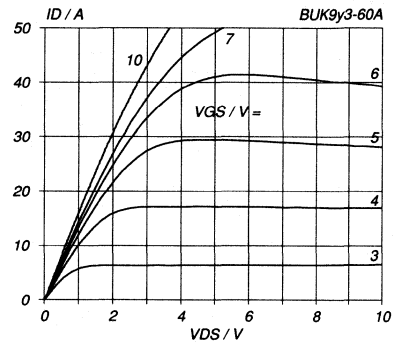


Fig.5. Typical output characteristics, T_j = 25 ˚C. $I_D = f(V_{DS})$; parameter V_{GS}

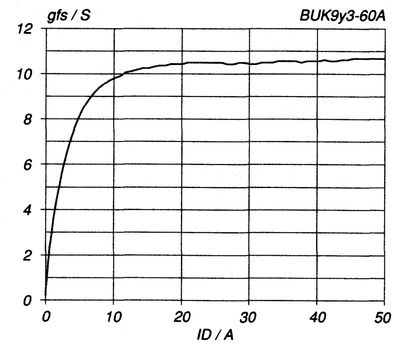


Fig.8. Typical transconductance, T_j = 25 ˚C. $g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

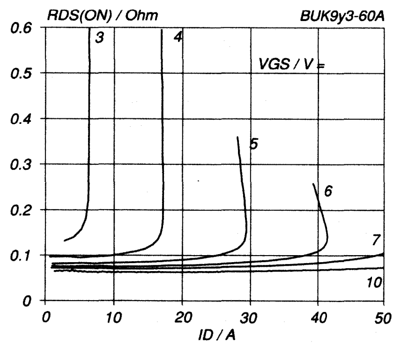


Fig.6. Typical on-state resistance, T_j = 25 ˚C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

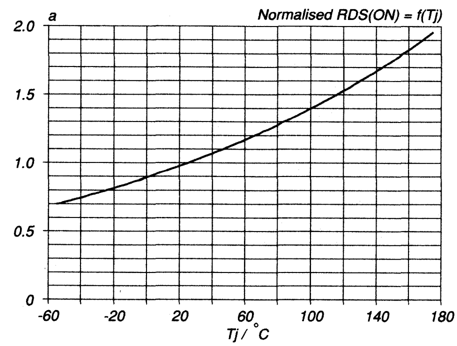


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,^\circ C} = f(T_j)$; I_D = 10 A; V_{GS} = 5 V

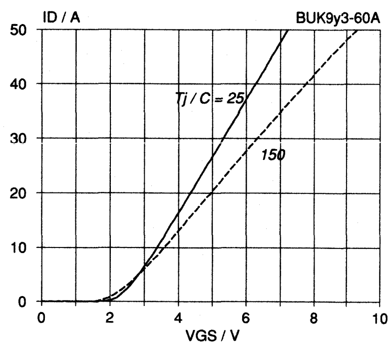


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

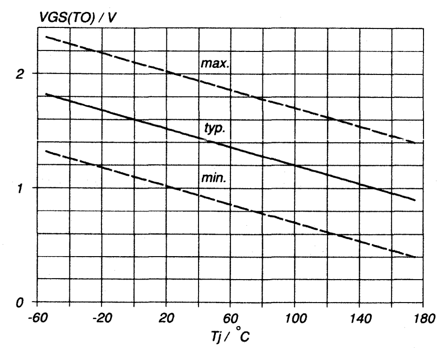


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

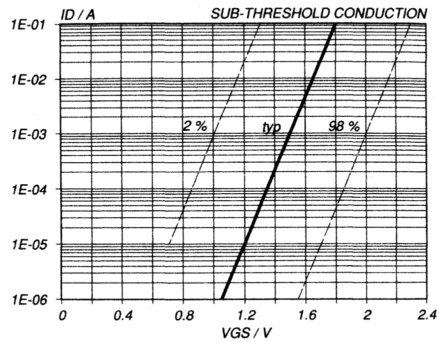


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

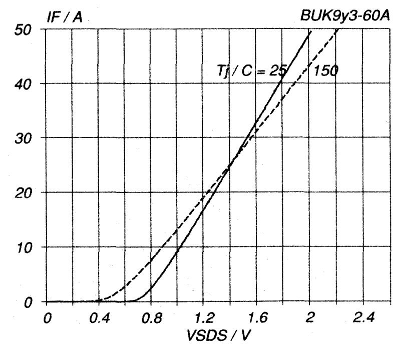


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

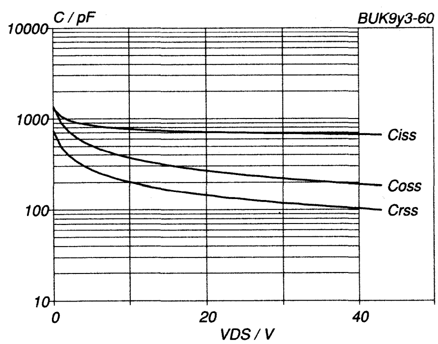


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

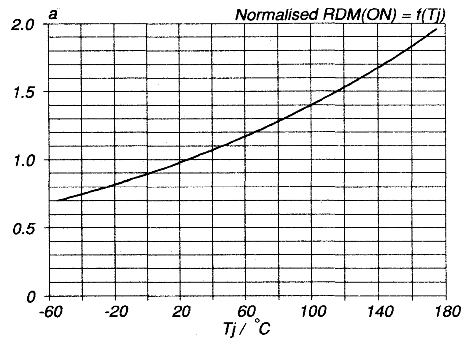


Fig.15. Normalised drain-measure resistance.
$a = R_{DM(ON)}/R_{DM(ON)25\,°C} = f(T_j)$; $I_D = 6$ mA; $V_{GS} = 5$ V

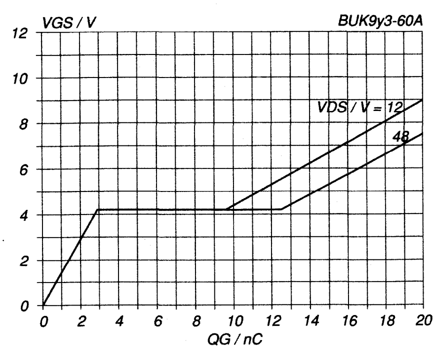


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 18$ A; parameter V_{DS}

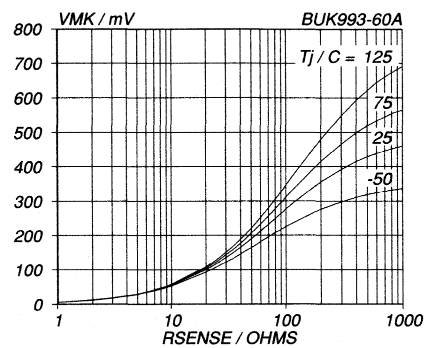


Fig.16. Typical measure voltage. parameter T_j
$V_{MK} = f$ (Rsense); conditions: $I_D = 10$ A; $V_{GS} = 5$ V

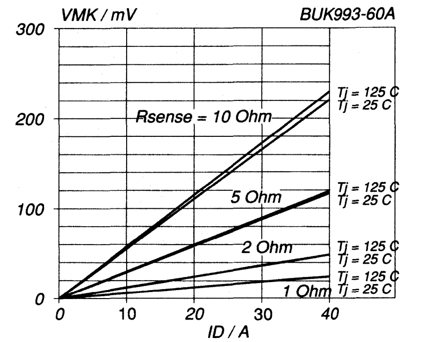


Fig.17. Typical measure voltage. $V_{MK} = f\,(I_D)$
conditions: $V_{GS} = 5$ V; parameter Rsense

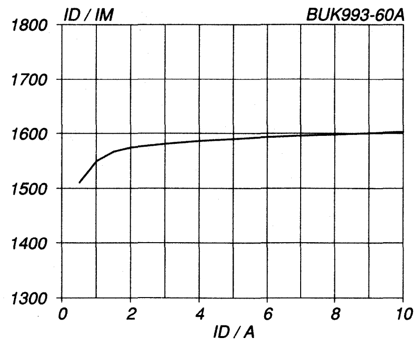


Fig.20. Typical measure ratio. $I_D/I_M = f\,(I_D)$
conditions: $V_{GS} = 5$ V; $T_j = 25$ ˚C

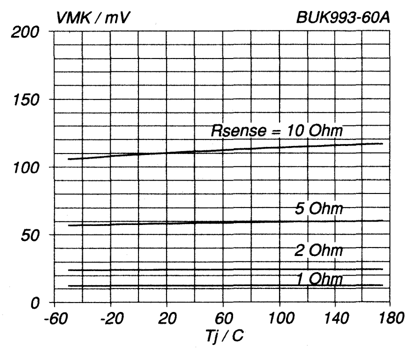


Fig.18. Typical measure voltage. $V_{MK} = f\,(T_j)$
conditions: $I_D = 20$ A; $V_{GS} = 5$ V; parameter Rsense

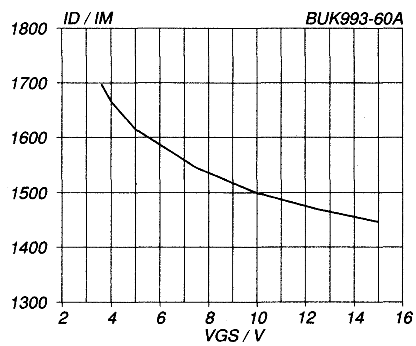


Fig.21. Typical measure ratio. $I_D/I_M = f\,(V_{GS})$
conditions: $I_D = 10$ A; $T_j = 25$ ˚C

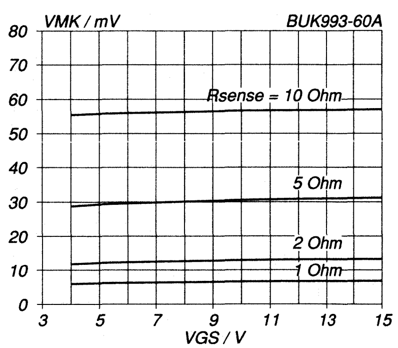


Fig.19. Typical measure voltage. $V_{MK} = f\,(V_{GS})$
conditions: $I_D = 10$ A; $T_j = 25$ ˚C; parameter Rsense

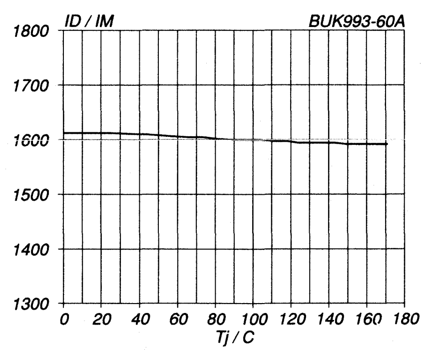


Fig.22. Typical measure ratio. $I_D/I_M = f\,(T_j)$
$I_D = 10$ A; $V_{GS} = 5$ V

Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK995-60A
PowerMOS transistor Logic Level SensorFET

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a 5 pin plastic envelope.
The measure pin provides on-state current measurement without extra insertion losses by means of integral current sensing cells and ancillary source kelvin pin. It is suitable for a wide variety of linear and switching applications.

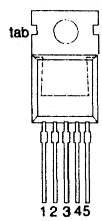
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	60	V
I_D	Drain current (DC)	34	A
P_{tot}	Total power dissipation	125	W
T_j	Junction temperature	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.055	Ω
$\pm\Delta I_D/I_M$	Measure ratio tolerance	5	%

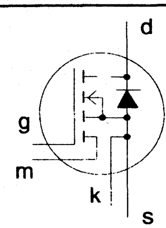
PINNING - SOT263

PIN	DESCRIPTION
1	gate
2	measure
3	drain
4	kelvin source
5	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)
V_{MK} = 0 V unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60	V
$\pm V_{GS}$	Gate-source voltage	-	-	15	V
$\pm V_{GSM}$	Non-repetitive gate-source voltage	tp ≤ 50 µs	-	20	V
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	34	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	25	A
I_{DM}	Drain current (pulse peak value)	$T_j \leq T_j$max	-	136	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125	W
T_{stg}	Storage temperature	-	- 55	175	˚C
T_j	Junction Temperature	-	-	175	˚C

THERMAL RESISTANCES

From junction to mounting base	$R_{th\,j\text{-}mb}$ = 1.2 K/W
From junction to ambient	$R_{th\,j\text{-}a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	1.0	1.5	2.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 5 V; I_D = 20 A	-	0.040	0.055	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	15	20	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1450	1750	pF
C_{oss}	Output capacitance		-	500	600	pF
C_{rss}	Feedback capacitance		-	220	275	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 5 V; R_{GS} = 50 Ω;	-	120	150	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	160	220	ns
t_f	Turn-off fall time		-	110	145	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

MEASURE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_M	Continuous measure current	-	-	-	20	mA
I_{MM}	Pulsed measure current	-	-	-	80	mA
$\pm V_{MK}$	Measure to kelvin voltage	V_{GS}=0 V; V_{DS}=0 V	-	-	15	V
$R_{DM(ON)}$	Drain-measure on-state resistance	I_D = 10 mA; V_{GM}=5 V; I_S = 0 A	-	40	60	Ω
I_D/I_M	Drain to measure current ratio	I_D = 20 A; V_{GS} = 5 V; V_{MK} = 0 V	1580	1665	1750	-
C_{moss}	Output capacitance of measure cells	V_{MK}=0 V; V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	21	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C and V_{MK} = 0 V unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	34	A
I_{DRM}	Pulsed reverse drain current	-	-	-	136	A
V_{SD}	Diode forward voltage	I_F = 34 A ; V_{GS} = 0 V	-	1.0	2.0	V
t_{rr}	Reverse recovery time	I_F = 34 A; -dI_F/dt = 100 A/µs;	-	80	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.3	-	µC

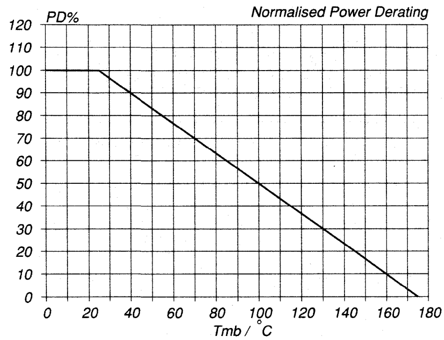


Fig.1. Normalised power dissipation.
PD% = 100·P_D/$P_{D\ 25\ ˚C}$ = f(T_{mb})

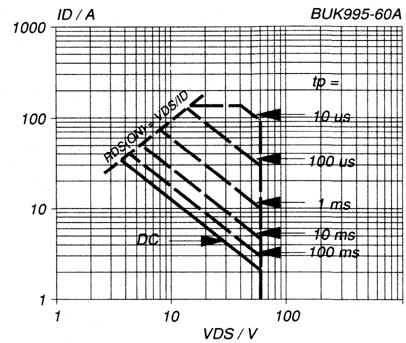


Fig.3. Safe operating area. T_{mb} = 25 ˚C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

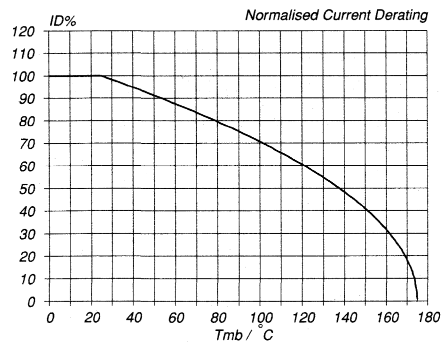


Fig.2. Normalised continuous drain current.
ID% = 100·I_D/$I_{D\ 25\ ˚C}$ = f(T_{mb}); conditions: V_{GS} ≥ 5 V

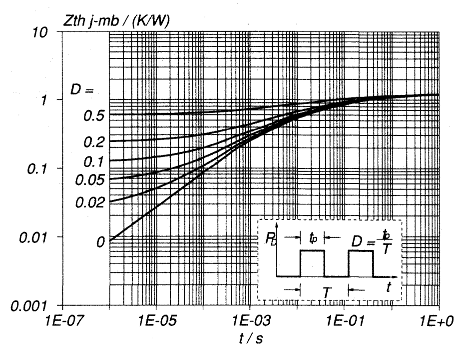


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}mb}$ = f(t); parameter D = t_p/T

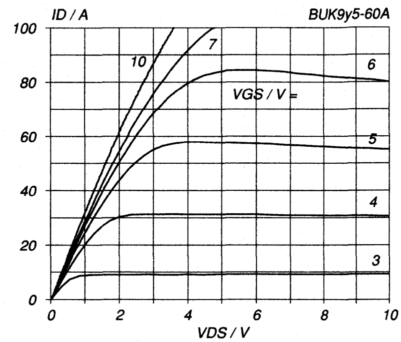


Fig.5. Typical output characteristics, T_j = 25 ˚C.
$I_D = f(V_{DS})$; parameter V_{GS}

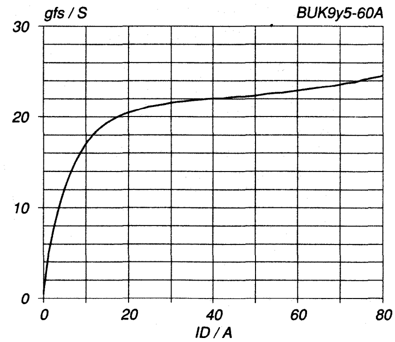


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

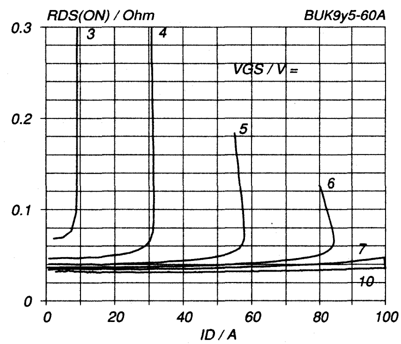


Fig.6. Typical on-state resistance, T_j = 25 ˚C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

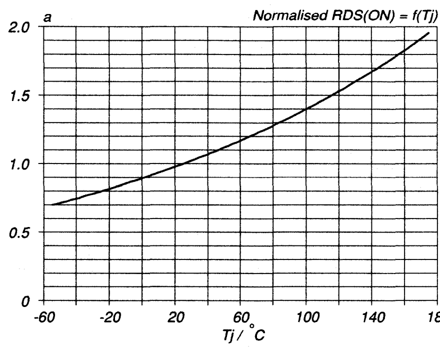


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\ ^\circ C} = f(T_j)$; I_D = 20 A; V_{GS} = 5 V

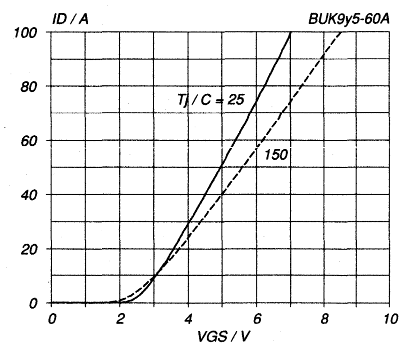


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

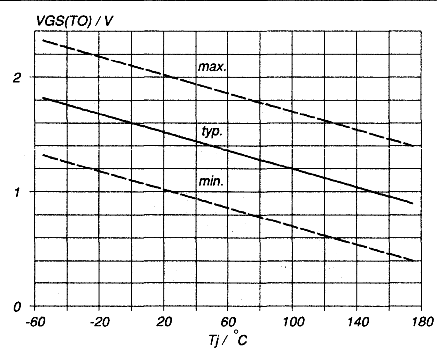


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

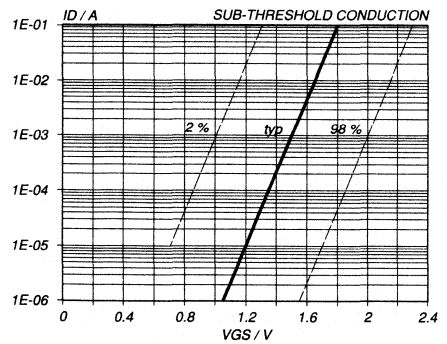


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

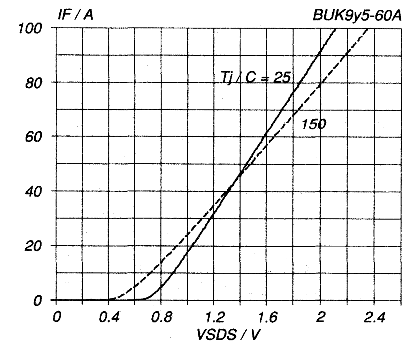


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

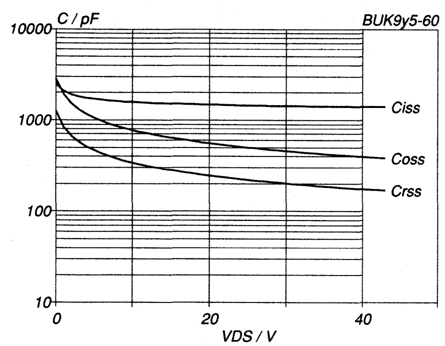


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; f = 1 MHz

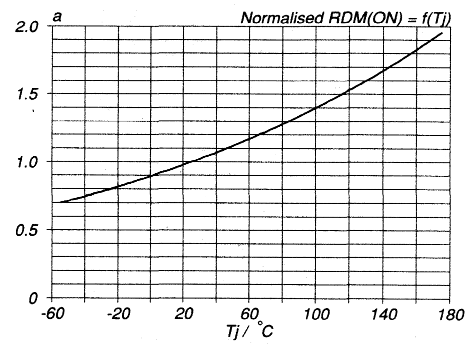


Fig.15. Normalised drain-measure resistance.
$a = R_{DM(ON)}/R_{DM(ON)25\,°C} = f(T_j)$; $I_D = 10$ mA; $V_{GS} = 5$ V

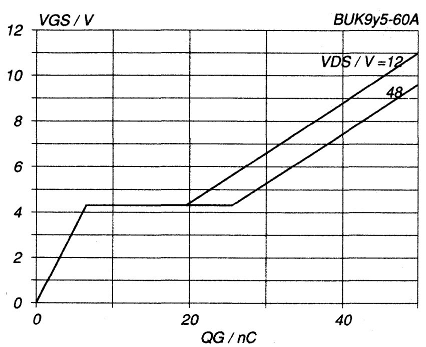


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 35$ A; parameter V_{DS}

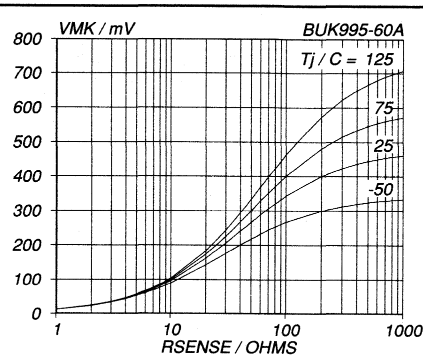


Fig.16. Typical measure voltage. parameter T_j
$V_{MK} = f$ (Rsense); conditions: $I_D = 20$ A; $V_{GS} = 5$ V

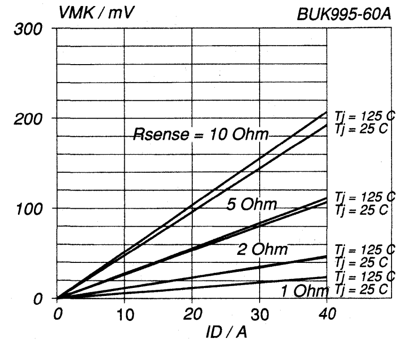


Fig.17. Typical measure voltage. $V_{MK} = f\ (I_D)$
conditions: $V_{GS} = 5$ V; parameter Rsense

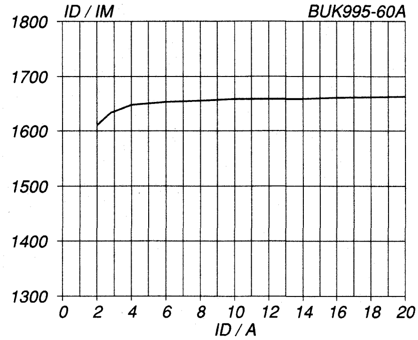


Fig.20. Typical measure ratio. $I_D/I_M = f\ (I_D)$
conditions: $V_{GS} = 5$ V; $T_j = 25^\circ C$

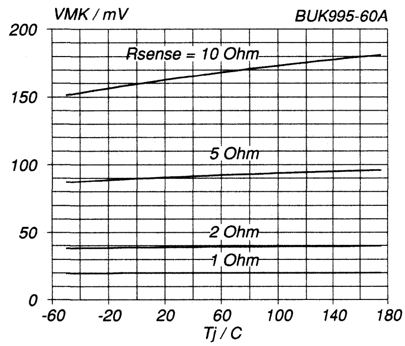


Fig.18. Typical measure voltage. $V_{MK} = f\ (T_j)$
conditions: $I_D = 40$ A; $V_{GS} = 5$ V; parameter Rsense

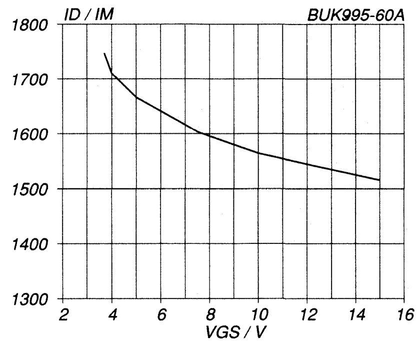


Fig.21. Typical measure ratio. $I_D/I_M = f\ (V_{GS})$
conditions: $I_D = 20$ A; $T_j = 25^\circ C$

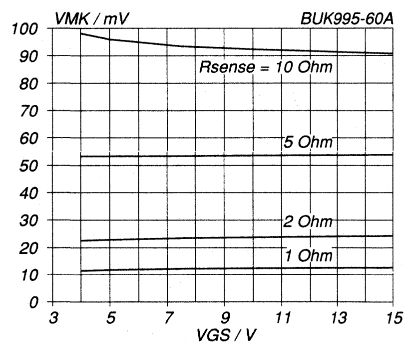


Fig.19. Typical measure voltage. $V_{MK} = f\ (V_{GS})$
conditions: $I_D = 20$ A; $T_j = 25^\circ C$; parameter Rsense

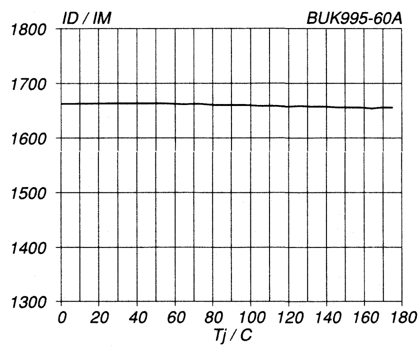


Fig.22. Typical measure ratio. $I_D/I_M = f\ (T_j)$
conditions: $I_D = 20$ A; $V_{GS} = 5$ V

Mechanical data

MECHANICAL DATA

Dimensions in mm

Net Mass: 5 g

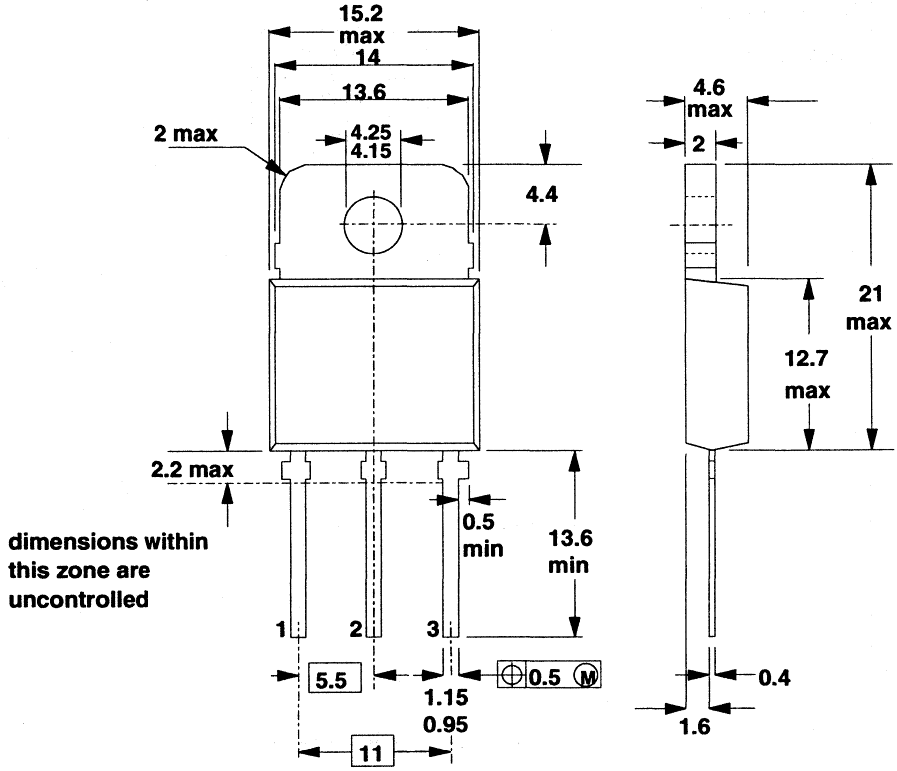


Fig.1. SOT93; pin 2 connected to mounting base.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for SOT93 envelope.

MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

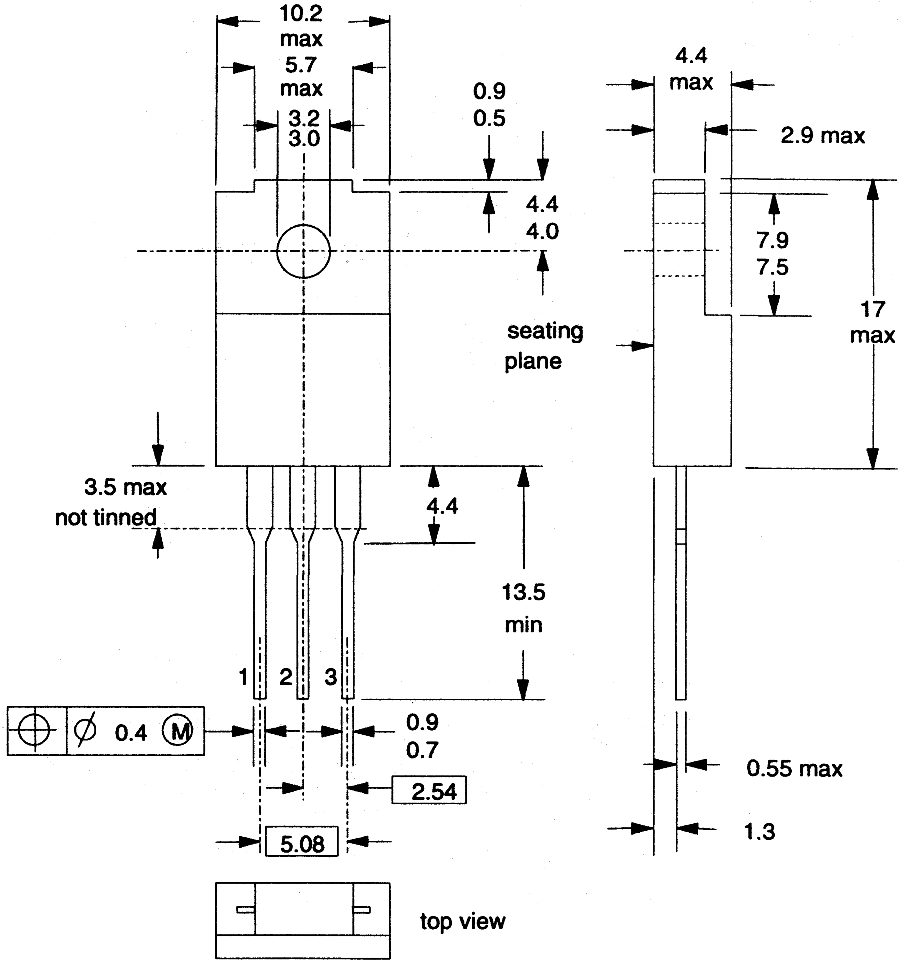


Fig.1. SOT186; The seating plane is electrically isolated from all terminals.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for F-pack envelopes.

MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

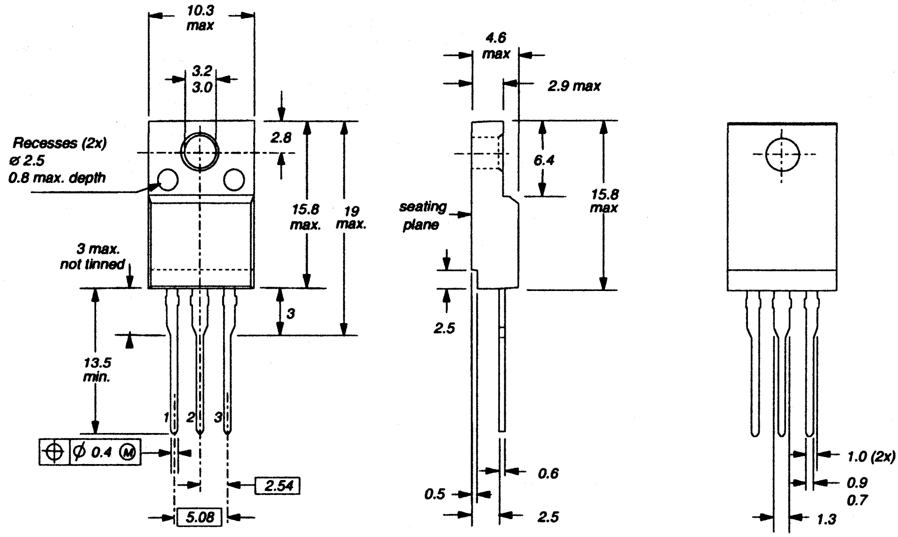


Fig.1. SOT186A; The seating plane is electrically isolated from all terminals.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for F-pack envelopes.
3. The improved isolation rating applies only to the SOT186 version A envelope.

MECHANICAL DATA

Dimensions in mm

Net Mass: 5.5 g

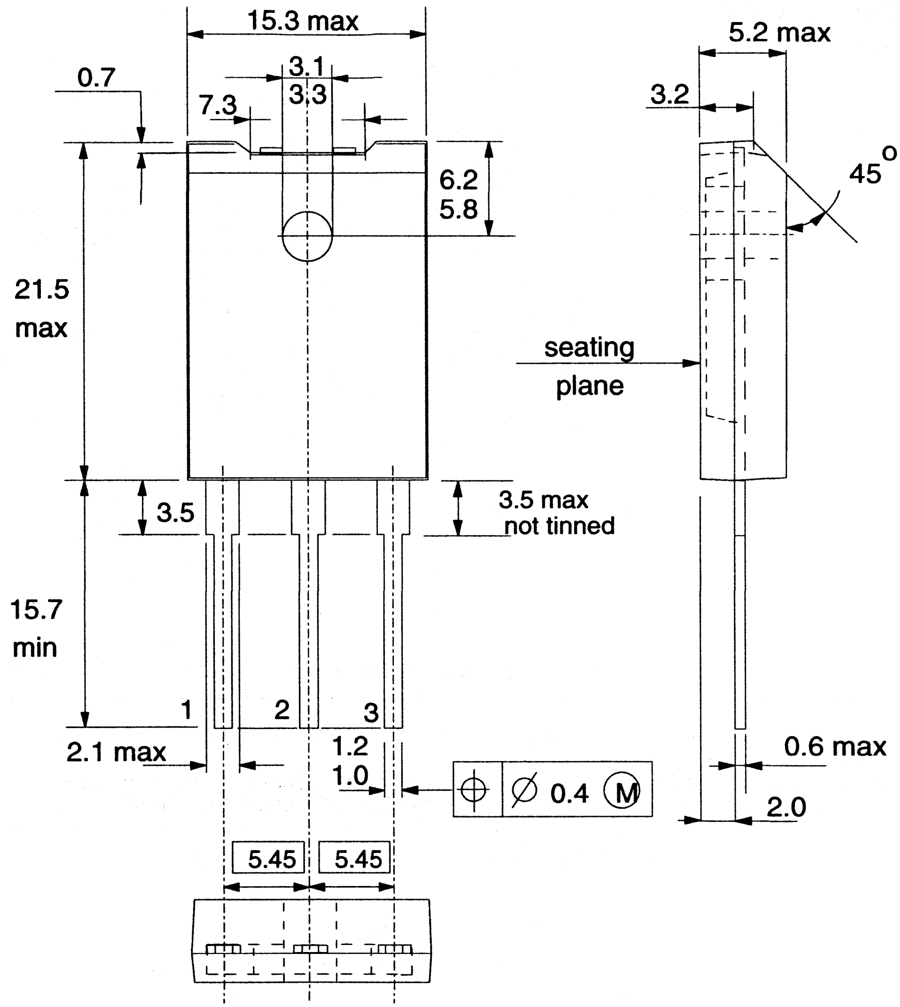


Fig.1. SOT199; The seating plane is electrically isolated from all terminals.

Notes
1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for F-pack envelopes.

MECHANICAL DATA

Dimensions in mm

Net mass: 30 g

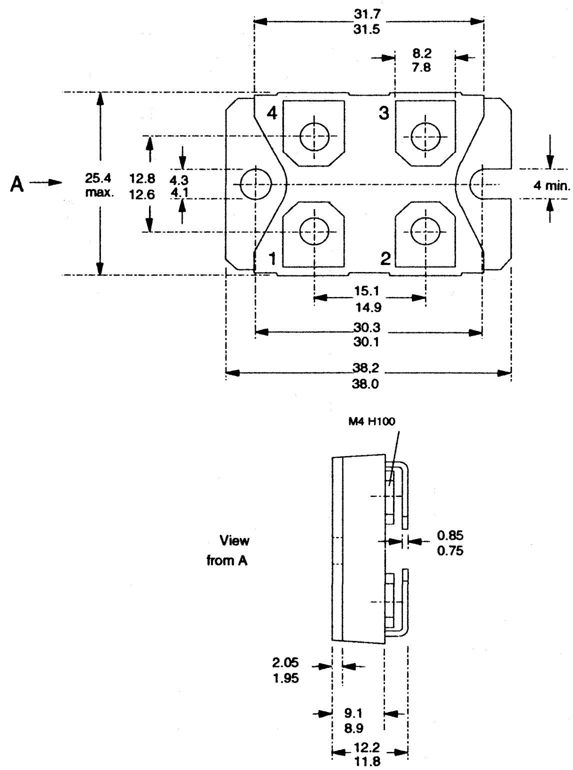


Fig.1. SOT227B; isolated mounting base.

Screw torque; Mounting and terminals	Recommended	1.3 ± 0.2 Nm
	Maximum	1.5 Nm

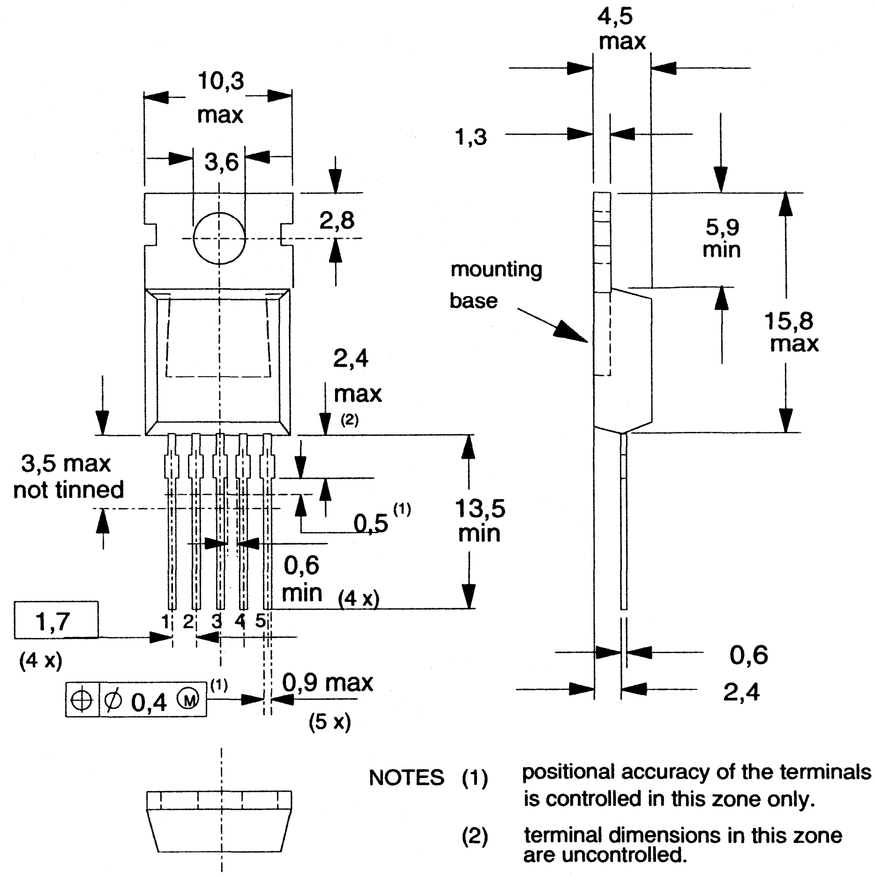
Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. M4 screws (x4) supplied.

MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g



NOTES (1) positional accuracy of the terminals is controlled in this zone only.

(2) terminal dimensions in this zone are uncontrolled.

Fig.1. SOT263 (5-pin TO220);

pin 3 connected to mounting base.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for TO220 envelopes.

MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

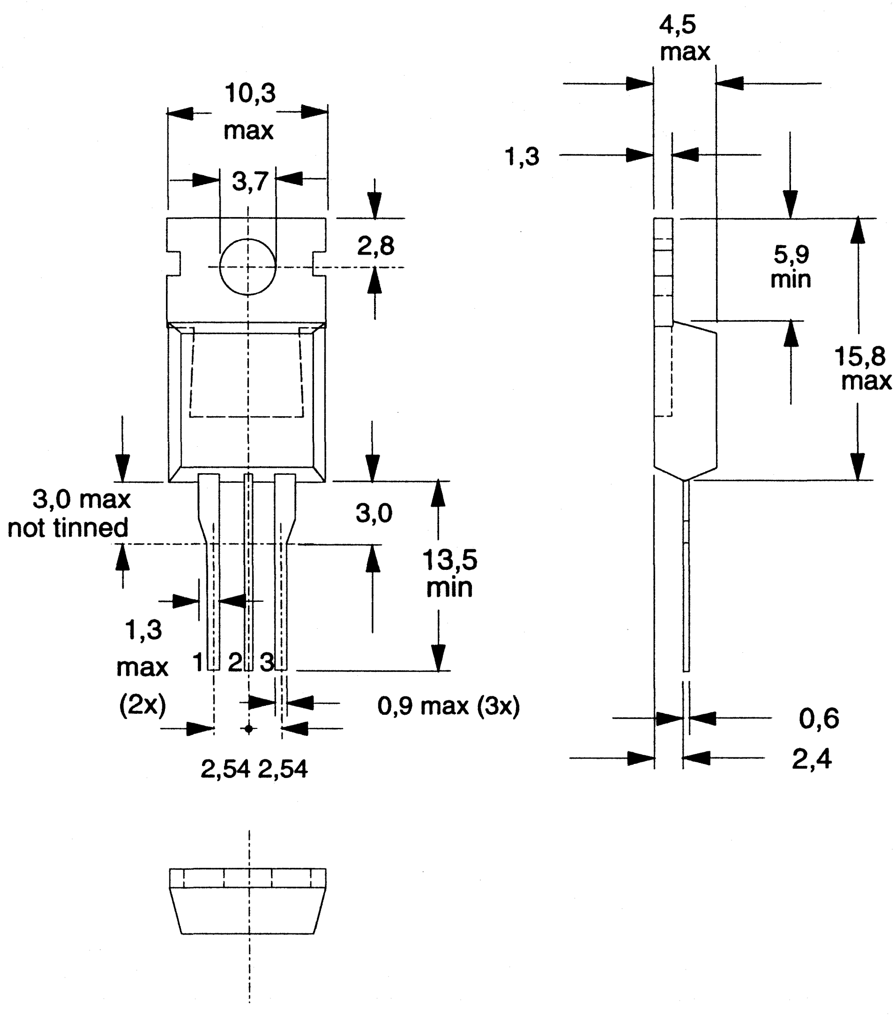


Fig.1. TO220AB; pin 2 connected to mounting base.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for TO220 envelopes.

Mounting instructions

GENERAL DATA AND INSTRUCTIONS

General rules

1. Fasten the device to the heatsink before soldering the leads.
2. Avoid stress to the leads.
3. Keep mounting tool (e.g. screwdriver) clear of the plastic body.
4. The washer may only touch the plastic part of the body; it should not exert any force on that part (screw mounting).

Mounting methods

CLIP MOUNTING

Mounting with a spring clip gives:

a) A good thermal contact under the crystal area.

b) Safe insulation for mains operation.

MOUNTING TORQUES

For M3 screw (insulated mounting):

Minimum torque for good heat transfer is 0.4 Nm.

Maximum torque to avoid damaging the device is 0.6 Nm.

For M4 screw (direct mounting only):

Minimum torque for good heat transfer is 0.4 Nm.

Maximum torque to avoid damaging the device is 1.0 Nm.

The M4 screw head should not touch the plastic part of the envelope.

RIVET MOUNTING NON-INSULATED

The device should not be pop-rivetted to the heatsink. It is permissible to press-rivet SOT93 providing that eyelet rivets of soft material are used, and the press forces are slowly and carefully controlled.

This method is NOT recommended for F packs because it will damage the plastic encapsulation.

Heatsink requirements

Flatness in the mounting area: 0.02 mm maximum per 10 mm.
Mounting holes must be deburred, for further information see clip and screw mounting instructions.

Heatsink compound

The thermal resistance from mounting base to heatsink ($R_{th\ mb-h}$) can be reduced by applying a metallic oxide compound between the contact surfaces. Values given are of thermal resistance using this type of compound. Dow Corning 340 Heat sink compound is recommended. For insulated mounting, the compound should be applied to the bottom of both device and insulator.

Mounting instructions

SOT93; SOT199

Thermal data for heatsink mounting methods (SOT93 only)

Typical figures, for exact figures see data for each device type.

$R_{th\ mb\text{-}h}$	**Thermal resistance from mounting base to heatsink**	**K/W**	
Mounting method		**clip**	**screw**
direct with heatsink compound		0.3	0.3
direct without heatsink compound		1.5	0.8
with heatsink compound and 0.05 mm maximum mica insulator		0.8	0.8
without heatsink compound and 0.05 mm maximum mica insulator		3.0	2.2

Mica washers are generally not required when mounting the SOT199 F-Pack outline.

Soldering

Recommendations for devices with a maximum junction temperature rating < 175 ˚C:

DIP OR WAVE SOLDERING

Maximum permissible solder temperature is 260 ˚C at a distance from the body of > 5 mm and for a total contact time with soldering bath or waves of < 7 s.

HAND SOLDERING

Maximum permissible temperature is 275 ˚C at a distance from the body of > 3 mm and for a total contact time with the soldering iron of < 5 s.

The body of the device must not touch anything with a temperature > 200 ˚C.

It is not permitted to solder the metal tab of the device to a heatsink, otherwise the junction temperature rating will be exceeded.

Avoid any force on body and leads during or after soldering; do not correct the position of the device or of its leads after soldering.

Lead bending

Maximum permissible tensile force on the body for 5 seconds is 20 N.

The leads can be bent, twisted or straightened. To keep forces within the above mentioned limits the leads should always be clamped rigidly near the body during bending. This is also to prevent damage to the seal of the leads within the plastic body.

Leads can be bent as near to the body as required, but adequate length should always be allowed for clamping. This is a minimum of 1.75 mm from the body to the start of a bend radius.

The internal radius of bend should never be less than the thickness of the lead. A minimum radius of at least 1.5 x lead thickness is preferred. See figure 1 Surface cracks in the dip tin coating on the lead are common when a radius less than 1.5 x lead thickness is used. Although exposing the copper material, these cracks do not affect the mechanical strength of the lead. Lead forming by Philips is available as an option on all products supplied in these outlines.

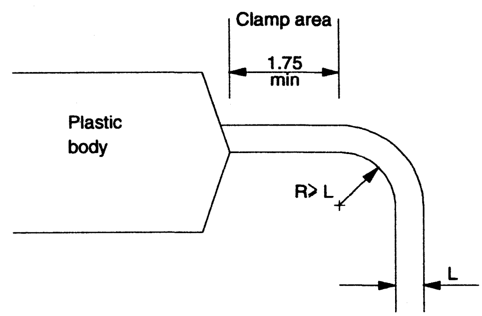
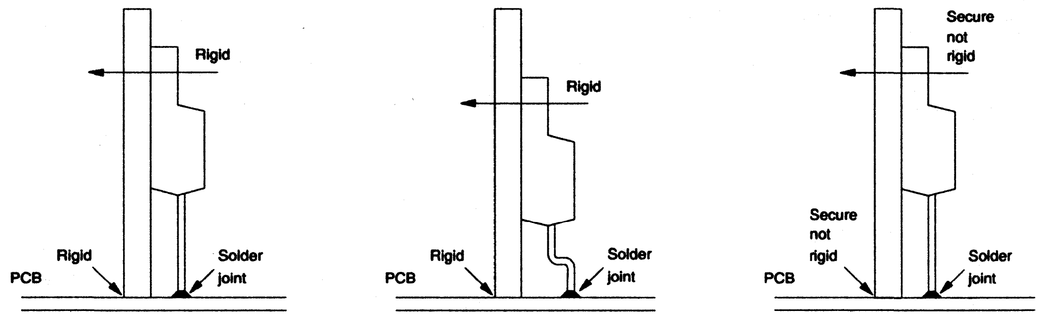


Fig 1. Minimum lead bend radius.

Mounting instructions SOT93; SOT199

Additional guidelines

It is recommended that where a device is rigidly secured to a heatsink which is in turn rigidly secured to a PCB, that a bend is put in the leads to act as an expansion loop. This will prevent differential expansion of the mounting parts transferring stress to the soldering joint, as shown in figure 2 below. This is only necessary where the device is mounted so rigidly that expansion forces are transmitted through the assembly.



(a) Incorrect (b) Correct (c) Correct

Fig 2. Printed circuit board and heatsink mounting.

INSTRUCTIONS FOR CLIP MOUNTING

Direct mounting with clip 56379

1. Place the device on the heatsink, applying heatsink compound to the mounting base.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical. See figures 3 and 4.
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. See figure 5.

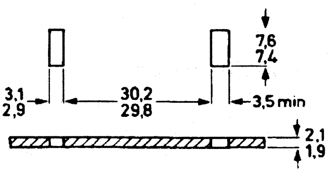


Fig 3. Heatsink requirements

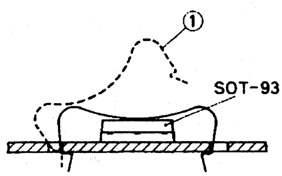


Fig 4. Mounting
(1) spring clip 56379

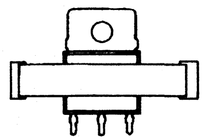


Fig 5. Position of the device.

Insulated mounting with clip 56379

With the mica 56378 insulation up to 1500 V is obtained.

1. Place the device with the insulator on the heatsink, applying heatsink compound to the bottom of both device and insulator.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical. See figures 6, 7 and 8.
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. There should be a minimum of 3 mm distance between the device and the edge of the insulator for adequate creepage distance.

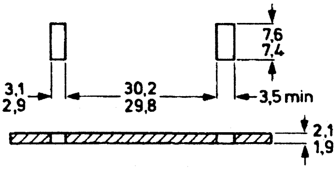


Fig 6. Heatsink requirements

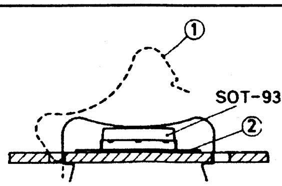


Fig 7. Mounting
(1) spring clip 56379
(2) insulator 56378

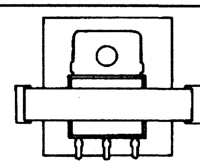


Fig 8. Position of the device.

Mounting instructions SOT93; SOT199

INSTRUCTIONS FOR SCREW MOUNTING

Direct mounting through heatsink with nut

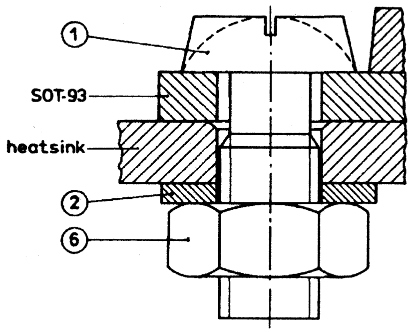


Fig 9. Assembly

(1) M4 screw
(2) plain washer
(6) M4 nut.

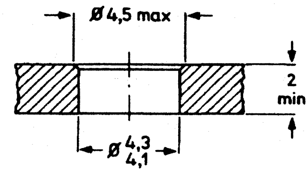


Fig 10. Heatsink requirements

When screw mounting the SOT93 envelope, it is particularly important to apply a thin, even layer of heatsink compound to the mounting base, and to apply torque to the screw slowly so that the compound has time to flow and the mounting base is not deformed. Most SOT93 envelopes contain a crystal larger than that in the other plastic envelopes, and it is more likely to crack if the mounting base is deformed.

Where vibrations are to be expected the use of a lock washer or of a curved spring washer is recommended with a plain washer between aluminium heatsink and spring washer.

Insulated screw mounting upto 800V isolation

Axial deviation requirements must be adhered.

THROUGH HEATSINK WITH NUT

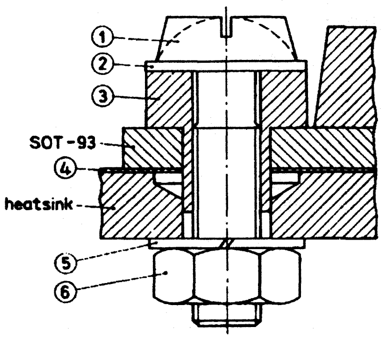


Fig 11. Assembly
(1) M3 screw
(2) plain washer
(3) insulating bush (56368b)
(4) mica insulator (56368c)
(5) lock washer
(6) M3 nut

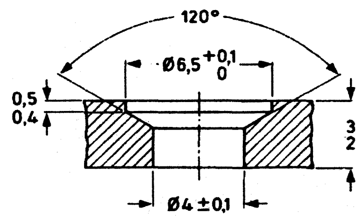


Fig 12. Heatsink requirements up to 800V.

INTO TAPPED HEATSINK

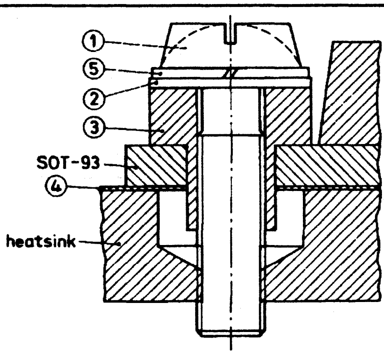


Fig 13. Assembly
(1) M3 screw
(2) plain washer
(3) insulating bush (56368b)
(4) mica insulator (56368c)
(5) lock washer

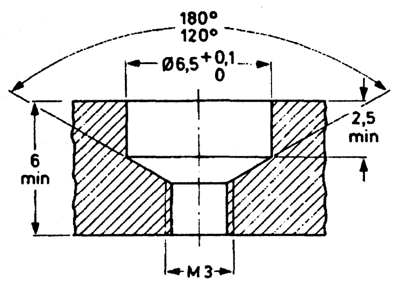


Fig 14. Heatsink requirements up to 800V

Insulated screw mounting with insert nut; up to 500V

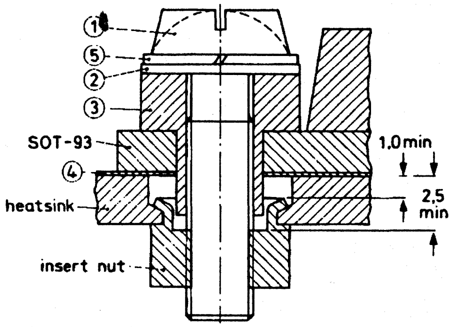


Fig 15. Assembly and heatsink requirements for 500V insulation. See also figures 9 and 10.

(1) M3 screw
(2) plain washer
(3) insulating bush (56368b)
(4) mica insulator (56368c)
(5) lock washer

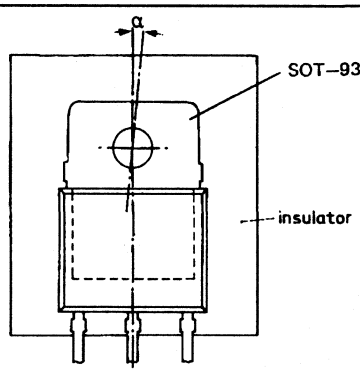


Fig 16. Mica insulator
The axial deviation (α) between package and mica should not exceed 5°

GENERAL DATA AND INSTRUCTIONS

General rules

1. Fasten the device to the heatsink before soldering the leads.
2. Avoid stress to the leads.
3. Keep mounting tool (e.g. screwdriver) clear of the plastic body.
4. The rectangular washer may only touch the plastic part of the body; it should not exert any force on that part (screw mounting).

Mounting methods

CLIP MOUNTING

Mounting with a spring clip gives:

a) A good thermal contact under the crystal area, and slightly lower thermal resistance than screw mounting.

b) Safe insulation for mains operation.

M3 SCREW MOUNTING

It is recommended that the rectangular spacing washer is inserted between screw head and mounting tab.

Do not use self-tapping screws.

Mounting torque for screw mounting:

For thread-forming screws these are final values.

Minimum torque for good heat transfer is 0.55 Nm.

Maximum torque to avoid damaging the device is 0.80 Nm.

When a nut or screw is driven directly against the tab, the torques are as follows:

Minimum torque for good heat transfer is 0.40 Nm.

Maximum torque to avoid damaging the device is 0.60 Nm.

RIVET MOUNTING NON-INSULATED.

The device should not be pop-rivetted to the heatsink. It is permissible to press-rivet the metal tab providing that eyelet rivets of soft material are used, and the press forces are slowly and carefully controlled.

This method is not permitted for full-pack envelopes because it will damage the plastic encapsulation.

Heatsink requirements

Flatness in the mounting area: 0.02 mm maximum per 10 mm.
Mounting holes must be deburred, for further information see clip and screw mounting instructions.

Heatsink compound

The thermal resistance from mounting base to heatsink ($R_{th\ mb-h}$) can be reduced by applying a metallic oxide compound between the contact surfaces. Values given are of thermal resistance using this type of compound. Dow Corning 340 Heat sink compound is recommended. For insulated mounting, the compound should be applied to the bottom of both device and insulator.

Mounting instructions

SOT186; SOT186A; SOT226; SOT263; SOT281; TO220AB

Thermal data for heatsink mounting methods (TO220 only)

Typical figures, for exact figures see data for each device type.

$R_{th\ mb\text{-}h}$	Thermal resistance from mounting base to heatsink	K/W	
Mounting method		**clip**	**screw**
direct with heatsink compound		0.3	0.5
direct without heatsink compound		1.4	1.4
with heatsink compound and 0.1 mm maximum mica insulator		2.2	-
with heatsink compound and 0.25 mm maximum alumina insulator		0.8	-
with heatsink compound and 0.05 mm mica insulator			
insulated up to 500 V		-	1.4
insulated up to 800 V / 1000 V		-	1.6
without heatsink compound and 0.05 mm mica insulator			
insulated up to 500 V		-	3.0
insulated up to 800 V / 1000 V		-	4.5

Additional insulators are generally not required when mounting the full-pack outlines.

Soldering

Recommendations for devices with a maximum junction temperature rating < 175 °C:

DIP OR WAVE SOLDERING.

Maximum permissible solder temperature is 260 °C at a distance from the body of > 5 mm and for a total contact time with soldering bath or waves of < 7 s.

HAND SOLDERING.

Maximum permissible temperature is 275 °C at a distance from the body of > 3 mm and for a total contact time with the soldering iron of < 5 s.

The body of the device must not touch anything with a temperature > 200 °C.

It is not permitted to solder the metal tab of the device to a heatsink, otherwise the junction temperature rating will be exceeded.

Avoid any force on body and leads during or after soldering; do not correct the position of the device or of its leads after soldering.

Lead bending

Maximum permissible tensile force on the body for 5 seconds is 20 N.

The leads can be bent, twisted or straightened. To keep forces within the above mentioned limits the leads should always be clamped rigidly near the body during bending. This is also to prevent damage to the seal of the leads within the plastic body.

Leads can be bent as near to the body as required, but adequate length should always be allowed for clamping. This is a minimum of 1.75 mm from the body to the start of a bend radius.

The internal radius of bend should never be less than the thickness of the lead. A minimum radius of at least 1.5 x lead thickness is preferred. See figure 1. Surface cracks in the dip tin coating on the lead are common when a radius less than 1.5 x lead thickness is used. Although exposing the copper material, these cracks do not affect the mechanical strength of the lead. Lead forming by Philips is available as an option on all products supplied in these outlines.

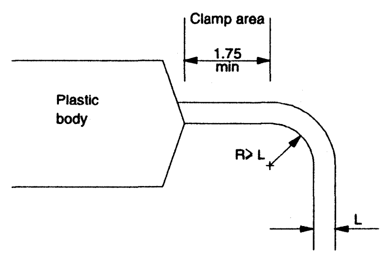


Fig 1. Minimum lead bend radius.

Additional guide-lines

It is recommended that where a device is rigidly secured to a heatsink which is in turn rigidly secured to a PCB, that a bend is put in the leads to act as an expansion loop. This will prevent differential expansion of the mounting parts transferring stress to the soldering joint, as shown in figure 2 below. This is only necessary where the device is mounted so rigidly that expansion forces are transmitted through the assembly.

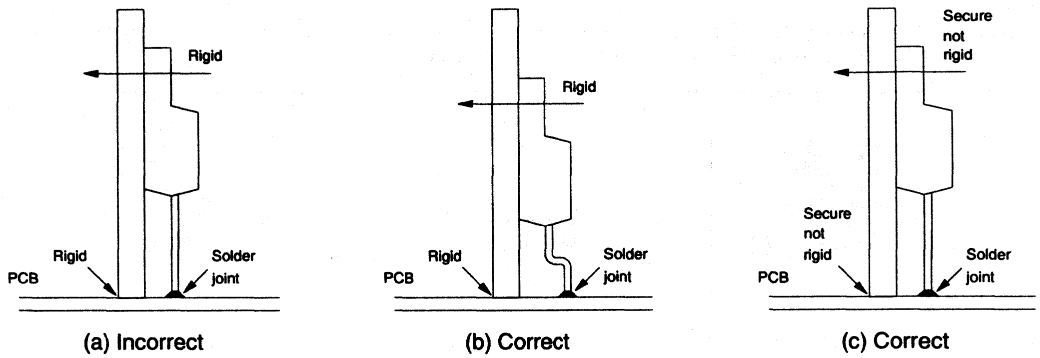


Fig 2. Printed circuit board and heatsink mounting.

INSTRUCTIONS FOR CLIP MOUNTING

Direct mounting with clip 56363

1. Apply heatsink compound to the mounting base, then place the device on the heatsink.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical. See figures 3 and 4.
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. See figure 5.

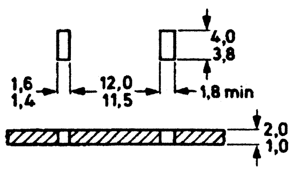


Fig 3. Heatsink requirements.

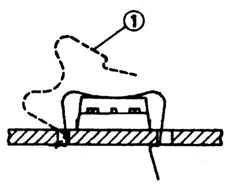


Fig 4. Mounting.
(1) spring clip 56363.

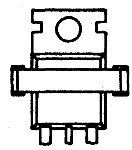


Fig 5. Position of device (top view).

Insulated mounting with clip 56364

With the insulators 56367 or 56369 insulation up to 2 kV is obtained.

1. Apply heatsink compound to the bottom of both device and insulator, then place the device with the insulator on the heatsink.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical. See figures 6, 7 and 8.
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. Ensure that the device is centred on the mica insulator to prevent unwanted movement.

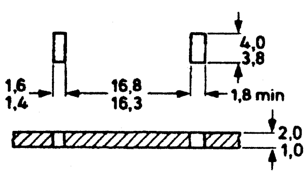


Fig 6. Heatsink requirements.

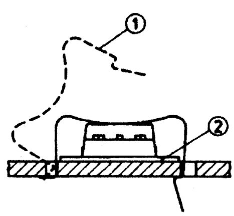


Fig 7. Mounting.
(1) spring clip 56364.
(2) insulator 56369 or 56367.

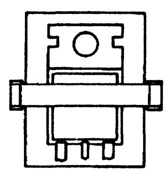


Fig 8. Position of device (top view).

INSTRUCTIONS FOR SCREW MOUNTING

Direct mounting with screw and spacing washer

THROUGH HEATSINK WITH NUT

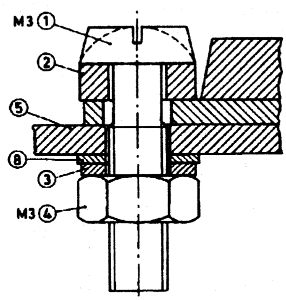


Fig 9. Assembly

(1) M3 screw
(2) rectangular washer (56360a)
(3) lock washer
(4) M3 nut
(5) heatsink
(8) plain washer

Item (2) not required for F-pack

Dimensions in mm

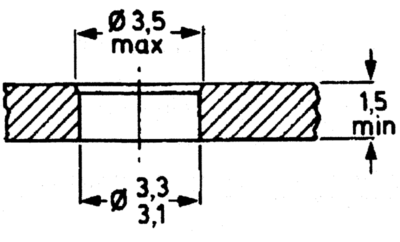


Fig 10. Heatsink requirements.

INTO TAPPED HEATSINK

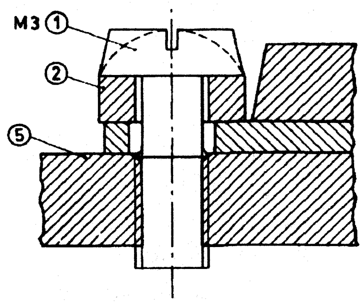


Fig 11. Assembly.

(1) M3 screw
(2) rectangular washer 56360a

(5) heatsink

Item (2) not required for F-pack

Dimensions in mm

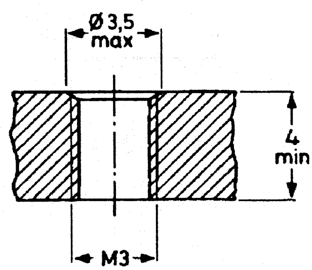


Fig 12. Heatsink requirements.

Insulated mounting with screw and spacing washer

Not recommended where mounting tab is on mains voltage. Not applicable for F-pack.

THROUGH HEATSINK WITH NUT

Known as a "bottom mounting".

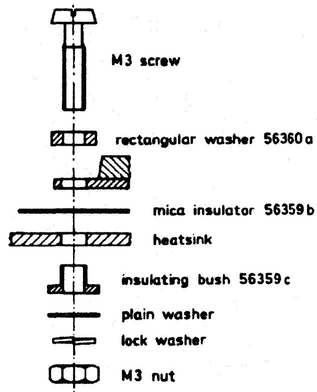


Fig 13. Insulated screw mounting with rectangular washer.

Dimensions in mm.

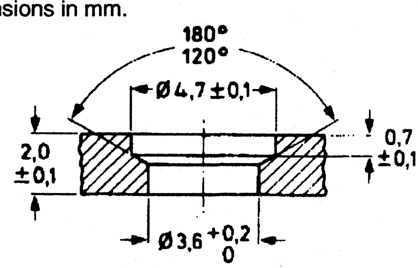


Fig 14. Heatsink requirements for 500 V insulation.

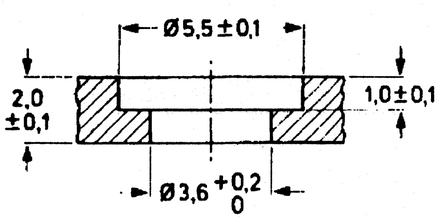


Fig 15. Heatsink requirements for 800 V insulation.

INTO TAPPED HEATSINK

Known as a "top mounting".

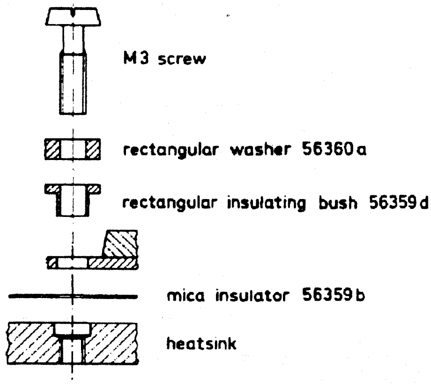


Fig 16. Insulated screw mounting with rectangular washer into tapped heatsink.

Dimensions in mm.

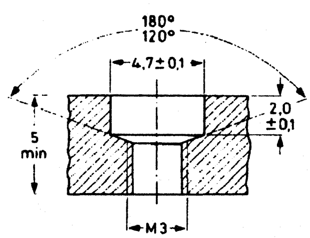


Fig 17. Heatsink requirements for 500 V insulation.

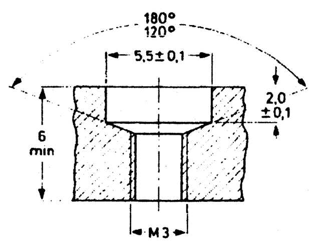


Fig 18. Heatsink requirements for 1000 V insulation.

INSTRUCTIONS FOR PCB CONNECTION

Recommended minimum copper film thickness on the PCB is 135 μm.

For high currents use of a slotted washer is recommended.

Use a torque value of 1.3 Nm for the connection.

See figures 1, 2 and 3.

Single-sided PCB

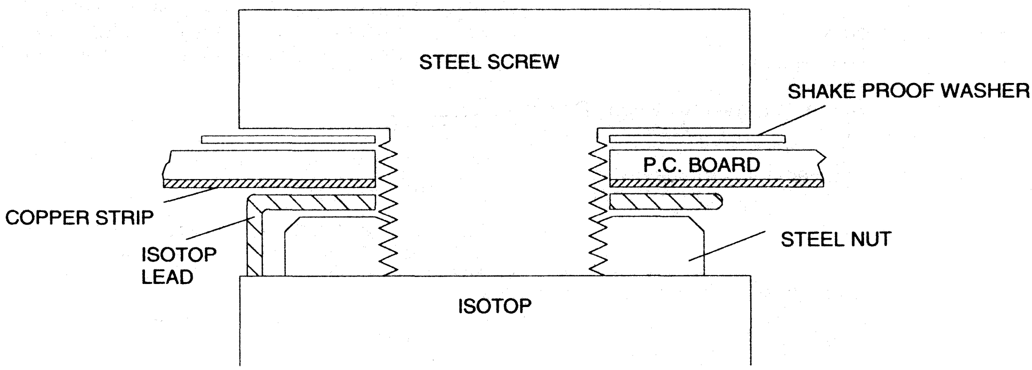


Fig 1. Suitable single-sided PCB connection of ISOTOP devices.

Double-sided PCB

Method 1

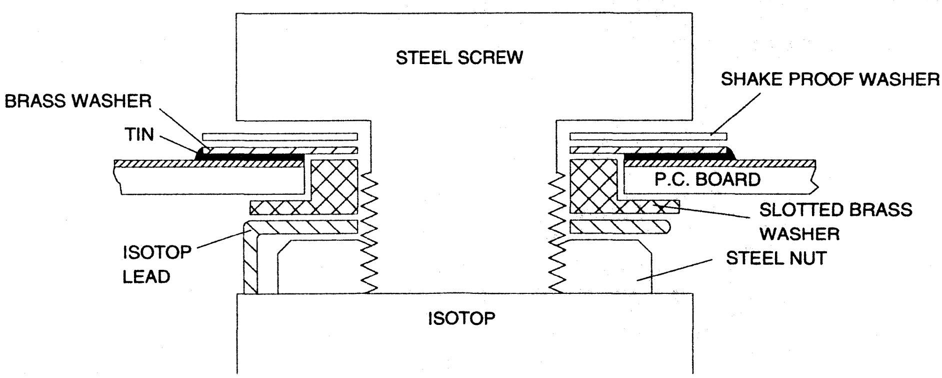


Fig 2. Suitable double-sided PCB connection of ISOTOP devices.

GENERAL DATA AND INSTRUCTIONS

General rules

1. Fasten the device to the heatsink before connecting the leads.
2. Keep mounting tool (e.g. screwdriver) clear of the plastic body.

Mounting method

M4 SCREW MOUNTING ONLY

Mounting torque for screw mounting:

For thread-forming screws this is the final value. Do not use self-tapping screws

Maximum torque to avoid damaging the device is 1.5 Nm

Connection methods

1. Push-on terminals (SOT227A).
2. Printed circuit board (SOT227B).

Isolation

The device is already fully isolated between the mounting base and all terminals.

Heatsink requirements

Flatness in the mounting area: 0.05 mm maximum per 40 mm.
Mounting holes must be deburred.

Heatsink compound

The thermal resistance from mounting base to heatsink ($R_{th\ mb\text{-}h}$) can be reduced by applying a metallic oxide compound between the contact surfaces. Dow Corning 340 Heat sink compound is recommended.

Soldering

Recommendations for devices with a maximum junction temperature rating < 175 °C:

Maximum permissible temperature is 275 °C at a distance from the body of > 3 mm and for a total contact time with the soldering iron of < 5 s.

The body of the device must not touch anything with a temperature > 200 °C.

It is not permitted to solder the metal base of the device to a heatsink, otherwise the junction temperature rating will be exceeded.

Avoid any force on body and leads during or after soldering; do not correct the position of the device or of its leads after soldering.

INSTRUCTIONS FOR PUSH-ON CONNECTION

Use push-on connector size 6.35 mm.

Method 2

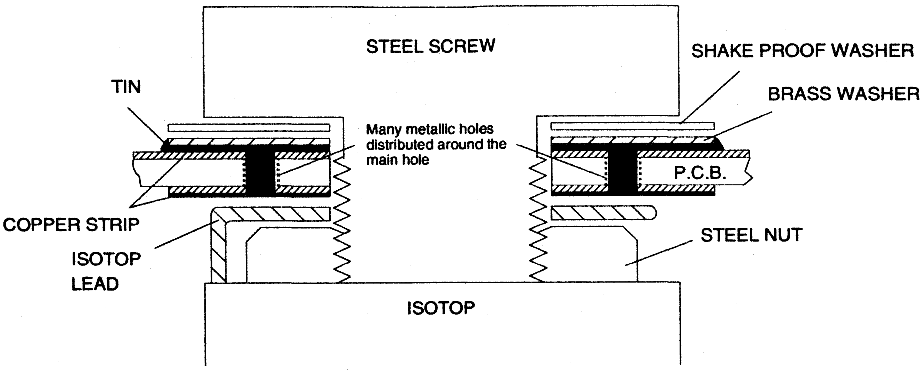


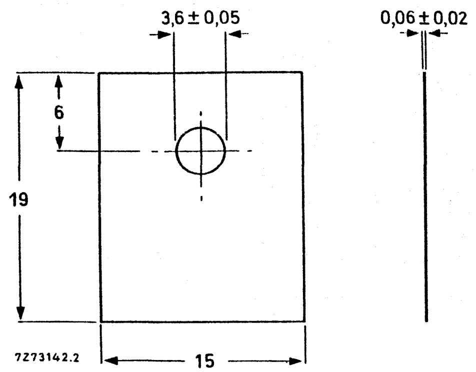
Fig 3. Suitable double-sided PCB connection of ISOTOP devices.

Accessories

SURVEY OF ACCESSORIES

TYPE NUMBER	DESCRIPTION	ENVELOPE
56359b	mica washer (up to 1000 V)	TO220
56359c	insulating bush (up to 800 V)	TO220
56359d	rectangular insulating bush (up to 1000 V)	TO220
56360a	rectangular washer	TO220
56363	spring clip (direct mounting)	TO220, SOT186
56364	spring clip (insulated mounting)	TO220
56367	alumina insulator (up to 2000 V)	TO220
56368b	insulating bush (up to 800 V)	SOT93
56368c	mica insulator (up to 800 V)	SOT93
56369	mica insulator (up to 2000 V)	TO220
56378	mica insulator (up to 1500 V)	SOT93
56379	spring clip	SOT93

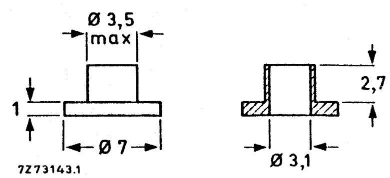
ACCESSORIES FOR TO220



Dimensions in mm.

Part no. 56359b, insulator up to 1000 V.

Fig.1 Mica washer.



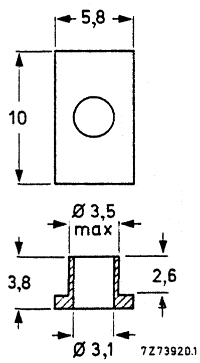
Dimensions in mm.

Part no. 56359c, insulator up to 800 V.

Material: polyester.

Maximum permissible temperature (T_{max}) = 150 °C.

Fig.2 Insulating bush.

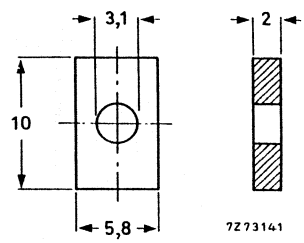


Dimensions in mm.

Part no. 56359d, insulator up to 1000 V.

Maximum permissible temperature (T_{max}) = 150 °C.

Fig.3 Rectangular insulating bush.

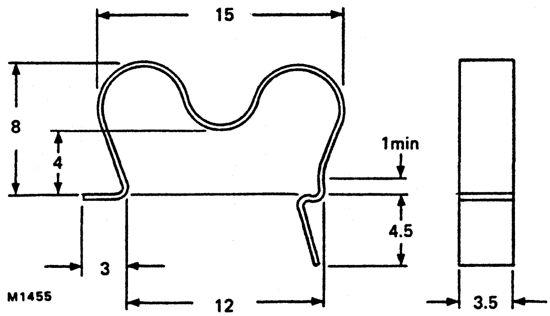


Dimensions in mm.

Part no. 56360a, for direct and insulated mounting.

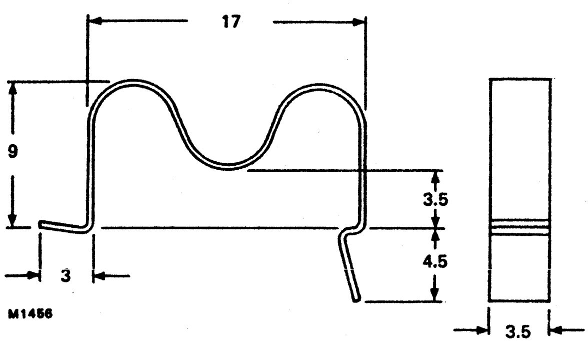
Material: brass; nickel plated.

Fig.4 Rectangular washer.



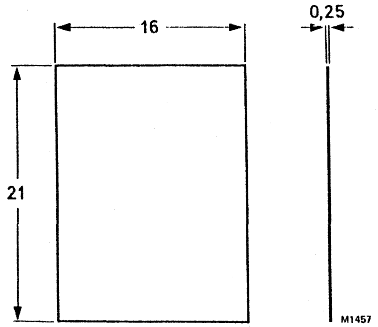
Dimensions in mm.
Part no. 56363, for direct mounting.
Material: stainless steel; for mounting on heatsink of 1.0 to 2.0 mm.
Recommended force of clip on device is 20 N (2 kgf).

Fig.5 Spring clip.



Dimensions in mm.
Part no. 56364, for insulated mounting.
Material: stainless steel; for mounting on heatsink of 1.0 to 1.5 mm.
Recommended force of clip on device is 20 N (2 kgf).
To be used in conjunction with insulators 56367 or 56369.

Fig.6 Spring clip.



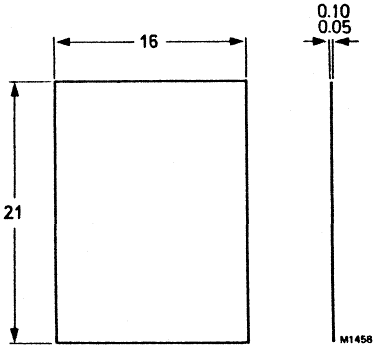
Dimensions in mm.

Part no. 56367, for insulated clip mounting up to 2 kV.

Material: 96-alumina.

Because alumina is brittle, extreme care must be taken when mounting devices not to crack the alumina, particularly when used without heatsink compound.

Fig.7 Alumina insulator.

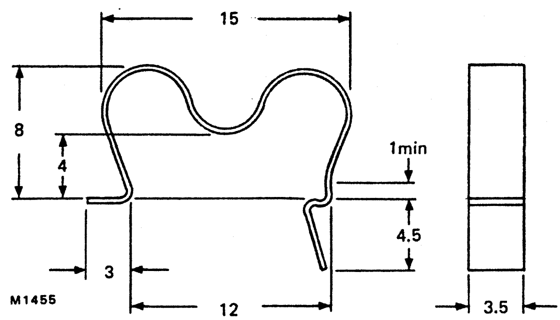


Dimensions in mm.

Part no. 56369, for insulated clip mounting up to 2 kV.

Fig.8 Mica insulator.

ACCESSORIES FOR SOT186



Dimensions in mm.

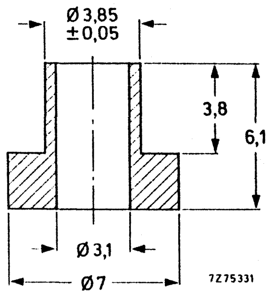
Part no. 56363, for direct mounting.

Material: stainless steel; for mounting on heatsink of 1.0 to 2.0 mm.

Recommended force of clip on device is 20 N (2 kgf).

Fig.9 Spring clip.

ACCESSORIES FOR SOT93



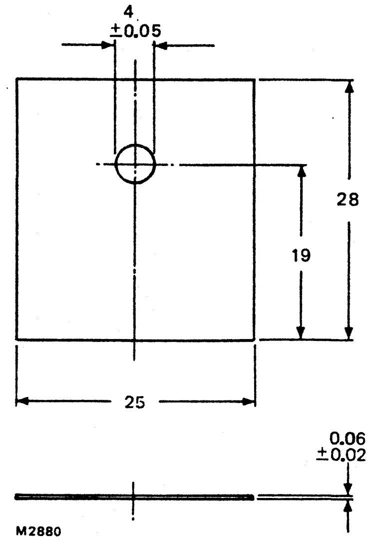
Dimensions in mm.

Part no. 56368b, for insulated screw mounting up to 800 V.

Material: polyester.

Maximum permissible temperature (T_{max}) = 150 °C.

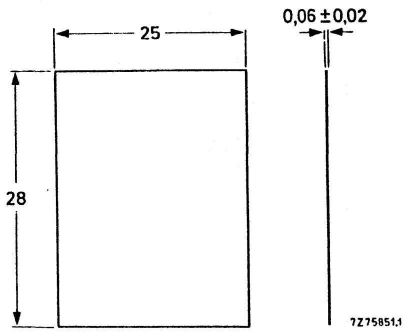
Fig.10 Insulating bush.



Dimensions in mm.

Part no. 56368c, for insulated screw mounting up to 800 V.

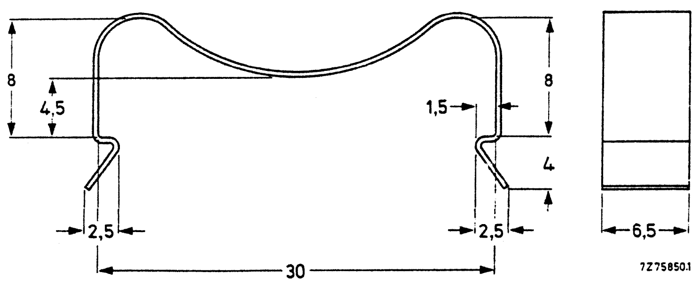
Fig.11 Mica insulator.



Dimensions in mm.

Part no. 56378, for clip mounting up to 1500 V.

Fig.12 Mica insulator.



Dimensions in mm.

Part no. 56379, for direct and insulated mounting of SOT93 envelopes.

Material: CrNi steel NLN-939; thickness 0.4 ± 0.04.

Fig.13 Spring clip.

Index

INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

Key to handbook sections

A	=	Accessories
FET	=	Field-effect transistors
I	=	Infrared devices
LED	=	Light-emitting diodes
LCD	=	Liquid crystal displays
Mm	=	Surface-mounted devices
M	=	Microwave transistors
P	=	Low-frequency power transistors and modules
PDT	=	Photodiodes or transistors
Ph	=	Photoconductive devices
PhC	=	Photocouplers
PM	=	Power MOS transistors
R	=	Rectifier diodes
RFP	=	RF power transistors and modules
RT	=	Triplers
Sen	=	Semiconductor sensors
SD	=	Small-signal diodes
Sm	=	Small-signal transistors
Sp	=	Special diodes
SP	=	Low-frequency switching power diodes
St	=	Rectifier stacks
T	=	Tuner diodes
Th	=	Thyristors
Tri	=	Triacs
TS	=	Transient suppressor diodes
Vrf	=	Voltage reference diodes
Vrg	=	Voltage regulator diodes
WBT	=	Wideband hybrid IC transistors
WBM	=	Wideband hybrid IC modules.

* series.

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BA221	SC01	SD
BA223	SC01	T
BA281	SC01	SD
BA314	SC01	Vrg
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BA317	SC01	SD
BA318	SC01	SD
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BA423L	SC01/10	T/Mm
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BA481	SC01	T
BA482	SC01	T
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BA484	SC01	T
BA682	SC01/10	T/Mm
BA683	SC01/10	T/Mm
BAS11	SC01	SD
BAS15	SC01	SD
BAS16	SC01/10	SD/Mm
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BAS20	SC01/10	SD/Mm
BAS21	SC01/10	SD/Mm
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BAS31	SC01/10	SD/Mm
BAS32	SC01/10	SD/Mm
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BAS45L	SC01/10	SD/Mm
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BB130	SC01	T
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BB204G	SC01	T
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BB215	SC01/10	SD/Mm
BB219	SC01/10	SD/Mm
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BB909A	SC01	T
BB909B	SC01	T
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BDV67C	SC05	P
BDV67D	SC05	P
BDV91	SC05	P
BDV92	SC05	P
BDV93	SC05	P
BDV94	SC05	P
BDV95	SC05	P
BDV96	SC05	P
BDX35	SC05	P
BDX36	SC05	P
BDX37	SC05	P
BDX42	SC05	P
BDX43	SC05	P
BDX44	SC05	P
BDX45	SC05	P
BDX46	SC05	P
BDX47	SC05	P
BDX62	SC05	P
BDX62A	SC05	P
BDX62B	SC05	P
BDX62C	SC05	P
BDX63	SC05	P
BDX63A	SC05	P
BDX63B	SC05	P
BDX63C	SC05	P
BDX64	SC05	P
BDX64A	SC05	P
BDX64B	SC05	P
BDX64C	SC05	P
BDX65	SC05	P
BDX65A	SC05	P
BDX65B	SC05	P
BDX65C	SC05	P
BDX66	SC05	P
BDX66A	SC05	P
BDX66B	SC05	P

TYPE NUMBER	BOOK	SECTION
BDX66C	SC05	P
BDX67	SC05	P
BDX67A	SC05	P
BDX67B	SC05	P
BDX67C	SC05	P
BDX68	SC05	P
BDX68A	SC05	P
BDX68B	SC05	P
BDX68C	SC05	P
BDX69	SC05	P
BDX69A	SC05	P
BDX69B	SC05	P
BDX69C	SC05	P
BDX77	SC05	P
BDX77F	SC05	P
BDX78	SC05	P
BDX78F	SC05	P
BDX91	SC05	P
BDX92	SC05	P
BDX93	SC05	P
BDX94	SC05	P
BDX95	SC05	P
BDX96	SC05	P
BDY90	SC05	P
BDY91	SC05	P
BDY92	SC05	P
BF198	SC04	Sm
BF199	SC04	Sm
BF240	SC04	Sm
BF241	SC04	Sm
BF245A	SC07	FET
BF245B	SC07	FET
BF245C	SC07	FET
BF246A	SC07	FET
BF246B	SC07	FET
BF246C	SC07	FET
BF247A	SC07	FET
BF247B	SC07	FET
BF247C	SC07	FET
BF256A	SC07	FET

TYPE NUMBER	BOOK	SECTION
BF256B	SC07	FET
BF256C	SC07	FET
BF324	SC04	Sm
BF370	SC04	Sm
BF410A	SC07	FET
BF410B	SC07	FET
BF410C	SC07	FET
BF410D	SC07	FET
BF420	SC04	Sm
BF421	SC04	Sm
BF422	SC04	Sm
BF423	SC04	Sm
BF450	SC04	Sm
BF451	SC04	Sm
BF483	SC04	Sm
BF485	SC04	Sm
BF486	SC04	Sm
BF487	SC04	Sm
BF488	SC04	Sm
BF494	SC04	Sm
BF495	SC04	Sm
BF496	SC04	Sm
BF510	SC07/10	FET/Mm
BF511	SC07/10	FET/Mm
BF512	SC07/10	FET/Mm
BF513	SC07/10	FET/Mm
BF550	SC10	Mm
BF550R	SC10	Mm
BF569	SC10	Mm
BF570	SC10	Mm
BF579	SC10	Mm
BF620	SC10	Mm
BF621	SC10	Mm
BF622	SC10	Mm
BF623	SC10	Mm
BF660	SC10	Mm
BF660R	SC10	Mm
BF689K	SC14	WBT
BF720	SC10	Mm
BF721	SC10	Mm

TYPE NUMBER	BOOK	SECTION
BF722	SC10	Mm
BF723	SC10	Mm
BF747	SC14/10	WBT/Mm
BF763	SC14	WBT
BF820	SC10	Mm
BF821	SC10	Mm
BF822	SC10	Mm
BF823	SC10	Mm
BF824	SC10	Mm
BF840	SC10	Mm
BF841	SC10	Mm
BF926	SC04	Sm
BF960	SC07	FET
BF964S	SC07	FET
BF965	SC07	FET
BF966S	SC07	FET
BF970	SC04	Sm
BF970A	SC04	Sm
BF979	SC04	Sm
BF980A	SC07	FET
BF981	SC07	FET
BF982	SC07	FET
BF988	SC07/10	FET/Mm
BF989	SC07/10	FET/Mm
BF990A	SC07/10	FET/Mm
BF990AR	SC07/10	FET/Mm
BF991	SC07/10	FET/Mm
BF992	SC07/10	FET/Mm
BF992R	SC07/10	FET/Mm
BF994S	SC07/10	FET/Mm
BF996S	SC07/10	FET/Mm
BF997	SC07/10	FET/Mm
BF998	SC07/10	FET/Mm
BF998R	SC07/10	FET/Mm
BFG16A	SC14/10	WBT/Mm
BFG17A	SC14/10	WBT/Mm
BFG23	SC14	WBT
BFG25AX	SC14/10	WBT/Mm
BFG31	SC14/10	WBT/Mm
BFG32	SC14	WBT

TYPE NUMBER	BOOK	SECTION
BFG33	SC14/10	WBT/Mm
BFG33X	SC14/10	WBT/Mm
BFG34	SC14	WBT
BFG35	SC14/10	WBT/Mm
BFG51	SC14	WBT
BFG65	SC14	WBT
BFG67	SC14/10	WBT/Mm
BFG67X	SC14/10	WBT/Mm
BFG90A	SC14	WBT
BFG91A	SC14	WBT
BFG92A	SC14/10	WBT/Mm
BFG92AX	SC14/10	WBT/Mm
BFG93A	SC14/10	WBT/Mm
BFG93AX	SC14/10	WBT/Mm
BFG94	SC14/10	WBT/Mm
BFG96	SC14	WBT
BFG97	SC14/10	WBT/Mm
BFG135	SC14/10	WBT/Mm
BFG195	SC14	WBT
BFG197	SC14/10	WBT/Mm
BFG197X	SC14/10	WBT/Mm
BFG198	SC14/10	WBT/Mm
BFP90A	SC14	WBT
BFP91A	SC14	WBT
BFP96	SC14	WBT
BFQ10	SC07	FET
BFQ11	SC07	FET
BFQ12	SC07	FET
BFQ13	SC07	FET
BFQ14	SC07	FET
BFQ15	SC07	FET
BFQ16	SC07	FET
BFQ17	SC14/10	WBT/Mm
BFQ18A	SC14/10	WBT/Mm
BFQ19	SC14/10	WBT/Mm
BFQ22S	SC14	WBT
BFQ23	SC14	WBT
BFQ23C	SC14	WBT
BFQ24	SC14	WBT
BFQ32	SC14	WBT

TYPE NUMBER	BOOK	SECTION
BFQ32C	SC14	WBT
BFQ32M	SC14	WBT
BFQ32S	SC14	WBT
BFQ33	SC14	WBT
BFQ33C	SC14	WBT
BFQ34	SC14	WBT
BFQ34T	SC14	WBT
BFQ42	SC08a	RFP
BFQ43	SC08a	RFP
BFQ43S	SC08a	RFP
BFQ51	SC14	WBT
BFQ51C	SC14	WBT
BFQ52	SC14	WBT
BFQ53	SC14	WBT
BFQ63	SC14	WBT
BFQ65	SC14	WBT
BFQ66	SC14	WBT
BFQ67	SC14/10	WBT/Mm
BFQ68	SC14	WBT
BFQ135	SC14	WBT
BFQ136	SC14	WBT
BFQ149	SC14/10	WBT/Mm
BFQ161	SC14	WBT
BFQ162	SC14	WBT
BFQ163	SC14	WBT
BFQ231	SC14	WBT
BFQ231A	SC14	WBT
BFQ232	SC14	WBT
BFQ232A	SC14	WBT
BFQ233	SC14	WBT
BFQ233A	SC14	WBT
BFQ234	SC14	WBT
BFQ235	SC14	WBT
BFQ235A	SC14	WBT
BFQ251	SC14	WBT
BFQ251A	SC14	WBT
BFQ252	SC14	WBT
BFQ252A	SC14	WBT
BFQ253	SC14	WBT
BFQ253A	SC14	WBT

TYPE NUMBER	BOOK	SECTION
BFQ254	SC14	WBT
BFQ255	SC14	WBT
BFQ255A	SC14	WBT
BFQ262	SC14	WBT
BFQ262A	SC14	WBT
BFQ263	SC14	WBT
BFQ263A	SC14	WBT
BFQ265	SC14	WBT
BFQ265A	SC14	WBT
BFQ268	SC14	WBT
BFQ270	SC14	WBT
BFR29	SC07	FET
BFR30	SC07/10	FET/Mm
BFR31	SC07/10	FET/Mm
BFR49	SC14	WBT
BFR53	SC14/10	WBT/Mm
BFR54	SC04	Sm
BFR64	SC14	WBT
BFR65	SC14	WBT
BFR84	SC07	FET
BFR90	SC14	WBT
BFR90A	SC14	WBT
BFR91	SC14	WBT
BFR91A	SC14	WBT
BFR92	SC14/10	WBT/Mm
BFR92A	SC14/10	WBT/Mm
BFR93	SC14/10	WBT/Mm
BFR93A	SC14/10	WBT/Mm
BFR94	SC14	WBT
BFR95	SC14	WBT
BFR96	SC14	WBT
BFR96S	SC14	WBT
BFR106	SC14/10	WBT/Mm
BFR101A	SC07/10	FET/Mm
BFR101B	SC07/10	FET/Mm
BFR134	SC14	WBT
BFR200	SC07/10	FET/Mm
BFS17	SC14/10	WBT
BFS17A	SC14	WBT
BFS18	SC10	Mm

TYPE NUMBER	BOOK	SECTION
BFS18R	SC10	Mm
BFS19	SC10	Mm
BFS19R	SC10	Mm
BFS20	SC10	Mm
BFS20R	SC10	Mm
BFS21	SC07	FET
BFS21A	SC07	FET
BFS22A	SC08a	RFP
BFS23A	SC08a	RFP
BFT24	SC14	WBT
BFT25	SC14/10	WBT/Mm
BFT25A	SC14	WBT
BFT44	SC04	Sm
BFT45	SC04	Sm
BFT46	SC07/10	FET/Mm
BFT92	SC14/10	WBT/Mm
BFT93	SC14/10	WBT/Mm
BFW10	SC07	FET
BFW11	SC07	FET
BFW12	SC07	FET
BFW13	SC07	FET
BFW16A	SC14	WBT
BFW17A	SC14	WBT
BFW30	SC14	WBT
BFW61	SC07	FET
BFW92	SC14	WBT
BFW92A	SC14	WBT
BFW93	SC14	WBT
BFX29	SC04	Sm
BFX30	SC04	Sm
BFX34	SC04	Sm
BFX84	SC04	Sm
BFX85	SC04	Sm
BFX87	SC04	Sm
BFX88	SC04	Sm
BFX89	SC14	WBT
BFY50	SC04	Sm
BFY51	SC04	Sm
BFY52	SC04	Sm
BFY55	SC04	Sm

TYPE NUMBER	BOOK	SECTION
BFY90	SC14	WBT
BG2000	SC01	RT
BG2097	SC01	RT
BGD102	SC14	WBM
BGD102E	SC14	WBM
BGD104	SC14	WBM
BGD104E	SC14	WBM
BGD106	SC14	WBM
BGD108	SC14	WBM
BGD502	SC14	WBM
BGD504	SC14	WBM
BGD506	SC14	WBM
BGD508	SC14	WBM
BGE85A	SC14	WBM
BGE88	SC14	WBM
BGE88-01	SC14	WBM
BGE885	SC14	WBM
BGE887	SC14	WBM
BGX885	SC14	WBM
BGY22	SC09	RFP
BGY22A	SC09	RFP
BGY23	SC09	RFP
BGY23A	SC09	RFP
BGY32	SC09	RFP
BGY33	SC09	RFP
BGY35	SC09	RFP
BGY36	SC09	RFP
BGY40A	SC09	RFP
BGY40B	SC09	RFP
BGY41A	SC09	RFP
BGY41B	SC09	RFP
BGY43	SC09	RFP
BGY45A	SC09	RFP
BGY45B	SC09	RFP
BGY45C	SC09	RFP
BGY46A	SC09	RFP
BGY46B	SC09	RFP
BGY47A	SC09	RFP
BGY47F	SC09	RFP
BGY48A	SC09	RFP

TYPE NUMBER	BOOK	SECTION
BGY48B	SC09	RFP
BGY48C	SC09	RFP
BGY49A	SC09	RFP
BGY49B	SC09	RFP
BGY50	SC14	WBM
BGY51	SC14	WBM
BGY52	SC14	WBM
BGY53	SC14	WBM
BGY54	SC14	WBM
BGY55	SC14	WBM
BGY56	SC14	WBM
BGY57	SC14	WBM
BGY58	SC14	WBM
BGY58A	SC14	WBM
BGY59	SC14	WBM
BGY60	SC14	WBM
BGY61	SC14	WBM
BGY65	SC14	WBM
BGY67	SC14	WBM
BGY67A	SC14	WBM
BGY70	SC14	WBM
BGY71	SC14	WBM
BGY74	SC14	WBM
BGY75	SC14	WBM
BGY78	SC14	WBM
BGY80	SC14	WBM
BGY81	SC14	WBM
BGY82	SC14	WBM
BGY83	SC14	WBM
BGY84	SC14	WBM
BGY84A	SC14	WBM
BGY85	SC14	WBM
BGY85A	SC14	WBM
BGY85H	SC14	WBM
BGY85H/01	SC14	WBM
BGY86	SC14	WBM
BGY87	SC14	WBM
BGY87B	SC14	WBM
BGY88	SC14	WBM
BGY90A	SC09	RFP

TYPE NUMBER	BOOK	SECTION
BGY90B	SC09	RFP
BGY91A	SC09	RFP
BGY91B	SC09	RFP
BGY93A	SC09	RFP
BGY93B	SC09	RFP
BGY93C	SC09	RFP
BGY94A	SC09	RFP
BGY94B	SC09	RFP
BGY94C	SC09	RFP
BGY95A	SC09	RFP
BGY95B	SC09	RFP
BGY96A	SC09	RFP
BGY96B	SC09	RFP
BGY110A	SC09	RFP
BGY110B	SC09	RFP
BGY580	SC14	WBM
BGY581	SC14	WBM
BGY582	SC14	WBM
BGY583	SC14	WBM
BGY584	SC14	WBM
BGY584A	SC14	WBM
BGY585	SC14	WBM
BGY585A	SC14	WBM
BGY586	SC14	WBM
BGY587	SC14	WBM
BGY587B	SC14	WBM
BGY588	SC14	WBM
BLF145	SC08b	RFP/FET
BLF147	SC08b	RFP/FET
BLF175	SC08b	RFP/FET
BLF177	SC08b	RFP/FET
BLF221	SC08b	RFP/FET
BLF225	SC08b	RFP/FET
BLF241	SC08b	RFP/FET
BLF242	SC08b	RFP/FET
BLF244	SC08b	RFP/FET
BLF245	SC08b	RFP/FET
BLF245B	SC08b	RFP/FET
BLF246	SC08b	RFP/FET
BLF246B	SC08b	RFP/FET

TYPE NUMBER	BOOK	SECTION
BLF277	SC08b	RFP/FET
BLF278	SC08b	RFP/FET
BLF346	SC08b	RFP/FET
BLF348	SC08b	RFP/FET
BLF368	SC08b	RFP/FET
BLF378	SC08b	RFP/FET
BLF521	SC08b	RFP/FET
BLF522	SC08b	RFP/FET
BLF543	SC08b	RFP/FET
BLF544	SC08b	RFP/FET
BLF544B	SC08b	RFP/FET
BLF545	SC08b	RFP/FET
BLF546	SC08b	RFP/FET
BLF548	SC08b	RFP/FET
BLT50	SC08a	RFP
BLT80	SC08a	RFP
BLT90/SL	SC08a	RFP
BLT91/SL	SC08a	RFP
BLT92/SL	SC08a	RFP
BLT93/SL	SC08a	RFP
BLU11/SL	SC08a	RFP
BLU15/12	SC08a	RFP
BLU20/12	SC08a	RFP
BLU30/12	SC08a	RFP
BLU30/28	SC08a	RFP
BLU45/12	SC08a	RFP
BLU50	SC08a	RFP
BLU51	SC08a	RFP
BLU52	SC08a	RFP
BLU53	SC08a	RFP
BLU56	SC08a	RFP
BLU60/12	SC08a	RFP
BLU60/28	SC08a	RFP
BLU86	SC08a	RFP
BLU97	SC08a	RFP
BLU98	SC08a	RFP
BLU99	SC08a	RFP
BLV10	SC08a	RFP
BLV11	SC08a	RFP
BLV12	SC08a	RFP

TYPE NUMBER	BOOK	SECTION
BLV20	SC08a	RFP
BLV21	SC08a	RFP
BLV25	SC08a	RFP
BLV30	SC08a	RFP
BLV31	SC08a	RFP
BLV32F	SC08a	RFP
BLV33	SC08a	RFP
BLV33F	SC08a	RFP
BLV36	SC08a	RFP
BLV37	SC08a	RFP
BLV38	SC08a	RFP
BLV45/12	SC08a	RFP
BLV57	SC08a	RFP
BLV59	SC08a	RFP
BLV75/12	SC08a	RFP
BLV80/28	SC08a	RFP
BLV90	SC08a	RFP
BLV90/SL	SC08a	RFP
BLV91	SC08a	RFP
BLV91/SL	SC08a	RFP
BLV92	SC08a	RFP
BLV93	SC08a	RFP
BLV94	SC08a	RFP
BLV95	SC08a	RFP
BLV97	SC08a	RFP
BLV97CE	SC08a	RFP
BLV98	SC08a	RFP
BLV98CE	SC08a	RFP
BLV99	SC08a	RFP
BLV100	SC08a	RFP
BLV101A	SC08a	RFP
BLV101B	SC08a	RFP
BLW29	SC08a	RFP
BLW30	SC08a	RFP
BLW31	SC08a	RFP
BLW32	SC08a	RFP
BLW33	SC08a	RFP
BLW34	SC08a	RFP
BLW50F	SC08a	RFP
BLW60	SC08a	RFP

TYPE NUMBER	BOOK	SECTION
BSR61	SC04	Sm
BSR62	SC04	Sm
BSS38	SC04	Sm
BSS50	SC04	Sm
BSS51	SC04	Sm
BSS52	SC04	Sm
BSS60	SC04	Sm
BSS61	SC04	Sm
BSS62	SC04	Sm
BSS63	SC10	Mm
BSS63R	SC10	Mm
BSS64	SC10	Mm
BSS64R	SC10	Mm
BSS68	SC04	Sm
BSS83	SC07/10	FET/Mm
BSS84	SC07/10	FET/Mm
BSS87	SC07/10	FET/Mm
BSS89	SC07	FET
BSS91	SC07	FET
BSS92	SC07	FET
BSS100	SC07	FET
BSS123	SC07	FET
BSS131	SC07	FET
BSS138	SC07	FET
BSS192	SC07/10	FET/Mm
BST15	SC10	Mm
BST16	SC10	Mm
BST39	SC10	Mm
BST40	SC10	Mm
BST50	SC10	Mm
BST51	SC10	Mm
BST52	SC10	Mm
BST60	SC10	Mm
BST61	SC10	Mm
BST62	SC10	Mm
BST70A	SC07	FET
BST72A	SC07	FET
BST74A	SC07	FET
BST76A	SC07	FET
BST78	SC07	FET

TYPE NUMBER	BOOK	SECTION
BST80	SC07/10	FET/Mm
BST82	SC07/10	FET/Mm
BST84	SC07/10	FET/Mm
BST86	SC07/10	FET/Mm
BST95	SC07	FET
BST97	SC07	FET
BST100	SC07	FET
BST110	SC07	FET
BST120	SC07/10	FET/Mm
BST122	SC07/10	FET/Mm
BSV15	SC04	Sm
BSV16	SC04	Sm
BSV17	SC04	Sm
BSV52	SC10	Mm
BSV52R	SC10	Mm
BSV64	SC04	Sm
BSV78	SC07	FET
BSV79	SC07	FET
BSV80	SC07	FET
BSV81	SC07	FET
BSW66A	SC04	Sm
BSW67A	SC04	Sm
BSW68A	SC04	Sm
BSX19	SC04	Sm
BSX20	SC04	Sm
BSX32	SC04	Sm
BSX45	SC04	Sm
BSX46	SC04	Sm
BSX47	SC04	Sm
BSX59	SC04	Sm
BSX60	SC04	Sm
BSX61	SC04	Sm
BSX62	SC04	Sm
BSX63	SC04	Sm
BSY95A	SC04	Sm
BT134*	SC03	Tri
BT134W*	SC03	Tri
BT136*	SC03	Tri
BT136F*	SC03	Tri
BT137*	SC03	Tri

TYPE NUMBER	BOOK	SECTION
BT137F*	SC03	Tri
BT138*	SC03	Tri
BT138F*	SC03	Tri
BT139*	SC03	Tri
BT139F*	SC03	Tri
BT145*	SC03	Tri
BT148*	SC03	Th
BT149*	SC03	Th
BT150	SC03	Th
BT151*	SC03	Th
BT151F*	SC03	Th
BT152*	SC03	Th
BT153	SC03	Th
BT169*	SC03	Th
BT169W*	SC03	Th
BTA140*	SC03	Tri
BTR59*	SC03	Tri
BTS59*	SC03	Tri
BTV58*	SC03	Th
BTW38*	SC03	Th
BTW40*	SC03	Th
BTW42*	SC03	Th
BTW43*	SC03	Tri
BTW45*	SC03	Th
BTW58*	SC03	Th
BTY79*	SC03	Th
BTY91*	SC03	Th
BU306	SC06	SP
BU306F	SC06	SP
BU505	SC06	SP
BU506	SC06	SP
BU506D	SC06	SP
BU508A	SC06	SP
BU508D	SC06	SP
BU705	SC06	SP
BU706	SC06	SP
BU706D	SC06	SP
BU806	SC06	SP
BU807	SC06	SP
BU808	SC06	SP

TYPE NUMBER	BOOK	SECTION
BU824	SC06	SP
BU826	SC06	SP
BUP22*	SC06	SP
BUP23*	SC06	SP
BUS11	SC06	SP
BUS11A	SC06	SP
BUS12	SC06	SP
BUS12A	SC06	SP
BUS13	SC06	SP
BUS13A	SC06	SP
BUS14	SC06	SP
BUS14A	SC06	SP
BUS21*	SC06	SP
BUS22*	SC06	SP
BUS23*	SC06	SP
BUS24*	SC06	SP
BUS131*	SC06	SP
BUS132*	SC06	SP
BUS133*	SC06	SP
BUT11	SC06	SP
BUT11A	SC06	SP
BUT11F	SC06	SP
BUT11AF	SC06	SP
BUT12	SC06	SP
BUT12A	SC06	SP
BUT12F	SC06	SP
BUT12AF	SC06	SP
BUT18	SC06	SP
BUT18A	SC06	SP
BUT18F	SC06	SP
BUT18AF	SC06	SP
BUT21B	SC06	SP
BUT21C	SC06	SP
BUT21BF	SC06	SP
BUT21CF	SC06	SP
BUT22B	SC06	SP
BUT22C	SC06	SP
BUT22BF	SC06	SP
BUT22CF	SC06	SP
BUT131	SC06	SP

TYPE NUMBER	BOOK	SECTION
BUK437-400A/B	SC13	PM
BUK437-500A/B	SC13	PM
BUK437-600A/B	SC13	PM
BUK438-500A/B	SC13	PM
BUK438-800A/B	SC13	PM
BUK438-1000A/B	SC13	PM
BUK439-60A	SC13	PM
BUK441-60A/B	SC13	PM
BUK441-100A/B	SC13	PM
BUK442-60A/B	SC13	PM
BUK442-100A/B	SC13	PM
BUK443-60A/B	SC13	PM
BUK443-100A/B	SC13	PM
BUK444-200A/B	SC13	PM
BUK444-400A/B	SC13	PM
BUK444-500A/B	SC13	PM
BUK444-600A/B	SC13	PM
BUK444-800A/B	SC13	PM
BUK445-60A/B	SC13	PM
BUK445-100A/B	SC13	PM
BUK445-200A/B	SC13	PM
BUK445-400A/B	SC13	PM
BUK445-500A/B	SC13	PM
BUK445-600A/B	SC13	PM
BUK446-800A/B	SC13	PM
BUK446-1000A/B	SC13	PM
BUK451-60A/B	SC13	PM
BUK451-100A/B	SC13	PM
BUK452-60A/B	SC13	PM
BUK452-100A/B	SC13	PM
BUK453-60A	SC13	PM
BUK453-60B	SC13	PM
BUK453-100A	SC13	PM
BUK453-100B	SC13	PM
BUK453-500A	SC13	PM
BUK453-500B	SC13	PM
BUK454-200A	SC13	PM
BUK454-200B	SC13	PM
BUK454-400A	SC13	PM
BUK454-400B	SC13	PM

TYPE NUMBER	BOOK	SECTION
BUK454-500A	SC13	PM
BUK454-500B	SC13	PM
BUK454-600A	SC13	PM
BUK454-600B	SC13	PM
BUK454-800A	SC13	PM
BUK454-800B	SC13	PM
BUK455-60A	SC13	PM
BUK455-60B	SC13	PM
BUK455-100A	SC13	PM
BUK455-100B	SC13	PM
BUK455-200A	SC13	PM
BUK455-200B	SC13	PM
BUK455-400A	SC13	PM
BUK455-400B	SC13	PM
BUK455-500A	SC13	PM
BUK455-500B	SC13	PM
BUK455-600A	SC13	PM
BUK455-600B	SC13	PM
BUK456-60A	SC13	PM
BUK456-60B	SC13	PM
BUK456-100A	SC13	PM
BUK456-100B	SC13	PM
BUK456-200A	SC13	PM
BUK456-200B	SC13	PM
BUK456-800A	SC13	PM
BUK456-800B	SC13	PM
BUK456-1000A	SC13	PM
BUK456-1000B	SC13	PM
BUK457-400A	SC13	PM
BUK457-400B	SC13	PM
BUK457-500A	SC13	PM
BUK457-500B	SC13	PM
BUK457-600B	SC13	PM
BUK471-60A*	SC13	PM
BUK471-60B*	SC13	PM
BUK471-100A*	SC13	PM
BUK471-100B*	SC13	PM
BUK472-60A*	SC13	PM
BUK472-60B*	SC13	PM
BUK472-100A*	SC13	PM

TYPE NUMBER	BOOK	SECTION
BUK472-100B*	SC13	PM
BUK473-60A*	SC13	PM
BUK473-60B*	SC13	PM
BUK473-100A*	SC13	PM
BUK473-100B*	SC13	PM
BUK474-200A*	SC13	PM
BUK474-200B*	SC13	PM
BUK474-400A*	SC13	PM
BUK474-400B*	SC13	PM
BUK474-500A*	SC13	PM
BUK474-500B*	SC13	PM
BUK474-600A*	SC13	PM
BUK474-600B*	SC13	PM
BUK474-800A*	SC13	PM
BUK474-800B*	SC13	PM
BUK475-60A*	SC13	PM
BUK475-60B*	SC13	PM
BUK475-100A*	SC13	PM
BUK475-100B*	SC13	PM
BUK475-200A*	SC13	PM
BUK475-200B*	SC13	PM
BUK475-400A*	SC13	PM
BUK475-400B*	SC13	PM
BUK475-500A*	SC13	PM
BUK475-500B*	SC13	PM
BUK475-600A*	SC13	PM
BUK475-600B*	SC13	PM
BUK476-800A*	SC13	PM
BUK476-800B*	SC13	PM
BUK476-1000A*	SC13	PM
BUK476-1000B*	SC13	PM
BUK539-60A*	SC13	PM
BUK541-60A*	SC13	PM
BUK541-60B*	SC13	PM
BUK541-100A	SC13	PM
BUK541-100B	SC13	PM
BUK542-60A	SC13	PM
BUK542-60B	SC13	PM
BUK542-100A	SC13	PM
BUK542-100B	SC13	PM

TYPE NUMBER	BOOK	SECTION
BUK543-60A	SC13	PM
BUK543-60B	SC13	PM
BUK543-100A	SC13	PM
BUK543-100B	SC13	PM
BUK545-60A	SC13	PM
BUK545-60B	SC13	PM
BUK545-100A	SC13	PM
BUK545-100B	SC13	PM
BUK545-200A	SC13	PM
BUK545-200B	SC13	PM
BUK551-60A*	SC13	PM
BUK551-60B*	SC13	PM
BUK551-100A	SC13	PM
BUK551-100B	SC13	PM
BUK552-60A	SC13	PM
BUK552-60B	SC13	PM
BUK552-100A	SC13	PM
BUK552-100B	SC13	PM
BUK553-60A	SC13	PM
BUK553-60B	SC13	PM
BUK553-100A	SC13	PM
BUK553-100B	SC13	PM
BUK554-200A	SC13	PM
BUK554-200B	SC13	PM
BUK555-60A	SC13	PM
BUK555-60B	SC13	PM
BUK555-100A	SC13	PM
BUK555-100B	SC13	PM
BUK555-200A	SC13	PM
BUK555-200B	SC13	PM
BUK556-60A*	SC13	PM
BUK571-60A*	SC13	PM
BUK571-60A*	SC13	PM
BUK571-60B*	SC13	PM
BUK571-100A*	SC13	PM
BUK571-100B*	SC13	PM
BUK572-60A*	SC13	PM
BUK572-60B*	SC13	PM
BUK572-100A*	SC13	PM
BUK572-100B*	SC13	PM

TYPE NUMBER	BOOK	SECTION
BUK573-60A*	SC13	PM
BUK573-60B*	SC13	PM
BUK573-100A*	SC13	PM
BUK573-100B*	SC13	PM
BUK575-60A*	SC13	PM
BUK575-60B*	SC13	PM
BUK575-100A*	SC13	PM
BUK575-100B*	SC13	PM
BUK575-200A*	SC13	PM
BUK575-200B*	SC13	PM
BUK617-500AE	SC13	PM
BUK617-500BE	SC13	PM
BUK627-500A	SC13	PM
BUK627-500B	SC13	PM
BUK637-400A	SC13	PM
BUK637-400B	SC13	PM
BUK637-500A	SC13	PM
BUK637-500B	SC13	PM
BUK638-500A	SC13	PM
BUK638-500B	SC13	PM
BUK638-800A*	SC13	PM
BUK638-800B*	SC13	PM
BUK638-1000A*	SC13	PM
BUK638-1000B*	SC13	PM
BUK655-500A	SC13	PM
BUK655-500B	SC13	PM
BUK657-400A	SC13	PM
BUK657-400B	SC13	PM
BUK657-500A	SC13	PM
BUK657-500B	SC13	PM
BUK793-60A*	SC13	PM
BUK795-60A*	SC13	PM
BUK993-60A*	SC13	PM
BUK995-60A*	SC13	PM
BUZ308	SC13	PM
BUZ310	SC13	PM
BUZ311	SC13	PM
BUZ326	SC13	PM
BUZ330	SC13	PM
BUZ331	SC13	PM

TYPE NUMBER	BOOK	SECTION
BUZ347	SC13	PM
BUZ348	SC13	PM
BUZ349	SC13	PM
BUZ350	SC13	PM
BUZ351	SC13	PM
BUZ355	SC13	PM
BUZ356	SC13	PM
BUZ357	SC13	PM
BUZ358	SC13	PM
BUZ384	SC13	PM
BUZ385	SC13	PM
BY228	SC01	R
BY229*	SC02	R
BY229F*	SC02	R
BY249*	SC02	R
BY249F*	SC02	R
BY260*	SC02	R
BY328	SC01	SD
BY329*	SC02	R
BY359*	SC02	R
BY359F	SC02	R
BY438	SC01	R
BY448	SC01	R
BY458	SC01	R
BY505	SC01	R
BY509	SC01	R
BY527	SC01	R
BY584	SC01	R
BY588	SC01	R
BY609	SC01	R
BY610	SC01	R
BY614	SC01	R
BY619	SC01	R
BY620	SC01	R
BY627	SC01	R
BY705	SC01	R
BY706	SC01	R
BY707	SC01	R
BY708	SC01	R
BY709	SC01	R

TYPE NUMBER	BOOK	SECTION
BY710	SC01	R
BY711	SC01	R
BY712	SC01	R
BY713	SC01	R
BY714	SC01	R
BY715	SC01	R
BY716	SC01	R
BY717	SC01	R
BY718	SC01	R
BY719	SC01	R
BY720	SC01	R
BY721	SC01	R
BY722	SC01	R
BY723	SC01	R
BY724	SC01	R
BYD11*	SC01	R
BYD13*	SC01	R
BYD14*	SC01	R
BYD17*	SC01/10	R/Mm
BYD31*	SC01	R
BYD33*	SC01	R
BYD34*	SC01	R
BYD37*	SC01/10	R/Mm
BYD73*	SC01	R
BYD74*	SC01	R
BYD77*	SC01	R
BYM26*	SC01	R
BYM36*	SC01	R
BYM56*	SC01	R
BYP20*	SC02	R
BYP21*	SC02	R
BYP22*	SC02	R
BYQ27*	SC01	R
BYQ28*	SC02	R
BYQ28F*	SC02	R
BYR28*	SC02	R
BYR29*	SC02	R
BYR29F*	SC02	R
BYR30*	SC02	R
BYR34*	SC02	R

TYPE NUMBER	BOOK	SECTION
BYR79*	SC02	R
BYT28*	SC02	R
BYT79*	SC02	R
BYT23OPIV	SC02	R
BYV10*	SC01	R
BYV24*	SC02	R
BYV26*	SC01	R
BYV27*	SC01	R
BYV28*	SC01	R
BYV29*	SC02	R
BYV29F*	SC02	R
BYV30*	SC02	R
BYV31*	SC02	R
BYV32*	SC02	R
BYV32F*	SC02	R
BYV34*	SC02	R
BYV36*	SC01	R
BYV42*	SC02	R
BYV44*	SC02	R
BYV54V	SC02	R
BYV72*	SC02	R
BYV72F*	SC02	R
BYV74*	SC02	R
BYV74F*	SC02	R
BYV79*	SC02	R
BYV92*	SC02	R
BYV95A	SC01	R
BYV95B	SC01	R
BYV95C	SC01	R
BYV96D	SC01	R
BYV96E	SC01	R
BYV118*	SC02	R
BYV118F*	SC02	R
BYV120*	SC02	R
BYV121*	SC02	R
BYV133*	SC02	R
BYV133F*	SC02	R
BYV143*	SC02	R
BYV143F*	SC02	R
BYW25*	SC02	R

TYPE NUMBER	BOOK	SECTION
CNX82A	SC12	PhC
CNX83A	SC12	PhC
CNY17-1	SC12	PhC
CNY17-2	SC12	PhC
CNY17-3	SC12	PhC
CNY17-4	SC12	PhC
CQW58A	S8a	I
CQW89A	S8a	I
CQW89B	S8a	I
CQY58A	S8a	I
CQY89A	S8a	I
CQY89F	S8a	I
ESM3045A(V)	SC06	SP
ESM3045D(V)	SC06	SP
ESM4045A(V)	SC06	SP
ESM4045D(V)	SC06	SP
ESM5045D(V)	SC06	SP
ESM6045A(V)	SC06	SP
ESM6045D(V)	SC06	SP
Fresnel-lens	SC12	A
H11A1	SC12	PhC
H11A2	SC12	PhC
H11A3	SC12	PhC
H11A4	SC12	PhC
H11A5	SC12	PhC
H11B1	SC12	PhC
H11B2	SC12	PhC
H11B3	SC12	PhC
H11B255	SC12	PhC
J108	SC07	FET
J109	SC07	FET
J110	SC07	FET
J111	SC07	FET
J112	SC07	FET
J113	SC07	FET
J174	SC07	FET
J175	SC07	FET
J176	SC07	FET
J177	SC07	FET
JA100	SC04	Sm

TYPE NUMBER	BOOK	SECTION
JA101	SC04	Sm
JC327	SC04	Sm
JC327A	SC04	Sm
JC328	SC04	Sm
JC337	SC04	Sm
JC337A	SC04	Sm
JC338	SC04	Sm
JC500	SC04	Sm
JC501	SC04	Sm
JC546	SC04	Sm
JC547	SC04	Sm
JC550	SC04	Sm
JC556	SC04	Sm
JC557	SC04	Sm
JC558	SC04	Sm
JC559	SC04	Sm
JC560	SC04	Sm
JF494	SC04	Sm
KGZ10	SC17	SEN
KGZ20	SC17	SEN
KGZ21	SC17	SEN
KMZ10A	SC17	SEN
KMZ10A1	SC17	SEN
KMZ10B	SC17	SEN
KMZ10C	SC17	SEN
KP100A	SC17	SEN
KP100A1	SC17	SEN
KP101A	SC17	SEN
KP130AE	SC17	SEN
KP131AE	SC17	SEN
KPZ20G	SC17	SEN
KPZ21G	SC17	SEN
KPZ21GE	SC17	SEN
KRX10	SC17	SEN
KRX11	SC17	SEN
KTY81-100*	SC17	SEN
KTY81-200*	SC17	SEN
KTY83-100*	SC17	SEN
KTY84-100*	SC17	SEN
KTY85-100*	SC10/17	SEN

TYPE NUMBER	BOOK	SECTION
KTY86-205	SC17	SEN
KTY87-205	SC17	SEN
LAE4001R	SC15	M
LAE4002S	SC15	M
LAE6000Q	SC15	M
LBE2003S	SC15	M
LBE2009S	SC15	M
LCE2003S	SC15	M
LCE2009S	SC15	M
LJE42002T	SC15	M
LKE21004R	SC15	M
LKE21015T	SC15	M
LKE21050T	SC15	M
LTE21009R	SC15	M
LTE21015R	SC15	M
LTE21025R	SC15	M
LTE4002S	SC15	M
LTE42005S	SC15	M
LTE42008R	SC15	M
LTE42012R	SC15	M
LUE2003S	SC15	M
LUE2009S	SC15	M
LV172E50R	SC15	M
LV2024E45R	SC15	M
LV2327E40R	SC15	M
LV2931E50S	SC15	M
LVE21050R	SC15	M
LWE2015R	SC15	M
LWE2025R	SC15	M
LZ1418E100R	SC15	M
LZE18100R	SC15	M
MCA230	SC12	PhC
MCA231	SC12	PhC
MCA255	SC12	PhC
MCT2	SC12	PhC
MCT26	SC12	PhC
MJE13004	SC06	SP
MJE13005	SC06	SP
MJE13006	SC06	SP
MJE13007	SC06	SP

TYPE NUMBER	BOOK	SECTION
MJE13008	SC06	SP
MJE13009	SC06	SP
MPS3702	SC04	Sm
MPS3703	SC04	Sm
MPS3704	SC04	Sm
MPS3705	SC04	Sm
MPS3706	SC04	Sm
MPS3904	SC04	Sm
MPS3906	SC04	Sm
MPS6513	SC04	Sm
MPS6514	SC04	Sm
MPS6515	SC04	Sm
MPS6517	SC04	Sm
MPS6518	SC04	Sm
MPS6519	SC04	Sm
MPS6520	SC04	Sm
MPS6521	SC04	Sm
MPS6522	SC04	Sm
MPS6523	SC04	Sm
MPS6531	SC04	Sm
MPS6532	SC04	Sm
MPS6534	SC04	Sm
MPS6535	SC04	Sm
MPSA05	SC04	Sm
MPSA06	SC04	Sm
MPSA13	SC04	Sm
MPSA14	SC04	Sm
MPSA25	SC04	Sm
MPSA26	SC04	Sm
MPSA27	SC04	Sm
MPSA42	SC04	Sm
MPSA43	SC04	Sm
MPSA55	SC04	Sm
MPSA56	SC04	Sm
MPSA63	SC04	Sm
MPSA64	SC04	Sm
MPSA75	SC04	Sm
MPSA76	SC04	Sm
MPSA77	SC04	Sm
MPSA92	SC04	Sm

TYPE NUMBER	BOOK	SECTION
MPSA93	SC04	Sm
MRB11175Y	SC15	M
MRB11350Y	SC15	M
MSB11900Y	SC15	M
MX0912B250Y	SC15	M
MX0912B350Y	SC15	M
MZ0912B50Y	SC15	M
MZ0912B100Y	SC15	M
OM200/S2	SC17	SEN
OM286	SC17	SEN
OM286M	SC17	SEN
OM287	SC17	SEN
OM287M	SC17	SEN
OM320	SC14	WBM
OM321	SC14	WBM
OM322	SC14	WBM
OM323	SC14	WBM
OM323A	SC14	WBM
OM335	SC14	WBM
OM336	SC14	WBM
OM337	SC14	WBM
OM337A	SC14	WBM
OM339	SC14	WBM
OM345	SC14	WBM
OM350	SC14	WBM
OM360	SC14	WBM
OM361	SC14	WBM
OM370	SC14	WBM
OM386B	SC17	SEN
OM386M	SC17	SEN
OM387B	SC17	SEN
OM387M	SC17	SEN
OM388B	SC17	SEN
OM389B	SC17	SEN
OM390	SC17	SEN
OM391	SC17	SEN
OM931	SC05	P
OM961	SC05	P
OM2860	SC17	SEN
OM2870	SC17	SEN

TYPE NUMBER	BOOK	SECTION
OSB/M/S9115*	SC02	St
OSB/M/S9215*	SC02	St
OSB/M/S9415*	SC02	St
OSM9510-12	SC02	St
PBYR635/40/45CT	SC02	R
PBYR735/40/45	SC02	R
PBYR735/40/45F	SC02	R
PBYR1035/40/45	SC02	R
PBYR1035/40/45F	SC02	R
PBYR1535/40/45CT	SC02	R
PBYR1535/40/45CTF	SC02	R
PBYR1635/40/45	SC02	R
PBYR1635/40/45F	SC02	R
PBYR2035/40/45CT	SC02	R
PBYR2035/40/45CTF	SC02	R
PBYR2535/40/45CT	SC02	R
PBYR2535/40/45CTF	SC02	R
PBYR3035/40/45PT	SC02	R
PBYR12035/40/45TV	SC02	R
PBYR16035/40/45TV	SC02	R
PBYR30035/40/45CT	SC02	R
PBYR40035/40/45CT	SC02	R
PH2222/A	SC04	Sm
PH2369	SC04	Sm
PH2907	SC04	Sm
PH2907A	SC04	Sm
PH5415	SC04	Sm
PH5416	SC04	Sm
PH6659	SC07	FET
PH6660	SC07	FET
PH6661	SC07	FET
PH13002	SC06	SP
PH13003	SC06	SP
PKB12005U	SC15	M
PKB20010U	SC15	M
PMBD914	SC01/10	SD/Mm
PMBD2835	SC01	SD
PMBD2836	SC01	SD
PMBD2837	SC01	SD
PMBD2838	SC01	SD

TYPE NUMBER	BOOK	SECTION	TYPE NUMBER	BOOK	SECTION
PTB32005X	SC15	M	PZTA14	SC10	Mm
PTB42001X	SC15	M	PZTA42	SC10	Mm
PTB42002X	SC15	M	PZTA43	SC10	Mm
PTB42003X	SC15	M	PZTA55	SC10	Mm
PVB42004X	SC15	M	PZTA56	SC10	Mm
PXB16050U	SC15	M	PZTA63	SC10	Mm
PXT2222	SC10	Mm	PZTA64	SC10	Mm
PXT2222A	SC10	Mm	PZTA92	SC10	Mm
PXT2907	SC10	Mm	PZTA93	SC10	Mm
PXT2907A	SC10	Mm	RPW100	SC17	SEN
PXT3904	SC10	Mm	RPW101	SC17	SEN
PXT3906	SC10	Mm	RPW102	SC17	SEN
PXT4401	SC10	Mm	RPY98A	SC17	SEN
PXT4403	SC10	Mm	RPY98C	SC17	SEN
PXTA14	SC10	Mm	RPY98F	SC17	SEN
PXTA27	SC10	Mm	RPY98G	SC17	SEN
PXTA64	SC10	Mm	RPY98S	SC17	SEN
PXTA77	SC10	Mm	RPY99A	SC17	SEN
PZ1418B15U	SC15	M	RPY99C	SC17	SEN
PZ1418B30U	SC15	M	RPY99D	SC17	SEN
PZ1721B12U	SC15	M	RPY99F	SC17	SEN
PZ1721B25U	SC15	M	RPY99G	SC17	SEN
PZ2024B10U	SC15	M	RPY99S	SC17	SEN
PZ2024B20U	SC15	M	RPY99P/P5206	SC17	SEN
PZ2327B15U	SC15	M	RPY100	SC17	SEN
PZB16035U	SC15	M	RPY102	SC17	SEN
PZB16040U	SC15	M	RPY104A	SC17	SEN
PZB27020U	SC15	M	RPY104C	SC17	SEN
PZFJ108	SC07	FET	RPY104D	SC17	SEN
PZFJ109	SC07	FET	RPY104F	SC17	SEN
PZFJ110	SC07	FET	RPY104G	SC17	SEN
PZT2222	SC10	Mm	RPY104S	SC17	SEN
PZT2222A	SC10	Mm	RPY105P/P5206	SC17	SEN
PZT2907	SC10	Mm	RPY107	SC17	SEN
PZT2907A	SC10	Mm	RPY108P/P5211	SC17	SEN
PZT3904	SC10	Mm	RPY109	SC17	SEN
PZT3906	SC10	Mm	RPY109B/P2105	SC17	SEN
PZTA05	SC10	Mm	RPY222	SC17	SEN
PZTA06	SC10	Mm	RV3135B5X	SC15	M
PZTA13	SC10	Mm	RX1011B350Y	SC15	M

DATA HANDBOOK SYSTEM

DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of seven series of handbooks:

INTEGRATED CIRCUITS

DISCRETE SEMICONDUCTORS

DISPLAY COMPONENTS

PASSIVE COMPONENTS*

PROFESSIONAL COMPONENTS**

MAGNETIC PRODUCTS*

LIQUID CRYSTAL DISPLAYS

The contents of each series are listed on pages iii to ix.

The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where application is given it is advisory and does not form part of the product specification.

Condensed data on the preferred products of Philips Components is given in our Preferred Type Range catalogue (issued annually).

Information on current Data Handbooks and how to obtain a subscription for future issues is available from any of the Organizations listed on the back cover.
Product specialists are at your service and enquiries will be answered promptly.

* Will replace the Components and materials (green) series of handbooks.
** Will replace the Electron tubes (blue) series of handbooks.

INTEGRATED CIRCUITS

This series of handbooks comprises:

code	handbook title
IC01	**Radio, audio and associated systems** Bipolar, MOS
IC02a/b	**Video and associated systems** Bipolar, MOS
IC03	**ICs for Telecom;** Subscriber sets, Cordless Telephones, Mobile/Cellular, Radio Pagers
IC04	**HE4000B logic family** CMOS
IC05	**Advanced Low-power Schottky (ALS) Logic Series**
IC06	**High-speed CMOS; 74HC/HCT/HCU** Logic family
IC07	**Advanced CMOS logic (ACL)**
Supplement to IC07	**Advanced CMOS logic (ACL)**
IC08	**10/100K ECL Logic/Memory/PLD**
IC09	**TTL logic series**
IC10	**Memories** MOS, TTL, ECL
IC11	**Linear Products**
IC12	**I^2C-bus compatible ICs**
IC13	**Programmable Logic Devices (PLD)**
IC14	**Microcontrollers** NMOS, CMOS
IC15	**FAST TTL logic series**
Supplement to IC15	**FAST TTL logic series**
IC16	**CMOS integrated circuits for clocks and watches**
IC17	**ICs for Telecom;** ISDN
IC18	**Microprocessors and peripherals**
IC19	**Data communication products**
IC20	**8051-based 8-bit microcontrollers**
IC23	**Advanced BiCMOS interface logic**

DISCRETE SEMICONDUCTORS

This series of data handbooks comprises:

current code	new code	handbook title
S1	**SC01**	**Diodes** High-voltage tripler units
S2a	**SC02**	**Power diodes**
S2b	**SC03**	**Thyristors and triacs**
S3	**SC04**	**Small-signal transistors**
S4a	**SC05**	**Low-frequency power transistors and hybrid IC power modules**
S4b	**SC06**	**High-voltage and switching power transistors**
S5	**SC07**	**Small-signal field-effect transistors**
S6	**SC08a***	**RF power bipolar transistors**
	SC08b	**RF power MOS transistors**
	SC09	**RF power modules**
S7	**SC10**	**Surface mounted semiconductors**
S8b	**SC12**	**Optocouplers**
S9	**SC13**	**PowerMOS transistors**
S10	**SC14**	**Wideband transistors and wideband hybrid IC modules**
S11	**SC15**	**Microwave transistors**
S15**	**SC16**	**Laser diodes**
S13	**SC17**	**Semiconductor sensors**

* Not yet issued with the new code in this series of handbooks.
** New handbook in this series; will be issued shortly.

DISPLAY COMPONENTS

This series of data handbooks comprises:

code	handbook title
DC01	**Colour display components** Colour TV Picture Tubes and Assemblies Colour Monitor Tube Assemblies
DC02	**Monochrome monitor tubes and deflection units**
DC03	**Television tuners, coaxial aerial input assemblies**
DC04	**Loudspeakers**
DC05	**Flyback transformers, mains transformers and general-purpose FXC assemblies**

PASSIVE COMPONENTS

This series of data handbooks comprises:

current code	new code	handbook title
C14	**PA01**	**Electrolytic capacitors; solid and non-solid**
C11	**PA02**	**Varistors, thermistors and sensors**
C12	**PA03**	**Potentiometers and switches**
C7	**PA04**	**Variable capacitors**
C22	**PA05***	**Film capacitors**
C15	**PA06**	**Ceramic capacitors**
C9	**PA07***	**Piezoelectric quartz devices**
C13	**PA08**	**Fixed resistors**

* Not yet issued with the new code in this series of handbooks.

PROFESSIONAL COMPONENTS

This series of data handbooks comprises:

current code	new code	handbook title
T3	**PC01**	**High-power klystrons and accessories**
T5	**PC02***	**Cathode-ray tubes**
T6	**PC03***	**Geiger-Müller tubes**
T9	**PC04**	**Photo multipliers**
T10	**PC05**	**Plumbicon camera tubes and accessories**
T11	**PC06**	**Circulators and Isolators**
T12	**PC07**	**Vidicon and Newvicon camera tubes and deflection units**
T13	**PC08**	**Image intensifiers**
T15	**PC09**	**Dry-reed switches**
	PC11	**Solid state image sensors and peripherals integrated circuits**
T9	**PC12***	**Electron multipliers**

* Not yet issued with the new code in this series of handbooks.

MAGNETIC PRODUCTS

This series of data handbooks comprises:

current code	new code	handbook title
C4 **C5**	**MA01**	**Soft Ferrites**
C16	**MA02***	**Permanent magnet materials**
C19	**MA03***	**Piezoelectric ceramics**

* Not yet issued with the new code in this series of handbooks.

LIQUID CRYSTAL DISPLAYS

current code	new code	handbook title
S14	**LCD01**	**Liquid Crystal Displays and driver ICs for LCDs**

Argentina: PHILIPS ARGENTINA S.A., Div. Philips Components, Vedia 3892, 1430 BUENOS AIRES, Tel.(01)541-4261.
Australia: PHILIPS COMPONENTS PTY Ltd, 11 Waltham Street, ARTARMON, N.S.W. 2064, Tel.(02)4393322.
Austria: ÖSTERREICHISCHE PHILIPS INDUSTRIE G.m.b.H., UB Bauelemente, Triester Str. 64, 1101 WIEN, Tel.(0222)60 101-820.
Belgium: N.V PHILIPS PROF. SYSTEMS – Components Div., 80 Rue Des Deux Gares, B-1070 BRUXELLES, Tel.(02)5256111.
Brazil: PHILIPS COMPONENTS (Active Devices & LCD) Av. das Nacoes Unidas, 12495-SAO PAULO-SP, CEP04578, P.O. Box 7383, Tel.(011)534-2211. Fax.011 5347733.
PHILIPS COMPONENTS (Passive Devices & Materials) Av. Francisco Monteiro 702, RIBEIRAO PIRES-SP, CEP 09400, Tel.(011)459-8211.
Canada: PHILIPS ELECTRONICS LTD., Philips Components, 601 Milner Ave., SCARBOROUGH, Ontario, M1B 1M8, Tel.(416)292-5161.
(IC Products) PHILIPS COMPONENTS – Signetics Canada LTD., 1 Eva Road, Suite 411, ETOBICOKE, Ontario, M9C 4Z5, Tel.(416)626-6676.
Chile: PHILIPS CHILENA S.A., Av. Santa Maria 0760, SANTIAGO, Tel.(02)773816.
Colombia: IPRELENSO LTDA., Carrera 21 No. 56-17, BOGOTA, D.E., P.O. Box 77621, Tel.(01)2497624.
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Finland: PHILIPS COMPONENTS, Sinikalliontie 3, SF-2630 ESPOO, Tel.358-0-50261.
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Germany: PHILIPS COMPONENTS UB der Philips G.m.b.H., Burchardstrasse 19, D-2 HAMBURG 1, Tel.(040)3296-0. Fax.040 3296912.
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Turkey: TÜRK PHILIPS TICARET A.S., Philips Components, Talatpasa Cad. No. 5, 80640 LEVENT/ISTANBUL, Tel.(01)1792770.
United Kingdom: PHILIPS COMPONENTS LTD., Mullard House, Torrington Place, LONDON WC1E 7HD, Tel.(071)5806633. Fax.071 4362196.
United States: (Colour picture tubes – Monochrome & Colour Display Tubes) PHILIPS DISPLAY COMPONENTS COMPANY, 1600 Huron Parkway, P.O. Box 963, ANN ARBOR, Michigan 48106, Tel.313/996-9400. Fax.313 7612886.
(IC Products) PHILIPS COMPONENTS – Signetics, 811 East Arques Avenue, SUNNYVALE, CA 94088-3409, Tel.(408)991-2000.
(Passive Components, Discrete Semiconductors, Materials and Professional Components & LCD) PHILIPS COMPONENTS, Discrete Products Division, 2001 West Blue Heron Blvd., P.O. Box 10330, RIVIERA BEACH, Florida 33404, Tel.(407)881-3200.
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Venezuela: MAGNETICA S.A., Calle 6, Ed. Las Tres Jotas, CARACAS 1074A, App. Post. 78117, Tel.(02)2417509.
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