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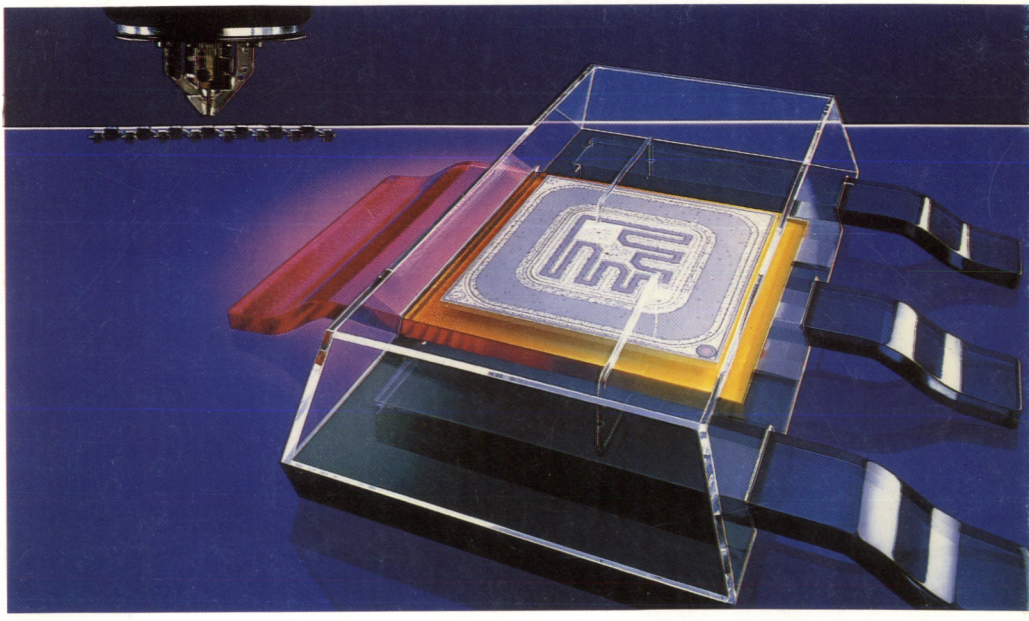

SMD Components in SOT-223 Package

Data Book

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Silicon Switching Diodes

Type	V_R	I_F	P_{tot}	V_F	at I_F	t_{rr}	Package	Page
	V	A	W	V	A	µs		
S BAS 78A	50	1	1.5	≦1.6	1.0	1	SOT-223	16
S BAS 78B	100	1	1.5	≦1.6	1.0	1	SOT-223	16
S BAS 78C	200	1	1.5	≦1.6	1.0	1	SOT-223	16
S BAS 78D	400	1	1.5	≦1.6	1.0	1	SOT-223	16
S BAS 79A	50	1	1.5	≦1.6	1.0	1	SOT-223	19
S BAS 79B	100	1	1.5	≦1.6	1.0	1	SOT-223	19
S BAS 79C	200	1	1.5	≦1.6	1.0	1	SOT-223	19
S BAS 79D	400	1	1.5	≦1.6	1.0	1	SOT-223	19

Silicon AF Transistors

Type		Maximum ratings			Characteristics at T_A = 25°C						Package	Page
NPN = N PNP = P		V_{CBO}	I_C	P_{tot}	h_{FE}	at		I_{CBO}	V_{CEsat}	f_T		
					-	I_C	V_{CE}					
		V	A	W		mA	V	nA	V	MHz		
BCP 51	P	45	1	1.5	40...250	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 51-10	P	45	1	1.5	63...160	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 51-16	P	45	1	1.5	100...250	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 52	P	60	1	1.5	40...250	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 52-10	P	60	1	1.5	63...160	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 52-16	P	60	1	1.5	100...250	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 53	P	100	1	1.5	40...250	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 53-10	P	100	1	1.5	63...160	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 53-16	P	100	1	1.5	100...250	150	2	≦ 100	≦ 0.5	125	SOT-223	24
BCP 54	N	45	1	1.5	40...250	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 54-10	N	45	1	1.5	63...160	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 54-16	N	45	1	1.5	100...250	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 55	N	60	1	1.5	40...250	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 55-10	N	60	1	1.5	63...160	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 55-16	N	60	1	1.5	100...250	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 56	N	100	1	1.5	40...250	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 56-10	N	100	1	1.5	63...160	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 56-16	N	100	1	1.5	100...250	150	2	≦ 100	≦ 0.5	100	SOT-223	28
BCP 68	N	25	1	1.5	63...400	500	1	≦ 100	≦ 0.5	100	SOT-223	32
BCP 69	P	25	1	1.5	63...400	500	1	≦ 100	≦ 0.5	100	SOT-223	36

Silicon Switching Transistors

Type		Maximum ratings			Characteristics at $T_A = 25°C$						Package	Page
NPN = N PNP = P		V_{CBO}	I_C	P_{tot}	h_{FE}	at I_C	at V_{CE}	I_{CBO}	V_{CEsat}	f_T		
		V	mA	W	-	mA	V	nA	V	MHz		
PZT 2222	N	60	600	1.5	100...300	150	10	≦20	≦1.6	300	SOT-223	42
PZT 2222A	N	75	600	1.5	100...300	150	10	≦10	≦1.0	300	SOT-223	42
PZT 2907	P	60	600	1.5	100...300	150	10	≦20	≦1.6	300	SOT-223	47
PZT 2907A	P	60	600	1.5	100...300	150	10	≦10	≦1.6	300	SOT-223	47
PZT 3904	N	60	200	1.5	100...300	10	1	≦50	≦0.3	400	SOT-223	52
PZT 3906	P	40	200	1.5	100...300	10	1	≦50	≦0.4	350	SOT-223	57

Silicon High-Voltage Transistors

Type		Maximum ratings			Characteristics at $T_A = 25°C$						Package	Page
NPN = N PNP = P		V_{CBO}	I_C	P_{tot}	h_{FE}	at I_C	at V_{CE}	I_{CBO}	V_{CEsat}	f_T		
		V	mA	W	-	mA	V	nA	V	MHz		
S BF 720	N	300	50	1.5	≧50	25	20	≦10	≦0.6	100	SOT-223	64
S BF 722	N	250	50	1.5	≧50	25	20	≦10	≦0.6	100	SOT-223	64
S BF 721	P	300	50	1.5	≧50	25	20	≦10	≦0.6	100	SOT-223	68
S BF 723	P	250	50	1.5	≧50	25	20	≦10	≦0.6	100	SOT-223	68
S BFN 36	N	250	200	1.5	≧40	30	10	≦100	≦0.4	70	SOT-223	72
S BFN 38	N	300	200	1.5	≧30	30	10	≦100	≦0.5	70	SOT-223	72
S BFN 37	P	250	200	1.5	≧40	30	10	≦100	≦0.4	100	SOT-223	76
S BFN 39	P	300	200	1.5	≧30	30	10	≦100	≦0.5	100	SOT-223	76
PZTA 42	N	300	500	1.5	≧40	30	10	≦100	≦0.5	≧50	SOT-223	80
PZTA 43	N	200	500	1.5	≧40	30	10	≦100	≦0.4	≧50	SOT-223	80
PZTA 92	P	300	500	1.5	≧25	30	10	≦250	≦0.5	≧50	SOT-223	84
PZTA 93	P	200	500	1.5	≧25	30	10	≦250	≦0.4	≧50	SOT-223	84

Silicon Darlington Transistors

Type		Maximum ratings			Characteristics at $T_A = 25°C$						Package	Page
NPN = N PNP = P		V_{CBO}	I_C	P_{tot}	h_{FE}	at I_C	at V_{CE}	I_{CBO}	V_{CEsat}	f_T		
		V	A	W	-	mA	V	µA	V	MHz		
S BCP 28	P	40	0.5	1.5	≧20 000	100	5	≦0.1	≦1.0	200	SOT-223	90
S BCP 48	P	80	0.5	1.5	≧10 000	100	5	≦0.1	≦1.0	200	SOT-223	90
S BCP 29	N	40	0.5	1.5	≧20 000	100	5	≦0.1	≦1.0	200	SOT-223	94
S BCP 49	N	80	0.5	1.5	≧10 000	100	5	≦0.1	≦1.0	200	SOT-223	94
S BSP 50	N	60	1	1.5	≧2000	500	10	≦10	≦1.3	200	SOT-223	98
S BSP 51	N	80	1	1.5	≧2000	500	10	≦10	≦1.3	200	SOT-223	98
S BSP 52	N	100	1	1.5	≧2000	500	10	≦10	≦1.3	200	SOT-223	98
S BSP 60	P	60	1	1.5	≧2000	500	10	≦10	≦1.3	200	SOT-223	103
S BSP 61	P	80	1	1.5	≧2000	500	10	≦10	≦1.3	200	SOT-223	103
S BSP 62	P	100	1	1.5	≧2000	500	10	≦10	≦1.3	200	SOT-223	103
PZTA 13	N	30	0.5	1.5	≧10 000	100	5	≦0.1	≦1.5	200	SOT-223	108
PZTA 14	N	30	0.5	1.5	≧20 000	100	5	≦0.1	≦1.5	200	SOT-223	108
PZTA 63	P	30	0.5	1.5	≧10 000	100	5	≦0.1	≦1.5	200	SOT-223	112
PZTA 64	P	30	0.5	1.5	≧20 000	100	5	≦0.1	≦1.5	200	SOT-223	112

Silicon RF Transistors

Type		Maximum ratings			Characteristics at $T_A = 25°C$					Package	Page
NPN = N		V_{CEO}	I_C	P_{tot}	h_{FE}	f_T	F	G_{pe}	at f		
		V	mA	W	-	GHz	dB	dB	GHz		
S BFG 193	N	12	80	0.5	100	8	1.2	19	0.8	SOT-223	118
S BFG 196	N	12	120	1.0	90	8	1.7	-	0.8	SOT-223	121

SIPMOS Small-Signal Transistors

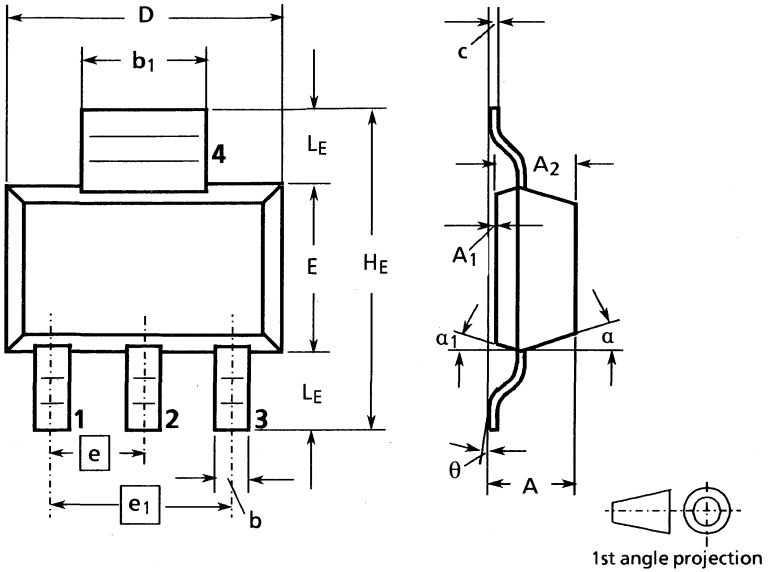
Type	$V_{DS(max)}$ V	$R_{DS(on)max}$ Ω	$P_{tot(max)}$ mW	$V_{GS(th)}$ V	$I_{D(max)}$ mA	Package	Page
S BSP 88	240	8	1500	0.6...1.2	290	SOT-223	124
S BSP 89	240	6	1500	0.8...2.0	340	SOT-223	129
S BSP 92	-240	20	1500	-0.8...-2.0	-180	SOT-223	135
S BSP 125	600	45	1500	1.5...2.5	110	SOT-223	141
S BSP 135	600	60	1500	-1.8...-0.7	100	SOT-223	146
S BSP 149	200	3.5	1500	-1.8...-0.7	440	SOT-223	148
S BSP 295	50	0.3	1500	0.8...2.0	1700	SOT-223	150
S BSP 296	100	0.8	1500	0.8...2.0	1000	SOT-223	155
S BSP 297	200	2	1500	0.8...2.0	600	SOT-223	160

Cross Reference

SOT-223	SOT-89 equivalent	TO-92 equivalent	TO-202 equivalent
BAS 78 A/B/C/D	BAW 78 A/B/C/D		
BAS 79 A/B/C/D	BAW 79 A/B/C/D		
BCP 28/48	BCV 28/48	BC 516	
BCP 29/49	BCV 29/49	BC 517	
BCP 51/52/53	BCX 51/52/53	BC 636/638/640	BD 826/828/830
BCP 54/55/56	BCX 54/55/56	BC 635/637/639	BD 825/827/829
BCP 68	BCX 68	BC 368	
BCP 69	BCX 69	BC 369	
BF 720/722	BFN 20/BF 622	BF 420/422	BF 869/871
BF 721/723	BFN 21/BF 623	BF 421/423	BF 870/872
BFG 193			
BFG 196			
BFN 36/38	BFN 16/18	BFP 22/25	BF 858/859
BFN 37/39	BFN 17/19	BFP 23/26	
BSP 50/51/52		BC 875/877/879	
BSP 60/61/62		BC 876/878/880	
BSP 88		BSS 88	
BSP 89	BSS 87	BSS 89	BSS 95
BSP 92	BSS 192	BSS 92	
BSP 125		BSS 125	
BSP 135		BSS 135	
BSP 149		BSS 149	
BSP 295		BSS 295	BSS 395
BSP 296		BSS 296	
BSP 297		BSS 297	BSS 97
PZT 2222/2222A	SXT 2222A		
PZT 2907/2907A	SXT 2907A		
PZT 3904	SXT 3904		
PZT 3906	SXT 3906		
PZTA 13/14	BCV 29/49	BC 517	
PZTA 42/43	SXTA 42/43	MPSA 42/43	BF 858/859
PZTA 63/64	BCV 28/48	BC 516	
PZTA 92/93	SXTA 92/93	MPSA 92/93	

Package Outlines

SOT-223



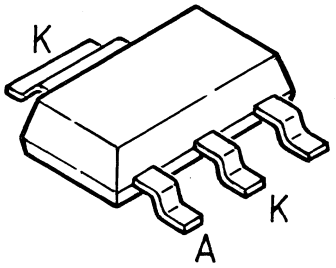
Dim.	Millimeters			Gradient	Note
	min.	typ.	max.		
A			1.7		
A_1	0.02		0.1		
A_2			1.6		
b	0.60		0.80		
b_1	2.9		3.1		
c	0.24		0.32		
D	6.3		6.7		
E	3.3		3.7		
|e|		2.3			
$\|e_1\|$		4.6			
H_E	6.7		7.3		
L_E		1.7			
α				max 16°	1
α_1				13°	2
θ				10°	

Notes: 1. Applicable on case top
2. Applicable on case bottom

In general, SOT-223 package is only available on 12-mm tape.
18-cm reel: 1000 pieces per reel; 33-cm reel: 2500 pieces per reel.

Silicon Switching Diodes

- Switching applications
- High breakdown voltage



Type	Marking	Ordering code (12–mm tape)	Package*
BAS 78A	BAS 78A	Q62702 - A910	SOT-223
BAS 78B	BAS 78B	Q62702 - A911	SOT-223
BAS 78C	BAS 78C	Q62702 - A912	SOT-223
BAS 78D	BAS 78D	Q62702 - A913	SOT-223

Maximum Ratings

Parameter	Symbol	BAS 78 A	BAS 78 B	BAS 78 C	BAS 78 D	Unit
Reverse voltage	V_R	50	100	200	400	V
Peak reverse voltage	V_{RM}	50	100	200	400	V
Forward current	I_F	1				A
Peak forward current	I_{FM}	1				A
Surge forward current $t = 1\mu s$	I_{FS}	10				A
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5				W
Junction temperature	T_j	150				°C
Storage temperature range	T_{stg}	-65 to + 150				°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm.
Mounting pad for the collector lead min 6 cm^2.

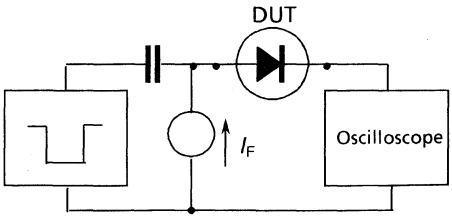
*) For detailed dimensions see chapter Package Outlines.

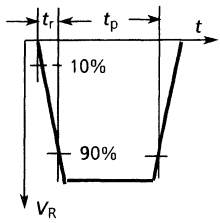
Characteristics

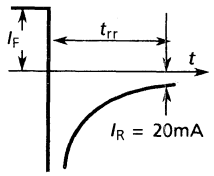
at $T_A = 25$ °C, unless otherwise specified.

Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Breakdown voltage $I_C = 10$mA, $I_B = 0$	BAS 78A BAS 78B BAS 78C BAS 78D	$V_{(BR)}$	50 100 200 400	- - - -	- - - -	V
Forward voltage [1] $I_F = 1$A $I_F = 2$A		V_F	- -	- -	1.6 2	V
Reverse current $V_R = V_{R\,max}$ $V_R = V_{R\,max}$, $T_A = 150$ °C		I_R	- -	- -	1 50	µA
AC Characteristics						
Diode capacitance $V_R = 0$, $f = 1$ MHz		C_D	-	10	-	pF
Reverse recovery time $I_F = 200$mA, $I_R = 200$mA, $R_L = 100\Omega$ measured at $I_R = 20$mA		t_{rr}	-	1	-	µs

Test circuit for reverse recovery time





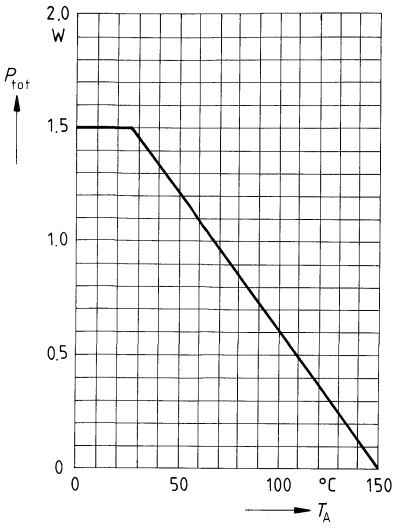


Pulse generator: $t_p = 100$ns, $D = 0.05$
$t_r = 0.6$ns, $R_i = 50\Omega$
$V_p = V_R + I_F \times R_i$

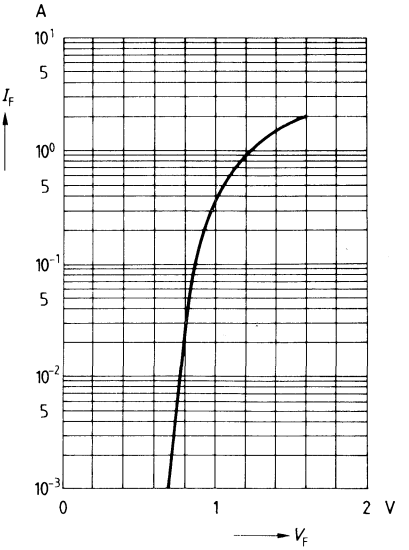
Oscilloscope: $R = 50\Omega$
$t_r = 0.35$ns,
$C \leq 1$pF

1) Pulse test conditions: $t \leqq 300\mu s$; $D = 2\%$

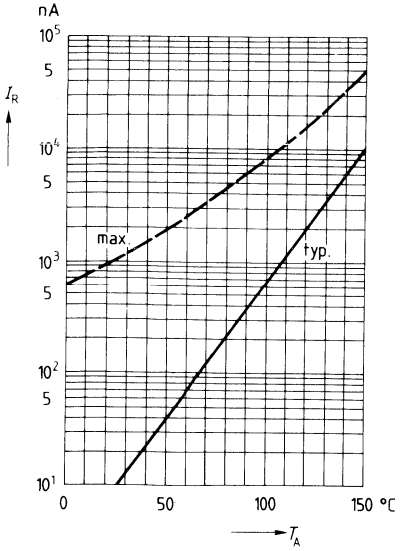
Total power dissipation $P_{tot} = f(T_A)$



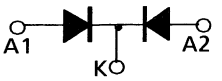
Forward current $I_F = f(V_F)$
$T_A = 25\,^{\circ}C$

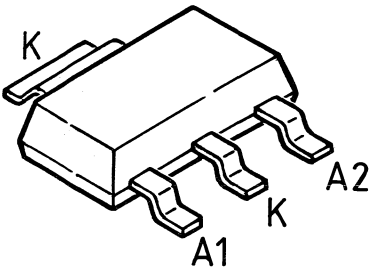


Reverse current $I_R = f(T_A)$
$V_{CE} = 10$ V



- Switching applications
- High breakdown voltage
- Common cathode





Type	Marking	Ordering code (12-mm tape)	Package*
BAS 79A	BAS 79A	Q62702 - A914	SOT-223
BAS 79B	BAS 79B	Q62702 - A915	SOT-223
BAS 79C	BAS 79C	Q62702 - A916	SOT-223
BAS 79D	BAS 79D	Q62702 - A917	SOT-223

Maximum Ratings

Parameter	Symbol	BAS 79A	BAS 79B	BAS 79C	BAS 79D	Unit
Reverse voltage	V_R	50	100	200	400	V
Peak reverse voltage	V_{RM}	50	100	200	400	V
Forward current	I_F	1				A
Peak forward current	I_{FM}	1				A
Surge forward current $t = 1\mu s$	I_{FS}	10				A
Total power dissipation, $T_A \leq 25°C$[1]	P_{tot}	1.5				W
Junction temperature	T_j	150				°C
Storage temperature range	T_{stg}	-65 to + 150				°C

Thermal Resistance

Junction - ambient[1]	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

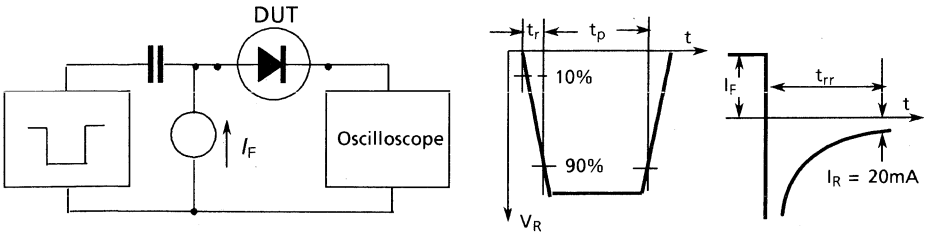
*) For detailed dimensions see chapter Package Outlines.

Characteristics

at $T_A = 25$ °C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC Characteristics						
Breakdown voltage		$V_{(BR)}$				V
$I_C = 10$mA, $I_B = 0$	BAS 79A		50	-	-	
	BAS 79B		100	-	-	
	BAS 79C		200	-	-	
	BAS 79D		400	-	-	
Forward voltage [1]		V_F				V
$I_F = 1$A			-	-	1.6	V
$I_F = 2$A			-	-	2	
Reverse current		I_R				
$V_R = V_{R\ max}$			-	-	1	µA
$V_R = V_{R\ max}$, $T_A = 150$ °C			-	-	50	
AC Characteristics						
Diode capacitance		C_D				pF
$V_R = 0$, $f = 1$ MHz			-	10	-	
Reverse recovery time		t_{rr}				µs
$I_F = 200$mA, $I_R = 200$mA,			-	1	-	
$R_L = 100\Omega$						
measured at $I_R = 20$mA						

Test circuit for reverse recovery time

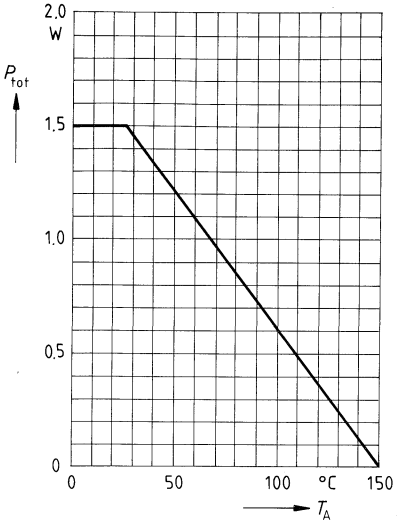


Pulse generator: $t_p = 100$ns, $D = 0.05$
$t_r = 0.6$ns, $R_i = 50\Omega$
$V_p = V_R + I_F \times R_i$

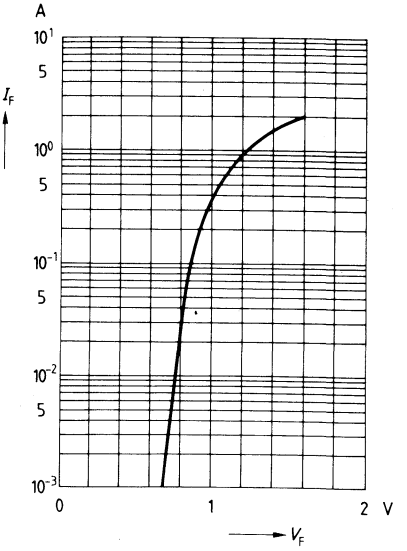
Oscilloscope: $R = 50\Omega$
$t_r = 0.35$ns,
$C \leq 1$pF

1) Pulse test conditions: $t \leqq 300\mu s$; $D = 2\%$

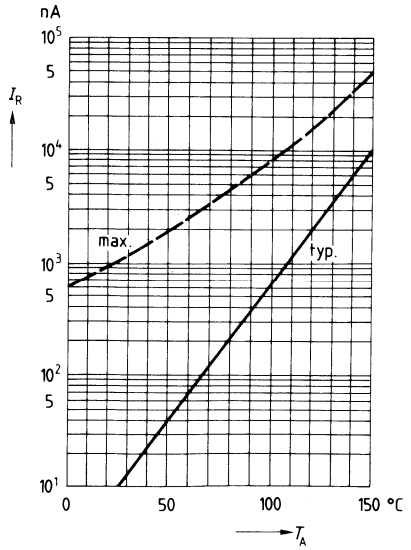
Total power dissipation $P_{tot} = f(T_A)$



Forward current $I_F = f(V_F)$
$T_A = 25\,°C$

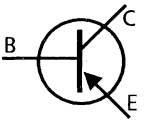


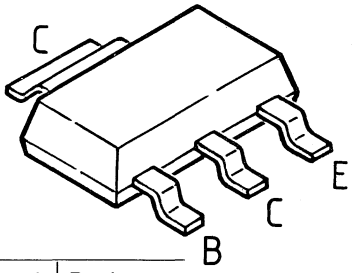
Reverse current $I_R = f(T_A)$
$V_{CE} = 10$ V



Silicon AF Transistors

- For AF driver and output stages
- High collector current
- Low collector -emitter saturation voltage
- Complementary types: BCP 54...BCP 56 (NPN)





Type	Marking	Ordering code (12–mm tape)	Package*
BCP 51	BCP 51	Q62702 - C2107	SOT-223
BCP 51-10	BCP 51-10	Q62702 - C2109	SOT-223
BCP 51-16	BCP 51-16	Q62702 - C2110	SOT-223
BCP 52	BCP 52	Q62702 - C2146	SOT-223
BCP 52-10	BCP 52-10	Q62702 - C2112	SOT-223
BCP 52-16	BCP 52-16	Q62702 - C2113	SOT-223
BCP 53	BCP 53	Q62702 - C2147	SOT-223
BCP 53-10	BCP 53-10	Q62702 - C2115	SOT-223
BCP 53-16	BCP 53-16	Q62702 - C2116	SOT-223

Maximum Ratings

Parameter	Symbol	BCP51	BCP52	BCP53	Unit
Collector-emitter voltage	V_{CEO}	45	60	80	V
$R_{BE} \leq 1k\Omega$	V_{CER}	45	60	100	V
Collector-base voltage	V_{CBO}	45	60	100	V
Emitter-base voltage	V_{EBO}		5		V
Collector current	I_C		1		A
Peak collector current	I_{CM}		1.5		A
Base current	I_B		100		mA
Peak base current	I_{BM}		200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}		1.5		W
Junction temperature	T_j		150		°C
Storage temperature range	T_{stg}	-65	to	+ 150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

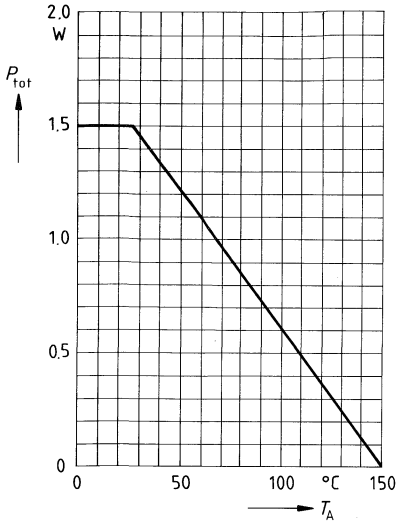
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

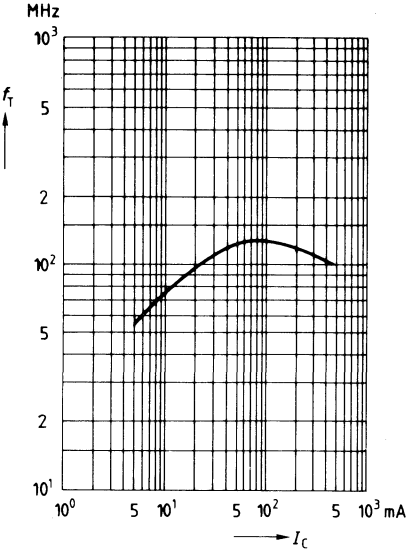
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 10mA, I_B = 0$	BCP 51		45	-	-	V
	BCP 52		60	-	-	V
	BCP 53		80	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 100\mu A, I_B = 0$	BCP 51		45	-	-	V
	BCP 52		60	-	-	V
	BCP 53		100	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 10\mu A, I_C = 0$			5	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 30$ V, $I_E = 0$			-	-	100	nA
$V_{CB} = 30$ V, $I_E = 0$, $T_A = 150$ °C			-	-	20	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 5$ V, $I_C = 0$			-	-	10	µA
DC current gain 1)		h_{FE}				
$I_C = 5$ mA, $V_{CE} = 2$ V			25	-	-	-
$I_C = 150$ mA, $V_{CE} = 2$ V						
	BCP 51/BCP 52/BCP 53		40	-	250	-
	BCP 51/BCP 52/BCP 53-10		63	100	160	-
	BCP 51/BCP 52/BPC 53-16		100	160	250	-
$I_C = 500$ mA, $V_{CE} = 2$ V			25	-	-	-
Collector-emitter saturation voltage 1)		V_{CEsat}				
$I_C = 500$ mA, $I_B = 50$ mA			-	-	0.5	V
Base-emitter voltage 1)		V_{BE}				
$I_C = 500$ mA, $V_{CE} = 2$ V			-	-	1	V
AC Characteristics						
Transition frequency		f_T				
$I_C = 50$ mA, $V_{CE} = 10$ V, $f = 100$ MHz			-	125	-	MHz

1) Pulse test conditions: t ≤ 300µs; D = 2%

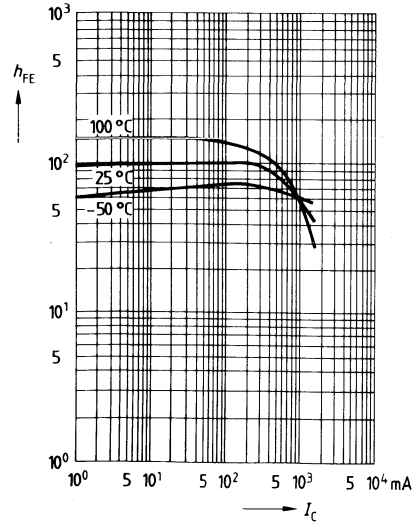
Total power dissipation $P_{tot} = f(T_A)$



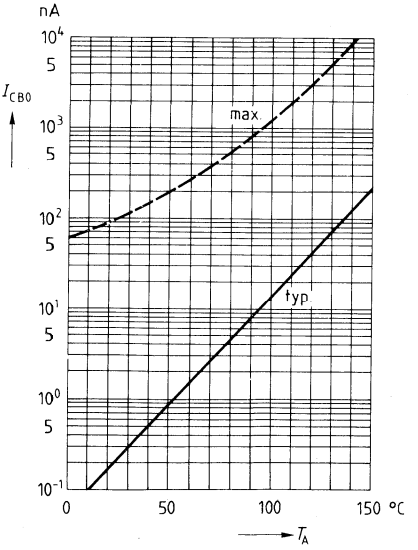
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V



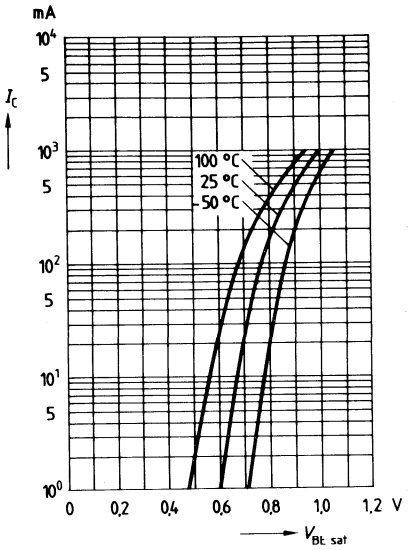
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 2$ V



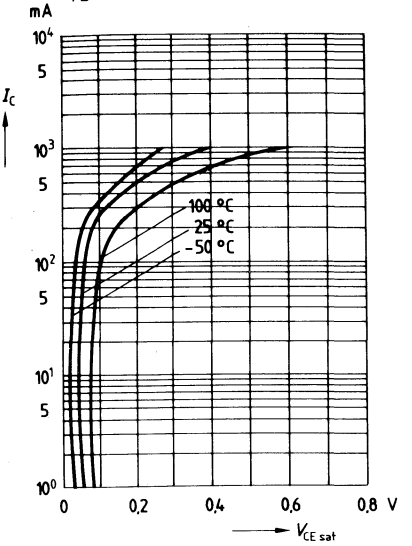
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 30$ V



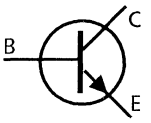
Base-emitter saturation voltage $I_C = f(V_{BE\,sat})$
$h_{FE} = 10$

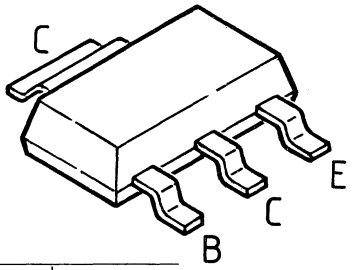


Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$
$h_{FE} = 10$



- For AF driver and output stages
- High collector current
- Low collector -emitter saturation voltage
- Complementary types: BCP51...BCP53 (PNP)





Type	Marking	Ordering code (12-mm tape)	Package*
BCP 54	BCP 54	Q62702 - C2117	SOT-223
BCP 54-10	BCP 54-10	Q62702 - C2119	SOT-223
BCP 54-16	BCP 54-16	Q62702 - C2120	SOT-223
BCP 55	BCP 55	Q62702 - C2148	SOT-223
BCP 55-10	BCP 55-10	Q62702 - C2122	SOT-223
BCP 55-16	BCP 55-16	Q62702 - C2123	SOT-223
BCP 56	BCP 56	Q62702 - C2149	SOT-223
BCP 56-10	BCP 56-10	Q62702 - C2125	SOT-223
BCP 56-16	BCP 56-16	Q62702 - C2106	SOT-223

Maximum Ratings

Parameter	Symbol	BCP54	BCP55	BCP56	Unit
Collector-emitter voltage	V_{CEO}	45	60	80	V
$R_{BE} \leq 1k\Omega$	V_{CER}	45	60	100	V
Collector-base voltage	V_{CBO}	45	60	100	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C		1		A
Peak collector current	I_{CM}		1.5		A
Base current	I_B		100		mA
Peak base current	I_{BM}		200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}		1.5		W
Junction temperature	T_j		150		°C
Storage temperature range	T_{stg}	-65	to	+150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

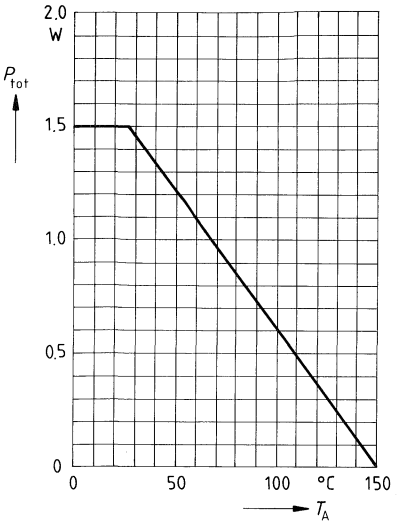
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

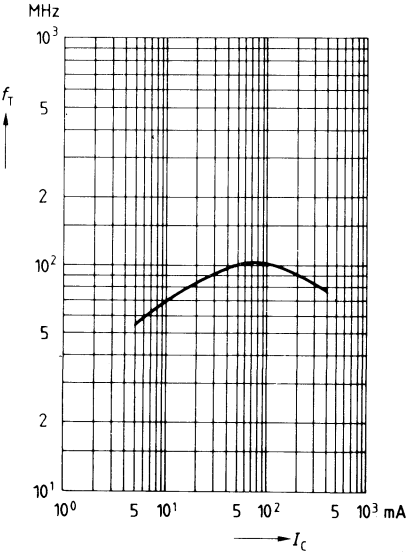
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				
$I_C = 10mA, I_B = 0$ BCP 54		45	-	-	V
BCP 55		60	-	-	V
BCP 56		80	-	-	V
Collector-base breakdown voltage 1)	$V_{(BR)CBO}$				
$I_C = 100\mu A, I_B = 0$ BCP 54		45	-	-	V
BCP 55		60	-	-	V
BCP 56		100	-	-	V
Emitter-base breakdown voltage	$V_{(BR)EBO}$				
$I_E = 10\mu A, I_C = 0$		5	-	-	V
Collector-base cutoff current	I_{CBO}				
$V_{CB} = 30$ V, $I_E = 0$		-	-	100	nA
$V_{CB} = 30$ V, $I_E = 0$, $T_A = 150$ °C		-	-	20	µA
Emitter-base cutoff current	I_{EBO}				
$V_{EB} = 5$V		-	-	10	µA
DC current gain	h_{FE}				
$I_C = 5$ mA, $V_{CE} = 2$ V		25	-	-	-
$I_C = 150$ mA, $V_{CE} = 2$ V					
BCP 54/BCP 55/BCP 56		40	-	250	-
BCP 54/BCP 55/BCP 56-10		63	100	160	-
BCP 54/BCP 55/BCP 56-16		100	160	250	-
$I_C = 500$ mA, $V_{CE} = 2$ V		25	-	-	-
Collector-emitter saturation voltage 1)	V_{CEsat}				
$I_C = 500$ mA, $I_B = 50$ mA		-	-	0.5	V
Base-emitter voltage 1)	V_{BE}				
$I_C = 500$ mA, $V_{CE} = 2$ V		-	-	1	V
AC Characteristics					
Transition frequency	f_T				
$I_C = 50$ mA, $V_{CE} = 10$V, $f = 100$ MHz		-	100	-	MHz

1) Pulse test conditions: t $\leqq$ 300µs; D = 2%

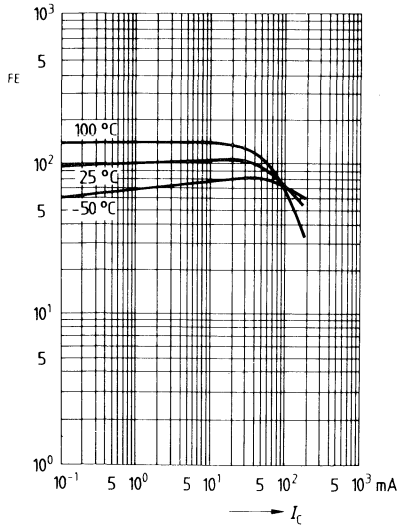
Total power dissipation $P_{tot} = f(T_A)$



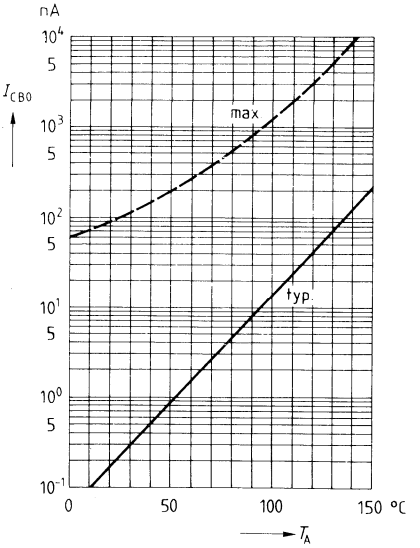
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V



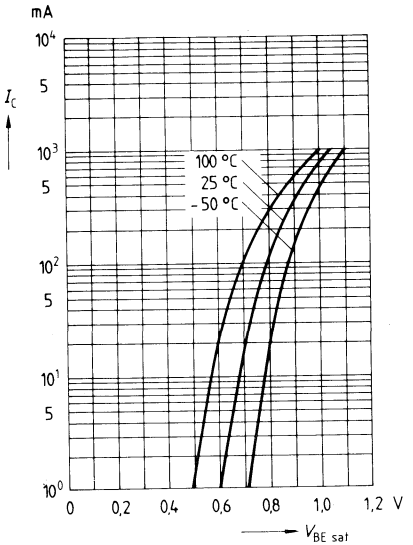
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 2$ V



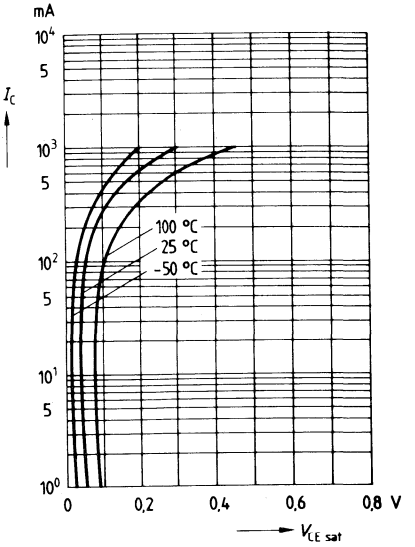
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 30$ V



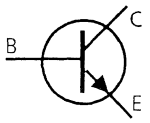
Base-emitter saturation voltage $I_C = f(V_{BE\,sat})$
$h_{FE} = 10$

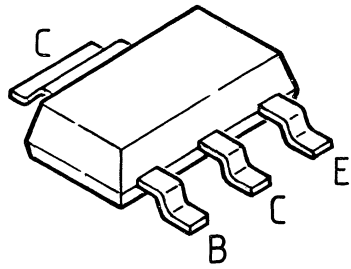


Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$
$h_{FE} = 10$



- For general AF application
- High collector current
- High current gain
- Low collector -emitter saturation voltage
- Complementary type: BCP 69 (PNP)





Type	Marking	Ordering code (12-mm tape)	Package*
BCP 68	BCP 68	Q62702 - C2126	SOT-223

Maximum Ratings

Parameter	Symbol	BCP 68	Unit
Collector-emitter voltage	V_{CEO} V_{CES}	20 25	V V
Collector-base voltage	V_{CBO}	25	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	A
Base current	I_B	100	mA
Peak base current	I_{BM}	200	mA
Total power dissipation, $T_A \leq 25$ °C [1]	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to + 150	°C

Thermal Resistance

Junction - ambient [1]	R_{thJA}	≤ 83.3	K/W

[1] Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

[*] For detailed dimensions see chapter Package Outlines

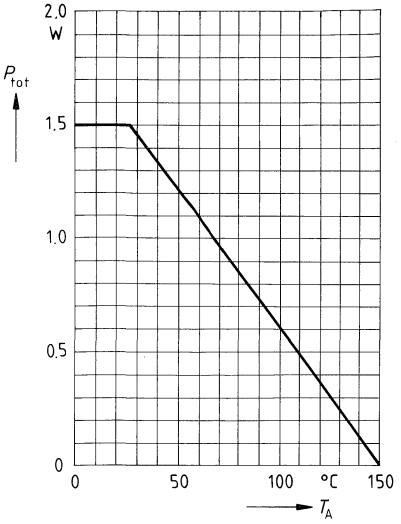
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

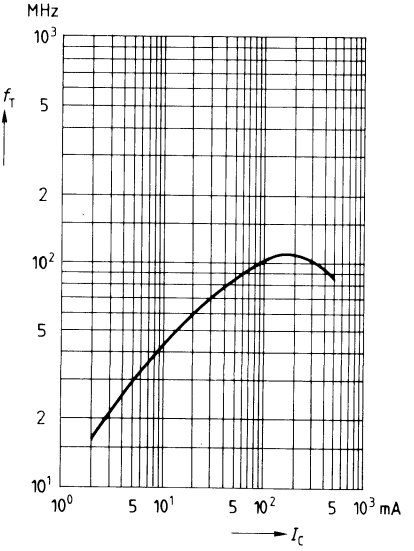
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 30$mA, $I_B = 0$	$V_{(BR)CEO}$	20	-	-	V
Collector-emitter breakdown voltage $I_C = 10\mu$A, $V_{BE} = 0$	$V_{(BR)CES}$	25	-	-	V
Collector-base breakdown voltage $I_C = 10\mu$A, $I_B = 0$	$V_{(BR)CBO}$	25	-	-	V
Emitter-base breakdown voltage $I_E = 10\mu$A, $I_B = 0$	$V_{(BR)EBO}$	5	-	-	V
Collector-base cutoff current $V_{CB} = 25$ V $V_{CB} = 25$ V, $T_A = 150$ °C	I_{CBO}	- -	- -	100 10	nA µA
Emitter-base cutoff current $V_{EB} = 5$ V, $I_C = 0$	I_{EBO}	-	-	10	µA
DC current gain 1) $I_C = 5$ mA, $V_{CE} = 10$ V $I_C = 500$ mA, $V_{CE} = 1$ V $I_C = 1$A, $V_{CE} = 1$V	h_{FE}	50 63 60	- - -	- 400 -	- - -
Collector-emitter saturation voltage 1) $I_C = 1$ A, $I_B = 100$ mA	V_{CEsat}	-	-	0.5	V
Base-emitter voltage 1) $I_C = 5$mA, $V_{CE} = 10$ V $I_C = 1$A, $V_{CE} = 1$V	V_{BE}	- -	0.6 -	- 1	V
AC Characteristics					
Transition frequency $I_C = 100$ mA, $V_{CE} = 5$ V, $f = 100$ MHz	f_T	-	100	-	MHz

1) Pulse test conditions: t ≤ 300µs; D = 2%

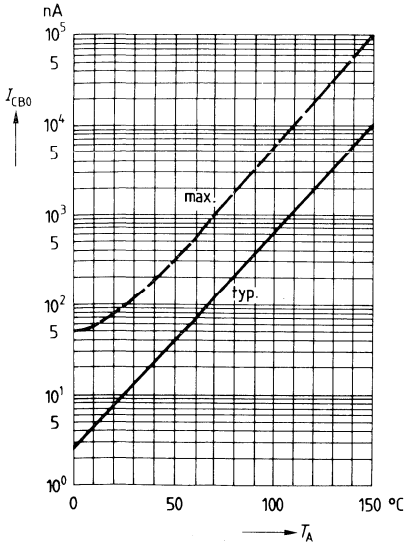
Total power dissipation $P_{tot} = f(T_A)$



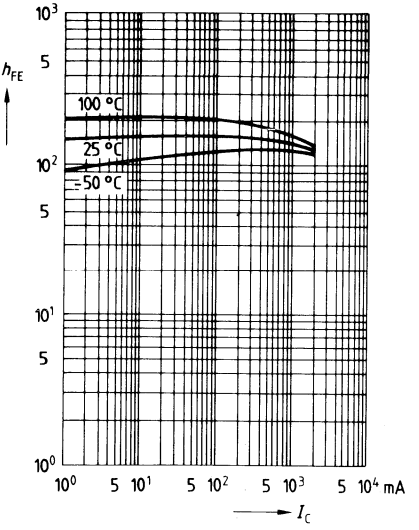
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 100$ MHz



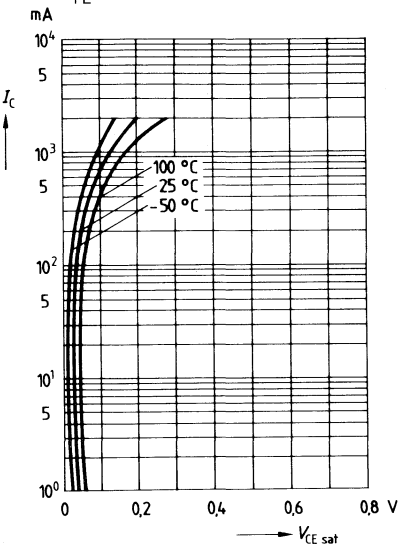
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CE} = 30$ V



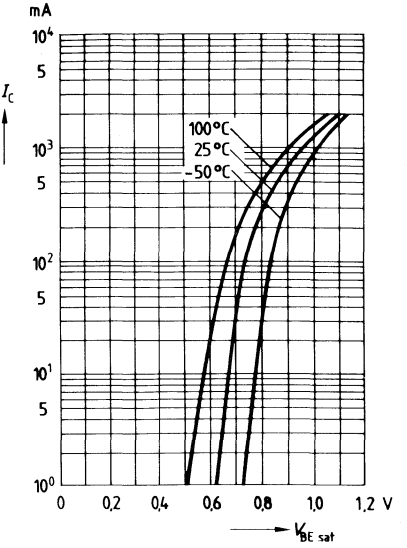
DC current gain $h_{FE} = f(I_C)$
$V_{CB} = 1$ V



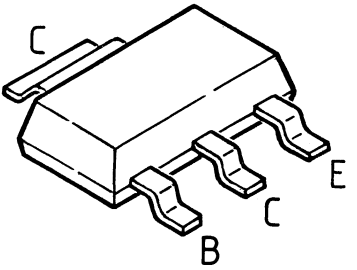
Collector-emitter saturation voltage
$I_c = f(V_{CE\,sat})$
$h_{FE} = 10$

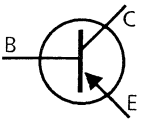


Base-emitter saturation voltage $I_c = f(V_{BE\,sat})$
$h_{FE} = 10$



- For general AF application
- High collector current
- High current gain
- Low collector -emitter saturation voltage
- Complementary type: BCP 68 (NPN)





Type	Marking	Ordering code (12-mm tape)	Package*
BCP 69	BCP 69	Q62702 - C2130	SOT-223

Maximum Ratings

Parameter	Symbol	BCP 69	Unit
Collector-emitter voltage	V_{CEO} V_{CES}	20 25	V V
Collector-base voltage	V_{CBO}	25	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	A
Base current	I_B	100	mA
Peak base current	I_{BM}	200	mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to +150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

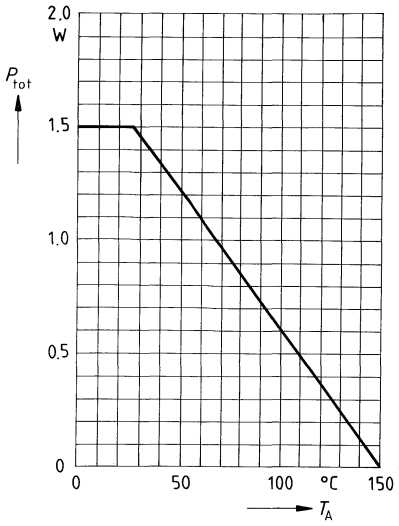
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

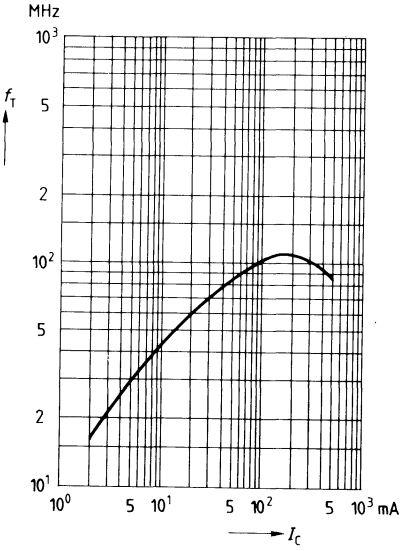
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 30$mA, $I_B = 0$	$V_{(BR)CEO}$	20	-	-	V
Collector-emitter breakdown voltage $I_C = 10\mu$A, $V_{BE} = 0$	$V_{(BR)CES}$	25	-	-	V
Collector-base breakdown voltage $I_C = 10\mu$A, $I_B = 0$	$V_{(BR)CBO}$	25	-	-	V
Emitter-base breakdown voltage $I_E = 10\mu$A, $I_B = 0$	$V_{(BR)EBO}$	5	-	-	V
Collector-base cutoff current $V_{CB} = 25$ V $V_{CB} = 25$ V, $T_A = 150$°C	I_{CBO}	- -	- -	100 10	nA µA
Emitter-base cutoff current $V_{EB} = 5$ V, $I_C = 0$	I_{EBO}	-	-	10	µA
DC current gain 1) $I_C = 5$ mA, $V_{CE} = 10$ V $I_C = 500$ mA, $V_{CE} = 1$ V $I_C = 1$A, $V_{CE} = 1$V	h_{FE}	50 63 60	- - -	- 400 -	- - -
Collector-emitter saturation voltage 1) $I_C = 1$ A, $I_B = 100$ mA	V_{CEsat}	-	-	0.5	V
Base-emitter voltage 1) $I_C = 5$mA, $V_{CE} = 10$ V $I_C = 1$A, $V_{CE} = 1$V	V_{BE}	- -	0.6 -	- 1	V
AC Characteristics					
Transition frequency $I_C = 100$ mA, $V_{CE} = 5$ V, $f = 100$ MHz	f_T	-	100	-	MHz

1) Pulse test conditions: t ≦ 300µs; D = 2%

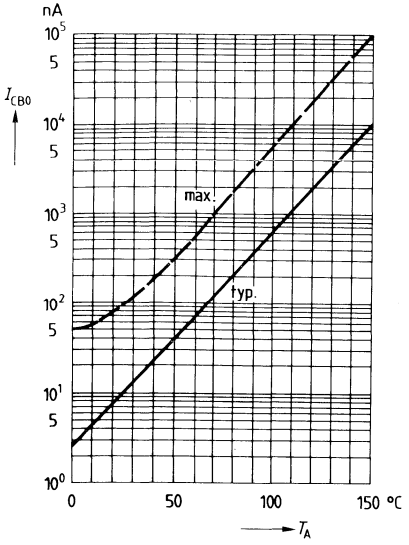
Total power dissipation $P_{tot} = f(T_A)$



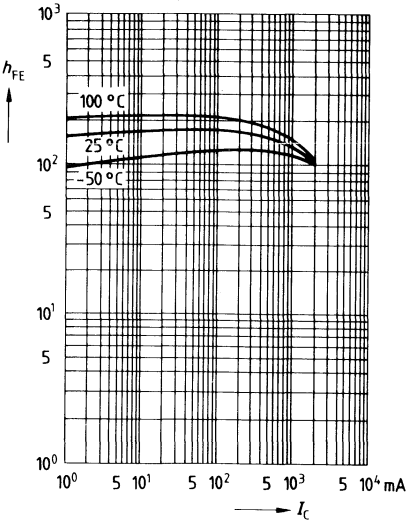
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 100$ MHz



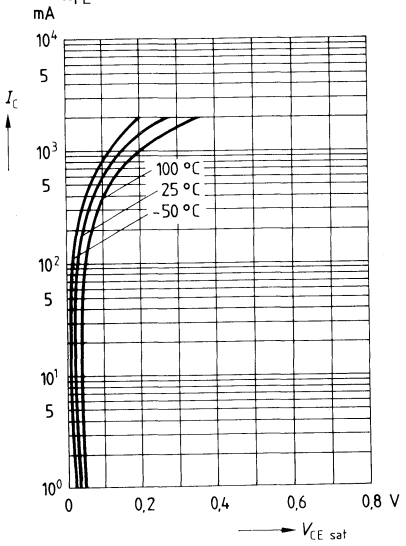
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CE} = 30$ V



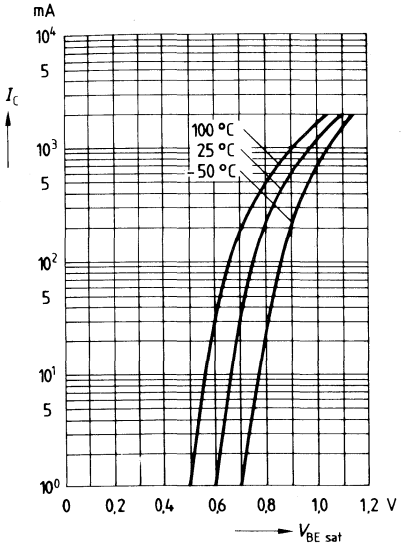
DC current gain $h_{FE} = f(I_C)$
$V_{CB} = 1$ V



Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$
$h_{FE} = 10$

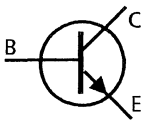


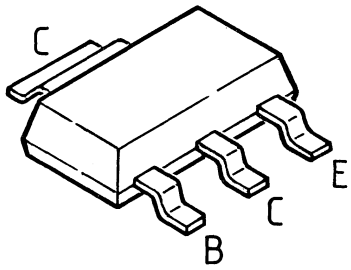
Base-emitter saturation voltage $I_C = f(V_{BE\,sat})$
$h_{FE} = 10$



Silicon Switching Transistors

- High DC current gain: 0.1 to 500 mA
- Low collector -emitter saturation voltage
- Complementary types: PZT 2907 (PNP)
  PZT 2907A (PNP)





Type	Marking	Ordering code (12-mm tape)	Package*
PZT 2222	ZT 2222	Q62702 - Z2026	SOT-223
PZT 2222A	ZT 2222A	Q62702 - Z2027	SOT-223

Maximum Ratings

Parameter	Symbol	PZT 2222	PZT 2222A	Unit
Collector-emitter voltage	V_{CEO}	30	40	V
Collector-base voltage	V_{CBO}	60	75	V
Emitter-base voltage	V_{EBO}	5	6	V
Collector current	I_C	600		mA
Total power dissipation, $T_A \leq 25°C$[1]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to + 150		°C

Thermal Resistance

Junction -ambient [1]	R_{thJA}	≤ 83.3	K/W

[1]) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm.
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines.

Characteristics

at $T_A = 25$ °C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
$I_C = 10$ mA, $I_B = 0$	PZT 2222		30	-	-	
	PZT 2222A		40	-	-	
Collector-base breakdown voltage		$V_{(BR)CBO}$				V
$I_C = 10$ µA, $I_B = 0$	PZT 2222		60	-	-	
	PZT 2222A		75	-	-	
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 10$ µA, $I_E = 0$	PZT 2222		5	-	-	V
	PZT 2222A		6	-	-	
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 50$ V, $I_E = 0$	PZT 2222		-	-	20	nA
	PZT 2222A		-	-	10	nA
$V_{CB} = 50$ V, $I_E = 0$, $T_A = 150$ °C	PZT 2222		-	-	20	µA
	PZT 2222A		-	-	10	µA
Emitter-base cutoff current		I_{EBO}				nA
$V_{EB} = 3$ V, $I_C = 0$			-	-	10	
Collector-emitter cutoff current		I_{CEV}				nA
$V_{CE} = 30$ V,$-V_{BE} = 0.5$ V			-	-	50	
Emitter-base cutoff current		I_{EBV}				nA
$V_{CE} = 30$ V,$-V_{BE} = 0.5$ V			-	-	50	
DC current gain 1)		h_{FE}				
$I_C = 0.1$ mA, $V_{CE} = 10$ V			35	-	-	-
$I_C = 1$ mA, $V_{CE} = 10$ V			50	-	-	-
$I_C = 10$ mA, $V_{CE} = 10$ V			75	-	-	-
$I_C = 150$ mA, $V_{CE} = 10$ V			100	-	300	-
$I_C = 500$ mA, $V_{CE} = 10$ V	PZT 2222		30	-	-	-
	PZT 2222A		40	-	-	-
Collector-emitter saturation voltage 1)		V_{CEsat}				V
$I_C = 150$ mA, $I_B = 15$ mA	PZT 2222		-	-	0.4	
	PZT 2222A		-	-	0.3	
$I_C = 500$ mA,$I_B = 50$ mA	PZT 2222		-	-	1.6	
	PZT 2222A		-	-	1.0	
Base-emitter saturation voltage 1)		V_{BEsat}				V
$I_C = 150$ mA, $I_B = 15$ mA	PZT 2222		-	-	1.3	
	PZT2222A		-	-	1.2	
$I_C = 500$ mA,$I_B = 50$ mA	PZT 2222		-	-	2.6	
	PZT2222A			-	2.0	

1) Pulse test conditions: t ≦ 300µs; D = 2%

AC Characteristics

Transition frequency I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	f_T	200	-	-	MHz
Collector-base capacitance V_{CB} = 10 V, f = 1 MHz	C_{ob}	-	-	8	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ib}	-	-	30	pF
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA (see Fig.2)					
Delay time	t_d	-	-	10	ns
Rise time	t_r	-	-	25	ns
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA (see Fig.3)					
Storage time	t_{stg}	-	-	225	ns
Fall time	t_f	-	-	60	ns

1) Pulse test conditions: t ≤ 300µs; D = 2%

Turn-on time (see Fig.2) when switched to I_{Con} = 150mA; I_{Bon} = 15mA

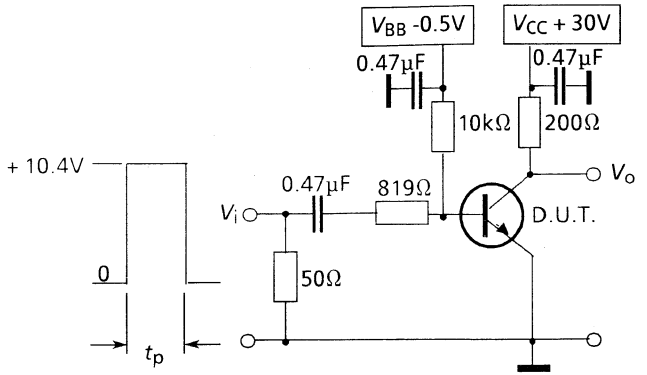


Fig.2 Input waveform and test circuit for determining delay,rise and turn-on time

Turn-off time (see Fig.3) when switched to I_{Con} = 150mA; I_{Bon} = 15mA to cut-off with $-I_{Boff}$ = 15mA

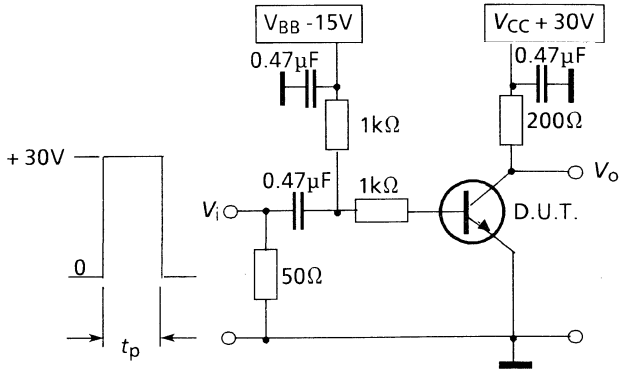


Fig.3 Input waveform and test circuit for determining storage,fall and turn-off time

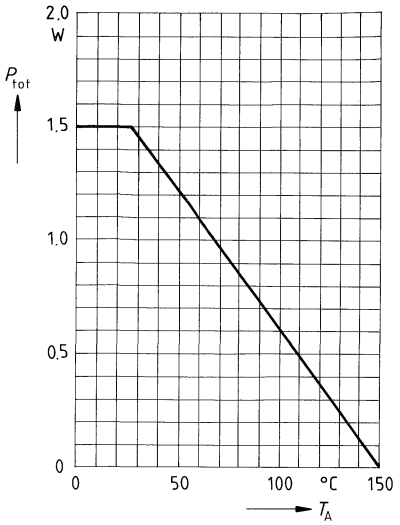
Pulse generator (see Fig.2 and 3)

duty factor	$D = 2\%$
pulse duration	$t_P = 200ns$
rise time	$t_r \leqq 2ns$
output impedance	$Z_o = 50\Omega$

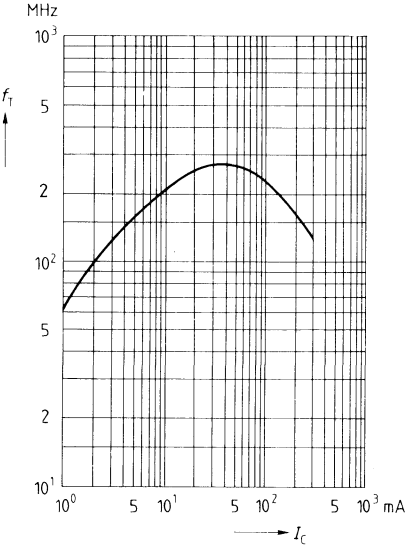
Oscilloscope (see Fig.2 and 3)

rise time	$t_r \leqq 5ns$
output impedance	$Z_i = 10M\Omega$

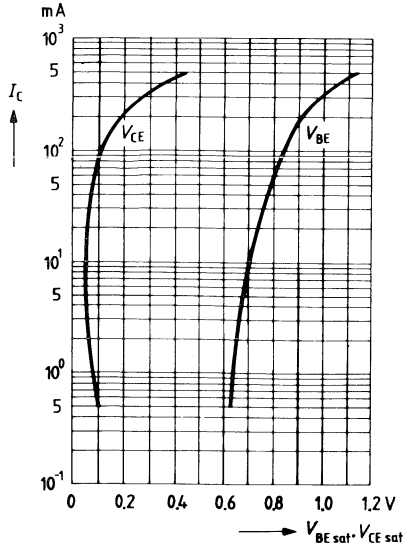
Total power dissipation $P_{tot} = f(T_A)$



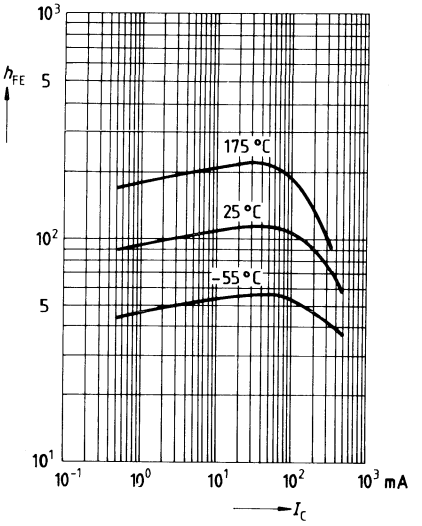
Transition frequency $f_T = f(I_c)$
$V_{CE} = 20$ V, $f = 100$ MHz



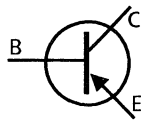
Saturation voltage $I_c = f(V_{BE\,sat}, V_{CE\,sat})$
$h_{FE} = 10$

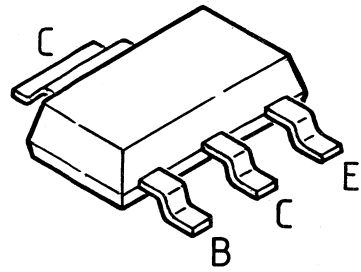


DC current gain $h_{FE} = f(I_c)$
$V_{CE} = 10$ V



- High DC current gain: 0.1 to 500 mA
- Low collector -emitter saturation voltage
- Complementary types: PZT 2222 (NPN)
  PZT 2222A (NPN)





Type	Marking	Ordering code (12-mm tape)	Package*
PZT 2907	ZT 2907	Q62702 - Z2028	SOT-223
PZT 2907A	ZT 2907A	Q62702 - Z2025	SOT-223

Maximum Ratings

Parameter	Symbol	PZT 2907	PZT 2907A	Unit
Collector-emitter voltage	V_{CEO}	40	60	V
Collector-base voltage	V_{CBO}	60	60	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	600		mA
Total power dissipation, $T_A \leq 25°C$ [1])	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient [1])	R_{thJA}	≤ 83.3	K/W

[1]) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1,5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

Characteristics

at $T_A = 25$ °C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 10$ mA, $I_B = 0$	PZT 2907		40	-	-	V
	PZT 2907A		60	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 10$ µA, $I_B = 0$	PZT 2907		60	-	-	V
	PZT 2907A		60	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 10$ µA, $I_E = 0$			5	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 50$ V, $I_E = 0$	PZT 2907		-	-	20	nA
	PZT 2907A		-	-	10	nA
$V_{CB} = 50$ V, $I_E = 0$, $T_A = 150$ °C	PZT 2907		-	-	20	µA
	PZT 2907A		-	-	10	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 3$ V, $I_C = 0$			-	-	10	nA
Collector-emitter cutoff current		I_{CEV}				
$V_{CE} = 30$ V, + $V_{BE} = 0.5$ V			-	-	50	nA
Collector-base cutoff current		I_{EBV}				
$V_{CE} = 30$ V, + $V_{BE} = 0.5$ V			-	-	50	nA
DC current gain 1)		h_{FE}				
$I_C = 0.1$ mA, $V_{CE} = 10$ V	PZT 2907		35	-	-	-
	PZT 2907A		75	-	-	-
$I_C = 1$ mA, $V_{CE} = 10$ V	PZT 2907		50	-	-	-
	PZT 2907A		100	-	-	-
$I_C = 10$ mA, $V_{CE} = 10$ V	PZT 2907		75	-	-	-
	PZT 2907A		100	-	-	-
$I_C = 150$ mA, $V_{CE} = 10$ V	PZT 2907		100	-	300	-
	PZT 2907A		100	-	300	-
$I_C = 500$ mA, $V_{CE} = 10$ V	PZT 2907		30	-	-	-
	PZT 2907A		50	-	-	-
Collector-emitter saturation voltage 1)		V_{CEsat}				
$I_C = 150$ mA, $I_B = 15$ mA			-	-	0.4	V
$I_C = 500$ mA, $I_B = 50$ mA			-	-	1.6	V
Base-emitter saturation voltage 1)		V_{BEsat}				
$I_C = 150$ mA, $I_B = 15$ mA			-	-	1.3	V
$I_C = 500$ mA, $I_B = 50$ mA			-	-	2.6	V

1) Pulse test conditions: t ≦ 300µs; D = 2%

AC Characteristics

Transition frequency $I_C = 20$ mA, $V_{CE} = 20$ V, $f = 100$ MHz	f_T	200	-	-	MHz
Collector-base capacitance $V_{CB} = 10$ V, $f = 1$ MHz	C_{ob}	-	-	8	pF
Input capacitance $V_{EB} = 0.5$ V, $f = 1$ MHz	C_{ib}	-	-	30	pF
$V_{CC} = 30$ V, $I_C = 150$ mA, $I_{B1} = 15$ mA (see Fig.2)					
Delay time	t_d	-	-	10	ns
Rise time	t_r	-	-	40	ns
$V_{CC} = 6$ V, $I_C = 150$ mA, $I_{B1} = I_{B2} = 15$ mA (see Fig.3)					
Storage time	t_{stg}	-	-	80	ns
Fall time	t_f	-	-	30	ns

Turn-on time (see Fig.2)

when switched to-I_{Con} = 150mA;-I_{Bon} = 15mA

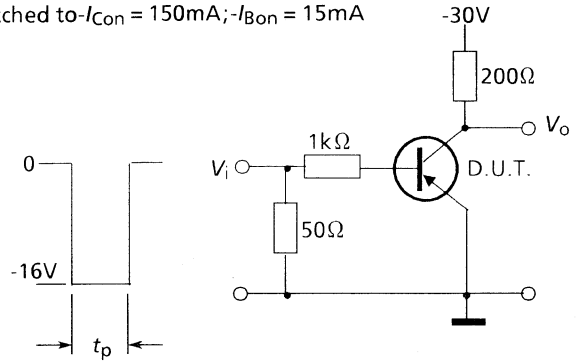


Fig.2 Input waveform and test circuit for determining delay,rise and turn-on time

Turn-off time (see Fig.3)

when switched to-I_{Con} = 150mA;-I_{Bon} = 15mA
to cut-off with + I_{Boff} = 15mA

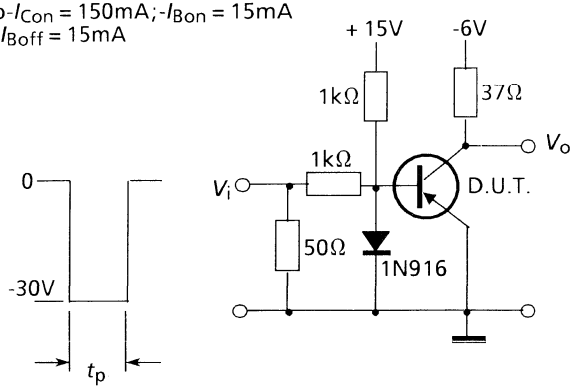


Fig.3 Input waveform and test circuit for determining storage,fall and turn-off time

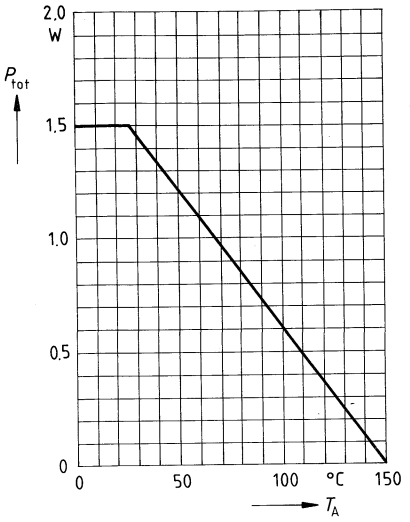
Pulse generator (see Fig.2 and 3)

duty factor	$D = 2\%$
pulse duration	$t_P = 200ns$
rise time	$t_r \leqq 2ns$
output impedance	$Z_o = 50\Omega$

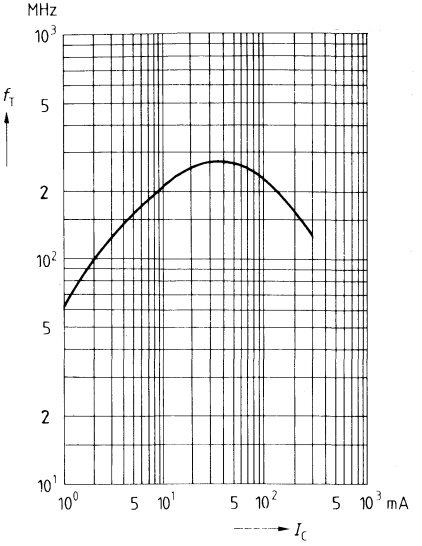
Oscilloscope (see Fig.2 and 3)

rise time	$t_r \leqq 5ns$
output impedance	$Z_i = 10M\Omega$

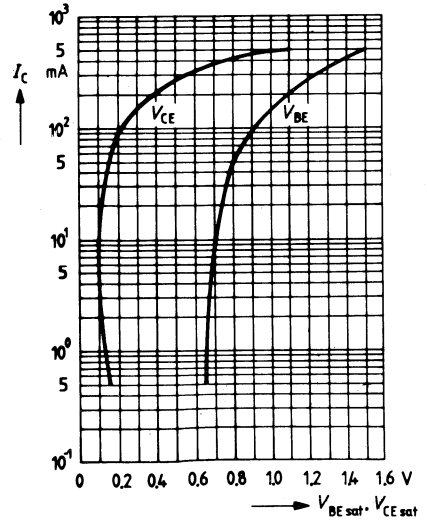
Total power dissipation $P_{tot} = f(T_A)$



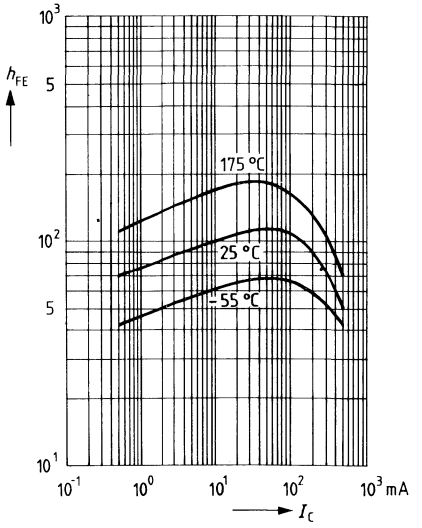
Transition frequency $f_T = f(I_C)$
$V_{CE} = 20$ V, $f = 100$ MHz



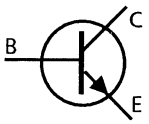
Saturation voltage $I_C = f(V_{BE\,sat}, V_{CE\,sat})$
$h_{FE} = 10$

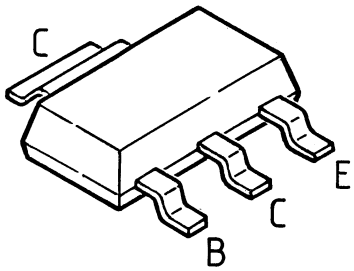


DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



- High DC current gain 0.1 to 100 mA
- Low collector -emitter saturation voltage
- Complementary type: PZT 3906 (PNP)





Type	Marking	Ordering code (12–mm tape)	Package*
PZT 3904	ZT 3904	Q62702 - Z2029	SOT-223

Maximum Ratings

Parameter	Symbol	PZT 3904	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	200	mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to +150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

Characteristics
at $T_A = 25$ °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$	$V_{(BR)CEO}$	40	-	-	V
Collector-base breakdown voltage $I_C = 10$ µA, $I_B = 0$	$V_{(BR)CBO}$	60	-	-	V
Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$	$V_{(BR)EBO}$	6	-	-	V
Collector-base cutoff current $V_{CB} = 30$ V, $I_E = 0$	I_{CBO}	-	-	50	nA
Collector -emitter cutoff current $V_{CE} = 30$ V,-$V_{BE} = 0{,}5$ V	I_{CEV}	-	-	50	nA
Base-emitter cutoff current $V_{CE} = 30$ V,-$V_{BE} = 0{,}5$ V	I_{BEV}	-	-	50	nA
DC current gain 1) $I_C = 0.1$ mA, $V_{CE} = 1$ V $I_C = 1$ mA, $V_{CE} = 1$ V $I_C = 10$ mA, $V_{CE} = 1$ V $I_C = 50$ mA, $V_{CE} = 1$ V $I_C = 100$ mA, $V_{CE} = 1$ V	h_{FE}	 40 70 100 60 30	 - - - - -	 - - 300 - -	 - - - - -
Collector-emitter saturation voltage 1) $I_C = 10$ mA, $I_B = 1$ mA $I_C = 50$ mA, $I_B = 5$ mA	V_{CEsat}	 - -	 - -	 0.2 0.3	 V V
Base-emitter saturation voltage 1) $I_C = 10$ mA, $I_C = 1$ mA $I_C = 50$ mA, $I_C = 5$ mA	V_{BEsat}	 - -	 - -	 0.85 0.95	 V V

1) Pulse test conditions: t ≦ 300µs; D = 2%

AC Characteristics

Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	-	-	MHz
Collector-base cpacitance V_{CB} = 5 V,f = 1 MHz	C_{ob}	-	-	4	pF
Input capacitance V_{EB} = 0.5 V,f = 1 MHz	C_{ib}	-	-	8	pF
Noise figure I_C = 100 µA,V_{CE} = 5 V,R_S = 1kΩ, f = 10 Hz to 15.7 kHz	F	-	-	5	dB
Input impedance I_C = 1 mA,V_{CE} = 10 V, f = 1 kHz	h_{11e}	1	-	10	kΩ
Open-circuit reverse voltage transfer ratio I_C = 1 mA,V_{CE} = 10 V, f = 1 kHz	h_{12e}	0.5	-	8	10^{-4}
Short-circuit forward current transfer ratio I_C = 1 mA,V_{CE} = 10 V, f = 1 kHz	h_{21e}	100	-	400	-
Open circuit output admittance I_C = 1 mA,V_{CE} = 10 V, f = 1 kHz	h_{22e}	1	-	40	µS
V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA $V_{BE(off)}$ = 0.5 V					
Delay time	t_d	-	-	35	ns
Rise time	t_r	-	-	35	ns
V_{CC} = 3 V,I_C = 10 mA, I_{B1} = I_{B2} = 1 mA					
Storage time	t_{stg}	-	-	200	ns
Fall time	t_f	-	-	50	ns

Switching times

Turn-on time (see Figs 2 and 3) when switched from
$-V_{BEoff} = 0.5V$ to $I_{Con} = 10mA; I_{Bon} = 1mA$

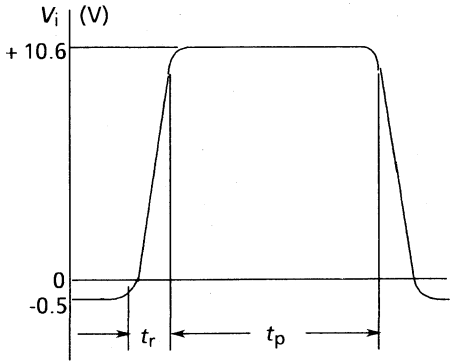


Fig.2 Input waveform; $t_r < 1ns$; $t_p = 300ns$
$\delta = 0.02$

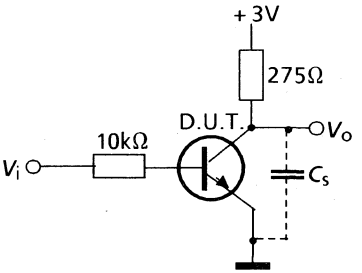


Fig. 3 Delay and rise time test circuit; total shunt capacitance of test jig and connectors $C_s < 4pF$; scope impedance = 10MΩ

Turn-off time (see Figs 4 and 5)
$I_{Con} = 10mA; I_{Bon} = -I_{Boff} = 1mA$

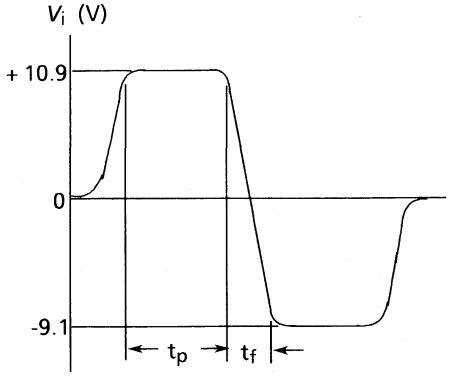


Fig.4 Input waveform; $t_f < 1ns$;
$10\mu s < t_p <= 500\mu s; \delta = 0.02$

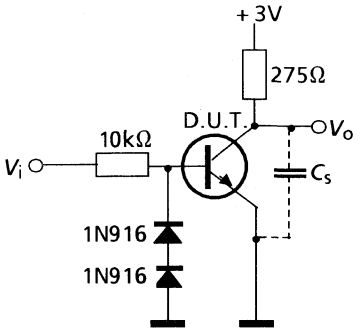
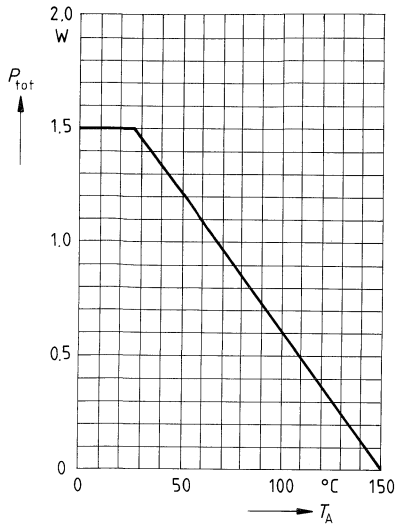
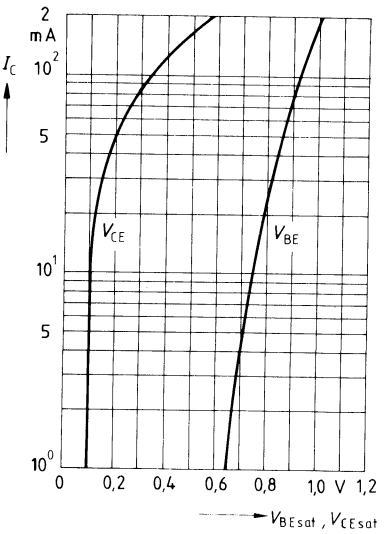


Fig. 5 Storage and fall time test circuit; total shunt capacitance of test jig and connectors $C_s < 4pF$; scope impedance = 10MΩ

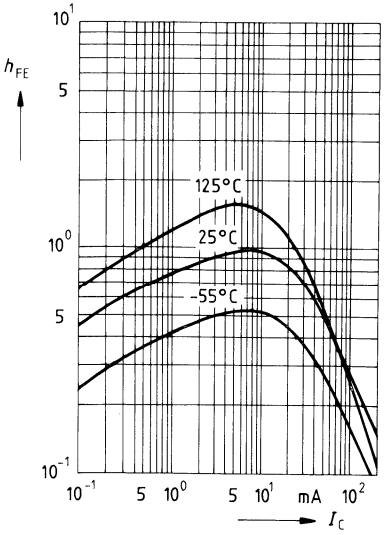
Total power dissipation $P_{tot} = f(T_A)$



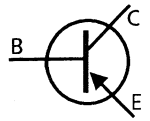
Saturation voltage $I_c = f(V_{BE\ sat}, V_{CE\ sat})$
$h_{FE} = 10$

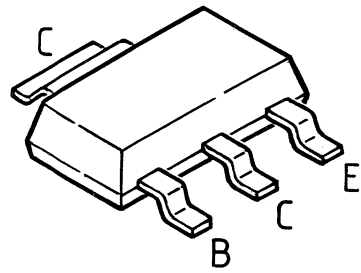


DC current gain $h_{FE} = f(I_c)$
$V_{CE} = 10$ V, normalized



- High DC current gain 0.1 to 100 mA
- Low collector -emitter saturation voltage
- Complementary type: PZT 3904 (NPN)





Type	Marking	Ordering code (12-mm tape)	Package*
PZT 3906	ZT 3906	Q62702 - Z2030	SOT-223

Maximum Ratings

Parameter	Symbol	PZT 3906	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	40	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	200	mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to +150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

Characteristics
at $T_A = 25$ °C, unless otherwise specified.

Parameter	Symbol	Values min.	typ.	max.	Unit
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$	$V_{(BR)CEO}$	40	-	-	V
Collector-base breakdown voltage $I_C = 10$ µA, $I_B = 0$	$V_{(BR)CBO}$	40	-	-	V
Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$	$V_{(BR)EBO}$	5	-	-	V
Collector-base cutoff current $V_{CB} = 30$ V, $I_E = 0$	I_{CBO}	-	-	50	nA
Collector-emitter cutoff current $V_{CE} = 30$ V, + $V_{BE} = 0.5$ V	I_{CEV}	-	-	50	nA
Collector-base cutoff current $V_{CE} = 30$ V; + $V_{BE} = 0.5$ V	I_{BEV}	-	-	50	nA
DC current gain 1) $I_C = 0.1$ mA, $V_{CE} = 1$ V $I_C = 1$ mA, $V_{CE} = 1$ V $I_C = 10$ mA, $V_{CE} = 1$ V $I_C = 50$ mA, $V_{CE} = 1$ V $I_C = 100$ mA, $V_{CE} = 1$ V	h_{FE}	 60 80 100 60 30	 - - - - -	 - - 300 - -	 - - - - -
Collector-emitter saturation voltage 1) $I_C = 10$ mA, $I_B = 1$ mA $I_C = 50$ mA, $I_B = 5$ mA	V_{CEsat}	 - -	 - -	 0.25 0.4	 V V
Base-emitter saturation voltage 1) $I_C = 10$ mA, $I_C = 1$ mA $I_C = 50$ mA, $I_C = 5$ mA	V_{BEsat}	 - -	 - -	 0.85 0.95	 V V

1) Pulse test conditions: t ≦ 300µs; D = 2%

AC Characteristics

Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	250	-	-	MHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz	C_{ob}	-	-	4.5	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ib}	-	-	10	pF
Noise figure I_C = 100 µA, V_{CE} = 5 V, R_S = 1kΩ, f = 10 Hz to 15.7 kHz	F	-	-	4	dB
Input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{11e}	2	-	12	kΩ
Open-circuit reverse voltage transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{12e}	0.1	-	10	10^{-4}
Short-circuit forward current transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{21e}	100	-	400	-
Open circuit output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{22e}	3	-	60	µS
V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA $V_{BE(off)}$ = 0.5 V Delay time Rise time	 t_d t_r	 - -	 - -	 35 35	 ns ns
V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1 mA Storage time Fall time	 t_{stg} t_f	 - -	 - -	 225 75	 ns ns

Switching times

Turn-on time (see Figs 2 and 3) when switched from
$+V_{BEoff} = 0.5V$ to $-I_{Con} = 10mA; -I_{Bon} = 1mA$

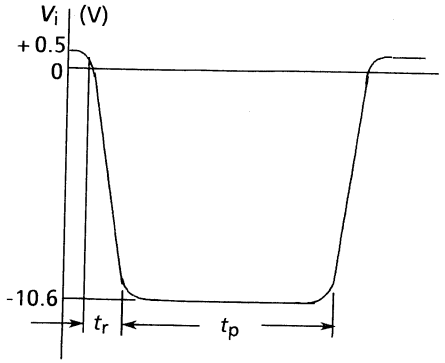


Fig.2 Input waveform; $t_r < 1ns$; $t_p = 300ns$
$\delta = 0.02$

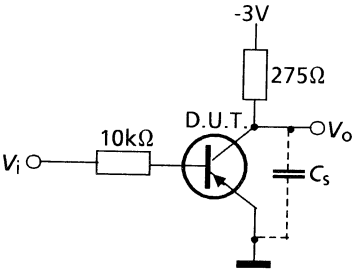


Fig. 3 Delay and rise time test circuit; total shunt capacitance of test jig and connectors $C_s < 4pF$; scope impedance = 10MΩ

Turn-off time (see Figs 4 and 5)
$-I_{Con} = 10mA; -I_{Bon} = I_{Boff} = 1mA$

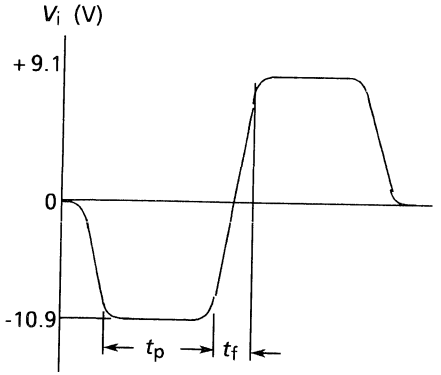


Fig.4 Input waveform; $t_f < 1ns$;
$10\mu s < t_p < = 500\mu s; \delta = 0.02$

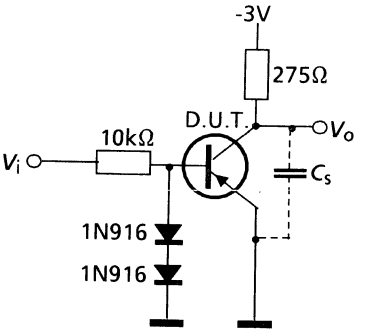
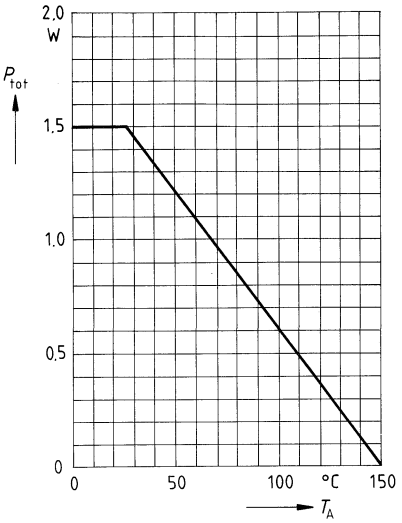
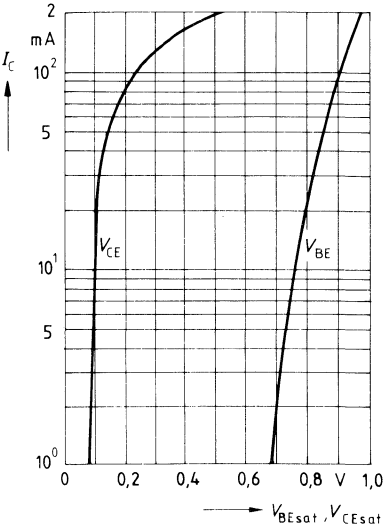


Fig. 5 Storage and fall time test circuit; total shunt capacitance of test jig and connectors $C_s < 4pF$; scope impedance = 10MΩ

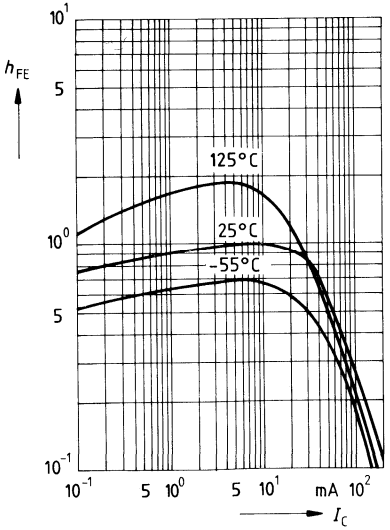
Total power dissipation $P_{tot} = f(T_A)$



Saturation voltage $I_c = f(V_{BE\,sat}, V_{CE\,sat})$
$h_{FE} = 10$

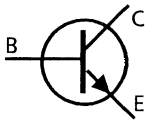


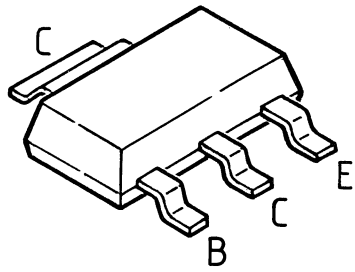
DC current gain $h_{FE} = f(I_c)$
$V_{CE} = 1$ V, normalized



Silicon High-Voltage Transistors

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector -emitter saturation voltage
- Low capacitance
- Complementary types: BF 721/723 (PNP)





Type	Marking	Ordering code (12–mm tape)	Package*
BF 720	BF 720	Q62702 - F1238	SOT-223
BF 722	BF 722	Q62702 - F1306	SOT-223

Maximum Ratings

Parameter	Symbol	BF 720	BF 722	Unit
Collector-emitter voltage	V_{CEO} V_{CER}	- 300	250 -	V V
Collector-base voltage	V_{CBO}	300	250	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	50		mA
Peak collector current	I_{CM}	100		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines.

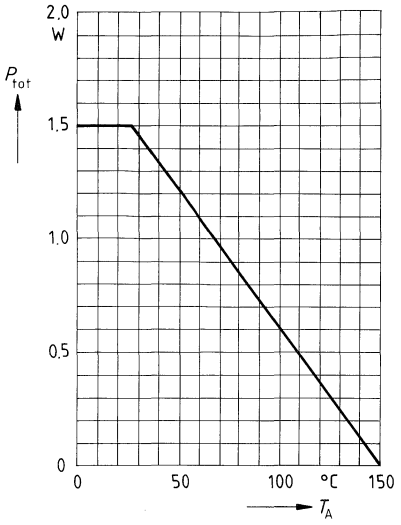
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

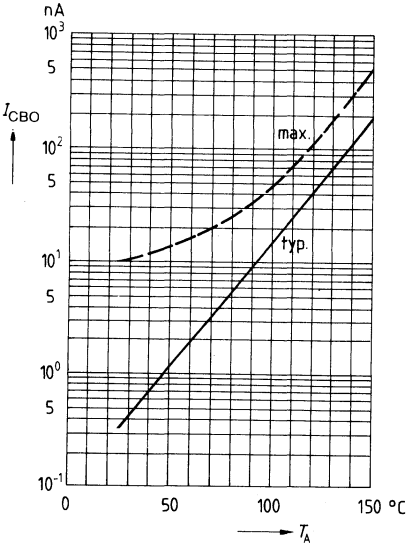
Parameter	Symbol	Values min.	typ.	max.	Unit
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$ BF 722	$V_{(BR)CEO}$	250	-	-	V
Collector-emitter breakdown voltage $I_C = 10$ µA, $R_{BE} = 2.7$kΩ BF 720	$V_{(BR)CER}$	300	-	-	V
Collector-base breakdown voltage $I_C = 10$ µA, $I_B = 0$ BF 720 BF 722	$V_{(BR)CBO}$	300 250	- -	- -	V V
Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$	$V_{(BR)EBO}$	5	-	-	V
Collector-base cutoff current $V_{CB} = 200$ V, $I_E = 0$	I_{CBO}	-	-	10	nA
Collector-emitter cutoff current $V_{CE} = 200$ V, $R_{BE} = 2.7$kΩ $V_{CE} = 200$ V, $R_{BE} = 2.7$kΩ, $T_A = 150$°C	I_{CER}	-	-	50 10	nA µA
Emitter-base cutoff current $V_{EB} = 5$ V, $I_C = 0$	I_{EBO}	-	-	10	µA
DC current gain 1) $I_C = 25$ mA, $V_{CE} = 20$ V	h_{FE}	50	-	-	-
Collector-emitter saturation voltage 1) $I_C = 30$ mA, $I_B = 5$ mA	V_{CEsat}	-	-	0.6	V
AC Characteristics					
Transition frequency $I_C = 10$ mA, $V_{CE} = 10$ V, $f = 100$ MHz	f_T	-	100	-	MHz
Collector-base capacitance $V_{CB} = 30$ V, $I_C = 0$, $f = 1$ MHz	C_{ob}	-	0.8	-	pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

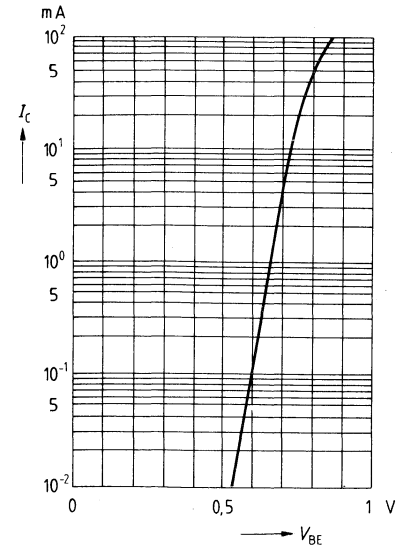
Total power dissipation $P_{tot} = f(T_A)$



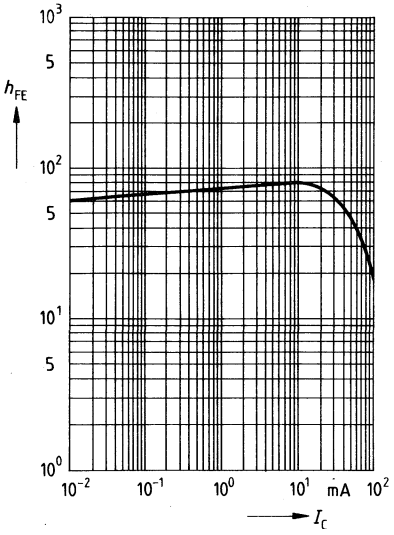
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 200$ V



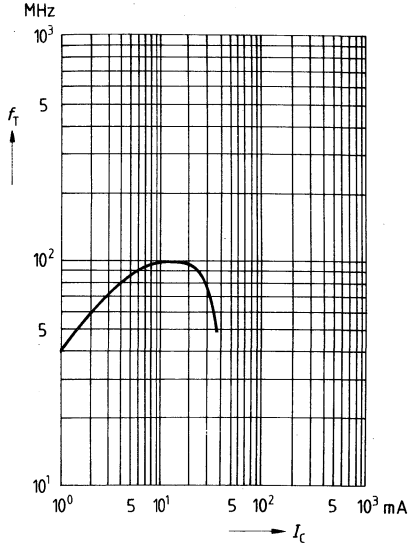
Collector current $I_c = f(V_{BE})$
$V_{CE} = 20$ V



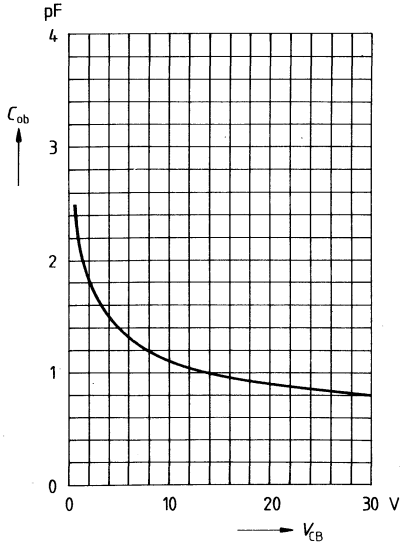
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 20$ V



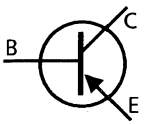
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V, $f = 100$ MHz

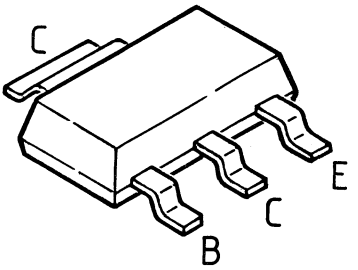


Collector-base capacitance $C_{ob} = f(V_{CB})$
$I_C = 0$, $f = 1$ MHz



- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector -emitter saturation voltage
- Low capacitance
- Complementary types: BF 720/722 (NPN)





Type	Marking	Ordering code (12–mm tape)	Package*
BF 721	BF 721	Q62702 - F1239	SOT-223
BF 723	BF 723	Q62702 - F1309	SOT-223

Maximum Ratings

Parameter	Symbol	BF 721	BF 723	Unit
Collector-emitter voltage	V_{CEO} V_{CER}	- 300	250 -	V
Collector-base voltage	V_{CBO}	300	250	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	50		mA
Peak collector current	I_{CM}	100		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to + 150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

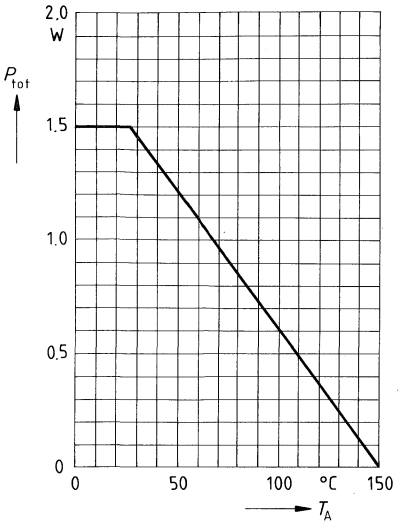
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

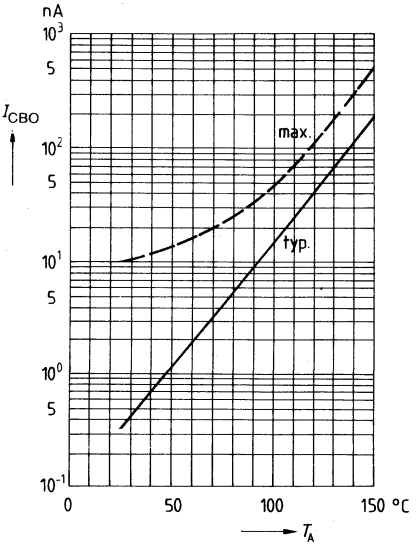
Parameter	Symbol	Values min.	typ.	max.	Unit
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$ BF 723	$V_{(BR)CEO}$	250	-	-	V
Collector-emitter breakdown voltage $I_C = 10$ µA, $R_{BE} = 2.7$kΩ BF 721	$V_{(BR)CER}$	300	-	-	V
Collector-base breakdown voltage $I_C = 10$ µA, $I_B = 0$ BF 721 BF 723	$V_{(BR)CBO}$	300 250	- -	- -	V V
Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$	$V_{(BR)EBO}$	5	-	-	V
Collector-base cutoff current $V_{CB} = 200$ V, $I_E = 0$	I_{CBO}	-	-	10	nA
Collector-emitter cutoff current $V_{CE} = 200$ V, $R_{BE} = 2.7$kΩ $V_{CE} = 200$ V, $R_{BE} = 2.7$kΩ, $T_A = 150$°C	I_{CER}	-	-	50 10	nA µA
Emitter-base cutoff current $V_{EB} = 5$ V, $I_C = 0$	I_{EBO}	-	-	10	µA
DC current gain 1) $I_C = 25$ mA, $V_{CE} = 20$ V	h_{FE}	50	-	-	-
Collector-emitter saturation voltage $I_C = 30$ mA, $I_B = 5$ mA	V_{CEsat}	-	-	0.6	V
AC Characteristics					
Transition frequency $I_C = 10$ mA, $V_{CE} = 10$ V, $f = 100$ MHz	f_T	-	100	-	MHz
Collector-base capacitance $V_{CB} = 30$ V, $I_C = 0$, $f = 1$ MHz	C_{ob}	-	0.8	-	pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

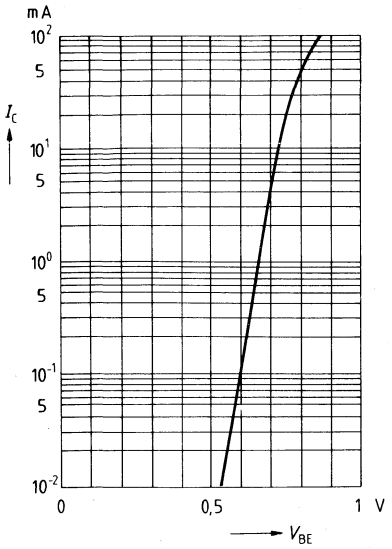
Total power dissipation $P_{tot} = f(T_A)$



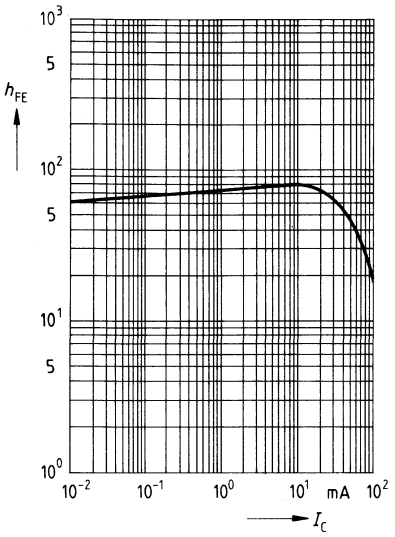
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 200$ V



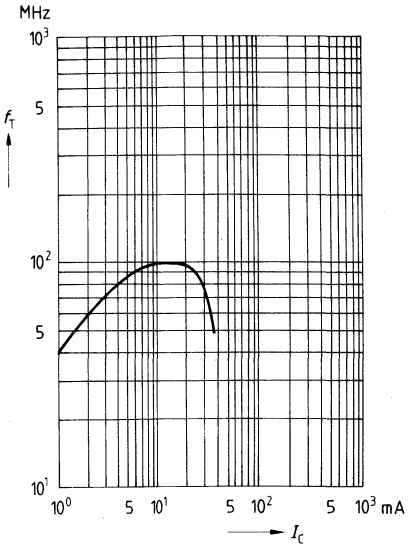
Collector current $I_c = f(V_{BE})$
$V_{CE} = 20$ V



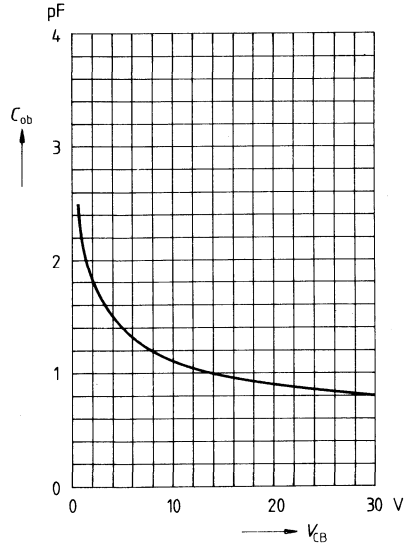
DC current gain $h_{FE} = f(I_c)$
$V_{CE} = 20$ V



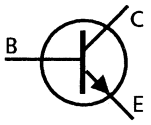
Transition frequency $f_T = f(I_c)$
$V_{CE} = 10$ V, $f = 100$ MHz

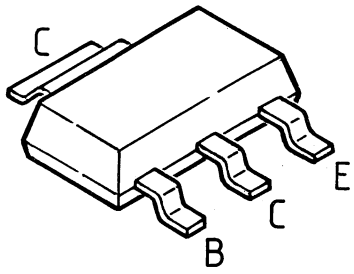


Collector-base capacitance $C_{ob} = f(V_{CB})$
$I_C = 0$, $f = 1$ MHz



- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector -emitter saturation voltage
Complementary types: BFN 37/39 (PNP)





Type	Marking	Ordering code (12–mm tape)	Package*
BFN 36	BFN 36	Q62702 - F1246	SOT-223
BFN 38	BFN 38	Q62702 - F1303	SOT-223

Maximum Ratings

Parameter	Symbol	BFN 36	BFN 38	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	V
Emitter-base voltage	V_{EBO}	5		V
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		mA
Base current	I_B	100		mA
Peak base current	I_{BM}	200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

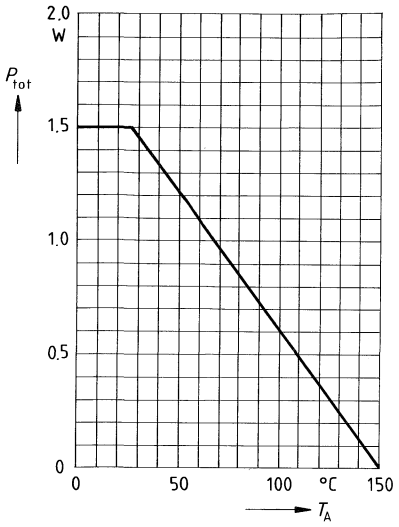
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

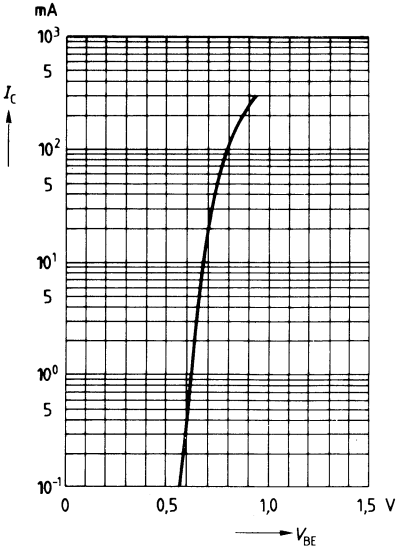
Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 1$ mA, $I_B = 0$	BFN 36		250	-	-	V
	BFN 38		300	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 100$ µA, $I_B = 0$	BFN 36		250	-	-	V
	BFN 38		300	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 100$ µA, $I_B = 0$			5	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 200$ V	BFN 36		-	-	100	nA
$V_{CB} = 250$ V	BFN 38		-	-	100	nA
$V_{CB} = 200$ V, $T_A = 150$°C	BFN 36		-	-	20	µA
$V_{CB} = 250$ V, $T_A = 150$°C	BFN 38		-	-	20	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 4$ V, $I_C = 0$			-	-	100	nA
DC current gain 1)		h_{FE}				
$I_C = 1$ mA, $V_{CE} = 10$ V			25	-	-	-
$I_C = 10$ mA, $V_{CE} = 10$ V			40	-	-	-
$I_C = 30$ mA, $V_{CE} = 10$ V	BFN 36		40	-	-	-
$I_C = 30$ mA, $V_{CE} = 10$ V	BFN 38		30	-	-	-
Collector-emitter saturation voltage 1)		V_{CEsat}				
$I_C = 20$ mA, $I_B = 2$ mA	BFN 36		-	-	0.4	V
	BFN 38				0.5	V
Base-emitter saturation voltage 1)		V_{BEsat}				
$I_C = 20$ mA, $I_B = 2$ mA			-	-	0.9	V
AC Characteristics						
Transition frequency		f_T				
$I_C = 20$ mA, $V_{CE} = 10$ V, $f = 100$ MHz			-	70	-	MHz
Output capacitance		C_{ob}				
$V_{CB} = 30$ V, $f = 1$ MHz			-	1.5	-	pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

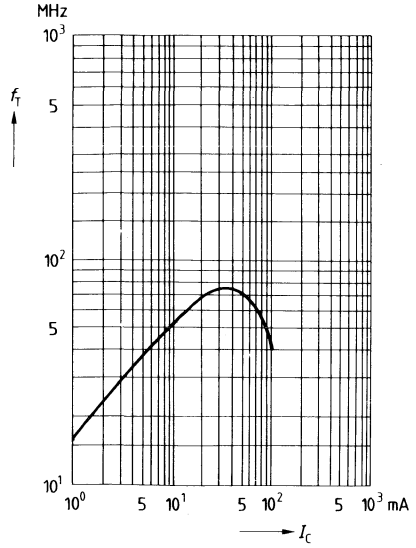
Total power dissipation $P_{tot} = f(T_A)$



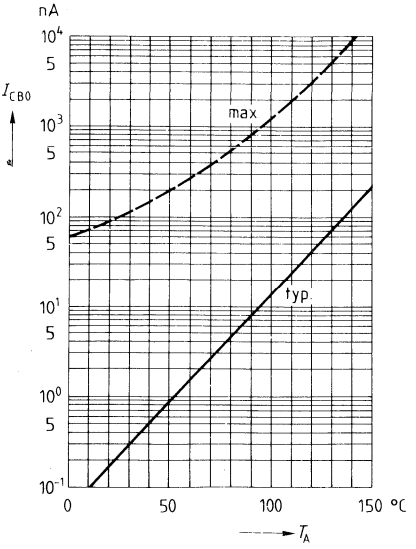
Collector current $I_c = f(V_{BE})$
$V_{CE} = 10$ V



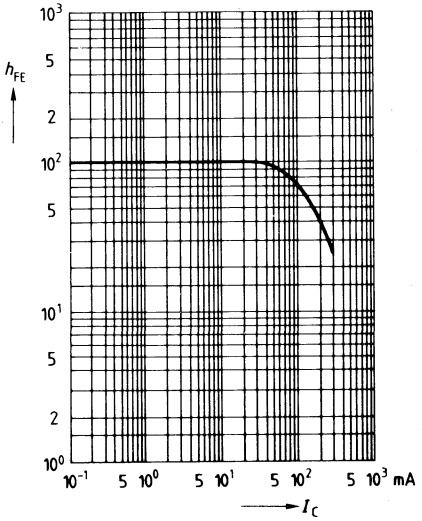
Transition frequency $f_T = f(I_c)$
$V_{CE} = 10$ V, $f = 100$ MHz



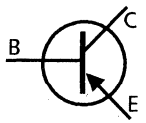
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 200$ V

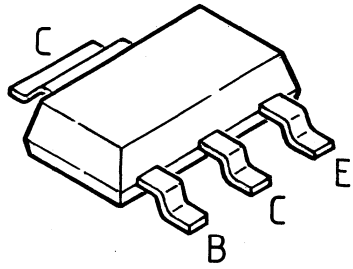


DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector -emitter saturation voltage
Complementary types: BFN 36/38 (NPN)





Type	Marking	Ordering code (12–mm tape)	Package*
BFN 37	BFN 37	Q62702- F1304	SOT-223
BFN 39	BFN 39	Q62702- F1305	SOT-223

Maximum Ratings

Parameter	Symbol	BFN 37	BFN 39	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	V
Emitter-base voltage	V_{EBO}	5		V
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		mA
Base current	I_B	100		mA
Peak base current	I_{BM}	200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to	+150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

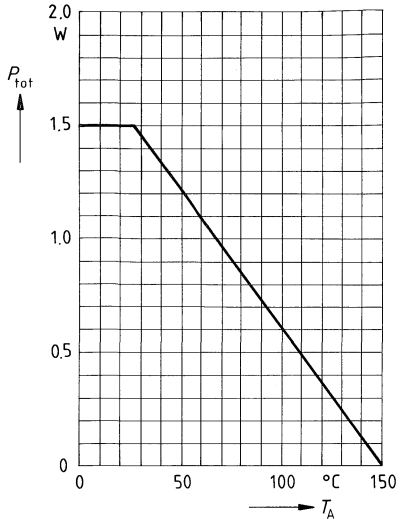
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

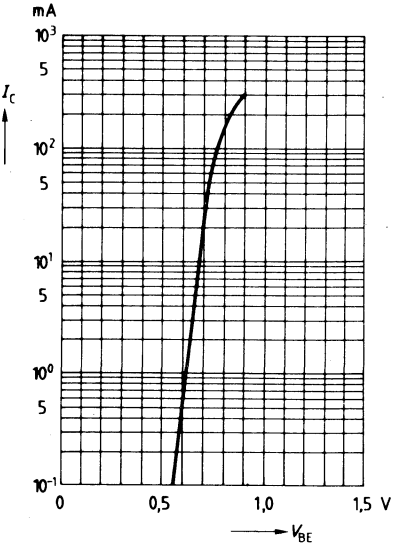
Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 1$ mA, $I_B = 0$	BFN 37		250	-	-	V
	BFN 39		300	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 100$ µA, $I_B = 0$	BFN 37		250	-	-	V
	BFN 39		300	-	-	V
Emitter-base breakdown voltage 1)		$V_{(BR)EBO}$				
$I_E = 100$ µA, $I_B = 0$			5	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 200$ V	BFN 37		-	-	100	nA
$V_{CB} = 250$ V	BFN 39		-	-	100	nA
$V_{CB} = 200$ V, $T_A = 150$ °C	BFN 37		-	-	20	µA
$V_{CB} = 250$ V, $T_A = 150$ °C	BFN 39		-	-	20	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 4$ V, $I_C = 0$			-	-	100	nA
DC current gain 1)		h_{FE}				
$I_C = 1$ mA, $V_{CE} = 10$ V			25	-	-	-
$I_C = 10$ mA, $V_{CE} = 10$ V			40	-	-	-
$I_C = 30$ mA, $V_{CE} = 10$ V	BFN 37		40	-	-	-
$I_C = 30$ mA, $V_{CE} = 10$ V	BFN 39		30	-	-	-
Collector-emitter saturation voltage 1)		V_{CEsat}				
$I_C = 20$ mA, $I_B = 2$ mA	BFN 37		-	-	0.4	V
	BFN 39				0.5	V
Base-emitter saturation voltage 1)		V_{BEsat}				
$I_C = 20$ mA, $I_B = 2$ mA			-	-	0.9	V
AC Characteristics						
Transition frequency		f_T				
$I_C = 20$ mA, $V_{CE} = 10$ V, $f = 100$ MHz			-	100	-	MHz
Output capacitance		C_{ob}				
$V_{CB} = 30$ V, $f = 1$ MHz			-	2.5	-	pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

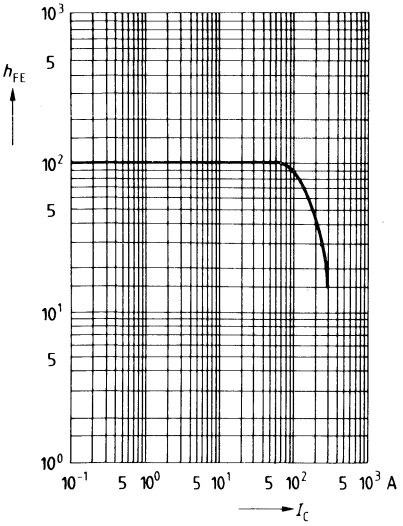
Total power dissipation $P_{tot} = f(T_A)$



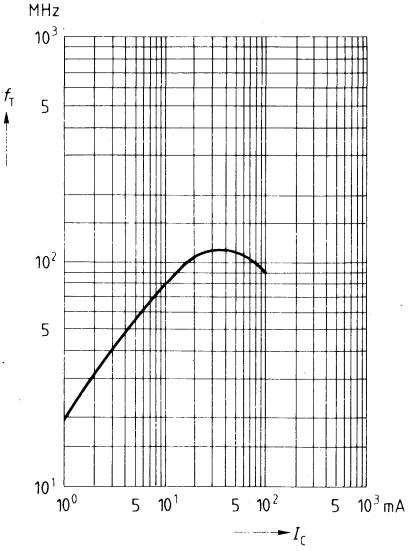
Collector current $I_C = f(V_{BE})$
$V_{CE} = 10$ V



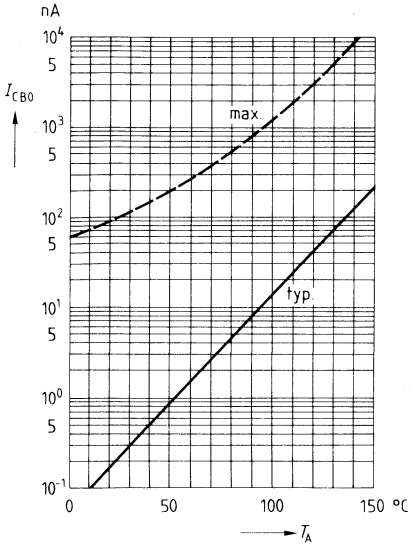
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



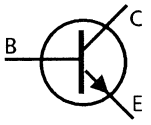
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V, $f = 100$ MHz

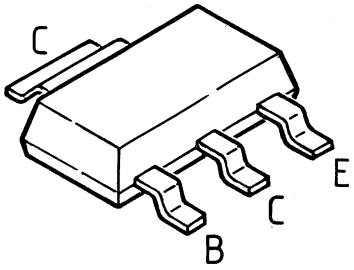


Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 200$ V



- High breakdown voltage
- Low collector -emitter saturation voltage
- Complementary types: PZTA 92/93 (PNP)





Type	Marking	Ordering code (12–mm tape)	Package*
PZTA 42	PZTA 42	Q62702 - Z2035	SOT-223
PZTA 43	PZTA 43	Q62702 - Z2036	SOT-223

Maximum Ratings

Parameter	Symbol	PZTA 42	PZTA 43	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	V
Emitter-base voltage	V_{EBO}	6	6	V
Collector current	I_C	500		mA
Base current	I_B	100		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3		K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

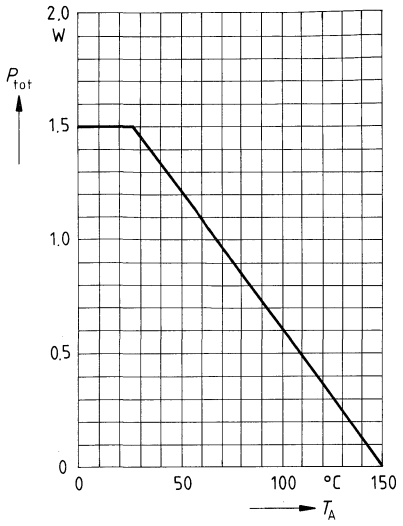
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

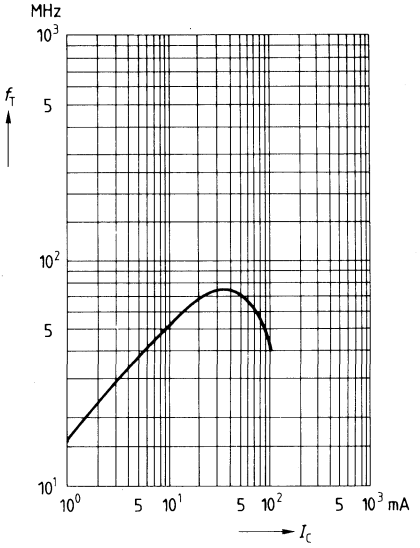
Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$	PZTA 42 PZTA 43	$V_{(BR)CEO}$	300 200	- -	- -	V V
Collector-base breakdown voltage $I_C = 100$ µA, $I_B = 0$	PZTA 42 PZTA 43	$V_{(BR)CBO}$	300 200	- -	- -	V V
Emitter-base breakdown voltage $I_E = 100$ µA, $I_C = 0$		$V_{(BR)EBO}$	6	-	-	V
Collector-base cutoff current $V_{CB} = 200$ V $V_{CB} = 160$ V $V_{CB} = 200$ V, $T_A = 150$ °C $V_{CB} = 160$ V, $T_A = 150$ °C	 PZTA 42 PZTA 43 PZTA 42 PZTA 43	I_{CBO}	 - - - -	 - -	 100 100 20 20	 nA nA µA µA
Emitter-base cutoff current $V_{EB} = 3$ V, $I_C = 0$		I_{EBO}	-	-	100	nA
DC current gain 1) $I_C = 1$ mA, $V_{CE} = 10$ V $I_C = 10$ mA, $V_{CE} = 10$ V $I_C = 30$ mA, $V_{CE} = 10$ V		h_{FE}	 25 40 40	 - - -	 - - -	 - - -
Collector-emitter saturation voltage 1) $I_C = 20$ mA, $I_B = 2$ mA	 PZTA 42 PZTA 43	V_{CEsat}	 - -	 - -	 0.5 0.4	 V V
Base-emitter saturation voltage $I_C = 20$ mA, $I_B = 2$ mA		V_{BEsat}	-	-	0.9	V
AC Characteristics						
Transition frequency $I_C = 20$ mA, $V_{CE} = 10$ V, $f = 100$ MHz		f_T	-	70	-	MHz
Collector-base capacitance $V_{CB} = 20$ V, $f = 1$ MHz	PZTA 42 PZTA 43	C_{ob}	- -	- -	3 4	pF pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

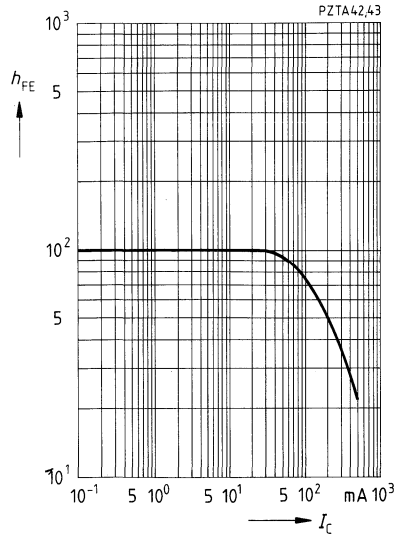
Total power dissipation $P_{tot} = f(T_A)$



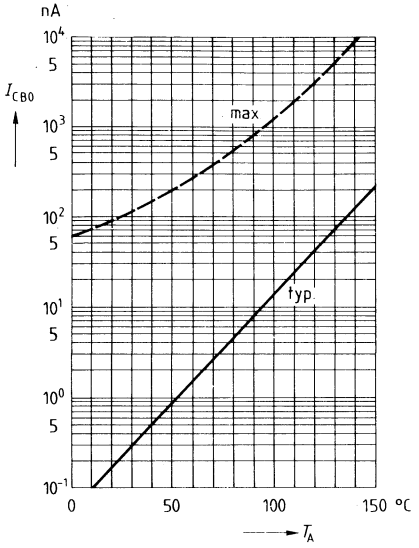
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V, $f = 100$ MHz



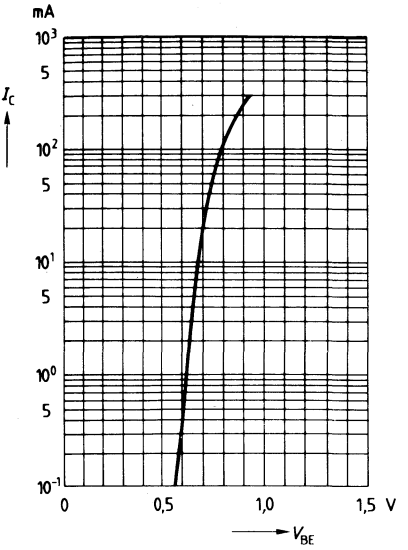
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



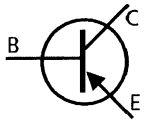
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = 160$ V

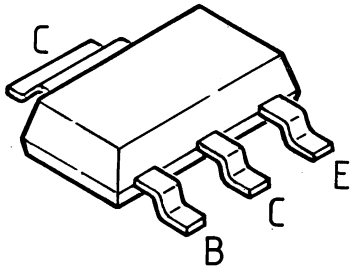


Collector current $I_C = f(V_{BE})$
$V_{CE} = 10$ V



- High breakdown voltage
- Low collector -emitter saturation voltage
- Complementary types: PZTA 42/43 (NPN)





Type	Marking	Ordering code (12–mm tape)	Package*
PZTA 92	PZTA 92	Q62702 - Z2037	SOT-223
PZTA 93	PZTA 93	Q62702 - Z2038	SOT-223

Maximum Ratings

Parameter	Symbol	PZTA 92	PZTA 93	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	500		mA
Base current	I_B	100		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

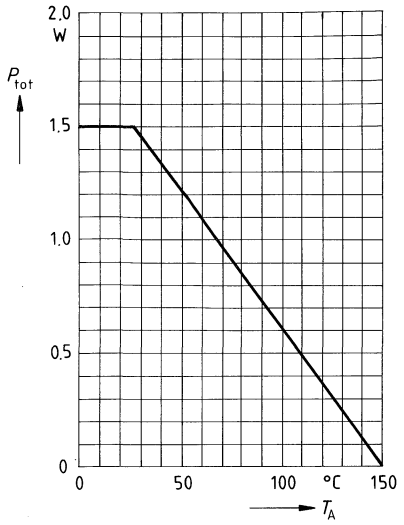
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

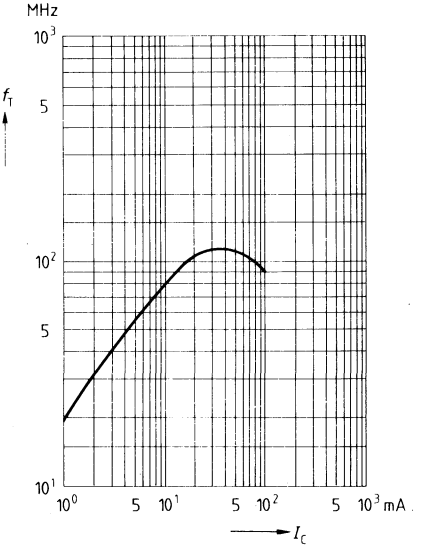
Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 1$ mA, $I_B = 0$	PZTA 92		300	-	-	V
	PZTA 93		200	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 100$ µA, $I_B = 0$	PZTA 92		300	-	-	V
	PZTA 93		200	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 100$ µA, $I_C = 0$			5	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 200$ V	PZTA 92		-	-	250	nA
$V_{CB} = 160$ V	PZTA 93		-	-	250	nA
$V_{CB} = 200$ V, $T_A = 150$ °C	PZTA 92		-		20	µA
$V_{CB} = 160$ V, $T_A = 150$ °C	PZTA 93		-		20	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 3$ V, $I_C = 0$			-	-	100	nA
DC current gain 1)		h_{FE}				
$I_C = 1$ mA, $V_{CE} = 10$ V			25	-	-	-
$I_C = 10$ mA, $V_{CE} = 10$ V			40	-	-	-
$I_C = 30$ mA, $V_{CE} = 10$ V			25	-	-	-
Collector-emitter saturation voltage 1)		V_{CEsat}				
$I_C = 20$ mA, $I_B = 2$ mA	PZTA 92		-	-	0.5	V
	PZTA 93				0.4	V
Base-emitter saturation voltage 1)		V_{BEsat}				
$I_C = 20$ mA, $I_B = 2$ mA			-	-	0.9	V
AC Characteristics						
Transition frequency		f_T				
$I_C = 20$ mA, $V_{CE} = 10$ V, $f = 100$ MHz			-	100	-	MHz
Collector-base capacitance		C_{ob}				
$V_{CB} = 20$ V, $f = 1$ MHz	PZTA 92		-	-	6	pF
	PZTA 93		-	-	8	pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

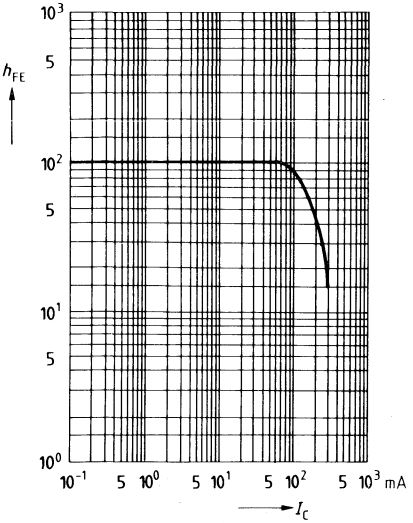
Total power dissipation $P_{tot} = f(T_A)$



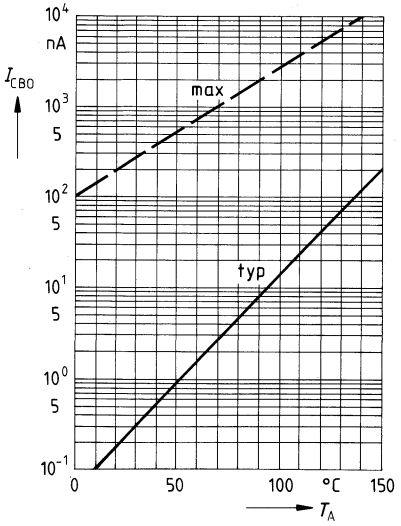
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V, $f = 100$ MHz



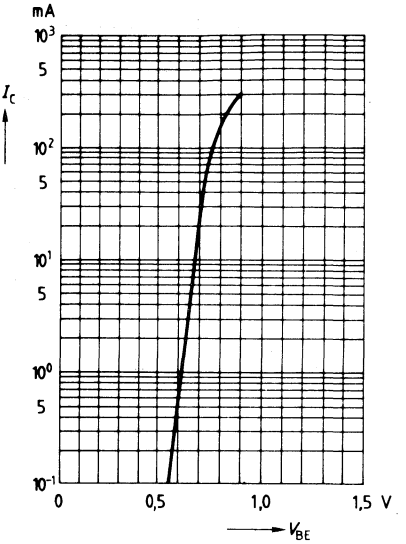
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 160$ V

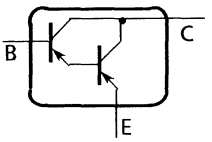


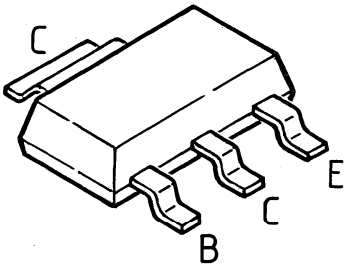
Collector current $I_c = f(V_{BE})$
$V_{CE} = 10$ V



Silicon Darlington Transistors

- For general AF applications
- High collector current
- High current gain
- Complementary types: BCP 29/49 (NPN)





Type	Marking	Ordering code (12-mm tape)	Package*
BCP 28	BCP 28	Q62702 - C1234	SOT-223
BCP 48	BCP 48	Q62702 - C1235	SOT-223

Maximum Ratings

Parameter	Symbol	BCP 28	BCP 48	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	V
Emitter-base voltage	V_{EBO}	10	10	V
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		mA
Base current	I_B	100		mA
Peak base current	I_{BM}	200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

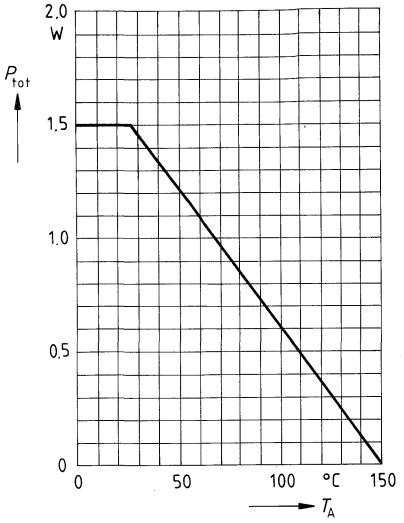
*) For detailed dimensions see chapter Package Outlines

Characteristics
at $T_A = 25$ °C, unless otherwise specified.

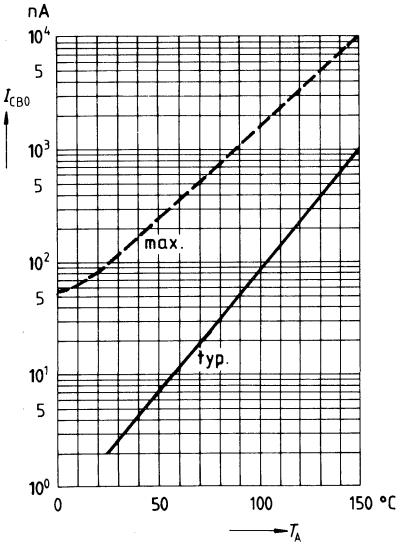
Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 1$mA, $I_B = 0$	BCP 28		30	-	-	V
	BCP 48		60	-	-	V
Collector-base breakdown voltage 1)		$V_{(BR)CBO}$				
$I_C = 100$ µA, $I_B = 0$	BCP 28		40	-	-	V
	BCP 48		80	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 10$ µA, $I_C = 0$			10	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 30$ V, $I_E = 0$	BCP 28		-	-	100	nA
$V_{CB} = 60$ V, $I_E = 0$	BCP 48		-	-	100	nA
$V_{CB} = 30$ V, $I_E = 0$, $T_A = 150$°C	BCP 28		-	-	10	µA
$V_{CB} = 60$ V, $I_E = 0$, $T_A = 150$°C	BCP 48		-	-	10	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 4$ V, $I_C = 0$			-	-	100	nA
DC current gain 1)		h_{FE}				
$I_C = 100$ µA , $V_{CE} = 1$V	BCP 28		4000	-	-	-
	BCP 48		2000	-	-	-
$I_C = 10$ mA, $V_{CE} = 5$ V	BCP 28		10000	-	-	-
	BCP 48		4000	-	-	-
$I_C = 100$ mA, $V_{CE} = 5$ V	BCP 28		20000	-	-	-
	BCP 48		10000	-	-	-
$I_C = 500$ mA, $V_{CE} = 5$ V	BCP 28		4000	-	-	-
	BCP 48		2000	-	-	-
Collector-emitter saturation voltage		V_{CEsat}				
$I_C = 100$mA, $I_B = 0.1$mA			-	-	1.0	V
Base-emitter saturation voltage		V_{BEsat}				
$I_C = 100$mA, $I_B = 0.1$mA			-	-	1.5	V
AC Characteristics						
Transition frequency		f_T				
$I_C = 50$ mA, $V_{CE} = 5$ V, $f = 100$ MHz			-	200	-	MHz
Output capacitance		C_{ob}				
$V_{CB} = 10$ V, $f = 1$ MHz			-	8	-	pF

1) Pulse test conditions: t ≦ 300µs; D = 2%

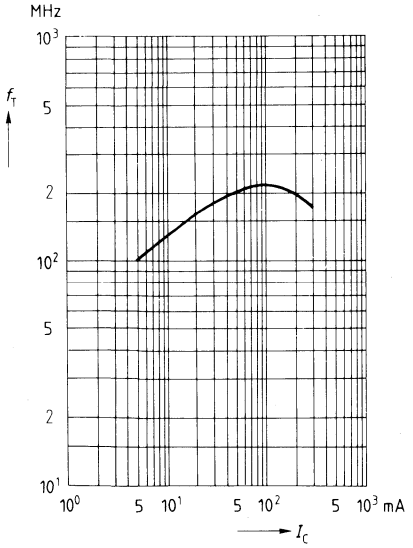
Total power dissipation $P_{tot} = f(T_A)$



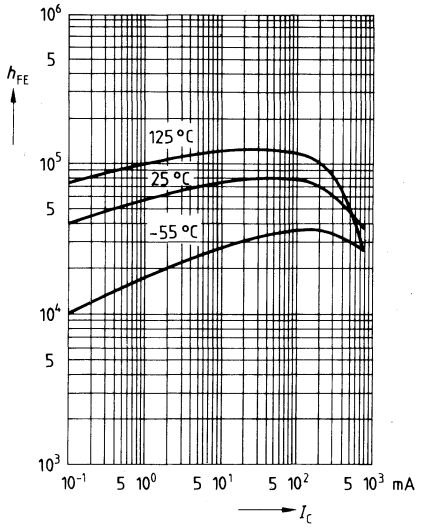
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = V_{CE\ max}$



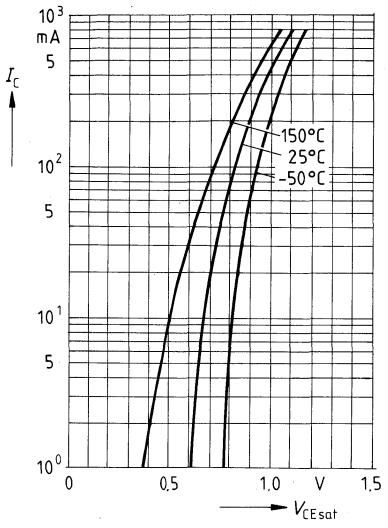
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



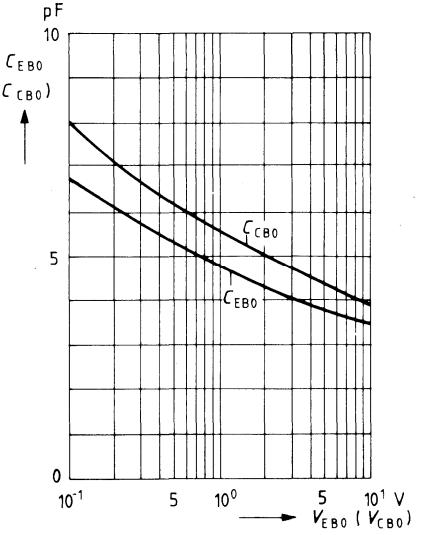
DC current gain $h_{FE} = f(I_c)$
$V_{CE} = 5$ V



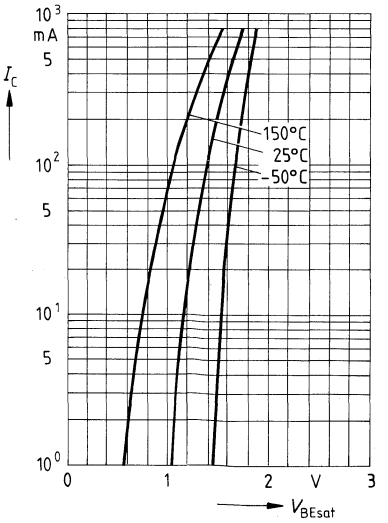
Collector-emitter saturation voltage
$I_c = f(V_{CE\,sat})$
$h_{FE} = 1000$



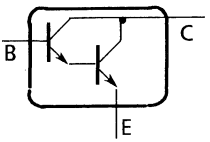
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$

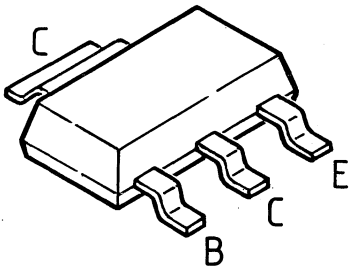


Base-emitter saturation voltage $I_c = f(V_{BE\,sat})$
$h_{FE} = 1000$



- For general AF applications
- High collector current
- High current gain
- Complementary types: BCP 28/48 (PNP)





Type	Marking	Ordering code (12–mm tape)	Package*
BCP 29	BCP 29	Q62702 - C1236	SOT-223
BCP 49	BCP 49	Q62702 - C1237	SOT-223

Maximum Ratings

Parameter	Symbol	BCP 29	BCP49	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	V
Emitter-base voltage	V_{EBO}	10	10	V
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		mA
Base current	I_B	100		mA
Peak base current	I_{BM}	200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to	+ 150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

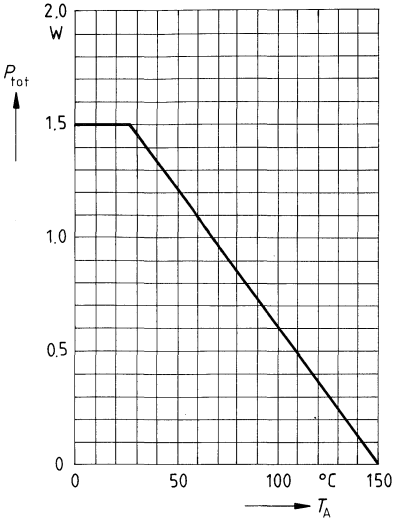
*) For detailed dimensions see chapter Package Outlines.

Characteristics
at $T_A = 25$ °C, unless otherwise specified.

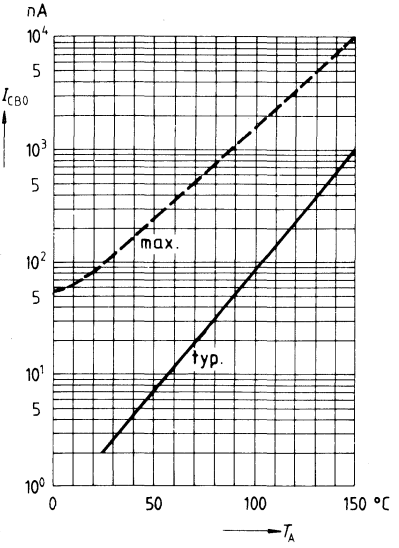
Parameter		Symbol	Values min.	typ.	max.	Unit
DC Characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				
$I_C = 1$mA, $I_B = 0$	BCP 29		30	-	-	V
	BCP 49		60	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 100$ µA, $I_B = 0$	BCP 29		40	-	-	V
	BCP 49		80	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 10$ µA, $I_C = 0$			10	-	-	V
Collector-base cutoff current		I_{CBO}				
$V_{CB} = 30$ V, $I_E = 0$	BCP 29		-	-	100	nA
$V_{CB} = 60$ V, $I_E = 0$	BCP 49		-	-	100	nA
$V_{CB} = 30$ V, $I_E = 0$, $T_A = 150$°C	BCP 29		-	-	10	µA
$V_{CB} = 60$ V, $I_E = 0$, $T_A = 150$°C	BCP 49		-	-	10	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 4$ V, $I_C = 0$			-	-	100	nA
DC current gain 1)		h_{FE}				
$I_C = 100$ µA, $V_{CE} = 1$V	BCP 29		4000	-	-	-
	BCP 49		2000	-	-	-
$I_C = 10$ mA, $V_{CE} = 5$ V	BCP 29		10000	-	-	-
	BCP 49		4000	-	-	-
$I_C = 100$ mA, $V_{CE} = 5$ V	BCP 29		20000	-	-	-
	BCP 49		10000	-	-	-
$I_C = 500$ mA, $V_{CE} = 5$ V	BCP 29		4000	-	-	-
	BCP 49		2000	-	-	-
Collector-emitter saturation voltage		V_{CEsat}				
$I_C = 100$mA, $I_B = 0.1$mA			-	-	1.0	V
Base-emitter saturation voltage		V_{BEsat}				
$I_C = 100$mA, $I_B = 0.1$mA			-	-	1.5	V
AC Characteristics						
Transition frequency		f_T	-	200	-	MHz
$I_C = 50$ mA, $V_{CE} = 5$ V, $f = 100$ MHz						
Output capacitance		C_{ob}	-	6.5	-	pF
$V_{CB} = 10$ V, $f = 1$ MHz						

1) Pulse test conditions: t ≦ 300µs; D = 2%

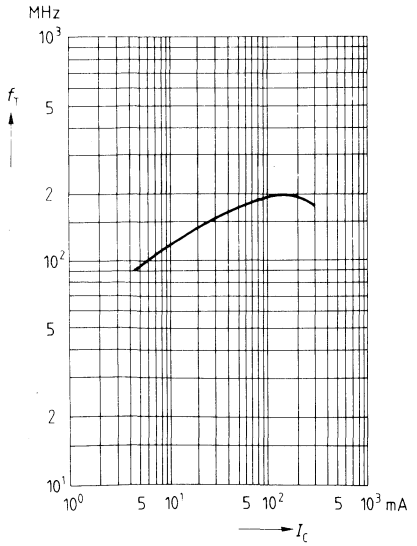
Total power dissipation $P_{tot} = f(T_A)$



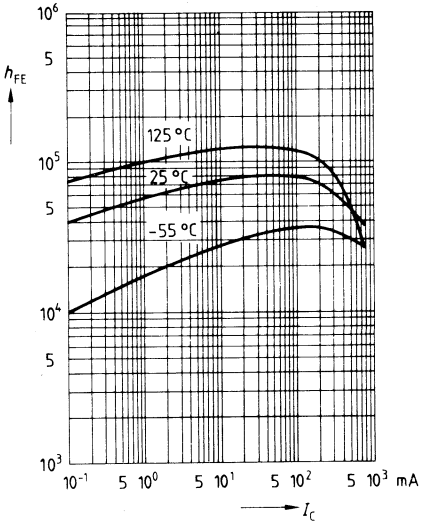
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = V_{CE\ max}$



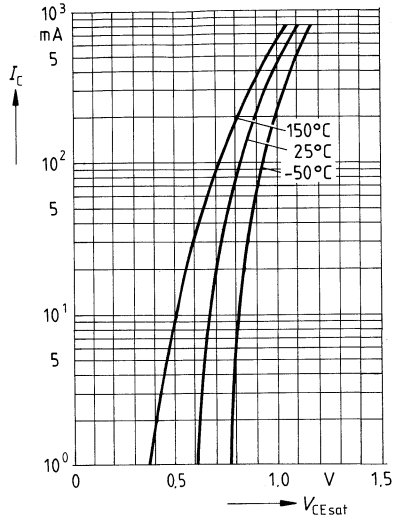
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



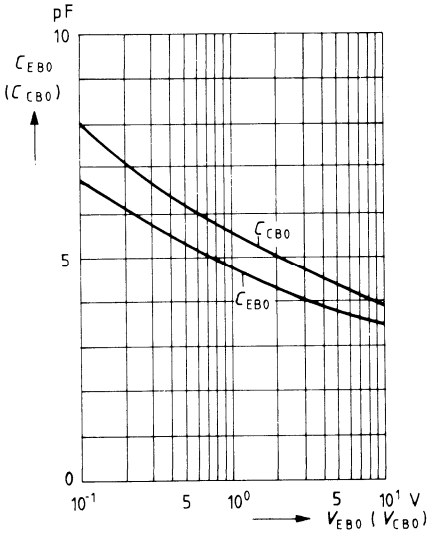
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



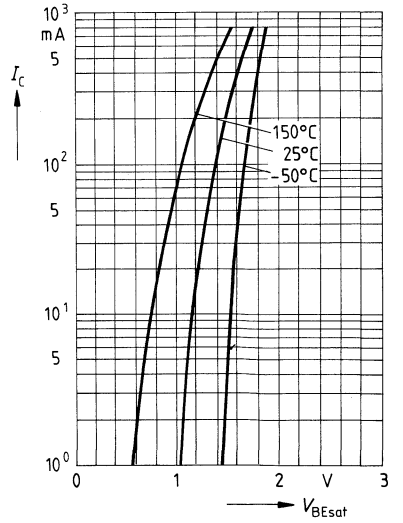
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$
$h_{FE} = 1000$



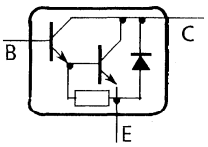
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$

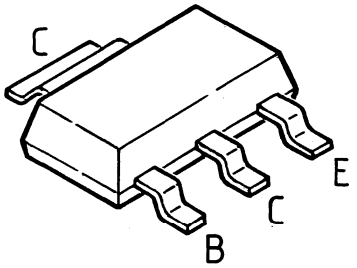


Base-emitter saturation voltage $I_C = f(V_{BE\,sat})$
$h_{FE} = 1000$



- High collector current
- Low collector -emitter saturation voltage
- Complementary types: BSP 60...BSP 62 (PNP)





Type	Marking	Ordering code (12-mm tape)	Package*
BSP 50	BSP 50	Q62702 - P1163	SOT-223
BSP 51	BSP 51	Q62702 - P1164	SOT-223
BSP 52	BSP 52	Q62702 - P1165	SOT-223

Maximum Ratings

Parameter	Symbol	BSP50	BSP51	BSP52	Unit
Collector-emitter voltage	V_{CER}	45	60	80	V
Collector-base voltage	V_{CBO}	60	80	100	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C		1		A
Peak collector current	I_{CM}		2		A
Base current	I_B		0.1		A
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}		1.5		W
Junction temperature	T_j		150		°C
Storage temperature range	T_{stg}	-65	to	+150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

Characteristics

at $T_A = 25$ °C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC Characteristics						
Collector-emitter breakdown voltage 1)		$V_{(BR)CER}$				
$I_C = 10$mA, $R_{BE} = 4.5$MΩ	BSP 50		45	-	-	V
	BSP 51		60	-	-	V
	BSP 52		80	-	-	V
Collector-base breakdown voltage		$V_{(BR)CBO}$				
$I_C = 100$µA, $I_B = 0$	BSP 50		60	-	-	V
	BSP 51		80	-	-	V
	BSP 52		100	-	-	V
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
$I_E = 100$µA, $I_B = 0$			5	-	-	V
Collector-emitter cutoff current		I_{CES}				
$V_{CE} = V_{CERmax}$, $V_{BE} = 0$			-	-	10	µA
Emitter-base cutoff current		I_{EBO}				
$V_{EB} = 4$ V, $I_C = 0$			-	-	10	µA
DC current gain 1)		h_{FE}				
$I_C = 150$ mA, $V_{CE} = 10$ V			1000	-	-	-
$I_C = 500$ mA, $V_{CE} = 10$ V			2000	-	-	-
Collector-emitter saturation voltage 2)		V_{CEsat}				
$I_C = 500$ mA, $I_B = 0.5$ mA			-	-	1.3	V
$I_C = 1$ A, $I_B = 1$ mA			-	-	1.8	V
Base-emitter saturation voltage 2)		V_{BEsat}				
$I_C = 500$ mA, $I_B = 0.5$ mA			-	-	1.9	V
$I_C = 1$ A, $I_B = 1$ mA			-	-	2.2	V
AC Characteristics						
Transition frequency		f_T	-	200	-	MHz
$I_C = 100$ mA, $V_{CE} = 5$ V, $f = 100$ MHz						
Switching times		t_{on}	-	400	-	ns
$I_C = 500$ mA, $I_{B1} = I_{B2} = 0.5$ mA		t_{off}	-	1500	-	ns
(see Fig. 2 and 3)						

1) Compare R_{BE} for thermal stability
2) Pulse test conditions: t ≦ 300µs; D = 2%

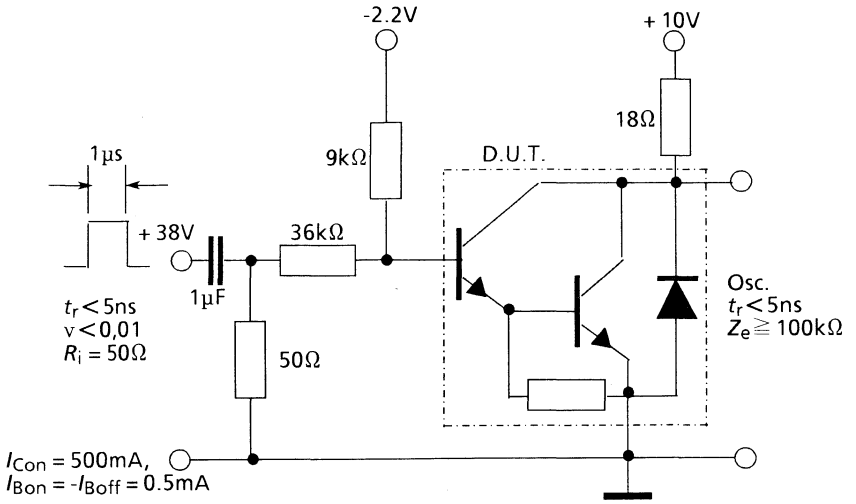


Fig.2 Switching time test circuit

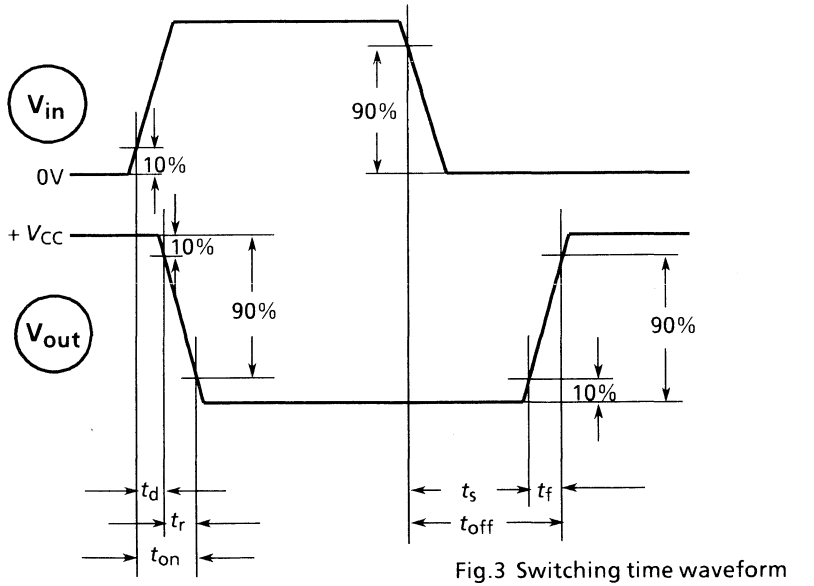
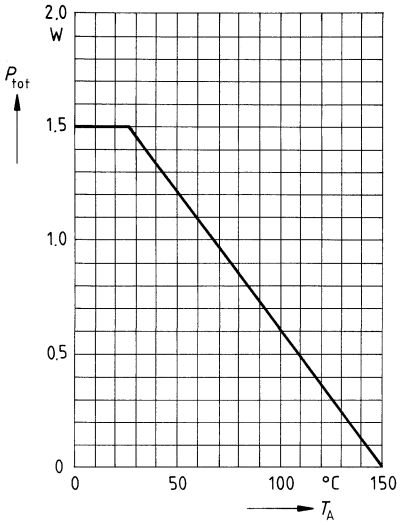
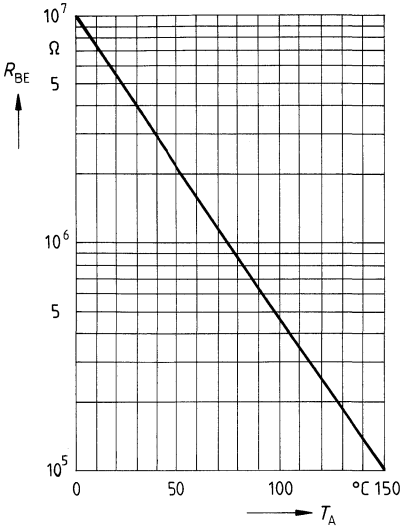


Fig.3 Switching time waveform

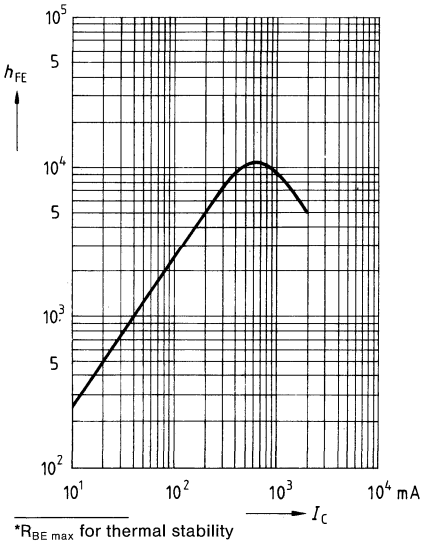
Total power dissipation $P_{tot} = f(T_A)$



External resistance $R_{BE} = f(T_A)$*
$V_{CB} = V_{CE\ max}$

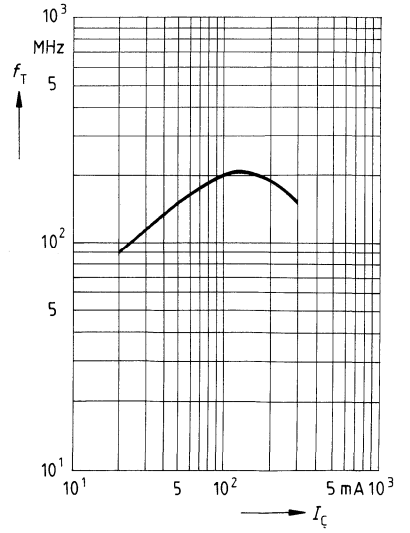


DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V

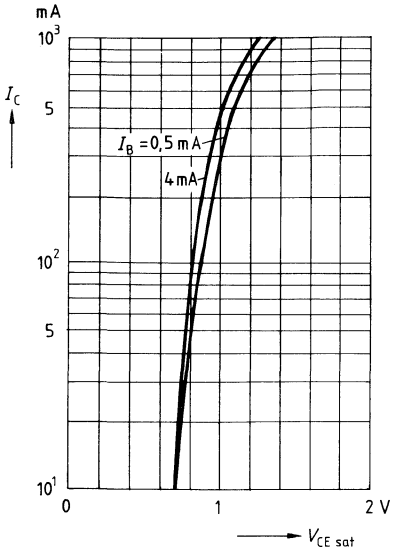


*$R_{BE\ max}$ for thermal stability

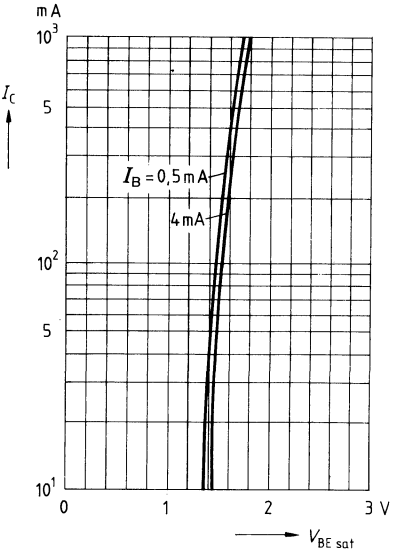
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 100$ MHz



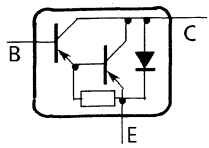
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, I_B-parameter

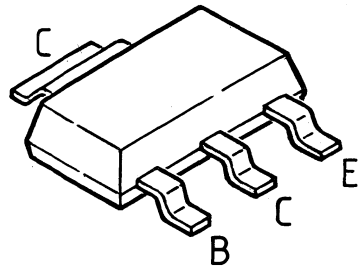


Base-emitter saturation voltage
$I_C = f(V_{BE\,sat})$, I_B-parameter



- High collector current
- Low collector -emitter saturation voltage
- Complementary types: BSP 50...BSP 52 (NPN)





Type	Marking	Ordering code (12-mm tape)	Package*
BSP 60	BSP 60	Q62702 - P1166	SOT-223
BSP 61	BSP 61	Q62702 - P1167	SOT-223
BSP 62	BSP 62	Q62702 - P1168	SOT-223

Maximum Ratings

Parameter	Symbol	BSP60	BSP61	BSP62	Unit
Collector-emitter voltage	V_{CER}	45	60	80	V
Collector-base voltage	V_{CBO}	60	80	100	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C		1		A
Peak collector current	I_{CM}		2		A
Base current	I_B		0.1		A
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}		1.5		W
Junction temperature	T_j		150		°C
Storage temperature range	T_{stg}	-65	to	+150	°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

Characteristics

at $T_A = 25$ °C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC Characteristics						
Collector-emitter breakdown voltage 1) $I_C = 10$mA, $R_{BE} = 4.5$MΩ	BSP 60 BSP 61 BSP 62	$V_{(BR)CER}$	 45 60 80	 - - -	 - - -	 V V V
Collector-base breakdown voltage $I_C = 100\mu A$, $I_B = 0$	BSP 60 BSP 61 BSP 62	$V_{(BR)CBO}$	 60 80 100	 - - -	 - - -	 V V V
Emitter-base breakdown voltage $I_E = 100\mu A$, $I_B = 0$		$V_{(BR)EBO}$	 5	 -	 -	 V
Collector-emitter cutoff current $V_{CE} = V_{CERmax}$, $V_{BE} = 0$		I_{CES}	 -	 -	 10	 µA
Emitter-base cutoff current $V_{EB} = 4$ V, $I_C = 0$		I_{EBO}	 -	 -	 10	 µA
DC current gain 1) $I_C = 150$ mA, $V_{CE} = 10$ V $I_C = 500$ mA, $V_{CE} = 10$ V		h_{FE}	 1000 2000	 - -	 - -	 - -
Collector-emitter saturation voltage 2) $I_C = 500$ mA, $I_B = 0{,}5$ mA $I_C = 1$ A, $I_B = 1$ mA		V_{CEsat}	 - -	 - -	 1.3 1.8	 V V
Base-emitter saturation voltage 2) $I_C = 500$ mA, $I_C = 0{,}5$ mA $I_C = 1$ A, $I_B = 1$ mA		V_{BEsat}	 - -	 - -	 1.9 2.2	 V V
AC Characteristics						
Transition frequency $I_C = 100$ mA, $V_{CE} = 5$ V, $f = 100$ MHz		f_T	-	200	-	MHz
Switching times $I_C = 500$ mA, $I_{B1} = I_{B2} = 0.5$ mA (see Fig. 2 and 3)		t_{on} t_{off}	- -	400 1500	- -	ns ns

1) Compare R_{BE} for thermal stability
2) Pulse test conditions: t ≦ 300µs; D = 2%

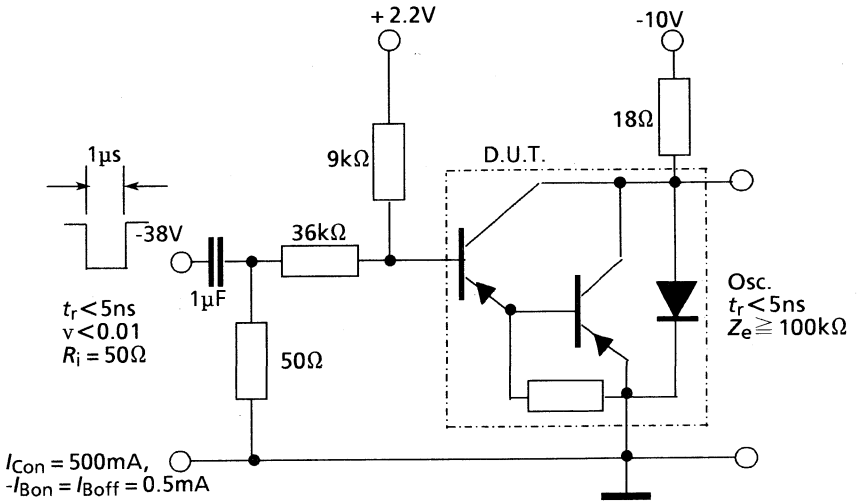


Fig.2 Switching time test circuit

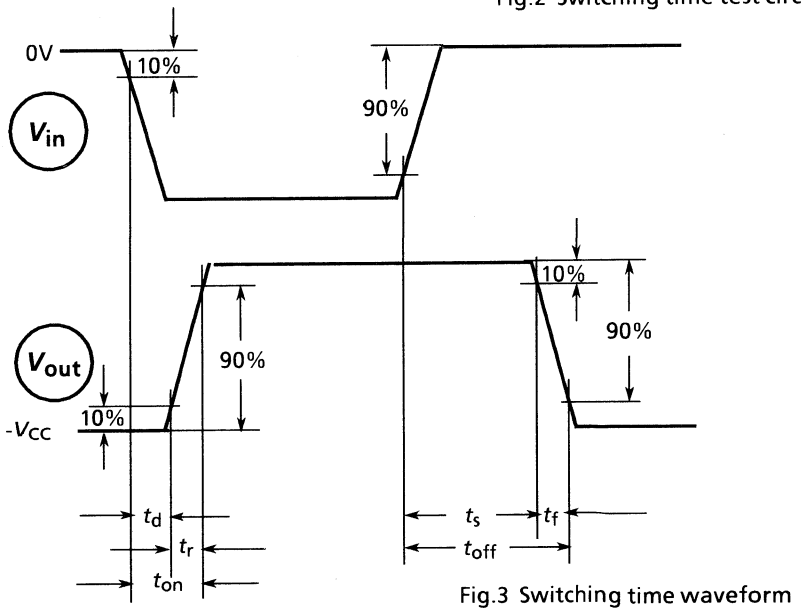
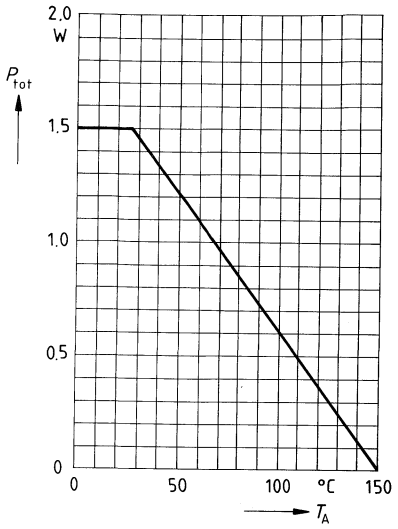
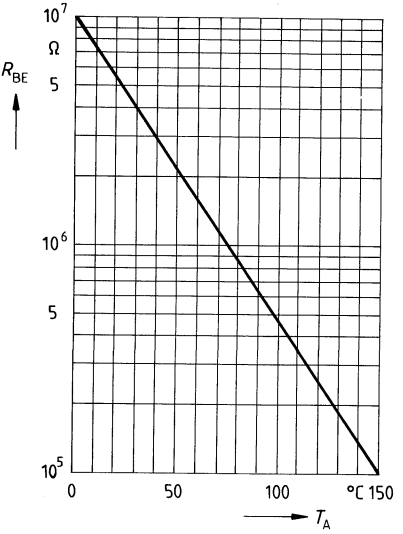


Fig.3 Switching time waveform

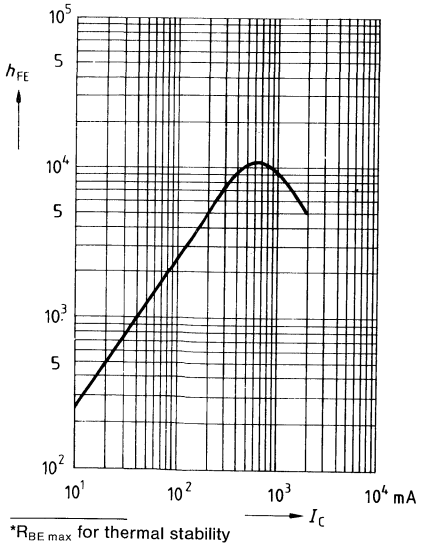
Total power dissipation $P_{tot} = f(T_A)$



External resistance $R_{BE} = f(T_A)$*
$V_{CB} = V_{CE\ max}$

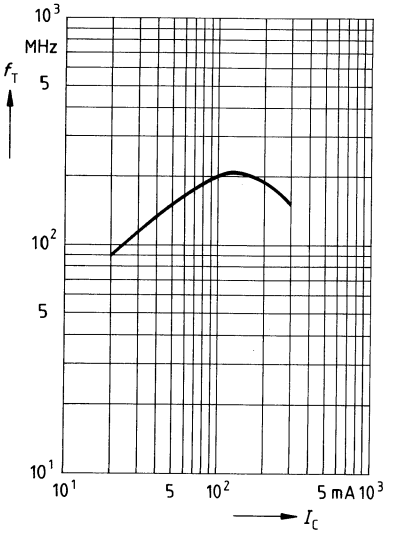


DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V

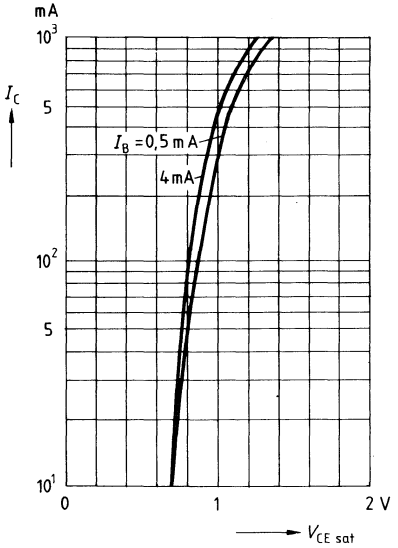


*$R_{BE\ max}$ for thermal stability

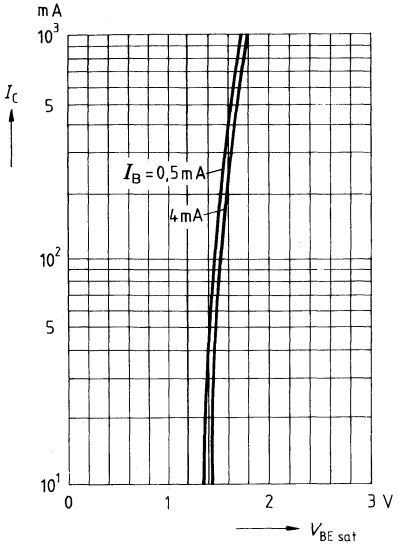
Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$V, $f = 100$ MHz



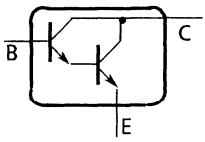
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, I_B-parameter

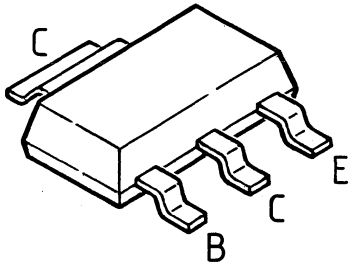


Base-emitter saturation voltage
$I_C = f(V_{BE\,sat})$, I_B-parameter



- For general AF applications
- High collector current
- High current gain
- Complementary types: PZTA 63 / 64 (PNP)





Type	Marking	Ordering code (12–mm tape)	Package*
PZTA 13	PZTA 13	Q62702 - Z2033	SOT-223
PZTA 14	PZTA 14	Q62702 - Z2034	SOT-223

Maximum Ratings

Parameter	Symbol	PZTA 13	PZTA 14	Unit
Collector-emitter voltage	V_{CES}	30	30	V
Collector-base voltage	V_{CBO}	30	30	V
Emitter-base voltage	V_{EBO}	10		V
Collector current	I_C	300		mA
Peak collector current	I_{CM}	500		mA
Base current	I_B	100		mA
Peak base current	I_{BM}	200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

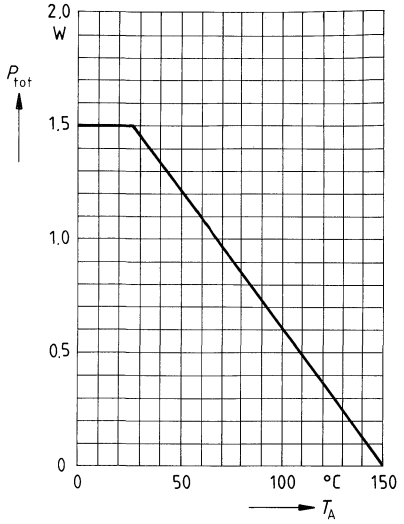
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

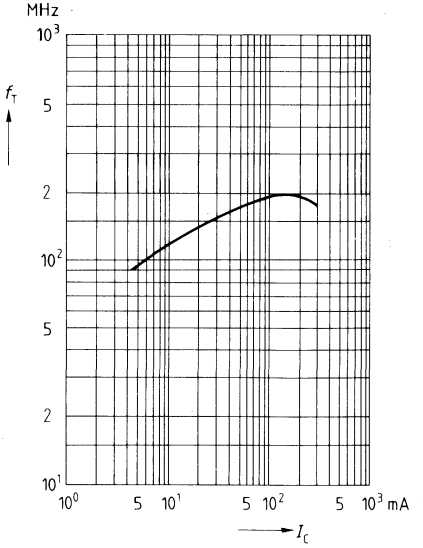
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 100$ µA	$V_{(BR)CES}$	30	-	-	V
Collector-base breakdown voltage $I_C = 100$ µA, $I_B = 0$	$V_{(BR)CBO}$	30	-	-	V
Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$	$V_{(BR)EBO}$	10	-	-	V
Collector-base cutoff current $V_{CE} = 30$ V, $I_E = 0$ $V_{CE} = 30$ V, $I_E = 0, T_A = 150$ °C	I_{CBO}	-	-	100 10	nA µA
Emitter-base cutoff current $V_{EB} = 10$ V, $I_C = 0$	I_{EBO}	-	-	100	nA
DC current gain $I_C = 10$ mA, $V_{CE} = 5$ V PZTA 13 PZTA 14 $I_C = 100$ mA, $V_{CE} = 5$ V PZTA 13 PZTA 14	h_{FE}	 5000 10000 10000 20000	 - - - -	 - - - -	 - - - -
Collector-emitter saturation voltage $I_C = 100$ mA, $I_B = 0.1$ mA	V_{CEsat}	-	-	1.5	V
Base-emitter saturation voltage $I_C = 100$ mA, $I_B = 0.1$mA	V_{BEsat}	-	-	2.0	V
AC Characteristics					
Transition frequency $I_C = 50$ mA, $V_{CE} = 5$ V, $f = 100$ MHz	f_T	125	-	-	MHz

1) Pulse test conditions t $\leqq$ 300µs, D = 2 %

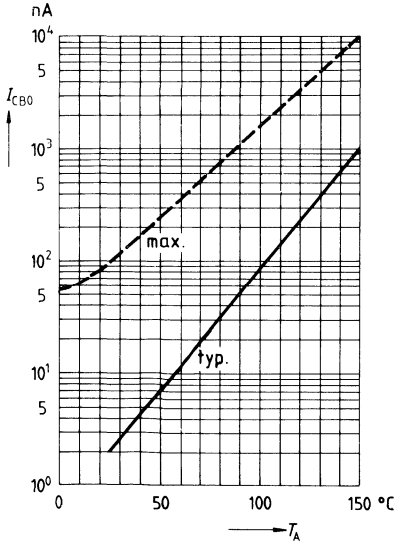
Total power dissipation $P_{tot} = f(T_A)$



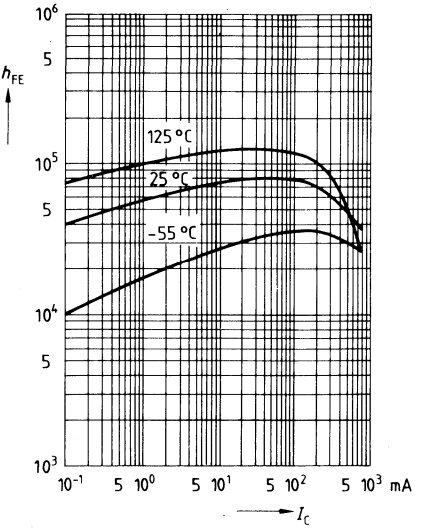
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 100$ MHz



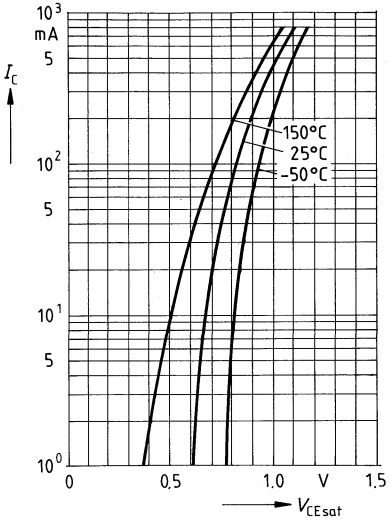
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CE} = 30$ V



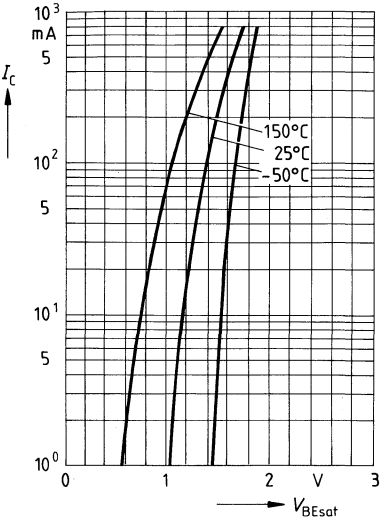
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 5$ V



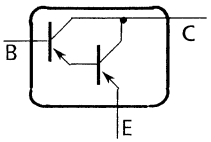
Collector-emitter saturation voltage
$I_c = f(V_{CE\ sat})$
$h_{FE} = 1000$

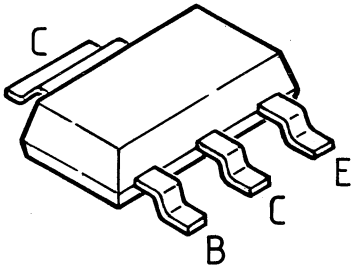


Base-emitter saturation voltage $I_c = f(V_{BE\ sat})$
$h_{FE} = 1000$



- For general AF applications
- High collector current
- High current gain
- Complementary types: PZTA 13 / 14 (NPN)





Type	Marking	Ordering code (12-mm tape)	Package*
PZTA 63	PZTA 63	Q62702 - Z2031	SOT-223
PZTA 64	PZTA 64	Q62702 - Z2032	SOT-223

Maximum Ratings

Parameter	Symbol	PZTA 63	PZTA 64	Unit
Collector-emitter voltage	V_{CES}	30	30	V
Collector-base voltage	V_{CBO}	30	30	V
Emitter-base voltage	V_{EBO}	10		V
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		mA
Base current	I_B	100		mA
Peak base current	I_{BM}	200		mA
Total power dissipation, $T_A \leq 25°C$ 1)	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	-65 to +150		°C

Thermal Resistance

Junction - ambient 1)	R_{thJA}	≤ 83.3	K/W

1) Package mounted on an epoxy printed circuit board 40mm x 40mm x 1.5mm
Mounting pad for the collector lead min 6cm²

*) For detailed dimensions see chapter Package Outlines

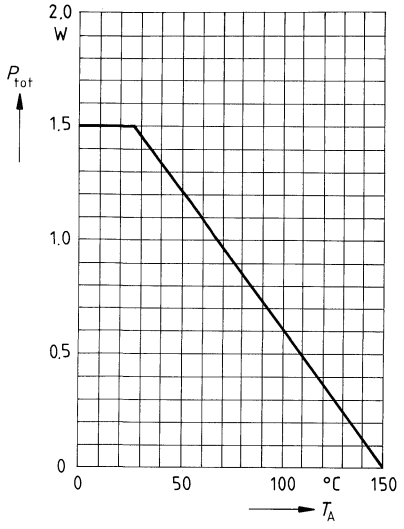
Characteristics

at $T_A = 25$ °C, unless otherwise specified.

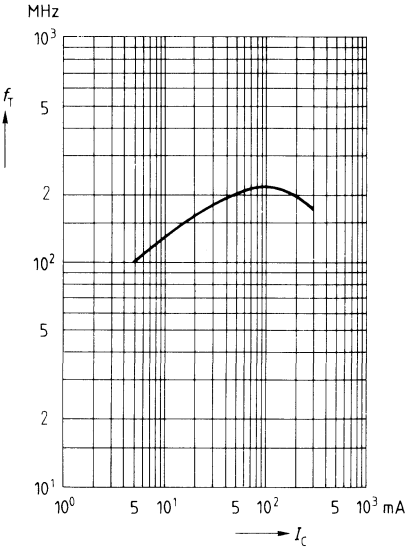
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 100$ µA	$V_{(BR)CES}$	30	-	-	V
Collector-base breakdown voltage $I_C = 100$ µA, $I_B = 0$	$V_{(BR)CBO}$	30	-	-	V
Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$	$V_{(BR)EBO}$	10	-	-	V
Collector-base cutoff current $V_{CE} = 30$ V, $I_E = 0$ $V_{CE} = 30$ V, $I_E = 0$, $T_A = 150$ °C	I_{CBO}	-	-	100 10	nA µA
Emitter-base cutoff current $V_{EB} = 10$ V, $I_C = 0$	I_{EBO}	-	-	100	nA
DC current gain $I_C = 10$ mA, $V_{CE} = 5$ V PZTA63 PZTA64 $I_C = 100$ mA, $V_{CE} = 5$ V PZTA63 PZTA64	h_{FE}	 5000 10000 10000 20000	 - - - -	 - - - -	 - - - -
Collector-emitter saturation voltage $I_C = 100$ mA, $I_B = 0.1$ mA	V_{CEsat}	-	-	1.5	V
Base-emitter saturation voltage $I_C = 100$ mA, $I_B = 0.1$ mA	V_{BEsat}	-	-	2.0	V
AC Characteristics					
Transition frequency $I_C = 50$ mA, $V_{CE} = 5$ V, $f = 100$ MHz	f_T	125	-	-	MHz

1) Pulse test conditions t ≦ 300µs, D = 2 %

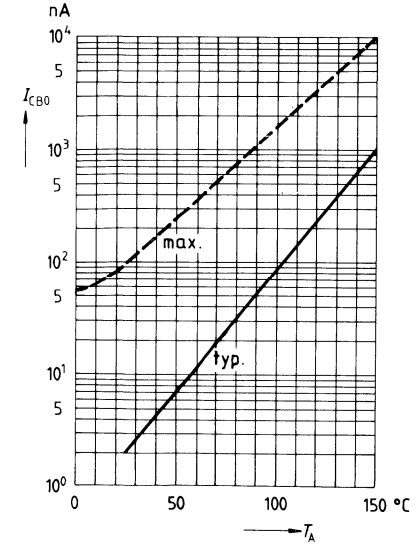
Total power dissipation $P_{tot} = f(T_A)$



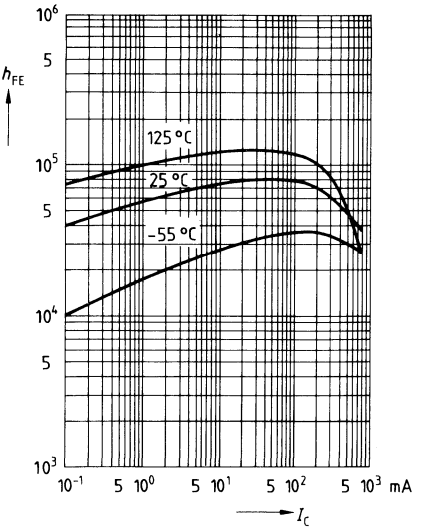
Transition frequency $f_T = f(I_c)$
$V_{CE} = 5$ V, $f = 100$ MHz



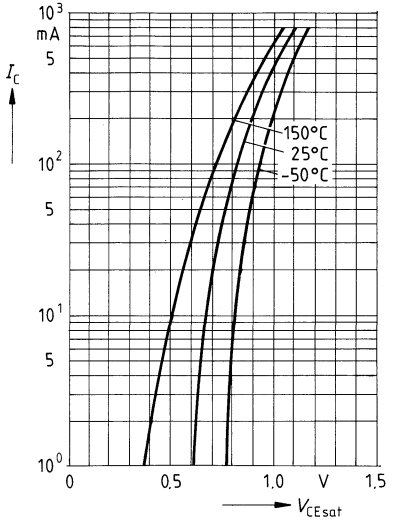
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CE} = 30$ V



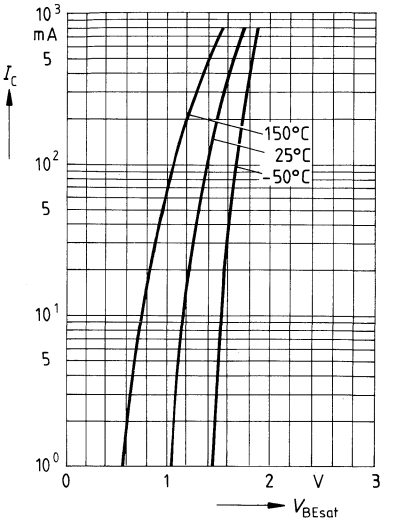
DC current gain $h_{FE} = f(I_c)$
$V_{CE} = 5$ V



Collector-emitter saturation voltage
$I_c = f(V_{CE\,sat})$
$h_{FE} = 1000$



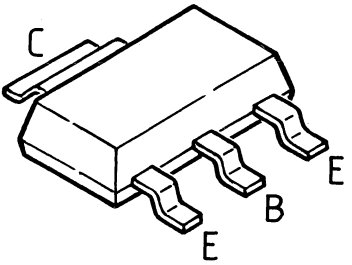
Base-emitter saturation voltage $I_c = f(V_{BE\,sat})$
$h_{FE} = 1000$



Silicon RF Transistors

Preliminary Data

- For low-noise, high-gain amplifiers up to 2 GHz at collector currents up to 50 mA
- For linear broadband amplifiers
- f_T = 8 GHz
  F = 1.2 dB at 800 MHz



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering code (12-mm tape)	Package*
BFG 193	BFG 193	Q62702 - F1291	SOT-223

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage, V_{BE} = 0	V_{CES}	20	V
Collector-base voltage	V_{CBO}	20	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	80	mA
Base current	I_B	10	mA
Total power dissipation, $T_C \leq 120°C$	P_{tot}	500	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to +150	°C
Ambient temperature range	T_A	-65 to +150	°C

*) For detailed dimensions see chapter Package Outlines

Characteristics
at $T_A = 25$ °C, unless otherwise specified.

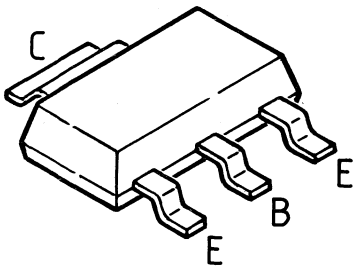
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$	$V_{(BR)CEO}$	12	-	-	V
Collector-emitter cutoff current $V_{CE} = 20$ V, $V_{BE} = 0$	I_{CES}	-	-	100	µA
Collector-base cutoff current $V_{CB} = 10$ V, $I_E = 0$	I_{CBO}	-	-	50	nA
Emitter-base cutoff current $V_{EB} = 1$ V, $I_C = 0$	I_{EBO}	-	-	1	µA
DC current gain $I_C = 5$ mA, $V_{CE} = 8$ V $I_C = 30$ mA, $V_{CE} = 8$ V	h_{FE}	- -	90 100	- -	-
Collector-emitter saturation voltage $I_C = 50$ mA, $I_B = 5$ mA	V_{CEsat}	-	-	0.4	V

AC Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Transition frequency I_C = 20 mA, V_{CE} = 8 V, f = 500 MHz I_C = 50 mA, V_{CE} = 8 V, f = 500 MHz	f_T	- -	6.4 8	- -	GHz
Collector-base capacitance V_{CB} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	-	0.65	-	pF
Collector-emitter capaitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{ce}	-	0.4	-	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	-	2.4	-	pF
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	-	1.05	-	pF
Noise figure I_C = 5 mA, V_{CE} = 8 V, f = 10 MHz, Z_S = 75 Ω I_C = 7 mA, V_{CE} = 8 V, f = 800 MHz, Z_S = Z_{Sopt} I_C = 30 mA, V_{CE} = 8 V, f = 1 GHz, Z_S = Z_{Sopt}	F	- - -	0.8 1.2 1.8	- - -	dB
Power gain I_C = 40 mA, V_{CE} = 8 V, f = 500 MHz, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}	G_{pe}	-	19	-	dB
Transducer gain I_C = 40 mA, V_{CE} = 8 V, f = 1 GHz, Z_0 = 50 Ω	$\lvert S_{21e}\rvert^2$	-	13	-	dB
Linear output voltage two-tone intermodulation test I_C = 40 mA, V_{CE} = 8 V, d_{IM} = 60 dB, f_1 = 806 MHz, f_2 = 810 MHz, Z_S = Z_L = 50 Ω	v_{o1} = v_{o2}	-	320	-	mV
Third order intercept point I_C = 40 mA, V_{CE} = 8 V, f = 800 MHz	IP_3	-	33	-	dBm

Preliminary Data

- For low-noise, low-distortion broadband amplifiers in antenna and telecommunications systems up to 1.5 GHz at collector currents from 20 to 80 mA
- $f_T = 8$ GHz
  $F = 1.7$ dB at 800 MHz



ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	Marking	Ordering code (12-mm tape)	Package*
BFG 196	BFG 196	Q62702 - F1292	SOT-223

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage, $V_{BE} = 0$	V_{CES}	20	V
Collector-base voltage	V_{CBO}	20	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	120	mA
Total power dissipation	P_{tot}	1	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-65 to +150	°C
Ambient temperature range	T_A	-65 to +150	°C

*) For detailed dimensions see chapter Package Outlines

Characteristics

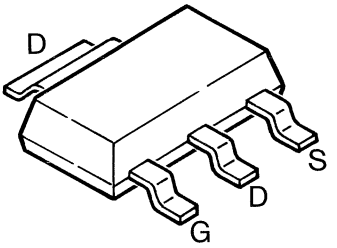
at $T_A = 25$ °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$	$V_{(BR)CEO}$	12	-	-	V
Collector-emitter cutoff current $V_{CE} = 20$ V, $V_{BE} = 0$	I_{CES}	-	-	100	µA
Collector-base cutoff current $V_{CB} = 10$ V, $I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1$ V, $I_C = 0$	I_{EBO}	-	-	1	µA
DC current gain $I_C = 50$ mA, $V_{CE} = 5$ V	h_{FE}	-	90	-	-
Collector-emitter saturation voltage $I_C = 75$ mA, $I_B = 7.5$ mA	V_{CEsat}	-	0.12	0.5	V

SIPMOS Small-Signal Transistors

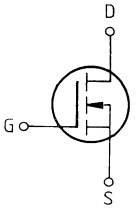
Preliminary Data

- V_{DS} = 240 V, I_D = 290 mA, $R_{DS(on)}$ = 8 Ω
- **N channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 88	Q67000-S070	BSP 88

N channel



Maximum Ratings

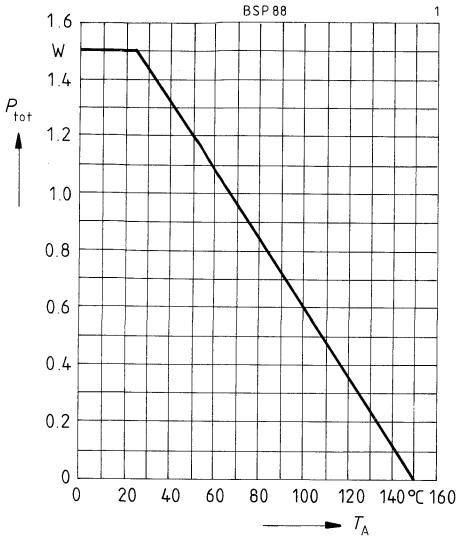
Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	240	V	-
Drain-gate voltage	V_{DGR}	240	V	R_{GS} = 20 kΩ
Continuous drain current	I_D	290	mA	T_A = 29 °C
Pulsed drain current	$I_{D\ puls}$	1160	mA	T_A = 25 °C
Gate-source voltage	V_{GS}	± 10	V	-
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	T_A = 25 °C
Operating and storage temperature range	T_j T_{stg}	-55... + 150	°C	-
DIN humidity category	-	E	-	DIN 40 040
IEC climatic category	-	55/150/56	-	DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	$R_{th\ JA}$	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

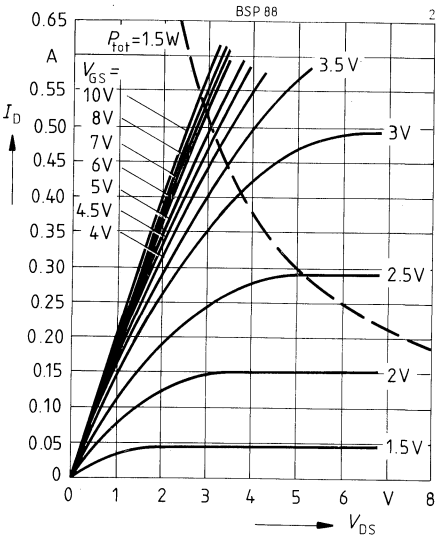
Electrical Characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	240	-	-	V	$V_{GS} = 0$ $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	0.6	0.8	1.2	V	$V_{GS} = V_{DS}$ $I_D = 1$ mA
Zero gate voltage drain current	I_{DSS}	- -	1 10	20 200	µA	$T_j = 25$ °C $T_j = 125$ °C $V_{DS} = 240$ V
			-	100	nA	$V_{DS} = 100$ V $V_{GS} = 0$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS} = 20$ V $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	-	6	8 15	Ω	$V_{GS} = 4.5$ V $I_D = 290$ mA $V_{GS} = 1.8$ V $I_D = 14$ mA
Dynamic characteristics						
Forward transconductance	g_{fs}	0.14	0.32	-	S	$V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$ $I_D = 290$ mA
Input capacitance	C_{iss}	-	90	140	pF	$V_{GS} = 0$ V $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	-	20	30		
Reverse transfer capacitance	C_{rss}	-	6	9		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	-	5	8	ns	$V_{CC} = 30$ V $V_{GS} = 10$ V $I_D = 280$ mA $R_{GS} = 50$ Ω
	t_r	-	10	15		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	-	30	40		
	t_f	-	25	30		
Reverse diode						
Continuous reverse drain current	I_{DR}	-	-	290	mA	$T_A = 25$ °C
Pulsed reverse drain current	I_{DRM}	-	-	1160		
Diode forward on-voltage	V_{SD}	-	1	1.3	V	$I_F = 580$ mA, $V_{GS} = 0$

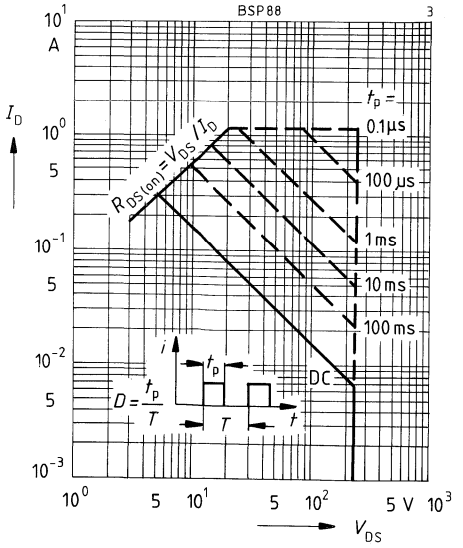
Permissible power dissipation $P_{tot} = f(T_A)$



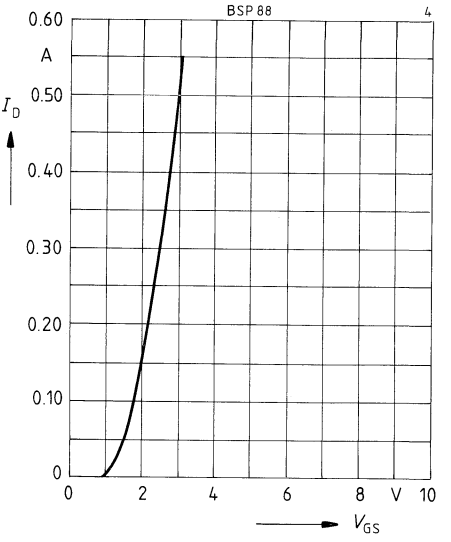
Typ. output characteristics $I_D = f(V_{DS})$



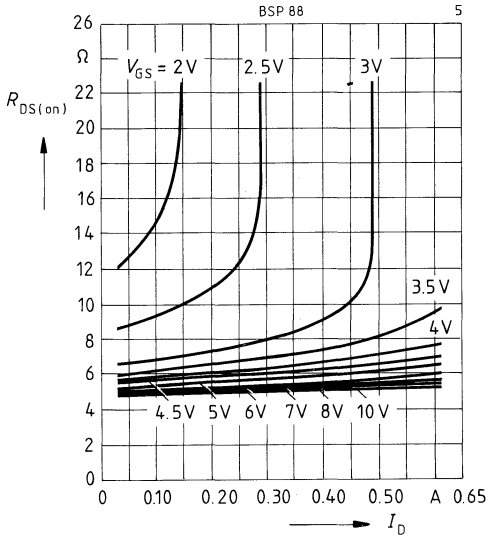
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



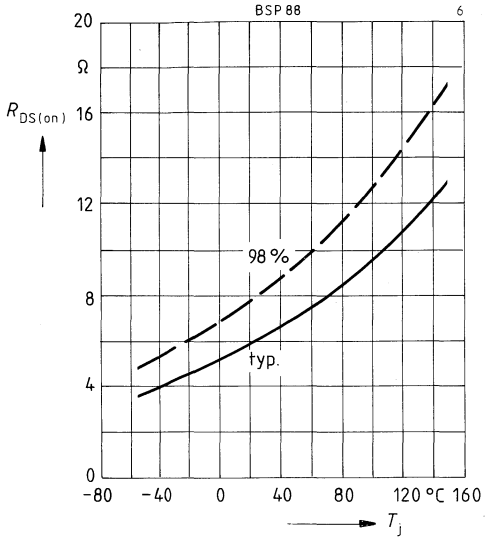
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



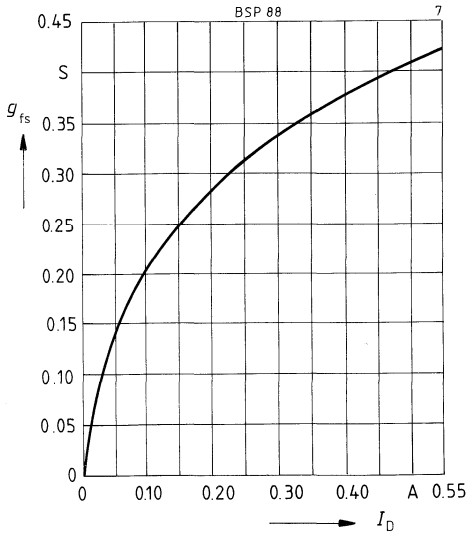
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



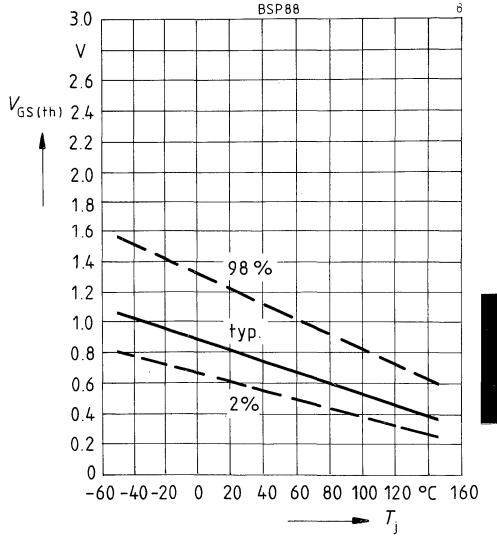
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $V_{GS} = 4.5$ V, $I_D = 0.29$ A, (spread)



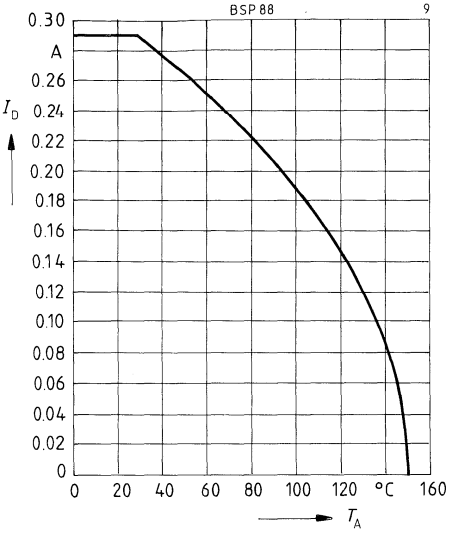
Typ. transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



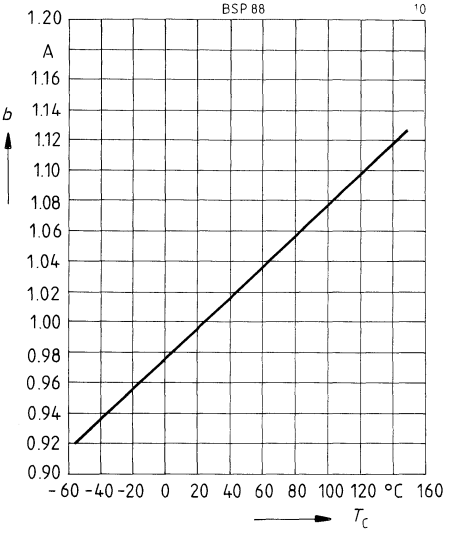
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, $I_D = 1$ mA
(spread)



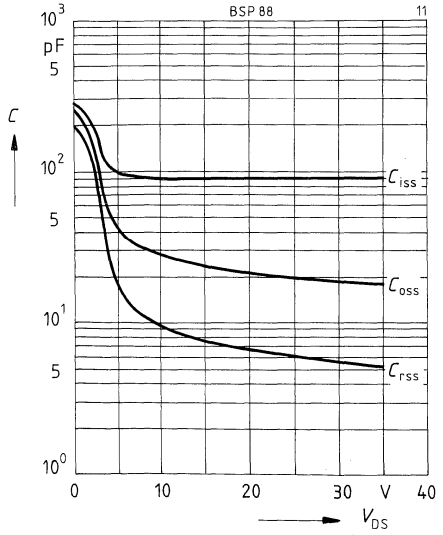
Continuous drain current $I_D = f(T_A)$



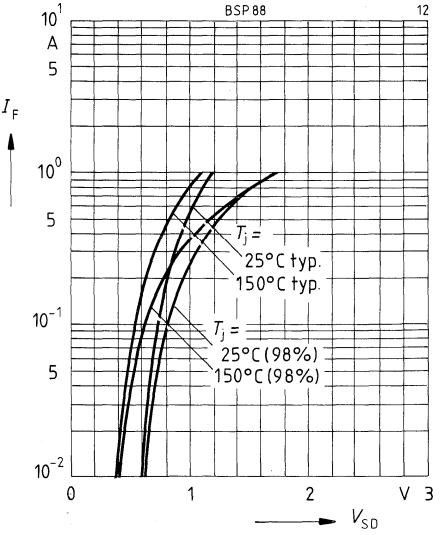
Drain-source breakdown voltage
$V_{(BR)DSS}$ $(T_j) = b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz

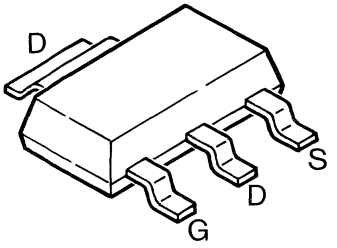


Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



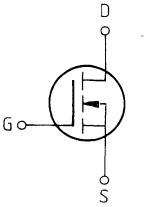
Preliminary Data

- V_{DS} = 240 V, I_D = 340 mA, $R_{DS(on)}$ = 6 Ω
- **N channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 89	Q62702-S652	BSP 89

N channel



Maximum Ratings

Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	240	V	-
Drain-gate voltage	V_{DGR}	240	V	R_{GS} = 20 kΩ
Continuous drain current	I_D	340	mA	T_A = 25 °C
Pulsed drain current	$I_{D\ puls}$	1360	mA	T_A = 25 °C
Gate-source voltage	V_{GS}	± 10	V	-
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	T_A = 25 °C
Operating and storage temperature range	T_j T_{stg}	-55... + 150	°C	-
DIN humidity category	-	E	-	DIN 40 040
IEC climatic category	-	55/150/56	-	DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	$R_{th\ JA}$	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

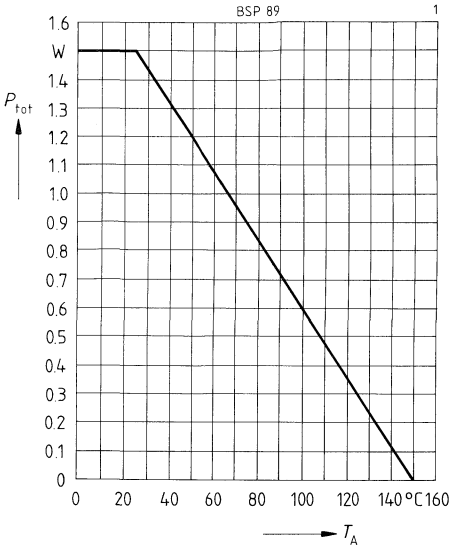
Electrical Characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	240	-	-	V	$V_{GS} = 0$ $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	0.8	1.5	2	V	$V_{GS} = V_{DS}$ $I_D = 1$ mA
Zero gate voltage drain current	I_{DSS}	- -	4 8	60 200	µA	$T_j = 25$ °C $T_j = 125$ °C $V_{DS} = 240$ V $V_{GS} = 0$
		-	-	200	nA	$V_{DS} = 60$ V $V_{GS} = 0$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS} = 20$ V $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	-	5.5 9	6 10	Ω	$V_{GS} = 10$ V $V_{GS} = 4.5$ V $I_D = 340$ mA
Dynamic characteristics						
Forward transconductance	g_{fs}	0.14	0.29	-	S	$V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$ $I_D = 340$ mA
Input capacitance	C_{iss}	-	90	140	pF	$V_{GS} = 0$ V $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	-	20	30		
Reverse transfer capacitance	C_{rss}	-	6	9		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	-	5	8	ns	$V_{CC} = 30$ V $V_{GS} = 10$ V $I_D = 280$ mA $R_{GS} = 50\ \Omega$
	t_r	-	8	12		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	-	25	30		
	t_f	-	22	28		

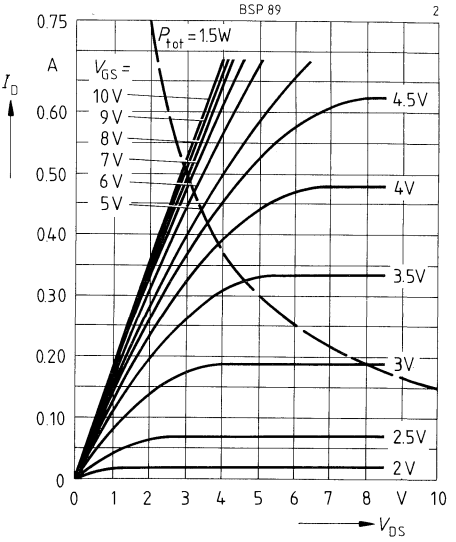
Electrical Characteristics (continued)
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Reverse diode						
Continuous reverse drain current	I_{DR}	-	-	340	mA	$T_A = 25$ °C
Pulsed reverse drain current	I_{DRM}	-	-	1360		
Diode forward on-voltage	V_{SD}	-	1.1	1.4	V	$I_F = 680$ mA $V_{GS} = 0$

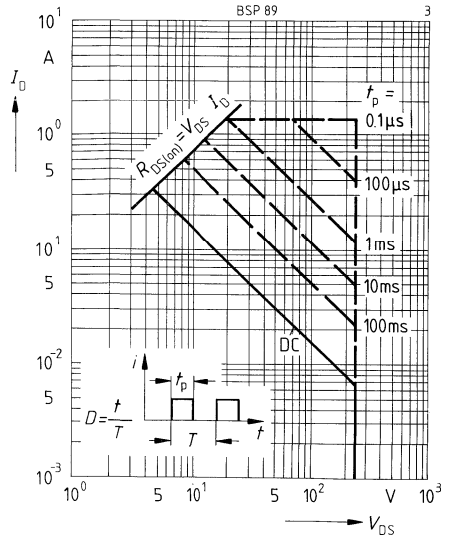
Permissible power dissipation $P_{tot} = f(T_A)$



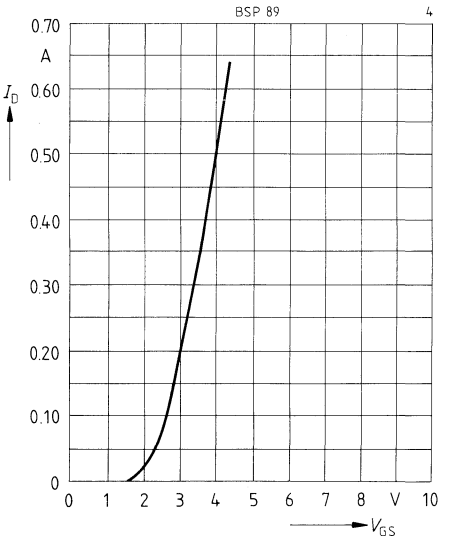
Typ. output characteristics $I_D = f(V_{DS})$



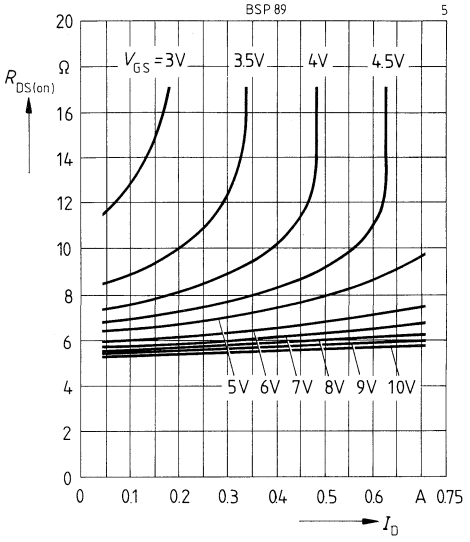
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



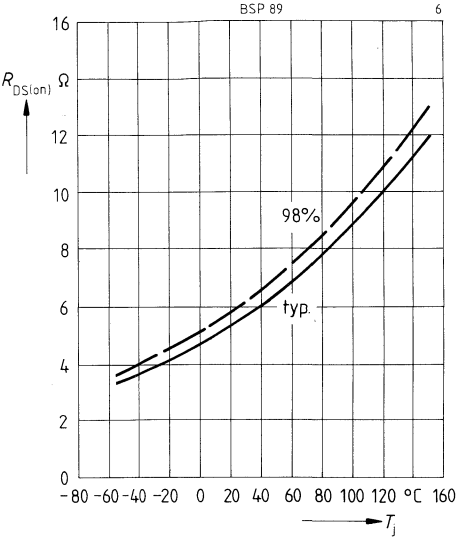
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



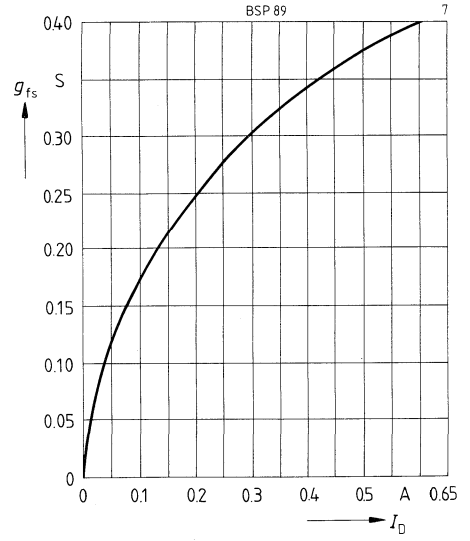
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



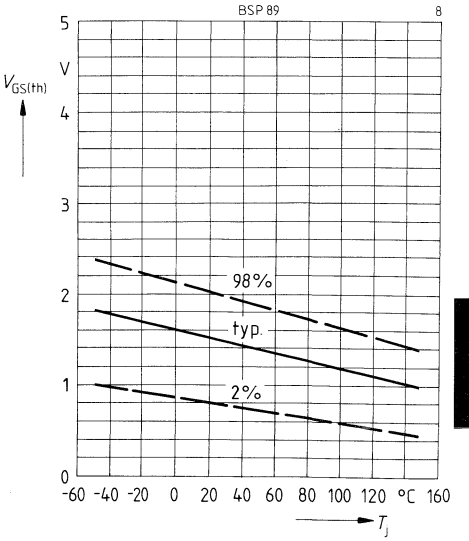
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $V_{GS} = 10$ V, $I_D = 0.34$ A, (spread)



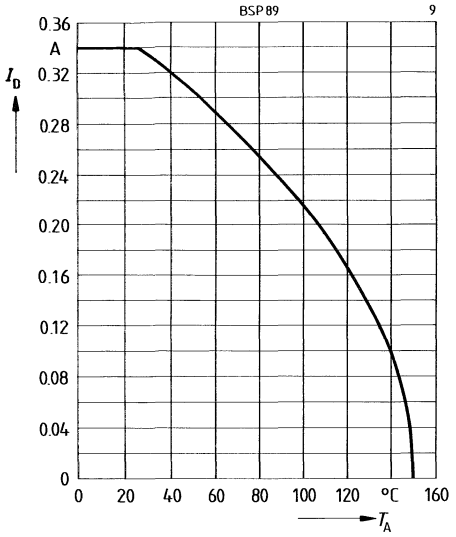
Typ. transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



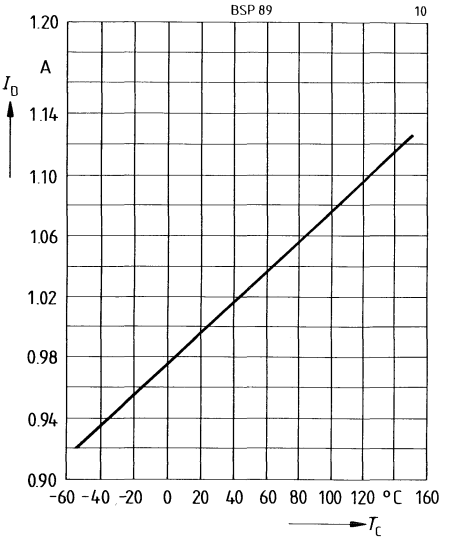
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, $I_D = 1$ mA
(spread)



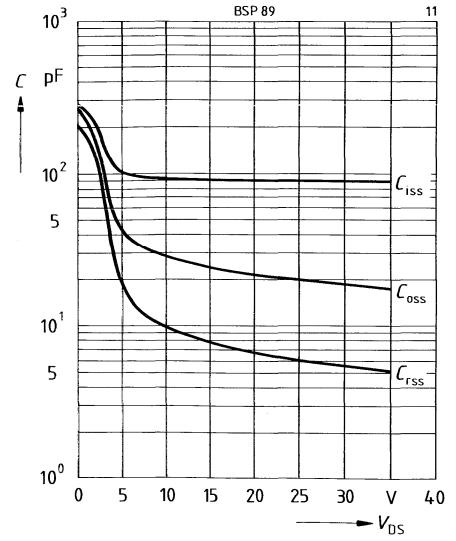
Continuous drain current $I_D = f(T_A)$



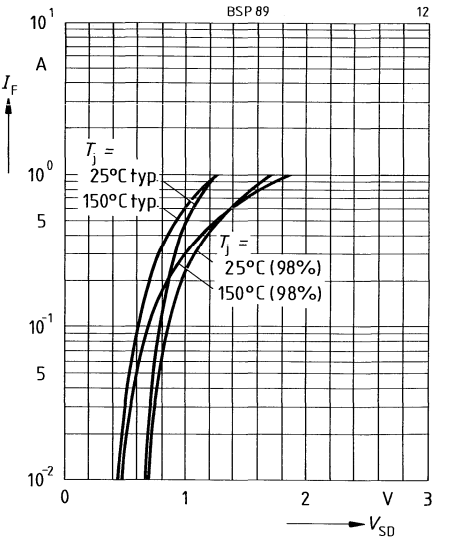
Drain-source breakdown voltage
$V_{(BR)DSS}$ (T_j) = $b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz

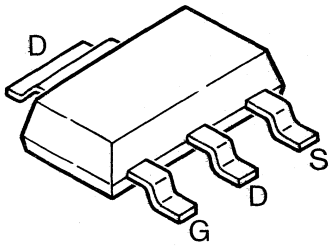


Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



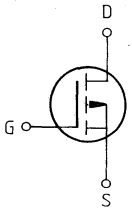
Preliminary Data

- V_{DS} = -240 V, I_D = -180 mA, $R_{DS(on)}$ = 20 Ω
- **P channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 92	Q62702-S653	BSP 92

P channel



Maximum Ratings

Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	-240	V	-
Drain-gate voltage	V_{DGR}	-240	V	R_{GS} = 20 kΩ
Continuous drain current	I_D	-180	mA	T_A = 33 °C
Pulsed drain current	$I_{D\ puls}$	-720	mA	T_A = 25 °C
Gate-source voltage	V_{GS}	± 20	V	-
Total power dissipation	P_{tot}	1.5	W	T_A = 25 °C
Operating and storage temperature range	T_j T_{stg}	-55... + 150	°C	-
DIN humidity category	-	E	-	DIN 40 040
IEC climatic category	-	55/150/56	-	DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	$R_{th\ JA}$	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

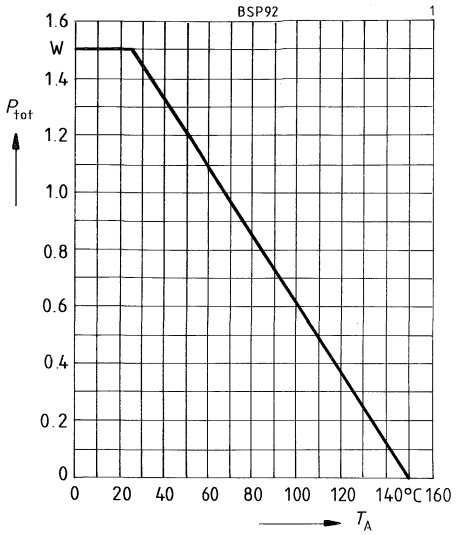
Electrical Characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	-240	-	-	V	$V_{GS} = 0$ $I_D = -0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	-0.8	-1.5	-2	V	$V_{GS} = V_{DS}$ $I_D = -1$ mA
Zero gate voltage drain current	I_{DSS}	- -	-4 -8	-60 -200 -200	µA nA	$T_j = 25$ °C $T_j = 125$ °C $V_{DS} = -240$ V $V_{DS} = -60$ V $V_{GS} = 0$
Gate-source leakage current	I_{GSS}	-	-10	-100	nA	$V_{GS} = -20$ V $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	-	12	20	Ω	$V_{GS} = -10$ V $I_D = -180$ mA
Dynamic characteristics						
Forward transconductance	g_{fs}	0.06	0.13	-	S	$V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$ $I_D = -180$ mA
Input capacitance	C_{iss}	-	70	105	pF	$V_{GS} = 0$ V $V_{DS} = -25$ V $f = 1$ MHz
Output capacitance	C_{oss}	-	20	30		
Reverse transfer capacitance	C_{rss}	-	8	12		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	-	8	12	ns	$V_{CC} = -30$ V $V_{GS} = -10$ V $I_D = -250$ mA $R_{GS} = 50\ \Omega$
	t_r	-	30	45		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	-	15	20		
	t_f	-	30	40		

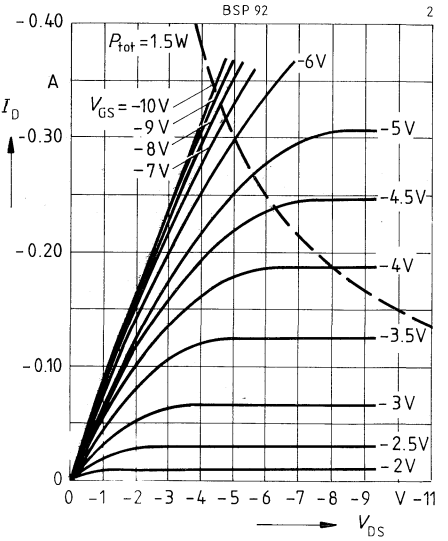
Electrical Characteristics (continued)
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Reverse diode						
Continuous reverse drain current	I_{DR}	-	-	-180	mA	$T_A = 25$ °C
Pulsed reverse drain current	I_{DRM}	-	-	-720		
Diode forward on-voltage	V_{SD}	-	-0.9	-1.2	V	$I_F = -360$ mA $V_{GS} = 0$

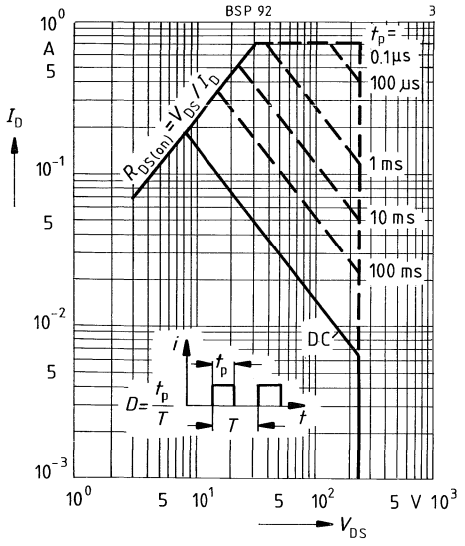
Permissible power dissipation $P_{tot} = f(T_A)$



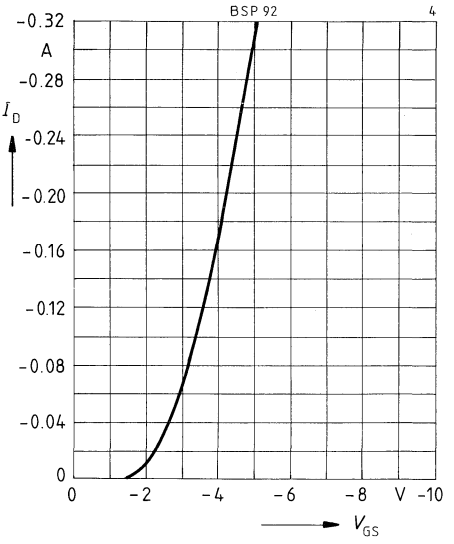
Typ. output characteristics $I_D = f(V_{DS})$



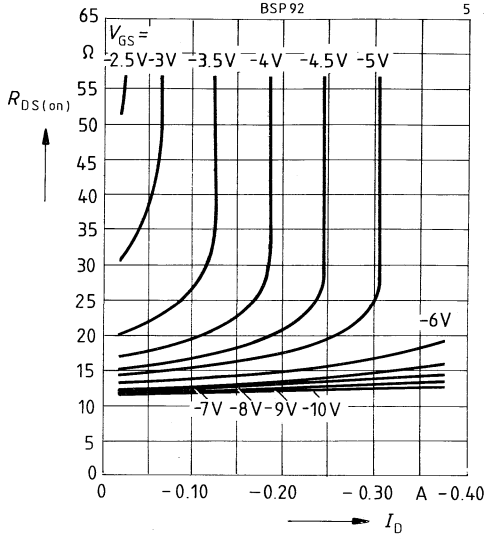
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



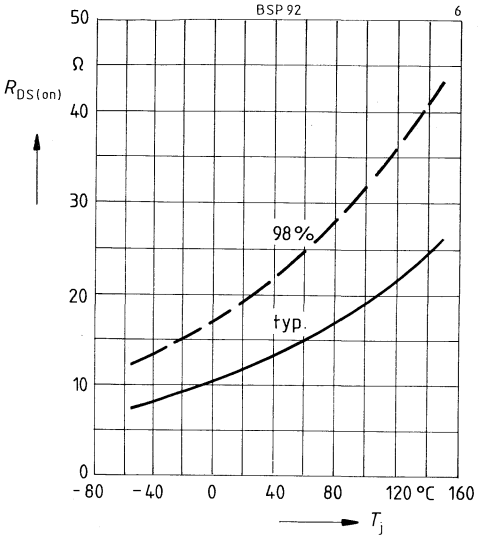
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = -25$ V, $t_p = 80$ µs, $T_j = 25$ °C



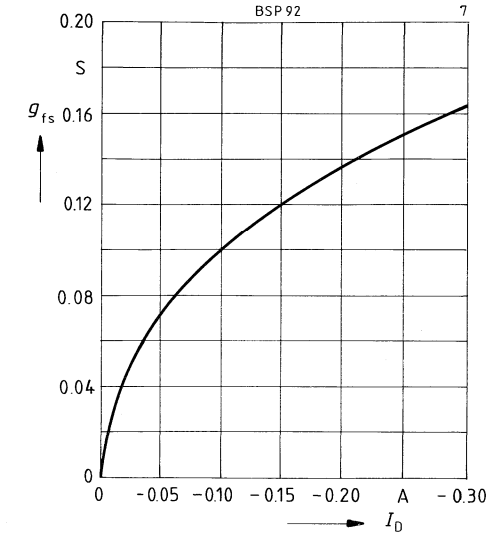
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



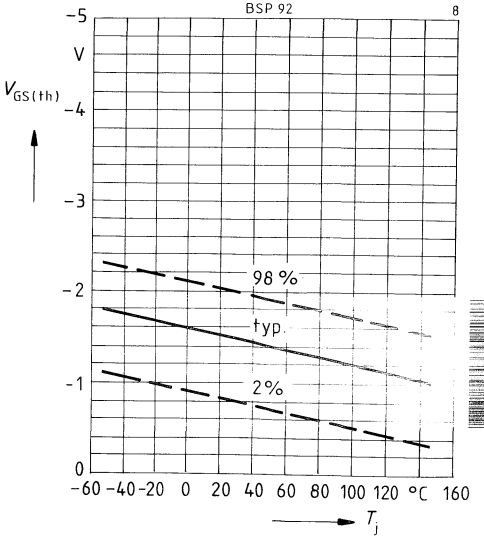
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $V_{GS} = -10$ V, $I_D = -0.18$ A, (spread)



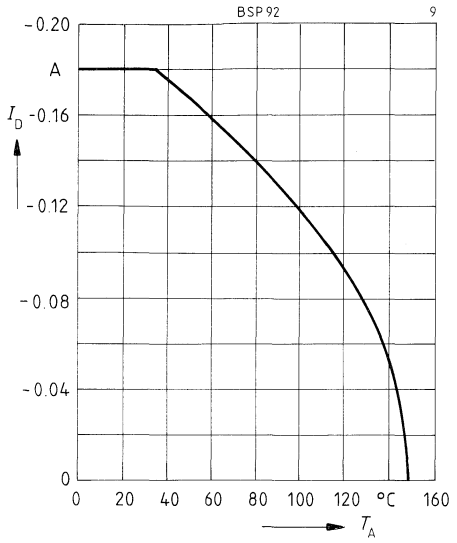
Typ. transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} = -25$ V, $t_p = 80$ µs, $T_j = 25$ °C



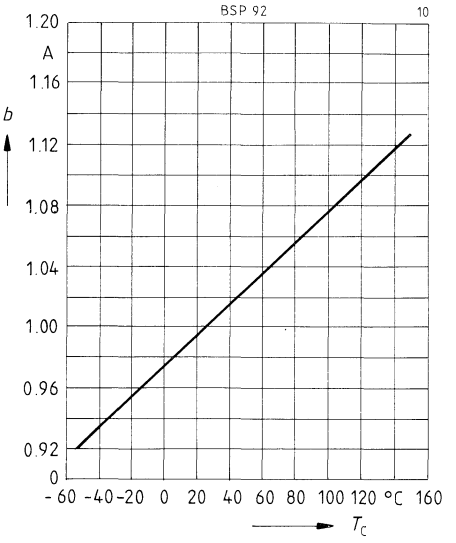
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, $I_D = -1$ mA
(spread)



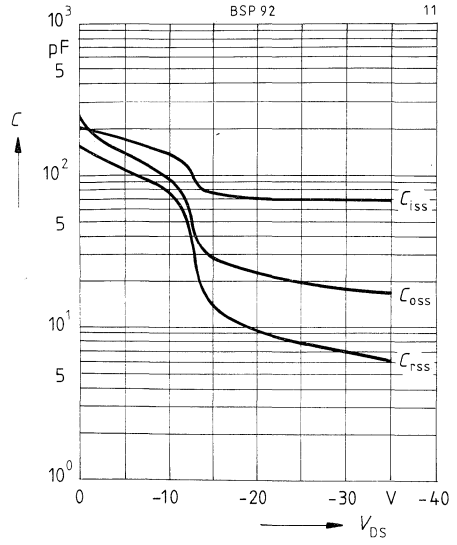
Continuous drain current $I_D = f(T_A)$



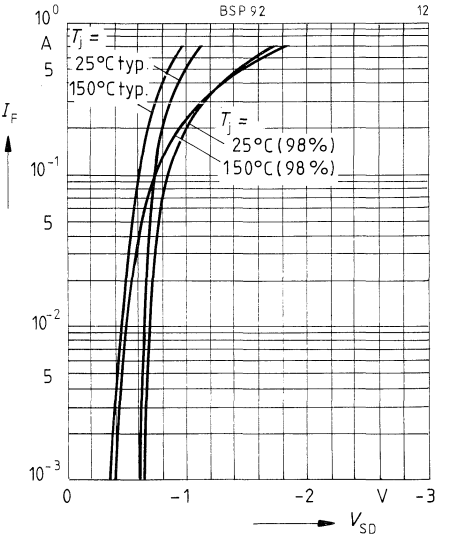
Drain-source breakdown voltage
$V_{(BR)DSS}$ (T_j) = $b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz

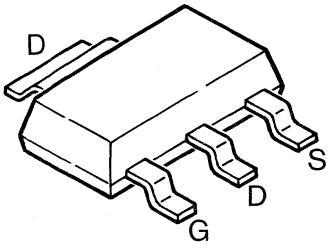


Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



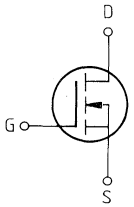
Preliminary Data

- V_{DS} = 600 V, I_D = 110 mA, $R_{DS(on)}$ = 45 Ω
- **N channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 125	Q62702-S654	BSP 125

N channel



Maximum Ratings

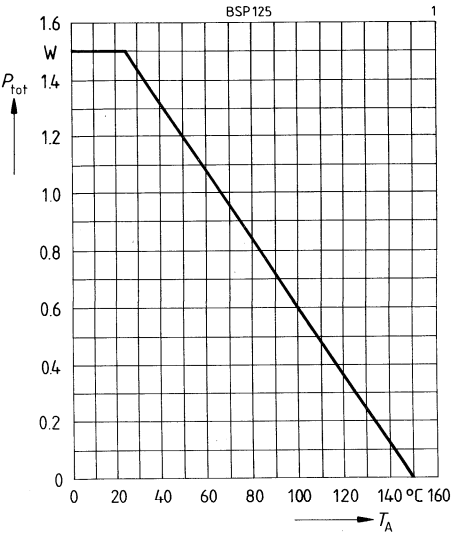
Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	600	V	-
Drain-gate voltage	V_{DGR}	600	V	R_{GS} = 20 kΩ
Continuous drain current	I_D	110	mA	T_A = 39 °C
Pulsed drain current	$I_{D\ puls}$	440	mA	T_A = 25 °C
Gate-source voltage	V_{GS}	± 10	V	-
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	T_A = 25 °C
Operating and storage temperature range	T_j T_{stg}	-55... + 150	°C	-
DIN humidity category	-	E	-	DIN 40 040
IEC climatic category	-	55/150/56	-	DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	$R_{th\ JA}$	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

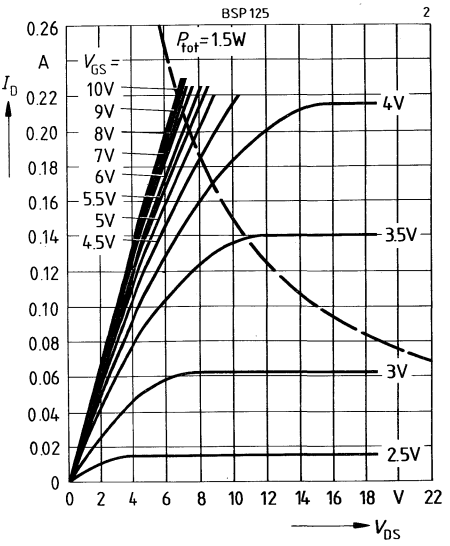
Electrical Characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	600	-	-	V	$V_{GS} = 0$ $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	1.5	2	2.5	V	$V_{GS} = V_{DS}$ $I_D = 1$ mA
Zero gate voltage drain current	I_{DSS}	- -	10 8	100 50	nA µA	$T_j = 25$ °C $T_j = 125$ °C $V_{DS} = 600$ V $V_{GS} = 0$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS} = 20$ V $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	-	30	45	Ω	$V_{GS} = 10$ V $I_D = 110$ mA
Dynamic characteristics						
Forward transconductance	g_{fs}	0.06	0.15	-	S	$V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$ $I_D = 110$ mA
Input capacitance	C_{iss}	-	110	170	pF	$V_{GS} = 0$ V $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	-	10	15		
Reverse transfer capacitance	C_{rss}	-	6	10		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	-	5	8	ns	$V_{CC} = 30$ V $V_{GS} = 10$ V $I_D = 210$ mA $R_{GS} = 50$ Ω
	t_r	-	10	15		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	-	18	25		
	t_f	-	20	25		
Reverse diode						
Continuous reverse drain current	I_{DR}	-	-	110	mA	$T_A = 25$ °C
Pulsed reverse drain current	I_{DRM}	-	-	440		
Diode forward on-voltage	V_{SD}	-	1	1.4	V	$I_F = 220$ mA, $V_{GS} = 0$

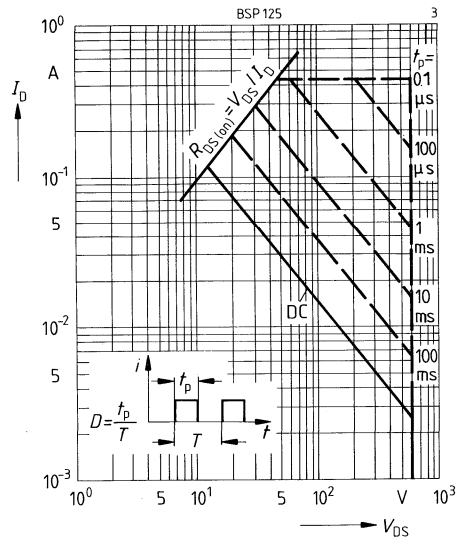
Permissible power dissipation $P_{tot} = f(T_A)$



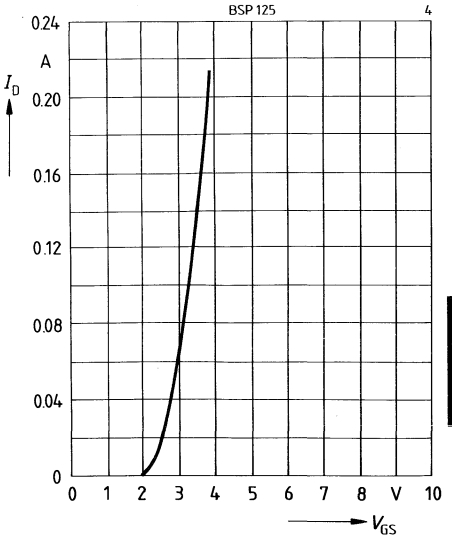
Typ. output characteristics $I_D = f(V_{DS})$



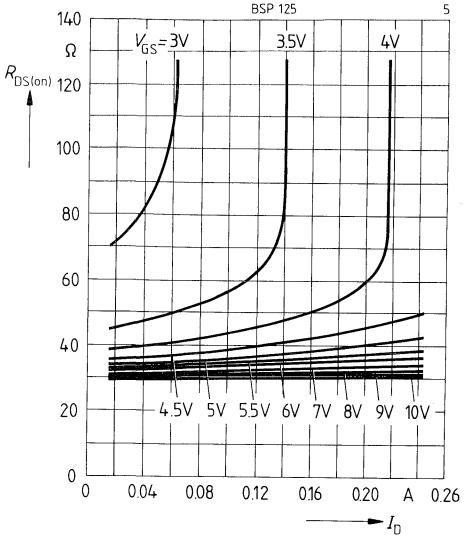
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



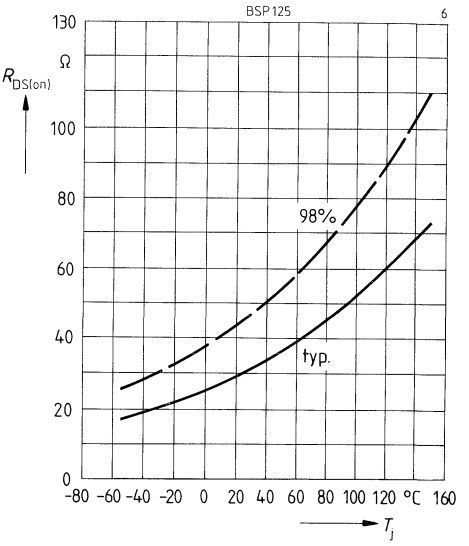
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



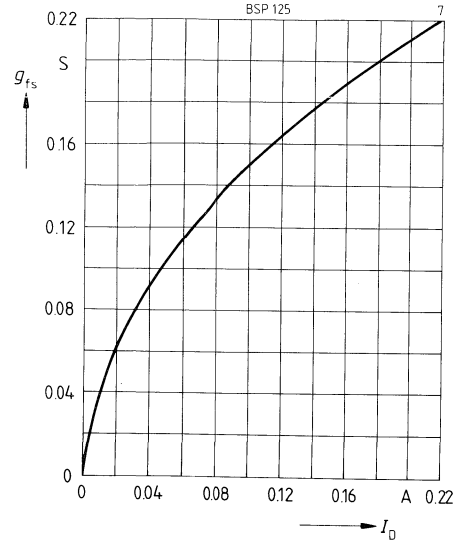
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



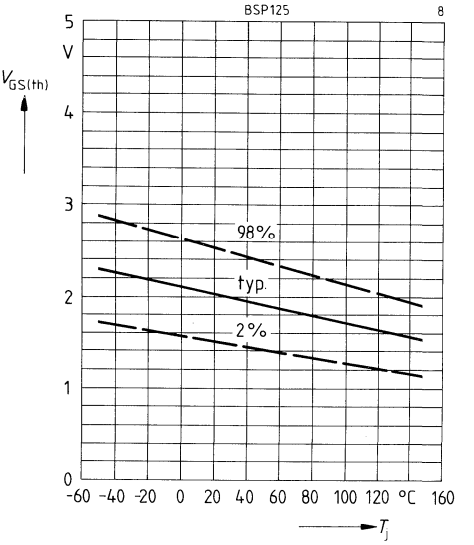
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $V_{GS} = 10$ V, $I_D = 0.11$ A, (spread)



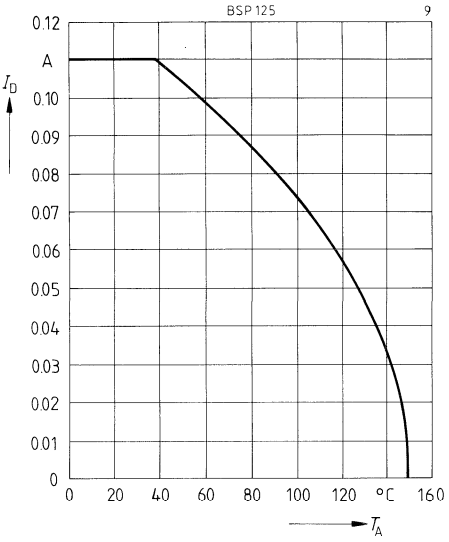
Typ. transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



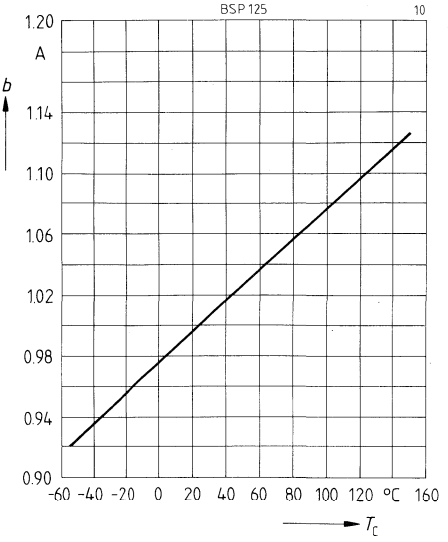
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, $I_D = 1$ mA
(spread)



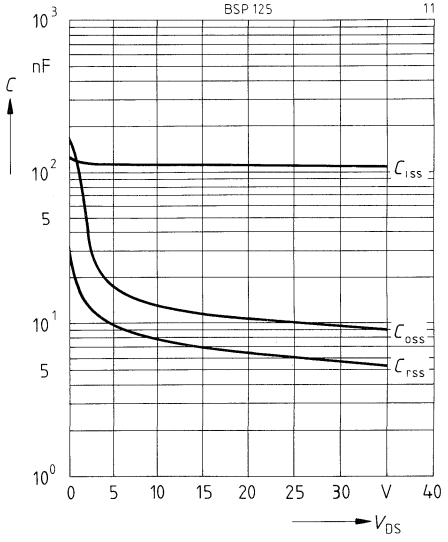
Continuous drain current $I_D = f(T_A)$



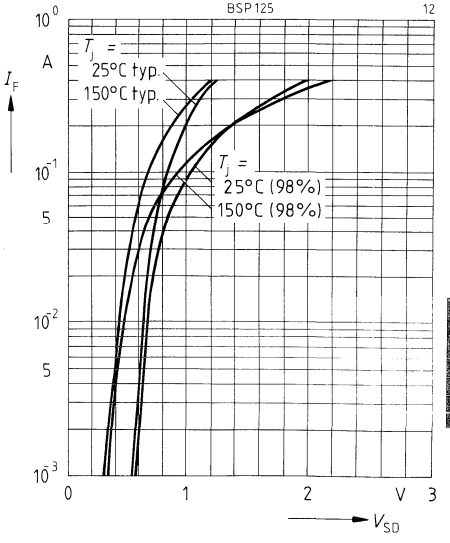
Drain-source breakdown voltage
$V_{(BR)DSS}$ $(T_j) = b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz

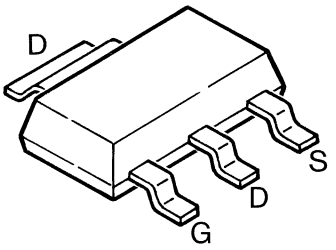


Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



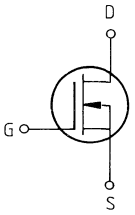
Preliminary Data

- V_{DS} = 600 V, I_D = 100 mA, $R_{DS(on)}$ = 60 Ω
- **N channel, *depletion mode***
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 135	Q62702-S655	BSP 135

N channel



Maximum Ratings

Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	600	V	-
Drain-gate voltage	V_{DGR}	600	V	R_{GS} = 20 kΩ
Continuous drain current	I_D	100	mA	T_A = 27 °C
Pulsed drain current	$I_{D\ puls}$	300	mA	T_A = 25 °C
Gate-source voltage	V_{GS}	± 10	V	-
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	T_A = 25 °C
Operating and storage temperature range	T_j T_{stg}	-55... + 150	°C	-
DIN humidity category	-	E	-	DIN 40 040
IEC climatic category	-	55/150/56	-	DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	$R_{th\ JA}$	≤ 83.3	K/W	

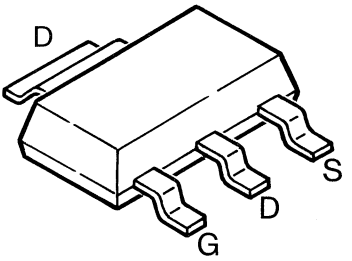
[1)] Transistor on epoxy pcb 40 mm x 40 mm x1.5 mm with 6 cm² copper area for drain connection

Electrical Characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSV}$	600	-	-	V	$V_{GS} = -3$ V $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	-1.8	-1.2	-0.7	V	$V_{DS} = 3$ V $I_D = 1$ mA
Zero gate voltage drain current	I_{DSV}	- -	- -	100 200	nA µA	$T_j = 25$ °C $T_j = 125$ °C $V_{DS} = 600$ V $V_{GS} = -3$ V
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS} = 20$ V $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	-	45	60	Ω	$V_{GS} = 0$ V $I_D = 10$ mA
Dynamic characteristics						
Forward transconductance	g_{fs}	0.01	0.04	-	S	$V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$ $I_D = 10$ mA
Input capacitance	C_{iss}	-	110	-	pF	$V_{GS} = -3$ V $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	-	20	-		
Reverse transfer capacitance	C_{rss}	-	5	-		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	-	10	-	ns	$V_{CC} = 30$ V $V_{GS} = -3$ V... + 5 V $I_D = 200$ mA $R_{GS} = 50$ Ω
	t_r	-	10	-		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	-	15	-		
	t_f	-	25	-		
Reverse diode						
Continuous reverse drain current	I_{DR}	-	-	100	mA	$T_A = 25$ °C
Pulsed reverse drain current	I_{DRM}	-	-	300		
Diode forward on-voltage	V_{SD}	-	0.9	1.3	V	$I_F = 200$ mA $V_{GS} = 0$

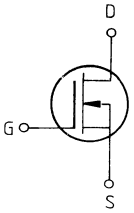
Preliminary Data

- V_{DS} = 200 V, I_D = 440 mA, $R_{DS(on)}$ = 3.5 Ω
- **N channel, *depletion mode***
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 149	Q67000-S071	BSP 149

N channel



Maximum Ratings

Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	200	V	-
Drain-gate voltage	V_{DGR}	200	V	R_{GS} = 20 kΩ
Continuous drain current	I_D	440	mA	T_A = 28 °C
Pulsed drain current	$I_{D\ puls}$	1320	mA	T_A = 25 °C
Gate-source voltage	V_{GS}	± 10	V	-
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	T_A = 25 °C
Operating and storage temperature range	T_j T_{stg}	-55... + 150	°C	-
DIN humidity category	-	E	-	DIN 40 040
IEC climatic category	-	55/150/56	-	DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	$R_{th\ JA}$	≤ 83.3	K/W	

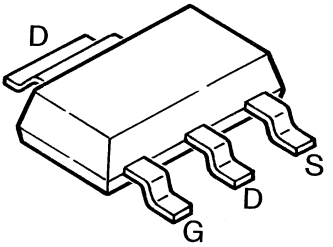
[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm ^{2} copper area for drain connection

Electrical Characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSV}$	200	-	-	V	$V_{GS} = -3$ V $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	-1.8	-	-0.7	V	$V_{DS} = 3$ V $I_D = 1$ mA
Zero gate voltage drain current	I_{DSV}	- -	- -	0.2 200	µA	$T_j = 25$ °C $T_j = 125$ °C $V_{DS} = 200$ V $V_{GS} = -3$ V
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS} = 20$ V $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	-	3	3.5	Ω	$V_{GS} = 0$ $I_D = 30$ mA
Dynamic characteristics						
Forward transconductance	g_{fs}	0.4	1	-	S	$V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$ $I_D = 440$ mA
Input capacitance	C_{iss}	-	400	-	pF	$V_{GS} = 0$ V $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	-	50	-		
Reverse transfer capacitance	C_{rss}	-	15	-		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	-	15	-	ns	$V_{CC} = 30$ V $V_{GS} = -2$ V... +5 V $I_D = 290$ mA $R_{GS} = 50$ Ω
	t_r	-	10	-		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	-	100	-		
	t_f	-	40	-		
Reverse diode						
Continuous reverse diode current	I_{DR}	-	-	440	mA	$T_A = 25$ °C
Pulsed reverse diode current	I_{DRM}	-	-	1320		
Diode forward on-voltage	V_{SD}	-	0.9	1.2	V	$I_F = 880$ mA $V_{GS} = 0$

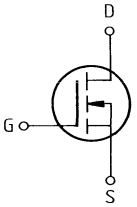
Preliminary Data

- $V_{DS} = 50$ V, $I_D = 1.7$ A, $R_{DS(on)} = 0.3\ \Omega$
- **N channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 295	Q67000-S066	BSP 295

N channel



Maximum Ratings

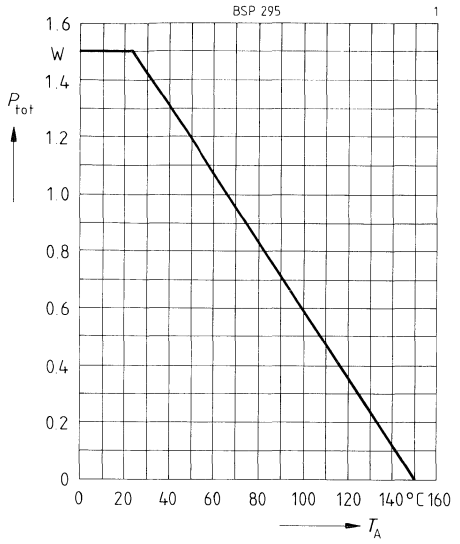
Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	50	V	–
Drain-gate voltage	V_{DGR}	50	V	$R_{GS} = 20$ kΩ
Continuous drain current	I_D	1.7	A	$T_A = 25$ °C
Pulsed drain current	I_{Dpuls}	6.8	A	$T_A = 25$ °C
Gate-source voltage	V_{GS}	± 10	V	–
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	$T_A = 25$ °C
Operating and storage temperature range	T_j T_{stg}	–55...+150	°C	
DIN humidity category		E		DIN 40040
IEC climatic category		55/150/56		DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	R_{thJA}	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

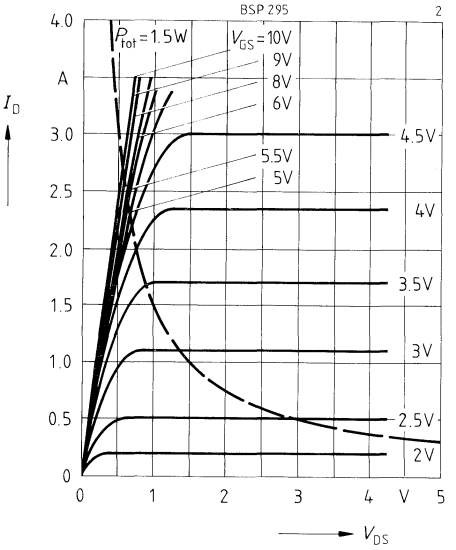
Electrical characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	50	-	-	V	$V_{GS} = 0$ $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	0.8	1.2	2	V	$V_{GS} = V_{DS}$ $I_D = 1$ mA
Zero gate voltage drain current	I_{DSS}	– –	0.1 8	1 50	µA	$T_j = 25$ °C $T_j = 125$ °C $V_{GS} = 0$ $V_{DS} = 50$ V
Gate-source leakage current	I_{GSS}	–	10	100	nA	$V_{GS} = 20$ V, $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	– –	0.4 0.2	0.5 0.3	Ω	I_D=1.7 A, V_{GS}=4.5 V I_D=1.7 A, V_{GS}=10 V
Dynamic characteristics						
Forward transconductance	g_{fs}	0.5	1.4	–	S	$V_{DS} \geq 2^x/_D{}^x R_{DS(on)max.}$ $I_D = 1.7$ A
Input capacitance	C_{iss}	–	370	550	pF	$V_{GS} = 0$ $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	–	110	170		
Reverse transfer capacitance	C_{rss}	–	40	60		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	–	8	12	ns	$V_{CC} = 30$ V $V_{GS} = 10$ V $I_D = 0.29$ A $R_{GS} = 50$ Ω
	t_r	–	15	25		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	–	100	150		
	t_f	–	75	110		
Reverse diode						
Continuous reverse drain current	I_S	–	1.7	–	A	$T_C = 25$ °C
Pulsed reverse drain current	I_{SM}	–	6.8	–		
Diode forward on-voltage	V_{SD}	–	1	1.5	V	$T_j = 25$ °C, $V_{GS} = 0$ $I_F = 3.4$ A

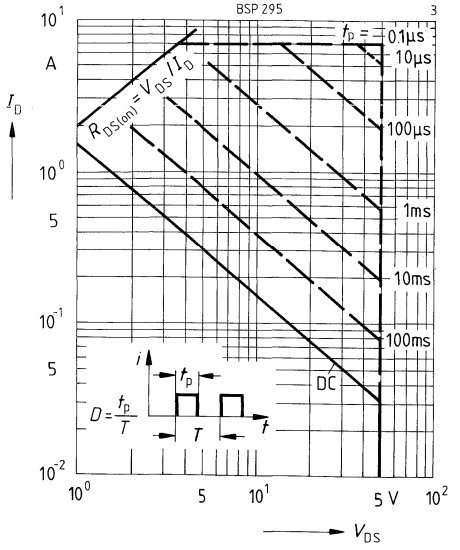
Permissible power dissipation $P_{tot} = f(T_A)$



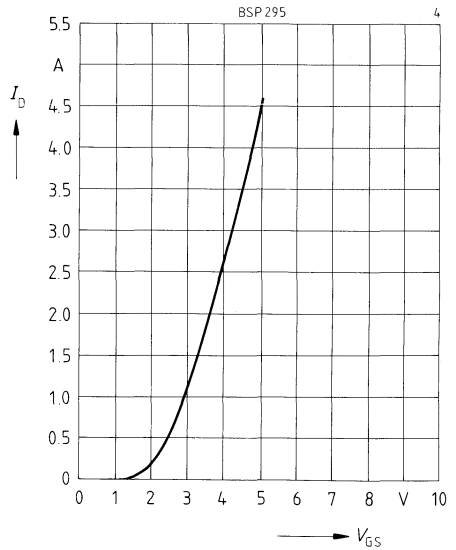
Typ. output characteristics $I_D = f(V_{DS})$



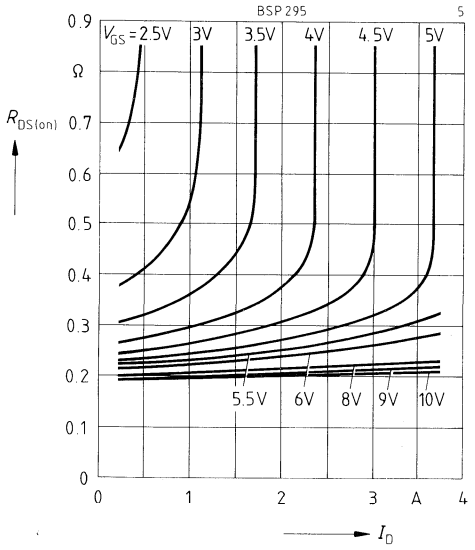
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



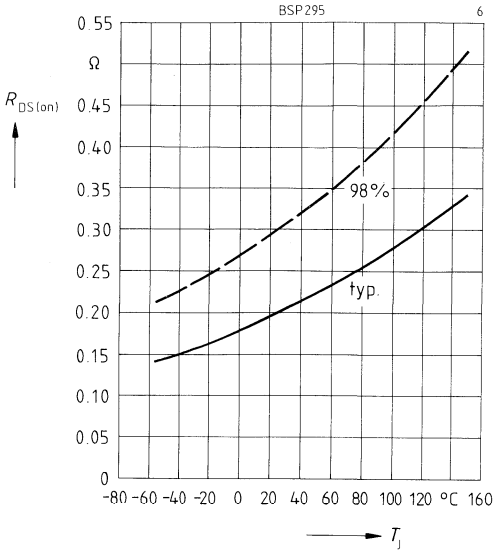
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



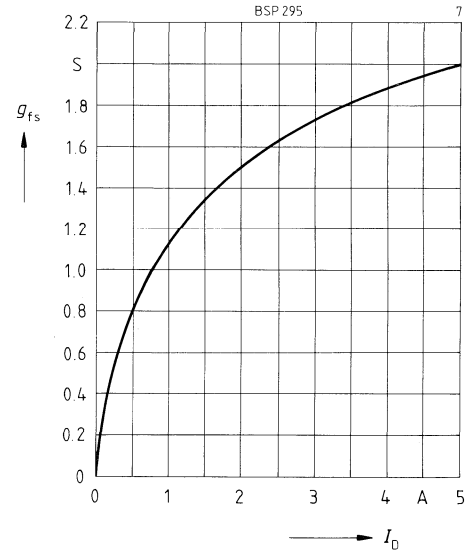
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



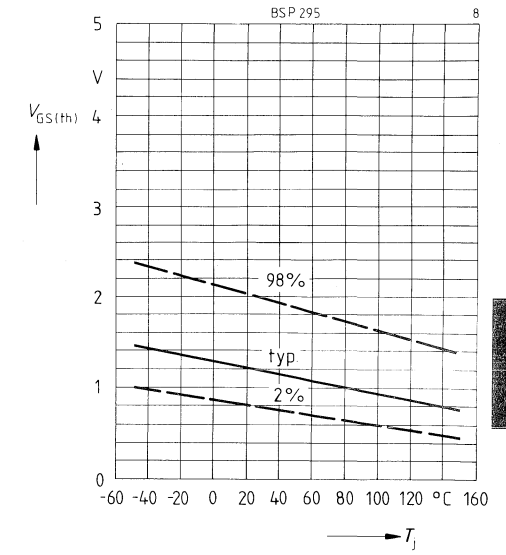
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $V_{GS} = 10$ V, $I_D = 1.7$ A, (spread)



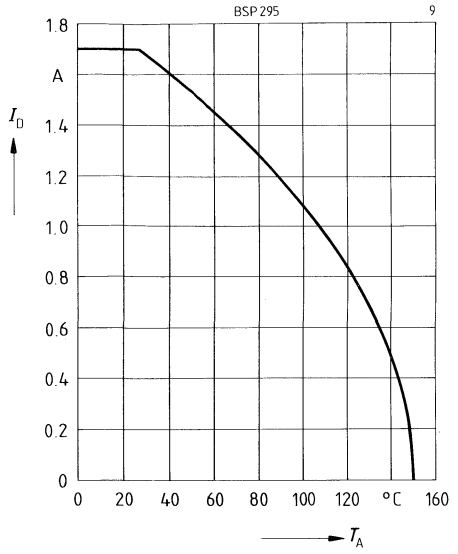
Typ. transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



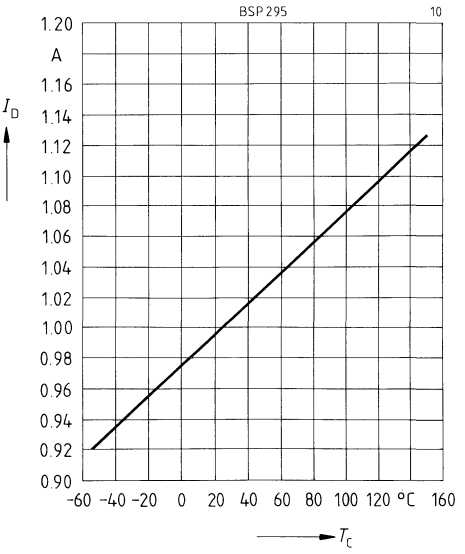
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, $I_D = 1$ mA
(spread)



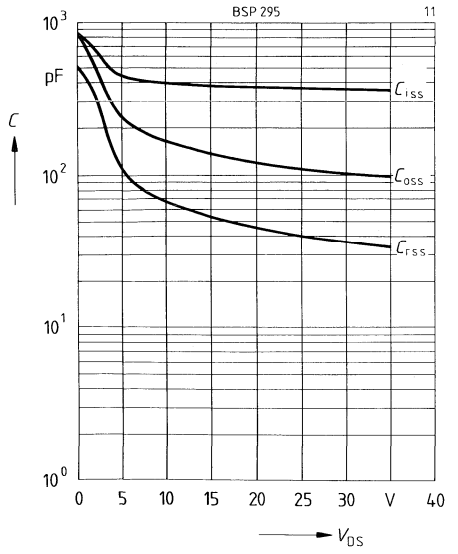
Continuous drain current $I_D = f(T_A)$



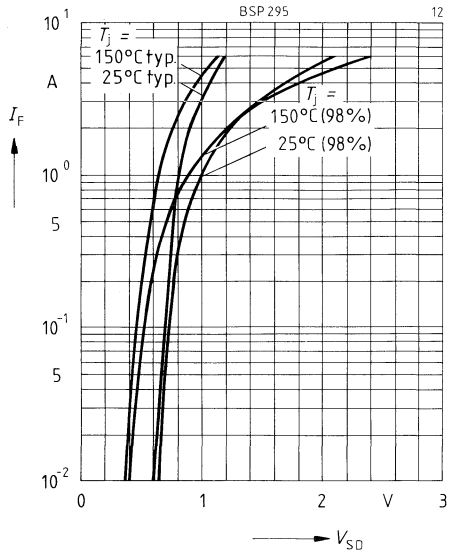
Drain-source breakdown voltage
$V_{(BR)DSS}$ (T_j) = $b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz

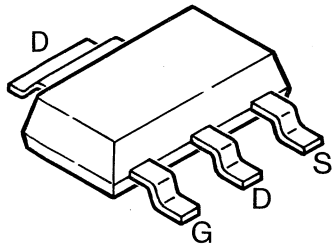


Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



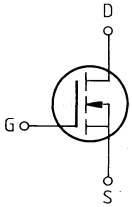
Preliminary Data

- $V_{DS} = 100$ V, $I_D = 1$ A, $R_{DS(on)} = 0.8\ \Omega$
- **N channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 296	Q67000-S067	BSP 296

N channel



Maximum Ratings

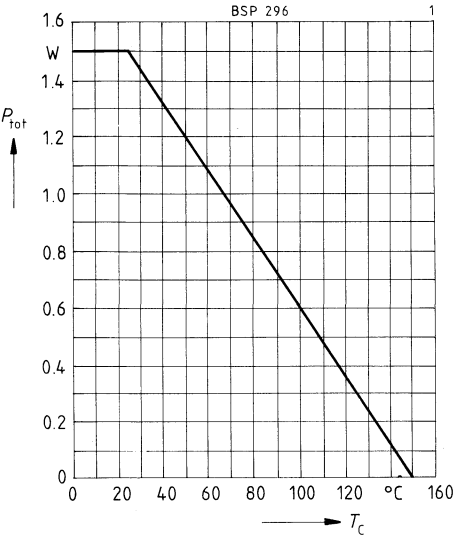
Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	100	V	–
Drain-gate voltage	V_{DGR}	100	V	$R_{GS} = 20$ kΩ
Continuous drain current	I_D	1	A	$T_A = 25$ °C
Pulsed drain current	I_{Dpuls}	4	A	$T_A = 25$ °C
Gate-source voltage	V_{GS}	± 10	V	–
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	$T_A = 25$ °C
Operating and storage temperature range	T_j T_{stg}	– 55...+ 150	°C	
DIN humidity category		E		DIN 40 040
IEC climatic category		55/150/56		DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	R_{thJA}	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

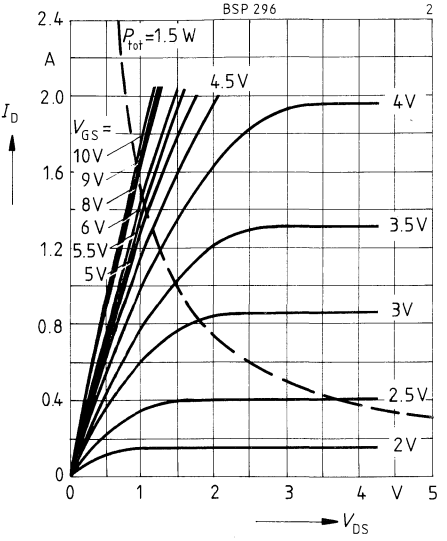
Electrical characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	$V_{GS} = 0$ $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	0.8	1.2	2	V	$V_{GS} = V_{DS}$ $I_D = 1$ mA
Zero gate voltage drain current	I_{DSS}	– –	0.1 8	1 50	µA	$T_j = 25$ °C $T_j = 125$ °C $V_{GS} = 0$ $V_{DS} = 100$ V
Gate-source leakage current	I_{GSS}	–	10	100	nA	$V_{GS} = 20$ V, $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	– –	0.95 0.55	1.4 0.8	Ω	$V_{GS} = 4.5$ V, $I_D = 1$ A $V_{GS} = 10$ V, $I_D = 1$ A
Dynamic characteristics						
Forward transconductance	g_{fs}	0.5	1.1	–	S	$V_{DS} \geq 2^x/_D{}^x R_{DS(on)max.}$ $I_D = 1$ A
Input capacitance	C_{iss}	–	400	600	pF	$V_{GS} = 0$ $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	–	65	110		
Reverse transfer capacitance	C_{rss}	–	20	30		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	–	8	12	ns	$V_{CC} = 30$ V $V_{GS} = 10$ V $I_D = 0.29$ A $R_{GS} = 50$ Ω
	t_r	–	15	25		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	–	100	150		
	t_f	–	75	110		
Reverse diode						
Continuous reverse drain current	I_S	–	1	–	A	$T_C = 25$ °C
Pulsed reverse drain current	I_{SM}	–	4	–		
Diode forward on-voltage	V_{SD}	–	0.9	1.3	V	$T_j = 25$ °C, $V_{GS} = 0$ $I_F = 2$ A

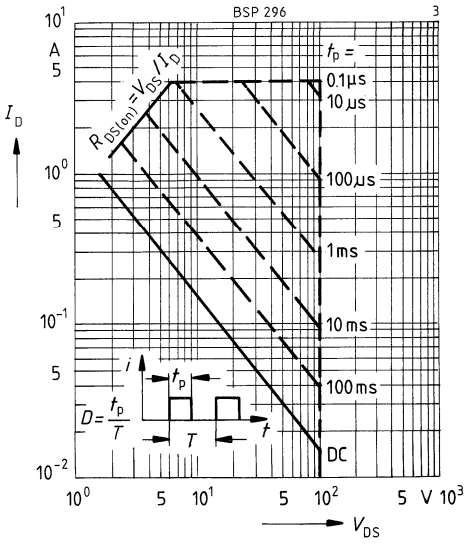
Permissible power dissipation $P_{tot} = f(T_A)$



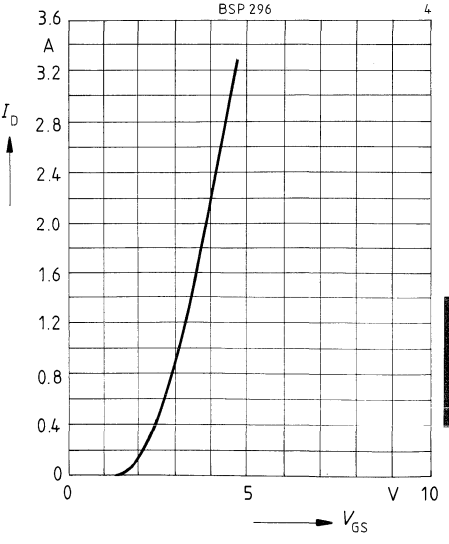
Typ. output characteristics $I_D = f(V_{DS})$



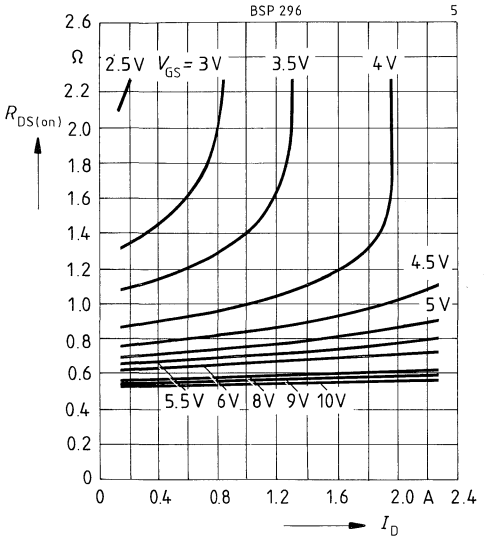
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



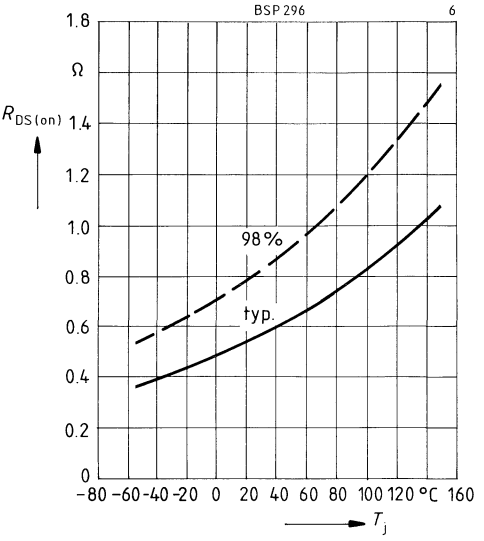
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



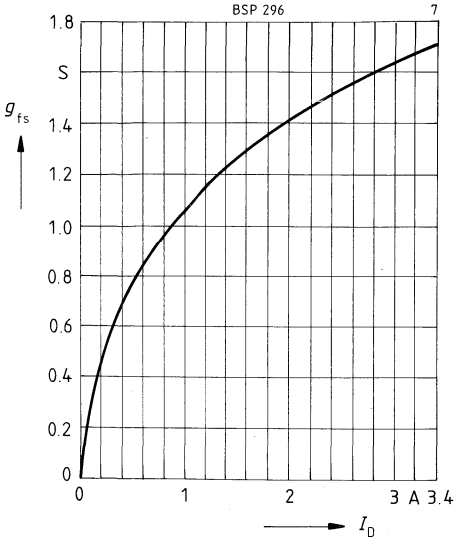
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



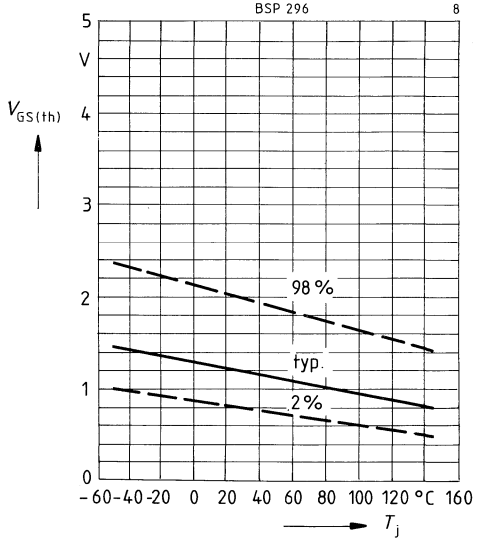
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $V_{GS} = 10$ V, $I_D = 1.0$ A, (spread)



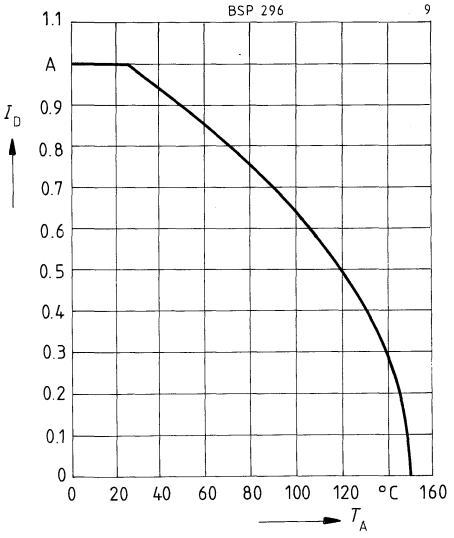
Typ. transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



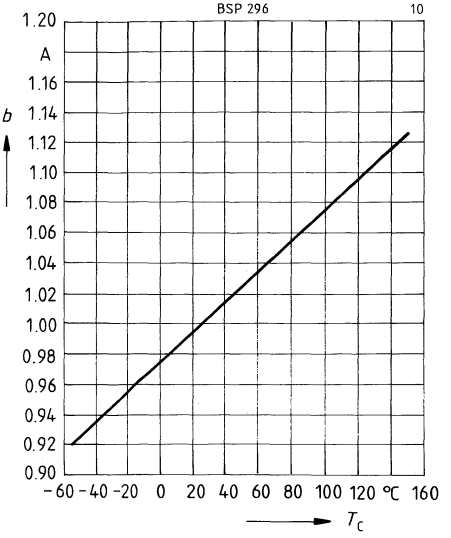
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, $I_D = 1$ mA
(spread)



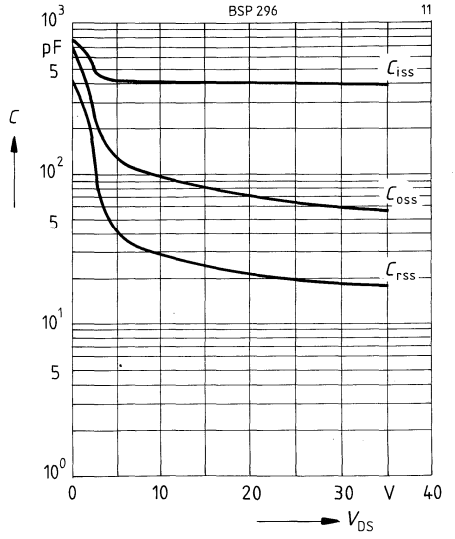
Continuous drain current $I_D = f(T_A)$



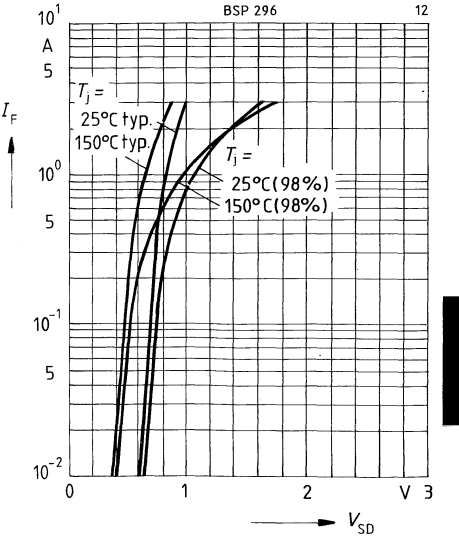
Drain-source breakdown voltage
$V_{(BR)DSS}$ (T_j) = $b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz

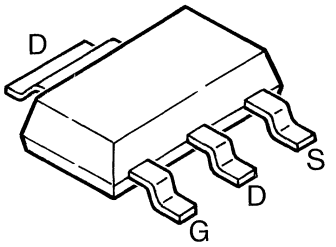


Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



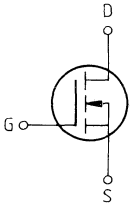
Preliminary Data

- $V_{DS} = 200$ V, $I_D = 0.6$ A, $R_{DS(on)} = 2\ \Omega$
- **N channel, enhancement mode**
- Plastic package SOT-223, SMD version



Type	Ordering code	Marking
BSP 297	Q67000-S068	BSP 297

N channel



Maximum Ratings

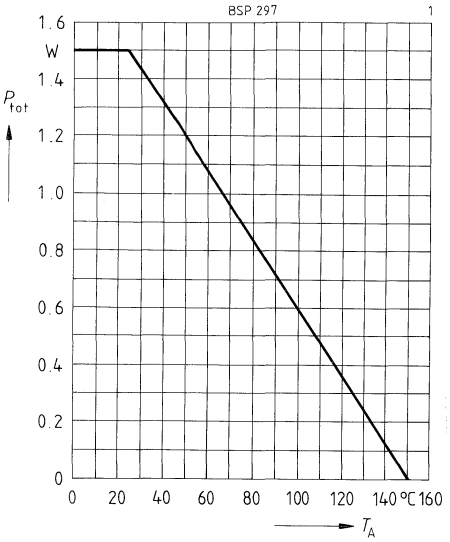
Parameter	Symbol	Value	Unit	Condition
Drain-source voltage	V_{DS}	200	V	–
Drain-gate voltage	V_{DGR}	200	V	$R_{GS} = 20$ kΩ
Continuous drain current	I_D	0.6	A	$T_A = 25$ °C
Pulsed drain current	I_{Dpuls}	2.4	A	$T_A = 25$ °C
Gate-source voltage	V_{GS}	± 10	V	–
Gate-source peak voltage	V_{gs}	± 20	V	aperiodic
Total power dissipation	P_{tot}	1.5	W	$T_A = 25$ °C
Operating and storage temperature range	T_j T_{stg}	–55...+150	°C	
DIN humidity category		E		DIN 40040
IEC climatic category		55/150/56		DIN IEC 68-1
Thermal resistance Chip - ambient[1)]	R_{thJA}	≤ 83.3	K/W	

[1)] Transistor on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for drain connection

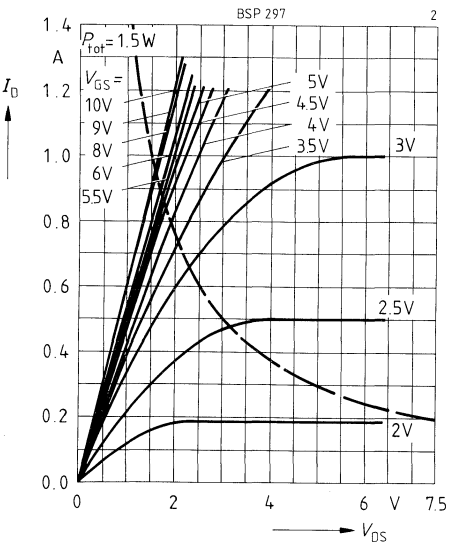
Electrical characteristics
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Value			Unit	Condition
		min.	typ.	max.		
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	200	-	-	V	$V_{GS} = 0$ $I_D = 0.25$ mA
Gate threshold voltage	$V_{GS(th)}$	0.8	1.2	2	V	$V_{GS} = V_{DS}$ $I_D = 1$ mA
Zero gate voltage drain current	I_{DSS}	– –	0.1 8	1 50	µA	$T_j = 25$ °C $T_j = 125$ °C $V_{GS} = 0$ $V_{DS} = 200$ V
Gate-source leakage current	I_{GSS}	–	10	100	nA	$V_{GS} = 20$ V, $V_{DS} = 0$
Drain-source on-state resistance	$R_{DS(on)}$	– –	2.0 1.6	3.3 2	Ω	V_{GS}=4.5 V, I_D=0.6 A V_{GS}=10 V, I_D=0.6 A
Dynamic characteristics						
Forward transconductance	g_{fs}	0.5	0.9	–	S	$V_{DS} \geq 2^x/_D{}^x R_{DS(on)max.}$ $I_D = 0.6$ A
Input capacitance	C_{iss}	–	420	630	pF	$V_{GS} = 0$ $V_{DS} = 25$ V $f = 1$ MHz
Output capacitance	C_{oss}	–	40	60		
Reverse transfer capacitance	C_{rss}	–	10	15		
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$)	$t_{d(on)}$	–	8	12	ns	$V_{CC} = 30$ V $V_{GS} = 10$ V $I_D = 0.29$ A $R_{GS} = 50$ Ω
	t_r	–	15	25		
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$)	$t_{d(off)}$	–	100	150		
	t_f	–	75	110		
Reverse diode						
Continuous reverse drain current	I_S	–	0.6	–	A	$T_C = 25$ °C
Pulsed reverse drain current	I_{SM}	–	2.4	–		
Diode forward on-voltage	V_{SD}	–	0.85	1.1	V	$T_j = 25$ °C, $V_{GS} = 0$ $I_F = 1.2$ A

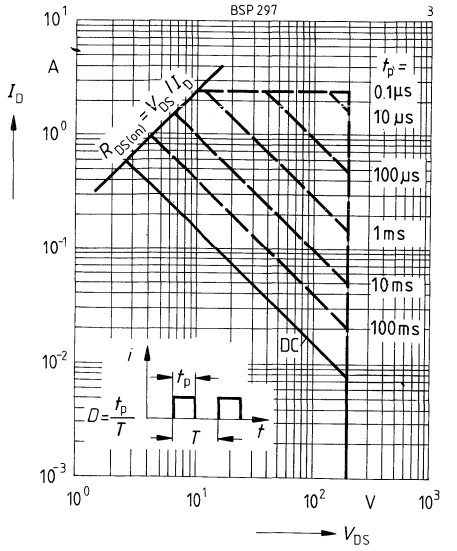
Permissible power dissipation $P_{tot} = f(T_A)$



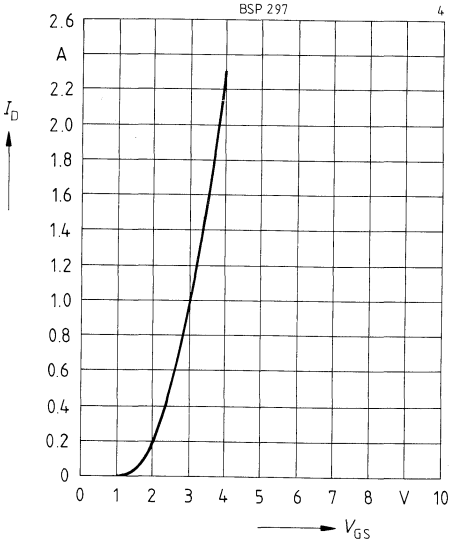
Typ. output characteristics $I_D = f(V_{DS})$



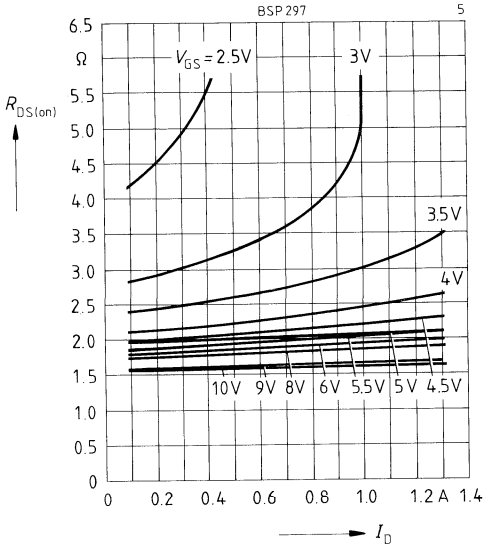
Permissible operating area $I_D = f(V_{DS})$
parameter: $D = 0.01$, $T_C = 25$ °C



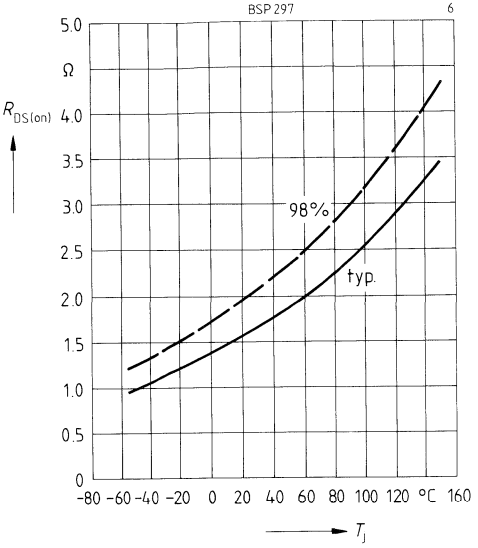
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: $V_{DS} = 25$ V, $t_p = 80$ µs, $T_j = 25$ °C



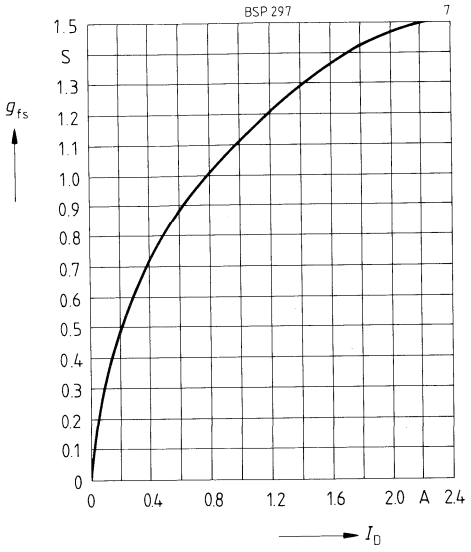
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}, $T_j = 25$ °C



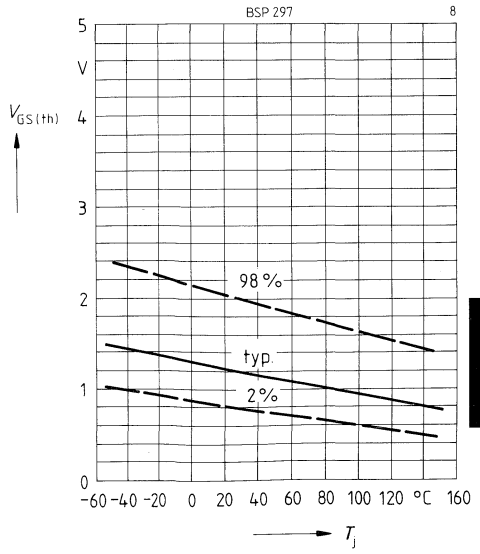
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: V_{GS} = 10 V, I_D = 0.6 A, (spread)



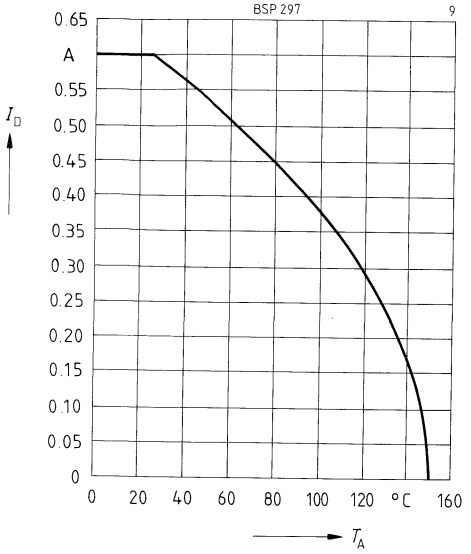
Typ. transconductance $g_{fs} = f(I_D)$
parameter: V_{DS} = 25 V, t_p = 80 µs, T_j = 25 °C



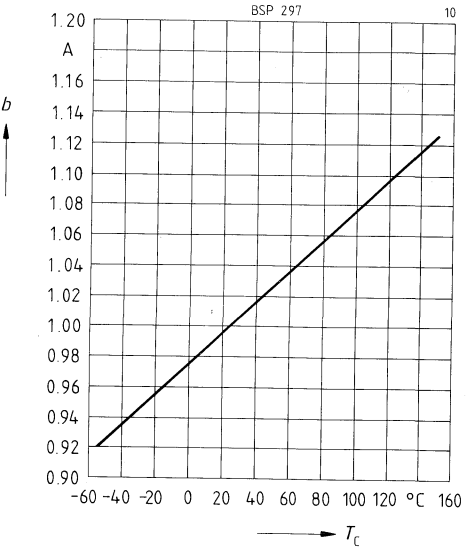
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, I_D = 1 mA
(spread)



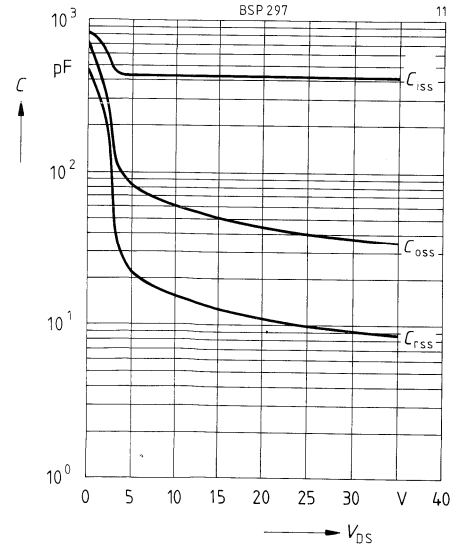
Continuous drain current $I_D = f(T_A)$



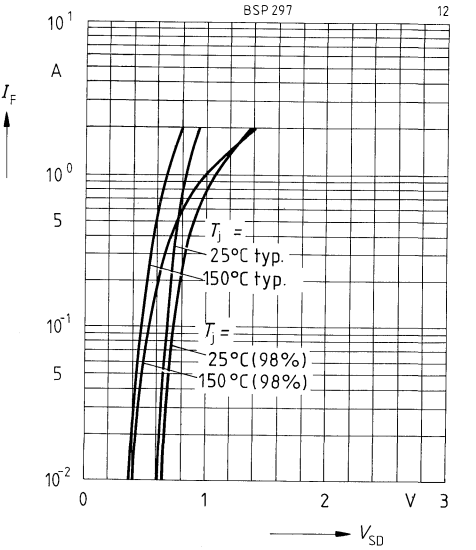
Drain-source breakdown voltage
$V_{(BR)DSS}$ $(T_j) = b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitance $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz



Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: $t_p = 80$ µs, T_j (spread)



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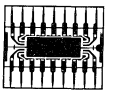

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