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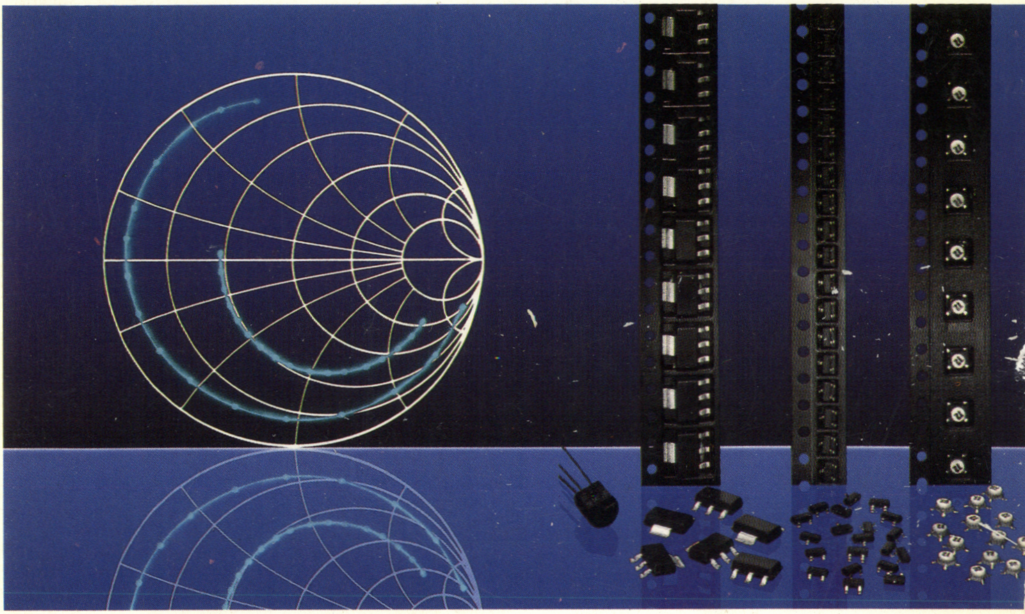

Einzelhalbleiter
Small-Signal Semiconductors

NF-Transistoren und Dioden
AF Transistors and Diodes

Datenbuch II

Data Book II

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Type	Max. Ratings		Characteristics					Package	Page
	V_R V	I_F mA	$V_{BR\,(min)}$ V	$V_{F\,(max)}$ mV	$C_{T\,(max)}$ pF	$I_{R\,(max)}$ µA	τ ps		
BAS 40 BAS 40-04 BAS 40-05 BAS 40-06 BAS 40-07	40	120	40	380	5	1.0	100	SOT-23 SOT-23 SOT-23 SOT-23 SOT-143	134 134 134 134 135
BAS 70 BAS 70-04 BAS 70-05 BAS 70-06 BAS 70-07	70	70	70	410	2	0.1	100	SOT-23 SOT-23 SOT-23 SOT-23 SOT-143	139 139 139 139 140
BAT 64 BAT 64-04 BAT 64-05 BAT 64-06 BAT 64-07	30	250	–	1000	6	2	–	SOT-23 SOT-23 SOT-23 SOT-23 SOT-143	154 154 154 154 155
BAT 65	30	500	–	700	12	10	–	SOD-123	158
BAT 66-05	30	2000	–	600	40	10	–	SOT-223	161

2. Switching Diodes

2.1 SMD Plastic Package

Type	Max. Ratings				Characteristics			Package	Page
	V_R V	I_F mA	T_j °C	P_{tot} mW	V_F V	I_R µA	t_{rr} ns		
BAL 74	50	250	150	370	≤ 1	≤ 0.1	≤ 4	SOT-23	106
BAL 99	70	250	150	370	≤ 1.25	≤ 2.5	≤ 6	SOT-23	110
BAR 74	50	250	150	370	≤ 1	≤ 0.1	≤ 4	SOT-23	114
BAR 99	70	250	150	370	≤ 1.25	≤ 2.5	≤ 6	SOT-23	118
BAS 16	75	250	150	370	≤ 1.25	≤ 1	≤ 6	SOT-23	122
BAS 19	100	250	150	350	≤ 1.25	≤ 100	≤ 50	SOT-23	126
BAS 20	150	250	150	350	≤ 1.25	≤ 100	≤ 50	SOT-23	126
BAS 21	200	250	150	350	≤ 1.25	≤ 100	≤ 50	SOT-23	126
BAS 28	75	200	150	330	≤ 1.25	≤ 1	≤ 6	SOT-143	130

2. Switching Diodes (cont'd)

2.1 SMD Plastic Package

Type	Max. Ratings V_R V	I_F mA	T_j °C	P_{tot} mW	Characteristics V_F V	I_R µA	t_{rr} ns	Package	Page
BAS 78 A	50	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	144
BAS 78 B	100	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	144
BAS 78 C	200	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	144
BAS 78 D	400	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	144
BAS 79 A	50	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	147
BAS 79 B	100	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	147
BAS 79 C	200	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	147
BAS 79 D	400	1000	150	1200	≤ 1.6	≤ 1	1000	SOT-223	147
BAS 116	75	250	150	370	≤ 1.25	≤ 0.005	≤ 3000	SOT-23	150
BAV 70	70	200	150	250	≤ 1.25	≤ 2.5	≤ 6	SOT-23	164
BAV 74	50	200	150	250	≤ 1	≤ 0.1	≤ 4	SOT-23	168
BAV 99	70	200	150	330	≤ 1.25	≤ 2.5	≤ 6	SOT-23	172
BAV 170	70	200	150	250	≤ 1.25	≤ 0.005	≤ 3000	SOT-23	176
BAV 199	70	200	150	330	≤ 1.25	≤ 0.005	≤ 3000	SOT-23	180
BAW 56	70	200	150	250	≤ 1.25	≤ 2.5	≤ 6	SOT-23	184
BAW 78 A	50	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	188
BAW 78 B	100	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	188
BAW 78 C	200	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	188
BAW 78 D	400	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	188
BAW 79 A	50	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	191
BAW 79 B	100	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	191
BAW 79 C	200	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	191
BAW 79 D	400	1000	150	1000	≤ 1.6	≤ 1	1000	SOT-89	191
BAW 100	75	200	150	330	≤ 1.25	≤ 1	≤ 6	SOT-143	194
BAW 101	300	250	150	350	≤ 1.3	≤ 0.150	1000	SOT-143	198
BAW 156	70	200	150	250	≤ 1.25	≤ 0.005	≤ 3000	SOT-23	201
BGX 50 A	50	140	150	210	≤ 1.3	≤ 0.2	≤ 6	SOT-143	205
SMBD 914	70	250	150	370	≤ 1	≤ 0.025	≤ 4	SOT-23	209
SMBD 2835	30	200	150	250	≤ 1.2	≤ 0.1	≤ 6	SOT-23	213
SMBD 2836	50	200	150	250	≤ 1.2	≤ 0.1	≤ 6	SOT-23	213
SMBD 2837	30	200	150	250	≤ 1.2	≤ 0.1	≤ 6	SOT-23	217
SMBD 2838	50	200	150	250	≤ 1.2	≤ 0.1	≤ 6	SOT-23	217
SMBD 6050	70	250	150	370	≤ 1.1	≤ 0.1	≤ 10	SOT-23	221
SMBD 6100	70	200	150	250	≤ 1.1	≤ 0.1	≤ 15	SOT-23	225
SMBD 7000	100	200	150	330	≤ 1.1	≤ 0.3	≤ 15	SOT-23	229

1. Silicon Bipolar Transistors

1.1 SMD Plastic Package

NPN

Type	Max. Ratings			Characteristics					Package	Page
	V_{CE0}	I_C	P_{tot}	h_{FE}	I_C	V_{CE}	V_{CEsat}	f_T		
	V	mA	mW	–	mA	V	V	MHz		
BC 817-16	45	500	330	100 … 250	100	1	≤ 0.7	170	SOT-23	362
BC 817-25	45	500	330	160 … 400	100	1	≤ 0.7	170	SOT-23	362
BC 817-40	45	500	330	250 … 630	100	1	≤ 0.7	170	SOT-23	362
BC 818-16	25	500	330	100 … 250	100	1	≤ 0.7	170	SOT-23	362
BC 818-25	25	500	330	160 … 400	100	1	≤ 0.7	170	SOT-23	362
BC 818-40	25	500	330	250 … 630	100	1	≤ 0.7	170	SOT-23	362
BC 846 A	65	100	330	110 … 220	2	5	≤ 0.6	250	SOT-23	367
BC 846 B	65	100	330	200 … 450	2	5	≤ 0.6	250	SOT-23	367
BC 847 A	45	100	330	110 … 220	2	5	≤ 0.6	250	SOT-23	367
BC 847 B	45	100	330	200 … 450	2	5	≤ 0.6	250	SOT-23	367
BC 847 C	45	100	330	420 … 800	2	5	≤ 0.6	250	SOT-23	367
BC 848 A	30	100	330	110 … 220	2	5	≤ 0.6	250	SOT-23	367
BC 848 B	30	100	330	200 … 450	2	5	≤ 0.6	250	SOT-23	367
BC 848 C	30	100	330	420 … 800	2	5	≤ 0.6	250	SOT-23	367
BC 849 B	30	100	330	200 … 450	2	5	≤ 0.6	250	SOT-23	367
BC 849 C	30	100	330	420 … 800	2	5	≤ 0.6	250	SOT-23	367
BC 850 B	45	100	330	200 … 450	2	5	≤ 0.6	250	SOT-23	367
BC 850 C	45	100	330	420 … 800	2	5	≤ 0.6	250	SOT-23	367
BCP 54	45	1000	1500	40 … 250	150	2	≤ 0.5	100	SOT-223	406
BCP 54-10	45	1000	1500	63 … 160	150	2	≤ 0.5	100	SOT-223	406
BCP 54-16	45	1000	1500	100 … 250	150	2	≤ 0.5	100	SOT-223	406
BCP 55	60	1000	1500	40 … 250	150	2	≤ 0.5	100	SOT-223	406
BCP 55-10	60	1000	1500	63 … 160	150	2	≤ 0.5	100	SOT-223	406
BCP 55-16	60	1000	1500	100 … 250	150	2	≤ 0.5	100	SOT-223	406
BCP 56	80	1000	1500	40 … 250	150	2	≤ 0.5	100	SOT-223	406
BCP 56-10	80	1000	1500	63 … 160	150	2	≤ 0.5	100	SOT-223	406
BCP 56-16	80	1000	1500	100 … 250	150	2	≤ 0.5	100	SOT-223	406
BCP 68	20	1000	1500	63 … 400	500	1	≤ 0.5	100	SOT-223	411
BCW 60 A	32	100	330	120 … 220	2	5	≤ 0.55	250	SOT-23	445
BCW 60 B	32	100	330	180 … 310	2	5	≤ 0.55	250	SOT-23	445
BCW 60 C	32	100	330	250 … 460	2	5	≤ 0.55	250	SOT-23	445
BCW 60 D	32	100	330	380 … 630	2	5	≤ 0.55	250	SOT-23	445
BCW 60 FF	32	100	330	250 … 460	2	5	≤ 0.55	250	SOT-23	445
BCW 60 FN	32	100	330	380 … 630	2	5	≤ 0.55	250	SOT-23	445
BCW 65 A	32	800	330	100 … 250	100	1	≤ 0.7	170	SOT-23	463
BCW 65 B	32	800	330	160 … 400	100	1	≤ 0.7	170	SOT-23	463
BCW 65 C	32	800	330	250 … 630	100	1	≤ 0.7	170	SOT-23	463

1.1 SMD Plastic Package (cont'd)

NPN

Type	Max. Ratings			Characteristics					Package	Page
	V_{CEO} V	I_C mA	P_{tot} mW	h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz		
BCW 66 F	45	800	330	100 ... 250	100	1	≤ 0.7	170	SOT-23	463
BCW 66 G	45	800	330	160 ... 400	100	1	≤ 0.7	170	SOT-23	463
BCW 66 H	45	800	330	250 ... 630	100	1	≤ 0.7	170	SOT-23	463
BCX 41	125	800	330	≥ 63	100	1	≤ 0.9	100	SOT-23	483
BCX 54	45	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 54-10	45	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 54-16	45	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 55	60	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 55-10	60	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 55-16	60	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 56	80	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 56-10	80	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 56-16	80	1000	1000	40 ... 250	150	2	≤ 0.5	100	SOT-89	496
BCX 68	20	1000	1000	85 ... 375	500	1	≤ 0.5	100	SOT-89	507
BCX 68-10	20	1000	1000	85 ... 160	500	1	≤ 0.5	100	SOT-89	507
BCX 68-16	20	1000	1000	100 ... 250	500	1	≤ 0.5	100	SOT-89	507
BCX 68-25	20	1000	1000	160 ... 375	500	1	≤ 0.5	100	SOT-89	507
BCX 70 G	45	100	330	120 ... 220	2	5	≤ 0.55	250	SOT-23	445
BCX 70 H	45	100	330	180 ... 310	2	5	≤ 0.55	250	SOT-23	445
BCX 70 J	45	100	330	250 ... 460	2	5	≤ 0.55	250	SOT-23	445
BCX 70 K	45	100	330	380 ... 630	2	5	≤ 0.55	250	SOT-23	445
SMBT 6428	50	200	330	250 ... 650	0.1	5	≤ 0.6	≥ 100	SOT-23	739
SMBT 6429	45	200	330	500 ... 1250	0.1	5	≤ 0.6	≥ 100	SOT-23	739
SMBTA 05	60	500	330	≥ 100	100	1	≤ 0.25	100	SOT-23	745
SMBTA 06	80	500	330	≥ 100	100	1	≤ 0.25	100	SOT-23	745
SMBTA 20	40	100	330	40 ... 400	5	10	≤ 0.25	≥ 125	SOT-23	753

1.1 SMD Plastic Package (cont'd)

PNP

Type	Max. Ratings			Characteristics					Package	Page
	V_{CE0} V	I_C mA	P_{tot} mW	h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz		
BC 807-16	45	500	330	100 ... 250	100	1	≤ 0.7	200	SOT-23	357
BC 807-25	45	500	330	160 ... 400	100	1	≤ 0.7	200	SOT-23	357
BC 807-40	45	500	330	250 ... 630	100	1	≤ 0.7	200	SOT-23	357
BC 808-16	25	500	330	100 ... 250	100	1	≤ 0.7	200	SOT-23	357
BC 808-25	25	500	330	160 ... 400	100	1	≤ 0.7	200	SOT-23	357
BC 808-40	25	500	330	250 ... 630	100	1	≤ 0.7	200	SOT-23	357
BC 856 A	65	100	330	125 ... 250	2	5	≤ 0.65	250	SOT-23	375
BC 856 B	65	100	330	220 ... 475	2	5	≤ 0.65	250	SOT-23	375
BC 857 A	45	100	330	125 ... 250	2	5	≤ 0.65	250	SOT-23	375
BC 857 B	45	100	330	220 ... 475	2	5	≤ 0.65	250	SOT-23	375
BC 857 C	45	100	330	420 ... 800	2	5	≤ 0.65	250	SOT-23	375
BC 858 A	30	100	330	125 ... 250	2	5	≤ 0.65	250	SOT-23	375
BC 858 B	30	100	330	220 ... 475	2	5	≤ 0.65	250	SOT-23	375
BC 858 C	30	100	330	420 ... 800	2	5	≤ 0.65	250	SOT-23	375
BC 859 A	30	100	330	125 ... 250	2	5	≤ 0.65	250	SOT-23	375
BC 859 B	30	100	330	220 ... 475	2	5	≤ 0.65	250	SOT-23	375
BC 859 C	30	100	330	420 ... 800	2	5	≤ 0.65	250	SOT-23	375
BC 860 B	45	100	330	220 ... 475	2	5	≤ 0.65	250	SOT-23	375
BC 860 C	45	100	330	420 ... 800	2	5	≤ 0.65	250	SOT-23	375
BCP 51	45	1000	1500	40 ... 250	150	2	≤ 0.5	125	SOT-223	401
BCP 51-10	45	1000	1500	63 ... 160	150	2	≤ 0.5	125	SOT-223	401
BCP 51-16	45	1000	1500	100 ... 250	150	2	≤ 0.5	125	SOT-223	401
BCP 52	60	1000	1500	40 ... 250	150	2	≤ 0.5	125	SOT-223	401
BCP 52-10	60	1000	1500	63 ... 160	150	2	≤ 0.5	125	SOT-223	401
BCP 52-16	60	1000	1500	100 ... 250	150	2	≤ 0.5	125	SOT-223	401
BCP 53	80	1000	1500	40 ... 250	150	2	≤ 0.5	125	SOT-223	401
BCP 53-10	80	1000	1500	63 ... 160	150	2	≤ 0.5	125	SOT-223	401
BCP 53-16	80	1000	1500	100 ... 250	150	2	≤ 0.5	125	SOT-223	401
BCP 69	20	1000	1500	85 ... 375	500	1	≤ 0.5	100	SOT-223	415
BCW 61 A	32	100	330	120 ... 220	2	5	≤ 0.55	250	SOT-23	454
BCW 61 B	32	100	330	180 ... 310	2	5	≤ 0.55	250	SOT-23	454
BCW 61 C	32	100	330	250 ... 460	2	5	≤ 0.55	250	SOT-23	454
BCW 61 D	32	100	330	380 ... 630	2	5	≤ 0.55	250	SOT-23	454
BCW 61 FF	32	100	330	250 ... 460	2	5	≤ 0.55	250	SOT-23	454
BCW 61 FN	32	100	330	380 ... 630	2	5	≤ 0.55	250	SOT-23	454
BCW 67 A	32	800	330	100 ... 250	100	1	≤ 0.7	200	SOT-23	469
BCW 67 B	32	800	330	160 ... 400	100	1	≤ 0.7	200	SOT-23	469
BCW 67 C	32	800	330	250 ... 630	100	1	≤ 0.7	200	SOT-23	469

1.1 SMD Plastic Package (cont'd)

PNP

Type	Max. Ratings			Characteristics					Package	Page
	V_{CE0} V	I_C mA	P_{tot} mW	h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz		
BCW 68 F	45	800	330	100 ... 250	100	1	≤ 0.7	200	SOT-23	469
BCW 68 G	45	800	330	160 ... 400	100	1	≤ 0.7	200	SOT-23	469
BCW 68 H	45	800	330	250 ... 630	100	1	≤ 0.7	200	SOT-23	469
BCX 42	125	800	330	≥ 63	100	1	≤ 0.9	150	SOT-23	487
BCX 51	45	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 51-10	45	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 51-16	45	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 52	60	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 52-10	60	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 52-16	60	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 53	80	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 53-10	80	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 53-16	80	1000	1000	40 ... 250	150	2	≤ 0.5	125	SOT-89	491
BCX 69	20	1000	1000	85 ... 375	500	1	≤ 0.5	100	SOT-89	511
BCX 69-10	20	1000	1000	85 ... 160	500	1	≤ 0.5	100	SOT-89	511
BCX 69-16	20	1000	1000	100 ... 250	500	1	≤ 0.5	100	SOT-89	511
BCX 69-25	20	1000	1000	160 ... 375	500	1	≤ 0.5	100	SOT-89	511
BCX 71 G	45	100	330	120 ... 220	2	5	≤ 0.55	250	SOT-23	454
BCX 71 H	45	100	330	180 ... 310	2	5	≤ 0.55	250	SOT-23	454
BCX 71 J	45	100	330	250 ... 460	2	5	≤ 0.55	250	SOT-23	454
BCX 71 K	45	100	330	380 ... 630	2	5	≤ 0.55	250	SOT-23	454
SMBT 5086	50	50	330	150 ... 500	0.1	5	≤ 0.3	≥ 40	SOT-23	729
SMBT 5087	50	50	330	250 ... 800	0.1	5	≤ 0.3	≥ 40	SOT-23	729
SMBTA 55	60	500	330	≥ 100	10	1	≤ 0.25	100	SOT-23	761
SMBTA 56	80	500	330	≥ 100	10	1	≤ 0.25	100	SOT-23	761
SMBTA 70	40	100	330	40 ... 400	5	10	≤ 0.25	≥ 125	SOT-23	769

1.2 Plastic Package

NPN

Type	Max. Ratings			Characteristics					Package	Page
	V_{CEO}	I_C	P_{tot}	h_{FE}	I_C	V_{CE}	V_{CEsat}	f_T		
	V	mA	mW	–	mA	V	V	MHz		
BC 167 [1]	45	100	500	120 ... 460	2	5	≤ 0.6	200	TO-92	234
BC 168 [1]	20	100	500	120 ... 800	2	5	≤ 0.6	200	TO-92	234
BC 169 [1][2]	20	100	500	180 ... 800	2	5	≤ 0.6	200	TO-92	234
BC 182 [1]	50	100	500	120 ... 460	2	5	≤ 0.6	200	TO-92	242
BC 183 [1]	30	100	500	120 ... 800	2	5	≤ 0.6	200	TO-92	242
BC 237 [1]	45	100	500	120 ... 460	2	5	≤ 0.6	200	TO-92	258
BC 238 [1]	20	100	500	120 ... 800	2	5	≤ 0.6	200	TO-92	258
BC 239 [1][2]	20	100	500	180 ... 800	2	5	≤ 0.6	200	TO-92	258
BC 337 [1]	45	800	625	100 ... 630	100	1	≤ 0.7	170	TO-92	288
BC 338 [1]	25	800	625	100 ... 630	100	1	≤ 0.7	170	TO-92	288
BC 368	20	1000	800	85 ... 375	500	1	≤ 0.5	100	TO-92	294
BC 413 [1]	30	100	500	180 ... 800	2	5	≤ 0.6	200	TO-92	302
BC 414 [1]	45	100	500	180 ... 800	2	5	≤ 0.6	200	TO-92	302
BC 546 [1]	65	100	500	110 ... 450	2	5	≤ 0.6	200	TO-92	326
BC 547 [1]	45	100	500	110 ... 450	2	5	≤ 0.6	200	TO-92	326
BC 548 [1]	30	100	500	110 ... 800	2	5	≤ 0.6	200	TO-92	326
BC 549 [1][2]	30	100	500	200 ... 800	2	5	≤ 0.6	200	TO-92	326
BC 550 [1][2]	45	100	500	200 ... 800	2	5	≤ 0.6	200	TO-92	326
BC 635	45	1	800	40 ... 250	150	2	0.5	100	TO-92	347
BC 637	60	1	800	40 ... 250	150	2	0.5	100	TO-92	347
BC 639	80	1	800	40 ... 250	150	2	0.5	100	TO-92	347
BCX 58 [1]	32	100	500	120 ... 630	2	5	≤ 0.5	200	TO-92	501
BCX 59 [1]	45	100	500	120 ... 630	2	5	≤ 0.5	200	TO-92	501
BCX 73 [1]	32	800	625	100 ... 630	100	1	≤ 0.6	170	TO-92	515
BCX 74 [1]	45	800	625	100 ... 630	100	1	≤ 0.6	170	TO-92	515
BD 825 [1]	45	1000	8000	40 ... 250	150	2	≤ 0.5	100	TO-202	534
BD 827 [1]	60	1000	8000	40 ... 160	150	2	≤ 0.5	100	TO-202	534
BD 829 [1]	80	1000	8000	40 ... 160	150	2	≤ 0.5	100	TO-202	534

[1] Available in different groups of current gain.
[2] Low-noise type.

1.2 Plastic Package (cont'd)

PNP

Type	Max. Ratings			Characteristics					Package	Page
	V_{CEO}	I_C	P_{tot}	h_{FE}	I_C	V_{CE}	V_{CEsat}	f_T		
	V	mA	mW	–	mA	V	V	MHz		
BC 212 [1]	50	100	500	120 ... 460	2	5	≤ 0.65	250	TO-92	250
BC 213 [1]	30	100	500	120 ... 800	2	5	≤ 0.65	250	TO-92	250
BC 257 [1]	45	100	500	120 ... 460	2	5	≤ 0.65	250	TO-92	266
BC 258 [1]	25	100	500	120 ... 800	2	5	≤ 0.65	250	TO-92	266
BC 259 [1][2]	20	100	500	180 ... 800	2	5	≤ 0.65	250	TO-92	266
BC 307 [1]	45	100	500	120 ... 460	2	5	≤ 0.65	250	TO-92	274
BC 308 [1]	25	100	500	120 ... 800	2	5	≤ 0.65	250	TO-92	274
BC 309 [1][2]	20	100	500	180 ... 800	2	5	≤ 0.65	250	TO-92	274
BC 327 [1]	45	800	625	100 ... 630	100	1	≤ 0.7	200	TO-92	282
BC 328 [1]	25	800	625	100 ... 630	100	1	≤ 0.7	200	TO-92	282
BC 369	20	1000	800	85 ... 375	500	1	≤ 0.5	100	TO-92	298
BC 415 [1]	35	100	500	120 ... 800	2	5	≤ 0.65	250	TO-92	310
BC 416 [1]	45	100	500	120 ... 800	2	5	≤ 0.65	250	TO-92	310
BC 556 [1]	65	100	500	110 ... 450	2	5	≤ 0.65	250	TO-92	334
BC 557 [1]	45	100	500	110 ... 450	2	5	≤ 0.65	250	TO-92	334
BC 558 [1]	30	100	500	110 ... 800	2	5	≤ 0.65	250	TO-92	334
BC 559 [1]	30	100	500	110 ... 800	2	5	≤ 0.65	250	TO-92	334
BC 560 [1][2]	45	100	500	110 ... 800	2	5	≤ 0.65	250	TO-92	334
BC 636	45	1	800	40 ... 250	150	2	≤ 0.5	100	TO-92	352
BC 638	60	1	800	40 ... 250	150	2	≤ 0.5	100	TO-92	352
BC 640	80	1	800	40 ... 250	150	2	≤ 0.5	100	TO-92	352
BCX 75 [1]	32	800	625	100 ... 630	100	1	≤ 0.6	200	TO-92	521
BCX 76 [1]	45	800	625	100 ... 630	100	1	≤ 0.6	200	TO-92	521
BCX 78 [1]	32	100	500	120 ... 630	2	5	≤ 0.6	250	TO-92	527
BCX 79 [1]	45	100	500	120 ... 630	2	5	≤ 0.6	250	TO-92	527
BD 826 [1]	45	1000	8000	40 ... 250	150	2	≤ 0.5	125	TO-202	539
BD 828 [1]	60	1000	8000	40 ... 160	150	2	≤ 0.5	125	TO-202	539
BD 830 [1]	80	1000	8000	40 ... 160	150	2	≤ 0.5	125	TO-202	539

1) Available in different groups of current gain.
2) Low-noise type.

2. Silicon Double Transistors

2.1 SMD Plastic Package

Type	Max. Ratings			Characteristics					Package	Page
	V_{CE0} V	I_C mA	P_{tot} mW	h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz		
NPN										
BCV 61 A	30	100	300	110 … 220	2	5	≤ 600	250	SOT-143	435
BCV 61 B				200 … 450						435
BCV 61 C				420 … 800						435
PNP										
BCV 62 A	30	100	300	125 … 220	2	5	≤ 650	250	SOT-143	440
BCV 62 B				220 … 475						440
BCV 62 C				420 … 800						440

3. Switching Transistors

3.1 SMD Plastic Package

Type	V_{CE0} V	I_C mA	P_{tot} mW	h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz	Package	Page
NPN										
BSS 64	80	800	330	≥ 20	4	1	≤ 0.7	100	SOT-23	483
BSS 79 B	40	800	330	40 … 120	150	10	≤ 0.3	250	SOT-23	638
BSS 79 C	40	800	330	100 … 300	150	10	≤ 0.3	250	SOT-23	638
BSS 81 B	35	800	330	40 … 120	150	10	≤ 0.3	250	SOT-23	638
BSS 81 C	35	800	330	100 … 300	150	10	≤ 0.3	250	SOT-23	638
PZT 2222	30	600	1500	100 … 300	150	10	≤ 0.4	≥ 200	SOT-223	657
PZT 2222 A	40	600	1500	100 … 300	150	10	≤ 0.3	≥ 200	SOT-223	657
PZT 3904	40	200	1500	100 … 300	10	1	≤ 0.2	≥ 300	SOT-223	669
SMBT 2222	30	600	330	100 … 300	150	10	≤ 0.4	≥ 250	SOT-23	695
SMBT 2222 A	40	600	330	100 … 300	150	10	≤ 0.3	≥ 300	SOT-23	695
SMBT 3904	40	200	330	100 … 300	10	1	≤ 0.2	≥ 300	SOT-23	707
SMBT 4124	25	200	330	120 … 360	2	1	≤ 0.3	≥ 300	SOT-23	721
SXT 2222 A	40	600	1000	100 … 300	150	10	≤ 0.3	≥ 300	SOT-89	777
SXT 3904	40	200	1000	100 … 300	10	1	≤ 0.2	≥ 300	SOT-89	789
PNP										
BSS 63	100	800	330	≥ 30	10	5	≤ 0.25	150	SOT-23	487
BSS 80 B	40	800	330	40 … 120	150	10	≤ 0.4	250	SOT-23	643
BSS 80 C	40	800	330	100 … 300	150	10	≤ 0.4	250	SOT-23	643
BSS 82 B	60	800	330	40 … 120	150	10	≤ 0.4	250	SOT-23	643
BSS 82 C	60	800	330	100 … 300	150	10	≤ 0.4	250	SOT-23	643
PZT 2907	40	600	1500	100 … 300	150	10	≤ 0.4	≥ 200	SOT-223	663
PZT 2907 A	60	600	1500	100 … 300	150	10	≤ 0.4	≥ 200	SOT-223	663
PZT 3906	40	200	1500	100 … 300	10	1	≤ 0.25	≥ 250	SOT-223	674

3.1 SMD Plastic Package (cont'd)

PNP

Type	Max. Ratings V_{CE0} V	I_C mA	P_{tot} mW	Characteristics h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz	Package	Page
SMBT 2907	40	600	330	100 ... 300	150	10	≤ 0.4	≥ 200	SOT-23	701
SMBT 2907 A	60	600	330	100 ... 300	150	10	≤ 0.4	≥ 200	SOT-23	701
SMBT 3906	40	200	330	100 ... 300	10	1	≤ 0.25	≥ 250	SOT-23	714
SMBT 4126	25	200	330	120 ... 360	2	1	≤ 0.4	≥ 250	SOT-23	725
SXT 2907 A	60	600	1000	100 ... 300	150	10	≤ 0.4	≥ 200	SOT-89	783
SXT 3906	40	200	1000	100 ... 300	10	1	≤ 0.25	≥ 250	SOT-89	796

3.2 Plastic Package

NPN

BCX 12	125	800	625	≥ 63	100	1	≤ 1.0	100	TO-92	475

PNP

BCX 13	125	800	625	≥ 63	100	1	≤ 1.0	120	TO-92	479

4. Darlington Transistors

4.1 SMD Plastic Package

NPN

Type	Max. Ratings V_{CE0} V_{CER}* V	I_C mA	P_{tot} mW	Characteristics h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz	Package	Page
BCP 29	30	500	1500	≥ 20000	100	5	≤ 1.0	200	SOT-223	396
BCP 49	60	500	1500	≥ 10000	100	5	≤ 1.0	200	SOT-223	396
BCV 27	30	500	360	≥ 20000	100	5	≤ 1.0	170	SOT-23	423
BCV 29	30	500	1000	≥ 20000	100	5	≤ 1.0	150	SOT-89	431
BCV 47	60	500	360	≥ 10000	100	5	≤ 1.0	170	SOT-23	423
BCV 49	60	500	1000	≥ 10000	100	5	≤ 1.0	150	SOT-89	431
BSP 50	45*	1000	1500	≥ 2000	500	10	≤ 1.3	200	SOT-223	628
BSP 51	60*	1000	1500	≥ 2000	500	10	≤ 1.3	200	SOT-223	628
BSP 52	80*	1000	1500	≥ 2000	500	10	≤ 1.3	200	SOT-223	628
PZTA 13	30	300	1500	≥ 10000	100	5	≤ 1.5	≥ 125	SOT-223	679
PZTA 14	30	300	1500	≥ 20000	100	5	< 1.5	> 125	SOT-223	679
SMBT 6427	40	500	360	≥ 20000	100	5	≤ 1.2	≥ 130	SOT-23	735
SMBTA 13	30	300	330	≥ 10000	100	5	≤ 1.5	≥ 125	SOT-23	749
SMBTA 14	30	300	330	≥ 20000	100	5	≤ 1.5	≥ 125	SOT-23	749

4.1 SMD Plastic Package (cont'd)

PNP

Type	Max. Ratings			Characteristics					Package	Page
	V_{CEO} V_{CER}*	I_C	P_{tot}	h_{FE}	I_C	V_{CE}	V_{CEsat}	f_T		
	V	mA	mW	–	mA	V	V	MHz		
BCP 28	30	500	1500	≥ 20000	100	5	≤ 1.0	200	SOT-223	391
BCP 48	60	500	1500	≥ 10000	100	5	≤ 1.0	200	SOT-223	391
BCV 26	30	500	360	≥ 20000	100	5	≤ 1.0	200	SOT-23	419
BCV 28	30	500	1000	≥ 20000	100	5	≤ 1.0	200	SOT-89	427
BCV 46	60	500	360	≥ 10000	100	5	≤ 1.0	200	SOT-23	419
BCV 48	60	500	1000	≥ 10000	100	5	≤ 1.0	200	SOT-89	427
BSP 60	45*	1000	1500	≥ 2000	500	10	≤ 1.3	200	SOT-223	633
BSP 61	60*	1000	1500	≥ 2000	500	10	≤ 1.3	200	SOT-223	633
BSP 62	80*	1000	1500	≥ 2000	500	10	≤ 1.3	200	SOT-223	633
PZTA 63	30	500	1500	≥ 10000	100	5	≤ 1.5	≥ 125	SOT-223	687
PZTA 64	30	500	1500	≥ 20000	100	5	≤ 1.5	≥ 125	SOT-223	687
SMBTA 63	30	500	360	≥ 10000	100	5	≤ 1.5	≥ 125	SOT-23	765
SMBTA 64	30	500	360	≥ 20000	100	5	≤ 1.5	≥ 125	SOT-23	765

4.2 Plastic Package

NPN

BC 517	30	500	625	≥ 30000	20	2	≤ 1.0	150	TO-92	322
BC 617	40	500	625	≥ 20000	200	5	≤ 1.1	150	TO-92	342
BC 618	55	500	625	≥ 10000	200	5	≤ 1.1	150	TO-92	342
BC 875	45	1000	800	≥ 2000	500	10	≤ 1.3	150	TO-92	383
BC 877	60	1000	800	≥ 2000	500	10	≤ 1.3	150	TO-92	383
BC 879	80	1000	800	≥ 2000	500	10	≤ 1.3	150	TO-92	383

PNP

BC 516	30	500	625	≥ 30000	20	2	≤ 1.0	200	TO-92	318
BC 876	45	1000	800	≥ 2000	500	10	≤ 1.3	150	TO-92	387
BC 878	60	1000	800	≥ 2000	500	10	≤ 1.3	150	TO-92	387
BC 880	80	1000	800	≥ 2000	500	10	≤ 1.3	150	TO-92	387

5. High-Voltage Transistors

5.1 SMD Plastic Package

NPN

Type	Max. Ratings			Characteristics					Package	Page
	V_{CE0} / V_{CER}*	I_C	P_{tot}	h_{FE}	I_C	V_{CE}	V_{CEsat}	f_T		
	V	mA	mW	–	mA	V	V	MHz		
BF 622	250	50	1000	≥ 50	25	20	≤ 0.5	100	SOT-89	552
BF 720	300*	50	1500	≥ 50	25	20	≤ 0.6	100	SOT-223	560
BF 722	250	50	1500	≥ 50	25	20	≤ 0.6	100	SOT-223	560
BFN 16	250	200	1000	≥ 40	30	10	≤ 0.4	70	SOT-89	580
BFN 18	300	200	1000	≥ 30	30	10	≤ 0.5	70	SOT-89	580
BFN 20	300	50	1000	≥ 40	25	20	≤ 0.5	100	SOT-89	588
BFN 22	250	50	360	≥ 50	25	20	≤ 0.5	100	SOT-23	596
BFN 24	250	200	360	≥ 40	30	10	≤ 0.4	70	SOT-23	604
BFN 26	300	200	360	≥ 30	30	10	≤ 0.5	70	SOT-23	604
BFN 36	250	200	1500	≥ 40	30	10	≤ 0.4	70	SOT-223	612
BFN 38	300	200	1500	≥ 30	30	10	≤ 0.5	70	SOT-223	612
PZTA 42	300	500	1500	≥ 40	30	10	≤ 0.5	70	SOT-223	683
PZTA 43	200	500	1500	≥ 40	30	10	≤ 0.4	70	SOT-223	683
SMBTA 42	300	500	360	≥ 40	30	10	≤ 0.5	≥ 50	SOT-23	757
SMBTA 43	200	500	360	≥ 40	30	10	≤ 0.4	≥ 50	SOT-23	757
SXTA 42	300	500	1000	≥ 40	30	10	≤ 0.5	≥ 50	SOT-89	803
SXTA 43	200	500	1000	≥ 40	30	10	≤ 0.4	≥ 50	SOT-89	803

PNP

Type	V_{CE0} / V_{CER}* (V)	I_C (mA)	P_{tot} (mW)	h_{FE}	I_C (mA)	V_{CE} (V)	V_{CEsat} (V)	f_T (MHz)	Package	Page
BF 623	250	50	1000	≥ 50	25	20	≤ 0.5	100	SOT-89	556
BF 721	300*	50	1500	≥ 50	25	20	≤ 0.6	100	SOT-223	564
BF 723	250	50	1500	≥ 50	25	20	≤ 0.6	100	SOT-223	564
BFN 17	250	200	1000	≥ 40	30	10	≤ 0.4	100	SOT-89	584
BFN 19	300	200	1000	≥ 30	30	10	≤ 0.5	100	SOT-89	584
BFN 21	300	50	1000	≥ 40	25	20	≤ 0.5	100	SOT-89	592
BFN 23	250	50	360	≥ 50	25	20	≤ 0.5	100	SOT-23	600
BFN 25	250	200	360	≥ 40	30	10	≤ 0.4	100	SOT-23	608
BFN 27	300	200	360	≥ 30	30	10	≤ 0.5	100	SOT-23	608
BFN 37	250	200	1500	≥ 40	30	10	≤ 0.4	100	SOT-223	616
BFN 39	300	200	1500	≥ 30	30	10	≤ 0.5	100	SOT-223	616
PZTA 92	300	500	1500	≥ 25	30	10	≤ 0.5	100	SOT-223	691
PZTA 93	200	500	1500	≥ 25	30	10	≤ 0.4	100	SOT-223	691

5.1 SMD Plastic Package (cont'd)

PNP

Type	Max. Ratings V_{CE0} V	I_C mA	P_{tot} mW	Characteristics h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} V	f_T MHz	Package	Page
SMBTA 92	300	500	360	≥ 25	30	10	≤ 0.5	≥ 50	SOT-23	773
SMBTA 93	200	500	360	≥ 25	30	10	≤ 0.4	≥ 50	SOT-23	773
SXTA 92	300	500	1000	≥ 25	30	10	≤ 0.5	≥ 50	SOT-89	807
SXTA 93	200	500	1000	≥ 25	30	10	≤ 0.4	≥ 50	SOT-89	807

5.2 Plastic Package

NPN

Type	Max. Ratings V_{CE0} V_{CER}* V	I_C mA	P_{tot} mW	Characteristics h_{FE} –	I_C mA	V_{CE} V	V_{CEsat} $V_{CEsat\ RF}$* V	f_T MHz	Package	Page
BF 420	300*	50	830	≥ 50	25	20	20*	100	TO-92	544
BF 422	250	50	830	≥ 50	25	20	20*	100	TO-92	544
BF 857	160	200	1800	≥ 25	30	10	≤ 1.0	100	TO-202	568
BF 858	250	200	1800	≥ 25	30	10	≤ 1.0	100	TO-202	568
BF 859	300	200	1800	≥ 25	30	10	< 1.0	100	TO-202	568
BF 869	250	50	1600	≥ 50	25	20	20*	100	TO-202	572
BF 871	300*	50	1600	≥ 40	25	20	20*	100	TO-202	572
BF 881	400*	50	1600	≥ 40	25	20	20*	100	TO-202	572
BFP 22	200	200	625	≥ 50	30	10	≤ 0.4	70	TO-92	620
BFP 25	300	200	625	≥ 40	30	10	≤ 0.5	70	TO-92	620
MPSA 42	300	500	625	≥ 40	30	10	≤ 0.5	70	TO-92	649
MPSA 43	200	500	625	≥ 40	30	10	≤ 0.4	70	TO-92	649

PNP

BF 421	300*	50	830	≥ 50	25	20	20*	100	TO-92	548
BF 423	250	50	830	≥ 50	25	20	20*	100	TO-92	548
BF 870	250	50	1600	≥ 50	25	20	20*	100	TO-202	576
BF 872	300*	50	1600	≥ 40	25	20	20*	100	TO-202	576
BFP 23	200	200	625	≥ 30	30	10	≤ 0.4	70	TO-92	624
BFP 26	300	200	625	≥ 25	30	10	≤ 0.5	70	TO-92	624
MPSA 92	300	500	625	≥ 25	30	10	≤ 0.5	70	TO-92	653
MPSA 93	200	500	625	≥ 30	30	10	≤ 0.4	70	TO-92	653

Cross Reference Table of Plastic Packages (Conventional Devices to SMD)

SOD-123

Conventional Devices	SMD
BA 282	BA 582
BA 389	BA 585
BB 112	BB 512
BB 409	BB 419
BB 505	BB 515
BB 609	BB 619

SOD-323

BA 282	BA 592
BA 389	BA 595
BB 409	BB 439
BB 505	BB 535
BB 609	BB 639

SOT-23

BA 282	BAT 18
BA 389	BA 885
1N 4148	BAL 74
1N 4148	BAL 99
BAR 12-1	BAR 14-1
1N 4148	BAR 74
1N 4148	BAR 99
1N 4148	BAS 16
BAV 19	BAS 19
BAV 20	BAS 20
BAV 21	BAS 21
BAS 45	BAS 116
BAT 85	BAT 64
1N 4148 (2×)	BAV 70 (Dual)
1N 4148 (2×)	BAV 74 (Dual)
1N 4148 (2×)	BAV 99 (Dual)
BAS 45 (2×)	BAV 170 (Dual)
BAS 45 (2×)	BAV 199 (Dual)
1N 4148 (2×)	BAW 56 (Dual)
BAS 45 (2×)	BAW 156 (Dual)
1N 914	SMBD 914
BB 304	BB 804
BC 337	BC 817
BC 338	BC 818

SOT-23

Conventional Devices	SMD
BC 516	BCV 26
MPSA 63	SMBTA 63
MPSA 64	SMBTA 64
BC 516	BCV 46
BC 517	BCV 27
BC 546	BC 846
BC 547	BC 847
BC 548	BC 848
BC 549	BC 849
BC 550	BC 850
BC 556	BC 856
BC 557	BC 857
BC 558	BC 858
BC 559	BC 859
BC 560	BC 860
BC 618	BCV 47
BCX 58	BCW 60
BCX 59	BCX 70
BCX 78	BCW 61
BCX 79	BCX 71
BCX 73	BCW 65
BCX 74	BCW 66
BCX 75	BCW 67
BCX 76	BCW 68
BC 327	BC 807
BC 328	BC 808
BCX 22	BCX 41
BCX 23	BCX 42
MPS 2222	SMBT 2222
MPS 2222 A	SMBT 2222 A
MPS 2907	SMBT 2907
MPS 2907 A	SMBT 2907 A
2N 4126	SMBT 4126
MPSA 05	SMBTA 05
MPSA 06	SMBTA 06
MPSA 55	SMBTA 55
MPSA 56	SMBTA 56
BF 199	BF 599
BF 240	BF 840
BF 241	BF 841

Cross Reference Table of Plastic Packages (Conventional Devices to SMD)

SOT-23 (cont'd)

Conventional Devices	SMD
BF 254	BF 554
BF 422	BFN 22
BF 423	BFN 23
BF 450	BF 550
BF 506	BF 660
BF 544	BF 543
BF 763	BF 517
BF 959	BF 799
BF 970	BF 569
BF 979 S	BF 579
BF 987	BF 999
BFP 22	BFN 24
MPSA 43	SMBTA 43
BFP 23	BFN 25
MPSA 93	SMBTA 93
BFP 25	BFN 26
MPSA 42	SMBTA 42
BFP 26	BFN 27
MPSA 92	SMBTA 92
BFQ 23	BFT 93
BFQ 51	BFT 92
BFQ 69	BFQ 81
BFR 90	BFR 35 AP
BFR 90	BFR 92 P
BRF 91 A	BFR 93 A
BFR 91	BFR 93 P
BFR 96 S	BFR 106
BFW 92	BFS 17 P
MPSA 20	SMBTA 20
MPSA 13	SMBTA 13
MPSA 14	SMBTA 14

SOT-223

Conventional Devices	SMD
1N 4001	BAS 78 A
1N 4002	BAS 78 B
1N 4003	BAS 78 C
1N 4004	BAS 78 D
1N 4001 (2×)	BAS 79 A (Dual)
1N 4002 (2×)	BAS 79 B (Dual)
1N 4003 (2×)	BAS 79 C (Dual)
1N 4004 (2×)	BAS 79 D (Dual)
BC 368	BCP 68
BC 369	BCP 69
BC 516	BCP 28
BC 516	BCP 48
MPSA 63	PZTA 63
MPSA 64	PZTA 64
BC 517	BCP 29
MPSA 13	PZTA 13
BC 618	BCP 49
MPSA 14	PZTA 14
BC 635	BCP 54
BC 636	BCP 51
BC 637	BCP 55
BC 638	BCP 52
BC 639	BCP 56
BC 640	BCP 53
BC 875	BSP 50
BC 876	BSP 60
BC 877	BSP 51
BC 878	BSP 61
BC 879	BSP 52
BC 880	BSP 62
BF 420	BF 720
BF 421	BF 721
BF 422	BF 722
BF 423	BF 723
BFP 22	BFN 36
MPSA 43	PZTA 43
BFP 23	BFN 37
MPSA 93	PZTA 93
BFP 25	BFN 38
MPSA 92	PZTA 42

Cross Reference Table of Plastic Packages (Conventional Devices to SMD)

SOT-223 (cont'd)

Conventional Devices	SMD
BFP 26	BFN 39
MPSA 92	PZTA 92
MPS 2222	PZT 2222
MPS 2222 A	PZT 2222 A
MPS 2907	PZT 2907
MPS 2907 A	PZT 2907 A
MPS 3904	PZT 3904
MPS 3906	PZT 3906
BFR 96 S	BFG 19 S

SOT-143

1N 4148 (2×)	BAS 28 (Dual)
1N 4148 (2×)	BAW 100 (Dual)
BAV 21 (2×)	BAW 101 (Dual)
1N 4148 (4×)	BGX 50A (Bridge)
BF 961	BF 995
BF 963	BF 993
BF 964 S	BF 994 S
BF 965	BF 997
BF 966 S	BF 996 S
BF 988	BF 998
BFQ 69	BFP 81
BFR 91 A	BFP 93 A

SOT-89

BC 368	BCX 68
BC 369	BCX 69
BC 516	BCV 28
BC 516	BCV 48
BC 517	BCV 29
BC 618	BCV 49
BC 635	BCX 54
BC 636	BCX 51
BC 637	BCX 55
BC 638	BCX 52
BC 639	BCX 56
BC 640	BCX 53
BF 420	BFN 20
BF 421	BFN 21

SOT-89

Conventional Devices	SMD
BF 422	BF 622
BF 423	BF 623
BFP 22	BFN 16
BFP 23	BFN 17
BFP 25	BFN 18
BFP 26	BFN 19
BFR 96	BFQ 19 P
BFR 96 S	BFQ 19 S
BFW 16 A	BFQ 17 P
1N 4001	BAW 78 A
1N 4002	BAW 78 B
1N 4003	BAW 78 C
1N 4004	BAW 78 D
1N 4001 (2×)	BAW 79 A
1N 4002 (2×)	BAW 79 B
1N 4003 (2×)	BAW 79 C
1N 4004 (2×)	BAW 79 D

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Ordering Codes

Ordering Codes
AF Transistors and Diodes

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AF Diodes		
S BAL 74	Q62702-A718	106
BAL 99	Q62702-A687	110
BAR 74	Q62702-A704	114
BAR 99	Q62702-A388	118
S BAS 16	Q62702-A739	122
S BAS 19	Q62702-A95	126
S BAS 20	Q62702-A113	126
S BAS 21	Q62702-A79	126
S BAS 28	Q62702-A77	130
S BAS 40	Q62702-D339	134
S BAS 40-04	Q62702-D980	134
S BAS 40-05	Q62702-D979	134
S BAS 40-06	Q62702-D978	134
S BAS 40-07	Q62702-D1314	135
S BAS 70	Q62702-A118	139
S BAS 70-04	Q62702-A730	139
S BAS 70-05	Q62702-A711	139
S BAS 70-06	Q62702-A774	139
S BAS 70-07	Q62702-A846	140
S BAS 78A	Q62702-A910	144
S BAS 78B	Q62702-A911	144
S BAS 78C	Q62702-A912	144
S BAS 78D	Q62702-A913	144
S BAS 79A	Q62702-A914	147
S BAS 79B	Q62702-A915	147
S BAS 79C	Q62702-A916	147
S BAS 79D	Q62702-A917	147
BAS 116	Q62702-A919	150
S BAT 64	Q62702-A879	154
BAT 64-04	Q62702-A961	154
BAT 64-05	Q62702-A962	154
BAT 64-06	Q62702-A963	154
BAT 64-07	Q62702-A964	155
BAT 65	Q62702-A990	158
BAT 66-05	Q62702-A988	161
S BAV 70	Q68000-A6622	164
BAV 74	Q62702-A693	168
S BAV 99	Q68000-A549	172

Type	Ordering code	Page
BAV 170	Q62702-A920	176
BAV 199	Q62702-A921	180
S BAW 56	Q62702-A688	184
BAW 78A	Q62702-A778	188
BAW 78B	Q62702-A779	188
BAW 78C	Q62702-A784	188
BAW 78D	Q62702-A109	188
BAW 79A	Q62702-A781	191
BAW 79B	Q62702-A782	191
BAW 79C	Q62702-A771	191
BAW 79D	Q62702-A733	191
BAW 100	Q62702-A376	194
S BAW 101	Q62702-A712	198
BAW 156	Q62702-A922	201
BGX 50A	Q62702-G38	205
SMBD 914	Q68000-A625	209
SMBD 2835	Q68000-A8547	213
SMBD 2836	Q68000-A8436	213
SMBD 2837	Q68000-A8487	217
SMBD 2838	Q68000-A8437	217
SMBD 6050	Q68000-A8439	221
SMBD 6100	Q68000-A8438	225
SMBD 7000	Q68000-A8440	229
AF Transistors		
BC 167	Q62702-C706	234
S BC 167A	Q62702-C74	234
S BC 167B	Q62702-C75	234
BC 168	Q62702-C707	234
BC 168A	Q62702-C76	234
BC 168B	Q62702-C77	234
BC 168C	Q62702-C78	234
BC 169	Q62702-C708	234
BC 169B	Q62702-C79	234
BC 169C	Q62702-C80	234
BC 182	Q62702-C455	242
BC 182A	Q62702-C372	242
BC 182B	Q62702-C373	242
BC 183	Q62702-C833	242

S Preferred type: shortly available via the Semiconductor Distribution Center (Edition April 1991)

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BC 183A	Q62702-C388	242
BC 183B	Q62702-C387	242
BC 183C	Q62702-C524	242
BC 212	Q62702-C242	250
BC 212A	Q62702-C374-V1	250
BC 212B	Q62702-C374-V2	250
BC 213	Q62702-C564	250
BC 213A	Q62702-C1159	250
BC 213B	Q62702-C1160	250
BC 213C	Q62702-C1158	250
BC 237	Q62702-C697	258
S BC 237A	Q62702-C276	258
S BC 237B	Q62702-C277	258
BC 238	Q62702-C698	258
BC 238A	Q62702-C278	258
S BC 238B	Q62702-C279	258
S BC 238C	Q62702-C280	258
BC 239	Q62702-C699	258
BC 239B	Q62702-C281	258
S BC 239C	Q62702-C282	258
BC 257	Q62702-C700	266
S BC 257A	Q62702-C184	266
S BC 257B	Q62702-C206	266
BC 258	Q62702-C701	266
BC 258A	Q62702-C187	266
BC 258B	Q62702-C188	266
BC 258C	Q62702-C438	266
BC 259	Q62702-C702	266
BC 259B	Q62702-C192	266
BC 259C	Q62702-C439	266
BC 307	Q62702-C703	274
S BC 307A	Q62702-C283	274
S BC 307B	Q62702-C324	274
BC 308	Q62702-C704	274
BC 308A	Q62702-C285	274
S BC 308B	Q62702-C286	274
S BC 308C	Q62702-C393	274
BC 309	Q62702-C705	274
BC 309B	Q62702-C289	274
BC 309C	Q62702-C323	274
BC 327	Q62702-C311	282
S BC 327-16	Q62702-C311-V3	282
S BC 327-25	Q62702-C311-V4	282
S BC 327-40	Q62702-C311-V2	282

Type	Ordering code	Page
BC 328	Q62702-C312	282
BC 328-16	Q62702-C312-V3	282
S BC 328-25	Q62702-C312-V4	282
S BC 328-40	Q62702-C312-V2	282
BC 337	Q62702-C313	288
S BC 337-16	Q62702-C313-V3	288
S BC 337-25	Q62702-C313-V1	288
S BC 337-40	Q62702-C313-V2	288
BC 338	Q62702-C314	288
BC 338-16	Q62702-C314-V1	288
S BC 338-25	Q62702-C314-V2	288
S BC 338-40	Q62702-C314-V3	288
S BC 368	Q62702-C747	294
S BC 369	Q62702-C748	298
BC 413	Q62702-C375	302
BC 413B	Q62702-C375-V1	302
BC 413C	Q62702-C375-V2	302
BC 414	Q62702-C376	302
BC 414B	Q62702-C376-V1	302
S BC 414C	Q62702-C376-V2	302
BC 415	Q62702-C377	310
BC 415A	Q62702-C377-V1	310
BC 415B	Q62702-C377-V2	310
S BC 415C	Q62702-C377-V3	310
BC 416	Q62702-C378	310
BC 416A	Q62702-C378-V1	310
BC 416B	Q62702-C378-V2	310
S BC 416C	Q62702-C378-V3	310
S BC 516	Q62702-C944	318
S BC 517	Q62702-C825	322
BC 546	Q62702-C687	326
BC 546A	Q62702-C687-V1	326
S BC 546B	Q62702-C687-V2	326
BC 547	Q62702-C688	326
BC 547A	Q62702-C688-V1	326
S BC 547B	Q62702-C688-V2	326
BC 548	Q62702-C689	326
BC 548A	Q62702-C689-V1	326
S BC 548B	Q62702-C689-V2	326
S BC 548C	Q62702-C689-V3	326
BC 549	Q62702-C690	326
BC 549B	Q62702-C690-V1	326
S BC 549C	Q62702-C690-V2	326
BC 550	Q62702-C691	326

S Preferred type: shortly available via the Semiconductor Distribution Center (Edition April 1991)

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Type	Ordering code	Page
BC 550B	Q62702-C691-V1	326
[S] BC 550C	Q62702-C691-V2	326
BC 556	Q62702-C692	334
BC 556A	Q62702-C692-V1	334
[S] BC 556B	Q62702-C692-V2	334
BC 557	Q62702-C693	334
BC 557A	Q62702-C693-V1	334
[S] BC 557B	Q62702-C693-V2	334
BC 558	Q62702-C694	334
BC 558A	Q62702-C694-V1	334
[S] BC 558B	Q62702-C694-V2	334
[S] BC 558C	Q62702-C694-V3	334
BC 559	Q62702-C695	334
BC 559A	Q62702-C695-V1	334
BC 559B	Q62702-C695-V2	334
[S] BC 559C	Q62702-C695-V3	334
BC 560	Q62702-C696	334
BC 560A	Q62702-C696-V1	334
[S] BC 560B	Q62702-C696-V2	334
[S] BC 560C	Q62702-C696-V3	334
BC 617	Q62702-C1137	342
BC 618	Q62702-C1138	342
[S] BC 635	Q68000-A3360	347
[S] BC 636	Q68000-A3365	352
[S] BC 637	Q68000-A2285	347
[S] BC 638	Q68000-A3366	352
[S] BC 639	Q68000-A3361	347
[S] BC 640	Q68000-A3367	352
[S] BC 807-16	Q62702-C1735	357
[S] BC 807-25	Q62702-C1689	357
[S] BC 807-40	Q62702-C1721	357
[S] BC 808-16	Q62702-C1736	357
[S] BC 808-25	Q62702-C1504	357
[S] BC 808-40	Q62702-C1692	357
[S] BC 817-16	Q62702-C1732	362
[S] BC 817-25	Q62702-C1690	362
[S] BC 817-40	Q62702-C1738	362
[S] BC 818-16	Q62702-C1739	362
[S] BC 818-25	Q62702-C1740	362
[S] BC 818-40	Q62702-C1505	362
[S] BC 846A	Q62702-C1772	367
BC 846B	Q62702-C1746	367
[S] BC 847A	Q62702-C1884	367
[S] BC 847B	Q62702-C1687	367
[S] BC 847C	Q62702-C1715	367
[S] BC 848A	Q62702-C1741	367
[S] BC 848B	Q62702-C1704	367
[S] BC 848C	Q62702-C1506	367
BC 849B	Q62702-C1727	367
BC 849C	Q62702-C1713	367
BC 850B	Q62702-C1885	367
BC 850C	Q62702-C1712	367
[S] BC 856A	Q62702-C1773	375
[S] BC 856B	Q62702-C1886	375
[S] BC 857A	Q62702-C1850	375
[S] BC 857B	Q62702-C1688	375
[S] BC 857C	Q62702-C1851	375
[S] BC 858A	Q62702-C1742	375
[S] BC 858B	Q62702-C1698	375
[S] BC 858C	Q62702-C1507	375
BC 859A	Q62702-C1887	375
BC 859B	Q62702-C1774	375
BC 859C	Q62702-C1761	375
BC 860B	Q62702-C1888	375
BC 860C	Q62702-C1889	375
[S] BC 875	Q62702-C853	383
[S] BC 876	Q62702-C943	387
[S] BC 877	Q62702-C854	383
[S] BC 878	Q62702-C942	387
[S] BC 879	Q62702-C855	383
[S] BC 880	Q62702-C941	387
[S] BCP 28	Q62702-C2134	391
[S] BCP 29	Q62702-C2136	396
[S] BCP 48	Q62702-C2135	391
[S] BCP 49	Q62702-C2137	396
[S] BCP 51	Q62702-C2107	401
[S] BCP 51-10	Q62702-C2109	401
[S] BCP 51-16	Q62702-C2110	401
[S] BCP 52	Q62702-C2146	401
[S] BCP 52-10	Q62702-C2112	401
[S] BCP 52-16	Q62702-C2113	401
[S] BCP 53	Q62702-C2147	401
[S] BCP 53-10	Q62702-C2115	401
[S] BCP 53-16	Q62702-C2116	401
[S] BCP 54	Q62702-C2117	406
[S] BCP 54-10	Q62702-C2119	406
[S] BCP 54-16	Q62702-C2120	406

[S] Preferred type: shortly available via the Semiconductor Distribution Center (Edition April 1991)

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S BCP 55	Q62702-C2148	406
S BCP 55-10	Q62702-C2122	406
S BCP 55-16	Q62702-C2123	406
S BCP 56	Q62702-C2149	406
S BCP 56-10	Q62702-C2125	406
S BCP 56-16	Q62702-C2106	406
S BCP 68	Q62702-C2126	411
S BCP 69	Q62702-C2130	415
S BCV 26	Q62702-C1493	419
S BCV 27	Q62702-C1474	423
BCV 28	Q62702-C1852	427
BCV 29	Q62702-C1853	431
S BCV 46	Q62702-C1475	419
S BCV 47	Q62702-C1501	423
S BCV 48	Q62702-C1854	427
S BCV 49	Q62702-C1832	431
BCV 61A	Q62702-C2155	435
BCV 61B	Q62702-C2156	435
BCV 61C	Q62702-C2157	435
BCV 62A	Q62702-C2158	440
BCV 62B	Q62702-C2159	440
BCV 62C	Q62702-C2160	440
S BCW 60A	Q62702-C1517	445
S BCW 60B	Q62702-C1497	445
S BCW 60C	Q62702-C1476	445
S BCW 60D	Q62702-C1477	445
BCW 60FF	Q62702-C1529	445
BCW 60FN	Q62702-C1567	445
S BCW 61A	Q62702-C452	454
S BCW 61B	Q62702-C1585	454
S BCW 61C	Q62702-C1478	454
S BCW 61D	Q62702-C1556	454
BCW 61FF	Q62702-C1890	454
BCW 61FN	Q62702-C1891	454
S BCW 65A	Q62702-C1516	463
S BCW 65B	Q62702-C1612	463
S BCW 65C	Q62702-C1479	463
S BCW 66F	Q62702-C1892	463
S BCW 66G	Q62702-C1526	463
S BCW 66H	Q62702-C1632	463
S BCW 67A	Q62702-C1560	469
S BCW 67B	Q62702-C1480	469
S BCW 67C	Q62702-C1681	469
S BCW 68F	Q62702-C1893	469
S BCW 68G	Q62702-C1322	469
S BCW 68H	Q62702-C1555	469
BCX 12	Q62702-C25	475
BCX 13	Q62702-C26	479
S BCX 41	Q62702-C1659	483
S BCX 42	Q62702-C1485	487
BCX 51	Q62702-C1847	491
BCX 51-10	Q62702-C1831	491
BCX 51-16	Q62702-C1857	491
BCX 52	Q62702-C1743	491
BCX 52-10	Q62702-C1744	491
BCX 52-16	Q62702-C1900	491
BCX 53	Q62702-C905	491
BCX 53-10	Q62702-C1753	491
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BCX 55-10	Q62702-C1730	496
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BCX 56	Q62702-C1614	496
BCX 56-10	Q62702-C1635	496
BCX 56-16	Q62702-C1613	496
BCX 58 VIII	Q62702-C619	501
BCX 58 IX	Q62702-C620	501
BCX 58 X	Q62702-C621	501
BCX 59 VIII	Q62702-C623	501
BCX 59 IX	Q62702-C624	501
BCX 59 X	Q62702-C625	501
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BCX 68-10	Q62702-C1864	507
BCX 68-16	Q62702-C1865	507
BCX 68-25	Q62702-C1866	507
BCX 69	Q62702-C1714	511
BCX 69-10	Q62702-C1867	511
BCX 69-16	Q62702-C1868	511
BCX 69-25	Q62702-C1869	511
S BCX 70G	Q62702-C1539	445
S BCX 70H	Q62702-C1481	445
S BCX 70J	Q62702-C1552	445

S Preferred type: shortly available via the Semiconductor Distribution Center (Edition April 1991)

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S BCX 70K	Q62702-C1571	445
S BCX 71G	Q62702-C1482	454
S BCX 71H	Q62702-C1586	454
S BCX 71J	Q62702-C1554	454
S BCX 71K	Q62702-C1654	454
BCX 73	Q62702-C634	515
BCX 73-16	Q62702-C634-S1	515
BCX 73-25	Q62702-C634-S2	515
BCX 73-40	Q62702-C634-S3	515
BCX 74	Q62702-C635	515
BCX 74-16	Q62702-C635-S1	515
BCX 74-25	Q62702-C635-S2	515
BCX 74-40	Q62702-C635-S3	515
BCX 75	Q62702-C636	521
BCX 75-16	Q62702-C636-S1	521
BCX 75-25	Q62702-C636-S2	521
BCX 75-40	Q62702-C636-S3	521
BCX 76	Q62702-C637	521
BCX 76-16	Q62702-C637-S1	521
BCX 76-25	Q62702-C637-S2	521
BCX 76-40	Q62702-C637-S3	521
BCX 78	Q62702-C717	527
BCX 78 VII	Q62702-C626	527
BCX 78 VIII	Q62702-C627	527
BCX 78 IX	Q62702-C628	527
BCX 78 X	Q62702-C629	527
BCX 79	Q62702-C718	527
BCX 79 VII	Q62702-C630	527
BCX 79 VIII	Q62702-C631	527
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BD 825-10	Q62702-D1213	534
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BD 826-10	Q62702-D1179	539
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BD 827-6	Q62702-D1306	534
BD 827-10	Q62702-D1113	534
BD 828	Q62702-D1307	539

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BD 828-10	Q62702-D61	539
BD 829	Q62702-D1309	534
BD 829-6	Q62702-D1310	534
BD 829-10	Q62702-D1311	534
BD 830	Q62702-D1312	539
BD 830-6	Q62702-D1313	539
BD 830-10	Q62702-D1238	539
BF 420	Q62702-F531	544
BF 421	Q62702-F532	548
BF 422	Q62702-F495	544
BF 423	Q62702-F496	548
BF 622	Q62702-F1052	552
BF 623	Q62702-F1053	556
S BF 720	Q62702-F1238	560
S BF 721	Q62702-F1239	564
S BF 722	Q62702-F1306	560
S BF 723	Q62702-F1309	564
BF 857	Q62702-F784	568
BF 858	Q62702-F785	568
BF 859	Q62702-F786	568
BF 869	Q62702-F683	572
BF 870	Q62702-F685	576
BF 871	Q62702-F676	572
BF 872	Q62702-F677	576
BF 881	Q62702-F794	572
S BFN 16	Q62702-F885	580
S BFN 17	Q62702-F884	584
BFN 18	Q62702-F1056	580
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BFN 20	Q62702-F1058	588
BFN 21	Q62702-F1059	592
BFN 22	Q62702-F1024	596
BFN 23	Q62702-F1064	600
BFN 24	Q62702-F1065	604
BFN 25	Q62702-F1066	608
S BFN 26	Q62702-F976	604
S BFN 27	Q62702-F977	608
S BFN 36	Q62702-F1246	612
S BFN 37	Q62702-F1304	616
S BFN 38	Q62702-F1303	612
S BFN 39	Q62702-F1305	616

S Preferred type: shortly available via the Semiconductor Distribution Center (Edition April 1991)

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BFP 22	Q62702-F621	620
BFP 23	Q62702-F622	624
BFP 25	Q62702-F721	620
BFP 26	Q62702-F722	624
S BSP 50	Q62702-P1163	628
S BSP 51	Q62702-P1164	628
S BSP 52	Q62702-P1165	628
S BSP 60	Q62702-P1166	633
S BSP 61	Q62702-P1167	633
S BSP 62	Q62702-P1168	633
BSS 63	Q62702-S534	487
BSS 64	Q62702-S535	483
BSS 79B	Q62702-S503	638
BSS 79C	Q62702-S501	638
BSS 80B	Q62702-S557	643
BSS 80C	Q62702-S492	643
BSS 81B	Q62702-S555	638
BSS 81C	Q62702-S605	638
BSS 82B	Q62702-S560	643
BSS 82C	Q62702-S482	643
MPSA 42	Q68000-A413	649
MPSA 43	Q68000-A4809	649
MPSA 92	Q68000-A5906	653
MPSA 93	Q68000-A4810	653
PZT 2222	Q62702-Z2026	657
PZT 2222A	Q62702-Z2027	657
PZT 2907	Q62702-Z2028	663
PZT 2907A	Q62702-Z2025	663
PZT 3904	Q62702-Z2029	669
PZT 3906	Q62702-Z2030	674
PZTA 13	Q62702-Z2033	679
PZTA 14	Q62702-Z2034	679
PZTA 42	Q62702-Z2035	683
PZTA 43	Q62702-Z2036	683
PZTA 63	Q62702-Z2031	687
PZTA 64	Q62702-Z2032	687
PZTA 92	Q62702-Z2037	691
PZTA 93	Q62702-Z2038	691

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SMBT 2222	Q68000-A6481	695
SMBT 2222A	Q68000-A6473	695
SMBT 2907	Q68000-A6501	701
SMBT 2907A	Q68000-A6474	701
SMBT 3904	Q68000-A4416	707
SMBT 3906	Q68000-A4417	714
SMBT 4124	Q68000-A8316	721
SMBT 4126	Q68000-A8549	725
SMBT 5086	Q62702-M0002	729
SMBT 5087	Q68000-A8319	729
SMBT 6427	Q68000-A8320	735
SMBT 6428	Q68000-A8321	739
SMBT 6429	Q68000-A8322	739
SMBTA 05	Q68000-A3430	745
SMBTA 06	Q68000-A3428	745
SMBTA 13	Q68000-A6475	749
SMBTA 14	Q68000-A6476	749
SMBTA 20	Q68000-A6477	753
SMBTA 42	Q68000-A6478	757
SMBTA 43	Q68000-A6482	757
SMBTA 55	Q68000-A3386	761
SMBTA 56	Q68000-A2882	761
SMBTA 63	Q68000-A2625	765
SMBTA 64	Q68000-A2485	765
SMBTA 70	Q62702-M0003	769
SMBTA 92	Q68000-A6479	773
SMBTA 93	Q68000-A6483	773
SXT 2222A	Q68000-A8330	777
SXT 2907A	Q68000-A8300	783
SXT 3904	Q68000-A8396	789
SXT 3906	Q68000-A8397	796
SXTA 42	Q68000-A8394	803
SXTA 43	Q68000-A8650	803
SXTA 92	Q68000-A8393	807
SXTA 93	Q68000-A8651	807

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BA 243	Q62702-A521	142
BA 243S	Q62702-A607	144
BA 244	Q62702-A421	142
BA 244S	Q62702-A618	144
BA 282	Q62702-A428	146
BA 283	Q62702-A429	146
BA 284	Q62702-A632	148
BA 389	Q62702-A732	150
BA 582	Q62702-A829	153
BA 585	Q62702-A859	155
BA 586	Q62702-A930	157
BA 592	Q62702-A950	159
BA 595	Q62702-A952	161
BA 596	Q62702-A954	163
BA 885	Q62702-A608	165
BA 886	Q62702-A932	167
S BAR 14-1	Q62702-A772	169
S BAR 15-1	Q62702-A731	169
S BAR 16-1	Q62702-A773	169
S BAR 17	Q62702-A785	172
S BAR 60	Q62702-A786	175
S BAR 61	Q62702-A120	175
BAS 125	Q62702-D1316	179
BAS 125-04	Q62702-D1321	179
BAS 125-05	Q62702-D1322	179
BAS 125-06	Q62702-D1323	179
BAS 125-07	Q62702-D1327	180
BAT 14-014	Q62702-D1005	192
BAT 14-020D	Q62702-D1259	184
BAT 14-020R	Q62702-D1260	186
BAT 14-020S	Q62702-D1258	188
BAT 14-022R	Q62702-D411	190
BAT 14-025D	Q62702-A790	195
BAT 14-025R	Q62702-A791	197
BAT 14-025S	Q62702-A789	199
BAT 14-034	Q62702-D1019	192
BAT 14-044	Q62702-D1026	192
BAT 14-050D	Q62702-D1268	184
BAT 14-050R	Q62702-D1269	186
BAT 14-050S	Q62702-D1267	188
BAT 14-052R	Q62702-D412	190
BAT 14-055D	Q62702-A793	195
BAT 14-055R	Q62702-A794	197
BAT 14-055S	Q62702-A792	199
BAT 14-064	Q62702-D1036	192
BAT 14-074	Q62702-D1041	192
BAT 14-090D	Q62702-D1276	184
BAT 14-090R	Q62702-D1277	186
BAT 14-090S	Q62702-D1275	188
BAT 14-092R	Q62702-D413	190
BAT 14-094	Q62702-D1051	192
BAT 14-095D	Q62702-A797	195
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BAT 14-098	Q62702-A0960	201
BAT 14-099	Q62702-A3461	205
BAT 14-099R	Q62702-A0042	209
BAT 14-104	Q62702-D1056	192
BAT 14-110D	Q62702-D1285	184
BAT 14-110R	Q62702-D1286	186
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BAT 14-112R	Q62702-D414	190
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BAT 14-115S	Q62702-A799	199
BAT 14-124	Q62702-D1066	192
BAT 15-014	Q62702-D3429	219
BAT 15-020D	Q62702-D1263	211
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BAT 15-020S	Q62702-D1262	215
BAT 15-022R	Q62702-D1265	217
BAT 15-025D	Q62702-A803	221
BAT 15-025R	Q62702-A804	223
BAT 15-025S	Q62702-A802	225
BAT 15-044	Q62702-D3431	219
BAT 15-050D	Q62702-D3450	211
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BAT 15-050S	Q62702-D1271	215
BAT 15-052R	Q62702-D1273	217
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BAT 15-055R	Q62702-A806	223
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RF Transistors and Diodes*)

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BAT 15-074	Q62702-D3433	219
BAT 15-090D	Q62702-D1280	211
BAT 15-090R	Q62702-D1281	213
BAT 15-090S	Q62702-D1279	215
BAT 15-092R	Q62702-D1282	217
BAT 15-095D	Q62702-A798	221
BAT 15-095R	Q62702-A809	223
BAT 15-095S	Q62702-A808	225
BAT 15-098	Q62702-A0062	227
BAT 15-099	Q62702-A0066	231
BAT 15-099R	Q62702-A0043	235
BAT 15-104	Q62702-D3435	219
BAT 15-110D	Q62702-D1289	211
BAT 15-110R	Q62702-D1290	213
BAT 15-110S	Q62702-D1288	215
BAT 15-112R	Q62702-D1291	217
BAT 15-115D	Q62702-A811	221
BAT 15-115R	Q62702-A812	223
BAT 15-115S	Q62702-A810	225
BAT 15-124	Q62702-D3437	219
S BAT 17	Q62702-A504	237
S BAT 17-04	Q62702-A775	237
S BAT 17-05	Q62702-A776	237
S BAT 17-06	Q62702-A777	237
S BAT 17-07	Q62702-A918	238
BAT 18	Q62702-A787	242
BAT 18-04	Q62702-A938	242
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BAT 32	Q62702-A826	246
S BAT 62	Q62702-A971	248
S BAT 68	Q62702-A926	251
S BAT 68-04	Q62702-A4	251
S BAT 68-05	Q62702-A15	251
S BAT 68-06	Q62702-A19	251
S BAT 68-07	Q62702-A44	252
BB 112	Q62702-B240	256
BB 204B	Q62702-B58-X6	259
BB 204G	Q62702-B57-X5	259
BB 304	Q62702-B118	262
BB 409	Q62702-B112	265
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BB 439	Q62702-B577	270
BB 505B	Q62702-B37	272
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BB 512	Q62702-B479	275
BB 515	Q62702-B607	278
BB 535	Q62702-B580	280
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BB 609B	Q62702-B197	282
BB 619	Q62702-B570	284
BB 620	Q62702-B403	286
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BB 640	Q62702-B589	290
BB 804	Q62702-B372	292
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BBY 24-S1	Q62702-B20-S1	305
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BBY 33BB-2	Q62702-B70	307
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BXY 18A2	Q62702-X140	315
BXY 18AB2	Q62702-X133	315
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BXY 42BB-S	Q62702-X159	317
BXY 43A	Q62702-X116	328
BXY 43B	Q62702-X104	328
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RF Transistors		
BF 199	Q62702-F355	334
BF 240	Q62702-F302	338
BF 241	Q62702-F1241	338
BF 254	Q62702-F201	341
BF 255	Q62702-F202	341
BF 414	Q62702-F517	344
BF 450	Q62702-F312	346
BF 451	Q62702-F313	346
BF 506	Q62702-F534	352
BF 517	Q62702-F42	354
BF 543	Q62702-F1372	357
BF 544	Q62702-F1231	362
BF 550	Q62702-F944	367
BF 554	Q62702-F1042	372
BF 569	Q62702-F869	376
BF 579	Q62702-F971	379
BF 599	Q62702-F979	382
BF 606A	Q62702-F535	386
BF 660	Q62702-F982	388
BF 763	Q62702-F766	391
BF 770A	Q62702-F1124	393
BF 771	Q62702-F1225	396
BF 772	Q62702-F1222	399
BF 775	Q62702-F102	402
BF 775A	Q62702-F1250	405
BF 777	Q62702-F1426	408
BF 799	Q62702-F935	411
BF 840	Q62702-F1240	414
BF 841	Q62702-F1287	414
BF 959	Q62702-F640	416
BF 961	Q62702-F518	419
BF 963	Q62702-F904	429
BF 964S	Q62702-F446	435
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BF 970	Q62702-F650	449
BF 987	Q62702-F35	451
BF 988	Q62702-F36	456
BF 993	Q62702-F1018	464
BF 994S	Q62702-F1020	471
BF 995	Q62702-F936	478
BF 996S	Q62702-F1021	488
BF 997	Q62702-F1055	496
BF 998	Q62702-F1129	503
BF 999	Q62702-F1132	511
[S] BFG 19S	Q62702-F1359	516
BFG 135A	Q62702-F1322	525
[S] BFG 193	Q62702-F1291	536
[S] BFG 194	Q62702-F1321	545
[S] BFG 196	Q62702-F1292	548
BFG 235	Q62702-F1432	557
[S] BFP 81	Q62702-F1122	560
[S] BFP 93A	Q62702-F1144	579
[S] BFP 180	Q62702-F1297	594
[S] BFP 181	Q62702-F1317	602
[S] BFP 182	Q62702-F1318	610
[S] BFP 183	Q62702-F1319	620
[S] BFP 193	Q62702-F1282	629
[S] BFP 194	Q62702-F1347	646
[S] BFP 196	Q62702-F1320	649
[S] BFP 280	Q62702-F1300	658
[S] BFQ 19S	Q62702-F1088	666
[S] BFQ 29P	Q62702-F659	677
BFQ 64	Q62702-F1061	687
[S] BFQ 69	Q62702-F780	690
[S] BFQ 70	Q62702-F774	693
[S] BFQ 71	Q62702-F775	707
[S] BFQ 72	Q62702-F776	725
[S] BFQ 73S	Q62702-F1104	739
[S] BFQ 74	Q62702-F778	752
BFQ 75	Q62702-F803	766
BFQ 76	Q62702-F804	769
[S] BFQ 81	Q62702-F1049	773
[S] BFQ 82	Q62702-F1189	791
[S] BFQ 181	Q62702-F1295	809
BFQ 182	Q62702-F1355	817
[S] BFQ 193	Q62702-F1312	821
BFQ 194	Q62702-F1345	831
BFQ 196	Q62702-F1348	834
[S] BFQ 645	Q62702-F1283	843
[S] BFR 15A	Q62702-F460	850
[S] BFR 34A	Q62702-F346-S1	854

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S BFR 35AP	Q62702-F938	860
S BFR 90	Q62702-F560	877
S BFR 91	Q62702-F5619	883
S BFR 91A	Q62702-F735	888
S BFR 92P	Q62702-F1050	892
S BFR 93A	Q62702-F1086	909
S BFR 93P	Q62702-F1051	917
S BFR 96S	Q68000-A5689	926
BFR 106	Q62702-F1219	936
S BFR 180	Q62702-F1296	945
S BFR 181	Q62702-F1314	953
S BFR 182	Q62702-F1315	961
S BFR 183	Q62702-F1316	972
S BFR 193	Q62702-F1218	981
BFR 194	Q62702-F1346	998
S BFR 280	Q62702-F1298	1001
S BFS 17P	Q62702-F940	1009
S BFS 55A	Q62702-F454	1018
S BFT 65	Q62702-F451	1022
S BFT 66	Q62702-F456	1027
S BFT 92	Q62702-F1062	1030
S BFT 93	Q62702-F1063	1041
S BFT 97	Q62702-F514	1044
S BFT 98	Q62702-F523	1047
BFT 98B	Q62702-F1084	1047
S BFT 98T	Q62702-F877	1051
S BFT 99	Q62702-F524	1054
BFT 99A	Q62702-F901	1054
S BFW 92	Q62702-F321	1058
S BFX 59	Q60206-X59	1061
S BFX 59F	Q60206-X59-S5	1061
S BFX 60	Q60206-X60	1064
S BFY 90	Q62702-F297	1067
S CF 739	Q62702-F1215	1074
S CF 750	Q62702-F1391	1081
CFY 10	Q62703-F11	1086
S CFY 19-18	Q62703-F14	1088

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S CFY 19-22	Q62703-F3	1088
S CFY 25-17	Q62703-F106	1096
S CFY 25-20	Q62703-F107	1096
CFY 25-20 E7916	Q62703-F113	1102
S CFY 25-23	Q62703-F108	1096
S CFY 30	Q62703-F97	1107
CFY 35-20	Q62702-F1393	1117
CFY 35-23	Q62702-F1394	1117
S CFY 65-12	Q62703-F101	1123
S CFY 65-14	Q62703-F102	1123
CFY 75-13	Q62702-F1368	1128
CFY 75-15	Q62702-F1369	1128
S CGY 21	Q68000-A5953	1136
CGY 31	Q68000-A6887	1145
CGY 40	Q68000-A4444	1154
S CGY 50	Q68000-A8370	1163
CGY 52	Q68000-A8615	1173
CMY 90	Q62702-M1	1175

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Marking Catalog

Marking	Type	Package
13	BAS 125	SOT-23
14	BAS 125-04	SOT-23
15	BAS 125-05	SOT-23
16	BAS 125-06	SOT-23
17	BAS 125-07	SOT-143
181	BFQ 181	Cerec-X
182	BFQ 182	Cerec-X
194	BFQ 194	Cerec-X
196	BFQ 196	Cerec-X
1A	SXT 3904	SOT-89
1As	BC 846 A	SOT-23
1Bs	BC 846 B	SOT-23
1D	SXTA 42	SOT-89
1E	SXTA 43	SOT-89
1Es	BC 847 A	SOT-23
1Fs	BC 847 B	SOT-23
1Gs	BC 847 C	SOT-23
1Js	BCV 61 A	SOT-143
1Js	BC 848 A	SOT-23
1Ks	BC 848 B	SOT-23
1Ks	BCV 61 B	SOT-143
1Ls	BC 848 C	SOT-23
1Ls	BCV 61 C	SOT-143
2	BB 439	SOD-323
2	BB 419	SOD-123
2A	SXT 3906	SOT-89
2Bs	BC 849 B	SOT-23
2Cs	BC 849 C	SOT-23
2D	SXTA 92	SOT-89
2E	SXTA 93	SOT-89
2F	SXT 2907 A	SOT-89
2Fs	BC 850 B	SOT-23
2Gs	BC 850 C	SOT-23
2P	SXT 2222 A	SOT-89
32	BAT 32	Cerec-X
3As	BC 856 A	SOT-23
3Bs	BC 856 B	SOT-23
3Es	BC 857 A	SOT-23
3Fs	BC 857 B	SOT-23
3Gs	BC 857 C	SOT-23
3Js	BCV 62 A	SOT-143
3Js	BC 858 A	SOT-23
3Ks	BC 858 B	SOT-23
3Ks	BCV 62 B	SOT-143
3Ls	BC 858 C	SOT-23
3Ls	BCV 62 C	SOT-143

Marking	Type	Package
41	BAT 14-115 R	SOT-143
41	BAT 14-115 S	Cerec-X
41D	BAT 14-115 D	Cerec-X
42	BAT 14-025 R	Cerec-X
42	BAT 14-025 R	Cerec-X
42	BAT 14-025 S	Cerec-X
42D	BAT 14-025 D	Cerec-X
43s	BAS 40	SOT-23
44s	BAS 40-04	SOT-23
45	BAT 14-055 R	Cerec-X
45	BAT 14-055 S	Cerec-X
45	BAT 14-055 R	Cerec-X
45D	BAT 14-055 D	Cerec-X
45s	BAS 40-05	SOT-23
46s	BAS 40-06	SOT-23
47s	BAS 40-07	SOT-143
49	BAT 14-095 R	Cerec-X
49	BAT 14-095 S	Cerec-X
49D	BAT 14-095 D	Cerec-X
4As	BC 859 A	SOT-23
4Bs	BC 859 B	SOT-23
4Cs	BC 859 C	SOT-23
4Fs	BC 860 B	SOT-23
4Gs	BC 860 C	SOT-23
51	BAT 15-115 R	Cerec-X
51	BAT 15-115 S	Cerec-X
51D	BAT 15-115 D	Cerec-X
51D	BAT 15-115 D	Cerec-X
52	BAT 15-025 S	Cerec-X
52	BAT 15-025 R	Cerec-X
52D	BAT 15-025 D	Cerec-X
53s	BAT 17	SOT-23
54s	BAT 17-04	SOT-23
55	BAT 15-055 R	Cerec-X
55	BAT 15-055 S	Cerec-X
55D	BAT 15-055 D	Cerec-X
55s	BAT 17-05	SOT-23
56s	BAT 17-06	SOT-23
59	BAT 15-095 R	Cerec-X
59	BAT 15-095 S	Cerec-X
59D	BAT 15-095 D	Cerec-X
5As	BC 807-16	SOT-23
5Bs	BC 807-25	SOT-23
5Cs	BC 807-40	SOT-23
5Es	BC 808-16	SOT-23
5Fs	BC 808-25	SOT-23

Marking	Type	Package
5Gs	BC 808-40	SOT-23
60s	BAR 60	SOT-143
61s	BAR 61	SOT-143
62s	BAT 62	SOT-143
63s	BAT 64	SOT-23
645	BFQ 645	Cerec-X
64s	BAT 64-04	SOT-23
65s	BAT 64-05	SOT-23
66s	BAT 64-06	SOT-23
67s	BAT 64-07	SOT-143
6As	BC 817-16	SOT-23
6Bs	BC 817-25	SOT-23
6Cs	BC 817-40	SOT-23
6Es	BC 818-16	SOT-23
6Fs	BC 818-25	SOT-23
6Gs	BC 818-40	SOT-23
70	BFQ 70	Cerec-X
71	BFQ 71	Cerec-X
72	BFQ 72	Cerec-X
73	BFQ 73	Cerec-X
73S	BFQ 73 S	Cerec-X
73s	BAS 70	SOT-23
74	BFQ 74	Cerec-X
74s	BAS 70-04	SOT-23
75	BFQ 75	Cerec-X
75s	BAS 70-05	SOT-23
76	BFQ 76	Cerec-X
76s	BAS 70-06	SOT-23
77s	BAS 70-07	SOT-143
82	BFQ 82	Cerec-X
83	BAT 68	SOT-23
84	BAT 68-04	SOT-23
85	BAT 68-05	SOT-23
86	BAT 68-06	SOT-23
87	BAT 68-07	SOT-143
A	BAT 14-098	SOD-123
A1	CFY 19-18	Cerec-X
A1s	BAW 56	SOT-23
A2	CFY 19-22	Cerec-X
A2s	CFY 30	SOT-143
A2s	BAT 18	SOT-23
A4s	BAV 70	SOT-23
A6s	BAS 16	SOT-23
A7s	BAV 99	SOT-23
AAs	BCW 60 A	SOT-23
ABs	BCW 60 B	SOT-23

Marking	Type	Package
AC	BCX 51-10	SOT-89
ACs	BCW 60 C	SOT-23
AD	BCX 51-16	SOT-89
ADs	BCW 60 D	SOT-23
AFs	BCW 60 FF	SOT-23
AG	BCX 52-10	SOT-89
AGs	BCX 70 G	SOT-23
AHs	BCX 70 H	SOT-23
AJs	BCX 70 J	SOT-23
AK	BCX 53-10	SOT-89
AKs	BCX 70 K	SOT-23
AL	BCX 53-16	SOT-89
AM	BCX 52-16	SOT-89
AMs	BSS 64	SOT-23
ANs	BCW 60 FN	SOT-23
ASs	BAT 18-05	SOT-23
ATs	BAT 18-06	SOT-23
AUs	BAT 18-04	SOT-23
B	BAT 15-098	SOD-123
BAs	BCW 61 A	SOT-23
BBs	BCW 61 B	SOT-23
BC	BCX 54-10	SOT-89
BCs	BCW 61 C	SOT-23
BD	BCX 54-16	SOT-89
BDs	BCW 61 D	SOT-23
BFs	BCW 61 FF	SOT-23
BG	BCX 55-10	SOT-89
BGs	BCX 71 G	SOT-23
BHs	BCX 71 H	SOT-23
BJs	BCX 71 J	SOT-23
BK	BCX 56-10	SOT-89
BKs	BCX 71 K	SOT-23
BL	BCX 56-16	SOT-89
BM	BCX 55-16	SOT-89
BMs	BSS 63	SOT-23
BNs	BCW 61 FN	SOT-23
C	BAT 65	SOD-123
C5	CFY 25-17	Micro-X
C6	CFY 25-20	Micro-X
C7	CFY 25-23	Micro-X
CB	BCX 68-10	SOT-89
CC	BCX 68-16	SOT-89
CCs	BF 554	SOT-23
CD	BCX 68-25	SOT-89
CDs	BSS 81 B	SOT-23
CEs	BSS 79 B	SOT-23

Marking	Type	Package
CF	BCX 69-10	SOT-89
CFs	BSS 79 C	SOT-23
CG	BCX 69-16	SOT-89
CGs	BSS 81 C	SOT-23
CH	BCX 69-25	SOT-89
CHs	BSS 80 B	SOT-23
CJs	BSS 80 C	SOT-23
CLs	BSS 82 B	SOT-23
CMs	BSS 82 C	SOT-23
DA	BF 622	SOT-89
DAs	BCW 67 A	SOT-23
DB	BF 623	SOT-89
DBs	BCW 67 B	SOT-23
DC	BFN 20	SOT-89
DCs	BCW 67 C	SOT-23
DD	BFN 16	SOT-89
DE	BFN 18	SOT-89
DF	BFN 21	SOT-89
DFs	BCW 68 F	SOT-23
DG	BFN 17	SOT-89
DGs	BCW 68 G	SOT-23
DH	BFN 19	SOT-89
DHs	BCW 68 H	SOT-23
DKs	BCX 42	SOT-23
E	BAT 66	SOD-123
EAs	BCW 65 A	SOT-23
EBs	BCW 65 B	SOT-23
ECs	BCW 65 C	SOT-23
ED	BCV 28	SOT-89
EE	BCV 48	SOT-89
EF	BCV 29	SOT-89
EFs	BCW 66 F	SOT-23
EG	BCV 49	SOT-89
EGs	BCW 66 G	SOT-23
EHs	BCW 66 H	SOT-23
EKs	BCX 41	SOT-23
FAs	BFP 81	SOT-143
FDs	BCV 26	SOT-23
FEs	BFP 93 A	SOT-143
FEs	BCV 46	SOT-23
FFs	BCV 27	SOT-23
FG	BFQ 19 S	SOT-89
FGs	BCV 47	SOT-23
FHs	BFN 24	SOT-23
FJs	BFN 26	SOT-23
FKs	BFN 25	SOT-23

Marking	Type	Package
FLs	BFN 27	SOT-23
GA	BAW 78 A	SOT-89
GB	BAW 78 B	SOT-89
GC	BAW 78 C	SOT-89
GD	BAW 78 D	SOT-89
GE	BAW 79 A	SOT-89
GF	BAW 79 B	SOT-89
GFs	BFR 92 P/S	SOT-23
GG	BAW 79 C	SOT-89
GGs	BFR 93 P	SOT-23
GH	BAW 79 D	SOT-89
HA	CFY 65-12	Micro-X
HB	CFY 65-14	Micro-X
HBs	BFN 22	SOT-23
HCs	BFN 23	SOT-23
JAs	BAV 74	SOT-23
JBs	BAR 74	SOT-23
JCs	BAL 74	SOT-23
JFs	BAL 99	SOT-23
JGs	BAR 99	SOT-23
JPs	BAS 19	SOT-23
JPs	BAW 101	SOT-143
JRs	BAS 20	SOT-23
JSs	BAW 100	SOT-143
JSs	BAS 21	SOT-23
JTs	BAS 28	SOT-143
JVs	BAS 116	SOT-23
JXs	BAV 170	SOT-23
JYs	BAV 199	SOT-23
JZs	BAW 156	SOT-23
KCs	BFQ 29 P	SOT-23
L6s	BAR 17	SOT-23
L7s	BAR 14-1	SOT-23
L8s	BAR 15-1	SOT-23
L9s	BAR 16-1	SOT-23
LAs	BF 550	SOT-23
LBs	BF 999	SOT-23
LDs	BF 543	SOT-23
LEs	BF 660	SOT-23
LFs	BF 777	SOT-23
LGs	BF 775 A	SOT-23
LHs	BF 569	SOT-23
LJs	BF 579	SOT-23
LKs	BF 799	SOT-23
LOs	BF 775	SOT-23
LRs	BF 517	SOT-23

Marking	Type	Package
LSs	BF 770 A	SOT-23
M	BB 512	SOD-123
MCs	BFS 17 P	SOT-23
MGs	BF 994 S	SOT-143
MHs	BF 996 S	SOT-143
MKs	BF 997	SOT-143
MOs	BF 998	SOT-143
MSs	CF 739	SOT-143
MXs	CF 750	SOT-143
NBs	BF 599	SOT-23
NCs	BF 840	SOT-23
NDs	BF 841	SOT-23
P	BA 596	SOD-323
P	BA 586	SOD-123
PAs	BA 885	SOT-23
PCs	BA 886	SOT-23
R2s	BFR 93 A	SOT-23
R7s	BFR 106	SOT-23
RAs	BFQ 81	SOT-23
RAs	BF 772	SOT-143
RBs	BF 771	SOT-23
RC	BFQ 193	SOT-89
RCs	BFP 193	SOT-143
RCs	BFR 193	SOT-23
RDs	BFR 180	SOT-23
RDs	BFP 180	SOT-143
REs	BFP 280	SOT-143
REs	BFR 280	SOT-23
RFs	BFP 181	SOT-143
RFs	BFR 181	SOT-23
RGs	BFP 182	SOT-143
RGs	BFR 182	SOT-23
RHs	BFP 183	SOT-143
RHs	BFR 183	SOT-23
RIs	BFP 196	SOT-143
RIs	BFR 196	SOT-23
RKs	BFP 194	SOT-143
RKs	BFR 194	SOT-23
S	BA 592	SOD-323
S	BB 535	SOD-323
S	BB 639	SOD-323
S	BB 640	SOD-323
S	BA 582	SOD-123
S	BB 515	SOD-123
S	BB 619	SOD-123
S	BB 620	SOD-123

Marking	Type	Package
s1A	SMBT 3904	SOT-23
s1B	SMBT 2222	SOT-23
s1C	SMBTA 20	SOT-23
s1D	SMBTA 42	SOT-23
s1E	SMBTA 43	SOT-23
s1G	SMBTA 06	SOT-23
s1H	SMBTA 05	SOT-23
s1K	SMBT 6428	SOT-23
s1L	SMBT 6429	SOT-23
s1M	SMBTA 13	SOT-23
s1N	SMBTA 14	SOT-23
s1P	SMBT 2222 A	SOT-23
s1V	SMBT 6427	SOT-23
s2A	SMBT 3906	SOT-23
s2B	SMBT 2907	SOT-23
s2C	SMBTA 70	SOT-23
s2D	SMBTA 92	SOT-23
s2E	SMBTA 93	SOT-23
s2F	SMBT 2907 A	SOT-23
s2G	SMBTA 56	SOT-23
s2H	SMBTA 55	SOT-23
s2P	SMBT 5086	SOT-23
s2Q	SMBT 5087	SOT-23
s2U	SMBTA 63	SOT-23
s2V	SMBTA 64	SOT-23
s5A	SMBD 6050	SOT-23
s5B	SMBD 6100	SOT-23
s5C	SMBD 7000	SOT-23
s5D	SMBD 914	SOT-23
S5s	BAT 15-099	SOT-143
S6s	BAT 15-099 R	SOT-143
S9s	BAT 14-099	SOT-143
sA2	SMBD 2836	SOT-23
sA3	SMBD 2835	SOT-23
sA4	SMBD 2838	SOT-23
sA5	SMBD 2837	SOT-23
sC3	SMBT 4126	SOT-23
SF0	BB 804	SOT-23
SF1	BB 804	SOT-23
SF2	BB 804	SOT-23
SF3	BB 804	SOT-23
SF4	BB 804	SOT-23
SH1	BB 814	SOT-23
SH2	BB 814	SOT-23
sZC	SMBT 4124	SOT-23
T	BB 831	SOD-323

Marking	Type	Package
T	BB 811	SOD-123
X	BB 813	SOD-123
X	BB 833	SOD-323
U1s	BGX 50 A	SOT-143
W1s	BFT 92	SOT-23
X1s	BFT 93	SOT-23

Technische Angaben

Technical Information

1. Typenbezeichnung nach Pro Electron

Dieses Typenbezeichnungssystem gilt für Einzelhalbleiter-Bauelemente (im Gegensatz zu integrierten Schaltungen), Vielfache von solchen Bauelementen und Halbleiterchips.

Die Nummer des Grundtyps besteht aus zwei Buchstaben und einem laufenden Kennzeichen:

Erster Buchstabe

Der erste Buchstabe gibt Auskunft über das Ausgangsmaterial.

A. Germanium oder anderes Material mit Bandabstand 0,6 ... 1,0 eV
B. Silizium oder anderes Material mit Bandabstand 1,0 ... 1,3 eV
C. Gallium-Arsenid oder anderes Material mit Bandabstand 1,3 eV
R. Verbindungshalbleiter, z. B. Kadmium-Sulfid

Zweiter Buchstabe

Der zweite Buchstabe beschreibt die Hauptfunktion

A. Diode: Signal, kleine Leistungen
B. Diode: mit veränderlicher Kapazität
C. Transistor: kleine Leistungen, Tonfrequenzbereich
D. Transistor: Leistung, Tonfrequenzbereich
E. Diode: Tunneldiode
F. Transistor: kleine Leistungen, Hochfrequenzbereich
G. Vielfaches von nicht gleichen Typen – Diversen (z.B. Oszillator)
H. Diode: auf Magnetfelder ansprechend
L. Transistor: Leistung, Hochfrequenzbereich
N. Fotokopplungselement
P. Strahlungsempfindliches Element
Q. Strahlungserzeugendes Element
R. Kontrollelement, Schaltzwecke: (z. B. Thyristor), kleine Leistungen
S. Transistor: für kleine Leistungen, Schaltzwecke
T. Kontrollelement, Schaltzwecke: (z. B. Thyristor), Leistung
U. Transistor: Leistungsschalttransistor
X. Diode: Vervielfacher, z. B. Varaktor, step recovery
Y. Diode: Gleichrichter, Booster
Z. Diode: Referenzdiode, Spannungsreglerdiode, Spannungsbegrenzerdiode

Das laufende Kennzeichen der Bezeichnung besteht aus:
- einer 3stelligen Zahl (100 ... 999) für Bauelemente zur Verwendung in Rundfunk- und Fernsehempfängern usw.
- einem Buchstaben und einer 2stelligen Zahl für Bauelemente für professionelle Geräte und Anwendungen. Der Buchstabe hat keine fest zugeordnete Bedeutung.

2. Schreibweise der Symbole und Begriffe (DIN 41 785)

Die Kennzeichnung der Strom-, Spannungs-, Leistungs- (Wechselwerte, Gleich- bzw. Mittelwerte) und Widerstandsart (Wechsel- bzw. Gleichwerte) wird durch Groß- und Kleinschreibung der Symbole vorgenommen.

Kurzzeichen

Kurzzeichen für Größen

Für Augenblickswerte zeitlich veränderlicher Größen werden kleine Buchstaben verwendet.

Beispiele: i, v, p

Für Gleichwerte, Mittel- und Effektivwerte und für Scheitelwerte periodischer Funktionen des Stromes, der Spannung und der Leistung, d. h. für zeitlich konstante Größen, werden große Buchstaben verwendet.

Beispiele: I, V, P

Indizes für Kurzzeichen von Größen

Es werden folgende Indizes verwendet:

E, e	Emitter
B, b	Basis
C, c	Kollektor
F, f	Vorwärtsrichtung (Diode in Durchlaßrichtung)
R, r	Rückwärtsrichtung (Diode in Sperrichtung)
M, m	Scheitelwert
av	Mittelwert

Der Index für die Kennzeichnung von Scheitel- und Mittelwerten kann weggelassen werden, wenn eine Verwechslung nicht möglich ist.

Für Gesamtwerte vom Wert Null an gezählt werden Indizes mit großen Buchstaben verwendet, z. B. Augenblickswerte, Gleichwerte, Mittel-, Effektiv- und Scheitelwerte.

Beispiele: i_{C}, I_{C}, v_{BE}, V_{BE}, p_{C}, P_{C}

Für Werte der veränderlichen Komponenten werden Indizes mit kleinen Buchstaben verwendet, z. B. für Augenblickswerte, Scheitel- und Effektivwerte vom arithmetischen Mittelwert an gezählt.

Beispiele: i_{c}, I_{c}, v_{be}, V_{be}, p_{c}, P_{c}

Um Scheitel-, Mittel- und Effektivwerte voneinander zu unterscheiden, können weitere Indizes hinzugefügt werden. Als Abkürzungen werden empfohlen:

Scheitelwerte	M, m
Mittelwerte (arithmetische Mittelwerte)	Av, av

Beispiele: I_{CM}, I_{CAV}, I_{cm}, I_{cav}

Bei Scheitelwerten kann auch ein "∧" über dem Buchstaben verwendet werden.

Beispiele: $\hat{I}_{\mathrm{C}}$, $\hat{I}_{\mathrm{c}}$

3. Grenzwerte

Die angegebenen Grenzwerte sind eigenständige Absolutdaten der Belastbarkeit, bei deren Überschreiten eine Zerstörung des Bauelementes oder eine nachhaltige Beeinträchtigung seiner Daten bzw. Funktion zu erwarten ist. Bei Bauelementeprüfungen, etwa der Durchbruchsspannungen, wie auch in der Anwendung, muß deswegen mit entsprechenden Sicherungen das Überschreiten der Grenzwerte zuverlässig verhindert werden.

4. Kennwerte

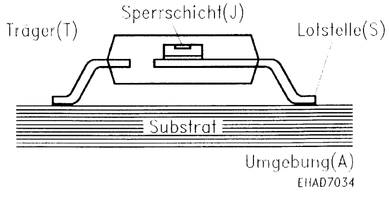
Typische Kennwerte charakterisieren den Bauelementetyp unter definierten Betriebsbedingungen in Zahlen und Diagrammen. Sie sind nicht als Daten jedes einzelnen Exemplars aufzufassen. Die aus wichtigen Qualitäts- oder Anwendungserfordernissen angegebenen Minimal- und Maximalwerte bezeichnen den tatsächlichen Streubereich der Kennwerte, in Diagrammen eingetragene Streukurven in der Regel den überwiegend zu erwartenden Streubereich. Die elektrischen Kennwerte sind fallweise nach Gleichstromwerte "statisch" und Wechselstromwerte "dynamisch" gruppiert. Als eng mit der Belastbarkeit gekoppelter Kennwert ist der Wärmewiderstand als oberer Streuwert unmittelbar nach den Grenzwerten angeordnet. Gehäusedaten sind durch Verweis auf Normenblätter oder bemaßte Zeichnung definiert.

5. Wärmewiderstände

Im Betrieb wird die am Bauteil abfallende Verlustleistung P_{tot} in Wärme umgesetzt, was eine Erhöhung der Bauteil-Temperatur zur Folge hat. Die entstehende Wärme wird von der Wärmequelle (Sperrschicht/Junction J bzw. Kanal/Channel Ch) über die Komponenten Chip, Gehäuse und Substrat (Leiterplatte) an die Wärmesenke (Umgebung/Ambient A) abgeführt. Die Sperrschichttemperatur T_J bei einer Umgebungstemperatur T_A ist bestimmt durch den Wärmewiderstand R_{thJA} und die abfallende Verlustleistung P_{tot} :

$$T_J = T_A + P_{tot} \times R_{thJA}$$

(R_{thJA} in K/W bzw. °C/W)



5.1 HF und NF-Transistoren und Dioden in SMD-Gehäusen

Bei SMD-Bauformen wird die Wärme im wesentlichen über die Anschlüsse abgeführt. Der Gesamtwärmewiderstand setzt sich hier aus folgenden Komponenten zusammen:

$$R_{thJA} = R_{thJT} + R_{thTS} + R_{thSA}$$
$$R_{thJS} = R_{thJT} + R_{thTS}$$

R_{thJA} = Wärmewiderst. zw. Sperrschicht und Umgebung (Gesamtwärmewiderstand)
R_{thJS} = Wärmewiderst. zw. Sperrschicht und Lötpunkt
R_{thJT} = Wärmewiderst. zw. Sperrschicht und Chipunters. (Chip-Gesamtwärmewiderstand)
R_{thTS} = Wärmewiderst. zw. Chipunterseite und Lötstelle (Gehäuse/Legierschicht)
R_{thSA} = Wärmewiderst. zw. Lötstelle und Umgebung (Substrat-Legierschicht)

Der R_{thJS} enthält alle typabhängigen Größen. Mit ihm kann bei vorgegebener Verlustleistung P_{tot} eine exakte Bestimmung der Bauteil-Temperatur vorgenommen werden, wenn die Temperatur T_S der wärmsten Lötstelle gemessen wird (bei bipolaren Transistoren: typisch Kollektoranschluß, bei FETs: Source-Anschluß).

$$T_J = T_S + P_{tot} \times R_{thJS}$$

Die Lötstellentemperatur T_S ist anwendungspezifisch von Substrat, Fremderwärmung durch benachbarte Bauteile und die Umgebungstemperatur T_A vorgegeben. Diese Komponenten zusammen bilden den schaltungsabhängigen, durch Wärmeabfuhrmaßnahmen beeinflußbaren Substrat-Wärmewiderstand R_{thSA}.

$$T_S = T_A + P_{tot} \times R_{thSA}$$

Ist die Messung der Lötstellentemperatur T_S nicht möglich oder genügt eine Abschätzung der Sperrschicht-Temperatur, kann der R_{thSA} aus den folgenden Diagrammen abgelesen werden. Damit geben wir einen Anhaltswert des Wärmewiderstandes R_{thSA} zwischen der Lötstelle auf Epoxy- bzw. Keramiksubstrat und ruhender Luft als Funktion der Kollektoranschluß- bzw. Keramik-Fläche. Als Parameter wird die abgeführte Verlustleistung, d. h. die Erwärmung $T_S - T_A$ der Platine angegeben. In diesem Fall gilt für die Betriebstemperatur:

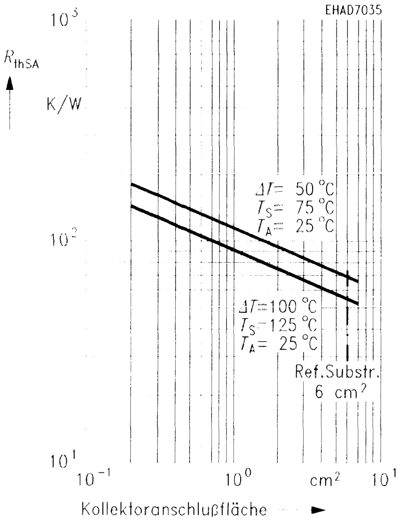
$$T_J = T_A + P_{tot} \times (R_{thJS} + R_{thSA})$$

In den Datenblättern ist R_{thJS} als thermische Bezugsgröße der Wärmeableitung angegeben. Zu Vergleichszwecken dient die Angabe des Gesamtwärmewiderstandes R_{thJA}. Dazu werden je nach typischer Bauteile-Anwendung Referenzsubstrate folgender Ausführungen zugrundegelegt:

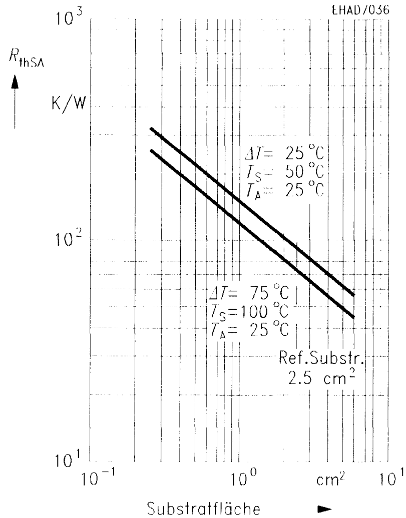
- NF-Anwendungen
  Epoxid-Leiterplatte: Kollektor-Anschlußfläche 6 cm^2 Cu, 35 µm Cu-Dicke
- HF-Anwendungen
  Keramik-Substrat: 15 mm × 16.7 mm × 0.7 mm

Die beiden folgenden Diagramme zeigen näherungsweise den Wärmewiderstand als Funktion der Substratfläche, wobei angenommen wird, daß sich der Prüfling in der Mitte des etwa quadratischen Substrates befindet.

Wärmeableitung von Platine an Umgebung
(Montagefläche: Cu 35 µm, Substrat: Epoxy 1,5 mm)



Wärmeableitung vom Al_2O_3-Substrat an Umgebung
(Substrat in ruhender Luft, vertikal 0,6 mm Dicke)



5.2 HF und NF-Transistoren in konventionellen Gehäusen

Anstelle der Anschlußbänder übernimmt hier überwiegend das Gehäuse den Wärmetransport vom Bauteil an die Umgebung. In den vorherigen Formeln ist daher der Punkt "Lötstelle (Soldering point)" durch den Term "Gehäuse (Case)" zu ersetzen. Durch Anbringen von Kühlkörpern an der Gehäuseoberfläche kann der Wärmewiderstand zwischen Gehäuse und Luft erheblich verringert werden. Im Datenblatt sind daher die R_{th} Werte für den Einsatz mit und ohne Kühlkörper angegeben:

$$R_{thJA} = R_{thJT} + R_{thTC} + R_{thCA}$$
$$R_{thJC} = R_{thJT} + R_{thTC} + R_{thCA} \text{ (mit Kühlkörper)}$$

R_{thJA} = Wärmewiderstand zwischen Sperrschicht und Umgebung (ohne zusätzliche Kühlfläche). Die Sperrschicht-Temperatur ergibt sich aus der Verlustleistung P_{tot} und der Umgebungstemperatur) T_A (Luft):

$$T_J = T_A + P_{tot} \times R_{thJA}$$

R_{thJC} = Wärmewiderstand zwischen Sperrschicht und Umgebung bei Verwendung des Referenz-Kühlkörpers. Die Sperrschicht-Temperatur berechnet sich aus T_A (= Umgebungstemperatur) und P_{tot}:

$$T_J = T_A + P_{tot} \times R_{thJC}$$

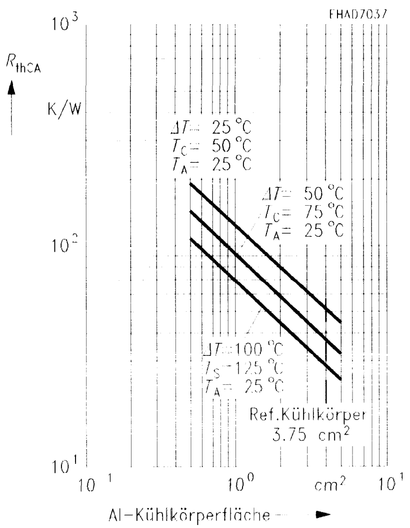
Die Datenblattangaben R_{thJC} gelten für einen Referenz-Kühlkörper: Al-Platte 15 mm × 25 mm × 0,5 mm, mit Epoxidharz-Kleber befestigt, R_{thCA} = 40 K/W

Für die Verwendung anders dimensionierter Kühlkörper dient die folgende Graphik, in der näherungsweise der R_{thCA} einer 0,5 mm dicken Al-Platte als Funktion der Plattenfläche abzulesen ist. Parameter ist die Temperaturdifferenz zwischen Kühlkörper und Umgebungsluft, die von der abgeführten Leistung abhängt. Der Referenz-Kühlkörper ist dort markiert.

Bei Verwendung eines anderen Kühlkörpers ist vom R_{thJC} der Wärmewiderstand des Referenz-Kühlkörpers R_{thCA} abzuziehen und durch den aus der Graphik ermittelten R_{thCA} des neuen Kühlkörpers zu ersetzen.

$$R_{thJC} = R_{thJC\,ref} - R_{thCA\,ref} + R_{thCA}$$

Abschätzung des Wärmewiderstands R_{thCA} einer 0,5 mm dicken Al-Platte. Positionierung des Transistors in Mitte der Platte.



5.3 Temperaturmeßmethoden der Bauelementeanschlüsse

Messen mit Temperaturindikatoren (z. B. Thermopapier)

Beim Messen mit Temperaturindikatoren kann die Temperatur ohne zusätzliche Wärmeableitung und somit fast fehlerfrei bestimmt werden. Der entsprechende Fehler ist praktisch nur durch die Abstufung der Temperaturindikatoren gegeben. Die Methode ist einfach durchzuführen, ausreichend genau und eignet sich besonders für Messungen auf Platinen.

Messen mit Thermoelementen

Dies wird nicht empfohlen, weil durch die elektrische Leitung die Funktion der Schaltung beeinflußt werden kann und Wärme von der Lötstelle abgeführt wird, was zu Falschmessungen führt, wenn nicht ein erheblicher Meßaufwand betrieben wird.

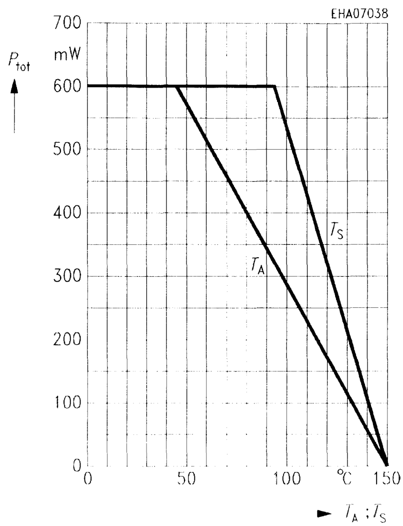
5.4 Zulässige Gesamtverlustleistung bei statischem Betrieb

Mit der Gesamtverlustleistung P_{tot} ist das max. Wärmegefälle im Bauteil festgelegt. Infolge der Erwärmung der Bauelemente ist die im Datenblatt angegebene max. Gesamtverlustleistung $P_{tot\ max}$ nur bis zu Grenzwerten $T_{S\ max}$ oder $T_{A\ max}$ erlaubt. Diese Grenztemperaturen beschreiben den Punkt, an dem die max. zulässige Sperrschichttemperatur $T_{J\ max}$ erreicht wird. Die max. zulässige Umgebungs- bzw. Lötstellen-Temperatur wird nach folgender Formel berechnet:

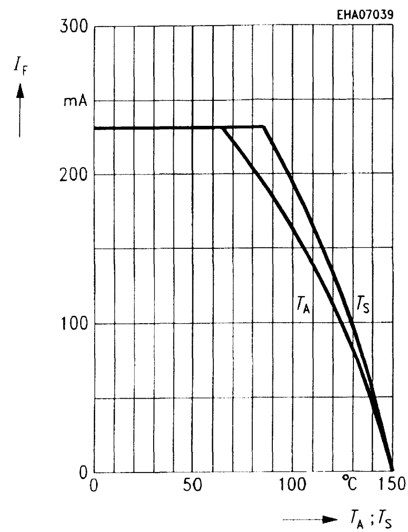
$$T_{S\ max} = T_{J\ max} - P_{tot\ max} \times R_{thJS}$$
$$T_{A\ max} = T_{J\ max} - P_{tot\ max} \times R_{thJA}$$

Bei Dioden wird die Verlustleistung weitgehend durch den Dioden-Bahnwiderstand verursacht. Daher ist das Diagramm praxisnah in die Form $I_F = f\ (T_S;\ T_A)$ übertragen, woraus sich die gekrümmte Form des Kurvenverlaufes ergibt. Für R_{thJA} wurde jeweils das entsprechende Normsubstrat zugrunde gelegt. Die hier gezeigten Diagramme sind als Beispiele anzusehen. Im Anwendungsfall ist die im Datenblatt angegebene Kurve heranzuziehen. Eine Überschreitung der thermischen Grenzdaten ist nicht zulässig, weil dadurch eine nachhaltige Beeinträchtigung der Bauelemente-Kenndaten oder sogar eine Zerstörung des Bauelementes eintreten kann.

Max. Verlustleistung $P_{tot} = f\ (T_S;\ T_A^*)$
$^*Al_2O_3$-Substrat 15 mm × 16,7 mm × 0,7 mm



Durchlaßstrom $I_F = f\ (T_S;\ T_A^*)$
$^*Al_2O_3$-Substrat 15 mm × 16,7 mm × 0,7 mm



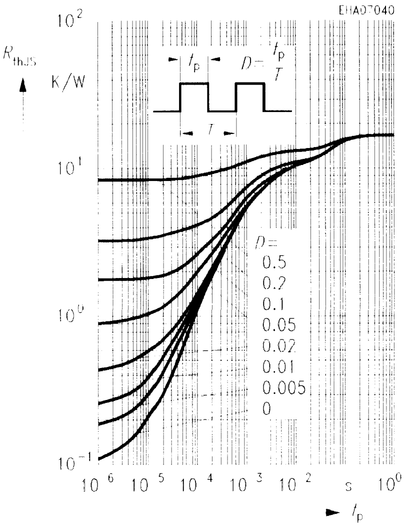
5.5 Zulässige Gesamtverlustleistung bei Pulsbetrieb

Im Pulsbetrieb können unter bestimmten Voraussetzungen höhere Gesamtverlustleistungen als im statischen Betrieb zugelassen werden. Dies ist der Fall, wenn die Impulsdauer t_p, d. h. die Dauer der Leistungszufuhr, klein gegenüber der thermischen Zeitkonstanten des Systems ist. Diese Zeitkonstante, d. h. die Dauer bis zum Erreichen der statischen Endtemperatur, ist abhängig von den Wärmekapazitäten und -widerständen der Komponenten Chip, Gehäuse und Substrat. Die im Bauteil ausgenutzte Wärmekapazität ist eine Funktion der Pulsdauer. Im vorliegenden Fall beschreiben wir dieses durch den transienten Wärmewiderstand. Der Pulsbetriebs-Wärmewiderstand bzw. die daraus ableitbare zulässige P_{tot}-Anhebung ist in den folgenden Kurven exemplarisch dargestellt. Für den Anwendungsfall ist das jeweilige Datenblatt heranzuziehen.

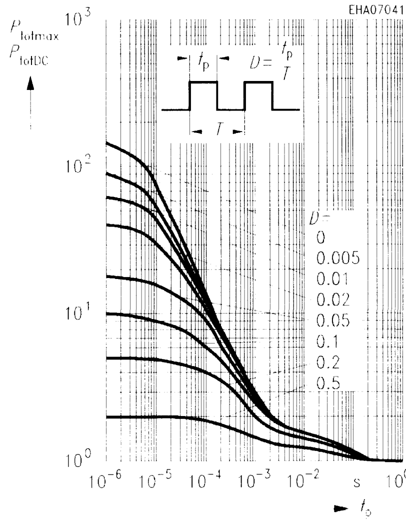
$$P_{tot\ max}/P_{tot\ DC} = f\ (t_p)$$

Für periodische Pulsbelastung der Periode T ist als Parameter das Tastverhältnis t_p/T angegeben. Für lange Impulsdauer nähert sich der Faktor $P_{tot\ max}/P_{tot\ DC}$ dem Wert 1, d. h. P_{tot} im Pulsbetrieb ist dem statischen Wert gleichzusetzen. Bei extrem geringen Pulsbreiten hingegen wird der pulsbedingte Temperaturanstieg (Restwelligkeit) vernachlässigbar und es stellt sich eine mittlere Temperatur des Systems ein, die einem statischen Betrieb bei mittlerer Pulsleistung entspricht.

Zulässige Pulsbelastbarkeit
$R_{thJS} = f\ (t_p)$



Zulässige Pulsbelastbarkeit
$P_{tot\ max}/P_{tot\ DC} = f\ (t_p)$



6. EGB (Elektrostatisch Gefährdete Bauelemente)

ESD (**E**lectro**s**tatic **D**ischarge)-empfindliche Bauelemente werden in "antistatischer" Verpackung geliefert. Das aufgedruckte Warnschild verweist auf die Notwendigkeit von Schutzmaßnahmen gegen unkontrollierte Überlastung der Bauelemente durch elektrische Entladungen, beginnend beim Öffnen der Packung.

7. Normen

Spezielle Einzelheiten entnehmen Sie bitte folgenden Unterlagen:
DIN 41 782: Dioden
DIN 41 785: Grenzwerte
DIN 41 791: Allgemeine Vorschriften
DIN 41 852: Halbleiter-Technologie
DIN 41 853: Begriffe für Dioden
DIN 41 854: Begriffe für Bipolartransistoren

1. Type Designation in Accordance with Pro Electron

This type designation applies to small-signal semiconductor components – in contrast to integrated circuits, multiples of these components and semiconductor chips.

The number of the basic type consists of:
two letters and a three-digit code.

First letter

gives information about the material.

A. Germanium or other material with a band gap of 0.6 ... 1.0 eV
B. Silicon or other material with a band gap of 1.0 ... 1.3 eV
C. Gallium-arsenide or other material with a band gap of 1.3 eV
R. Compound material, e.g. cadmium-sulfide

Second letter

indicates the function for which the device is primarily designed.

A. Diode: signal, low power
B. Diode: variable capacitance
C. Transistor: low power, audio frequency
D. Transistor: power, audio frequency
E. Diode: tunnel diode
F. Transistor: low power, high frequency
G. Multiple of dissimilar devices; miscellaneous devices (e. g. oscillator)
H. Diode: magnetic sensitive
L. Transistor: power, high frequency
N. Optocoupler
P. Radiation-sensitive semiconductor component
Q. Radiation-emitting semiconductor component
R. Control or switching device: low power (e. g. thyristor)
S. Transistor: low power, switching
T. Control or switching device: power (e. g. thyristor)
U. Transistor: power switching
X. Diode: multiplier, e.g. varactor, step recovery
Y. Diode: rectifier, booster
Z. Diode: voltage reference or regulator; transient voltage suppressor diode

The three-digit code of the type designation consists of:
- a three-digit number, running from 100 to 999, for devices primarily intended for consumer equipment etc.
- one letter and a two-digit number for devices primarily intended for industrial/professional equipment. This letter has no fixed meaning.

2. Notation of the Symbols and Terms Used (DIN 41 785)

The current, voltage, power (AC, DC, or average values) and resistance types (AC or DC values) are indicated by using capital and small letters for the symbols.

Symbols

The instantaneous data of values varying with time are indicated by small letters.

Examples: i, v, p

Capital letters are used for DC, average, rms, and peak values of periodical functions of the current, the voltage, and the power – i. e. for constant quantities.

Examples: I, V, P

Subscripts for the symbols

The following subscripts are used:

E, e	Emitter
B, b	Base
C, c	Collector
F, f	Forward direction (diode operated in forward direction)
R, r	Reverse direction (diode operated in reverse direction)
M, m	Peak value
av	Average value

The subscripts for peak and average values may be omitted provided that a confusion with other values is impossible.

Total values (instantaneous values, DC values, average, rms, and peak values) referred to a zero point are indicated by subscripts with capital letters.

Examples: i_{C}, I_{C}, v_{BE}, V_{BE}, p_{C}, P_{C}

Subscripts with small letters are used for the values of variable components (e. g. for instantaneous values, peak, and rms values referred to an average value).

Examples: i_{c}, I_{c}, v_{be}, V_{be}, p_{c}, P_{c}

To distinguish between peak, average, and rms values, further subscripts may be added. The following abbreviations are recommended:

Peak values	M, m
Average values	Av, av

Examples: I_{CM}, I_{CAV}, I_{cm}, I_{cav}

Peak values may also be indicated by placing the symbol "∧" over the letter.

Examples: $\hat{I}_{C}$, $\hat{I}_{c}$

3. Maximum Ratings

The maximum ratings specified are absolute ratings which, if exceeded, may result in the destruction or permanent functional impairment of the component. When testing the component, as for example in respect to breakdown voltages, or during application, protection is to be provided in order to reliably ensure that maximum ratings are not exceeded.

4. Characteristics

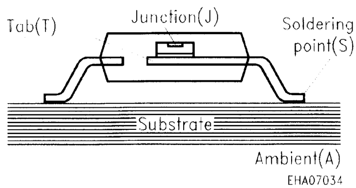
Typical characteristics describe the component behavior at defined operating conditions. The numerical values and diagrams pertain to the component type and shall not be considered as characteristics of an individual component. The minimum and maximum ratings stated for reasons of essential quality and application requirements describe the actual spread of the characteristics, whereas spread curves in diagrams usually specify the spread range which is to be expected. Electrical values are grouped into "static" DC values and "dynamic" AC values. The thermal resistance is closely related to the maximum ratings and, constituting the upper spread value, comes immediately after the maximum ratings. The component's case data is defined by reference to standard sheets and dimensional drawings.

5. Thermal Resistance

The heat caused by the power loss P_{tot} in the active semiconductor region during operation results in an increased temperature of the component. The heat is dissipated from its source (junction J or channel Ch) via the chip, the case and the substrate (pc board) to the heat sink (ambient A). The junction temperature T_J at an ambient temperature T_A is determined by the thermal resistance R_{thJA} and the power dissipation P_{tot} :

$$T_J = T_A + P_{tot} \times R_{thJA}$$

(with R_{thJA} in K/W or °C/W)



5.1 RF and AF Transistors and Diodes of SMD Packages

In SMD packages the heat is primarily dissipated via the pins. The total thermal resistance in this case is made up of the following components:

$$R_{thJA} = R_{thJT} + R_{thTS} + R_{thSA}$$
$$R_{thJS} = R_{thJT} + R_{thTS}$$

R_{thJA} = thermal resistance between junction and ambient (total thermal resistance)
R_{thJS} = thermal resistance between junction and soldering point
R_{thJT} = thermal resistance between junction and chip base (chip thermal resistance)
R_{thTS} = thermal resistance between chip base and soldering point (package/alloy layer)
R_{thSA} = thermal resistance between soldering point and ambient (substrate thermal resistance)

R_{thJS} contains all type-dependent quantities. For a given power dissipation P_{tot} it is possible to use it to precisely determine the component temperature if the temperature T_S of the warmest soldering point is measured (for bipolar transistors typically the collector, for FETs the source lead).

$$T_J = T_S + P_{tot} \times R_{thJS}$$

The temperature of the soldering point T_S is determined by the application, i.e. by the substrate, heat produced by external components and the ambient temperature T_A. These components combine to form the substrate thermal resistance R_{thSA} that is circuit-dependent and can be influenced by heat dissipation measures.

$$T_S = T_A + P_{tot} \times R_{thSA}$$

If measurement of the temperature of the soldering point T_S is not possible, or if estimation of the junction temperature is sufficient, R_{thSA} can be read from diagrams below. Here we give an approximate value of the thermal resistance R_{thSA} between the soldering point on an epoxy or ceramic substrate and still air as a function of the area of the collector mounting or ceramic. The parameter is the dissipated power, i. e. the heat $T_S - T_A$ of the pc board. So in this case for the operating temperature:

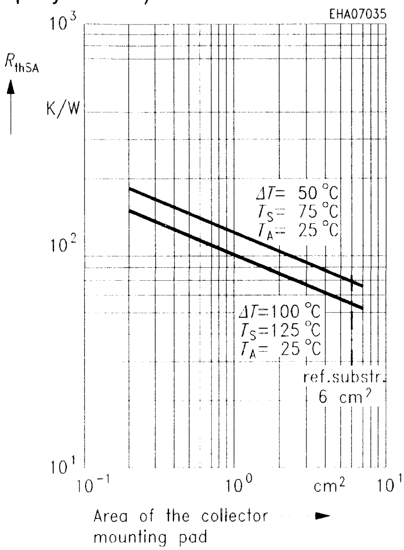
$$T_J = T_A + P_{tot} \times (R_{thJS} + R_{thSA})$$

In the data sheets R_{thJS} is stated as a thermal reference quantity of the heat dissipation. The total thermal resistance R_{thJA} is stated for comparison purposes. Depending on the typical component application, substrates of the following kinds are used for reference:

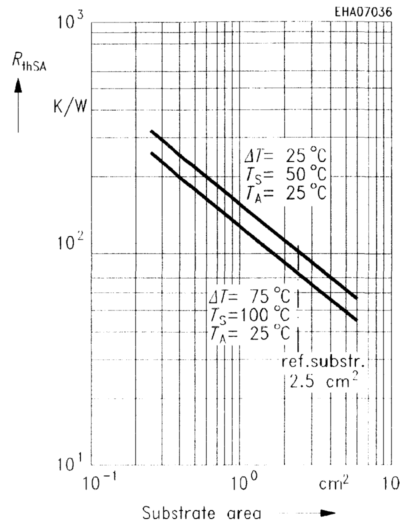
- AF applications
  epoxy circuit board: collector mounting area 6 cm^2 Cu, 35 µm Cu thickness
- RF applications
  ceramic substrate: 15 mm × 16.7 mm × 0.7 mm (alumina)

The two diagrams below show, to an approximation, the thermal resistance as a function of the substrate area, assuming that the test device is located in the center of a virtually square substrate.

Heat dissipation from pc board to ambient air
(mounting pad Cu 35 µm/substrate: epoxy 1.5 mm)



Heat dissipation from Al_2O_3 – substrate to ambient air
(substrate in still air, vertical 0.6 mm thick)



5.2 RF and AF Transistors and Diodes of Conventional Packages

Here, instead of the pins, it is primarily the case that is responsible for heat transfer from the component to its environment. So, in the previous formulas, "S" for soldering point is replaced by "C" for case. The thermal resistance between the case and its ambient can be reduced substantially by attaching heat sinks to the case surface. In the data sheets the R_{th} values are consequently stated for use with and without heat sinks:

$$R_{thJA} = R_{thJT} + R_{thTC} + R_{thCA}$$
$$R_{thJC} = R_{thJT} + R_{thTC} \text{ (with heat sink)}$$

R_{thJA} = thermal resistance between junction and ambient (without extra cooling). The junction temperature is the result of the power dissipation P_{tot} and the ambient temperature (air) T_A:

$$T_J = T_A + P_{tot} \times R_{thJA}$$

R_{thJC} = thermal resistance between junction and ambient using the reference heat sink. The junction temperature is calculated from T_A (ambient temperature) and P_{tot}:

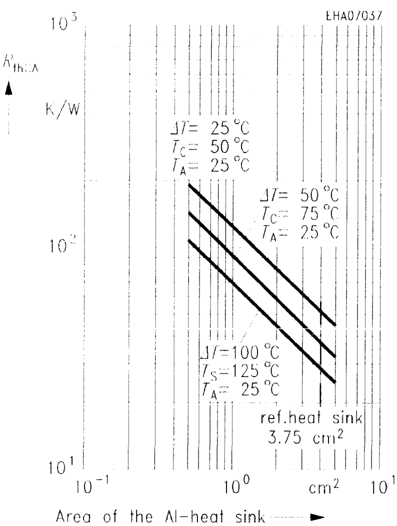
$$T_J = T_A + P_{tot} \times R_{thJC}$$

The data-sheet figures for R_{thJC} apply to a reference heat sink: Al plate 15 mm × 25 mm × 0.5 mm, attached with epoxy-resin adhesive, R_{thCA} = 40 K/W.

For the use of heat sinks of different dimensions refer to the following diagram, from which the approximate R_{thCA} of a 0.5-mm-thick Al plate can be read as a function of the plate area. The parameter is the difference in temperature between the heat sink and ambient air which depends on the dissipated power. The reference heat sink is marked.

When a different heat sink is used, the thermal resistance of the reference heat sink R_{thCA} is to be subtracted from R_{thJC} and replaced by the R_{thCA} figure for the new heat sink that is deduced from the diagram.

$$R_{thJC} = R_{thJC\,ref} - R_{thCA\,ref} + R_{thCA}$$



Estimation of thermal resistance R_{thCA} of 0.5-mm-thick Al plate; position of transistor in center of plate.

5.3 Temperature Measuring of Components Leads

Measuring with temperature indicators (e. g. thermopaper)

Temperature indicators do not cause heat dissipation and thus allow an almost exact determination of temperature. A certain degree of deviations can only result from rough-grade indication of the temperature indicators. This method is quite easy and provides sufficient accuracy. It is particularly suitable for measurement on pc boards.

Measuring with thermocouple elements

Measurement with thermocouple elements is not advisable because the functioning of the circuit can be influenced by the electrical conduction and the heat dissipation by the soldering point. This corrupts the results of the measurement, unless measurement is carried out with appropriate effort.

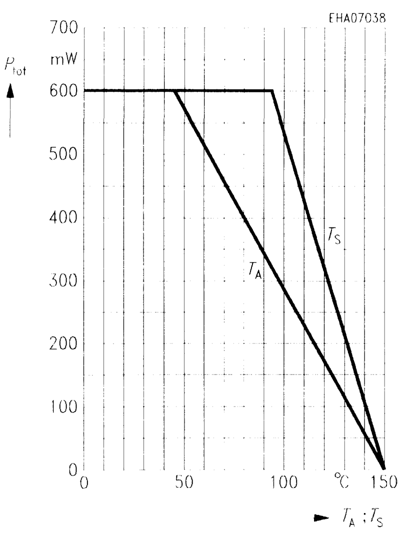
5.4 Permissible Total Power Dissipation in DC Operation

The total power dissipation P_{tot} defines the maximum thermal gradient in the component. As a result of the heating of components, the maximum total power dissipation $P_{tot\,max}$ stated in the data sheets is only permissible up to limits of $T_{S\,max}$ or $T_{A\,max}$. These critical temperatures describe the point at which the maximum permissible junction temperature $T_{J\,max}$ is reached. The maximum permissible ambient or soldering-point temperature is calculated as follows:

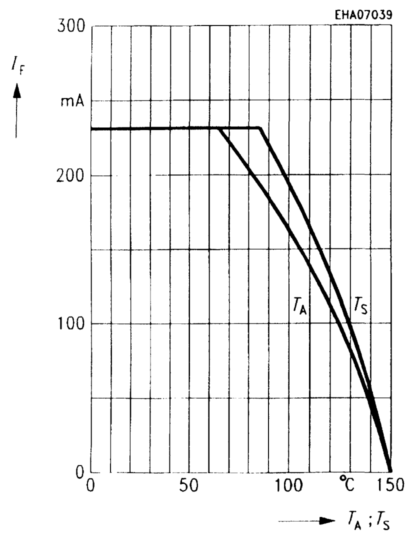
$$T_{S\,max} = T_{J\,max} - P_{tot\,max} \times R_{thJS}$$
$$T_{A\,max} = T_{J\,max} - P_{tot\,max} \times R_{thJA}$$

In diodes the power dissipation is for the most part caused by internal resistance. So the diagram has to be translated into the form $I_F = f\ (T_S;\ T_A)$, resulting in the bent shape of the curve. For R_{thJA} the appropriate standard substrate was taken in each case. The diagrams shown here are intended as examples. For the application the curve given in the data sheet is to be taken. Exceeding the thermal max. ratings is not permissible because this could mean lasting degradation of the component's characteristics or even its destruction.

Total power dissipation
$P_{tot} = f\ (T_S;\ T_A{*})$
*Package mounted on alumina
15 mm × 16.7 mm × 0.7 mm



Forward current
$I_F = f\ (T_S;\ T_A{*})$
*Package mounted on alumina
15 mm × 16.7 mm × 0.7 mm



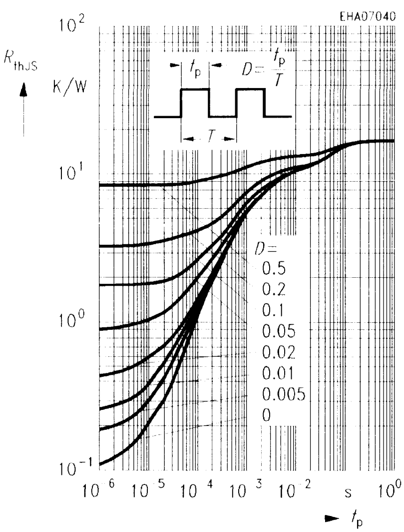
5.5 Permissible Total Power Dissipation in Pulse Operation

In pulse operation, under certain circumstances, higher total power dissipation than in DC operation can be permitted. This will be the case when the pulse duration t_p, i. e. the length of time that power is applied, is small compared to the thermal time constant of the system. This time constant, i. e. the time until the final temperature is reached, depends on the thermal capacitances and resistances of the components chip, case and substrate. The thermal capacitance utilized in the component is a function of the pulse duration. Here we describe this through the transient thermal resistance. The pulse-load thermal resistance, or the permissible increase in P_{tot} that can be derived from it, is shown by way of examples in the following curves. For the application the particular data sheet should be taken.

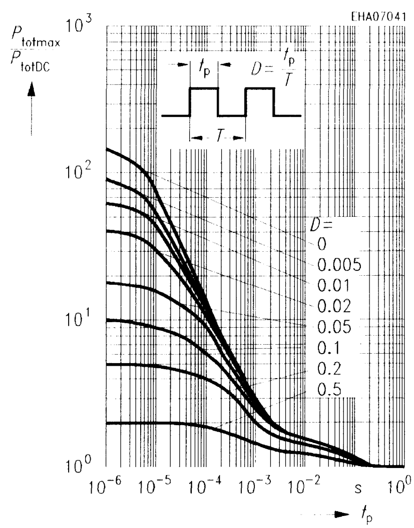
$$P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$$

The duty factor t_p/T is given as a parameter for periodic pulse load with a period of T. For long pulse durations the factor $P_{tot\,max}/P_{tot\,DC}$ approaches a value of 1, i. e. P_{tot} in pulsed operation can be equated with the DC value. At extremely short pulse widths, on the other hand, the increase in temperature as a result of the pulse (residual ripple) becomes negligible and a mean temperature is created in the system that corresponds to DC operation with average pulse power.

Permissible pulse load
$R_{thJS} = f\,(t_p)$



Permissible pulse load
$P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



6. ESD (**E**lectro**s**tatic **D**ischarge Sensitive Device)

ESD-sensitive components are supplied in anti-static packaging. The attached warning label calls your attention to the necessity of protecting the components against electrostatic discharge, beginning with the opening of the package.

7. Standards

For detailed information please refer to the following DIN literature:
DIN 41 782: Diodes
DIN 41 785: Maximum Ratings
DIN 41 791: General Instructions
DIN 41 852: Semiconductor Technology
DIN 41 853: Terms Relating to Diodes
DIN 41 854: Terms Relating to Bipolar Transistors

Qualitätsangaben

Quality Specifications

1. Qualitätssicherung

Qualität liefern heißt für den Bereich Einzelhalbleiter:
die derzeitigen und künftigen Erwartungen unserer Kunden erfüllen.

Dazu haben wir folgende Strategie:
Durch eine stetige Verbesserung der Anlieferqualität, haben wir das Null-Fehler Ziel weitgehend erreicht. Dafür haben wir außerordentlich hohe Investitionen zur Automatisierung der Fertigung, für eine computergestützte statistische Prozeßkontrolle (SPC) und eine doppelte 100% Prüfung aufgewendet.

Notwendige Voraussetzung dieser Strategie ist ein hohes Fertigungsvolumen technologisch ähnlicher Bauelemente. Von SMD-Bauelementen fertigen wir mehrere Milliarden Stück pro Jahr.

Durch ein aufwendiges Konzept der Vorserien- und Serienfreigabe werden nur ausgereifte Produkte in den Fertigungsprozeß eingeschleust (**Bild 1**). Durch diese Maßnahme sowie durch eine aufwendige Prozeßüberwachung wurde ein Niveau der Auslieferungsqualität von:

10 ppm für elektrische Fehler und 20 ppm für mechanische Fehler erreicht.

Unseren Kunden bietet das niedrige ppm Niveau folgende Vorteile:

- Reduzierung oder Verzicht auf die Eingangsprüfung.
- Kostensenkung durch geringere Nacharbeit bei der Geräteherstellung.
- Kostenreduzierung durch geringere Reparaturkosten während der Gerätegarantiezeit.
- Unsere durchgängige statistische Prozeßkontrolle (SPC, **Bild 2**) verhindert Qualitätseinbrüche und sichert eine termingerechte Kundenbelieferung (Just-in-Time).

Bild 1
Qualitätssicherung in der Fertigung
Produkt-Ablaufdiagramm

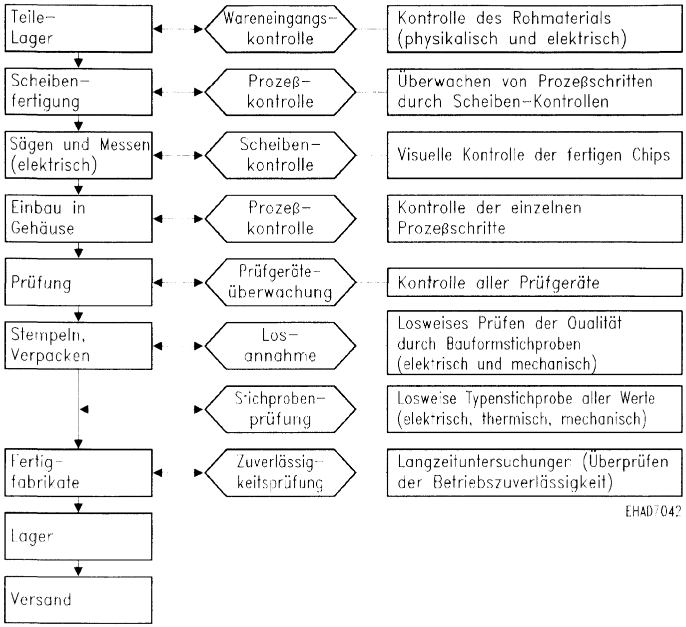
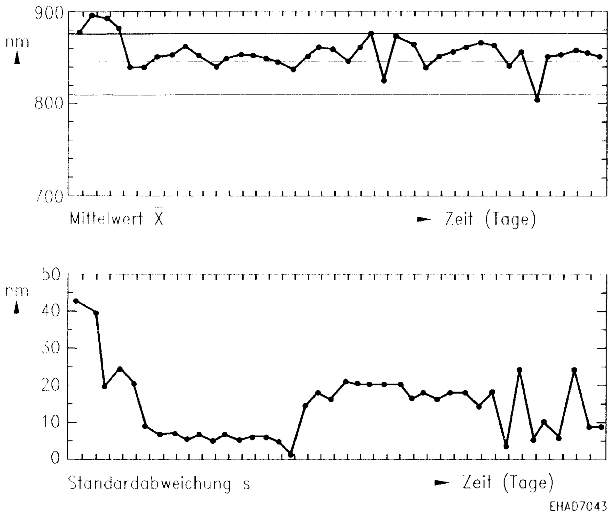


Bild 2
Statistische Prozeßkontrolle in der Montage.
Parameter: Nitriddicke



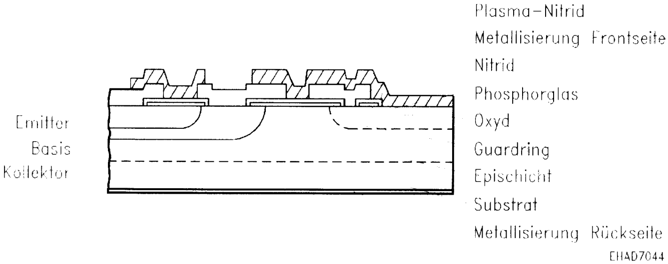
2. Zuverlässigkeit

Eine hohe Bauteilezuverlässigkeit wird erreicht durch:

- Konstruktive und technologische Maßnahmen, wobei erprobte Designregeln zur Entwicklung robuster Chips bei praktikablen Prozeßtoleranzen genutzt werden. (**Bild 3**)
- Verbesserungen werden vor Einführung durch sorgfältig abgestimmte Erprobungsversuche abgesichert. (**Bild 4**)
- Ableitung von Verbesserungsmaßnahmen an Hand von Fehleranalysen, welche aus gezielt durchgeführten Overstressversuchen stammen.

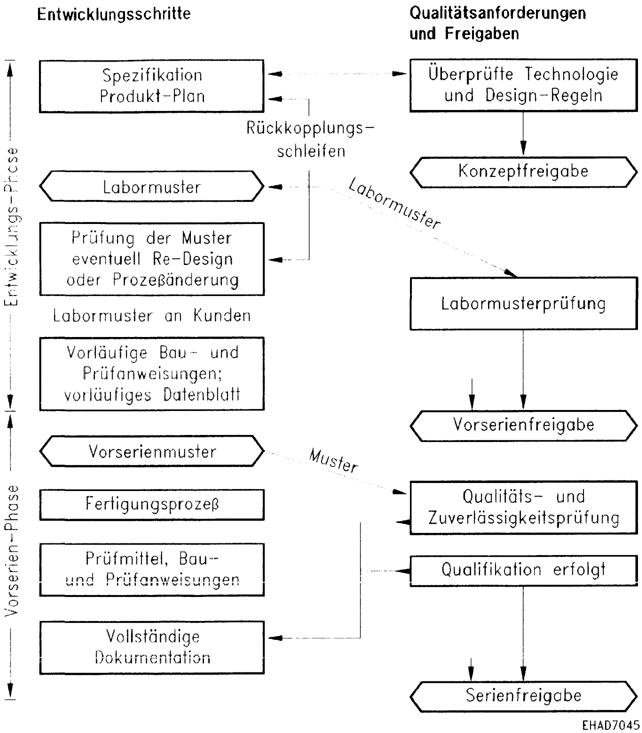
Bei geeigneter Schaltungsdimensionierung kann mit Siemens SMD-Bauelementen und einer Sperrschichttemperatur von kleiner 60 °C eine Ausfallrate λ von ca. 10 Fit erwartet werden.

Bild 3
Chipstruktur
Querschnitt durch einen NF-Transistortyp



Schicht	Wesentliche Schutzfunktionen
Plasma-Nitrid und Vorderseiten-Metallisierung	Kratz- und Korrosionsschutz sowie Schutz gegen unkontrollierten Ladungsaufbau
Hochtemperatur-Nitride	Sperre gegen Ionen-Diffusion
Phosphorglas	Getterung beweglicher Ionen im Oxyd
Oxyd	Schutzisolation der PN-Übergänge
Schutz(Guard)-Ring	verhindert Channelströme

Bild 4
Freigabeverfahren (Konzept-, Vorserien- und Serienfreigabe)
Entwicklungsschritte und Qualitätsfreigabe



2.1 Qualifizierungen

Die hohe Zuverlässigkeit kann nur durch aufwendige gestaffelte Erprobungsversuche ermittelt werden. Der Zuverlässigkeitsnachweis erfolgt an Leittypen nach internen Richtlinien. Ein Teil dieser Prüfungen erfolgt auch nach CECC Vorschriften. Unsere beiden Fertigungsstandorte Regensburg und Malacca (Malaysia) haben die CECC Anerkennung (Cenelec Electronic Components Committee) als Bauelementhersteller. Die Einbeziehung unseres gesamten SMD-Typenspektrums ist vorgesehen. Die Qualifikationen nach CECC umfassen neben den periodischen Qualifikationen der Bauelemente auch die Qualifikation der Scheibenfertigung, der Montagelinien und des für die Durchführung der Tests verantwortlichen Prüflabors.

3. Ship-to-Stock Vereinbarungen

Derartige Vereinbarungen werden von unseren Kunden in zunehmendem Maße gewünscht. Wesentlicher Bestandteil ist dabei die Qualitäts-Sicherungs-Vereinbarung (QSV), in welcher AQL-Werte, Ausfallkriterien, Ablauf bei Beanstandungen und gegenseitige Informationspflicht festgelegt werden können.

Weitere Angaben zur Qualität können der Themenschrift

Einzelhalbleiter
Qualitätssicherung, Qualität und Zuverlässigkeit

entnommen werden. (siehe Literaturverzeichnis)

1. Quality Assurance

For our small-signal semiconductor division supplying quality means satisfying our customers' present and future expectations.

Our strategic goal is the zero-defect principle, which we have largely achieved by a continuous improvement of the delivered quantity. Extremely high investments in the automation of manufacturing processes, computer-aided statistical process control (SPC) and a double 100% inspection helped up to ensure and significantly improve the quality.

A basic requirement for our strategy is a high output of components based on a similar technology. We manufacture e.g. several billion components in SMD technology per year. A large-scale concept of preproduction and production release allows only fully developed products to enter the manufacturing process (**Figure 1**).

This procedure as well as extensive process monitoring caused the level of delivery quality to increase to only:

10 ppm for electrical defects and
20 ppm for mechanical defects.

This low ppm level offers the following advantages to our customers:

- scaling down or doing without incoming inspections.
- reduced costs by minor refinishing of units in production.
- reduced cost of repairs for units under guarantee.
- Our universal statistical process control (SPC, **Figure 2**) prevents a decrease in quality and ensures the timely delivery to customers. (Just-in-Time).

Figure 1
Quality Assurance in Production
Product Flowchart

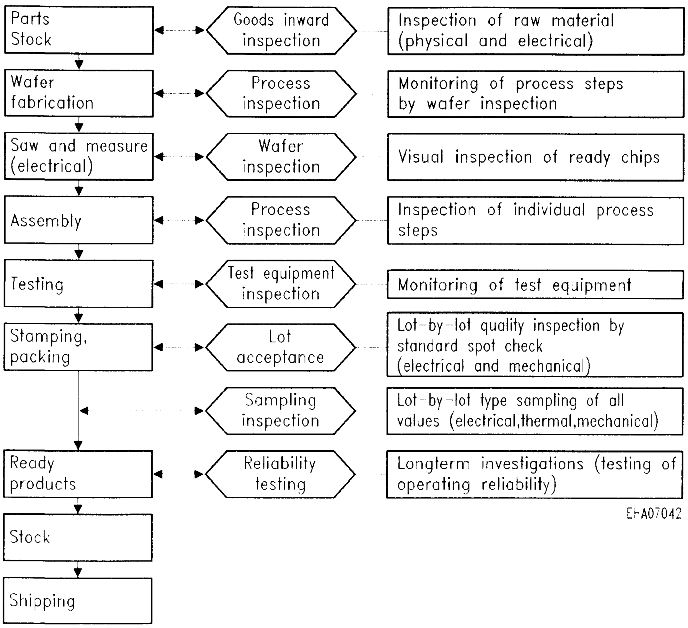
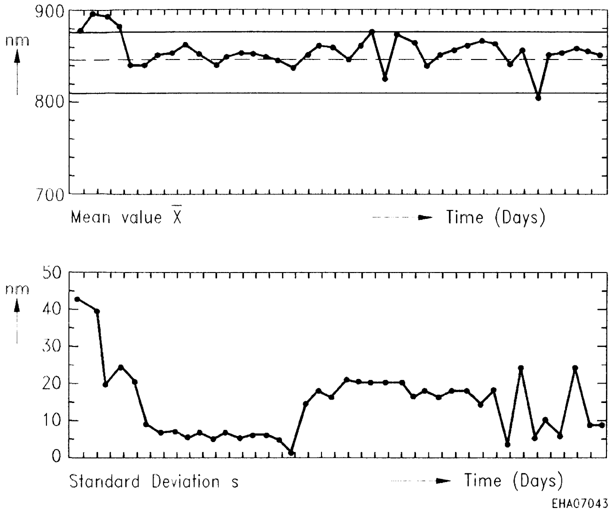


Figure 2
Statistical process control in wafer fabrication, parameter: nitride layer thickness



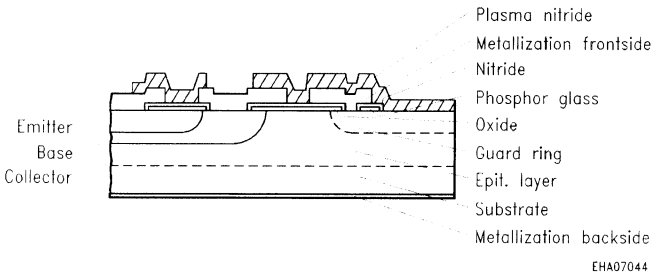
2. Reliability

High component reliability is attained by:

- constructive and technological procedures with the use of approved measures of design for the development of robust chips at practicable process tolerances (**Figure 3**).
- Careful inspection of improvements for conformity with requirements before their introduction (**Figure 4**).
- taking over improving procedures from fault analyses made in specific overstress tests.

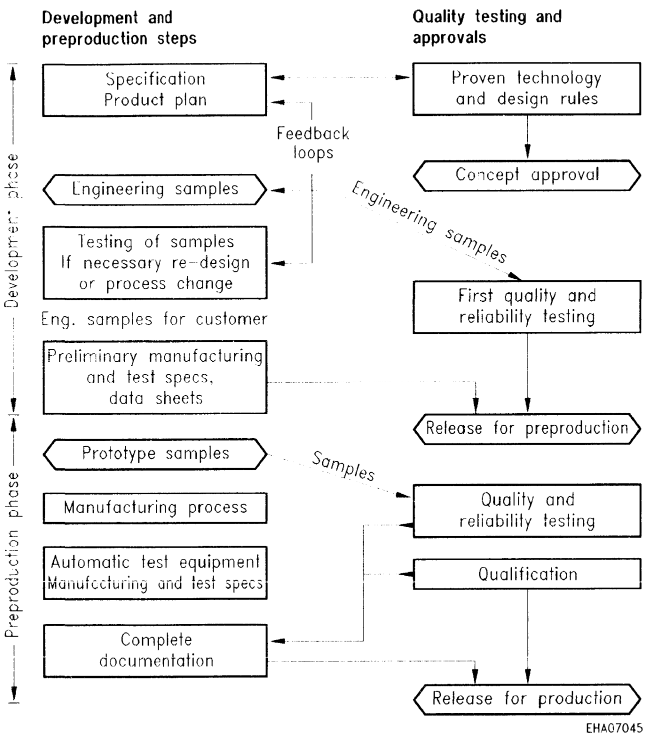
With appropriate circuit dimensioning, it is possible to achieve a failure rate λ of approx. 10 Fit for Siemens components at a junction temperature of less than 60 °C.

Figure 3
Chip structure
Cross-section through AF transistor chip



Layer	Major protective function
Plasma nitride and front metallization	Protection against scratching and corrosion as well as uncontrolled build-up of charge
High-temperature nitride	Guard against ion diffusion
Phosphor glass	Gettering of mobile ions in the oxide
Oxide	Protective isolation of pn junctions
Guard ring	Prevention of channel currents

Figure 4
Approval procedures (concept, preproduction and production release)
Development steps and quality approval procedures



2.1 Quality Assessment

The high reliability can only be determined by large-scale, graded testing. The verification of reliability is made for generic reference types according to internal standards. Some of these tests will be carried out in compliance with the CECC system of quality assessment. Both our production plants in Regensburg and Malacca (Malaysia) have already received CECC (Cenelec Electronic Components Committee) qualification as component manufacturer. We intend to include the whole range of our SMD types. Besides the periodic qualification the CECC qualification covers as well the qualification of the wafer fabrication, the assembly lines and the test lab that is responsible for conducting tests.

3. Ship-to Stock Agreements

There is a great demand for these agreements with our customers. The essential part of it is a quality-assurance contract (QSV) which can contain AQL values, failure criteria, the procedure with customer returns and mutual obligation to provide information.

For further information about quality please refer to our special-subject brochure:

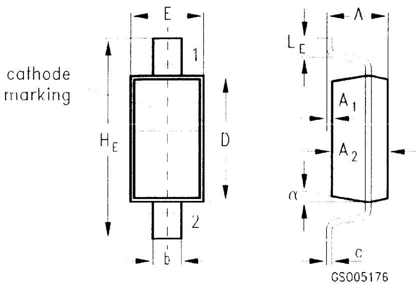
Discrete Semiconductors
Quality Assurance, Quality and Reliability
(see our Information on Literature)

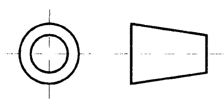
Gehäuse

Package Outlines

All dimensions in mm, unless otherwise specified.

SOD-123

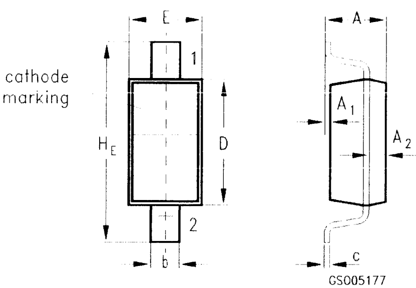


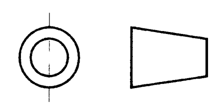


Dim.	min.	typ.	max.
A	–	–	1.35
A_1	–	–	0.1
A_2	0.95	1.1	1.25
b	0.5	0.6	0.7
c	–	0.15	–
D	2.55	2.7	2.85
E	1.4	1.55	1.7
H_E	3.55	3.7	3.85
L_E	0.25	–	–

Approx. weight: 0.01 g

SOD-323



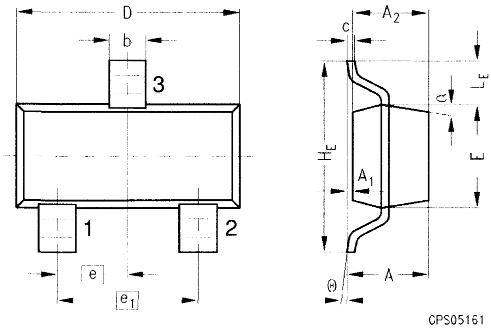


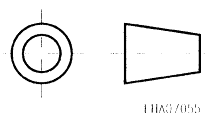
Dim.	min.	typ.	max.
A	–	–	1.1
A_1	– 0.05	0	0.05
A_2	–	–	0.2
b	0.25	0.3	0.4
c	–	0.15	–
D	1.6	1.7	1.9
E	1.15	1.25	1.45
H_E	2.3	2.5	2.7

Approx. weight: 0.01 g

All dimensions in mm, unless otherwise specified.

SOT-23





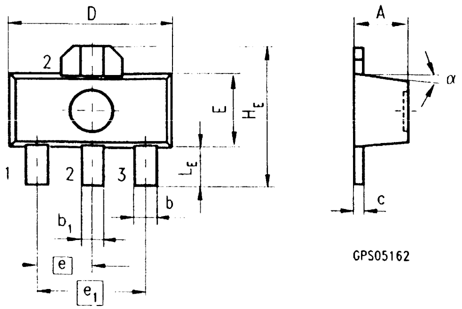
Approx. weight: 0.02 g

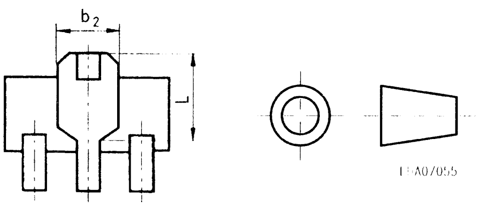
Dim.	min.	typ.	max.	Gradient
A	–	–	1.1	–
A_1	–	–	0.1	–
A_2	–	–	1.0	–
b	0.35	–	0.50	–
c	0.08	–	0.15	–
D	2.8	–	3.0	–
E	1.2	–	1.4	–
$\|e\|$	–	0.95	–	–
$\|e_1\|$	–	1.9	–	–
H_E	–	–	2.6	–
L_E	0.6	–	–	–
α*	–	–	–	max. 10°
θ	–	–	–	2°...30°

* Note: Applicable to all sides.

All dimensions in mm, unless otherwise specified.

SOT-89





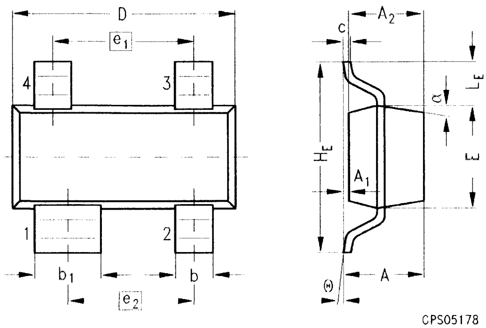
Approx. weight: 0.1 g

Dim.	min.	typ.	max.	Gradient
A	–	1.5	–	–
b	–	–	0.65	–
b_1	–	–	0.65	–
b_2	–	1.6	–	–
c	0.25	–	–	–
D	–	4.5	–	–
E	–	–	2.6	–
|e|	–	1.5	–	–
|e_1|	–	3	–	–
H_E	–	–	4.25	–
L	2.6	–	2.85	–
L_E	0.8	–	1.2	–
α*	–	–	–	max. 10°

* Note: Applicable to all sides.

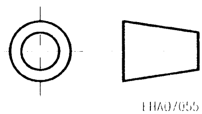
All dimensions in mm, unless otherwise specified.

SOT-143



Dim.	min.	typ.	max.	Gradient
A	–	–	1.1	–
A_1	–	–	0.1	–
A_2	–	–	1.0	–
b	0.35	0.4	0.50	–
b_1	0.75	0.8	0.90	–
c	0.08	–	0.15	–
D	2.8	–	3.0	–
E	1.2	–	1.4	–
$\|e_1\|$	–	1.9	–	–
$\|e_2\|$	–	1.7	–	–
H_E	–	–	2.6	–
L_E	0.6	–	–	–
α^*	–	–	–	max. 10°
θ	–	–	–	2°...30°

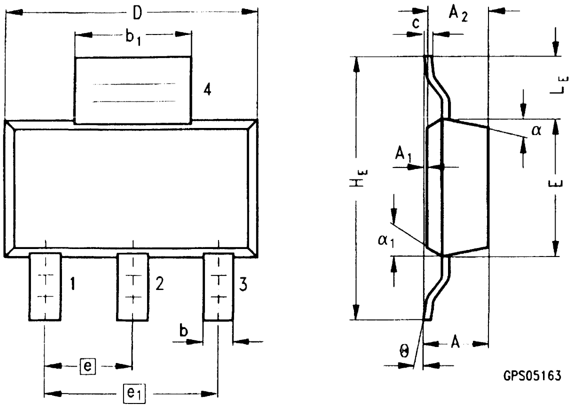
* Note: Applicable to all sides.

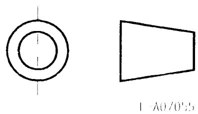


Approx. weight: 0.03 g

All dimensions in mm, unless otherwise specified.

SOT-223





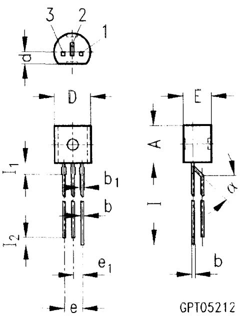
Approx. weight: 0.15 g

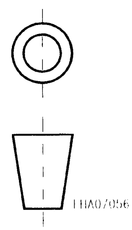
Dim.	min.	typ.	max.	Gradient
A	–	–	1.7	–
A_1	0.02	–	0.1	–
A_2	–	–	1.6	–
b	0.60	–	0.80	–
b_1	2.9	–	3.1	–
c	0.24	–	0.32	–
D	6.3	–	6.7	–
E	3.3	–	3.7	–
$\|e\|$	–	2.3	–	–
$\|e_1\|$	–	4.6	–	–
H_E	6.7	–	7.3	–
L_E	–	1.7	–	
α^{*1}	–	–	–	max. 16°
$\alpha_1{}^{*2}$	–	–	–	13°
θ	–	–	–	10°

* Note 1: Applicable to case top
* Note 2: Applicable to case bottom

All dimensions in mm, unless otherwise specified.

TO-92 (off-set)

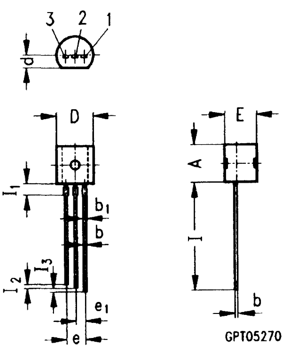


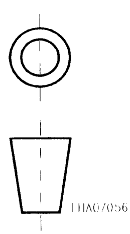


Approx. weight: 0.25 g

Dim.	min.	typ.	max.	Gradient
A	5.0	5.2	–	–
b	–	0.4	0.45	–
b_1	–	0.6	0.62	–
E	4.0	4.2	–	–
|e|	–	2.54	–	–
|e_1|	–	1.27	–	–
D	5.0	5.2	–	–
d	1.5	1.6	–	–
l	13.5	14.5	–	–
l_1	–	1.5	1.7	–
l_2	0.9	1.0	1.1	–
α	–	–	–	45°

TO-92 (in-line)



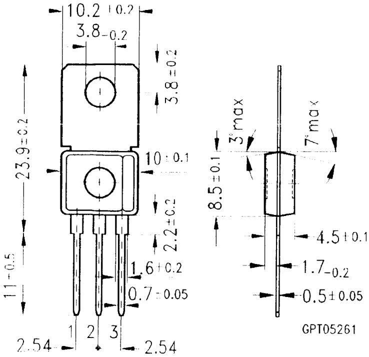


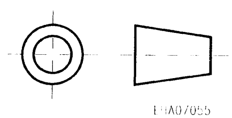
Approx. weight: 0.25 g

Dim.	min.	typ.	max.
A	5.0	5.2	–
b	–	0.4	0.45
b_1	–	0.6	0.62
E	4.0	4.2	–
|e|	–	2.54	–
|e_1|	–	1.27	–
D	5.0	5.2	–
d	1.5	1.6	–
l	13.5	14.5	–
l_1	–	1.5	1.7
l_2	0.4	0.5	0.6
l_3	0.4	0.5	0.6

All dimensions in mm, unless otherwise specified.

TO-202





Approx. weight: 15 g

Verarbeitungshinweise

Mounting Instructions

1. Mechanische Beanspruchung

Die Einbaulage der Bauelemente ist beliebig. SMD-Bauteile sind für die automatische Bestückung gegurtet. Daher sind Zug- oder Biegebeanspruchungen der Anschlußbänder unzulässig soweit diese über die Bestückungskräfte hinausgehen.

Für konventionelle, bedrahtete Bauelemente wie TO-12, TO-72, TO-92, T-Plast, TO-117, T1, Cerec X, 50 und 100 mil gilt:

- Biegebeanspruchungen der Anschlußbänder sind nur zulässig, wenn eine mechanische Entlastung zwischen Biegestelle und Gehäuse vorgenommen wird. Das gleiche gilt auch für das Kürzen der Anschlußbänder.
- Bandförmige Anschlüsse dürfen nicht in der Bandebene gebogen werden.
- Wiederholtes Biegen ist unzulässig.

2. Thermische Beanspruchung

Jedes Halbleiterbauelement ist empfindlich gegen Überschreiten der höchstzulässigen Sperrschichttemperatur. Die max. zulässige Lagertemperatur darf daher nur für den Lötprozeß überschritten werden.

3. Lötangaben

Bei Lötung der SMD-Bauteile ist möglichst das genormte Verfahren nach CECC 00802 anzuwenden. Die Schwallötung ist das in der Flachbaugruppentechnik am häufigsten eingesetzte maschinelle Lötverfahren. Dazu sind die Bauteile zwischen Unterseite und Auflageseite zu fixieren, wobei der Abstand 0,3 mm nicht übersteigen darf. Die Lötflächen dürfen dabei mit dem Kleber nicht in Berührung kommen. Die Lötbadtemperatur kann max. 260 °C betragen.
Eine Verweildauer von 8 sec darf dabei nicht überschritten werden. Erfolgt eine Vorwärmung auf ca. 100 °C, so ist die Lötzeit auf max. 5 sec zu vermindern. Hinweise über Reinigungsverfahren sind ebenfalls dem CECC 00802 Leitfaden zu entnehmen.

Gehäuse	SOT-23	SOT-143 MW-4	SOT-89	SOD-123 SOD-323	SOT-223 MW-7	Cerec-X/XF
Wellenlötung	X	X	Δ	X	X	O
Reflowlötung	X	X	X	X	X	X

Lötverfahren: X = geeignet O = ungeeignet Δ = wird nicht empfohlen

4. Konventionell bedrahtete Bauelemente

Bei der Lötung ist auf verspannungsfreie Fixierung der Bauelemente zu achten. Bei Kolbenlötung ist darauf zu achten, daß das Gehäuse nicht mit dem Lötkolben berührt wird.

Folgende Lötzeiten dürfen abhängig von der Anschlußlänge L nicht überschritten werden:

Anschlußlänge L (mm)	**0.5**	**1.5**	**5**
Löttemperatur 245 °C (s)	4	5	10
Löttemperatur 265 °C (s)	3	4	8
Löttemperatur 300 °C (s)	2	3	5

Der Lötabstand L wird zwischen Lötstelle und Gehäuse gemessen, bei durchmetallisierter Bohrung ist der Abstand zur Plattenunterseite zu subtrahieren.

1. Mechanical Stress

The mounting position of the component is optional. SMD components are taped for automatic assembly. Therefore, it must be ensured that the leads are not subjected to mechanical stress exceeding that of the placement machine.

With conventional, leaded components as TO-12, TO-72, TO-92, T-plast, TO-117, T1, Cerec-X, 50 and 100 mil

- bending of the leads always requires mechanical relief between the point of bending and the package. The same applies to the cutting of the leads.
- band-shaped leads are not to be bent in the mounting plane.
- avoid repeated bending at the same point.

2. Thermal Stress

Each semiconductor component is sensitive to an exceeding of the maximum permissible junction temperature. Consequently the maximum permissible storage temperature may only be exceeded in the soldering process.

3. Soldering Specifications

For soldering SMD components it is recommended to use the standardized CECC 00802-process. Wave soldering is the most widely used automated solder method in the manufacture of pcb assemblies. The components must be attached with their bottom side to the mounting area without exceeding a distance of 0.3 mm.

It must be ensured that the metallization areas are free from any adhesive. With a maximum solder bath temperature of 260 °C, the soldering time of 8 s should not be exceeded. In case of a preheating to approx. 100 °C the soldering time can be reduced to max. 5 s. For cleaning methods please refer to CECC 00802 as well.

Package	**SOT-23**	**SOT-143 MW-4**	**SOT-89**	**SOD-123 SOD-323**	**SOT-223 MW-7**	**Cerec-X/XF**
Wave soldering	X	X	Δ	X	X	O
Reflow soldering	X	X	X	X	X	X

Soldering methods: X = suitable O = unsuitable Δ = not recommended

4. Conventional Components

Before starting the soldering, make sure the component is attached to the pcb in a way that does not exert undue mechanical stress on the leads. With Iron soldering it must be avoided to damage the package with the iron.

The following soldering times must not be exceeded depending on the lead length L:

Lead length L (mm)	**0.5**	**1.5**	**5**
Soldering temperature 245 °C (s)	4	5	10
Soldering temperature 265 °C (s)	3	4	8
Soldering temperature 300 °C (s)	2	3	5

The lead length L is measured from soldering point to package. With through-plated holes the distance to the plate bottom must be subtracted.

Verpackungshinweise

Packaging Instructions

Verpackungshinweise

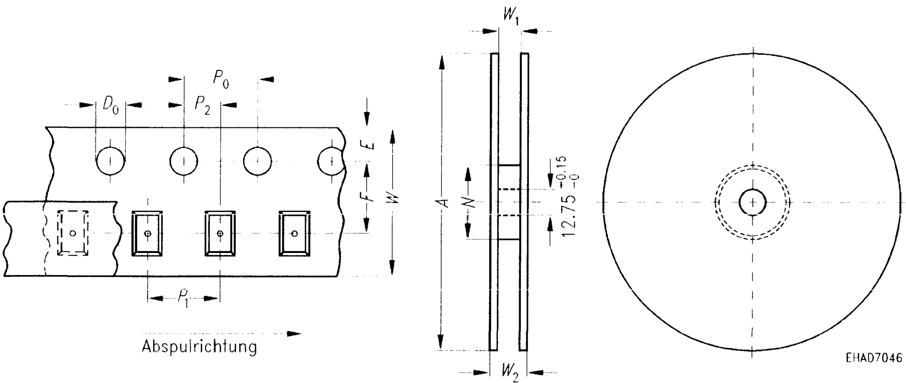
Jede Verpackungseinheit regulärer Lieferungen trägt Aufdrucke mit Informationen über Hersteller, Typ, Anzahl, Herstelldatum und -ort, Loszugehörigkeit, ESD-Empfindlichkeit, Paarung usw. Diese für den Inhalt verbindlichen Angaben kennzeichnen im Klartext insbesondere Typen, deren Bauformen keine ausführliche Bestempelung zulassen. Außerdem sind sie zur Rückmeldung wichtig, sollten einmal Reklamationen nötig sein.

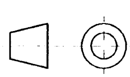
Schüttgut ist die allgemeine ungerichtete Verpackungsform ("bulk packaging"), die eine ungehinderte Einzelentnahme ermöglicht, bei automatischer Gerätebestückung aber richtungsorientierende Zufuhrstationen erfordert. Sie gilt, insbesondere bei T-plast und X-plast-Bauelementen, als normale Verpackungsform. Gurtung ist in standardisierten Versionen bei SMD-Gehäusen vorgesehen.

Die folgende Zusammenstellung gibt einen Überblick über die derzeitigen Gurtformen. Zu Einzelheiten über Maßtoleranzen oder Variationen der Orientierung erbitten wir Ihre Anfrage.

1. Gurtung

Blistergurt und Gurtrollenmaße nach IEC 286-3





Gurtmaße (mm)

W	P_0	P_1	P_2	D_0	E	F
8 ± 0,3	4 ± 0,1	4 ± 0,1	2 ± 0,05	$1{,}5\,^{+0,1}_{-0}$	1,75 ± 0,1	3,5 ± 0,05
12 ± 0,3	4 ± 0,1	8 ± 0,1	2 ± 0,05	$1{,}5\,^{+0,1}_{-0}$	1,75 ± 0,1	5,5 ± 0,05

Gurtrollenmaße (mm)

A	N	W_1	$W_{2\,max}$
180/330	62 ± 1,5	$8{,}4\,^{+1,5}_{-0}$	14,4
180/330	62 ± 1,5	$12{,}4\,^{+2}_{-0}$	18,4

SMD-Verpackungseinheiten

Gehäuse / Zusatzkennung	SOT-23	SOT-143 MW-4	SOT-89 SOT 223 MW-7	SOD-123 SOD-323
E6327 (18 cm Rollen-durchmesser)	3000	3000	1000	3000
E6433 (33 cm Rollen-durchmesser)	10000	10000	4000	10000

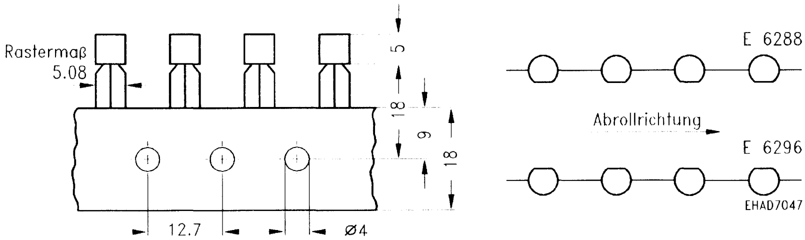
TO-202-Kunststoffgehäuse

Wird als Schüttgut in Pappschachteln geliefert. Gehäuse mit gebogenem Anschlußblech sind auf Anfrage lieferbar.

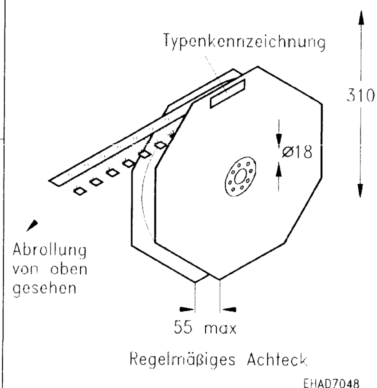
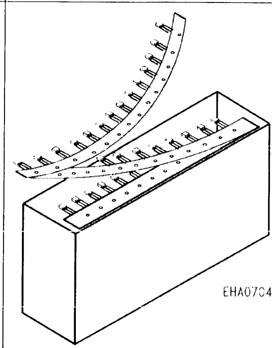
TO-92-Kunststoffgehäuse

Neben der Schüttgutverpackung wird das TO-92-Gehäuse gegurtet geliefert. Die zusätzlichen Bestellbezeichnungen sind aus der nachfolgenden Tabelle zu entnehmen.

Die Gurtmaße entsprechen den DIN-IEC-Normen-Vorschlägen. Die Anschlüsse sind symmetrisch entsprechend dem in-line-Rastermaß 200 mil auf 5 mm gekröpft (äußere Anschlüsse).



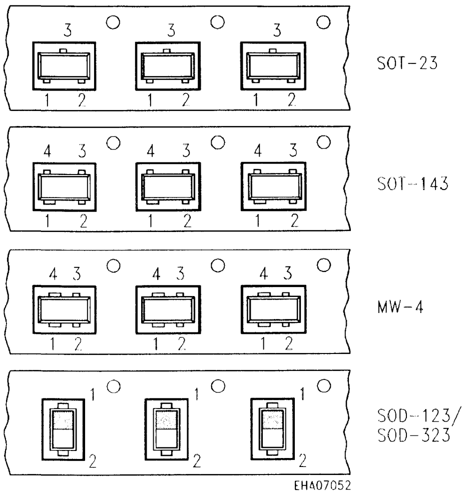
Verpackungshinweise

Zusatzkennung	Verpackungseinheit		Karton
E6288	1500 Stück (pro Rolle)	3000 Stück (pro Karton, = 2 Rollen)	
E6296	1500 Stück (pro Rolle)	3000 Stück (pro Karton, = 2 Rollen)	
E6325	Ammopack (Zick-Zack-Lagen)	2000 Stück (pro Karton)	

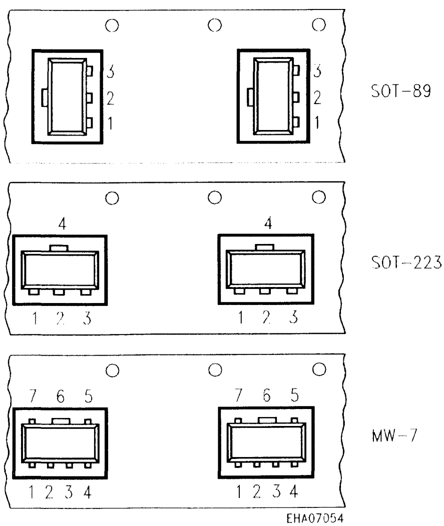
2. Polarität und Lage der Bauelemente im Gurt

Ansicht Oberseite

8-mm-Gurt



12-mm-Gurt



Packaging Instructions

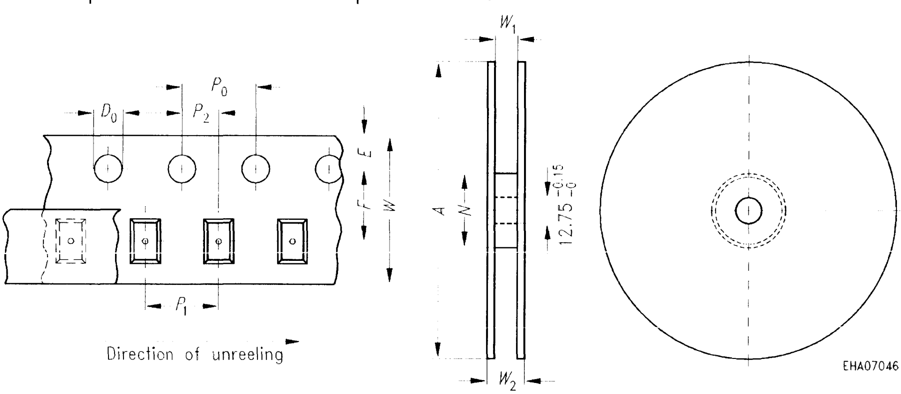
Each packaging unit of regular deliveries is marked with information about the manufacturer, type, quantity, date and place of manufacture, lot, ESD sensitivity, matching, etc. These details on the contents are mandatory and characterize in uncoded form particularly those types whose size does not permit the full marking. In addition, it is important for possible claims.

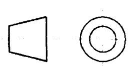
Bulk is the general loose form of packaging that enables components to be removed singly, but appropriate stations are needed to direct their supply for automatic placement. This is the normal form of packaging, especially for T-plast and X-plast devices. Taping is available in standardized versions for SMD packages.

Below, the current forms of taping are summarized. Please inquire for details of dimensional tolerances or variations on how the components are oriented.

1. Tape Packaging

Blister tape and reel dimensions as per IEC 286-3





Tape dimensions (mm)

W	P_0	P_1	P_2	D_0	E	F
8 ± 0.3	4 ±0.1	4 ± 0.1	2 ± 0.05	$1.5^{+0.1}_{-0}$	1.75 ± 0.1	3.5 ± 0.05
12 ± 0.3	4 ± 0.1	8 ± 0.1	2 ± 0.05	$1.5^{+0.1}_{-0}$	1.75 ± 0.1	5.5 ± 0.05

Reel dimensions (mm)

A	N	W_1	$W_{2\,max}$
180/330	62 ± 1.5	$8.4^{+1.5}_{-0}$	14.4
180/330	62 ± 1.5	12.4^{+2}_{-0}	18.4

SMD Packaging Units

Supplementary code \ Package	SOT-23	SOT-143 MW-4	SOT-89 SOT 223 MW-7	SOD-123 SOD-323
E6327 (18 cm ø reel)	3000	3000	1000	3000
E6433 (33 cm ø reel)	10000	10000	4000	10000

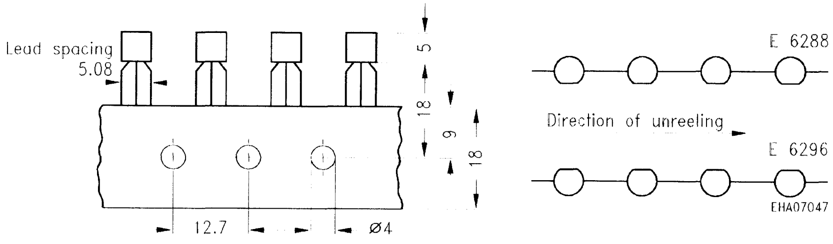
TO-202 plastic package

is supplied in bulk in cardboard boxes. Packages with bent pins are available upon request.

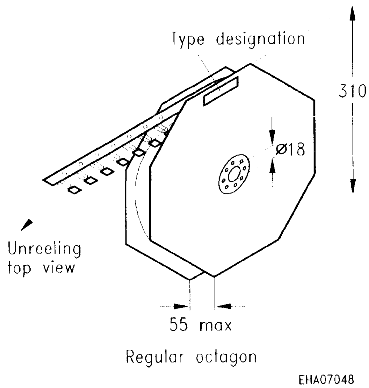
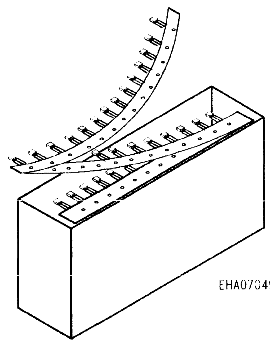
TO-92 plastic package

In addition to the bulk packing, the TO-92 package is also available on tape. For the supplementary code added to the type designation refer to the table shown below. The ordering codes are available upon request.

The tape dimensions correspond to the DIN-IEC-standard recommendations. The terminals are symmetric according to the in-line lead spacing 200 mil spaced 5 mm apart (external terminals).



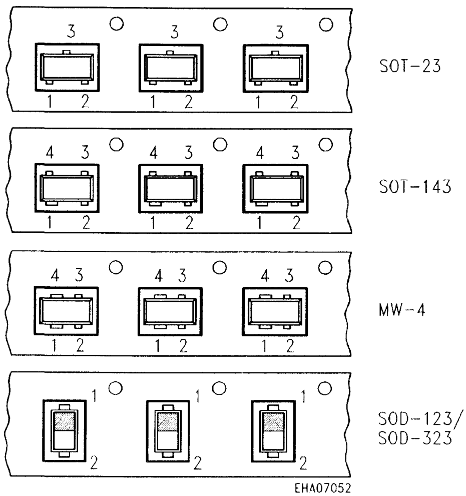
Packaging Instructions

Supplementary code	Packaging unit		Cardboard box
E6288	1500 items (per reel)	3000 items (per card-board box, = 2 reels)	
E6296	1500 items (per reel)	3000 items (per card-board box, = 2 reels)	
E6325	Ammopack (placed in zigzag)	2000 items (per card-board box)	

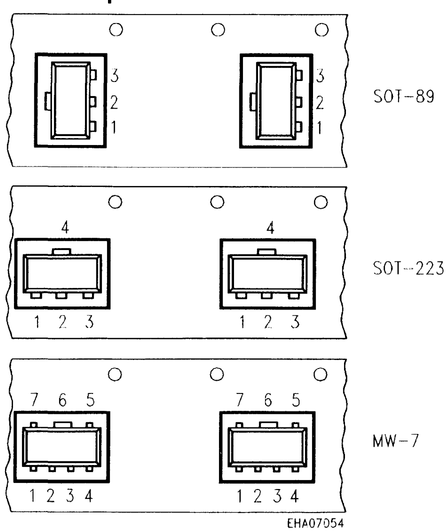
2. Polarity and Orientation of Taped Components

View top

8-mm tape



12-mm tape



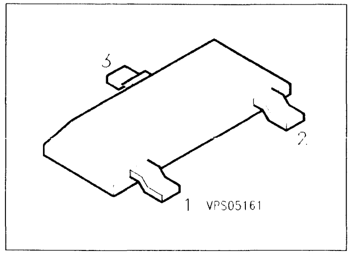
NF-Dioden

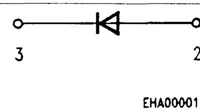
AF Diodes

SIEMENS

Silicon Switching Diode BAL 74

- For high-speed switching



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAL 74	JCs	Q62702-A718		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	50	V
Peak reverse voltage	V_{RM}	50	
Forward current	I_F	250	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 ˚C	P_{tot}	370	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 330	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 260	

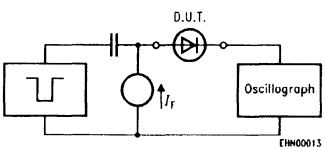
[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	50	–	–	V
Forward voltage I_F = 100 mA	V_F	–	–	1	
Reverse current V_R = 50 V V_R = 50 V, T_A = 150 °C	I_R	 – –	 – –	 0.1 100	 µA µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	4	ns

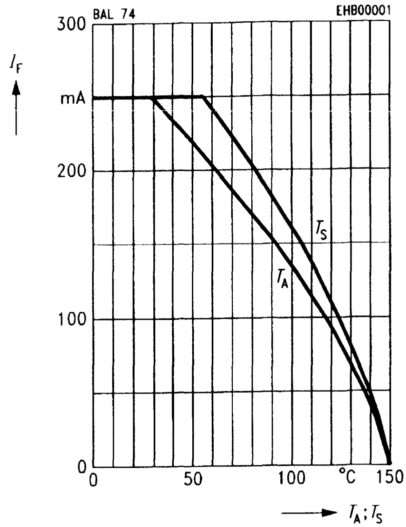
Test circuit for reverse recovery time



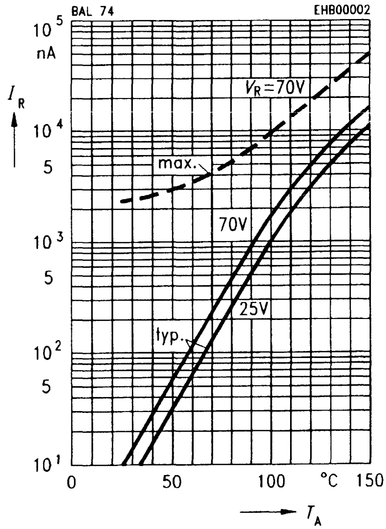
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

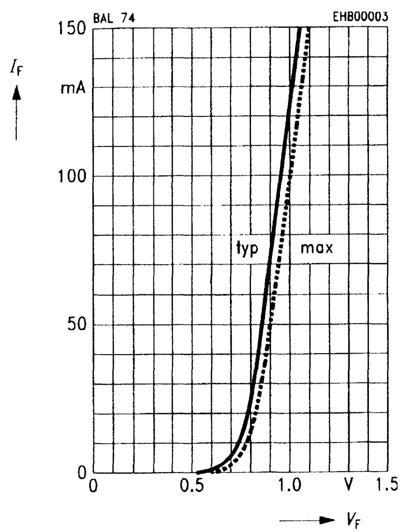
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



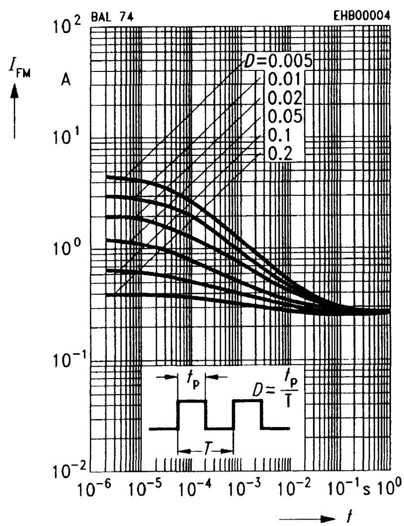
Reverse current $I_R = f(T_A)$



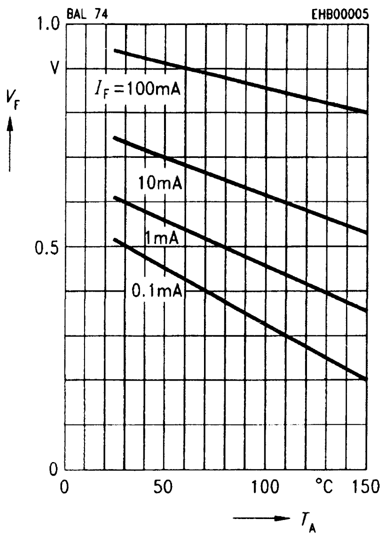
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

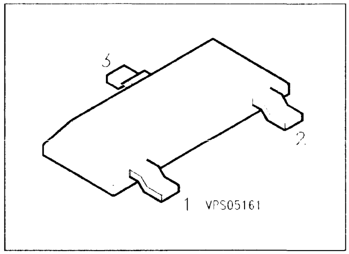


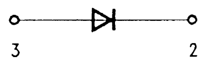
SIEMENS

Silicon Switching Diode

BAL 99

- For high-speed switching



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAL 99	JFs	Q62702-A687		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	250	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 ˚C	P_{tot}	370	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 330	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 260	

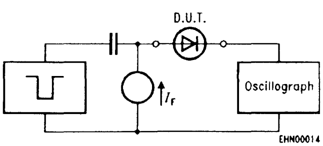
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage	V_F				
I_F = 1 mA		–	–	715	mV
I_F = 10 mA		–	–	855	mV
I_F = 50 mA		–	–	1	V
I_F = 150 mA		–	–	1.25	V
Reverse current	I_R				µA
V_R = 70 V		–	–	2.5	
V_R = 25 V, T_A = 150 °C		–	–	30	
V_R = 70 V, T_A = 150 °C		–	–	50	
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	1.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

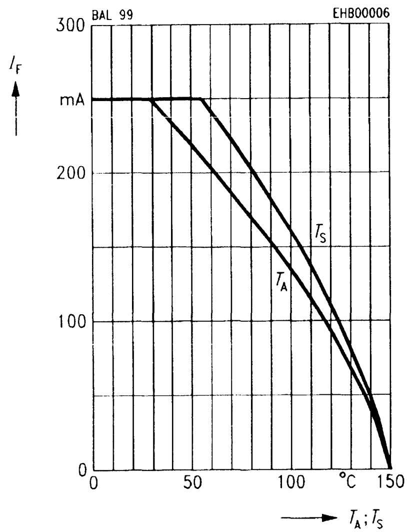
Test circuit for reverse recovery time



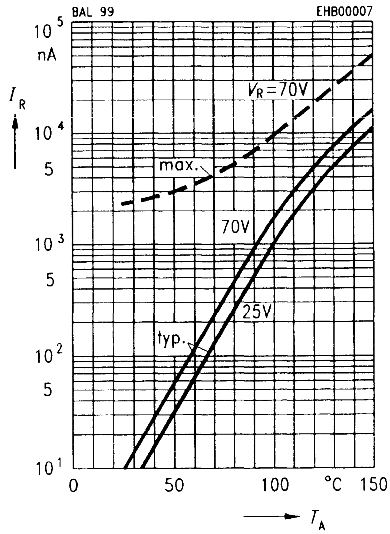
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

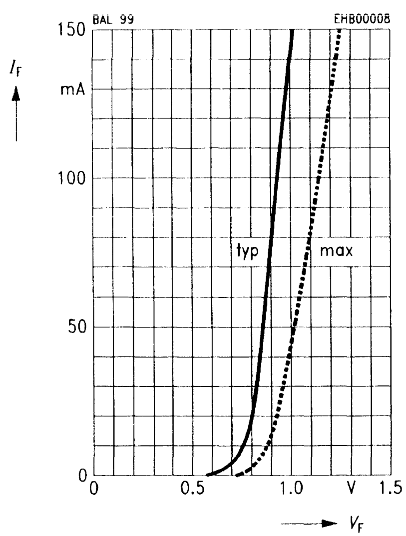
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



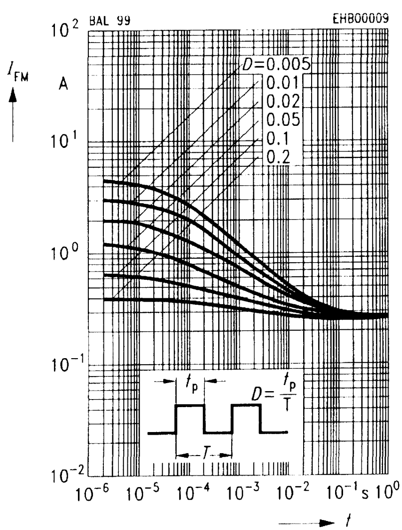
Reverse current $I_R = f(T_A)$



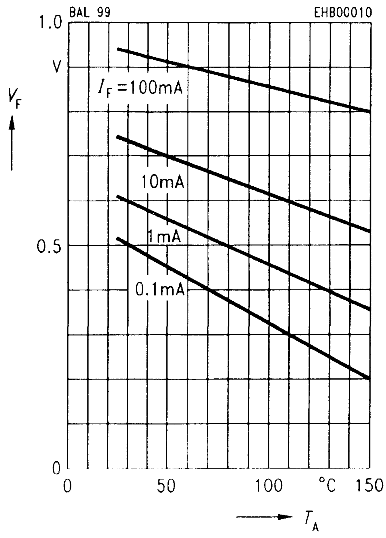
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



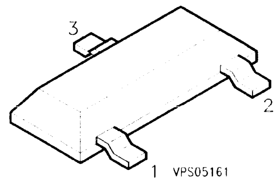
Forward voltage $V_F = f\,(T_A)$



Silicon Switching Diode

BAR 74

- For high-speed switching



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAR 74	JBs	Q62702-F704		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	50	V
Peak reverse voltage	V_{RM}	50	
Forward current	I_F	250	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 °C	P_{tot}	370	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

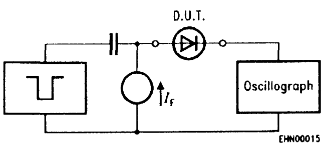
Junction - ambient[2)]	$R_{th\,JA}$	≤ 330	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 260	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	50	–	–	V
Forward voltage I_F = 100 mA	V_F	–	–	1	
Reverse current V_R = 50 V V_R = 50 V, T_A = 150 °C	I_R	 – –	 – –	 0.1 100	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	4	ns

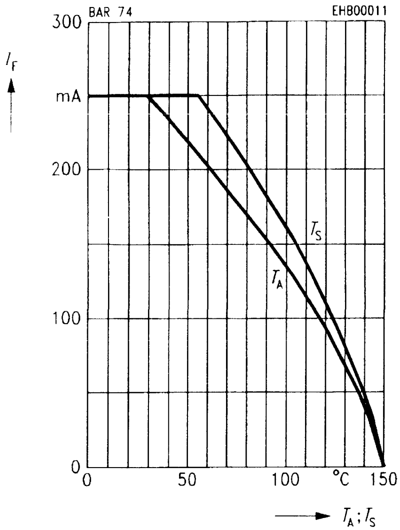
Test circuit for reverse recovery time



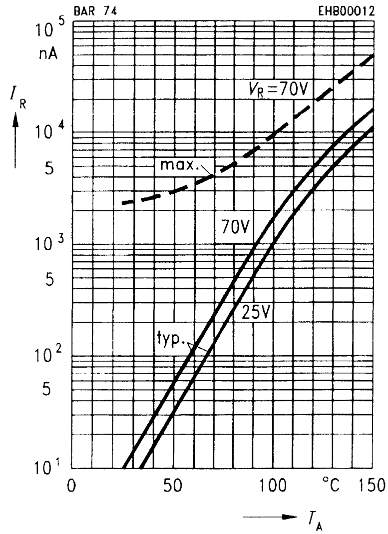
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

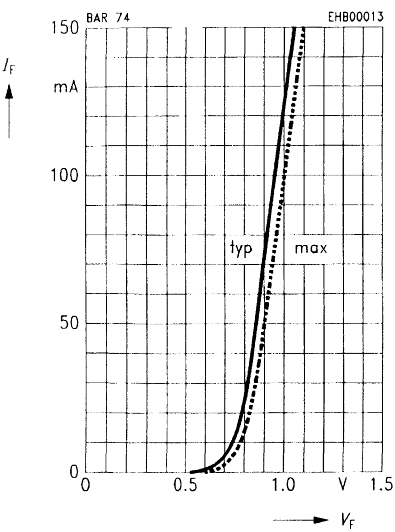
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



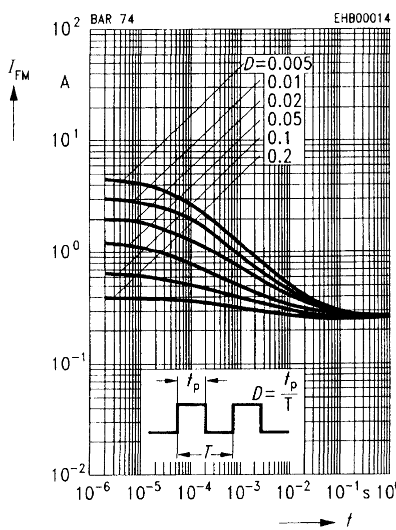
Reverse current $I_R = f(T_A)$



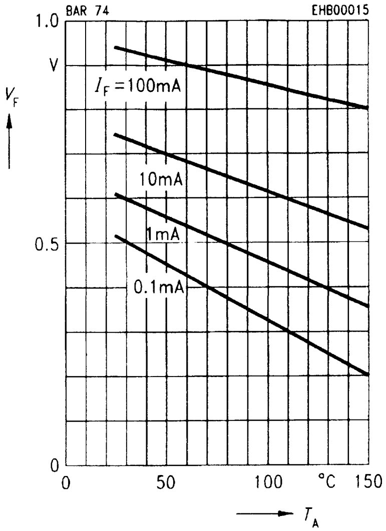
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

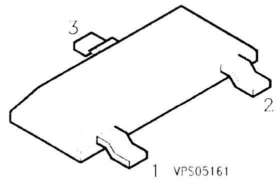


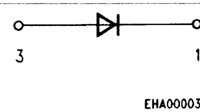
SIEMENS

Silicon Switching Diode

BAR 99

- For high-speed switching



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAR 99	JGs	Q62702-A388		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	250	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 °C	P_{tot}	370	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

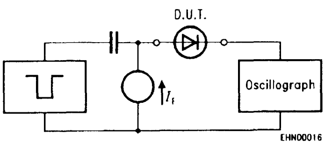
Junction - ambient[2)]	$R_{th\,JA}$	≤ 330	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 260	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 715 855 1000 1250	mV
Reverse current V_R = 70 V V_R = 25 V, T_A = 150 °C V_R = 70 V, T_A = 150 °C	I_R	 – – –	 – – –	 2.5 30 50	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	1.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

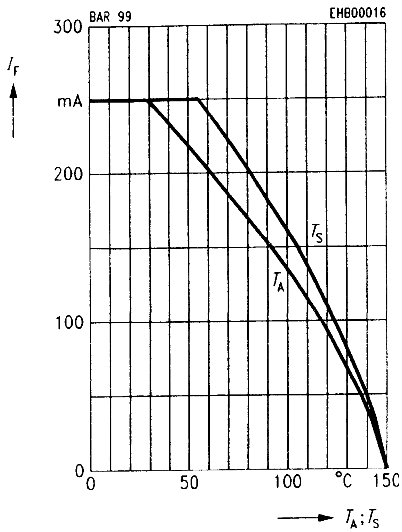
Test circuit for reverse recovery time



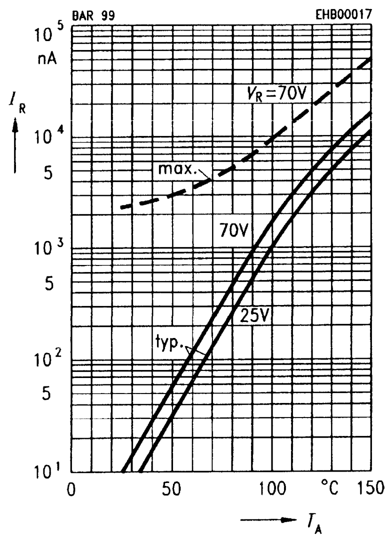
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

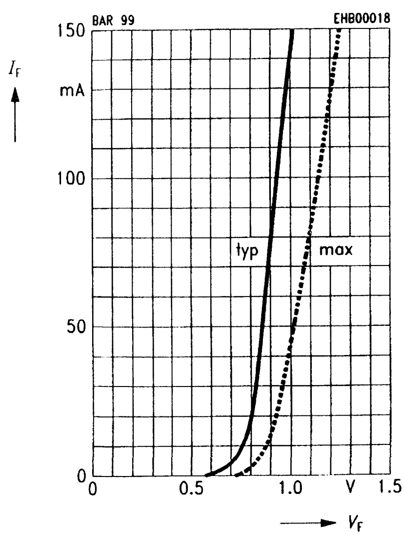
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



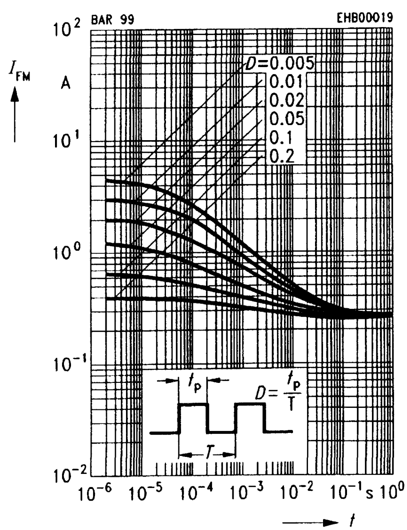
Reverse current $I_R = f(T_A)$



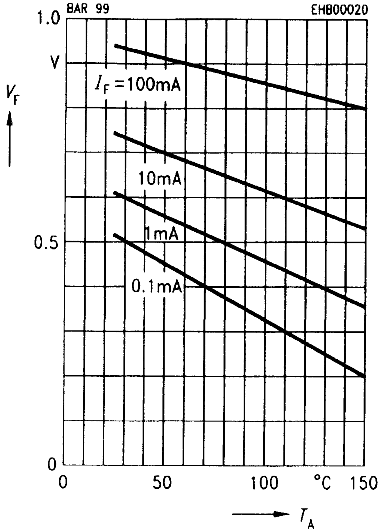
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

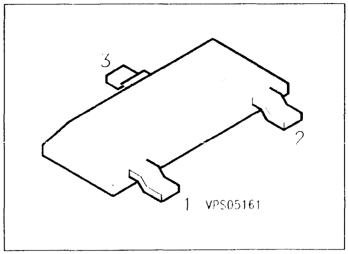


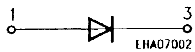
SIEMENS

Silicon Switching Diode

BAS 16

- For high-speed switching



Type	**Marking**	**Ordering Code (tape and reel)**	**Pin Configuration**	**Package**[1]
BAS 16	A6s	Q62702-F739		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	75	V
Peak reverse voltage	V_{RM}	85	
Forward current	I_F	250	mA
Surge forward current, t = 1 μs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 °C	P_{tot}	370	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 330	K/W
Junction - soldering point	$R_{th JS}$	≤ 260	

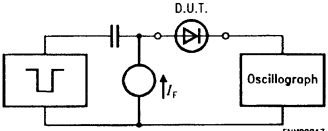
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	75	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 715 855 1000 1250	mV
Reverse current V_R = 75 V V_R = 25 V, T_A = 150 °C V_R = 75 V, T_A = 150 °C	I_R	 – – –	 – – –	 1 30 50	µA
Forward recovery voltage I_F = 10 mA, t_p = 20 ns	V_{fr}	–	–	1.75	V
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

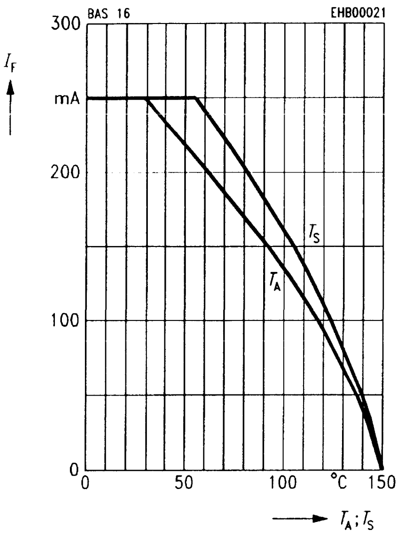
Test circuit for reverse recovery time



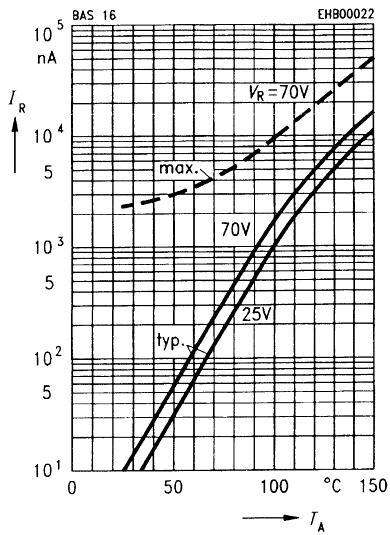
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

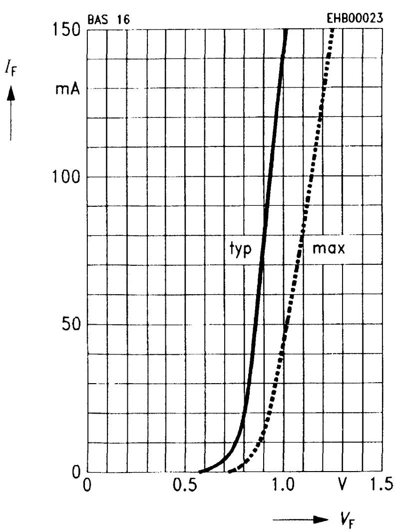
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



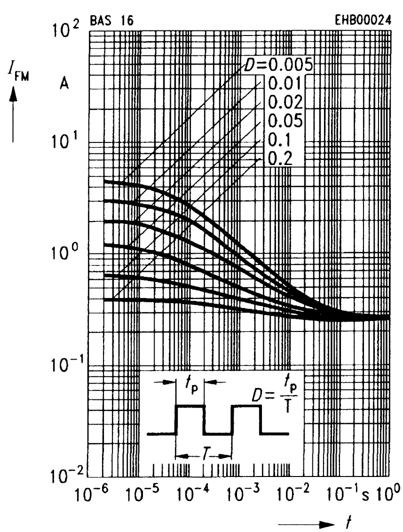
Reverse current $I_R = f(T_A)$



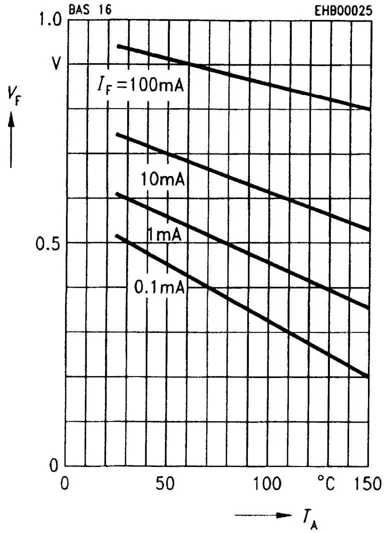
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

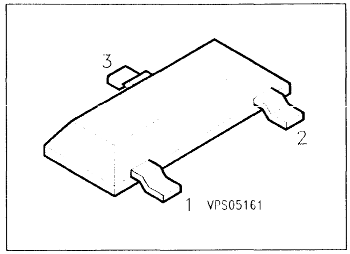


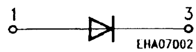
SIEMENS

Silicon Switching Diodes

BAS 19
... BAS 21

- High-speed, high-voltage switch



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAS 19 BAS 20 BAS 21	JPs JRs JSs	Q62702-A95 Q62702-A113 Q62702-A79		SOT-23

Maximum Ratings

<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Symbol</th><th colspan="3">Values</th><th rowspan="2">Unit</th></tr>
<tr><th>BAS 19</th><th>BAS 20</th><th>BAS 21</th></tr>
<tr><td>Reverse voltage</td><td>V_R</td><td>100</td><td>150</td><td>200</td><td rowspan="2">V</td></tr>
<tr><td>Peak reverse voltage</td><td>V_{RM}</td><td>120</td><td>200</td><td>200</td></tr>
<tr><td>Forward current</td><td>I_F</td><td colspan="3">250</td><td rowspan="2">mA</td></tr>
<tr><td>Peak forward current</td><td>I_{FM}</td><td colspan="3">625</td></tr>
<tr><td>Total power dissipation, T_S = 70 ˚C</td><td>P_{tot}</td><td colspan="3">350</td><td>mW</td></tr>
<tr><td>Junction temperature</td><td>T_j</td><td colspan="3">150</td><td rowspan="2">˚C</td></tr>
<tr><td>Storage temperature range</td><td>T_{stg}</td><td colspan="3">– 65 ... + 150</td></tr>
</table>

Thermal Resistance

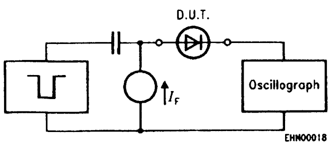
Junction - ambient[2]	$R_{th\,JA}$	$\leq$ 300	K/W
Junction - soldering point	$R_{th\,JS}$	$\leq$ 230	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Breakdown voltage [1]		$V_{(BR)}$				V
$I_{(BR)}$ = 100 µA	BAS 19		120	–	–	
	BAS 20		200	–	–	
	BAS 21		250	–	–	
Forward voltage		V_F				
I_F = 100 mA			–	–	1	
I_F = 200 mA			–	–	1.25	
Reverse current		I_R				
$V_R = V_{R\,max}$			–	–	100	nA
$V_R = V_{R\,max}$; T_j = 150 °C			–	–	100	µA
AC characteristics						
Diode capacitance V_R = 0 V, f = 1 MHz		C_D	–	–	5	pF
Reverse recovery time I_F = 30 mA, I_R = 30 mA, R_L = 100 Ω measured at I_R = 3 mA		t_{rr}	–	–	50	ns

Test circuit for reverse recovery time

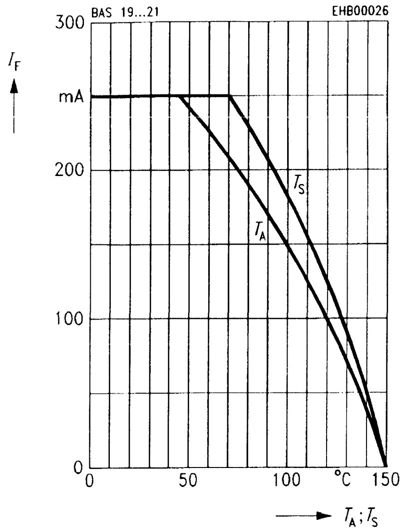


Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

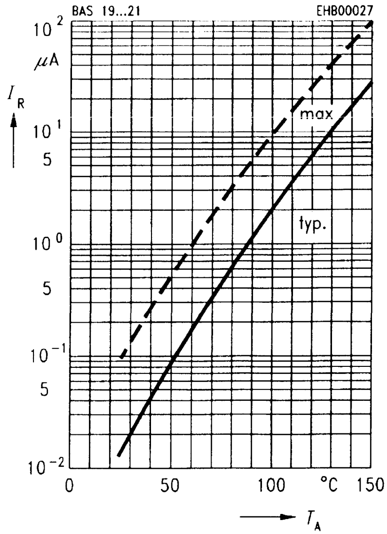
Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

[1] Pulse test: $t_p \leq$ 300 µs, D = 2 %.

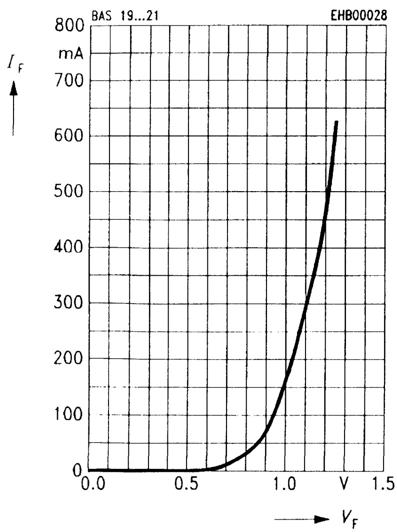
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



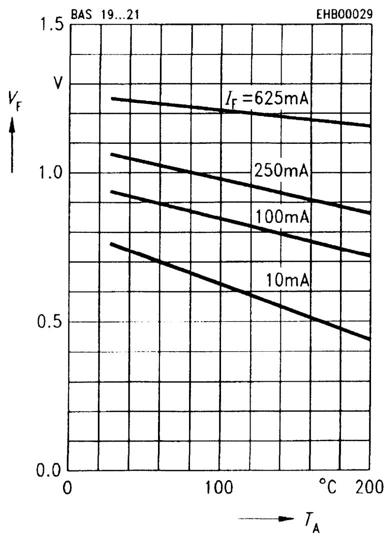
Reverse current $I_R = f(T_A)$



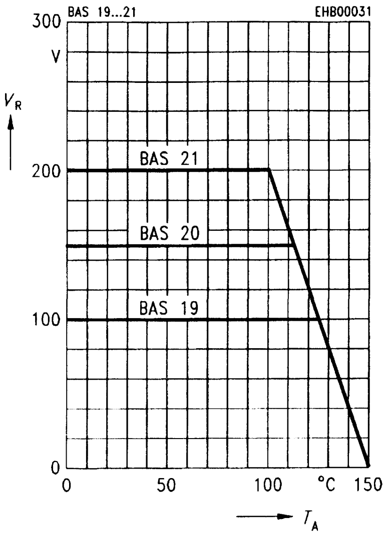
Forward current $I_F = f(V_F)$



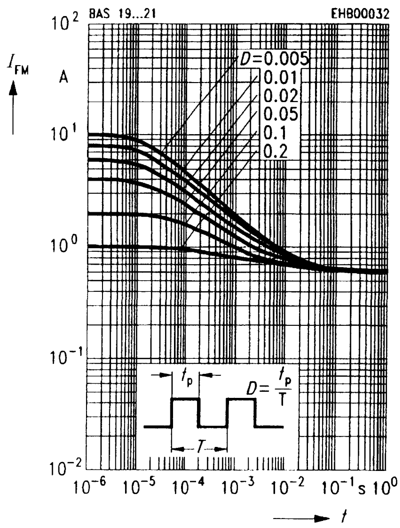
Forward voltage $V_F = f(T_A)$



Reverse voltage $V_R = f(T_A)$



Peak forward current $I_{FM} = f(t)$

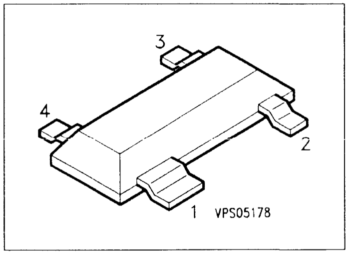


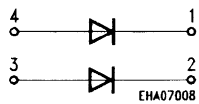
SIEMENS

Silicon Switching Diode Array

BAS 28

- For high-speed switching
- Electrically insulated diodes



Type	**Marking**	**Ordering Code (tape and reel)**	**Pin Configuration**	**Package**[1]
BAS 28	JTs	Q62702-A77		SOT-143

Maximum Ratings

Parameter	**Symbol**	**Values**	**Unit**
Reverse voltage	V_R	75	V
Peak reverse voltage	V_{RM}	75	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 31 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 500	K/W
Junction - soldering point	$R_{th JS}$	≤ 360	

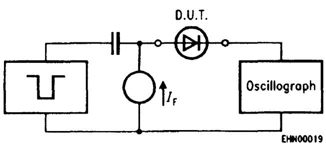
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	85	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 715 855 1000 1250	mV
Reverse current V_R = 75 V V_R = 25 V, T_A = 150 ˚C V_R = 75 V, T_A = 150 ˚C	I_R	 – – –	 – – –	 1 30 50	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

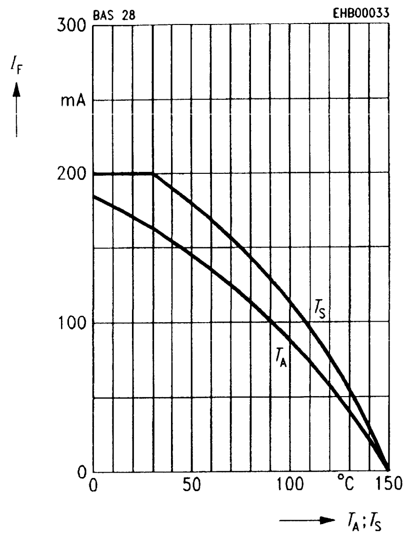
Test circuit for reverse recovery time



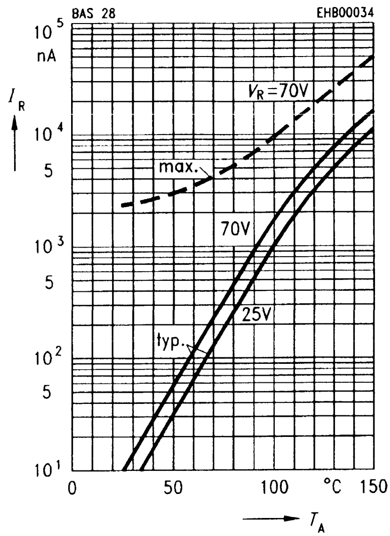
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

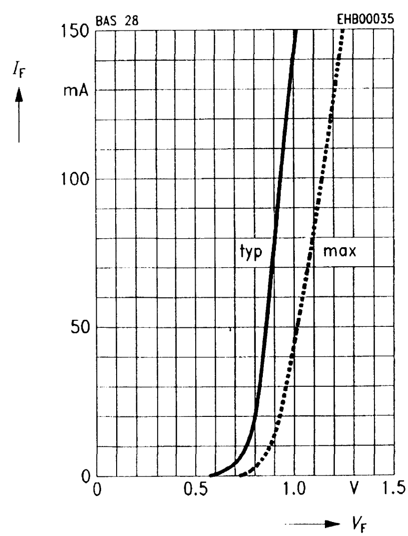
Forward current $I_F = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



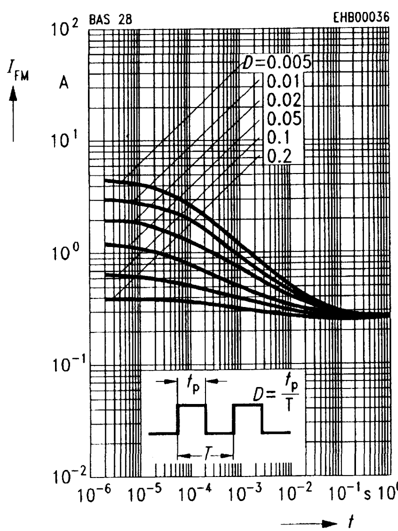
Reverse current $I_R = f\,(T_A)$



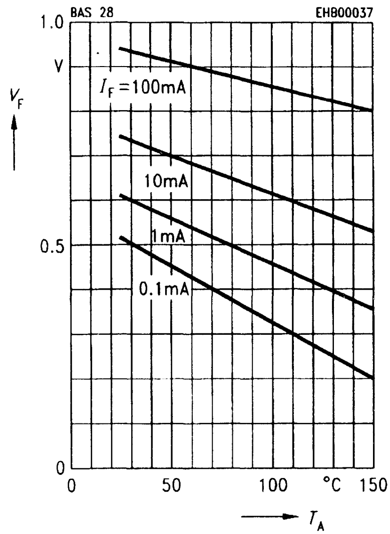
Forward current $I_F = f\,(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f\,(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$



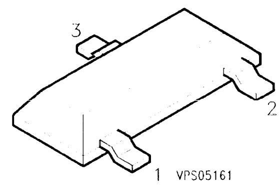
SIEMENS

Silicon Schottky Diodes

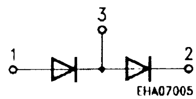
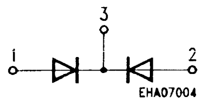
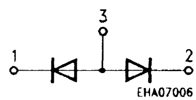
BAS 40 ...

- General-purpose diodes for high-speed switching
- Circuit protection
- Voltage clamping
- High-level detecting and mixing

€ Available with CECC quality assessment



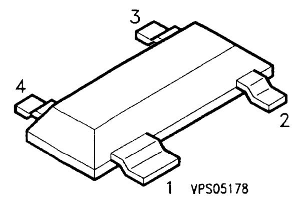
ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
€ BAS 40	43s	Q62702-D339		SOT-23
€ BAS 40-04	44s	Q62702-D980		
€ BAS 40-05	45s	Q62702-D979		
€ BAS 40-06	46s	Q62702-D978		

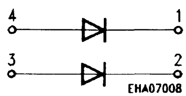
1) For detailed information see chapter Package Outlines.

- General-purpose diodes for high-speed switching
- Circuit protection
- Voltage clamping
- High-level detecting and mixing

Available with CECC quality assessment



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

Type	**Marking**	**Ordering Code (tape and reel)**	**Pin Configuration**	**Package**[1]
BAS 40-07	47s	Q62702-D1314		SOT-143

Maximum Ratings per Diode

Parameter	**Symbol**	**Values**	**Unit**
Reverse voltage	V_R	40	V
Forward current	I_F	120	mA
Surge forward current, $t \leq 10$ ms	I_{FSM}	200	
Total power dissipation BAS 40 $T_S \leq 81$ °C BAS 40-04 ... $T_S \leq 55$ °C	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Operating temperature range	T_{op}	– 55 ... + 150	
Storage temperature range	T_{stg}	– 55 ... + 150	

Thermal Resistance

Junction - ambient[2] BAS 40 BAS 40-04 ...	$R_{th JA}$	 ≤ 345 ≤ 515	K/W
Junction - soldering point BAS 40 BAS 40-04 ...	$R_{th JS}$	 ≤ 275 ≤ 375	

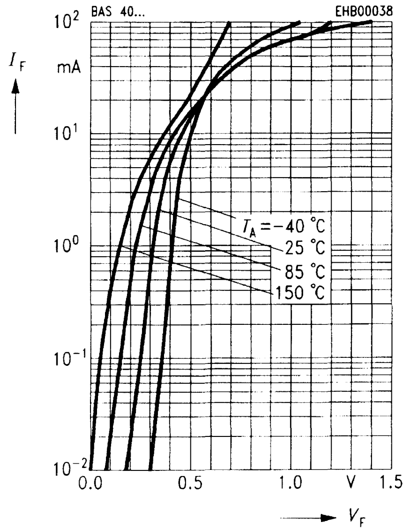
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

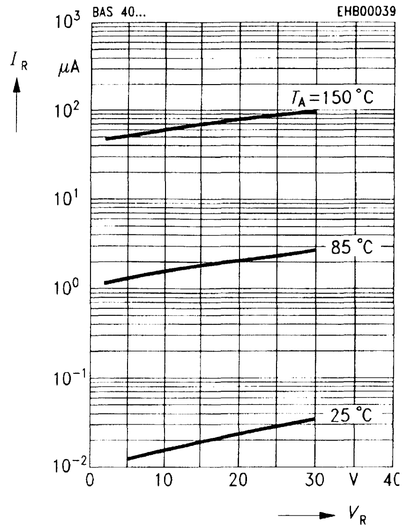
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage I_R = 10 µA	$V_{(BR)}$	40	–	–	V
Reverse current V_R = 30 V V_R = 40 V	I_R	 – –	 – –	 1 10	µA
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 40 mA	V_F	 – – –	 310 450 720	 380 500 1000	mV
Diode capacitance V_R = 0, f = 1 MHz	C_T	–	4	5	pF
Charge carrier life time I_F = 25 mA	τ	–	–	100	ps
Differential forward resistance I_F = 10 mA, f = 10 kHz	r_f	–	10	–	Ω

Characteristics per Diode at T_j = 25 ˚C, unless otherwise specified.

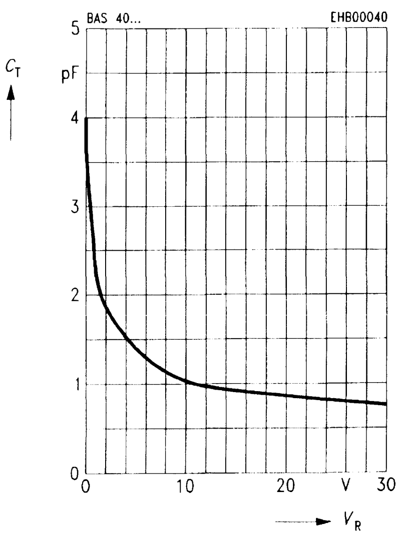
Forward current $I_F = f(V_F)$



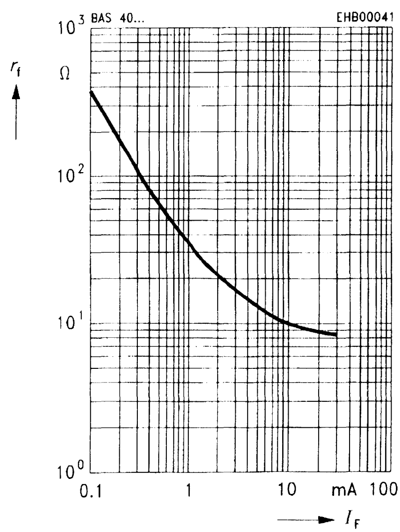
Reverse current $I_R = f(V_R)$



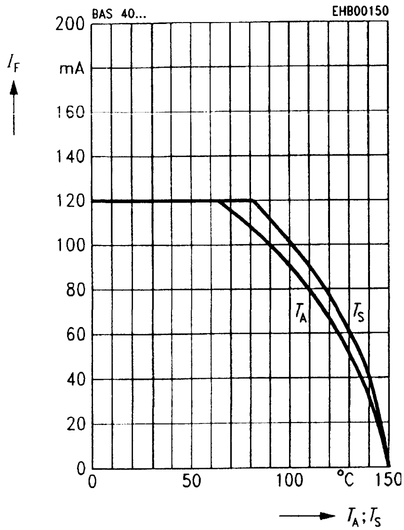
Diode capacitance $C_T = f(V_R)$
f = 1 MHz



Differential forward resistance $r_f = f(I_F)$
f = 10 kHz



Forward current $I_F = f(T_A{}^*; T_S)$
* Package mounted on epoxy



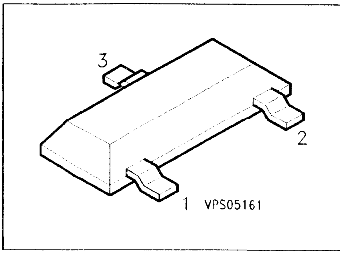
SIEMENS

Silicon Schottky Diodes

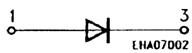
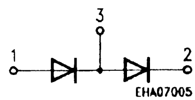
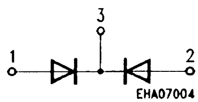
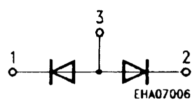
BAS 70 ...

- General-purpose diodes for high-speed switching
- Circuit protection
- Voltage clamping
- High-level detecting and mixing

Ⓔ Available with CECC quality assessment



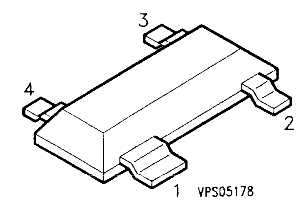
ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	**Marking**	**Ordering Code (tape and reel)**	**Pin Configuration**	**Package**[1]
Ⓔ BAS 70	73s	Q62702-A118		SOT-23
Ⓔ BAS 70-04	74s	Q62702-A730		
Ⓔ BAS 70-05	75s	Q62702-A711		
Ⓔ BAS 70-06	76s	Q62702-A774		

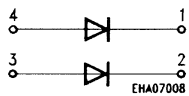
[1] For detailed information see chapter Package Outlines.

- General-purpose diodes for high-speed switching
- Circuit protection
- Voltage clamping
- High-level detecting and mixing

Available with CECC quality assessment



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

Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAS 70-07	77s	Q62702-A846		SOT-143

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Forward current	I_F	70	mA
Surge forward current, $t \leq$ 10 ms	I_{FSM}	100	
Total power dissipation BAS 70 $T_S \leq$ 66 ˚C[2] BAS 70-04 ... $T_S \leq$ 40 ˚C[2]	P_{tot}	250	mW
Junction temperature	T_j	150	˚C
Operating temperature range	T_{op}	– 55 ... + 150	
Storage temperature range	T_{stg}	– 55 ... + 150	

Thermal Resistance

Junction - ambient[3] BAS 70 BAS 70-04 ...	$R_{th JA}$	 ≤ 405 ≤ 575	K/W
Junction - soldering point BAS 70 BAS 70-04 ...	$R_{th JS}$	 ≤ 335 ≤ 435	

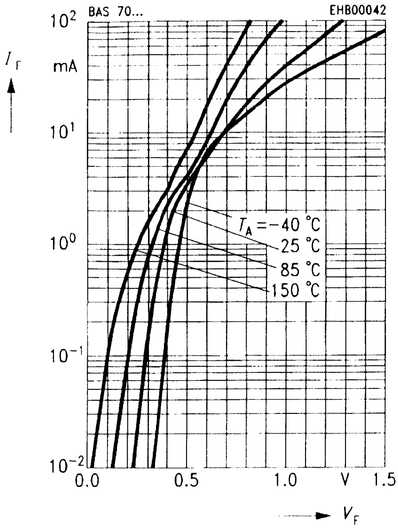
[1] For detailed information see chapter Package Outlines.
[2] Max. 450 mW per package.
[3] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

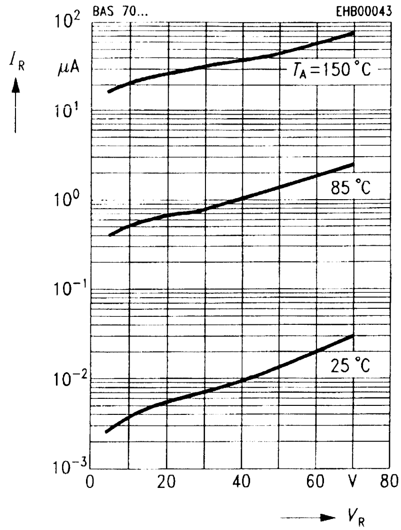
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage I_R = 10 µA	$V_{(BR)}$	70	–	–	V
Reverse current V_R = 50 V V_R = 70 V	I_R	 – –	 – –	 0.1 10	µA
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 15 mA	V_F	 – – –	 380 690 780	 410 750 1000	mV
Diode capacitance V_R = 0, f = 1 MHz	C_T	–	1.6	2	pF
Charge carrier life time I_F = 25 mA	τ	–	–	100	ps
Differential forward resistance I_F = 10 mA, f = 10 kHz	r_f	–	30	–	Ω

Characteristicper Diode at T_j = 25 °C, unless otherwise specified.

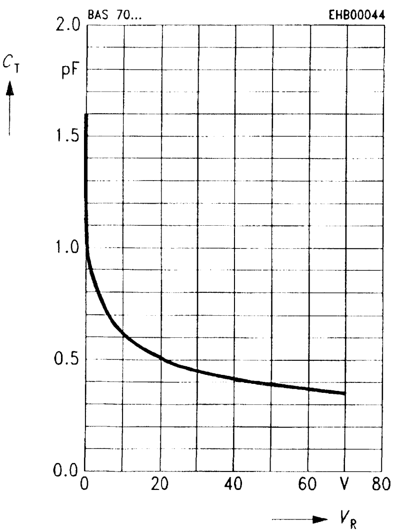
Forward current $I_F = f(V_F)$



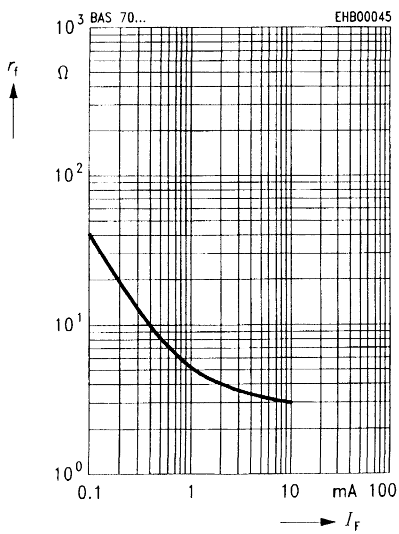
Reverse current $I_R = f(V_R)$



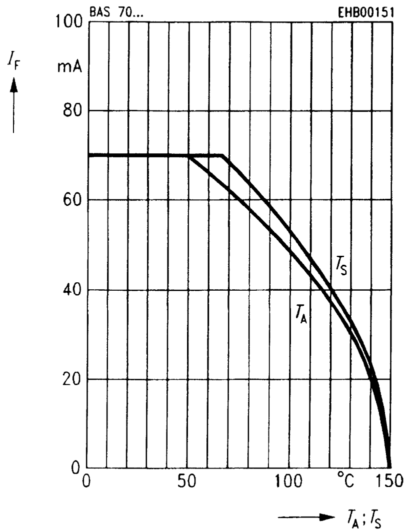
Diode capacitance $C_T = f(V_R)$
f = 1 MHz



Differential forward resistance $r_f = f(I_F)$
f = 10 kHz



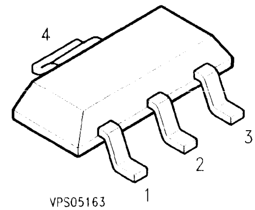
Forward current $I_F = f\,(T_A{}^*;\,T_S)$
* Package mounted on epoxy

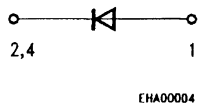


Silicon Switching Diodes

BAS 78 A
... BAS 78 D

- Switching applications
- High breakdown voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAS 78 A BAS 78 B BAS 78 C BAS 78 D	BAS 78 A BAS 78 B BAS 78 C BAS 78 D	Q62702-A910 Q62702-A911 Q62702-A912 Q62702-A913		SOT-223

Maximum Ratings

Parameter	Symbol	Values				Unit
		BAS 78 A	BAS 78 B	BAS 78 C	BAS 78 D	
Reverse voltage	V_R	50	100	200	400	V
Peak reverse voltage	V_{RM}	50	100	200	400	
Forward current	I_F	1				A
Peak forward current	I_{FM}	1				
Surge forward current, t = 1 μs	I_{FS}	10				
Total power dissipation, T_S = 124°C [2]	P_{tot}	1.2				W
Junction temperature	T_j	150				°C
Storage temperature range	T_{stg}	– 65 ... + 150				

Thermal Resistance

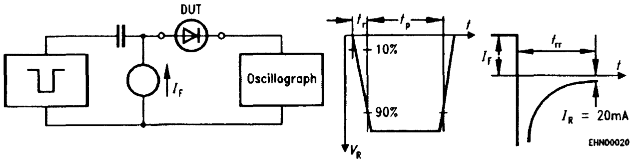
Junction - ambient [2]	$R_{th JA}$	≤ 92	K/W
Junction - soldering point	$R_{th JS}$	≤ 22	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Breakdown voltage I_C = 10 mA, I_B = 0	BAS 78 A BAS 78 B BAS 78 C BAS 78 D	$V_{(BR)}$	50 100 200 400	– – – –	– – – –	V
Forward voltage [1] I_F = 1 A I_F = 2 A		V_F	– –	– –	1.6 2	
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 Ω measured at I_R = 20 mA		t_{rr}	–	1	–	µs

Test circuit for reverse recovery time

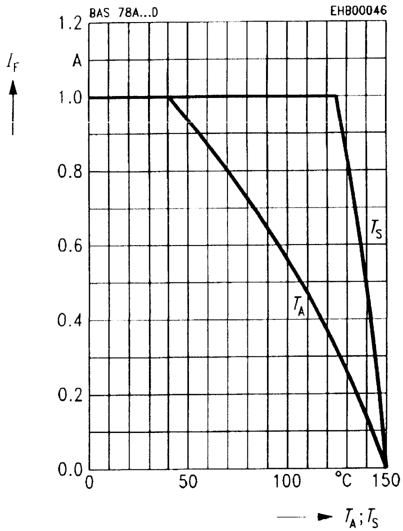


Pulse generator: t_p = 5 µs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω
V_p = V_R + $I_F \times R_i$

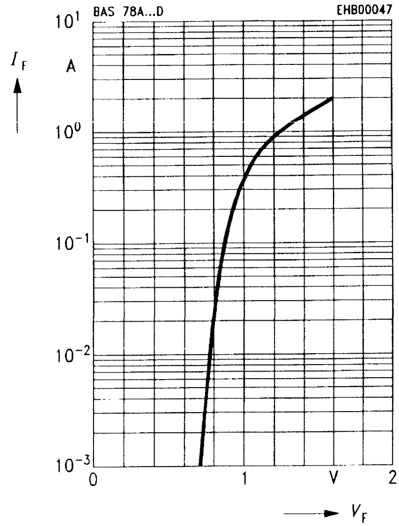
Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

[1] Pulse test conditions: $t \leq$ 300 µs, D = 2 %.

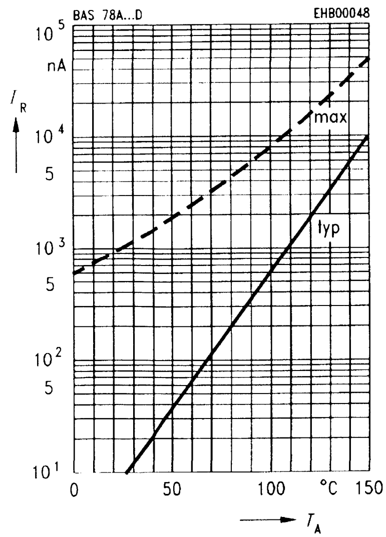
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



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



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

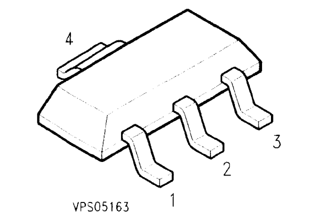


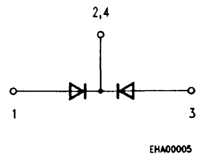
SIEMENS

Silicon Switching Diodes

BAS 79 A
... BAS 79 D

- Switching applications
- High breakdown voltage
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAS 79 A BAS 79 B BAS 79 C BAS 79 D	BAS 79 A BAS 79 B BAS 79 C BAS 79 D	Q62702-A914 Q62702-A915 Q62702-A916 Q62702-A917		SOT-223

Maximum Ratings

Parameter	Symbol	Values BAS 79 A	BAS 79 B	BAS 79 C	BAS 79 D	Unit
Reverse voltage	V_R	50	100	200	400	V
Peak reverse voltage	V_{RM}	50	100	200	400	
Forward current	I_F	1				A
Peak forward current	I_{FM}	1				
Surge forward current, t = 1 µs	I_{FS}	10				
Total power dissipation, T_S = 114 ˚C [2)]	P_{tot}	1.2				W
Junction temperature	T_j	150				˚C
Storage temperature range	T_{stg}	– 65 ... + 150				

Thermal Resistance

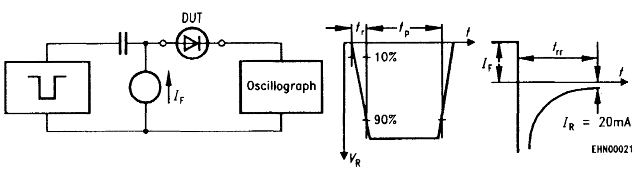
Junction - ambient [2)]	$R_{th\,JA}$	≤ 170	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 30	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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 79 A		50	–	–	
	BAS 79 B		100	–	–	
	BAS 79 C		200	–	–	
	BAS 79 D		400	–	–	
Forward voltage [1]		V_F				
I_F = 1 A			–	–	1.6	
I_F = 2 A			–	–	2	
Reverse current		I_R				µA
$V_R = V_{R\,max}$			–	–	1	
$V_R = V_{R\,max}$, T_A = 150 °C			–	–	50	
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 Ω measured at I_R = 20 mA		t_{rr}	–	1	–	µs

Test circuit for reverse recovery time

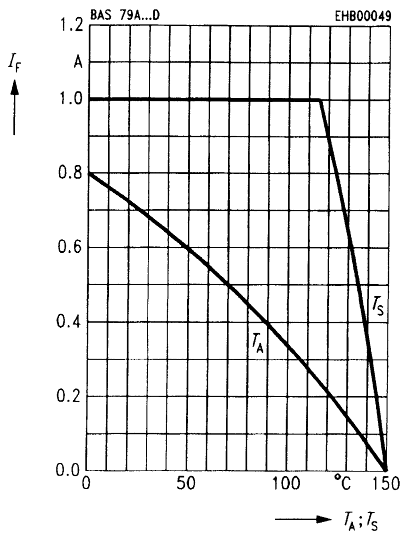


Pulse generator: t_p = 5 µs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω
$V_p = V_R + I_F \times R_i$

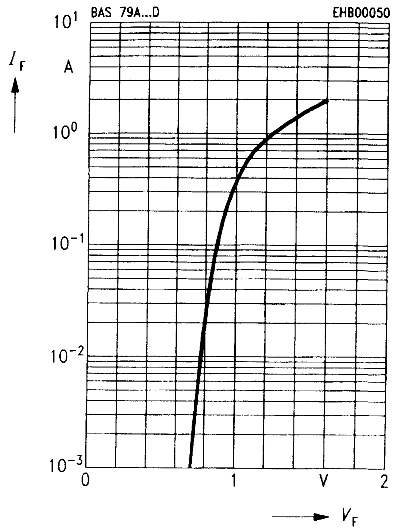
Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

[1] Pulse test conditions: $t \leq$ 300 µs, D = 2 %.

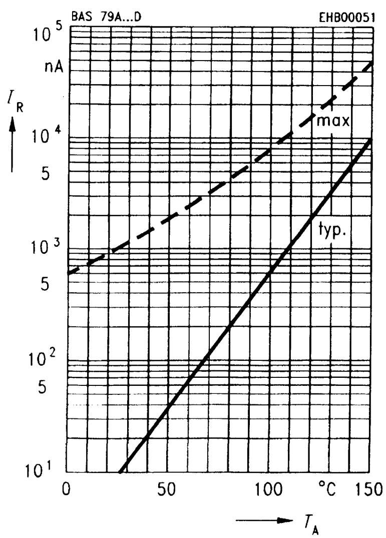
Forward current $I_F = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



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



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

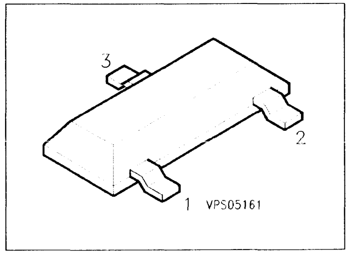


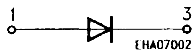
SIEMENS

Silicon Low Leakage Diode

BAS 116

- Low-leakage applications
- Medium speed switching times
- Single diode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAS 116	JVs	Q62702-A919		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	75	V
Peak reverse voltage	V_{RM}	85	
Forward current	I_F	250	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 °C	P_{tot}	370	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 330	K/W
Junction - soldering point	$R_{th JS}$	≤ 260	

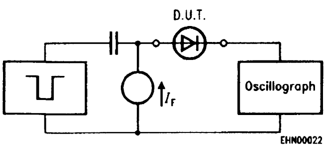
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	75	–	–	V
Forward voltage	V_F				mV
I_F = 1 mA		–	–	900	
I_F = 10 mA		–	–	1000	
I_F = 50 mA		–	–	1100	
I_F = 150 mA		–	–	1250	
Reverse current	I_R				nA
V_R = 75 V		–	–	5	
V_R = 75 V, T_A = 150 ˚C		–	–	80	
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	2	–	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	0.5	3	µs

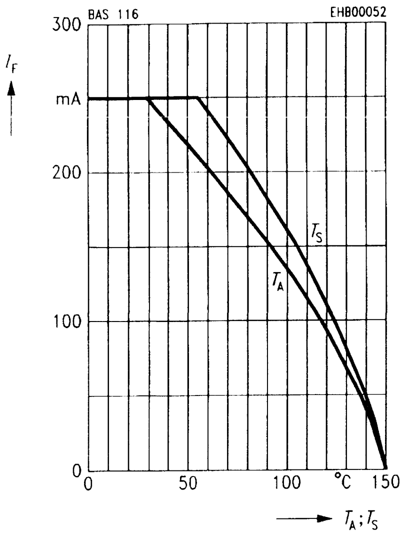
Test circuit for reverse recovery time



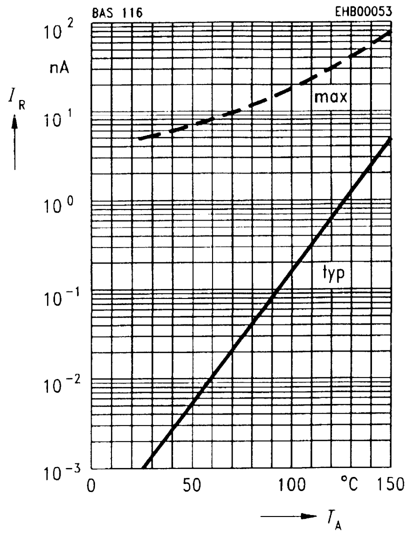
Pulse generator: t_p = 5 µs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

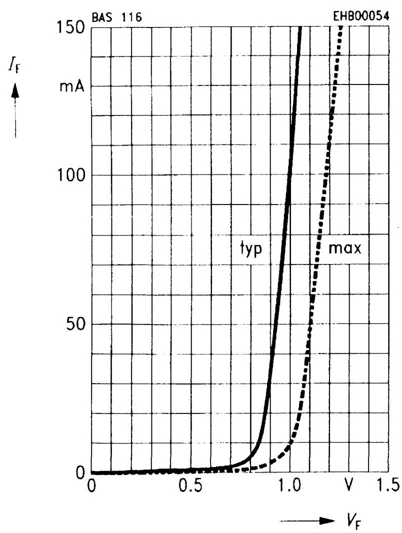
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



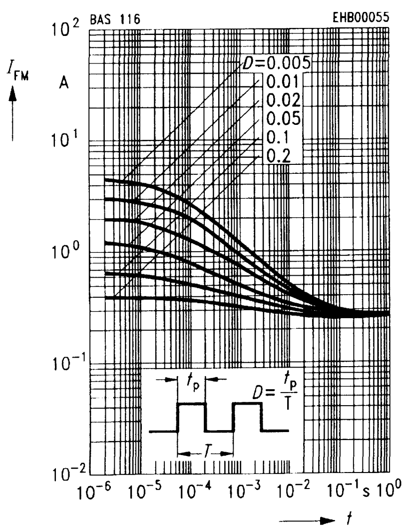
Reverse current $I_R = f(T_A)$



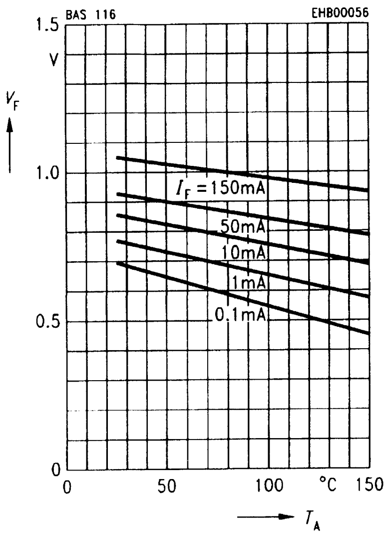
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$



Forward voltage $V_F = f(T_A)$



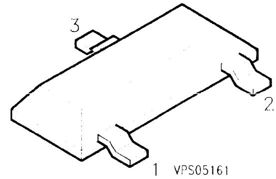
SIEMENS

Silicon Schottky Diodes

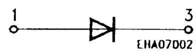
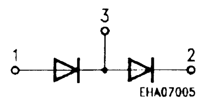
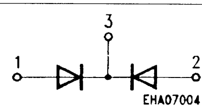
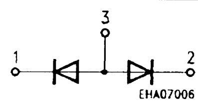
BAT 64 ...

Preliminary Data

- For low-loss, fast-recovery, meter protection, bias isolation and clamping applications
- Integrated diffused guard ring
- Low forward voltage

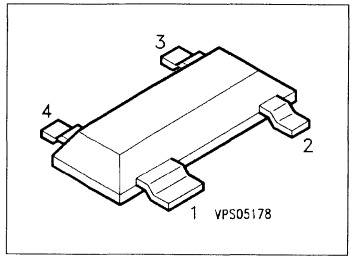


ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

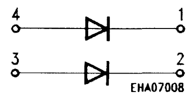
Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAT 64	63s	Q62702-A879		SOT-23
BAT 64-04	64s	Q62702-A961		
BAT 64-05	65s	Q62702-A962		
BAT 64-06	66s	Q62702-A963		

[1)] For detailed information see chapter Package Outlines.

- For low-loss, fast-recovery, meter protection, bias isolation and clamping applications
- Integrated diffused guard ring
- Low forward voltage



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

Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAT 64-07	67s	Q62702-A964		SOT-143

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	30	V
Forward current	I_F	250	mA
Average forward current (50/60 Hz, sinus)	I_{FAV}	120	
Surge forward current ($t \leq$ 10 ms)	I_{FSM}	800	
Total power dissipation, T_S = 61 °C	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 55 ... + 150	

Thermal Resistance

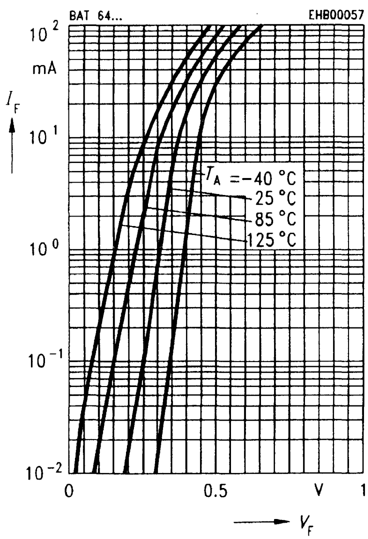
Parameter	Symbol	Values	Unit
Junction - ambient[2)]	$R_{th\,JA}$	≤ 495	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 355	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

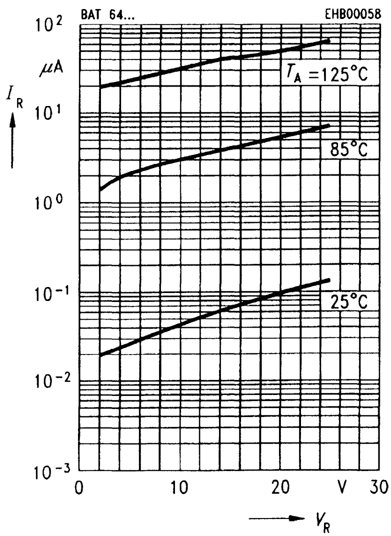
Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Reverse current	I_R				µA
V_R = 25 V		–	–	2	
V_R = 25 V, T_A = 125 °C		–	–	200	
Forward voltage	V_F				mV
I_F = 1 mA		–	320	–	
I_F = 10 mA		–	385	–	
I_F = 30 mA		–	440	–	
I_F = 100 mA		–	570	1000	
Diode capacitance V_R = 1 V, f = 1 MHz	C_T	–	4	6	pF

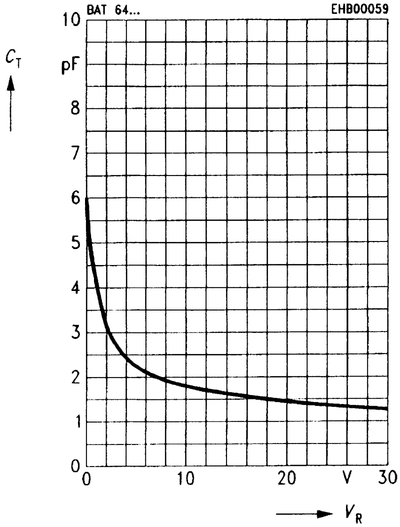
Forward current $I_F = f(V_F)$



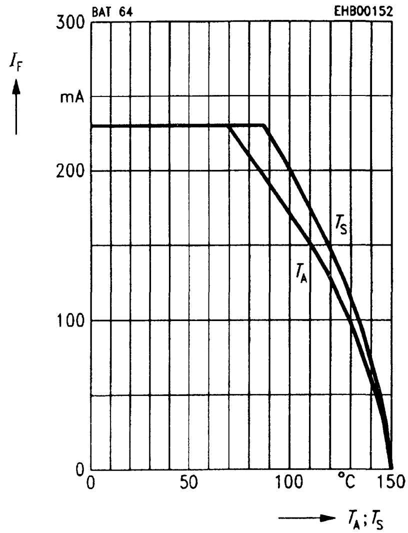
Reverse current $I_R = f(V_R)$



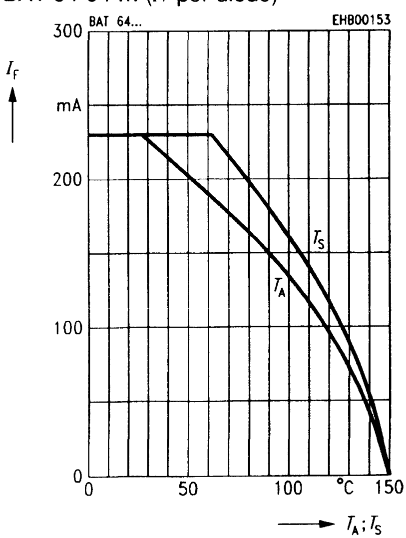
Diode capacitance $C_T = f(V_R)$
f = 1 MHz



Forward current $I_F = f(T_A{}^*; T_S)$
* Package mounted on epoxy
BAT 64



Forward current $I_F = f(T_A{}^*; T_S)$
* Package mounted on epoxy
BAT 64-04 … (I_F per diode)



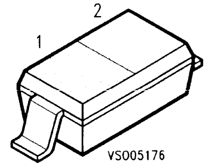
SIEMENS

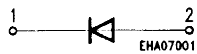
Silicon Schottky Diode

BAT 65

Preliminary Data

- Low-power Schottky rectifier diode
- For low-loss, fast-recovery rectification, meter protection, bias isolation and clamping purposes



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAT 65	C	Q62702-A990		SOD-123

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	30	V
Forward current	I_F	500	mA
Average forward current, 50 Hz	I_{FAV}	300	
Surge forward current, $t \leq 10$ ms	I_{FSM}	2.5	A
Total power dissipation, $T_S \leq 125$ ˚C	P_{tot}	300	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 55 ... + 150	

Thermal Resistance

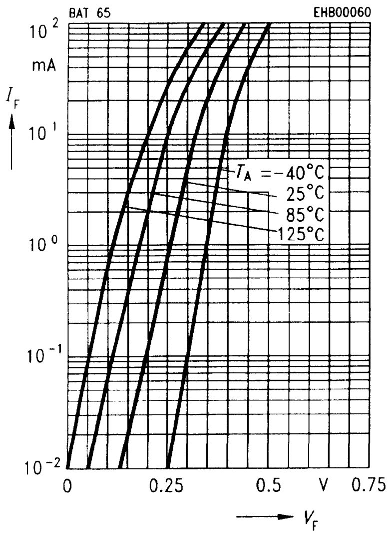
Parameter	Symbol	Values	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 150	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 80	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

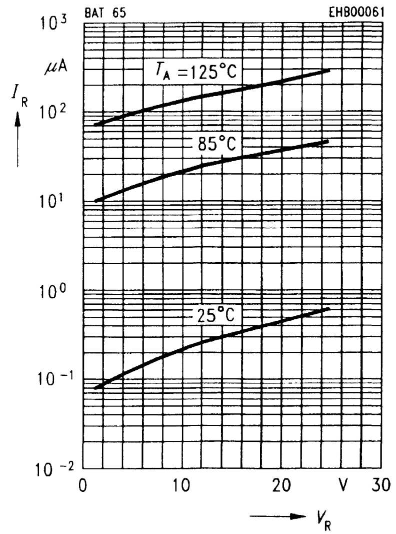
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse current	I_R				µA
V_R = 25 V		–	–	10	
V_R = 25 V, T_A = 85 °C		–	–	500	
Forward voltage	V_F				V
I_F = 10 mA		–	0.32	0.40	
I_F = 100 mA		–	0.39	–	
I_F = 250 mA		–	0.46	0.70	
Diode capacitance V_R = 10 V, f = 1 MHz	C_T	–	8	12	pF

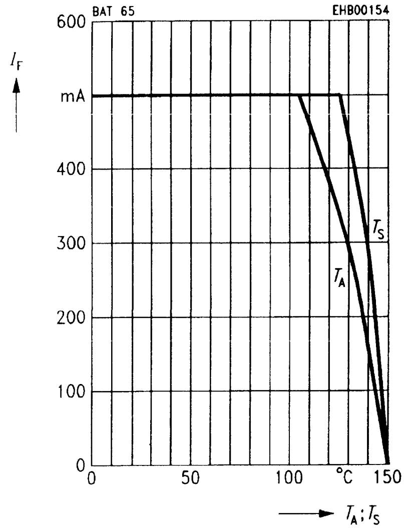
Forward current $I_F = f(V_F)$



Reverse current $I_R = f(V_R)$



Forward current $I_F = f(T_A{}^*; T_S)$
* Package mounted on epoxy

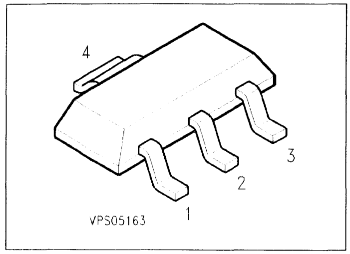


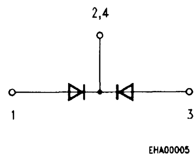
SIEMENS

Silicon Schottky Diode — BAT 66-05

Preliminary Data

- Low-power Schottky rectifier diode
- For low-loss, fast-recovery rectification, meter protection, bias isolation and clamping purposes



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAT 66-05	BAT 66-05	Q62702-A988		SOT-223

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	30	V
Forward current	I_F	2	A
Average forward current, 50 Hz	I_{FAV}	1	
Surge forward current, $t \leq 10$ ms	I_{FSM}	10	
Total power dissipation, $T_S \leq 126$ °C	P_{tot}	1.2	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 55 ... + 150	

Thermal Resistance

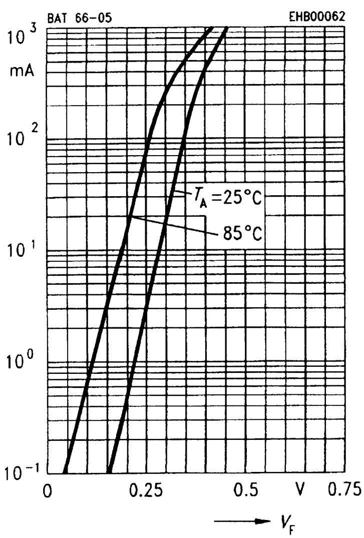
Junction - ambient[2]	R_{thJA}	≤ 160	K/W
Junction - soldering point	R_{thJS}	≤ 20	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

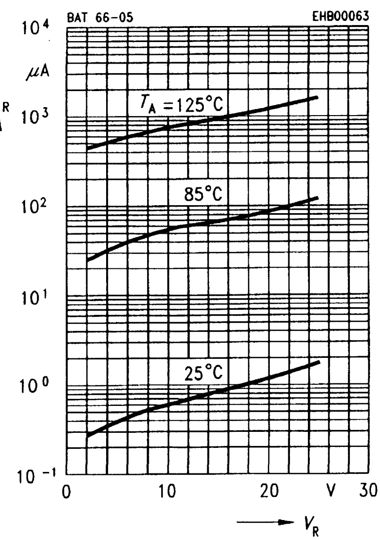
Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse current	I_R				
V_R = 25 V		–	–	10	µA
V_R = 25 V, T_A = 85 ˚C		–	–	1	mA
Forward voltage	V_F				V
I_F = 10 mA		–	0.28	0.35	
I_F = 100 mA		–	0.35	–	
I_F = 1 A		–	0.47	0.60	
Diode capacitance V_R = 10 V, f = 1 MHz	C_T	–	30	40	pF

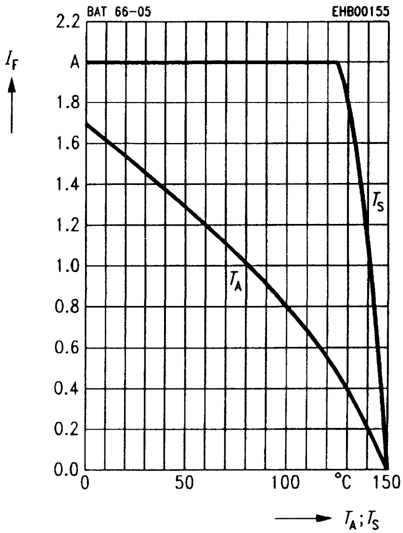
Forward current $I_F = f(V_F)$



Reverse current $I_R = f(V_R)$



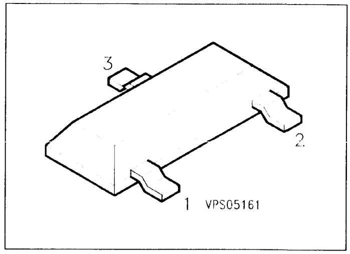
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy

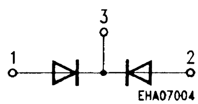


Silicon Switching Diode Array

BAV 70

- For high-speed switching
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAV 70	A4s	Q68000-A6622		SOT-23

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 35 °C	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 600	K/W
Junction - soldering point	$R_{th JS}$	≤ 460	

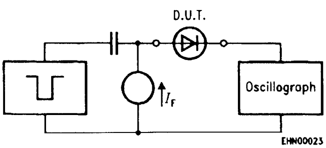
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2.

Electrical Characteristics per Diode

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 715 855 1000 1250	mV
Reverse current V_R = 70 V V_R = 25 V, T_A = 150 °C V_R = 70 V, T_A = 150 °C	I_R	 – – –	 – – –	 2.5 30 50	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	1.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

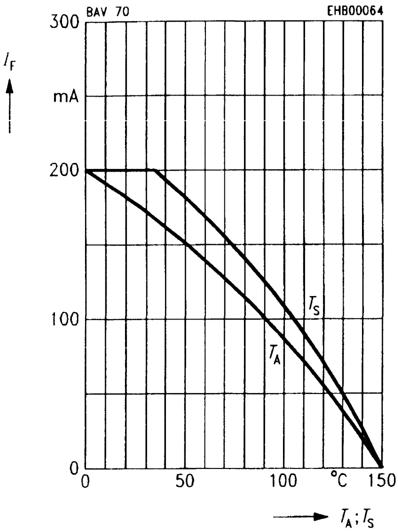
Test circuit for reverse recovery time



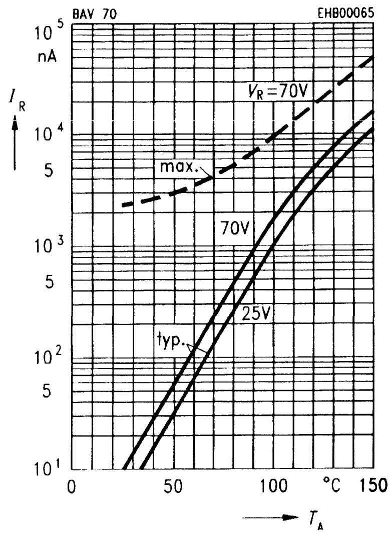
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

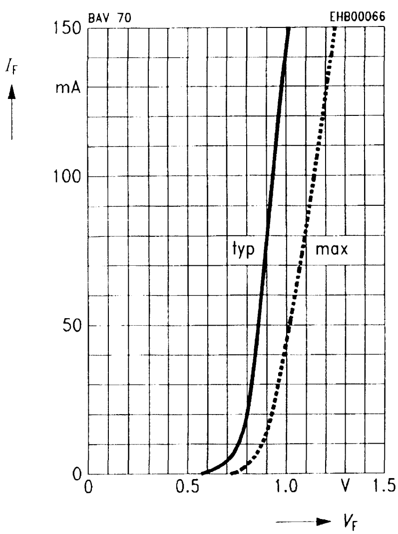
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



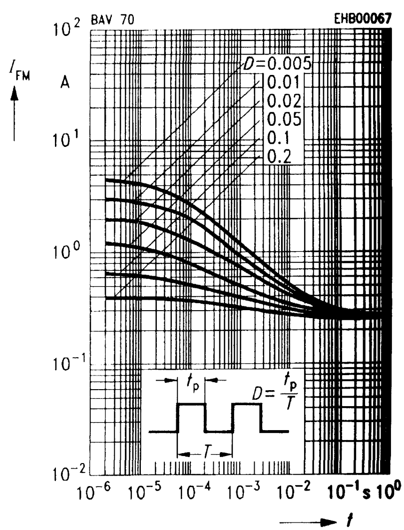
Reverse current $I_R = f(T_A)$



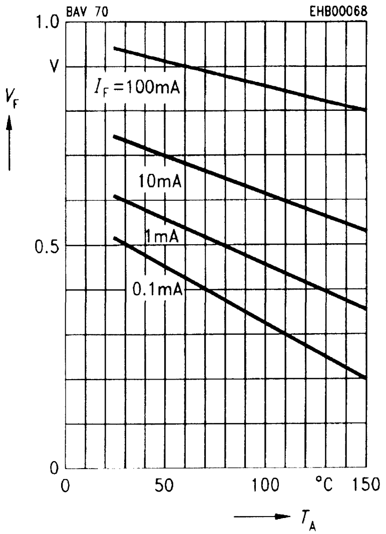
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

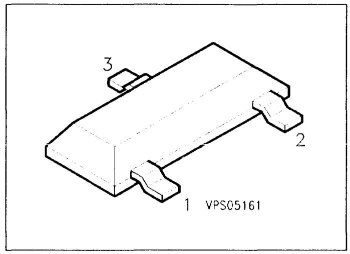


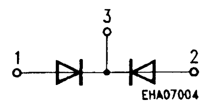
SIEMENS

Silicon Switching Diode Array

BAV 74

- For high-speed switching
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAV 74	JAs	Q62702-A693		SOT-23

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	50	V
Peak reverse voltage	V_{RM}	50	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 35 ˚C	P_{tot}	250	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

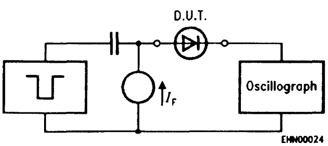
Parameter	Symbol	Values	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 600	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 460	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	50	–	–	V
Forward voltage I_F = 100 mA	V_F	–	–	1	
Reverse current V_R = 50 V V_R = 50 V, T_A = 150 °C	I_R	 – –	 – –	 0.1 100	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	4	ns

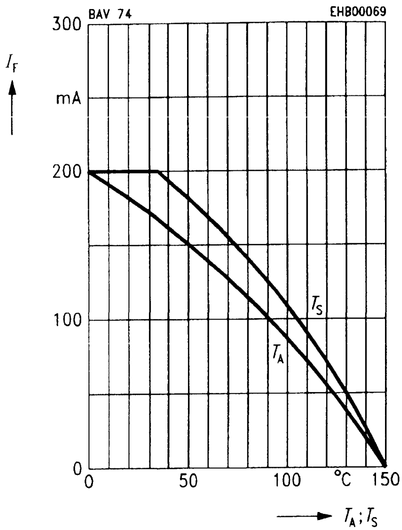
Test circuit for reverse recovery time



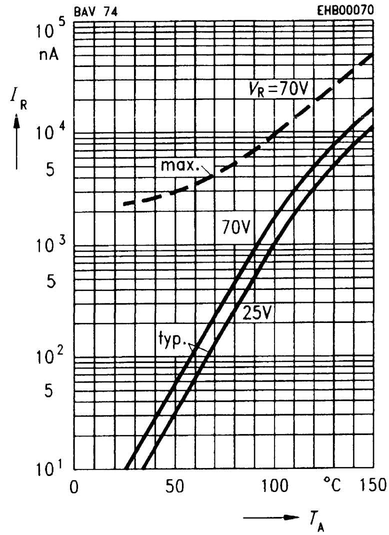
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

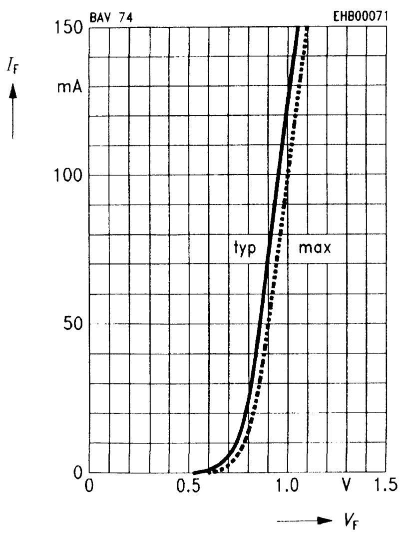
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



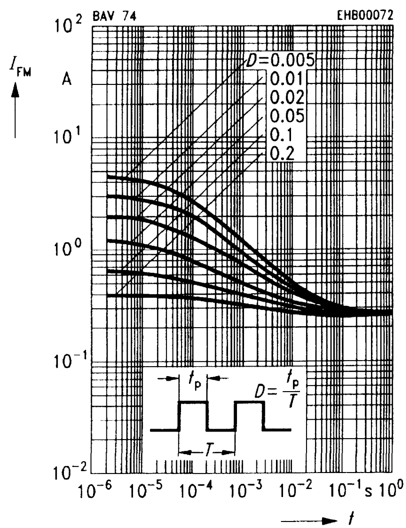
Reverse current $I_R = f(T_A)$



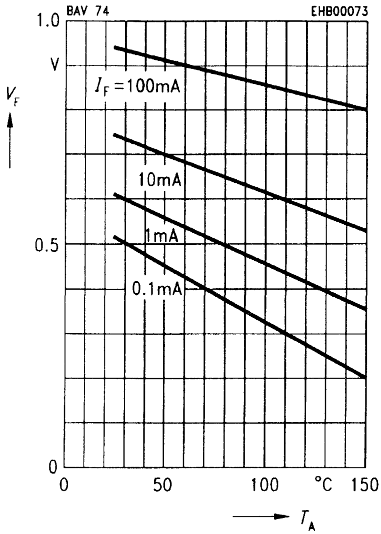
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

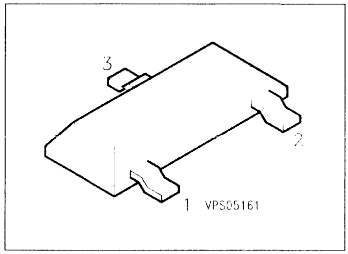


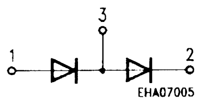
SIEMENS

Silicon Switching Diode Array

BAV 99

- For high-speed switching
- Connected in series



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAV 99	A7s	Q68000-A549		SOT-23

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 31 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

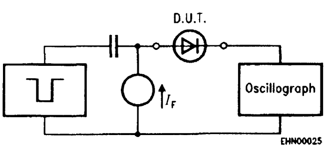
Junction - ambient[2]	$R_{th\,JA}$	≤ 500	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 360	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage	V_F				mV
I_F = 1 mA		–	–	715	
I_F = 10 mA		–	–	855	
I_F = 50 mA		–	–	1000	
I_F = 150 mA		–	–	1250	
Reverse current	I_R				µA
V_R = 70 V		–	–	2.5	
V_R = 25 V, T_A = 150 °C		–	–	30	
V_R = 70 V, T_A = 150 °C		–	–	50	
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	1.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

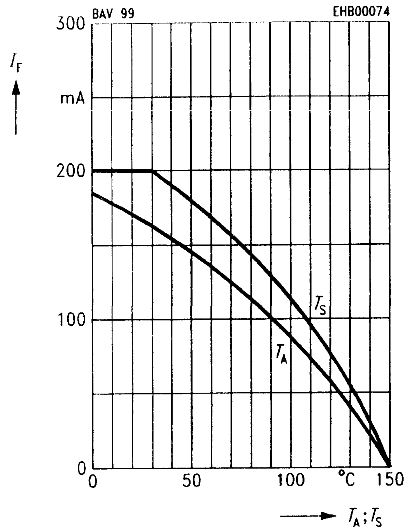
Test circuit for reverse recovery time



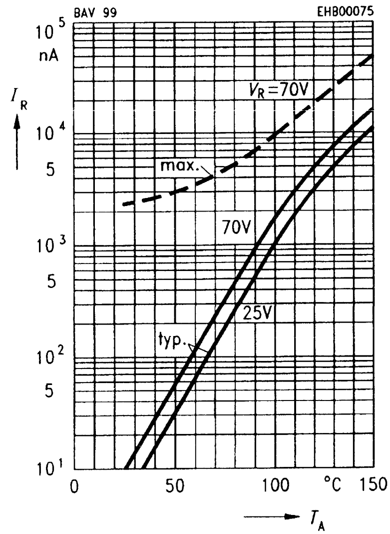
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

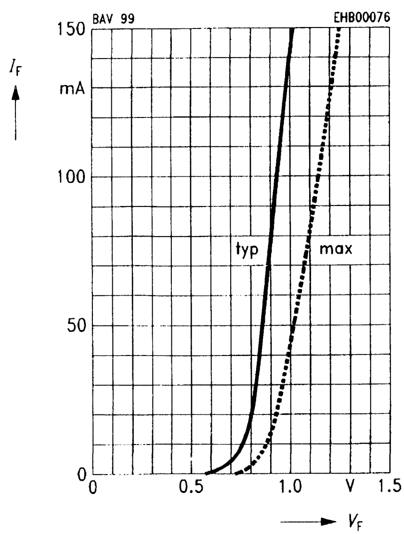
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



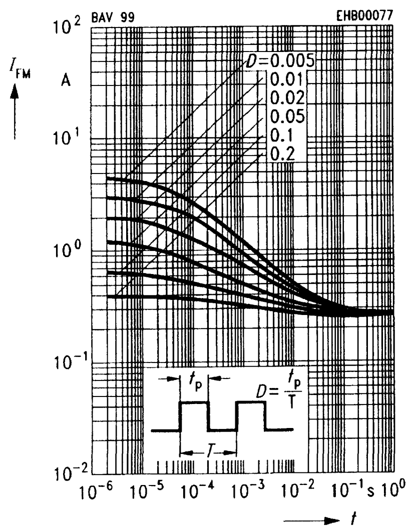
Reverse current $I_R = f(T_A)$



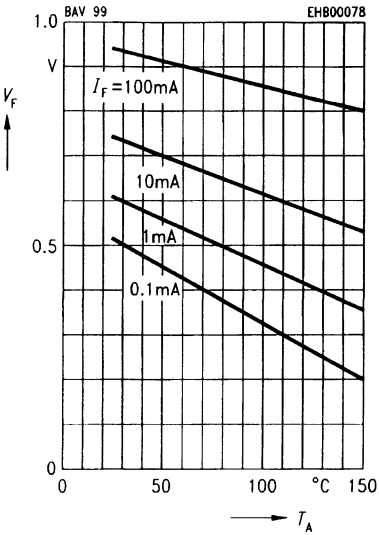
Forward current $I_F = f(V_F)$
$T_A = 25\ ^\circ C$



Peak forward current $I_{FM} = f(t)$
$T_A = 25\ ^\circ C$



Forward voltage $V_F = f(T_A)$

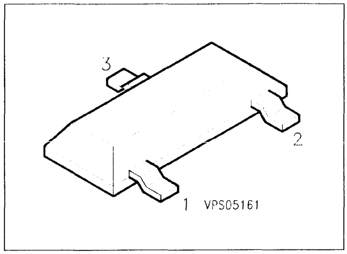


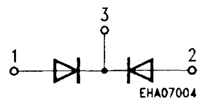
SIEMENS

Silicon Low Leakage Diode Array

BAV 170

- Low leakage applications
- Medium speed switching times
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAV 170	JXs	Q62702-A920		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 35 °C	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 600	K/W
Junction - soldering point	$R_{th JS}$	≤ 460	

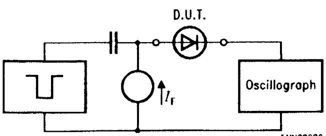
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics per Diode

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 μA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 900 1000 1100 1250	mV
Reverse current V_R = 70 V V_R = 70 V, T_A = 150 °C	I_R	 – –	 – –	 5 80	nA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	2	–	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	0.5	3	μs

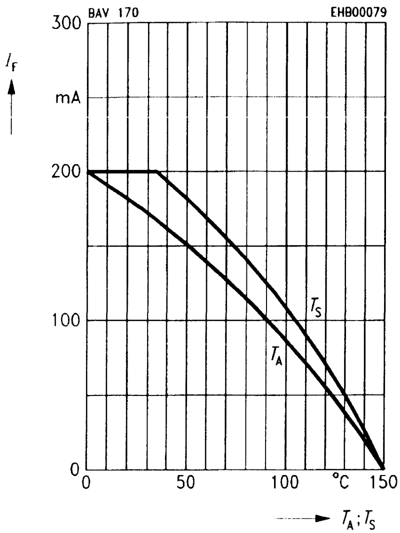
Test circuit for reverse recovery time



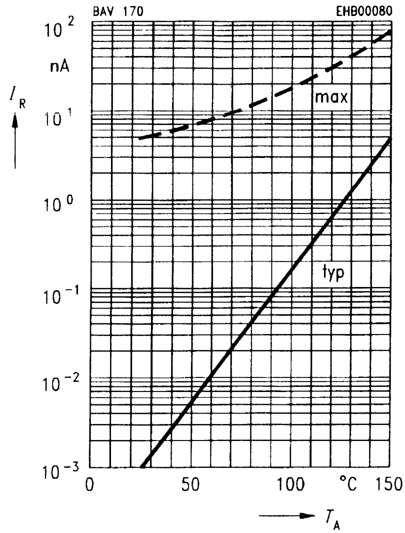
Pulse generator: t_p = 5 μs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

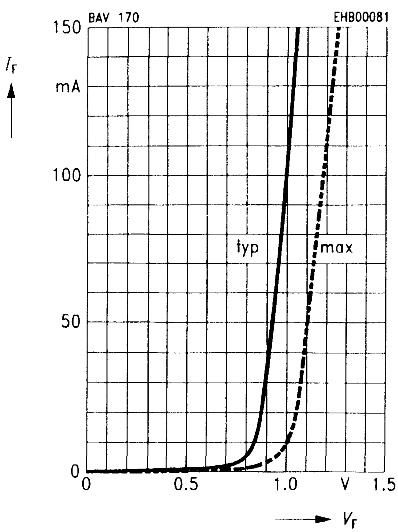
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



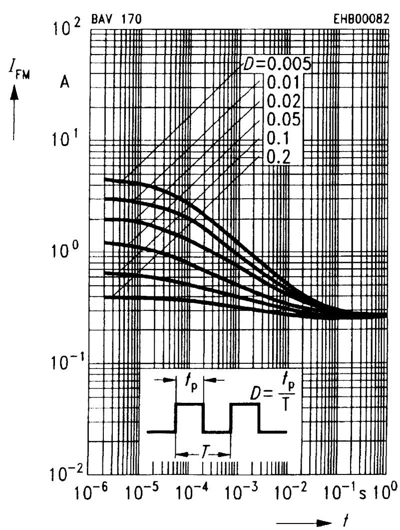
Reverse current $I_R = f(T_A)$



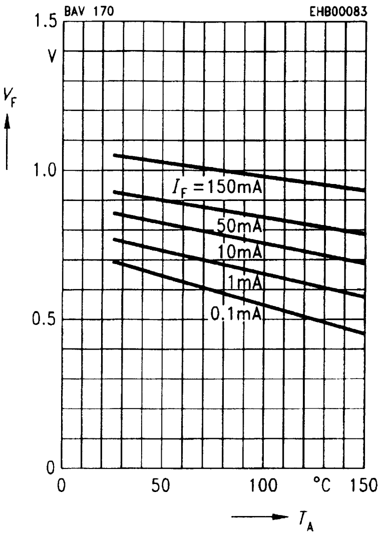
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$



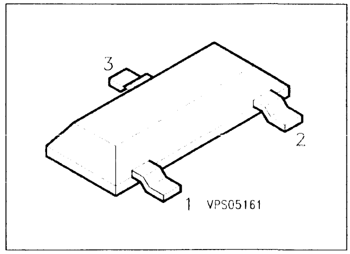
Forward voltage $V_F = f(T_A)$

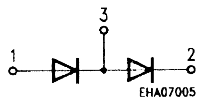


Silicon Low Leakage Diode Array

BAV 199

- Low-leakage applications
- Medium speed switching times
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAV 199	JYs	Q62702-A921		SOT-23

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 31 °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

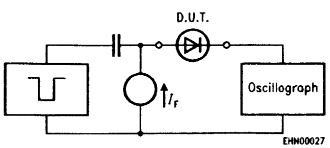
Junction - ambient[2]	$R_{th\,JA}$	≤ 500	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 360	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 900 1000 1100 1250	mV
Reverse current V_R = 70 V V_R = 70 V, T_A = 150 °C	I_R	 – –	 – –	 5 80	nA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	2	–	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	0.5	3	µs

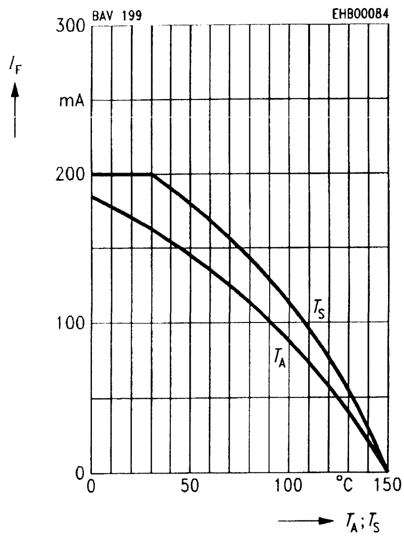
Test circuit for reverse recovery time



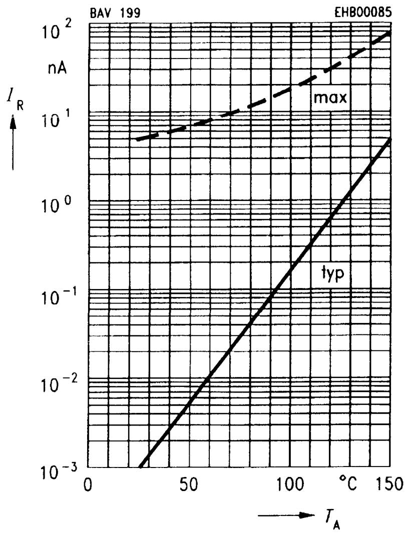
Pulse generator: t_p = 5 µs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

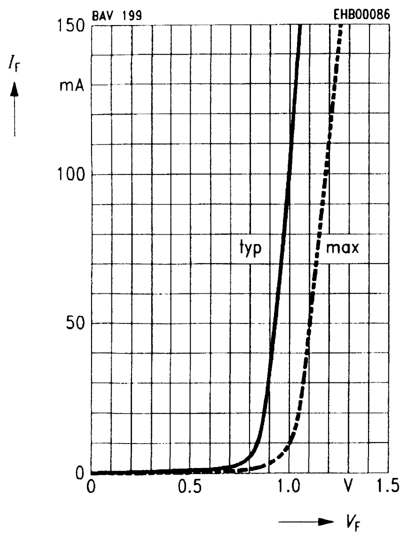
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



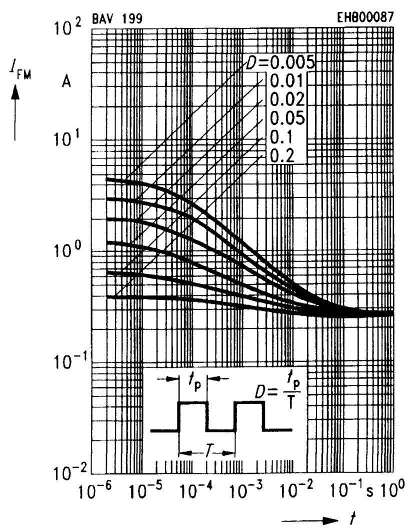
Reverse current $I_R = f(T_A)$



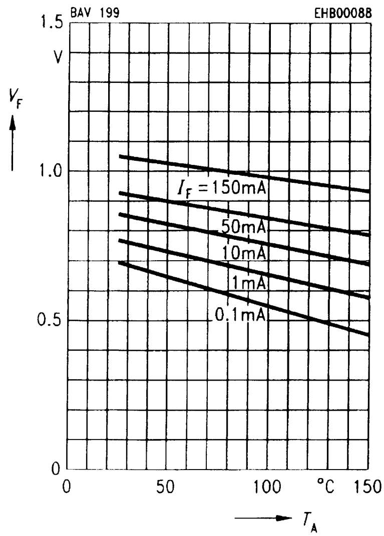
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$



Forward voltage $V_F = f(T_A)$

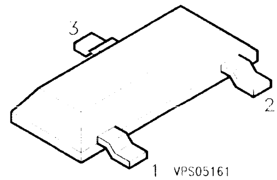


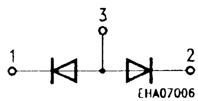
SIEMENS

Silicon Switching Diode Array

BAW 56

- For high-speed switching applications
- Common anode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAW 56	A1s	Q62702-A688		SOT-23

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 35 ˚C	P_{tot}	250	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

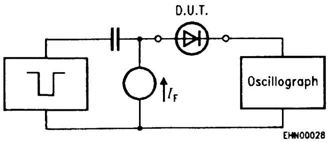
Junction - ambient[2)]	$R_{th\,JA}$	≤ 600	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 460	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 715 855 1000 1250	mV
Reverse current V_R = 70 V V_R = 25 V, T_A = 150 °C V_R = 70 V, T_A = 150 °C	I_R	 – – –	 – – –	 2.5 30 50	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

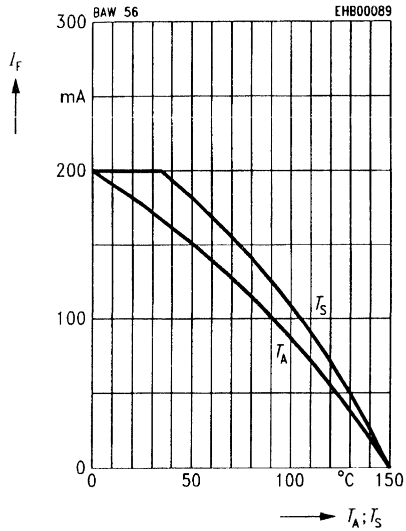
Test circuit for reverse recovery time



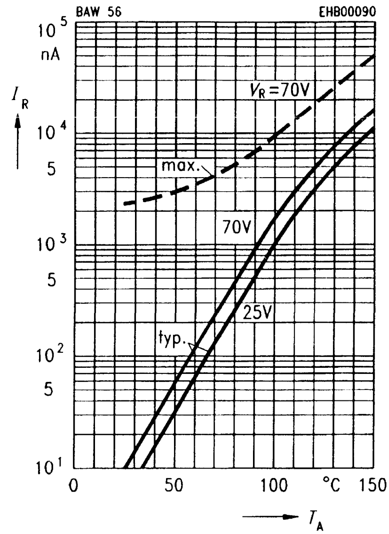
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

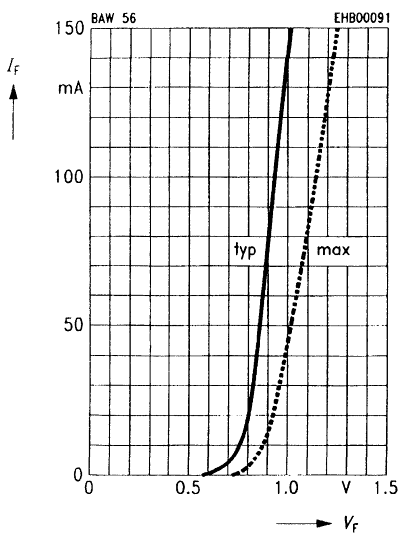
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



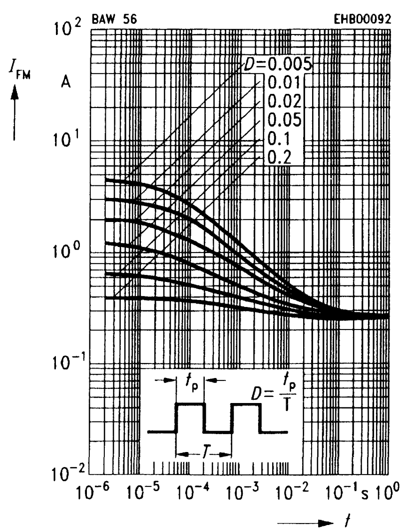
Reverse current $I_R = f(T_A)$



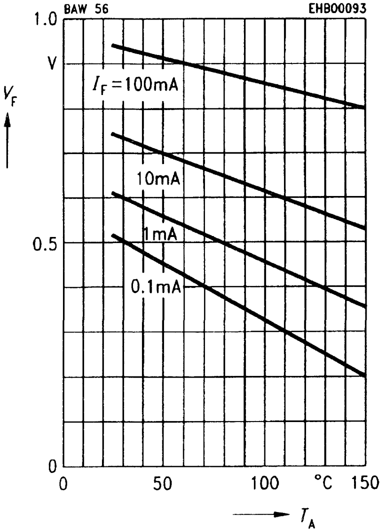
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f\,(T_A)$

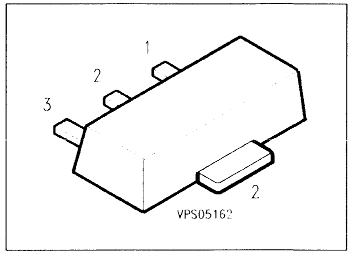


SIEMENS

Silicon Switching Diodes

BAW 78 A
... BAW 78 D

- Switching applications
- High breakdown voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAW 78 A BAW 78 B BAW 78 C BAW 78 D	GA GB GC GD	Q62702-A778 Q62702-A779 Q62702-A784 Q62702-A109		SOT-89

Maximum Ratings

Parameter	Symbol	Values				Unit
		BAW 78 A	BAW 78 B	BAW 78 C	BAW 78 D	
Reverse voltage	V_R	50	100	200	400	V
Peak reverse voltage	V_{RM}	50	100	200	400	
Forward current	I_F	1				A
Peak forward current	I_{FM}	1				
Surge forward current $t = 1$ µs	I_{FS}	10				
Total power dissipation $T_S = 125$ °C	P_{tot}	1				W
Junction temperature	T_j	150				°C
Storage temperature range	T_{stg}	– 65 ... + 150				

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 95	K/W
Junction - soldering point	$R_{th JS}$	≤ 25	

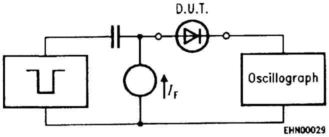
[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 μA	$V_{(BR)}$				V
BAW 78 A		50	–	–	
BAW 78 B		100	–	–	
BAW 78 C		200	–	–	
BAW 78 D		400	–	–	
Forward voltage[1]	V_F				V
I_F = 1 A		–	–	1.6	
I_F = 2 A		–	–	2	
Reverse current	I_R				μA
$V_R = V_{Rmax}$		–	–	1	
$V_R = V_{Rmax}$, T_A = 150 °C		–	–	50	
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 Ω measured at I_R = 20 mA	t_{rr}	–	1	–	μs

Test circuit for reverse recovery time

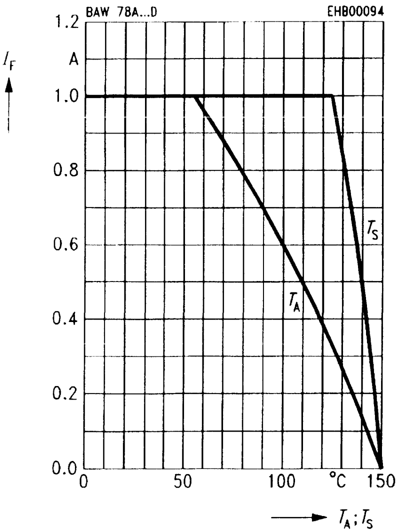


Pulse generator: t_p = 5 μs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

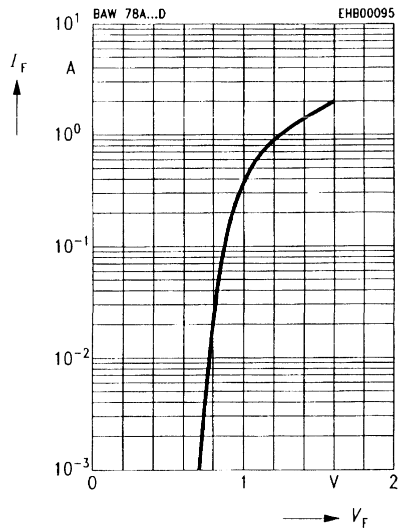
Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

[1] Pulse test: t_p < 300 μs, D = 2 %.

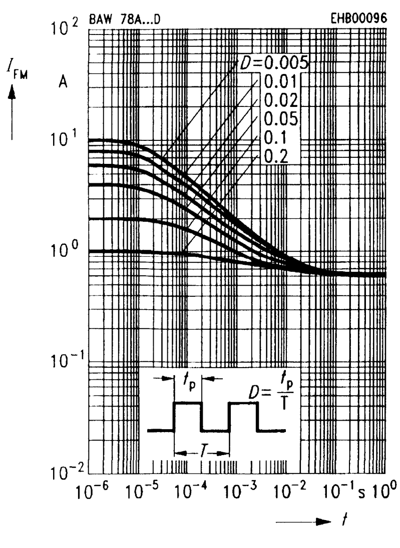
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



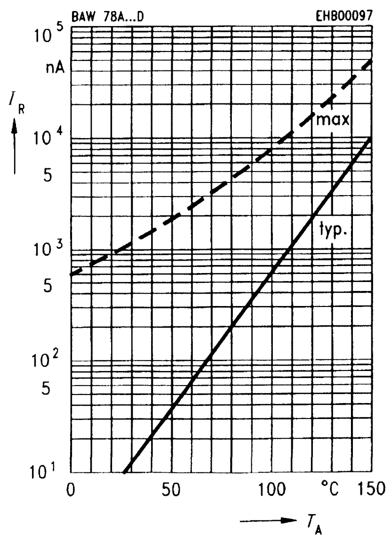
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Reverse current $I_R = f(T_A)$
$V_R = V_{R\,max}$

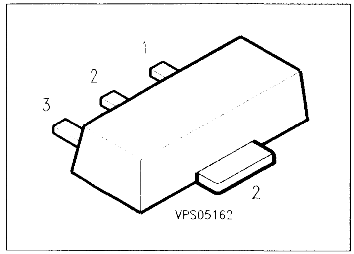


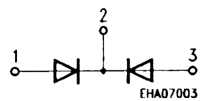
SIEMENS

Silicon Switching Diodes

BAW 79 A
... BAW 79 D

- For high-speed switching
- High breakdown voltage
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAW 79 A	GE	Q62702-A781		SOT-89
BAW 79 B	GF	Q62702-A782		
BAW 79 C	GG	Q62702-A771		
BAW 79 D	GH	Q62702-A733		

Maximum Ratings per Diode

Parameter	Symbol	Values				Unit
		BAW 79A	**BAW 79B**	**BAW 79C**	**BAW 79D**	
Reverse voltage	V_R	50	100	200	400	V
Peak reverse voltage	V_{RM}	50	100	200	400	
Forward current	I_F	1				A
Peak forward current	I_{FM}	1				
Surge forward current $t = 1$ µs	I_{FS}	10				
Total power dissipation $T_S = 115$ °C	P_{tot}	1				W
Junction temperature	T_j	150				°C
Storage temperature range	T_{stg}	– 65 ... + 150				

Thermal Resistance

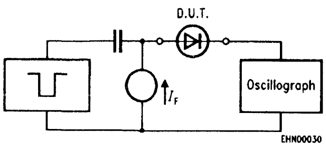
Junction - ambient[2)]	$R_{th JA}$	≤ 175	K/W
Junction - soldering point	$R_{th JS}$	≤ 35	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics per Diode
at T_A = 25 °C, unless otherwise specified.

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

Test circuit for reverse recovery time

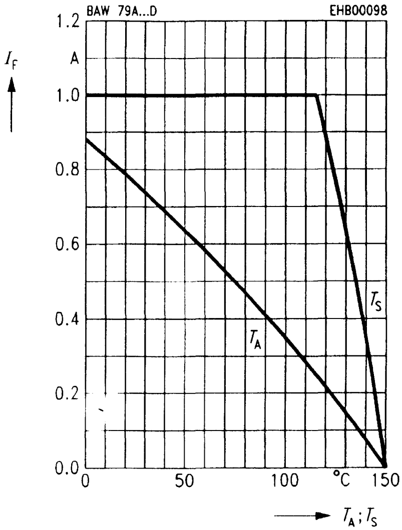


Pulse generator: t_p = 5 µs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

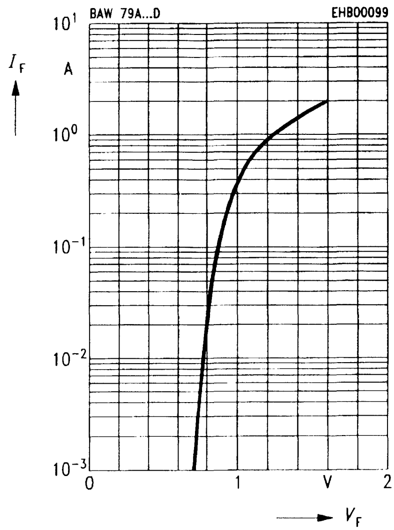
Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

1) Pulse test: $t_p \leq$ 300 µs, D = 2 %.

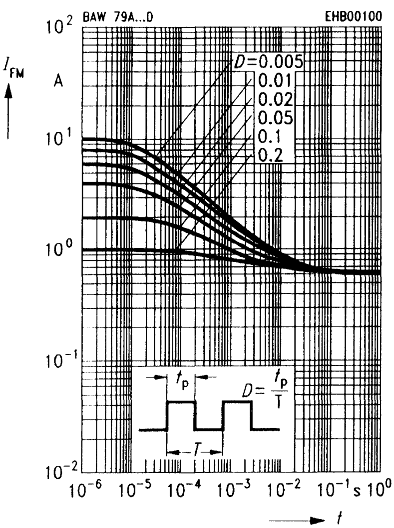
Forward current $I_F = f(T_A{}^*; T_S)$
* Package mounted on epoxy



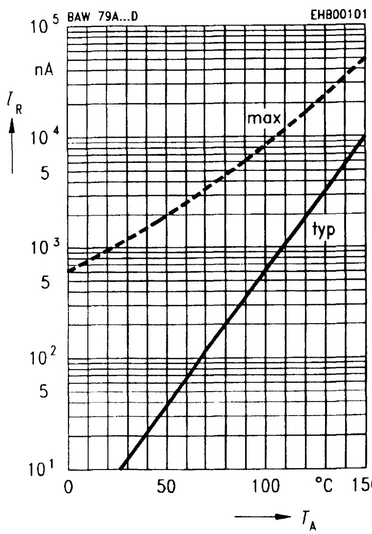
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



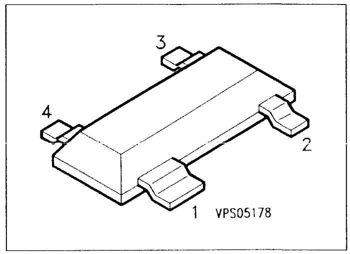
Reverse current $I_R = f(T_A)$
$V_R = V_{R\,max}$

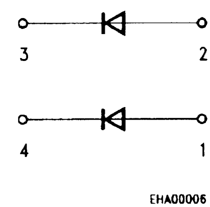


SIEMENS

Silicon Switching Diode Array **BAW 100**

- For high-speed switching
- Electrically insulated diodes



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAW 100	JSs	Q62702-A376		SOT-143

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	75	V
Peak reverse voltage	V_{RM}	85	
Forward current	I_F	200	mA
Surge forward current, $t = 1\ \mu s$	I_{FS}	4.5	A
Total power dissipation, $T_S = 31\ ^\circ C$	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

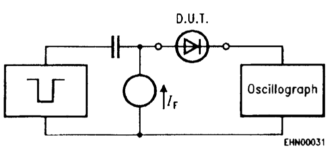
Parameter	Symbol	Values	Unit
Junction - ambient[2]	$R_{th JA}$	≤ 500	K/W
Junction - soldering point	$R_{th JS}$	≤ 360	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	85	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 715 855 1000 1250	mV
Reverse current V_R = 75 V V_R = 25 V, T_A = 150 °C V_R = 75 V, T_A = 150 °C	I_R	 – – –	 – – –	 1 30 50	µA
AC characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

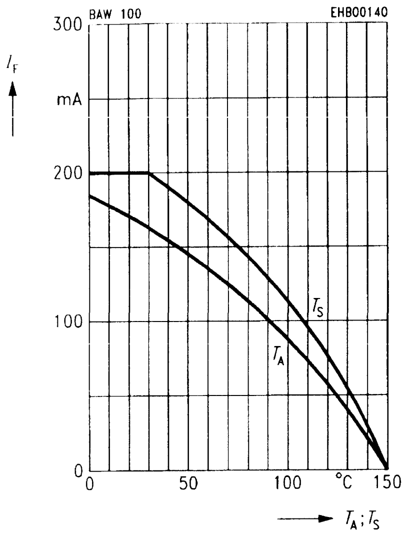
Test circuit for reverse recovery time



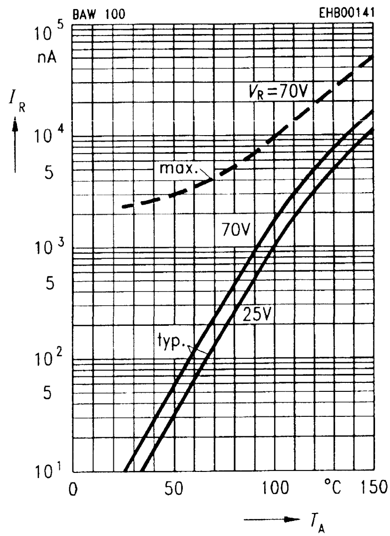
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C < 1 pF

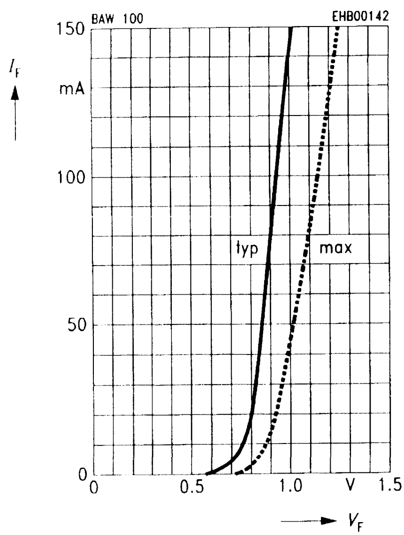
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



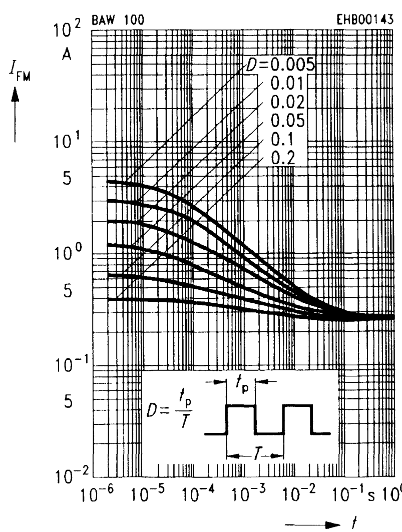
Reverse current $I_R = f(T_A)$



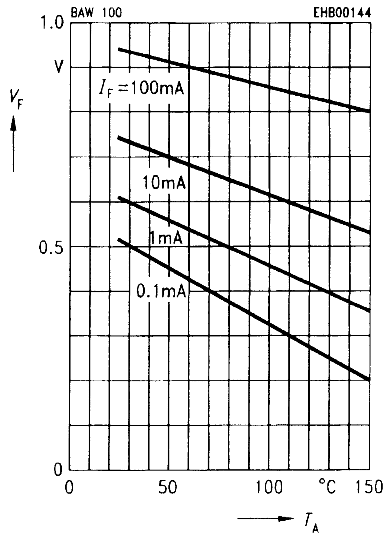
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

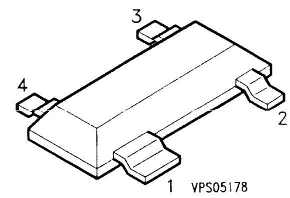


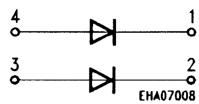
SIEMENS

Silicon Switching Diode Array

BAW 101

- Electrically insulated high-voltage medium-speed diodes



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BAW 101	JPs	Q62702-A712		SOT-143

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	300	V
Peak reverse voltage	V_{RM}	300	
Forward current	I_F	250	mA
Peak forward current	I_{FM}	500	
Surge forward current, $t = 1\ \mu s$	I_{FS}	4.5	A
Total power dissipation, $T_S \leq 35\ ^\circ C$	P_{tot}	350	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

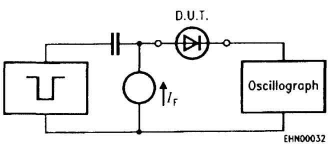
Junction - ambient[2]	$R_{th\,JA}$	$\leq$ 470	K/W
Junction - soldering point	$R_{th\,JS}$	$\leq$ 330	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	300	–	–	V
Forward voltage I_F = 100 mA	V_F	–	–	1.3	
Reverse current V_R = 250 V V_R = 250 V, T_A = 150 °C	I_R	 – –	 – –	 150 50	 nA µA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	6	–	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	1	–	µs

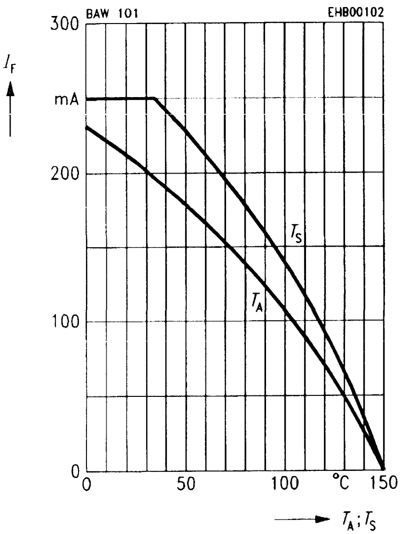
Test circuit for reverse recovery time



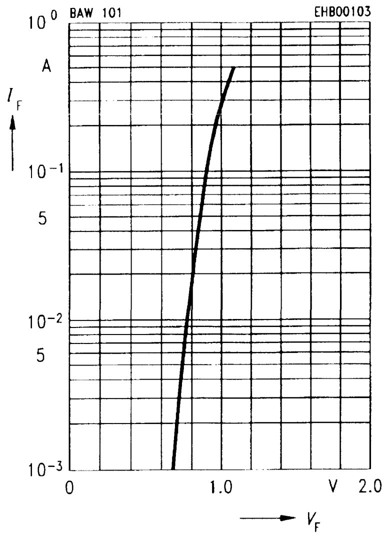
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

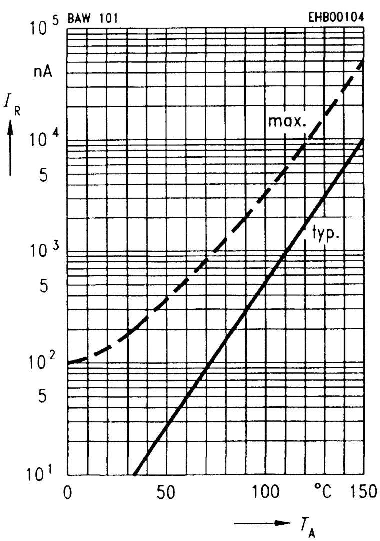
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



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



Reverse current $I_R = f(T_A)$

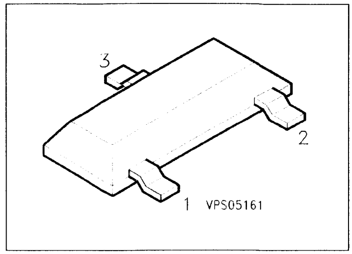


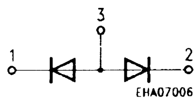
SIEMENS

Silicon Low Leakage Diode Array

BAW 156

- Low-leakage applications
- Medium speed switching times
- Common anode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BAW 156	JZs	Q62702-A922		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, t = 1 μs	I_{FS}	4.5	A
Total power dissipation, T_S = 35 °C	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

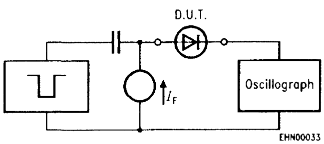
Junction - ambient[2)]	$R_{th JA}$	≤ 600	K/W
Junction - soldering point	$R_{th JS}$	≤ 460	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 10 mA I_F = 50 mA I_F = 150 mA	V_F	 – – – –	 – – – –	 900 1000 1100 1250	mV
Reverse current V_R = 70 V V_R = 70 V, T_A = 150 °C	I_R	 – –	 – –	 5 80	nA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	2	–	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	0.5	3	µs

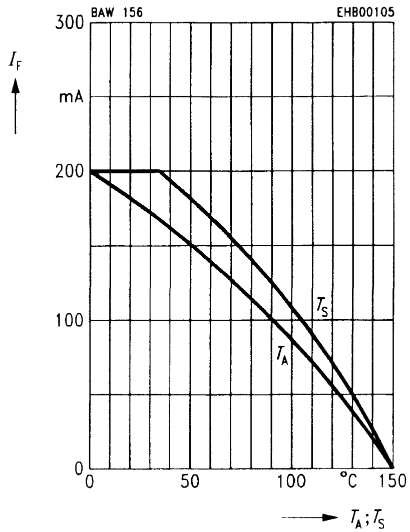
Test circuit for reverse recovery time



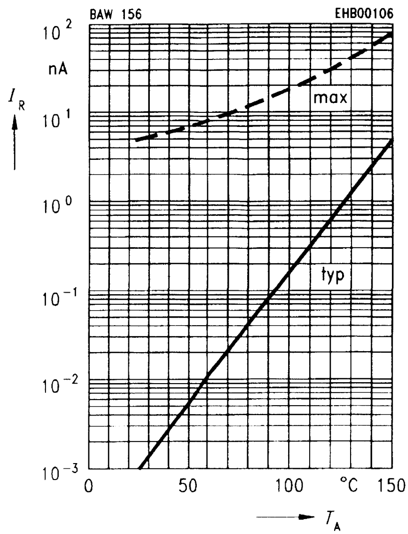
Pulse generator: t_p = 5 µs, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

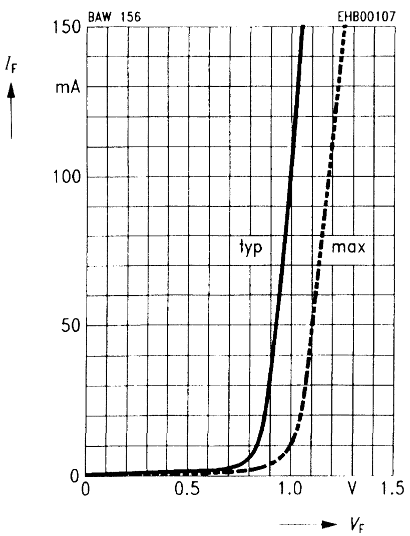
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



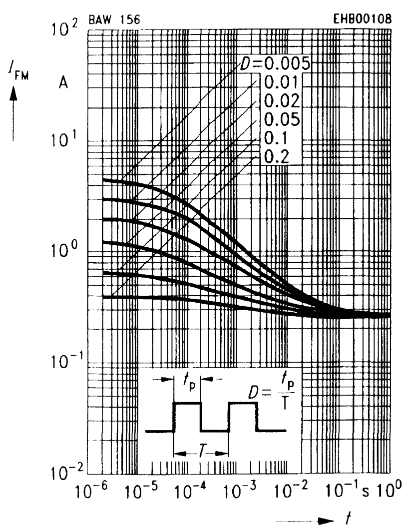
Reverse current $I_R = f(T_A)$



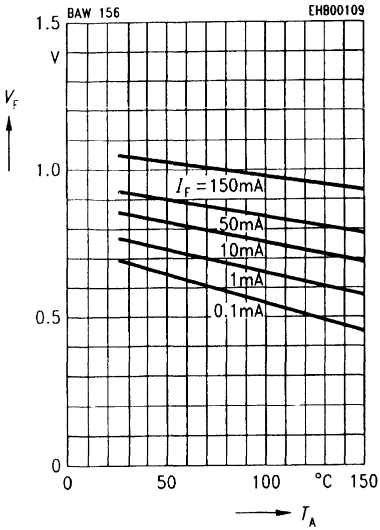
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$



Forward voltage $V_F = f(T_A)$

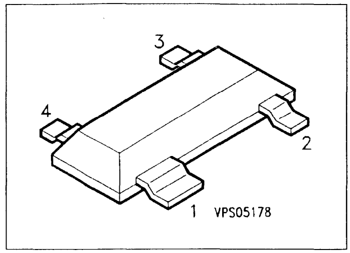


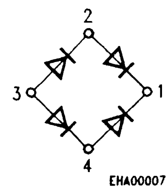
SIEMENS

Silicon Switching Diode Array

BGX 50 A

- Bridge configuration
- High-speed switch diode chip



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BGX 50 A	U1s	Q62702-G38		SOT-143

Maximum Ratings per Diode

Parameter	Symbol	Values	Unit
Surge reverse voltage	V_{RS}	50	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	140	mA
Total power dissipation, T_S = 74 ˚C	P_{tot}	210	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

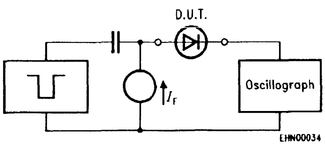
Junction - ambient[2)]	$R_{th\,JA}$	≤ 640	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 360	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Forward voltage per diode I_F = 100 mA	V_F	–	–	1.3	V
Reverse current per diode V_R = 50 V V_R = 50 V, T_A = 150 °C	I_R	 – –	 – –	 0.2 100	µA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	–	1.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	6	ns

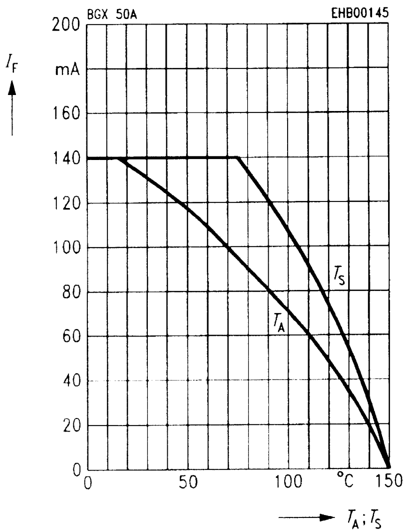
Test circuit for reverse recovery time



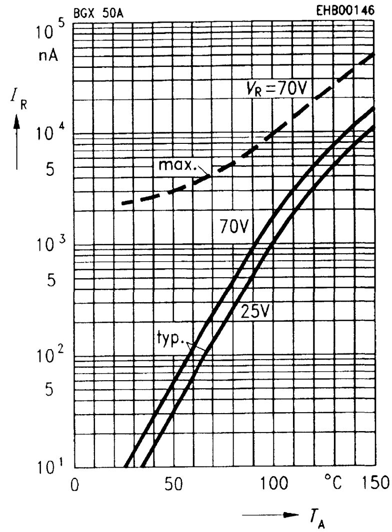
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

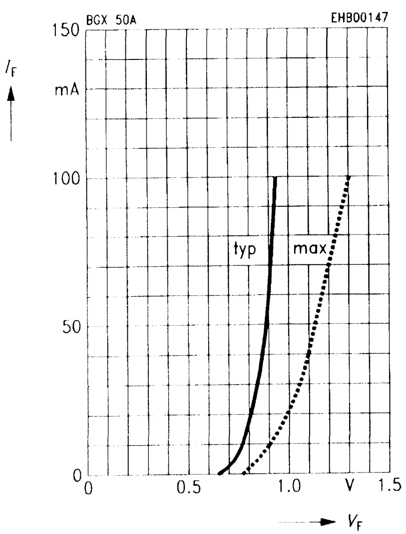
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



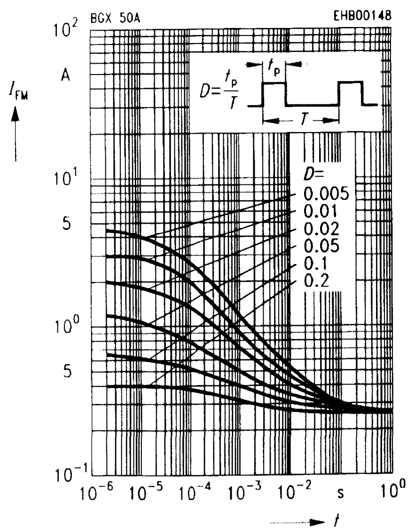
Reverse current $I_R = f(T_A)$



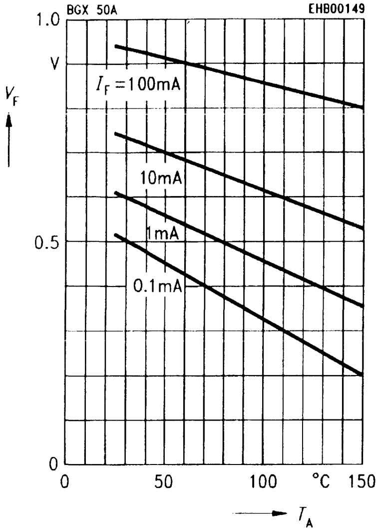
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f\,(T_A)$

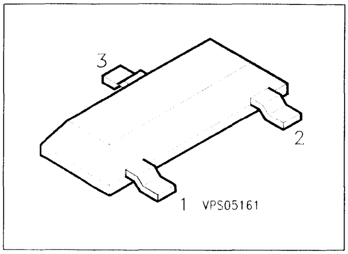


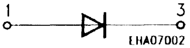
SIEMENS

Silicon Switching Diode

SMBD 914

- For high-speed switching applications



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
SMBD 914	s5D	Q68000-A625		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	100	
Forward current	I_F	250	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 °C	P_{tot}	370	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 330	K/W
Junction - soldering point	$R_{th JS}$	≤ 260	

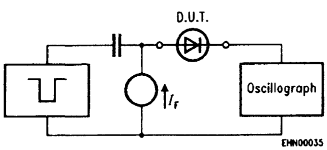
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	100	–	–	V
Forward voltage I_F =100 mA	V_F	–	–	1	V
Reverse current	I_R				
V_R = 20 V		–	–	25	nA
V_R = 75 V		–	–	5	µA
V_R = 20 V; T_A = 150 °C		–	–	30	µA
V_R = 75 V; T_A = 150 °C		–	–	50	µA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA V_R = 1 V, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	4	ns

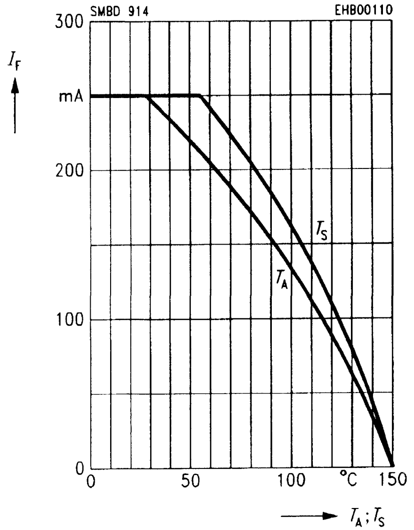
Test circuit for reverse recovery time



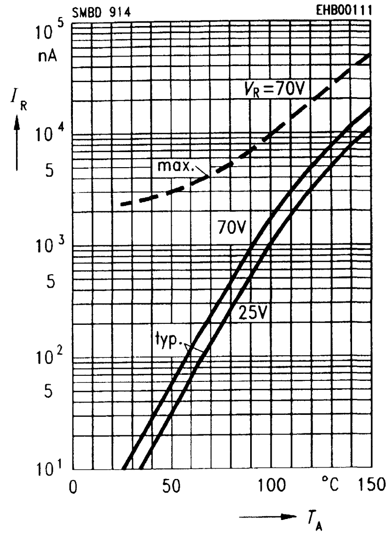
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

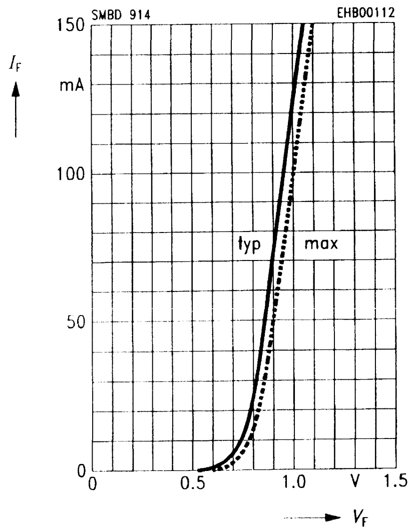
Forward current $I_F = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



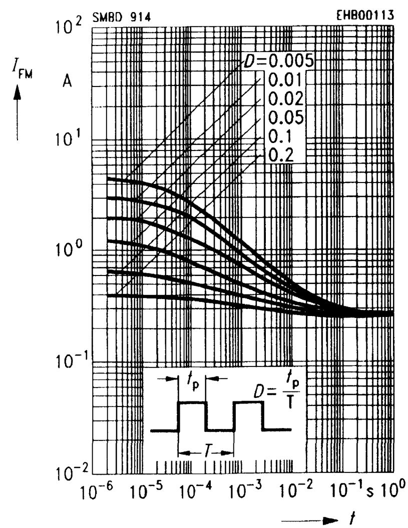
Reverse current $I_R = f\,(T_A)$



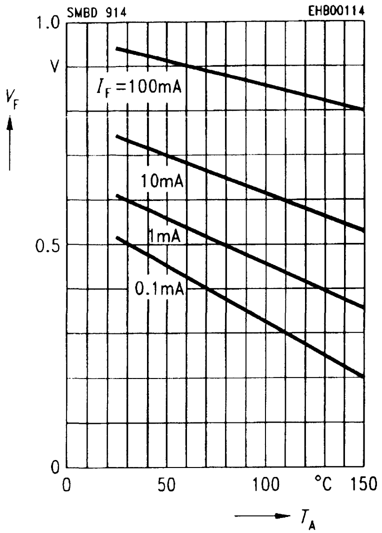
Forward current $I_F = f\,(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f\,(t)$
T_A = 25 °C



Forward voltage $V_F = f\,(T_A)$

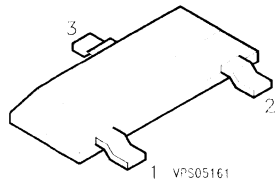


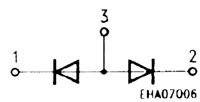
SIEMENS

Silicon Switching Diode Array

SMBD 2835
SMBD 2836

- For high-speed switching applications
- Common anode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
SMBD 2835 SMBD 2836	sA3 sA2	Q68000-A8547 Q68000-A8436		SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBD 2835	Values SMBD 2836	Unit
Reverse voltage	V_R	30	50	V
Peak reverse voltage	V_{RM}	75	75	
Forward current	I_F	200		mA
Surge forward current, t = 1 µs	I_{FS}	4.5		A
Total power dissipation, T_S = 35 °C	P_{tot}	250		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

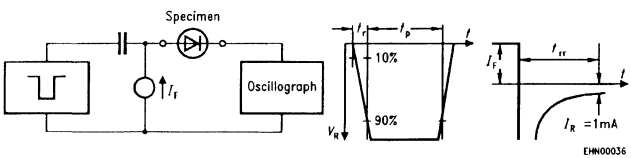
Parameter	Symbol	Values	Unit
Junction - ambient[2)]	$R_{th JA}$	$<$ 600	K/W
Junction - soldering point	$R_{th JS}$	$\leq$ 460	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Breakdown voltage		$V_{(BR)}$				V
$I_{(BR)}$ = 100 μA	SMBD 2835		75	–	–	
	SMBD 2836		75	–	–	
Forward voltage		V_F				mV
I_F = 10 mA			–	–	855	
I_F = 50 mA			–	–	1000	
I_F = 100 mA			–	–	1200	
Reverse current		I_R				nA
V_R = 30 V	SMBD 2835		–	–	100	
V_R = 50 V	SMBD 2836		–	–	100	
AC characteristics						
Diode capacitance V_R = 0, f = 1 MHz		C_D	–	–	4	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA		t_{rr}	–	–	6	ns

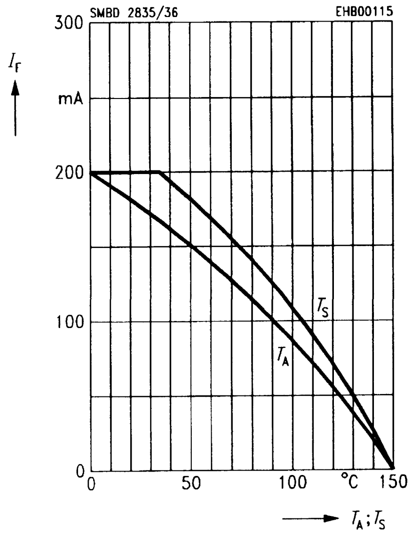
Test circuit for reverse recovery time



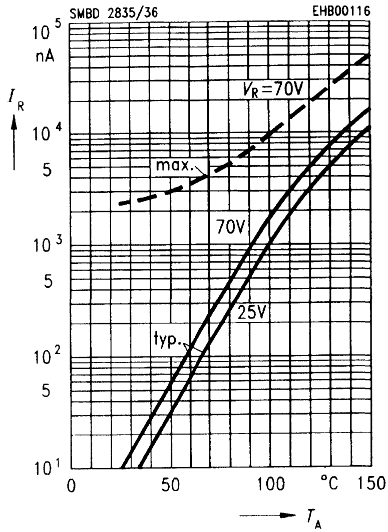
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

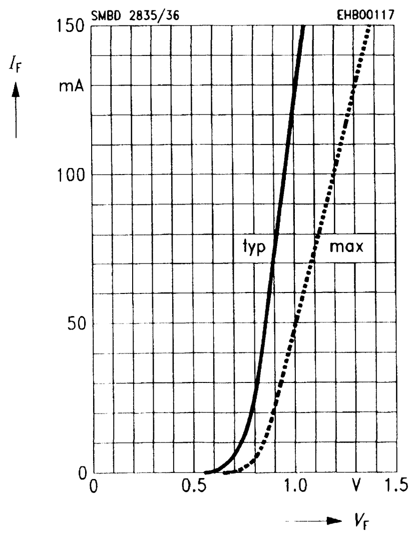
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



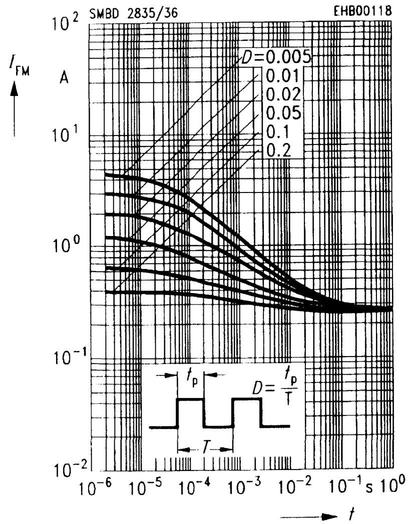
Reverse current $I_R = f(T_A)$



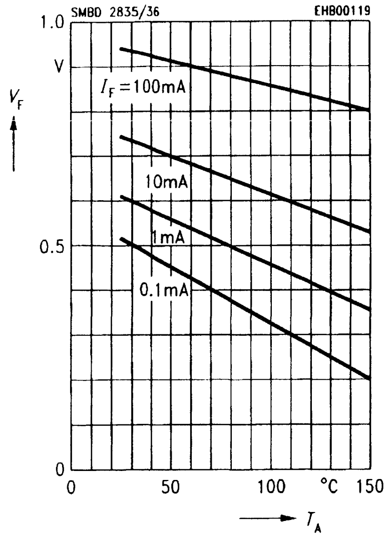
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

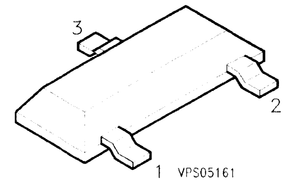


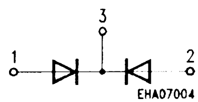
SIEMENS

Silicon Switching Diode Array

SMBD 2837
SMBD 2838

- For high-speed switching applications
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
SMBD 2837 SMBD 2838	sA5 sA4	Q68000-A8487 Q68000-A8437		SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBD 2837	SMBD 2838	Unit
Reverse voltage	V_R	30	50	V
Peak reverse voltage	V_{RM}	75	75	
Forward current	I_F	200		mA
Surge forward current, t = 1 µs	I_{FS}	4.5		A
Total power dissipation, T_S = 35 ˚C	P_{tot}	250		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

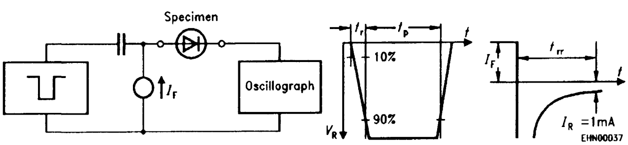
Junction - ambient[2]	$R_{th\,JA}$	≤ 600	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 460	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Breakdown voltage		$V_{(BR)}$				V
$I_{(BR)}$ = 100 µA	SMBD 2837		75	–	–	
	SMBD 2838		75	–	–	
Forward voltage		V_F				mV
I_F = 10 mA			–	–	855	
I_F = 50 mA			–	–	1000	
I_F = 100 mA			–	–	1200	
Reverse current		I_R				nA
V_R = 30 V	SMBD 2837		–	–	100	
V_R = 50 V	SMBD 2838		–	–	100	
AC characteristics						
Diode capacitance V_R = 0, f = 1 MHz		C_D	–	–	4	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA		t_{rr}	–	–	6	ns

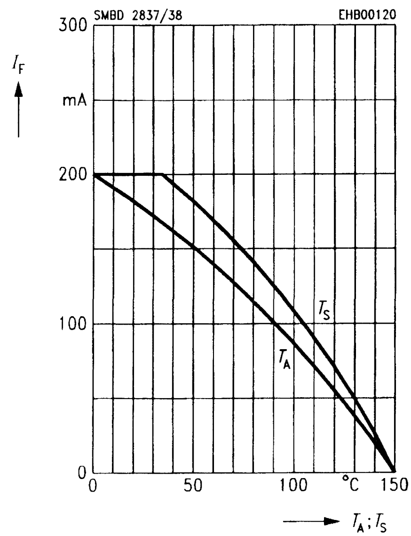
Test circuit for reverse recovery time



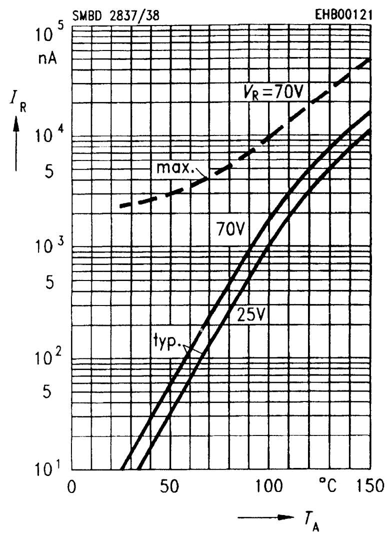
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

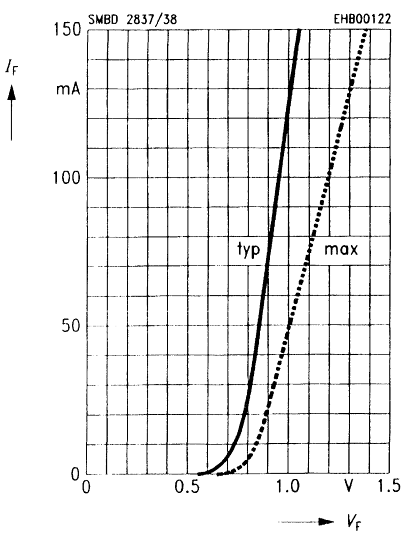
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



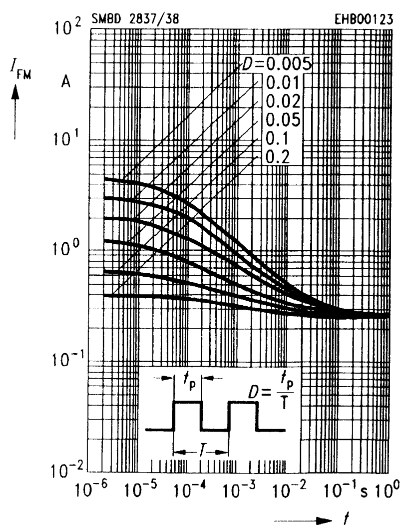
Reverse current $I_R = f(T_A)$



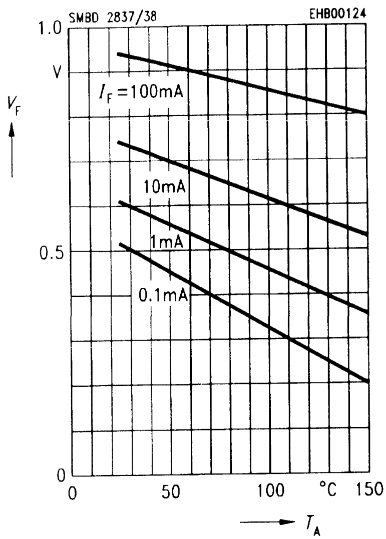
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

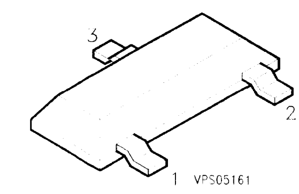


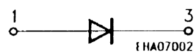
SIEMENS

Silicon Switching Diode

SMBD 6050

- For high-speed switching applications



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
SMBD 6050	s5A	Q68000-A8439		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	250	mA
Surge forward current, t = 1 μs	I_{FS}	4.5	A
Total power dissipation, T_S = 54 °C	P_{tot}	370	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 330	K/W
Junction - soldering point	$R_{th JS}$	≤ 260	

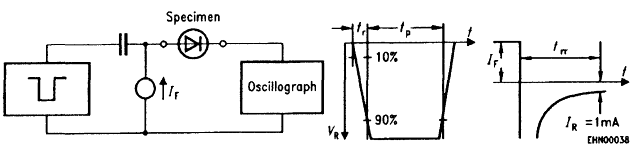
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 100 mA	V_F	 550 850	 – –	 700 1100	mV
Reverse current V_R = 50 V	I_R	–	–	100	nA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	–	2.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	10	ns

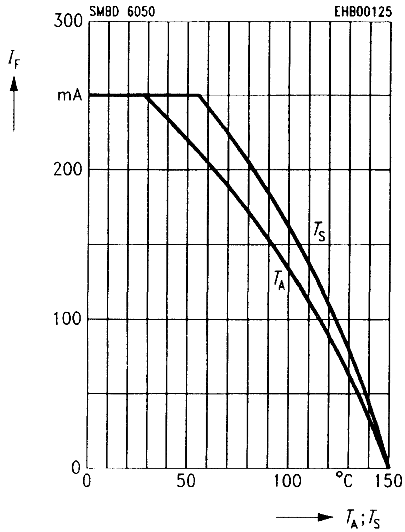
Test circuit for reverse recovery time



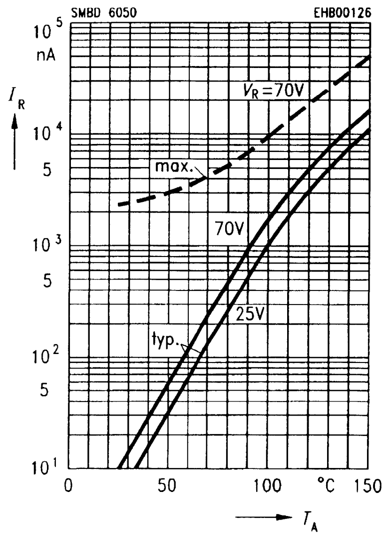
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

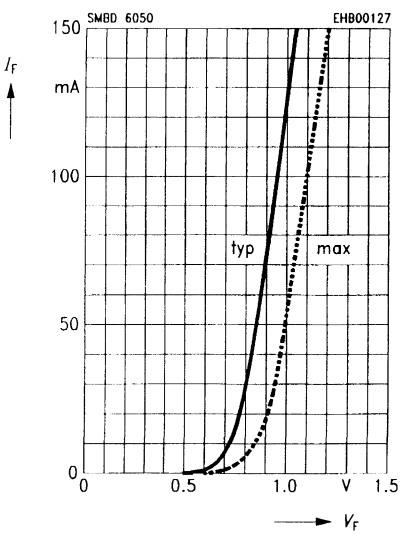
Forward current $I_F = f(T_A^*; T_S)$
* Package mounted on epoxy



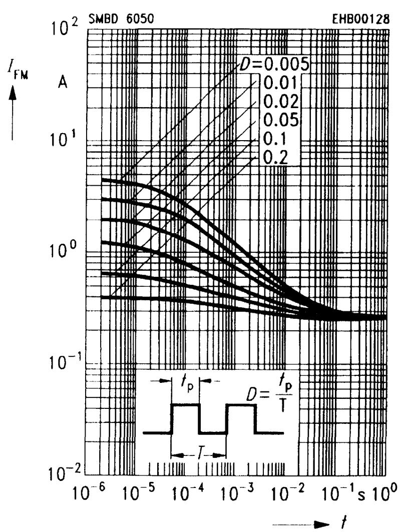
Reverse current $I_R = f(T_A)$



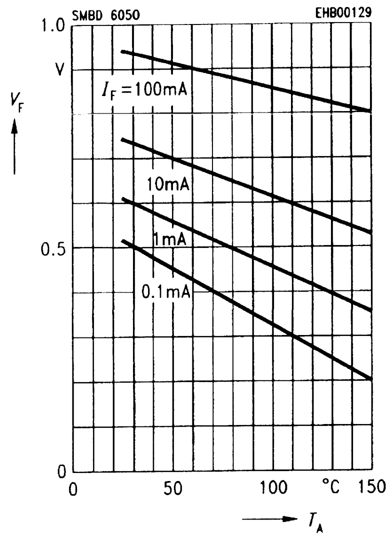
Forward current $I_F = f(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$

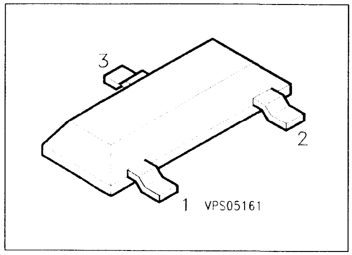


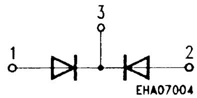
SIEMENS

Silicon Switching Diode Array

SMBD 6100

- For high-speed switching applications
- Common cathode



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
SMBD 6100	s5B	Q68000-A8438		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	70	V
Peak reverse voltage	V_{RM}	70	
Forward current	I_F	200	mA
Surge forward current, $t = 1\ \mu s$	I_{FS}	4.5	A
Total power dissipation, $T_S = 35\ ^\circ C$	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

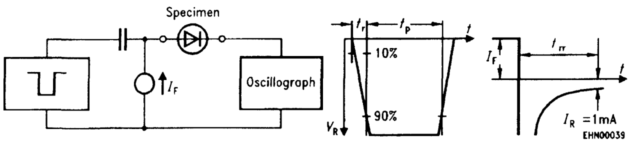
Parameter	Symbol	Values	Unit
Junction - ambient[2]	$R_{th JA}$	≤ 600	K/W
Junction - soldering point	$R_{th JS}$	≤ 460	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	70	–	–	V
Forward voltage I_F = 1 mA I_F = 100 mA	V_F	 550 850	 – –	 700 1100	mV
Reverse current V_R = 50 V	I_R	–	–	100	nA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	–	2.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	–	–	15	ns

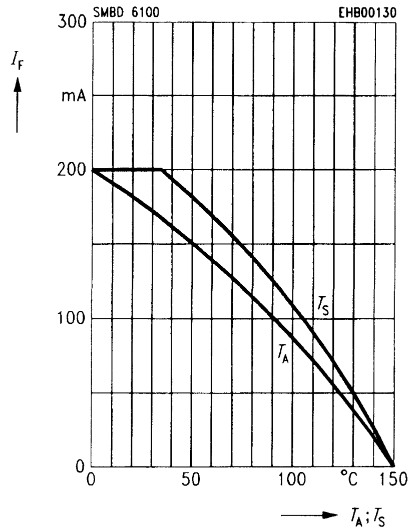
Test circuit for reverse recovery time



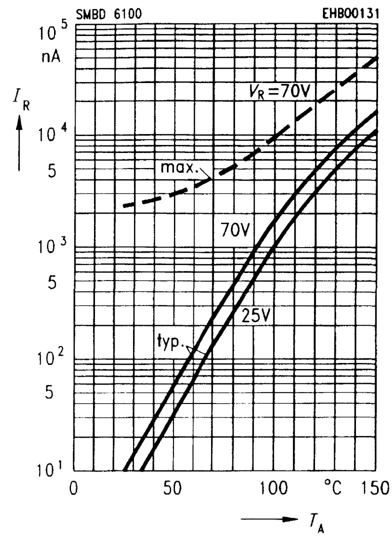
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
$C \leq$ 1 pF

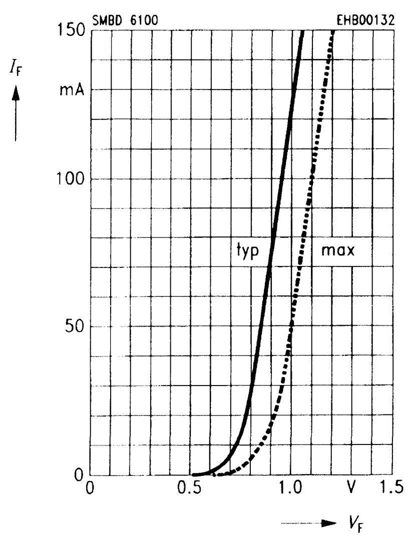
Forward current $I_F = f(T_A{}^*; T_S)$
* Package mounted on epoxy



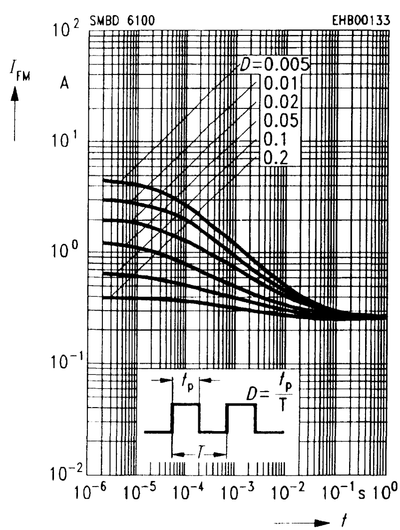
Reverse current $I_R = f(T_A)$



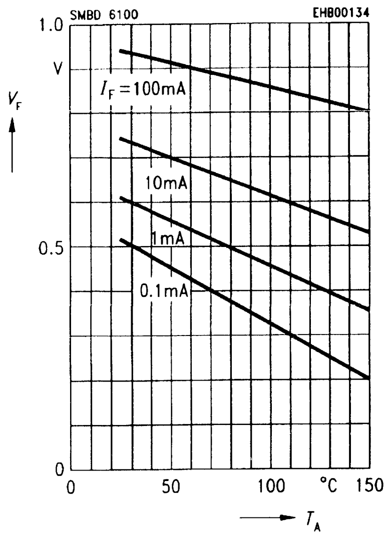
Forward current $I_F = f(V_F)$
$T_A = 25\ ^\circ C$



Peak forward current $I_{FM} = f(t)$
$T_A = 25\ ^\circ C$



Forward voltage $V_F = f\,(T_A)$

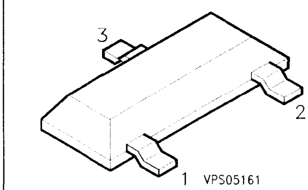


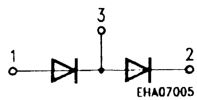
SIEMENS

Silicon Switching Diode Array

SMBD 7000

- For high-speed switching applications
- Connected in series



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
SMBD 7000	s5C	Q68000-A8440		SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Reverse voltage	V_R	100	V
Peak reverse voltage	V_{RM}	100	
Forward current	I_F	200	mA
Surge forward current, t = 1 µs	I_{FS}	4.5	A
Total power dissipation, T_S = 31 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

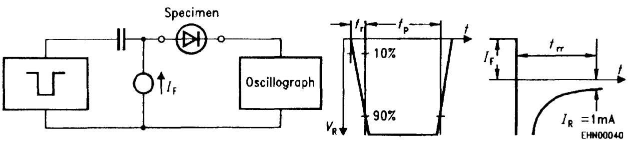
Junction - ambient[2]	$R_{th JA}$	≤ 500	K/W
Junction - soldering point	$R_{th JS}$	≤ 360	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Breakdown voltage	$V_{(BR)}$	100	–	–	V
Forward voltage	V_F				mV
I_F = 1 mA		550	–	700	
I_F = 10 mA		670	–	820	
I_F = 100 mA		750	–	1100	
Reverse current	I_R				
V_R = 50 V		–	–	300	nA
V_R = 100 V		–	–	500	nA
V_R = 50 V, T_A = 125 °C		–	–	100	µA
AC characteristics					
Diode capacitance V_R = 0, f = 1 MHz	C_D	–	–	2	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, R_L = 100 Ω	t_{rr}	–	–	15	ns

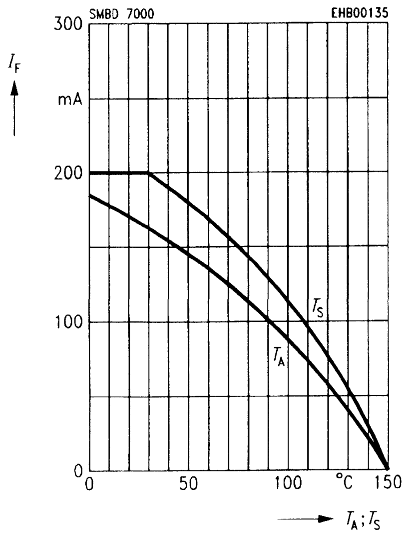
Test circuit for reverse recovery time



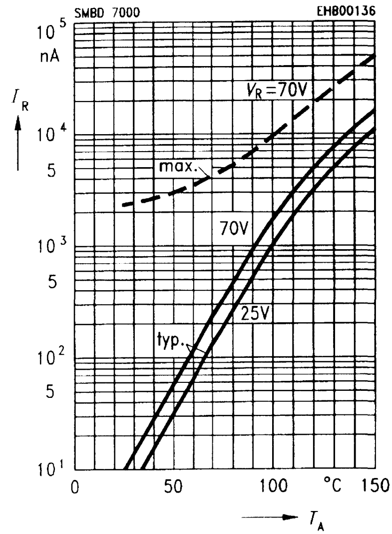
Pulse generator: t_p = 100 ns, D = 0.05
t_r = 0.6 ns, R_i = 50 Ω

Oscillograph: R = 50 Ω
t_r = 0.35 ns
C ≤ 1 pF

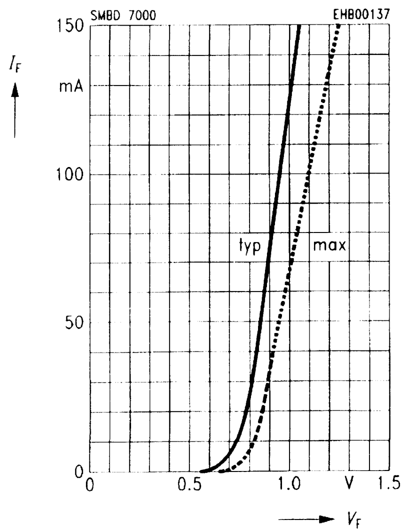
Forward current $I_F = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



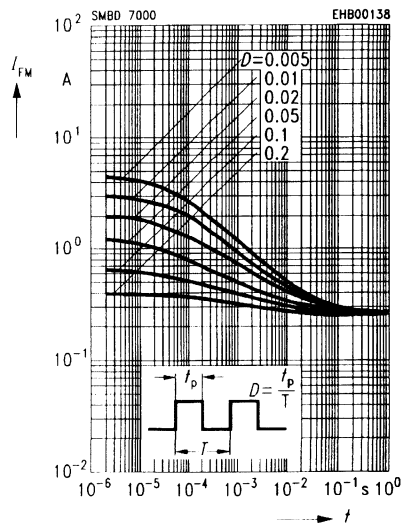
Reverse current $I_R = f\,(T_A)$



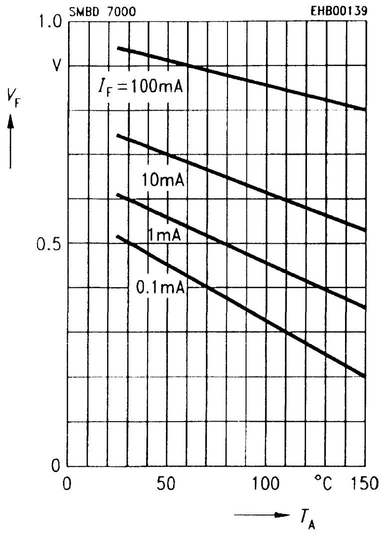
Forward current $I_F = f\,(V_F)$
T_A = 25 °C



Peak forward current $I_{FM} = f\,(t)$
T_A = 25 °C



Forward voltage $V_F = f(T_A)$



NF-Transistoren

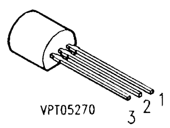
AF Transistors

SIEMENS

NPN Silicon AF Transistors

BC 167
... BC 169

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 257, BC 258, BC 259 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 167	–	Q62702-C706	E	C	B	TO-92
BC 167 A		Q62702-C74				
BC 167 B		Q62702-C75				
BC 168		Q62702-C707				
BC 168 A		Q62702-C76				
BC 168 B		Q62702-C77				
BC 168 C		Q62702-C78				
BC 169		Q62702-C708				
BC 169 B		Q62702-C79				
BC 169 C		Q62702-C80				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 167	BC 168	BC 169	Unit
Collector-emitter voltage	V_{CEO}	45	20	20	V
Collector-base voltage	V_{CBO}	50	30	30	
Emitter-base voltage	V_{EBO}	6	5	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 70 °C	P_{tot}	500			mW
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 250	K/W
Junction - case [1]	$R_{th JC}$	≤ 160	

1) Mounted on Al-heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA BC 167 BC 168 BC 169	$V_{(BR)CE0}$	 45 20 20	 – – –	 – – –	V
Collector-base breakdown voltage I_C = 10 μA BC 167 BC 168 BC 169	$V_{(BR)CB0}$	 50 30 30	 – – –	 – – –	
Emitter-base breakdown voltage I_E = 1 μA BC 167 BC 168, BC 169	$V_{(BR)EB0}$	 6 5	 – –	 – –	
Collector cutoff current V_{CB} = 30 V V_{CB} = 30 V, T_A = 150 °C	I_{CB0}	 – –	 – –	 15 4	 nA μA
DC current gain I_C = 10 μA; V_{CE} = 5 V BC 167 A, BC 168 A BC 167 B, BC 168 B, BC 169 B BC 168 C, BC 169 C I_C = 2 mA; V_{CE} = 5 V BC 167 A, BC 168 A BC 167 B, BC 168 B, BC 169 B BC 168 C, BC 169 C	h_{FE}	 – – – 110 200 420	 90 150 270 180 290 520	 – – – 220 450 800	–
Collector-emitter saturation voltage [1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{CEsat}	 – –	 90 200	 250 600	mV
Base-emitter saturation voltage [1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{BEsat}	 – –	 700 900	 – –	
Base-emitter voltage I_C = 2 mA; V_{CE} = 5 V I_C = 10 mA; V_{CE} = 5 V	$V_{BE (on)}$	 580 –	 660 –	 700 770	

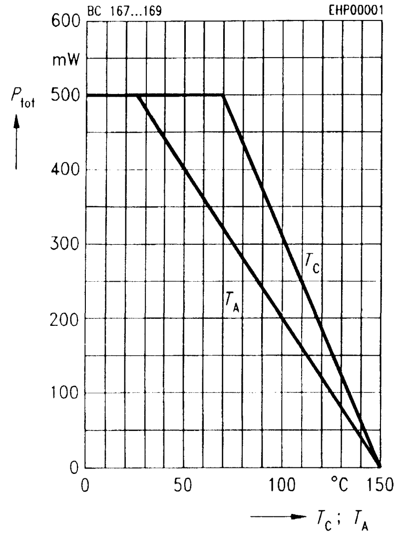
[1] Pulse test: $t \leq 300$ μs, $D \leq 2$ %.

Electrical Characteristics

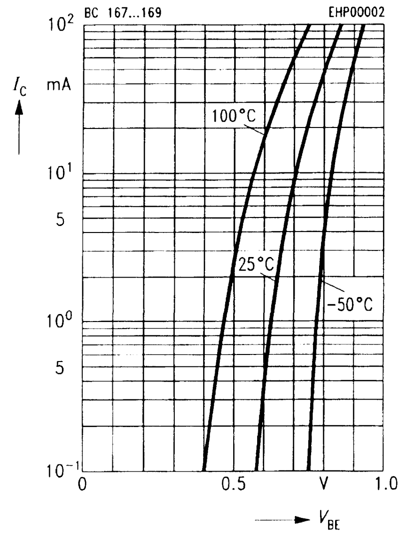
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 167 A, BC 168 A		–	2.7	–	
BC 167 B, BC 168 B, BC 169 B		–	4.5	–	
BC 168 C, BC 169 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 167 A, BC 168 A		–	1.5	–	
BC 167 B, BC 168 B, BC 169 B		–	2	–	
BC 168 C, BC 169 C		–	3	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 167 A, BC 168 A		–	200	–	
BC 167 B, BC 168 B, BC 169 B		–	330	–	
BC 168 C, BC 169 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				μS
BC 167 A, BC 168 A		–	18	–	
BC 167 B, BC 168 B, BC 169 B		–	30	–	
BC 168 C, BC 169 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F				dB
BC 167, BC 168		–	2	–	
BC 169		–	1	4	

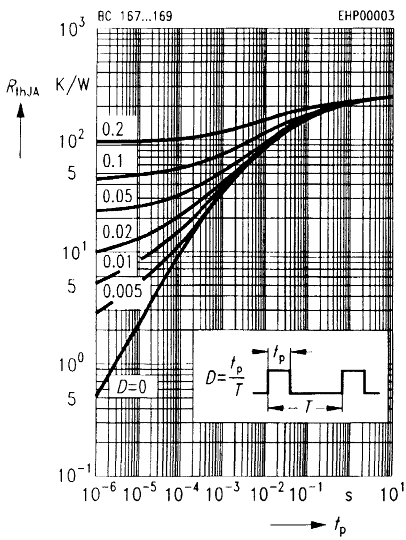
Total power dissipation $P_{tot} = f\,(T_A;\, T_C)$



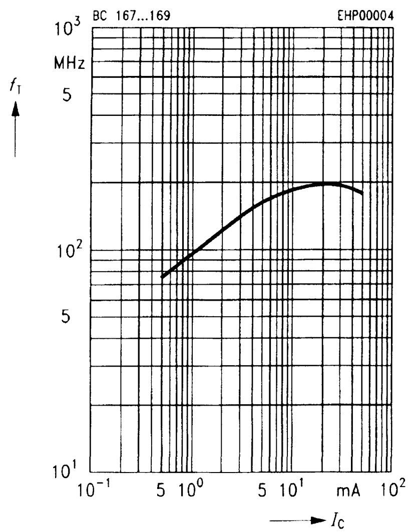
Collector current $I_C = f\,(V_{BE})$
V_{CE} = 5 V



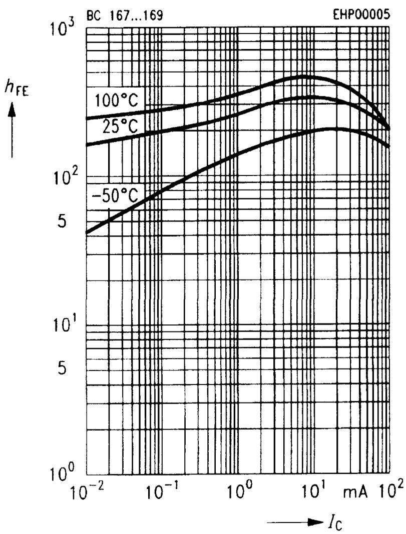
Permissible pulse load $R_{thJA} = f\,(t_p)$



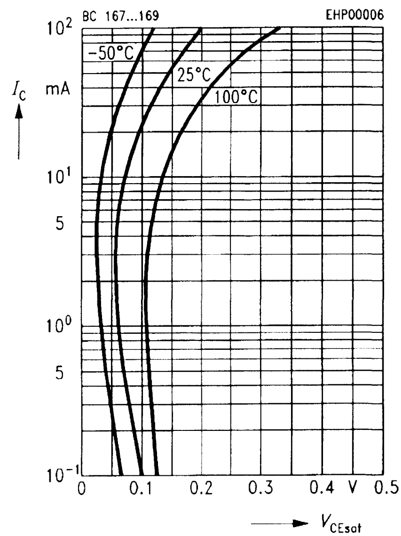
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V, f = 100 MHz



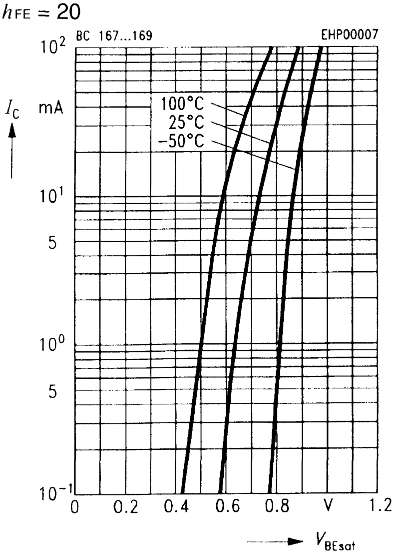
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



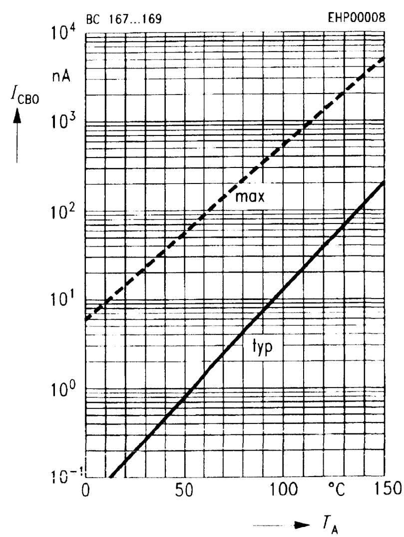
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



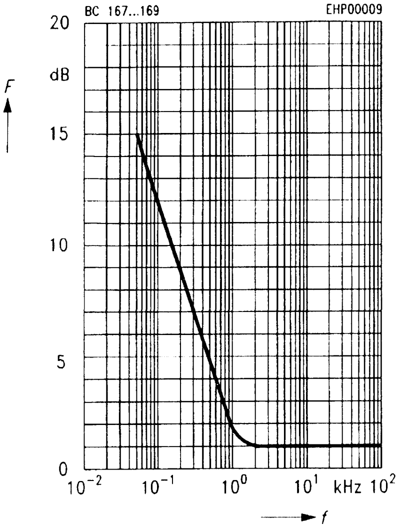
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



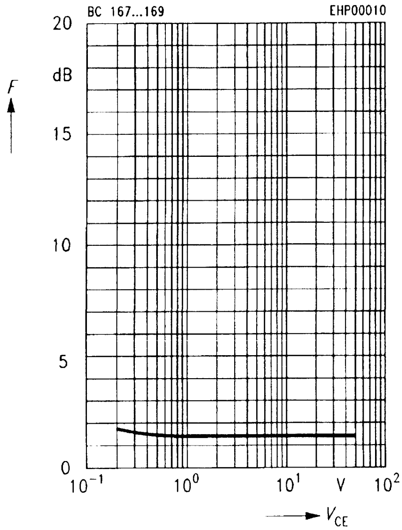
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



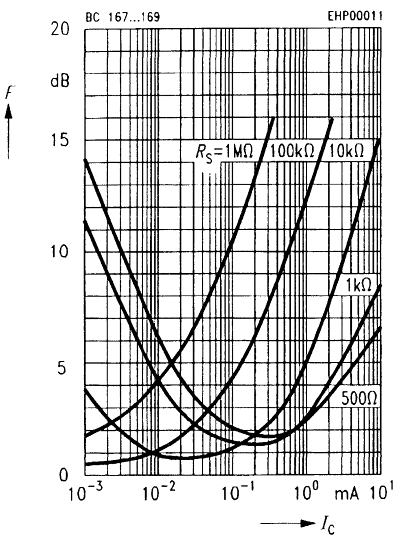
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 1 kHz, R_S = 2 kΩ



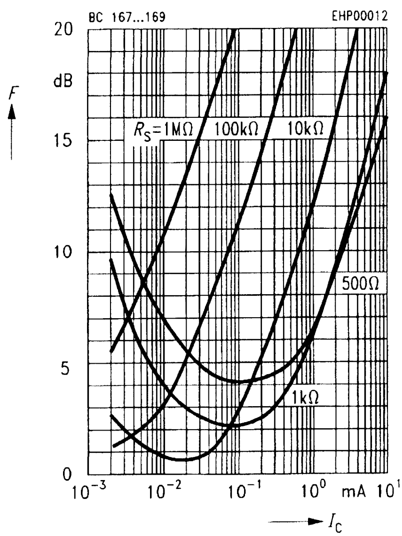
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



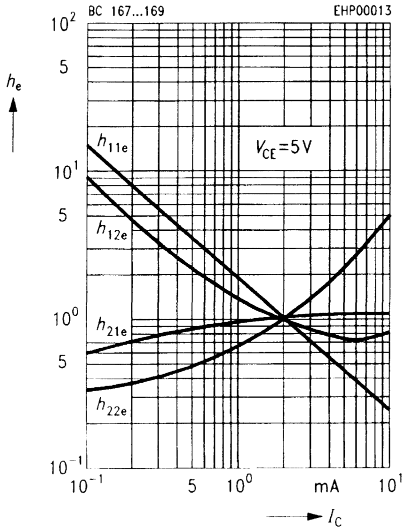
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



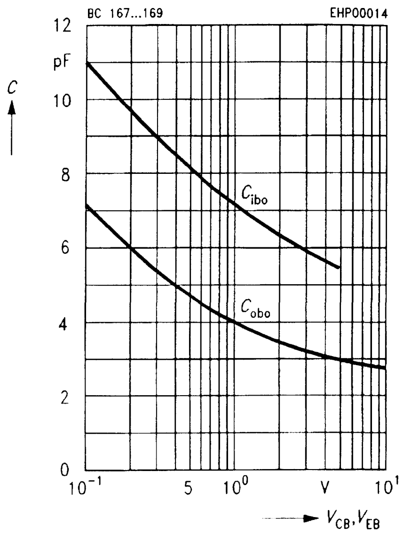
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

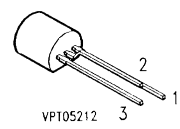


SIEMENS

NPN Silicon AF Transistors

BC 182
BC 183

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 212, BC 213 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 182	–	Q62702-C455	C	B	E	TO-92
BC 182 A		Q62702-C372				
BC 182 B		Q62702-C373				
BC 183		Q62702-C833				
BC 183 A		Q62702-C388				
BC 183 B		Q62702-C387				
BC 183 C		Q62702-C524				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 182	BC 183	Unit
Collector-emitter voltage	V_{CE0}	50	30	V
Collector-base voltage	V_{CB0}	60	45	
Emitter-base voltage	V_{EB0}	6		
Collector current	I_C	100		mA
Peak collector current	I_{CM}	200		
Peak base current	I_{BM}	200		
Peak emitter current	I_{EM}	200		
Total power dissipation, $T_C = 70$ °C	P_{tot}	500		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 250	K/W
Junction - case [1]	$R_{th JC}$	≤ 160	

[1] Mounted on Al-heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA BC 182 BC 183	$V_{(BR)CE0}$	 50 30	 – –	 – –	V
Collector-base breakdown voltage I_C = 10 µA BC 182 BC 183	$V_{(BR)CB0}$	 60 45	 – –	 – –	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	6	–	–	
Collector cutoff current V_{CB} = 50 V V_{CB} = 50 V, T_A = 150 °C	I_{CB0}	 – –	 – –	 15 4	 nA µA
DC current gain I_C = 10 µA; V_{CE} = 5 V BC 182 A, BC 183 A BC 182 B, BC 183 B BC 183 C I_C = 2 mA; V_{CE} = 5 V BC 182 A, BC 183 A BC 182 B, BC 183 B BC 183 C	h_{FE}	 – – – 110 200 420	 90 150 270 180 290 520	 – – – 220 450 800	–
Collector-emitter saturation voltage[1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{CEsat}	 – –	 75 200	 250 600	mV
Base-emitter saturation voltage[1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{BEsat}	 – –	 700 900	 – –	
Base-emitter voltage I_C = 2 mA; V_{CE} = 5 V I_C = 10 mA; V_{CE} = 5 V	$V_{BE\,(on)}$	 580 –	 660 –	 700 770	

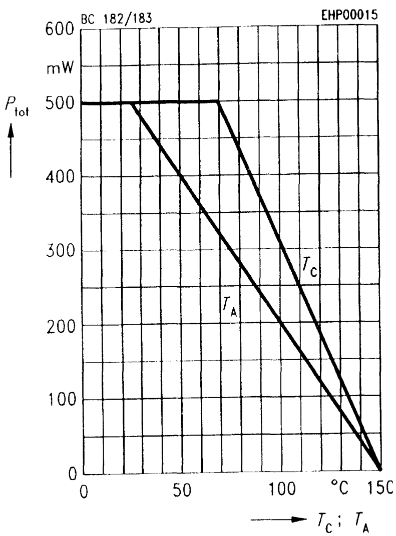
[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

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

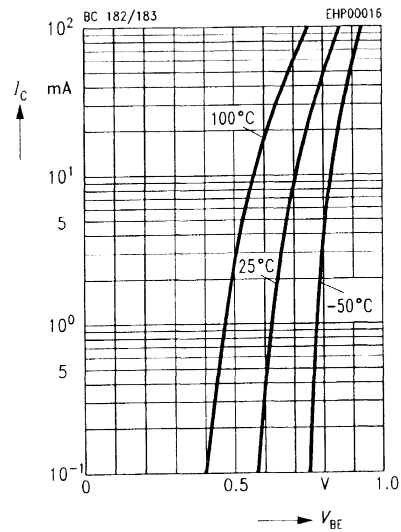
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 182 A, BC 183 A BC 182 B, BC 183 B BC 183 C	h_{11e}	 – – –	 2.7 4.5 8.7	 – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 182 A, BC 183 A BC 182 B, BC 183 B BC 183 C	h_{12e}	 – – –	 1.5 2 3	 – – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 182 A, BC 183 A BC 182 B, BC 183 B BC 183 C	h_{21e}	 – – –	 200 330 600	 – – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 182 A, BC 183 A BC 182 B, BC 183 B BC 183 C	h_{22e}	 – – –	 18 30 60	 – – –	µS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F	–	2	–	dB

For **characteristic curves** refer to BC 546 … BC 550

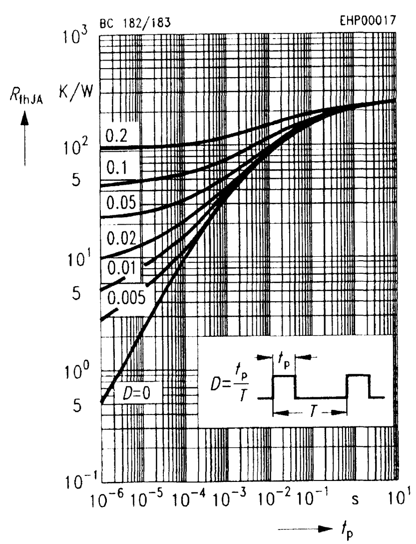
Total power dissipation $P_{tot} = f(T_A; T_C)$



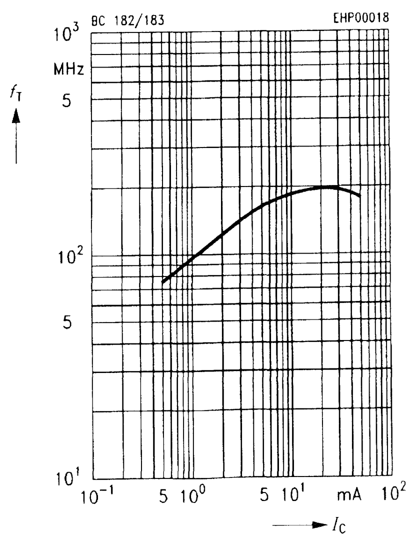
Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V



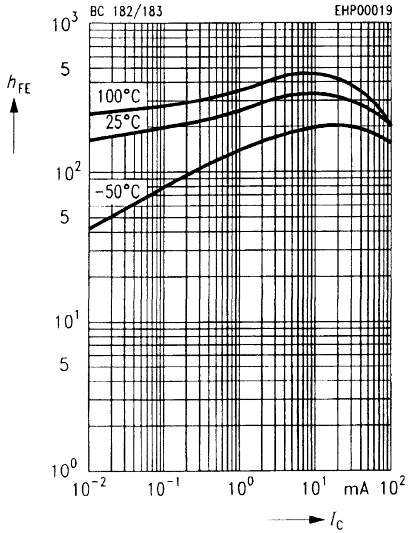
Permissible pulse load $R_{thJA} = f(t_p)$



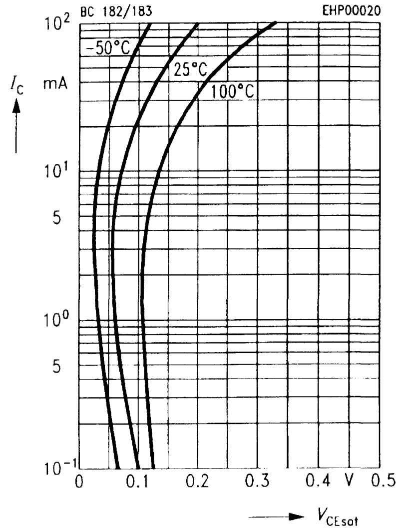
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 100$ MHz



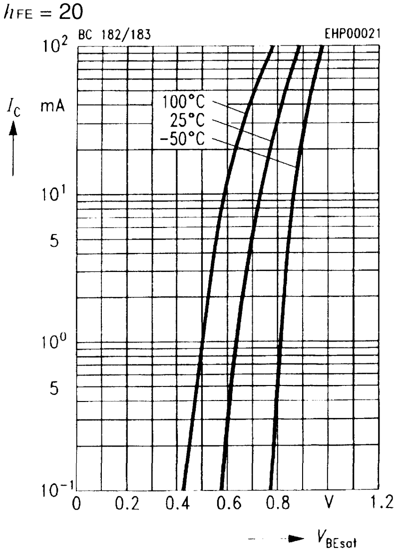
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



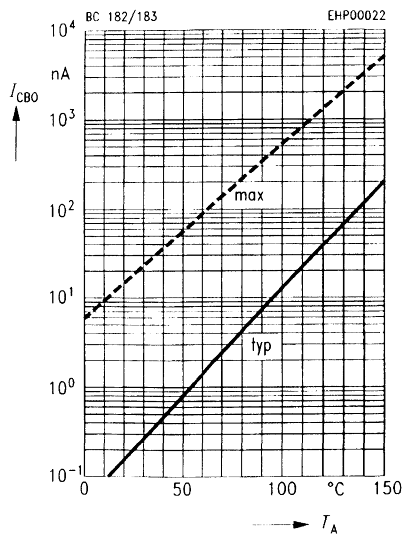
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



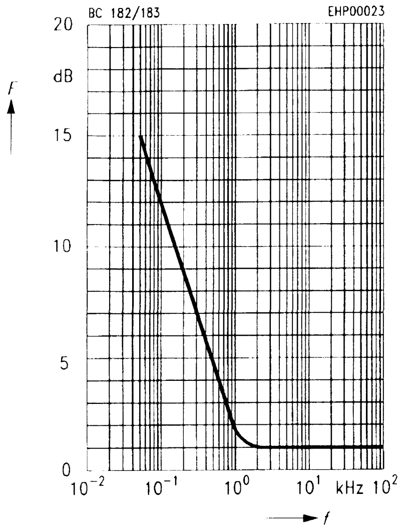
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



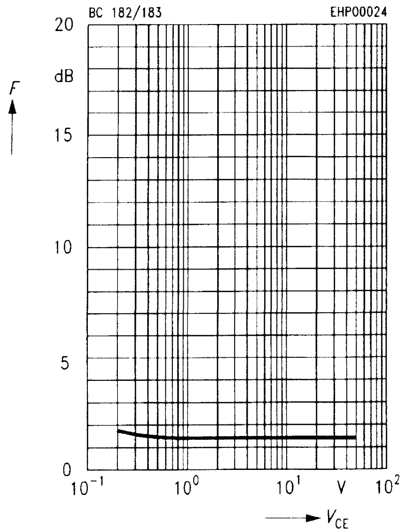
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



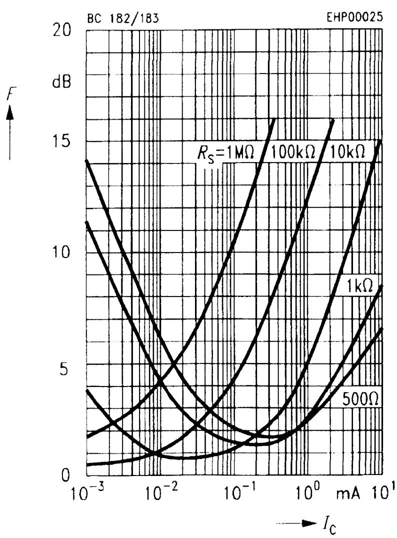
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 1 kHz, R_S = 2 kΩ



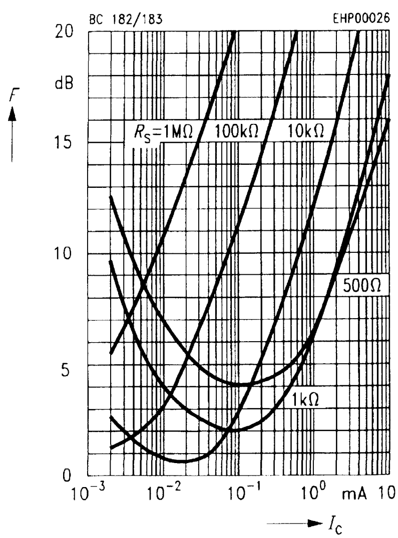
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



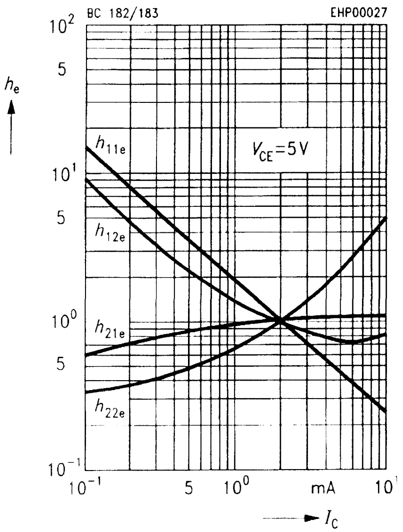
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



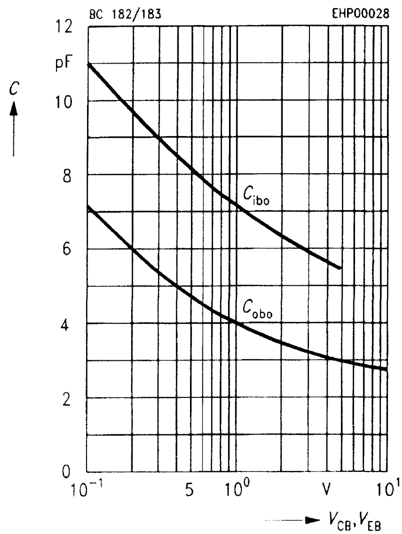
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

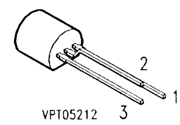


SIEMENS

PNP Silicon AF Transistors

BC 212
BC 213

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 182, BC 183 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 212	–	Q62702-C242	C	B	E	TO-92
BC 212 A		Q62702-C374-V1				
BC 212 B		Q62702-C374-V2				
BC 213		Q62702-C564				
BC 213 A		Q62702-C1159				
BC 213 B		Q62702-C1160				
BC 213 C		Q62702-C1158				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 212	BC 213	Unit
Collector-emitter voltage	V_{CEO}	50	30	V
Collector-base voltage	V_{CBO}	60	45	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	100		mA
Peak collector current	I_{CM}	200		
Peak base current	I_{BM}	200		
Peak emitter current	I_{EM}	200		
Total power dissipation, $T_C = 70$ °C	P_{tot}	500		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 250	K/W
Junction - case [1]	$R_{th JC}$	≤ 160	

[1] Mounted on Al-heat sink 15 mm × 25 mm × 0.5 mm.

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

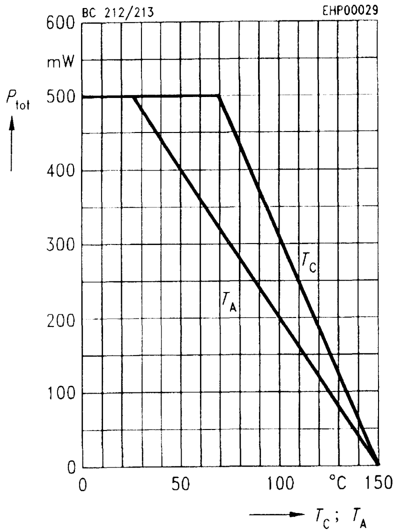
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA	$V_{(BR)CEO}$				V
BC 212		50	–	–	
BC 213		30	–	–	
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$				
BC 212		60	–	–	
BC 213		45	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	µA
DC current gain I_C = 10 µA; V_{CE} = 5 V	h_{FE}				–
BC 212 A, BC 213 A		–	90	–	
BC 212 B, BC 213 B		–	150	–	
BC 213 C		–	270	–	
I_C = 2 mA; V_{CE} = 5 V					
BC 212 A, BC 213 A		125	180	250	
BC 212 B, BC 213 B		220	290	475	
BC 213 C		420	520	800	
Collector-emitter saturation voltage[1]	V_{CEsat}				mV
I_C = 10 mA; I_B = 0.5 mA		–	75	300	
I_C = 100 mA; I_B = 5 mA		–	250	650	
Base-emitter saturation voltage[1]	V_{BEsat}				
I_C = 10 mA; I_B = 0.5 mA		–	700	–	
I_C = 100 mA; I_B = 5 mA		–	930	–	
Base-emitter voltage	$V_{BE\,(on)}$				
I_C = 2 mA; V_{CE} = 5 V		600	650	750	
I_C = 10 mA; V_{CE} = 5 V		–	–	820	

[1] Pulse test: t < 300 µs, D < 2 %.

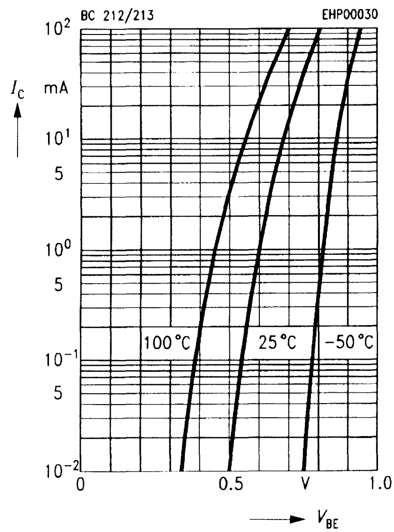
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	4	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	10	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 212 A, BC 213 A		–	2.7	–	
BC 212 B, BC 213 B		–	4.5	–	
BC 213 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 212 A, BC 213 A		–	1.5	–	
BC 212 B, BC 213 B		–	2	–	
BC 213 C		–	3	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 212 A, BC 213 A		–	200	–	
BC 212 B, BC 213 B		–	330	–	
BC 213 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BC 212 A, BC 213 A		–	18	–	
BC 212 B, BC 213 B		–	30	–	
BC 213 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F	–	2	–	dB

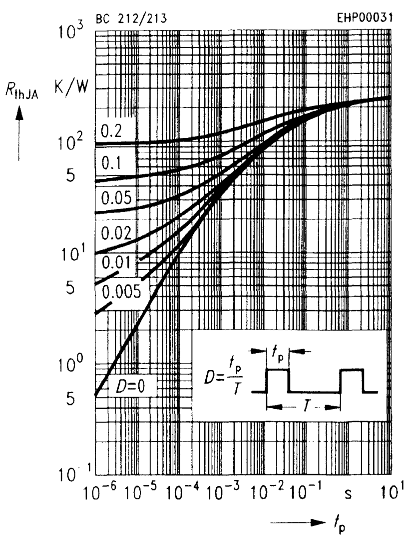
Total power dissipation $P_{tot} = f(T_A; T_C)$



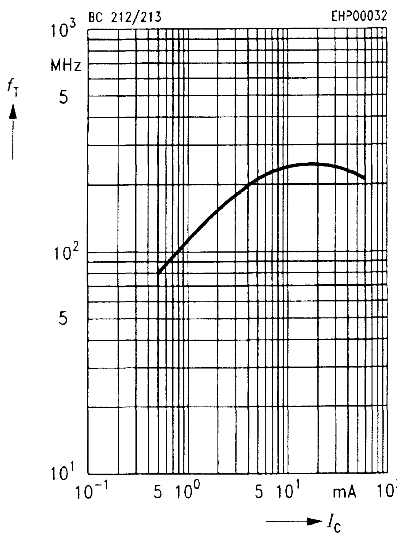
Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V



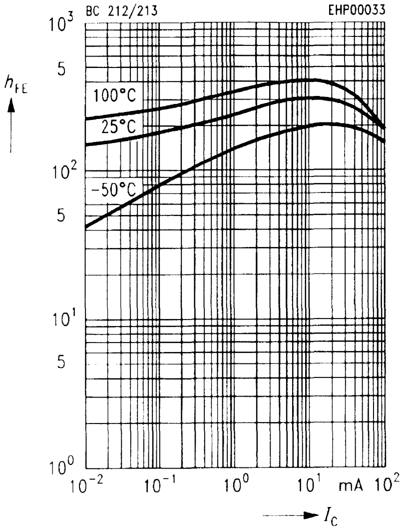
Permissible pulse load $R_{thJA} = f(t_p)$



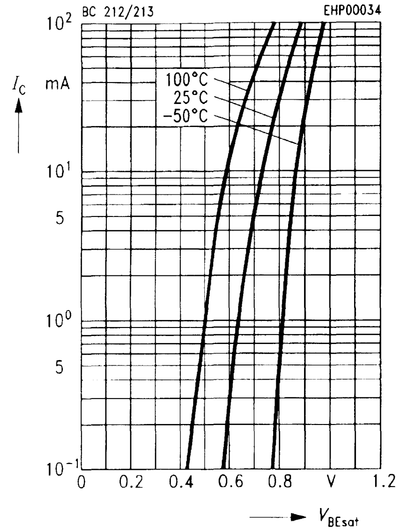
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 100$ MHz



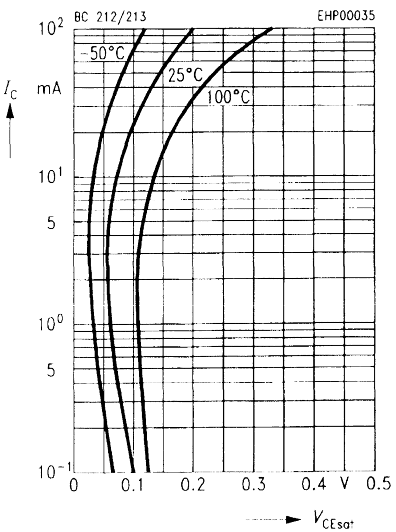
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



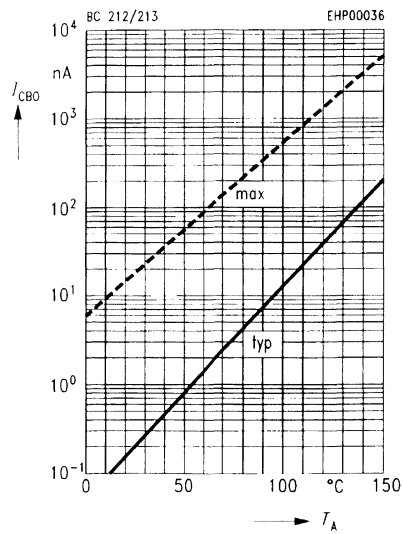
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



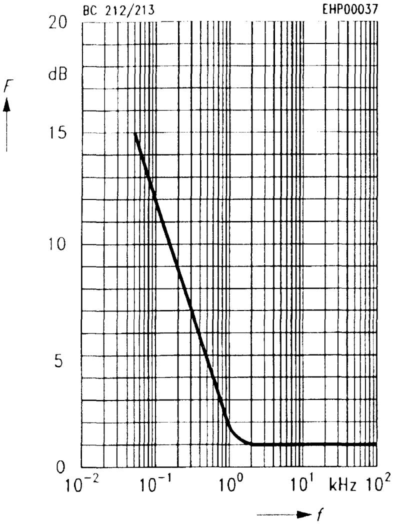
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



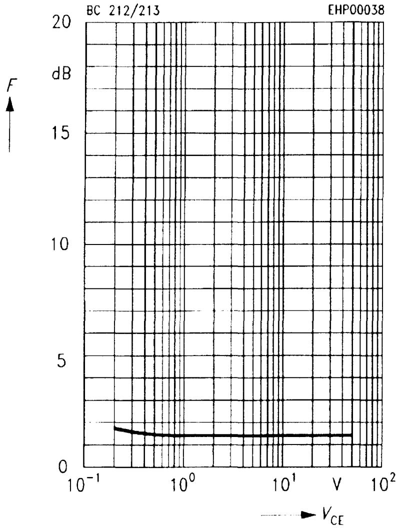
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



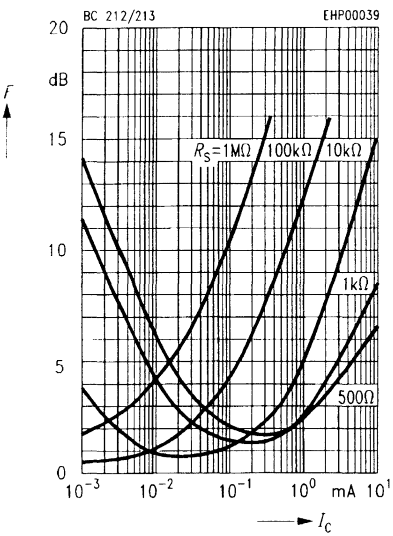
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 12 kHz, R_S = 2 kΩ



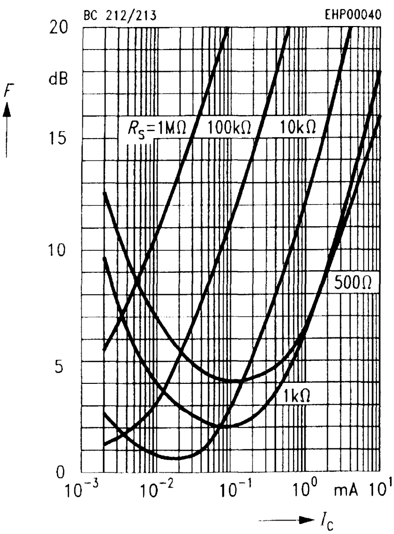
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



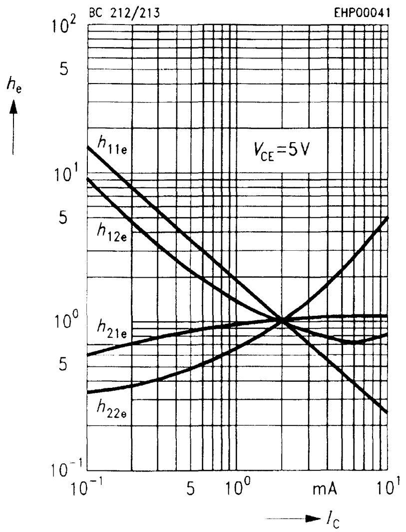
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



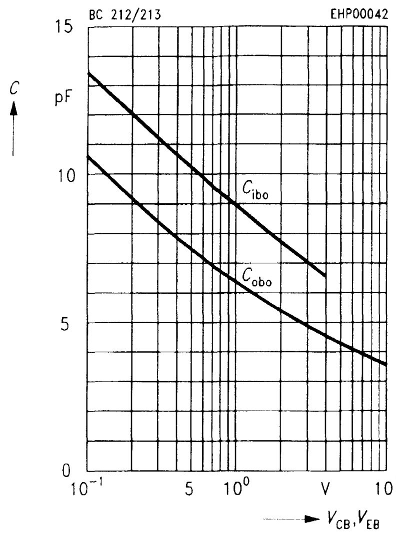
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



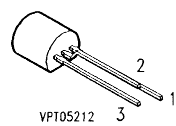
Capacitance $C = f(V_{CB}, V_{EB})$



NPN Silicon AF Transistors

BC 237 ... BC 239

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 307, BC 308, BC 309 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 237	–	Q62702-C697	C	B	E	TO-92
BC 237 A		Q62702-C276				
BC 237 B		Q62702-C277				
BC 238		Q62702-C698				
BC 238 A		Q62702-C278				
BC 238 B		Q62702-C279				
BC 238 C		Q62702-C280				
BC 239		Q62702-C699				
BC 239 B		Q62702-C281				
BC 239 C		Q62702-C282				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 237	BC 238	BC 239	Unit
Collector-emitter voltage	V_{CEO}	45	20	20	V
Collector-base voltage	V_{CBO}	50	30	30	
Emitter-base voltage	V_{EBO}	6	5	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, T_C = 70 °C	P_{tot}	500			mW
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al-heat sink 15 mm × 25 mm × 0.5 mm.

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

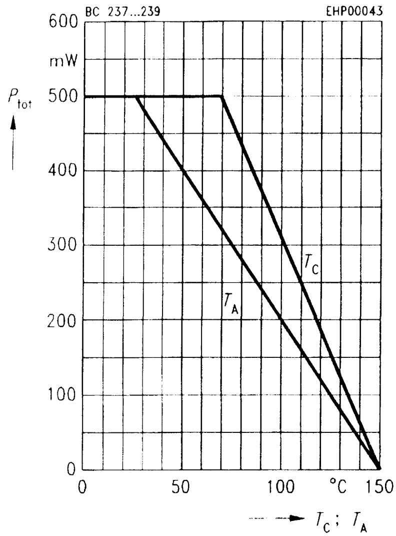
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA	$V_{(BR)CEO}$				V
BC 237		45	–	–	
BC 238		20	–	–	
BC 239		20	–	–	
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$				
BC 237		50	–	–	
BC 238		30	–	–	
BC 239		30	–	–	
Emitter-base breakdown voltage I_E = 1 µA BC 237	$V_{(BR)EBO}$	6	–	–	
BC 238, BC 239		5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 50 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	µA
V_{CB} = 50 V, T_A = 150 °C		–	–	4	µA
DC current gain I_C = 10 µA; V_{CE} = 5 V	h_{FE}				–
BC 237 A, BC 238 A		–	90	–	
BC 237 B, BC 238 B, BC 239 B		–	150	–	
BC 238 C, BC 239 C		–	270	–	
I_C = 2 mA; V_{CE} = 5 V					
BC 237 A, BC 238 A, BC 239 A		110	180	220	
BC 237 B, BC 238 B, BC 239 B		200	290	450	
BC 238 C, BC 239 C		420	520	800	
Collector-emitter saturation voltage [1]	V_{CEsat}				mV
I_C = 10 mA; I_B = 0.5 mA		–	90	250	
I_C = 100 mA; I_B = 5 mA		–	200	600	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA; I_B = 0.5 mA		–	700	–	
I_C = 100 mA; I_B = 5 mA		–	900	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA; V_{CE} = 5 V		580	660	700	
I_C = 10 mA; V_{CE} = 5 V		–	–	770	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

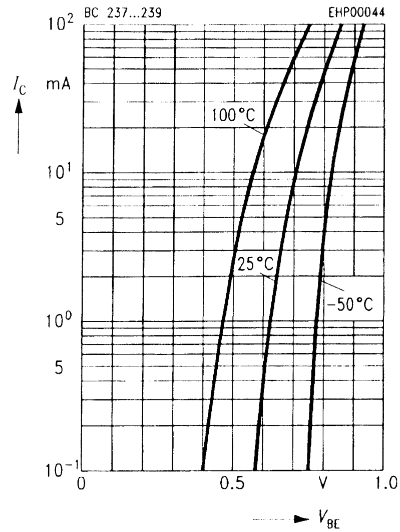
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 237 A, BC 238 A		–	2.7	–	
BC 237 B, BC 238 B, BC 239 B		–	4.5	–	
BC 238 C, BC 239 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 237 A, BC 238 A		–	1.5	–	
BC 237 B, BC 238 B, BC 239 B		–	2	–	
BC 238 C, BC 239 C		–	3	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 237 A, BC 238 A		–	200	–	
BC 237 B, BC 238 B, BC 239 B		–	330	–	
BC 238 C, BC 239 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				μS
BC 237 A, BC 238 A		–	18	–	
BC 237 B, BC 238 B, BC 239 B		–	30	–	
BC 238 C, BC 239 C		–	60	–	
Noise figure	F				dB
I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz BC 239		–	1.2	4	
I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz BC 237, BC 238		–	2	–	

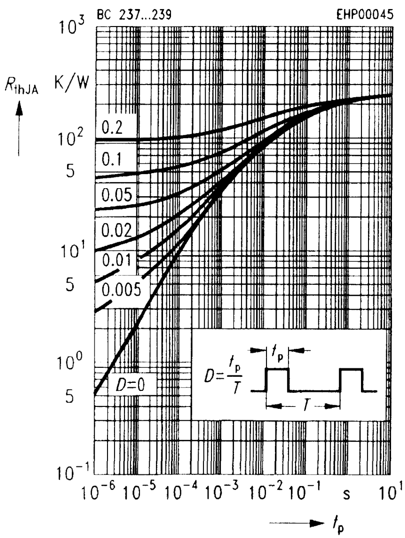
Total power dissipation $P_{tot} = f(T_A; T_C)$



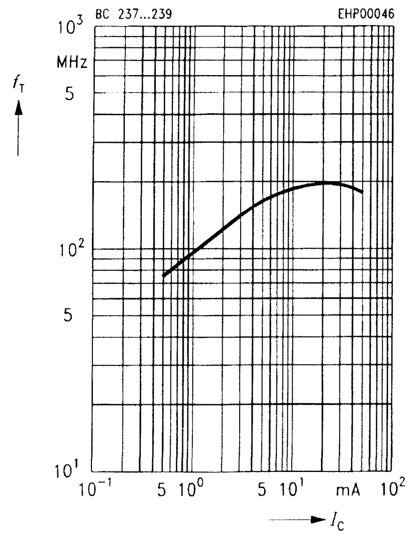
Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V



Permissible pulse load $R_{thJA} = f(t_p)$

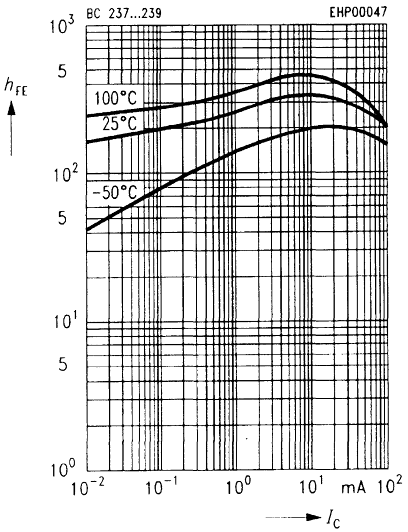


Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



DC current gain $h_{FE} = f\,(I_C)$

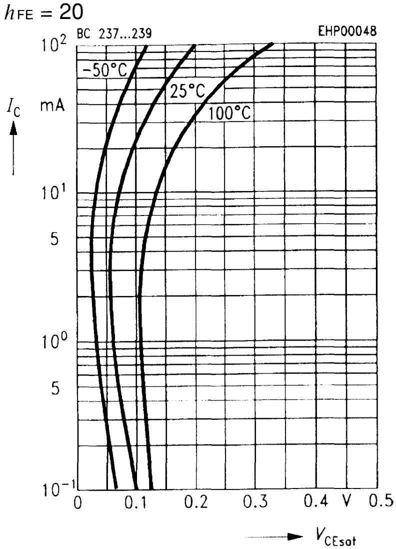
V_{CE} = 5 V (common emitter configuration)



Collector-emitter saturation voltage

$V_{CEsat} = f\,(I_C)$

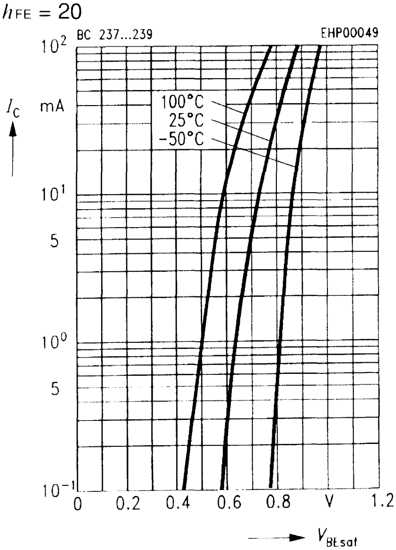
h_{FE} = 20



Base-emitter saturation voltage

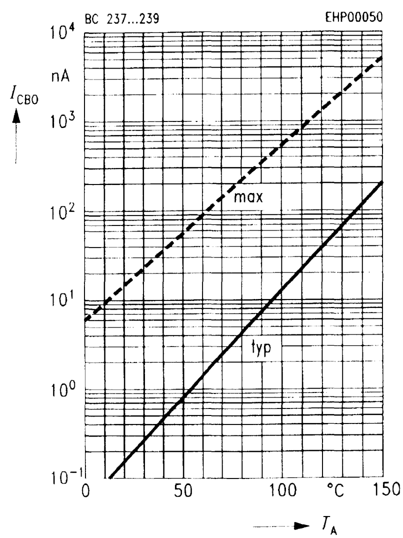
$V_{BEsat} = f\,(I_C)$

h_{FE} = 20

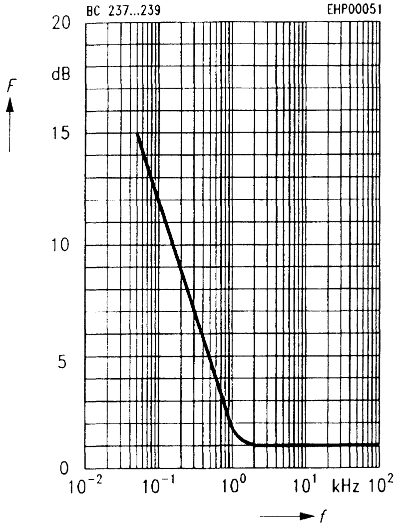


Collector cutoff current $I_{CBO} = f\,(T_A)$

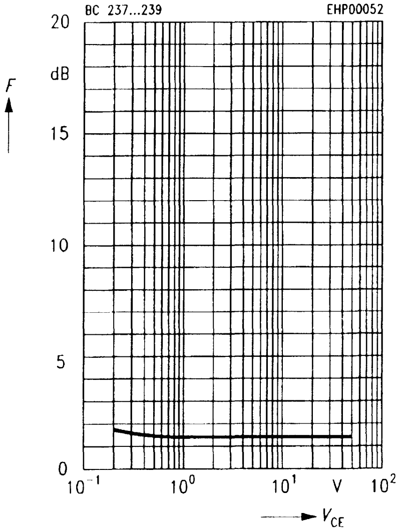
V_{CB} = 30 V



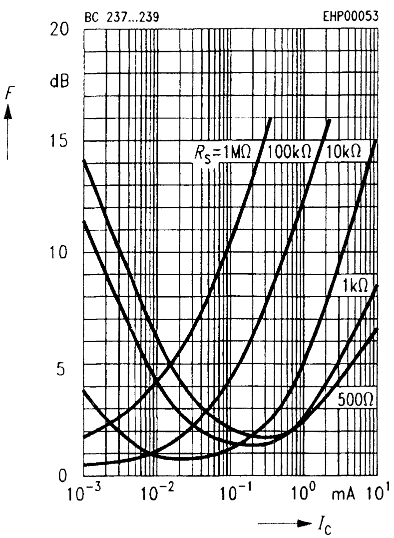
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 1 kHz, R_S = 2 kΩ



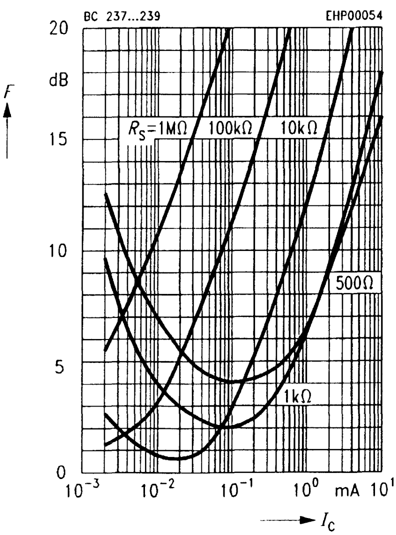
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



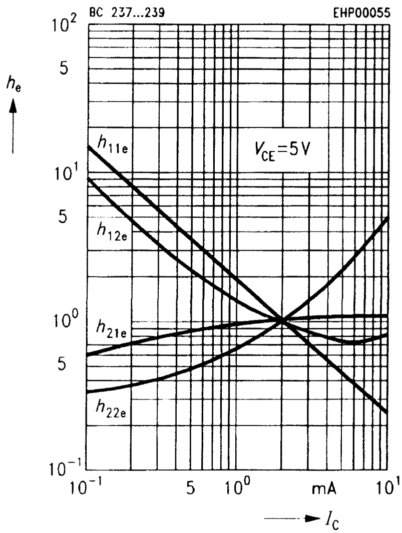
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



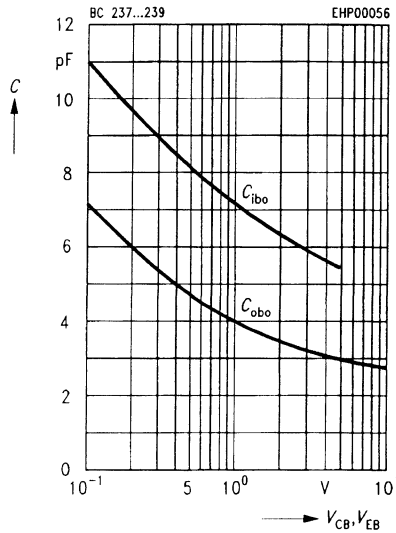
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

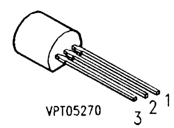


SIEMENS

PNP Silicon AF Transistors

BC 257 ... BC 259

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 167, BC 168, BC 169 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 257	–	Q62702-C700	E	C	B	TO-92
BC 257 A		Q62702-C184				
BC 257 B		Q62702-C206				
BC 258		Q62702-C701				
BC 258 A		Q62702-C187				
BC 258 B		Q62702-C188				
BC 258 C		Q62702-C438				
BC 259		Q62702-C702				
BC 259 B		Q62702-C192				
BC 259 C		Q62702-C439				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 257	BC 258	BC 259	Unit
Collector-emitter voltage	V_{CE0}	45	25	20	V
Collector-base voltage	V_{CB0}	50	30	25	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, T_C = 70 ˚C	P_{tot}	500			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al-heat sink 15 mm × 25 mm × 0.5 mm.

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

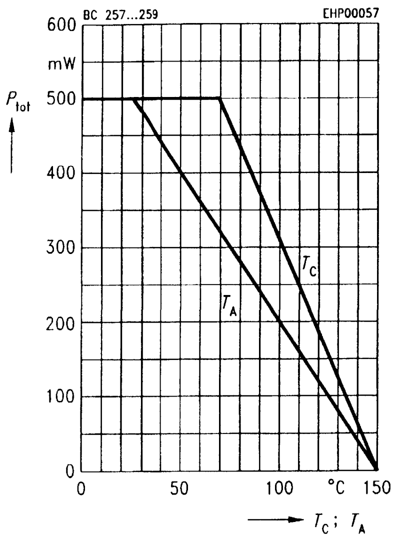
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA	$V_{(BR)CE0}$				V
BC 257		45	–	–	
BC 258		25	–	–	
BC 259		20	–	–	
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CB0}$				
BC 257		50	–	–	
BC 258		30	–	–	
BC 259		25	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	µA
DC current gain	h_{FE}				–
I_C = 10 µA; V_{CE} = 5 V					
BC 257 A, BC 258 A		–	90	–	
BC 257 B, BC 258 B, BC 259 B		–	150	–	
BC 258 C, BC 259 C		–	270	–	
I_C = 2 mA; V_{CE} = 5 V					
BC 257 A, BC 258 A		125	180	250	
BC 257 B, BC 258 B, BC 259 B		220	290	475	
BC 258 C, BC 259 C		420	520	800	
Collector-emitter saturation voltage [1]	V_{CEsat}				mV
I_C = 10 mA; I_B = 0.5 mA		–	75	300	
I_C = 100 mA; I_B = 5 mA		–	250	650	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA; I_B = 0.5 mA		–	700	–	
I_C = 100 mA; I_B = 5 mA		–	930	–	
Base-emitter voltage	$V_{BE (on)}$				
I_C = 2 mA; V_{CE} = 5 V		600	650	750	
I_C = 10 mA; V_{CE} = 5 V		–	–	820	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

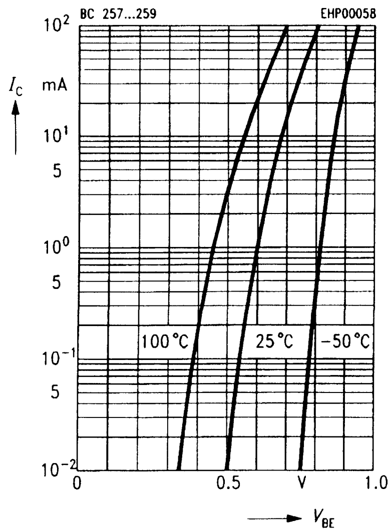
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	4	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	10	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 257 A, BC 258 A		–	2.7	–	
BC 257 B, BC 258 B, BC 259 B		–	4.5	–	
BC 258 C, BC 259 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 257 A, BC 258 A		–	1.5	–	
BC 257 B, BC 258 B, BC 259 B		–	2	–	
BC 258 C, BC 259 C		–	3	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 257 A, BC 258 A		–	200	–	
BC 257 B, BC 258 B, BC 259 B		–	330	–	
BC 258 C, BC 259 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BC 257 A, BC 258 A		–	18	–	
BC 257 B, BC 258 B, BC 259 B		–	30	–	
BC 258 C, BC 259 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F				dB
BC 257, BC 258		–	2	–	
BC 259		–	1	4	

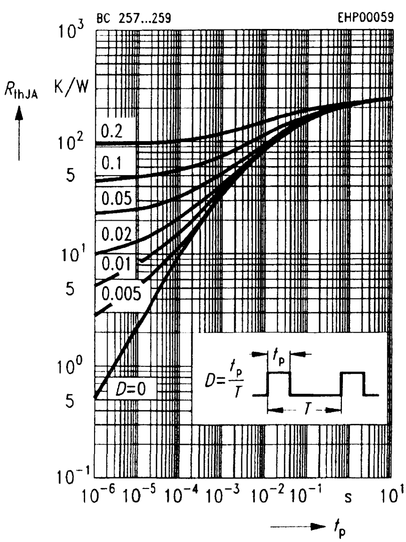
Total power dissipation $P_{tot} = f(T_A; T_C)$



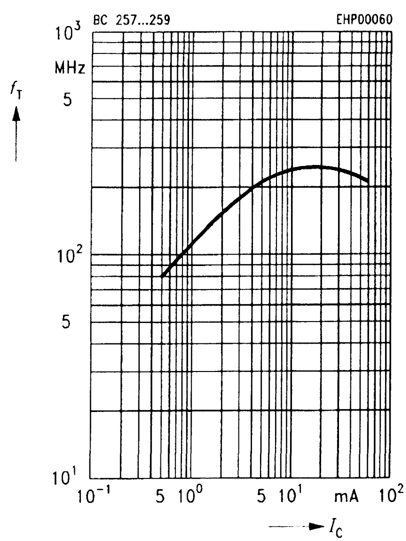
Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V



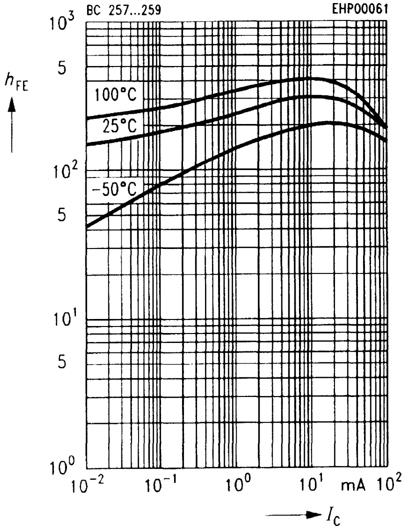
Permissible pulse load $R_{thJA} = f(t_p)$



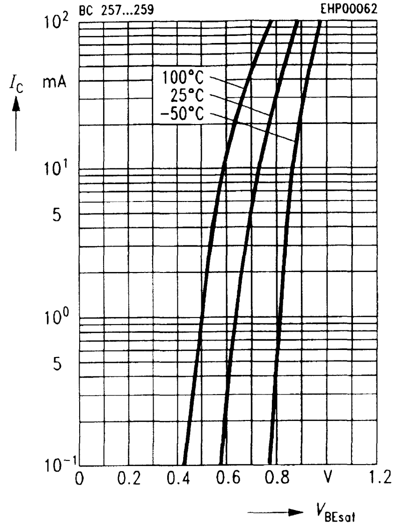
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



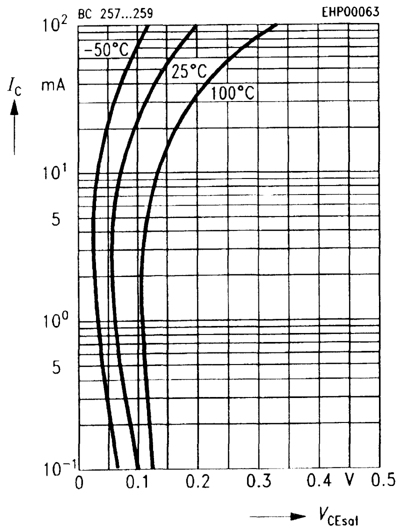
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



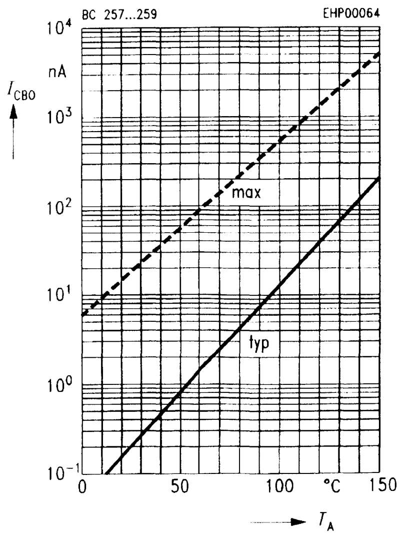
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



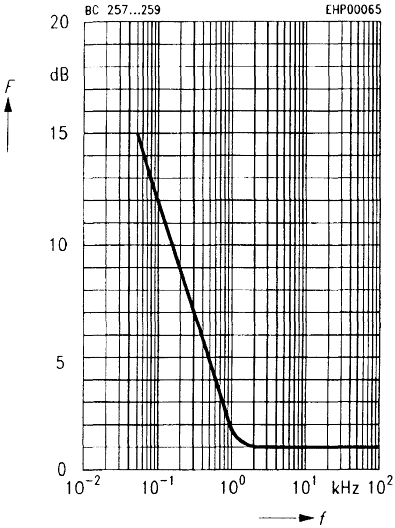
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



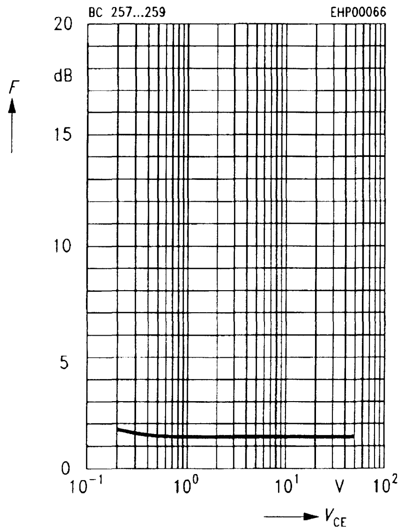
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



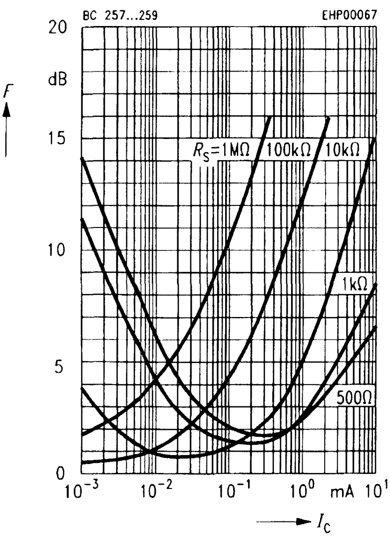
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 12 kHz, R_S = 2 kΩ



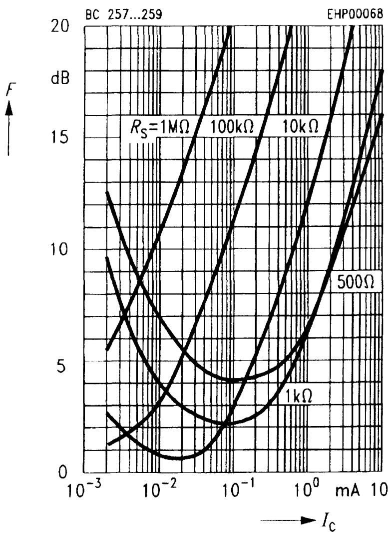
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



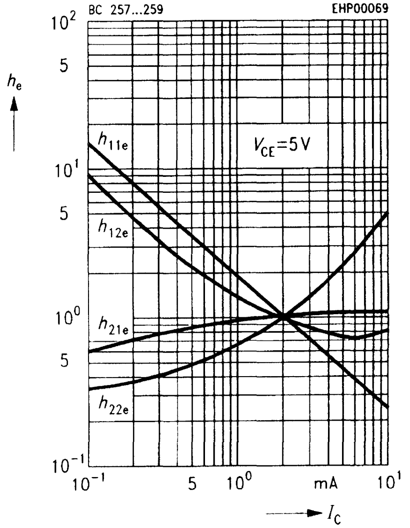
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



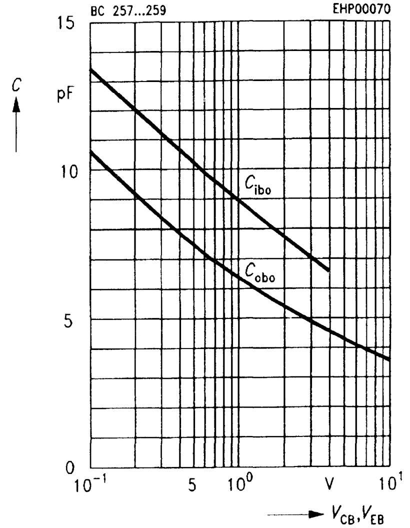
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

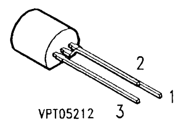


SIEMENS

PNP Silicon AF Transistors

BC 307
... BC 309

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 237, BC 238, BC 239 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 307	–	Q62702-C703	C	B	E	TO-92
BC 307 A		Q62702-C283				
BC 307 B		Q62702-C324				
BC 308		Q62702-C704				
BC 308 A		Q62702-C285				
BC 308 B		Q62702-C286				
BC 308 C		Q62702-C393				
BC 309		Q62702-C705				
BC 309 B		Q62702-C289				
BC 309 C		Q62702-C323				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 307	BC 308	BC 309	Unit
Collector-emitter voltage	V_{CEO}	45	25	20	V
Collector-base voltage	V_{CBO}	50	30	25	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, T_C = 70 ˚C	P_{tot}	500			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

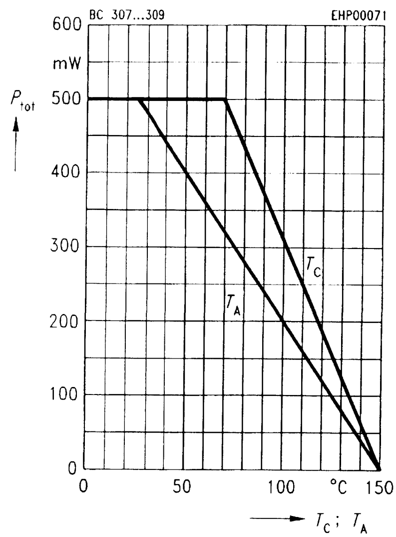
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA BC 307 BC 308 BC 309	$V_{(BR)CEO}$	 45 25 20	 – – –	 – – –	V
Collector-base breakdown voltage I_C = 10 μA BC 307 BC 308 BC 309	$V_{(BR)CBO}$	 50 30 25	 – – –	 – – –	
Emitter-base breakdown voltage, I_E = 1 μA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 50 V BC 307 V_{CB} = 30 V BC 308 V_{CB} = 25 V BC 309 V_{CB} = 50 V, T_A = 150 °C BC 307 V_{CB} = 30 V, T_A = 150 °C BC 308 V_{CB} = 25 V, T_A = 150 °C BC 309	I_{CBO}	 – – – – – –	 – – – – – –	 15 15 15 4 4 4	 nA nA nA μA μA μA
DC current gain I_C = 10 μA; V_{CE} = 5 V BC 307 A, BC 308 A BC 307 B, BC 308 B, BC 309 B BC 308 C, BC 309 C I_C = 2 mA; V_{CE} = 5 V BC 307 A, BC 308 A BC 307 B, BC 308 B, BC 309 B BC 308 C, BC 309 C	h_{FE}	 – – – 125 220 420	 90 150 270 180 290 520	 – – – 250 475 800	–
Collector-emitter saturation voltage [1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{CEsat}	 – –	 75 250	 300 650	mV
Base-emitter saturation voltage [1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{BEsat}	 – –	 700 930	 – –	
Base-emitter voltage I_C = 2 mA; V_{CE} = 5 V I_C = 10 mA; V_{CE} = 5 V	$V_{BE (on)}$	 600 –	 650 –	 750 820	

[1] Pulse test: $t \leq 300$ μs, $D \leq 2$ %.

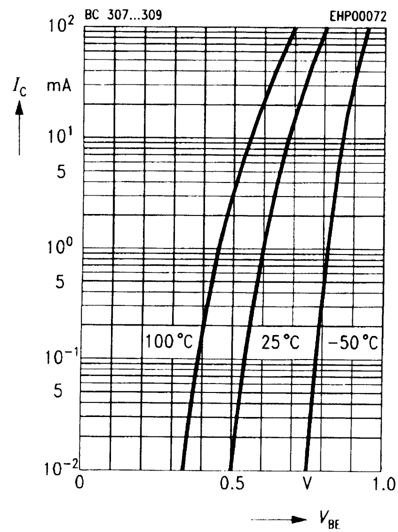
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	4	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	10	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 307 A, BC 308 A		–	2.7	–	
BC 307 B, BC 308 B, BC 309 B		–	4.5	–	
BC 308 C, BC 309 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 307 A, BC 308 A		–	1.5	–	
BC 307 B, BC 308 B, BC 309 B		–	2	–	
BC 308 C, BC 309 C		–	3	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 307 A, BC 308 A		–	200	–	
BC 307 B, BC 308 B, BC 309 B		–	330	–	
BC 308 C, BC 309 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BC 307 A, BC 308 A		–	18	–	
BC 307 B, BC 308 B, BC 309 B		–	30	–	
BC 308 C, BC 309 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ	F				dB
f = 1 kHz, Δf = 200 Hz BC 309		–	1	4	
BC 307, BC 308		–	2	–	

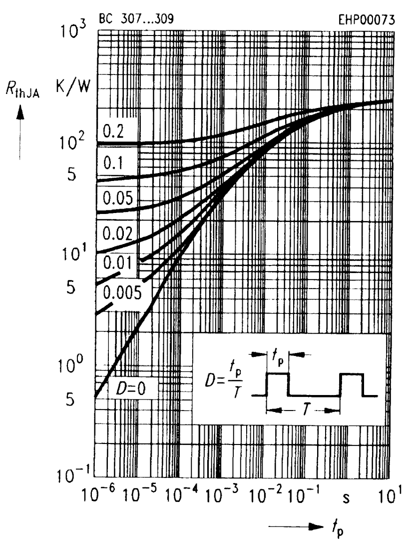
Total power dissipation $P_{tot} = f\,(T_A; T_C)$



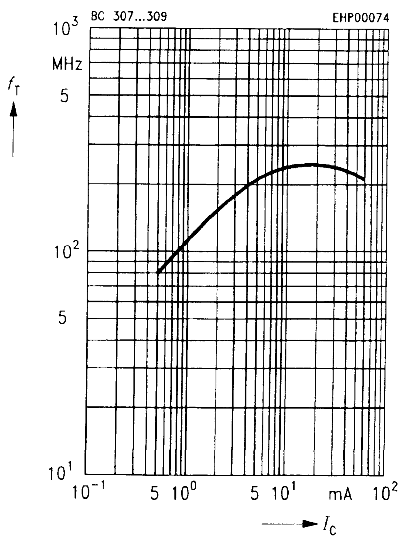
Collector current $I_C = f\,(V_{BE})$
V_{CE} = 5 V



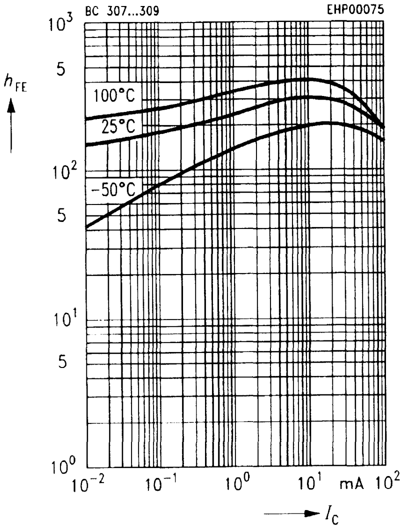
Permissible pulse load $R_{thJA} = f\,(t_p)$



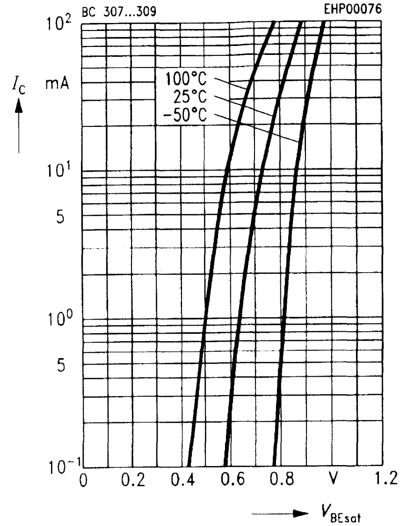
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V, f = 100 MHz



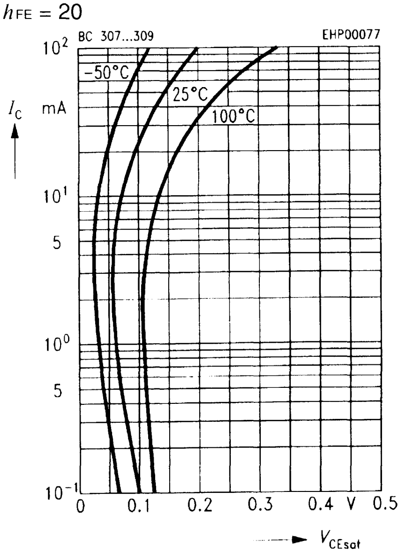
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



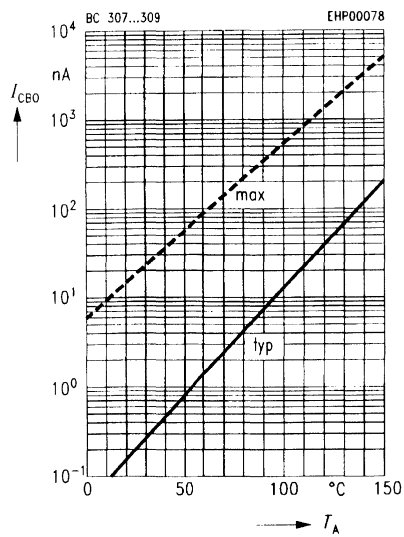
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



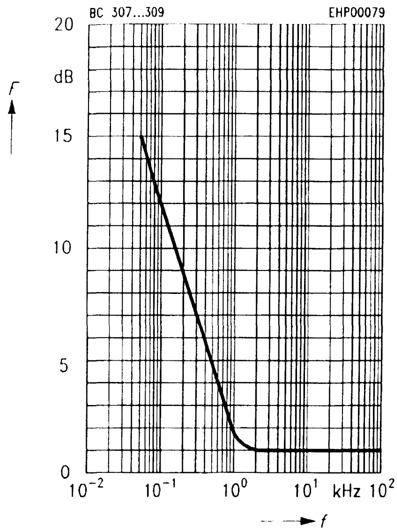
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



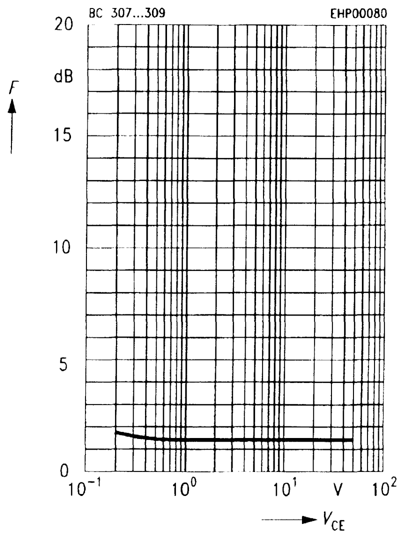
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



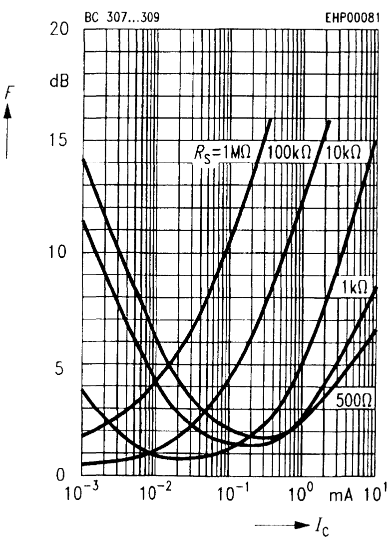
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 12 kHz, R_S = 2 kΩ



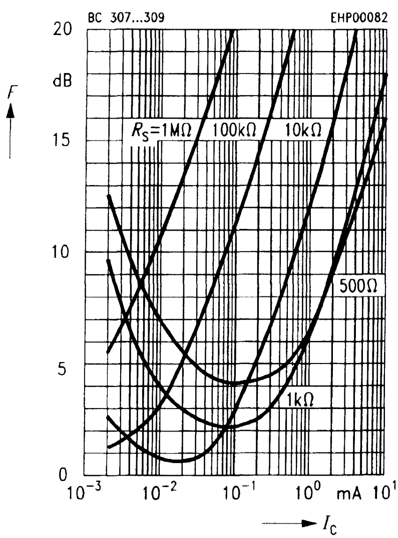
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



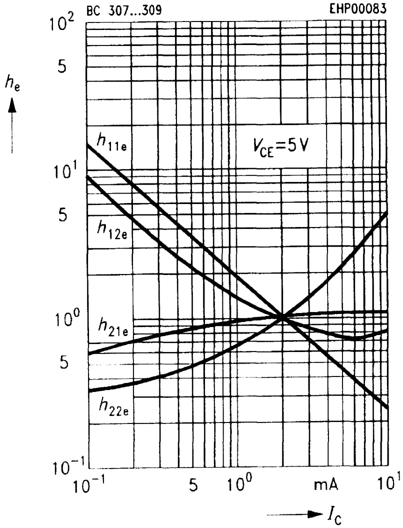
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



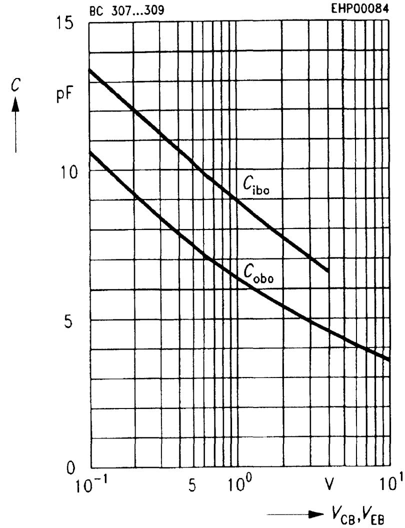
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



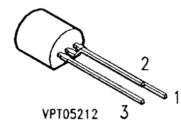
Capacitance $C = f(V_{CB}, V_{EB})$



PNP Silicon AF Transistors

BC 327
BC 328

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BC 337, BC 338 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 327	–	Q62702-C311	C	B	E	TO-92
BC 327-16		Q62702-C311-V3				
BC 327-25		Q62702-C311-V4				
BC 327-40		Q62702-C311-V2				
BC 328		Q62702-C312				
BC 328-16		Q62702-C312-V3				
BC 328-25		Q62702-C312-V4				
BC 328-40		Q62702-C312-V2				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 327	BC 328	Unit
Collector-emitter voltage	V_{CEO}	45	25	V
Collector-base voltage	V_{CBO}	50	30	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, $T_C = 66$ °C	P_{tot}	625		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 135	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA BC 327 BC 328	$V_{(BR)CE0}$	 45 25	 – –	 – –	V
Collector-base breakdown voltage I_C = 100 µA BC 327 BC 328	$V_{(BR)CB0}$	 50 30	 – –	 – –	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current V_{CB} = 25 V BC 328 V_{CB} = 45 V BC 327 V_{CB} = 25 V, T_A = 150 °C BC 328 V_{CB} = 45 V, T_A = 150 °C BC 327	I_{CB0}	 – – – –	 – – – –	 100 100 10 10	 nA nA µA µA
Emitter cutoff current V_{EB} = 4 V	I_{EB0}	–	–	100	nA
DC current gain[1)] I_C = 100 mA; V_{CE} = 1 V BC 327/16; BC 328/16 BC 327/25; BC 328/25 BC 327/40; BC 328/40 I_C = 300 mA; V_{CE} = 1 V BC 327/16; BC 328/16 BC 327/25; BC 328/25 BC 327/40; BC 328/40	h_{FE}	 100 160 250 60 100 170	 160 250 350 – – –	 250 400 630 – – –	–
Collector-emitter saturation voltage[1)] I_C = 500 mA; I_B = 50 mA	V_{CEsat}	–	–	0.7	V
Base-emitter saturation voltage[1)] I_C = 500 mA; I_B = 50 mA	V_{BEsat}	–	–	2	

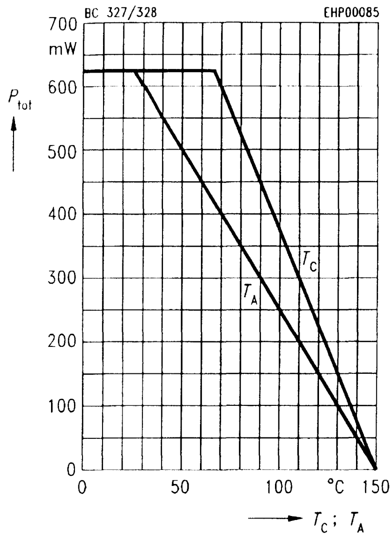
1) Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

Electrical Characteristics

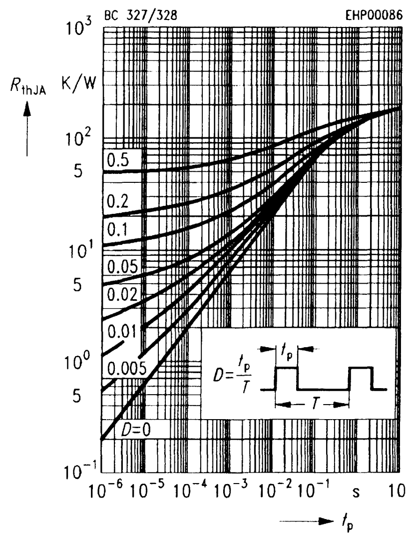
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	12	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

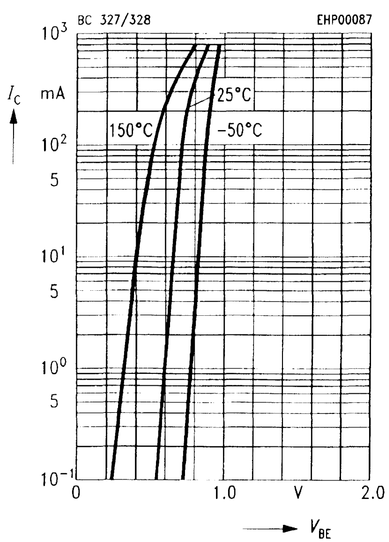
Total power dissipation $P_{tot} = f(T_A; T_C)$



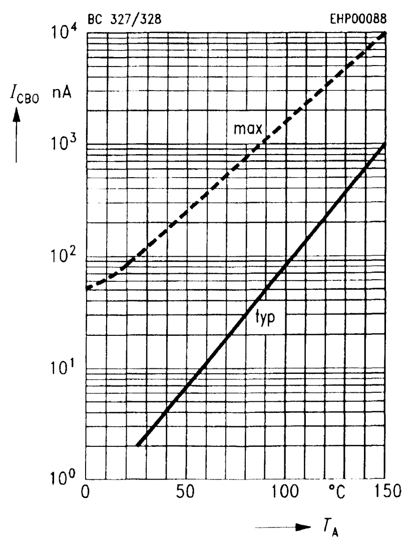
Permissible pulse load $R_{thJA} = f(t_p)$



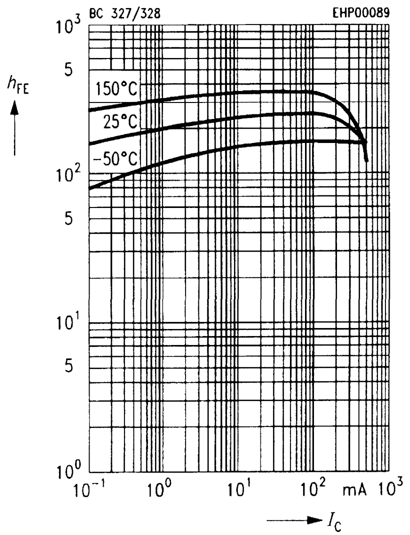
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V



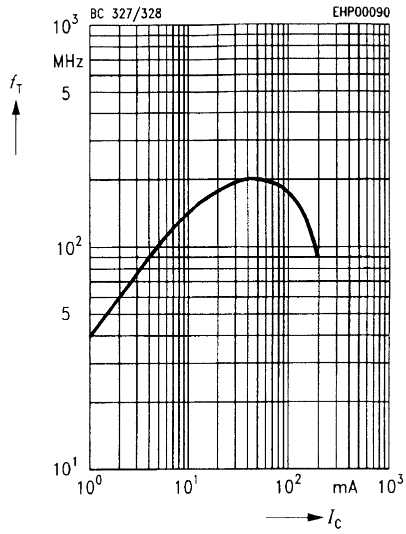
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 45 V



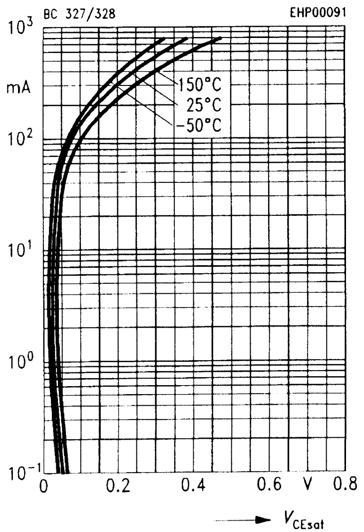
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V



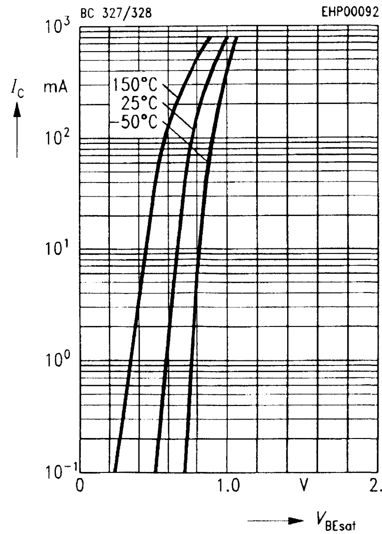
Transition frequency $f_T = f(I_C)$
f = 20 MHz, T_A = 25 °C



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 10



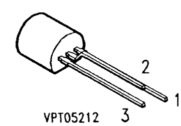
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 10



NPN Silicon AF Transistors

BC 337
BC 338

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BC 327, BC 328 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 337	–	Q62702-C313	C	B	E	TO-92
BC 337-16		Q62702-C313-V3				
BC 337-25		Q62702-C313-V1				
BC 337-40		Q62702-C313-V2				
BC 338		Q62702-C314				
BC 338-16		Q62702-C314-V1				
BC 338-25		Q62702-C314-V2				
BC 338-40		Q62702-C314-V3				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 337	BC 338	Unit
Collector-emitter voltage	V_{CEO}	45	25	V
Collector-base voltage	V_{CBO}	50	30	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 66 °C	P_{tot}	625		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 135	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

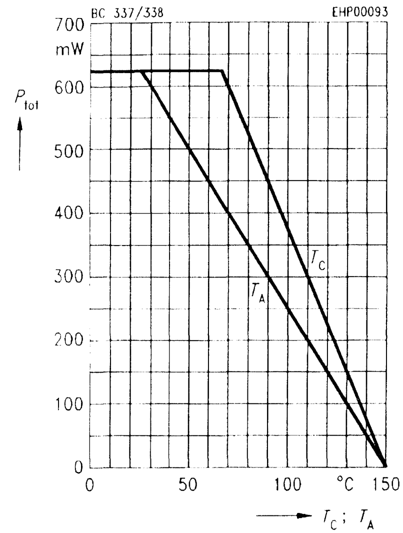
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CE0}$				V
BC 337		45	–	–	
BC 338		25	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CB0}$				
BC 337		50	–	–	
BC 338		30	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 25 V BC 338		–	–	100	nA
V_{CB} = 45 V BC 337		–	–	100	nA
V_{CB} = 25 V, T_A = 150 °C BC 338		–	–	10	µA
V_{CB} = 45 V, T_A = 150 °C BC 337		–	–	10	µA
Emitter cutoff current V_{EB} = 4 V	I_{EB0}	–	–	100	nA
DC current gain[1)]	h_{FE}				–
I_C = 100 mA; V_{CE} = 1 V					
BC 337/16; BC 338/16		100	160	250	
BC 337/25; BC 338/25		160	250	400	
BC 337/40; BC 338/40		250	350	630	
I_C = 300 mA; V_{CE} = 1 V					
BC 337/16; BC 338/16		60	–	–	
BC 337/25; BC 338/25		100	–	–	
BC 337/40; BC 338/40		170	–	–	
Collector-emitter saturation voltage[1)] I_C = 500 mA; I_B = 50 mA	V_{CEsat}	–	–	0.7	V
Base-emitter saturation voltage I_C = 500 mA; I_B = 50 mA	V_{BEsat}	–	–	2	

1) Pulse test: t < 300 µs, D < 2 %.

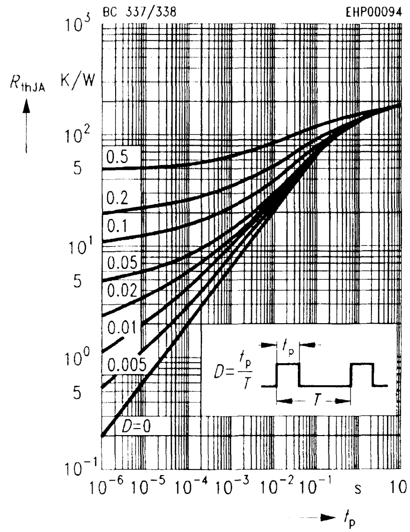
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	170	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	8	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

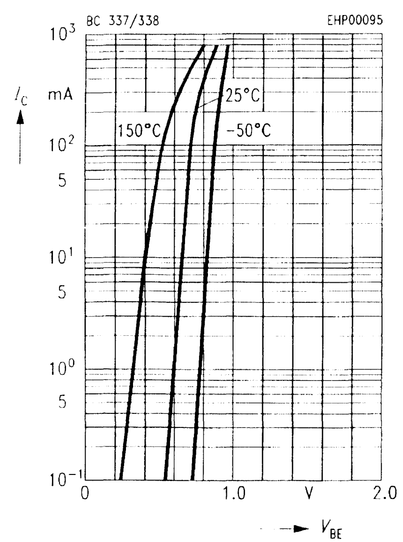
Total power dissipation $P_{tot} = f(T_A; T_C)$



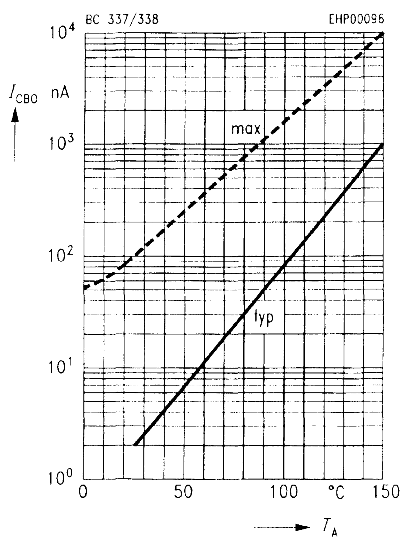
Permissible pulse load $R_{thJA} = f(t_p)$



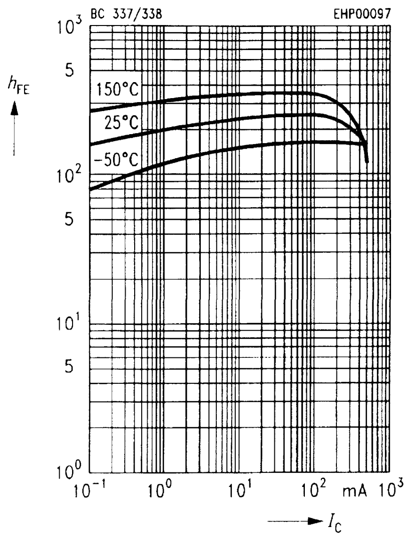
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V



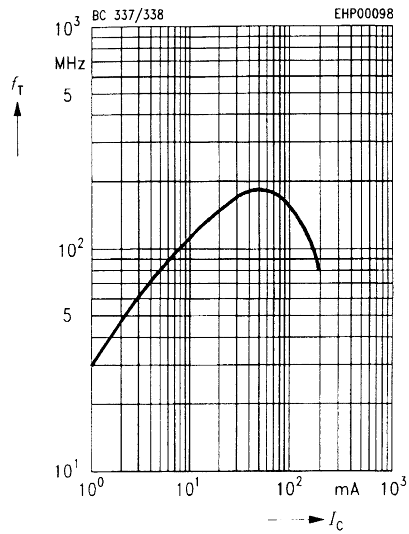
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 45 V



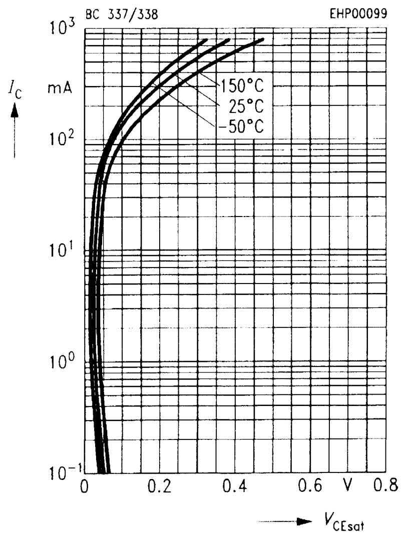
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V



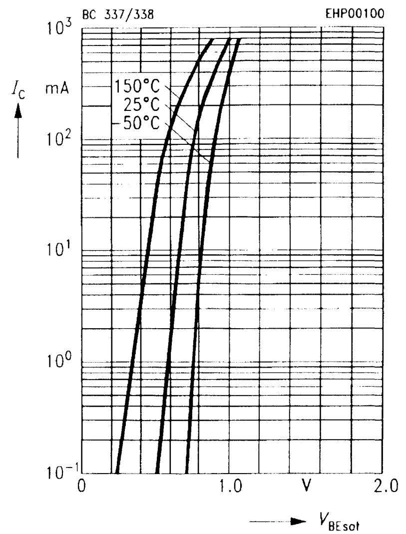
Transition frequency $f_T = f(I_C)$
f = 20 MHz, T_A = 25 °C



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 10



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 10

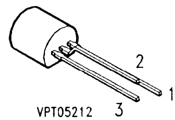


SIEMENS

NPN Silicon AF Transistor

BC 368

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary type: BC 369 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 368	–	C62702-C747	E	C	B	TO-92

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 90 °C[2)]	P_{tot}	0.8 (1)	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 156	K/W
Junction - case[3)]	$R_{th\,JC}$	≤ 75	

1) For detailed information see chapter Package Outlines.

2) If transistors with max. 4 mm lead length are fixed on PCBs with a min. 10 mm × 10 mm large copper area for the collector terminal, R_{thJA} = 125 K/W and thus $P_{tot\,max}$ = 1 W at T_A = 25 °C.

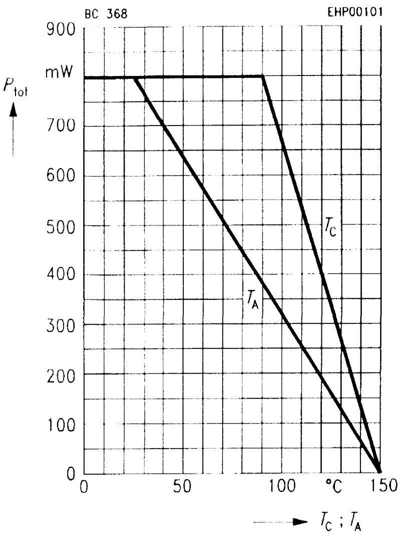
3) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

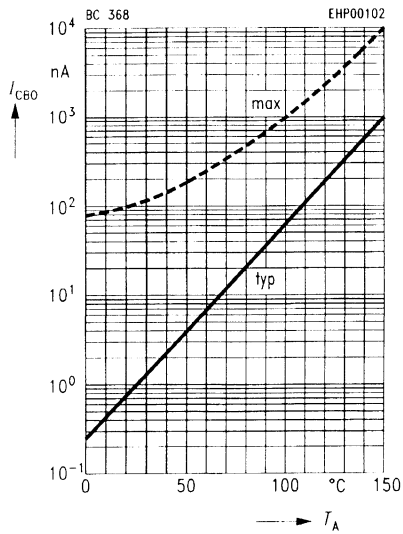
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 30 mA	$V_{(BR)CEO}$	20	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	25	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 25 V V_{CB} = 25 V, T_A = 150 ˚C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 5 V	I_{EBO}	–	–	100	nA
DC current gain I_C = 5 mA; V_{CE} = 10 V I_C = 500 mA; V_{CE} = 1 V [1] I_C = 1 A; V_{CE} = 1 V [1]	h_{FE}	 50 85 60	 – 160 –	 – 375 –	–
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	
AC characteristics					
Transition frequency I_C = 100 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	100	–	MHz

[1] Pulse test: $t \leq$ 300 µs, $D \leq$ 2 %.

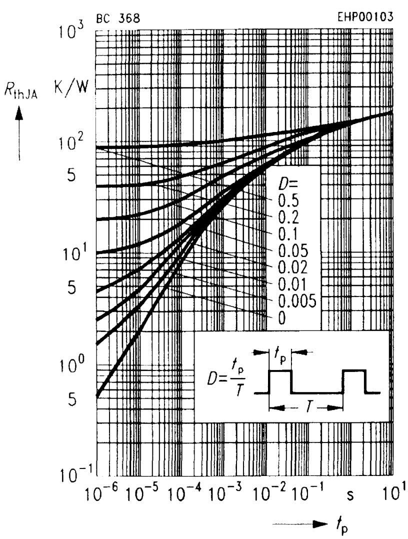
Total power dissipation $P_{tot} = f(T_A; T_C)$



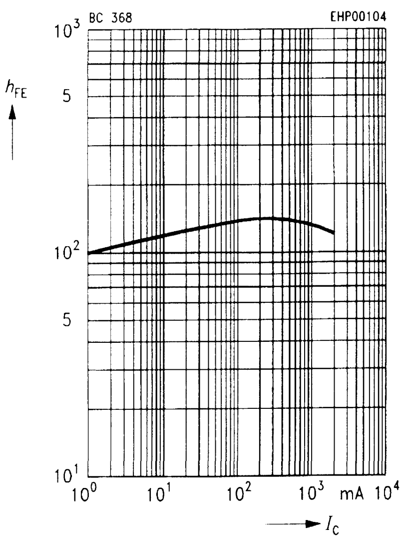
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 25 V



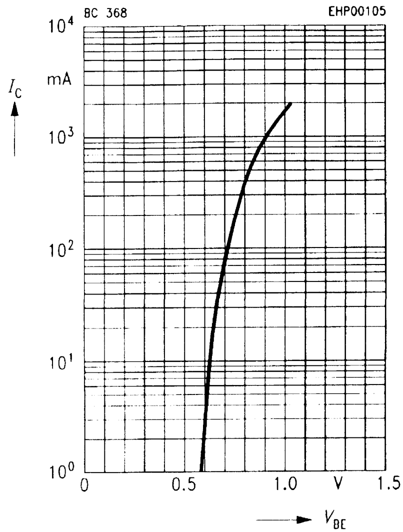
Permissible pulse load $R_{thJA} = f(t_p)$



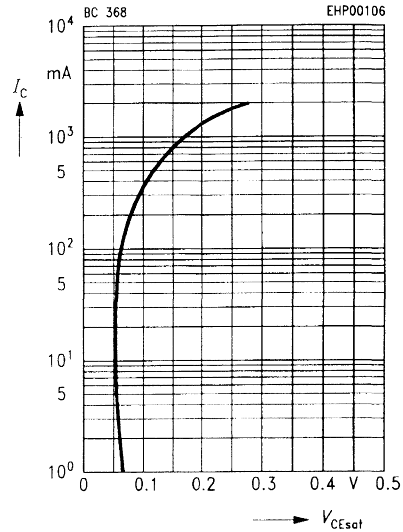
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V, T_A = 25 °C



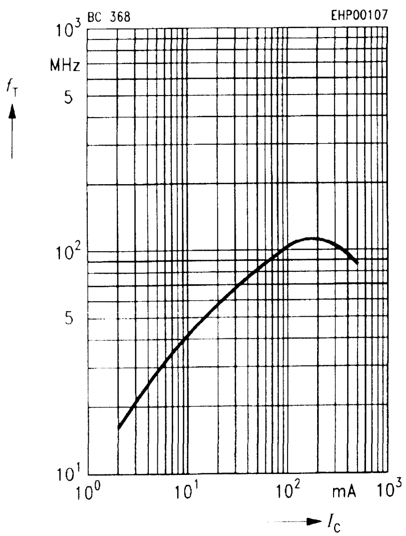
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 10$, $T_A = 25$ °C



Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 20$ MHz

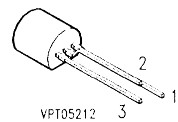


SIEMENS

PNP Silicon AF Transistor

BC 369

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary type: BC 368 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BC 369	–	C62702-C748	E	C	B	TO-92

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 90 °C [2]	P_{tot}	0.8 (1)	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient [2]	$R_{th\,JA}$	≤ 156	K/W
Junction - case [3]	$R_{th\,JC}$	≤ 75	

1) For detailed information see chapter Package Outlines.

2) If transistors with max. 4 mm lead length are fixed on PCBs with a min. 10 mm × 10 mm large copper area for the collector terminal, R_{thJA} = 125 K/W and thus $P_{tot\,max}$ = 1 W at T_A = 25 °C.

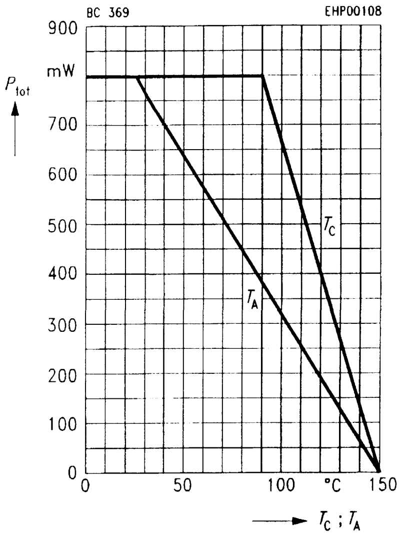
3) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

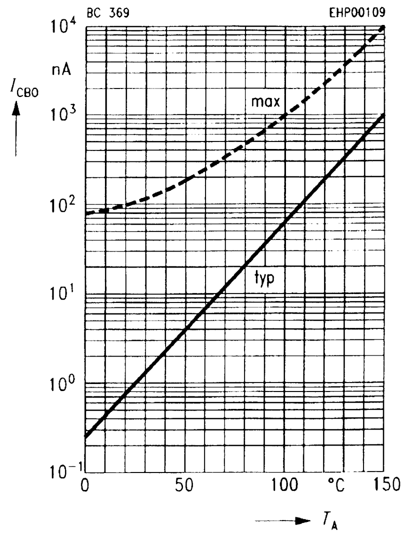
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 30 mA	$V_{(BR)CE0}$	20	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CB0}$	25	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current V_{CB} = 25 V V_{CB} = 25 V, T_A = 150 ˚C	I_{CB0}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 5 V	I_{EB0}	–	–	100	nA
DC current gain I_C = 5 mA; V_{CE} = 10 V I_C = 500 mA; V_{CE} = 1 V [1] I_C = 1 A; V_{CE} = 1 V [1]	h_{FE}	 50 85 60	 – 160 –	 – 375 –	–
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	
AC characteristics					
Transition frequency I_C = 100 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	100	–	MHz

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

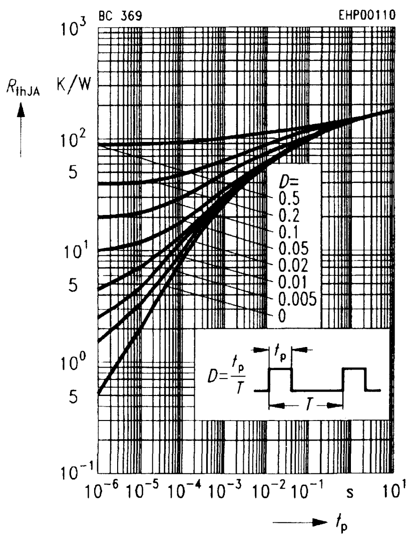
Total power dissipation $P_{tot} = f(T_A; T_C)$



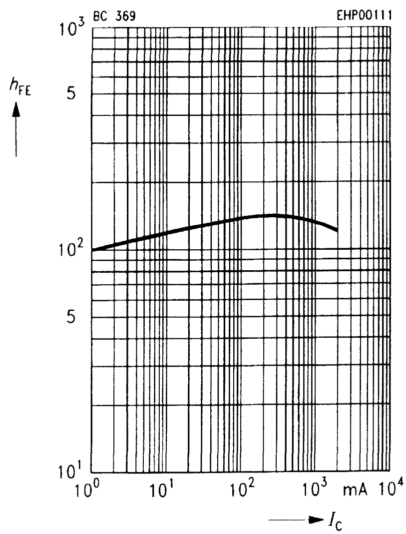
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 25 V



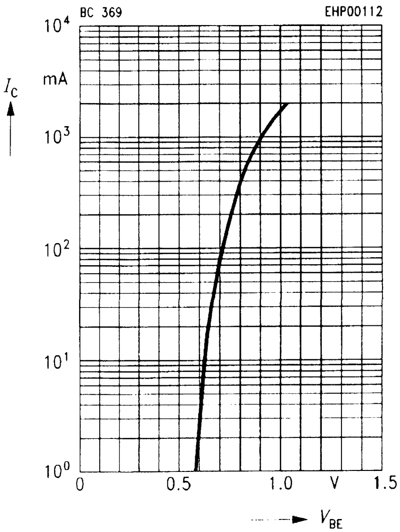
Permissible pulse load $R_{thJA} = f(t_p)$



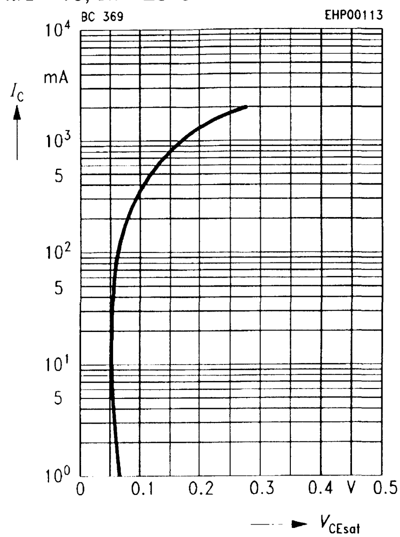
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V, T_A = 25 °C



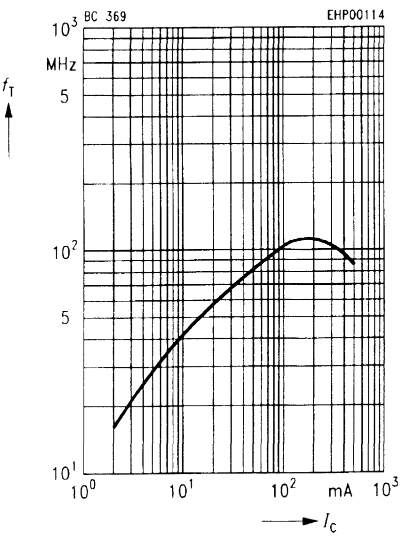
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V, T_A = 25 °C



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 10, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 20 MHz

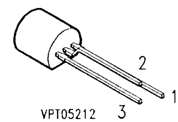


SIEMENS

NPN Silicon AF Transistors

BC 413
BC 414

- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BC 415, BC 416 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BC 413	–	Q62702-C375	C	B	E	TO-92
BC 413 B		Q62702-C375-V1				
BC 413 C		Q62702-C375-V2				
BC 414		Q62702-C376				
BC 414 B		Q62702-C376-V1				
BC 414 C		Q62702-C376-V2				

[1] For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 413	BC 414	Unit
Collector-emitter voltage	V_{CE0}	30	45	V
Collector-base voltage	V_{CB0}	45	50	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	100		mA
Peak collector current	I_{CM}	200		
Peak base current	I_{BM}	200		
Peak emitter current	I_{EM}	200		
Total power dissipation, T_C = 70 °C	P_{tot}	500		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

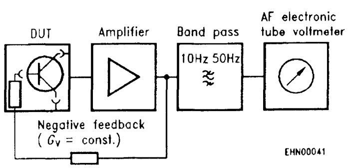
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA BC 413 BC 414	$V_{(BR)CE0}$	 30 45	 – –	 – –	V
Collector-base breakdown voltage I_C = 10 µA BC 413 BC 414	$V_{(BR)CB0}$	 45 50	 – –	 – –	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current V_{CB} = 30 V V_{CB} = 30 V, T_A = 150 °C	I_{CB0}	 – –	 – –	 15 4	 nA µA
DC current gain I_C = 10 µA; V_{CE} = 5 V BC 413 B, BC 414 B BC 413 C, BC 414 C I_C = 2 mA; V_{CE} = 5 V BC 413 B, BC 414 B BC 413 C, BC 414 C	h_{FE}	 100 100 200 420	 150 270 290 520	 – – 450 800	–
Collector-emitter saturation voltage [1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{CEsat}	 – –	 90 200	 250 600	mV
Base-emitter saturation voltage [1] I_C = 10 mA; I_B = 0.5 mA I_C = 100 mA; I_B = 5 mA	V_{BEsat}	 – –	 700 900	 – –	
Base-emitter voltage I_C = 2 mA; V_{CE} = 5 V I_C = 10 mA; V_{CE} = 5 V	$V_{BE\,(on)}$	 580 –	 660 –	 700 770	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

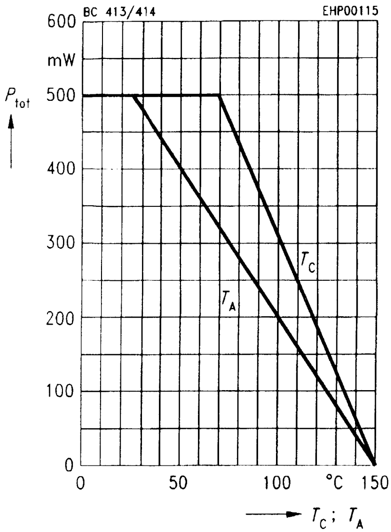
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 200 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 413 B, BC 414 B BC 413 C, BC 414 C	h_{11e}	 – –	 4.5 8.7	 – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 413 B, BC 414 B BC 413 C, BC 414 C	h_{12e}	 – –	 2 3	 – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 413 B, BC 414 B BC 413 C, BC 414 C	h_{21e}	 – –	 330 600	 – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 413 B, BC 414 B BC 413 C, BC 414 C	h_{22e}	 – –	 30 60	 – –	µS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F	–	1.2	4	dB
Noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz	E_n	–	–	0.135	mV

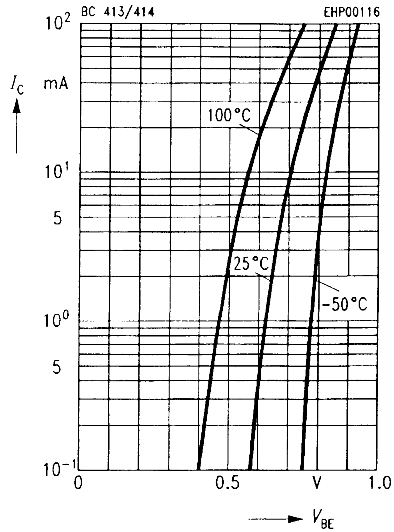
Test circuit for noise voltage measurement



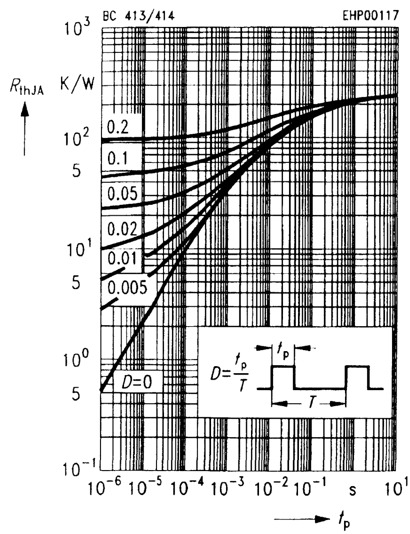
Total power dissipation $P_{tot} = f(T_A; T_C)$



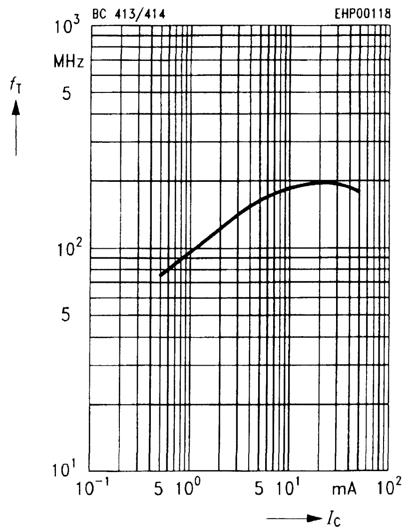
Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V



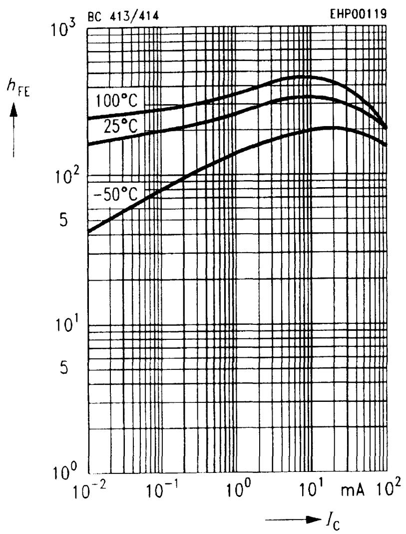
Permissible pulse load $R_{thJA} = f(t_p)$



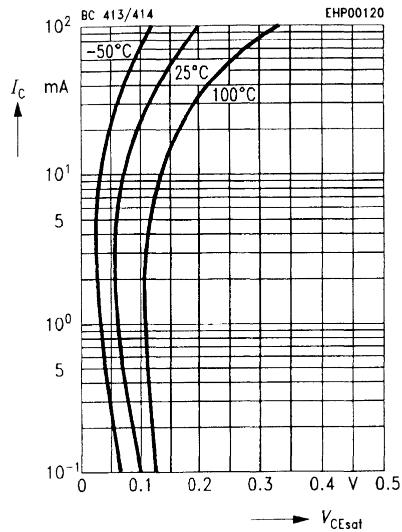
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



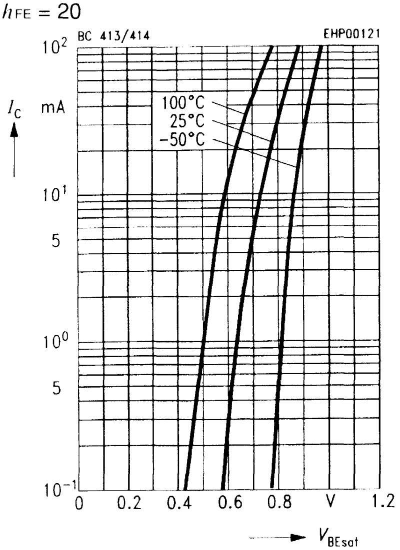
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



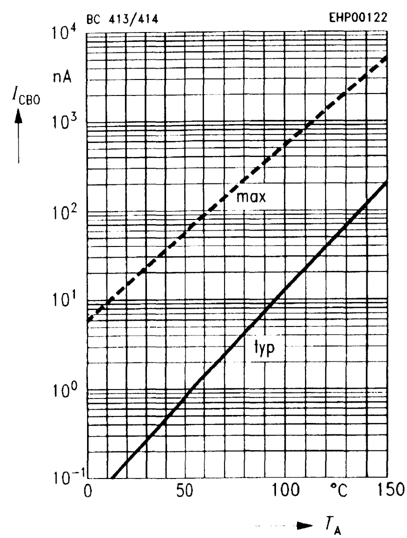
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



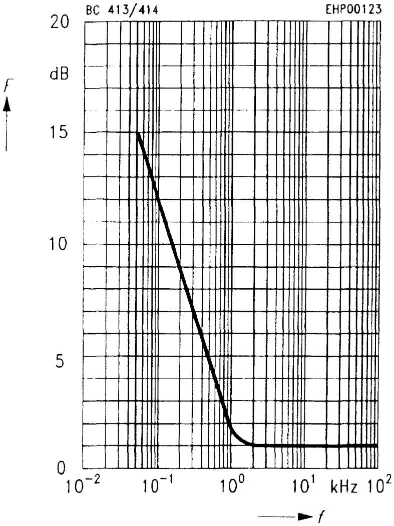
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



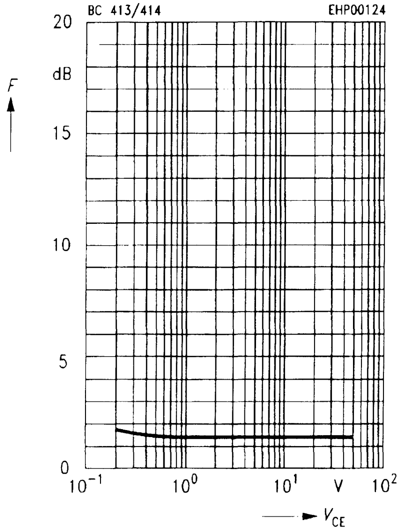
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



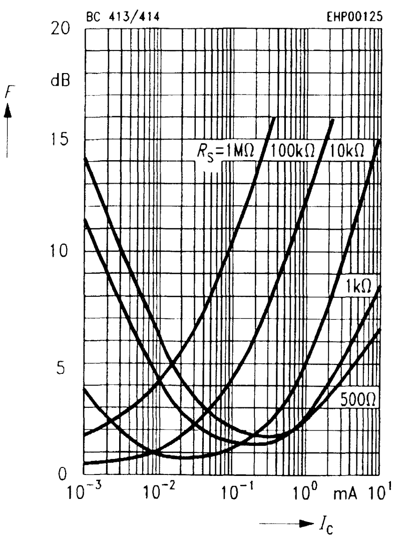
Noise figure $F = f(f)$
I_C = 0.2 mA, f = 1 kHz, R_S = 2 kΩ



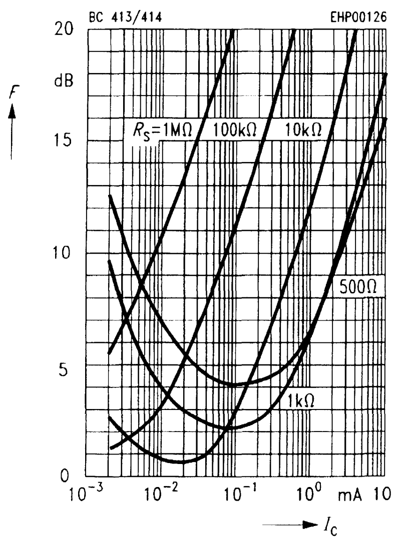
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
Δf = 200 Hz, T_A = 25 °C



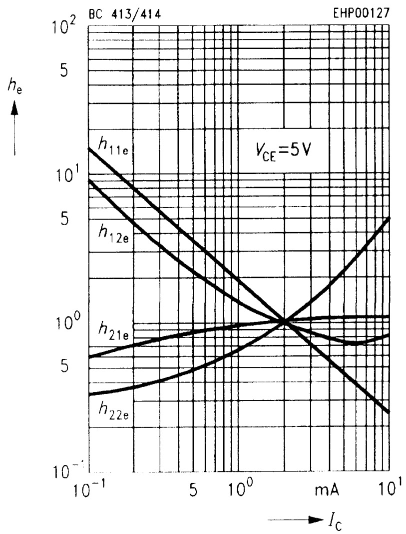
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



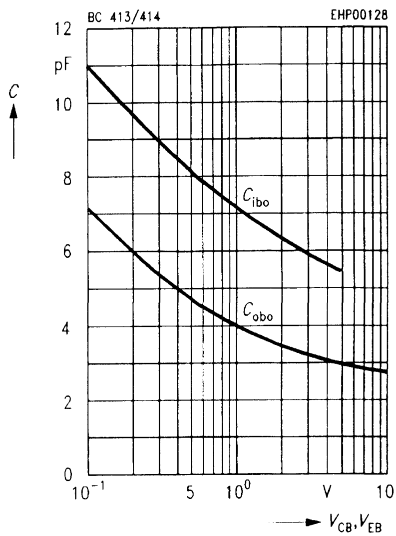
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

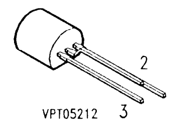


SIEMENS

PNP Silicon AF Transistors

BC 415
BC 416

- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BC 413, BC 414 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 415	–	Q62702-C377	C	B	E	TO-92
BC 415 A		Q62702-C377-V1				
BC 415 B		Q62702-C377-V2				
BC 415 C		Q62702-C377-V3				
BC 416		Q62702-C378				
BC 416 A		Q62702-C378-V1				
BC 416 B		Q62702-C378-V2				
BC 416 C		Q62702-C378-V3				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 415	BC 416	Unit
Collector-emitter voltage	V_{CE0}	35	45	V
Collector-base voltage	V_{CB0}	45	50	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	100		mA
Peak collector current	I_{CM}	200		
Peak base current	I_{BM}	200		
Peak emitter current	I_{EM}	200		
Total power dissipation, $T_C = 70$ °C	P_{tot}	500		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA	$V_{(BR)CEO}$				V
BC 415		35	–	–	
BC 416		45	–	–	
Collector-base breakdown voltage I_C = 10 μA	$V_{(BR)CBO}$				
BC 415		45	–	–	
BC 416		50	–	–	
Emitter-base breakdown voltage I_E = 1 μA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	μA
DC current gain	h_{FE}				–
I_C = 10 μA; V_{CE} = 5 V					
BC 415 A, BC 416 A		40	90	–	
BC 415 B, BC 416 B		100	150	–	
BC 415 C, BC 416 C		100	270	–	
I_C = 2 mA; V_{CE} = 5 V					
BC 415 A, BC 416 A		125	180	250	
BC 415 B, BC 416 B		220	290	475	
BC 415 C, BC 416 C		420	520	800	
Collector-emitter saturation voltage [1]	V_{CEsat}				mV
I_C = 10 mA; I_B = 0.5 mA		–	75	300	
I_C = 100 mA; I_B = 5 mA		–	250	650	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA; I_B = 0.5 mA		–	700	–	
I_C = 100 mA; I_B = 5 mA		–	930	–	
Base-emitter voltage	$V_{BE\ (on)}$				
I_C = 2 mA; V_{CE} = 5 V		600	650	750	
I_C = 10 mA; V_{CE} = 5 V		–	–	820	

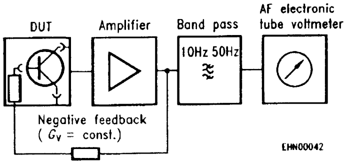
[1] Pulse test: $t \leq 300$ μs, $D \leq 2$ %.

Electrical Characteristics

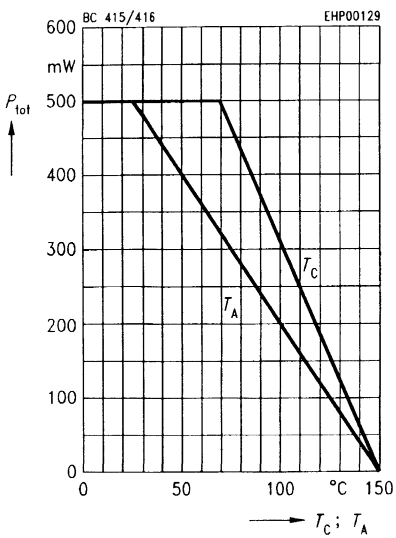
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	4	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 415 A, BC 416 A BC 415 B, BC 416 B BC 415 C, BC 416 C	h_{11e}	 – – –	 2.7 4.5 8.7	 – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 415 A, BC 416 A BC 415 B, BC 416 B BC 415 C, BC 416 C	h_{12e}	 – – –	 1.5 2 3	 – – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 415 A, BC 416 A BC 415 B, BC 416 B BC 415 C, BC 416 C	h_{21e}	 – – –	 200 330 600	 – – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 415 A, BC 416 A BC 415 B, BC 416 B BC 415 C, BC 416 C	h_{22e}	 – – –	 18 30 60	 – – –	µS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F	–	1	4	dB
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz	E_n	–	–	0.110	mV

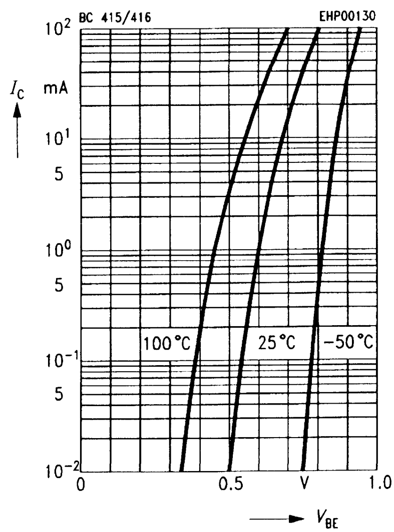
Test circuit for noise voltage measurement



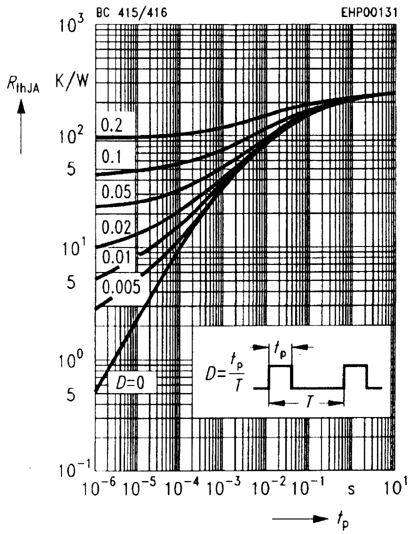
Total power dissipation $P_{tot} = f\,(T_A;\, T_C)$



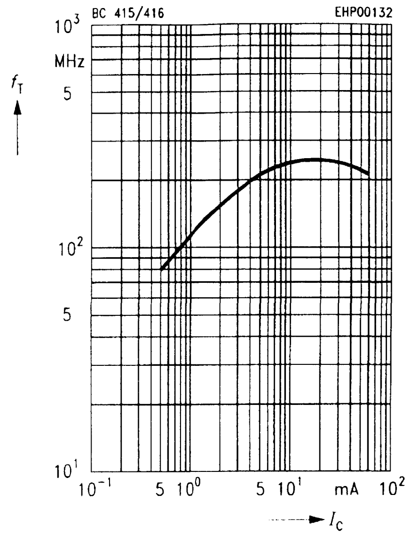
Collector current $I_C = f\,(V_{BE})$
V_{CE} = 5 V



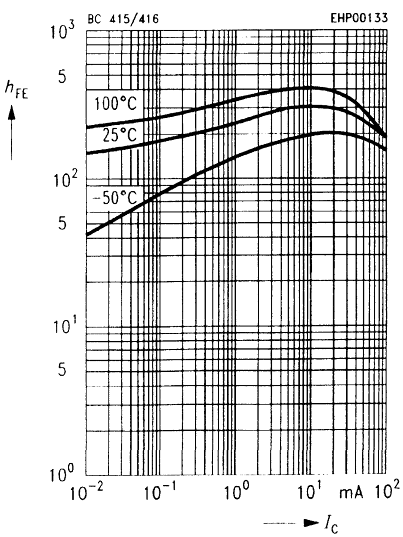
Permissible pulse load $R_{thJA} = f(t_p)$



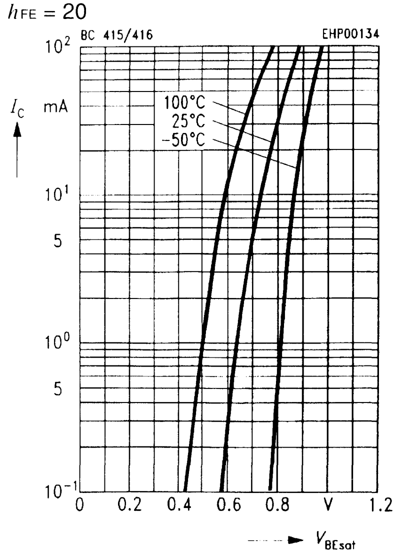
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



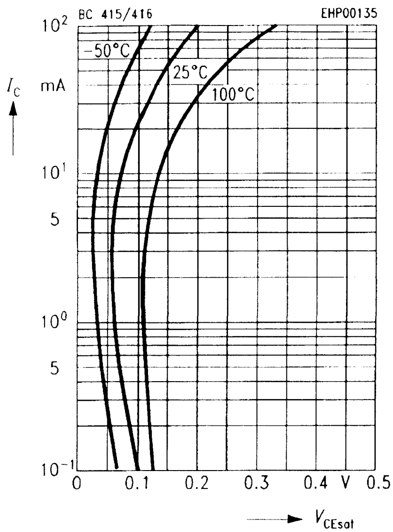
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



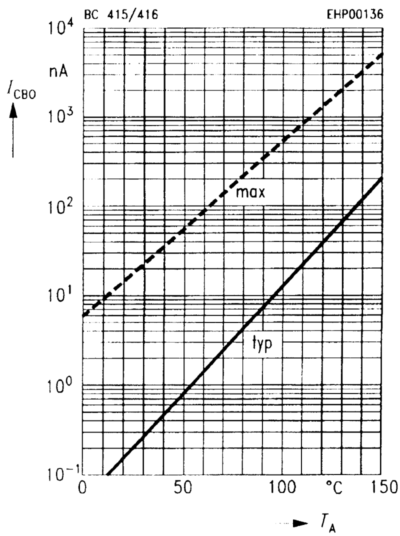
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 20$



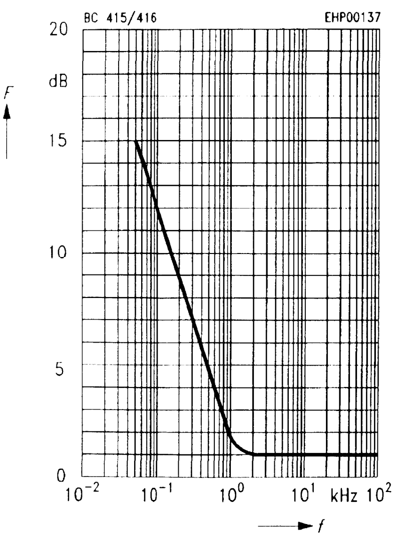
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 20$



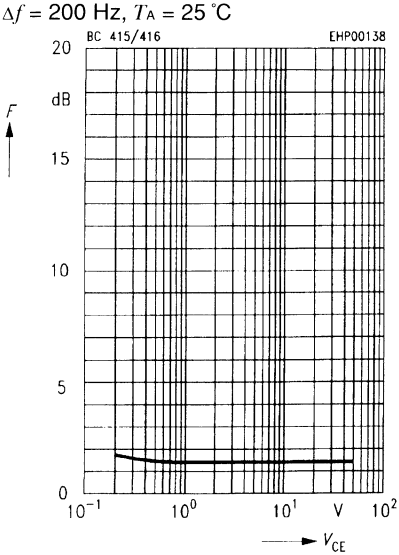
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = 30$ V



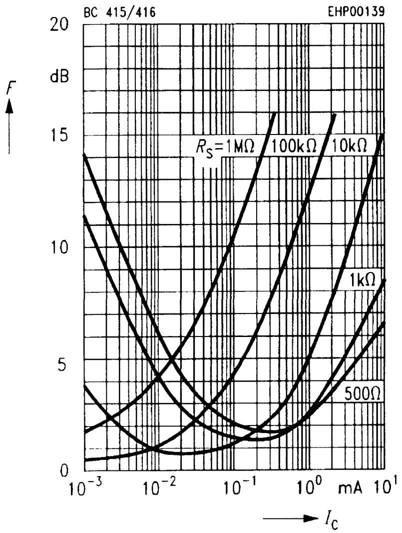
Noise figure $F = f(f)$
$I_C = 0.2$ mA, $f = 12$ kHz, $R_S = 2$ kΩ



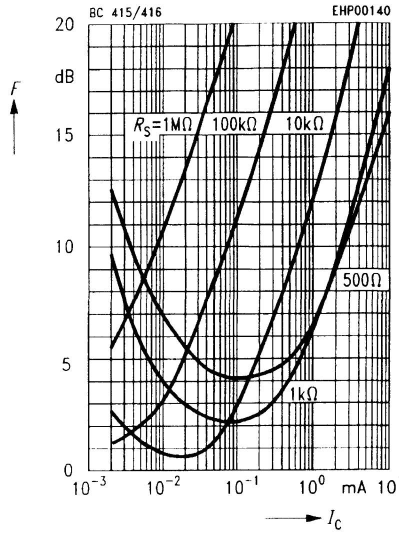
Noise figure $F = f(V_{CE})$
$I_C = 0.2$ mA, $R_S = 2$ kΩ, $f = 1$ kHz
$\Delta f = 200$ Hz, $T_A = 25$ °C



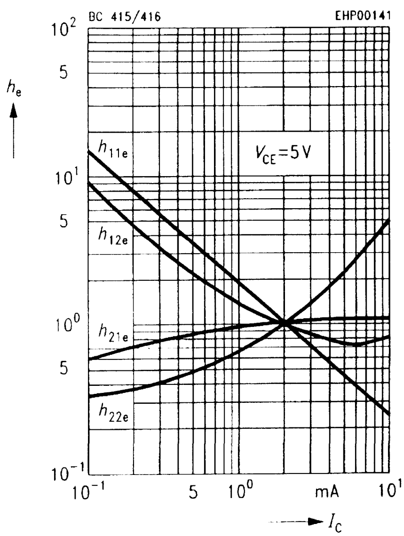
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



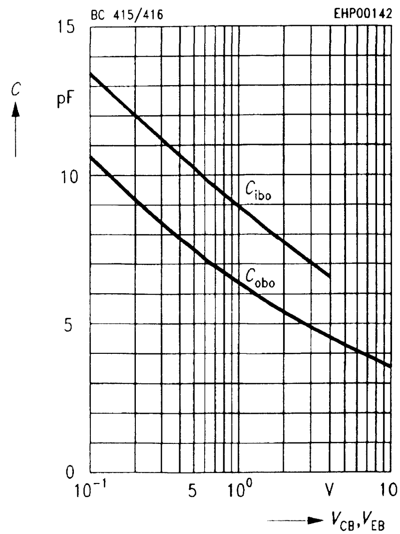
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



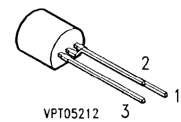
Capacitance $C = f(V_{CB}, V_{EB})$



PNP Silicon Darlington Transistor

BC 516

- High current gain
- High collector current
- Complementary type: BC 517 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BC 516	–	Q62702-C944	C	B	E	TO-92

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	30	V
Collector-base voltage	V_{CB0}	40	
Emitter-base voltage	V_{EB0}	10	
Collector current	I_C	500	mA
Peak collector current	I_{CM}	800	
Base current	I_B	100	
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 66 ˚C	P_{tot}	625	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case[2]	$R_{th\,JC}$	≤ 135	

[1] For detailed information see chapter Package Outlines.
[2] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

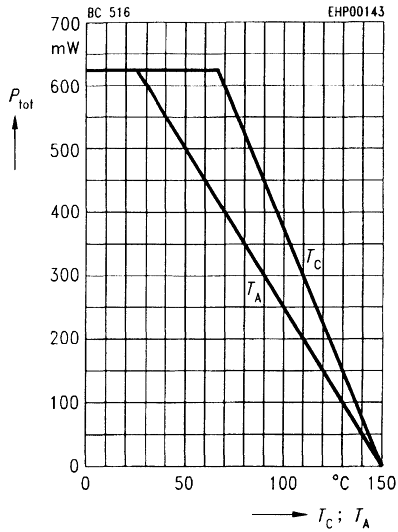
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

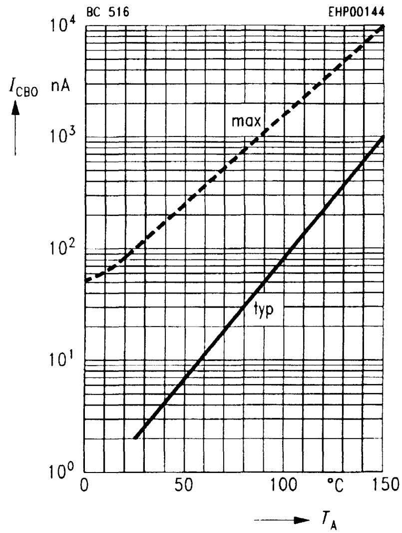
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$	30	–	–	V
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$	40	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	10	–	–	
Collector cutoff current V_{CB} = 30 V V_{CB} = 30 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	µA
DC current gain I_C = 20 mA; V_{CE} = 2 V	h_{FE}	30 000	–	–	–
Collector-emitter saturation voltage [1] I_C = 100 mA; I_B = 0.1 mA	V_{CEsat}	–	–	1	V
Base-emitter voltage [1] I_C = 10 mA; V_{CE} = 5 V	V_{BE}	–	–	1.4	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3.5	–	pF

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

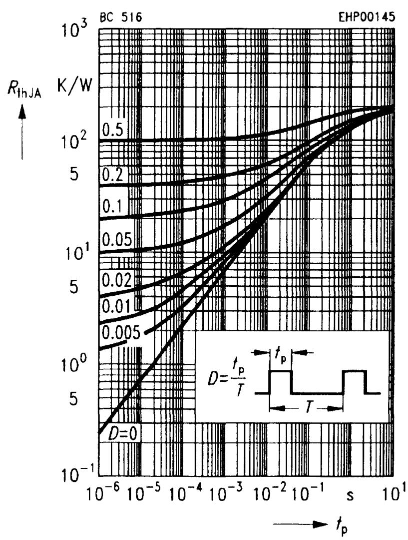
Total power dissipation $P_{tot} = f\,(T_A;\,T_C)$



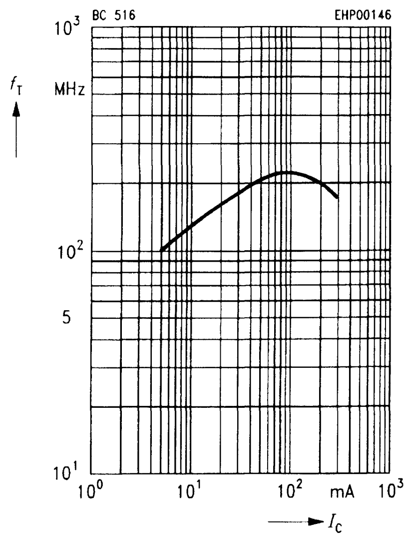
Collector cutoff current $I_{CBO} = f\,(T_A)$
V_{CB} = 30 V



Permissible pulse load $R_{thJA} = f\,(t_p)$



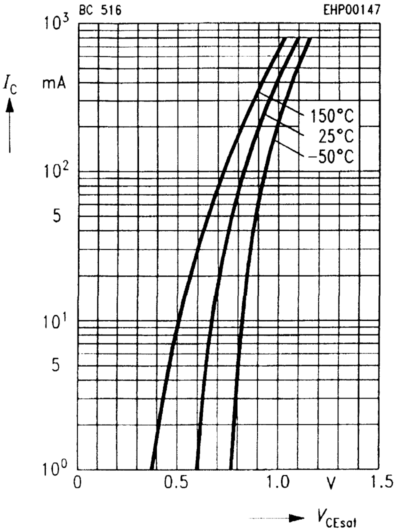
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V



Collector-emitter saturation voltage

$V_{CEsat} = f(I_C)$

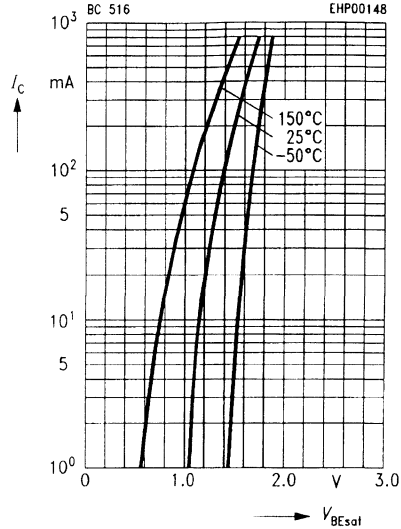
$h_{FE} = 1000$



Base-emitter saturation voltage

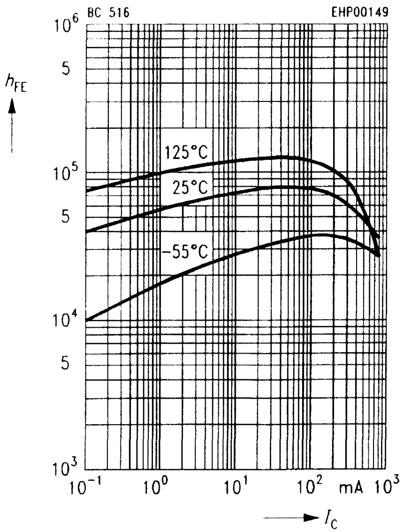
$V_{BEsat} = f(I_C)$

$h_{FE} = 1000$

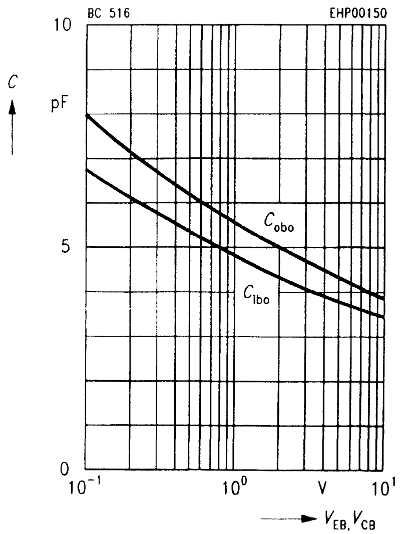


DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 2$ V



Capacitance $C = f(V_{EB}, V_{CB})$

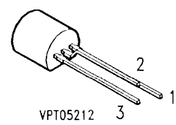


SIEMENS

NPN Silicon Darlington Transistor

BC 517

- High current gain
- High collector current
- Complementary type: BC 516 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 517	–	Q62702-C825	C	B	E	TO-92

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	30	V
Collector-base voltage	V_{CB0}	40	
Emitter-base voltage	V_{EB0}	10	
Collector current	I_C	500	mA
Peak collector current	I_{CM}	800	
Base current	I_B	100	
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 66 ˚C	P_{tot}	625	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 200	K/W
Junction - case[2)]	$R_{th JC}$	≤ 135	

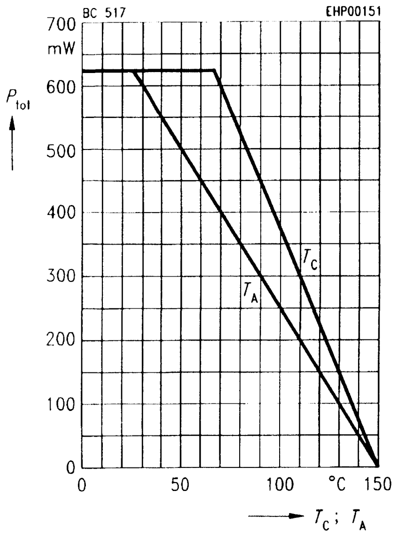
1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

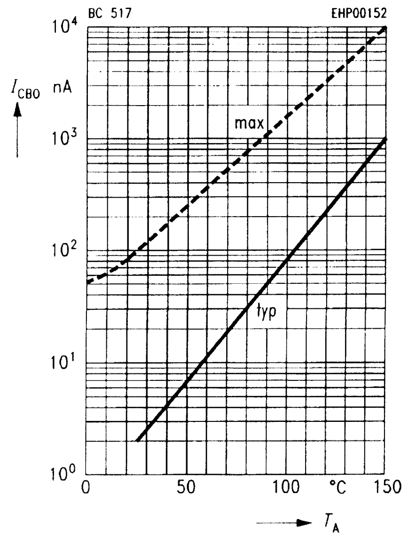
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$	30	–	–	V
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$	40	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	10	–	–	
Collector cutoff current V_{CB} = 30 V V_{CB} = 30 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain I_C = 20 mA; V_{CE} = 2 V [1]	h_{FE}	30 000	–	–	–
Collector-emitter saturation voltage [1] I_C = 100 mA; I_B = 0.1 mA	V_{CEsat}	–	–	1	V
Base-emitter voltage [1] I_C = 10 mA; V_{CE} = 5 V	V_{BE}	–	–	1.4	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	150	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3.5	–	pF

[1] Pulse test: t < 300 µs, D < 2 %.

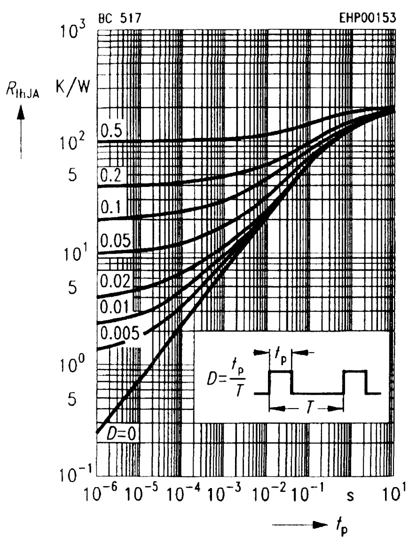
Total power dissipation $P_{tot} = f(T_A; T_C)$



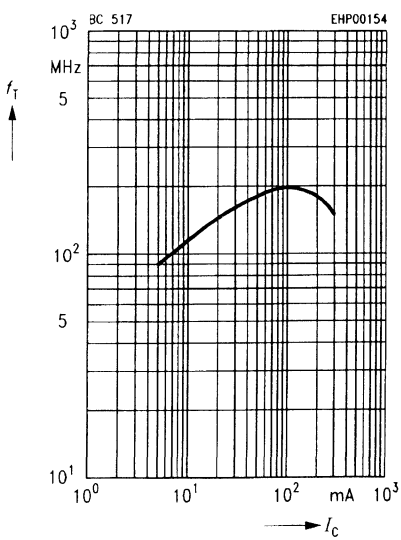
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



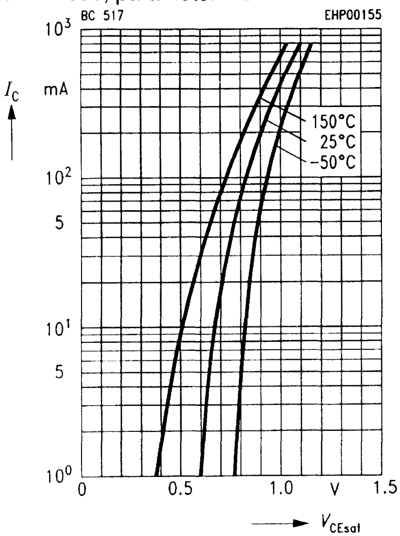
Permissible pulse load $R_{thJA} = f(t_p)$



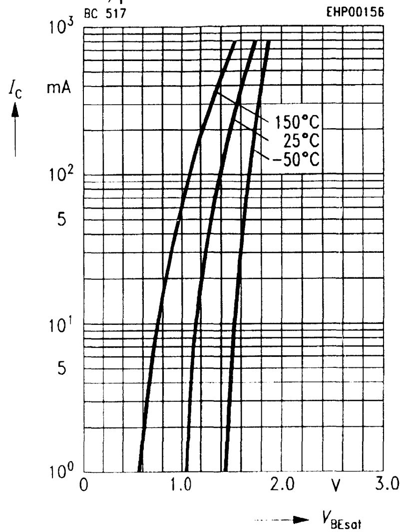
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 20 MHz



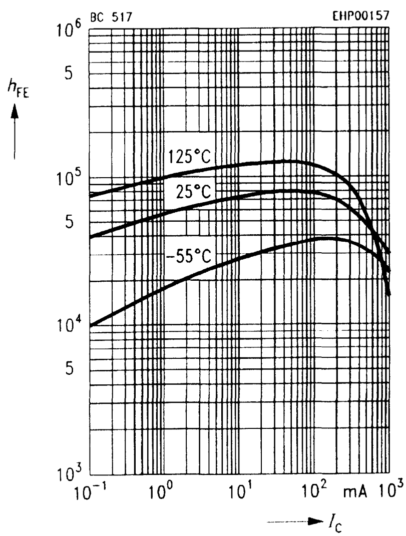
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 1000, parameter = T_A



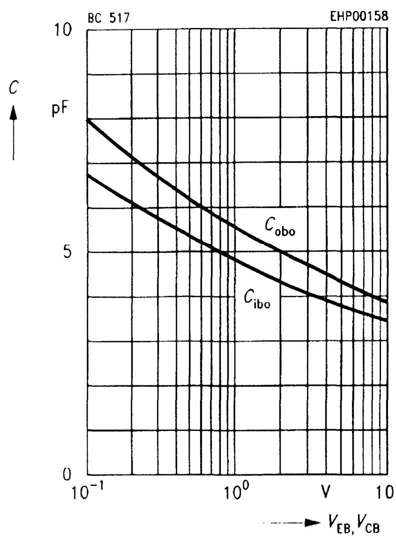
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 1000, parameter = T_A



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



Capacitance $C = f(V_{EB}, V_{CB})$

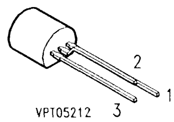


SIEMENS

NPN Silicon AF Transistors

BC 546
... BC 550

- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BC 556, BC 557, BC 558, BC 559, BC 560 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 546	–	Q62702-C687	C	B	E	TO-92
BC 546 A		Q62702-C687-V1				
BC 546 B		Q62702-C687-V2				
BC 547		Q62702-C688				
BC 547 A		Q62702-C688-V1				
BC 547 B		Q62702-C688-V2				
BC 548		Q62702-C689				
BC 548 A		Q62702-C689-V1				
BC 548 B		Q62702-C689-V2				
BC 548 C		Q62702-C689-V3				
BC 549		Q62702-C690				
BC 549 B		Q62702-C690-V1				
BC 549 C		Q62702-C690-V2				
BC 550		Q62702-C691				
BC 550 B		Q62702-C691-V1				
BC 550 C		Q62702-C691-V2				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 546	BC 547 BC 550	BC 548 BC 549	Unit
Collector-emitter voltage	V_{CEO}	65	45	30	V
Collector-base voltage	V_{CBO}	80	50	30	
Emitter-base voltage	V_{EBO}	6	6	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, T_C = 70 °C	P_{tot}	500			mW
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 250	K/W
Junction - case [1]	$R_{th JC}$	≤ 160	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

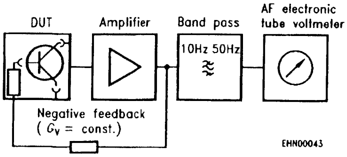
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 2 mA BC 546		65	–	–	
BC 547, BC 550		45	–	–	
BC 548, BC 549		30	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 µA BC 546		80	–	–	
BC 547, BC 550		50	–	–	
BC 548, BC 549		30	–	–	
Collector-emitter breakdown voltage	$V_{(BR)CES}$				
I_C = 10 µA, V_{BE} = 0 BC 546		80	–	–	
BC 547, BC 550		50	–	–	
BC 548, BC 549		30	–	–	
Emitter-base breakdown voltage	$V_{(BR)EB0}$				
I_E = 1 µA BC 546, BC 547		6	–	–	
BC 548, BC 549, BC 550		5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	µA
DC current gain	h_{FE}				–
I_C = 10 µA; V_{CE} = 5 V					
BC 546 A, BC 547 A, BC 548 A		–	90	–	
BC 546 B, BC 547 B, BC 548 B, BC 549 B, BC 550 B		–	150	–	
BC 548 C, BC 549 C, BC 550 C		–	270	–	
I_C = 2 mA; V_{CE} = 5 V					
BC 546 A, BC 547 A, BC 548 A		110	180	220	
BC 546 B, BC 547 B, BC 548 B, BC 549 B, BC 550 B		200	290	450	
BC 548 C, BC 549 C, BC 550 C		420	520	800	
Collector-emitter saturation voltage [1]	V_{CEsat}				mV
I_C = 10 mA; I_B = 0.5 mA		–	90	250	
I_C = 100 mA; I_B = 5 mA		–	200	600	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA; I_B = 0.5 mA		–	700	–	
I_C = 100 mA; I_B = 5 mA		–	900	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA; V_{CE} = 5 V		580	660	700	
I_C = 10 mA; V_{CE} = 5 V		–	–	770	

[1] Pulse test: $t \le 300$ µs, $D \le 2$ %.

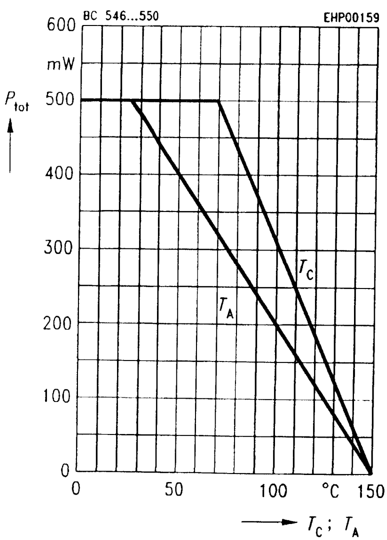
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 546 A, BC 547 A, BC 548 A BC 546 B, BC 547 B, BC 548 B, BC 549 B, BC 550 B BC 548 C, BC 549 C, BC 550 C	h_{11e}	 – – –	 2.7 4.5 8.7	 – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 45 V, f = 1 kHz BC 546 A, BC 547 A, BC 548 A BC 546 B, BC 547 B, BC 548 B, BC 549 B, BC 550 B BC 548 C, BC 549 C, BC 550 C	h_{12e}	 – – –	 1.5 2 3	 – – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 546 A, BC 547 A, BC 548 A BC 546 B, BC 547 B, BC 548 B, BC 549 B, BC 550 B BC 548 C, BC 549 C, BC 550 C	h_{21e}	 – – –	 200 330 600	 – – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 546 A, BC 547 A, BC 548 A BC 546 B, BC 547 B, BC 548 B, BC 549 B, BC 550 B BC 548 C, BC 549 C, BC 550 C	h_{22e}	 – – –	 18 30 60	 – – –	µS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 30 Hz ... 15 kHz BC 549 BC 550 I_C = 1 kHz, Δf = 200 Hz BC 549 BC 550 BC 546, BC 547, BC 548	F	 – – – – –	 1.4 1.4 1.2 1 2	 4 3 4 4 –	dB
Noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz BC 550	E_n	–	–	0.135	µV

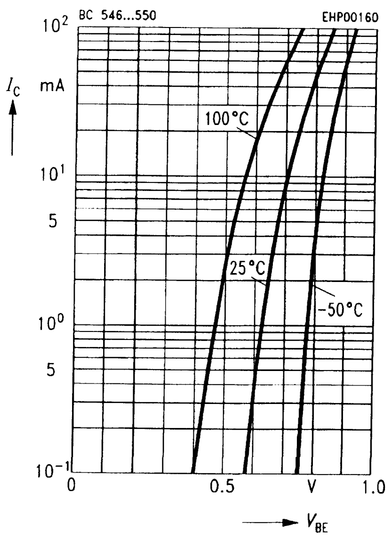
Test circuit for noise voltage measurement



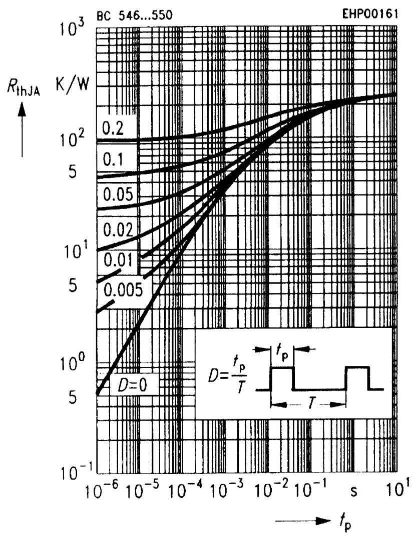
Total power dissipation $P_{tot} = f(T_A; T_C)$



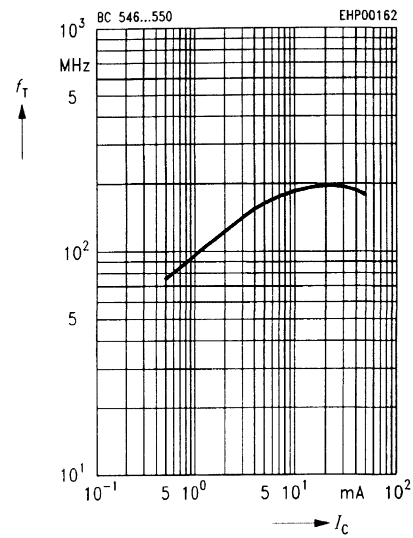
Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V



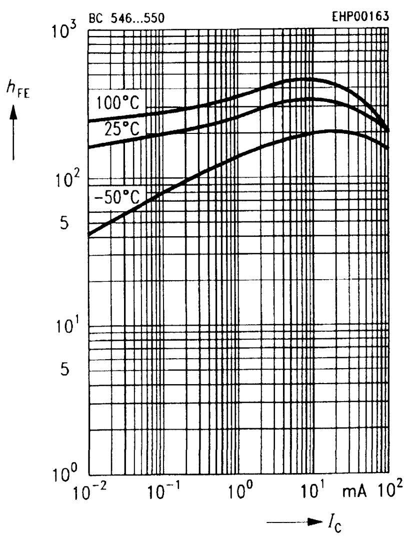
Permissible pulse load $R_{thJA} = f(t_p)$



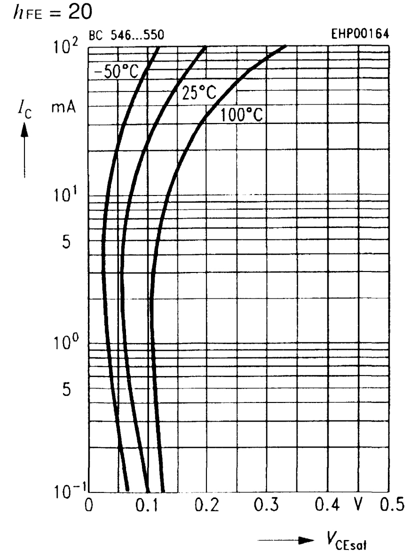
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



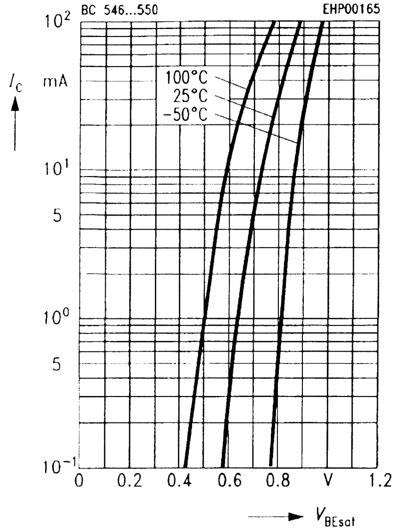
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



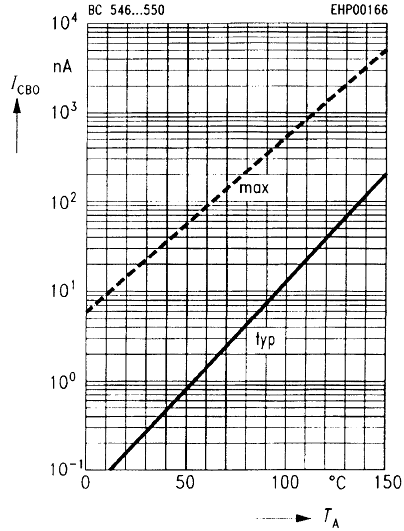
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



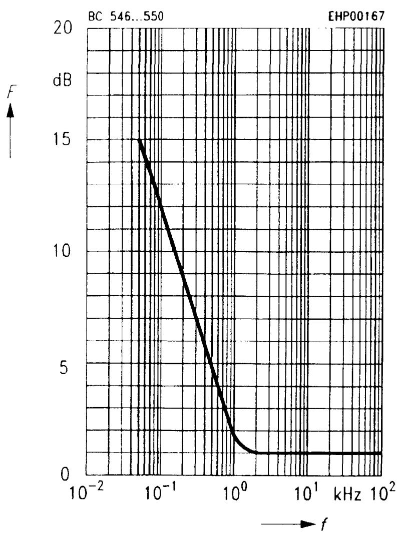
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 20$



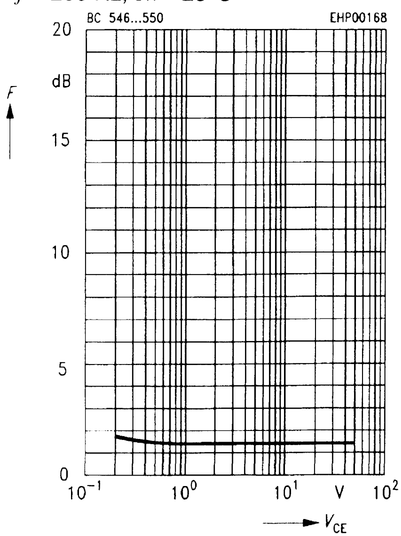
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = 30$ V



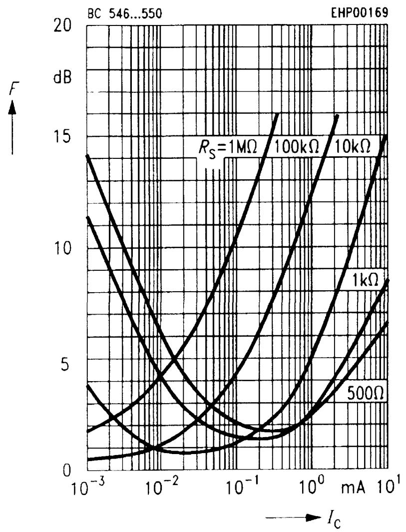
Noise figure $F = f(f)$
$I_C = 0.2$ mA, $f = 1$ kHz, $R_S = 2$ kΩ



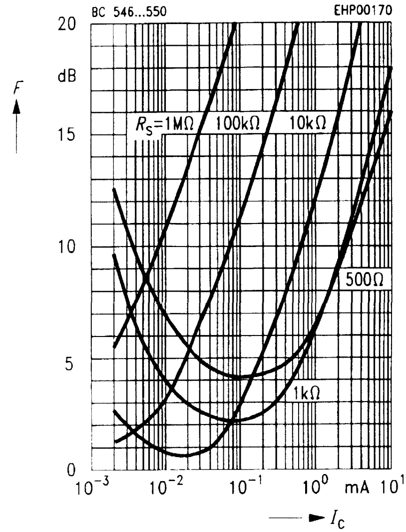
Noise figure $F = f(V_{CE})$
$I_C = 0.2$ mA, $R_S = 2$ kΩ, $f = 1$ kHz
$\Delta f = 200$ Hz, $T_A = 25$ °C



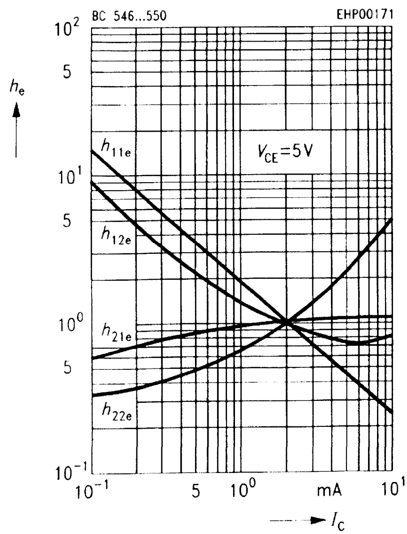
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



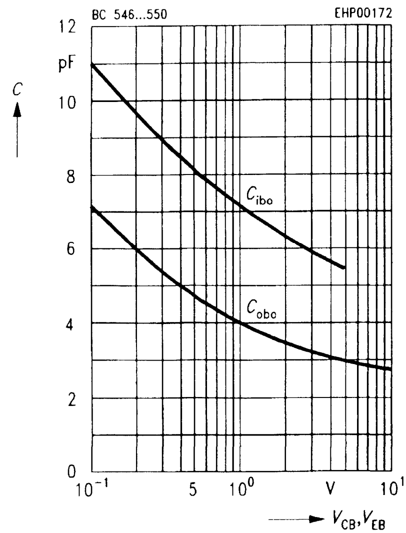
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

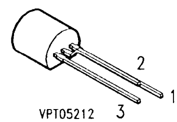


SIEMENS

PNP Silicon AF Transistors

BC 556 ... BC 560

- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BC 546, BC 547, BC 548, BC 549, BC 550 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BC 556	–	Q62702-C692	C	B	E	TO-92
BC 556 A		Q62702-C692-V1				
BC 556 B		Q62702-C692-V2				
BC 557		Q62702-C693				
BC 557 A		Q62702-C693-V1				
BC 557 B		Q62702-C693-V2				
BC 558		Q62702-C694				
BC 558 A		Q62702-C694-V1				
BC 558 B		Q62702-C694-V2				
BC 558 C		Q62702-C694-V3				
BC 559		Q62702-C695				
BC 559 A		Q62702-C695-V1				
BC 559 B		Q62702-C695-V2				
BC 559 C		Q62702-C695-V3				
BC 560		Q62702-C696				
BC 560 A		Q62702-C696-V1				
BC 560 B		Q62702-C696-V2				
BC 560 C		Q62702-C696-V3				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 556	BC 557 BC 560	BC 558 BC 559	Unit
Collector-emitter voltage	V_{CEO}	65	45	30	V
Collector-base voltage	V_{CBO}	80	50	30	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, T_C = 70 ˚C	P_{tot}	500			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

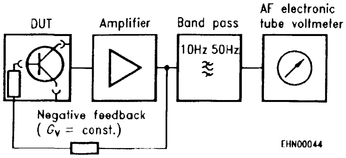
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 2 mA BC 556		65	–	–	
BC 557, BC 560		45	–	–	
BC 558, BC 559		30	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 10 µA BC 556		80	–	–	
BC 557, BC 560		50	–	–	
BC 558, BC 559		30	–	–	
Collector-emitter breakdown voltage	$V_{(BR)CES}$				
I_C = 10 µA, V_{BE} = 0 BC 556		80	–	–	
BC 557, BC 560		50	–	–	
BC 558, BC 559		30	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	µA
DC current gain	h_{FE}				–
I_C = 10 µA; V_{CE} = 5 V					
BC 556 A, BC 557 A, BC 558 A, BC 559 A, BC 560 A		–	90	–	
BC 556 B, BC 557 B, BC 558 B, BC 559 B, BC 560 B		–	150	–	
BC 558 C, BC 559 C, BC 560 C		–	270	–	
I_C = 2 mA; V_{CE} = 5 V					
BC 556 A, BC 557 A, BC 558 A		125	180	250	
BC 556 B, BC 557 B, BC 558 B, BC 559 B, BC 560 B		220	290	475	
BC 558 C, BC 559 C		420	520	800	
Collector-emitter saturation voltage [1]	V_{CEsat}				mV
I_C = 10 mA; I_B = 0.5 mA		–	75	300	
I_C = 100 mA; I_B = 5 mA		–	250	650	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA; I_B = 0.5 mA		–	700	–	
I_C = 100 mA; I_B = 5 mA		–	930	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA; V_{CE} = 5 V		600	650	750	
I_C = 10 mA; V_{CE} = 5 V		–	–	820	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

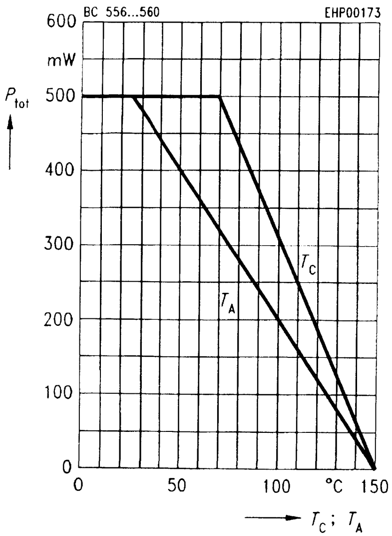
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	4	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	10	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 556 A, BC 557 A, BC 558 A BC 556 B, BC 557 B, BC 558 B, BC 559 B, BC 560 B BC 558 C, BC 559 C, BC 560 C	h_{11e}	 – – –	 2.7 4.5 8.7	 – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 556 A, BC 557 A, BC 558 A BC 556 B, BC 557 B, BC 558 B, BC 559 B, BC 560 B BC 558 C, BC 559 C, BC 560 C	h_{12e}	 – – –	 1.5 2 3	 – – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 556 A, BC 557 A, BC 558 A BC 556 B, BC 557 B, BC 558 B, BC 559 B, BC 560 B BC 558 C, BC 559 C, BC 560 C	h_{21e}	 – – –	 200 330 600	 – – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 556 A, BC 557 A, BC 558 A BC 556 B, BC 557 B, BC 558 B, BC 559 B, BC 560 B BC 558 C, BC 559 C, BC 560 C	h_{22e}	 – – –	 18 30 60	 – – –	µS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 30 Hz ... 15 kHz BC 559 BC 560 I_C = 1 kHz, Δf = 200 Hz BC 559 BC 560 BC 556, BC 557, BC 558	F	 – – – – –	 1.2 1 1 1 2	 4 3 4 4 –	dB
Noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz BC 560	E_n	–	–	0.110	µV

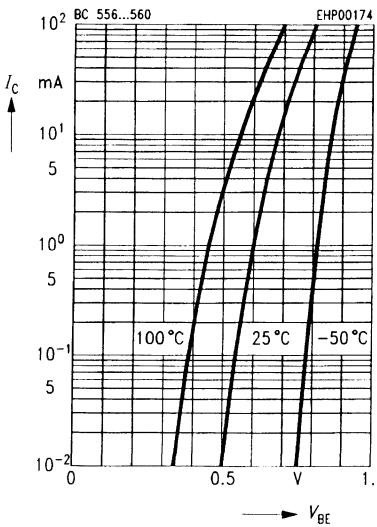
Test circuit for noise voltage measurement



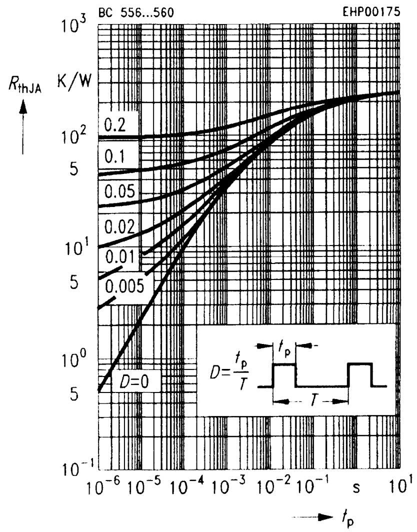
Total power dissipation $P_{tot} = f(T_A; T_C)$



Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V

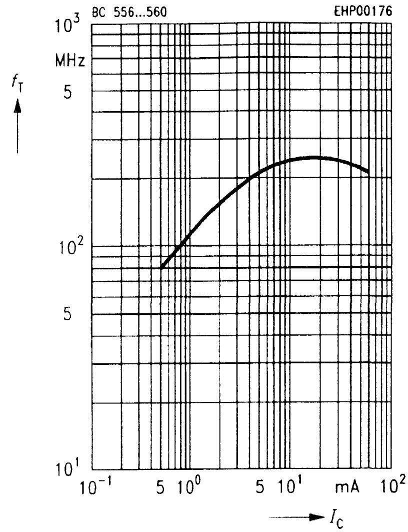


Permissible pulse load $R_{thJA} = f(t_p)$



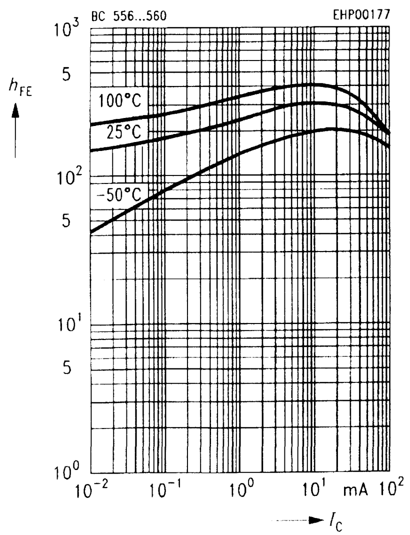
Transition frequency $f_T = f(I_C)$

V_{CE} = 5 V, f = 100 MHz



DC current gain $h_{FE} = f(I_C)$

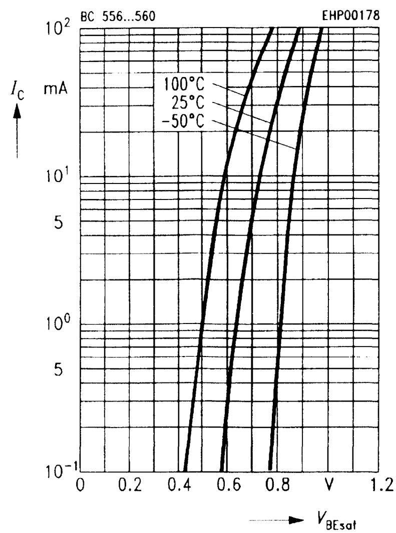
V_{CE} = 5 V (common emitter configuration)



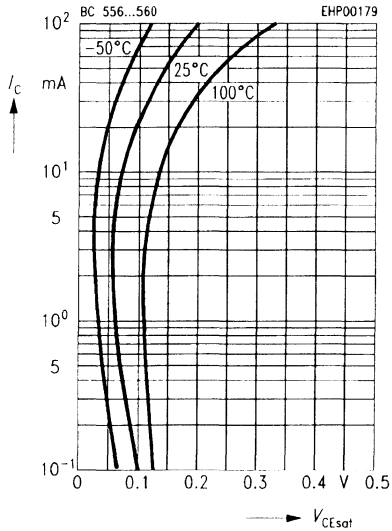
Base-emitter saturation voltage

$V_{BEsat} = f(I_C)$

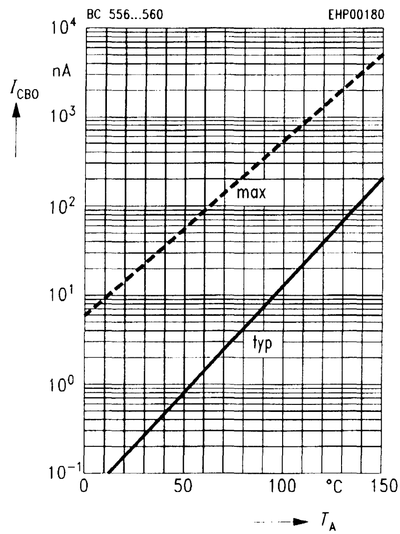
h_{FE} = 20



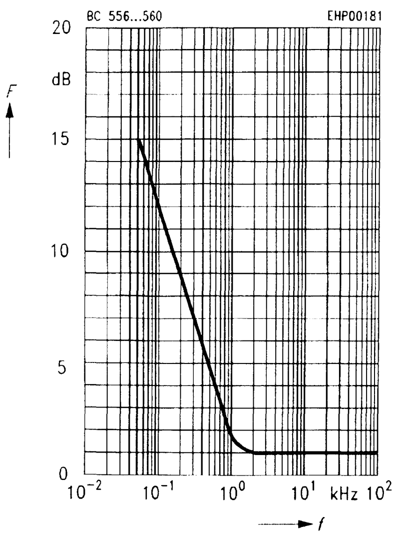
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 20$



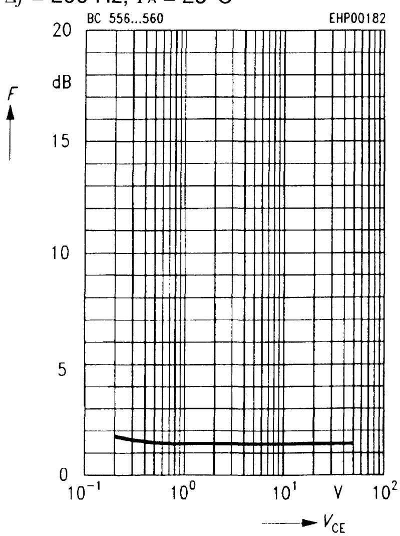
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = 30$ V



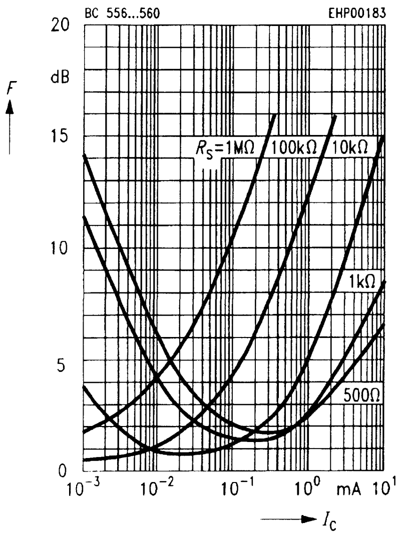
Noise figure $F = f(f)$
$I_C = 0.2$ mA, $f = 12$ kHz, $R_S = 2$ kΩ



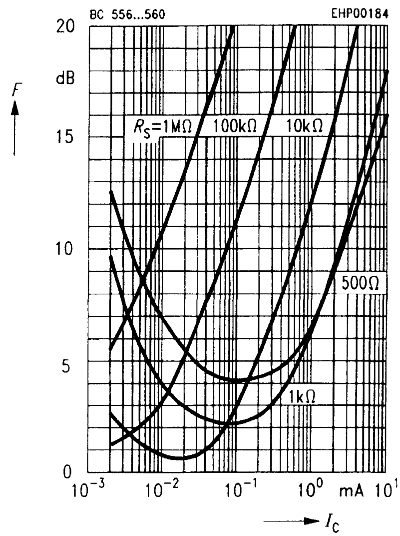
Noise figure $F = f(V_{CE})$
$I_C = 0.2$ mA, $R_S = 2$ kΩ, $f = 1$ kHz
$\Delta f = 200$ Hz, $T_A = 25$ °C



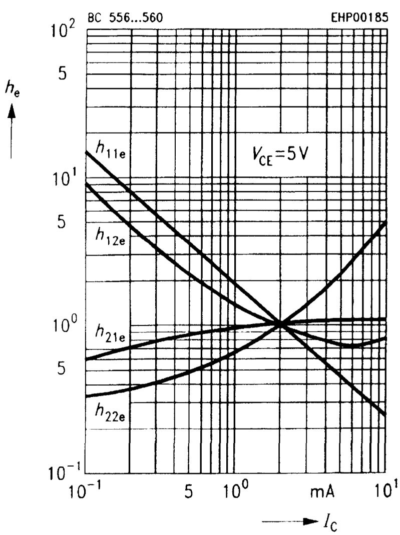
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 kHz



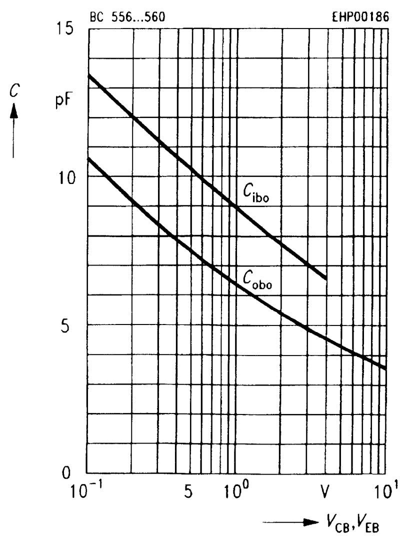
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 Hz



h parameter $h_e = f(I_C)$



Capacitance $C = f(V_{CB}, V_{EB})$

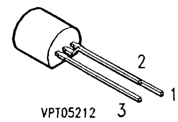


SIEMENS

NPN Silicon Darlington Transistors

BC 617
BC 618

- High current gain
- High collector current



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 617 BC 618	–	Q62702-C1137 Q62702-C1138	C	B	E	TO-92

Maximum Ratings

Parameter	Symbol	Values BC 617	BC 618	Unit
Collector-emitter voltage	V_{CE0}	40	55	V
Collector-base voltage	V_{CB0}	50	80	
Emitter-base voltage	V_{EB0}	12		
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_C = 66$ °C	P_{tot}	625		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case[2)]	$R_{th\,JC}$	≤ 135	

1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

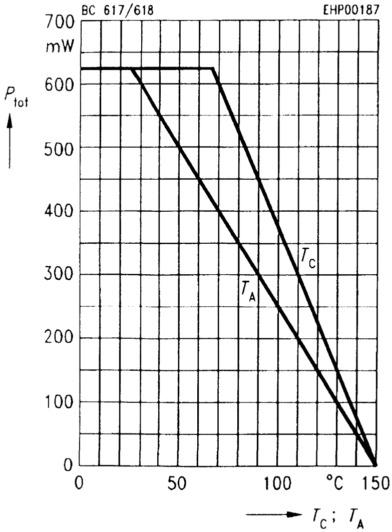
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage I_C = 10 mA		$V_{(BR)CEO}$				V
	BC 617		40	–	–	
	BC 618		55	–	–	
Collector-base breakdown voltage I_C = 100 µA		$V_{(BR)CBO}$				
	BC 617		50	–	–	
	BC 618		80	–	–	
Emitter-base breakdown voltage I_E = 10 µA		$V_{(BR)EBO}$	12	–	–	
Collector cutoff current		I_{CBO}				
V_{CB} = 40 V	BC 617		–	–	100	nA
V_{CB} = 60 V	BC 618		–	–	100	nA
V_{CB} = 40 V, T_A = 150 °C	BC 617		–	–	10	µA
V_{CB} = 60 V, T_A = 150 °C	BC 618		–	–	10	µA
Emitter cutoff current V_{EB} = 4 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 100 µA; V_{CE} = 5 V	BC 617		4000	–	–	
	BC 618		2000	–	–	
I_C = 10 mA; V_{CE} = 5 V [1]	BC 617		10000	–	–	
	BC 618		4000	–	–	
I_C = 200 mA; V_{CE} = 5 V [1]	BC 617		20000	–	70000	
	BC 618		10000	–	50000	
I_C = 1000 mA; V_{CE} = 5 V [1]	BC 617		10000	–	–	
	BC 618		4000	–	–	
Collector-emitter saturation voltage [1] I_C = 200 mA; I_B = 0.2 mA		V_{CEsat}	–	–	1.1	V
Base-emitter saturation voltage [1] I_C = 200 mA; I_B = 0.2 mA		V_{BEsat}	–	–	1.6	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

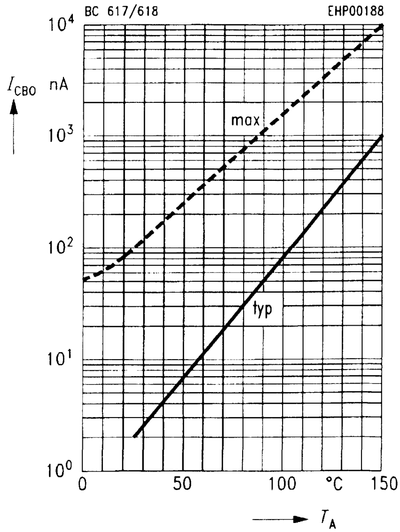
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	150	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3.5	–	pF

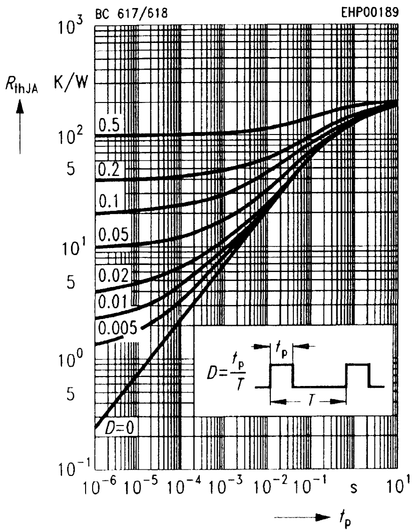
Total power dissipation $P_{tot} = f(T_A; T_C)$



Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 40 V, 60 V

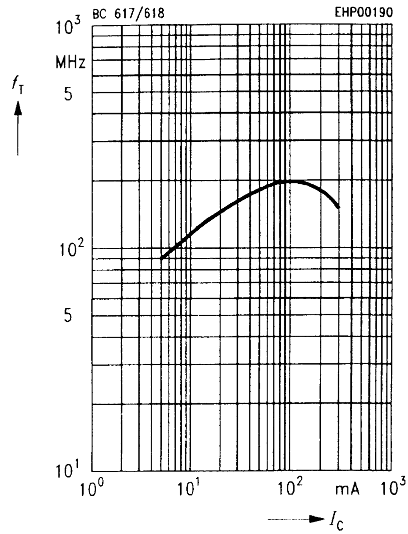


Permissible pulse load $R_{thJA} = f(t_p)$



Transition frequency $f_T = f(I_C)$

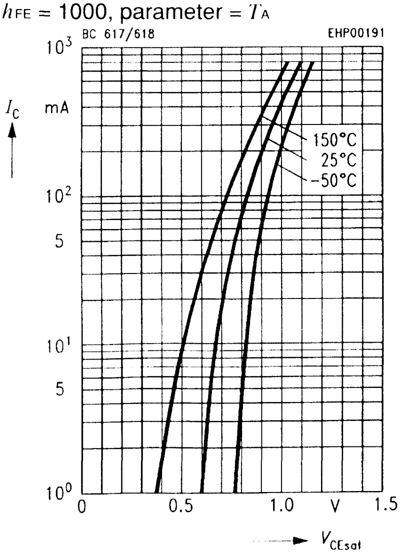
$V_{CE} = 5$ V, $f = 20$ MHz



Collector-emitter saturation voltage

$V_{CEsat} = f(I_C)$

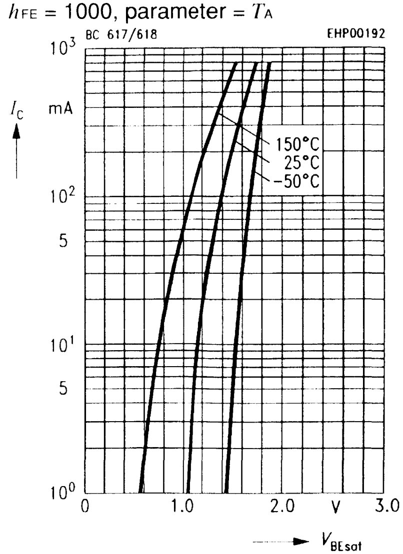
$h_{FE} = 1000$, parameter = T_A



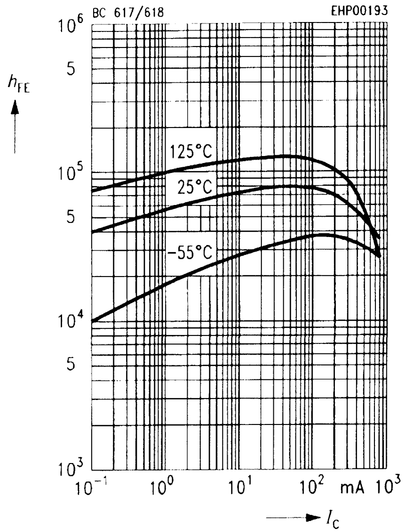
Base-emitter saturation voltage

$V_{BEsat} = f(I_C)$

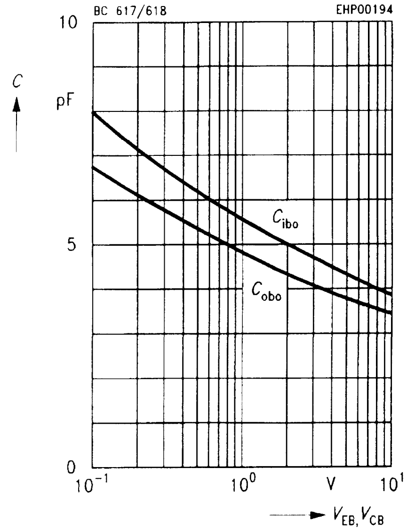
$h_{FE} = 1000$, parameter = T_A



DC current gain $h_{FE} = f(I_C)$



Capacitance $C = f(V_{EB}, V_{CB})$

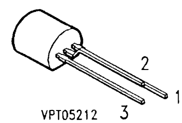


SIEMENS

NPN Silicon AF Transistors

BC 635
... BC 639

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BC 636, BC 638,
  BC 640 (PNP)



Type	Marking	Ordering Code	Pin Configuration			Package[1)]
			1	2	3	
BC 635 BC 637 BC 639	–	Q68000-A3360 Q68000-A2285 Q68000-A3361	E	C	B	TO-92

If desired, selected transistors, type BC 63 ★ –10 (h_{FE} = 63 ... 160), or BC 63 ★ –16 (h_{FE} = 100 ... 250) are available. Ordering codes upon request.

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 635	BC 637	BC 639	Unit
Collector-emitter voltage	V_{CEO}	45	60	80	V
Collector-base voltage	V_{CBO}	45	60	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 90 ˚C[1]	P_{tot}	0.8 (1)			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient[1]	$R_{th JA}$	≤ 156	K/W
Junction - case[2]	$R_{th JC}$	≤ 75	

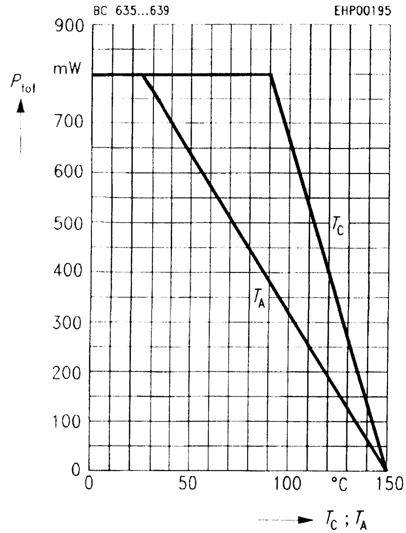
1) If the transistors with max. 4 mm lead length are fixed on PCBs with a min. 10 mm × 10 mm large copper area for the collector terminal, $R_{th JA}$ = 125 K/W and thus $P_{tot max}$ = 1 W at T_A = 25 ˚C.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

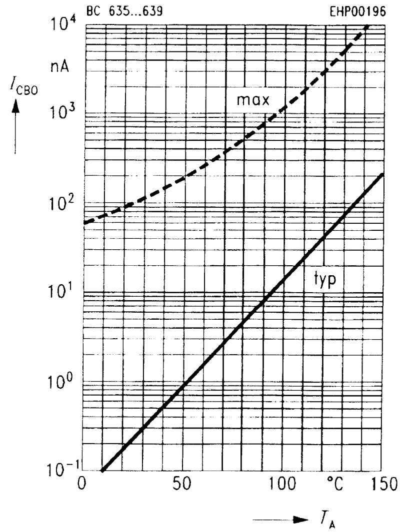
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BC 635		45	–	–	
BC 637		60	–	–	
BC 639		80	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$				
BC 635		45	–	–	
BC 637		60	–	–	
BC 639		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain	h_{FE}				–
I_C = 5 mA; V_{CE} = 2 V		25	–	–	
I_C = 150 mA; V_{CE} = 2 V[1]		40	–	250	
I_C = 500 mA; V_{CE} = 2 V[1]		25	–	–	
Collector-emitter saturation voltage[1] I_C = 500 mA; I_B = 50 mA	V_{CEsat}	–	–	500	mV
Base-emitter voltage[1] I_C = 500 mA; V_{CE} = 2 V	$V_{BE)}$	–	–	1	V
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

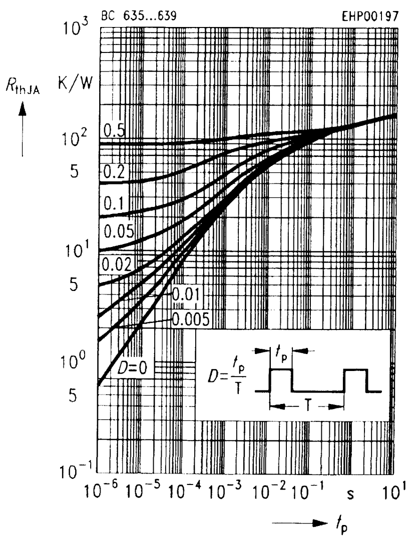
Total power dissipation $P_{tot} = f(T_A; T_C)$



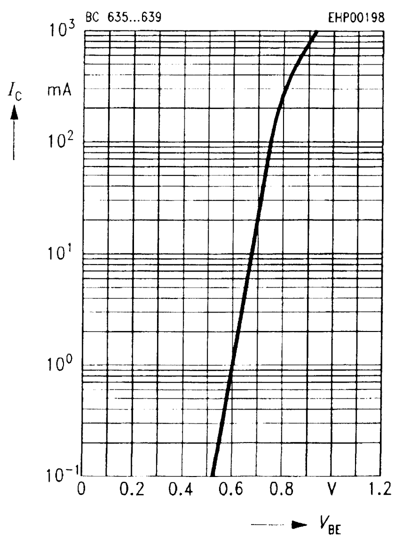
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 30 V



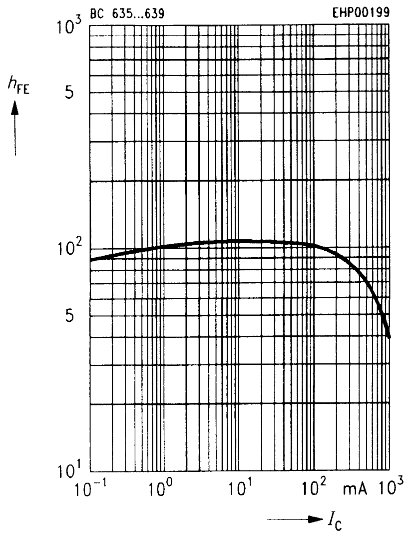
Permissible pulse load $R_{thJA} = f(t_p)$
V_{CE} = 2 V



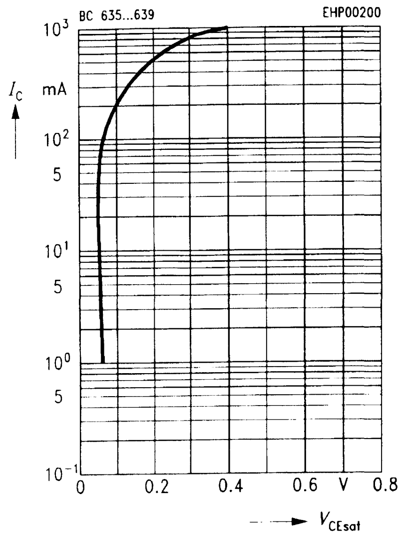
Collector current $I_C = f(V_{BE})$



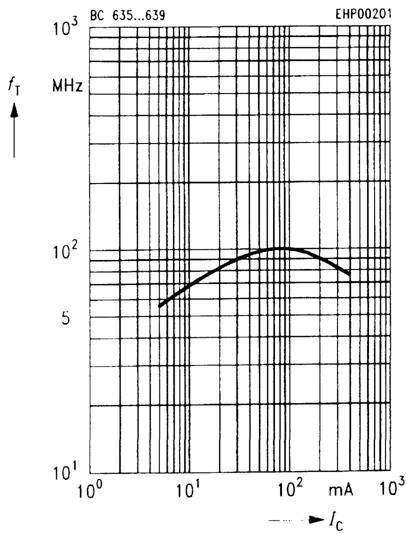
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 2$ V



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 10$



Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V, $f = 20$ MHz

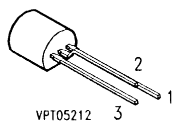


SIEMENS

PNP Silicon AF Transistors

BC 636
... BC 640

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BC 635, BC 637,
  BC 639 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 636 BC 638 BC 640	–	Q68000-A3365 Q68000-A3366 Q68000-A3367	E	C	B	TO-92

If desired, selected transistors, type BC 6 ★ ★ –10 (h_{FE} = 63 ... 160), or BC 6 ★ ★ –16 (h_{FE} = 100 ... 250) are available. Ordering codes upon request.

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 636	BC 638	BC 640	Unit
Collector-emitter voltage	V_{CEO}	45	60	80	V
Collector-base voltage	V_{CBO}	45	60	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 90 ˚C[1]	P_{tot}	0.8 (1)			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient[1]	$R_{th\,JA}$	≤ 156	K/W
Junction - case[2]	$R_{th\,JC}$	≤ 55	

1) If the transistors with max. 4 mm lead length are fixed on PCBs with a min. 10 mm x 10 mm large copper area for the collector terminal, $R_{th\,JA}$ = 125 K/W and thus $P_{tot\,max}$ = 1 W at T_A = 25 ˚C.

2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

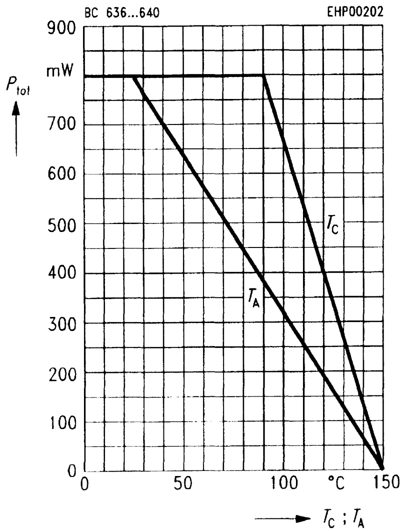
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

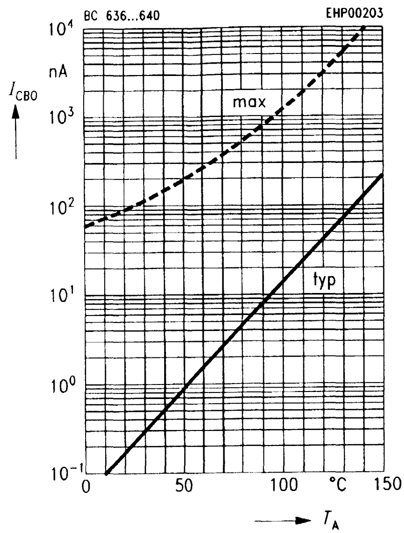
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BC 636		45	–	–	
BC 638		60	–	–	
BC 640		80	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$				
BC 636		45	–	–	
BC 638		60	–	–	
BC 640		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain	h_{FE}				–
I_C = 5 mA; V_{CE} = 2 V		25	–	–	
I_C = 150 mA; V_{CE} = 2 V[1]		40	–	250	
I_C = 500 mA; V_{CE} = 2 V[1]		25	–	–	
Collector-emitter saturation voltage[1] I_C = 500 mA; I_B = 50 mA	V_{CEsat}	–	–	500	mV
Base-emitter voltage[1] I_C = 500 mA; V_{CE} = 2 V	V_{BE}	–	–	1	V
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

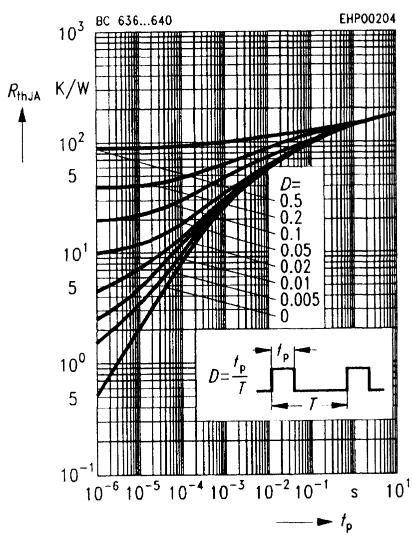
Total power dissipation $P_{tot} = f(T_A; T_C)$



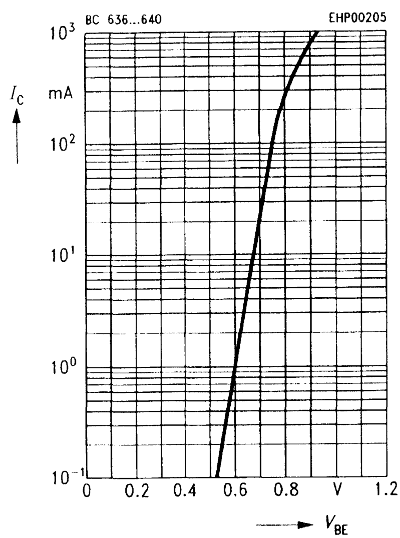
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



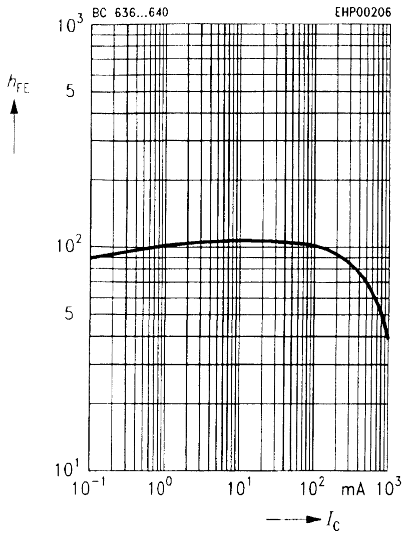
Permissible pulse load $R_{thJA} = f(t_p)$



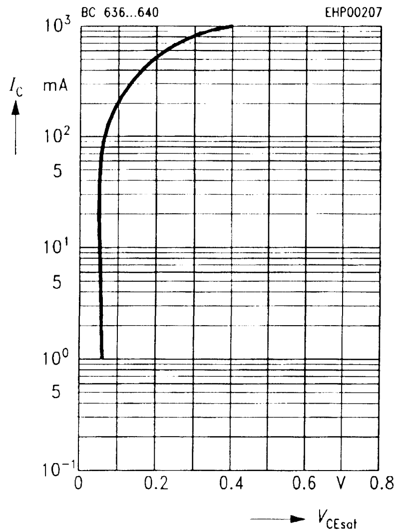
Collector current $I_C = f(V_{BE})$
V_{CE} = 2 V



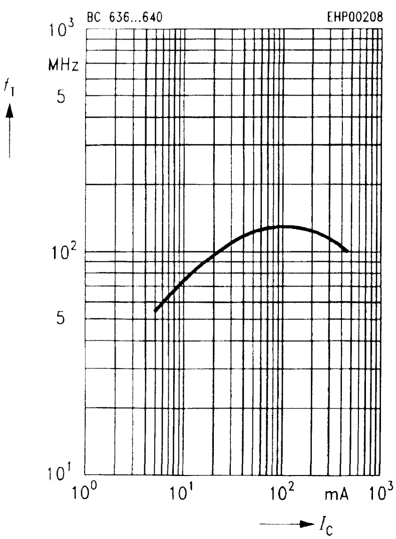
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 2$ V



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 10$



Transition frequency $f_T = f(I_C)$

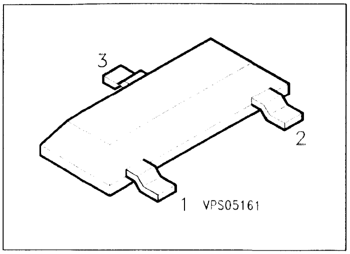


SIEMENS

PNP Silicon AF Transistors

BC 807
BC 808

- For general AF applications
- High collector current
- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 817, BC 818 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 807-16	5As	Q62702-C1735	B	E	C	SOT-23
BC 807-25	5Bs	Q62702-C1689				
BC 807-40	5Cs	Q62702-C1721				
BC 808-16	5Es	Q62702-C1736				
BC 808-25	5Fs	Q62702-C1504				
BC 808-40	5Gs	Q62702-C1692				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 807	BC 808	Unit
Collector-emitter voltage	V_{CEO}	45	25	V
Collector-base voltage	V_{CBO}	50	30	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 79 ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient [1]	$R_{th JA}$	≤ 285	K/W
Junction - soldering point	$R_{th JS}$	≤ 215	

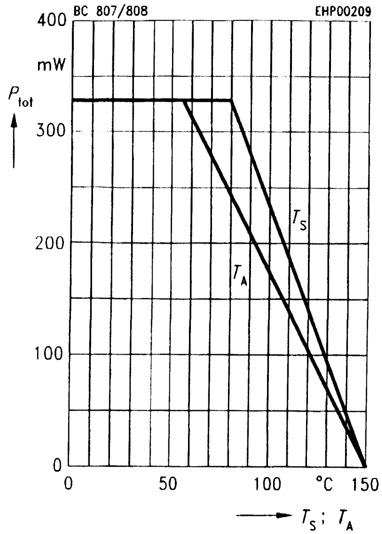
[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

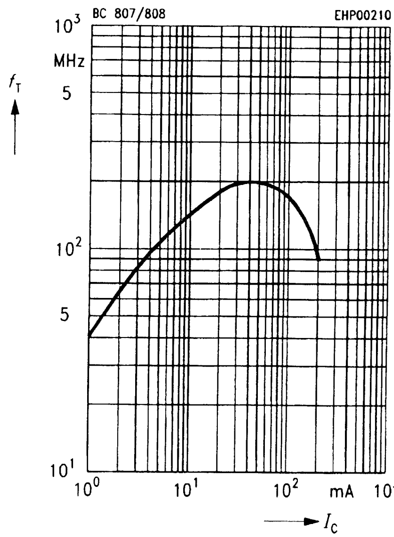
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BC 807		45	–	–	
BC 808		25	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$				
BC 807		50	–	–	
BC 808		30	–	–	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 25 V		–	–	100	nA
V_{CB} = 25 V, T_A = 150 °C		–	–	5	µA
Emitter cutoff current, V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain [1]	h_{FE}				–
I_C = 100 mA; V_{CE} = 1 V					
BC 807-16, BC 808-16		100	160	250	
BC 807-25, BC 808-25		160	250	400	
BC 807-40, BC 808-40		250	350	630	
I_C = 300 mA; V_{CE} = 1 V					
BC 807-16, BC 808-16		60	–	–	
BC 807-25, BC 808-25		100	–	–	
BC 807-40, BC 808-40		170	–	–	
Collector-emitter saturation voltage [1] I_C = 500 mA; I_B = 50 mA	V_{CEsat}	–	–	0.7	V
Base-emitter saturation voltage [1] I_C = 500 mA; I_B = 50 mA	V_{BEsat}	–	–	2	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	10	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

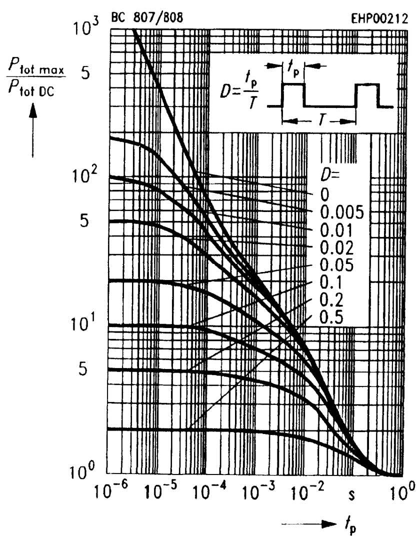
Total power dissipation $P_{tot} = f\,(T_A{}^*;\, T_S)$
* Package mounted on epoxy



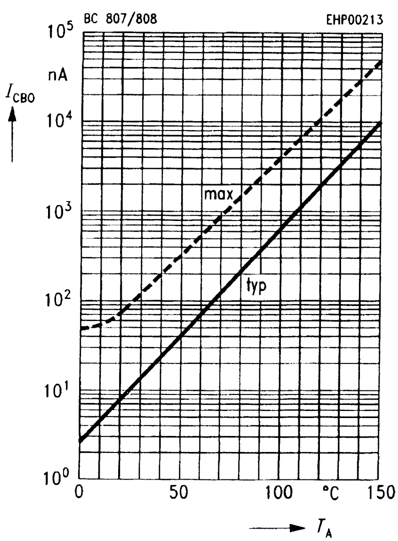
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$

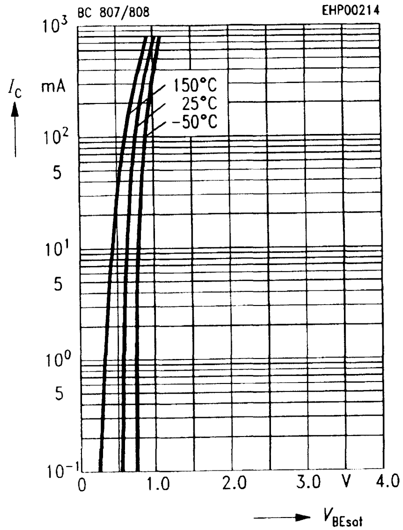


Collector cutoff current $I_{CBO} = f\,(T_A)$
V_{CBO} = 60 V



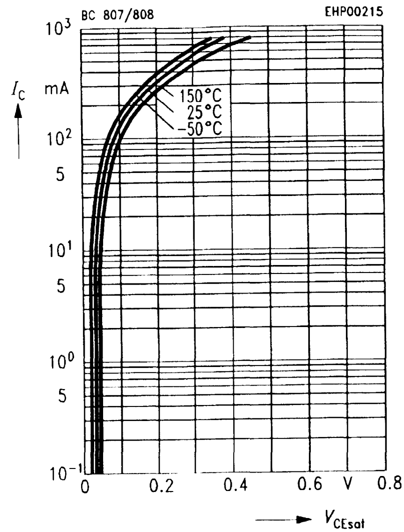
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$
$h_{FE} = 10$



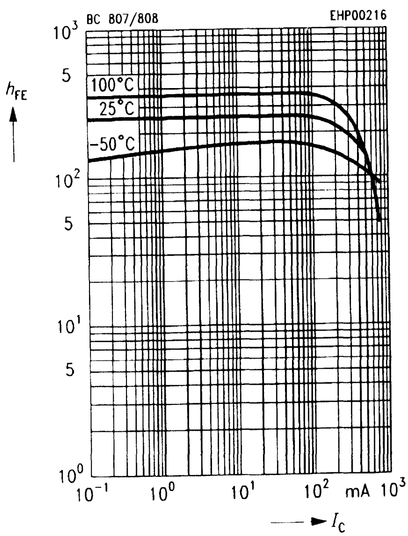
Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$
$h_{FE} = 10$



DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 1$ V

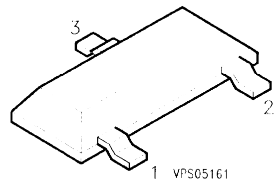


SIEMENS

NPN Silicon AF Transistors

BC 817
BC 818

- For general AF applications
- High collector current
- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 807, BC 808 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BC 817-16	6As	Q62702-C1732	B	E	C	SOT-23
BC 817-25	6Bs	Q62702-C1690				
BC 817-40	6Cs	Q62702-C1738				
BC 818-16	6Es	Q62702-C1739				
BC 818-25	6Fs	Q62702-C1740				
BC 818-40	6Gs	Q62702-C1505				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 817	Values BC 818	Unit
Collector-emitter voltage	V_{CEO}	45	25	V
Collector-base voltage	V_{CBO}	50	30	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 79 ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient [1]	$R_{th JA}$	≤ 285	K/W
Junction - soldering point	$R_{th JS}$	≤ 215	

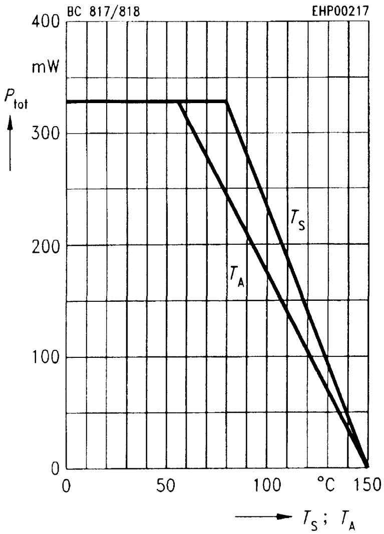
[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

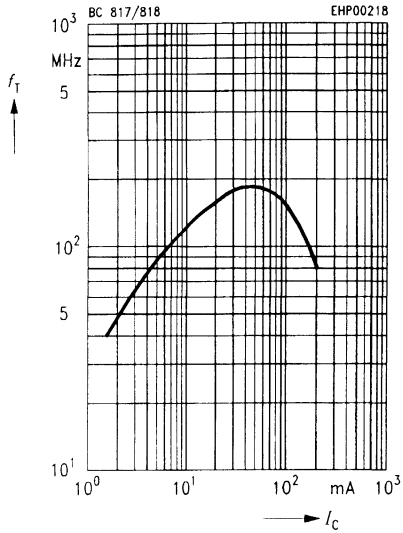
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CE0}$				V
BC 817		45	–	–	
BC 818		25	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CB0}$				
BC 817		50	–	–	
BC 818		30	–	–	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 25 V		–	–	100	nA
V_{CB} = 25 V, T_A = 150 °C		–	–	5	µA
Emitter cutoff current, V_{EB} = 4 V	I_{EB0}	–	–	100	nA
DC current gain [1] I_C = 100 mA; V_{CE} = 1 V	h_{FE}				–
BC 817-16, BC 818-16		100	160	250	
BC 817-25, BC 818-25		160	250	400	
BC 817-40, BC 818-40		250	350	630	
I_C = 300 mA; V_{CE} = 1 V					
BC 817-16, BC 818-16		60	–	–	
BC 817-25, BC 818-25		100	–	–	
BC 817-40, BC 818-40		170	–	–	
Collector-emitter saturation voltage [1] I_C = 500 mA; I_B = 50 mA	V_{CEsat}	–	–	0.7	V
Base-emitter saturation voltage [1] I_C = 500 mA; I_B = 50 mA	V_{BEsat}	–	–	2	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	170	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	6	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

[1] Pulse test: t ≤ 300 µs, D ≤ 2 %.

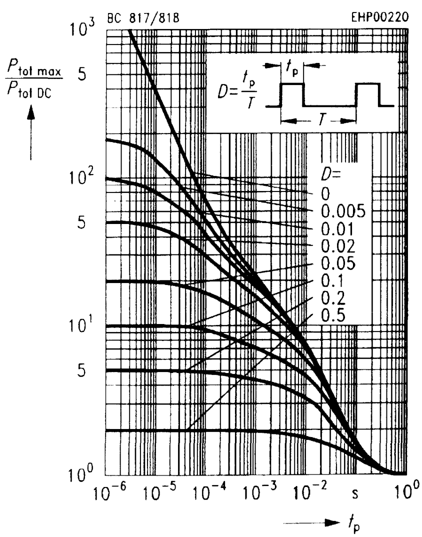
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



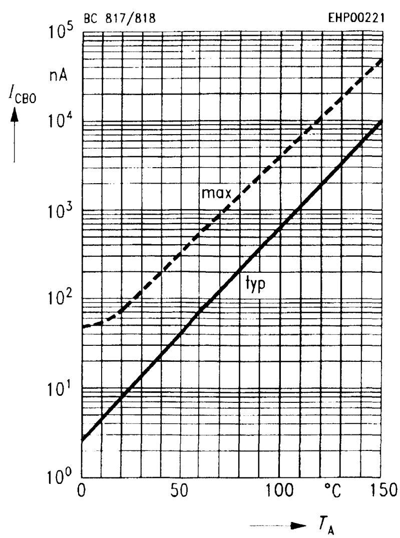
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



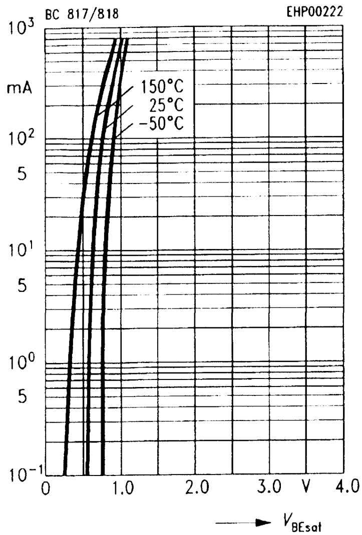
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



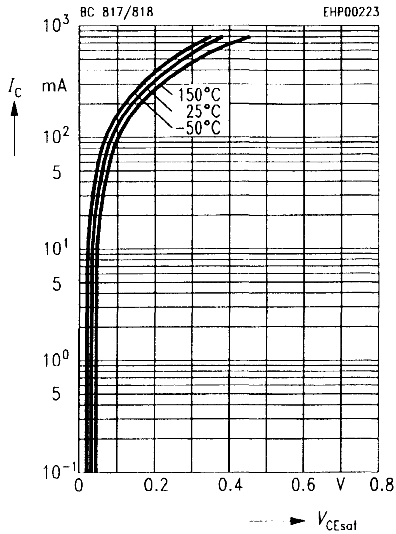
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB0} = 60 V



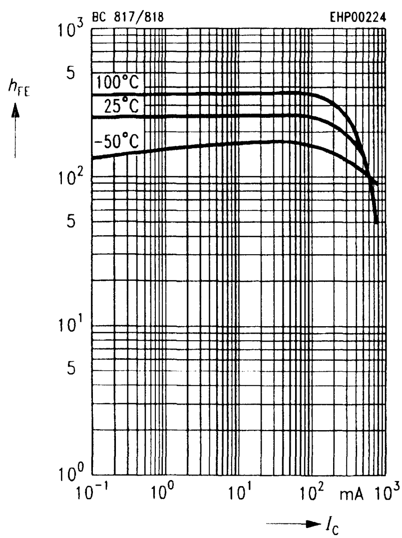
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 10$



Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 10$



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

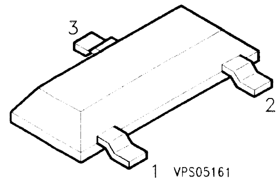


SIEMENS

NPN Silicon AF Transistors

BC 846
... BC 850

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BC 856, BC 857, BC 859, BC 860 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BC 846 A	1As	Q62702-C1772	B	E	C	SOT-23
BC 846 B	1Bs	Q62702-C1746				
BC 847 A	1Es	Q62702-C1884				
BC 847 B	1Fs	Q62702-C1687				
BC 847 C	1Gs	Q62702-C1715				
BC 848 A	1Js	Q62702-C1741				
BC 848 B	1Ks	Q62702-C1704				
BC 848 C	1Ls	Q62702-C1506				
BC 849 B	2Bs	Q62702-C1727				
BC 849 C	2Cs	Q62702-C1713				
BC 850 B	2Fs	Q62702-C1885				
BC 850 C	2Gs	Q62702-C1712				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 846	BC 847 BC 850	BC 848 BC 849	Unit
Collector-emitter voltage	V_{CE0}	65	45	30	V
Collector-base voltage	V_{CB0}	80	50	30	
Collector-emitter voltage	V_{CES}	80	50	30	
Emitter-base voltage	V_{EB0}	6	6	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, $T_S = 71$ ˚C	P_{tot}	330			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient [1]	$R_{th JA}$	≤ 310	K/W
Junction - soldering point	$R_{th JS}$	≤ 240	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

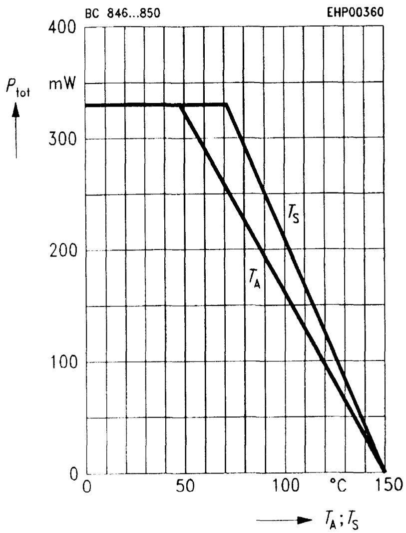
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 10 mA BC 846		65	–	–	
BC 847, BC 850		45	–	–	
BC 848, BC 849		30	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 10 µA BC 846		80	–	–	
BC 847, BC 850		50	–	–	
BC 848, BC 849		30	–	–	
Collector-emitter breakdown voltage	$V_{(BR)CES}$				
I_C = 10 µA, V_{BE} = 0 BC 846		80	–	–	
BC 847, BC 850		50	–	–	
BC 848, BC 849		30	–	–	
Emitter-base breakdown voltage	$V_{(BR)EBO}$				
I_E = 1 µA BC 846, BC 847		6	–	–	
BC 848, BC 849, BC 850		5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	5	µA
DC current gain	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BC 846 A, BC 847 A, BC 848 A		–	140	–	
BC 846 B … BC 850 B		–	250	–	
BC 847 C, BC 848 C, BC 849 C, BC 850 C		–	480	–	
I_C = 2 mA, V_{CE} = 5 V					
BC 846 A, BC 847 A, BC 848 A		110	180	220	
BC 846 B … BC 850 B		200	290	450	
BC 847 C, BC 848 C, BC 849 C, BC 850 C		420	520	800	
Collector-emitter saturation voltage[1]	V_{CEsat}				mV
I_C = 10 mA, I_B = 0.5 mA		–	90	250	
I_C = 100 mA, I_B = 5 mA		–	200	600	
Base-emitter saturation voltage[1]	V_{BEsat}				
I_C = 10 mA, I_B = 0.5 mA		–	700	–	
I_C = 100 mA, I_B = 5 mA		–	900	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA, V_{CE} = 5 V		580	660	700	
I_C = 10 mA, V_{CE} = 5 V		–	–	770	

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

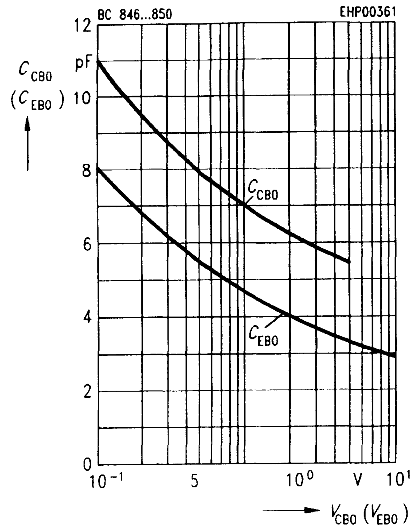
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 846 A ... BC 848 A		–	2.7	–	
BC 846 B ... BC 850 B		–	4.5	–	
BC 847 C ... BC 850 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 846 A ... BC 848 A		–	1.5	–	
BC 846 B ... BC 850 B		–	2.0	–	
BC 847 C ... BC 850 C		–	3.0	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 846 A ... BC 848 A		–	200	–	
BC 846 B ... BC 850 B		–	330	–	
BC 847 C ... BC 850 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BC 846 A ... BC 848 A		–	18	–	
BC 846 B ... BC 850 B		–	30	–	
BC 847 C ... BC 850 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ	F				dB
f = 30 Hz ... 15 kHz BC 849		–	1.4	4	
BC 850		–	1.4	3	
f = 1 kHz, Δf = 200 Hz BC 849		–	1.2	4	
BC 850		–	1.0	4	
Equivalent noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz BC 850	V_n	–	–	0.135	µV

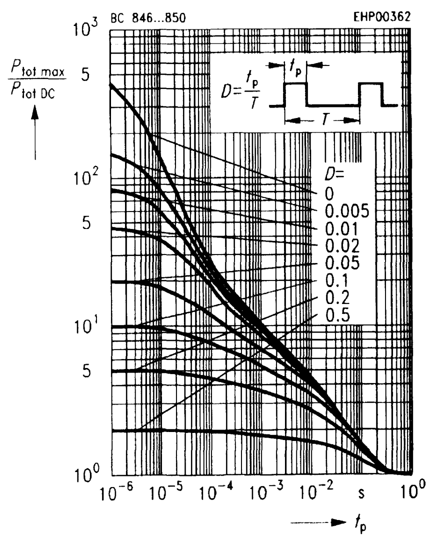
Total power dissipation $P_{tot} = f\,(T_A{}^*;\,T_S)$
* Package mounted on epoxy



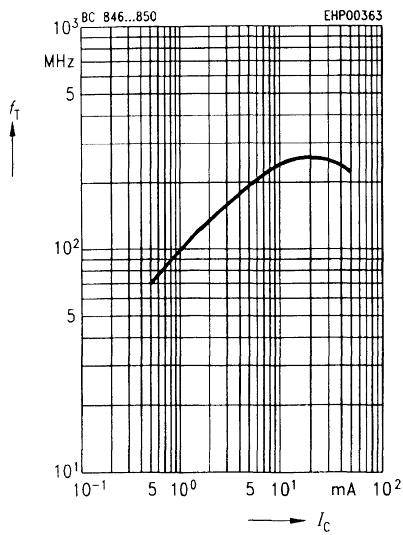
Collector-base capacitance $C_{CBO} = f\,(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f\,(V_{EBO})$



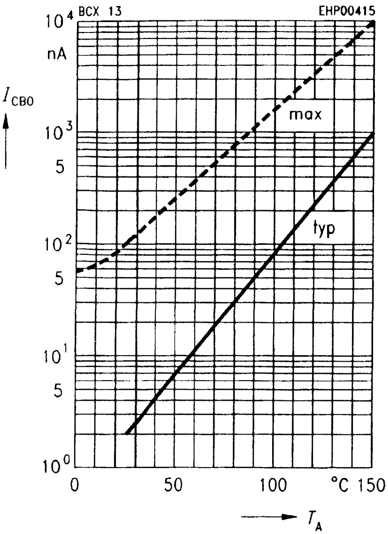
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



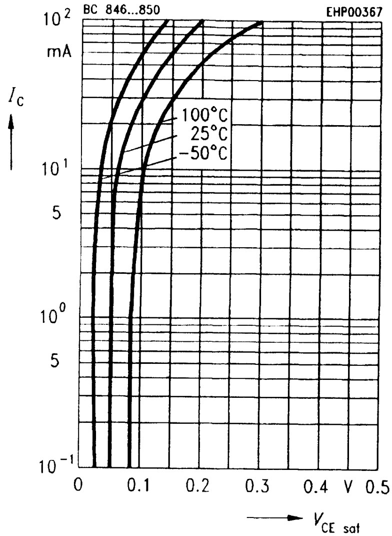
Transition frequency $f_T = f\,(I_C)$
$V_{CE} = 5$ V



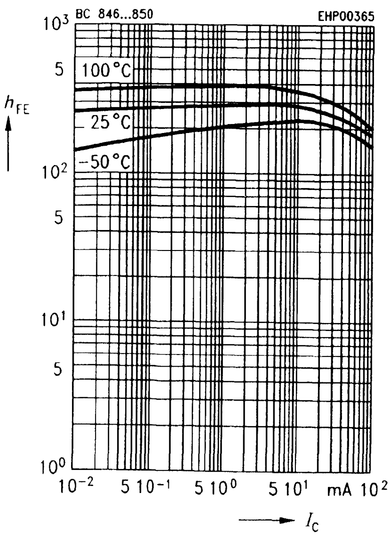
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



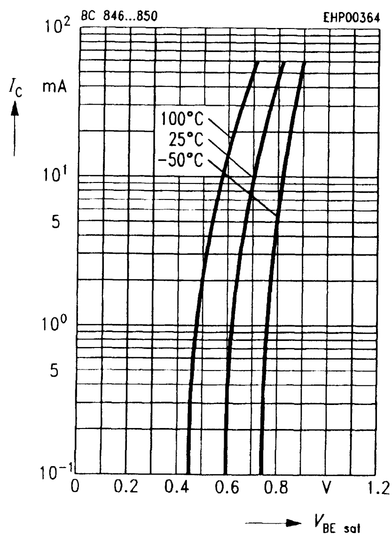
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$, h_{FE} = 20



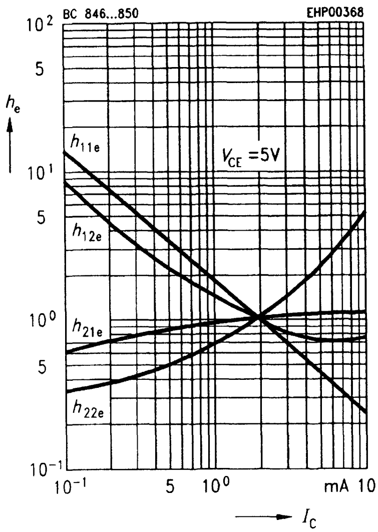
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V



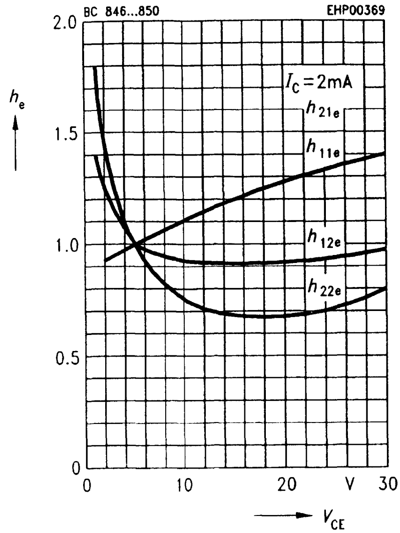
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$, h_{FE} = 20



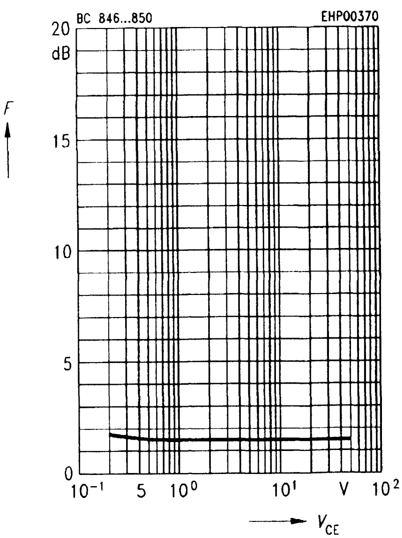
h parameter $h_e = f(I_C)$
V_{CE} = 5 V



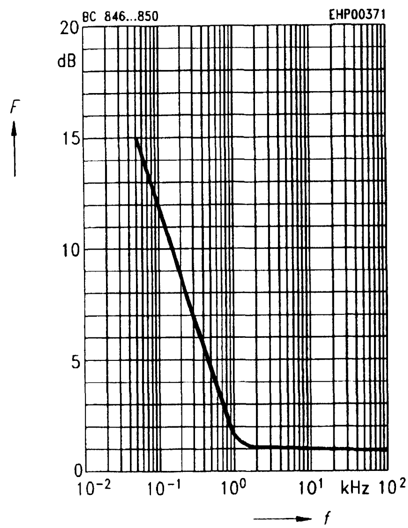
h parameter $h_e = f(V_{CE})$
I_C = 2 mA



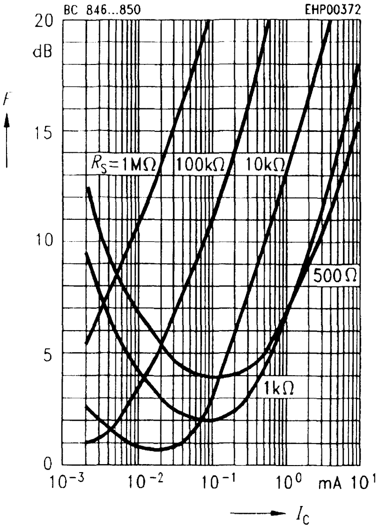
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



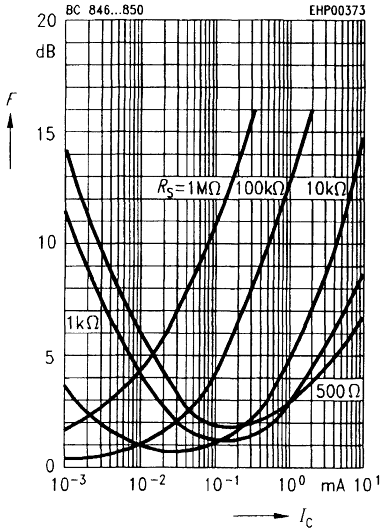
Noise figure $F = f(f)$
I_C = 0.2 mA, R_S = 2 kΩ



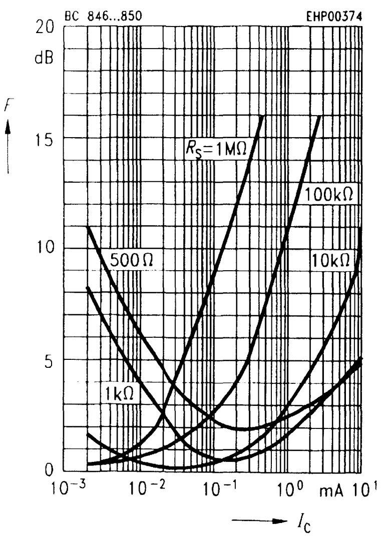
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 Hz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 kHz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 10 kHz

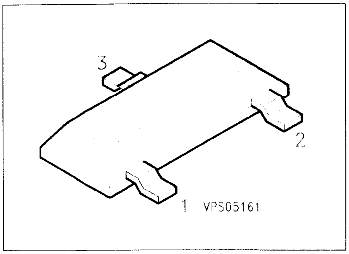


SIEMENS

PNP Silicon AF Transistors

BC 856
... BC 860

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BC 846, BC 847, BC 849, BC 850 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BC 856 A	3As	Q62702-C1773	B	E	C	SOT-23
BC 856 B	3Bs	Q62702-C1886				
BC 857 A	3Es	Q62702-C1850				
BC 857 B	3Fs	Q62702-C1688				
BC 857 C	3Gs	Q62702-C1851				
BC 858 A	3Js	Q62702-C1742				
BC 858 B	3Ks	Q62702-C1698				
BC 858 C	3Ls	Q62702-C1507				
BC 859 A	4As	Q62702-C1887				
BC 859 B	4Bs	Q62702-C1774				
BC 859 C	4Cs	Q62702-C1761				
BC 860 B	4Fs	Q62702-C1888				
BC 860 C	4Gs	Q62702-C1889				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BC 856	BC 857 BC 860	BC 858 BC 859	Unit
Collector-emitter voltage	V_{CE0}	65	45	30	V
Collector-base voltage	V_{CB0}	80	50	30	
Collector-emitter voltage	V_{CES}	80	50	30	
Emitter-base voltage	V_{EB0}	5	5	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	200			
Total power dissipation, $T_S = 71$ ˚C	P_{tot}	330			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient [1]	$R_{th\,JA}$	≤ 310	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 240	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

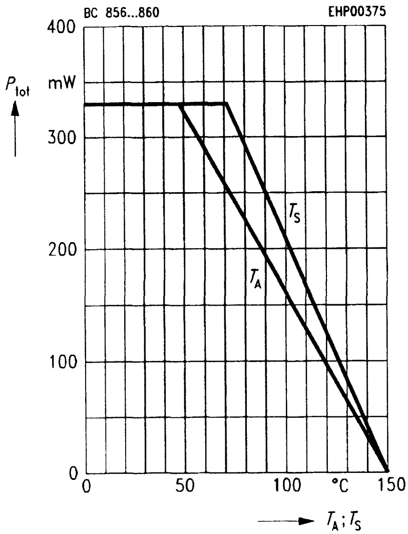
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 10 mA BC 856		65	–	–	
BC 857, BC 860		45	–	–	
BC 858, BC 859		30	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 µA BC 856		80	–	–	
BC 857, BC 860		50	–	–	
BC 858, BC 859		30	–	–	
Collector-emitter breakdown voltage	$V_{(BR)CES}$				
I_C = 10 µA, V_{BE} = 0 BC 856		80	–	–	
BC 857, BC 860		50	–	–	
BC 858, BC 859		30	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 30 V		–	1	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	4	µA
DC current gain	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BC 856 A ... BC 859 A		–	140	–	
BC 856 B ... BC 860 B		–	250	–	
BC 857 C ... BC 860 C		–	480	–	
I_C = 2 mA, V_{CE} = 5 V					
BC 856 A ... BC 859 A		125	180	250	
BC 856 B ... BC 860 B		220	290	475	
BC 857 C ... BC 860 C		420	520	800	
Collector-emitter saturation voltage[1]	V_{CEsat}				mV
I_C = 10 mA, I_B = 0.5 mA		–	75	300	
I_C = 100 mA, I_B = 5 mA		–	250	650	
Base-emitter saturation voltage[1]	V_{BEsat}				
I_C = 10 mA, I_B = 0.5 mA		–	700	–	
I_C = 100 mA, I_B = 5 mA		–	850	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA, V_{CE} = 5 V		600	650	750	
I_C = 10 mA, V_{CE} = 5 V		–	–	820	

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

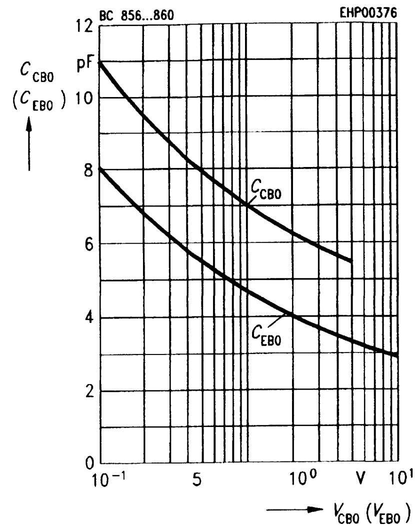
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 856 A ... BC 859 A BC 856 B ... BC 860 B BC 857 C ... BC 860 C	h_{11e}	 – – –	 2.7 4.5 8.7	 – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 856 A ... BC 859 A BC 856 B ... BC 860 B BC 857 C ... BC 860 C	h_{12e}	 – – –	 1.5 2.0 3.0	 – – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 856 A ... BC 859 A BC 856 B ... BC 860 B BC 857 C ... BC 860 C	h_{21e}	 – – –	 200 330 600	 – – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BC 856 A ... BC 859 A BC 856 B ... BC 860 B BC 857 C ... BC 860 C	h_{22e}	 – – –	 18 30 60	 – – –	μS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 30 Hz ... 15 kHz BC 859 BC 860 f = 1 kHz, Δf = 200 Hz BC 859 BC 860	F	 – – – –	 1.2 1.0 1.0 1.0	 4 3 4 4	dB
Equivalent noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz BC 860	V_n	–	–	0.110	μV

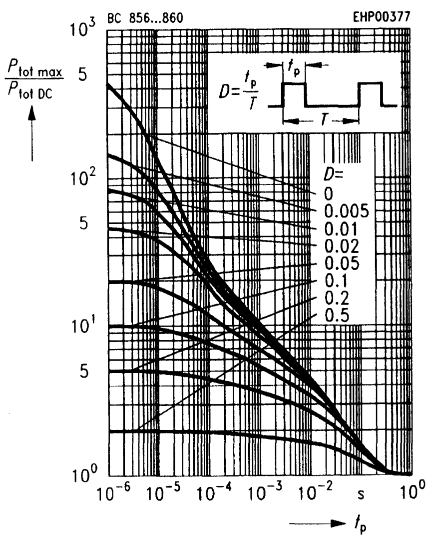
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



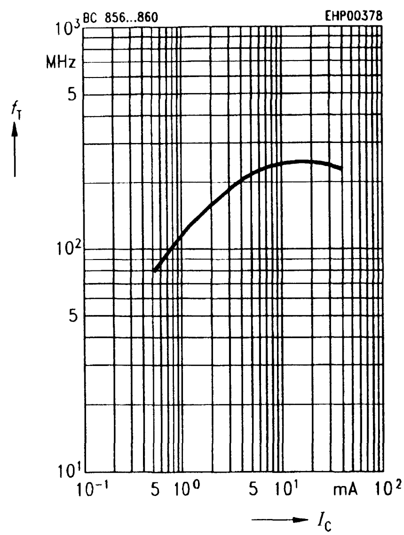
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$



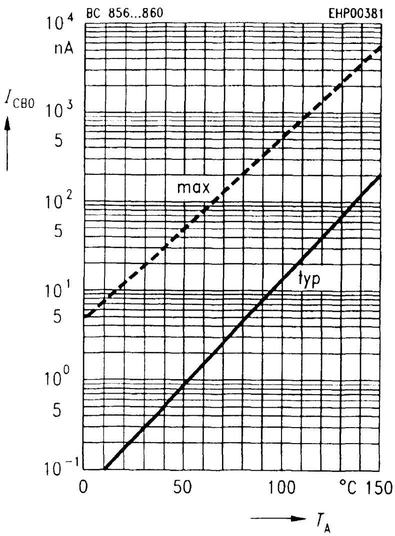
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



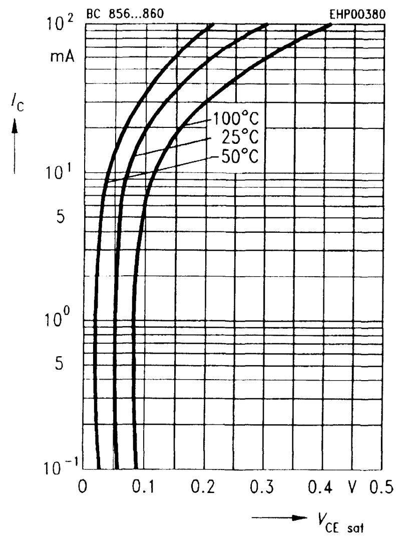
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



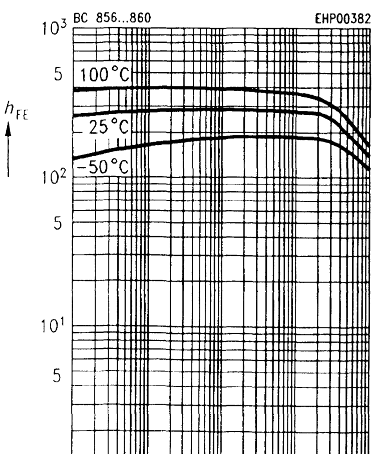
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = 30\ V$



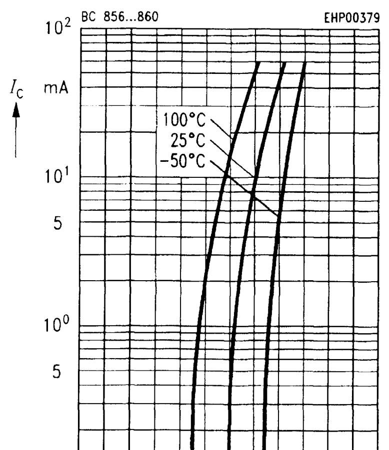
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$, $h_{FE} = 20$



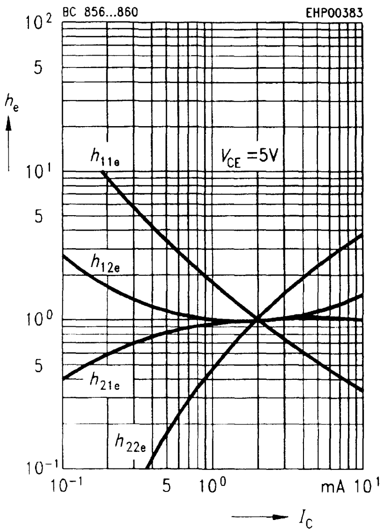
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 5\ V$



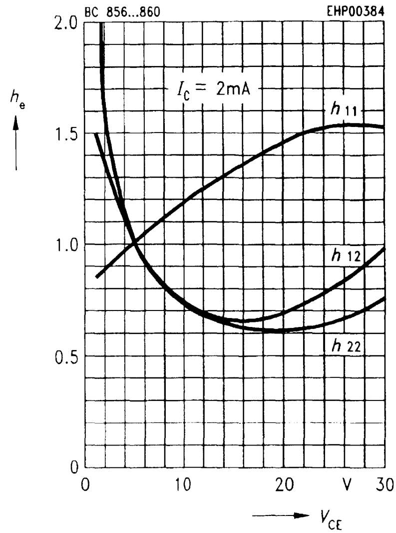
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$, $h_{FE} = 20$



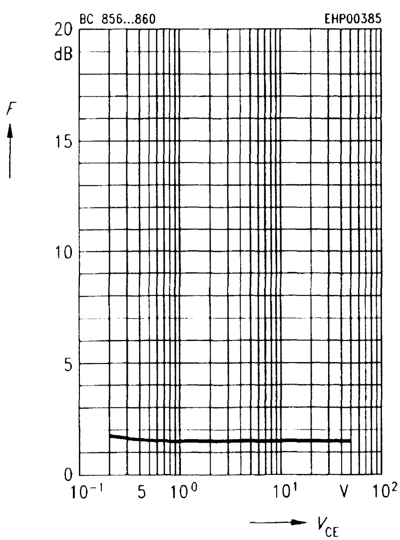
h parameter $h_e = f\,(I_C)$
V_{CE} = 5 V



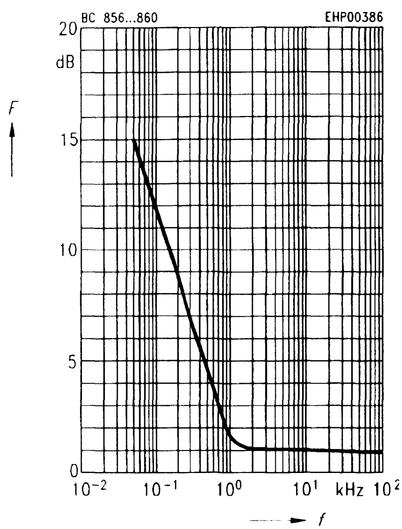
h parameter $h_e = f\,(V_{CE})$
I_C = 2 mA



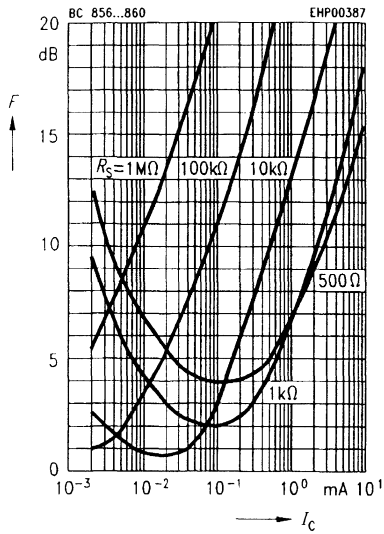
Noise figure $F = f\,(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



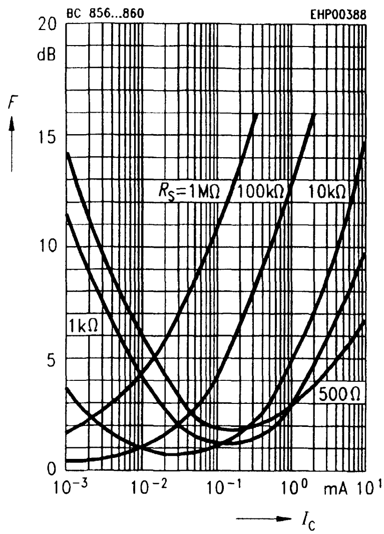
Noise figure $F = f\,(f)$
I_C = 0.2 mA, R_S = 2 kΩ, V_{CE} = 5 V



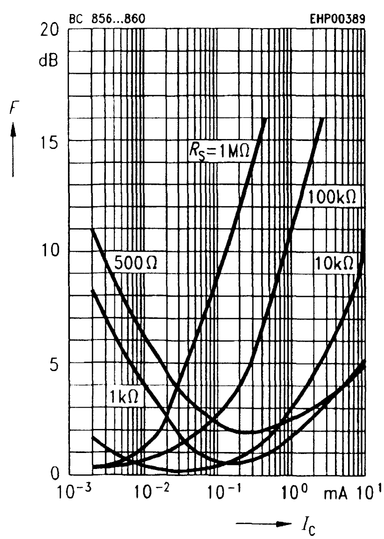
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 Hz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 kHz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 10 kHz

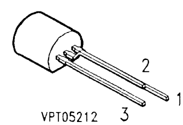


SIEMENS

NPN Silicon Darlington Transistors

BC 875
... BC 879

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BC 876, BC 878
  BC 880 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BC 875 BC 877 BC 879	–	C62702-C853 C62702-C854 C62702-C855	E	C	B	TO-92

Maximum Ratings

Parameter	Symbol	Values BC 875	BC 877	BC 879	Unit
Collector-emitter voltage	V_{CE0}	45	60	80	V
Collector-base voltage	V_{CB0}	60	80	100	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	2			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 90 °C[2]	P_{tot}	0.8 (1)			W
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th JA}$	≤ 156	K/W
Junction - case[3]	$R_{th JC}$	≤ 75	

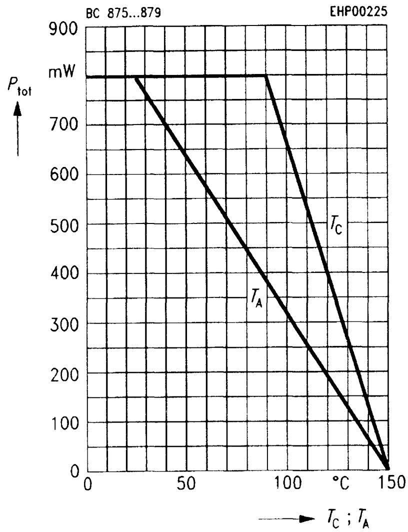
1) For detailed information see chapter Package Outlines.
2) If transistors with max. 4 mm lead length are fixed on PCBs with a min. 10 mm × 10 mm large copper area for the collector terminal, R_{thJA} = 125 K/W and thus $P_{tot\,max}$ = 1 W at T_A = 25 °C.
3) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

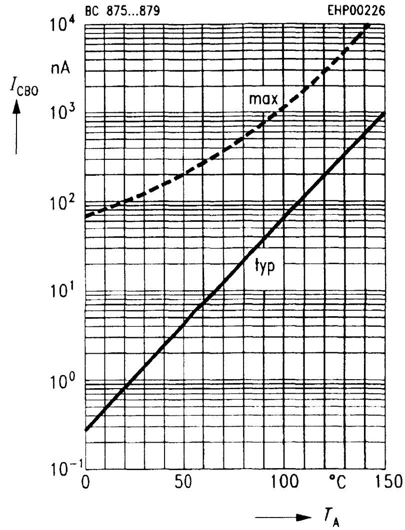
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 50 mA	$V_{(BR)CEO}$				V
BC 875		45	–	–	
BC 877		60	–	–	
BC 879		80	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$				
BC 875		60	–	–	
BC 877		80	–	–	
BC 879		100	–	–	
Emitter-base breakdown voltage, I_E = 100 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current $V_{CE} = 0.5 \times V_{CEmax}$	I_{CEO}	–	–	500	nA
Collector cutoff current	I_{CBO}				
$V_{CB} = V_{CBmax}$		–	–	100	nA
$V_{CB} = V_{CBmax}$, T_A = 150 °C		–	–	20	µA
Emitter cutoff current, V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain	h_{FE}				–
I_C = 150 mA; V_{CE} = 10 V [1]		1000	–	–	
I_C = 500 mA; V_{CE} = 10 V [1]		2000	–	–	
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 500 mA, I_B = 0.5 mA		–	–	1.3	
I_C = 1 A, I_B = 1 mA		–	–	1.8	
Base-emitter saturation voltage [1] I_C = 1 A; I_B = 1 mA	V_{BEsat}	–	–	2.2	
AC characteristics					
Transition frequency I_C = 200 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	150	–	MHz

[1] Pulse test: $t \leq$ 300 µs, $D \leq$ 2 %.

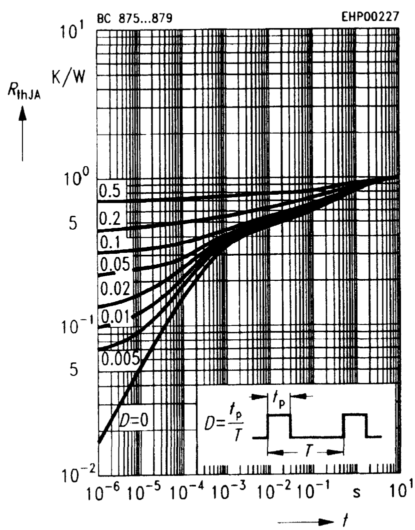
Total power dissipation $P_{tot} = f(T_A; T_C)$



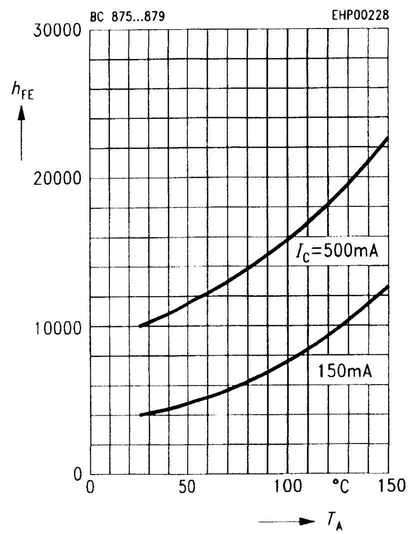
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 100 V



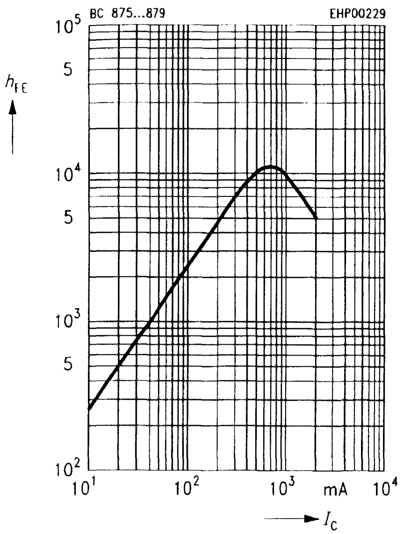
Permissible pulse load $R_{thJA} = f(t_p)$



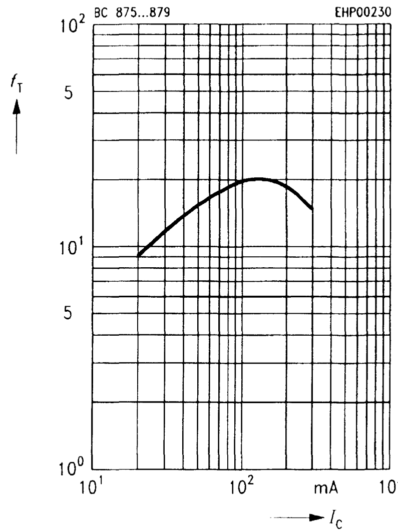
DC current gain $h_{FE} = f(T_A)$
V_{CE} = 10 V



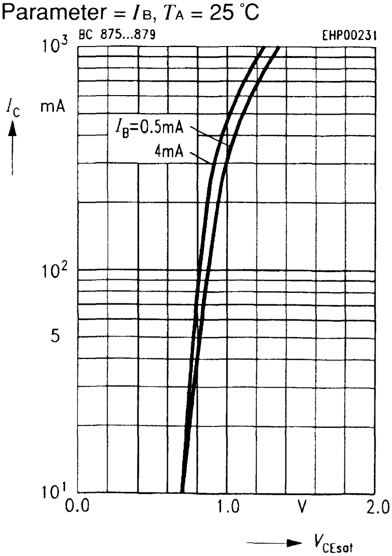
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V, T_A = 25 °C



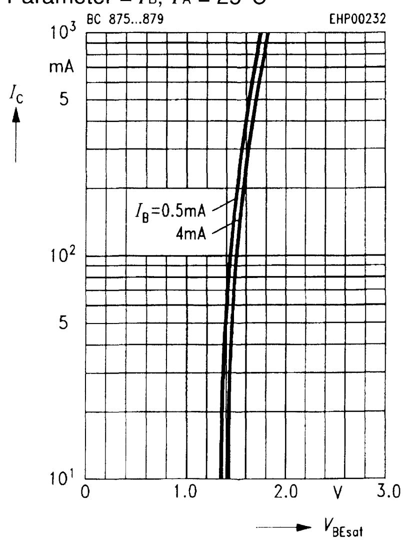
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 20 MHz



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
Parameter = I_B, T_A = 25 °C



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
Parameter = I_B, T_A = 25 °C

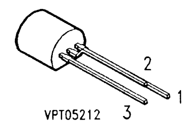


SIEMENS

PNP Silicon Darlington Transistors

BC 876 ... BC 880

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BC 875, BC 877, BC 879 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BC 876 BC 878 BC 880	–	C62702-C943 C62702-C942 C62702-C941	E	C	B	TO-92

Maximum Ratings

Parameter	Symbol	Values BC 876	BC 878	BC 880	Unit
Collector-emitter voltage	V_{CEO}	45	60	80	V
Collector-base voltage	V_{CBO}	60	80	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	2			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 90 °C[2]	P_{tot}	0.8 (1)			W
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 156	K/W
Junction - case[3]	$R_{th\,JC}$	≤ 75	

1) For detailed information see chapter Package Outlines.
2) If transistors with max. 4 mm lead length are fixed on PCBs with a min. 10 mm × 10 mm large copper area for the collector terminal, R_{thJA} = 125 K/W and thus $P_{tot\,max}$ = 1 W at T_A = 25 °C.
3) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

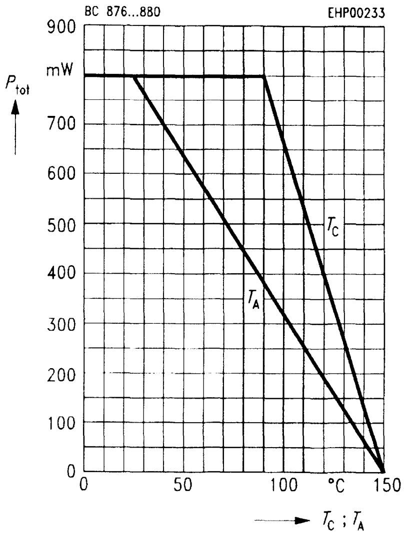
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

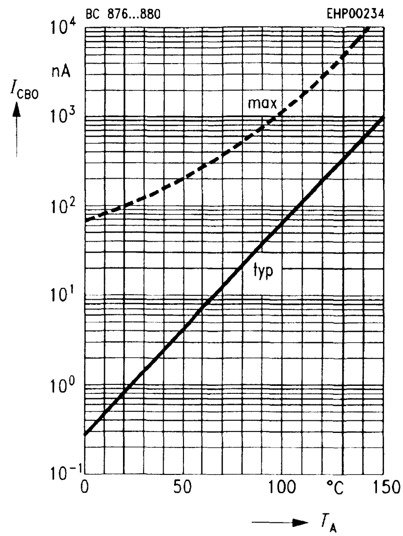
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage I_C = 50 mA BC 876 BC 878 BC 880	$V_{(BR)CEO}$	 45 60 80	 – – –	 – – –	V
Collector-base breakdown voltage I_C = 100 µA BC 876 BC 878 BC 880	$V_{(BR)CBO}$	 60 80 100	 – – –	 – – –	
Emitter-base breakdown voltage, I_E = 100 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current $V_{CE} = 0.5 \times V_{CEmax}$	I_{CEO}	–	–	500	
Collector cutoff current $V_{CB} = V_{CBmax}$ $V_{CB} = V_{CBmax}$, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA µA
Emitter cutoff current, V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain I_C = 150 mA; V_{CE} = 10 V [1)] I_C = 500 mA; V_{CE} = 10 V [1)]	h_{FE}	 1000 2000	 – –	 – –	–
Collector-emitter saturation voltage [1)] I_C = 500 mA, I_B = 0.5 mA I_C = 1000 mA, I_B = 1 mA	V_{CEsat}	 – –	 – –	 1.3 1.8	V
Base-emitter saturation voltage [1)] I_C = 1000 mA; I_B = 1 mA	V_{BEsat}	–	–	2.2	
AC characteristics					
Transition frequency I_C = 200 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	150	–	MHz

1) Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

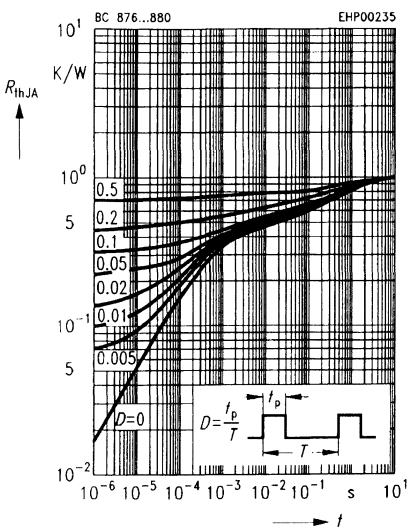
Total power dissipation $P_{tot} = f\,(T_A; T_C)$



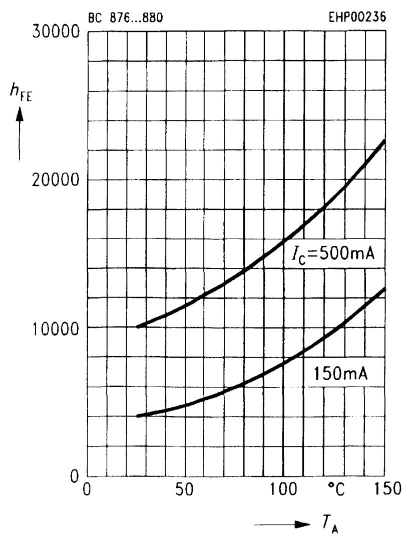
Collector cutoff current $I_{CBO} = f\,(T_A)$
V_{CB} = 100 V



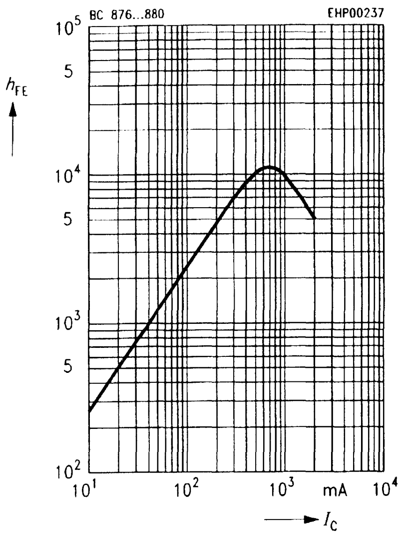
Permissible pulse load $R_{thJA} = f\,(t_p)$



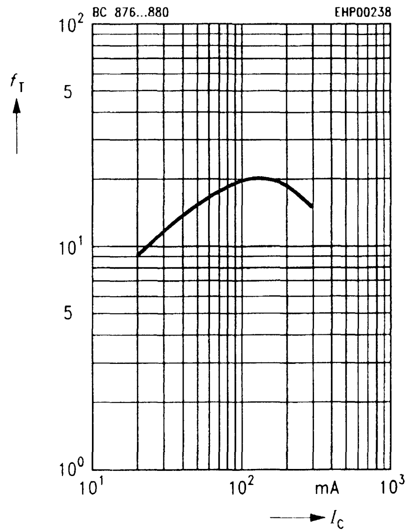
DC current gain $h_{FE} = f\,(T_A)$
V_{CE} = 10 V



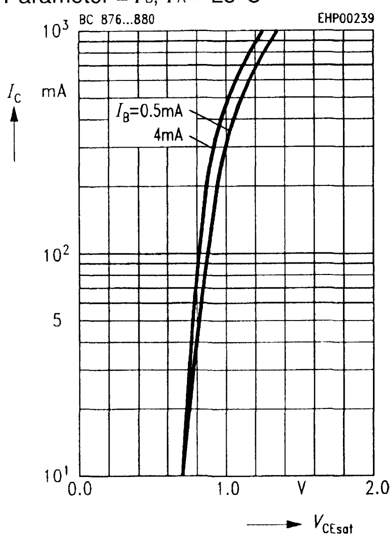
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V, T_A = 25 °C



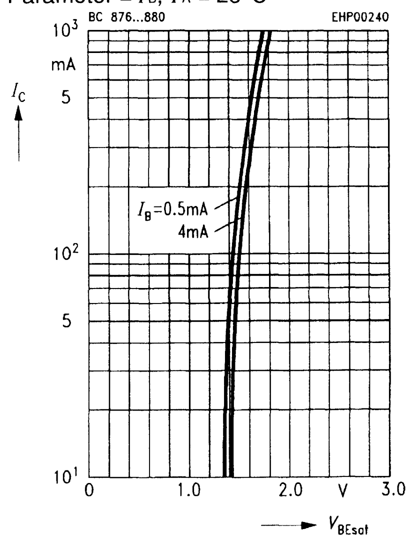
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 20 MHz



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
Parameter = I_B, T_A = 25 °C



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
Parameter = I_B, T_A = 25 °C

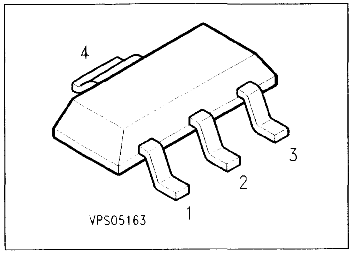


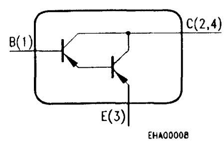
SIEMENS

PNP Silicon Darlington Transistors

BCP 28
BCP 48

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BCP 28 BCP 48	BCP 28 BCP 48	Q62702-C2134 Q62702-C2135		SOT-223

Maximum Ratings

Parameter	Symbol	Values BCP 28	BCP 48	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	
Emitter-base voltage	V_{EBO}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 130 ˚C [2)]	P_{tot}	1.5		W
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient [2)]	$R_{th\,JA}$	≤ 75	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 20	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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		$V_{(BR)CE0}$				V
	BCP 28		30	–	–	
	BCP 48		60	–	–	
Collector-base breakdown voltage[1)] I_C = 100 µA, I_B = 0		$V_{(BR)CB0}$				
	BCP 28		40	–	–	
	BCP 48		80	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0		$V_{(BR)EB0}$	10	–	–	
Collector-base cutoff current		I_{CB0}				
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 V_{EB} = 4 V, I_C = 0		I_{EB0}	–	–	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 I_C = 100 mA, I_B = 0.1 mA		V_{CEsat}	–	–	1.0	V
Base-emitter saturation voltage I_C = 100 mA, I_B = 0.1 mA		V_{BEsat}	–	–	1.5	

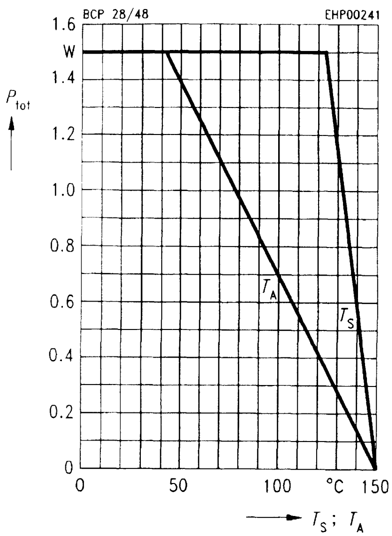
1) Pulse test conditions: $t \leq 300$ µs, D 2 %.

Electrical Characteristics

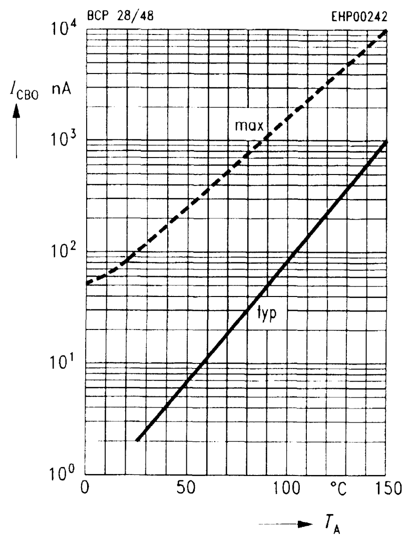
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	8	–	pF

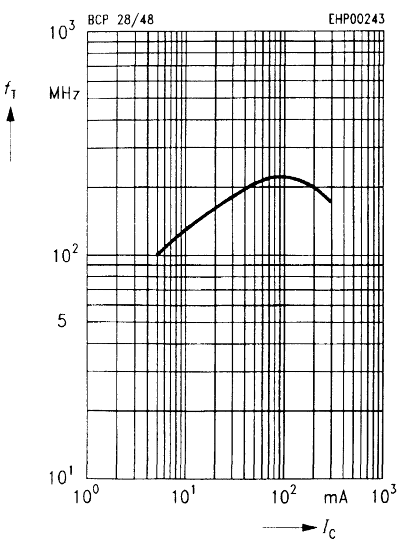
Total power dissipation $P_{tot} = f(T_A{}^*; T_S)$
* Package mounted on epoxy



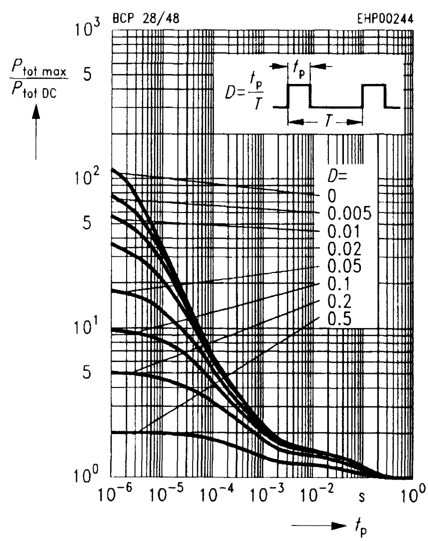
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = V_{CE\,max}$



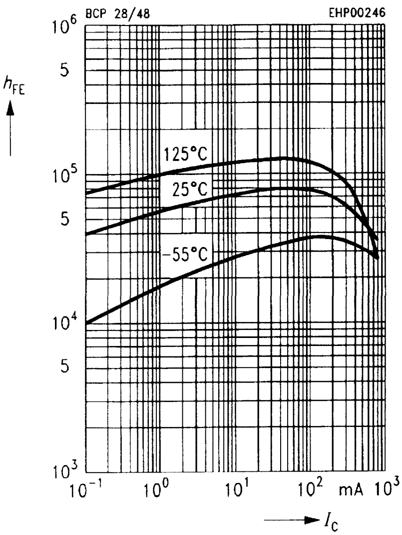
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



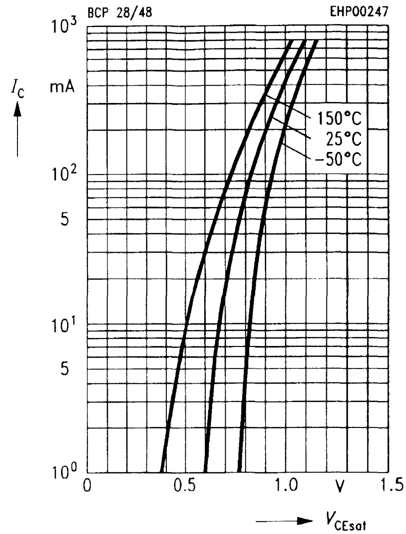
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



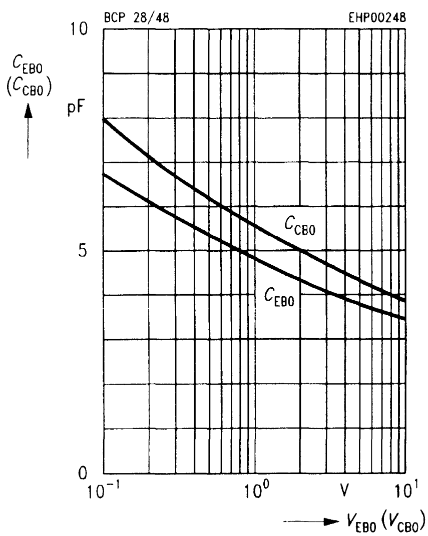
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V



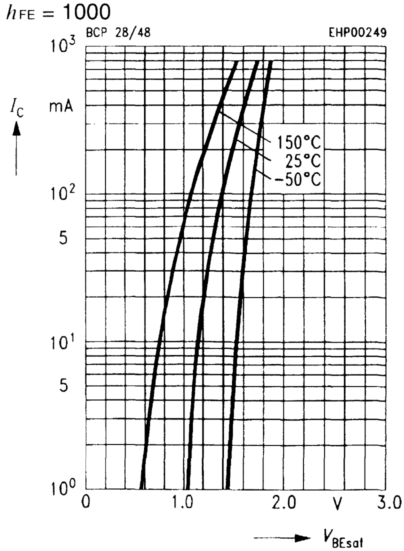
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
h_{FE} = 1000



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



Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
h_{FE} = 1000

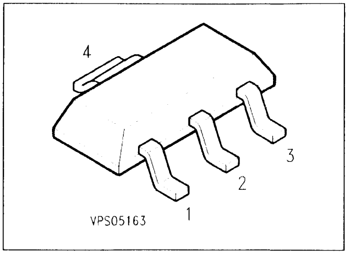


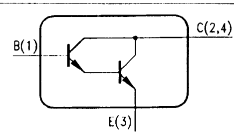
SIEMENS

NPN Silicon Darlington Transistors

BCP 29
BCP 49

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BCP 29 BCP 49	BCP 29 BCP 49	Q62702-C2136 Q62702-C2137		SOT-223

Maximum Ratings

Parameter	Symbol	Values BCP 29	BCP 49	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	
Emitter-base voltage	V_{EBO}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_C = 130$ °C [2]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient [2]	$R_{th JA}$	≤ 75	K/W
Junction - soldering point	$R_{th JS}$	≤ 20	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

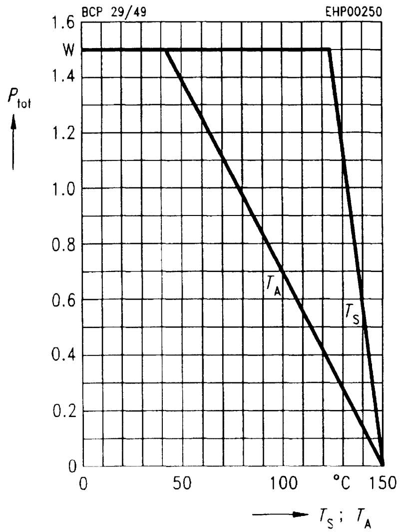
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0		$V_{(BR)CEO}$				V
	BCP 29		30	–	–	
	BCP 49		60	–	–	
Collector-base breakdown voltage I_C = 100 µA, I_B = 0		$V_{(BR)CBO}$				
	BCP 29		40	–	–	
	BCP 49		80	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0		$V_{(BR)EBO}$	10	–	–	
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 V_{EB} = 4 V, I_C = 0		I_{EBO}	–	–	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 I_C = 100 mA, I_B = 0.1 mA		V_{CEsat}	–	–	1.0	V
Base-emitter saturation voltage I_C = 100 mA, I_B = 0.1 mA		V_{BEsat}	–	–	1.5	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

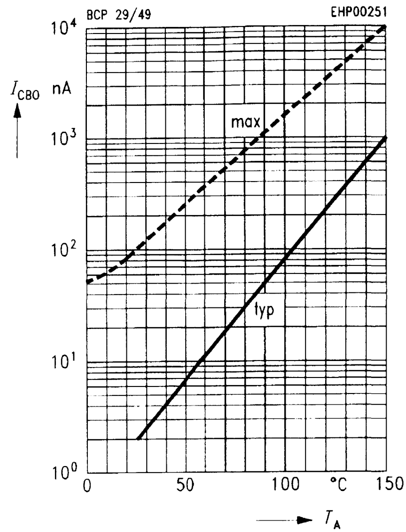
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	6.5	–	pF

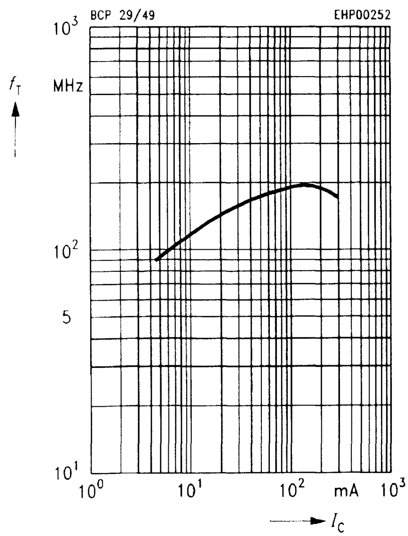
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



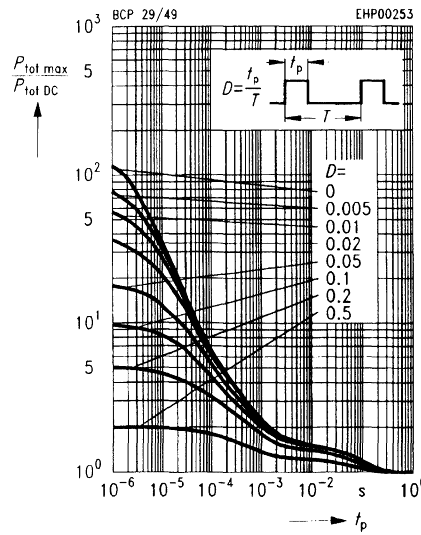
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = V_{CE\,max}$



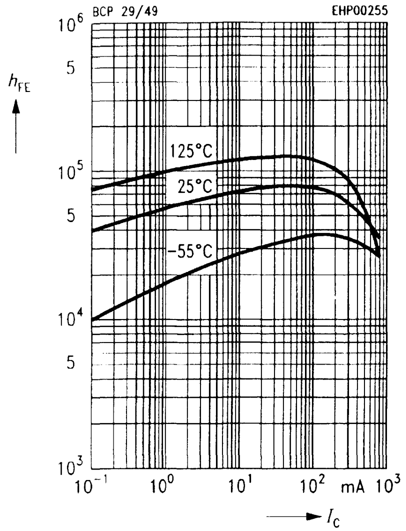
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



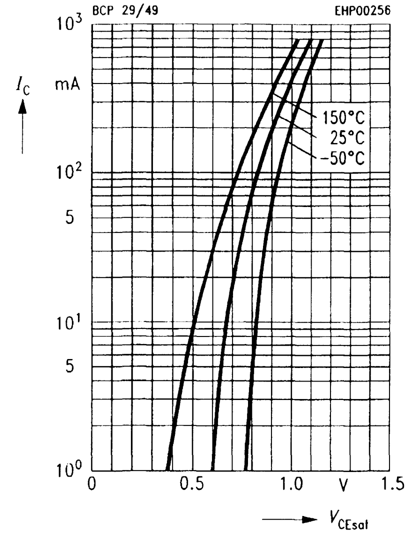
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



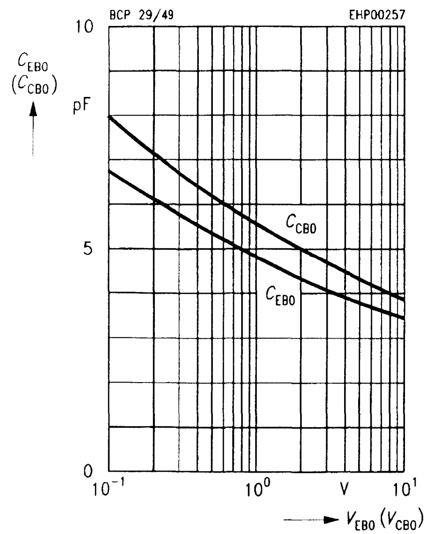
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



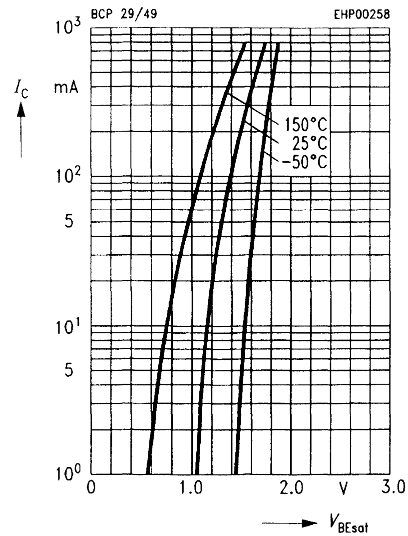
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
h_{FE} = 1000



Collector-base capacitance $C_{CBO} = f(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f(V_{EBO})$



Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
h_{FE} = 1000

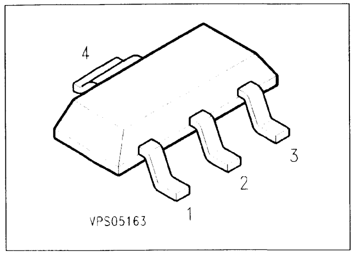


SIEMENS

PNP Silicon AF Transistors

BCP 51
... BCP 53

- 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 (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BCP 51	BCP 51	Q62702-C2107	B	C	E	C	SOT-223
BCP 51-10	BCP 51-10	Q62702-C2109					
BCP 51-16	BCP 51-16	Q62702-C2110					
BCP 52	BCP 52	Q62702-C2146					
BCP 52-10	BCP 52-10	Q62702-C2112					
BCP 52-16	BCP 52-16	Q62702-C2113					
BCP 53	BCP 53	Q62702-C2147					
BCP 53-10	BCP 53-10	Q62702-C2115					
BCP 53-16	BCP 53-16	Q62702-C2116					

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCP 51	BCP 52	BCP 53	Unit
Collector-emitter voltage	V_{CEO}	45	60	80	V
$R_{BE} \leq 1\ k\Omega$	V_{CER}	45	60	100	
Collector-base voltage	V_{CBO}	45	60	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, $T_C = 124$ ˚C [1]	P_{tot}	1.5			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient [1]	$R_{th\ JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\ JS}$	≤ 17	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

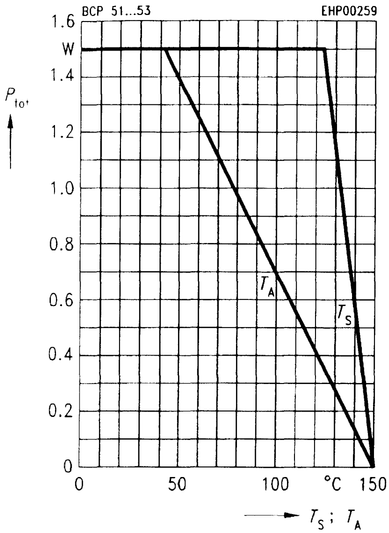
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

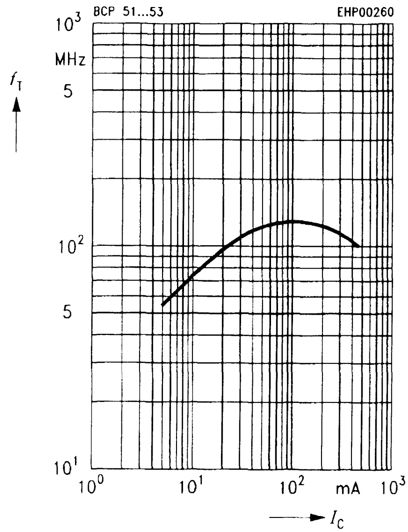
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 10 mA, I_B = 0 BCP 51		45	–	–	
BCP 52		60	–	–	
BCP 53		80	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 100 µA, I_B = 0 BCP 51		45	–	–	
BCP 52		60	–	–	
BCP 53		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	5	–	–	
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 V_{EB} = 5 V, I_C = 0	I_{EBO}	–	–	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/BCP 53-16		100	160	250	
I_C = 500 mA, V_{CE} = 2 V		25	–	–	
Collector-emitter saturation voltage[1] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	0.5	V
Base-emitter voltage[1] I_C = 500 mA, V_{CE} = 2 V	V_{BE}	–	–	1	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz	f_T	–	125	–	MHz

1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

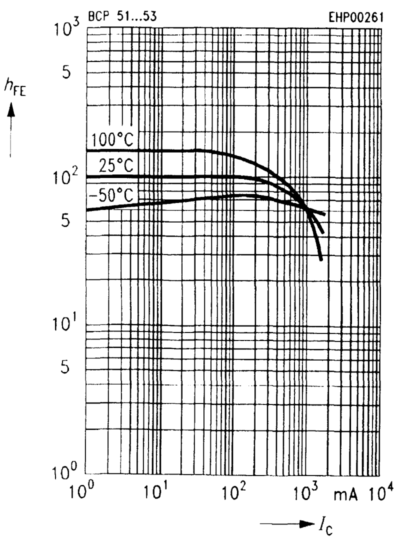
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



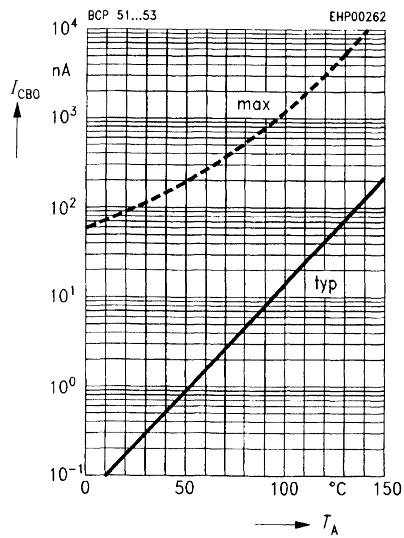
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



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

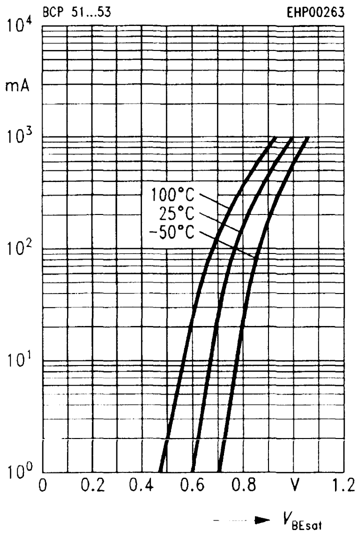


Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



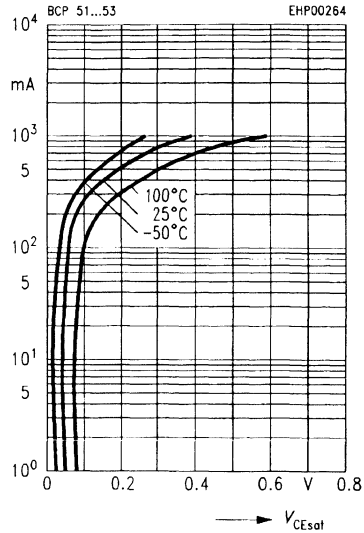
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$
$h_{FE} = 10$

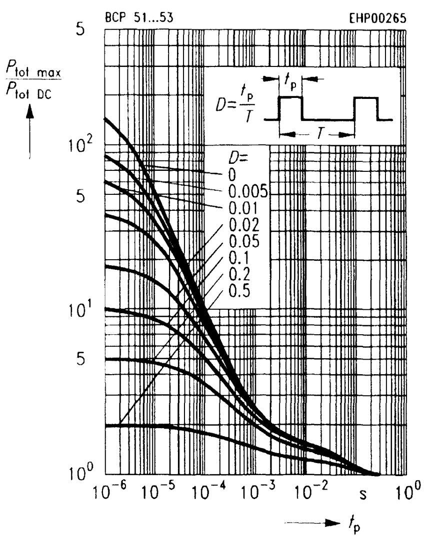


Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$
$h_{FE} = 10$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

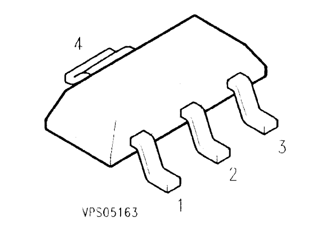


SIEMENS

NPN Silicon AF Transistors

BCP 54
... BCP 56

- For AF driver and output stages
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BCP 51 ... BCP 53 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BCP 54	BCP 54	Q62702-C2117	B	C	E	C	SOT-223
BCP 54-10	BCP 54-10	Q62702-C2119					
BCP 54-16	BCP 54-16	Q62702-C2120					
BCP 55	BCP 55	Q62702-C2148					
BCP 55-10	BCP 55-10	Q62702-C2122					
BCP 55-16	BCP 55-16	Q62702-C2123					
BCP 56	BCP 56	Q62702-C2149					
BCP 56-10	BCP 56-10	Q62702-C2125					
BCP 56-16	BCP 56-16	Q62702-C2106					

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCP 54	BCP 55	BCP 56	Unit
Collector-emitter voltage	V_{CE0}	45	60	80	V
$R_{BE} \leq 1$ kΩ	V_{CER}	45	60	100	
Collector-base voltage	V_{CB0}	45	60	100	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, $T_C = 124$ ˚C [1]	P_{tot}	1.5			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient [1]	$R_{th\ JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\ JS}$	≤ 17	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

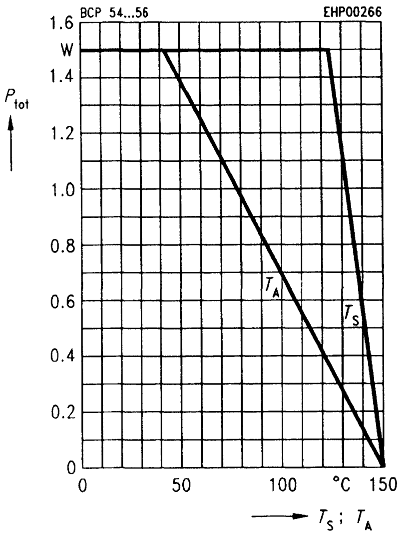
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 10 mA, I_B = 0 BCP 54		45	–	–	
BCP 55		60	–	–	
BCP 56		80	–	–	
Collector-base breakdown voltage[1)	$V_{(BR)CBO}$				
I_C = 100 µA, I_B = 0 BCP 54		45	–	–	
BCP 55		60	–	–	
BCP 56		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	5	–	–	
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 V_{EB} = 5 V	I_{EBO}	–	–	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) I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	0.5	V
Base-emitter voltage[1) I_C = 500 mA, V_{CE} = 2 V	V_{BE}	–	–	1	

AC characteristics

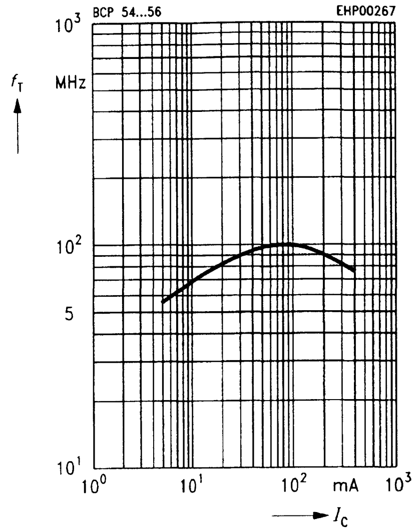
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz	f_T	–	100	–	MHz

[1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

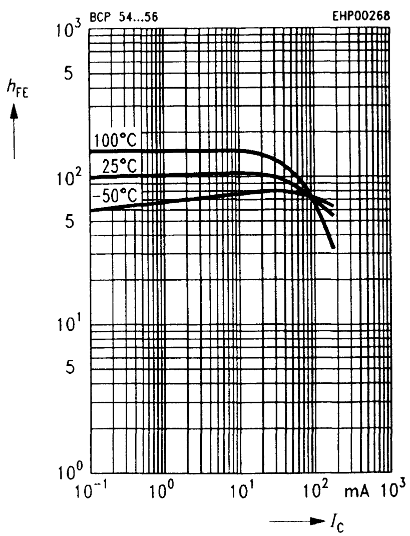
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



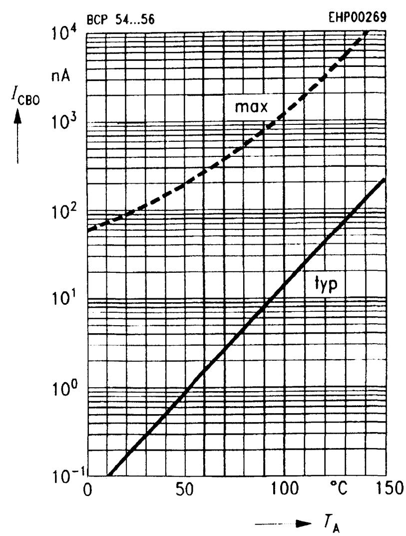
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



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



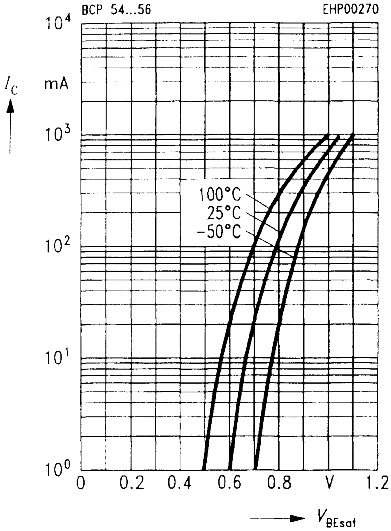
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



Base-emitter saturation voltage

$I_C = f(V_{BEsat})$

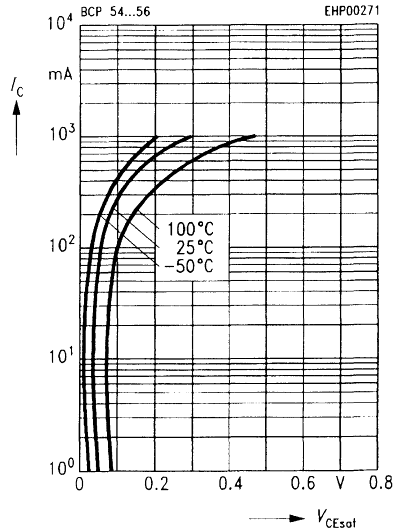
$h_{FE} = 10$



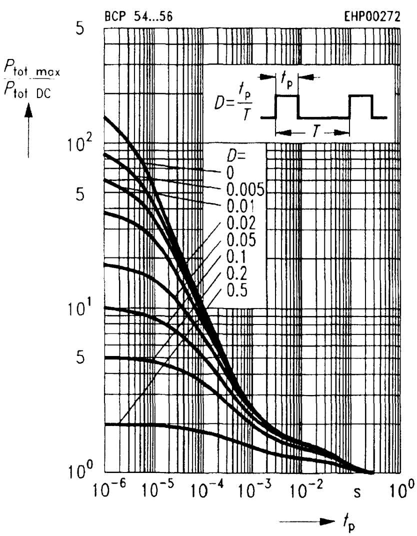
Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$

$h_{FE} = 10$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

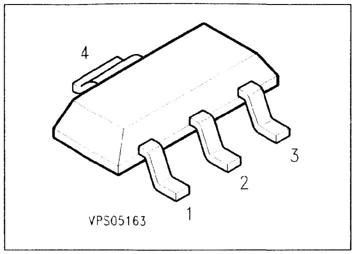


SIEMENS

NPN Silicon AF Transistor

BCP 68

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BCP 68	BCP 68	Q62702-C2126	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO} V_{CES}	20 25	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 124 ˚C [2)]	P_{tot}	1.5	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient [2)]	$R_{th JA}$	≤ 72	K/W
Junction - soldering point	$R_{th JS}$	≤ 17	

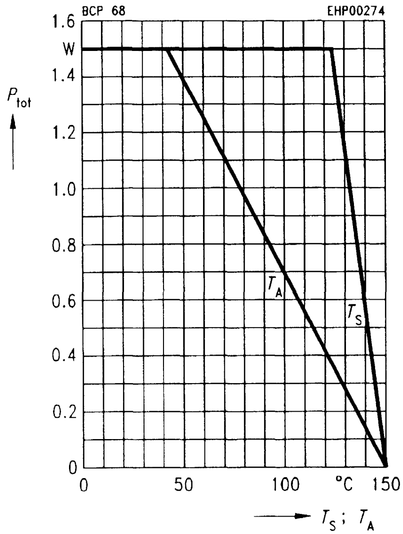
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm ^{2} Cu.

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

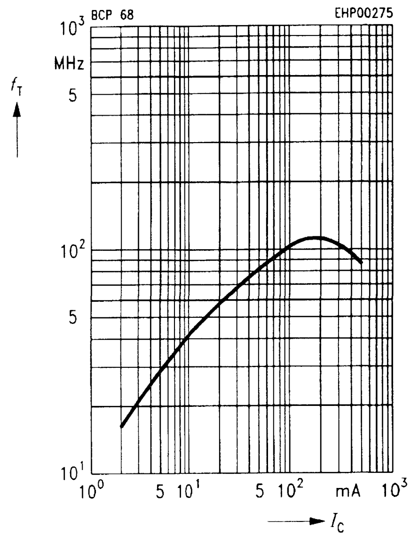
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 30 mA, I_B = 0	$V_{(BR)CEO}$	20	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA, V_{BE} = 0	$V_{(BR)CES}$	25	–	–	
Collector-base breakdown voltage I_C = 10 µA, I_B = 0	$V_{(BR)CBO}$	25	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_B = 0	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 25 V V_{CB} = 25 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 100	 nA µA
Emitter-base cutoff current V_{EB} = 5 V, I_C = 0	I_{EBO}	–	–	100	nA
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	
AC characteristics					
Transition frequency I_C = 100 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	100	–	MHz

[1] Pulse test conditions: $t \leq$ 300 µs, D = 2 %.

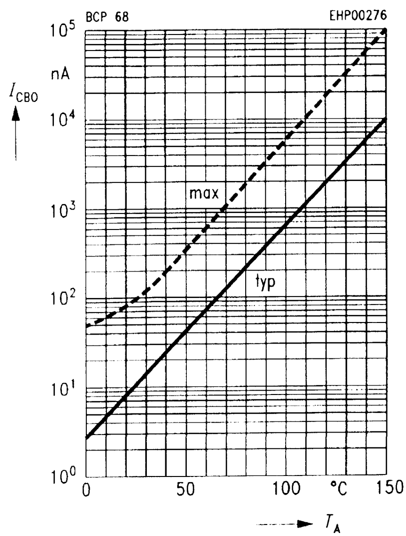
Total power dissipation $P_{tot} = f\,(T_A{}^*; T_S)$
* Package mounted on epoxy



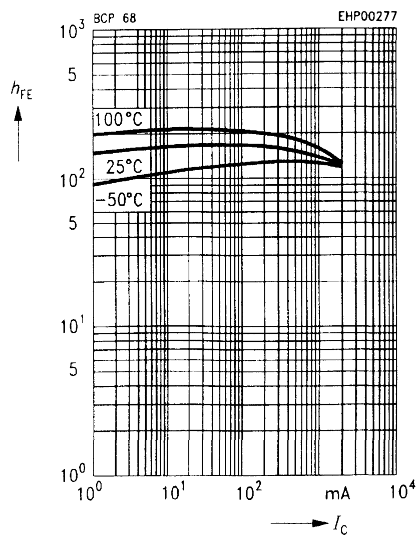
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V, f = 100 MHz



Collector cutoff current $I_{CBO} = f\,(T_A)$
V_{CB} = 25 V



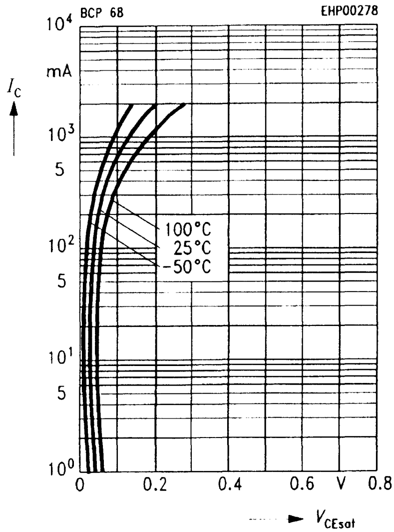
DC current gain $h_{FE} = f\,(I_C)$
V_{CB} = 1 V



Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$

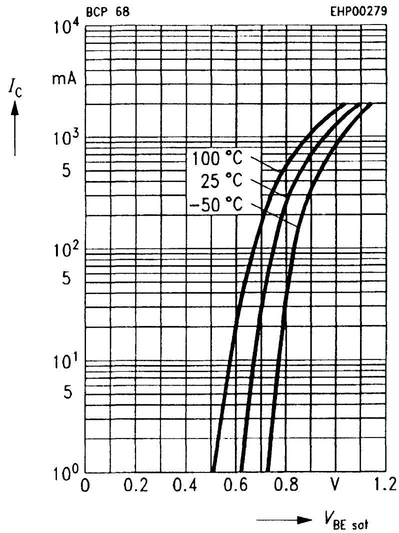
$h_{FE} = 10$



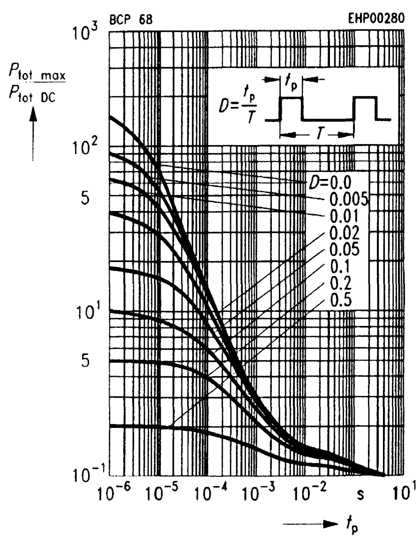
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$

$h_{FE} = 10$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

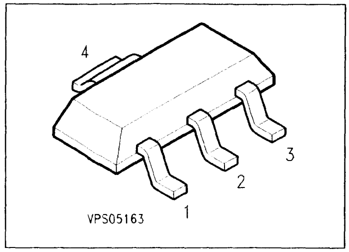


SIEMENS

PNP Silicon AF Transistor

BCP 69

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BCP 69	BCP 69	Q62702-C2130	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO} V_{CES}	20 25	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 124 °C [2)]	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient [2)]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

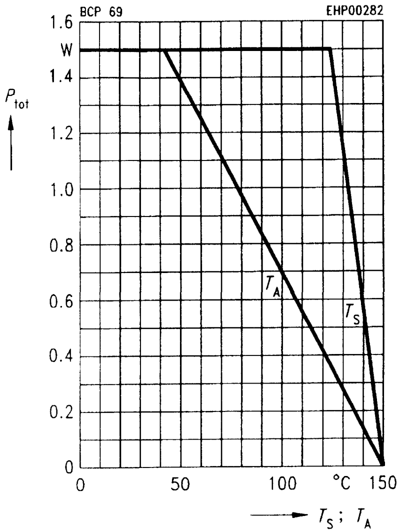
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

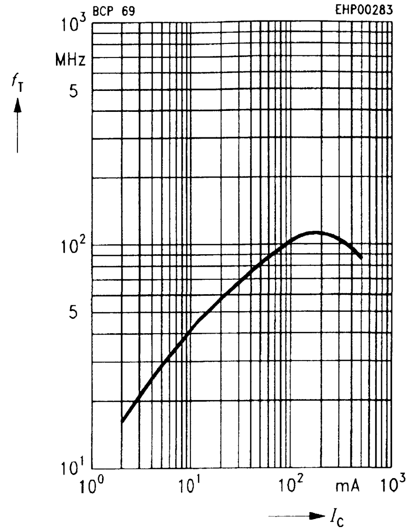
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 30 mA, I_B = 0	$V_{(BR)CEO}$	20	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA, V_{BE} = 0	$V_{(BR)CES}$	25	–	–	
Collector-base breakdown voltage I_C = 10 µA, I_B = 0	$V_{(BR)CBO}$	25	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_B = 0	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 25 V V_{CB} = 25 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 100	 nA µA
Emitter-base cutoff current V_{EB} = 5 V, I_C = 0	I_{EBO}	–	–	100	nA
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 85 60	 – – –	 – 375 –	–
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	
AC characteristics					
Transition frequency I_C = 100 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	100	–	MHz

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

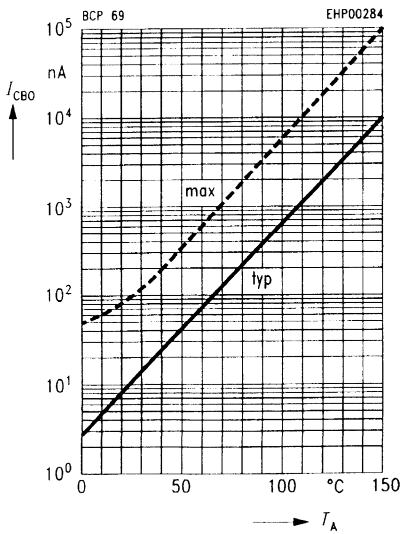
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



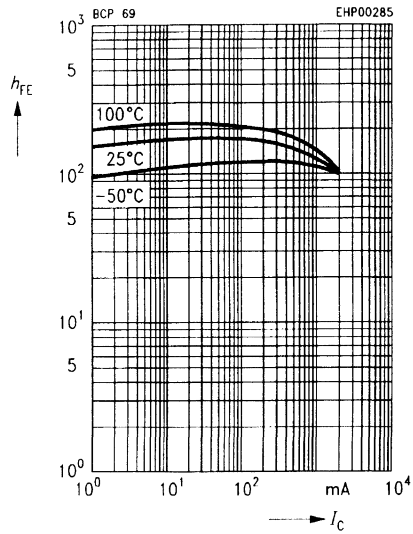
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



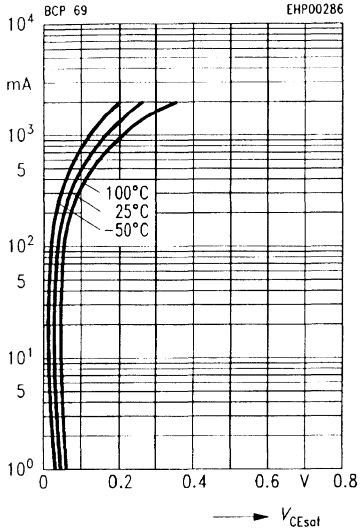
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 25 V



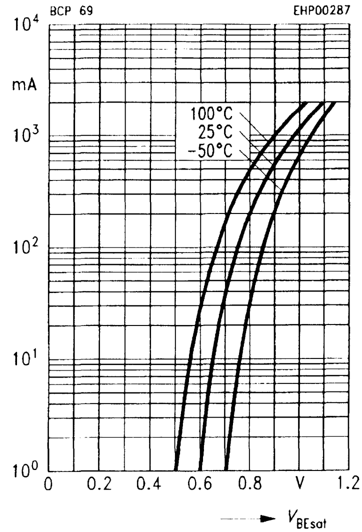
DC current gain $h_{FE} = f(I_C)$
V_{CB} = 1 V



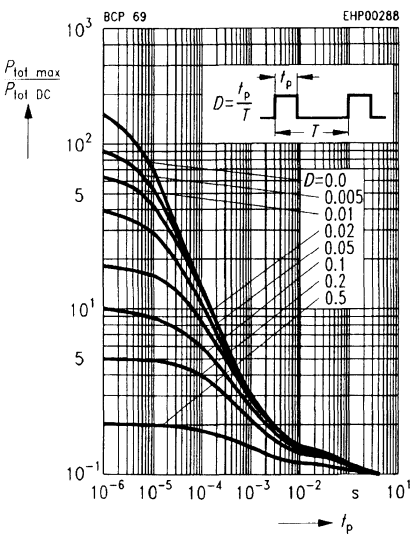
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 10$



Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 10$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

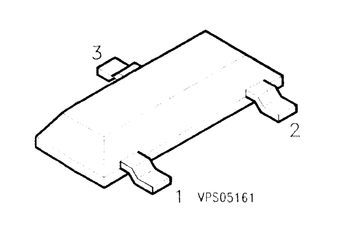


SIEMENS

PNP Silicon Darlington Transistors

BCV 26
BCV 46

- For general AF applications
- High collector current
- High current gain
- Complementary types: BCV 27, BCV 47 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BCV 26	FDs	Q62702-C1493	B	E	C	SOT-23
BCV 46	FEs	Q62702-C1475				

Maximum Ratings

Parameter	Symbol	Values BCV 26	BCV 46	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	
Emitter-base voltage	V_{EBO}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 74 ˚C	P_{tot}	360		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 280	K/W
Junction - soldering point	$R_{th JS}$	≤ 210	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

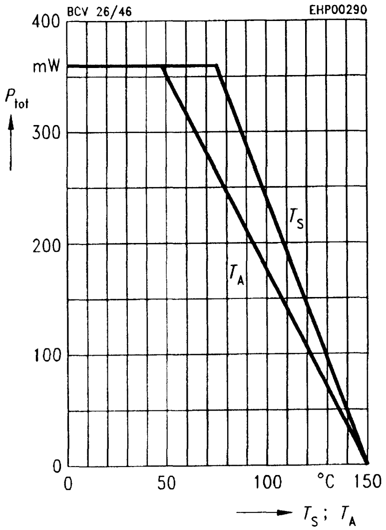
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

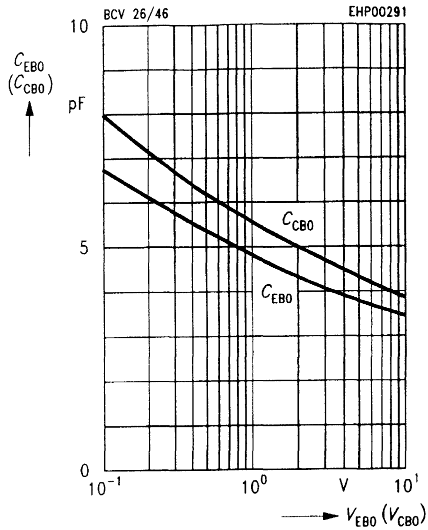
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage, I_C = 10 mA	$V_{(BR)CEO}$				V
BCV 26		30	–	–	
BCV 46		60	–	–	
Collector-base breakdown voltage, I_C = 100 µA	$V_{(BR)CBO}$				
BCV 26		40	–	–	
BCV 46		80	–	–	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EBO}$	10	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V BCV 26		–	–	100	nA
V_{CB} = 60 V BCV 46		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C BCV 26		–	–	10	µA
V_{CB} = 60 V, T_A = 150 °C BCV 46		–	–	10	µA
Emitter cutoff current, V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain [1]	h_{FE}				–
I_C = 100 µA, V_{CE} = 1 V BCV 26		4000	–	–	
BCV 46		2000	–	–	
I_C = 10 mA, V_{CE} = 5 V BCV 26		10000	–	–	
BCV 46		4000	–	–	
I_C = 100 mA, V_{CE} = 5 V BCV 26		20000	–	–	
BCV 46		10000	–	–	
I_C = 0.5 A, V_{CE} = 5 V BCV 26		4000	–	–	
BCV 46		2000	–	–	
Collector-emitter saturation voltage [1], I_C = 100 mA, I_B = 0.1 mA	V_{CEsat}	–	–	1	V
Base-emitter saturation voltage [1], I_C = 100 mA, I_B = 0.1 mA	V_{BEsat}	–	–	1.5	
AC characteristics					
Transition frequency, I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	200	–	MHz
Output capacitance, V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	4.5	–	pF

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

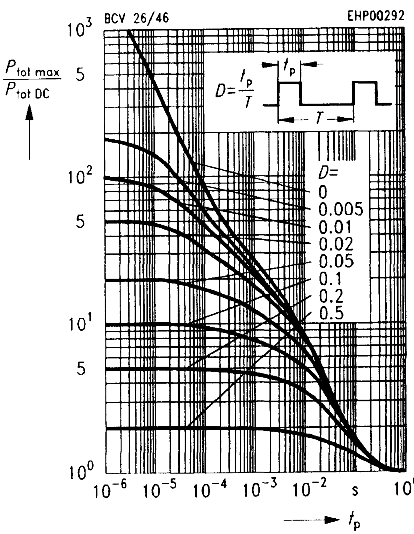
Total power dissipation $P_{tot} = f\,(T_A{}^*;\,T_S)$
* Package mounted on epoxy



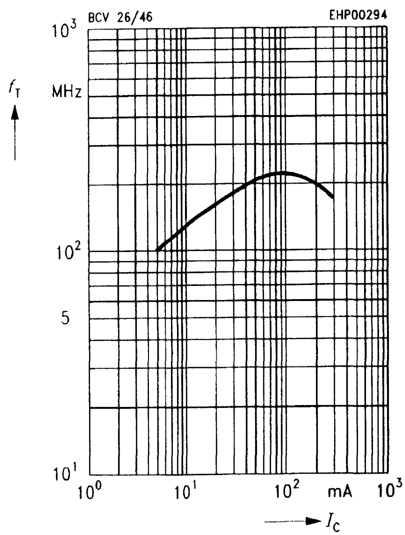
Collector-base capacitance $C_{CB0} = f\,(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f\,(V_{EB0})$



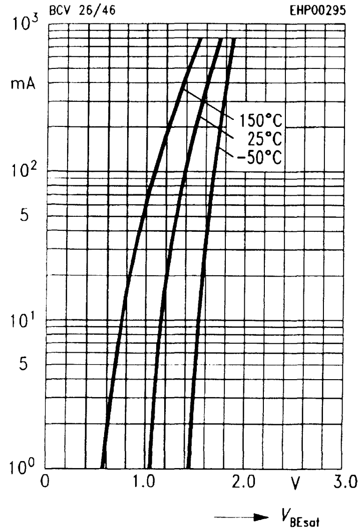
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



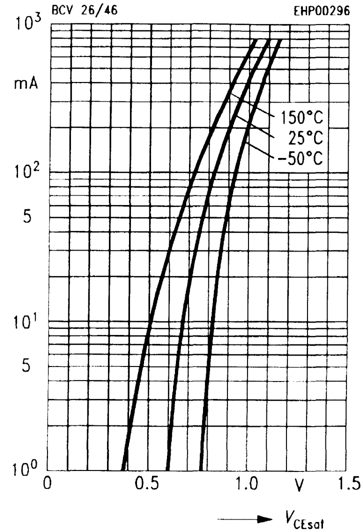
Transition frequency $f_T = f\,(I_C)$
$V_{CE} = 5$ V



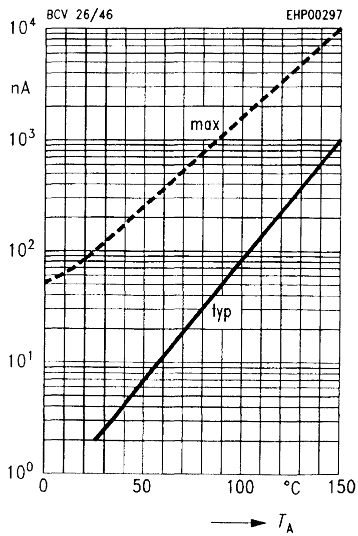
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 1000$



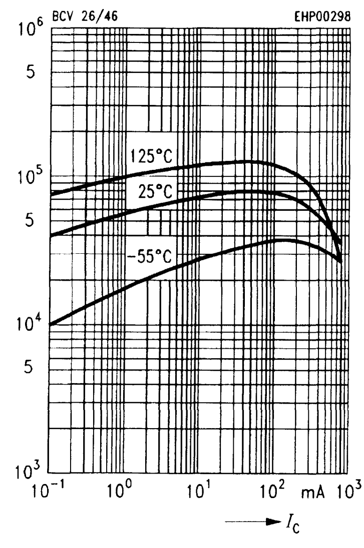
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 1000$



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



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

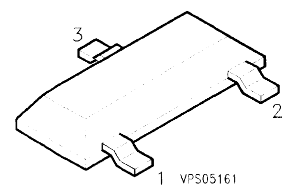


SIEMENS

NPN Silicon Darlington Transistors

BCV 27
BCV 47

- For general AF applications
- High collector current
- High current gain
- Complementary types: BCV 26, BCV 46 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCV 27	FFs	Q62702-C1474	B	E	C	SOT-23
BCV 47	FGs	Q62702-C1501				

Maximum Ratings

Parameter	Symbol	Values BCV 27	BCV 47	Unit
Collector-emitter voltage	V_{CE0}	30	60	V
Collector-base voltage	V_{CB0}	40	80	
Emitter-base voltage	V_{EB0}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 74 °C	P_{tot}	360		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 280	K/W
Junction - soldering point	$R_{th JS}$	≤ 210	

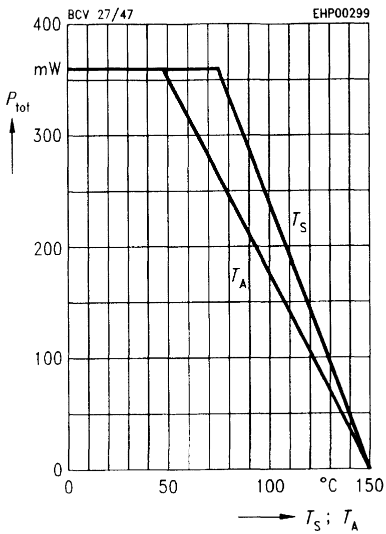
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

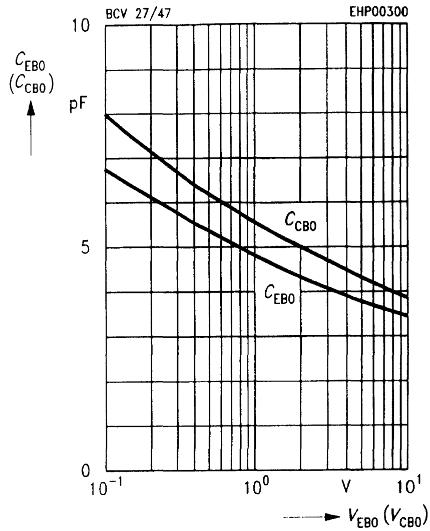
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage I_C = 10 mA	BCV 27 BCV 47	$V_{(BR)CE0}$	30 60	– –	– –	V
Collector-base breakdown voltage I_C = 100 µA	BCV 27 BCV 47	$V_{(BR)CB0}$	40 80	– –	– –	
Emitter-base breakdown voltage, I_E = 10 µA		$V_{(BR)EB0}$	10	–	–	
Collector cutoff current V_{CB} = 30 V V_{CB} = 60 V V_{CB} = 30 V, T_A = 150 °C V_{CB} = 60 V, T_A = 150 °C	 BCV 27 BCV 47 BCV 27 BCV 47	I_{CB0}	 – – – –	 – – – –	 100 100 10 10	 nA nA µA µA
Emitter cutoff current, V_{EB} = 4 V		I_{EB0}	–	–	100	nA
DC current gain [1] I_C = 100 µA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 5 V I_C = 100 mA, V_{CE} = 5 V I_C = 0.5 A, V_{CE} = 5 V	 BCV 27 BCV 47 BCV 27 BCV 47 BCV 27 BCV 47 BCV 27 BCV 47	h_{FE}	 4000 2000 10000 4000 20000 10000 4000 2000	 – – – – – – – –	 – – – – – – – –	–
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA		V_{CEsat}	–	–	1	V
Base-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA		V_{BEsat}	–	–	1.5	
AC characteristics						
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz		f_T	–	170	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz		C_{obo}	–	3.5	–	pF

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

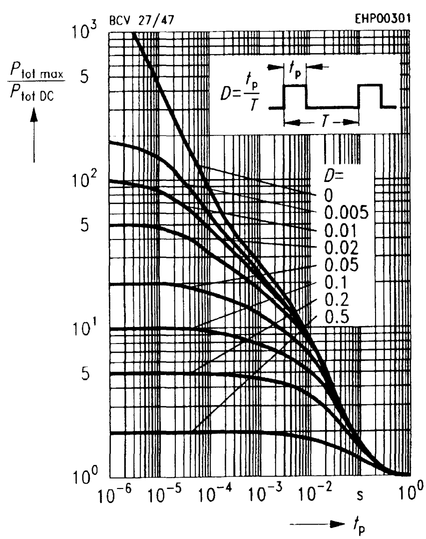
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



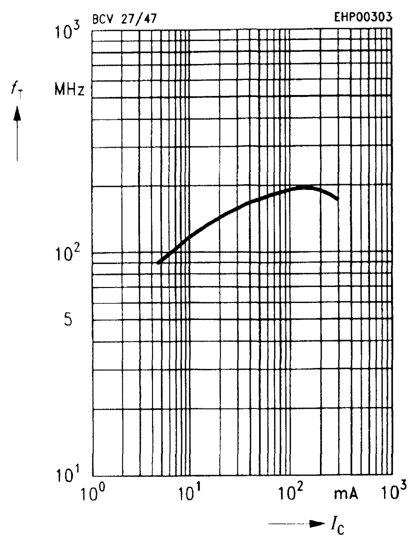
Collector-base capacitance $C_{CB0} = f\,(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f\,(V_{EB0})$



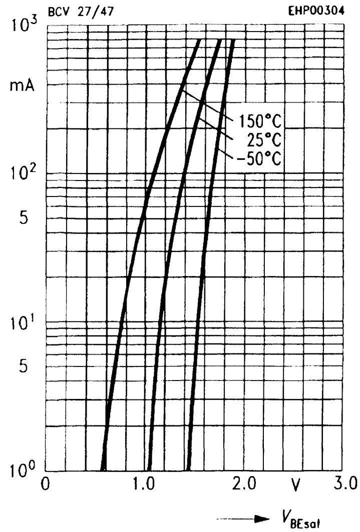
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



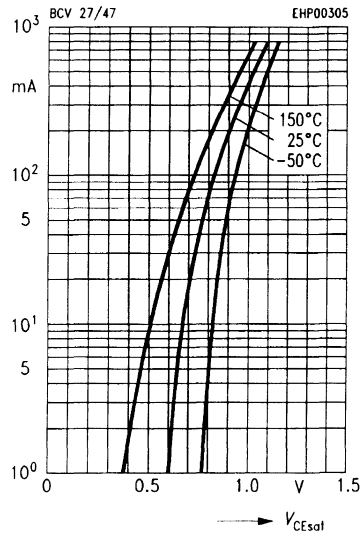
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V



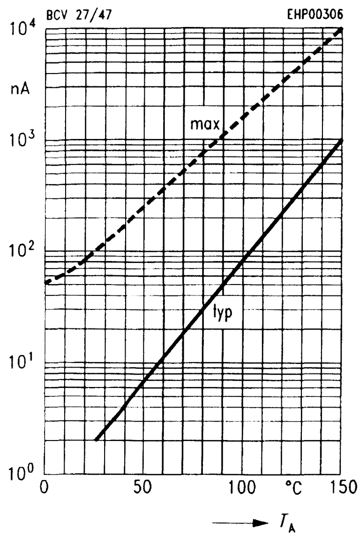
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 1000$



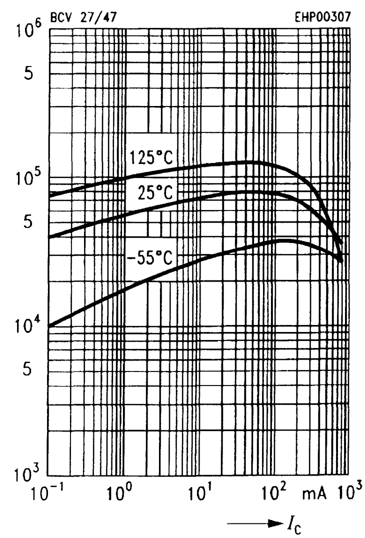
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 1000$



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



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

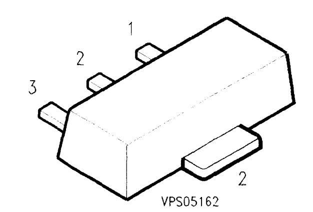


SIEMENS

PNP Silicon Darlington Transistors

BCV 28
BCV 48

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BCV 28	ED	Q62702-C1852	B	C	E	C	SOT-89
BCV 48	EE	Q62702-C1854					

Maximum Ratings

Parameter	Symbol	Values BCV 28	BCV 48	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	
Emitter-base voltage	V_{EBO}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 124 °C	P_{tot}	1		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2)]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

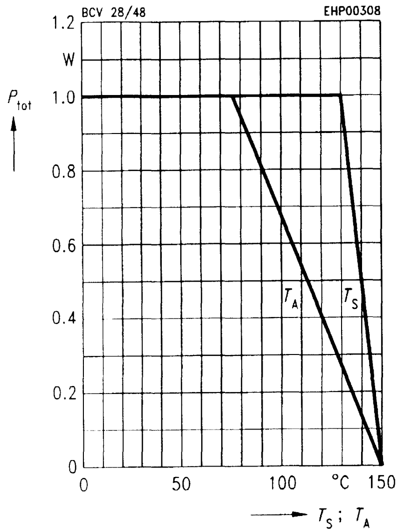
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

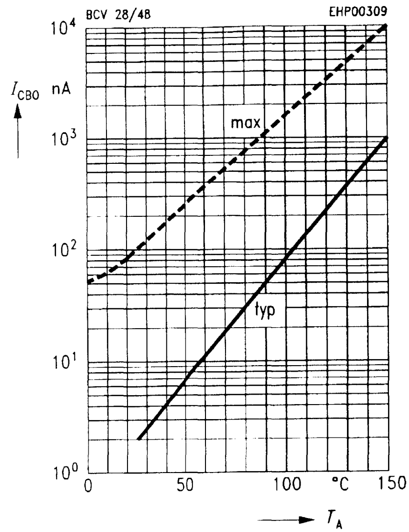
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage I_C = 10 mA	BCV 28 BCV 48	$V_{(BR)CEO}$	30 60	– –	– –	V
Collector-base breakdown voltage I_C = 100 µA	BCV 28 BCV 48	$V_{(BR)CBO}$	40 80	– –	– –	
Emitter-base breakdown voltage, I_E = 10 µA		$V_{(BR)EBO}$	10	–	–	
Collector cutoff current V_{CB} = 30 V V_{CB} = 60 V V_{CB} = 30 V, T_A = 150 °C V_{CB} = 60 V, T_A = 150 °C	 BCV 28 BCV 48 BCV 28 BCV 48	I_{CBO}	 – – – –	 – – – –	 100 100 10 10	 nA nA µA µA
Emitter cutoff current, V_{EB} = 4 V		I_{EBO}	–	–	100	nA
DC current gain [1] I_C = 100 µA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 5 V I_C = 100 mA, V_{CE} = 5 V I_C = 0.5 A, V_{CE} = 5 V	 BCV 28 BCV 48 BCV 28 BCV 48 BCV 28 BCV 48 BCV 28 BCV 48	h_{FE}	 4000 2000 10000 4000 20000 10000 4000 2000	 – – – – – – – –	 – – – – – – – –	–
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA		V_{CEsat}	–	–	1	V
Base-emitter saturation voltage [1] I_C = 100 mA; I_B = 0.1 mA		V_{BEsat}	–	–	1.5	
AC characteristics						
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz		f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz		C_{obo}	–	4.5	–	pF

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

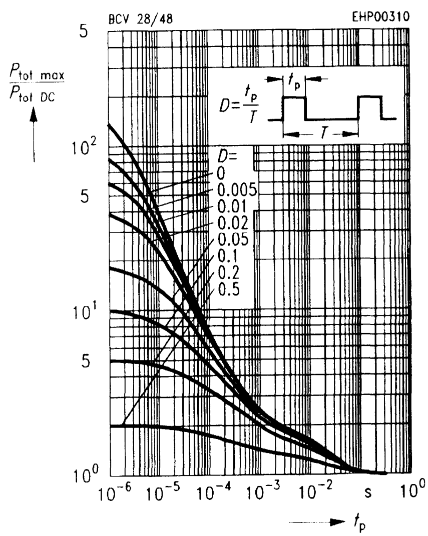
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



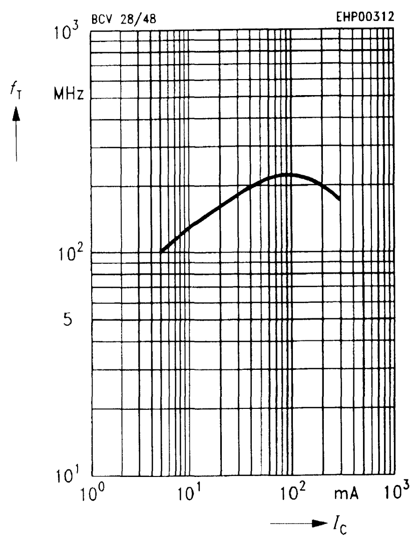
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = V_{CE\,max}$



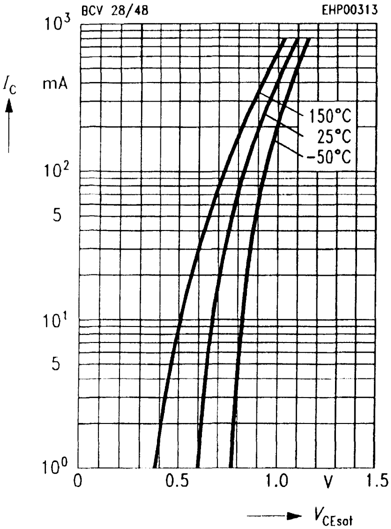
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



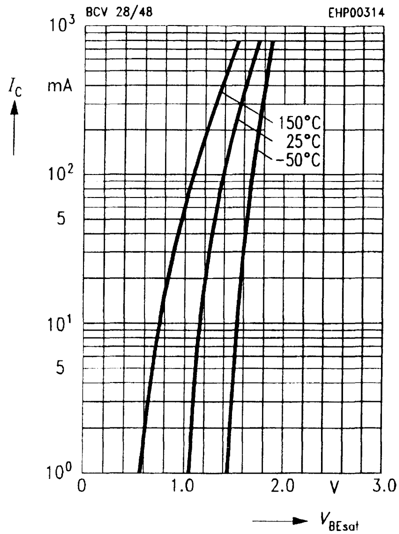
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



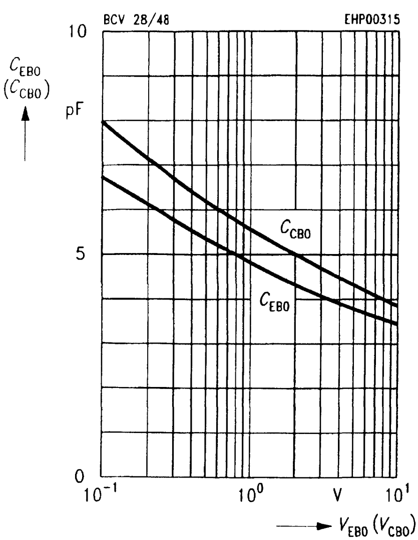
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 1000$



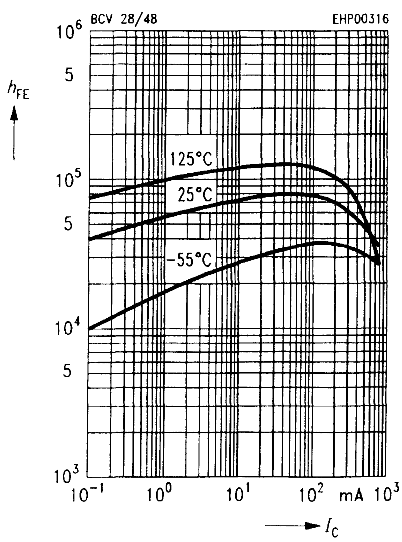
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 1000$



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



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

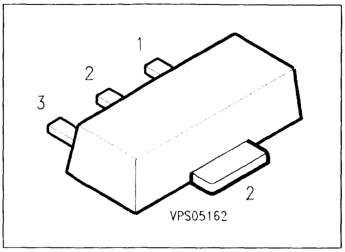


SIEMENS

NPN Silicon Darlington Transistors

BCV 29
BCV 49

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BCV 29 BCV 49	EF EG	Q62702-C1853 Q62702-C1832	B	C	E	C	SOT-89

Maximum Ratings

Parameter	Symbol	Values BCV 28	BCV 48	Unit
Collector-emitter voltage	V_{CEO}	30	60	V
Collector-base voltage	V_{CBO}	40	80	
Emitter-base voltage	V_{EBO}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 130 ˚C	P_{tot}	1		W
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 75	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 20	

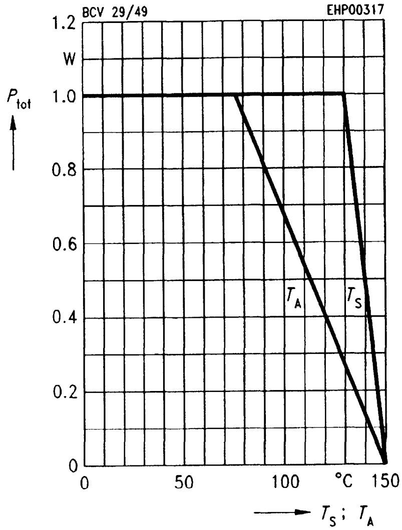
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

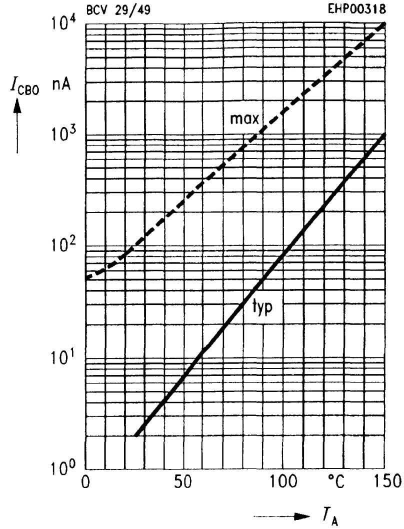
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage I_C = 10 mA		$V_{(BR)CEO}$				V
	BCV 29		30	–	–	
	BCV 49		60	–	–	
Collector-base breakdown voltage I_C = 100 µA		$V_{(BR)CBO}$				
	BCV 29		40	–	–	
	BCV 49		80	–	–	
Emitter-base breakdown voltage, I_E = 10 µA		$V_{(BR)EBO}$	10	–	–	
Collector cutoff current		I_{CBO}				
V_{CB} = 30 V	BCV 29		–	–	100	nA
V_{CB} = 60 V	BCV 49		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C	BCV 29		–	–	10	µA
V_{CB} = 60 V, T_A = 150 °C	BCV 49		–	–	10	µA
Emitter cutoff current, V_{EB} = 4 V		I_{EBO}	–	–	100	nA
DC current gain [1]		h_{FE}				–
I_C = 100 µA, V_{CE} = 1 V	BCV 29		4000	–	–	
	BCV 49		2000	–	–	
I_C = 10 mA, V_{CE} = 5 V	BCV 29		10000	–	–	
	BCV 49		4000	–	–	
I_C = 100 mA, V_{CE} = 5 V	BCV 29		20000	–	–	
	BCV 49		10000	–	–	
I_C = 0.5 A, V_{CE} = 5 V	BCV 29		4000	–	–	
	BCV 49		2000	–	–	
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA		V_{CEsat}	–	–	1	V
Base-emitter saturation voltage [1] I_C = 100 mA; I_B = 0.1 mA		V_{BEsat}	–	–	1.5	
AC characteristics						
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz		f_T	–	150	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz		C_{obo}	–	3.5	–	pF

[1] Pulse test: $t \leq$ 300 µs, D = 2 %.

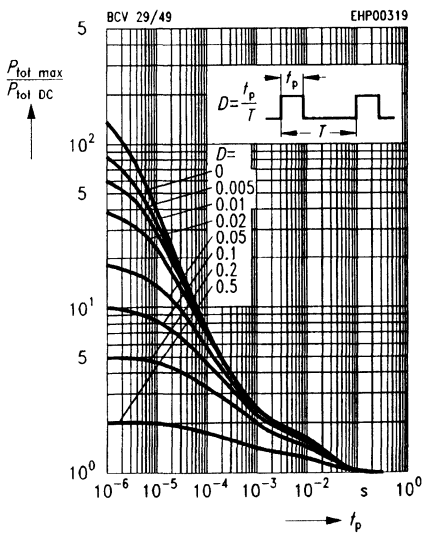
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



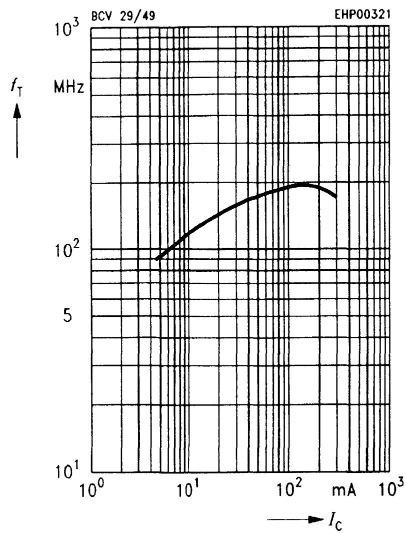
Collector cutoff current $I_{CBO} = f(T_A)$



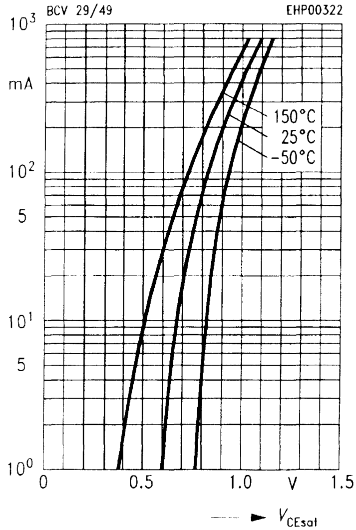
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



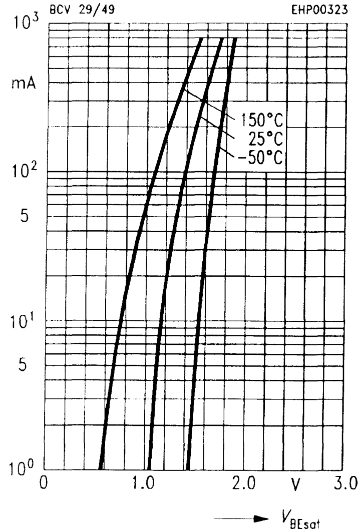
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



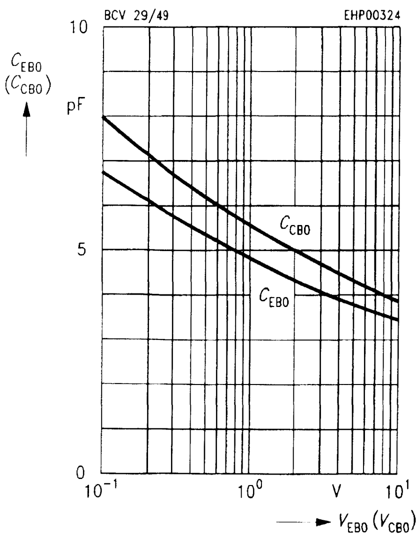
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 1000$



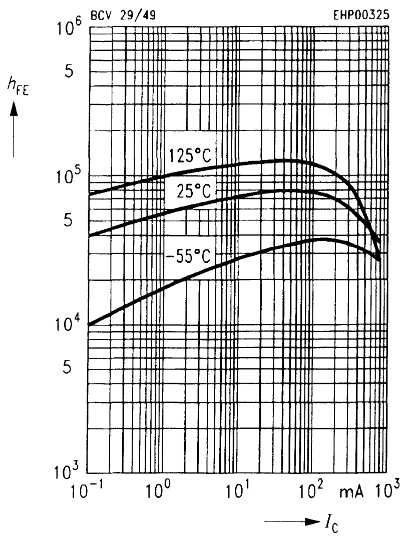
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 1000$



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



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



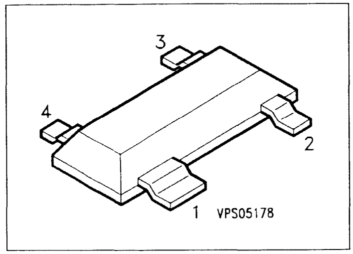
SIEMENS

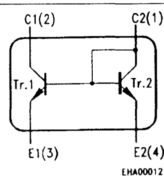
NPN Silicon Double Transistors

BCV 61

Preliminary Data

- To be used as a current mirror
- Good thermal coupling and V_{BE} matching
- High current gain
- Low emitter-saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1)]
BCV 61 A BCV 61 B BCV 61 C	1Js 1Ks 1Ls	Q62702-C2155 Q62702-C2156 Q62702-C2157		SOT-143

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage (transistor T1)	V_{CEO}	30	V
Collector-base voltage (open emitter) (transistor T1)	V_{CBO}	30	
Emitter-base voltage	V_{EBS}	6	
Collector current	I_C	100	mA
Collector peak current	I_{CM}	200	
Base peak current (transistor T1)	I_{BM}	200	
Total power dissipation, $T_S \le 99$ °C [2)]	P_{tot}	300	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient [2)]	$R_{th\,JA}$	$\le$ 240	K/W
Junction - soldering point	$R_{th\,JS}$	$\le$ 170	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics for transistor T1					
Collector-emitter breakdown voltage I_C = 10 mA, I_B = 0	$V_{(BR)CEO}$	30	–	–	V
Collector-base breakdown voltage I_C = 10 µA, I_B = 0	$V_{(BR)CBO}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBS}$	6	–	–	
Collector-base cutoff current V_{CB} = 30 V, I_E = 0 V_{CB} = 30 V, I_E = 0, T_A = 150 °C	I_{CBO}	 – –	 – –	 15 5	 nA µA
DC current gain 1) I_C = 0.1 mA, V_{CE} = 5 V I_C = 2 mA, V_{CE} = 5 V BCV 61 A BCV 61 B BCV 61 C	h_{FE}	 100 110 200 420	 – 180 290 520	 220 450 800	–
Collector-emitter saturation voltage 1) I_C = 10 mA, I_B = 0.5 mA I_C = 100 mA, I_B = 5 mA	V_{CEsat}	 – –	 90 200	 250 600	mV
Base-emitter saturation voltage 1) I_C = 10 mA, I_C = 0.5 mA I_C = 100 mA, I_C = 5 mA	V_{BEsat}	 – –	 700 900	 – –	
Base-emitter voltage I_C = 2 mA, V_{CE} = 5 V I_C = 10 mA, V_{CE} = 5 V	V_{BE}	 580 –	 660 –	 700 770	

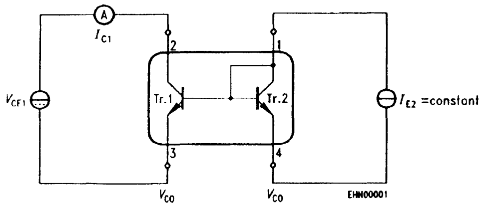
1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics for transistor T2					
Base-emitter forward voltage	V_{BES}				V
I_E = 10 µA		0.4	–	–	
I_E = 250 mA		–	–	1.8	
Matching of transistor T1 and transistor T2 at I_{E2} = 0.5 mA and V_{CE1} = 5 V					–
T_A = 25 °C	I_{C1} / I_{C2}	0.7	–	1.3	
T_A = 150 °C	I_{C1} / I_{C2}	0.7	–	1.3	
Thermal coupling of transistor T1 and transistor T2 [1) T1: V_{CE} = 5 V Maximum current for thermal stability of I_{C1}	I_{E2}	–	5	–	mA
AC characteristics for transistor T1					
Transition frequency I_C = 10 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Collector-base capacitance V_{CB} = 10 V, I_C = i_c = 0, f = 1 MHz	C_{cb}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	8	–	
Noise figure I_C = 200 µA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, B = 200 Hz	F	–	2	–	dB
Input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{11e}	–	4.5	–	kΩ
Open-circuit reverse voltage transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{12e}	–	2	–	10^{-4}
Short-circuit forward current transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{21e}	100	–	900	–
Open-circuit output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{22e}	–	30	–	µS

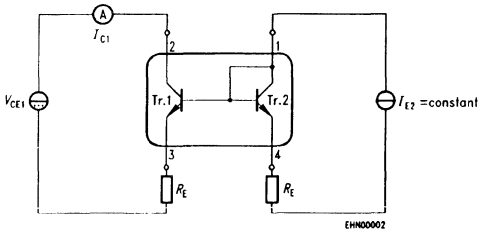
1) Without emitter resistor. Device mounted on alumina 15 mm × 16.5 mm × 0.7 mm.

Test circuit for current matching



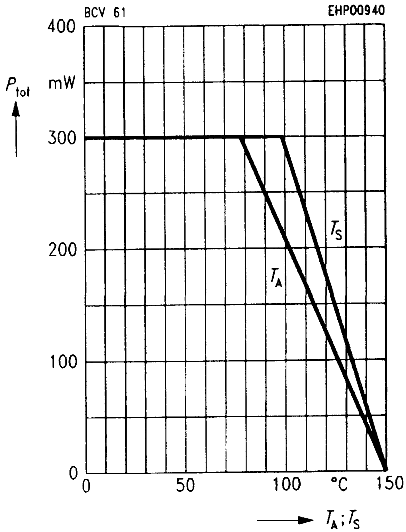
Note: Voltage drop at contacts: $V_{CO} < \frac{2}{3} V_T = 16$ mV

Characteristic for determination of V_{CE1} at specified R_E range with I_{E2} as parameter under condition of $I_{C1} / I_{E2} = 1.3$

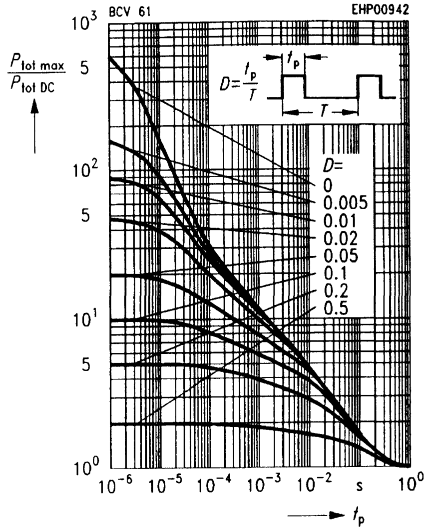


Note: BCV 61 with emitter resistors

Total power dissipation $P_{tot} = f\,(T_A^*;\, T_S)$
* Package mounted on epoxy



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



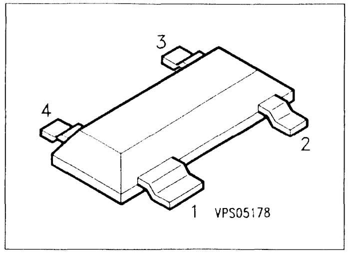
SIEMENS

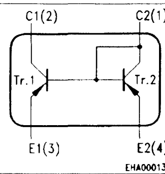
PNP Silicon Double Transistors

BCV 62

Preliminary Data

- To be used as a current mirror
- Good thermal coupling and V_{BE} matching
- High current gain
- Low emitter-saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration	Package[1]
BCV 62 A BCV 62 B BCV 62 C	3Js 3Ks 3Ls	Q62702-C2158 Q62702-C2159 Q62702-C2160		SOT-143

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage (transistor T1)	V_{CEO}	30	V
Collector-base voltage (open emitter) (transistor T1)	V_{CBO}	30	
Emitter-base voltage	V_{EBS}	6	
Collector current	I_C	100	mA
Collector peak current	I_{CM}	200	
Base peak current (transistor T1)	I_{BM}	200	
Total power dissipation, T_S = 99 °C [2]	P_{tot}	300	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 240	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 170	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics for transistor T1					
Collector-emitter breakdown voltage I_C = 10 mA, I_B = 0	$V_{(BR)CE0}$	30	–	–	V
Collector-base breakdown voltage I_C = 10 µA, I_B = 0	$V_{(BR)CB0}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBS}$	6	–	–	
Collector-base cutoff current V_{CB} = 30 V, I_E = 0 V_{CB} = 30 V, I_E = 0, T_A = 150 °C	I_{CB0}	 – –	 – –	 15 5	 nA µA
DC current gain [1] I_C = 0.1 mA, V_{CE} = 5 V I_C = 2 mA, V_{CE} = 5 V BCV 62 A BCV 62 B BCV 62 C	h_{FE}	 100 125 220 420	 – 180 290 520	 220 475 800	–
Collector-emitter saturation voltage [1] I_C = 10 mA, I_B = 0.5 mA I_C = 100 mA, I_B = 5 mA	V_{CEsat}	 – –	 75 250	 300 650	mV
Base-emitter saturation voltage [1] I_C = 10 mA, I_C = 0.5 mA I_C = 100 mA, I_C = 5 mA	V_{BEsat}	 – –	 700 850	 – –	
Base-emitter voltage I_C = 2 mA, V_{CE} = 5 V I_C = 10 mA, V_{CE} = 5 V	V_{BE}	 600 –	 650 –	 750 820	

1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

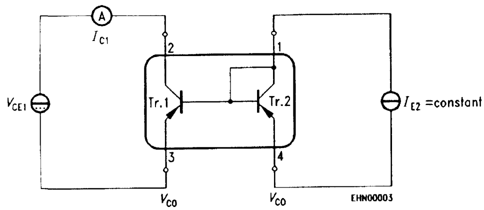
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics for transistor T2					
Base-emitter forward voltage	V_{BES}				V
I_E = 10 µA		0.4	–	–	
I_E = 250 mA		–	–	1.8	
Matching of transistor T1 and transistor T2 at I_{E2} = 0.5 mA and V_{CE1} = 5 V					
T_A = 25 °C	I_{C1} / I_{C2}	0.7	–	1.3	
T_A = 150 °C	I_{C1} / I_{C2}	0.7	–	1.3	
Thermal coupling of transistor T1 and transistor T2 [1] T1: V_{CE} = 5 V Maximum current for thermal stability of I_{C1}	I_{E2}	–	5	–	mA
AC characteristics for transistor T1					
Transition frequency I_C = 10 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Collector-base capacitance V_{CB} = 10 V, I_C = i_c = 0, f = 1 MHz	C_{cb}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, I_C = i_c = 0, f = 1 MHz	C_{ibo}	–	8	–	
Noise figure I_C = 200 µA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, B = 200 Hz	F	–	2	–	dB
Input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{11e}	–	4.5	–	kΩ
Open-circuit reverse voltage transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{12e}	–	2	–	10^{-4}
Short-circuit forward current transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{21e}	100	–	900	–
Open-circuit output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{22e}	–	30	–	µS

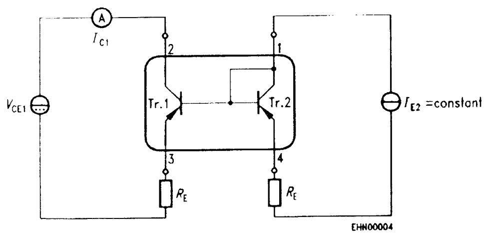
[1] Without emitter resistor. Device mounted on alumina 15 mm × 16.5 mm × 0.7 mm.

Test circuit for current matching



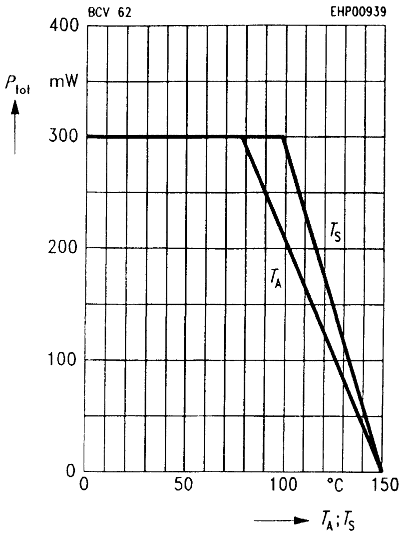
Note: Voltage drop at contacts: $V_{CO} < \frac{2}{3}\ V_T = 16$ mV

Characteristic for determination of V_{CE1} at specified R_E range with I_{E2} as parameter under condition of I_{C1} / I_{E2} = 1.3

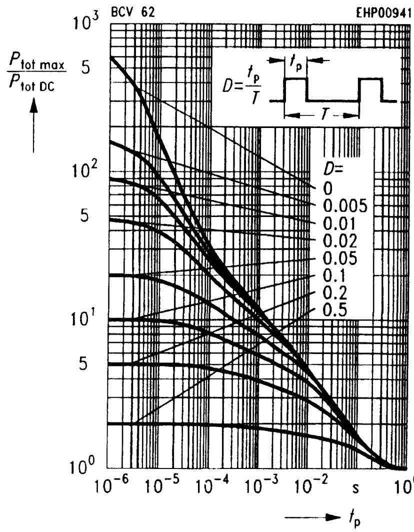


Note: BCV 62 with emitter resistors

Total power dissipation $P_{tot} = f\,(T_A{}^*;\,T_S)$
* Package mounted on epoxy



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$

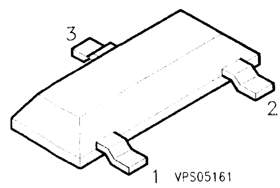


SIEMENS

NPN Silicon AF Transistors

BCW 60
BCX 70

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BCW 61, BCX 71 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCW 60 A	AAs	Q62702-C1517	B	E	C	SOT-23
BCW 60 B	ABs	Q62702-C1497				
BCW 60 C	ACs	Q62702-C1476				
BCW 60 D	ADs	Q62702-C1477				
BCW 60 FF	AFs	Q62702-C1529				
BCW 60 FN	ANs	Q62702-C1567				
BCX 70 G	AGs	Q62702-C1539				
BCX 70 H	AHs	Q62702-C1481				
BCX 70 J	AJs	Q62702-C1552				
BCX 70 K	AKs	Q62702-C1571				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCW 60	BCW60 FF	BCX 70	Unit
Collector-emitter voltage	V_{CE0}	32	32	45	V
Collector-base voltage	V_{CB0}	32	32	45	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Total power dissipation, T_S = 71 °C	P_{tot}	330			mW
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient [1]	$R_{th\,JA}$	≤ 310	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 240	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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 BCW 60, BCW 60 FF		32	–	–	
BCX 70		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 10 µA BCW 60, BCW 60 FF		32	–	–	
BCX 70		45	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 32 V BCW 60, BCW 60 FF		–	–	20	nA
V_{CB} = 45 V BCX 70		–	–	20	nA
V_{CB} = 32 V, T_A = 150 °C BCW 60, BCW 60 FF		–	–	20	µA
V_{CB} = 45 V, T_A = 150 °C BCX 70		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain [1]	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BCW 60 A, BCX 70 G		20	140	–	
BCW 60 B, BCX 70 H		20	200	–	
BCW 60 FF, BCW 60 C, BCX 70 J		40	300	–	
BCW 60 FN, BCW 60 D, BCX 70 K		100	460	–	
I_C = 2 mA, V_{CE} = 5 V					
BCW 60 A, BCX 70 G		120	170	220	
BCW 60 B, BCX 70 H		180	250	310	
BCW 60 FF, BCW 60 C, BCX 70 J		250	350	460	
BCW 60 FN, BCW 60 D, BCX 70 K		380	500	630	
I_C = 50 mA, V_{CE} = 1 V					
BCW 60 A, BCX 70 G		50	–	–	
BCW 60 B, BCX 70 H		70	–	–	
BCW 60 FF, BCW 60 C, BCX 70 J		90	–	–	
BCW 60 FN, BCW 60 D, BCX 70 K		100	–	–	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

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

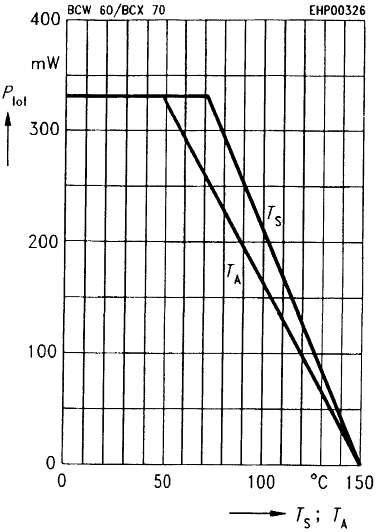
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 10 mA, I_B = 0.25 mA		–	0.12	0.25	
I_C = 50 mA, I_B = 1.25 mA		–	0.20	0.55	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA, I_B = 0.25 mA		–	0.70	0.85	
I_C = 50 mA, I_B = 1.25 mA		–	0.83	1.05	
Base-emitter voltage	$V_{BE\,(on)}$				
I_C = 10 µA, V_{CE} = 5 V		–	0.52	–	
I_C = 2 mA, V_{CE} = 5 V		0.55	0.65	0.75	
I_C = 50 mA, V_{CE} = 1 V [1]		–	0.78	–	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BCW 60 A, BCX 70 G		–	2.7	–	
BCW 60 B, BCX 70 H		–	3.6	–	
BCW 60 FF, BCW 60 C, BCX 70 J		–	4.5	–	
BCW 60 FN, BCW 60 D, BCX 70 K		–	7.5	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BCW 60 A, BCX 70 G		–	1.5	–	
BCW 60 B, BCX 70 H		–	2.0	–	
BCW 60 FF, BCW 60 C, BCX 70 J		–	2.0	–	
BCW 60 FN, BCW 60 D, BCX 70 K			3.0		

1) Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

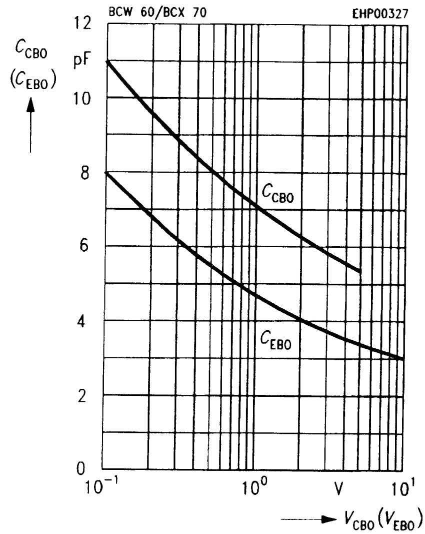
Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BCW 60 A, BCX 70 G		–	200	–	
BCW 60 B, BCX 70 H		–	260	–	
BCW 60 FF, BCW 60 C, BCX 70 J		–	330	–	
BCW 60 FN, BCW 60 D, BCX 70 K		–	520	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BCW 60 A, BCX 70 G		–	18	–	
BCW 60 B, BCX 70 H		–	24	–	
BCW 60 FF, BCW 60 C, BCX 70 J		–	30	–	
BCW 60 FN, BCW 60 D, BCX 70 K		–	50	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F				dB
BCW 60 A to BCX 70 K		–	2	–	
BCW 60 FF, BCW 60 FN		–	1	2	
Equivalent noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz BCW 60 FF, BCW 60 FN	V_n	–	–	0.135	µV

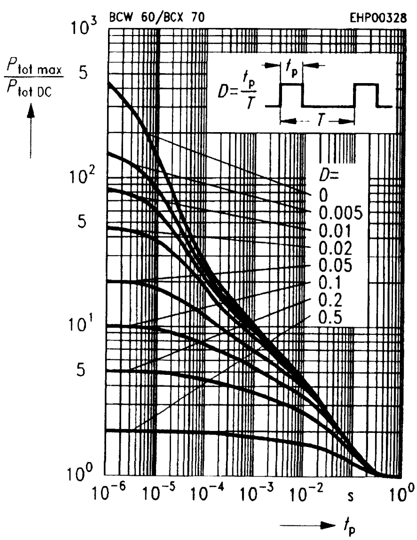
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



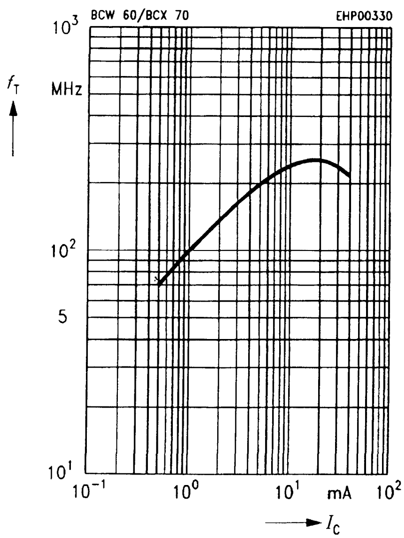
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



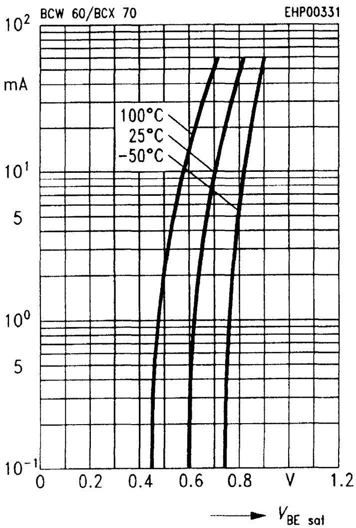
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



Base-emitter saturation voltage

$I_C = f\,(V_{BEsat})$

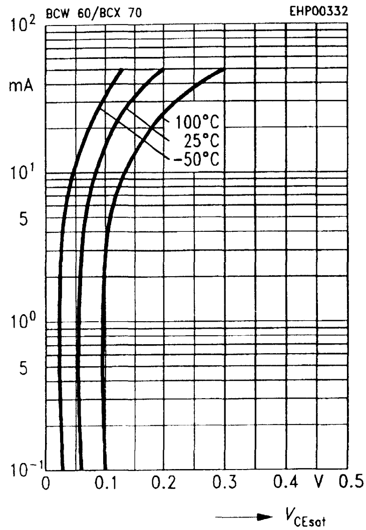
$h_{FE} = 40$



Collector-emitter saturation voltage

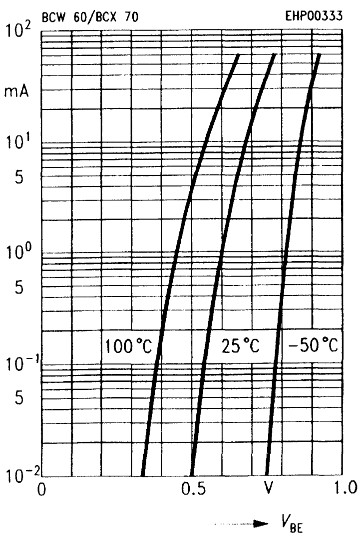
$I_C = f\,(V_{CEsat})$

$h_{FE} = 40$



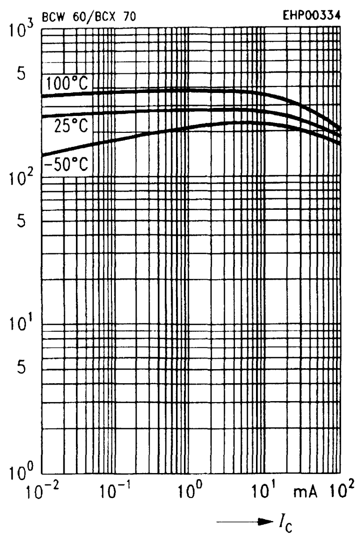
Collector current $I_C = f\,(V_{BE})$

$V_{CE} = 5$ V

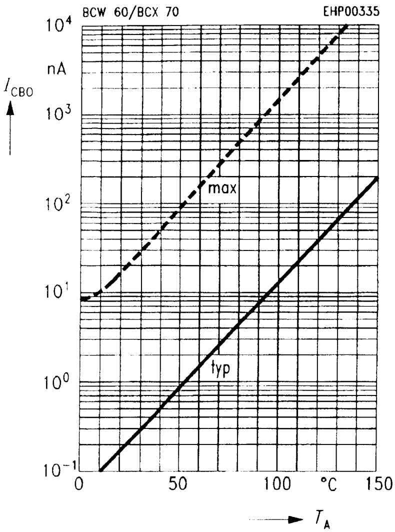


DC current gain $h_{FE} = f\,(I_C)$

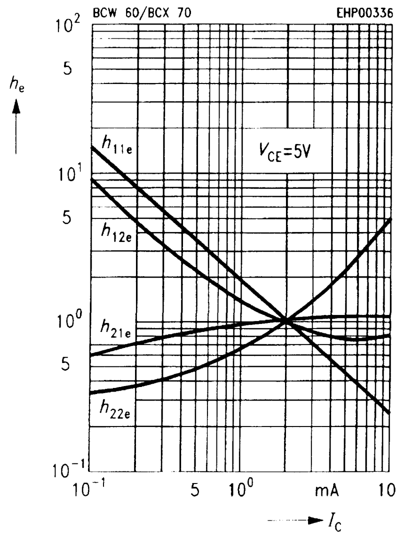
$V_{CE} = 5$ V



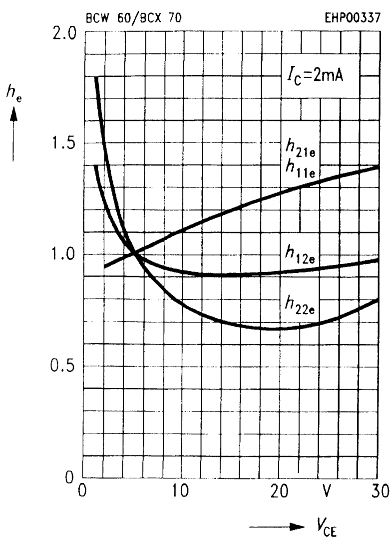
Collector cutoff current $I_{CBO} = f(T_A)$



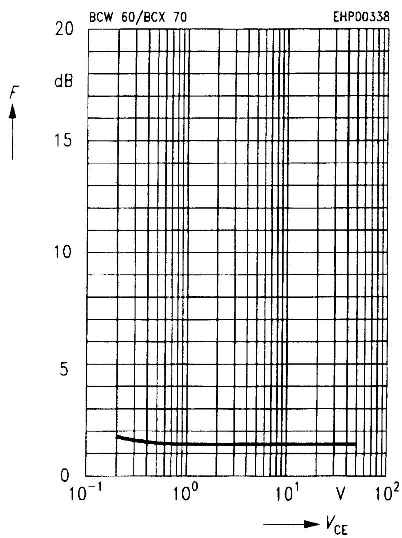
h parameter $h_e = f(I_C)$
V_{CE} = 5 V



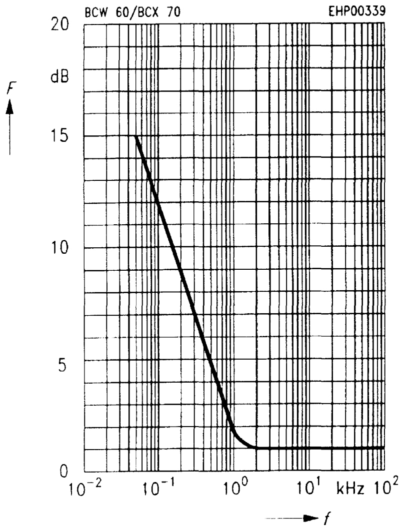
h parameter $h_e = f(V_{CE})$
I_C = 2 mA



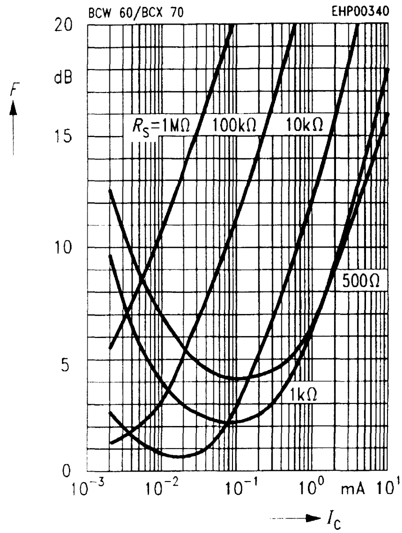
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



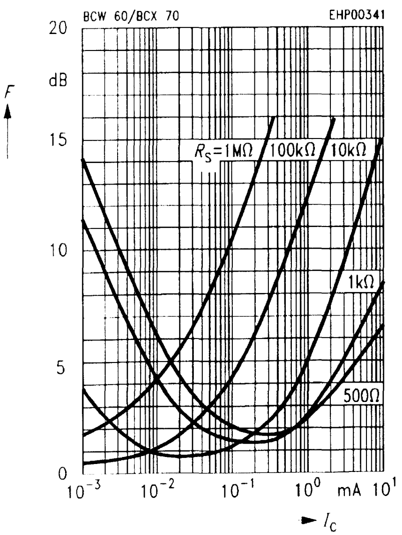
Noise figure $F = f(f)$
$I_C = 0.2$ mA, $R_S = 2$ kΩ, $V_{CE} = 5$ V



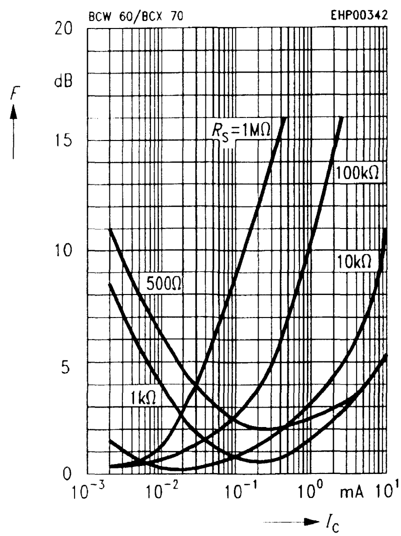
Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 120$ Hz



Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 1$ kHz



Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 10$ Hz

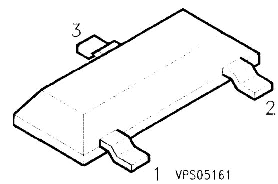


SIEMENS

PNP Silicon AF Transistors

BCW 61
BCX 71

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BCW 60, BCX 70 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCW 61 A	BAs	Q62702-C452	B	E	C	SOT-23
BCW 61 B	BBs	Q62702-C1585				
BCW 61 C	BCs	Q62702-C1478				
BCW 61 D	BDs	Q62702-C1556				
BCW 61 FF	BFs	Q62702-C1890				
BCW 61 FN	BNs	Q62702-C1891				
BCX 71G	BGs	Q62702-C1482				
BCX 71H	BHs	Q62702-C1586				
BCX 71J	BJs	Q62702-C1554				
BCX 71 K	BKs	Q62702-C1654				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCW 61	BCW61 FF	BCX 71	Unit
Collector-emitter voltage	V_{CEO}	32	32	45	V
Collector-base voltage	V_{CBO}	32	32	45	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Total power dissipation, T_S = 71 ˚C	P_{tot}	330			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient [1]	$R_{th\,JA}$	≤ 310	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 240	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 10 mA — BCW 61, BCW 61 FF		32	–	–	
BCX 71		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 µA — BCW 61, BCW 61 FF		32	–	–	
BCX 71		45	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 32 V — BCW 61, BCW 61 FF		–	–	20	nA
V_{CB} = 45 V — BCX 71		–	–	20	nA
V_{CB} = 32 V, T_A = 150 °C — BCW 61, BCW 61 FF		–	–	20	µA
V_{CB} = 45 V, T_A = 150 °C — BCX 71		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EB0}	–	–	20	nA
DC current gain [1]	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BCW 61 A, BCX 71 G		20	140	–	
BCW 61 B, BCX 71 H		30	200	–	
BCW 61 FF, BCW 61 C, BCX 71 J		40	300	–	
BCW 61 FN, BCW 61 D, BCX 71 K		100	460	–	
I_C = 2 mA, V_{CE} = 5 V					
BCW 61 A, BCX 71 G		120	170	220	
BCW 61 B, BCX 71 H		180	250	310	
BCW 61 FF, BCW 61 C, BCX 71 J		250	350	460	
BCW 61 FN, BCW 61 D, BCX 71 K		380	500	630	
I_C = 50 mA, V_{CE} = 1 V					
BCW 61 A, BCX 71 G		60	–	–	
BCW 61 B, BCX 71 H		80	–	–	
BCW 61 FF, BCW 61 C, BCX 71 J		100	–	–	
BCW 61 FN, BCW 61 D, BCX 71 K		110	–	–	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

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

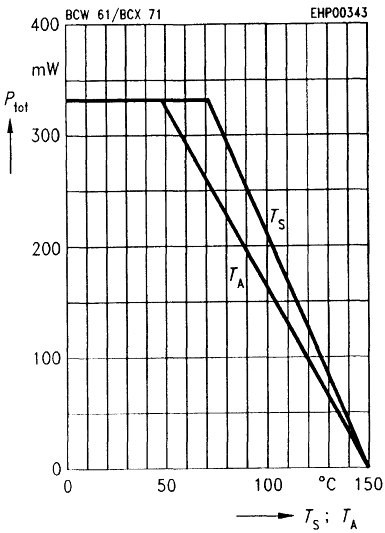
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 10 mA, I_B = 0.25 mA		–	0.12	0.25	
I_C = 50 mA, I_B = 1.25 mA		–	0.20	0.55	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 10 mA, I_B = 0.25 mA		–	0.70	0.85	
I_C = 50 mA, I_B = 1.25 mA		–	0.83	1.05	
Base-emitter voltage [1]	$V_{BE(on)}$				
I_C = 10 μA, V_{CE} = 5 V		–	0.52	–	
I_C = 2 mA, V_{CE} = 5 V		0.55	0.65	0.75	
I_C = 50 mA, V_{CE} = 1 V		–	0.78	–	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BCW 61 A, BCX 71 G		–	2.7	–	
BCW 61 B, BCX 71 H		–	3.6	–	
BCW 61 FF, BCW 61 C, BCX 71 J		–	4.5	–	
BCW 61 FN, BCW 61 D, BCX 71 K		–	7.5	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BCW 61 A, BCX 71 G		–	1.5	–	
BCW 61 B, BCX 71 H		–	2.0	–	
BCW 61 FF, BCW 61 C, BCX 71 J		–	2.0	–	
BCW 61 FN, BCW 61 D, BCX 71 K			3.0		

[1] Pulse test: $t \leq 300$ μs, $D \leq 2$ %.

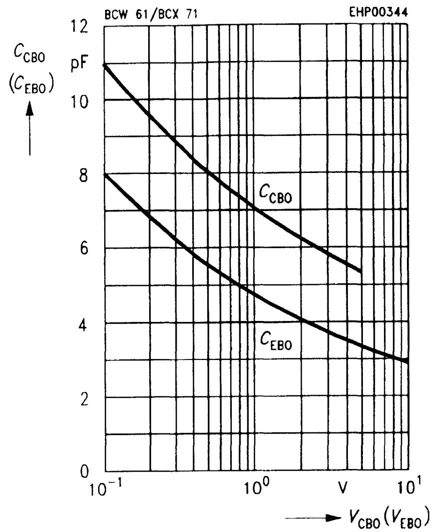
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BCW 61 A, BCX 71 G		–	200	–	
BCW 61 B, BCX 71 H		–	260	–	
BCW 61 FF, BCW 61 C, BCX 71 J		–	330	–	
BCW 61 FN, BCW 61 D, BCX 71 K		–	520	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BCW 61 A, BCX 71 G		–	18	–	
BCW 61 B, BCX 71 H		–	24	–	
BCW 61 FF, BCW 61 C, BCX 71 J		–	30	–	
BCW 61 FN, BCW 61 D, BCX 71 K		–	50	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F				dB
BCW 61 A to BCX 71 K		–	2	–	
BCW 61 FF, BCW 61 FN		–	1	2	
Equivalent noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz ... 50 Hz BCW 61 FF, BCW 61 FN	V_n	–	–	0.11	µV

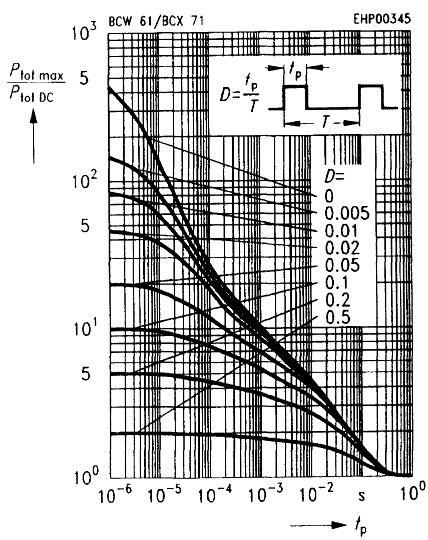
Total power dissipation $P_{tot} = f(T_A{}^*; T_S)$
* Package mounted on epoxy



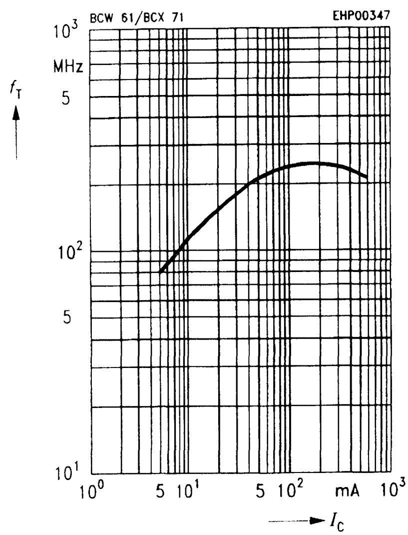
Collector-base capacitance $C_{CBO} = f(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f(V_{EBO})$



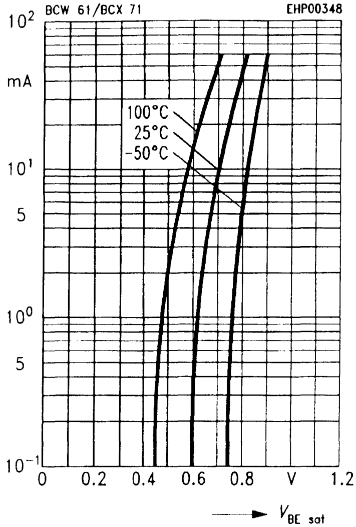
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



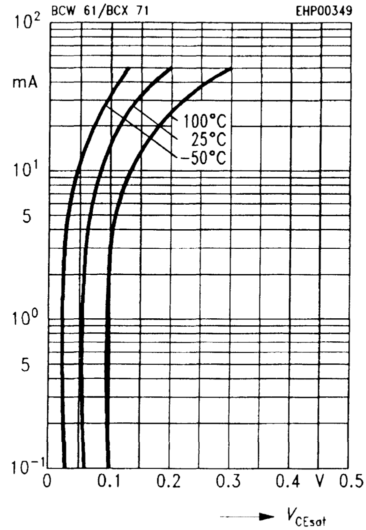
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



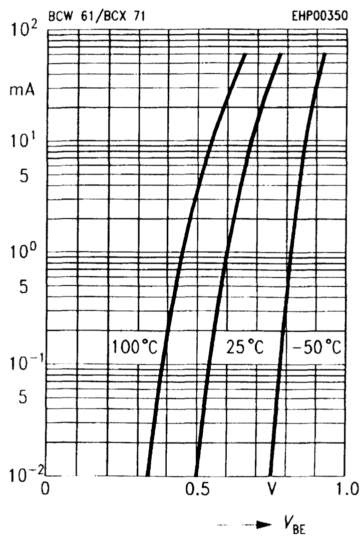
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 40$



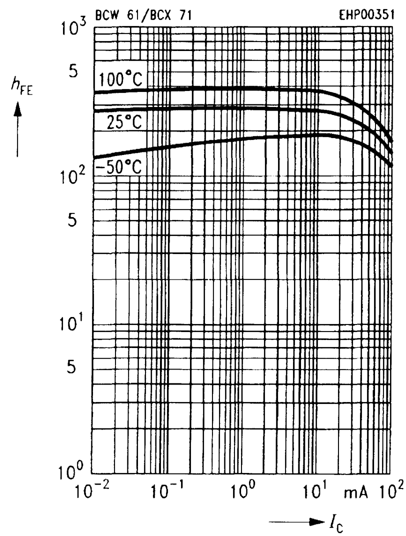
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 40$



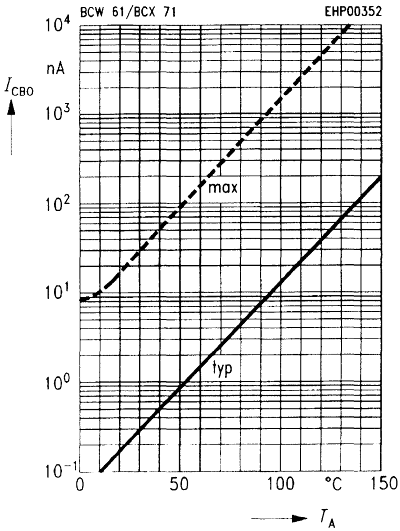
Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V



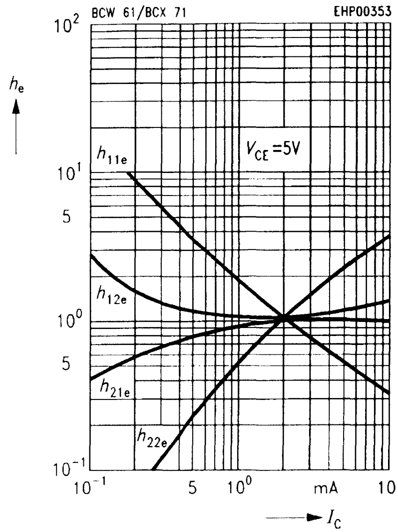
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 5$ V



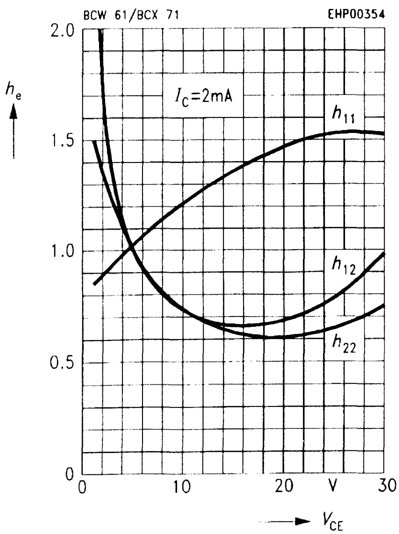
Collector cutoff current $I_{CBO} = f(T_A)$



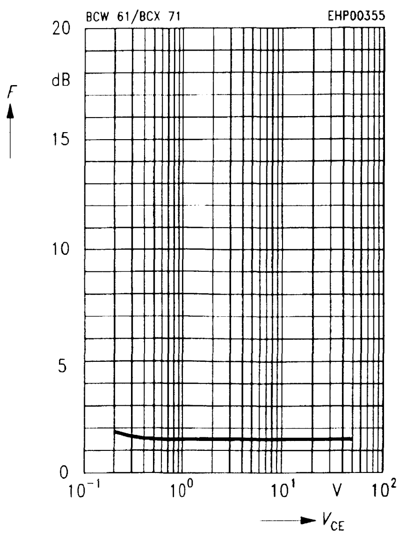
h parameter $h_e = f(I_C)$
V_{CE} = 5 V



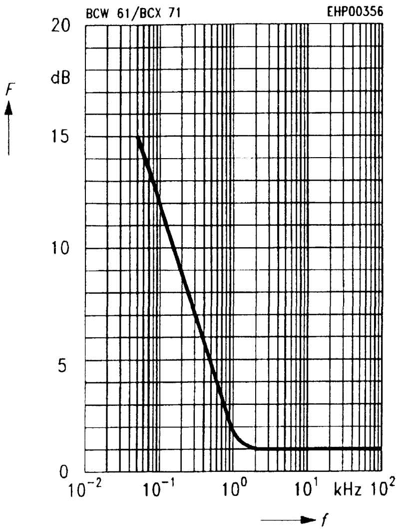
h parameter $h_e = f(V_{CE})$
I_C = 2 mA



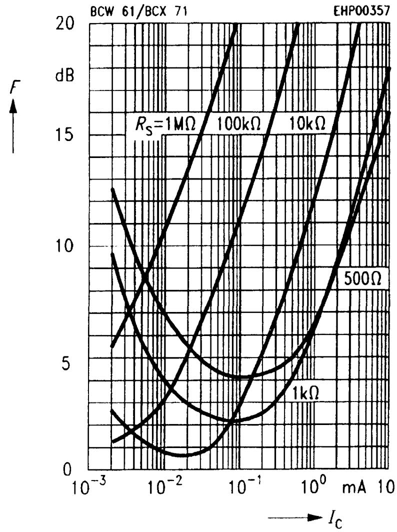
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



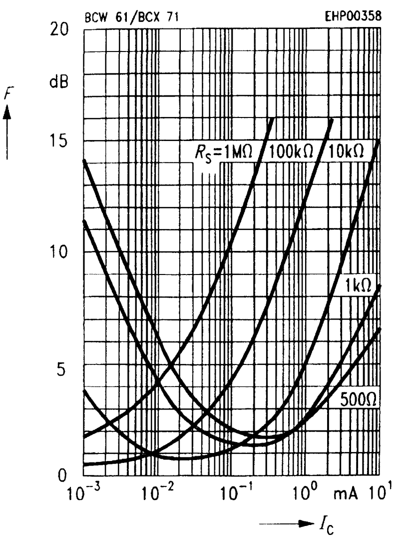
Noise figure $F = f(f)$
I_C = 0.2 mA, R_S = 2 kΩ, V_{CE} = 5 V



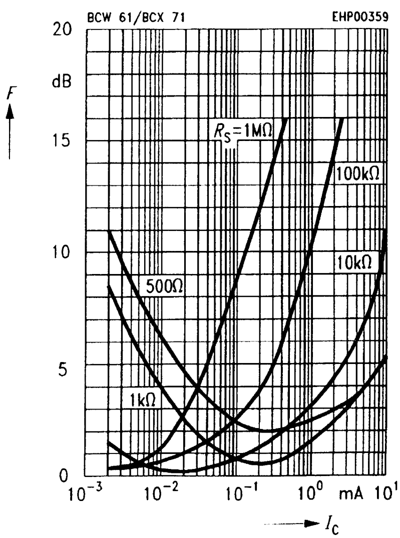
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 Hz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 1 kHz



Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 10 Hz

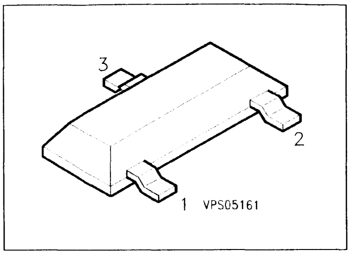


SIEMENS

NPN Silicon AF Transistors

BCW 65
BCW 66

- For general AF applications
- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BCW 67, BCW 68 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCW 65 A	EAs	Q62702-C1516	B	E	C	SOT-23
BCW 65 B	EBs	Q62702-C1612				
BCW 65 C	ECs	Q62702-C1479				
BCW 66 F	EFs	Q62702-C1892				
BCW 66 G	EGs	Q62702-C1526				
BCW 66 H	EHs	Q62702-C1632				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCW 65	BCW 66	Unit
Collector-emitter voltage	V_{CEO}	32	45	V
Collector-base voltage	V_{CBO}	60	75	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 79 ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient [1)]	$R_{th\,JA}$	≤ 285	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 215	

1) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BCW 65		32	–	–	
BCW 66		45	–	–	
Collector-base breakdown voltage I_C = 10 μA	$V_{(BR)CBO}$				
BCW 65		60	–	–	
BCW 66		75	–	–	
Emitter-base breakdown voltage, I_E = 10 μA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 32 V BCW 65		–	–	20	nA
V_{CB} = 45 V BCW 66		–	–	20	nA
V_{CB} = 32 V, T_A = 150 °C BCW 65		–	–	20	μA
V_{CB} = 45 V, T_A = 150 °C BCW 66		–	–	20	μA
Emitter-base cutoff current, V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain [1]	h_{FE}				–
I_C = 100 μA, V_{CE} = 10 V					
BCW 65 A, BCW 66 F		35	–	–	
BCW 65 B, BCW 66 G		50	–	–	
BCW 65 C, BCW 66 H		80	–	–	
I_C = 10 mA, V_{CE} = 1 V					
BCW 65 A, BCW 66 F		75	–	–	
BCW 65 B, BCW 66 G		110	–	–	
BCW 65 C, BCW 66 H		180	–	–	
I_C = 100 mA, V_{CE} = 1 V					
BCW 65 A, BCW 66 F		100	160	250	
BCW 65 B, BCW 66 G		160	250	400	
BCW 65 C, BCW 66 H		250	350	630	
I_C = 500 mA, V_{CE} = 2 V					
BCW 65 A, BCW 66 F		35	–	–	
BCW 65 B, BCW 66 G		60	–	–	
BCW 65 C, BCW 66 H		100	–	–	

[1] Pulse test: $t \leq 300$ μs, D = 2 %.

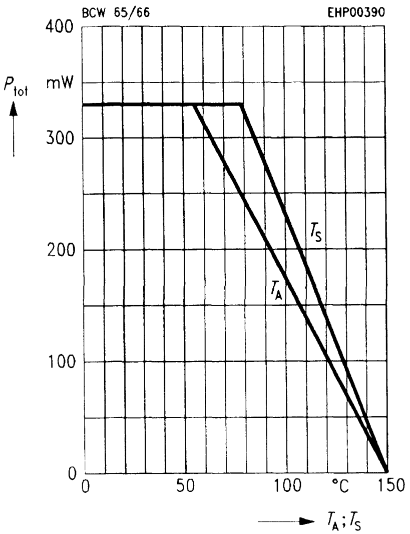
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

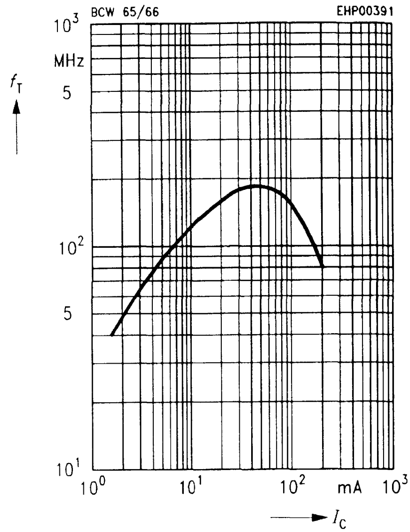
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 100 mA, I_B = 10 mA		–	–	0.3	
I_C = 500 mA, I_B = 50 mA		–	–	0.7	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 100 mA, I_B = 10 mA		–	–	1.25	
I_C = 500 mA, I_B = 50 mA		–	–	2	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	170	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	6	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

[1] Pulse test: $t \leq 300\ \mu s$, D = 2 %.

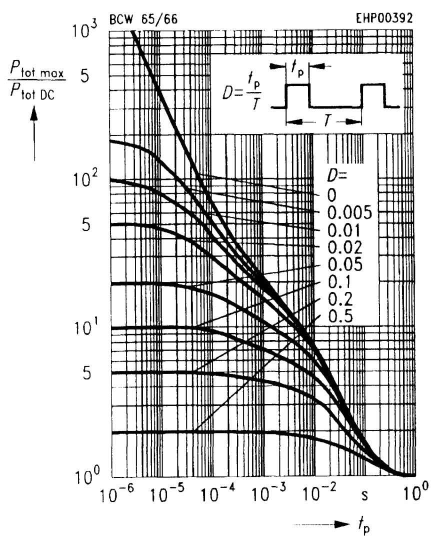
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



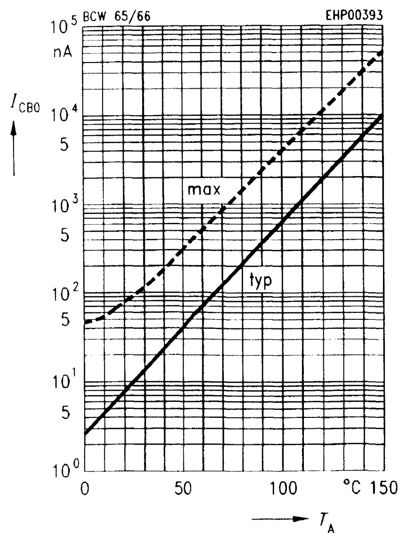
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



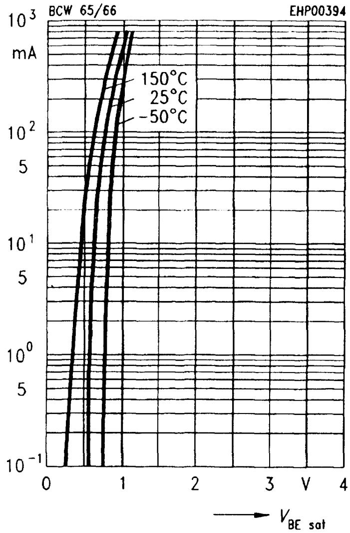
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



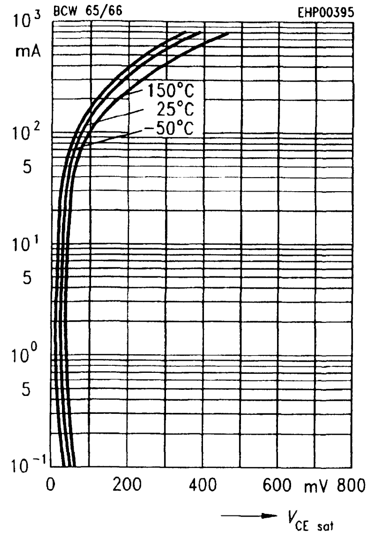
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = V_{CEmax}$



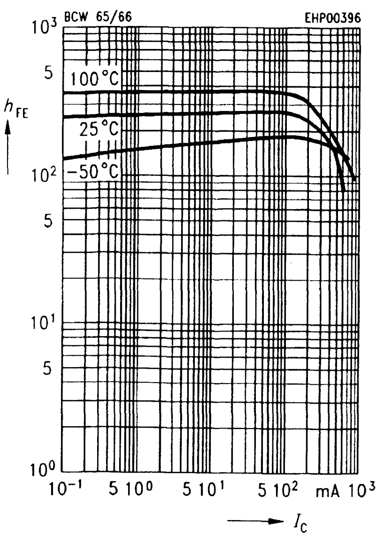
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 10$



Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 10$



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

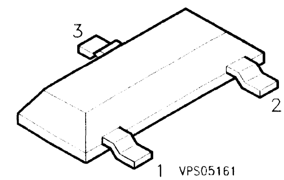


SIEMENS

PNP Silicon AF Transistors

BCW 67
BCW 68

- For general AF applications
- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BCW 65, BCW 66 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCW 67 A	DAs	Q62702-C1560	B	E	C	SOT-23
BCW 67 B	DBs	Q62702-C1480				
BCW 67 C	DCs	Q62702-C1681				
BCW 68 F	DFs	Q62702-C1893				
BCW 68 G	DGs	Q62702-C1322				
BCW 68 H	DHs	Q62702-C1555				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCW 67	BCW 68	Unit
Collector-emitter voltage	V_{CEO}	32	45	V
Collector-base voltage	V_{CBO}	45	60	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 79 °C	P_{tot}	330		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient [1]	$R_{th\,JA}$	≤ 285	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 215	

[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BCW 67		32	–	–	
BCW 68		45	–	–	
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$				
BCW 67		45	–	–	
BCW 68		60	–	–	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 32 V BCW 67		–	–	20	nA
V_{CB} = 45 V BCW 68		–	–	20	nA
V_{CB} = 32 V, T_A = 150 °C BCW 67		–	–	20	µA
V_{CB} = 45 V, T_A = 150 °C BCW 68		–	–	20	µA
Emitter-base cutoff current, V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain [1]	h_{FE}				–
I_C = 100 µA, V_{CE} = 10 V					
BCW 67 A, BCW 68 F		35	–	–	
BCW 67 B, BCW 68 G		50	–	–	
BCW 67 C, BCW 68 H		80	–	–	
I_C = 10 mA, V_{CE} = 1 V					
BCW 67 A, BCW 68 F		75	–	–	
BCW 67 B, BCW 68 G		120	–	–	
BCW 67 C, BCW 68 H		180	–	–	
I_C = 100 mA, V_{CE} = 1 V					
BCW 67 A, BCW 68 F		100	160	250	
BCW 67 B, BCW 68 G		160	250	400	
BCW 67 C, BCW 68 H		250	350	630	
I_C = 500 mA, V_{CE} = 2 V					
BCW 67 A, BCW 68 F		35	–	–	
BCW 67 B, BCW 68 G		60	–	–	
BCW 67 C, BCW 68 H		100	–	–	

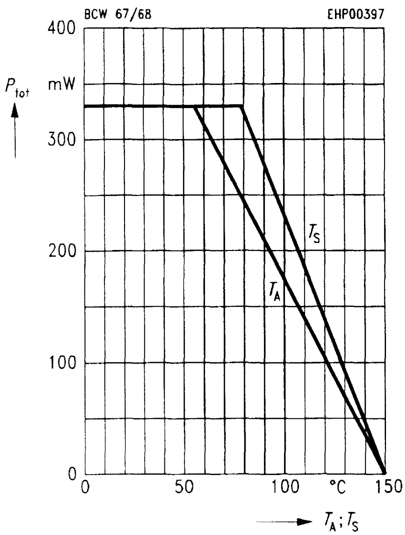
[1] Pulse test: t ≤ 300 µs, D = 2 %.

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

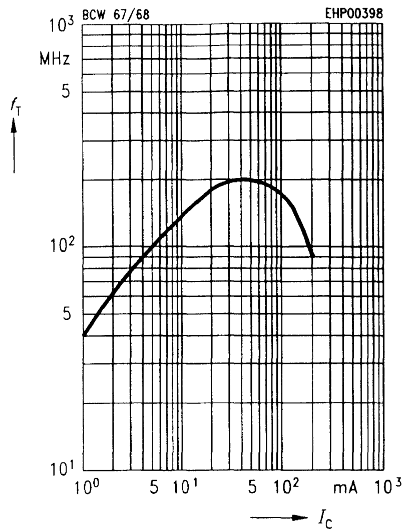
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 100 mA, I_B = 10 mA		–	–	0.3	
I_C = 500 mA, I_B = 50 mA		–	–	0.7	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 100 mA, I_B = 10 mA		–	–	1.25	
I_C = 500 mA, I_B = 50 mA		–	–	2	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	6	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

[1] Pulse test: $t \leq 300\ \mu s$, D = 2 %.

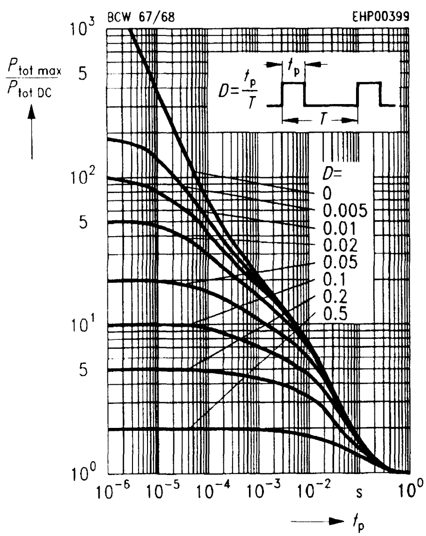
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



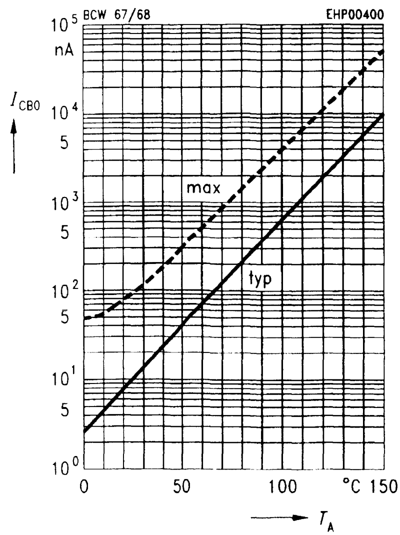
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

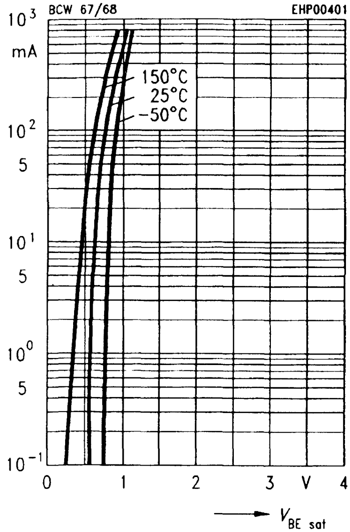


Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = V_{CEmax}$



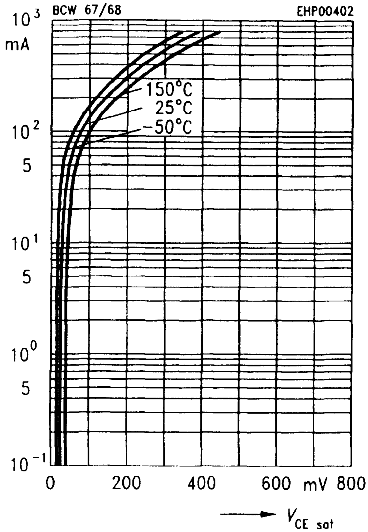
Base-emitter saturation voltage

$V_{BEsat} = f(I_C)$
$h_{FE} = 10$



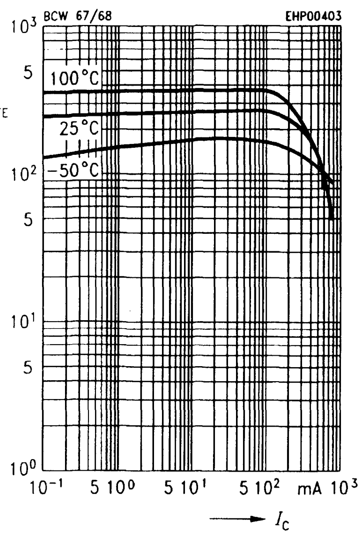
Collector-emitter saturation voltage

$V_{CEsat} = f(I_C)$
$h_{FE} = 10$



DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 1$ V

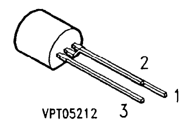


SIEMENS

NPN Silicon AF Switching Transistor

BCX 12

- For general AF applications
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary type: BCX 13 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BCX 12	BCX 12	Q62702-C25	C	B	E	TO-92

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	125	V
Collector-base voltage	V_{CBO}	125	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	800	mA
Peak collector current	I_{CM}	1	A
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 66 °C	P_{tot}	625	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case[2]	$R_{th\,JC}$	≤ 135	

[1] For detailed information see chapter Package Outlines.
[2] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

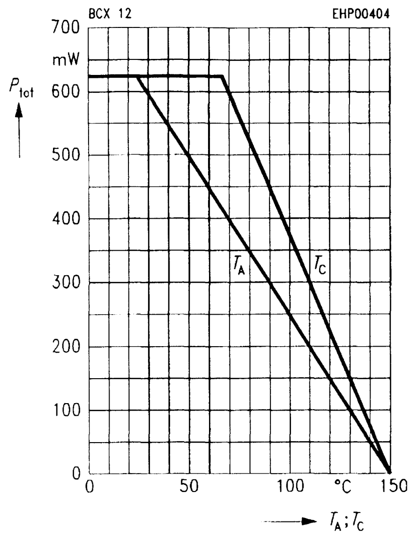
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

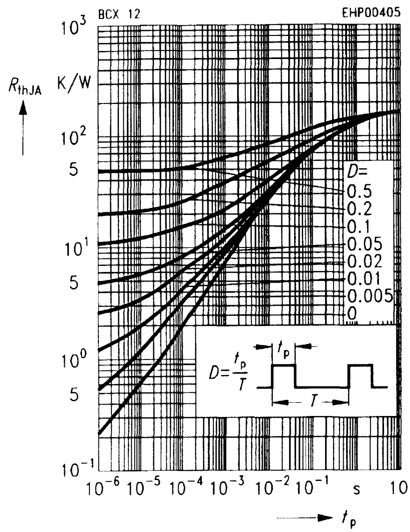
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA, I_B = 0	$V_{(BR)CEO}$	125	–	–	V
Collector-base breakdown voltage I_C = 100 µA, I_B = 0	$V_{(BR)CBO}$	125	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBS}$	5	–	–	
Collector-base cutoff current V_{CB} = 100 V, I_E = 0 V_{CB} = 100 V, I_E = 0, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain[1)] I_C = 1 mA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 1 V I_C = 100 mA, V_{CE} = 1 V I_C = 200 mA, V_{CE} = 1 V	h_{FE}	 25 50 63 40	 – – – –	 – – – –	–
Collector-emitter saturation voltage[1)] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	1.0	V
Base-emitter saturation voltage[1)] I_C = 500 mA, I_B = 50 mA	V_{BEsat}	–	–	1.6	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	10	–	pF

1) Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

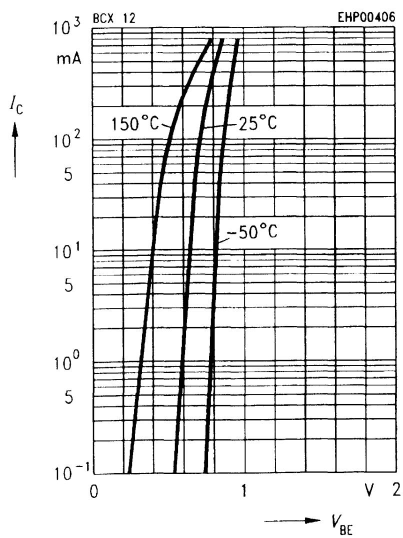
Total power dissipation $P_{tot} = f(T_A; T_C)$



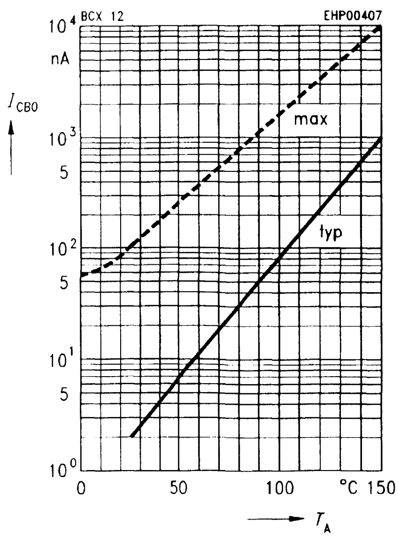
Permissible pulse load $R_{thJA} = f(t_p)$



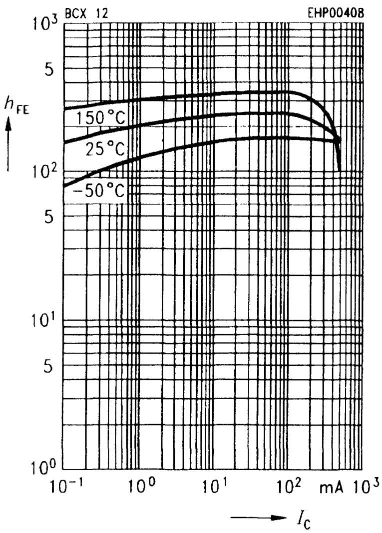
Collector current $I_C = f(V_{BE})$
V_C = 1 V



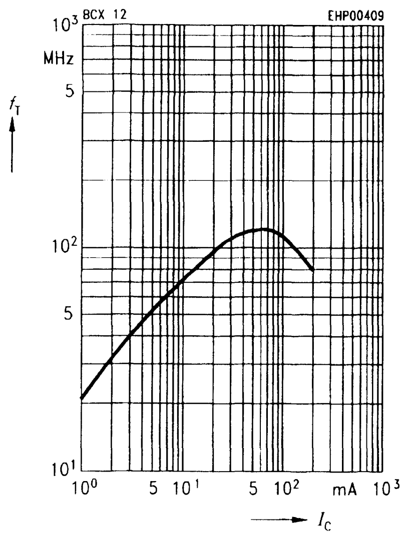
Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = V_{CBmax}$



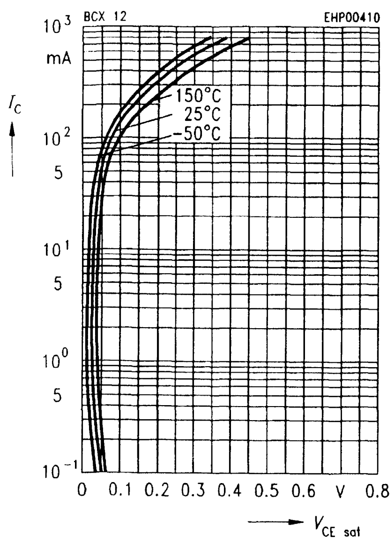
DC current gain $h_{FE} = f\,(I_C)$
$V_{CE} = 1$ V



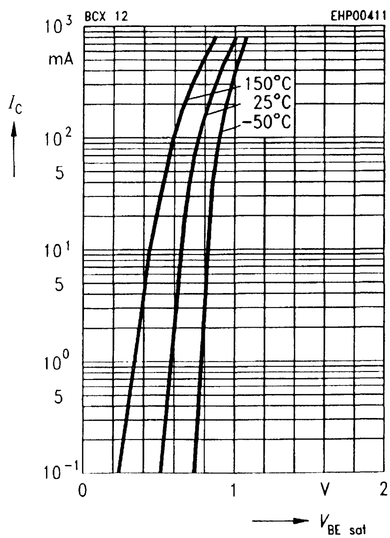
Transition frequency $f_T = f\,(I_C)$
$f = 20$ MHz, $V_{CE} = 5$ V, $T_A = 25$ °C



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



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

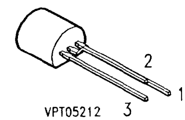


SIEMENS

PNP Silicon AF Switching Transistor

BCX 13

- For general AF applications
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary type: BCX 12 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BCX 13	BCX 13	Q62702-C26	C	B	E	TO-92

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	125	V
Collector-base voltage	V_{CBO}	125	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	800	mA
Peak collector current	I_{CM}	1	A
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_C = 66 °C	P_{tot}	625	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case[2]	$R_{th\,JC}$	≤ 135	

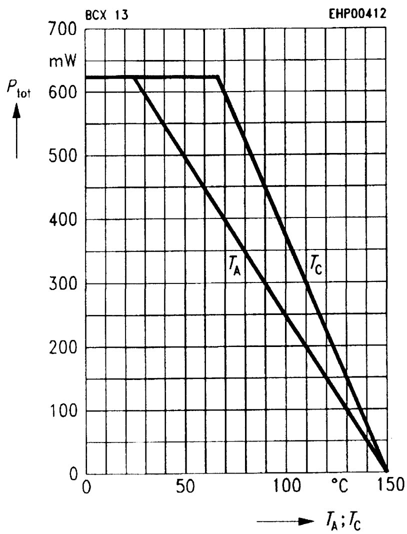
1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

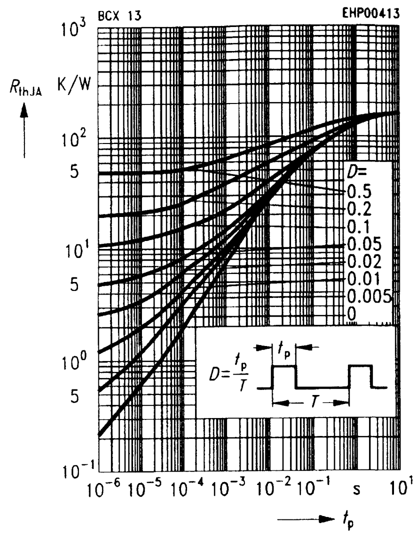
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics for transistor T1					
Collector-emitter breakdown voltage I_C = 10 mA, I_B = 0	$V_{(BR)CEO}$	125	–	–	V
Collector-base breakdown voltage I_C = 100 µA, I_B = 0	$V_{(BR)CBO}$	125	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBS}$	5	–	–	
Collector-base cutoff current V_{CB} = 100 V, I_E = 0 V_{CB} = 100 V, I_E = 0, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain[1)] I_C = 1 mA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 1 V I_C = 100 mA, V_{CE} = 1 V I_C = 200 mA, V_{CE} = 1 V	h_{FE}	 25 50 63 40	 – – – –	 – – – –	–
Collector-emitter saturation voltage[1)] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	1.0	V
Base-emitter saturation voltage[1)] I_C = 500 mA, I_B = 50 mA	V_{BEsat}	–	–	1.6	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	120	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	12	–	pF

1) Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

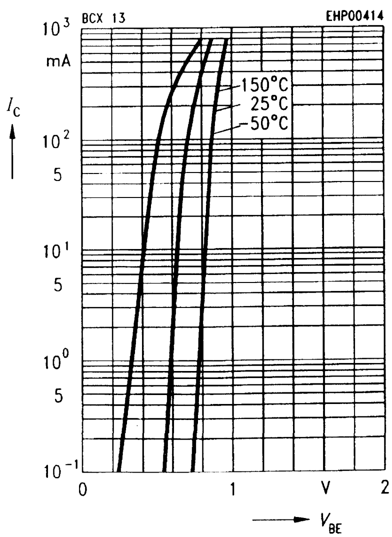
Total power dissipation $P_{tot} = f(T_A; T_C)$



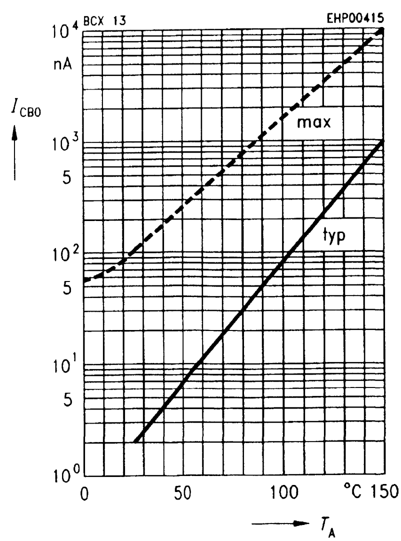
Permissible pulse load $R_{thJA} = f(t_p)$



Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V

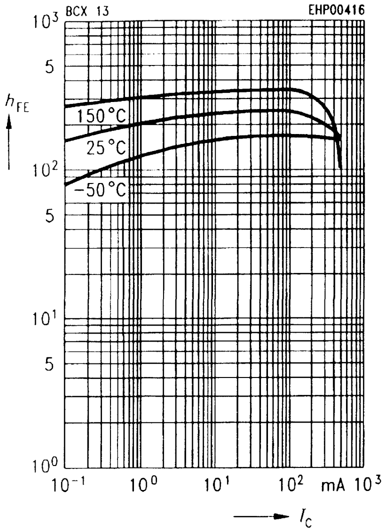


Collector cutoff current $I_{CBO} = f(T_A)$
$V_{CB} = V_{CBmax}$



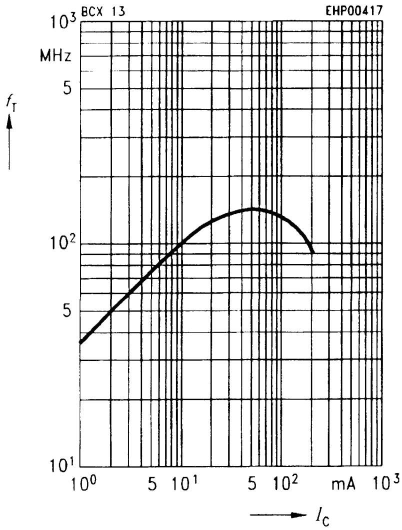
DC current gain $h_{FE} = f(I_C)$

V_{CE} = 1 V



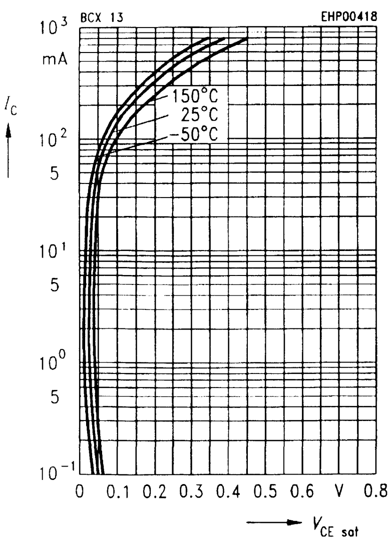
Transition frequency $f_T = f(I_C)$

f = 20 MHz, V_{CE} = 5 V, T_A = 25 °C



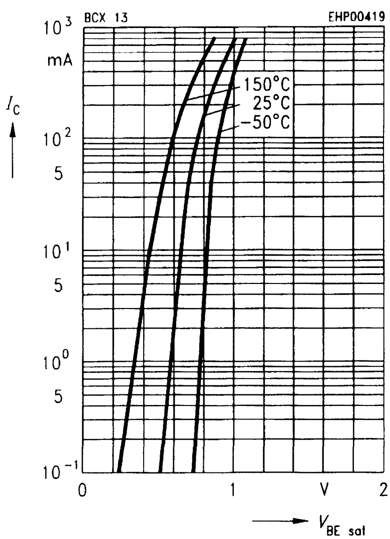
Collector-emitter saturation voltage

$V_{CEsat} = f(I_C)$, h_{FE} = 10



Base-emitter saturation voltage

$V_{BEsat} = f(I_C)$, h_{FE} = 10

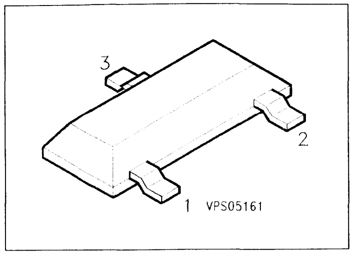


SIEMENS

NPN Silicon AF and Switching Transistor

BCX 41
BSS 64

- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: BCX 42, BSS 63 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCX 41 BSS 64	EKs AMs	Q62702-C1659 Q62702-S535	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values BSS 64	BCX 41	Unit
Collector-emitter voltage	V_{CEO}	80	125	V
Collector-base voltage	V_{CBO}	120	125	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 79 °C	P_{tot}	330		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 285	K/W
Junction - soldering point	$R_{th JS}$	≤ 215	

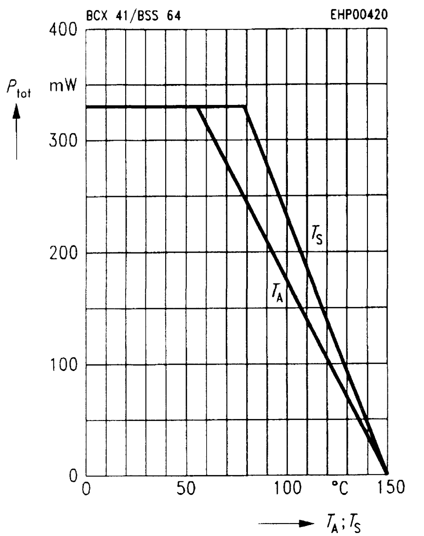
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

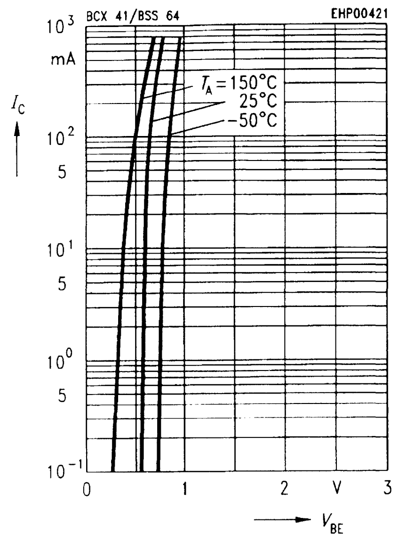
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 10 mA	BSS 64		80	–	–	
	BCX 41		125	–	–	
Collector-base breakdown voltage[1]		$V_{(BR)CB0}$				
I_C = 100 µA	BSS 64		120	–	–	
	BCX 41		125	–	–	
Emitter-base breakdown voltage I_E = 10 µA		$V_{(BR)EB0}$	5	–	–	
Collector cutoff current		I_{CB0}				
V_{CB} = 80 V	BSS 64		–	–	100	nA
V_{CB} = 100 V	BCX 41		–	–	100	nA
V_{CB} = 80 V, T_A = 150 °C	BSS 64		–	–	20	µA
V_{CB} = 100 V, T_A = 150 °C	BCX 41		–	–	20	µA
Collector cutoff current V_{CE} = 100 V		I_{CE0}				µA
T_A = 85 °C	BCX 41		–	–	10	
T_A = 125 °C	BCX 41		–	–	75	
Emitter cutoff current V_{EB} = 4 V		I_{EB0}	–	–	100	nA
DC current gain[1]		h_{FE}				–
I_C = 100 µA, V_{CE} = 1 V	BCX 41		25	–	–	
I_C = 1 mA, V_{CE} = 1 V	BSS 64		–	60	–	
I_C = 4 mA, V_{CE} = 1 V	BSS 64		20	80	–	
I_C = 10 mA, V_{CE} = 1 V	BSS 64		–	80	–	
I_C = 20 mA, V_{CE} = 1 V	BSS 64		–	55	–	
I_C = 100 mA, V_{CE} = 1 V	BCX 41		63	–	–	
I_C = 200 mA, V_{CE} = 1 V	BCX 41		40	–	–	
Collector-emitter saturation voltage[1]		V_{CEsat}				V
I_C = 300 mA, I_B = 30 mA	BCX 41		–	–	0.9	
I_C = 4 mA, I_B = 0.4 mA	BSS 64		–	–	0.7	
I_C = 50 mA, I_B = 15 mA	BSS 64		–	–	3.0	
Base-emitter saturation voltage[1] I_C = 300 mA, I_B = 30 mA	BCX 41	V_{BEsat}	–	–	1.4	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 20 MHz		f_T	–	100	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz		C_{obo}	–	12	–	pF

1) Pulse test: $t \leq 300$ µs, D = 2 %

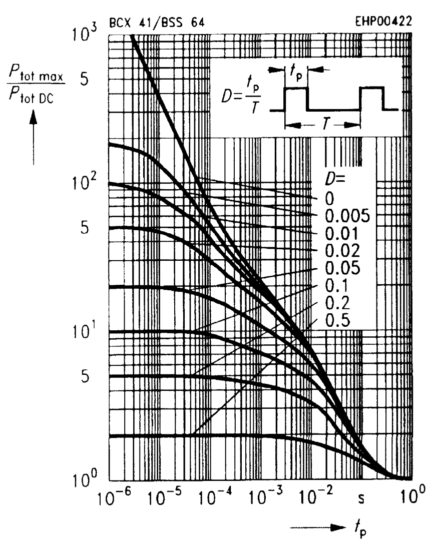
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



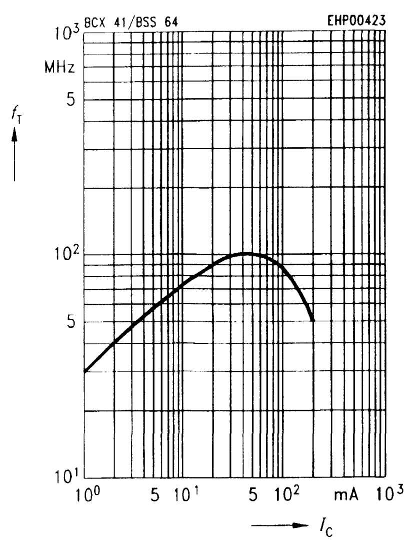
Collector current $I_C = f\,(V_{BE})$
V_{CE} = 1 V



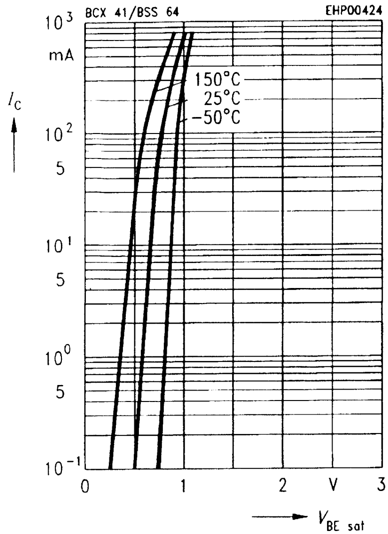
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



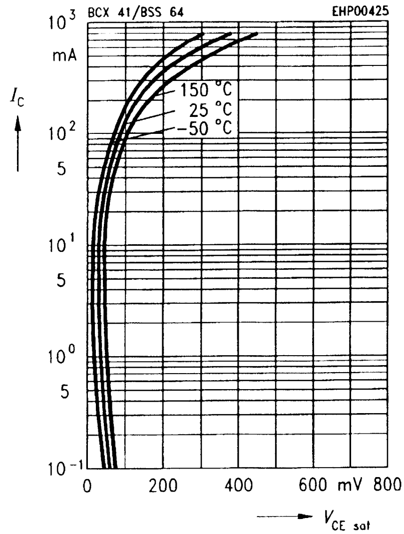
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V



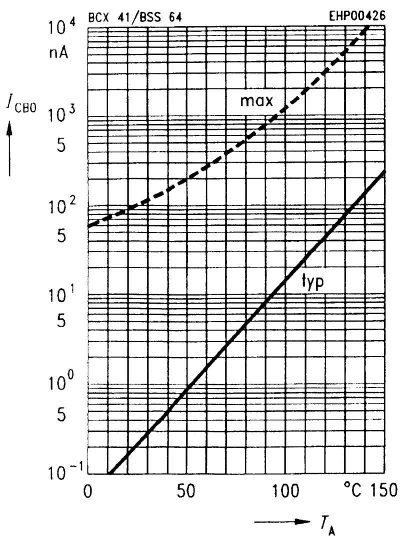
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 10$



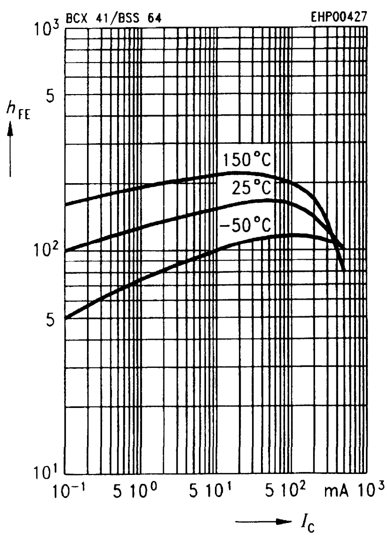
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 10$



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



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

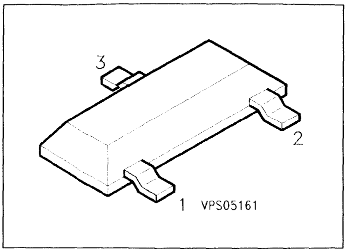


SIEMENS

PNP Silicon AF and Switching Transistors

BCX 42
BSS 63

- For general AF applications
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: BCX 41, BSS 64 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BCX 42 BSS 63	DKs BMs	Q62702-C1485 Q62702-S534	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values BSS 63	Values BCX 42	Unit
Collector-emitter voltage	V_{CEO}	100	125	V
Collector-base voltage	V_{CBO}	110	125	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 79 ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 285	K/W
Junction - soldering point	$R_{th JS}$	≤ 215	

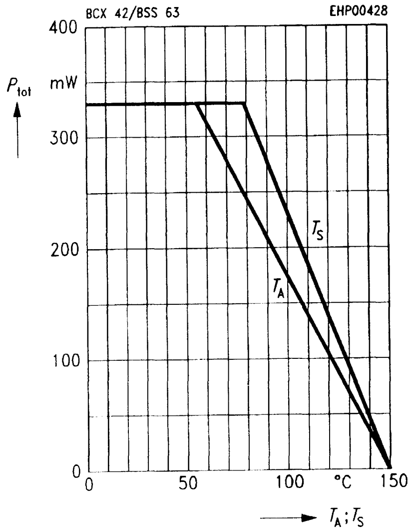
[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

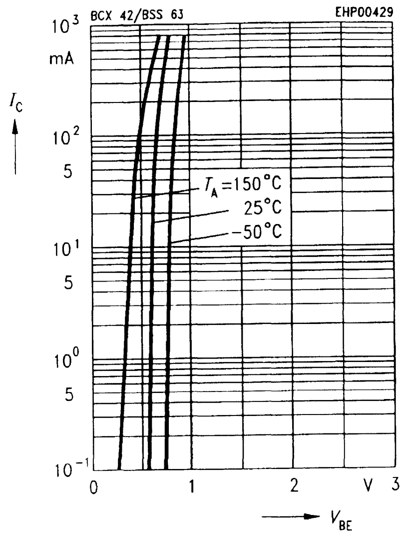
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage I_C = 10 mA	BCX 42 BSS 63	$V_{(BR)CEO}$	125 100	– –	– –	V
Collector-base breakdown voltage[1)] I_C = 100 µA	BCX 42 BSS 63	$V_{(BR)CBO}$	125 110	– –	– –	
Emitter-base breakdown voltage, I_E = 10 µA		$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 80 V V_{CB} = 100 V V_{CB} = 80 V, T_A = 150 °C V_{CB} = 100 V, T_A = 150 °C	 BSS 63 BCX 42 BSS 63 BCX 42	I_{CBO}	 – – – –	 – – – –	 100 100 20 20	 nA nA µA µA
Collector cutoff current V_{CE} = 100 V T_A = 85 °C T_A = 125 °C	 BCX 42 BCX 42	I_{CEO}	 – –	 – –	 10 75	µA
Emitter cutoff current, V_{EB} = 4 V		I_{EBO}	–	–	100	nA
DC current gain[1)] I_C = 100 µA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 5 V I_C = 20 mA, V_{CE} = 5 V I_C = 100 mA, V_{CE} = 1 V I_C = 200 mA, V_{CE} = 1 V	 BCX 42 BSS 63 BSS 63 BCX 42 BCX 42	h_{FE}	 25 30 30 63 40	 – – – – –	 – – – – –	–
Collector-emitter saturation voltage[1)] I_C = 300 mA, I_B = 30 mA I_C = 25 mA, I_B = 2.5 mA I_C = 75 mA, I_B = 7.5 mA	 BCX 42 BSS 63 BSS 63	V_{CEsat}	 – – –	 – – –	 0.9 0.25 0.9	V
Base-emitter saturation voltage[1)] I_C = 300 mA, I_B = 30 mA	 BCX 42	V_{BEsat}	–	–	1.4	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 20 MHz		f_T	–	150	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz		C_{obo}	–	12	–	pF

1) Pulse test: $t \leq 300$ µs, D = 2 %

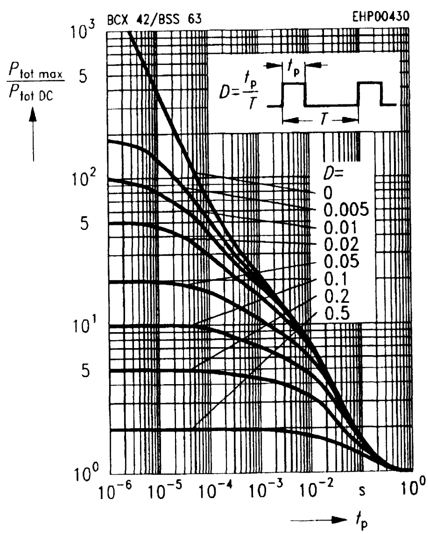
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



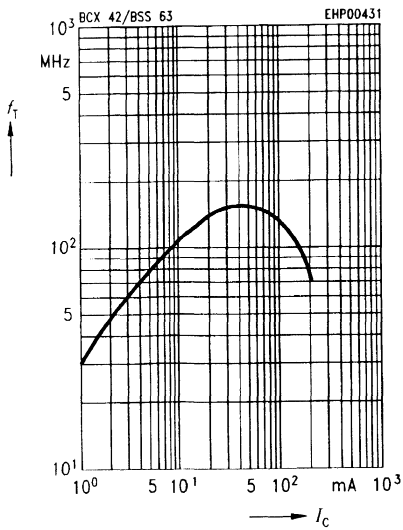
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

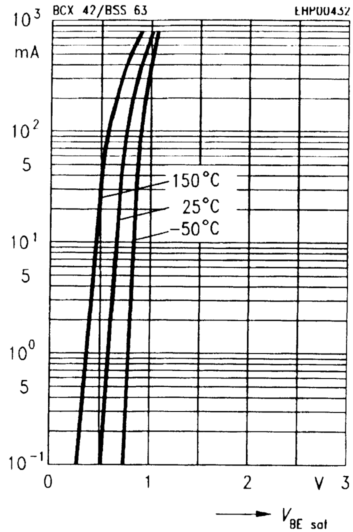


Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



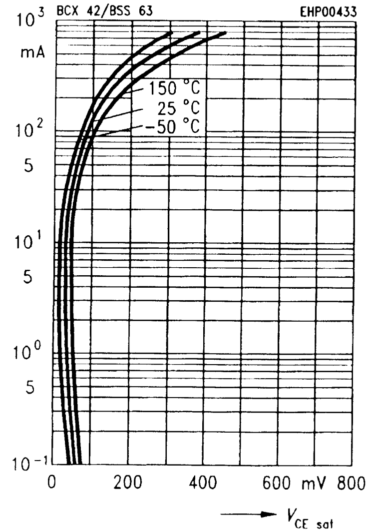
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$
$h_{FE} = 10$



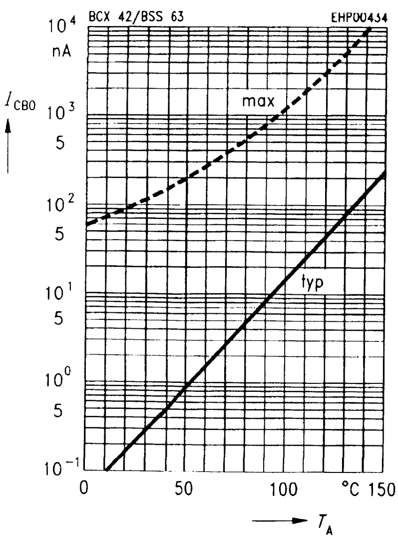
Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$
$h_{FE} = 10$



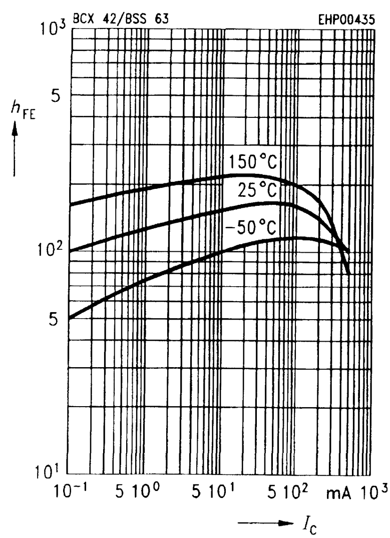
Collector cutoff current $I_{CBO} = f(T_A)$

$V_{CB} = V_{CEmax}$



DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 1$ V

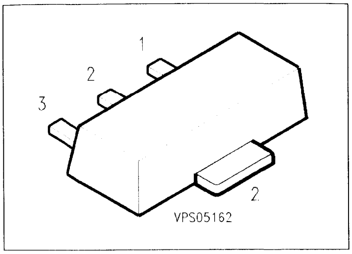


SIEMENS

PNP Silicon AF Transistors

BCX 51
... BCX 53

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCX 51	–	Q62702-C1847	B	C	E	SOT-89
BCX 51-10	AC	Q62702-C1831				
BCX 51-16	AD	Q62702-C1857				
BCX 52	–	Q62702-C1743				
BCX 52-10	AG	Q62702-C1744				
BCX 52-16	AM	Q62702-C1900				
BCX 53	–	Q62702-C905				
BCX 53-10	AK	Q62702-C1753				
BCX 53-16	AL	Q62702-C1502				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCX 51	BCX 52	BCX 53	Unit
Collector-emitter voltage	V_{CE0}	45	60	80	V
Collector-base voltage	V_{CB0}	45	60	100	
Emitter-base voltage	V_{EB0}	5	5	5	
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_S = 130 ˚C	P_{tot}	1			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient [1)]	$R_{th JA}$	≤ 75	K/W
Junction - soldering point	$R_{th JS}$	≤ 20	

1) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

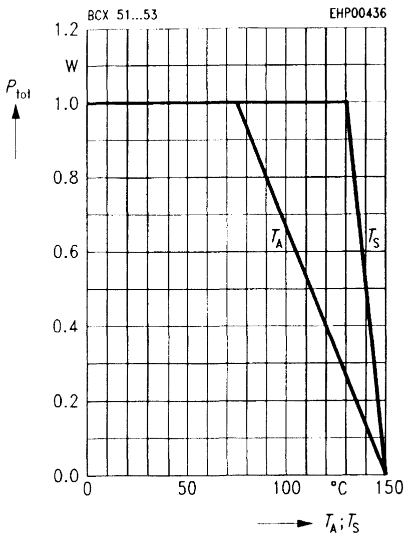
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

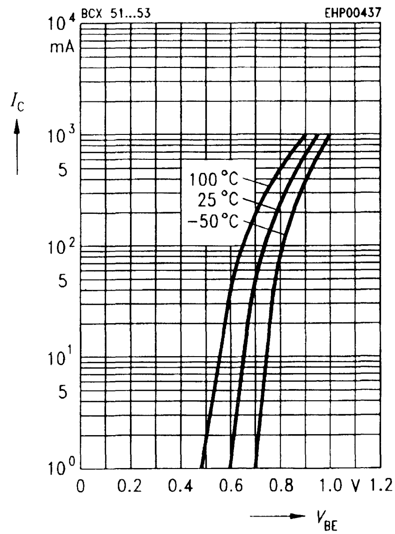
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BCX 51		45	–	–	
BCX 52		60	–	–	
BCX 53		80	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$				
BCX 51		45	–	–	
BCX 52		60	–	–	
BCX 53		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain [1]	h_{FE}				–
I_C = 5 mA, V_{CE} = 2 V		25	–	–	
I_C = 150 mA, V_{CE} = 2 V					
BCX 51, BCX 52, BCX 53		40	–	250	
BCX 51-10, BCX 52-10, BCX 53-10		63	100	160	
BCX 51-16, BCX 52-16, BCX 53-16		100	160	250	
I_C = 500 mA, V_{CE} = 2 V		25	–	–	
Collector-emitter saturation voltage [1] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	0.5	V
Base-emitter voltage [1] I_C = 500 mA, V_{CE} = 2 V	V_{BE}	–	–	1	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	125	–	MHz

[1] Pulse test: $t \leq$ 300 µs, D = 2 %.

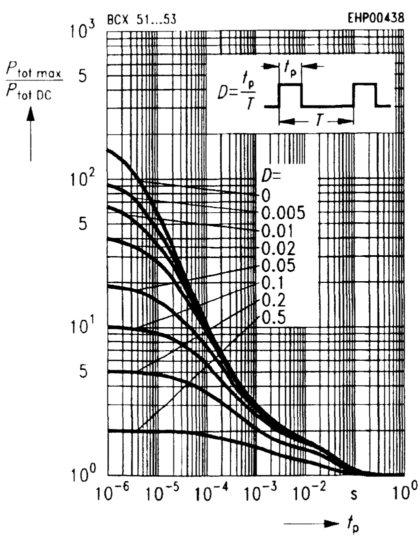
Total power dissipation $P_{tot} = f\,(T_A{}^{*};\ T_S)$
* Package mounted on epoxy



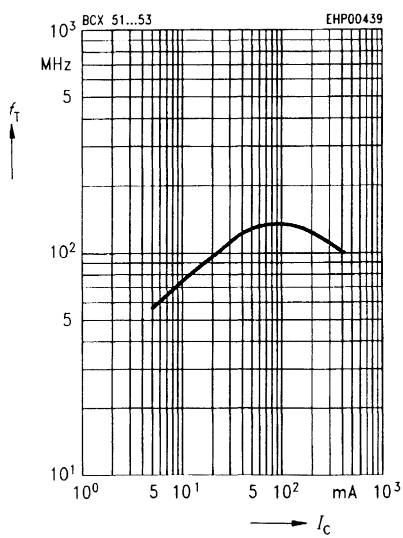
Collector current $I_C = f\,(V_{BE})$
V_{CE} = 2 V



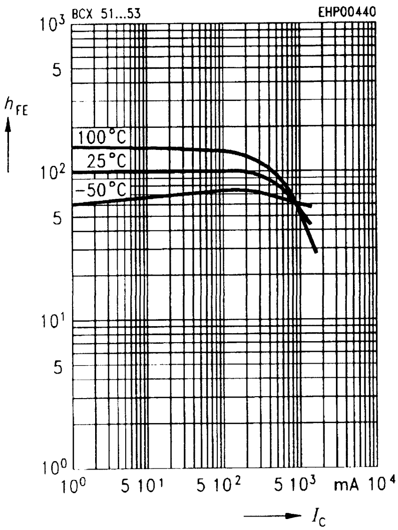
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



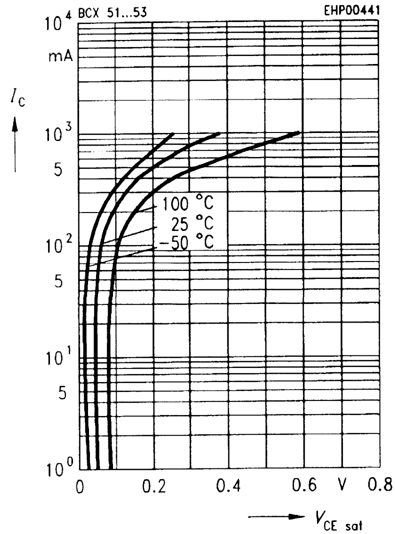
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 10 V



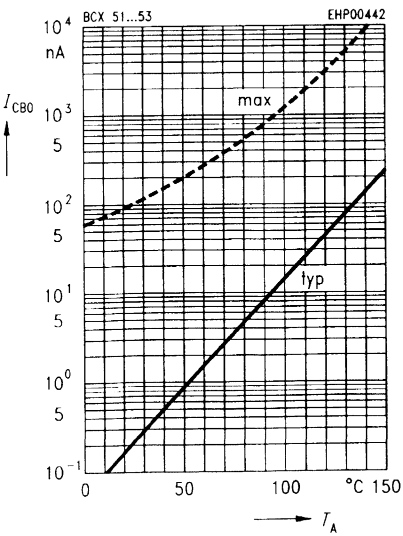
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 2$ V



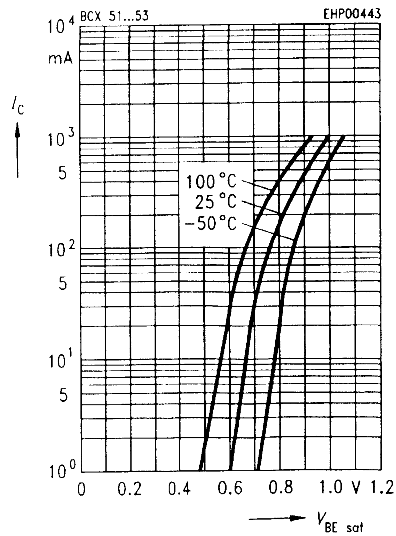
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 10$



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



Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 10$

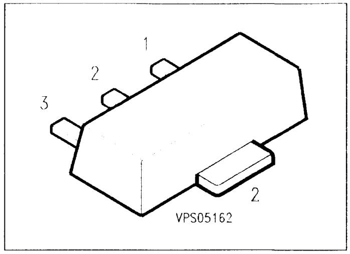


SIEMENS

NPN Silicon AF Transistors

BCX 54 ... BCX 56

- For AF driver and output stages
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BCX 51 ... BCX 53 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCX 54	–	Q62702-C954	B	C	E	SOT-89
BCX 54-10	BC	Q62702-C1861				
BCX 54-16	BD	Q62702-C1731				
BCX 55	–	Q62702-C1729				
BCX 55-10	BG	Q62702-C1730				
BCX 55-16	BM	Q62702-C1903				
BCX 56	–	Q62702-C1614				
BCX 56-10	BK	Q62702-C1635				
BCX 56-16	BL	Q62702-C1613				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values			Unit
		BCX 54	BCX 55	BCX 56	
Collector-emitter voltage	V_{CEO}	45	60	80	V
Collector-base voltage	V_{CBO}	45	60	100	
Emitter-base voltage	V_{EBO}	5	5	5	
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_S = 130 ˚C	P_{tot}	1			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient [1]	$R_{th JA}$	≤ 75	K/W
Junction - soldering point	$R_{th JS}$	≤ 20	

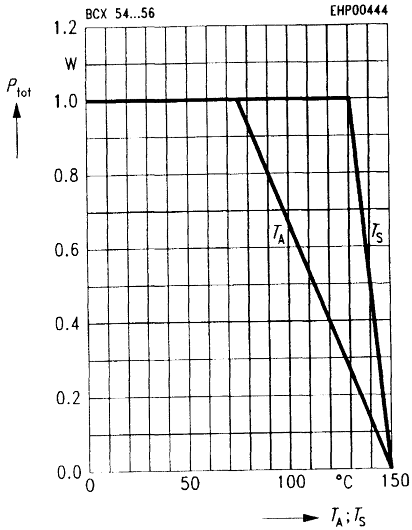
[1] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

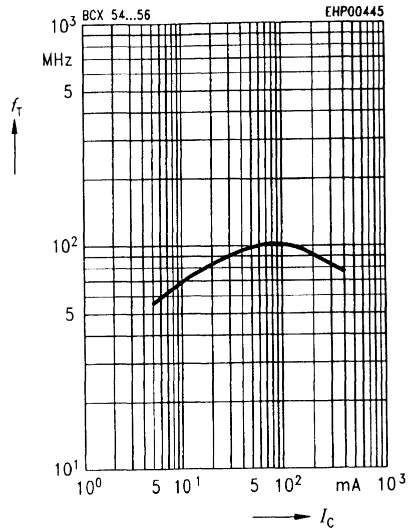
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$				V
BCX 54		45	–	–	
BCX 55		60	–	–	
BCX 56		80	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$				
BCX 54		45	–	–	
BCX 55		60	–	–	
BCX 56		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 30 V		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain [1]	h_{FE}				–
I_C = 5 mA, V_{CE} = 2 V		25	–	–	
I_C = 150 mA, V_{CE} = 2 V					
BCX 54, BCX 55, BCX 56		40	–	250	
BCX 54-10, BCX 55-10, BCX 56-10		63	100	160	
BCX 54-16, BCX 55-16, BCX 56-16		100	160	250	
I_C = 500 mA, V_{CE} = 2 V		25	–	–	
Collector-emitter saturation voltage [1] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	0.5	V
Base-emitter voltage [1] I_C = 500 mA, V_{CE} = 2 V	V_{BE}	–	–	1	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

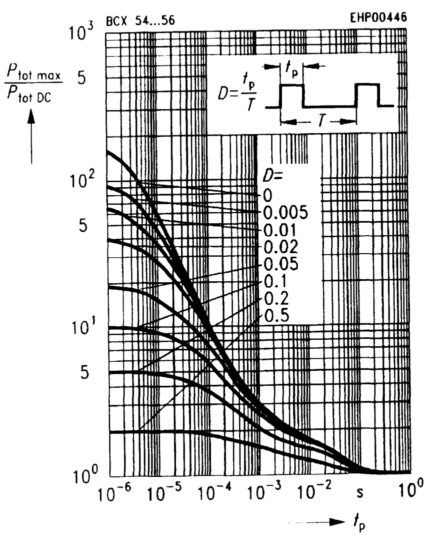
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



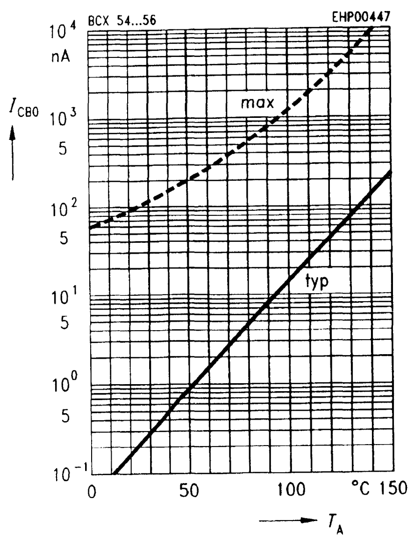
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



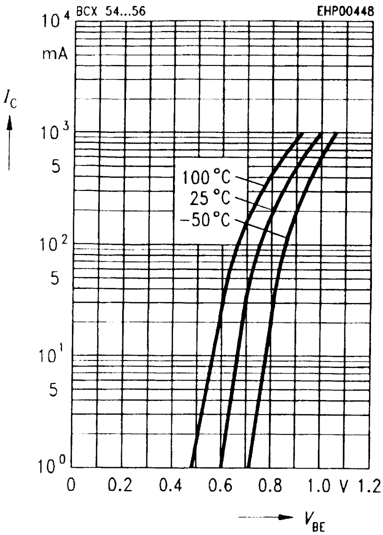
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



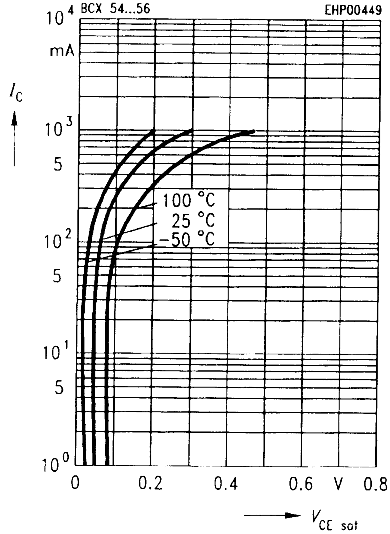
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



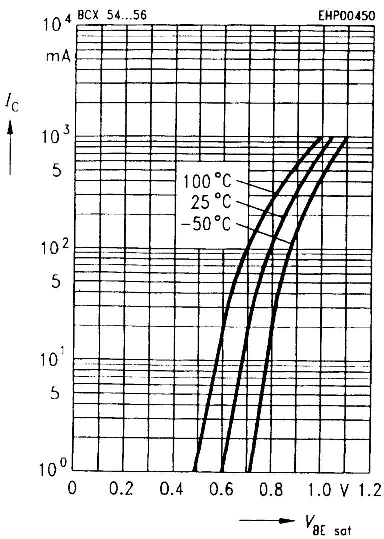
Collector current $I_C = f(V_{BE})$
V_{CE} = 2 V



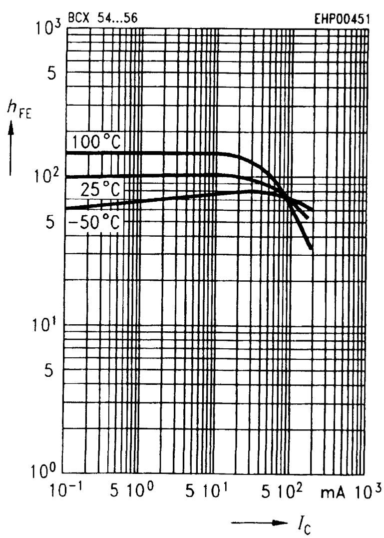
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
h_{FE} = 10



Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
h_{FE} = 10



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

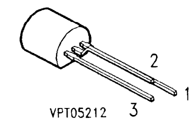


SIEMENS

NPN Silicon AF Transistors

BCX 58
BCX 59

- High current gain
- Low collector-emitter saturation voltage
- Complementary types: BCX 78, BCX 79 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BCX 58 VIII	–	Q62702-C619	C	B	E	TO-92
BCX 58 IX		Q62702-C620				
BCX 58 X		Q62702-C621				
BCX 59 VIII		Q62702-C623				
BCX 59 IX		Q62702-C624				
BCX 59 X		Q62702-C625				

Maximum Ratings

Parameter	Symbol	Values BCX 58	BCX 59	Unit
Collector-emitter voltage	V_{CEO}	32	45	V
Collector-base voltage	V_{CBO}	32	45	
Emitter-base voltage	V_{EBO}	7		
Collector current	I_C	100		mA
Peak collector current	I_{CM}	200		
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 70 °C	P_{tot}	500		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 250	K/W
Junction - case[2)]	$R_{th JC}$	≤ 160	

1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 2 mA BCX 58 BCX 59	$V_{(BR)CEO}$	 32 45	 – –	 – –	V
Collector-base breakdown voltage I_C = 10 µA BCX 58 BCX 59	$V_{(BR)CBO}$	 32 45	 – –	 – –	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	7	–	–	
Collector cutoff current V_{CB} = 32 V BCX 58 V_{CB} = 45 V BCX 59 V_{CB} = 32 V, T_A = 150 °C BCX 58 V_{CB} = 45 V, T_A = 150 °C BCX 59	I_{CBO}	 – – – –	 – – – –	 20 20 10 10	 nA nA µA µA
Collector cutoff current V_{CE} = 32 V, V_{BE} = 0.2 V, T_A = 100 °C V_{CE} = 45 V, V_{BE} = 0.2 V, T_A = 100 °C	I_{CEX}	 – –	 – –	 20 20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain I_C = 10 µA, V_{CE} = 5 V BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X	h_{FE}	 20 20 40 100	 78 145 220 300	 – – – –	–
I_C = 2 mA, V_{CE} = 5 V BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X		 120 180 250 380	 170 250 350 500	 220 310 460 630	
I_C = 100 mA, V_{CE} = 1 V[1)] BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X		 40 45 60 60	 – – – –	 – – – –	

1) Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

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

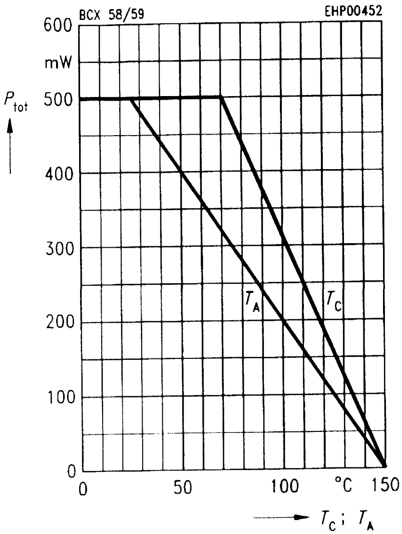
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 2.5 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage [1] I_C = 100 mA, I_B = 2.5 mA	V_{BEsat}	–	–	1.0	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 10 µA, V_{CE} = 5 V		–	0.52	–	
I_C = 2 mA, V_{CE} = 5 V		0.55	0.65	0.75	
I_C = 100 mA, V_{CE} = 1 V [1]		–	0.83	–	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

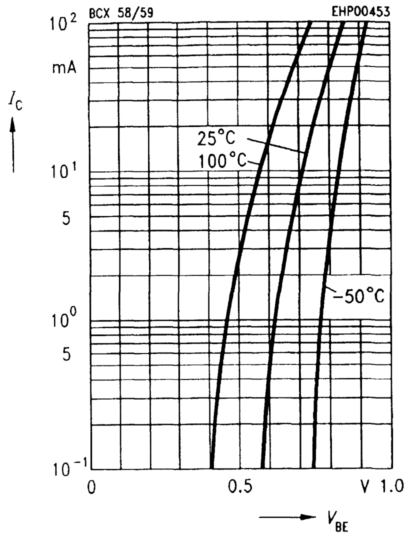
Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X	h_{11e}	 – – – –	 2.7 3.6 4.5 7.5	 – – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X	h_{12e}	 – – – –	 1.5 2.0 2.0 3.0	 – – – –	10^{-4}
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X	h_{21e}	 – – – –	 200 260 330 520	 – – – –	–
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BCX 58 VII, BCX 59 VII BCX 58 VIII, BCX 59 VIII BCX 58 IX, BCX 59 IX BCX 58 X, BCX 59 X	h_{22e}	 – – – –	 18 24 30 50	 – – – –	µS
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F	–	2	–	dB

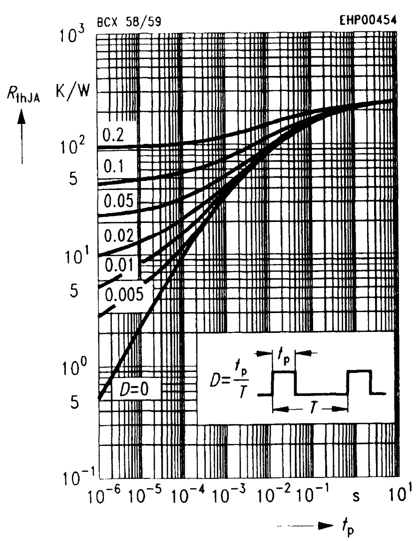
Total power dissipation $P_{tot} = f(T_A; T_C)$



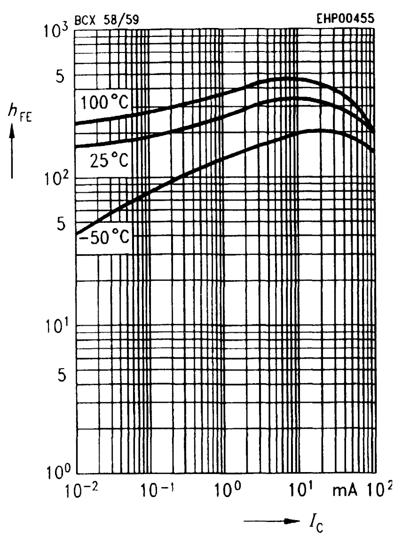
Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V (common emitter configuration)



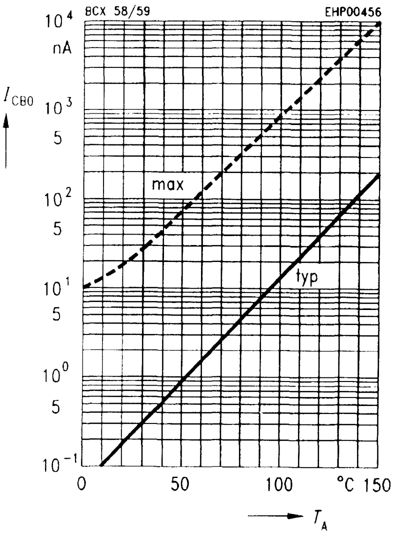
Permissible pulse load $R_{thJA} = f(t_p)$



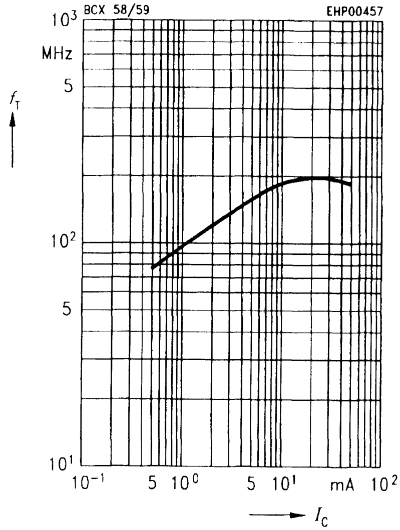
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



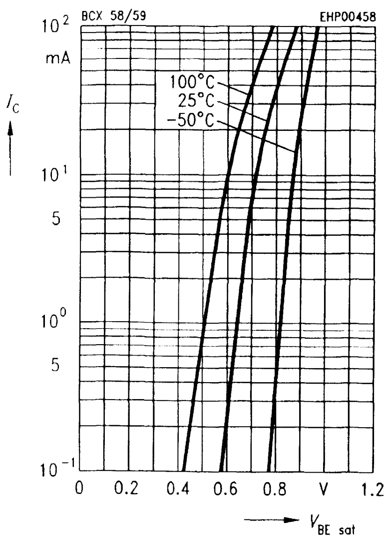
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 45 V



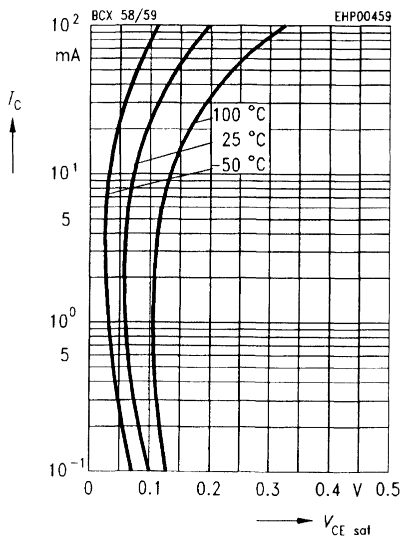
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20

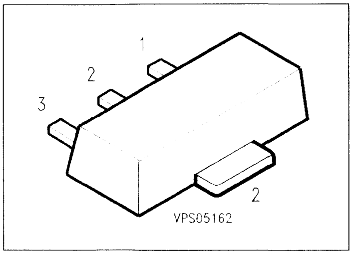


SIEMENS

NPN Silicon AF Transistors

BCX 68

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCX 68	–	Q62702-C1572	B	C	E	SOT-89
BCX 68-10	CB	Q62702-C1864				
BCX 68-16	CC	Q62702-C1865				
BCX 68-25	CD	Q62702-C1866				

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_S = 130 ˚C	P_{tot}	1	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 75	K/W
Junction - soldering point	$R_{th JS}$	≤ 20	

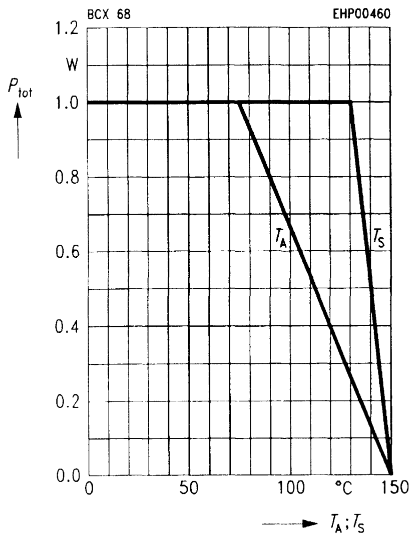
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

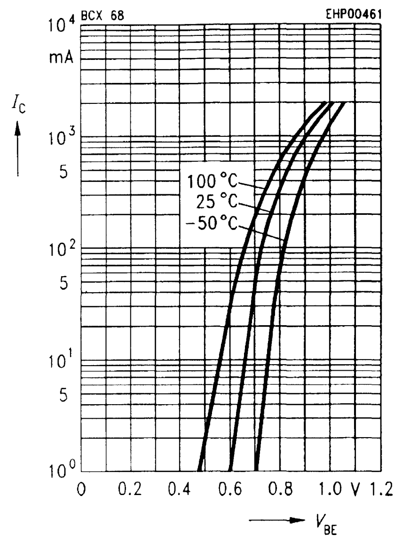
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 30 mA	$V_{(BR)CEO}$	20	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	25	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 25 V V_{CB} = 25 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	µA
DC current gain [1)] I_C = 5 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 1 V BCX 68 BCX 68-10 BCX 68-16 BCX 68-25 I_C = 1 A, V_{CE} = 1 V	h_{FE}	 50 85 85 100 160 60	 – – 100 160 250 –	 – 375 160 250 375 –	–
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	
AC characteristics					
Transition frequency I_C = 100 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	100	–	MHz

1) Pulse test: t < 300 µs, D = 2 %.

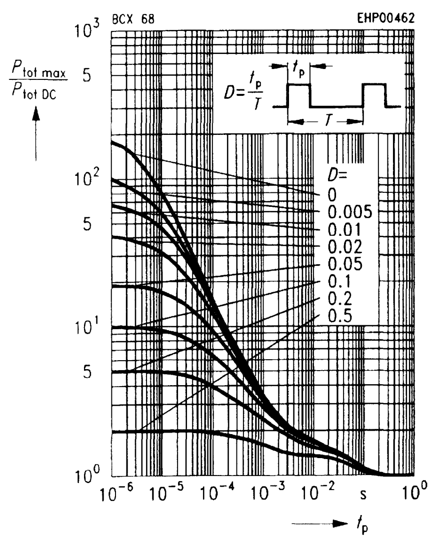
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



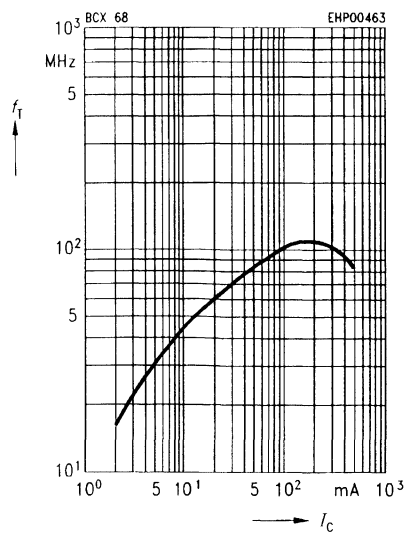
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V



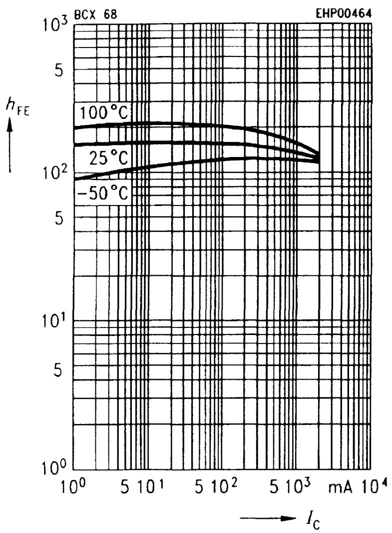
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



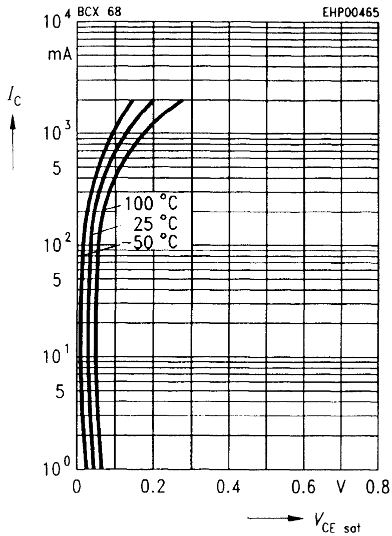
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



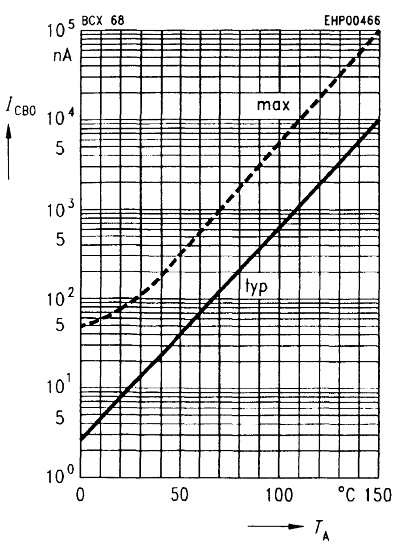
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V



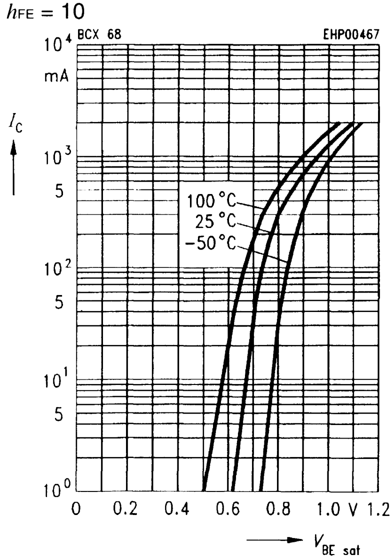
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
h_{FE} = 10



Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 25 V



Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
h_{FE} = 10

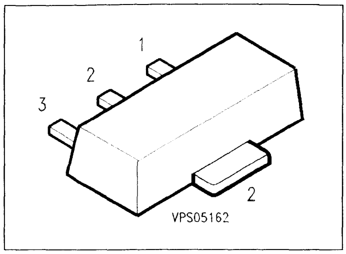


SIEMENS

PNP Silicon AF Transistors

BCX 69

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BCX 69	–	Q62702-C1714	B	C	E	SOT-89
BCX 69-10	CF	Q62702-C1867				
BCX 69-16	CG	Q62702-C1868				
BCX 69-25	CH	Q62702-C1869				

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current	I_{CM}	2	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation, T_S = 130 ˚C	P_{tot}	1	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 75	K/W
Junction - soldering point	$R_{th JS}$	≤ 20	

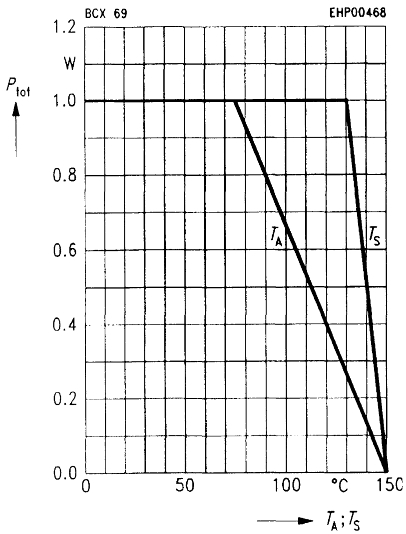
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

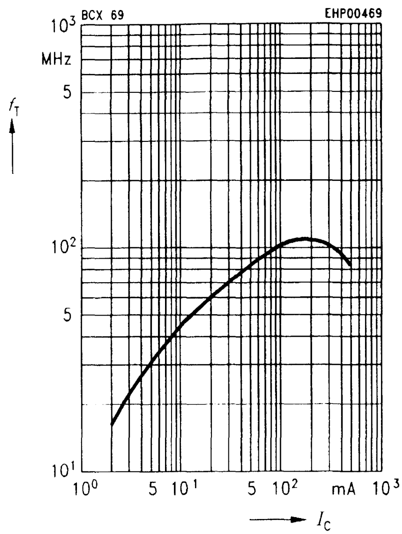
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 30 mA	$V_{(BR)CEO}$	20	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	25	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 25 V V_{CB} = 25 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 10	 nA µA
Emitter cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	µA
DC current gain [1)] I_C = 5 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 1 V BCX 69 BCX 69-10 BCX 69-16 BCX 69-25 I_C = 1 A, V_{CE} = 1 V	h_{FE}	 50 85 85 100 160 60	 – – 100 160 250 –	 – 375 160 250 375 –	–
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	
AC characteristics					
Transition frequency I_C = 100 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	100	–	MHz

1) Pulse test: $t \leq 300$ µs, D = 2 %.

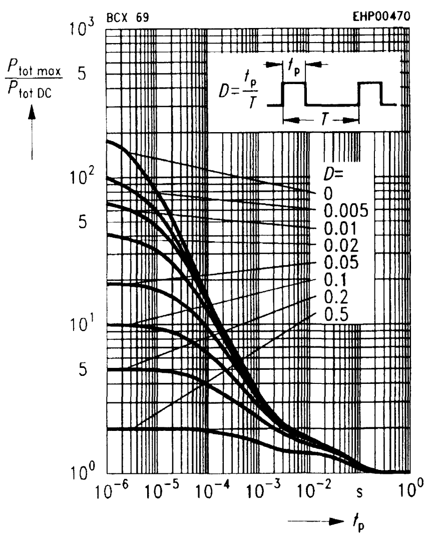
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



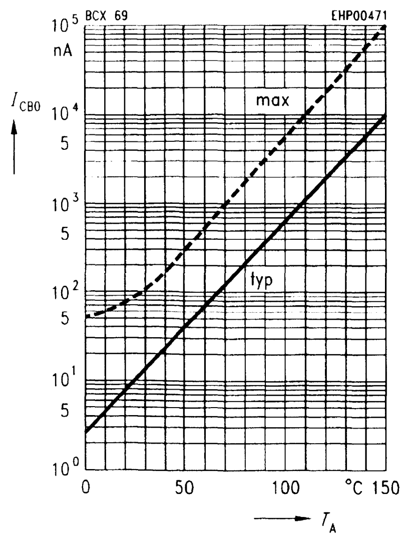
Transition frequency $f_T = f\,(I_C)$
$V_{CE} = 5$ V



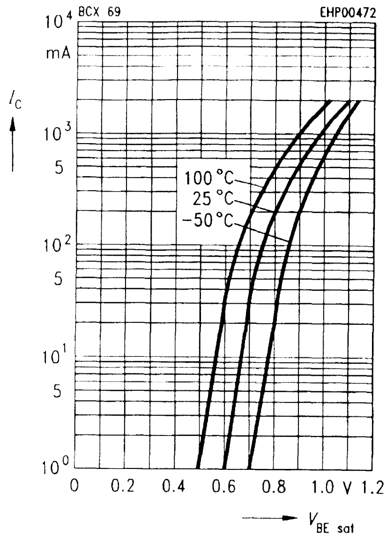
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



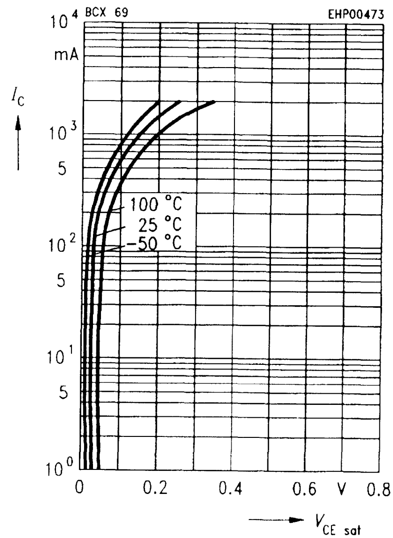
Collector cutoff current $I_{CBO} = f\,(T_A)$
$V_{CB} = 25$ V



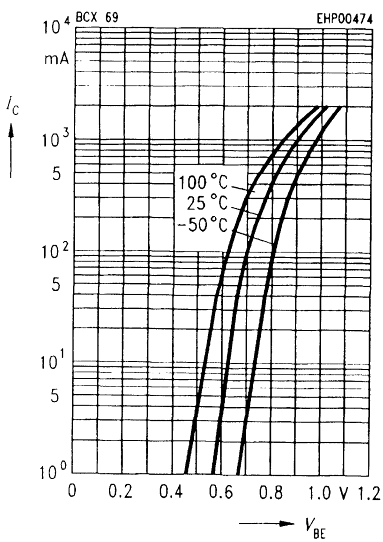
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 10$



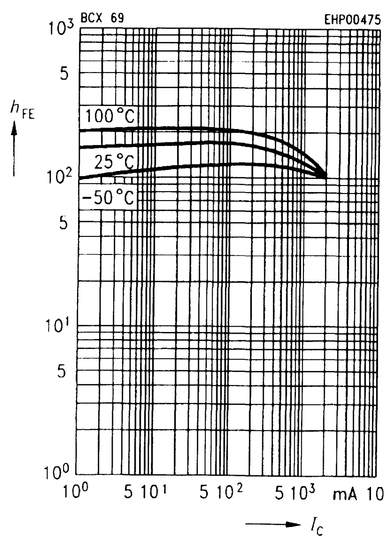
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 10$



Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V



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

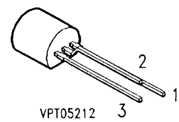


SIEMENS

NPN Silicon AF Transistors

BCX 73
BCX 74

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BCX 75, BCX 76 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BCX 73	–	Q62702-C634	C	B	E	TO-92
BCX 73-16		Q62702-C634-S1				
BCX 73-25		Q62702-C634-S2				
BCX 73-40		Q62702-C634-S3				
BCX 74		Q62702-C635				
BCX 74-16		Q62702-C635-S1				
BCX 74-25		Q62702-C635-S2				
BCX 74-40		Q62702-C635-S3				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCX 73	BCX 74	Unit
Collector-emitter voltage	V_{CEO}	32	45	V
Collector-base voltage	V_{CBO}	60	75	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 66 ˚C	P_{tot}	625		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 200	K/W
Junction - case [1]	$R_{th JC}$	≤ 135	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

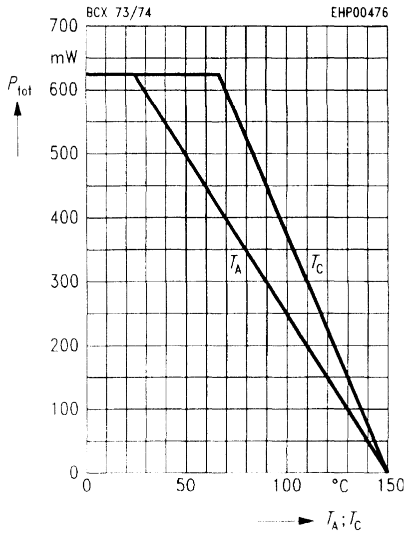
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 10 mA	BCX 73		32	–	–	
	BCX 74		45	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	BCX 73		60	–	–	
	BCX 74		75	–	–	
Emitter-base breakdown voltage I_E = 10 µA		$V_{(BR)EBO}$	5	–	–	
Collector cutoff current		I_{CBO}				
V_{CB} = 35 V	BCX 73		–	–	20	nA
V_{CB} = 45 V	BCX 74		–	–	20	nA
V_{CB} = 35 V, T_A = 150 °C	BCX 73		–	–	5	µA
V_{CB} = 45 V, T_A = 150 °C	BCX 74		–	–	5	µA
Emitter cutoff current V_{EB} = 4 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 100 µA, V_{CE} = 10 V			35	–	–	
I_C = 1 mA, V_{CE} = 1 V			50	–	–	
I_C = 10 mA, V_{CE} = 1 V			75	–	–	
I_C = 100 mA, V_{CE} = 1 V [1]						
	BCX 73-16, BCX 74-16		100	160	250	
	BCX 73-25, BCX 74-25		160	250	400	
	BCX 73-40, BCX 74-40		250	350	630	
I_C = 500 mA, V_{CE} = 2 V [1]			35	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 100 mA, I_B = 10 mA			–	–	0.25	
I_C = 500 mA, I_B = 50 mA			–	–	0.6	
Base-emitter saturation voltage [1] I_C = 500 mA, I_B = 50 mA		V_{BEsat}	–	–	1.5	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

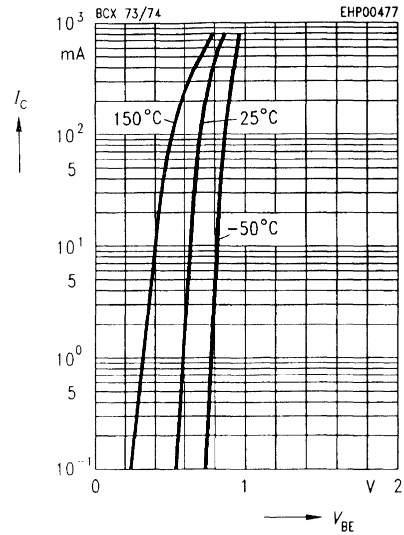
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	170	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	8	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

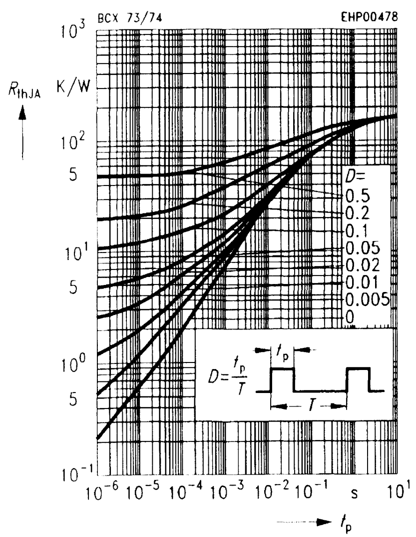
Total power dissipation $P_{tot} = f\,(T_A;\,T_C)$



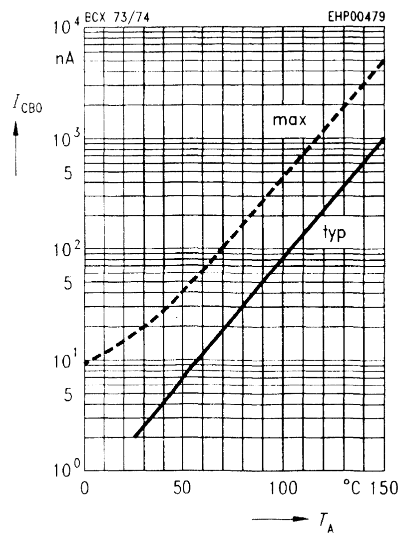
Collector current $I_C = f\,(V_{BE})$
$V_{CE} = 1$ V



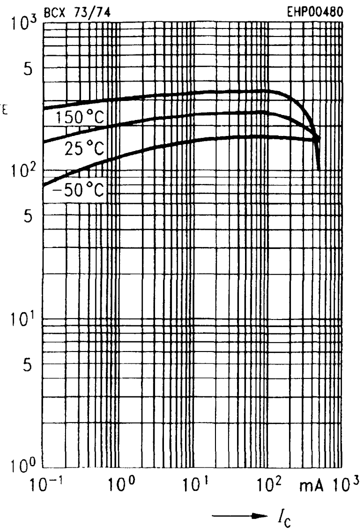
Permissible pulse load $R_{thJA} = f\,(t_p)$



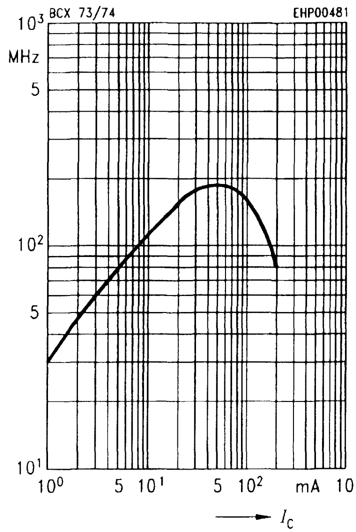
Collector cutoff current $I_{CB0} = f\,(T_A)$
$V_{CB} = 45$ V



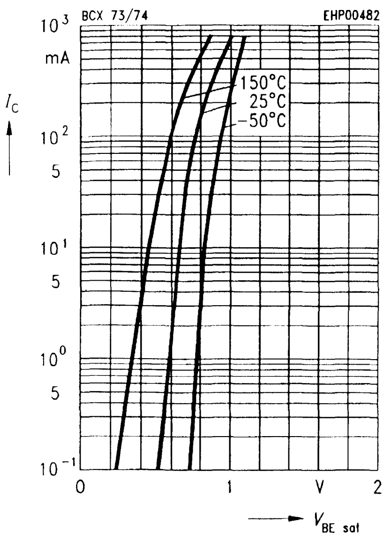
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 1$ V



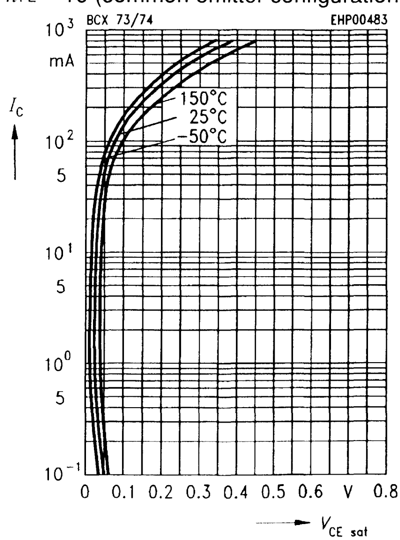
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V, $f = 200$ MHz



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 10$



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 10$ (common emitter configuration)

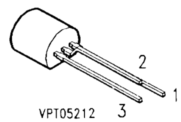


SIEMENS

PNP Silicon AF Transistors

BCX 75
BCX 76

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BCX 73, BCX 74 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BCX 75	–	Q62702-C636	C	B	E	TO-92
BCX 75-16		Q62702-C636-S1				
BCX 75-25		Q62702-C636-S2				
BCX 75-40		Q62702-C636-S3				
BCX 76		Q62702-C637				
BCX 76-16		Q62702-C637-S1				
BCX 76-25		Q62702-C637-S2				
BCX 76-40		Q62702-C637-S3				

[1)] For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCX 75	BCX 76	Unit
Collector-emitter voltage	V_{CE0}	32	45	V
Collector-base voltage	V_{CB0}	60	75	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 66 ˚C	P_{tot}	625		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 135	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics

at T_A = 25 ˚C, unless otherwise specified.

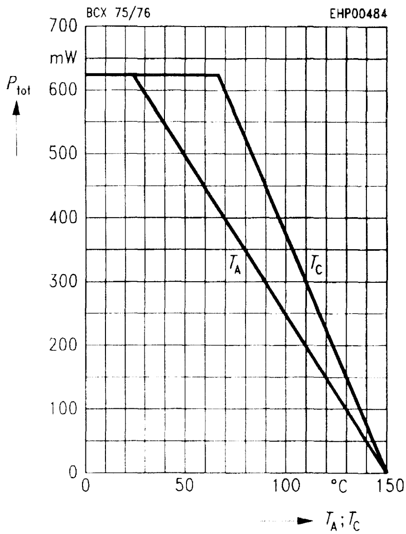
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 10 mA BCX 75		32	–	–	
BCX 76		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 100 µA BCX 75		60	–	–	
BCX 76		75	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 32 V BCX 75		–	–	20	nA
V_{CB} = 45 V BCX 76		–	–	20	nA
V_{CB} = 32 V, T_A = 150 ˚C BCX 75		–	–	5	µA
V_{CB} = 45 V, T_A = 150 ˚C BCX 76		–	–	5	µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain	h_{FE}				–
I_C = 100 µA, V_{CE} = 10 V		35	–	–	
I_C = 1 mA, V_{CE} = 1 V		50	–	–	
I_C = 10 mA, V_{CE} = 1 V		75	–	–	
I_C = 100 mA, V_{CE} = 1 V [1)					
BCX 75-16, BCX 76-16		100	160	250	
BCX 75-25, BCX 76-25		160	250	400	
BCX 75-40, BCX 76-40		250	350	630	
I_C = 500 mA, V_{CE} = 2 V [1)		35	–	–	
Collector-emitter saturation voltage [1)	V_{CEsat}				V
I_C = 100 mA, I_B = 10 mA		–	–	0.25	
I_C = 500 mA, I_B = 50 mA		–	–	0.6	
Base-emitter saturation voltage [1) I_C = 500 mA, I_B = 50 mA	V_{BEsat}	–	–	1.5	

1) Pulse test: $t \leq$ 300 µs, $D \leq$ 2 %.

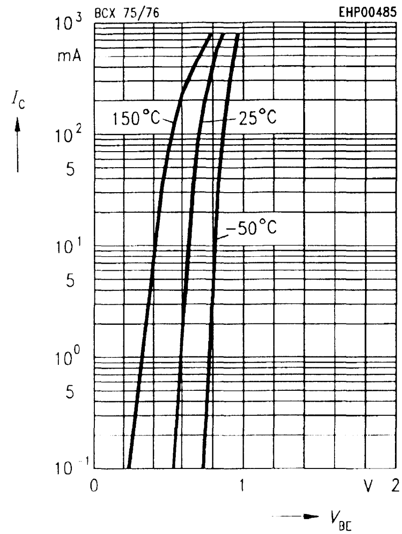
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	200	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	12	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	60	–	

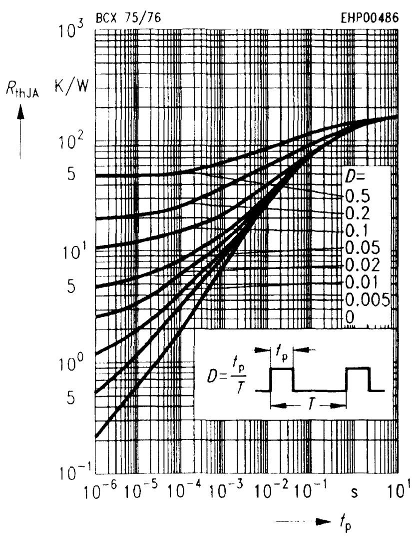
Total power dissipation $P_{tot} = f(T_A; T_C)$



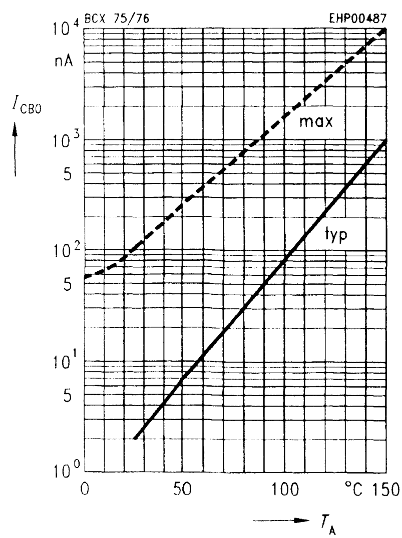
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V



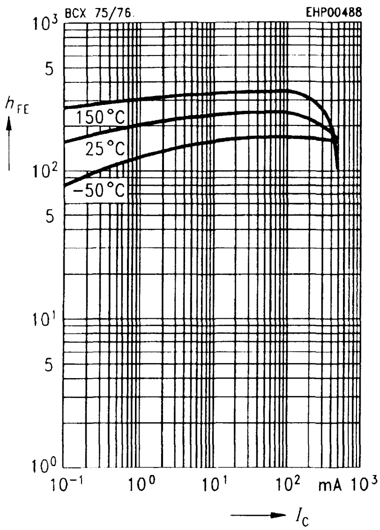
Permissible pulse load $R_{thJA} = f(t_p)$



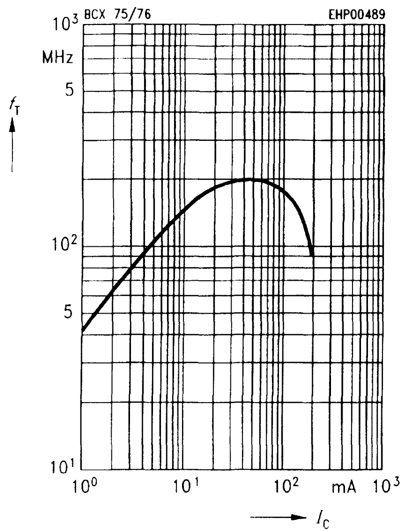
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 45 V



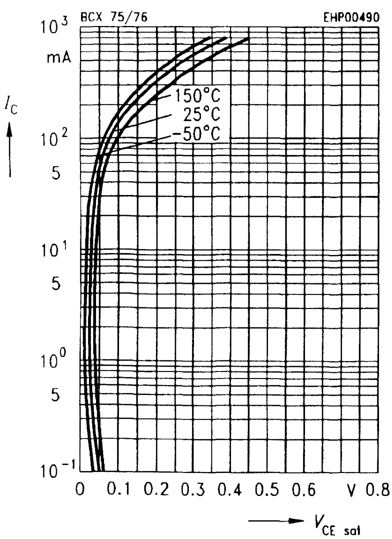
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V, T_A = parameter



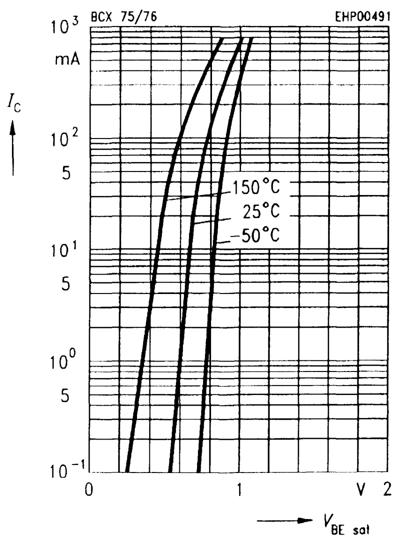
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 20 MHz



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 10



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 10

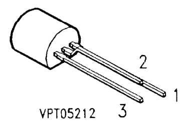


SIEMENS

PNP Silicon AF Transistors

BCX 78
BCX 79

- High current gain
- Low collector-emitter saturation voltage
- Low noise at 1 kHz
- Low noise at low frequencies
- Complementary types: BCX 58, BCX 59 (NPN)



Type	Marking	Ordering Code	Pin Configuration			Package[1)]
			1	2	3	
BCX 78	–	Q62702-C717	C	B	E	TO-92
BCX 78-VII		Q62702-C626				
BCX 78-VIII		Q62702-C627				
BCX 78-IX		Q62702-C628				
BCX 78-X		Q62702-C629				
BCX 79		Q62702-C718				
BCX 79-VII		Q62702-C630				
BCX 79-VIII		Q62702-C631				
BCX 79-IX		Q62702-C632				
BCX 79-X		Q62702-C633				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BCX 78	BCX 79	Unit
Collector-emitter voltage	V_{CE0}	32	45	V
Collector-base voltage	V_{CB0}	32	45	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	100		mA
Peak collector current	I_{CM}	200		
Peak base current	I_{BM}	200		
Total power dissipation, T_C = 70 ˚C	P_{tot}	500		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 250	K/W
Junction - case [1]	$R_{th\,JC}$	≤ 160	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical 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 = 2 mA BCX 78		32	–	–	
BCX 79		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 10 µA BCX 78		32	–	–	
BCX 79		45	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 32 V BCX 78		–	–	20	nA
V_{CB} = 45 V BCX 79		–	–	20	nA
V_{CB} = 32 V, T_A = 150 °C BCX 78		–	–	10	µA
V_{CB} = 45 V, T_A = 150 °C BCX 79		–	–	10	µA
Collector cutoff current	I_{CEO}				µA
V_{CB} = 32 V, V_{BE} = 0.2 V, T_A = 100 °C		–	–	20	
V_{CB} = 45 V, V_{BE} = 0.2 V, T_A = 100 °C		–	–	20	
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BCX 78 VII, BCX 79 VII		20	140	–	
BCX 78 VIII, BCX 79 VIII		30	200	–	
BCX 78 IX, BCX 79 IX		40	270	–	
BCX 78 X, BCX 79 X		100	340	–	
I_C = 2 mA, V_{CE} = 5 V					
BCX 78 VII, BCX 79 VII		120	170	220	
BCX 78 VIII, BCX 79 VIII		180	250	310	
BCX 78 IX, BCX 79 IX		250	350	460	
BCX 78 X, BCX 79 X		380	500	630	
I_C = 100 mA, V_{CE} = 1 V [1]					
BCX 78 VII, BCX 79 VII		40	–	–	
BCX 78 VIII, BCX 79 VIII		45	–	–	
BCX 78 IX, BCX 79 IX		60	–	–	
BCX 78 X, BCX 79 X		60	–	–	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

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

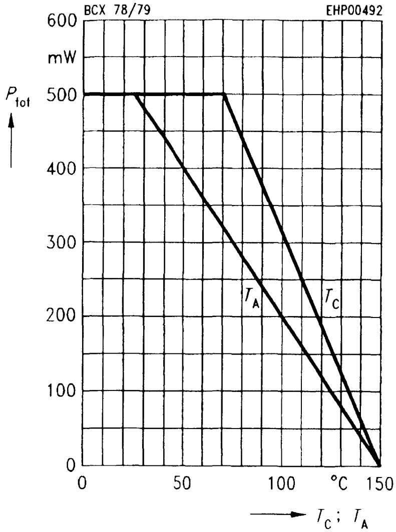
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 2.5 mA	V_{CEsat}	–	–	0.6	V
Base-emitter saturation voltage [1] I_C = 100 mA, I_B = 2.5 mA	V_{BEsat}	–	–	1.0	
Base-emitter voltage I_C = 10 µA, V_{CE} = 5 V I_C = 2 mA, V_{CE} = 5 V I_C = 100 mA, V_{CE} = 1 V [1]	$V_{BE(on)}$	 – 0.55 –	 0.52 0.65 0.93	 – 0.75 –	

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

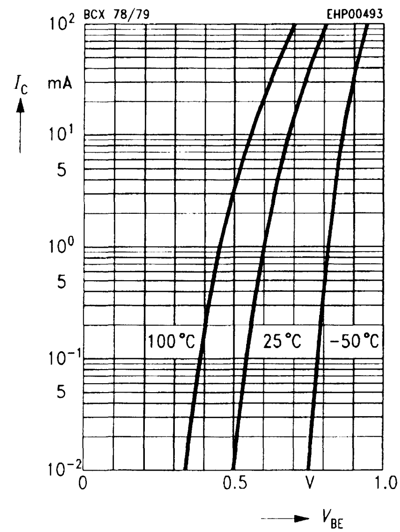
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	10	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BCX 78 VII, BCX 79 VII		–	2.7	–	
BCX 78 VIII, BCX 79 VIII		–	3.6	–	
BCX 78 IX, BCX 79 IX		–	4.5	–	
BCX 78 X, BCX 79 X		–	7.5	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BCX 78 VII, BCX 79 VII		–	1.5	–	
BCX 78 VIII, BCX 79 VIII		–	2	–	
BCX 78 IX, BCX 79 IX		–	2	–	
BCX 78 X, BCX 79 X		–	3	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BCX 78 VII, BCX 79 VII		–	200	–	
BCX 78 VIII, BCX 79 VIII		–	260	–	
BCX 78 IX, BCX 79 IX		–	330	–	
BCX 78 X, BCX 79 X		–	520	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BCX 78 VII, BCX 79 VII		–	18	–	
BCX 78 VIII, BCX 79 VIII		–	24	–	
BCX 78 IX, BCX 79 IX		–	30	–	
BCX 78 X, BCX 79 X		–	50	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F	–	2	–	dB

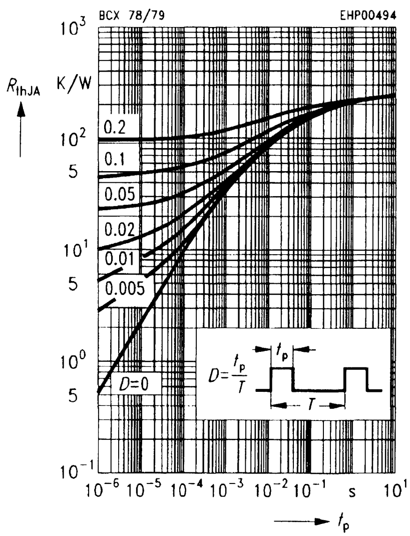
Total power dissipation $P_{tot} = f(T_A; T_C)$



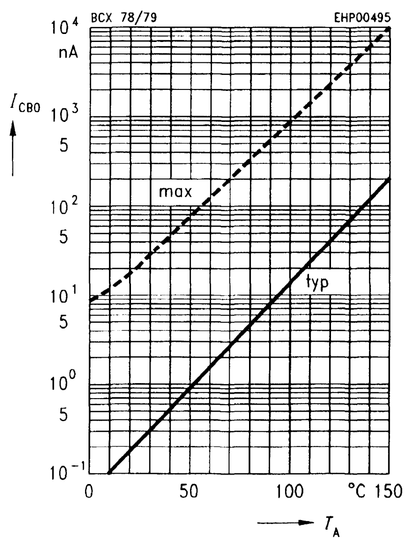
Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V



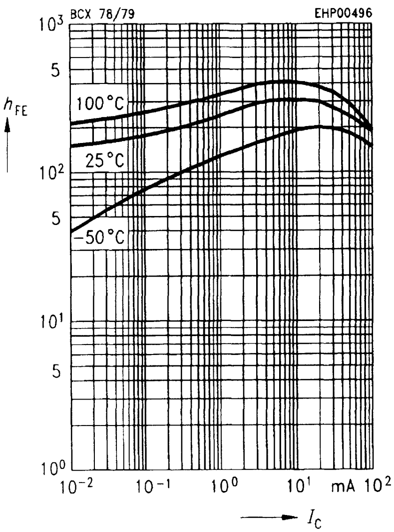
Permissible pulse load $R_{thJA} = f(t_p)$



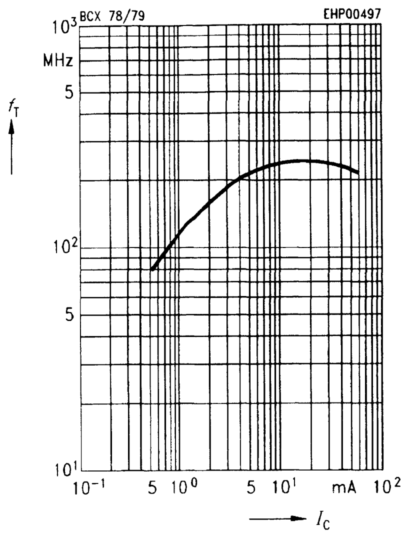
Collector cutoff current $I_{CB0} = f(T_A)$
for max. permissible reverse voltage



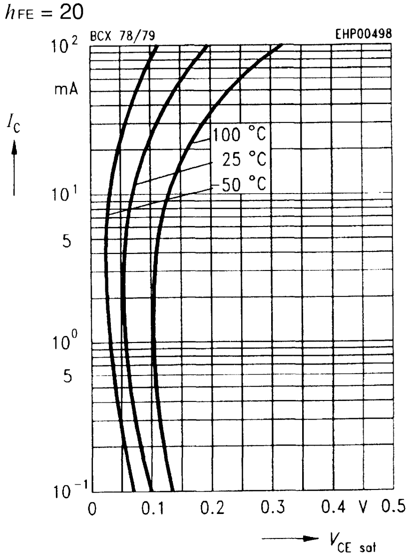
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V (common emitter configuration)



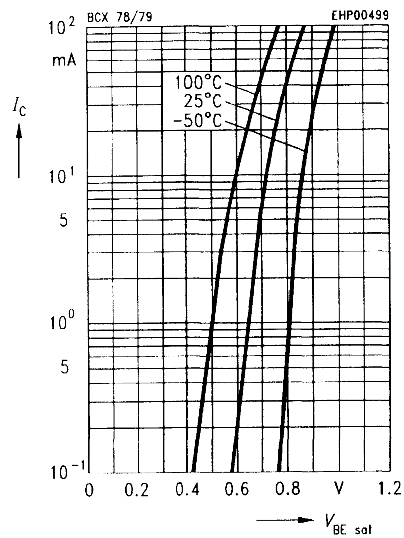
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20

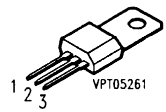


SIEMENS

NPN Silicon AF Transistors

BD 825 ... BD 829

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BD 826, BD 828, BD 830 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BD 825	–	Q62702-D1135	E	C	B	TO-202
BD 825-6		Q62702-D149				
BD 825-10		Q62702-D1213				
BD 825-16		Q62702-D60				
BD 827		Q62702-D1305				
BD 827-6		Q62702-D1306				
BD 827-10		Q62702-D1113				
BD 829		Q62702-D1309				
BD 829-6		Q62702-D1310				
BD 829-10		Q62702-D1311				

[1] For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values BD 825	BD 827	BD 829	Unit
Collector-emitter voltage	V_{CE0}	45	60	80	V
Collector-base voltage	V_{CB0}	45	60	100	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 30 ˚C	P_{tot}	8			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 63	K/W
Junction - case[1]	$R_{th JC}$	≤ 15	

[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

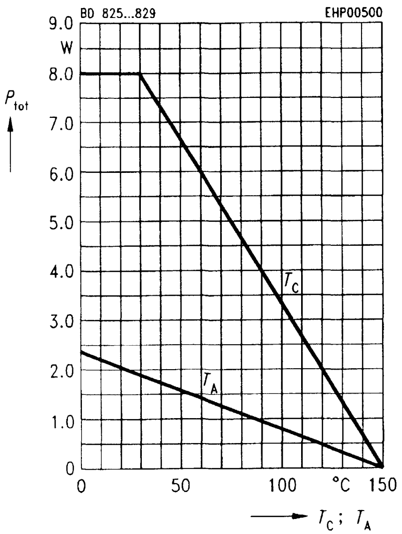
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

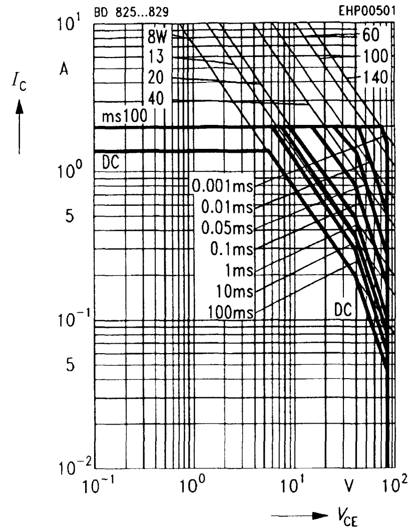
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA BD 825 BD 827 BD 829	$V_{(BR)CEO}$	 45 60 80	 – – –	 – – –	V
Collector-base breakdown voltage I_C = 100 µA BD 825 BD 827 BD 829	$V_{(BR)CBO}$	 45 60 100	 – – –	 – – –	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 30 V V_{CB} = 30 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA µA
Emitter cutoff current V_{EB} = 4 V	I_{EBO}	–	–	100	nA
DC current gain I_C = 5 mA, V_{CE} = 2 V I_C = 150 mA, V_{CE} = 2 V BD 825-6, BD 827-6, BD 829-6 BD 825-10, BD 827-10, BD 829-10 BD 825-16 I_C = 500 mA, V_{CE} = 2 V [1]	h_{FE}	 25 40 63 100 25	 – 63 100 160 –	 – 100 160 250 –	–
Collector-emitter saturation voltage [1] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	0.5	V
Base-emitter voltage I_C = 500 mA, V_{CE} = 2 V	V_{BE}	–	–	1	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

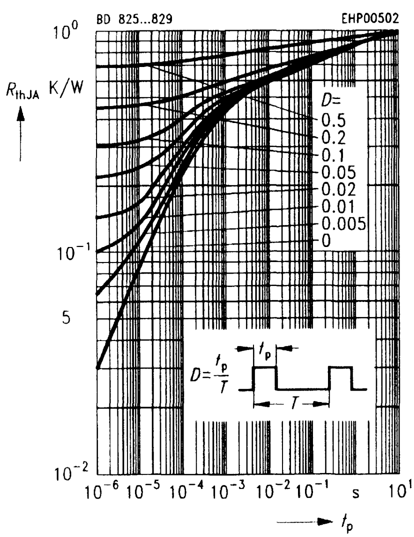
Total power dissipation $P_{tot} = f\,(T_A;\ T_C)$



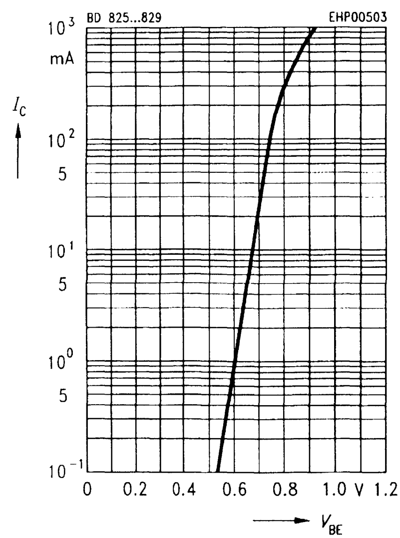
Operating range $I_C = f\,(V_{CE})$
$T_A = 25\ ^\circ\mathrm{C},\ D = 0$



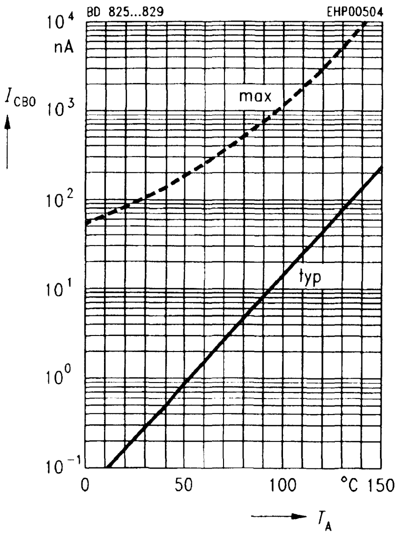
Permissible pulse load $R_{thJA} = f\,(t_p)$



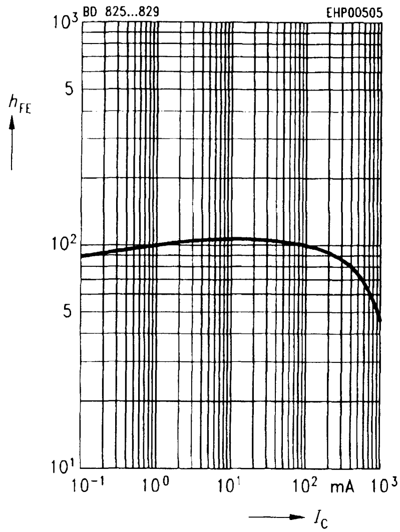
Collector current $I_C = f\,(V_{BE})$



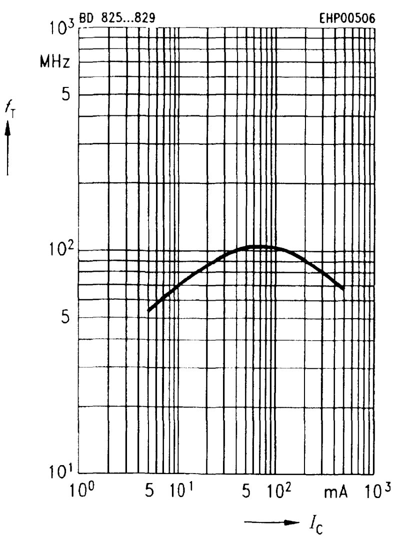
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 30 V



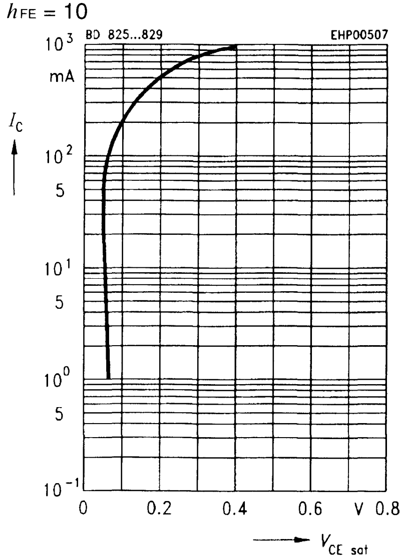
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 2 V



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz



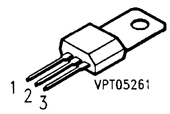
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 10



PNP Silicon AF Transistors

BD 826
... BD 830

- High current gain
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BC 825, BC 827,
  BC 829 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BD 826	–	Q62702-D1303	E	C	B	TO-202
BD 826-6		Q62702-D1304				
BD 826-10		Q62702-D1179				
BD 826-16		Q62702-D1257				
BD 828		Q62702-D1307				
BD 828-6		Q62702-D1308				
BD 828-10		Q62702-D61				
BD 830		Q62702-D1312				
BD 830-6		Q62702-D1313				
BD 830-10		Q62702-D1238				

[1] For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values			Unit
		BD 826	BD 828	BD 830	
Collector-emitter voltage	V_{CEO}	45	60	80	V
Collector-base voltage	V_{CBO}	45	60	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	1.5			
Base current	I_B	100			mA
Peak base current	I_{BM}	200			
Total power dissipation, T_C = 30 ˚C	P_{tot}	8			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 63	K/W
Junction - case[1]	$R_{th\,JC}$	≤ 15	

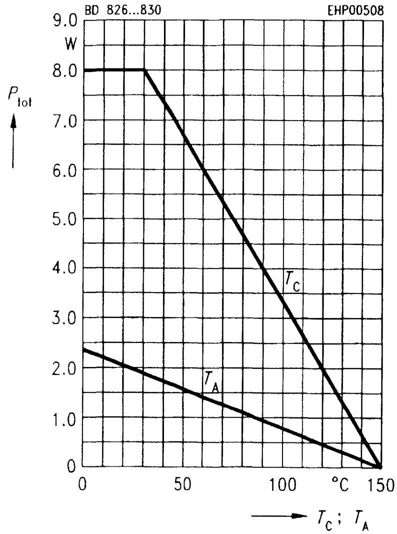
[1] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

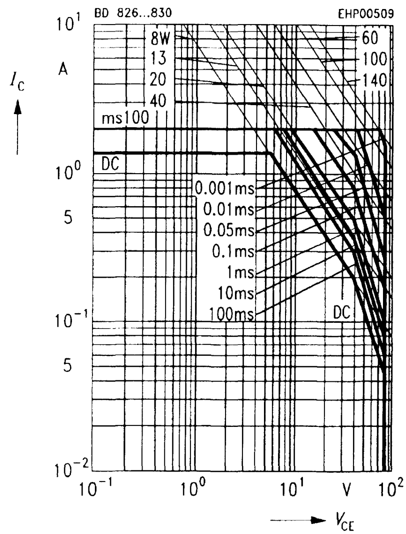
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CE0}$				V
BD 826		45	–	–	
BD 828		60	–	–	
BD 830		80	–	–	
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CB0}$				
BD 826		45	–	–	
BD 828		60	–	–	
BD 830		100	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EB0}$	5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 30 V		–	–	100	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	20	µA
Emitter cutoff current V_{EB} = 4 V	I_{EB0}	–	–	100	nA
DC current gain	h_{FE}				–
I_C = 5 mA, V_{CE} = 2 V		25	–	–	
I_C = 150 mA, V_{CE} = 2 V					
BD 826-6, BD 828-6, BD 830-6		40	63	100	
BD 826-10, BD 828-10, BD 830-10		63	100	160	
BD 826-16		100	160	250	
I_C = 500 mA, V_{CE} = 2 V [1]		25	–	–	
Collector-emitter saturation voltage [1] I_C = 500 mA, I_B = 50 mA	V_{CEsat}	–	–	0.5	V
Base-emitter voltage [1] I_C = 500 mA, V_{CE} = 2 V	V_{BE}	–	–	1	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	125	–	MHz

[1] Pulse test: $t \leq$ 300 µs, $D \leq$ 2 %.

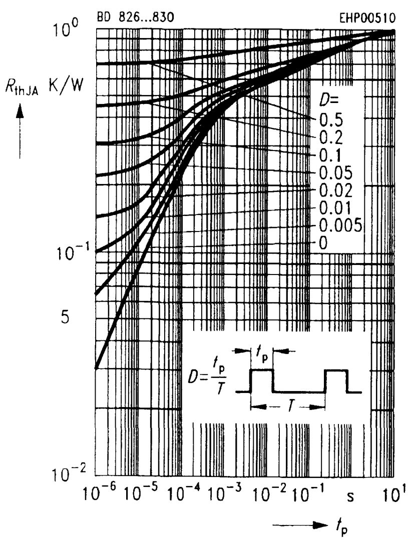
Total power dissipation $P_{tot} = f(T_A; T_C)$



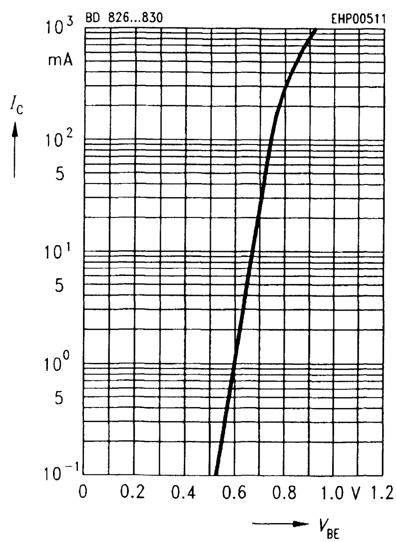
Operating range $I_C = f(V_{CE})$
T_A = 25 °C, D = 0



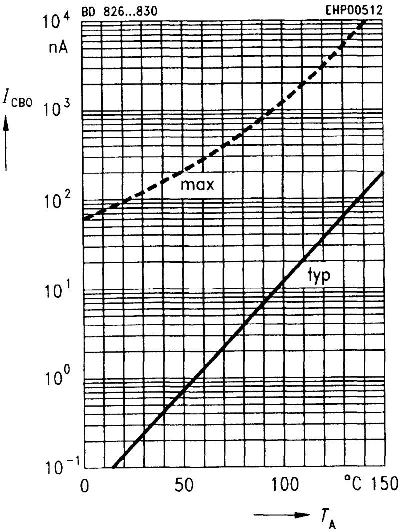
Permissible pulse load $R_{thJA} = f(t_p)$



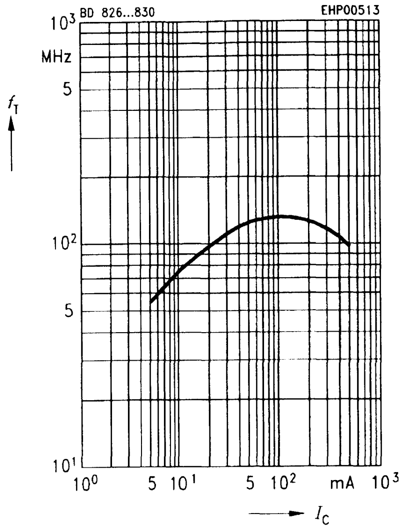
Collector current $I_C = f(V_{BE})$



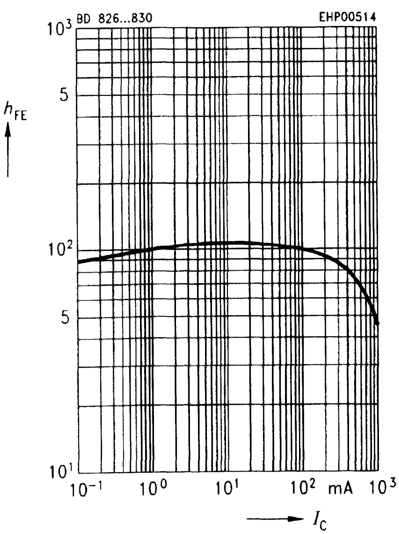
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 30 V



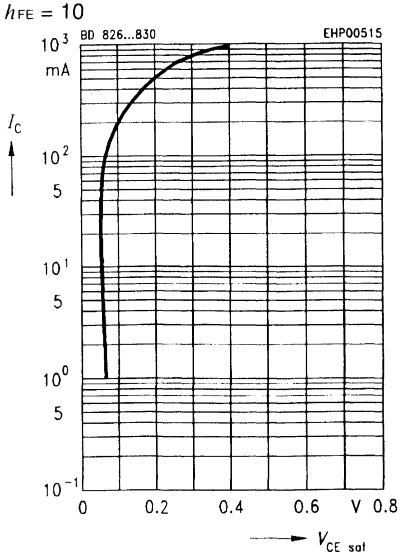
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz



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



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 10

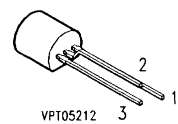


SIEMENS

NPN Silicon Transistors With High Reverse Voltage

BF 420
BF 422

- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary types: BF 421, BF 423 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BF 420 BF 422	–	Q62702-F531 Q62702-F495	E	C	B	TO-92

Maximum Ratings

Parameter	Symbol	Values BF 420	BF 422	Unit
Collector-emitter voltage	V_{CEO}	–	250	V
Collector-emitter voltage R_{BE} = 2.7 kΩ	V_{CER}	300	–	
Collector-base voltage	V_{CBO}	300	250	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	50		mA
Peak base current	I_{BM}	100		
Total power dissipation, T_C = 88 ˚C	P_{tot}	830		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 150	K/W
Junction - case[2]	$R_{th\,JC}$	≤ 75	

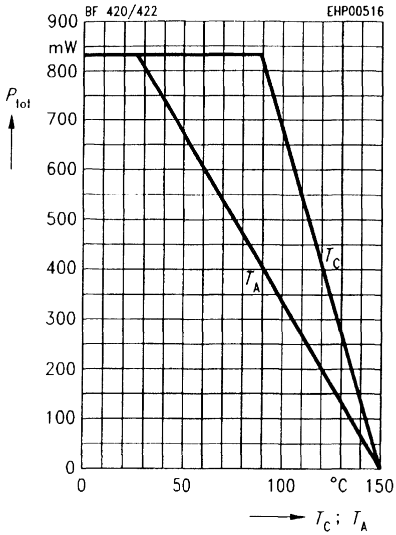
[1] For detailed information see chapter Package Outlines.
[2] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

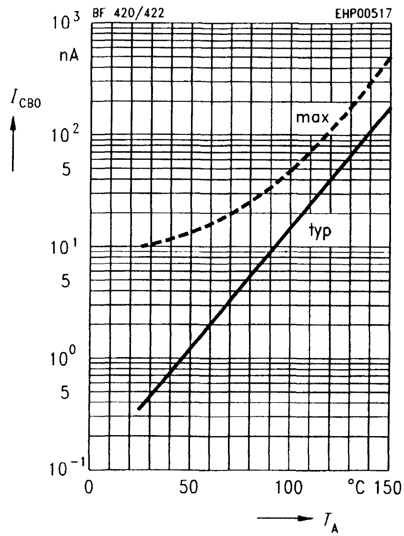
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA BF 422	$V_{(BR)CEO}$	250	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ BF 420	$V_{(BR)CER}$	300	–	–	
Collector-base breakdown voltage I_C = 10 µA BF 420 BF 422	$V_{(BR)CBO}$	 300 250	 – –	 – –	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 200 V	I_{CBO}	–	–	10	nA
Collector cutoff current V_{CE} = 200 V, R_{BE} = 2.7 kΩ, T_A = 150 ˚C	I_{CER}	–	–	10	µA
Emitter cutoff current, V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain I_C = 100 µA, V_{CE} = 20 V I_C = 25 mA, V_{CE} = 20 V	h_{FE}	 15 50	 – –	 – –	–
Collector-emitter saturation voltage [1] I_C = 25 mA, T_j =150 ˚C	$V_{CEsatRF}$	–	–	20	V
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	0.8	–	pF

[1] Pulse test: $t \leq$ 300 µs, $D \leq$ 2 %.

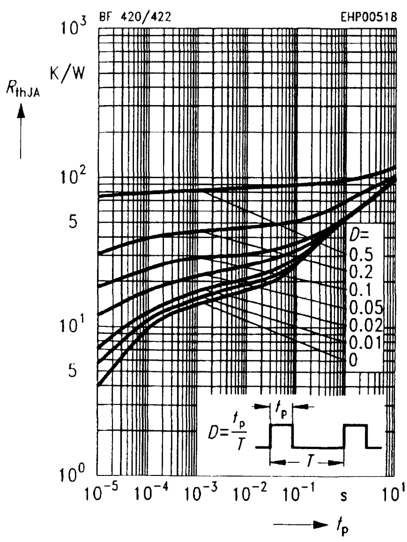
Total power dissipation $P_{tot} = f(T_A; T_C)$



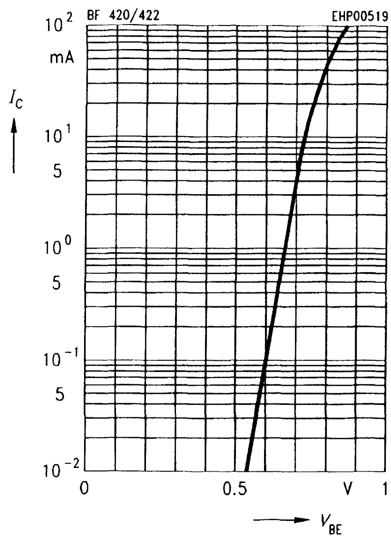
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 200 V



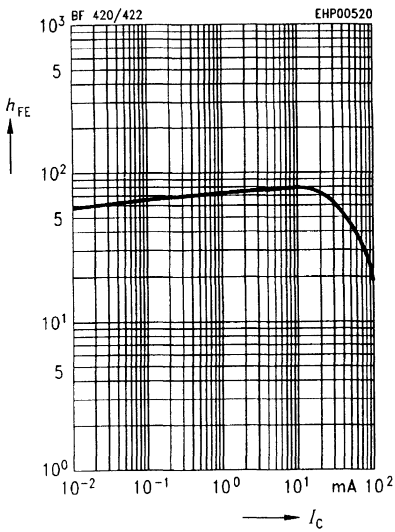
Permissible pulse load $R_{thJA} = f(t_p)$



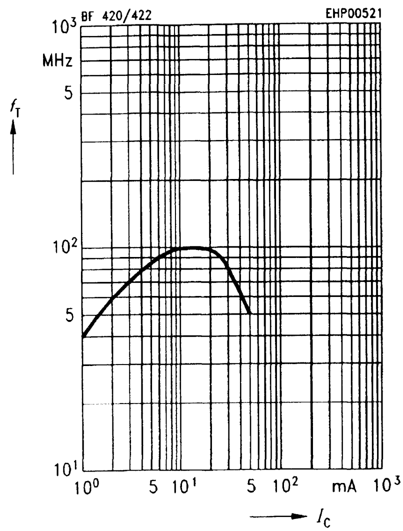
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V, T_A = 25 °C



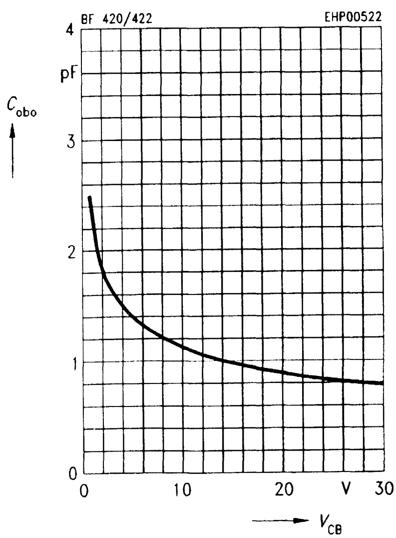
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 20 V, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz



Output capacitance $C_{obo} = f(V_{CB})$
I_C = 0, f = 1 MHz

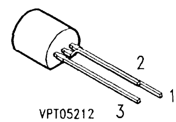


SIEMENS

PNP Silicon Transistors With High Reverse Voltage

BF 421
BF 423

- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary types: BF 420, BF 422 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BF 421 BF 423	–	Q62702-F532 Q62702-F496	E	C	B	TO-92

Maximum Ratings

Parameter	Symbol	Values BF 421	BF 423	Unit
Collector-emitter voltage	V_{CE0}	–	250	V
Collector-emitter voltage R_{BE} = 2.7 kΩ	V_{CER}	300	–	
Collector-base voltage	V_{CB0}	300	250	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	50		mA
Peak base current	I_{BM}	100		
Total power dissipation, T_C = 88 ˚C	P_{tot}	830		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 150	K/W
Junction - case[2]	$R_{th JC}$	≤ 75	

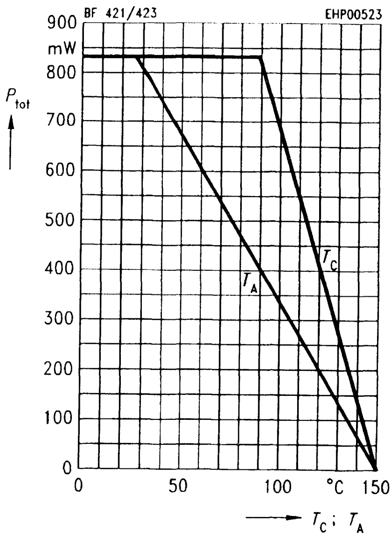
[1] For detailed information see chapter Package Outlines.
[2] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

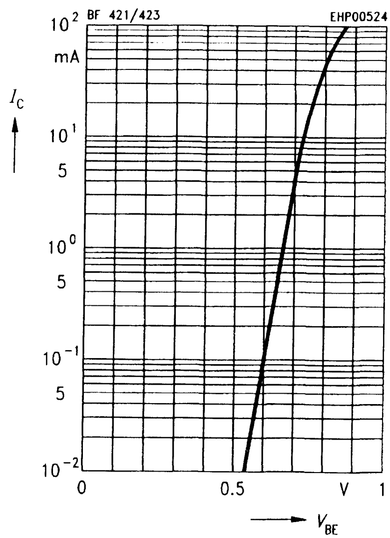
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA BF 423	$V_{(BR)CEO}$	250	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ BF 421	$V_{(BR)CER}$	300	–	–	
Collector-base breakdown voltage I_C = 10 µA BF 421 BF 423	$V_{(BR)CBO}$	 300 250	 – –	 – –	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 200 V	I_{CBO}	–	–	10	nA
Collector cutoff current V_{CE} = 200 V, R_{BE} = 2.7 kΩ, T_A = 150 °C	I_{CER}	–	–	10	µA
Emitter cutoff current, V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain I_C = 100 µA, V_{CE} = 20 V I_C = 25 mA, V_{CE} = 20 V	h_{FE}	 15 50	 – –	 – –	–
Collector-emitter saturation voltage [1] I_C = 25 mA, T_j = 150 °C	$V_{CEsatRF}$	–	–	20	V
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	0.8	–	pF

[1] Pulse test: $t \leq 300$ µs, $D \leq 2$ %.

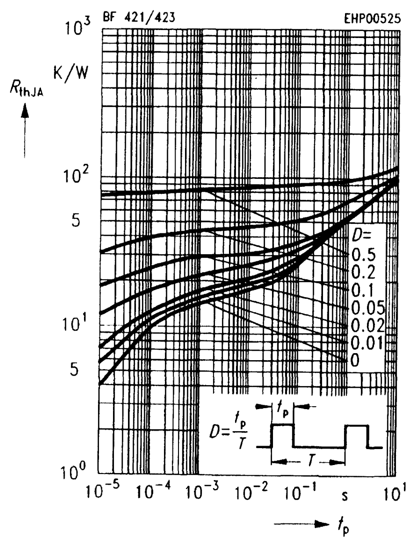
Total power dissipation $P_{tot} = f(T_A; T_C)$



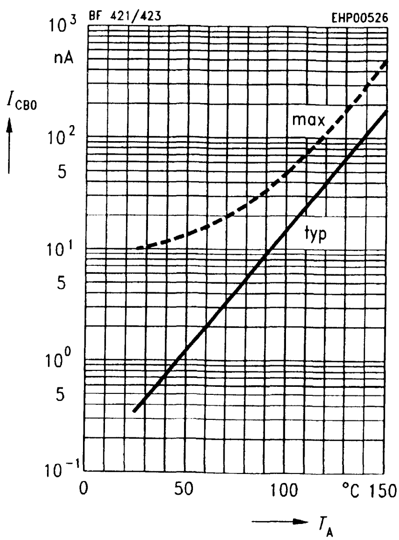
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V, T_A = 25 °C



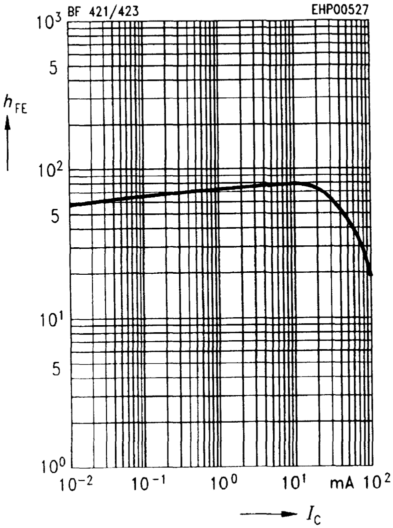
Permissible pulse load $R_{thJA} = f(t_p)$



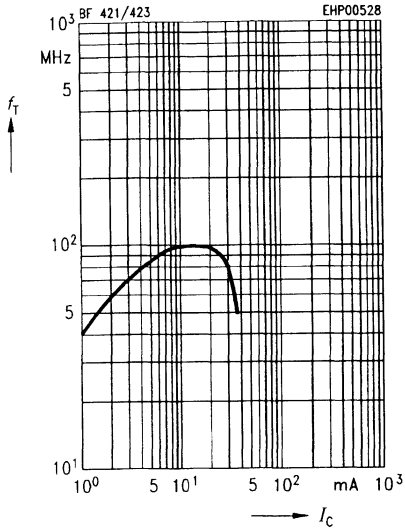
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 200 V



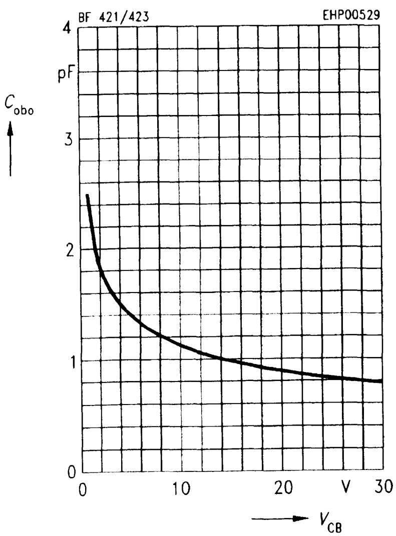
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 20 V, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz



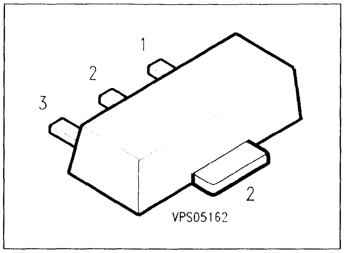
Output capacitance $C_{obo} = f(V_{CB})$
I_C = 0, f = 1 MHz



SIEMENS

NPN Silicon High-Voltage Transistor — BF 622

- Suitable for video output stages in TV sets
- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary type: BF 623 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BF 622	DA	Q62702-F1052	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	250	V
Collector-base voltage	V_{CBO}	250	
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	250	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	50	mA
Peak collector current	I_{CM}	100	
Total power dissipation, T_S = 120 °C	P_{tot}	1	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient[2)]	$R_{th\,JA}$	≤ 90	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 30	

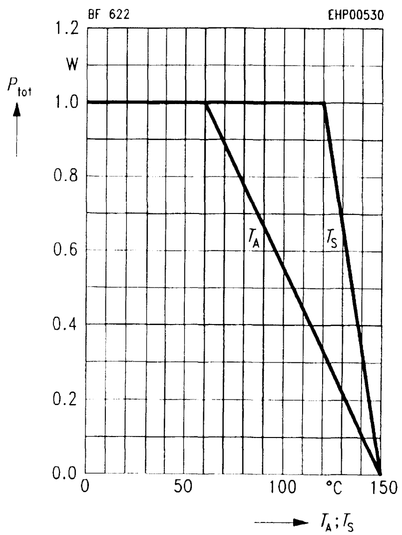
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

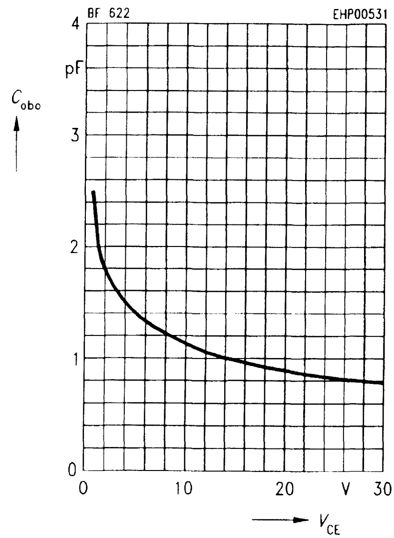
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage					V
I_C = 1 mA	$V_{(BR)CEO}$	250	–	–	
I_C = 10 µA, R_{BE} = 2.7 kΩ	$V_{(BR)CER}$	250	–	–	
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	250	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 200 V		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C		–	–	20	µA
Collector cutoff current	I_{CER}				µA
V_{CE} = 200 V, R_{BE} = 2.7 kΩ		–	–	1	
V_{CE} = 200 V, R_{BE} = 2.7 kΩ, T_A = 150 °C		–	–	50	
Emitter cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain [1)] I_C = 25 mA, V_{CE} = 20 V	h_{FE}	50	–	–	–
Collector-emitter saturation voltage [1)] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage [1)] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	1	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	0.8	–	pF

[1)] Pulse test: $t \leq$ 300 µs, D = 2 %.

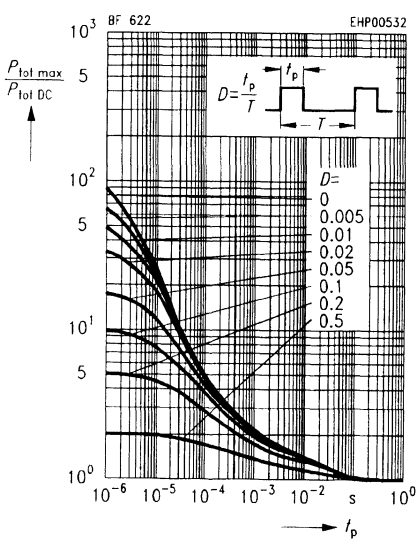
Total power dissipation $P_{tot} = f\,(T_A^*;\ T_S)$
* Package mounted on epoxy



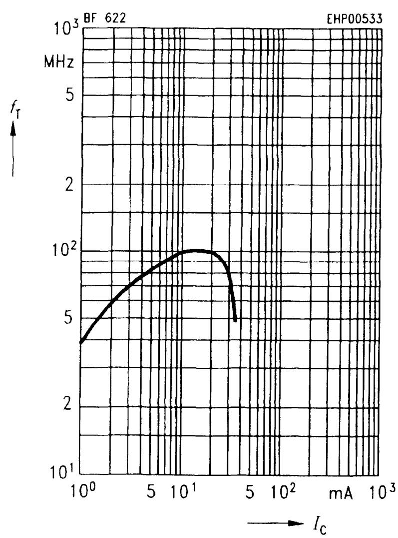
Output capacitance $C_{obo} = f\,(V_{CE})$
f = 1 MHz



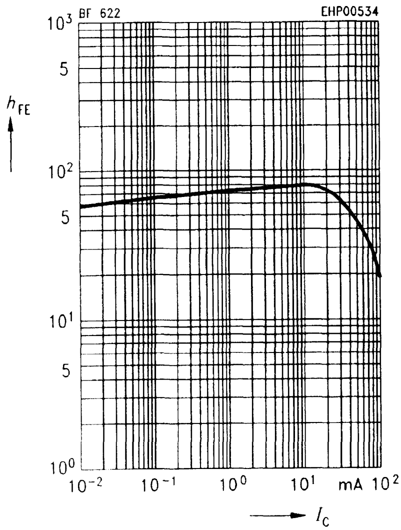
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



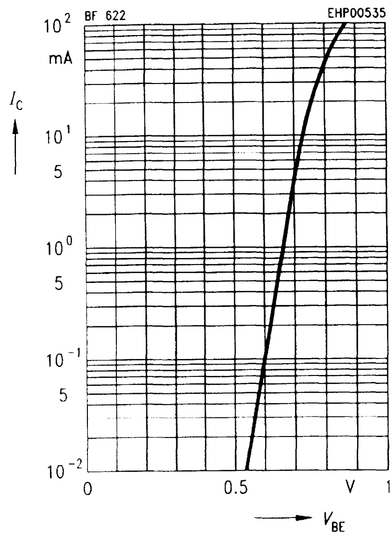
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 10 V, f = 20 MHz



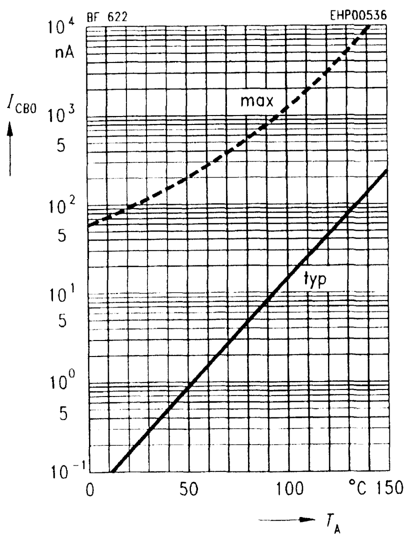
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 20 V



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



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

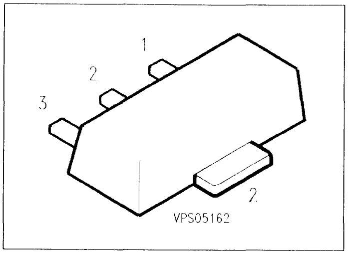


SIEMENS

PNP Silicon High-Voltage Transistor

BF 623

- Suitable for video output stages in TV sets
- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary type: BF 622 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BF 623	DB	Q62702-F1053	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	250	V
Collector-base voltage	V_{CBO}	250	
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	250	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	50	mA
Peak collector current	I_{CM}	100	
Total power dissipation, T_S = 120 °C	P_{tot}	1	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 90	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 30	

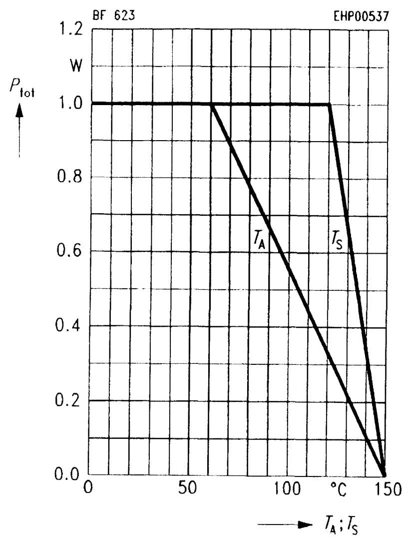
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

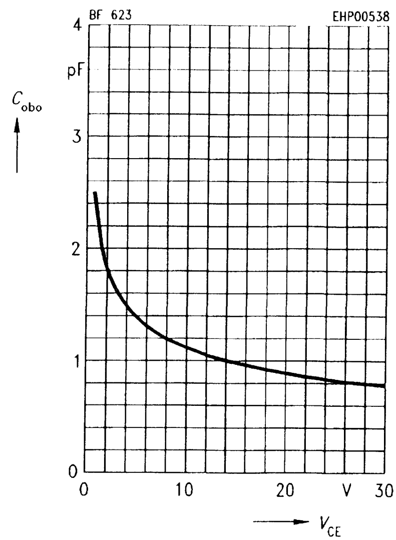
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage					V
I_C = 1 mA	$V_{(BR)CEO}$	250	–	–	
I_C = 10 µA, R_{BE} = 2.7 kΩ	$V_{(BR)CER}$	250	–	–	
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	250	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current	I_{CBO}				
V_{CB} = 200 V		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C		–	–	20	µA
Collector cutoff current	I_{CER}				µA
V_{CE} = 200 V, R_{BE} = 2.7 kΩ		–	–	1	
V_{CE} = 200 V, R_{BE} = 2.7 kΩ, T_A = 150 °C		–	–	50	
Emitter cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain [1] I_C = 25 mA, V_{CE} = 20 V	h_{FE}	50	–	–	–
Collector-emitter saturation voltage [1] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage [1] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	1	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	1.2	–	pF

[1] Pulse test: $t \leq 300$ µs, D = 2 %.

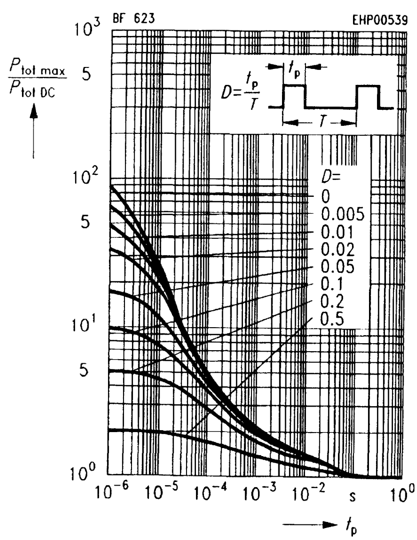
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



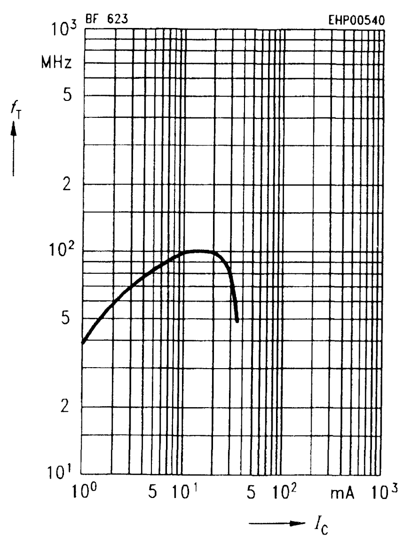
Output capacitance $C_{obo} = f(V_{CE})$
f = 1 MHz



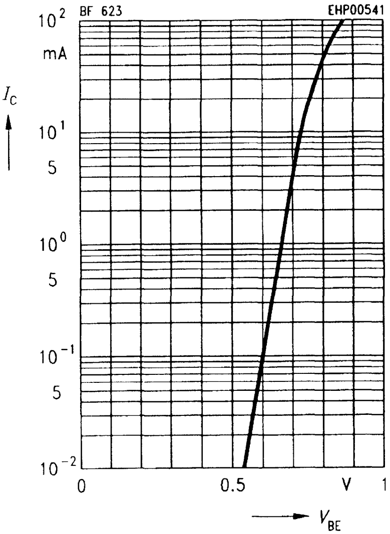
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



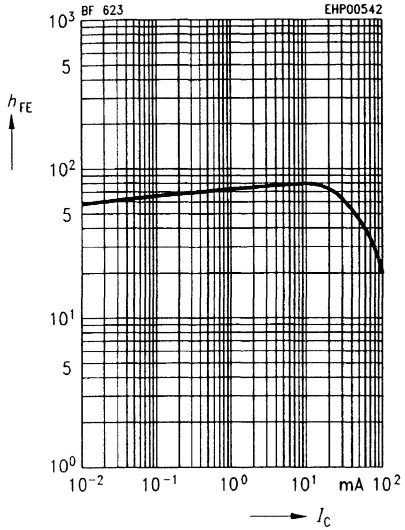
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz



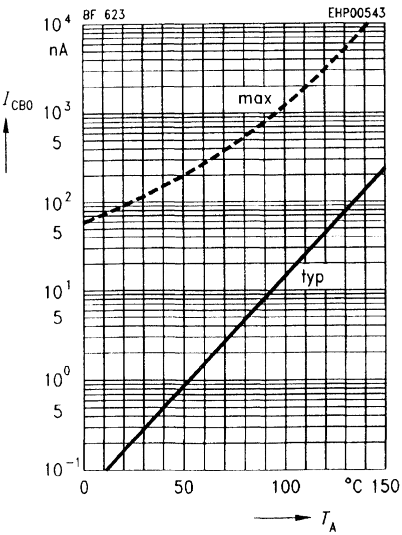
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



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



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

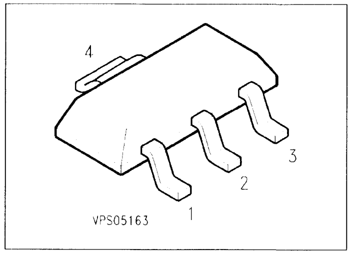


SIEMENS

NPN Silicon High-Voltage Transistors

BF 720
BF 722

- 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 (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BF 720 BF 722	BF 720 BF 722	Q62702-F1238 Q62702-F1306	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values BF 720	BF 722	Unit
Collector-emitter voltage	V_{CEO}	–	250	V
	V_{CER}	300	–	
Collector-base voltage	V_{CBO}	300	250	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	50		mA
Peak collector current	I_{CM}	100		
Total power dissipation, $T_S \leq 110$ °C [2)]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient [2)]	$R_{th JA}$	≤ 87	K/W
Junction - soldering point	$R_{th JS}$	≤ 27	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

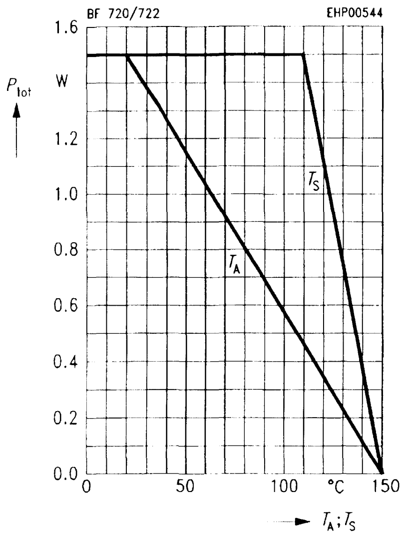
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

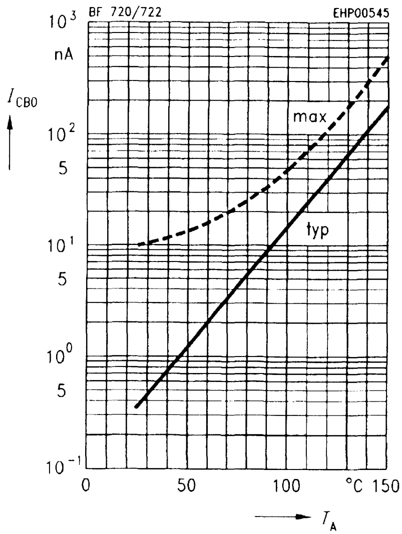
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0 BF 722	$V_{(BR)CEO}$	250	–	–	V
Collector-emitter breakdown voltage I_C = 10 μA, R_{BE} = 2.7 kΩ BF 720	$V_{(BR)CER}$	300	–	–	
Collector-base breakdown voltage I_C = 10 μA, I_B = 0 BF 720 BF 722	$V_{(BR)CBO}$	 300 250	 – –	 – –	
Emitter-base breakdown voltage I_E = 10 μA, I_C = 0	$V_{(BR)EBO}$	5	–	–	
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_{obo}	–	0.8	–	pF

[1] Pulse test conditions: t < 300 μs, D = 2 %.

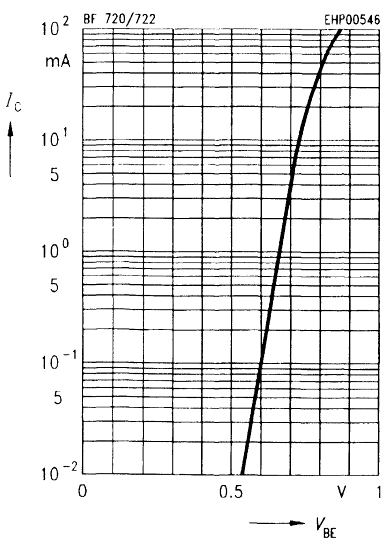
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



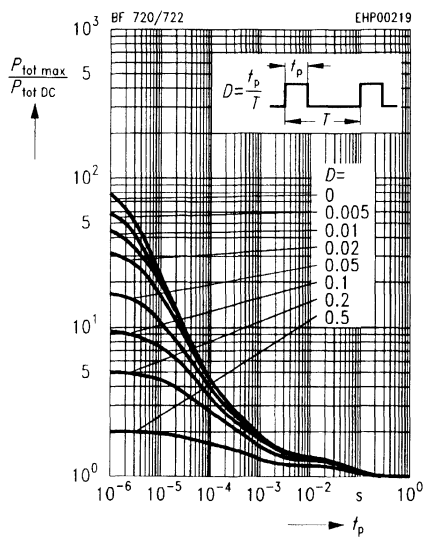
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 200 V



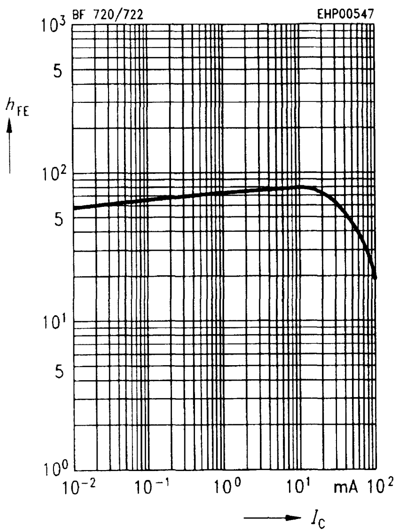
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



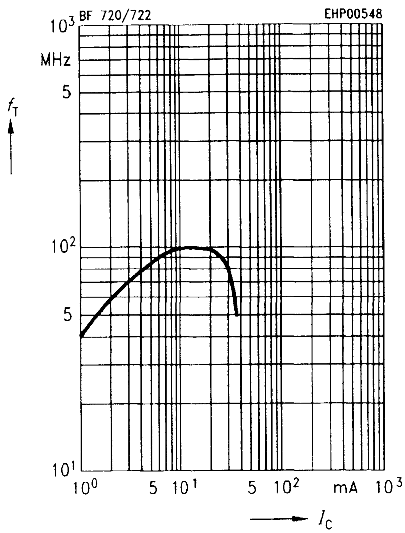
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



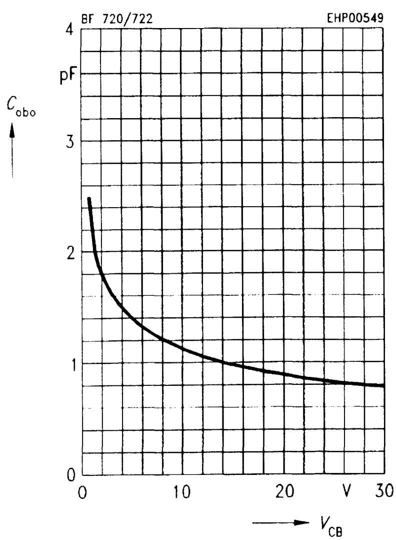
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 20 V



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



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

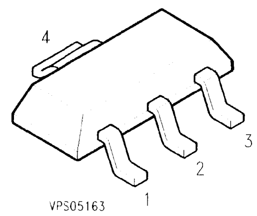


SIEMENS

PNP Silicon High-Voltage Transistors

BF 721
BF 723

- 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 (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BF 721 BF 723	BF 721 BF 723	Q62702-F1239 Q62702-F1309	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values BF 721	BF 723	Unit
Collector-emitter voltage	V_{CEO} V_{CER}	– 300	250 –	V
Collector-base voltage	V_{CBO}	300	250	
Emitter-base voltage	V_{EBO}	5	5	
Collector current	I_C	50		mA
Peak collector current	I_{CM}	100		
Total power dissipation, $T_S \leq 110$ °C [2)]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient [2)]	$R_{th\,JA}$	≤ 87	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 27	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

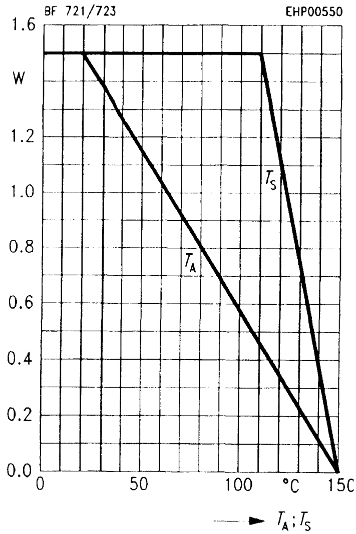
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

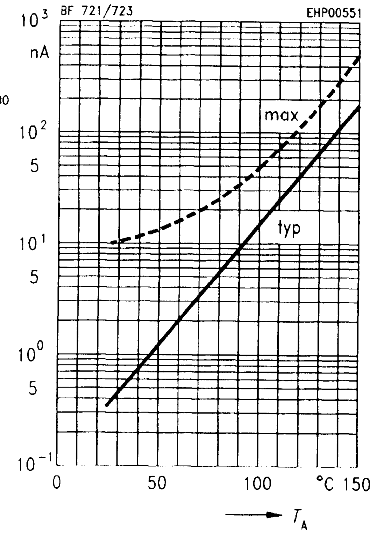
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0 BF 723	$V_{(BR)CEO}$	250	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ BF 721	$V_{(BR)CER}$	300	–	–	
Collector-base breakdown voltage I_C = 10 µA, I_B = 0 BF 721 BF 723	$V_{(BR)CBO}$	 300 250	 – –	 – –	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	5	–	–	
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_{obo}	–	0.8	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

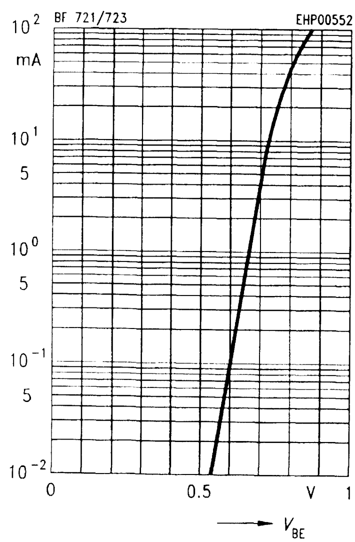
Total power dissipation $P_{tot} = f(T_A{}^*; T_S)$
* Package mounted on epoxy



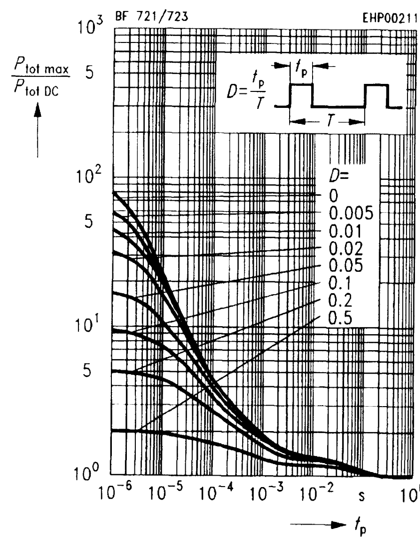
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 200 V



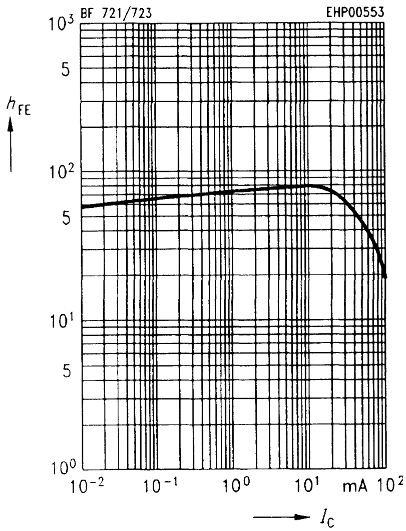
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



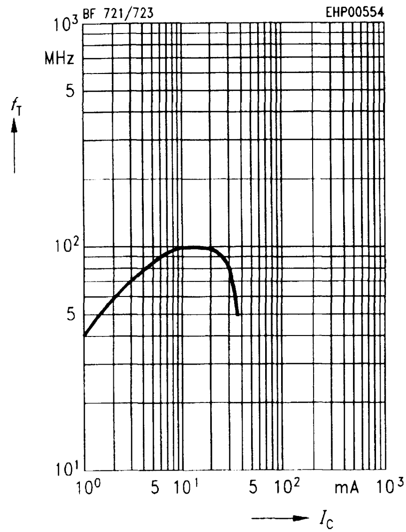
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



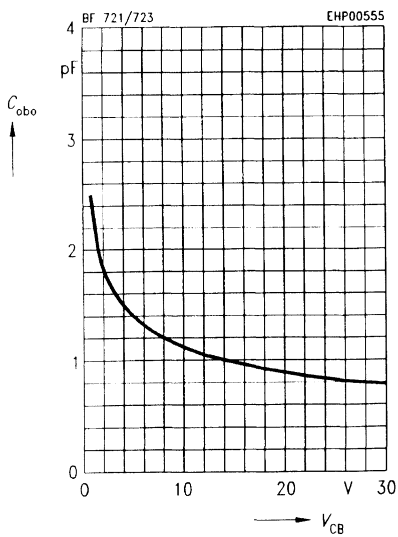
DC current gain $h_{FE} = f\,(I_C)$
V_{CE} = 20 V



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



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

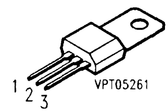


SIEMENS

NPN Silicon Transistors with High Reverse Voltage

BF 857 ... BF 859

- High breakdown voltage
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BF 857	–	Q62702-F784	E	C	B	TO-202
BF 858		Q62702-F785				
BF 859		Q62702-F786				

Maximum Ratings

Parameter	Symbol	Values BF 857	BF 858	BF 859	Unit
Collector-emitter voltage	V_{CE0}	160	250	300	V
Collector-base voltage	V_{CB0}	160	250	300	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	200			mA
Peak collector current	I_{CM}	500			
Base current	I_B	100			
Peak base current	I_{BM}	200			
Total power dissipation T_A = 25 °C T_C = 114 °C	P_{tot}	 1.8 2.5			W
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 70	K/W
Junction - case	$R_{th JC}$	≤ 20	

1) For detailed information see chapter Package Outlines.

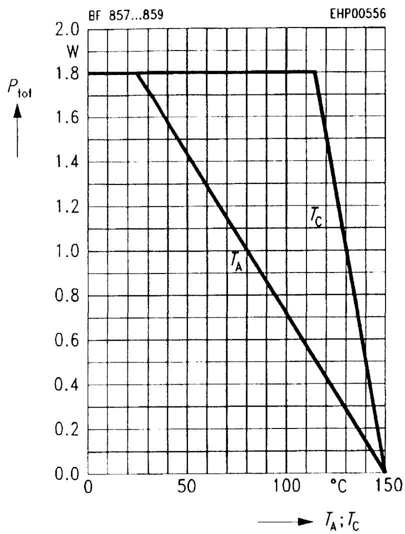
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

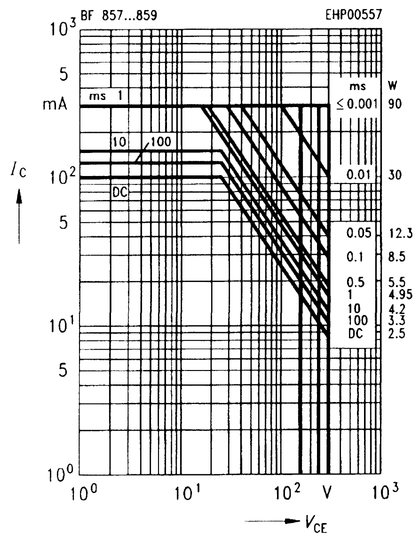
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 10 mA	BF 857		160	–	–	
	BF 858		250	–	–	
	BF 859		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	BF 857		160	–	–	
	BF 858		250	–	–	
	BF 859		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 100 V	BF 857		–	–	50	nA
V_{CB} = 200 V	BF 858		–	–	50	nA
V_{CB} = 250 V	BF 859		–	–	50	nA
V_{CB} = 100 V, T_A = 150 °C	BF 857		–	–	20	µA
V_{CB} = 200 V, T_A = 150 °C	BF 858		–	–	20	µA
V_{CB} = 250 V, T_A = 150 °C	BF 859		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	50	nA
DC current gain I_C = 30 mA, V_{CE} = 10 V [1]		h_{FE}	25	–	–	–
Collector-emitter saturation voltage [1] I_C = 30 mA, I_B = 6 mA		V_{CEsat}	–	–	1	V
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	5.5	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

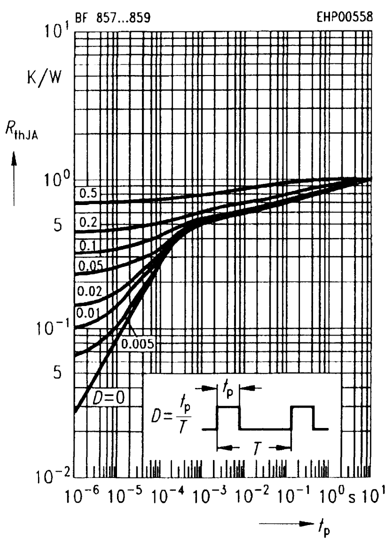
Total power dissipation $P_{tot} = f(T_A, T_C)$



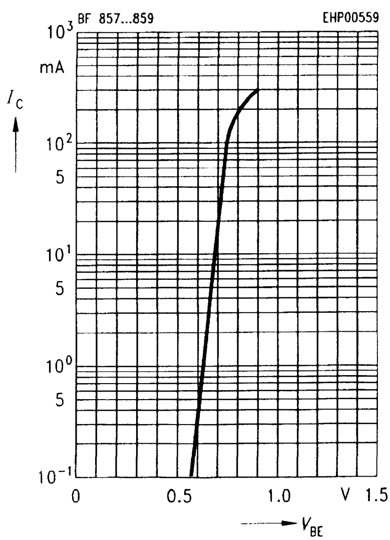
Permissible operating range $I_C = f(V_{CE})$
T_A = 100 °C, D = 0



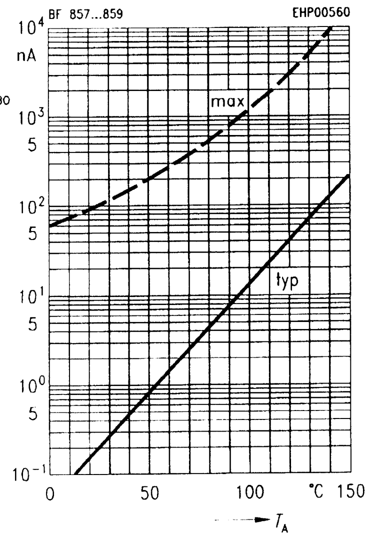
Permissible pulse load $R_{thJA} = f(t_p)$



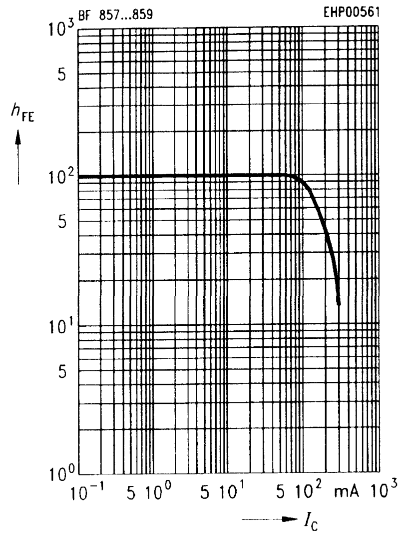
Collector current $I_C = f(V_{BE})$
V_{CE} = 10 V



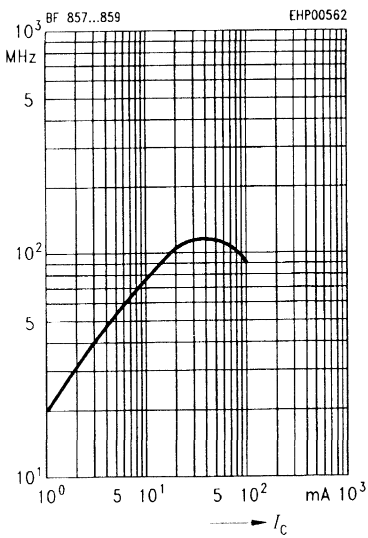
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 100 V/200 V/250 V



DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz

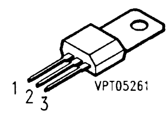


SIEMENS

NPN Silicon Transistors with High Reverse Voltage

BF 869 ... BF 881

- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary types: BF 870, BF 872 (PNP)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BF 869 BF 871 BF 881	–	Q62702-F683 Q62702-F676 Q62702-F794	E	C	B	TO-202

Maximum Ratings

Parameter	Symbol	Values BF 869	BF 871	BF 881	Unit
Collector-emitter voltage	V_{CEO}	250	–	–	V
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	–	300	400	
Collector-base voltage	V_{CBO}	250	300	400	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	50			mA
Peak base current	I_{BM}	100			
Total power dissipation T_A = 40 ˚C T_C = 110 ˚C	P_{tot}	 1.6 1.6			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 70	K/W
Junction - case	$R_{th JC}$	≤ 25	

1) For detailed information see chapter Package Outlines.

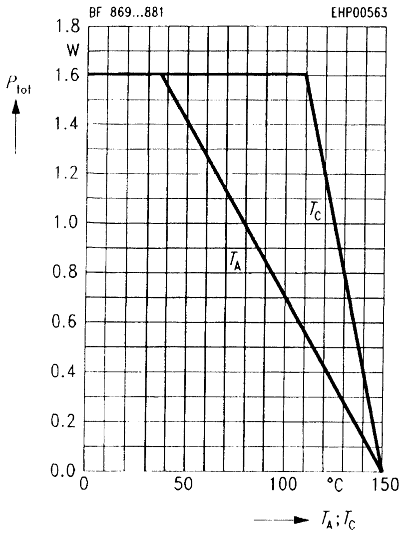
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

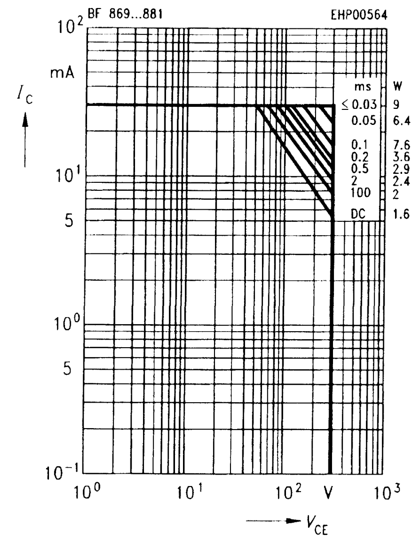
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA BF 869	$V_{(BR)CEO}$	250	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA BF 871 BF 881	$V_{(BR)CER}$	 300 400	 – –	 – –	
Collector-base breakdown voltage I_C = 10 µA BF 869 BF 871 BF 881	$V_{(BR)CBO}$	 250 300 400	 – – –	 – – –	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 200 V BF 869, BF 871 V_{CB} = 350 V BF 881	I_{CBO}	 – –	 – –	 10 100	nA
Collector cutoff current V_{CE} = 200 V, R_{BE} = 2.7 kΩ, T_A = 150 °C BF 869, BF 871 V_{CE} = 350 V, R_{BE} = 2.7 kΩ, T_A = 150 °C BF 881	I_{CER}	 – –	 – –	 10 10	µA
Emitter-base cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain I_C = 25 mA, V_{CE} = 20 V BF 869 BF 871, BF 881	h_{FE}	 50 40	 – –	 – –	–
Collector-emitter saturation voltage [1] I_C = 25 mA, T_j = 150 °C	$V_{CEsatRF}$	–	–	20	V
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	1.2	–	pF

[1] Pulse test conditions: t < 300 µs, D < 2 %.

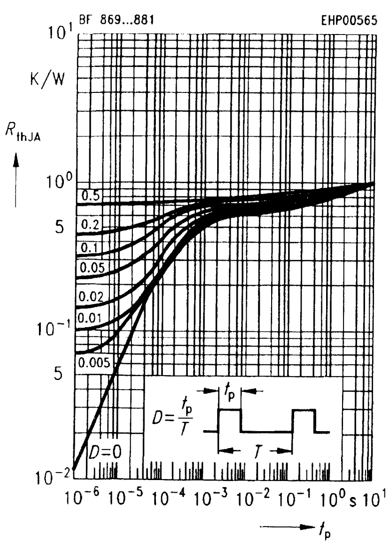
Total power dissipation $P_{tot} = f(T_A; T_C)$



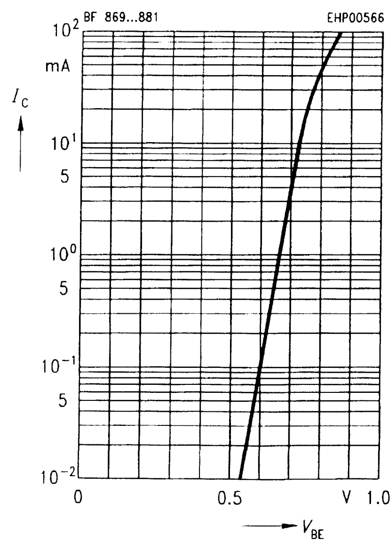
Operating range $I_C = f(V_{CE})$
$T_A \leq 110\ °C$, $D = 0.01$



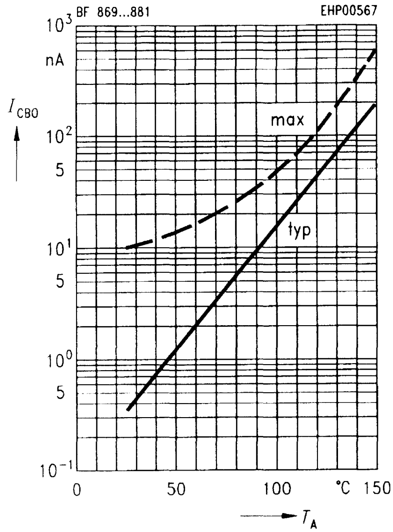
Permissible pulse load $R_{thJA} = f(t_p)$



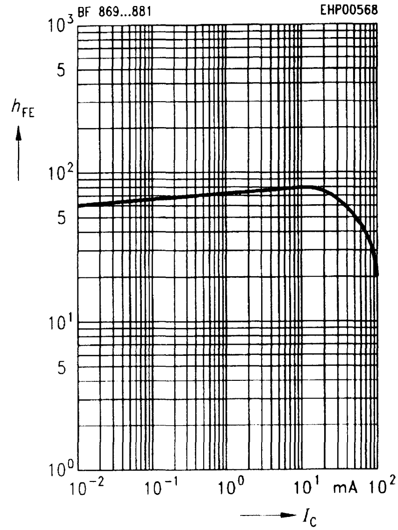
Collector current $I_C = f(V_{BE})$
$V_{CE} = 20$ V



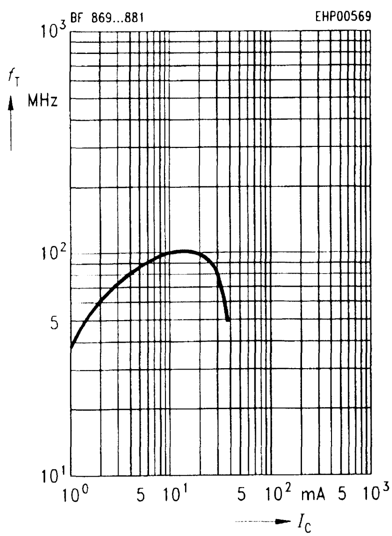
Collector cutoff current $I_{CBO} = f\,(T_A)$
V_{CB} = 200 V, 350 V



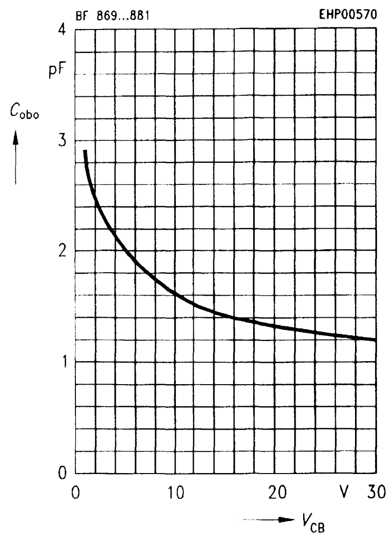
DC current gain $h_{FE} = f\,(I_C)$
V_{CE} = 20 V, T_A = 25 °C



Transition frequency $f_T = f\,(I_C)$
V_{CE} = 10 V, f = 20 MHz



Output capacitance $C_{obo} = f\,(V_{CB})$
I_C = 0, f = 1 MHz

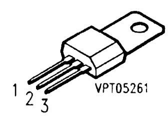


SIEMENS

PNP Silicon Transistors with High Reverse Voltage

BF 870
BF 872

- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary types: BF 869, BF 871 (NPN)



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
BF 870 BF 872	–	Q62702-F685 Q62702-F677	E	C	B	TO-202

Maximum Ratings

Parameter	Symbol	Values BF 870	BF 872	Unit
Collector-emitter voltage	V_{CE0}	250	–	V
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	–	300	
Collector-base voltage	V_{CB0}	250	300	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	50		mA
Peak base current	I_{BM}	100		
Total power dissipation T_A = 40 °C T_C = 110 °C	P_{tot}	 1.6 1.6		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 70	K/W
Junction - case	$R_{th\,JC}$	≤ 25	

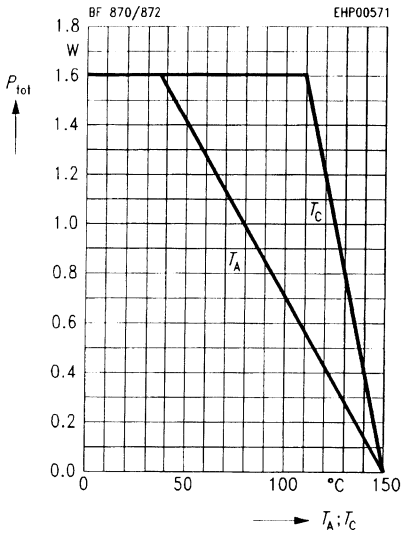
1) For detailed information see chapter Package Outlines.

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

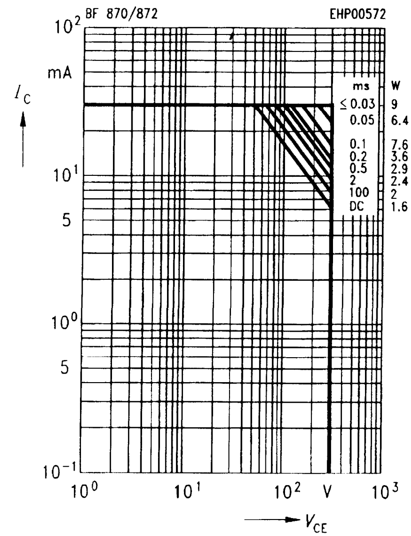
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA BF 870	$V_{(BR)CEO}$	250	–	–	V
Collector-emitter breakdown voltage I_C = 10 µA BF 872	$V_{(BR)CER}$	300	–	–	
Collector-base breakdown voltage I_C = 10 µA BF 870 BF 872	$V_{(BR)CBO}$	 250 300	 – –	 – –	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 200 V	I_{CBO}	–	–	10	nA
Collector cutoff current V_{CE} = 200 V, R_{BE} = 2.7 kΩ, T_A = 150 °C	I_{CER}	–	–	10	µA
Emitter-base cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain I_C = 25 mA, V_{CE} = 20 V BF 870 BF 872	h_{FE}	 50 40	 – –	 – –	–
Collector-emitter saturation voltage [1] I_C = 25 mA, T_j = 150 °C	$V_{CEsatRF}$	–	–	20	V
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	1.2	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

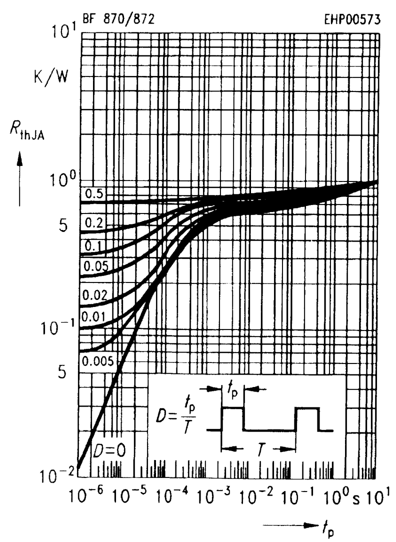
Total power dissipation $P_{tot} = f\,(T_A;\ T_C)$



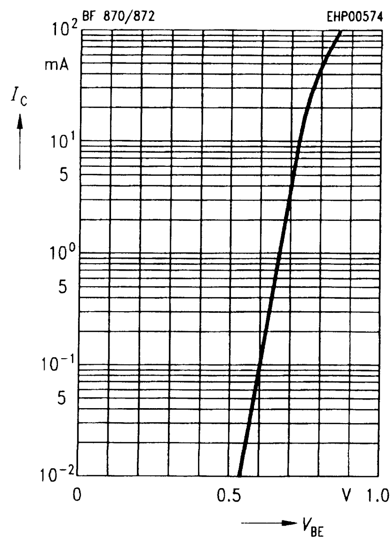
Operating range $I_C = f\,(V_{CE})$
$T_A \leq 110\ °C$, $D = 0.01$



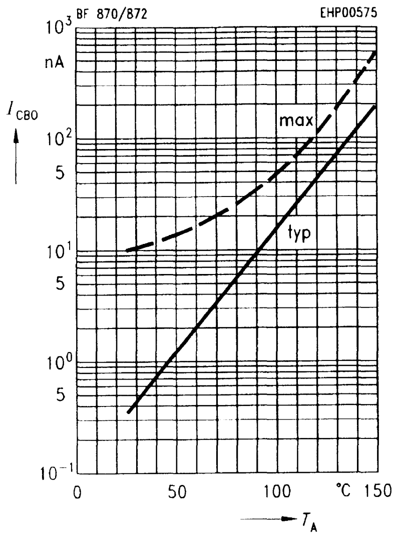
Permissible pulse load $R_{thJA} = f\,(t_p)$



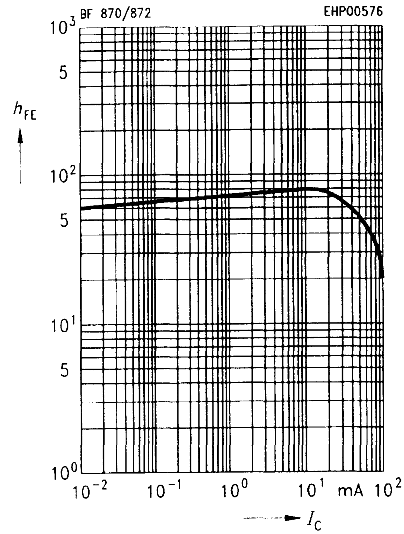
Collector current $I_C = f\,(V_{BE})$
$V_{CE} = 20$ V, $T_A = 25\ °C$



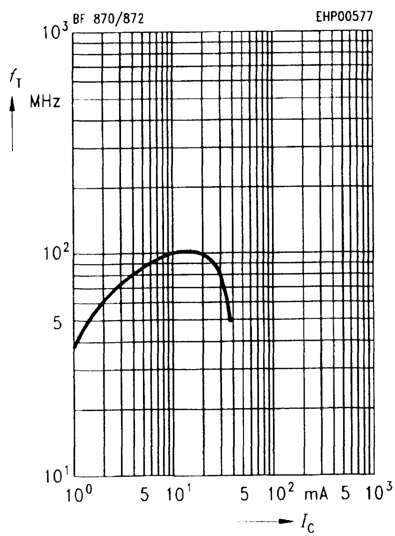
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 200 V



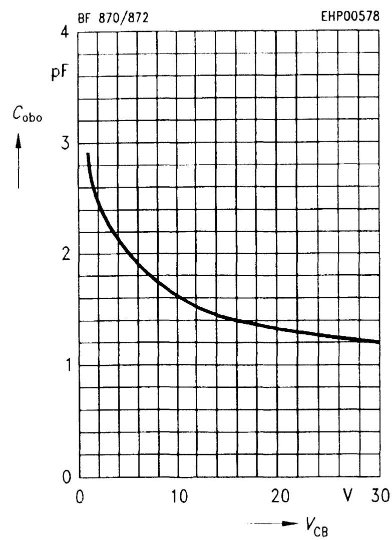
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 20 V, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz



Output capacitance $C_{obo} = f(V_{CB})$
I_C = 0, f = 1 MHz

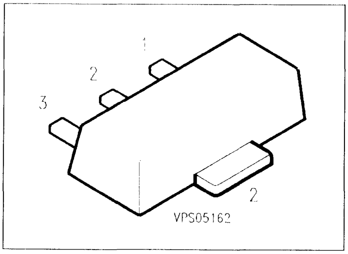


SIEMENS

NPN Silicon High-Voltage Transistors

BFN 16
BFN 18

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: BFN 17, BFN 19 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFN 16	DD	Q62702-F885	B	C	E	SOT-89
BFN 18	DE	Q62702-F1056				

Maximum Ratings

Parameter	Symbol	Values BFN 16	BFN 18	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_S = 130$ °C	P_{tot}	1		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 75	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 20	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

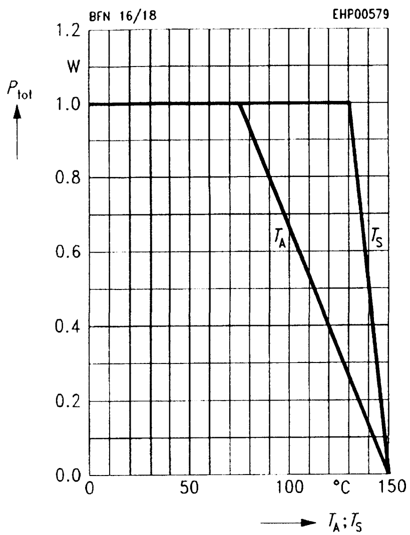
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

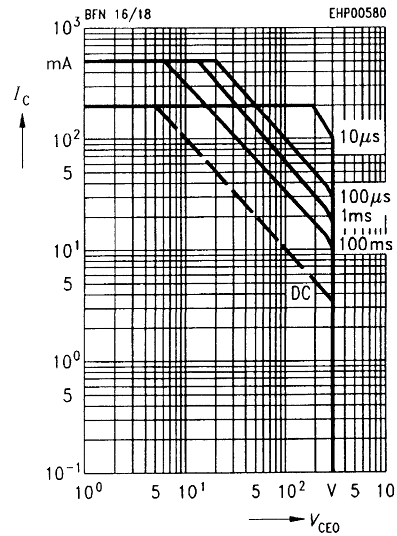
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA	BFN 16		250	–	–	
	BFN 18		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	BFN 16		250	–	–	
	BFN 18		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 200 V	BFN 16		–	–	100	nA
V_{CB} = 250 V	BFN 18		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	BFN 16		–	–	20	µA
V_{CB} = 250 V, T_A = 150 °C	BFN 18		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V[1]	BFN 16		40	–	–	
	BFN 18		30	–	–	
Collector-emitter saturation voltage[1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	BFN 16		–	–	0.4	
	BFN 18		–	–	0.5	
Base-emitter saturation voltage[1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	70	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	1.5	–	pF

[1] Pulse test conditions: t < 300 µs, D = 2 %.

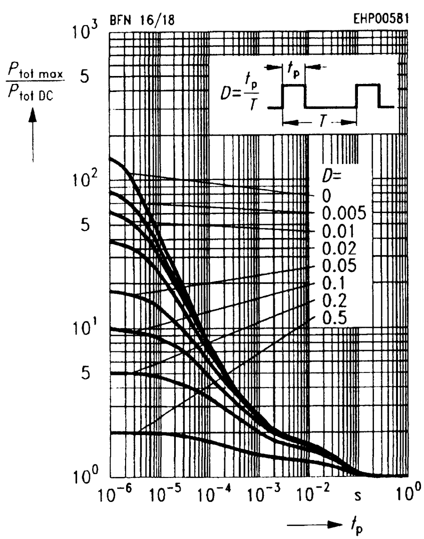
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



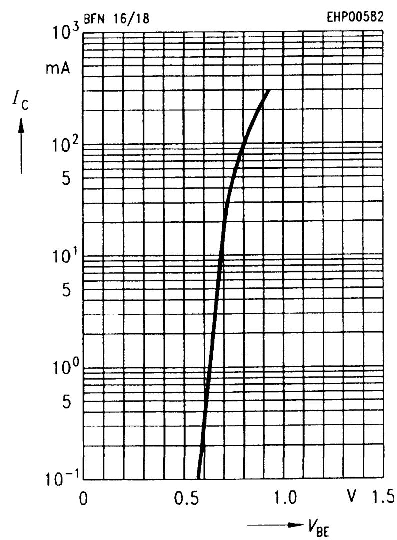
Operating range $I_C = f(V_{CE0})$
T_A = 25 °C, D = 0



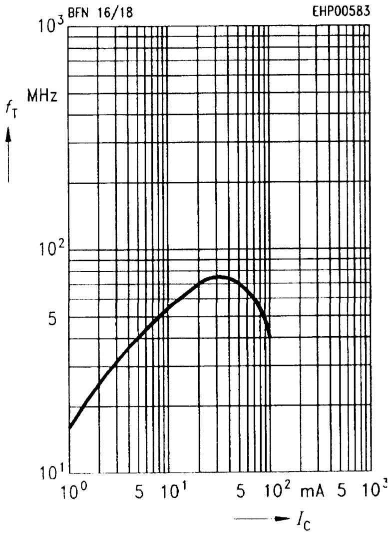
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



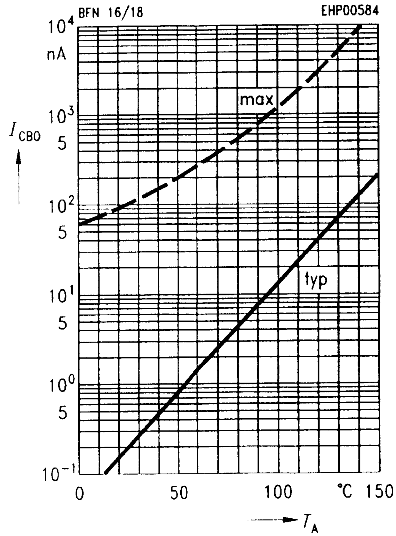
Collector current $I_C = f(V_{BE})$
V_{CE} = 10 V



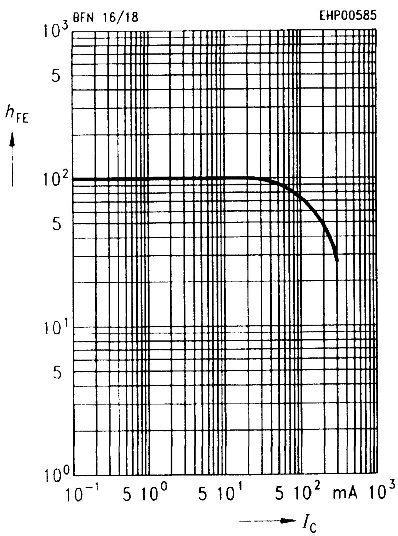
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



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



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

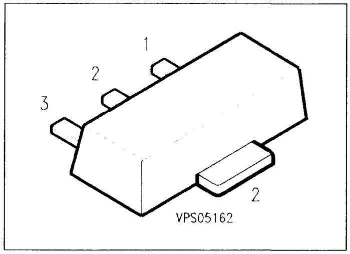


SIEMENS

PNP Silicon High-Voltage Transistors

BFN 17
BFN 19

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: BFN 16, BFN 18 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFN 17 BFN 19	DG DH	Q62702-F884 Q62702-F1057	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values BFN 17	BFN 19	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_S = 130$ ˚C	P_{tot}	1		W
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 75	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 20	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

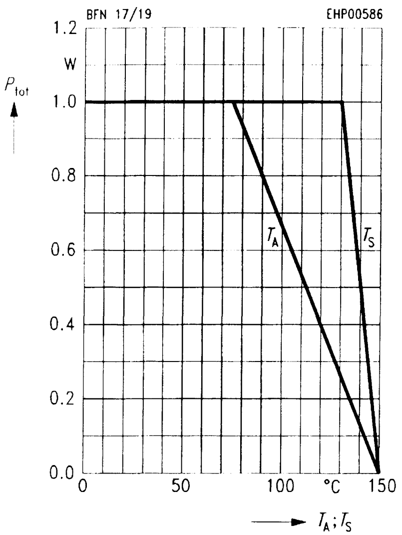
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

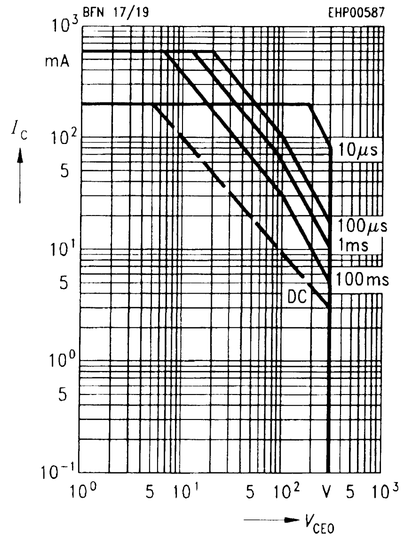
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA	BFN 17		250	–	–	
	BFN 19		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	BFN 17		250	–	–	
	BFN 19		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 200 V	BFN 17		–	–	100	nA
V_{CB} = 250 V	BFN 19		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	BFN 17		–	–	20	µA
V_{CB} = 250 V, T_A = 150 °C	BFN 19		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V[1]	BFN 17		40	–	–	
	BFN 19		30	–	–	
Collector-emitter saturation voltage[1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	BFN 17		–	–	0.4	
	BFN 19		–	–	0.5	
Base-emitter saturation voltage[1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	2.5	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

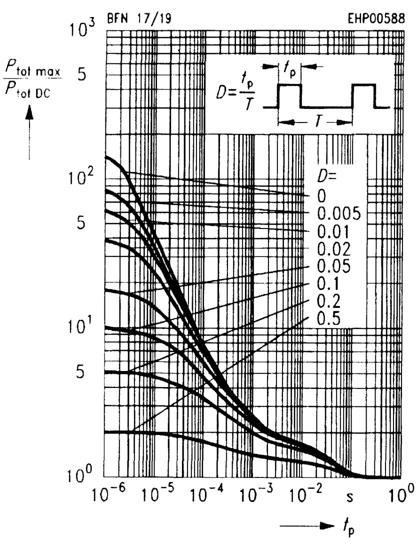
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



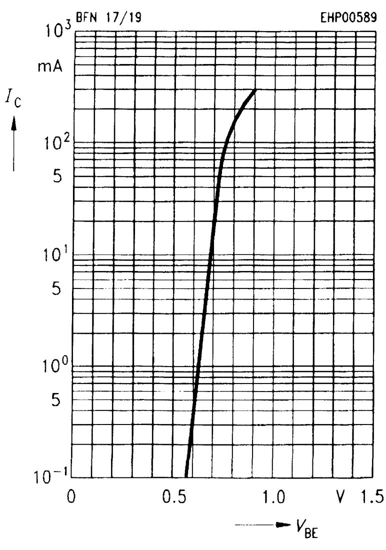
Operating range $I_C = f(V_{CE0})$
T_A = 25 °C, D = 0



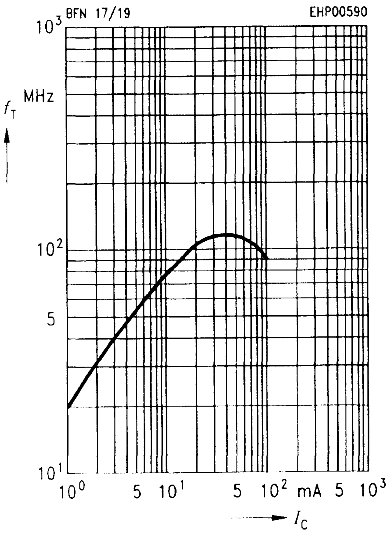
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



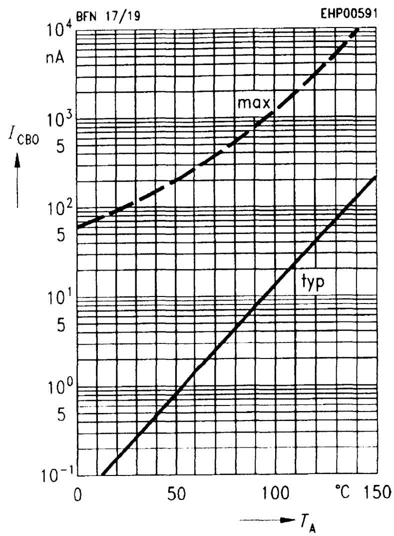
Collector current $I_C = f(V_{BE})$
V_{CE} = 10 V



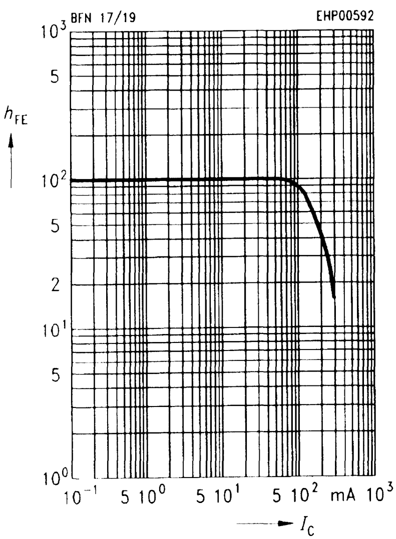
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



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



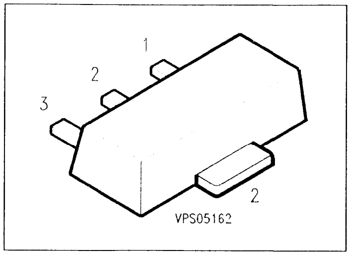
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



SIEMENS

NPN Silicon High-Voltage Transistor — BFN 20

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary type: BFN 21 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BFN 20	DC	Q62702-F1058	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	300	V
Collector-base voltage	V_{CBO}	300	
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	300	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	50	mA
Peak collector current	I_{CM}	100	
Total power dissipation, T_S = 120 ˚C	P_{tot}	1	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 90	K/W
Junction - soldering point	$R_{th JS}$	≤ 30	

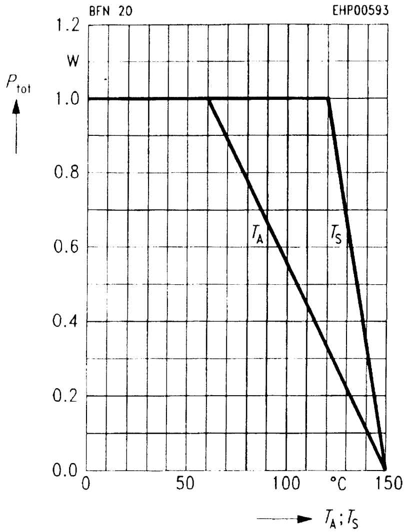
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

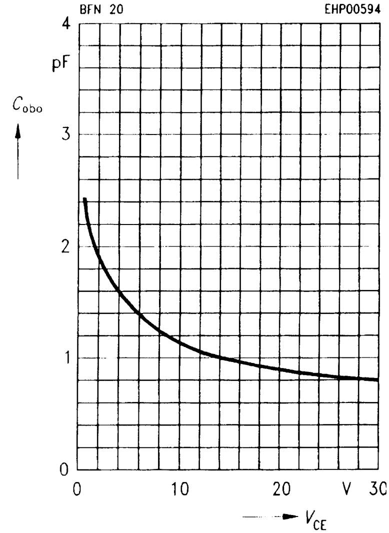
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	300	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	300	–	–	
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ	$V_{(BR)CER}$	300	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 250 V V_{CB} = 250 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA µA
Collector cutoff current V_{CE} = 300 V, R_{BE} = 2.7 kΩ V_{CE} = 300 V, T_A = 150 °C, R_{BE} = 2.7 kΩ	I_{CER}	 – –	 – –	 1 50	µA
Emitter-base cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain[1] I_C = 25 mA, V_{CE} = 20 V	h_{FE}	40	–	–	–
Collector-emitter saturation voltage[1] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage[1] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	1	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	0.8	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

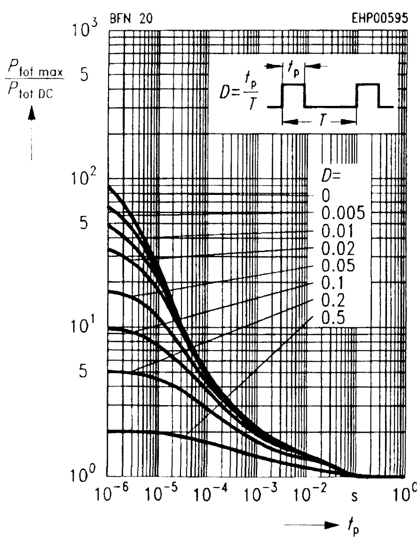
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



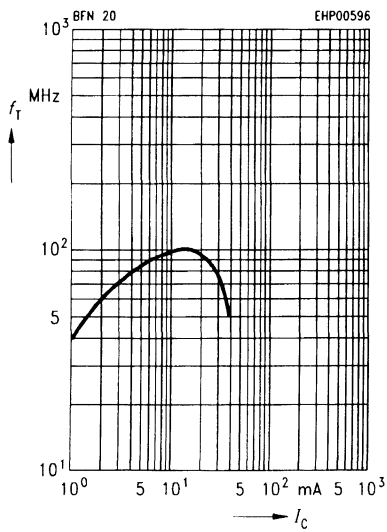
Output capacitance $C_{obo} = f(V_{CE})$
f = 1 MHz



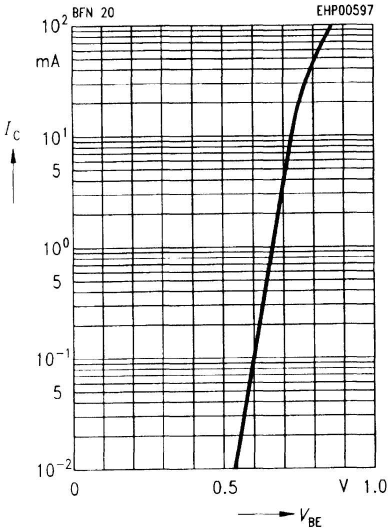
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



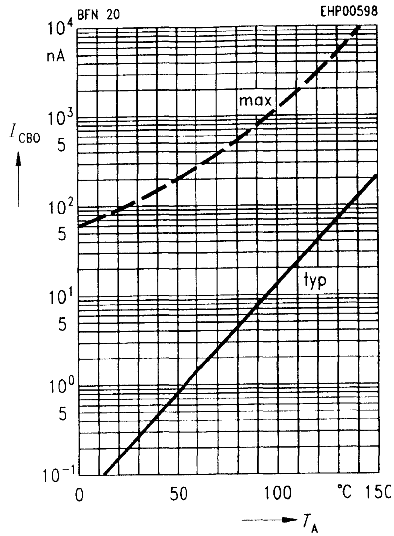
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



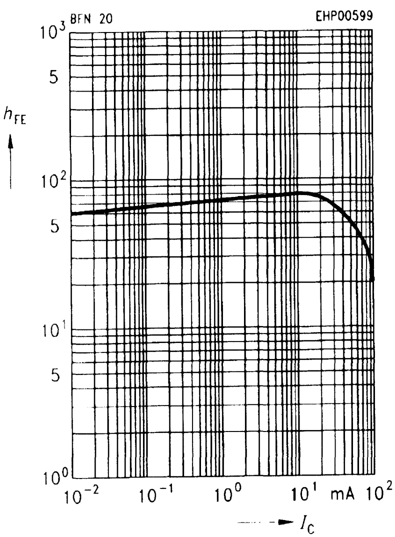
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 250 V



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

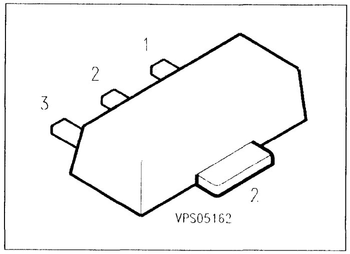


SIEMENS

PNP Silicon High-Voltage Transistor

BFN 21

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary type: BFN 20 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BFN 21	DF	Q62702-F1059	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	300	V
Collector-base voltage	V_{CB0}	300	
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	300	
Emitter-base voltage	V_{EB0}	5	
Collector current	I_C	50	mA
Peak collector current	I_{CM}	100	
Total power dissipation, T_S = 120 ˚C	P_{tot}	1	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 90	K/W
Junction - soldering point	$R_{th JS}$	≤ 30	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

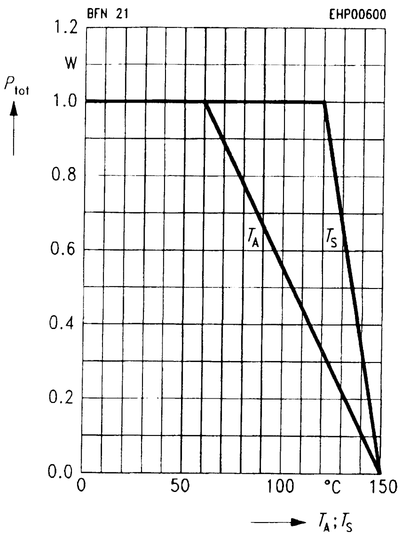
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

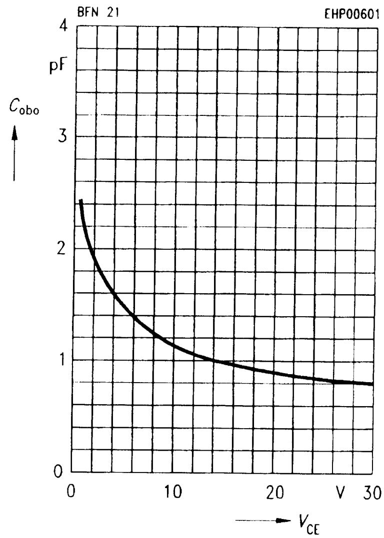
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	300	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	300	–	–	
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ	$V_{(BR)CER}$	300	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 250 V V_{CB} = 250 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA µA
Collector cutoff current V_{CE} = 300 V, R_{BE} = 2.7 kΩ V_{CE} = 300 V, T_A = 150 °C, R_{BE} = 2.7 kΩ	I_{CER}	 – –	 – –	 1 50	µA
Emitter-base cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain[1)] I_C = 25 mA, V_{CE} = 20 V	h_{FE}	40	–	–	–
Collector-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	1	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	1.2	–	pF

1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

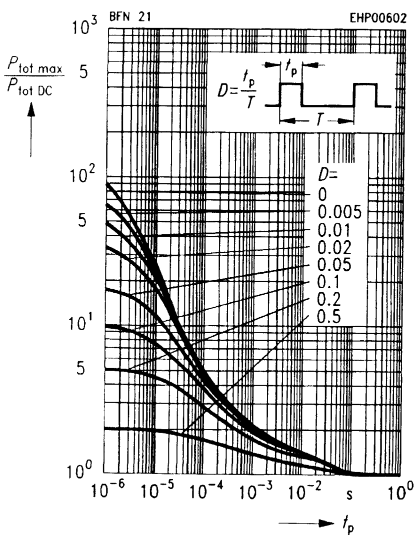
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



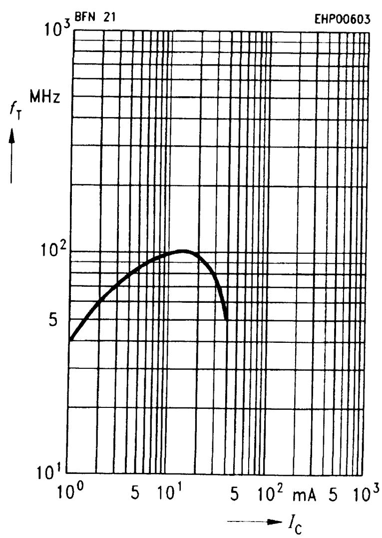
Output capacitance $C_{obo} = f(V_{CE})$
f = 1 MHz



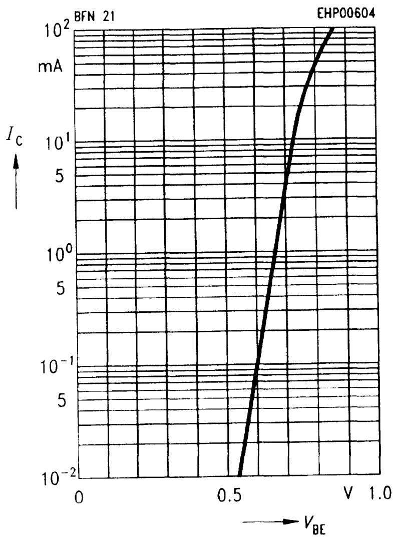
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



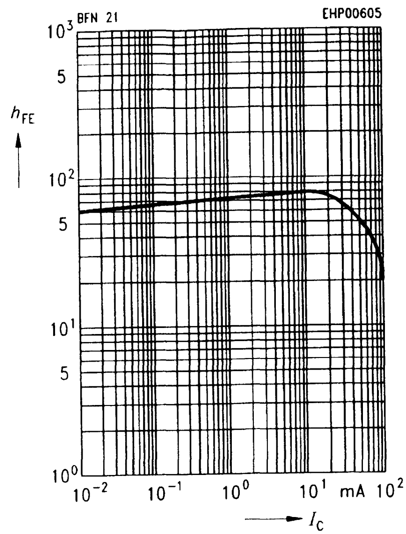
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



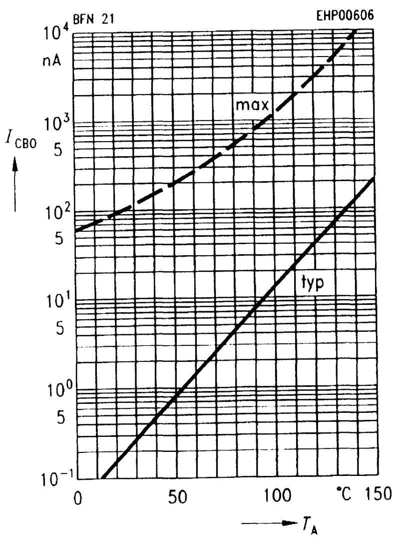
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



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



Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 250 V

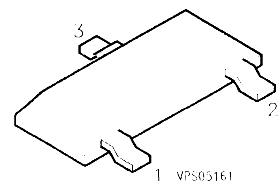


SIEMENS

NPN Silicon High-Voltage Transistor

BFN 22

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary type: BFN 23 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BFN 22	HBs	Q62702-F1024	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	250	V
Collector-base voltage	V_{CBO}	250	
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	250	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	50	mA
Peak collector current	I_{CM}	100	
Total power dissipation, T_S = 71 ˚C	P_{tot}	360	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 290	K/W
Junction - soldering point	$R_{th JS}$	≤ 220	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

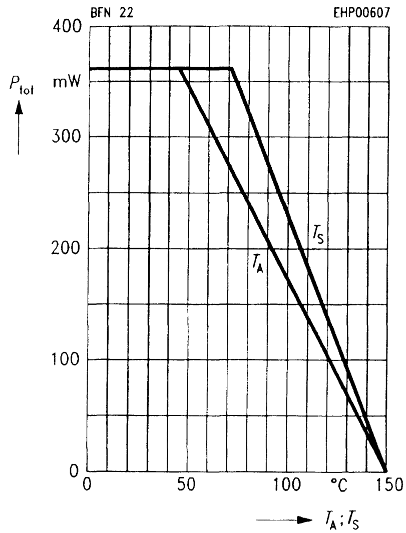
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

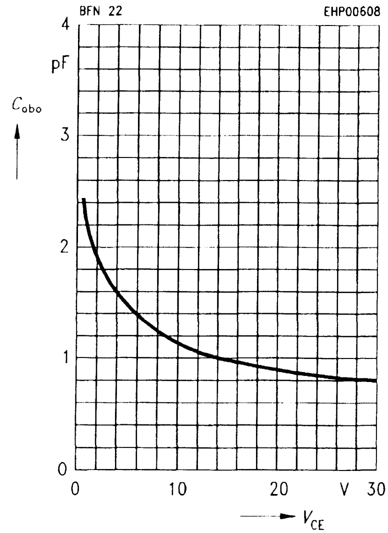
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	250	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	250	–	–	
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ	$V_{(BR)CER}$	250	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 200 V V_{CB} = 200 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA µA
Collector cutoff current V_{CE} = 250 V, R_{BE} = 2.7 kΩ V_{CE} = 250 V, T_A = 150 °C, R_{BE} = 2.7 kΩ	I_{CER}	 – –	 – –	 1 50	µA
Emitter-base cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain[1)] I_C = 25 mA, V_{CE} = 20 V	h_{FE}	50	–	–	–
Collector-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	1	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	0.8	–	pF

1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

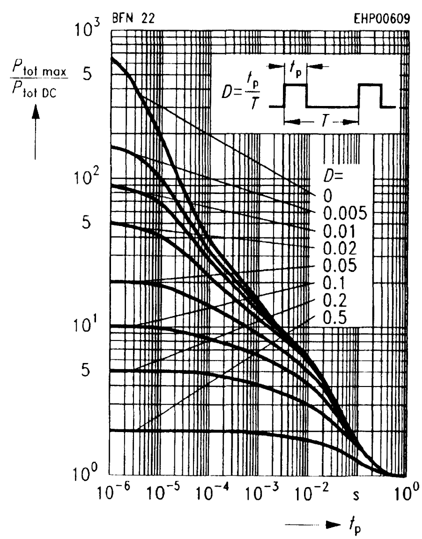
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



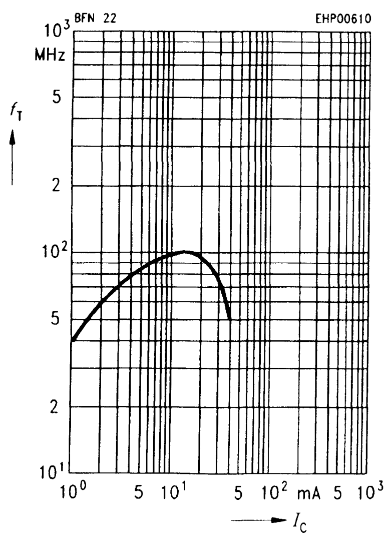
Output capacitance $C_{obo} = f(V_{CE})$
f = 1 MHz



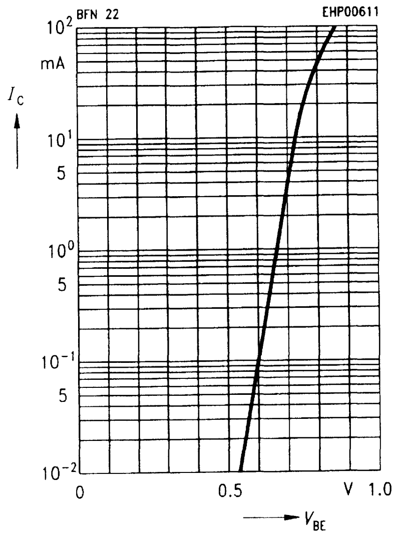
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



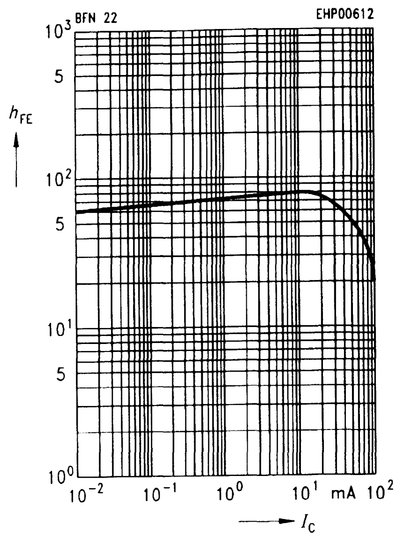
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



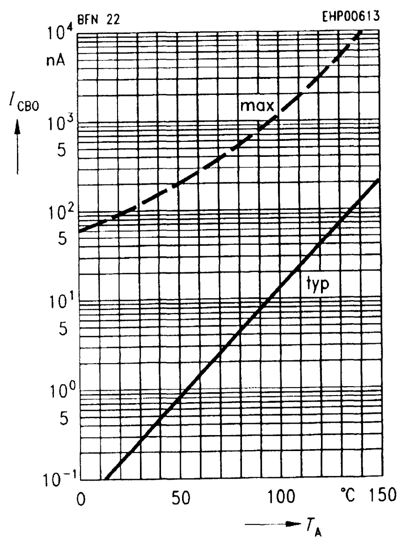
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



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



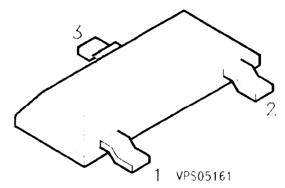
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 200 V



PNP Silicon High-Voltage Transistor

BFN 23

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary type: BFN 22 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFN 23	HCs	Q62702-F1064	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	250	V
Collector-base voltage	V_{CB0}	250	
Collector-emitter voltage, R_{BE} = 2.7 kΩ	V_{CER}	250	
Emitter-base voltage	V_{EB0}	5	
Collector current	I_C	50	mA
Peak collector current	I_{CM}	100	
Total power dissipation, T_S = 71 ˚C	P_{tot}	360	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 290	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 220	

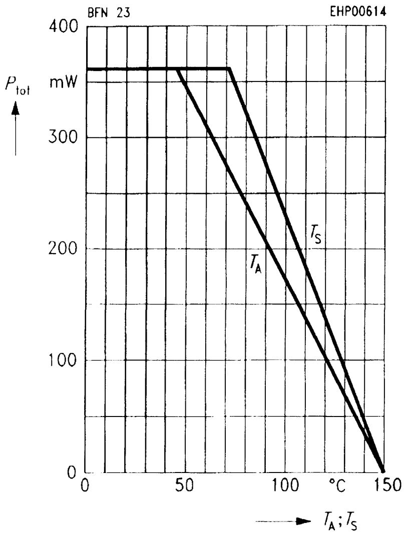
[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

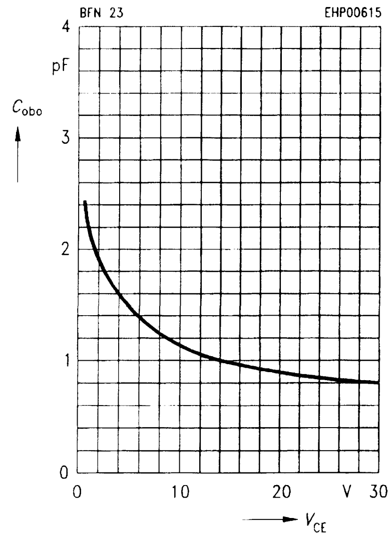
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	250	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	250	–	–	
Collector-emitter breakdown voltage I_C = 10 µA, R_{BE} = 2.7 kΩ	$V_{(BR)CER}$	250	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 200 V V_{CB} = 200 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA µA
Collector cutoff current V_{CE} = 250 V, R_{BE} = 2.7 kΩ V_{CE} = 250 V, T_A = 150 °C, R_{BE} = 2.7 kΩ	I_{CER}	 – –	 – –	 1 50	µA
Emitter-base cutoff current V_{EB} = 5 V	I_{EBO}	–	–	10	
DC current gain[1)] I_C = 25 mA, V_{CE} = 20 V	h_{FE}	50	–	–	–
Collector-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.5	V
Base-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	1	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 10 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz	C_{obo}	–	1.2	–	pF

1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

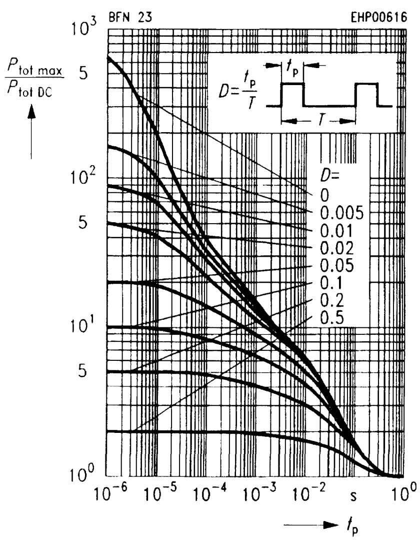
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



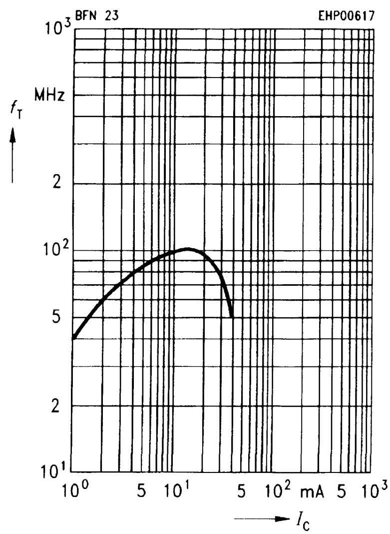
Output capacitance $C_{obo} = f(V_{CE})$
f = 1 MHz



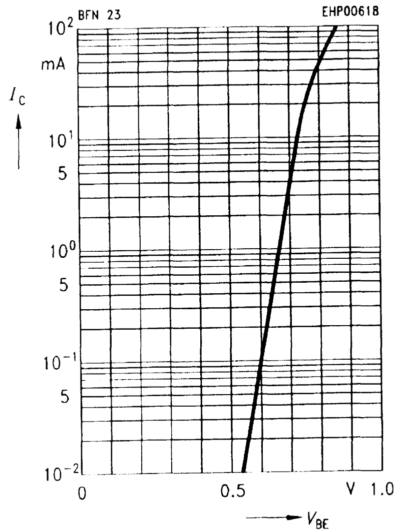
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



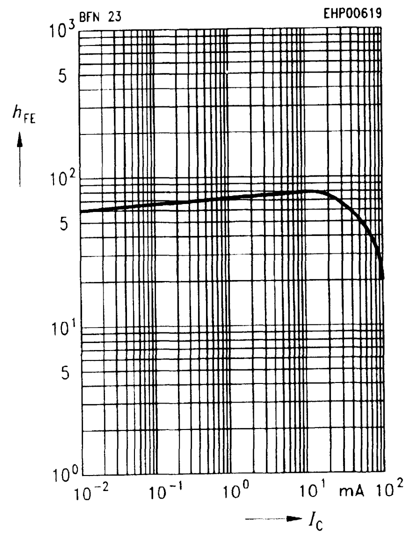
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



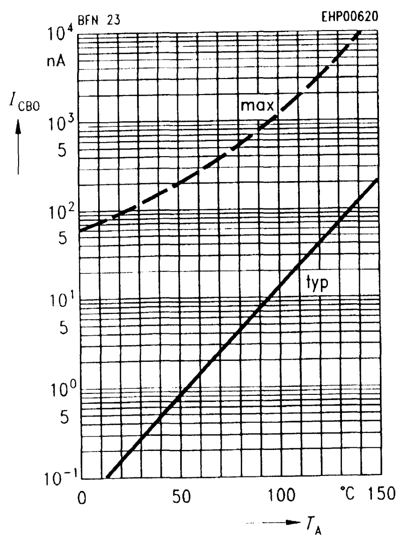
Collector current $I_C = f(V_{BE})$
V_{CE} = 20 V



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



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

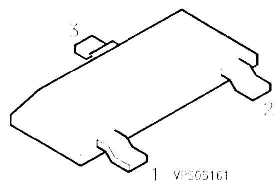


SIEMENS

NPN Silicon High-Voltage Transistors

BFN 24
BFN 26

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: BFN 25, BFN 27 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFN 24 BFN 26	FHs FJs	Q62702-F1065 Q62702-F976	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values BFN 24	BFN 26	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 74 °C	P_{tot}	360		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 280	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 210	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

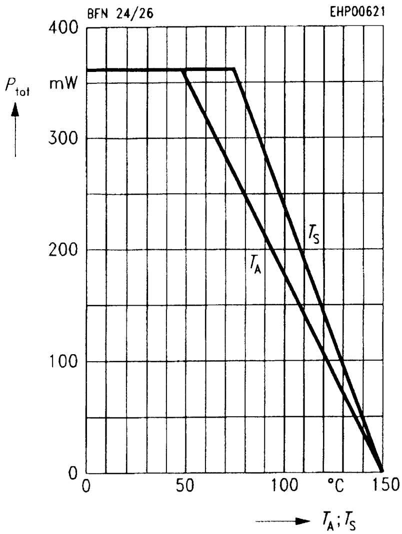
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

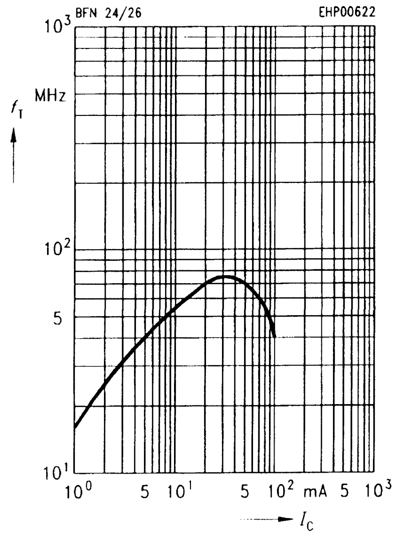
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 1 mA	BFN 24		250	–	–	
	BFN 26		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 100 μA	BFN 24		250	–	–	
	BFN 26		300	–	–	
Emitter-base breakdown voltage I_E = 100 μA		$V_{(BR)EB0}$	5	–	–	
Collector-base cutoff current		I_{CB0}				
V_{CB} = 200 V	BFN 24		–	–	100	nA
V_{CB} = 250 V	BFN 26		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	BFN 24		–	–	20	μA
V_{CB} = 250 V, T_A = 150 °C	BFN 26		–	–	20	μA
Emitter-base cutoff current V_{EB} = 3 V		I_{EB0}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V [1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V [1]	BFN 24		40	–	–	
	BFN 26		30	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	BFN 24		–	–	0.4	
	BFN 26		–	–	0.5	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	70	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	1.5	–	pF

[1] Pulse test conditions: $t \leq 300$ μs, D = 2 %.

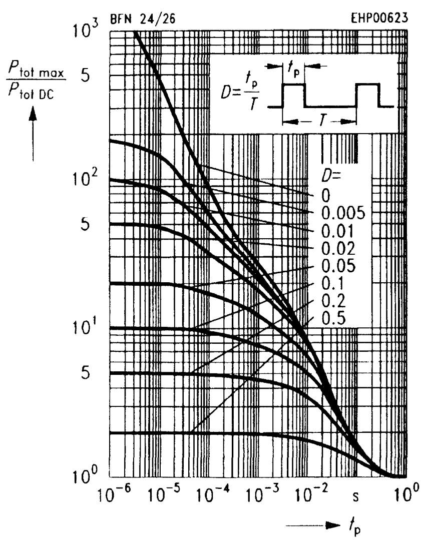
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



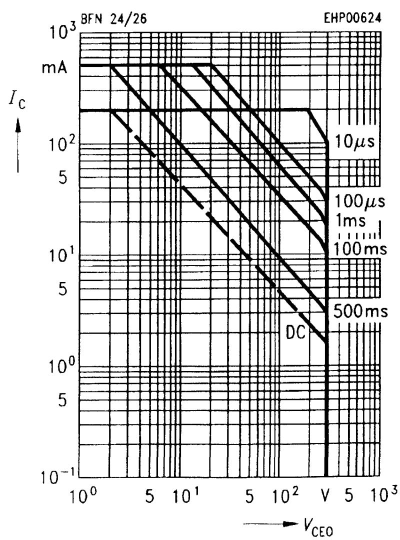
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



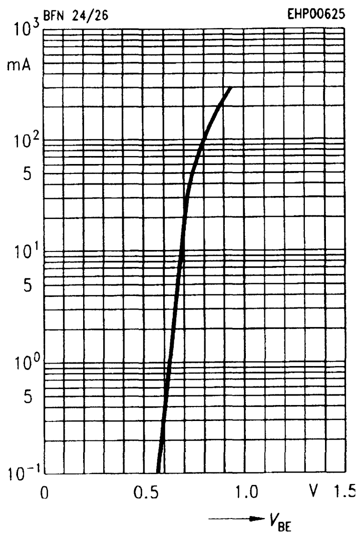
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



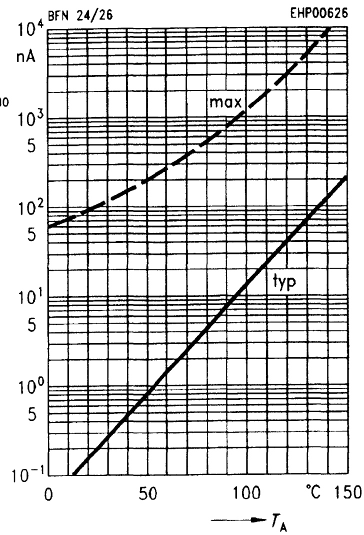
Operating range $I_C = f(V_{CE0})$
T_A = 25 °C, D = 0



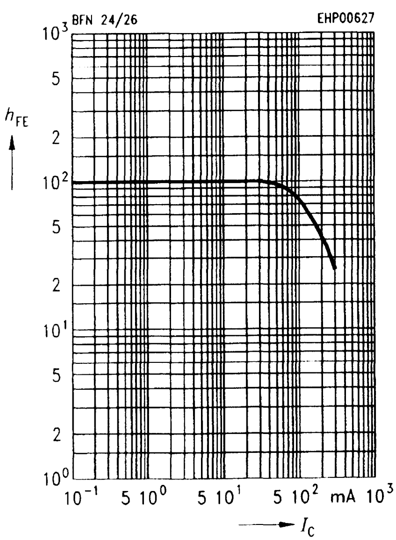
Collector current $I_C = f(V_{BE})$
V_{CE} = 10 V



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



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

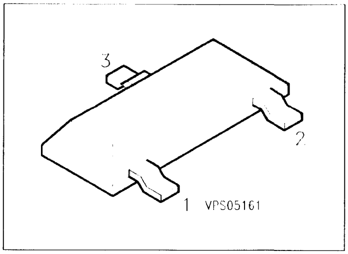


SIEMENS

PNP Silicon High-Voltage Transistors

BFN 25
BFN 27

- Suitable for video output stages in TV sets and switching power supplies
- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: BFN 24, BFN 26 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFN 25 BFN 27	FKs FLs	Q62702-F1066 Q62702-F977	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values BFN 25	BFN 27	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 74 °C	P_{tot}	360		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 280	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 210	

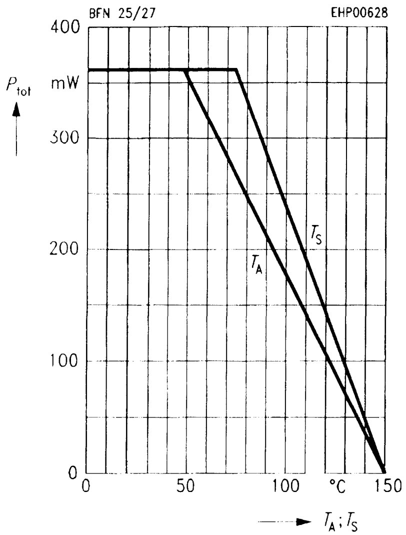
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

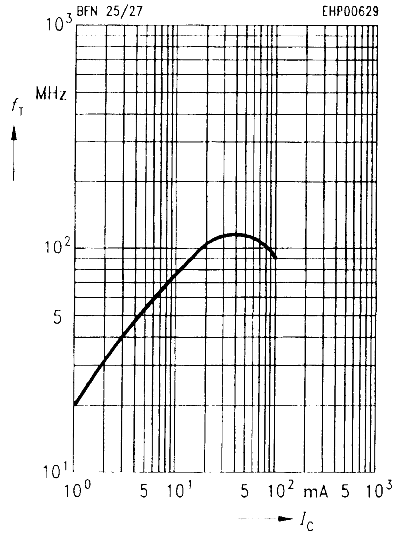
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 1 mA	BFN 25		250	–	–	
	BFN 27		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 100 µA	BFN 25		250	–	–	
	BFN 27		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EB0}$	5	–	–	
Collector-base cutoff current		I_{CB0}				
V_{CB} = 200 V	BFN 25		–	–	100	nA
V_{CB} = 250 V	BFN 27		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	BFN 25		–	–	20	µA
V_{CB} = 250 V, T_A = 150 °C	BFN 27		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EB0}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V [1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V [1]	BFN 25		40	–	–	
	BFN 27		30	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	BFN 25		–	–	0.4	
	BFN 27		–	–	0.5	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	2.5	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

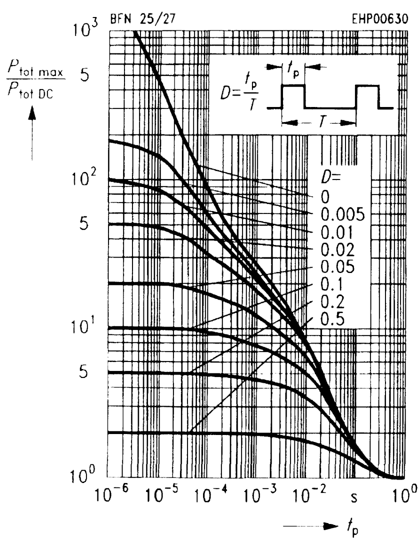
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



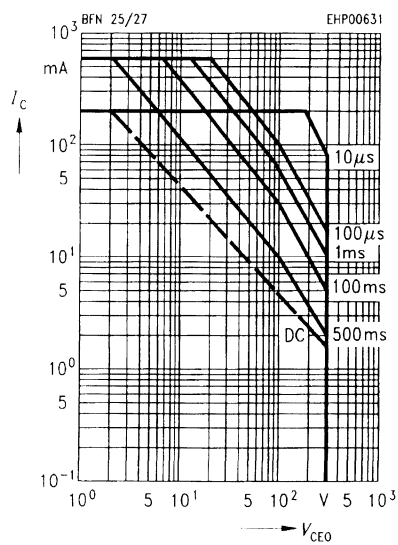
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V



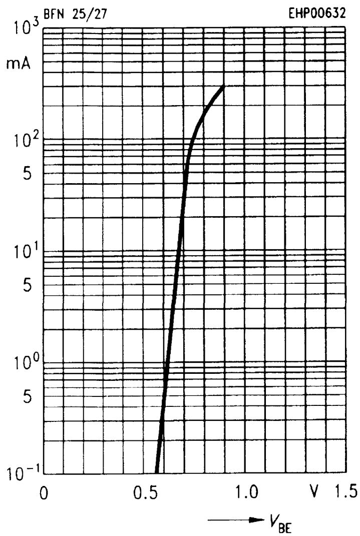
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



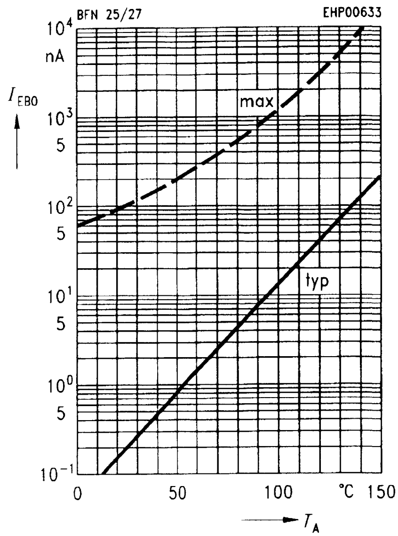
Operating range $I_C = f(V_{CEO})$
T_A = 25 °C, D = 0



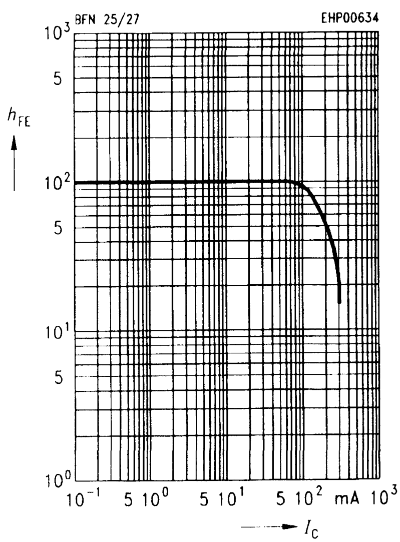
Collector current $I_C = f(V_{BE})$
V_{CE} = 10 V



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



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

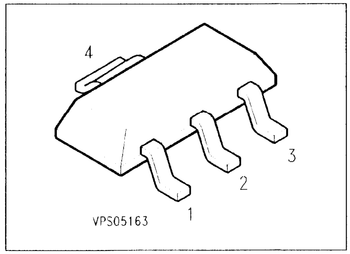


SIEMENS

NPN Silicon High-Voltage Transistors

BFN 36
BFN 38

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BFN 36 BFN 38	BFN 36 BFN 38	Q62702-F1246 Q62702-F1303	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values BFN 36	BFN 38	Unit
Collector-emitter voltage	V_{CEO}	250	300	V
Collector-base voltage	V_{CBO}	250	300	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 124 °C	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2)]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

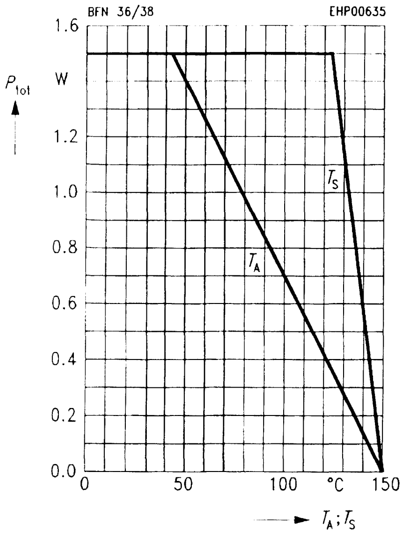
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

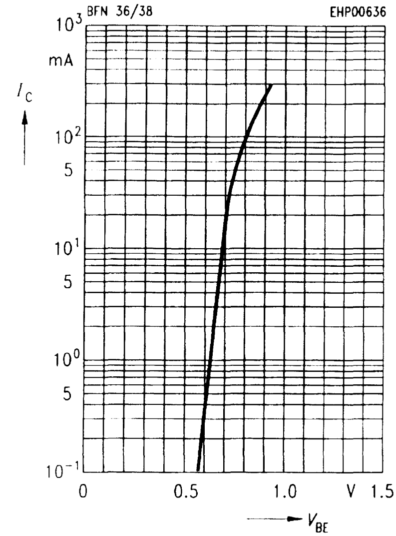
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA, I_B = 0	BFN 36		250	–	–	
	BFN 38		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA, I_B = 0	BFN 36		250	–	–	
	BFN 38		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_B = 0		$V_{(BR)EBO}$	5	–	–	
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 V_{EB} = 4 V, I_C = 0		I_{EBO}	–	–	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}				V
I_C = 20 mA, I_B = 2 mA	BFN 36		–	–	0.4	
	BFN 38		–	–	0.5	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz		f_T	–	70	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	1.5	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

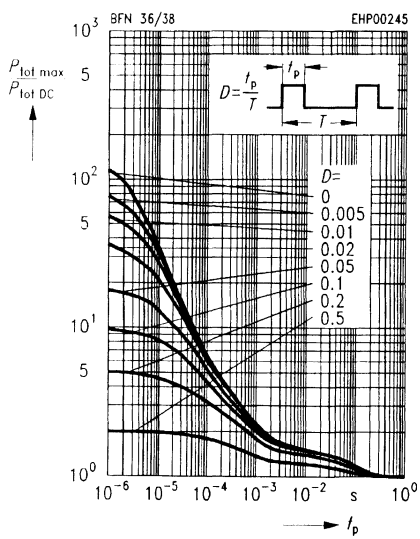
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



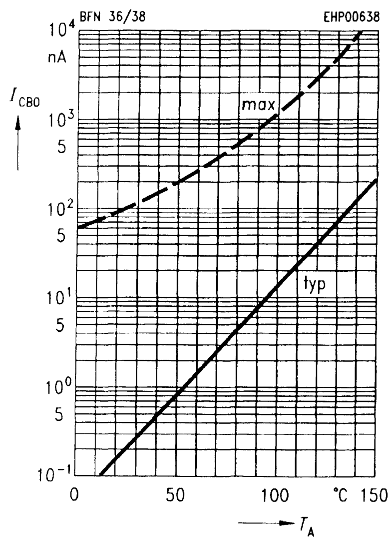
Collector current $I_C = f(V_{BE})$
$V_{CE} = 10$ V



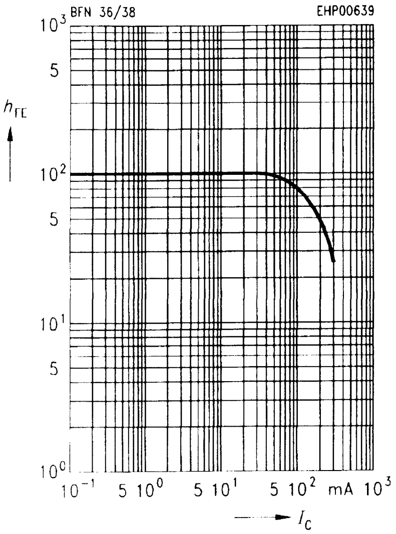
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



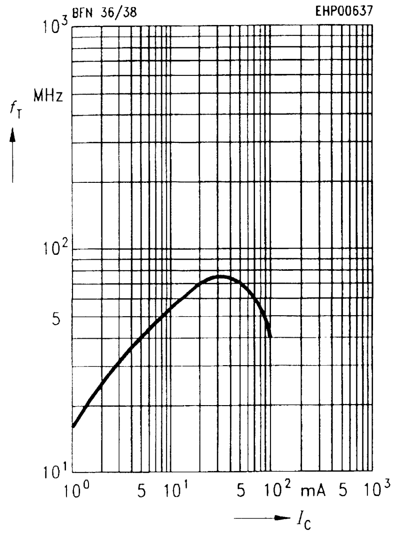
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 200$ V



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

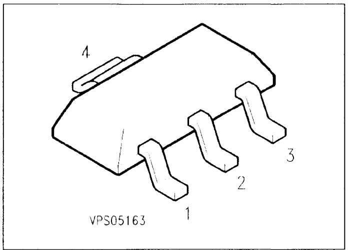


SIEMENS

PNP Silicon High-Voltage Transistors

BFN 37
BFN 39

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BFN 37 BFN 39	BFN 37 BFN 39	Q62702-F1304 Q62702-F1305	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values BFN 37	BFN 39	Unit
Collector-emitter voltage	V_{CE0}	250	300	V
Collector-base voltage	V_{CB0}	250	300	
Emitter-base voltage	V_{EB0}	5		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_S = 124$ °C	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2)]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

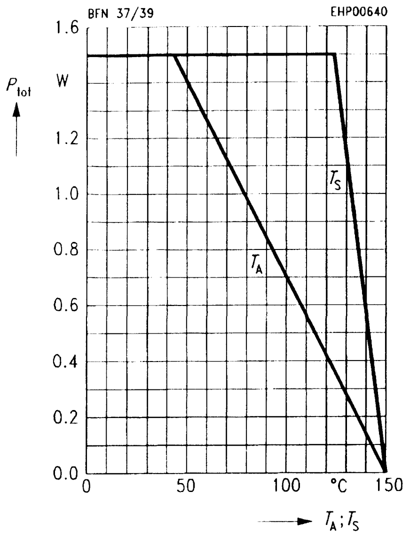
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

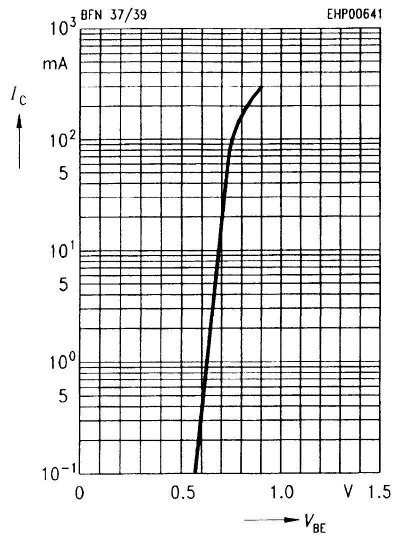
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 1 mA, I_B = 0	BFN 37		250	–	–	
	BFN 39		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 100 µA, I_B = 0	BFN 37		250	–	–	
	BFN 39		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_B = 0		$V_{(BR)EB0}$	5	–	–	
Collector-base cutoff current		I_{CB0}				
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 V_{EB} = 4 V, I_C = 0		I_{EB0}	–	–	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}				V
I_C = 20 mA, I_B = 2 mA	BFN 37		–	–	0.4	
	BFN 39		–	–	0.5	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz		f_T	–	100	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	2.5	–	pF

[1] Pulse test conditions: t < 300 µs, D = 2 %.

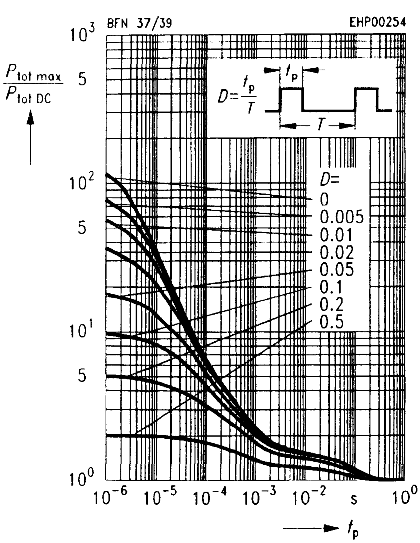
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



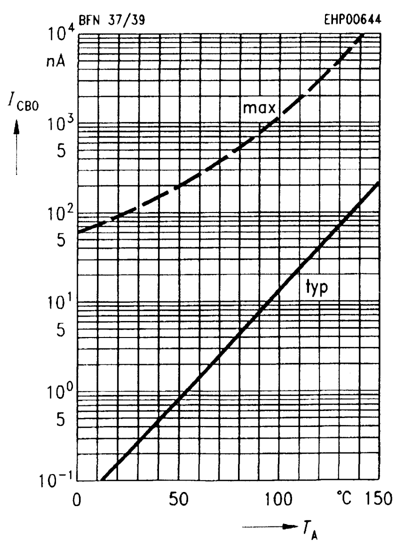
Collector current $I_C = f(V_{BE})$
V_{CE} = 10 V



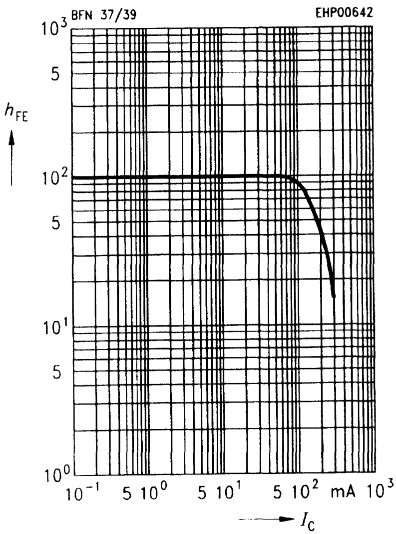
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



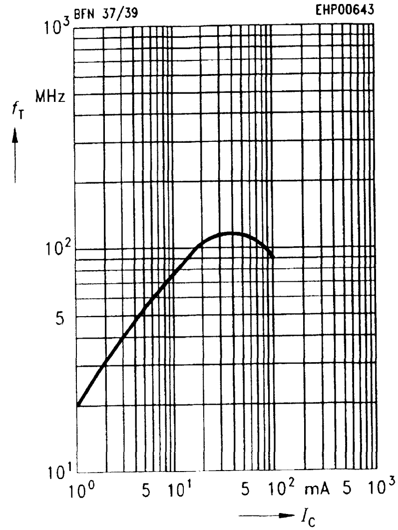
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 200 V



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

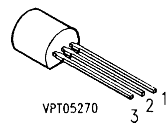


SIEMENS

NPN Silicon Transistors with High Reverse Voltage

BFP 22
BFP 25

- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary types: BFP 23, BFP 26 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BFP 22 BFP 25	–	Q62702-F621 Q62702-F721	E	B	C	TO-92

Maximum Ratings

Parameter	Symbol	Values BFP 22	BFP 25	Unit
Collector-emitter voltage	V_{CE0}	200	300	V
Collector-base voltage	V_{CB0}	200	300	
Emitter-base voltage	V_{EB0}	6		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_C = 66$ °C	P_{tot}	625		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 200	K/W
Junction - case[2)]	$R_{th JC}$	≤ 135	

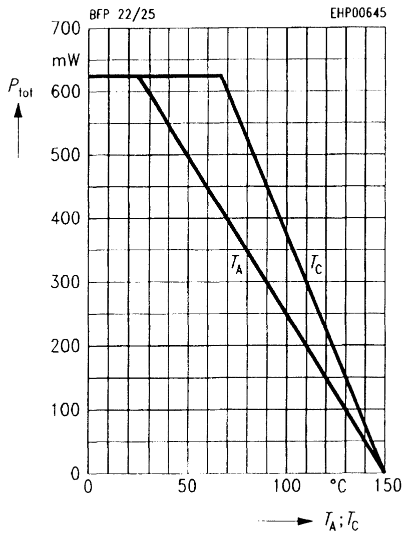
1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

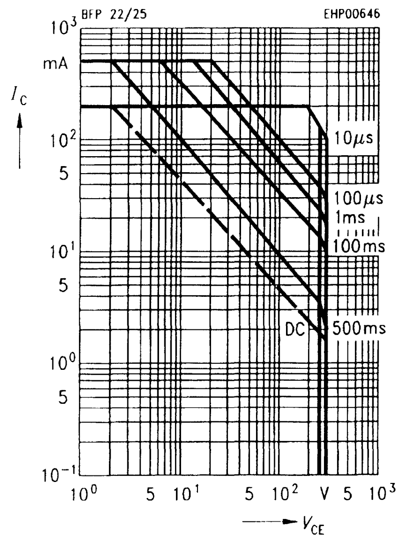
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA	BFP 22		200	–	–	
	BFP 25		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	BFP 22		200	–	–	
	BFP 25		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	6	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 160 V	BFP 22		–	–	100	nA
V_{CB} = 250 V	BFP 25		–	–	100	nA
V_{CB} = 160 V, T_A = 150 °C	BFP 22		–	–	20	µA
V_{CB} = 250 V, T_A = 150 °C	BFP 25		–	–	20	µA
Emitter-base cutoff current V_{EB} = 4 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V[1]	BFP 22		50	–	–	
	BFP 25		40	–	–	
Collector-emitter saturation voltage[1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	BFP 22		–	–	0.4	
	BFP 25		–	–	0.5	
Base-emitter saturation voltage[1] I_C = 20 A, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	70	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	1.5	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

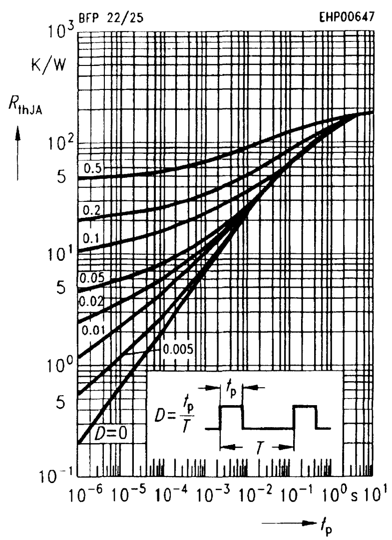
Total power dissipation $P_{tot} = f(T_A; T_C)$



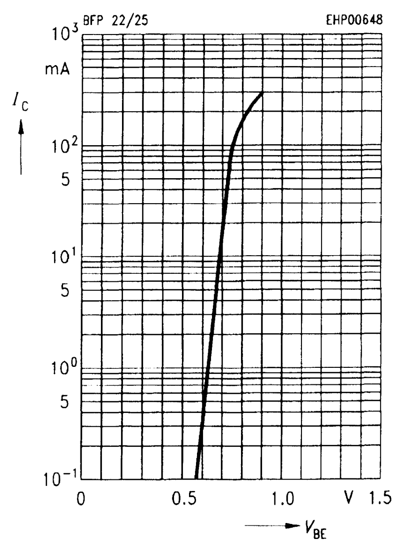
Operating range $I_C = f(V_{CE})$
$D = 0$, $T_A = 25$ °C



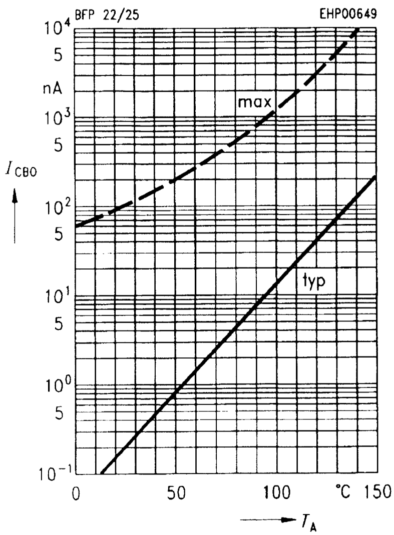
Permissible pulse load $R_{thJA} = f(t_p)$



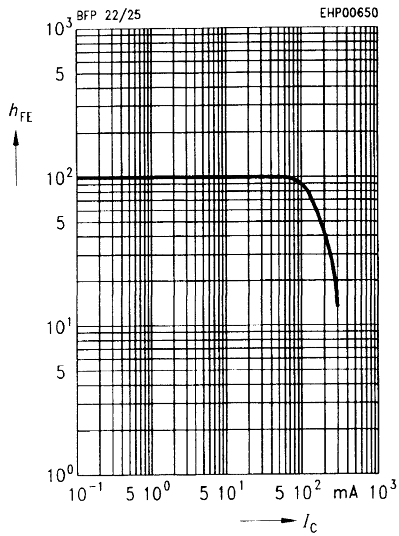
Collector current $I_C = f(V_{BE})$
$V_{CE} = 10$ V, $T_A = 25$ °C



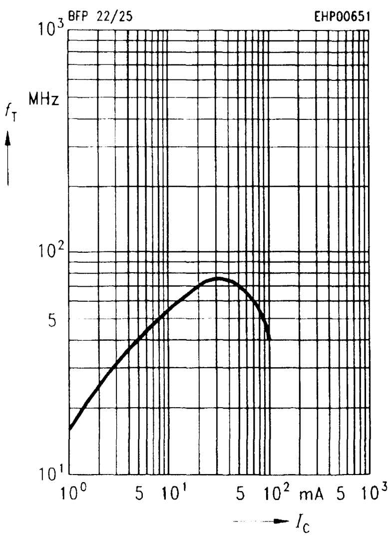
Collector cutoff current $I_{CBO} = f(T)$
V_{CB} = 160 V, 250 V



DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz

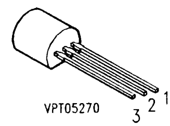


SIEMENS

PNP Silicon Transistors with High Reverse Voltage

BFP 23
BFP 26

- High breakdown voltage
- Low collector-emitter saturation voltage
- Low capacitance
- Complementary types: BFP 22, BFP 25 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BFP 23 BFP 26	–	Q62702-F622 Q62702-F722	E	B	C	TO-92

Maximum Ratings

Parameter	Symbol	Values BFP 23	BFP 26	Unit
Collector-emitter voltage	V_{CE0}	200	300	V
Collector-base voltage	V_{CB0}	200	300	
Emitter-base voltage	V_{EB0}	6		
Collector current	I_C	200		mA
Peak collector current	I_{CM}	500		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_C = 66$ ˚C	P_{tot}	625		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case[2]	$R_{th\,JC}$	≤ 135	

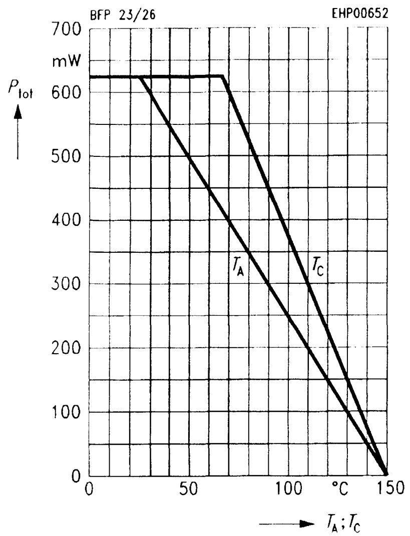
1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

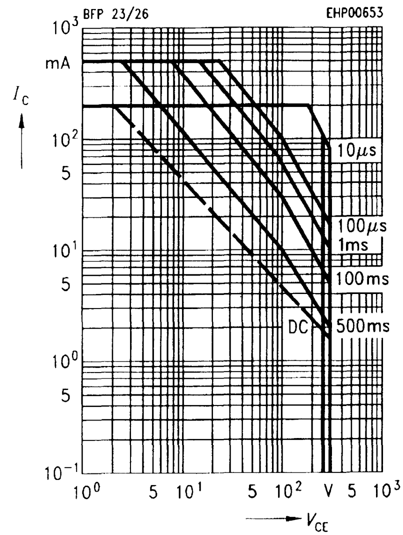
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA	BFP 23		200	–	–	
	BFP 26		300	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	BFP 23		200	–	–	
	BFP 26		300	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	6	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 160 V	BFP 23		–	–	100	nA
V_{CB} = 250 V	BFP 26		–	–	100	nA
V_{CB} = 160 V, T_A = 150 °C	BFP 23		–	–	20	µA
V_{CB} = 250 V, T_A = 150 °C	BFP 26		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V[1]	BFP 23		30	–	–	
	BFP 26		25	–	–	
Collector-emitter saturation voltage[1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	BFP 23		–	–	0.4	
	BFP 26		–	–	0.5	
Base-emitter saturation voltage[1] I_C = 20 A, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 20 MHz		f_T	–	70	–	MHz
Output capacitance V_{CB} = 30 V, f = 1 MHz		C_{obo}	–	1.5	–	pF

[1] Pulse test conditions: t < 300 µs, D ≤ 2 %.

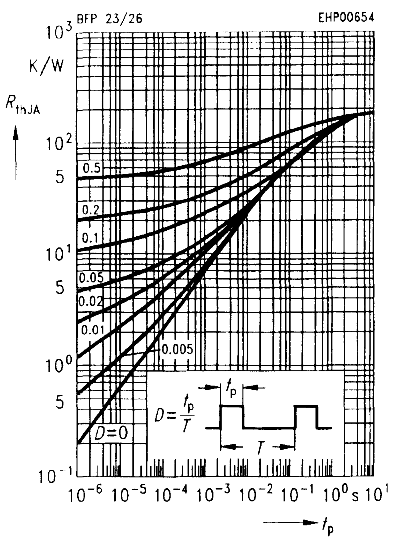
Total power dissipation $P_{tot} = f(T_A; T_C)$



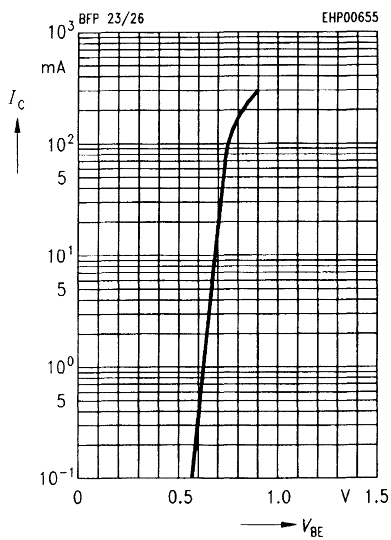
Operating range $I_C = f(V_{CE})$
$D = 0$, $T_A = 25$ °C



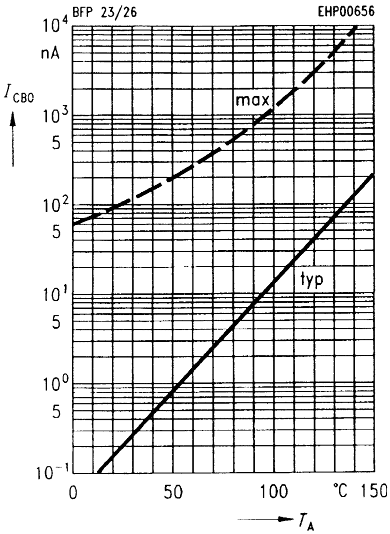
Permissible pulse load $R_{thJA} = f(t_p)$



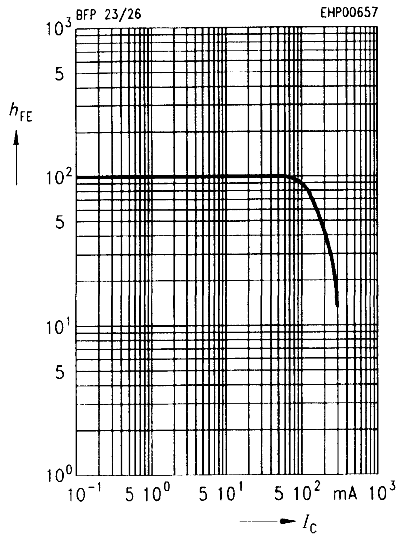
Collector current $I_C = f(V_{BE})$
$V_{CE} = 10$ V, $T_A = 25$ °C



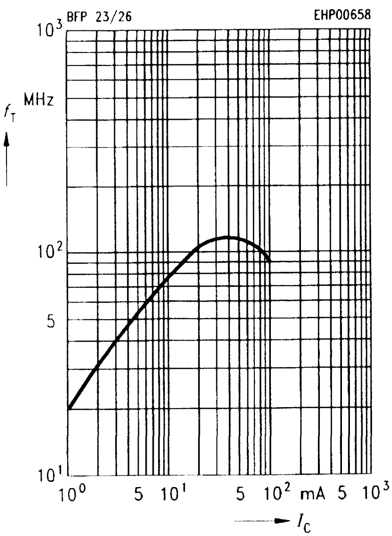
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 160 V, 250 V



DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V, T_A = 25 °C



Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 20 MHz

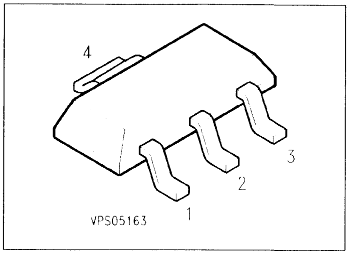


SIEMENS

NPN Silicon Darlington Transistors

BSP 50 ... BSP 52

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1]
BSP 50	BSP 50	Q62702-P1163	B	C	E	C	SOT-223
BSP 51	BSP 51	Q62702-P1164					
BSP 52	BSP 52	Q62702-P1165					

Maximum Ratings

Parameter	Symbol	Values BSP 50	BSP 51	BSP 52	Unit
Collector-emitter voltage	V_{CER}	45	60	80	V
Collector-base voltage	V_{CBO}	60	80	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	2			
Base current	I_B	0.1			
Total power dissipation, T_S = 124 ˚C	P_{tot}	1.5			W
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

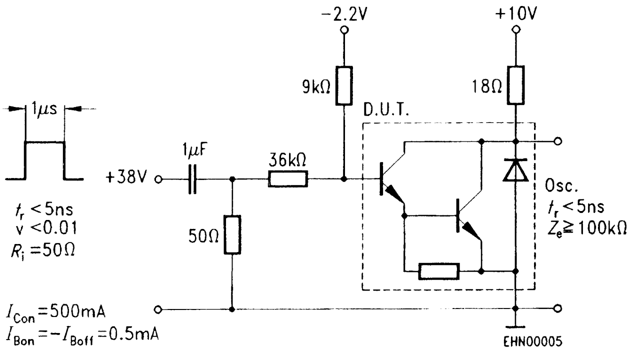
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage [1]	$V_{(BR)CER}$				V
I_C = 10 mA, R_{BE} = 4.5 MΩ BSP 50		45	–	–	
BSP 51		60	–	–	
BSP 52		80	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 100 µA, I_B = 0 BSP 50		60	–	–	
BSP 51		80	–	–	
BSP 52		100	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_B = 0	$V_{(BR)EB0}$	5	–	–	
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_{EB0}	–	–	10	
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}				V
I_C = 500 mA, I_B = 0.5 mA		–	–	1.3	
I_C = 1 A, I_B = 1 mA		–	–	1.8	
Base-emitter saturation voltage [2]	V_{BEsat}				
I_C = 500 mA, I_B = 0.5 mA		–	–	1.9	
I_C = 1 A, I_B = 1 mA		–	–	2.2	
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	t_{on}	–	400	–	ns
(see diagrams)	t_{off}	–	1500	–	ns

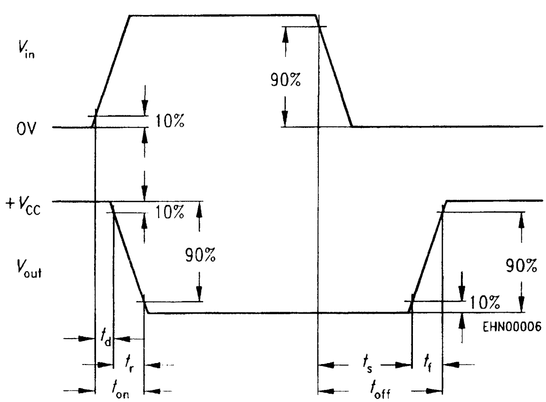
1) Compare R_{BE} for thermal stability.

2) Pulse test conditions: $t \leq 300$ µs, $D = 2$ %.

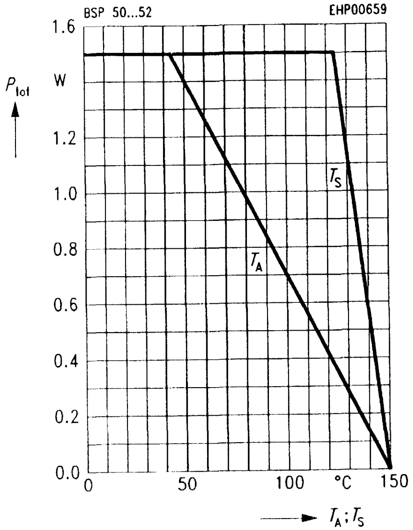
Switching time test circuit



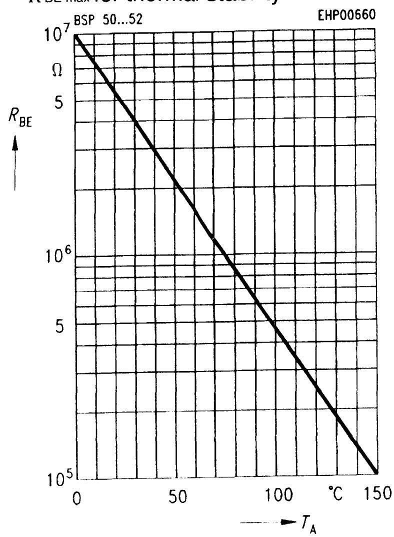
Switching time waveform



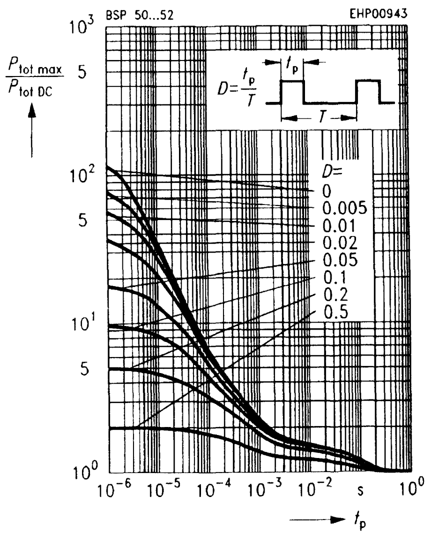
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



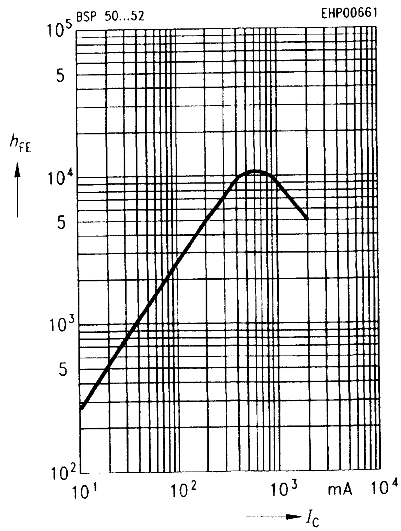
External resistance $R_{BE} = f(T_A)$**
$V_{CB} = V_{CE\,max}$
** $R_{BE\,max}$ for thermal stability



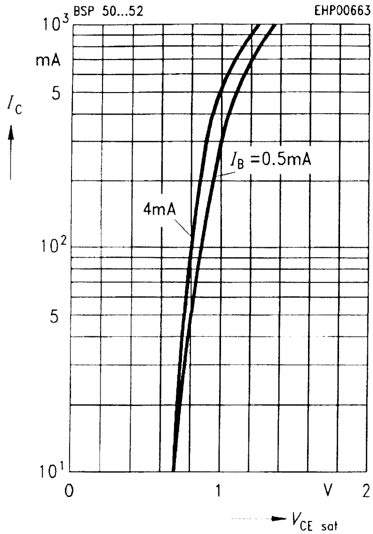
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



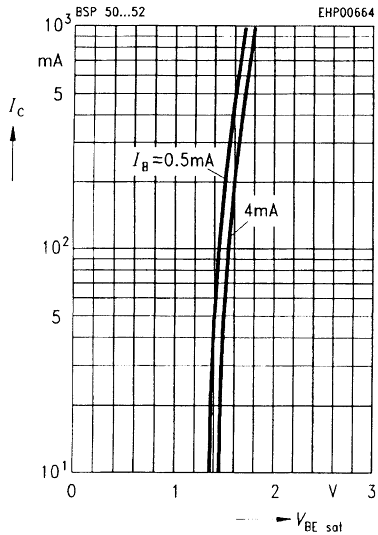
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



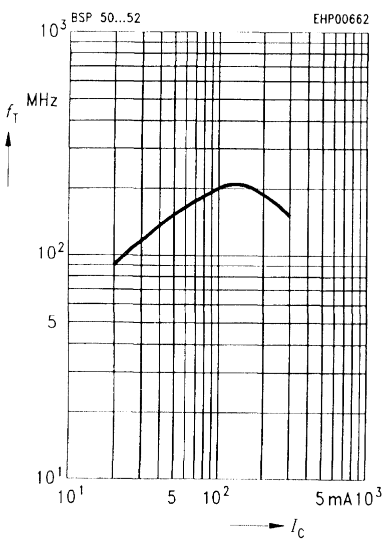
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, I_B-parameter



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



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

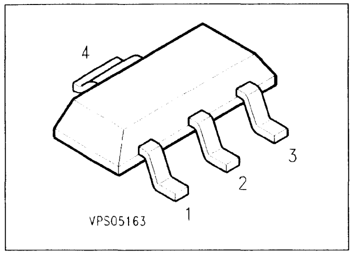


SIEMENS

PNP Silicon Darlington Transistors

BSP 60 ... BSP 62

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
BSP 60	BSP 60	Q62702-P1166	B	C	E	C	SOT-223
BSP 61	BSP 61	Q62702-P1167					
BSP 62	BSP 62	Q62702-P1168					

Maximum Ratings

Parameter	Symbol	Values BSP 60	BSP 61	BSP 62	Unit
Collector-emitter voltage	V_{CER}	45	60	80	V
Collector-base voltage	V_{CBO}	60	80	100	
Emitter-base voltage	V_{EBO}	5			
Collector current	I_C	1			A
Peak collector current	I_{CM}	2			
Base current	I_B	0.1			
Total power dissipation, T_S = 124 °C	P_{tot}	1.5			W
Junction temperature	T_j	150			°C
Storage temperature range	T_{stg}	– 65 ... + 150			

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	$\leq$ 72	K/W
Junction - soldering point	$R_{th JS}$	$\leq$ 17	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

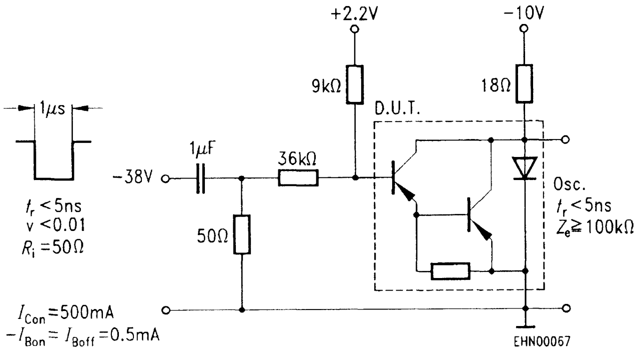
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage [1]	$V_{(BR)CER}$				V
I_C = 10 mA, R_{BE} = 4.5 MΩ BSP 60		45	–	–	
BSP 61		60	–	–	
BSP 62		80	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 100 µA, I_B = 0 BSP 60		60	–	–	
BSP 61		80	–	–	
BSP 62		100	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_B = 0	$V_{(BR)EB0}$	5	–	–	
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_{EB0}	–	–	10	
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}				V
I_C = 500 mA, I_B = 0.5 mA		–	–	1.3	
I_C = 1 A, I_B = 1 mA		–	–	1.8	
Base-emitter saturation voltage [2]	V_{BEsat}				
I_C = 500 mA, I_B = 0.5 mA		–	–	1.9	
I_C = 1 A, I_B = 1 mA		–	–	2.2	
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	t_{on}	–	400	–	ns
(see diagrams)	t_{off}	–	1500	–	ns

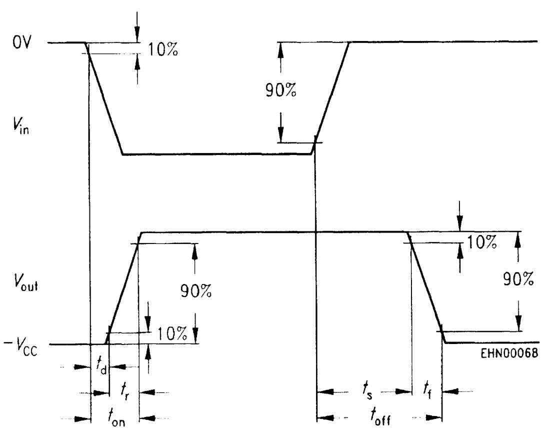
[1] Compare R_{BE} for thermal stability.

[2] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

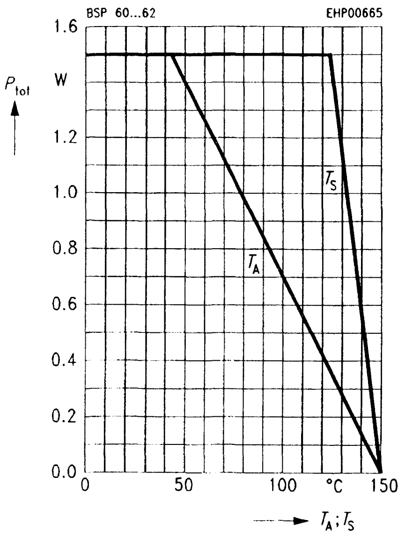
Switching time test circuit



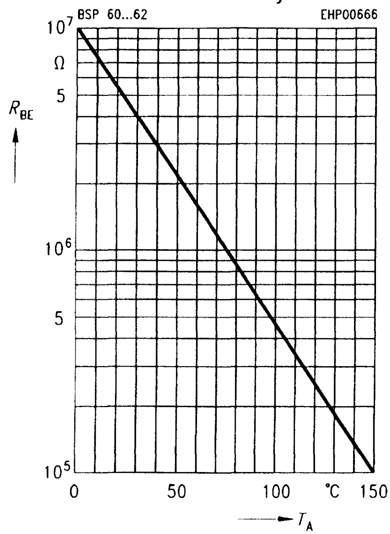
Switching time waveform



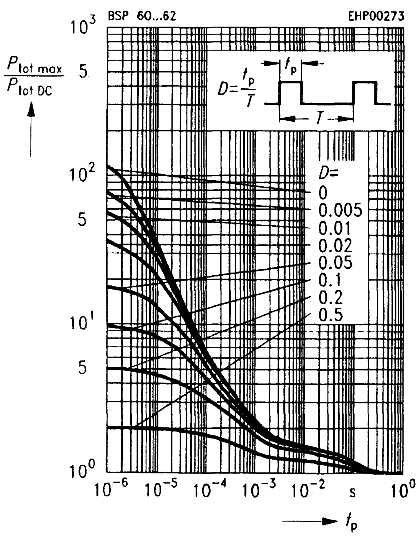
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



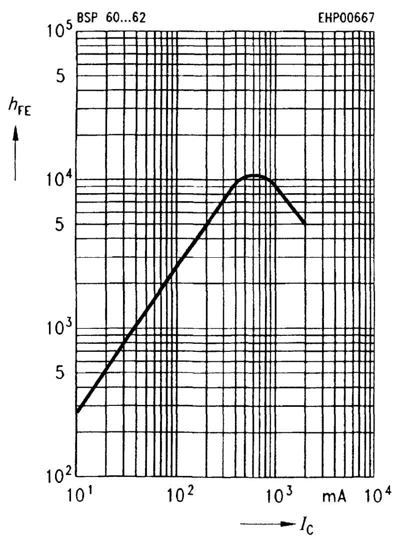
External resistance $R_{BE} = f(T_A)$**
$V_{CB} = V_{CE\,max}$
** $R_{BE\,max}$ for thermal stability



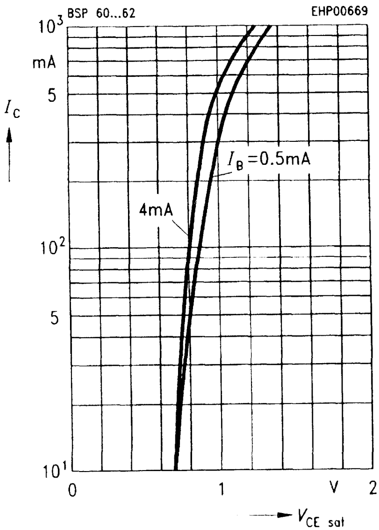
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



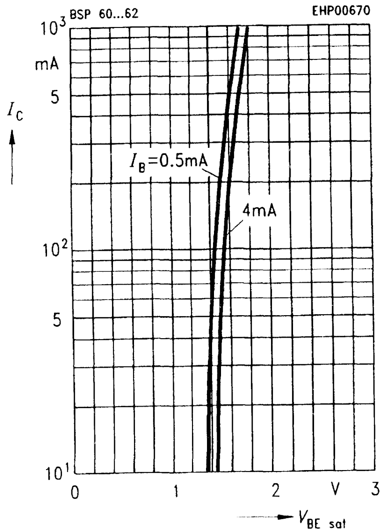
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



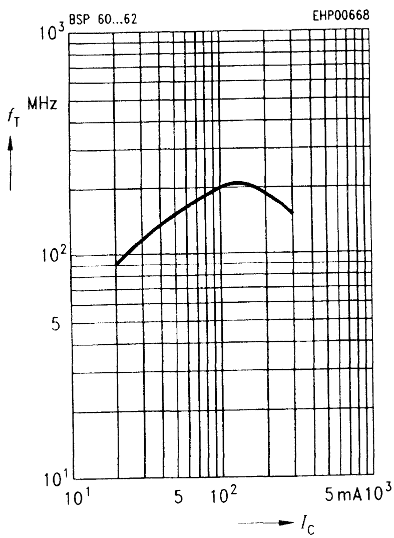
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, I_B-parameter



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



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

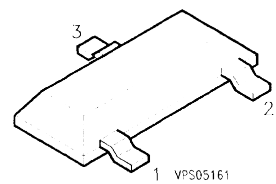


SIEMENS

NPN Silicon Switching Transistors

BSS 79
BSS 81

- High DC current gain
- Low collector-emitter saturation voltage
- Complementary types: BSS 80, BSS 82 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BSS 79 B	CEs	Q62702-S503	B	E	C	SOT-23
BSS 79 C	CFs	Q62702-S501				
BSS 81 B	CDs	Q62702-S555				
BSS 81 C	CGs	Q62702-S605				

Maximum Ratings

Parameter	Symbol	Values BSS 79	BSS 81	Unit
Collector-emitter voltage	V_{CE0}	40	35	V
Collector-base voltage	V_{CB0}	75		
Emitter-base voltage	V_{EB0}	6		
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, $T_S = 77$ ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 290	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 220	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	BSS 79		40	–	–	
	BSS 81		35	–	–	
Collector-base breakdown voltage I_C = 10 µA		$V_{(BR)CBO}$	75	–	–	
Emitter-base breakdown voltage I_E = 10 µA		$V_{(BR)EBO}$	6	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 60 V			–	–	10	nA
V_{CB} = 60 V, T_A = 150 °C			–	–	10	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	10	nA
DC current gain		h_{FE}				–
I_C = 100 µA, V_{CE} = 10 V	BSS 79 B/81 B		20	–	–	
	BSS 79 C/81 C		35	–	–	
I_C = 1 mA, V_{CE} = 10 V	BSS 79 B/81 B		25	–	–	
	BSS 79 C/81 C		50	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]	BSS 79 B/81 B		35	–	–	
	BSS 79 C/81 C		75	–	–	
I_C = 150 mA, V_{CE} = 10 V[1]	BSS 79 B/81 B		40	–	120	
	BSS 79 C/81 C		100	–	300	
I_C = 500 mA, V_{CE} = 10 V[1]	BSS 79 B/81 B		25	–	–	
	BSS 79 C/81 C		40	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA			–	–	0.3	
I_C = 500 mA, I_B = 50 mA			–	–	1.3	
Base-emitter saturation voltage [1]		V_{BEsat}				
I_C = 150 mA, I_B = 15 mA			–	–	1.2	
I_C = 500 mA, I_B = 50 mA			–	–	2.0	

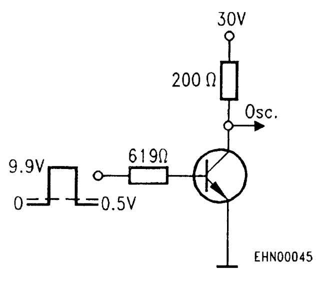
[1] Pulse test conditions: $t \leq$ 300 µs, D = 2 %.

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

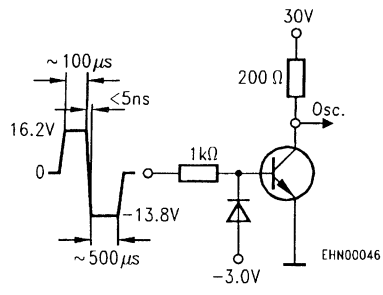
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	f_T	–	250	–	MHz
Open-circuit output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	6	–	pF
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{BE} = 0.5 V					
Delay time	t_d	–	–	10	ns
Rise time	t_r	–	–	25	ns
Storage time	t_{stg}	–	–	250	ns
Fall time	t_f	–	–	60	ns

Test circuits

Delay and rise time

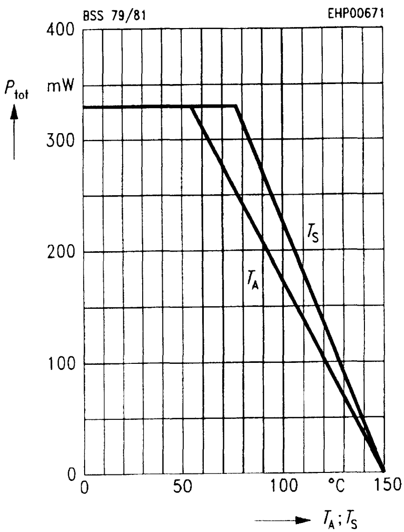


Storage and fall time

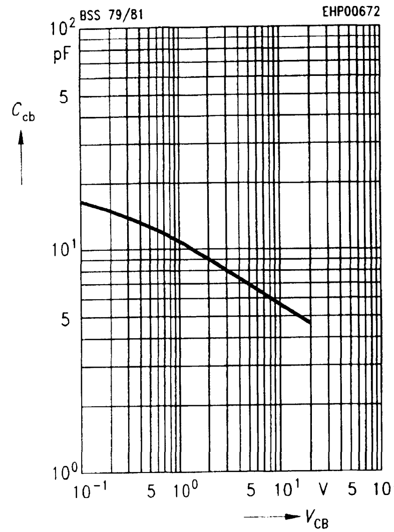


Oscillograph: R > 100 kΩ
C < 12 pF
t_r < 5 ns

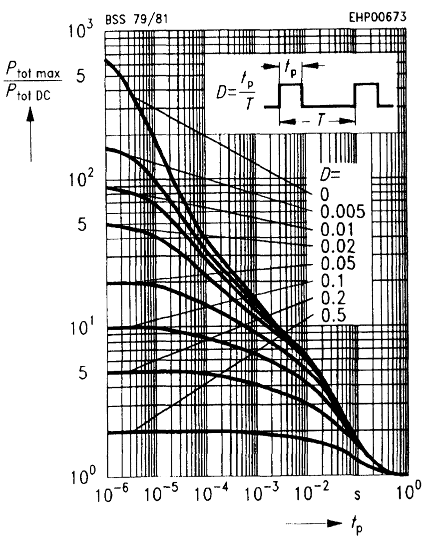
Total power dissipation $P_{tot} = f\,(T_A^{*};\ T_S)$
* Package mounted on epoxy



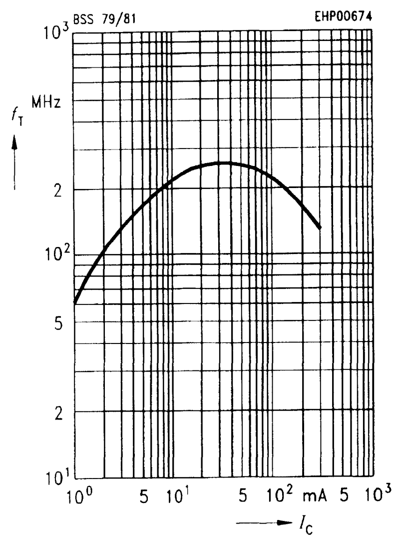
Collector-base capacitance $C_{cb} = f\,(V_{CB})$
f = 1 MHz



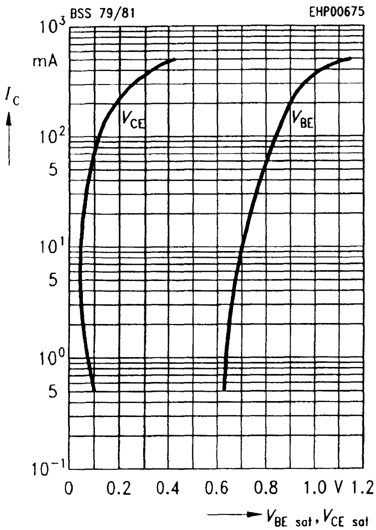
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



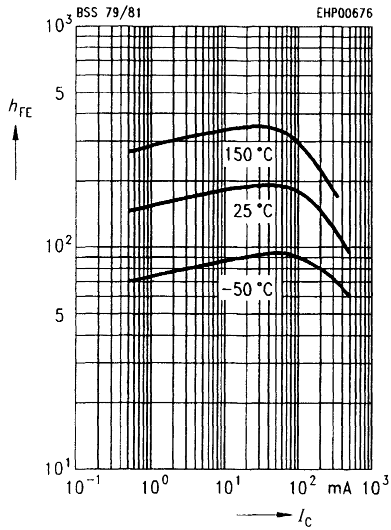
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 20 V



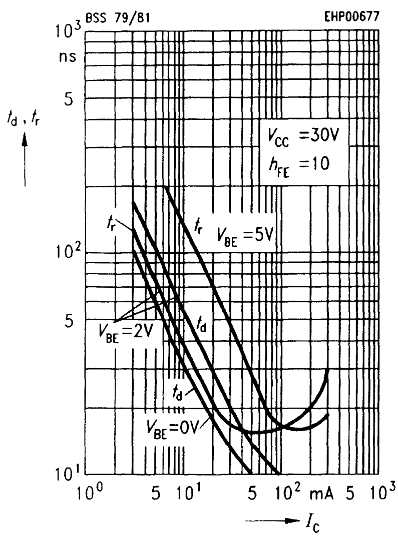
Saturation voltage $V_{BE\,sat} = f\,(I_C)$
$h_{FE} = 10$ $V_{CE\,sat} = f\,(I_C)$



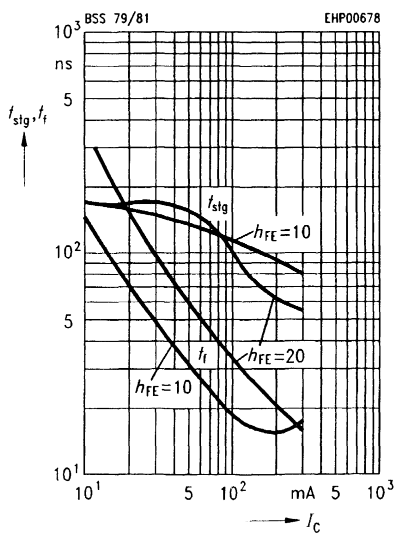
DC current gain $h_{FE} = f\,(I_C)$
$V_{CE} = 10$ V



Delay time $t_d = f\,(I_C)$
Rise time $t_r = f\,(I_C)$



Storage time $t_{stg} = f\,(I_C)$
Fall time $t_f = f\,(I_C)$

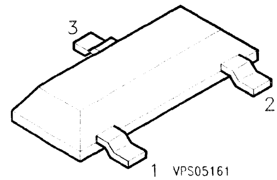


SIEMENS

PNP Silicon Switching Transistors

BSS 80
BSS 82

- High DC current gain
- Low collector-emitter saturation voltage
- Complementary types: BSS 79, BSS 81 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BSS 80 B	CHs	Q62702-S557	B	E	C	SOT-23
BSS 80 C	CJs	Q62702-S492				
BSS 82 B	CLs	Q62702-S560				
BSS 82 C	CMs	Q62702-S482				

Maximum Ratings

Parameter	Symbol	Values BSS 80	BSS 82	Unit
Collector-emitter voltage	V_{CEO}	40	60	V
Collector-base voltage	V_{CBO}	60		
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	800		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, $T_S = 77$ ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th JA}$	≤ 290	K/W
Junction - soldering point	$R_{th JS}$	≤ 220	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	BSS 80		40	–	–	
	BSS 82		60	–	–	
Collector-base breakdown voltage I_C = 10 µA		$V_{(BR)CBO}$	60	–	–	
Emitter-base breakdown voltage I_E = 10 µA		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 50 V			–	–	10	nA
V_{CB} = 50 V, T_A = 150 °C			–	–	10	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	10	nA
DC current gain		h_{FE}				–
I_C = 100 µA, V_{CE} = 10 V	BSS 80 B/82 B		40	–	–	
	BSS 80 C/82 C		75	–	–	
I_C = 1 mA, V_{CE} = 10 V	BSS 80 B/82 B		40	–	–	
	BSS 80 C/82 C		100	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]	BSS 80 B/82 B		40	–	–	
	BSS 80 C/82 C		100	–	–	
I_C = 150 mA, V_{CE} = 10 V[1]	BSS 80 B/82 B		40	–	120	
	BSS 80 C/82 C		100	–	300	
I_C = 500 mA, V_{CE} = 10 V[1]	BSS 80 B/82 B		40	–	–	
	BSS 80 C/82 C		50	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA			–	–	0.4	
I_C = 500 mA, I_B = 50 mA			–	–	1.6	
Base-emitter saturation voltage [1]		V_{BEsat}				
I_C = 150 mA, I_B = 15 mA			–	–	1.3	
I_C = 500 mA, I_B = 50 mA			–	–	2.6	

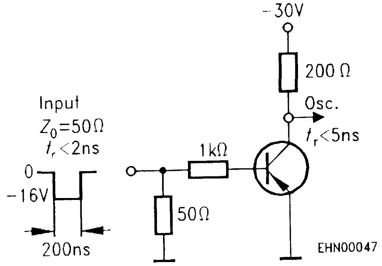
[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

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

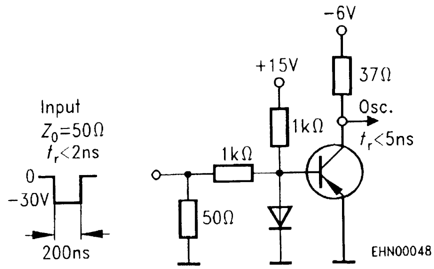
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	f_T	–	250	–	MHz
Open-circuit output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	6	–	pF
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 150 mA					
Delay time	t_d	–	–	10	ns
Rise time	t_r	–	–	40	ns
V_{CC} = 6 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA					
Storage time	t_{stg}	–	–	80	ns
Fall time	t_f	–	–	30	ns

Test circuits

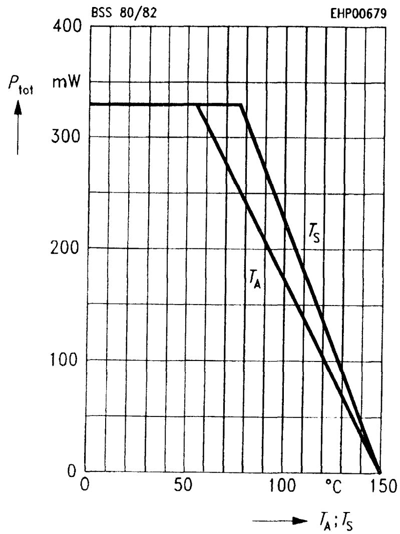
Delay and rise time



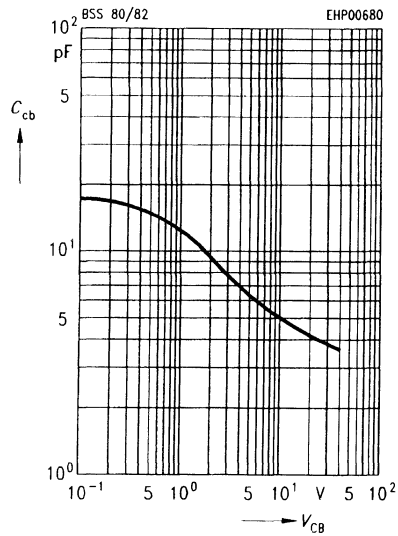
Storage and fall time



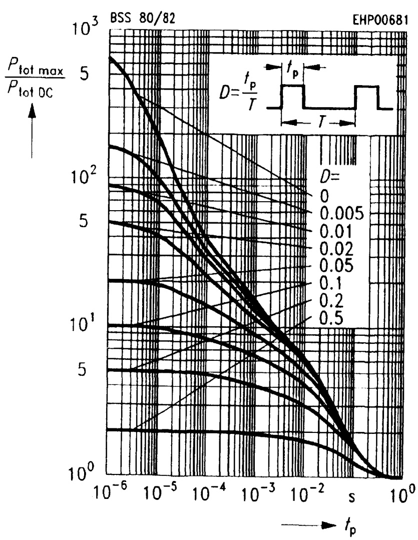
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



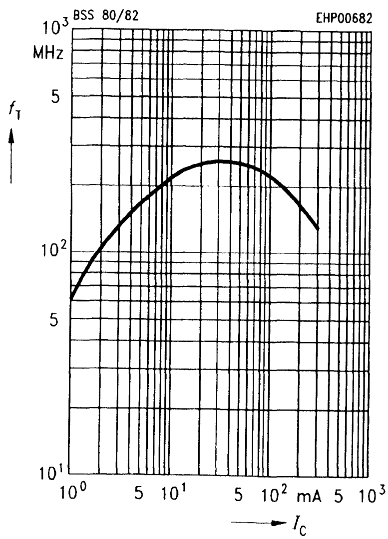
Collector-base capacitance $C_{cb} = f(V_{CB})$
f = 1 MHz



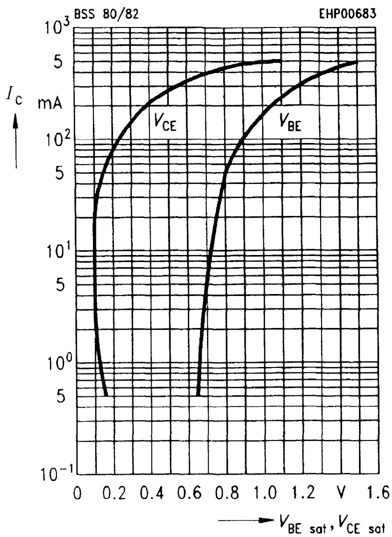
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



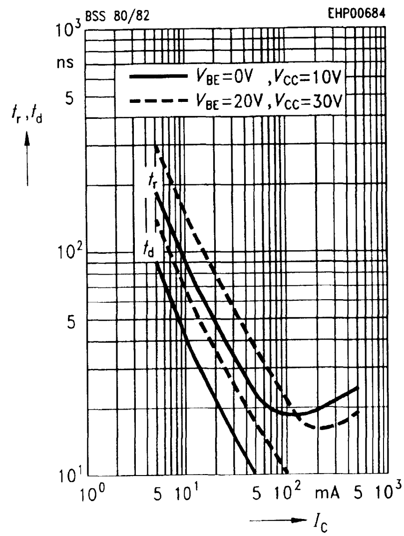
Transition frequency $f_T = f(I_C)$
V_{CE} = 20 V



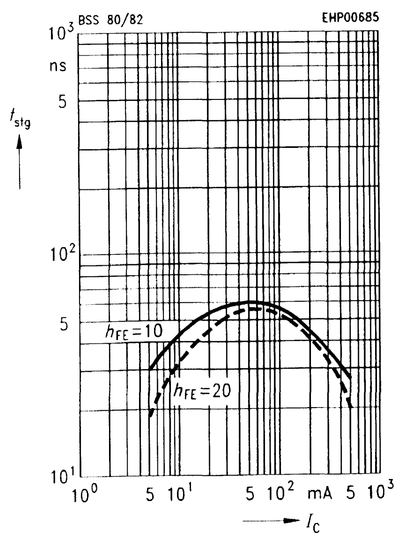
Saturation voltage $I_C = f\,(V_{BE\,sat},\ V_{CE\,sat})$
$h_{FE} = 10$



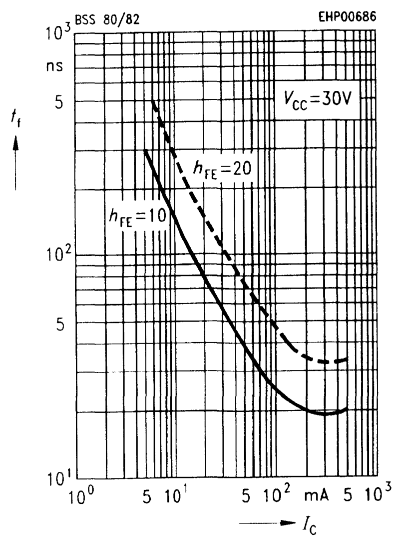
Delay time $t_d = f\,(I_C)$
Rise time $t_r = f\,(I_C)$



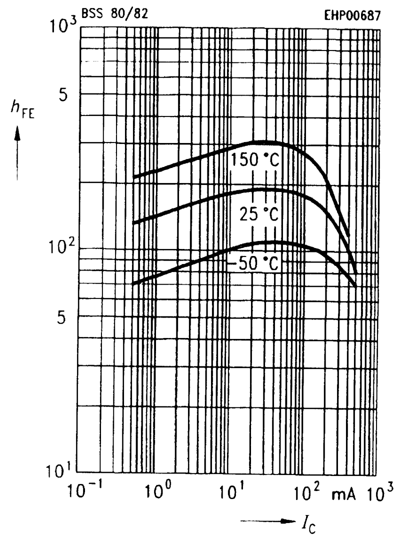
Storage time $t_{stg} = f\,(I_C)$



Fall time $t_f = f\,(I_C)$



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

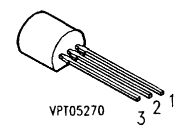


SIEMENS

NPN Silicon High-Voltage Transistors

MPSA 42
MPSA 43

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



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
MPSA 42 MPSA 43	MPSA 42 MPSA 43	Q68000-A413 Q68000-A4809	E	B	C	TO-92

Maximum Ratings

Parameter	Symbol	Values MPSA 42	MPSA 43	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	6		
Collector current	I_C	500		mA
Base current	I_B	100		
Total power dissipation, T_C = 66 ˚C[2]	P_{tot}	625		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient	$R_{th JA}$	≤ 200	K/W
Junction - case[2]	$R_{th JC}$	≤ 135	

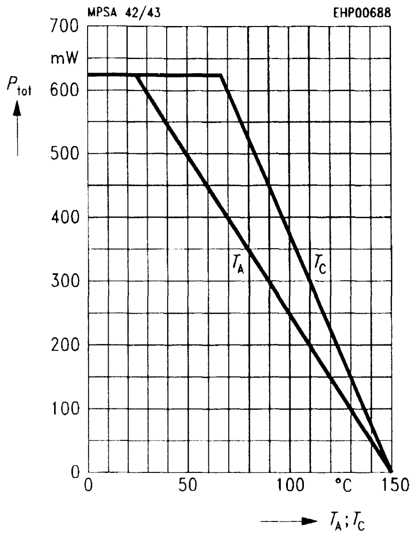
[1] For detailed information see chapter Package Outlines.
[2] Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

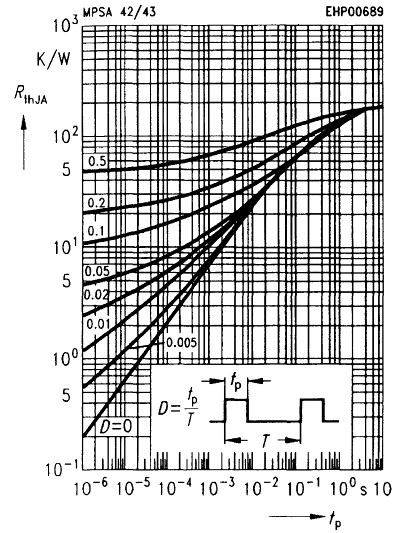
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 1 mA, I_B = 0	MPSA 42		300	–	–	
	MPSA 43		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 100 µA, I_B = 0	MPSA 42		300	–	–	
	MPSA 43		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_C = 0		$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current		I_{CB0}				
V_{CB} = 200 V	MPSA 42		–	–	100	nA
V_{CB} = 160 V	MPSA 43		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	MPSA 42		–	–	20	µA
V_{CB} = 160 V, T_A = 150 °C	MPSA 43		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0		I_{EB0}	–	–	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			40	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	MPSA 42		–	–	0.5	
	MPSA 43		–	–	0.4	
Base-emitter saturation voltage I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz		f_T	–	70	–	MHz
Collector-base capacitance		C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz	MPSA 42		–	–	3	
	MPSA 43		–	–	4	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

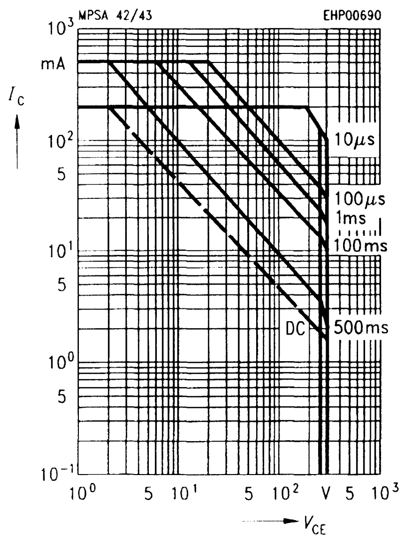
Total power dissipation $P_{tot} = f\,(T_A;\ T_C)$



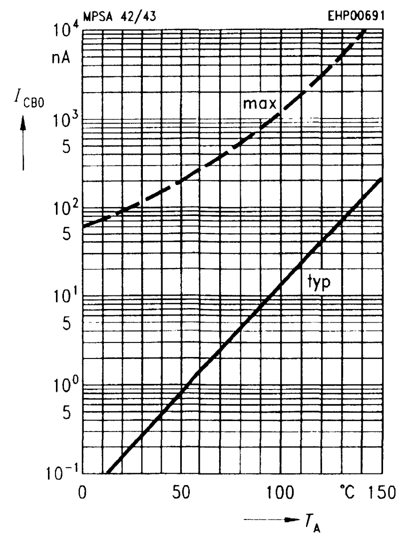
Permissible pulse load $R_{th\,JA} = f\,(t_p)$



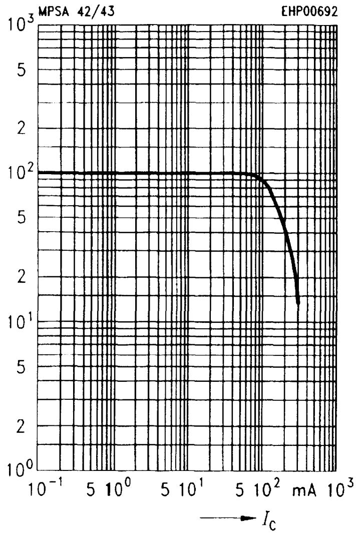
Operating range $I_C = f\,(V_{CE0})$
$T_A = 25\ °C$, $D = 0$



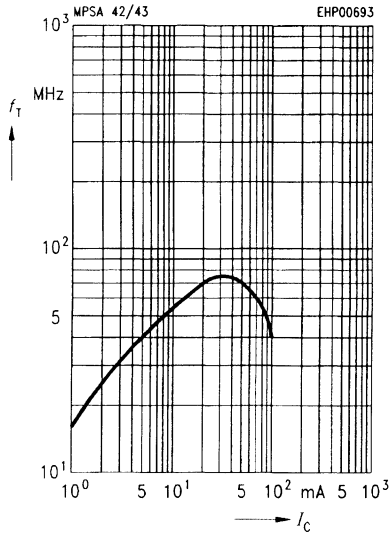
Collector cutoff current $I_{CB0} = f\,(T_A)$
$V_{CB} = V_{CB\,max}$



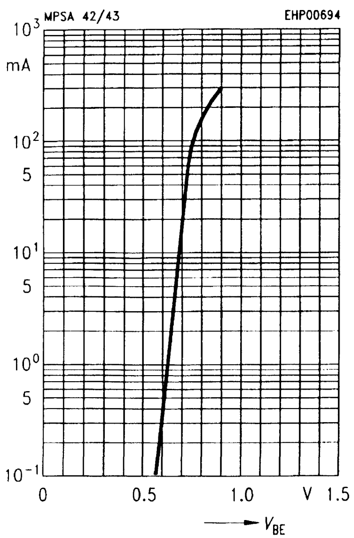
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



Transition frequency $f_T = f(I_C)$
f = 20 MHz, I_C = 20 mA, V_{CE} = 10 V



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

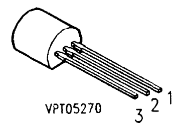


SIEMENS

PNP Silicon High-Voltage Transistors

MPSA 92
MPSA 93

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



Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1)]
MPSA 92 MPSA 93	MPSA 92 MPSA 93	Q68000-A5906 Q68000-A4810	E	B	C	TO-92

Maximum Ratings

Parameter	Symbol	Values MPSA 92	MPSA 93	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	500		mA
Base current	I_B	100		
Total power dissipation, T_C = 66 ˚C [2)]	P_{tot}	625		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient	$R_{th\,JA}$	≤ 200	K/W
Junction - case [2)]	$R_{th\,JC}$	≤ 135	

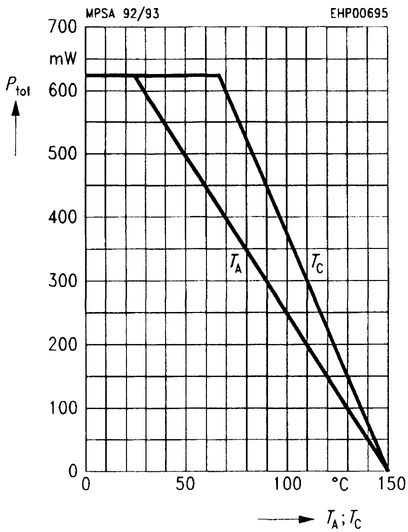
1) For detailed information see chapter Package Outlines.
2) Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

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

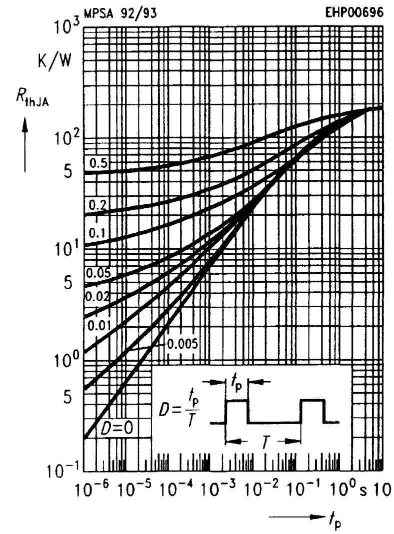
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA, I_B = 0	MPSA 92		300	–	–	
	MPSA 93		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA, I_B = 0	MPSA 92		300	–	–	
	MPSA 93		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_C = 0		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 200 V	MPSA 92		–	–	100	nA
V_{CB} = 160 V	MPSA 93		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	MPSA 92		–	–	20	µA
V_{CB} = 160 V, T_A = 150 °C	MPSA 93		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0		I_{EBO}	–	–	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}				V
I_C = 20 mA, I_B = 2 mA	MPSA 92		–	–	0.5	
	MPSA 93		–	–	0.4	
Base-emitter saturation voltage I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz		f_T	–	70	–	MHz
Collector-base capacitance		C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz	MPSA 92		–	–	6	
	MPSA 93		–	–	8	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

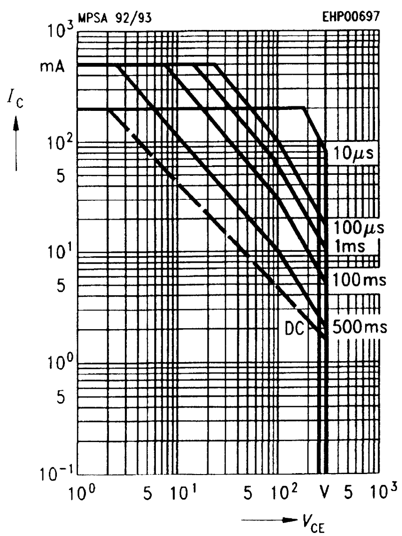
Total power dissipation $P_{tot} = f\,(T_A;\ T_C)$



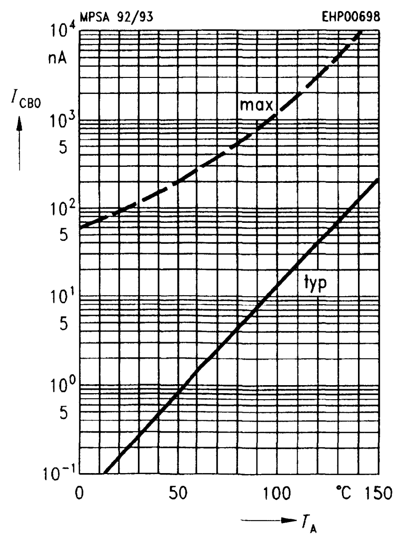
Permissible pulse load $R_{th\,JA} = f\,(t_p)$



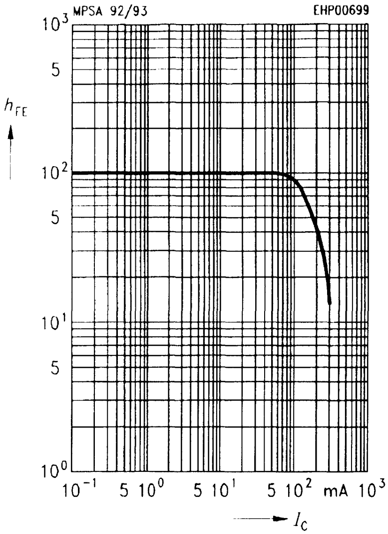
Operating range $I_C = f\,(V_{CE0})$
T_A = 25 °C, D = 0



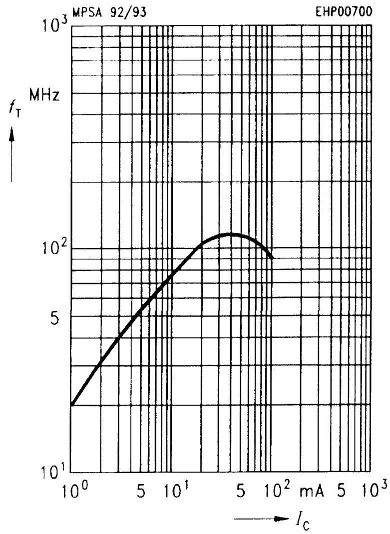
Collector cutoff current $I_{CB0} = f\,(T_A)$
$V_{CB} = V_{CB\,max}$



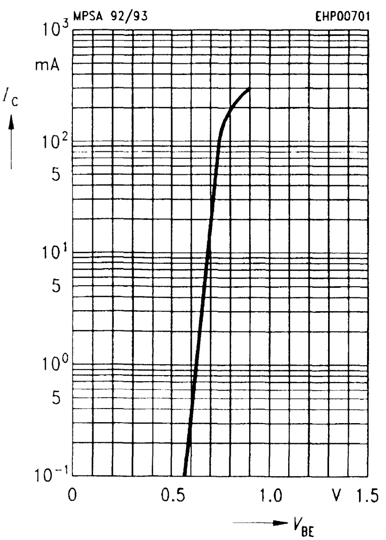
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



Transition frequency $f_T = f(I_C)$
f = 20 MHz, I_C = 20 mA, V_{CE} = 10 V



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

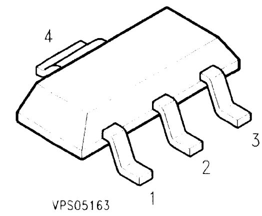


SIEMENS

NPN Silicon Switching Transistors

PZT 2222
PZT 2222 A

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1]
PZT 2222	ZT 2222	Q62702-Z2026	B	C	E	C	SOT-223
PZT 2222 A	ZT 2222 A	Q62702-Z2027					

Maximum Ratings

Parameter	Symbol	Values PZT 2222	PZT 2222 A	Unit
Collector-emitter voltage	V_{CEO}	30	40	V
Collector-base voltage	V_{CBO}	60	75	
Emitter-base voltage	V_{EBO}	5	6	
Collector current	I_C	600		mA
Total power dissipation, T_S = 110 °C[2]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 87	K/W
Junction - soldering point	$R_{th JS}$	≤ 27	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 10 mA, I_B = 0	PZT 2222		30	–	–	
	PZT 2222 A		40	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 10 µA, I_B = 0	PZT 2222		60	–	–	
	PZT 2222 A		75	–	–	
Emitter-base breakdown voltage		$V_{(BR)EB0}$				
I_E = 10 µA, I_E = 0	PZT 2222		5	–	–	
	PZT 2222 A		6	–	–	
Collector-base cutoff current		I_{CB0}				
V_{CB} = 50 V, I_E = 0	PZT 2222		–	–	20	nA
	PZT 2222 A		–	–	10	nA
V_{CB} = 50 V, I_E = 0, T_A = 150 ˚C	PZT 2222		–	–	20	µA
	PZT 2222 A		–	–	10	µA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0		I_{EB0}	–	–	10	nA
Collector-emitter cutoff current V_{CE} = 30 V, – V_{BE} = 0.5 V		I_{CEV}	–	–	50	
Emitter-base cutoff current V_{CE} = 30 V, – V_{BE} = 0.5 V		I_{EBV}	–	–	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 2222 A		40	–	–	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

Electrical Characteristics

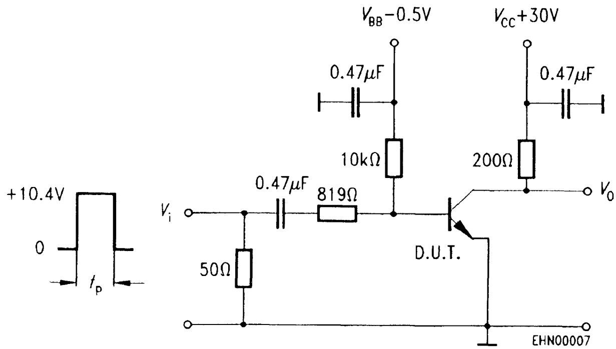
at T_A = 25 °C, unless otherwise specified.

Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA	PZT 2222		–	–	0.4	
	PZT 2222 A		–	–	0.3	
I_C = 500 mA, I_B = 50 mA	PZT 2222		–	–	1.6	
	PZT 2222 A		–	–	1.0	
Base-emitter saturation voltage [1]		V_{BEsat}				
I_C = 150 mA, I_B = 15 mA	PZT 2222		–	–	1.3	
	PZT 2222 A		–	–	1.2	
I_C = 500 mA, I_B = 50 mA	PZT 2222		–	–	2.6	
	PZT 2222 A		–	–	2.0	
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_{obo}	–	–	8	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz		C_{ibo}	–	–	30	
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA						
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						
Storage time		t_{stg}	–	–	225	ns
Fall time		t_f	–	–	60	ns
(see diagrams)						

[1] Pulse test conditions: $t \leq 300\ \mu s$, D = 2 %.

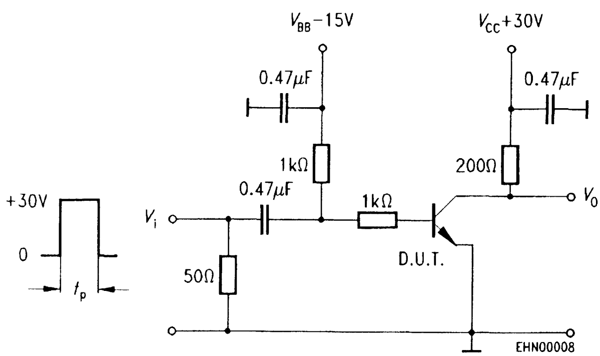
Input waveform and test circuit for determining delay, rise and turn-on time

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



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

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



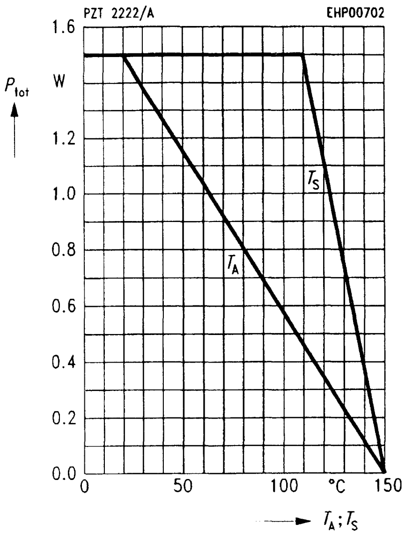
Pulse generator:

duty factor	D = 2 %
pulse duration	t_p = 200 ns
rise time	t_r ≤ 2 ns
output impedance	Z_o = 50 Ω

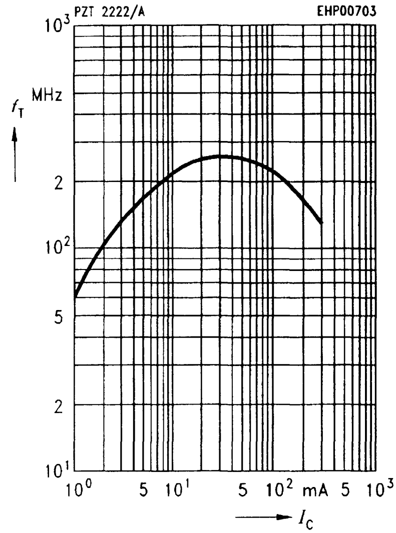
Oscillograph:

rise time	t_r ≤ 5 ns
output impedance	Z_i = 10 MΩ

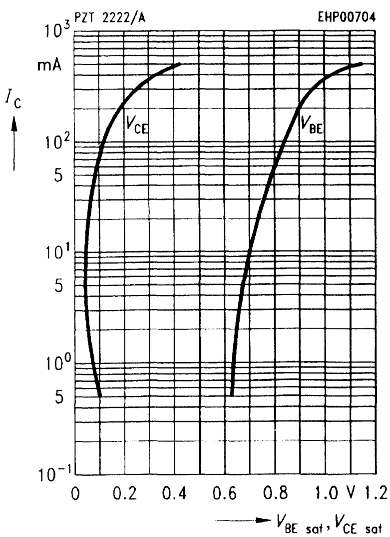
Total power dissipation $P_{tot} = f(T_A{}^*; T_S)$
* Package mounted on epoxy



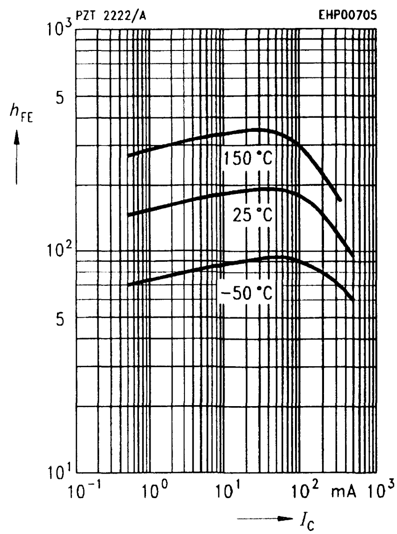
Transition frequency $f_T = f(I_C)$
V_{CE} = 20 V, f = 100 MHz



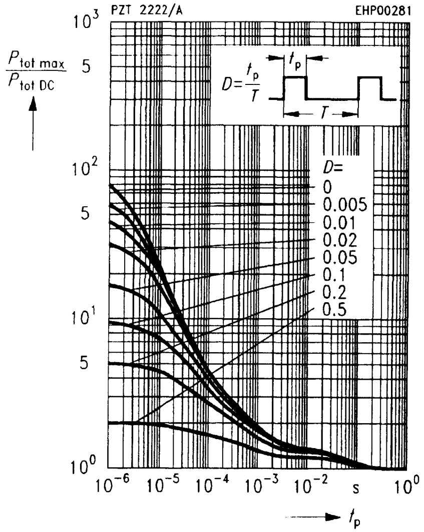
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$
h_{FE} = 10



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



Permissible pulse load $P_{\text{tot max}}/P_{\text{tot DC}} = f\,(t_p)$

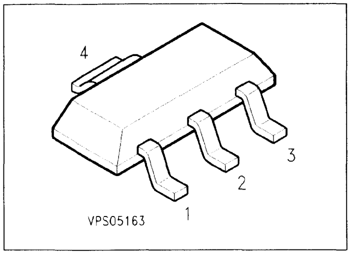


SIEMENS

PNP Silicon Switching Transistors

PZT 2907
PZT 2907 A

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1]
PZT 2907 PZT 2907 A	ZT 2907 ZT 2907 A	Q62702-Z2028 Q62702-Z2025	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values PZT 2907	PZT 2907 A	Unit
Collector-emitter voltage	V_{CEO}	40	60	V
Collector-base voltage	V_{CBO}	60		
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	600		mA
Total power dissipation, T_S = 110 ˚C [2]	P_{tot}	1.5		W
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient [2]	$R_{th JA}$	≤ 87	K/W
Junction - soldering point	$R_{th JS}$	≤ 27	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical 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 2907		40	–	–	
	PZT 2907 A		60	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 10 µA, I_B = 0	PZT 2907		60	–	–	
	PZT 2907 A		60	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_E = 0		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 50 V, I_E = 0	PZT 2907		–	–	20	nA
	PZT 2907 A		–	–	10	nA
V_{CB} = 50 V, I_E = 0, T_A = 150 ˚C	PZT 2907		–	–	20	µA
	PZT 2907 A		–	–	10	µA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0		I_{EBO}	–	–	10	nA
Collector-emitter cutoff current V_{CE} = 30 V, + V_{BE} = 0.5 V		I_{CEV}	–	–	50	
Collector-base cutoff current V_{CE} = 30 V, + V_{BE} = 0.5 V		I_{EBV}	–	–	50	
DC current gain [1]		h_{FE}				–
I_C = 0.1 mA, V_{CE} = 10 V	PZT 2907		35	–	–	
	PZT 2907 A		75	–	–	
I_C = 1 mA, V_{CE} = 10 V	PZT 2907		50	–	–	
	PZT 2907 A		100	–	–	
I_C = 10 mA, V_{CE} = 10 V	PZT 2907		75	–	–	
	PZT 2907 A		100	–	–	
I_C = 150 mA, V_{CE} = 10 V	PZT 2907		100	–	300	
	PZT 2907 A		100	–	300	
I_C = 500 mA, V_{CE} = 10 V	PZT 2907		30	–	–	
	PZT 2907 A		50	–	–	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

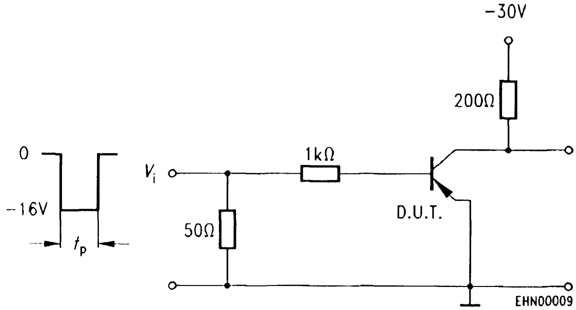
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA		–	–	0.4	
I_C = 500 mA, I_B = 50 mA		–	–	1.6	
Base-emitter saturation voltage [1]	V_{BEsat}				
I_C = 150 mA, I_B = 15 mA		–	–	1.3	
I_C = 500 mA, I_B = 50 mA		–	–	2.6	
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_{obo}	–	–	8	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	30	
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA					
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					
Storage time	t_{stg}	–	–	80	ns
Fall time	t_f	–	–	30	ns
(see diagrams)					

[1] Pulse test conditions: t < 300 µs, D = 2 %.

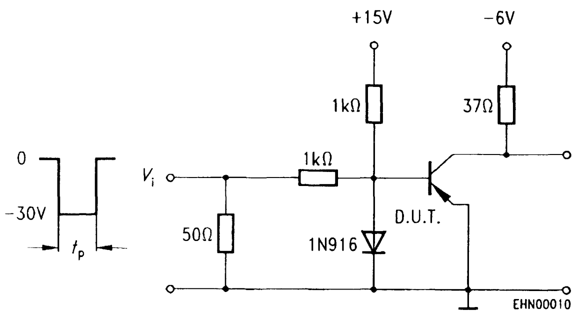
Input waveform and test circuit for determining delay, rise and turn-on time

Turn-on time when switched to $-I_{Con}$ = 150 mA; $-I_{Bon}$ = 15 mA



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

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



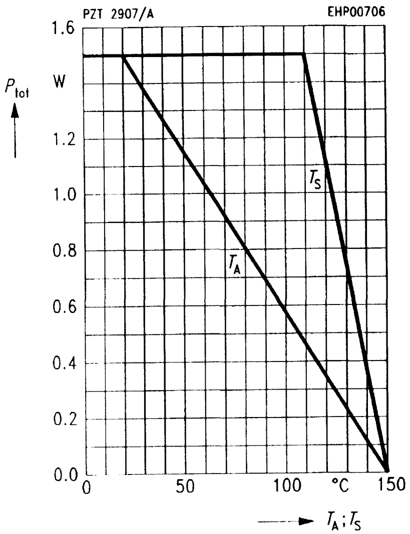
Pulse generator:

duty factor	D = 2 %
pulse duration	t_p = 200 ns
rise time	t_r ≤ 2 ns
output impedance	Z_o = 50 Ω

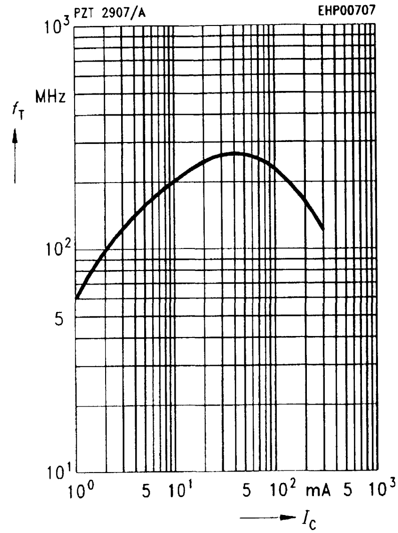
Oscillograph:

rise time	t_r ≤ 5 ns
output impedance	Z_i = 10 MΩ

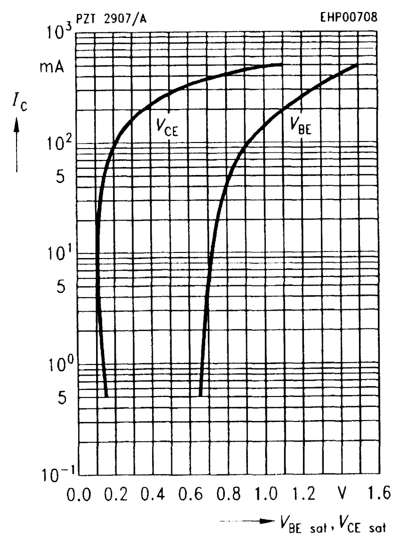
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



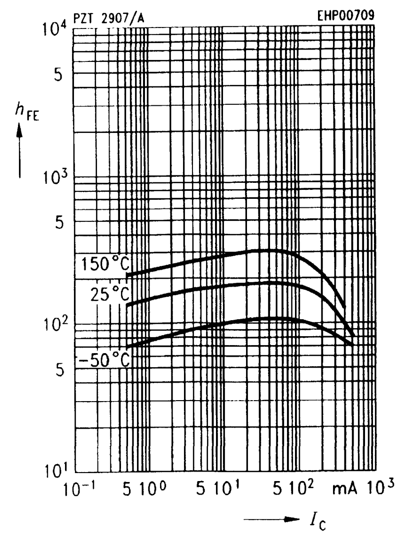
Transition frequency $f_T = f(I_C)$
V_{CE} = 20 V, f = 100 MHz



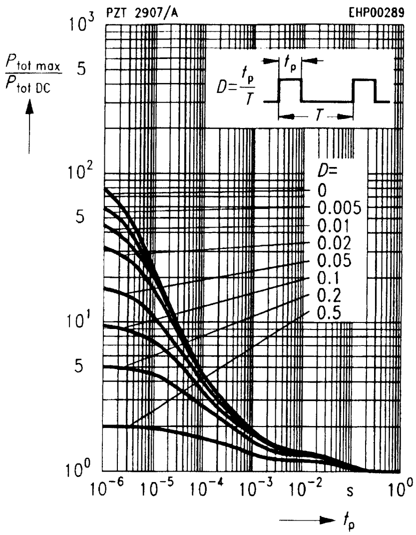
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$
h_{FE} = 10



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



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$

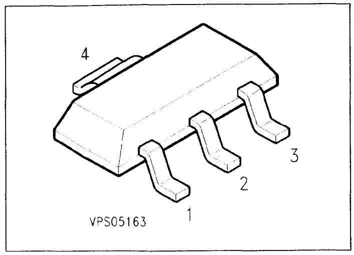


SIEMENS

NPN Silicon Switching Transistor

PZT 3904

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
PZT 3904	ZT 3904	Q62702-Z2029	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}	6	
Collector current	I_C	200	mA
Total power dissipation, T_S = 72 ˚C [2)]	P_{tot}	1.5	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient [2)]	$R_{th JA}$	≤ 122	K/W
Junction - soldering point	$R_{th JS}$	≤ 52	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	6	–	–	
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	
Base-emitter cutoff current V_{CE} = 30 V, – V_{BE} = 0.5 V	I_{BEV}	–	–	50	
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
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	

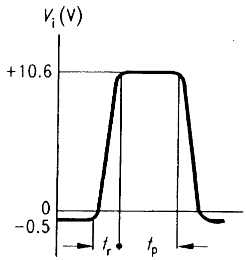
1) Pulse test conditions: $t \leq$ 300 µs, D = 2 %

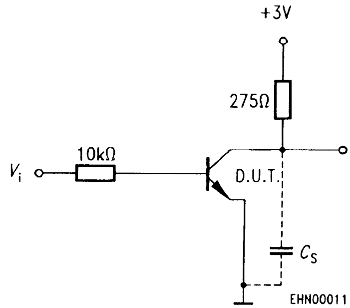
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	–	–	MHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	8	
Noise figure I_C = 100 µA, V_{CE} = 5 V, R_S = 1 kΩ, 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 (see diagrams)	t_f	–	–	50	ns

Switching Times

Turn-on time when switched from $-V_{BEoff} = 0.5$ V to $I_{Con} = 10$ mA; $I_{Bon} = 1$ mA

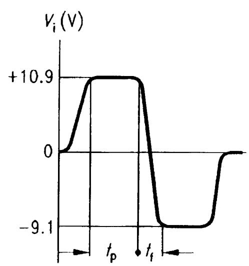


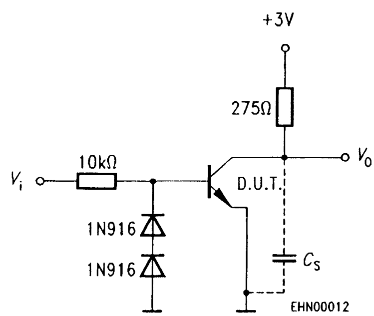


Input waveform; $t_r < 1$ ns; $t_p = 300$ ns; $\delta = 0.02$.

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

Turn-off time $I_{Con} = 10$ mA; $I_{Bon} = -I_{Boff} = 1$ mA

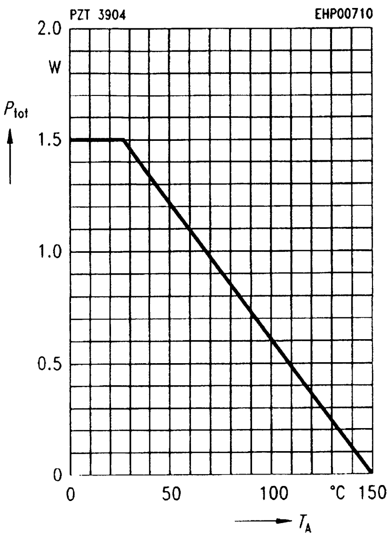




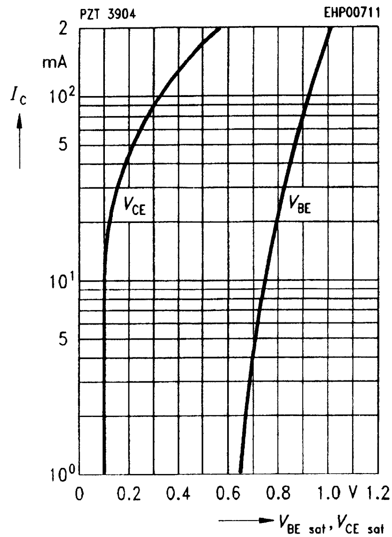
Input waveform; $t_f < 1$ ns; $10\ \mu s < t_p \leq 500\ \mu s$; $\delta = 0.02$.

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

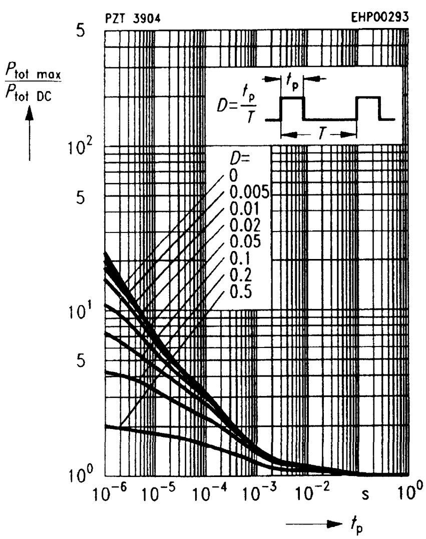
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



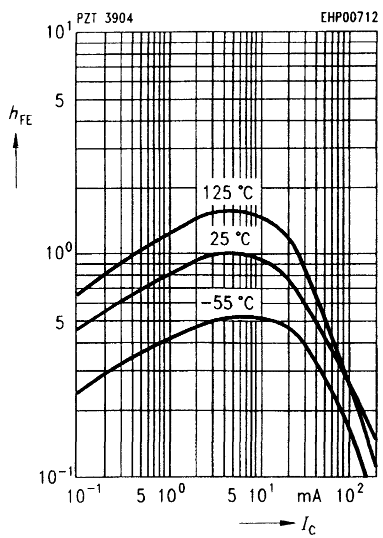
Saturation voltage $I_C = f\,(V_{BEsat},\ V_{CEsat})$
h_{FE} = 10



Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f\,(t_p)$



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

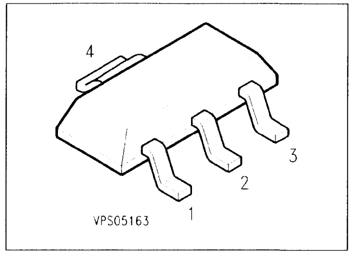


SIEMENS

PNP Silicon Switching Transistor

PZT 3906

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
PZT 3906	ZT 3906	Q62702-Z2030	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	40	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	200	mA
Total power dissipation, T_S = 80 °C [2)]	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient [2)]	$R_{th JA}$	≤ 117	K/W
Junction - soldering point	$R_{th JS}$	≤ 47	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	$V_{(BR)CBO}$	40	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	5	–	–	
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	
Collector-base cutoff current V_{CE} = 30 V, + V_{BE} = 0.5 V	I_{BEV}	–	–	50	
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
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	

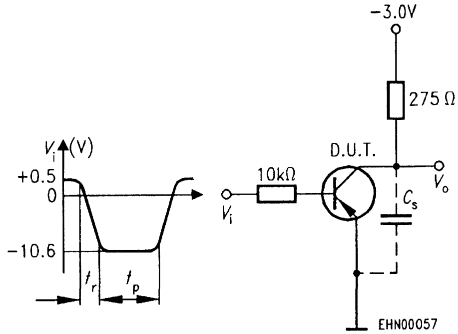
1) Pulse test conditions: $t \leq 300$ µs, D = 2 %

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
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_{obo}	–	–	4.5	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	10	
Noise figure I_C = 100 µA, V_{CE} = 5 V, R_S = 1 kΩ, 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	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}	–	–	225	ns
Fall time	t_f	–	–	75	ns
(see diagrams)					

Switching Times

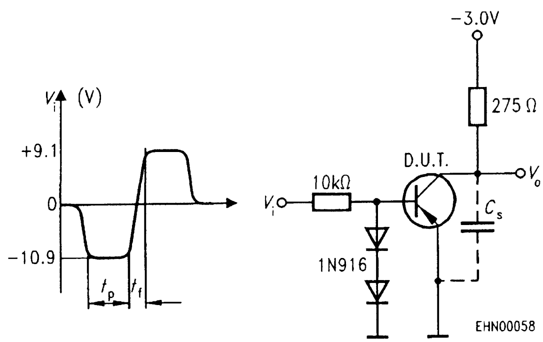
Turn-on time when switched from + V_{BEoff} = 0.5 V to – I_{Con} = 10 mA; – I_{Bon} = 1 mA



Input waveform; t_r < 1 ns; t_p = 300 ns; δ = 0.02.

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

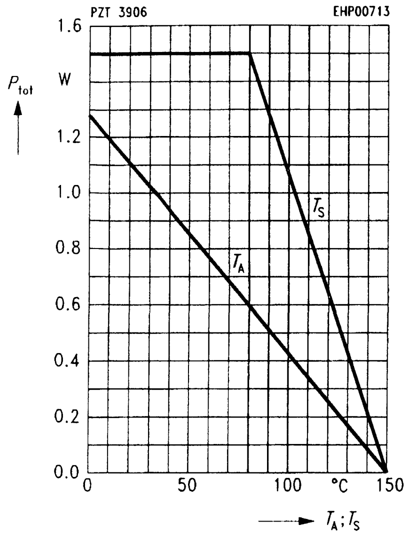
Turn-off time I_{Con} = 10 mA; I_{Bon} = – I_{Boff} = 1 mA



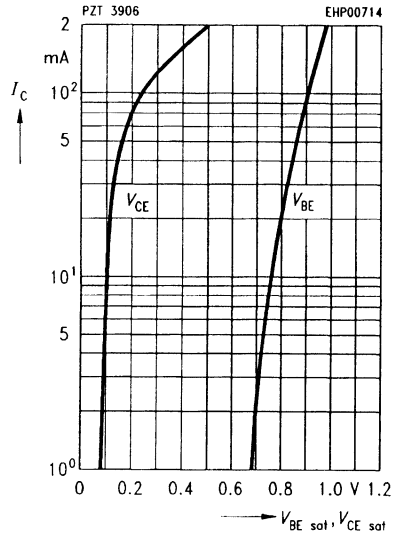
Input waveform; t_f < 1 ns; 10 µs < t_p ≤ 500 µs; δ = 0.02.

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

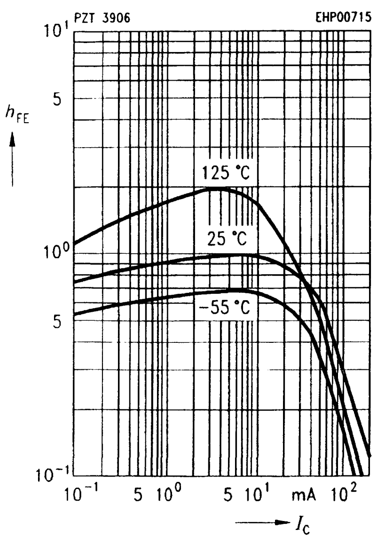
Total power dissipation $P_{tot} = f(T_A{}^*; T_S)$
* Package mounted on epoxy



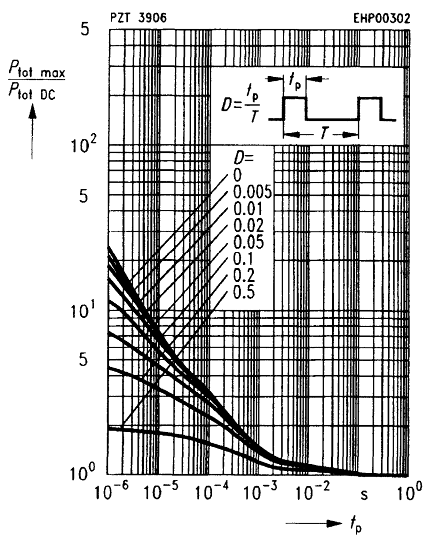
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$
$h_{FE} = 10$



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



Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$

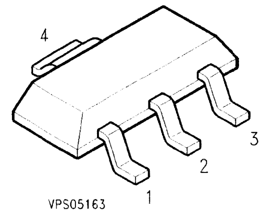


SIEMENS

NPN Silicon Darlington Transistors

PZTA 13
PZTA 14

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1]
PZTA 13	PZTA 13	Q62702-Z2033	B	C	E	C	SOT-223
PZTA 14	PZTA 14	Q62702-Z2034					

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CES}	30	V
Collector-base voltage	V_{CBO}	30	
Emitter-base voltage	V_{EBO}	10	
Collector current	I_C	300	mA
Peak collector current	I_{CM}	500	
Base current	I_B	100	
Peak base current	I_{BM}	200	
Total power dissipation, T_S = 124 ˚C[2]	P_{tot}	1.5	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

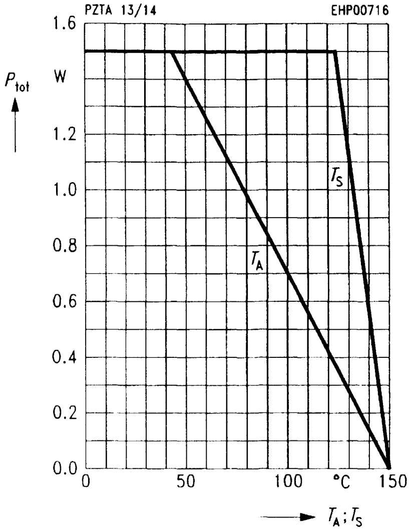
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

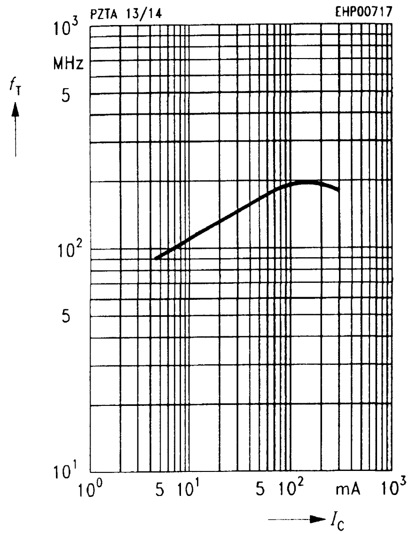
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 100 µA	$V_{(BR)CES}$	30	–	–	V
Collector-base breakdown voltage I_C = 100 µA, I_B = 0	$V_{(BR)CB0}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EB0}$	10	–	–	
Collector-base cutoff current V_{CE} = 30 V, I_E = 0 V_{CE} = 30 V, I_E = 0, T_A = 150 °C	I_{CB0}	 – –	 – –	 100 10	 nA µA
Emitter-base cutoff current V_{EB} = 10 V, I_C = 0	I_{EB0}	–	–	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[1] I_C = 100 mA, I_B = 0.1 mA	V_{CEsat}	–	–	1.5	V
Base-emitter saturation voltage[1] I_C = 100 mA, I_B = 0.1 mA	V_{BEsat}	–	–	2.0	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 100 MHz	f_T	125	–	–	MHz

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

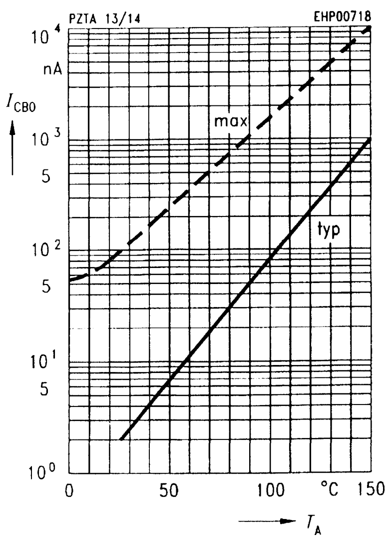
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



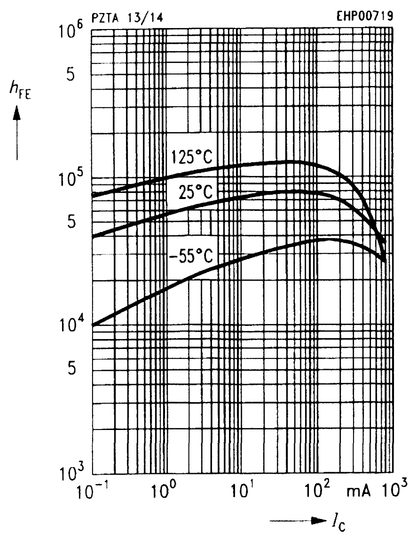
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V, f = 100 MHz



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

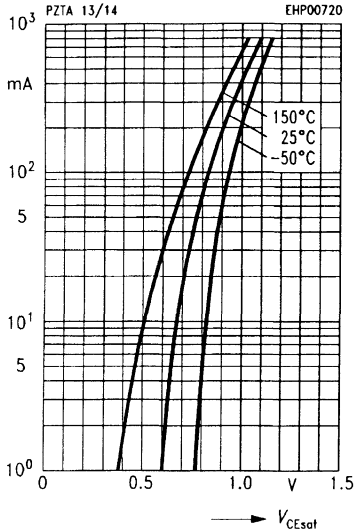


DC current gain $h_{FE} = f\,(I_C)$
V_{CE} = 5 V



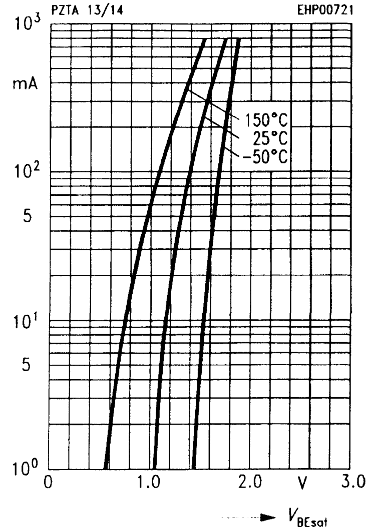
Collector-emitter saturation voltage

$I_C = f(V_{CE\,sat})$
$h_{FE} = 1000$

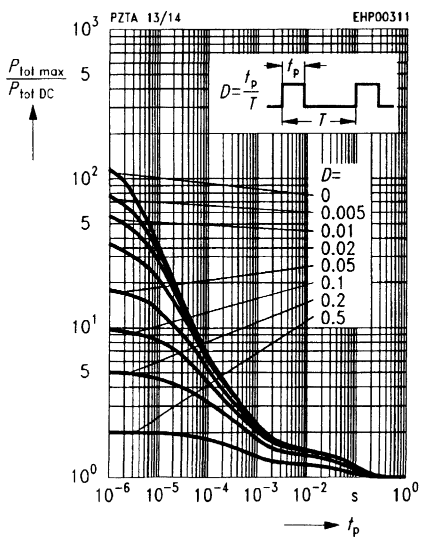


Base-emitter saturation voltage

$I_C = f(V_{BE\,sat})$
$h_{FE} = 1000$



Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$

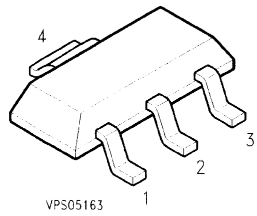


SIEMENS

NPN Silicon High-Voltage Transistors

PZTA 42
PZTA 43

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1)]
PZTA 42 PZTA 43	PZTA 42 PZTA 43	Q62702-Z2035 Q62702-Z2036	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values PZTA 42	PZTA 43	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	6		
Collector current	I_C	500		mA
Base current	I_B	100		
Total power dissipation, T_S = 124 °C [2)]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient [2)]	$R_{th\,JA}$	$\leq$ 72	K/W
Junction - soldering point	$R_{th\,JS}$	$\leq$ 17	

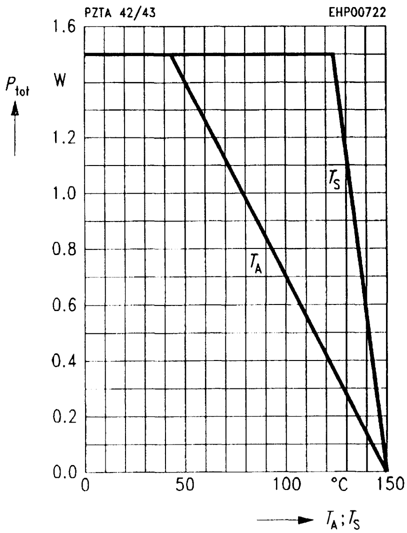
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

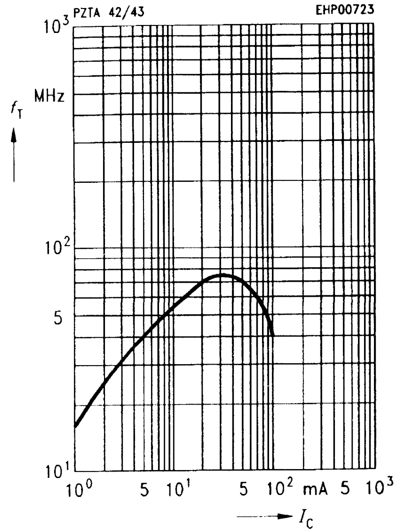
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA, I_B = 0	PZTA 42		300	–	–	
	PZTA 43		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA, I_B = 0	PZTA 42		300	–	–	
	PZTA 43		200	–	–	
Emitter-base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

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

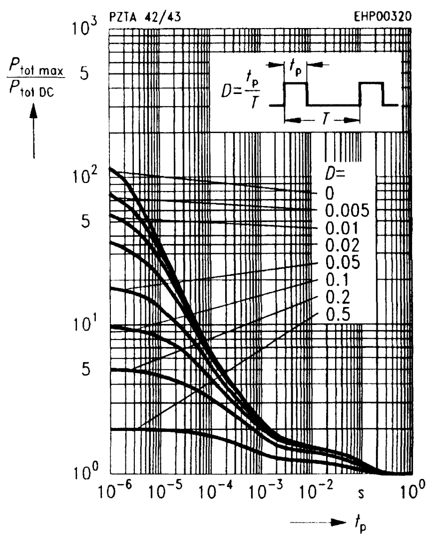
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



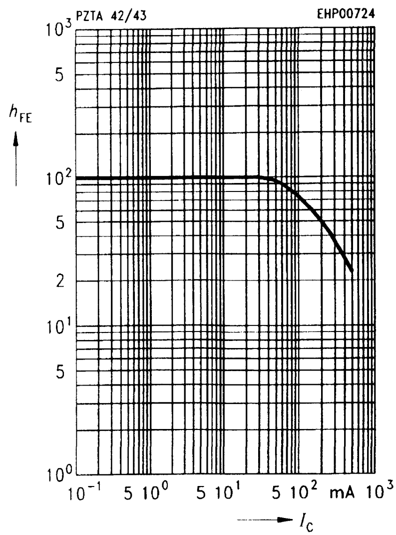
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 100 MHz



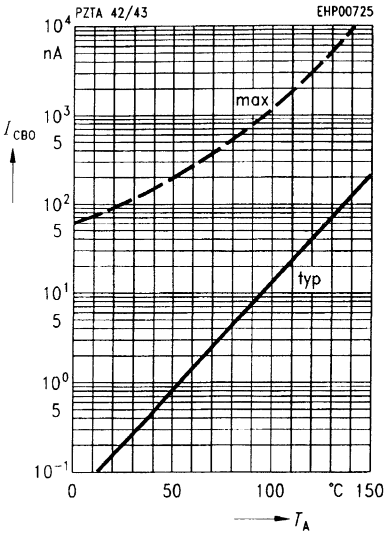
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



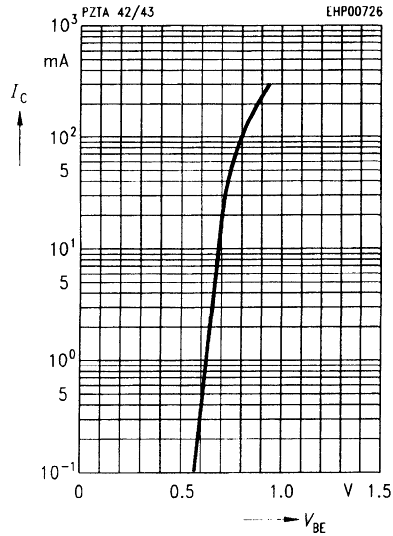
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 10 V



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



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

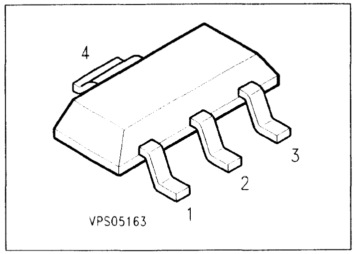


SIEMENS

PNP Silicon Darlington Transistors

PZTA 63
PZTA 64

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1]
PZTA 63	PZTA 63	Q62702-Z2031	B	C	E	C	SOT-223
PZTA 64	PZTA 64	Q62702-Z2032					

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CES}	30	V
Collector-base voltage	V_{CBO}	30	
Emitter-base voltage	V_{EBO}	10	
Collector current	I_C	500	mA
Peak collector current	I_{CM}	800	
Base current	I_B	100	
Peak base current	I_{BM}	200	
Total power dissipation, T_S = 124 °C[2]	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 72	K/W
Junction - soldering point	$R_{th JS}$	≤ 17	

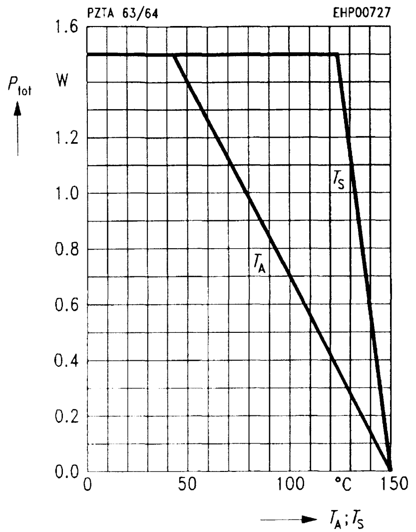
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

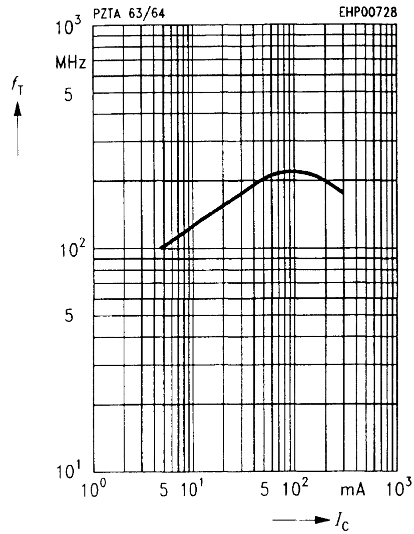
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 100 µA	$V_{(BR)CES}$	30	–	–	V
Collector-base breakdown voltage I_C = 100 µA, I_B = 0	$V_{(BR)CB0}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EB0}$	10	–	–	
Collector-base cutoff current V_{CE} = 30 V, I_E = 0 V_{CE} = 30 V, I_E = 0, T_A = 150 °C	I_{CB0}	 – –	 – –	 100 10	 nA µA
Emitter-base cutoff current V_{EB} = 10 V, I_C = 0	I_{EB0}	–	–	100	nA
DC current gain I_C = 10 mA, V_{CE} = 5 V PZTA 63 PZTA 64 I_C = 100 mA, V_{CE} = 5 V PZTA 63 PZTA 64	h_{FE}	 5000 10000 10000 20000	 – – – –	 – – – –	–
Collector-emitter saturation voltage[1] I_C = 100 mA, I_B = 0.1 mA	V_{CEsat}	–	–	1.5	V
Base-emitter saturation voltage[1] I_C = 100 mA, I_B = 0.1 mA	V_{BEsat}	–	–	2.0	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 100 MHz	f_T	125	–	–	MHz

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

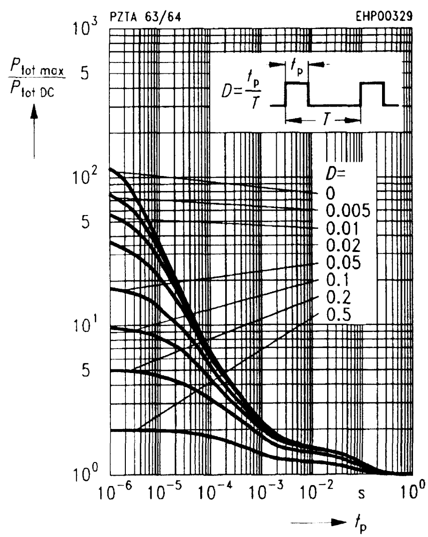
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



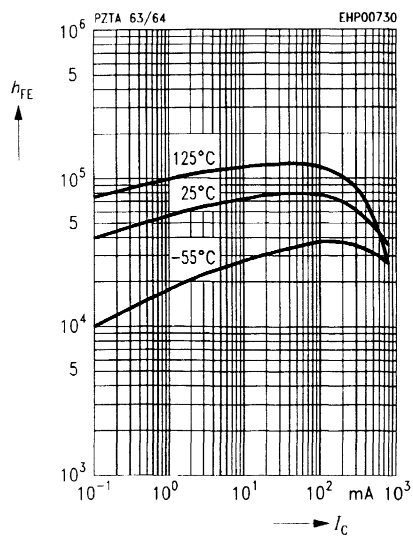
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$

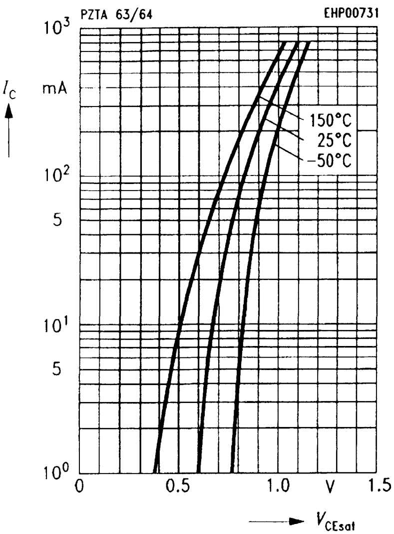


DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V



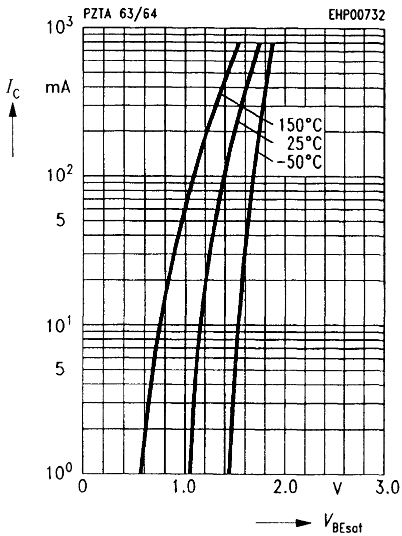
Collector-emitter saturation voltage

$I_C = f(V_{CE\,sat})$
$h_{FE} = 1000$



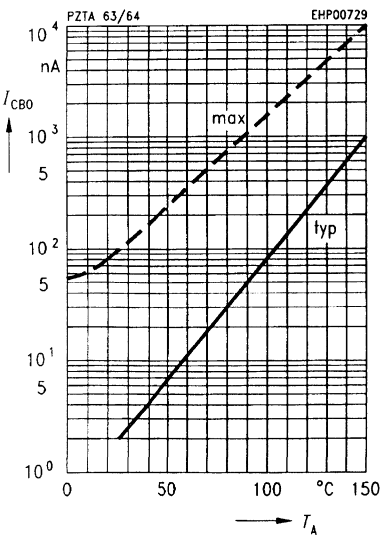
Base-emitter saturation voltage

$I_C = f(V_{BE\,sat})$
$h_{FE} = 1000$



Collector cutoff current $I_{CBO} = f(T_A)$

$V_{CE} = 30$ V

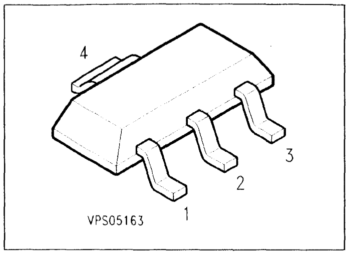


SIEMENS

PNP Silicon High-Voltage Transistors

PZTA 92
PZTA 93

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	4	Package[1]
PZTA 92 PZTA 93	PZTA 92 PZTA 93	Q62702-Z2037 Q62702-Z2038	B	C	E	C	SOT-223

Maximum Ratings

Parameter	Symbol	Values PZTA 92	PZTA 93	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	500		mA
Base current	I_B	100		
Total power dissipation, T_S = 124 °C[2]	P_{tot}	1.5		W
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 72	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 17	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

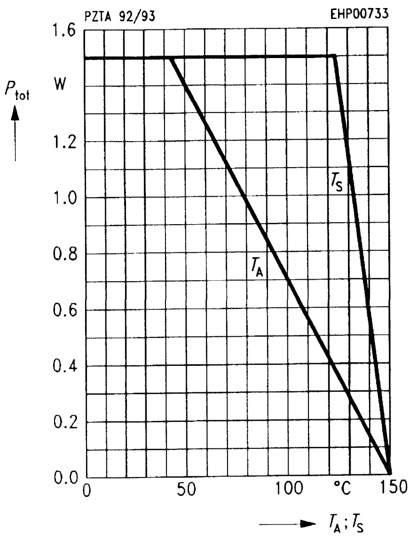
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

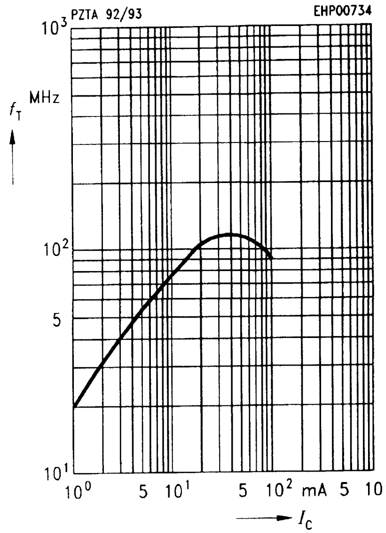
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA, I_B = 0	PZTA 92		300	–	–	
	PZTA 93		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA, I_B = 0	PZTA 92		300	–	–	
	PZTA 93		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA, I_C = 0		$V_{(BR)EBO}$	5	–	–	
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 V_{EB} = 3 V, I_C = 0		I_{EBO}	–	–	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}				V
I_C = 20 mA, I_B = 2 mA	PZTA 92		–	–	0.5	
	PZTA 93		–	–	0.4	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz		f_T	–	100	–	MHz
Collector-base capacitance		C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz	PZTA 92		–	–	6	
	PZTA 93		–	–	8	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

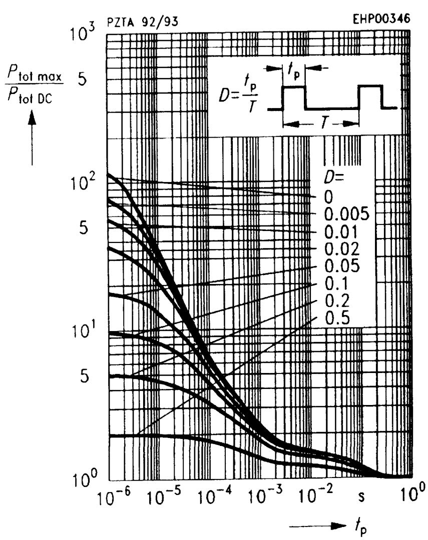
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



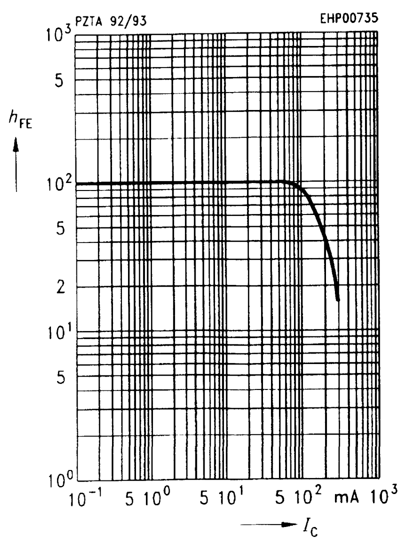
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 10 V, f = 100 MHz



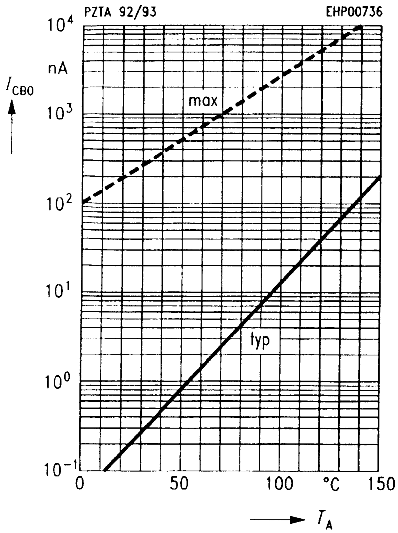
Permissible pulse load $P_{tot\,max}\,/\,P_{tot\,DC} = f\,(t_p)$



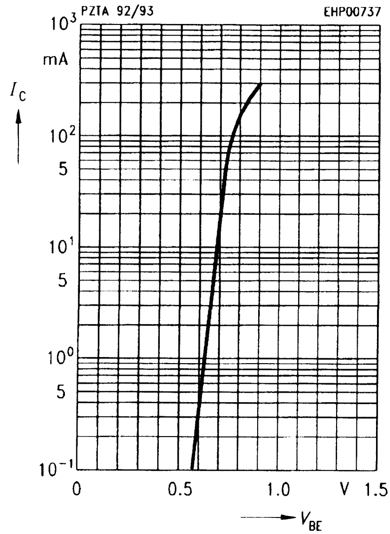
DC current gain $h_{FE} = f\,(I_C)$
V_{CE} = 10 V



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



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

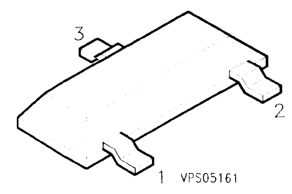


SIEMENS

NPN Silicon Switching Transistors

SMBT 2222
SMBT 2222 A

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBT 2222 SMBT 2222 A	s1B s1P	Q68000-A6481 Q68000-A6473	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBT 2222	SMBT 2222 A	Unit
Collector-emitter voltage	V_{CEO}	30	40	V
Collector-base voltage	V_{CBO}	60	75	
Emitter-base voltage	V_{EBO}	5	6	
Collector current	I_C	600		mA
Total power dissipation, T_S = 77 °C	P_{tot}	330		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 290	K/W
Junction - soldering point	$R_{th JS}$	≤ 220	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	SMBT 2222		30	–	–	
	SMBT 2222 A		40	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 10 µA	SMBT 2222		60	–	–	
	SMBT 2222 A		75	–	–	
Emitter-base breakdown voltage		$V_{(BR)EBO}$				
I_E = 10 µA	SMBT 2222		5	–	–	
	SMBT 2222 A		6	–	–	
Collector cutoff current		I_{CBO}				
V_{CB} = 50 V	SMBT 2222		–	–	10	nA
V_{CB} = 60 V	SMBT 2222 A		–	–	10	nA
V_{CB} = 50 V, T_A = 150 °C	SMBT 2222		–	–	10	µA
V_{CB} = 60 V, T_A = 150 °C	SMBT 2222 A		–	–	10	µA
Emitter cutoff current V_{EB} = 3 V		I_{EBO}	–	–	10	nA
DC current gain		h_{FE}				–
I_C = 100 µA, V_{CE} = 10 V			35	–	–	
I_C = 1 mA, V_{CE} = 10 V			50	–	–	
I_C = 10 mA, V_{CE} = 10 V[1]			75	–	–	
I_C = 150 mA, V_{CE} = 1 V[1]			50	–	–	
I_C = 150 mA, V_{CE} = 10 V[1]			100	–	300	
I_C = 500 mA, V_{CE} = 10 V[1]	SMBT 2222		30	–	–	
	SMBT 2222 A		40	–	–	
I_C = 10 mA, V_{CE} = 10 V, T_A = 55 °C	SMBT 2222 A		35	–	–	
Collector-emitter saturation voltage[1]		V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA	SMBT 2222		–	–	0.4	
	SMBT 2222 A		–	–	0.3	
I_C = 500 mA, I_B = 50 mA	SMBT 2222		–	–	1.6	
	SMBT 2222 A		–	–	1.0	
Base-emitter saturation voltage[1]		V_{BEsat}				
I_C = 150 mA, I_B = 15 mA	SMBT 2222		–	–	1.3	
	SMBT 2222 A		0.6	–	1.2	
I_C = 500 mA, I_B = 50 mA	SMBT 2222		–	–	2.6	
	SMBT 2222 A		–	–	2.0	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	f_T				MHz
SMBT 2222		250	–	–	
SMBT 2222 A		300	–	–	
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	8	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}				
SMBT 2222		–	–	30	
SMBT 2222 A		–	–	25	
Short-circuit input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{11e}				kΩ
SMBT 2222 A		2	–	8	
I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz SMBT 2222 A		0.25	–	1.25	
Open-circuit reverse voltage transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{12e}				10^{-4}
SMBT 2222 A		–	–	8.0	
I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz SMBT 2222 A		–	–	4.0	
Short-circuit forward current transfer ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{21e}				–
SMBT 2222 A		50	–	300	
I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz SMBT 2222 A		75	–	375	
Open-circuit output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{22e}				µS
SMBT 2222		5	–	35	
I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz SMBT 2222 A		25	–	200	
Collector-base time constant I_E = 20 mA, V_{CB} = 10 V, f = 31.8 MHz SMBT 2222 A	$r_{b'}C_c$	–	–	150	ps
Noise figure I_C = 100 µA, V_{CE} = 10 V, R_S = 1 kΩ f = 1 kHz SMBT 2222 A	F	–	–	4.0	dB

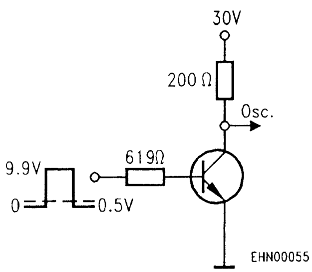
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

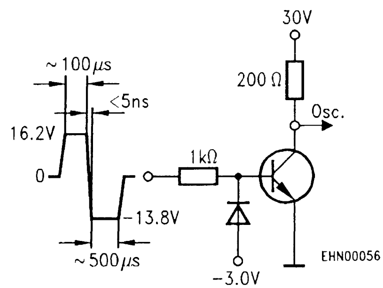
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics (continued)					
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA $V_{BE(off)}$ = 0.5 V					
Delay time	t_d	–	–	10	ns
Rise time	t_r	–	–	25	ns
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA					
Storage time	t_{stg}	–	–	225	ns
Fall time	t_f	–	–	60	ns

Test circuits

Delay and rise time

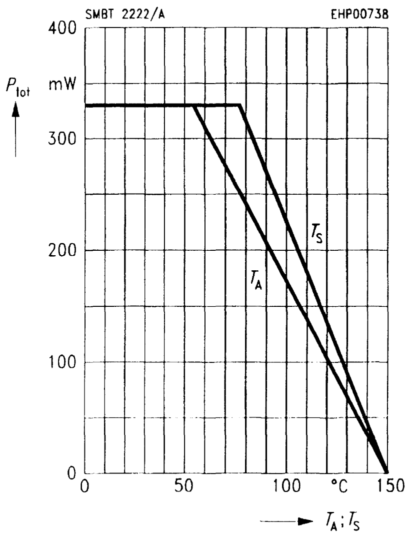


Storage and fall time

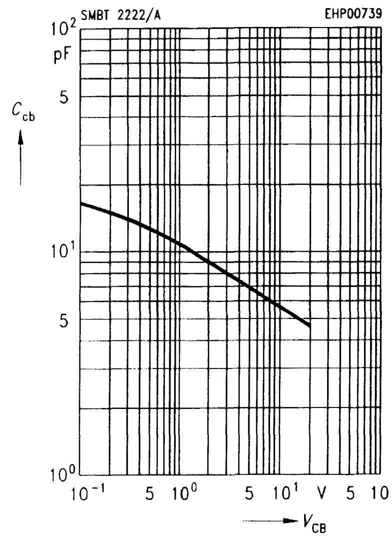


Oscillograph: R > 100 Ω
C < 12 pF
t_r < 5 ns

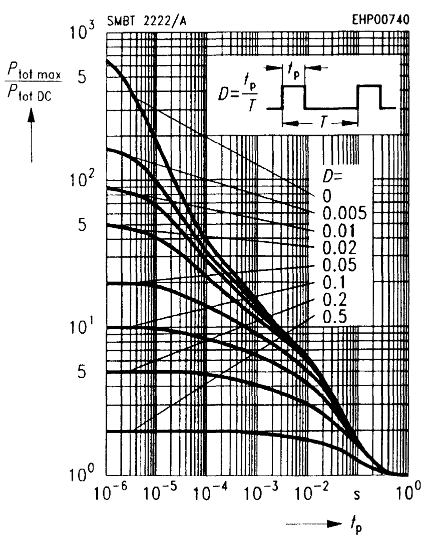
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



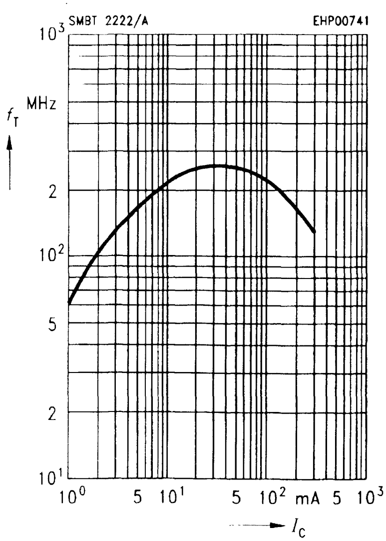
Collector-base capacitance $C_{cb} = f(V_{CB})$
f = 1 MHz



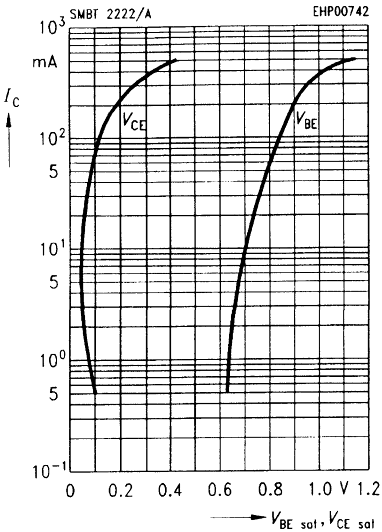
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



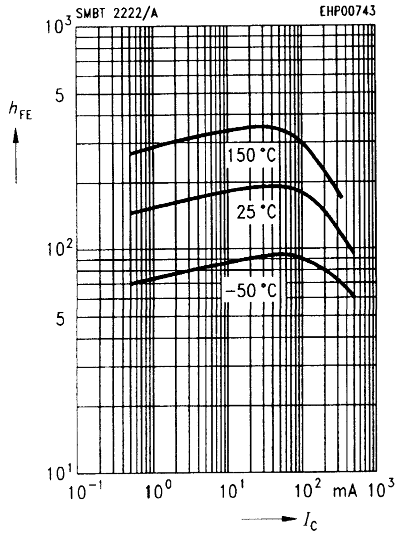
Transition frequency $f_T = f(I_C)$
V_{CE} = 20 V



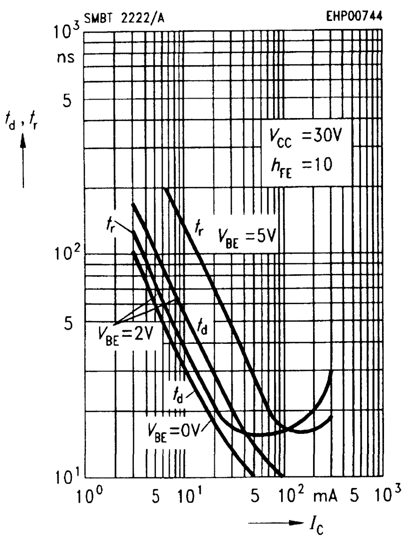
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$
$h_{FE} = 10$



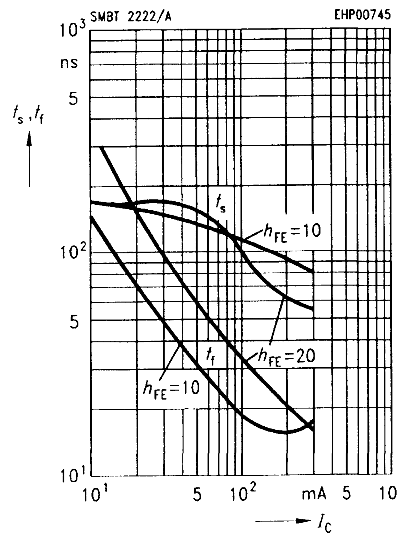
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$



Storage time $t_{stg} = f(I_C)$
Fall time $t_f = f(I_C)$

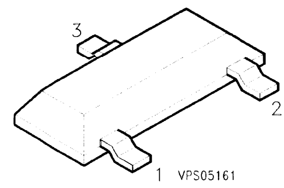


SIEMENS

PNP Silicon Switching Transistors

SMBT 2907
SMBT 2907 A

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBT 2907 SMBT 2907 A	s2B s2F	Q68000-A6501 Q68000-A6474	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBT 2907	SMBT 2907 A	Unit
Collector-emitter voltage	V_{CEO}	40	60	V
Collector-base voltage	V_{CBO}	60		
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	600		mA
Total power dissipation, T_S = 77 ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 290	K/W
Junction - soldering point	$R_{th JS}$	≤ 220	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	SMBT 2907		40	–	–	
	SMBT 2907 A		60	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 10 μA	SMBT 2907		60	–	–	
	SMBT 2907 A		60	–	–	
Emitter-base breakdown voltage I_E = 10 μA		$V_{(BR)EBO}$	5	–	–	
Collector cutoff current		I_{CBO}				
V_{CB} = 50 V	SMBT 2907		–	–	20	nA
V_{CB} = 50 V	SMBT 2907 A		–	–	10	nA
V_{CB} = 50 V, T_A = 150 °C	SMBT 2907		–	–	20	μA
V_{CB} = 50 V, T_A = 150 °C	SMBT 2907 A		–	–	10	μA
Emitter cutoff current V_{EB} = 3 V		I_{EBO}	–	–	10	nA
DC current gain [1]		h_{FE}				–
I_C = 100 μA, V_{CE} = 10 V	SMBT 2907		35	–	–	
	SMBT 2907 A		75	–	–	
I_C = 1 mA, V_{CE} = 10 V	SMBT 2907		50	–	–	
	SMBT 2907 A		100	–	–	
I_C = 10 mA, V_{CE} = 10 V [1]	SMBT 2907		75	–	–	
	SMBT 2907 A		100	–	–	
I_C = 150 mA, V_{CE} = 10 V [1]	SMBT 2907		100	–	300	
	SMBT 2907 A		100	–	300	
I_C = 500 mA, V_{CE} = 10 V [1]	SMBT 2907		30	–	–	
	SMBT 2907 A		50	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA			–	–	0.4	
I_C = 500 mA, I_B = 50 mA			–	–	1.6	
Base-emitter saturation voltage [1]		V_{BEsat}				
I_C = 150 mA, I_B = 15 mA			–	–	1.3	
I_C = 500 mA, I_B = 50 mA			–	–	2.6	

[1] Pulse test conditions: $t \leq 300$ μs, D = 2 %.

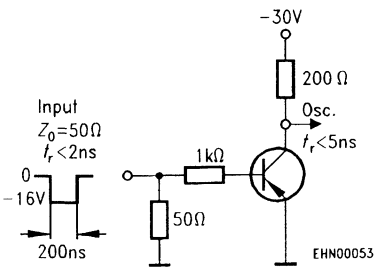
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

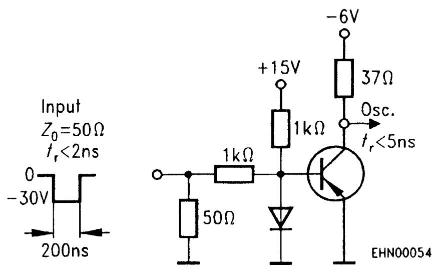
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	f_T	200	–	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	8	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	30	
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA					
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					
Storage time	t_{stg}	–	–	80	ns
Fall time	t_f	–	–	30	ns

Test circuits

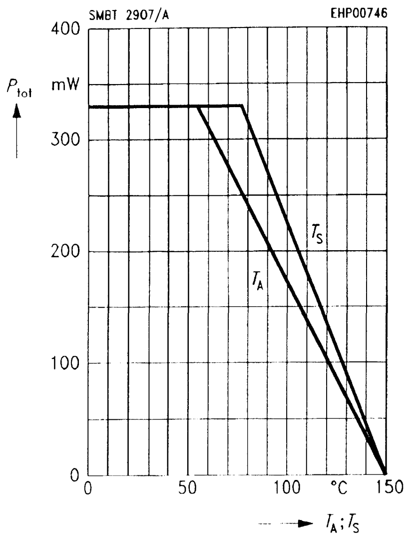
Delay and rise time



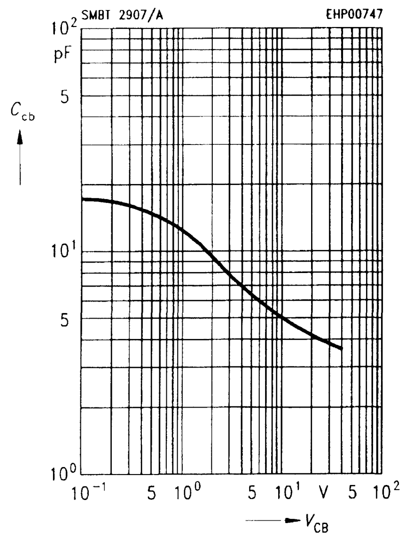
Storage and fall time



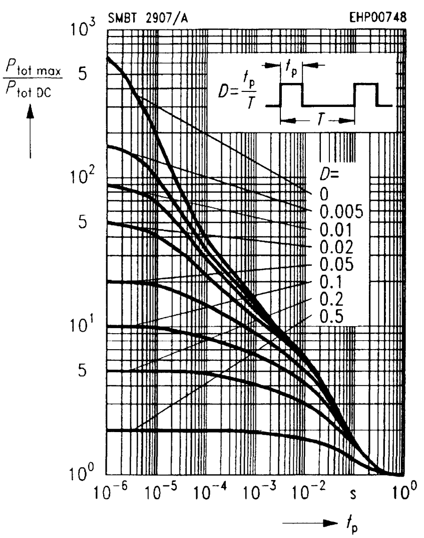
Total power dissipation $P_{tot} = f\,(T_A{}^*;\, T_S)$
* Package mounted on epoxy



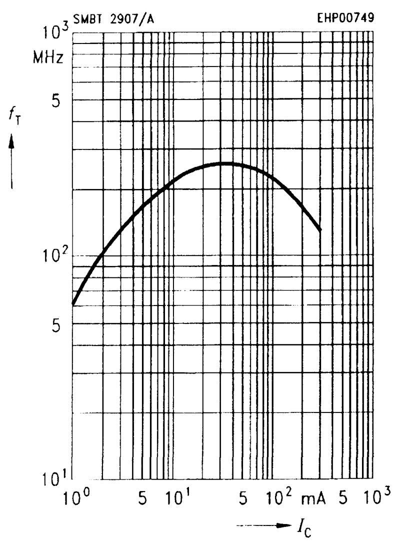
Collector-base capacitance $C_{CB} = f\,(V_{CB})$
f = 1 MHz



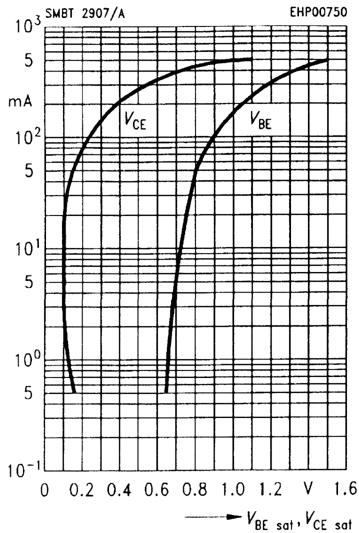
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



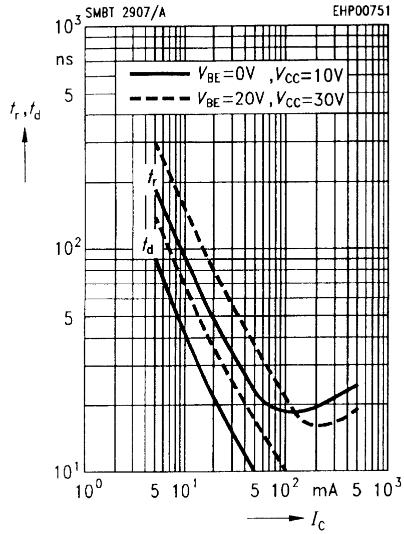
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 20 V



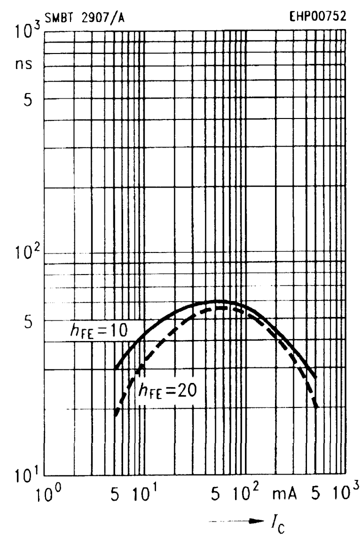
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$
$h_{FE} = 10$



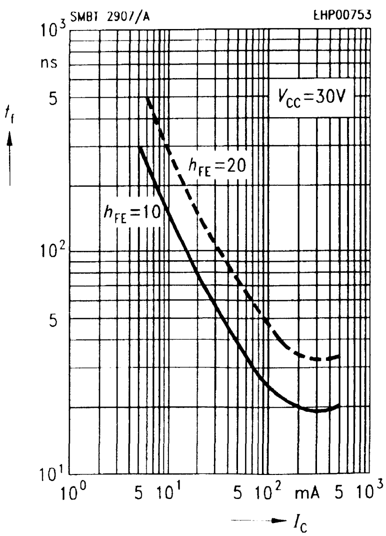
Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$
$h_{FE} = 10$



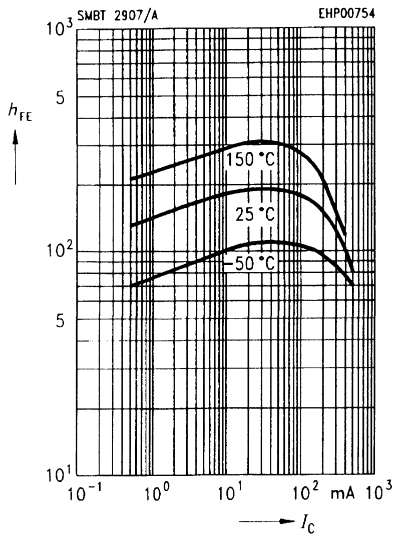
Storage time $t_{stg} = f(I_C)$



Fall time $t_f = f(I_C)$



DC current gain $h_{FE} = f(I_C)$

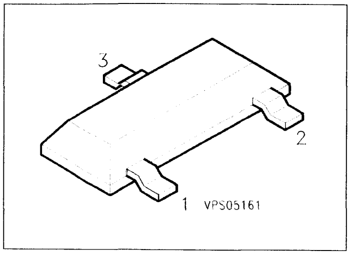


SIEMENS

NPN Silicon Switching Transistor

SMBT 3904

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBT 3904	s1A	Q68000-A4416	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}	6	
Collector current	I_C	200	mA
Total power dissipation, T_S = 69 °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 315	K/W
Junction - soldering point	$R_{th JS}$	≤ 245	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical 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	$V_{(BR)CE0}$	40	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CB0}$	60	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current V_{CB} = 30 V	I_{CB0}	–	–	50	nA
DC current gain I_C = 100 µA, V_{CE} = 1 V I_C = 1 mA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 1 V [1] I_C = 50 mA, V_{CE} = 1 V [1] I_C = 100 mA, V_{CE} = 1 V [1]	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
Base-emitter saturation voltage[1] I_C = 10 mA, I_B = 1 mA I_C = 50 mA, I_B = 5 mA	V_{BEsat}	 0.65 –	 – –	 0.85 0.95	

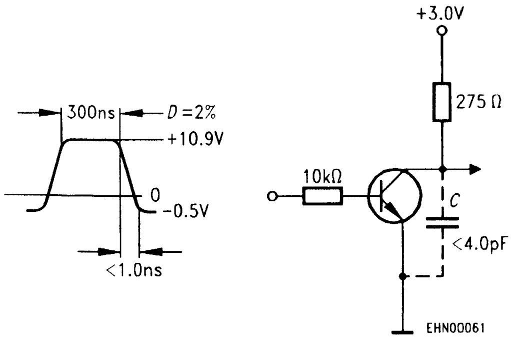
1) Pulse test conditions: $t \leq 300$ µs, D = 2 %.

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

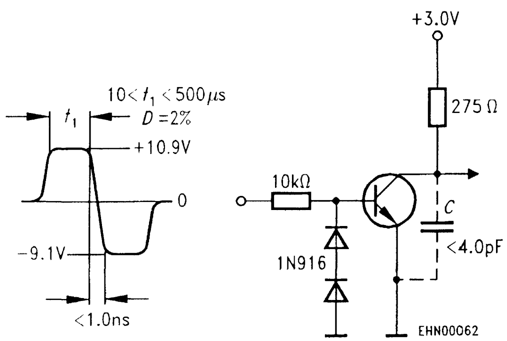
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	–	–	MHz
Output capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	8	
Input impedance I_C = 1 mA, V_{CE} = 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
Noise figure I_C = 100 µA, V_{CE} = 5 V, R_S = 1 kΩ, f = 1 kHz	F	–	–	5	dB
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 (see diagrams)	t_f	–	–	50	ns

Test circuits

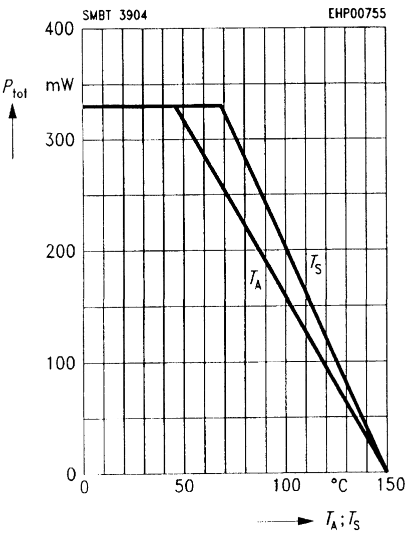
Delay and rise time



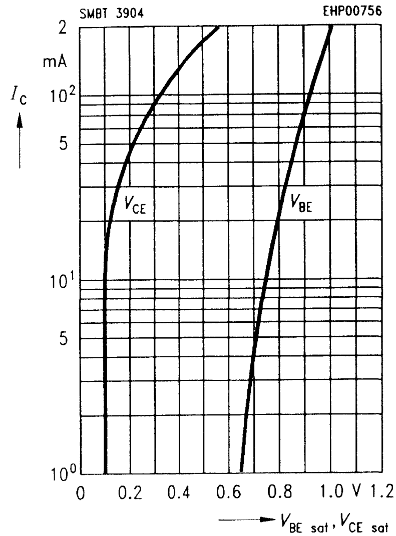
Storage and fall time



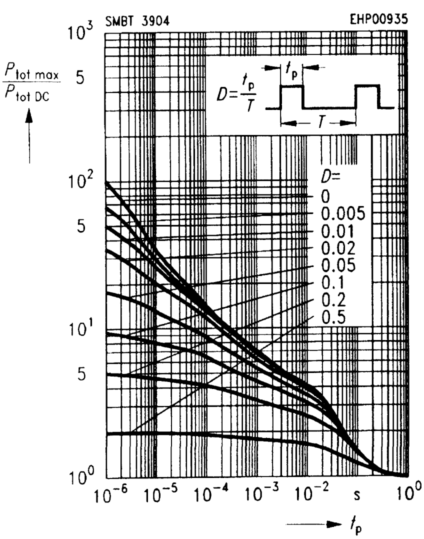
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



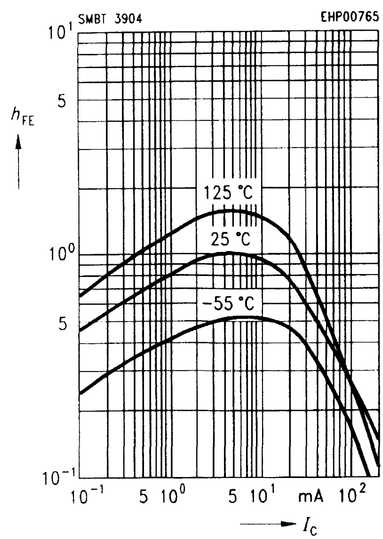
Saturation voltage $I_C = f\,(V_{BE\,sat},\ V_{CE\,sat})$



Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f\,(t_p)$

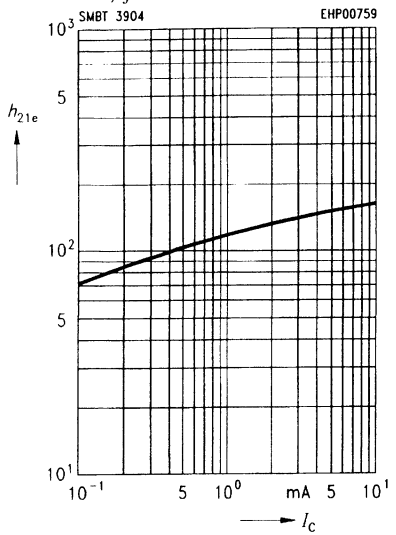


DC current gain $h_{FE} = f\,(I_C)$
V_{CE} = 10 V, normalized



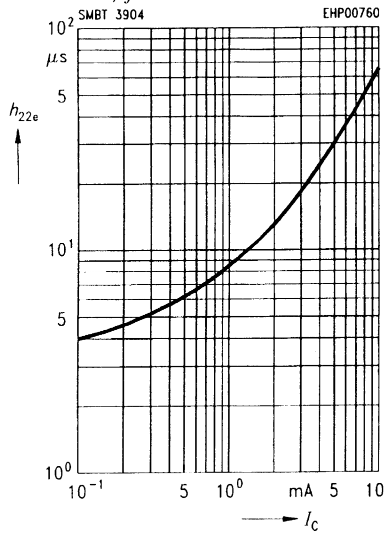
Short-circuit forward current transfer ratio $h_{21e} = f(I_C)$

V_{CE} = 10 V, f = 1 MHz

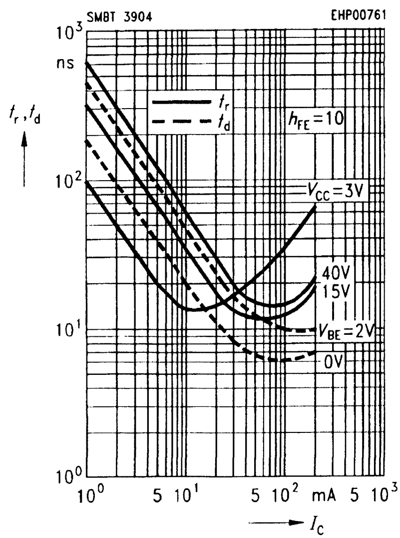


Open-circuit output admittance $h_{22e} = f(I_C)$

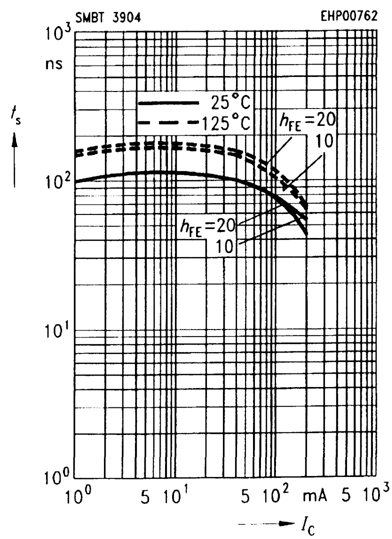
V_{CE} = 10 V, f = 1 MHz



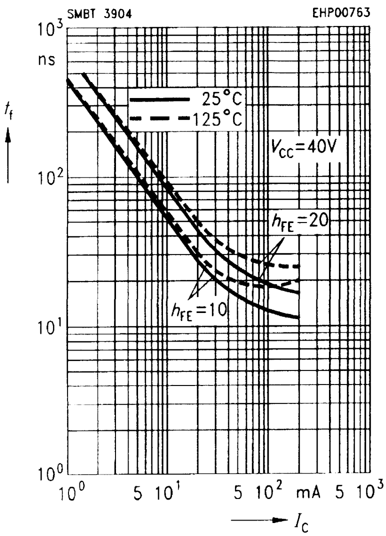
Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$



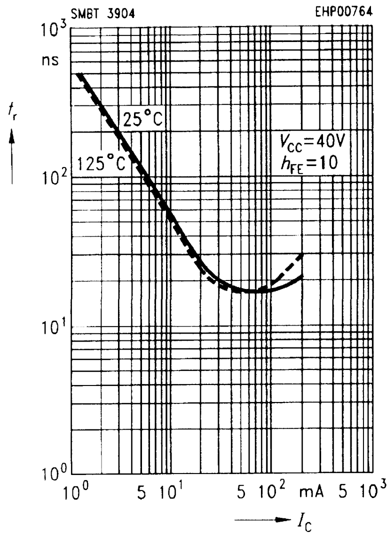
Storage time $t_{stg} = f(I_C)$



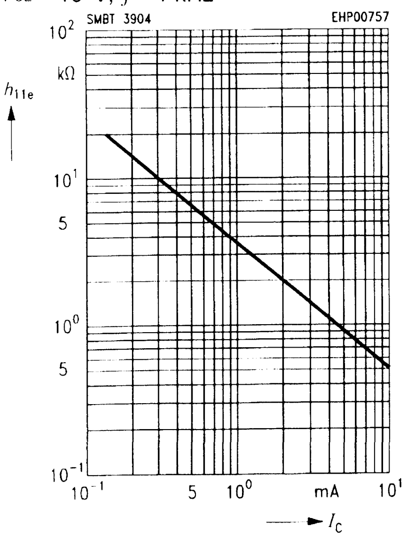
Fall time $t_f = f(I_C)$



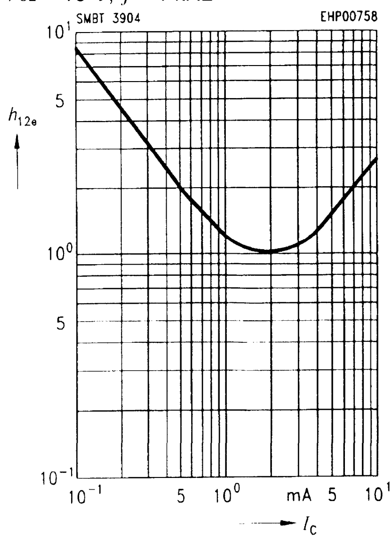
Rise time $t_r = f(I_C)$



Input impedance
$h_{11e} = f(I_C)$
V_{CE} = 10 V, f = 1 kHz



Open-circuit reverse voltage transfer ratio $h_{12e} = f(I_C)$
V_{CE} = 10 V, f = 1 kHz

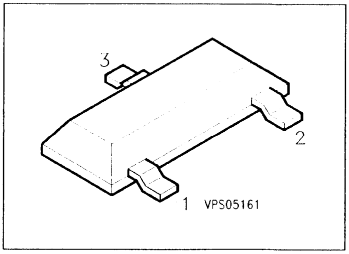


SIEMENS

PNP Silicon Switching Transistor

SMBT 3906

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBT 3906	s2A	Q68000-A4417	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	40	V
Collector-base voltage	V_{CB0}	40	
Emitter-base voltage	V_{EB0}	5	
Collector current	I_C	200	mA
Total power dissipation, T_S = 71 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 310	K/W
Junction - soldering point	$R_{th JS}$	≤ 240	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	$V_{(BR)CEO}$	40	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	40	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector cutoff current V_{CB} = 30 V	I_{CBO}	–	–	50	nA
DC current gain I_C = 100 µA, V_{CE} = 1 V I_C = 1 mA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 1 V [1] I_C = 50 mA, V_{CE} = 1 V [1] I_C = 100 mA, V_{CE} = 1 V [1]	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
Base-emitter saturation voltage[1] I_C = 10 mA, I_B = 1 mA I_C = 50 mA, I_B = 5 mA	V_{BEsat}	 0.65 –	 – –	 0.85 0.95	

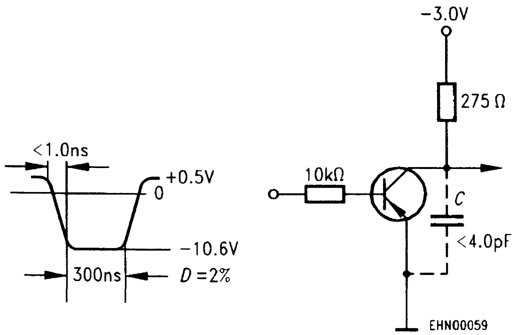
[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

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

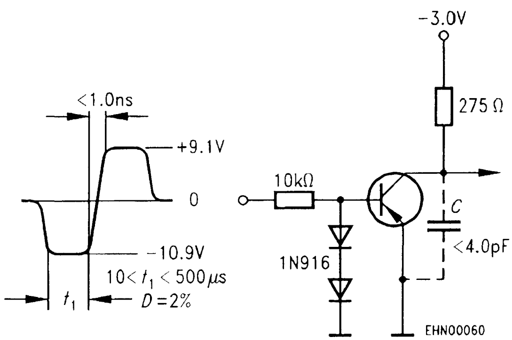
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	250	–	–	MHz
Output capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4.5	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	10	
Short-circuit input impedance 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
Noise figure I_C = 100 µA, V_{CE} = 5 V, R_S = 1 kΩ, f = 1 kHz	F	–	–	4	dB
V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA $V_{BE(off)}$ = 0.5 Vdc					
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}	–	–	225	ns
Fall time	t_f	–	–	75	ns
(see diagrams)					

Test circuits

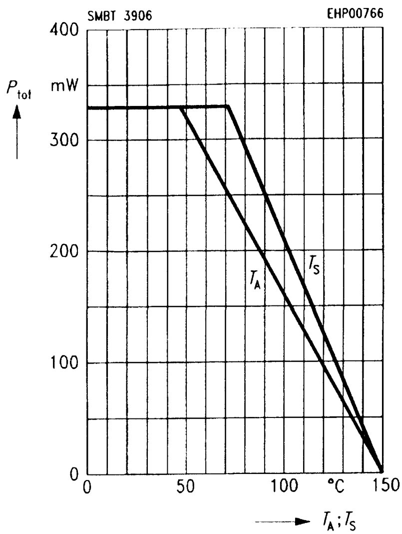
Delay and rise time



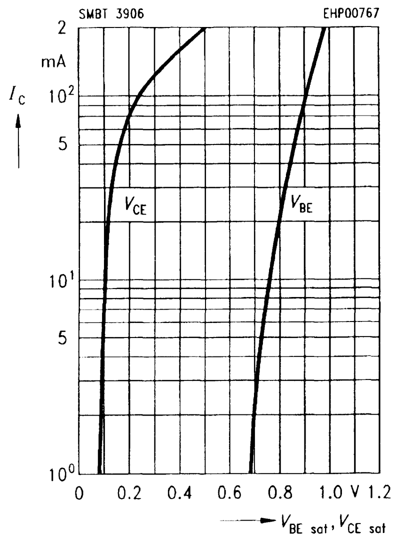
Storage and fall time



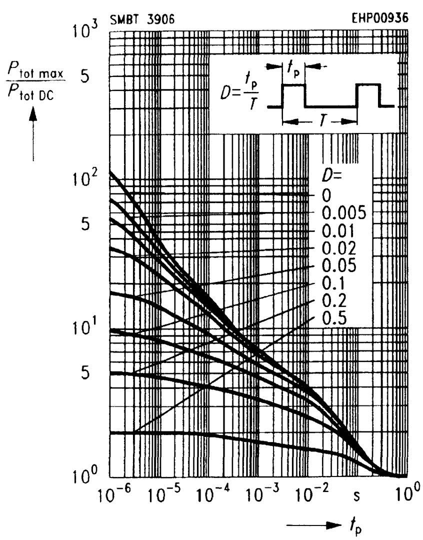
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



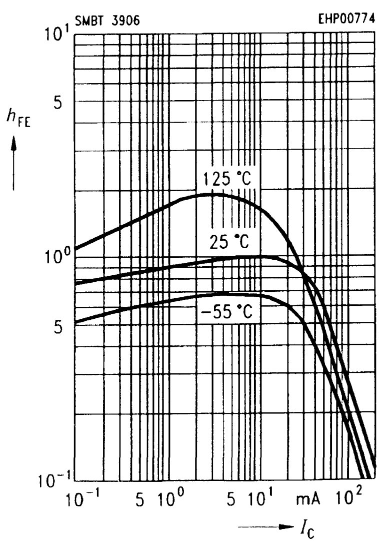
Saturation voltage $I_C = f(V_{BE\,sat}, V_{CE\,sat})$



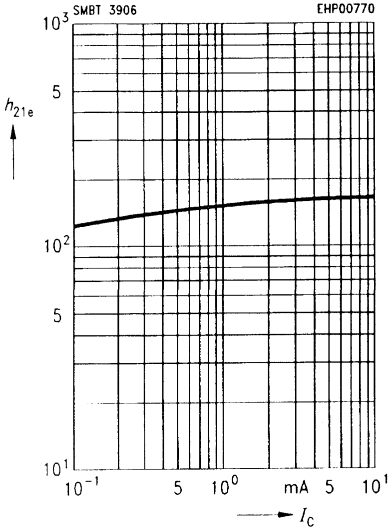
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



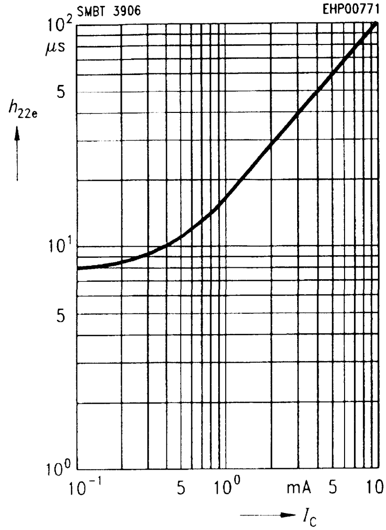
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V, normalized



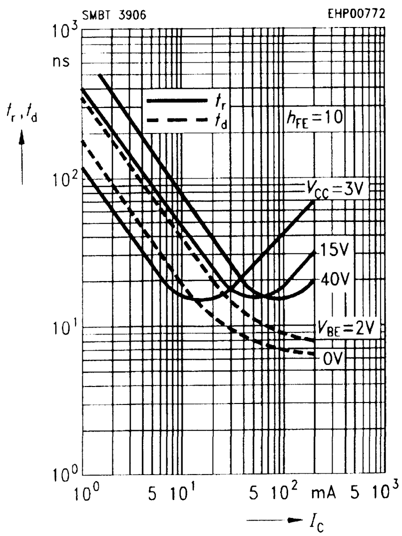
Short-circuit forward current transfer ratio $h_{21e} = f\,(I_C)$
V_{CE} = 10 V, f = 1 MHz



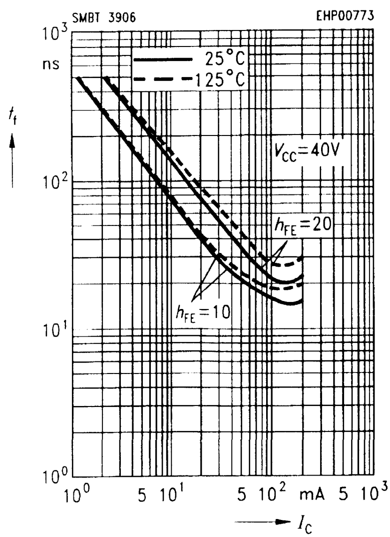
Open-circuit output admittance
$h_{22e} = f\,(I_C)$
V_{CE} = 10 V, f = 1 MHz



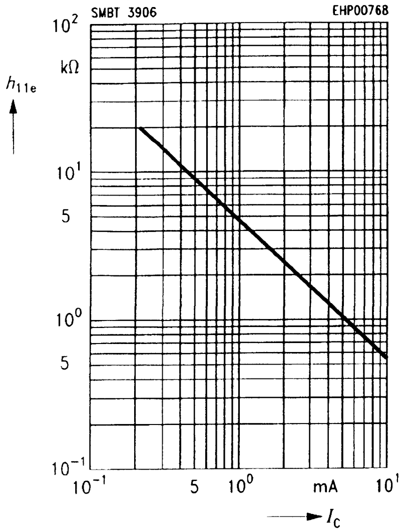
Delay time $t_d = f\,(I_C)$
Rise time $t_r = f\,(I_C)$



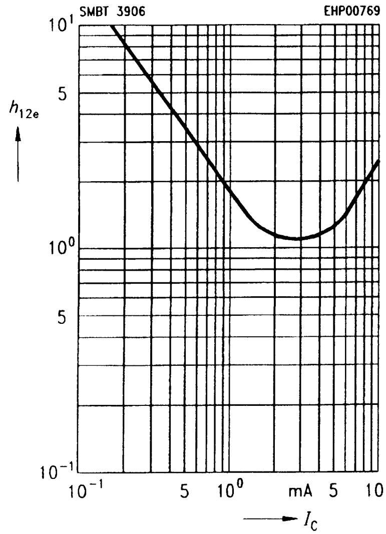
Fall time $t_f = f\,(I_C)$



Short-circuit input impedance
$h_{11e} = f\,(I_C)$
V_{CE} = 10 V, f = 1 kHz



Open-circuit reverse voltage transfer ratio $h_{12e} = f\,(I_C)$

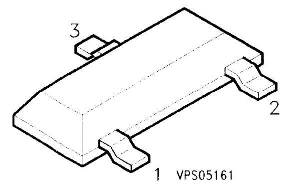


SIEMENS

NPN Silicon Switching Transistor

SMBT 4124

- High current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBT 4124	sZC	Q68000-A8316	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	25	V
Collector-base voltage	V_{CBO}	30	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	200	mA
Total power dissipation, T_S = 69 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient[2)]	$R_{th JA}$	≤ 315	K/W
Junction - soldering point	$R_{th JS}$	≤ 245	

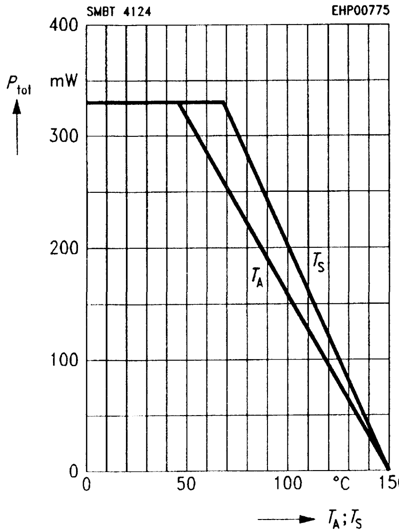
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

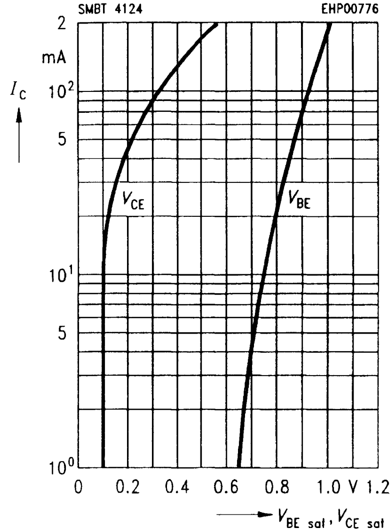
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	25	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 20 V, I_E = 0	I_{CBO}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0	I_{EBO}	–	–	50	
DC current gain I_C = 2 mA, V_{CE} = 1 V I_C = 50 mA, V_{CE} = 1 V	h_{FE}	 120 60	 – –	 360 –	–
Collector-emitter saturation voltage[1)] I_C = 50 mA, I_B = 5 mA	V_{CEsat}	–	–	0.3	V
Base-emitter saturation voltage[1)] I_C = 50 mA, I_B = 5 mA	V_{BEsat}	–	–	0.95	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	–	–	MHz
Output capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	8	
Small-signal current gain I_C = 1 mA, V_{CE} = 5 V, f = 1 kHz	h_{fe}	120	–	480	–
Noise figure I_C = 0.1 mA, V_{CE} = 5 V, f = 10 Hz to 15 kHz R_S = 1 kΩ	NF	–	–	5	dB

1) Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

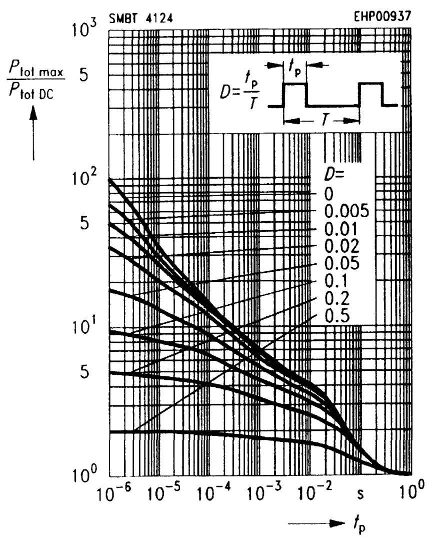
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



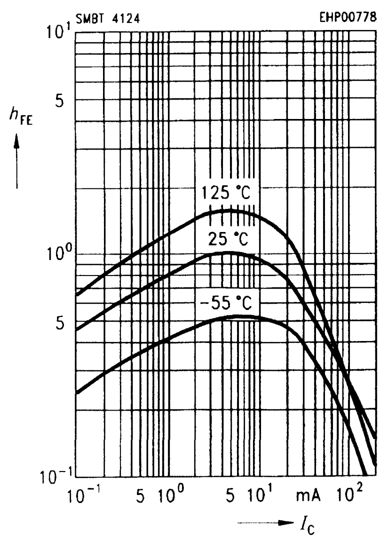
Saturation voltage $I_C = f(V_{BE\,sat}, V_{CE\,sat})$



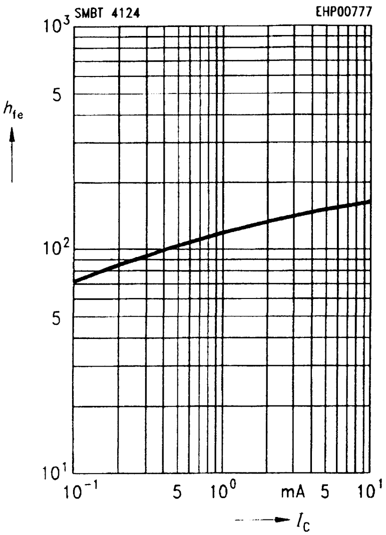
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



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



Small-signal current gain $h_{fe} = f(I_C)$
V_{CE} = 10 V, f = 1 MHz

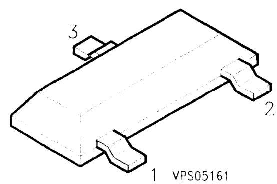


SIEMENS

PNP Silicon Switching Transistor

SMBT 4126

- High current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBT 4126	sC3	Q68000-A8549	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	25	V
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	4	
Collector current	I_C	200	mA
Total power dissipation, T_S = 71 °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 310	K/W
Junction - soldering point	$R_{th JS}$	≤ 240	

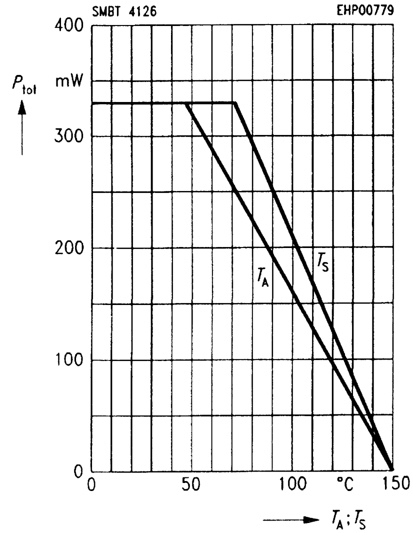
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

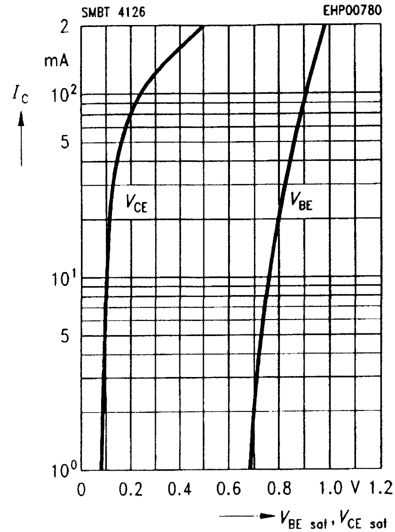
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	25	–	–	V
Collector-base breakdown voltage I_C = 10 μA	$V_{(BR)CBO}$	25	–	–	
Emitter-base breakdown voltage I_E = 10 μA	$V_{(BR)EBO}$	4	–	–	
Collector-base cutoff current V_{CB} = 20 V, I_E = 0	I_{CBO}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0	I_{EBO}	–	–	50	
DC current gain I_C = 2 mA, V_{CE} = 1 V I_C = 50 mA, V_{CE} = 1 V	h_{FE}	 120 60	 – –	 360 –	–
Collector-emitter saturation voltage[1)] I_C = 50 mA, I_B = 5 mA	V_{CEsat}	–	–	0.4	V
Base-emitter saturation voltage[1)] I_C = 50 mA, I_B = 5 mA	V_{BEsat}	–	–	0.95	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	250	–	–	MHz
Output capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4.5	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	10	
Small-signal current gain I_C = 1 mA, V_{CE} = 5 V, f = 1 kHz	h_{fe}	120	–	480	–
Noise figure I_C = 0.1 mA, V_{CE} = 5 V, f = 10 Hz to 15 kHz R_S = 1 kΩ	NF	–	–	4	dB

1) Pulse test conditions: $t \leq 300$ μs, $D \leq 2$ %.

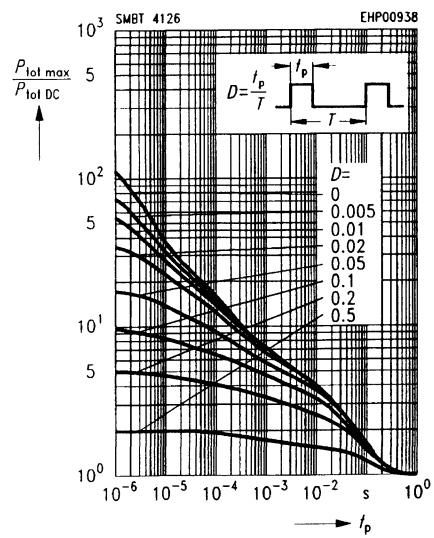
Total power dissipation $P_{tot} = f\,(T_A^*;\,T_S)$
* Package mounted on epoxy



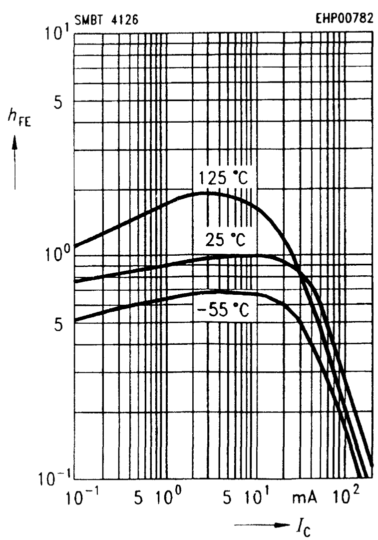
Saturation voltage $I_C = f\,(V_{BE\,sat},\,V_{CE\,sat})$



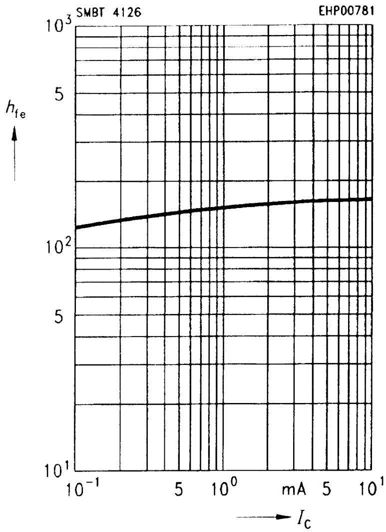
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f\,(t_p)$



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



Small-signal current gain $h_{fe} = f\,(I_C)$
V_{CE} = 10 V, f = 1 MHz

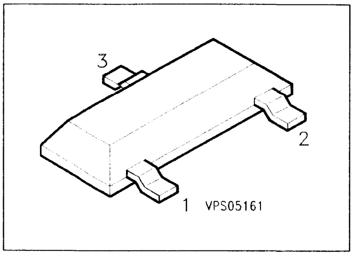


SIEMENS

PNP Silicon Transistors

SMBT 5086
SMBT 5087

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBT 5086	s2P	Q62702-M0002	B	E	C	SOT-23
SMBT 5087	s2Q	Q68000-A8319				

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	50	V
Collector-base voltage	V_{CB0}	50	
Emitter-base voltage	V_{EB0}	3	
Collector current	I_C	50	mA
Total power dissipation, T_S = 71 °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 310	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 240	

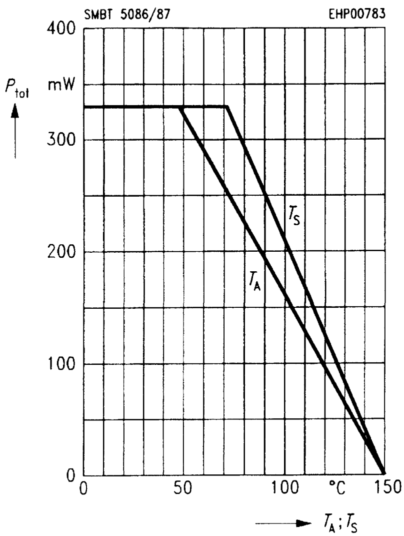
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

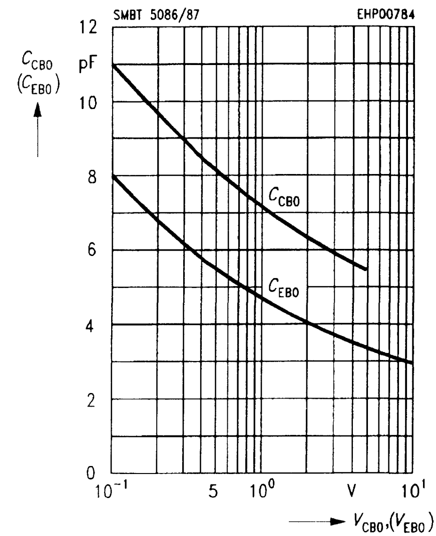
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	50	–	–	V
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CBO}$	50	–	–	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EBO}$	3	–	–	
Collector-base cutoff current V_{CB} = 10 V, I_E = 0 V_{CB} = 35 V, I_E = 0 V_{CB} = 35 V, I_E = 0, T_A = 150 °C	I_{CBO}	 – – –	 – – –	 10 50 20	 nA nA µA
DC current gain I_C = 100 µA, V_{CE} = 5 V SMBT 5086 SMBT 5087 I_C = 1 mA, V_{CE} = 5 V SMBT 5086 SMBT 5087 I_C = 10 mA, V_{CE} = 5 V SMBT 5086 SMBT 5087	h_{FE}	 150 250 150 250 150 250	 – – – – – –	 500 800 – – – –	–
Collector-emitter saturation voltage [1] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.3	V
Base-emitter saturation voltage [1] I_C = 10 mA, I_B = 1 mA	V_{BEsat}	–	–	0.85	
AC characteristics					
Transition frequency I_C = 0.5 mA, V_{CE} = 5 V, f = 100 MHz	f_T	40	–	–	MHz
Output capacitance, V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4	pF
Small-signal current gain I_C = 1 mA, V_{CE} = 5 V, f = 1 kHz SMBT 5086 I_C = 1 mA, V_{CE} = 5 V, f = 1 kHz SMBT 5087	h_{fe}	 150 250	 – –	 600 900	–
Noise figure I_C = 100 µA, V_{CE} = 5 V, f = 1 kHz, R_S = 3 kΩ SMBT 5086 SMBT 5087 I_C = 2 mA, V_{CE} = 5 V, f = 10 Hz to 15 kHz, R_S = 10 kΩ SMBT 5086 SMBT 5087	NF	 – – – –	 – – – –	 3 2 3 2	 dB dB dB dB

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

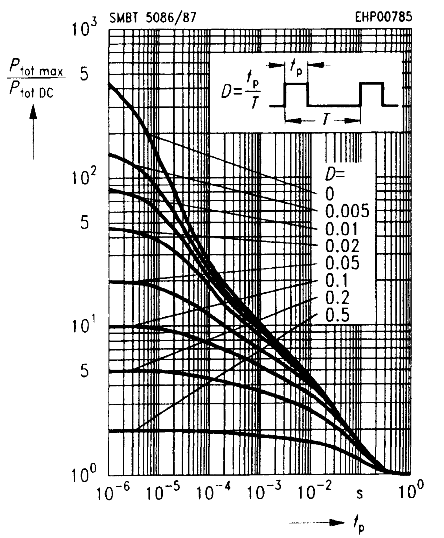
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



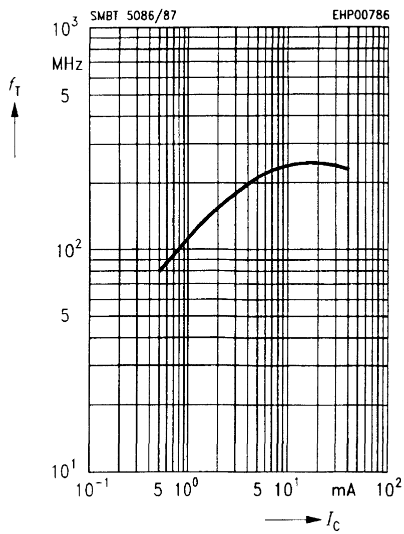
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

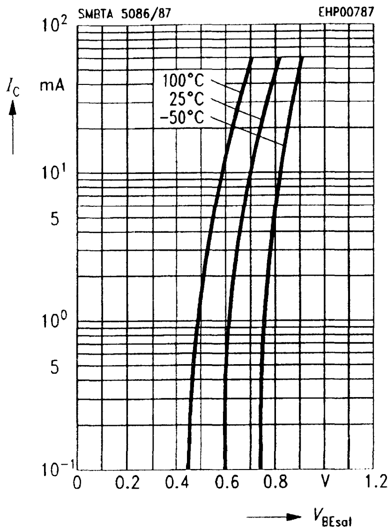


Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



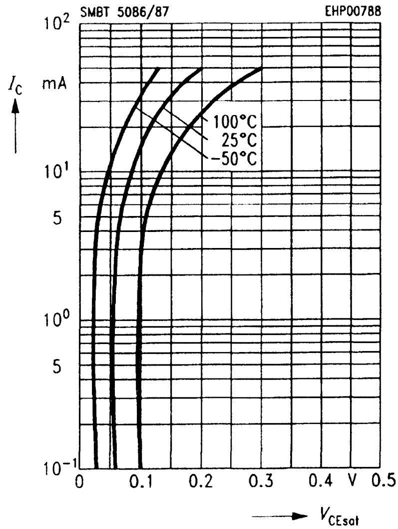
Base-emitter saturation voltage

$I_C = f(V_{BE\,sat})$, $h_{FE} = 40$



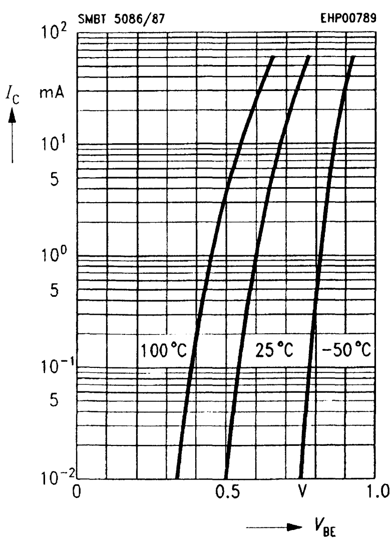
Collector-emitter saturation voltage

$I_C = f(V_{CE\,sat})$, $h_{FE} = 40$



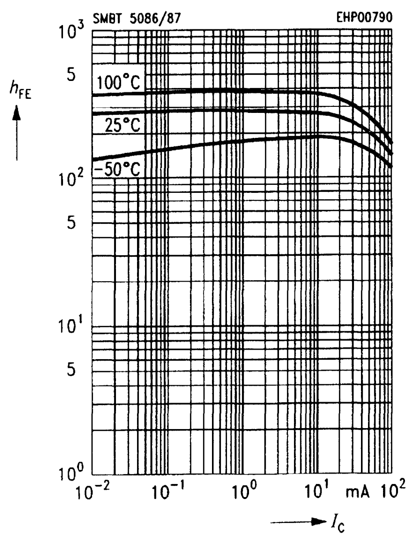
Collector current $I_C = f(V_{BE})$

$V_{CE} = 1$ V

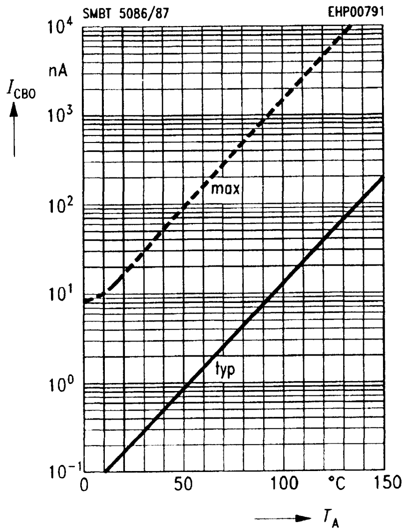


DC current gain $h_{FE} = f(I_C)$

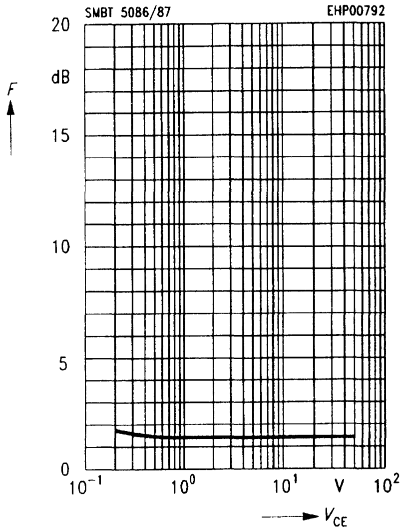
$V_{CE} = 1$ V



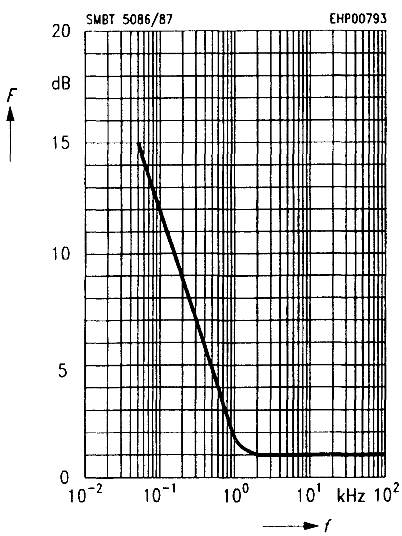
Collector cutoff current $I_{CBO} = f(T_A)$



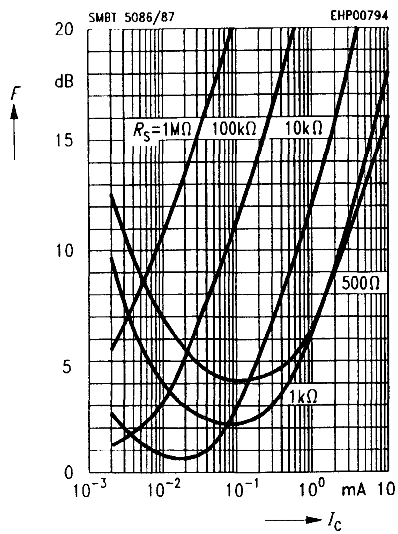
Noise figure $NF = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



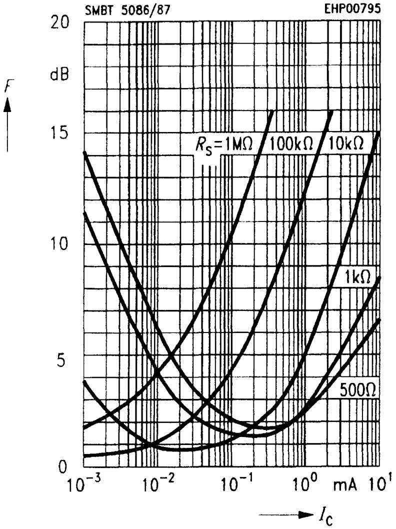
Noise figure $NF = f(f)$
I_C = 0.2 mA, R_S = 2 kΩ, V_{CE} = 5 V



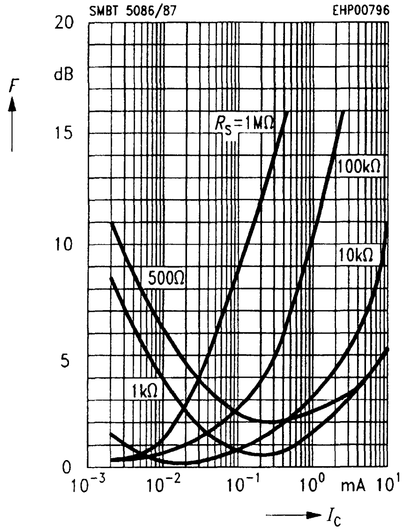
Noise figure $NF = f(I_C)$
V_{CE} = 5 V, f = 120 Hz



Noise figure $NF = f(I_C)$
V_{CE} = 5 V, f = 1 kHz



Noise figure $NF = f(I_C)$
V_{CE} = 5 V, f = 10 kHz

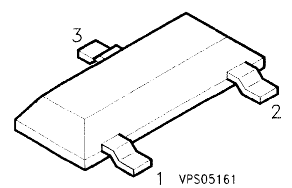


SIEMENS

NPN Silicon Darlington Transistor

SMBT 6427

- For general amplifier applications
- High collector current
- High current gain



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBT 6427	s1V	Q68000-A8320	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	40	
Emitter-base voltage	V_{EBO}	12	
Collector current	I_C	500	mA
Peak collector current	I_{CM}	800	
Total power dissipation, T_S = 74 °C	P_{tot}	360	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Parameter	Symbol	Values	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 280	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 210	

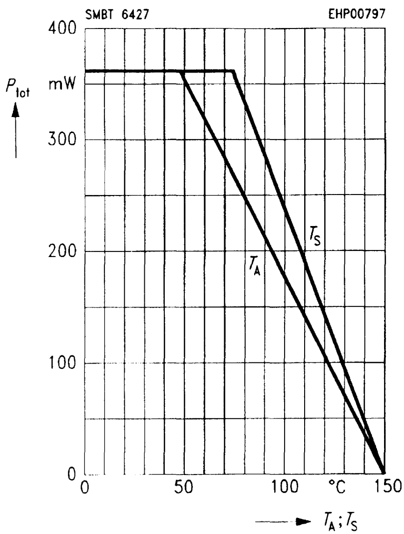
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

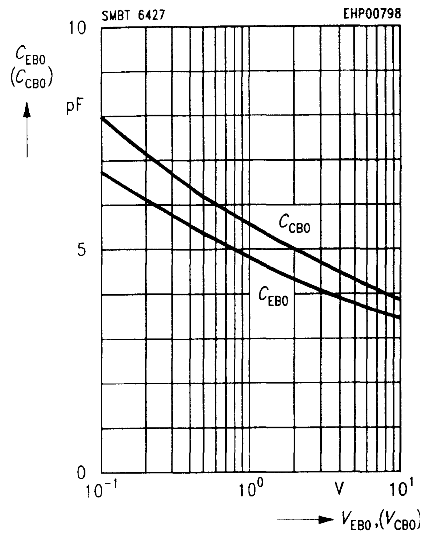
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CE0}$	40	–	–	V
Collector-base breakdown voltage I_C = 100 µA	$V_{(BR)CB0}$	40	–	–	
Emitter-base breakdown voltage, I_E = 10 µA	$V_{(BR)EB0}$	12	–	–	
Collector-base cutoff current V_{CB} = 30 V, I_E = 0 V_{CB} = 30 V, I_E = 0, T_A = 150 °C	I_{CB0}	 – –	 – –	 50 10	 nA µA
Collector cutoff current V_{CE} = 30 V, I_B = 0	I_{CE0}	–	–	1	µA
Emitter-base cutoff current V_{EB} = 10 V, I_C = 0	I_{EB0}	–	–	50	nA
DC current gain I_C = 10 mA, V_{CE} = 5 V I_C = 100 mA, V_{CE} = 5 V I_C = 500 mA, V_{CE} = 5 V	h_{FE}	 10000 20000 14000	 – – –	 100000 200000 140000	–
Collector-emitter saturation voltage[1] I_C = 50 mA, I_B = 0.5 mA I_C = 500 mA, I_B = 0.5 mA	V_{CEsat}	 – –	 – –	 1.2 1.5	V
Base-emitter saturation voltage[1] I_C = 500 mA, I_B = 0.5 mA	V_{BEsat}	–	–	2.0	
Base-emitter voltage I_C = 50 mA, V_{CE} = 5 V	$V_{BE(on)}$	–	–	1.75	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 100 MHz	f_T	130	–	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	7	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	25	
Noise figure I_C = 1 mA, V_{CE} = 5 V, R_S = 100 kΩ f = 1 kHz to 15 kHz	NF	–	–	10	dB

1) Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

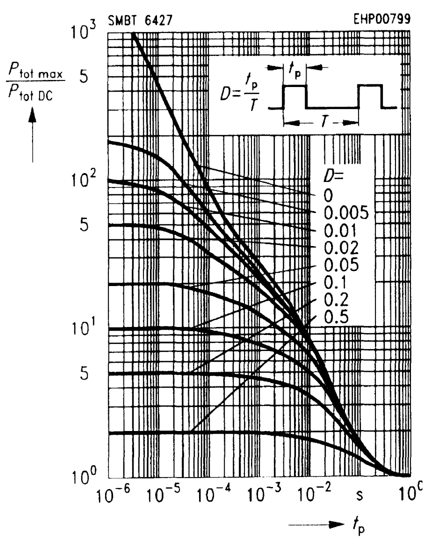
Total power dissipation $P_{tot} = f\,(T_A{}^{*};\,T_S)$
* Package mounted on epoxy



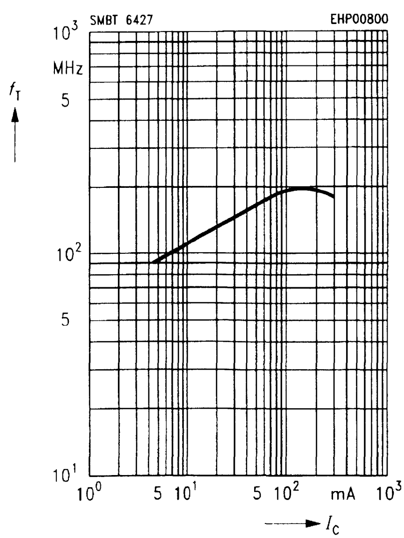
Collector-base capacitance $C_{CBO} = f\,(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f\,(V_{EBO})$



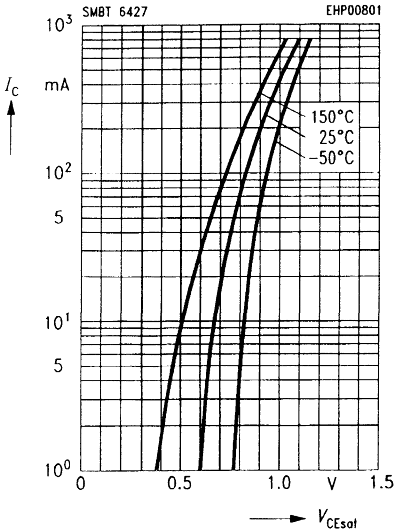
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



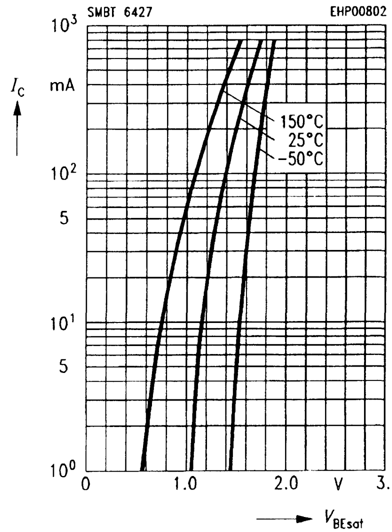
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V



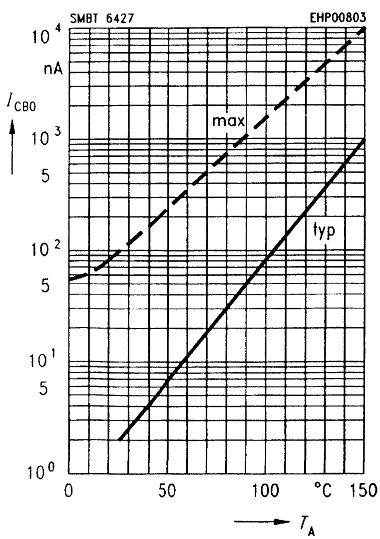
Base-emitter saturation voltage
$I_C = f(V_{BE\,sat})$, $h_{FE} = 1000$



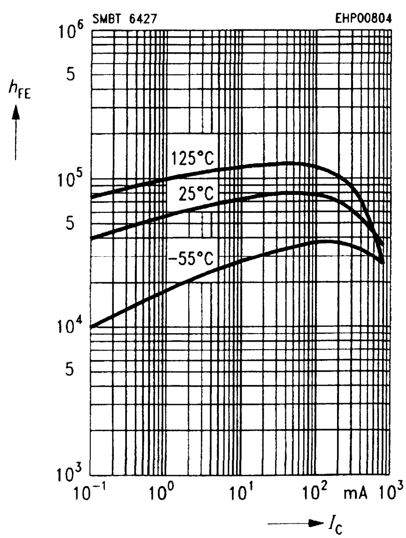
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, $h_{FE} = 1000$



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



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

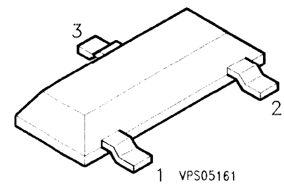


SIEMENS

NPN Silicon Transistors

SMBT 6428
SMBT 6429

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBT 6428 SMBT 6429	s1K s1L	Q68000-A8321 Q68000-A8322	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBT 6428	SMBT 6429	Unit
Collector-emitter voltage	V_{CEO}	50	45	V
Collector-base voltage	V_{CBO}	60	55	
Emitter-base voltage	V_{EBO}	6		
Collector current	I_C	200		mA
Total power dissipation, $T_S = 71$ °C	P_{tot}	330		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 310	K/W
Junction - soldering point	$R_{th JS}$	≤ 240	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

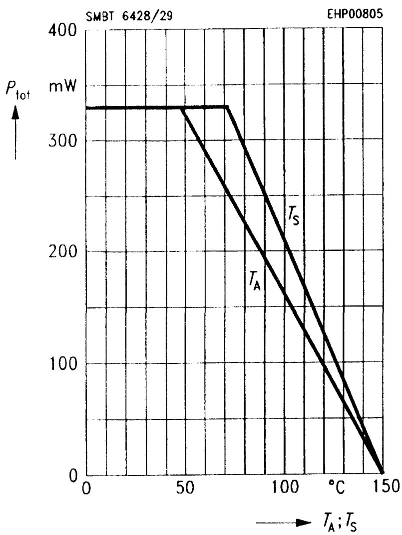
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 1 mA SMBT 6428		50	–	–	
SMBT 6429		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 µA SMBT 6428		60	–	–	
SMBT 6429		55	–	–	
Emitter-base breakdown voltage I_E = 1 µA	$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current	I_{CB0}				
V_{CB} = 30 V, I_E = 0		–	–	10	nA
V_{CB} = 30 V, I_E = 0, T_A = 150 °C		–	–	10	µA
Collector cutoff current V_{CE} = 30 V, I_B = 0	I_{CE0}	–	–	100	nA
Emitter-base cutoff current V_{EB} = 5 V, I_C = 0	I_{EB0}	–	–	10	
DC current gain	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V SMBT 6428		250	–	–	
SMBT 6429		500	–	–	
I_C = 100 µA, V_{CE} = 5 V SMBT 6428		250	–	650	
SMBT 6429		500	–	1250	
I_C = 1 mA, V_{CE} = 5 V SMBT 6428		250	–	–	
SMBT 6429		500	–	–	
I_C = 10 mA, V_{CE} = 5 V SMBT 6428		250	–	–	
SMBT 6429		500	–	–	
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 10 mA, I_B = 0.5 mA		–	–	0.2	
I_C = 100 mA, I_B = 5 mA		–	–	0.6	
Base-emitter voltage I_C = 1 mA, V_{CE} = 5 V	$V_{BE(on)}$	0.56	–	0.66	

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

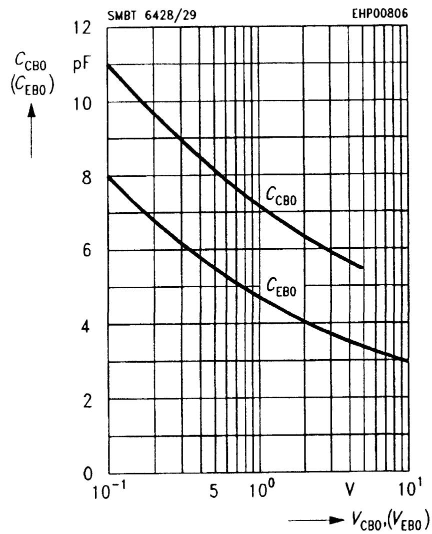
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 5 mA, V_{CE} = 5 V, f = 100 MHz	f_T	100	–	700	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	3	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	15	

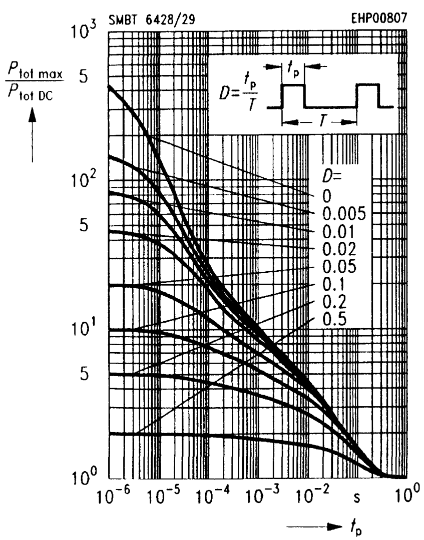
Total power dissipation $P_{tot} = f\,(T_A{}^*; T_S)$
* Package mounted on epoxy



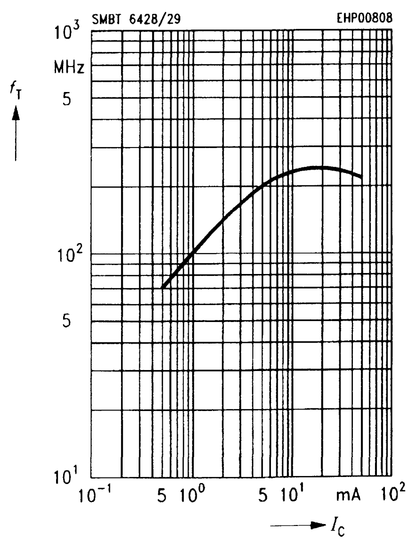
Collector-base capacitance $C_{CB0} = f\,(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f\,(V_{EB0})$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$

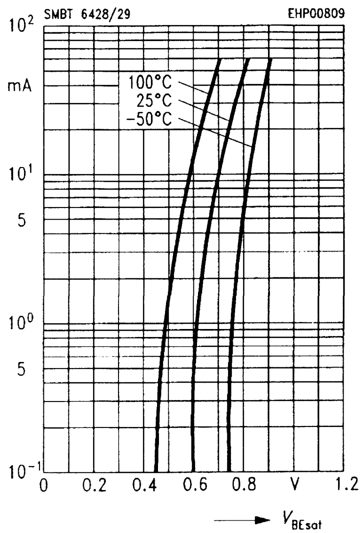


Transition frequency $f_T = f\,(I_C)$
$V_{CE} = 5$ V



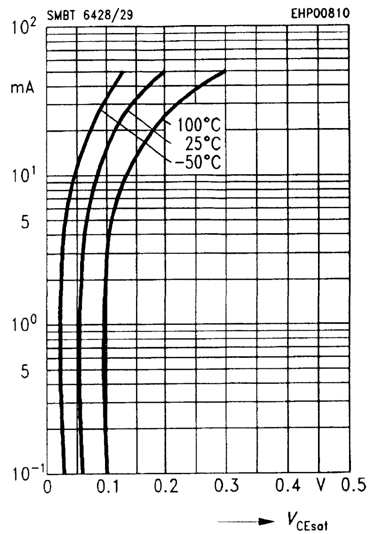
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$, $h_{FE} = 40$



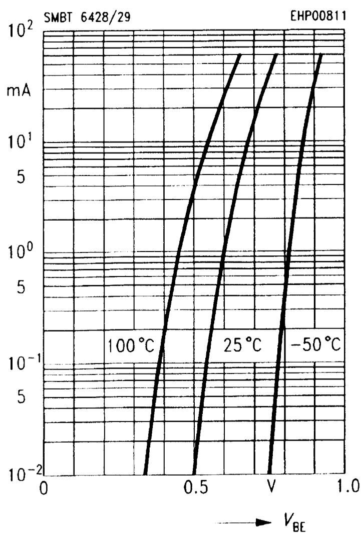
Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$, $h_{FE} = 40$



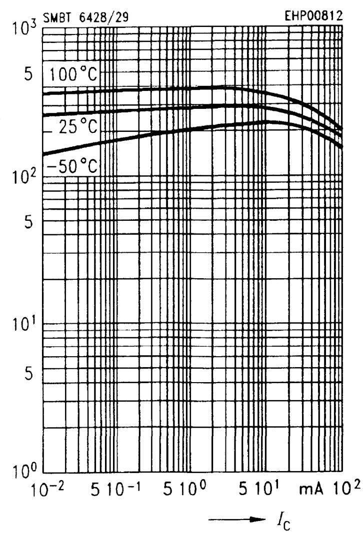
Collector current $I_C = f(V_{BE})$

$V_{CE} = 1$ V

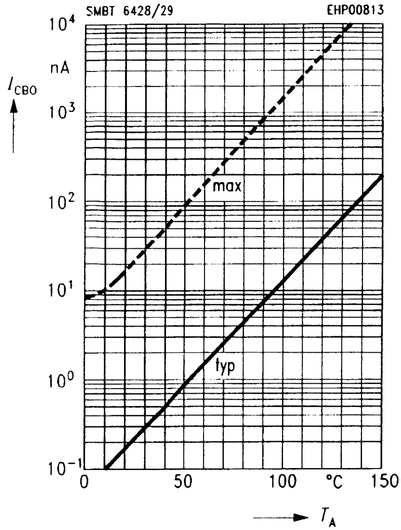


DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 1$ V



Collector cutoff current $I_{CBO} = f(T_A)$

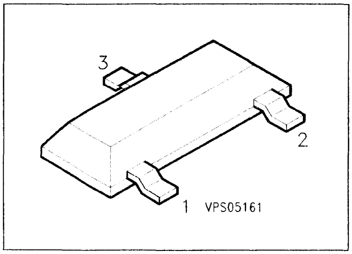


SIEMENS

NPN Silicon AF Transistors

SMBTA 05
SMBTA 06

- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: SMBTA 55
  SMBTA 56 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBTA 05	s1H	Q68000-A3430	B	E	C	SOT-23
SMBTA 06	s1G	Q68000-A3428				

Maximum Ratings

Parameter	Symbol	Values SMBTA 05	SMBTA 06	Unit
Collector-emitter voltage	V_{CEO}	60	80	V
Collector-base voltage	V_{CBO}	60	80	
Emitter-base voltage	V_{EBO}	4		
Collector current	I_C	500		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 79 ˚C	P_{tot}	330		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th JA}$	≤ 285	K/W
Junction - soldering point	$R_{th JS}$	≤ 215	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

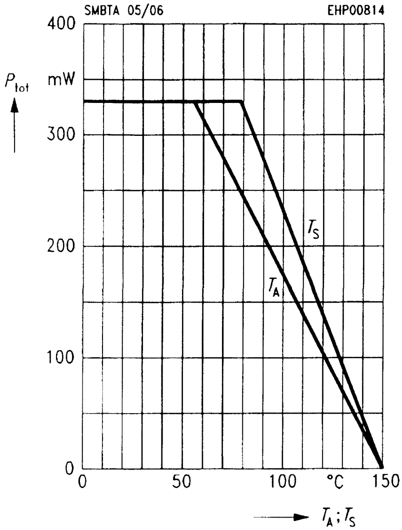
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

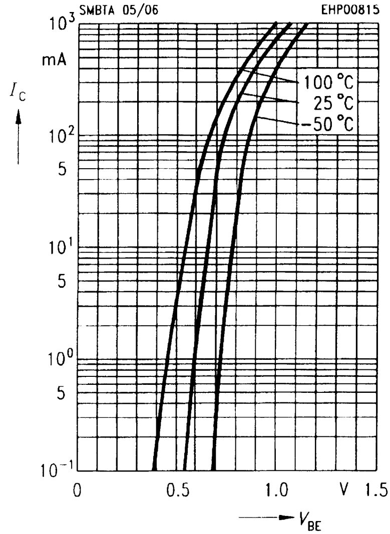
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 1 mA	SMBTA 05		60	–	–	
	SMBTA 06		80	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 100 µA	SMBTA 05		60	–	–	
	SMBTA 06		80	–	–	
Emitter-base breakdown voltage I_E = 10 µA		$V_{(BR)EB0}$	4	–	–	
Collector-base cutoff current		I_{CB0}				
V_{CB} = 60 V	SMBTA 05		–	–	100	nA
V_{CB} = 80 V	SMBTA 06		–	–	100	nA
V_{CB} = 60 V, T_A = 150 °C	SMBTA 05		–	–	20	µA
V_{CB} = 80 V, T_A = 150 °C	SMBTA 06		–	–	20	µA
Collector cutoff current V_{CE} = 60 V		I_{CE0}	–	–	100	nA
DC current gain [1]		h_{FE}				–
I_C = 10 mA, V_{CE} = 1 V			100	–	–	
I_C = 100 mA, V_{CE} = 1 V			100	–	–	
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 10 mA		V_{CEsat}	–	–	0.25	V
Base-emitter saturation voltage [1] I_C = 100 mA, V_{CE} = 1 V		V_{BEsat}	–	–	1.2	
AC characteristics						
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 20 MHz		f_T	–	100	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz		C_{obo}	–	12	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, $D = 2$ %.

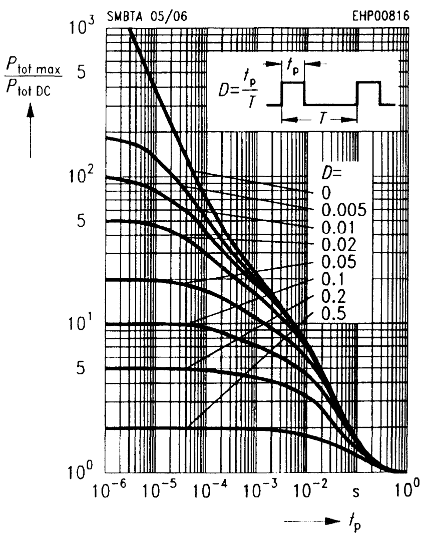
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



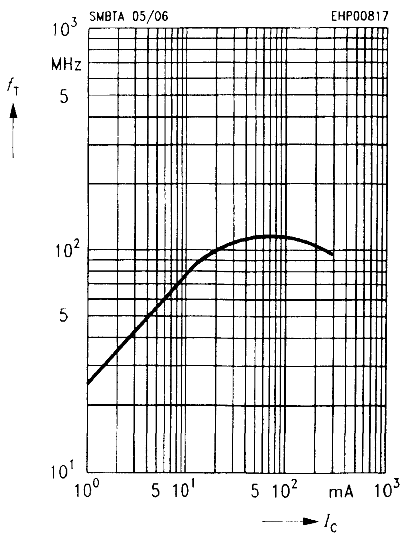
Collector current $I_C = f(V_{BEsat})$



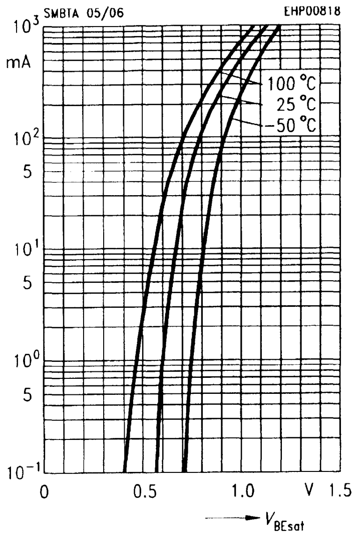
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



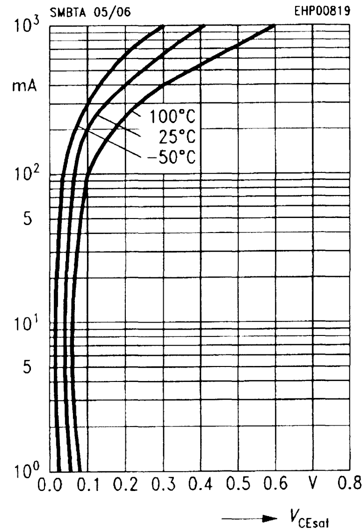
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



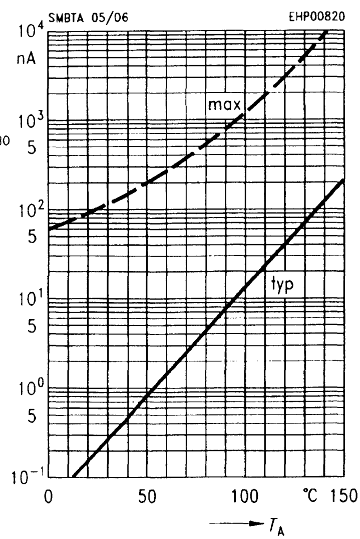
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$, $h_{FE} = 10$



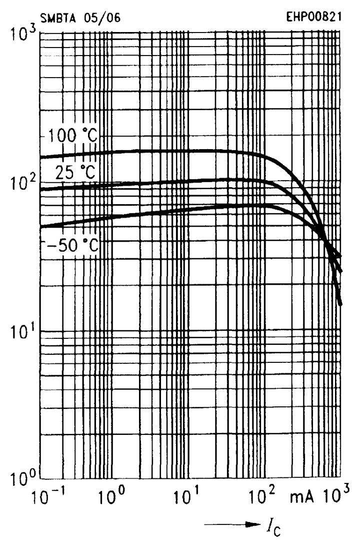
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$, $h_{FE} = 10$



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



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

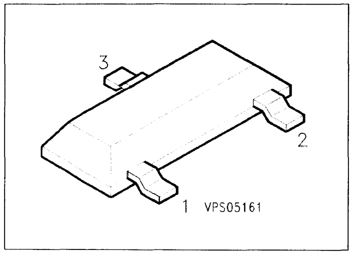


SIEMENS

NPN Silicon Darlington Transistors

SMBTA 13
SMBTA 14

- High DC current gain
- High collector current
- Collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBTA 13 SMBTA 14	s1M s1N	Q68000-A6475 Q68000-A6476	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	30	V
Collector-base voltage	V_{CBO}	30	
Emitter-base voltage	V_{EBO}	10	
Collector current	I_C	300	mA
Peak collector current	I_{CM}	500	
Base current	I_B	100	
Peak base current	I_{BM}	200	
Total power dissipation, T_S = 81 °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 280	K/W
Junction - soldering point	$R_{th JS}$	≤ 210	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

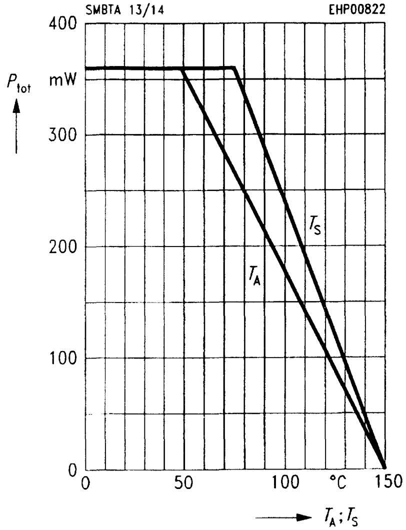
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 µA	$V_{(BR)CEO}$	30	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	10	–	–	
Collector-base cutoff current V_{CB} = 30 V	I_{CBO}	–	–	100	nA
Emitter-base cutoff current V_{EB} = 10 V	I_{EBO}	–	–	100	
DC current gain I_C = 10 mA, V_{CE} = 5 V [1] SMBTA 13 SMBTA 14 I_C = 100 mA, V_{CE} = 5 V [1] SMBTA 13 SMBTA 14	h_{FE}	 5000 10000 10000 20000	 – – – –	 – – – –	–
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA	V_{CEsat}	–	–	1.5	V
Base-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA	V_{BEsat}	–	–	2	

AC characteristics

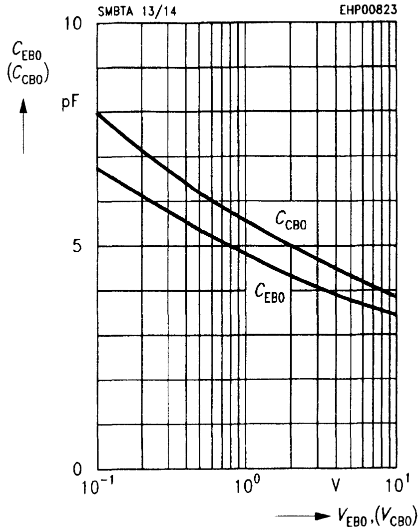
Parameter	Symbol	min.	typ.	max.	Unit
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	125	–	–	MHz

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

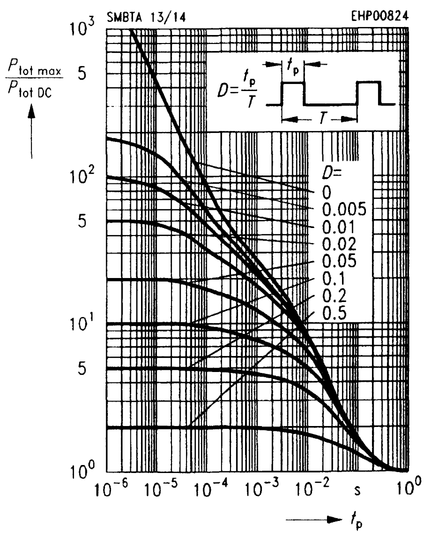
Total power dissipation $P_{tot} = f\,(T_A^*;\ T_S)$
* Package mounted on epoxy



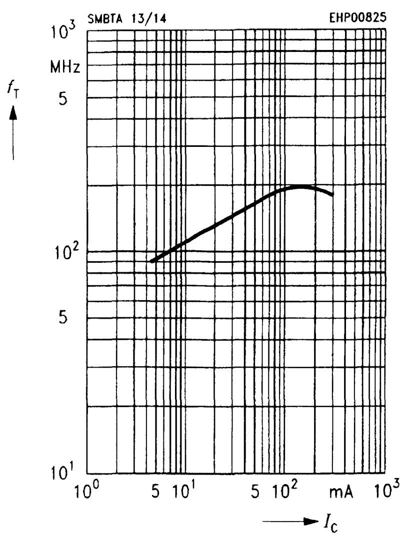
Capacitance $C_{CB0} = f\,(V_{CB0})$
$C_{EB0} = f\,(V_{EB0})$
f = 1 MHz



Permissible pulse load $P_{tot\,max}\,/\,P_{tot\,DC} = f\,(t_p)$

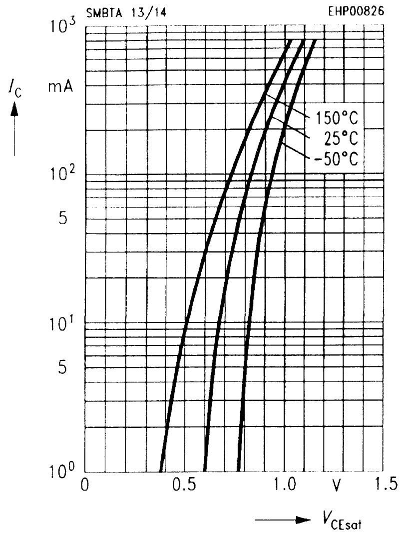


Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V, f = 20 MHz



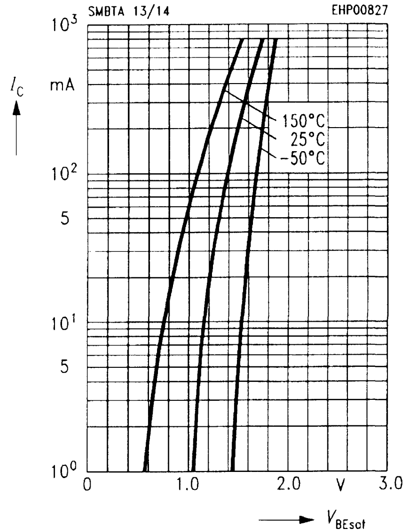
Base-emitter saturation voltage

$V_{BE\,sat} = f\,(I_C)$
h_{FE} = 1000



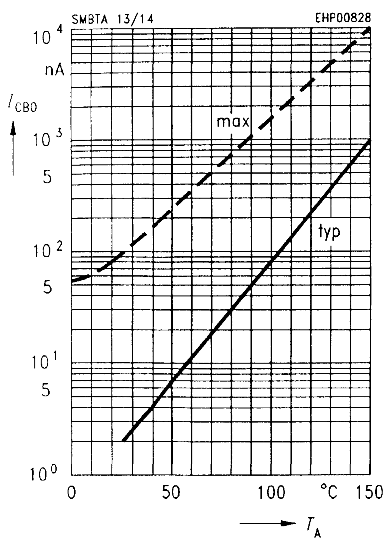
Collector-emitter saturation voltage

$V_{CE\,sat} = f\,(I_C)$
h_{FE} = 1000



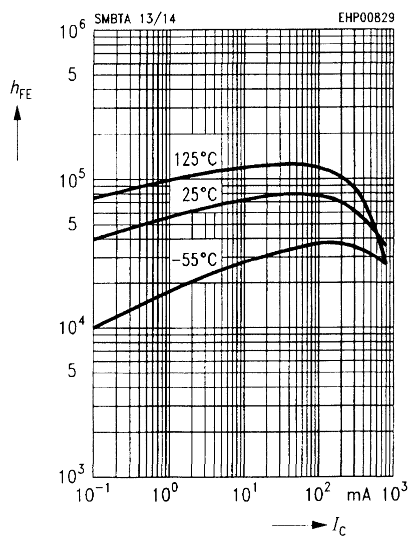
Collector cutoff current $I_{CB0} = f\,(T_A)$

V_{CB} = 30 V



DC current gain $h_{FE} = f\,(I_C)$

V_{CE} = 5 V

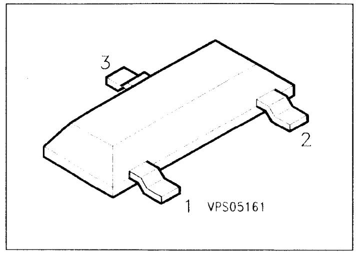


SIEMENS

NPN Silicon AF Transistor

SMBTA 20

- High DC current gain
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBTA 20	s1C	Q6800-A6477	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Emitter-base voltage	V_{EBO}	4	
Collector current	I_C	100	mA
Peak collector current	I_{CM}	200	
Peak base current	I_{BM}	200	
Total power dissipation, T_S = 71 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 310	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 240	

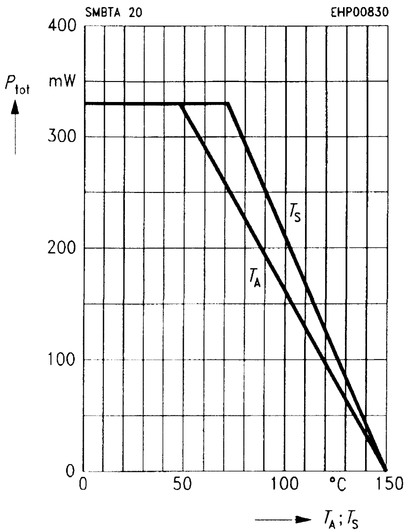
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

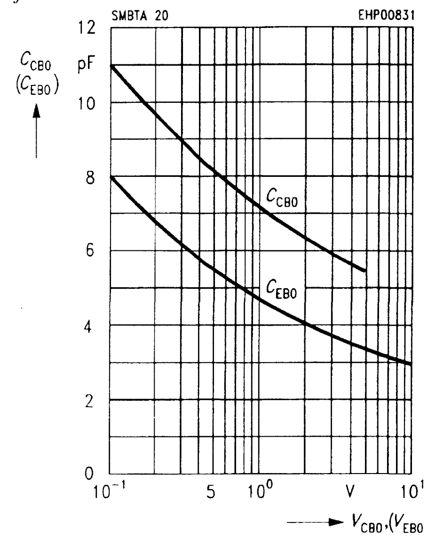
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	40	–	–	V
Emitter-base breakdown voltage I_E = 100 μA	$V_{(BR)EBO}$	4	–	–	
Collector-base cutoff current V_{CB} = 30 V V_{CB} = 30 V, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA μA
Emitter-base cutoff current V_{EB} = 4 V	I_{EBO}	–	–	20	nA
DC current gain I_C = 5 mA, V_{CE} = 10 V	h_{FE}	40	–	400	–
Collector-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.25	V
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	125	–	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	4	pF

1) Pulse test conditions: $t \leq 300$ μs, D = 2 %.

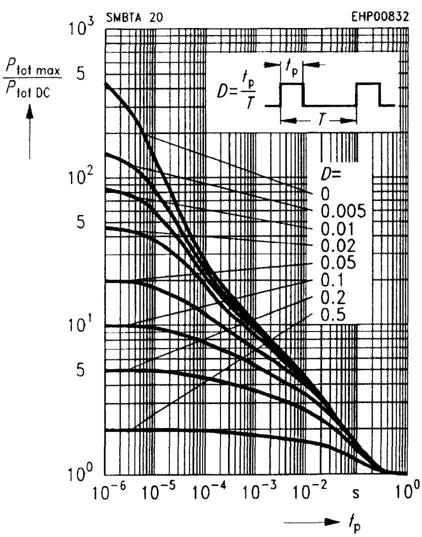
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



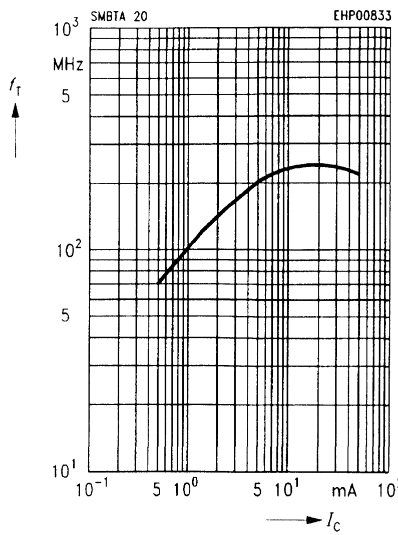
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$
f = 1 MHz



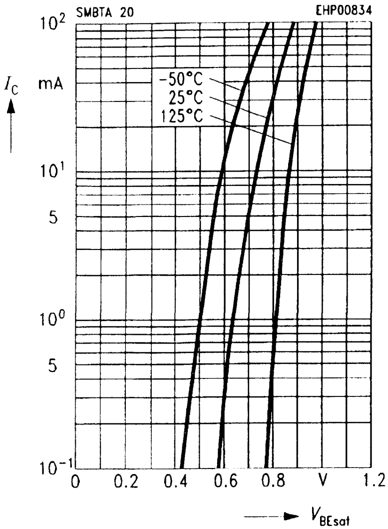
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



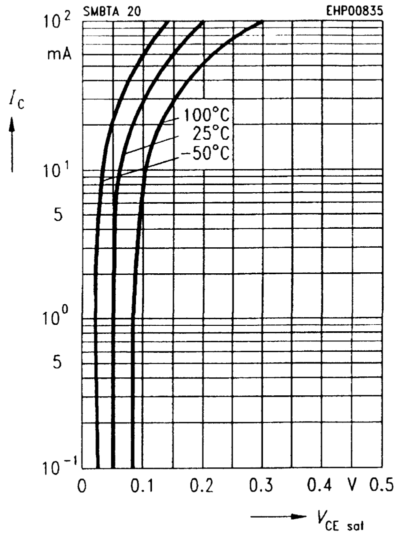
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V, f = 100 MHz



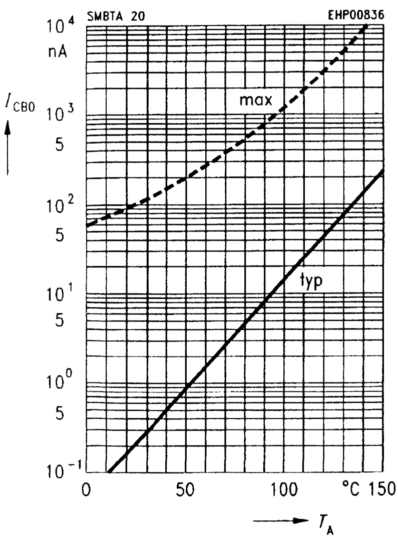
Base-emitter saturation voltage
$I_C = f(V_{BE\,sat})$, $h_{FE} = 20$



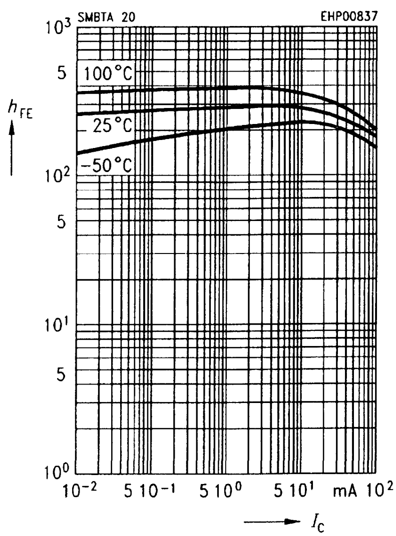
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, $h_{FE} = 20$



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



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

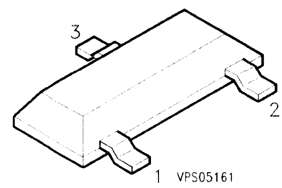


SIEMENS

NPN Silicon Transistors for High Voltages

SMBTA 42
SMBTA 43

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SMBTA 42 SMBTA 43	s1D s1E	Q68000-A6478 Q68000-A6482	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBTA 42	SMBTA 43	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	6		
Collector current	I_C	500		mA
Base current	I_B	100		
Total power dissipation, T_S = 74 ˚C	P_{tot}	360		mW
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2)]	$R_{th JA}$	≤ 280	K/W
Junction - soldering point	$R_{th JS}$	≤ 210	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

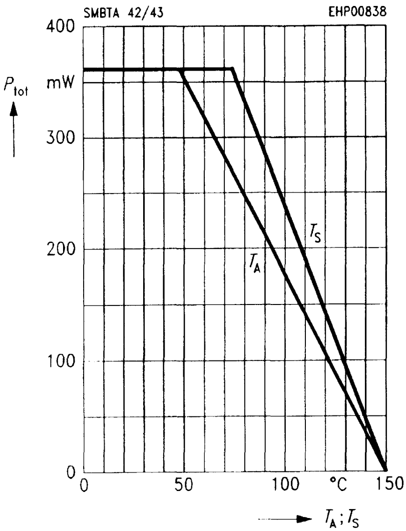
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

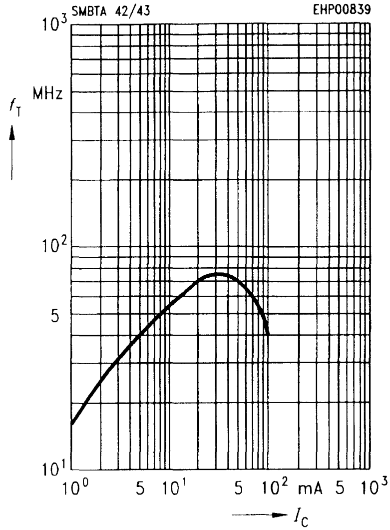
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CE0}$				V
I_C = 1 mA	SMBTA 42		300	–	–	
	SMBTA 43		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CB0}$				
I_C = 100 µA	SMBTA 42		300	–	–	
	SMBTA 43		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current		I_{CB0}				
V_{CB} = 200 V	SMBTA 42		–	–	100	nA
V_{CB} = 160 V	SMBTA 43		–	–	100	nA
V_{CB} = 200 V, T_A = 150 °C	SMBTA 42		–	–	20	µA
V_{CB} = 160 V, T_A = 150 °C	SMBTA 43		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EB0}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V [1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V [1]	SMBTA 42		40	–	–	
	SMBTA 43		40	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	SMBTA 42		–	–	0.5	
	SMBTA 43		–	–	0.4	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz		f_T	50	–	–	MHz
Output capacitance		C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz	SMBTA 42		–	–	3	
	SMBTA 43		–	–	4	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

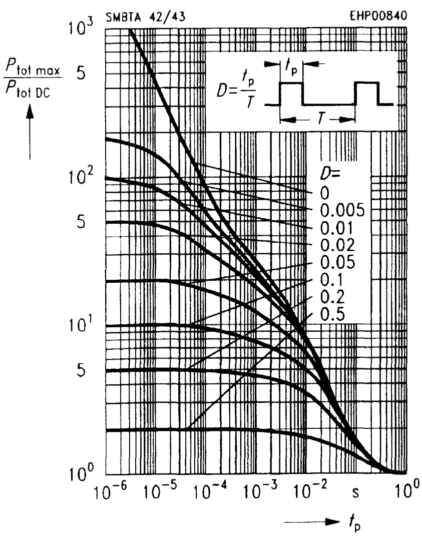
Total power dissipation $P_{tot} = f\,(T_A{}^*;\ T_S)$
* Package mounted on epoxy



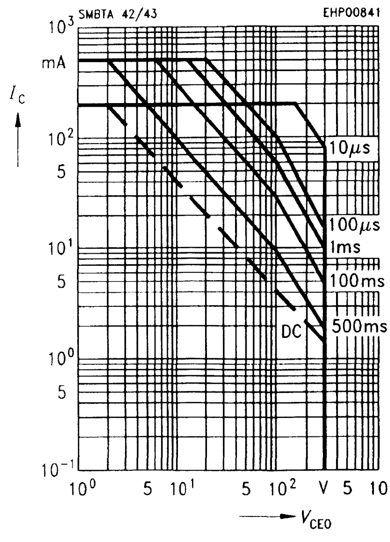
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 10 V, f = 100 MHz



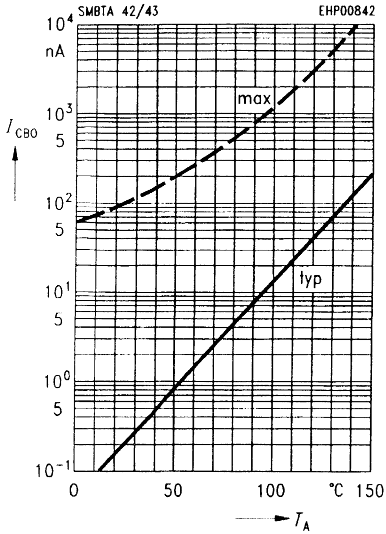
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



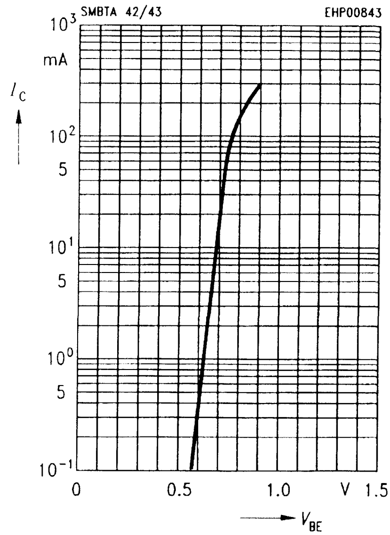
Operating range $I_C = f\,(V_{CE0})$
T_A = 25 °C, D = 0



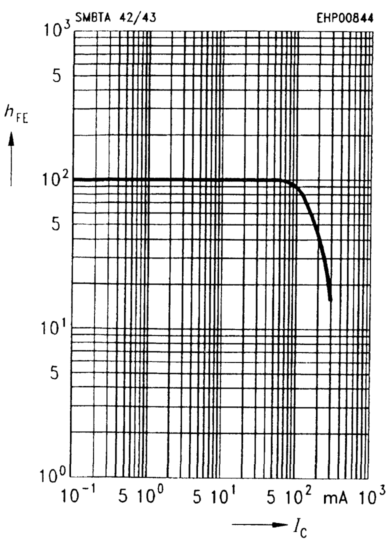
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 160 V



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



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

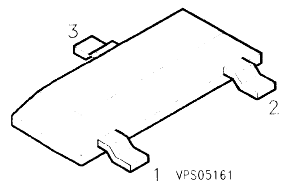


SIEMENS

PNP Silicon AF Transistors

SMBTA 55
SMBTA 56

- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: SMBTA 05, SMBTA 06 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBTA 55	s2H	Q68000-A3386	B	E	C	SOT-23
SMBTA 56	s2G	Q68000-A2882				

Maximum Ratings

Parameter	Symbol	Values SMBTA 55	SMBTA 56	Unit
Collector-emitter voltage	V_{CEO}	60	80	V
Collector-base voltage	V_{CBO}	60	80	
Emitter-base voltage	V_{EBO}	4		
Collector current	I_C	500		mA
Peak collector current	I_{CM}	1		A
Base current	I_B	100		mA
Peak base current	I_{BM}	200		
Total power dissipation, T_S = 79 °C	P_{tot}	330		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 285	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 215	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

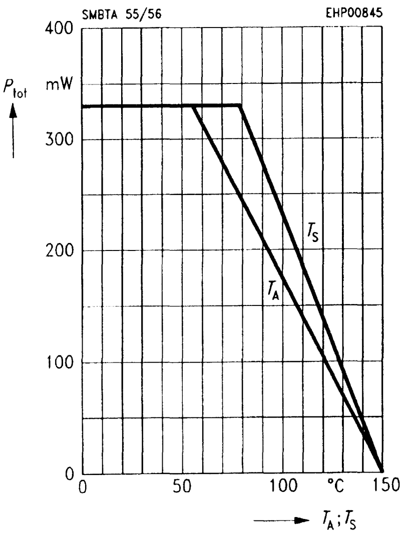
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

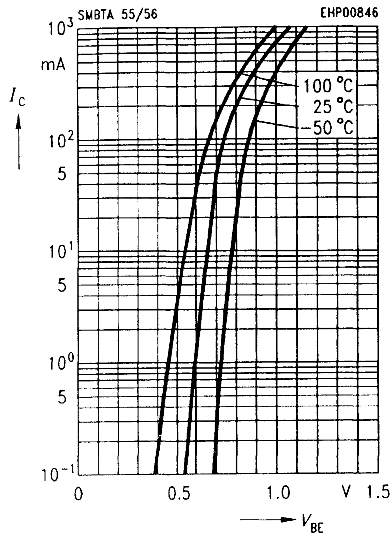
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA SMBTA 55 SMBTA 56	$V_{(BR)CE0}$	 60 80	 – –	 – –	V
Collector-base breakdown voltage I_C = 100 µA SMBTA 55 SMBTA 56	$V_{(BR)CB0}$	 60 80	 – –	 – –	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EB0}$	4	–	–	
Collector-base cutoff current V_{CB} = 60 V SMBTA 55 V_{CB} = 80 V SMBTA 56 V_{CB} = 60 V, T_A = 150 °C SMBTA 55 V_{CB} = 80 V, T_A = 150 °C SMBTA 56	I_{CB0}	 – – – –	 – – – –	 100 100 20 20	 nA nA µA µA
Collector cutoff current V_{CE} = 60 V	I_{CE0}	–	–	100	nA
DC current gain [1] I_C = 10 mA, V_{CE} = 1 V I_C = 100 mA, V_{CE} = 1 V	h_{FE}	 100 100	 – –	 – –	–
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 10 mA	V_{CEsat}	–	–	0.25	V
Base-emitter saturation voltage [1] I_C = 100 mA, V_{CE} = 1 V	V_{BEsat}	–	–	1.2	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 20 MHz	f_T	–	100	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	12	–	pF

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

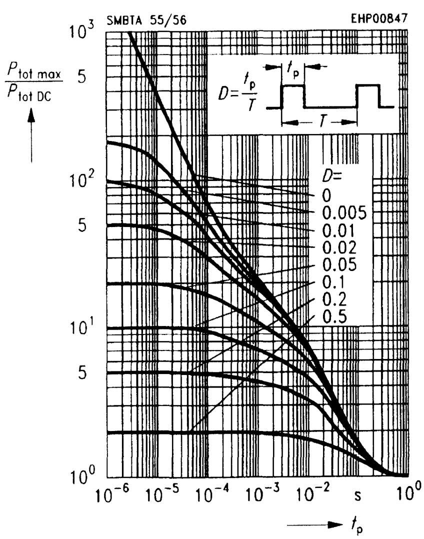
Total power dissipation $P_{tot} = f(T_A{}^*; T_S)$
* Package mounted on epoxy



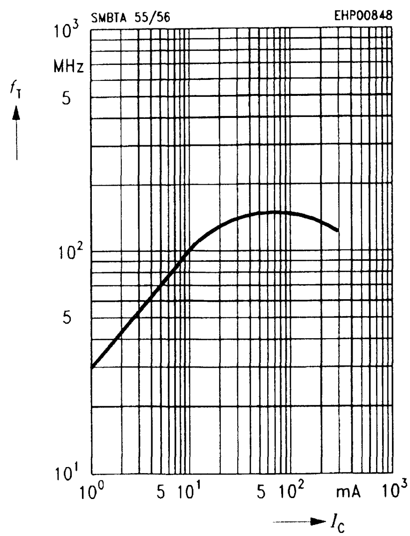
Collector current $I_C = f(V_{BE\,sat})$
V_{CE} = 1 V



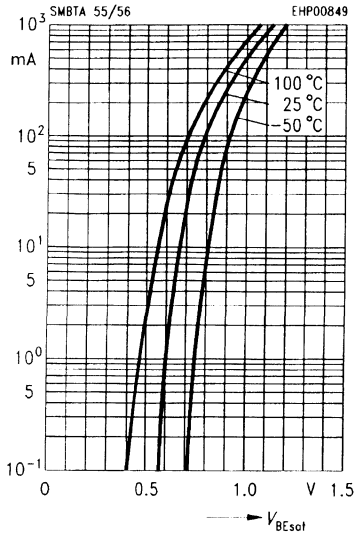
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



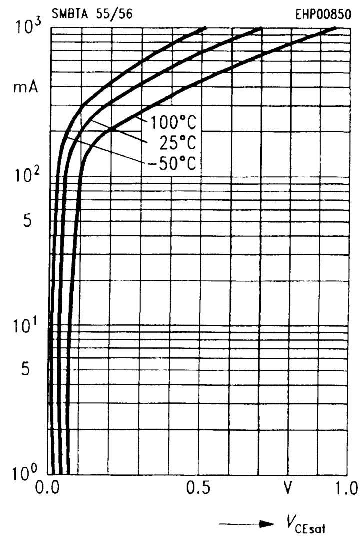
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



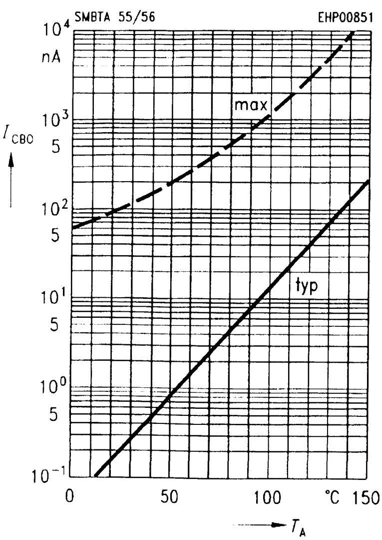
Base-emitter saturation voltage
$V_{BE\,sat} = f(I_C)$, $h_{FE} = 10$



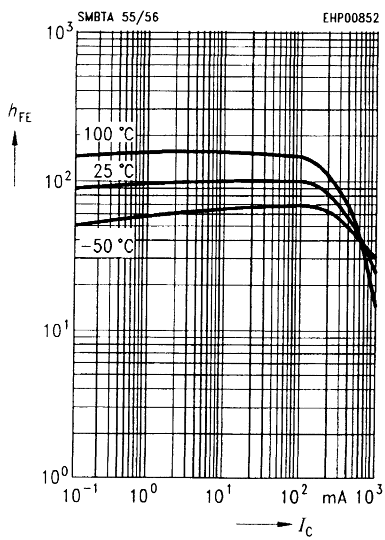
Collector-emitter saturation voltage
$V_{CE\,sat} = f(I_C)$, $h_{FE} = 10$



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



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

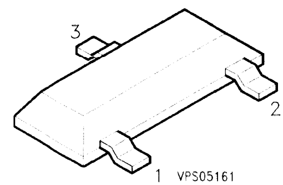


SIEMENS

PNP Silicon Darlington Transistors

SMBTA 63
SMBTA 64

- High collector current
- High DC current gain



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBTA 63 SMBTA 64	s2U s2V	Q68000-A2625 Q68000-A2485	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBTA 63	SMBTA 64	Unit
Collector-emitter voltage	V_{CE0}	30	30	V
Collector-base voltage	V_{CB0}	30	30	
Emitter-base voltage	V_{EB0}	10	10	
Collector current	I_C	500		mA
Peak collector current	I_{CM}	800		
Base current	I_B	100		
Peak base current	I_{BM}	200		
Total power dissipation, $T_S = 81$ °C	P_{tot}	360		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - ambient[2]	$R_{th\,JA}$	≤ 280	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 210	

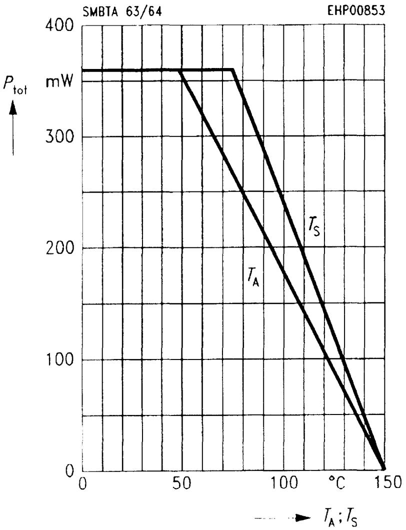
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

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

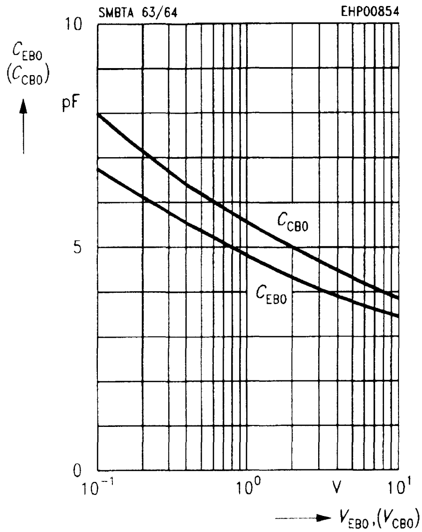
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 µA	$V_{(BR)CEO}$	30	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	30	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	10	–	–	
Collector-base cutoff current V_{CB} = 30 V	I_{CBO}	–	–	100	nA
Emitter cutoff current V_{EB} = 10 V	I_{EBO}	–	–	100	
DC current gain [1]	h_{FE}				–
I_C = 10 mA, V_{CE} = 5 V SMBTA 63		5000	–	–	
SMBTA 64		10000	–	–	
I_C = 100 mA, V_{CE} = 5 V SMBTA 63		10000	–	–	
SMBTA 64		20000	–	–	
Collector-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA	V_{CEsat}	–	–	1.5	V
Base-emitter saturation voltage [1] I_C = 100 mA, I_B = 0.1 mA	V_{BEsat}	–	–	2	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 5 V, f = 20 MHz	f_T	125	–	–	MHz

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

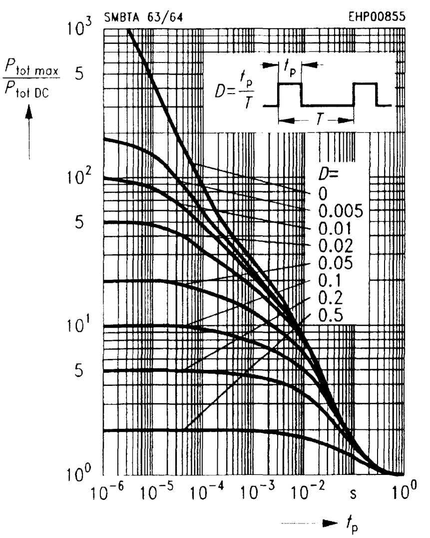
Total power dissipation $P_{tot} = f(T_A{}^*;\ T_S)$
* Package mounted on epoxy



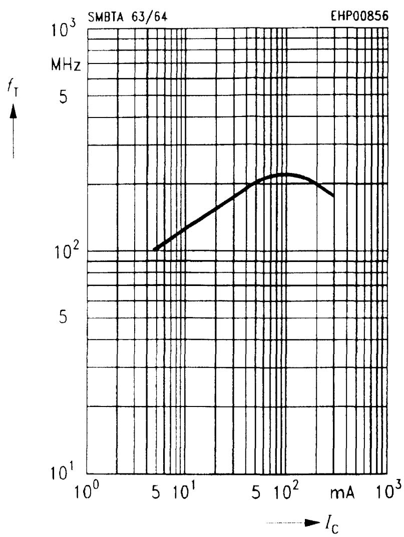
Collector-base capacitance $C_{CBO} = f(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f(V_{EBO})$
f = 1 MHz



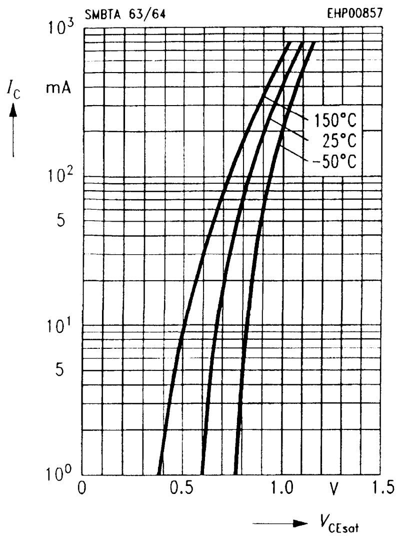
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



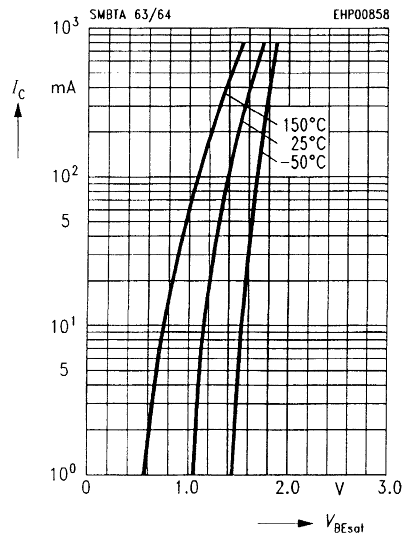
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



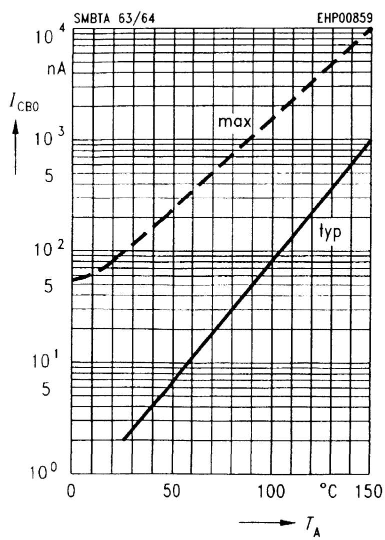
Base-emitter saturation voltage
$I_C = f(V_{BE\,sat})$, $h_{FE} = 1000$



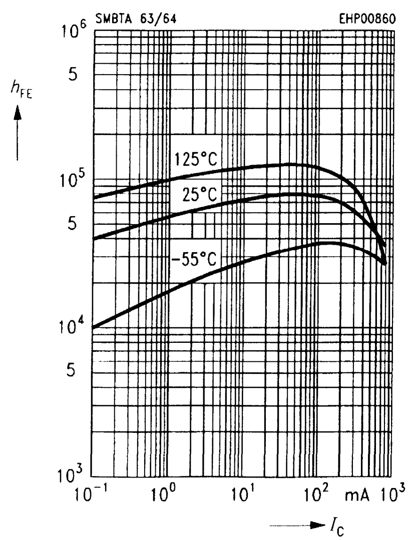
Collector-emitter saturation voltage
$I_C = f(V_{CE\,sat})$, $h_{FE} = 1000$



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



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

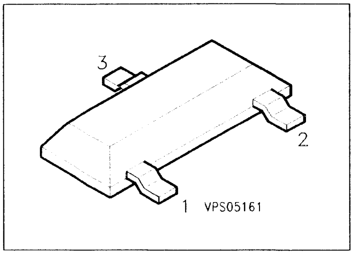


SIEMENS

PNP Silicon Transistor

SMBTA 70

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBTA 70	s2C	Q62702-M0003	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Emitter-base voltage	V_{EBO}	4	
Collector current	I_C	100	mA
Peak collector current	I_{CM}	200	
Peak base current	I_{BM}	100	
Total power dissipation, T_S = 71 ˚C	P_{tot}	330	mW
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 310	K/W
Junction - soldering point	$R_{th JS}$	≤ 240	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

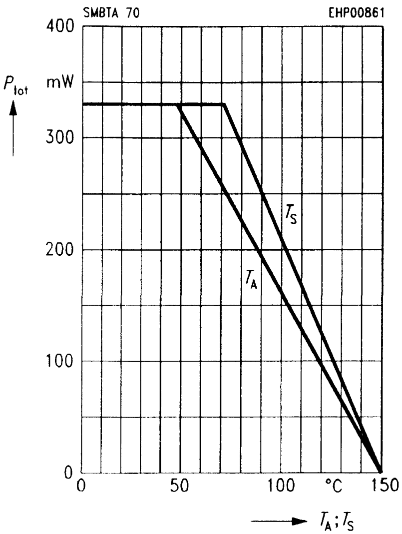
Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

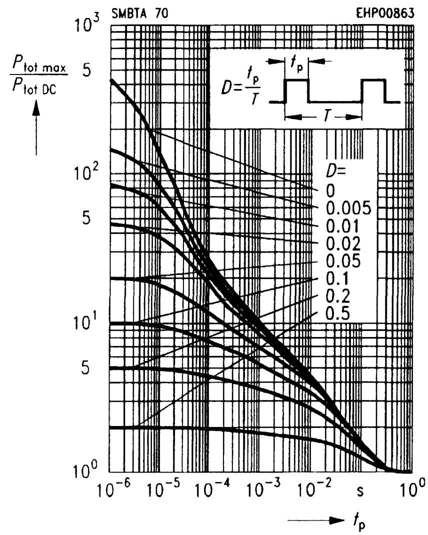
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA	$V_{(BR)CEO}$	40	–	–	V
Emitter-base breakdown voltage I_E = 100 μA	$V_{(BR)EBO}$	4	–	–	
Collector-base cutoff current V_{CB} = 30 V, I_E = 0 V_{CB} = 30 V, I_E = 0, T_A = 150 °C	I_{CBO}	 – –	 – –	 100 20	 nA μA
Emitter-base cutoff current V_{EB} = 4 V, I_C = 0	I_{EBO}	–	–	20	nA
DC current gain I_C = 5 mA, V_{CE} = 10 V	h_{FE}	40	–	400	–
Collector-emitter saturation voltage[1)] I_C = 10 mA, I_B = 1 mA	V_{CEsat}	–	–	0.25	V
AC characteristics					
Transition frequency I_C = 5 mA, V_{CE} = 10 V, f = 100 MHz	f_T	125	–	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	4	pF

1) Pulse test conditions: $t \leq 300$ μs, $D \leq 2$ %.

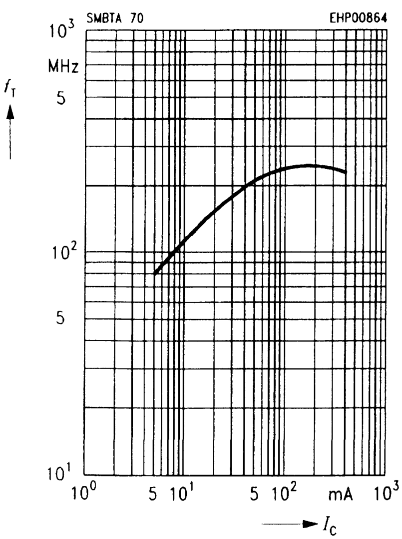
Total power dissipation $P_{tot} = f\,(T_A{}^*;\, T_S)$
* Package mounted on epoxy



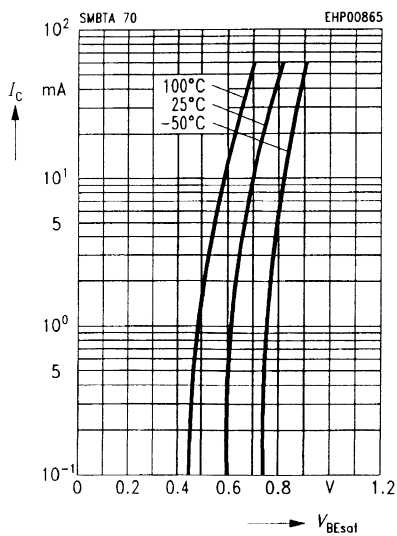
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



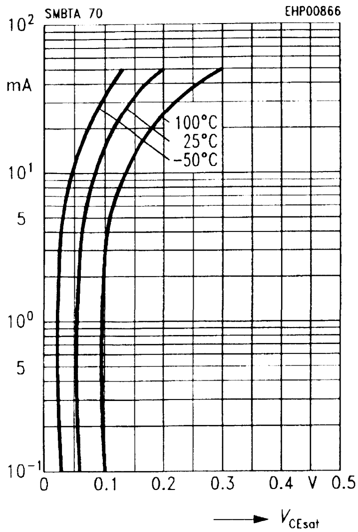
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 5 V



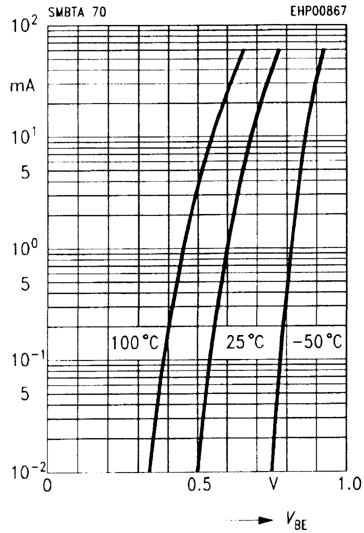
Base-emitter saturation voltage
$V_{BE\,sat} = f\,(I_C)$, h_{FE} = 40



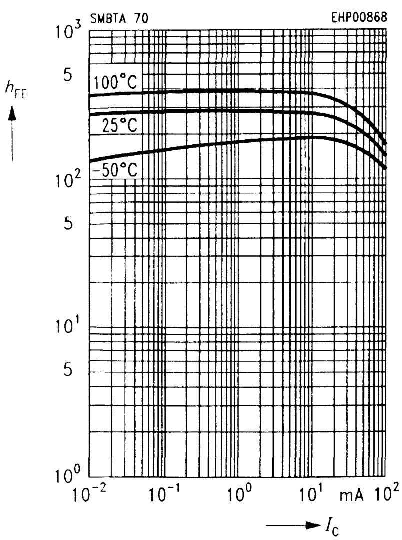
Collector-emitter saturation voltage
$V_{CE\,sat} = f\,(I_C)$, $h_{FE} = 40$



Collector current $I_C = f\,(V_{BE})$
$V_{CE} = 1$ V



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

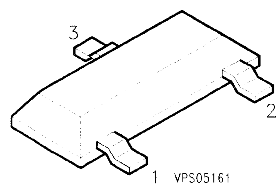


SIEMENS

PNP Silicon Transistors for High Voltages

SMBTA 92
SMBTA 93

- High breakdown voltage
- Low collector-emitter saturation voltage
- Complementary types: SMBTA 92, SMBTA 93 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SMBTA 92 SMBTA 93	s2D s2E	Q68000-A6479 Q68000-A6483	B	E	C	SOT-23

Maximum Ratings

Parameter	Symbol	Values SMBTA 92	SMBTA 93	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	500		mA
Base current	I_B	100		
Total power dissipation, T_S = 74 °C	P_{tot}	360		mW
Junction temperature	T_j	150		°C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th JA}$	≤ 280	K/W
Junction - soldering point	$R_{th JS}$	≤ 210	

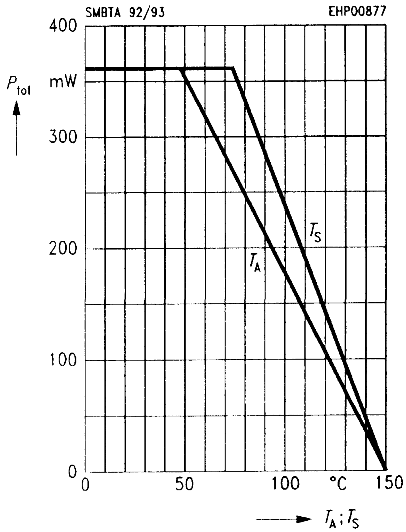
[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

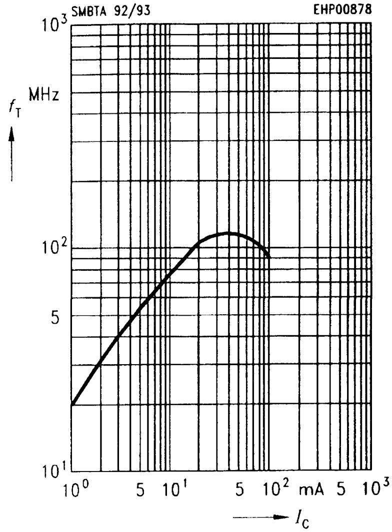
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA	SMBTA 92		300	–	–	
	SMBTA 93		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	SMBTA 92		300	–	–	
	SMBTA 93		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 200 V	SMBTA 92		–	–	250	nA
V_{CB} = 160 V	SMBTA 93		–	–	250	nA
V_{CB} = 200 V, T_A = 150 °C	SMBTA 92		–	–	20	µA
V_{CB} = 160 V, T_A = 150 °C	SMBTA 93		–	–	20	µA
Emitter-base cutoff current V_{EB} = 3 V		I_{EBO}	–	–	100	nA
DC current gain		h_{FE}				–
I_C = 1 mA, V_{CE} = 10 V			25	–	–	
I_C = 10 mA, V_{CE} = 10 V [1]			40	–	–	
I_C = 30 mA, V_{CE} = 10 V [1]	SMBTA 92		25	–	–	
	SMBTA 93		25	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	SMBTA 92		–	–	0.5	
	SMBTA 93		–	–	0.4	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	
AC characteristics						
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz		f_T	50	–	–	MHz
Output capacitance		C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz	SMBTA 92		–	–	6	
	SMBTA 93		–	–	8	

[1] Pulse test conditions: $t \leq 300$ µs, D = 2 %.

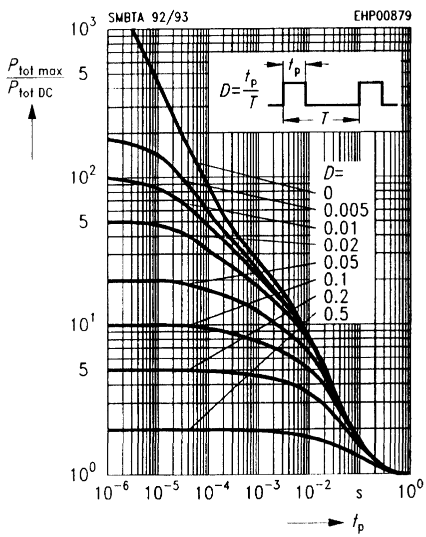
Total power dissipation $P_{tot} = f\,(T_A^*;\,T_S)$
* Package mounted on epoxy



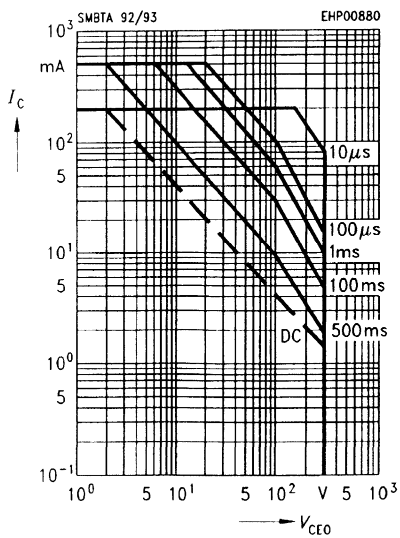
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 20 V, f = 100 MHz



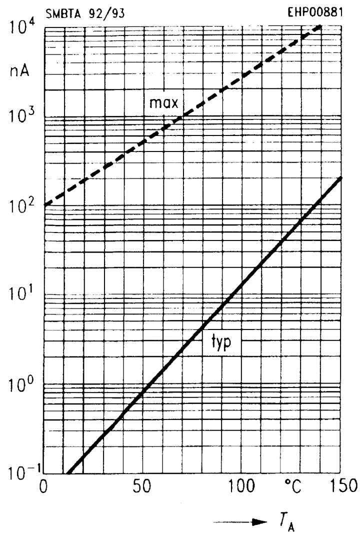
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



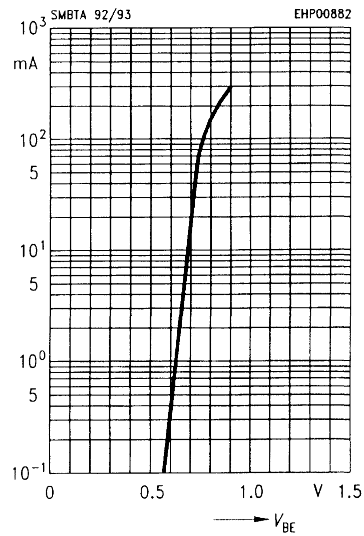
Operating range $I_C = f\,(V_{CE0})$
T_A = 25 °C, D = 0



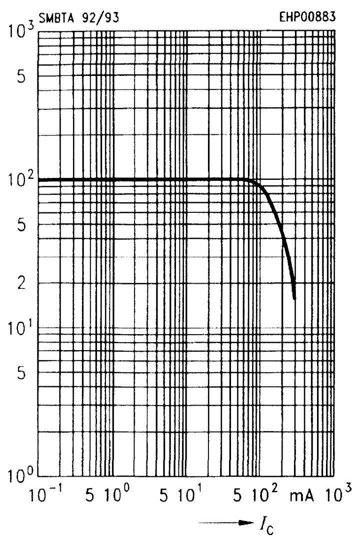
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 160 V



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



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

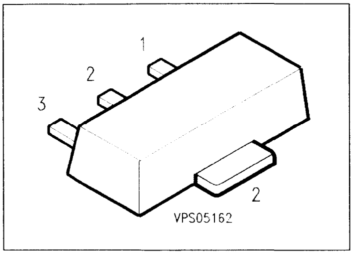


SIEMENS

NPN Silicon Switching Transistor

SXT 2222 A

- High current gain: 0.1 mA to 500 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SXT 2222 A	2P	Q68000-A8330	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	75	
Emitter-base voltage	V_{EBO}	6	
Collector current	I_C	600	mA
Total power dissipation, T_S = 120 °C	P_{tot}	1	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 90	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 30	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm^2 Cu.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CE0}$	40	–	–	V
Collector-base breakdown voltage I_C = 10 μA	$V_{(BR)CB0}$	75	–	–	
Emitter-base breakdown voltage I_E = 10 μA	$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current V_{CB} = 60 V, I_E = 0 V_{CB} = 60 V, I_E = 0, T_A = 125 °C	I_{CB0}	 – –	 – –	 10 10	 nA μA
Collector cutoff current V_{CE} = 30 V, V_{BE} = 0.5 V	I_{CEX}	–	–	10	nA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0	I_{EB0}	–	–	10	
Base cutoff current V_{CE} = 30 V, V_{BE} = – 3 V	I_{BL}	–	–	20	
DC current gain I_C = 100 μA, V_{CE} = 10 V I_C = 1 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V, T_A = – 55 °C I_C = 150 mA, V_{CE} = 10 V I_C = 150 mA, V_{CE} = 1 V I_C = 500 mA, V_{CE} = 10 V	h_{FE}	 35 50 75 35 100 50 40	 – – – – – – –	 – – – – 300 – –	–
Collector-emitter saturation voltage[1] I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	V_{CEsat}	 – –	 – –	 0.3 1.0	V
Base-emitter saturation voltage[1] I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	V_{BEsat}	 0.6 –	 – –	 1.2 2.0	

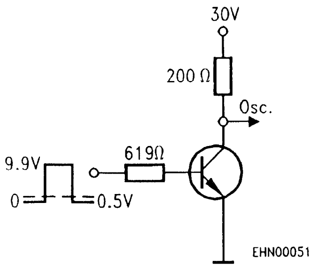
[1] Pulse test conditions: $t \leq 300$ μs, $D \leq 2$ %.

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

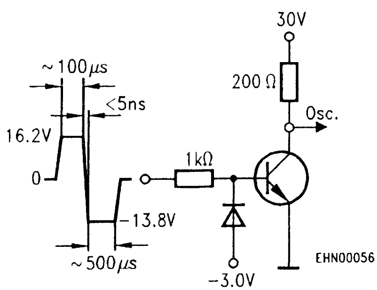
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	–	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	8	pF
Input capacitance V_{EB} = 2 V, f = 1 MHz	C_{ibo}	–	–	25	
Input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz	h_{ie}	 2 0.25	 – –	 8 1.25	kΩ
Voltage feedback ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz	h_{re}	 – –	 – –	 8 4	10^{-4}
Small-signal current gain I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz	h_{fe}	 50 75	 – –	 300 375	–
Output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz I_C = 10 mA, V_{CE} = 10 V, f = 1 kHz	h_{oe}	 5 25	 – –	 35 200	µS
Collector-base time constant I_E = 20 mA, V_{CB} = 20 V, f = 31.8 MHz	$r_{b'}C_c$	–	–	150	ps
Noise figure I_C = 100 µA, V_{CE} = 10 V, R_S = 1 kΩ, f = 1 kHz	NF	–	–	4	dB
Switching times V_{CC} = 30 V, V_{BE} = 0.5 V, I_C = 150 mA, I_{B1} = 15 mA	 t_d t_r	 – –	 – –	 10 25	 ns ns
V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA	t_s t_f	– –	– –	225 60	ns ns

Test circuits

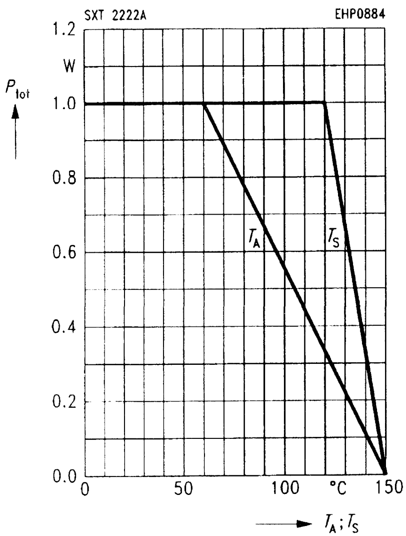
Delay and rise time



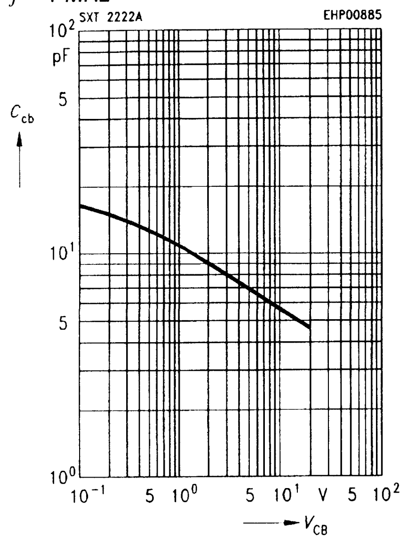
Storage and fall time



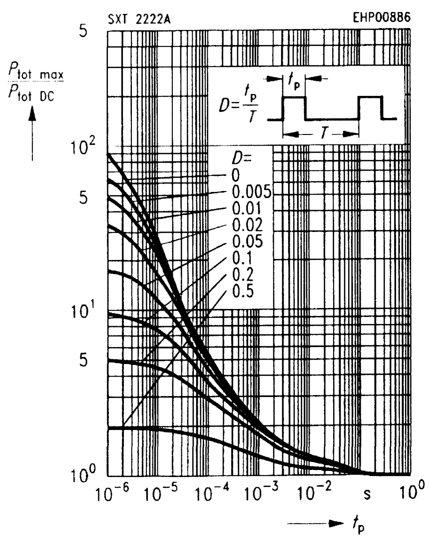
Total power dissipation $P_{tot} = f\,(T_A{}^*;\, T_S)$
* Package mounted on epoxy



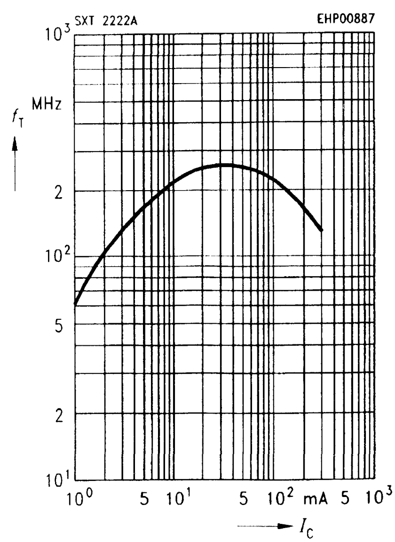
Collector-base capacitance
$C_{cb} = f\,(V_{CB})$
f = 1 MHz



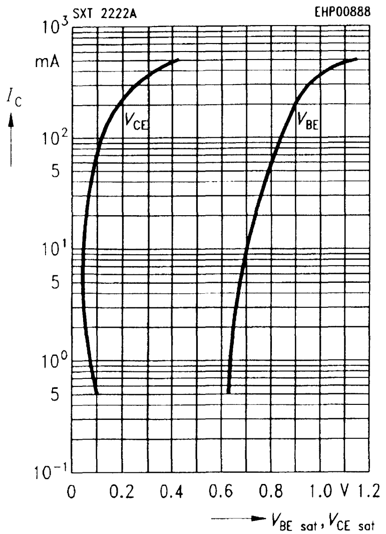
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f\,(t_p)$



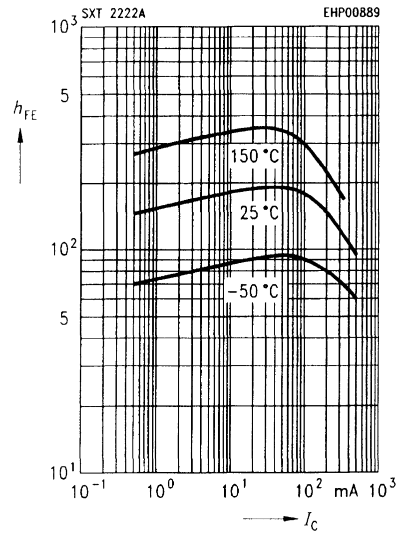
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 20 V



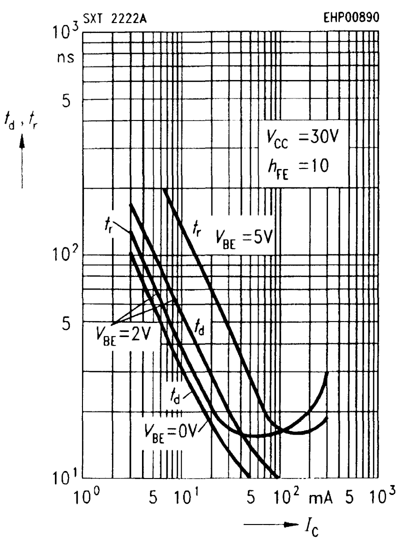
Saturation voltage $I_C = f(V_{BE\,sat}, V_{CE\,sat})$
$h_{FE} = 10$



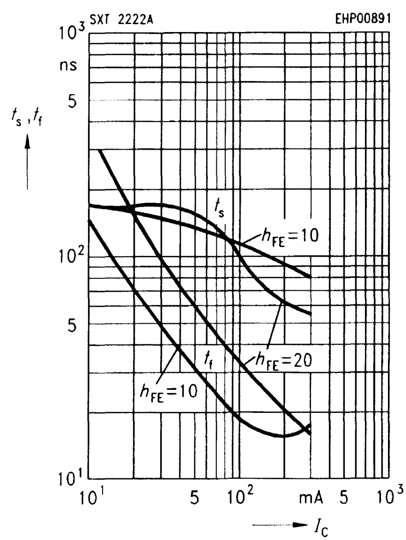
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 10$ V



Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$



Storage time $t_s = f(I_C)$
Fall time $t_f = f(I_C)$

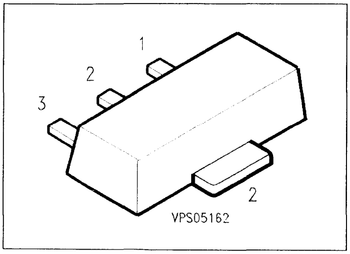


SIEMENS

PNP Silicon Switching Transistor

SXT 2907 A

- High current gain: 0.1 mA to 500 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SXT 2907 A	2F	Q68000-A8300	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	60	V
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	600	mA
Total power dissipation, T_S = 120 °C	P_{tot}	1	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 90	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 30	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 10 mA	$V_{(BR)CEO}$	60	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	60	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 60 V, I_E = 0 V_{CB} = 60 V, I_E = 0, T_A = 125 °C	I_{CBO}	 – –	 – –	 10 10	 nA µA
Collector cutoff current V_{CE} = 30 V, V_{BE} = 0.5 V	I_{CEX}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0	I_{EBO}	–	–	10	
Base cutoff current V_{CE} = 30 V, V_{BE} = 3 V	I_{BL}	–	–	50	
DC current gain I_C = 100 µA, V_{CE} = 10 V I_C = 1 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V I_C = 150 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 10 V	h_{FE}	 75 100 100 100 50	 – – – – –	 – – – 300 –	–
Collector-emitter saturation voltage[1)] I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	V_{CEsat}	 – –	 – –	 0.4 1.6	V
Base-emitter saturation voltage[1)] I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	V_{BEsat}	 – –	 – –	 1.3 2.0	

1) Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

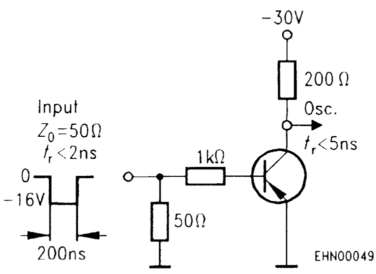
Electrical Characteristics

at T_A = 25 ˚C, unless otherwise specified.

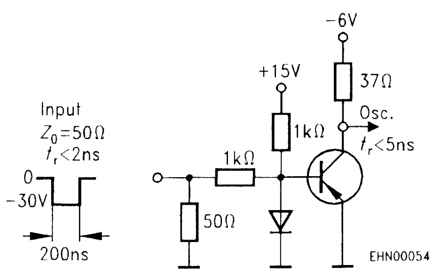
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 20 V, f = 100 MHz	f_T	200	–	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	–	8	pF
Input capacitance V_{EB} = 2 V, f = 1 MHz	C_{ibo}	–	–	30	
Switching times V_{CC} = 30 V, V_{BE} = 0.5 V, I_C = 150 mA, I_{B1} = 15 mA	t_d t_r	– –	– –	10 40	ns ns
V_{CC} = 6 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA	t_s t_f	– –	– –	80 30	ns ns

Test circuits

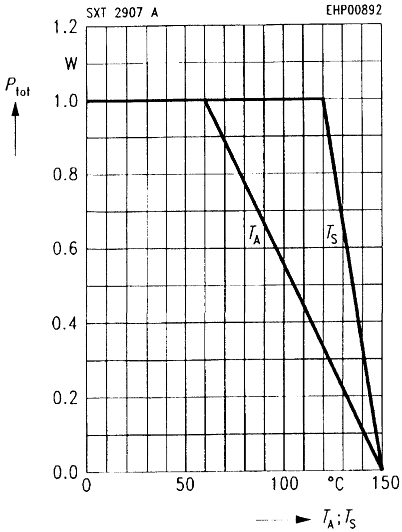
Delay and rise time



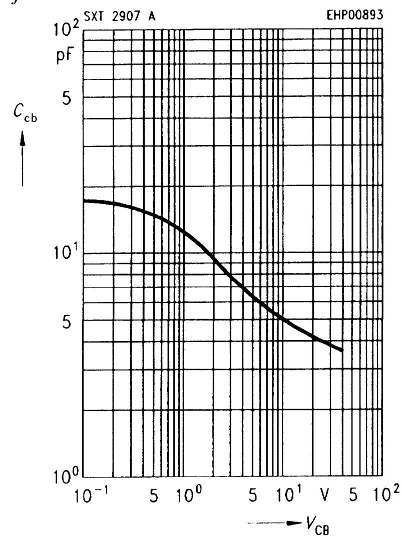
Storage and fall time



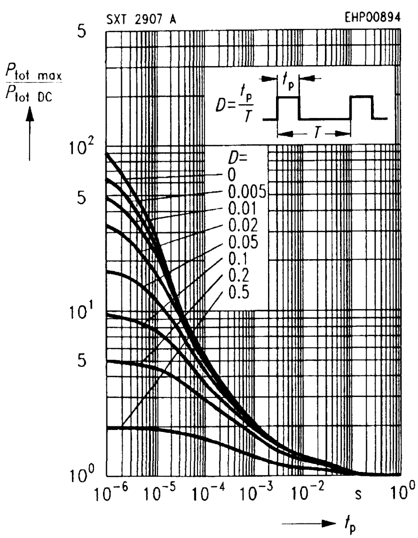
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



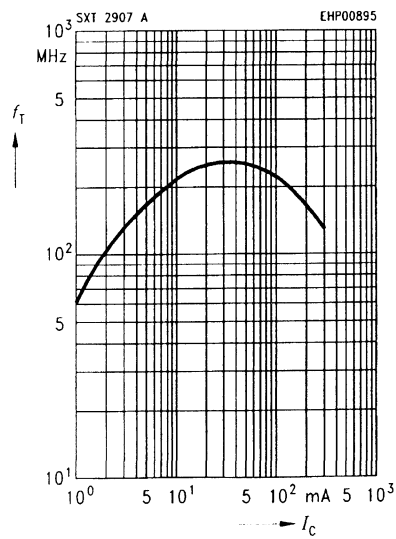
Collector-base capacitance
$C_{cb} = f(V_{CB})$
f = 1 MHz



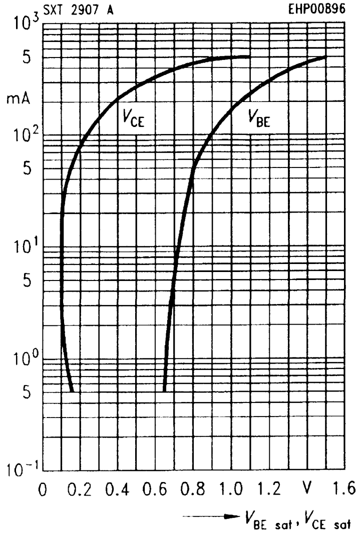
Permissible pulse load $P_{tot\,max} / P_{tot\,DC} = f(t_p)$



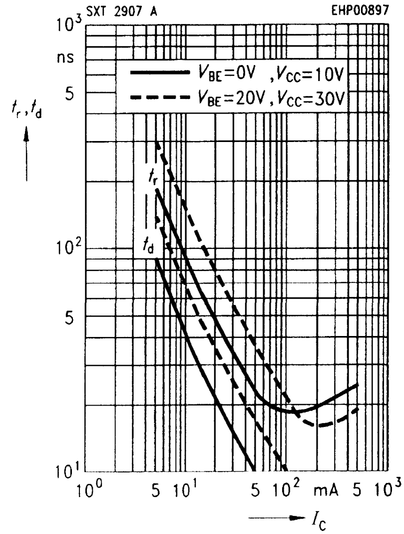
Transition frequency $f_T = f(I_C)$
V_{CE} = 20 V



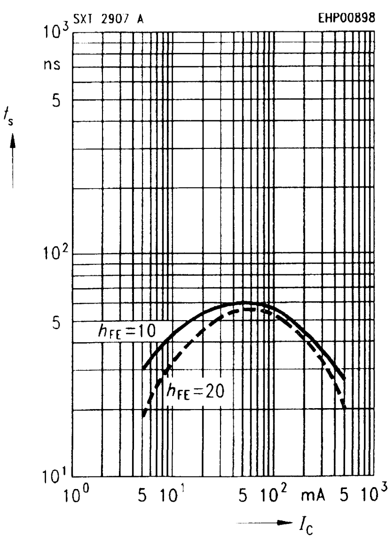
Saturation voltage $I_C = f(V_{BE\,sat}, V_{CE\,sat})$
$h_{FE} = 10$



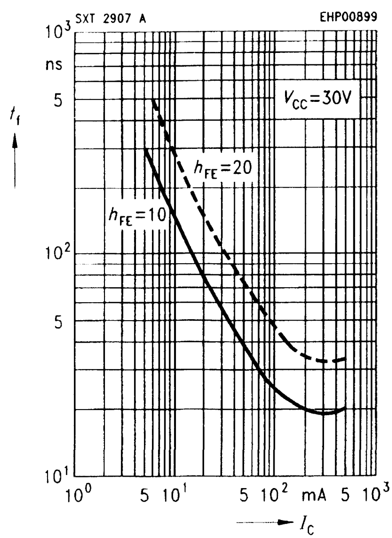
Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$
$h_{FE} = 10$



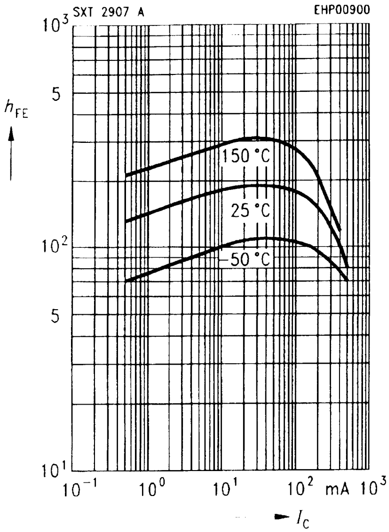
Storage time $t_s = f(I_C)$



Fall time $t_f = f(I_C)$



DC current gain $h_{FE} = f\,(I_C)$

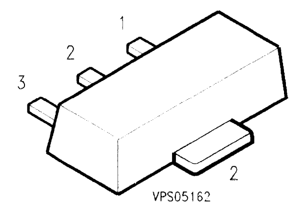


SIEMENS

NPN Silicon Switching Transistor

SXT 3904

- High current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SXT 3904	1A	Q68000-A8396	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	40	V
Collector-base voltage	V_{CB0}	60	
Emitter-base voltage	V_{EB0}	6	
Collector current	I_C	200	mA
Total power dissipation, T_S = 95 ˚C	P_{tot}	1	W
Junction temperature	T_j	150	˚C
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 125	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 55	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	$V_{(BR)CE0}$	40	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CB0}$	60	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current V_{CB} = 30 V	I_{CB0}	–	–	50	nA
Collector-emitter cutoff current V_{CE} = 30 V, V_{BE} = 3 V	I_{CEV}	–	–	50	
DC current gain I_C = 100 µA, 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
Base-emitter saturation voltage[1] I_C = 10 mA, I_B = 1 mA I_C = 50 mA, I_B = 5 mA	V_{BEsat}	 0.65 –	 – –	 0.85 0.95	

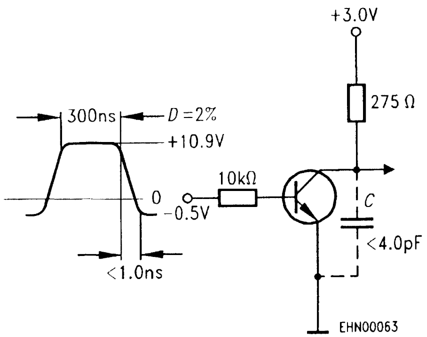
[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

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

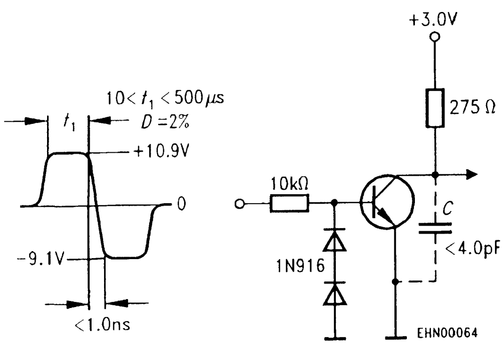
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	–	–	MHz
Output capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	8	
Input impedance I_{CE} = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{ie}	1	–	10	kΩ
Voltage feedback ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{re}	0.5	–	8	10^{-4}
Small-signal current gain I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{fe}	100	–	400	–
Output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{oe}	1	–	40	µS
Noise figure I_C = 0.1 mA, V_{CE} = 5 V, f = 10 Hz to 15 kHz R_S = 1 kΩ	NF	–	–	5	dB
Switching times V_{CC} = 3 V, V_{BE} = 0.5 V, I_C = 10 mA, I_{B1} = 1 mA	 t_d t_r	 – –	 – –	 35 35	 ns ns
V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1 mA	t_s t_f	– –	– –	200 50	ns ns

Test circuits

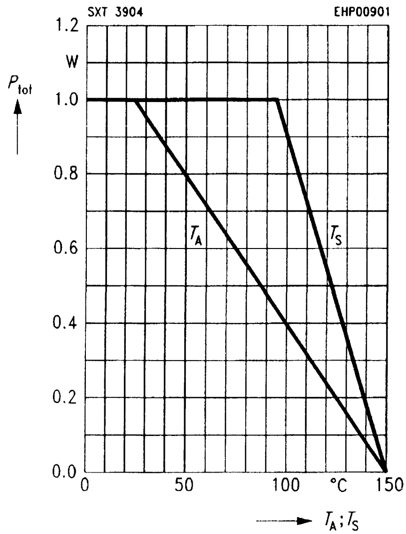
Delay and rise time



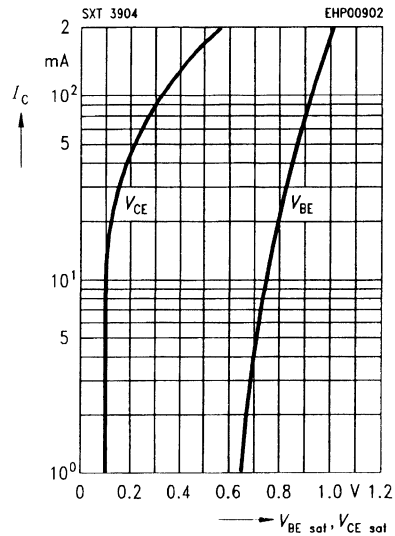
Storage and fall time



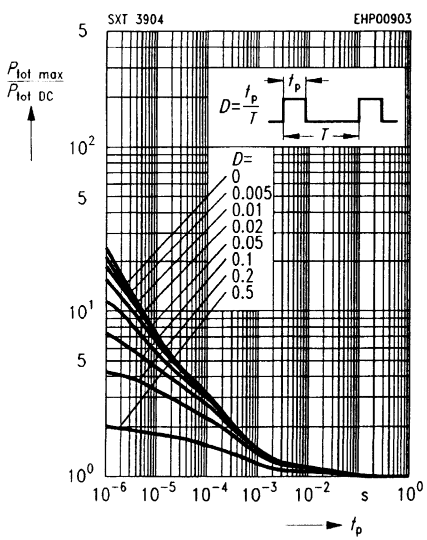
Total power dissipation $P_{tot} = f\,(T_A{}^*;\, T_S)$
* Package mounted on epoxy



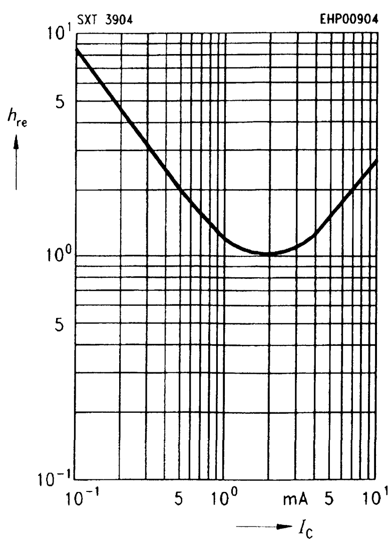
Saturation voltage $I_C = f\,(V_{BE\,sat},\, V_{CE\,sat})$



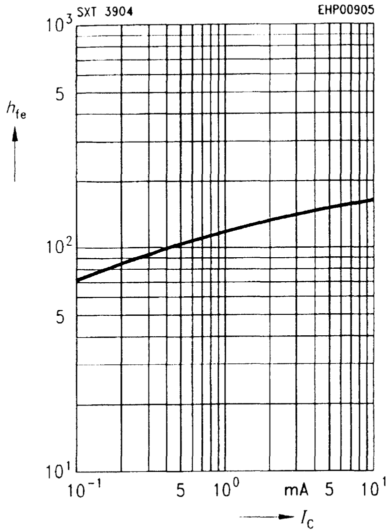
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



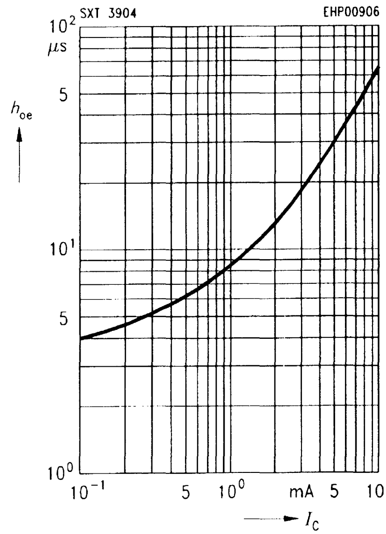
Voltage feedback ratio $h_{re} = f\,(I_C)$
$V_{CE} = 10$ V, $f = 1$ kHz



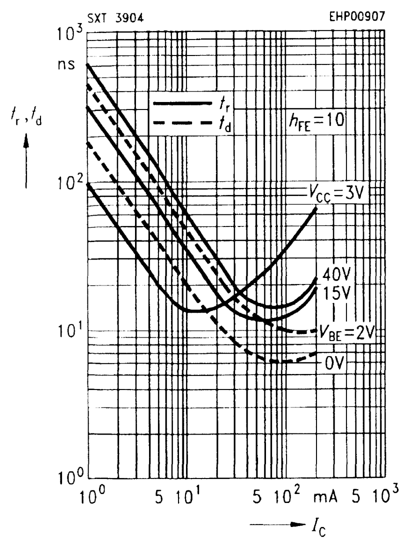
Small-signal current gain
$h_{fe} = f(I_C)$
V_{CE} = 10 V, f = 1 MHz



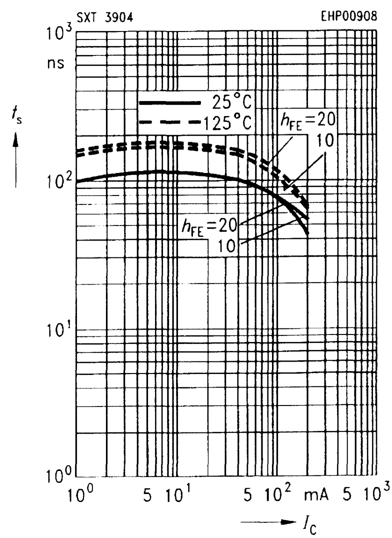
Output admittance
$h_{oe} = f(I_C)$
V_{CE} = 10 V, f = 1 MHz



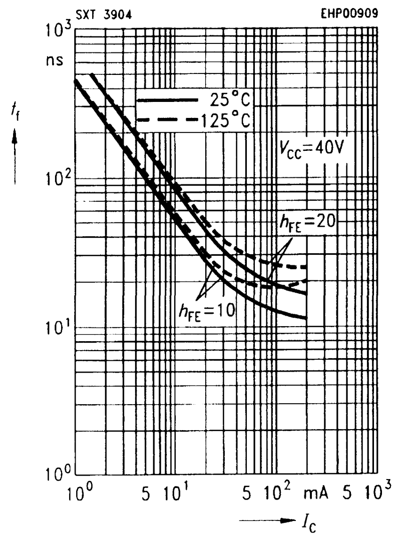
Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$



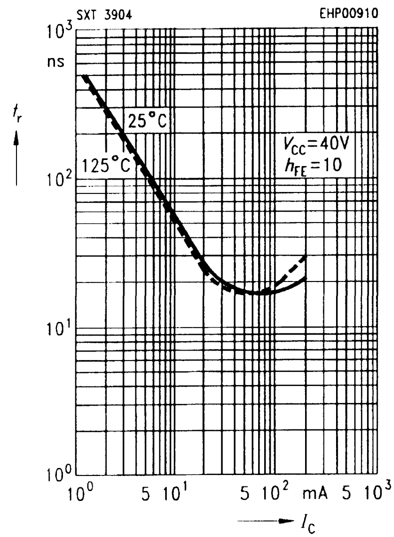
Storage time $t_s = f(I_C)$



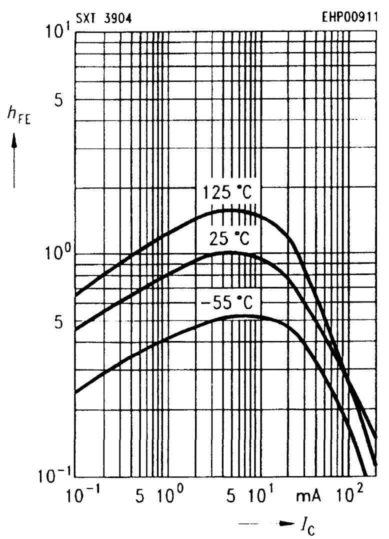
Fall time $t_f = f(I_C)$



Rise time $t_r = f(I_C)$



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

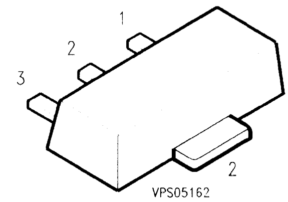


SIEMENS

PNP Silicon Switching Transistor

SXT 3906

- High current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
SXT 3906	2A	Q68000-A8397	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	40	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	200	mA
Total power dissipation, T_S = 100 °C	P_{tot}	1	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 65 … + 150	

Thermal Resistance

Junction - ambient[2)]	$R_{th\,JA}$	≤ 120	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 50	

1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical 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	$V_{(BR)CEO}$	40	–	–	V
Collector-base breakdown voltage I_C = 10 µA	$V_{(BR)CBO}$	40	–	–	
Emitter-base breakdown voltage I_E = 10 µA	$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current V_{CB} = 30 V	I_{CBO}	–	–	50	nA
Collector-emitter cutoff current V_{CE} = 30 V, V_{BE} = – 3 V	I_{CEV}	–	–	50	
DC current gain I_C = 100 µA, 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
Base-emitter saturation voltage[1] I_C = 10 mA, I_B = 1 mA I_C = 50 mA, I_B = 5 mA	V_{BEsat}	 0.65 –	 – –	 0.85 0.95	

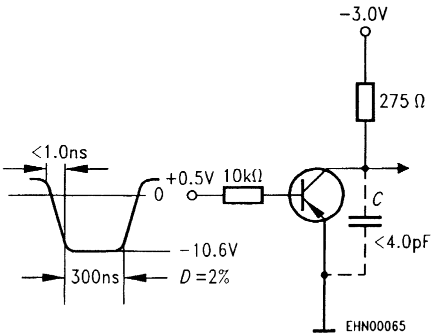
1) Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

Electrical Characteristics
at T_A = 25 ˚C, unless otherwise specified.

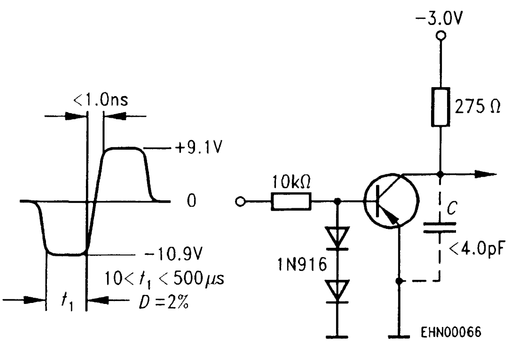
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	250	–	–	MHz
Output capacitance V_{CB} = 5 V, f = 1 MHz	C_{obo}	–	–	4.5	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	–	10	
Input impedance I_{CE} = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{ie}	2	–	12	kΩ
Voltage feedback ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{re}	0.1	–	10	10^{-4}
Small-signal current gain I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{fe}	100	–	400	–
Output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{oe}	3	–	60	µS
Noise figure I_C = 0.1 mA, V_{CE} = 5 V, f = 10 Hz to 15 kHz R_S = 1 kΩ	NF	–	–	4	dB
Switching times V_{CC} = 3 V, V_{BE} = 0.5 V, I_C = 10 mA, I_{B1} = 1 mA	 t_d t_r	 – –	 – –	 35 35	 ns ns
V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA	t_s t_f	– –	– –	225 75	ns ns

Test circuits

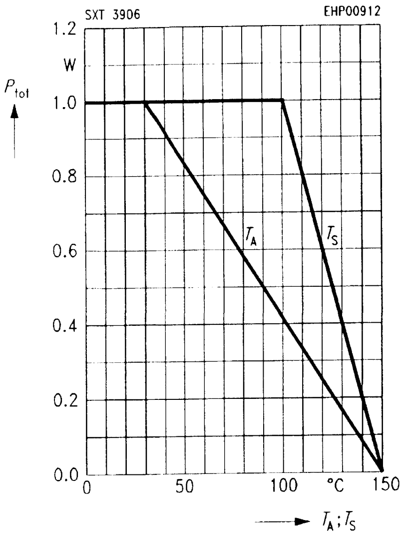
Delay and rise time



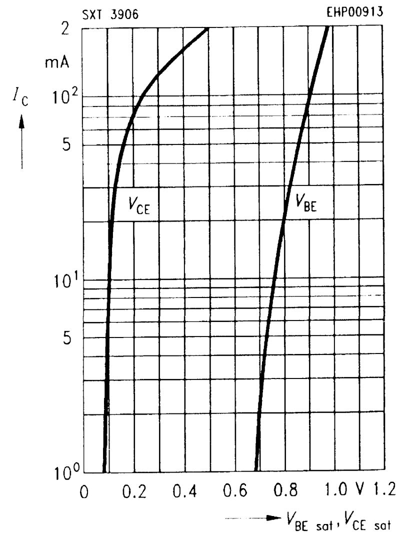
Storage and fall time



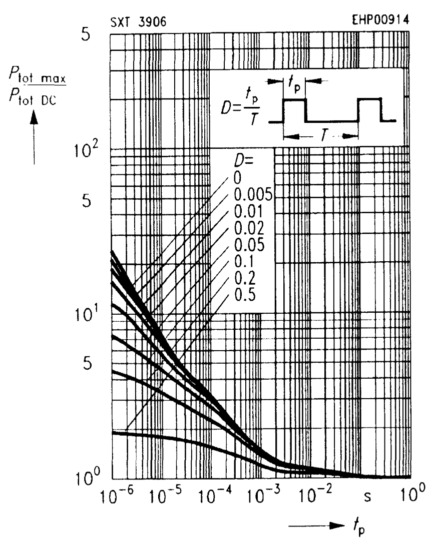
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



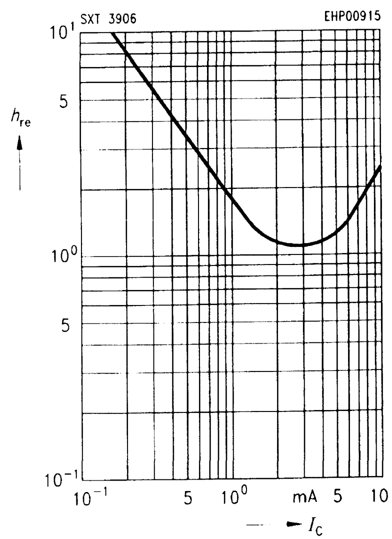
Saturation voltage $I_C = f(V_{BE\,sat}, V_{CE\,sat})$



Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



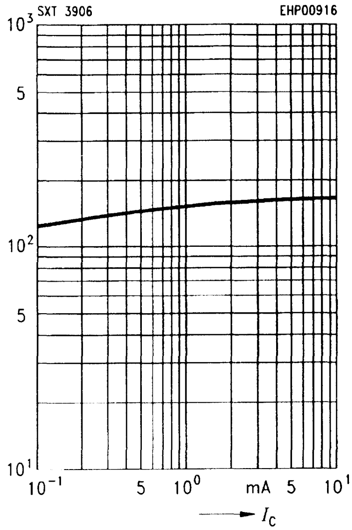
Voltage feedback ratio $h_{re} = f(I_C)$



Small-signal current gain

$h_{fe} = f(I_C)$

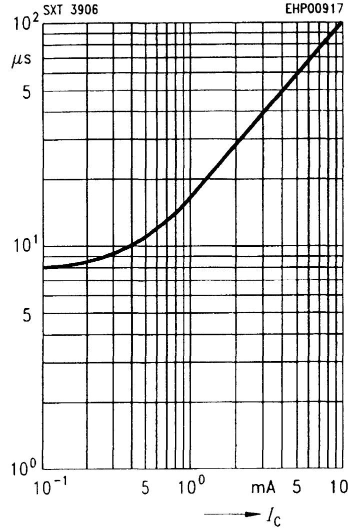
V_{CE} = 10 V, f = 1 MHz



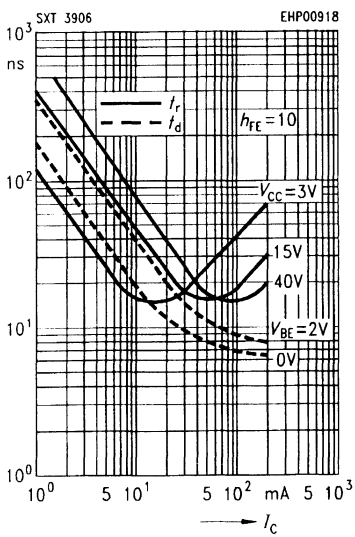
Output admittance

$h_{oe} = f(I_C)$

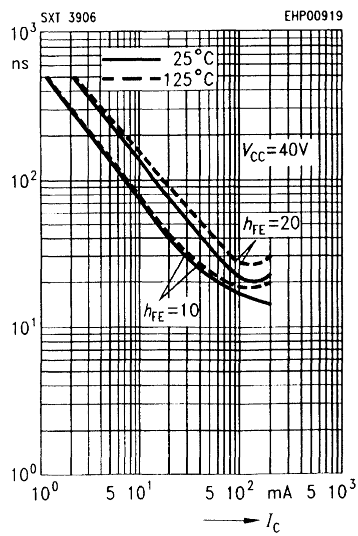
V_{CE} = 10 V, f = 1 MHz



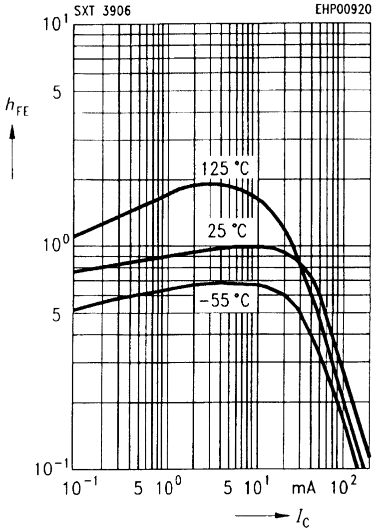
Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$



Fall time $t_f = f(I_C)$



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

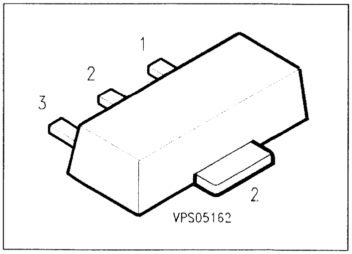


SIEMENS

NPN Silicon High Voltage Transistors

SXTA 42
SXTA 43

- High breakdown voltage
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SXTA 42	1D	Q68000-A8394	B	C	E	SOT-89
SXTA 43	1E	Q68000-A8650				

Maximum Ratings

Parameter	Symbol	Values SXTA 42	SXTA 43	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	6		
Collector current	I_C	500		mA
Total power dissipation, T_S = 130 ˚C	P_{tot}	1		W
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 … + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 75	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 20	

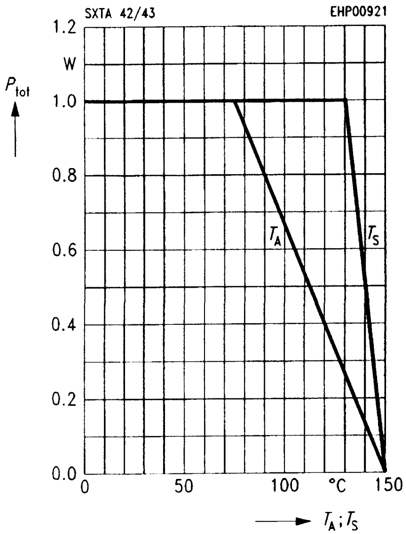
1) For detailed information see chapter Package Outlines.
2) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

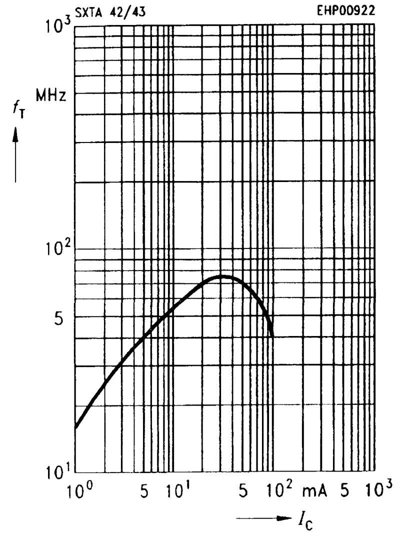
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 1 mA SXTA 42		300	–	–	
SXTA 43		200	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 100 µA SXTA 42		300	–	–	
SXTA 43		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA	$V_{(BR)EB0}$	6	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 200 V, I_E = 0 SXTA 42		–	–	100	nA
V_{CB} = 160 V, I_E = 0 SXTA 43		–	–	100	nA
V_{CB} = 200 V, I_E = 0, T_A = 125 °C SXTA 42		–	–	10	µA
V_{CB} = 160 V, I_E = 0, T_A = 125 °C SXTA 43		–	–	10	µA
Emitter-base cutoff current V_{EB} = 6 V, I_C = 0	I_{EB0}	–	–	100	nA
DC current gain	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 SXTA 42		40	–	–	
SXTA 43		40	–	–	
Collector-emitter saturation voltage [1]	V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA SXTA 42		–	–	0.5	
SXTA 43		–	–	0.4	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA	V_{BEsat}	–	–	0.9	
AC characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	50	–	–	MHz
Output capacitance	C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz SXTA 42		–	–	3	
SXTA 43		–	–	4	

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

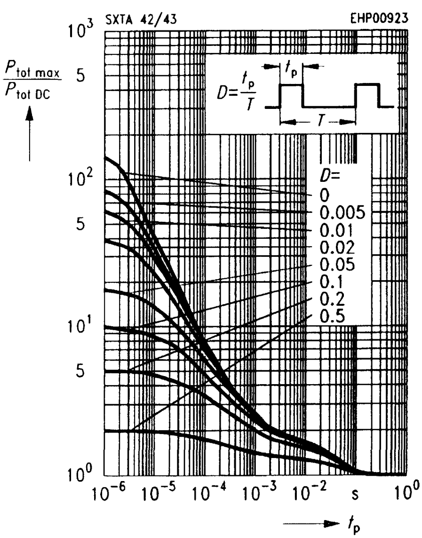
Total power dissipation $P_{tot} = f\,(T_A{}^*;\,T_S)$
* Package mounted on epoxy



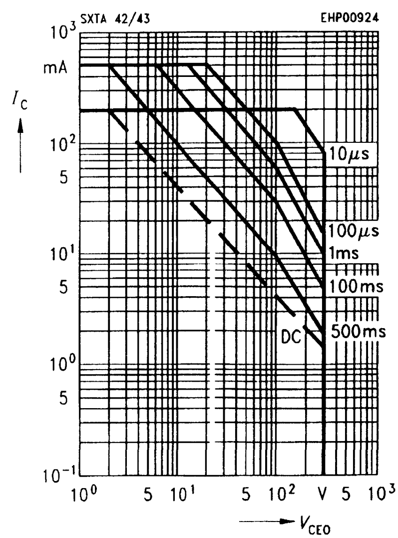
Transition frequency $f_T = f\,(I_C)$
V_{CE} = 10 V, f = 100 MHz



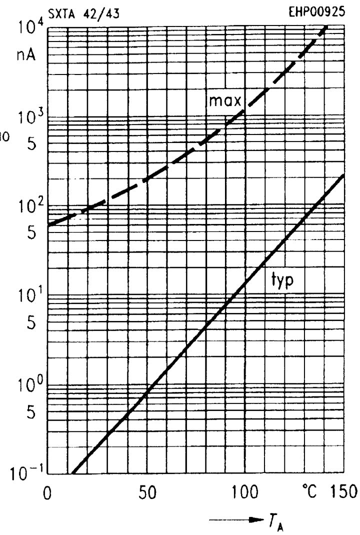
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f\,(t_p)$



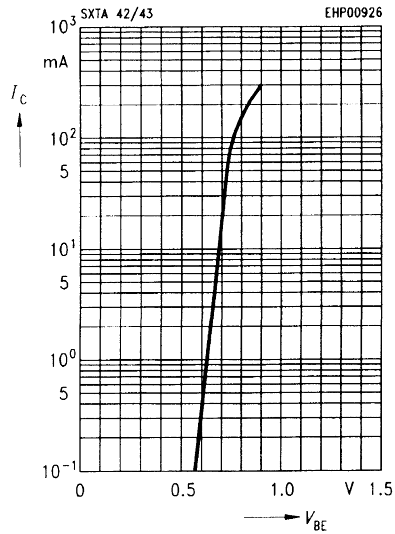
Operating range $I_C = f\,(V_{CEO})$
T_A = 25 ˚C, D = 0



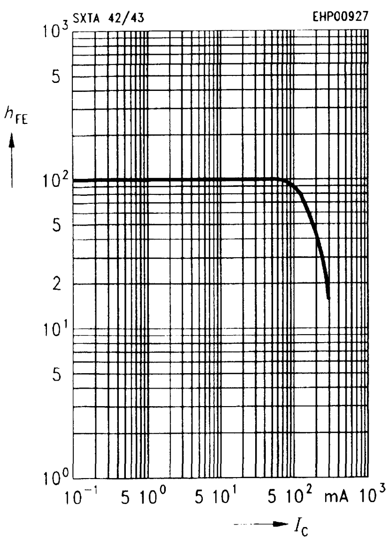
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 160 V



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



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

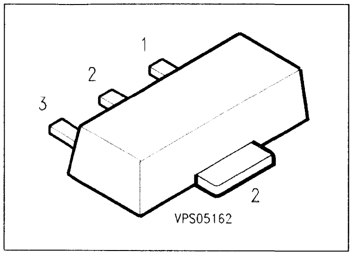


SIEMENS

PNP Silicon High Voltage Transistors

SXTA 92
SXTA 93

- High breakdown voltage
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
SXTA 92 SXTA 93	2D 2E	Q68000-A8393 Q68000-A8651	B	C	E	SOT-89

Maximum Ratings

Parameter	Symbol	Values SXTA 92	SXTA 93	Unit
Collector-emitter voltage	V_{CEO}	300	200	V
Collector-base voltage	V_{CBO}	300	200	
Emitter-base voltage	V_{EBO}	5		
Collector current	I_C	500		mA
Total power dissipation, T_S = 130 ˚C	P_{tot}	1		W
Junction temperature	T_j	150		˚C
Storage temperature range	T_{stg}	– 65 ... + 150		

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 75	K/W
Junction - soldering point	$R_{th\,JS}$	≤ 20	

[1] For detailed information see chapter Package Outlines.
[2] Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

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

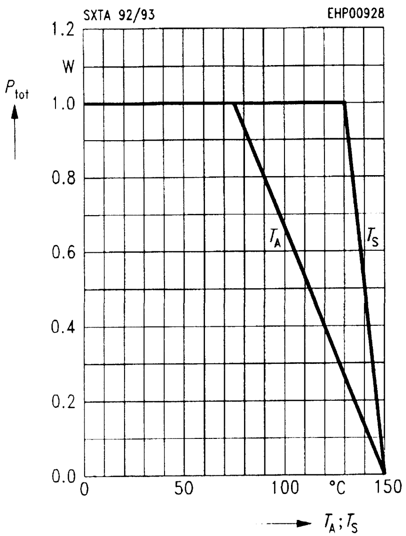
Parameter		Symbol	Values			Unit
			min.	typ.	max.	
DC characteristics						
Collector-emitter breakdown voltage		$V_{(BR)CEO}$				V
I_C = 1 mA	SXTA 92		300	–	–	
	SXTA 93		200	–	–	
Collector-base breakdown voltage		$V_{(BR)CBO}$				
I_C = 100 µA	SXTA 92		300	–	–	
	SXTA 93		200	–	–	
Emitter-base breakdown voltage I_E = 100 µA		$V_{(BR)EBO}$	5	–	–	
Collector-base cutoff current		I_{CBO}				
V_{CB} = 200 V, I_E = 0	SXTA 92		–	–	250	nA
V_{CB} = 160 V, I_E = 0	SXTA 93		–	–	250	nA
V_{CB} = 200 V, I_E = 0, T_A = 125 °C	SXTA 92		–	–	20	µA
V_{CB} = 160 V, I_E = 0, T_A = 25 °C	SXTA 93		–	–	20	µA
Emitter-base cutoff current V_{EB} = 4 V, I_C = 0		I_{EBO}	–	–	100	nA
DC current gain		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	SXTA 92		25	–	–	
	SXTA 93		25	–	–	
Collector-emitter saturation voltage [1]		V_{CEsat}				V
I_C = 20 mA, I_B = 2 mA	SXTA 92		–	–	0.5	
	SXTA 93		–	–	0.4	
Base-emitter saturation voltage [1] I_C = 20 mA, I_B = 2 mA		V_{BEsat}	–	–	0.9	

AC characteristics

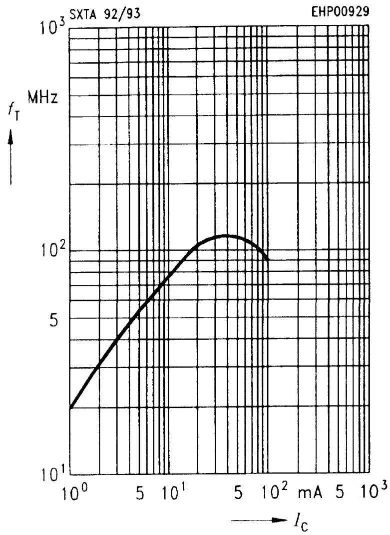
Parameter		Symbol	min.	typ.	max.	Unit
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz		f_T	50	–	–	MHz
Output capacitance		C_{obo}				pF
V_{CB} = 20 V, f = 1 MHz	SXTA 92		–	–	6	
	SXTA 93		–	–	8	

[1] Pulse test conditions: $t \leq 300$ µs, $D \leq 2$ %.

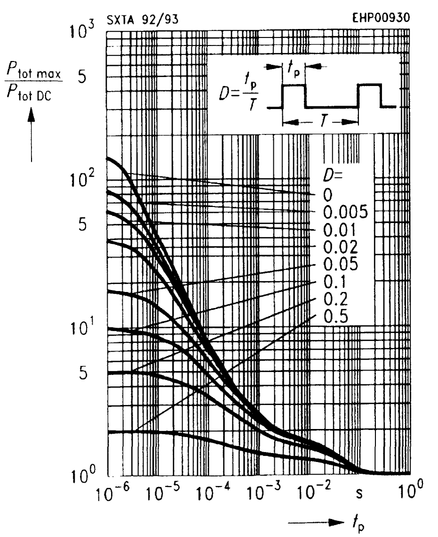
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



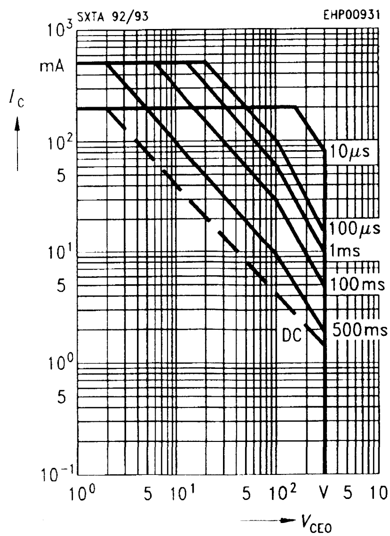
Transition frequency $f_T = f(I_C)$
V_{CE} = 20 V, f = 100 MHz



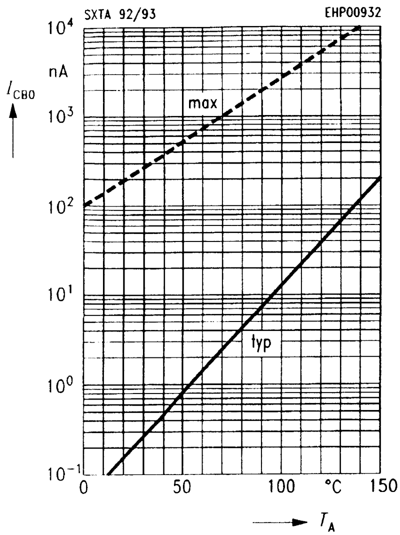
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



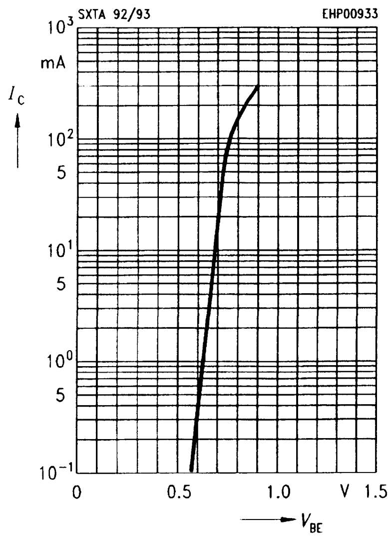
Operating range $I_C = f(V_{CEO})$
T_A = 25 °C, D = 0



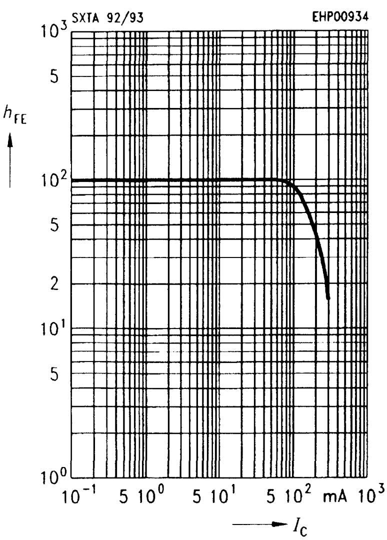
Collector cutoff current $I_{CBO} = f(T_A)$
V_{CB} = 160 V



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



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



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