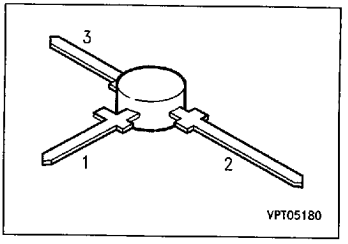
SIEMENS

NPN Silicon RF Transistor

BFR 90

- For broadband amplifiers up to 2 GHz at collector currents from 1 mA to 20 mA.



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering Code	Pin Configuration 1	2	3	Package[1]
BFR 90	BFR 90	Q62702-F560	E	C	B	T-plast

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE0}	15	V
Collector-emitter voltage, $V_{BE} = 0$	V_{CES}	20	
Emitter-base voltage	V_{EB0}	2.5	
Collector current	I_C	30	mA
Base current	I_B	4	
Total power dissipation, $T_S \leq 100$ °C[3]	P_{tot}	280	mW
Junction temperature	T_j	150	°C
Ambient temperature range	T_A	– 65 ... + 150	
Storage temperature range	T_{stg}	– 65 ... + 150	

Thermal Resistance

Junction - ambient[2]	$R_{th\,JA}$	≤ 280	K/W
Junction - soldering point[3]	$R_{th\,JS}$	≤ 200	

1) For detailed dimensions see chapter Package Outlines.
2) Package mounted on alumina 15 mm × 16.7 mm × 0.7 mm.
3) T_S is measured on the collector lead at the soldering point to the pcb.

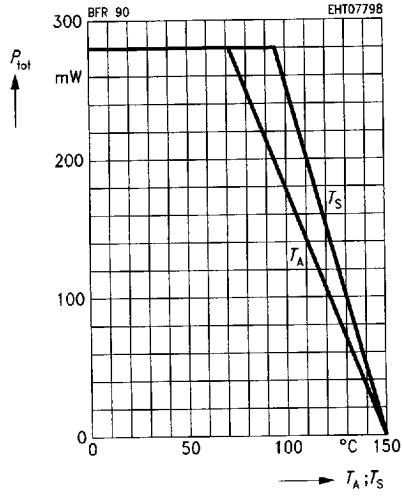
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CE0}$	15	–	–	V
Collector-emitter cutoff current V_{CE} = 20 V, V_{BE} = 0	I_{CES}	–	–	10	µA
Collector-base cutoff current V_{CB} = 10 V, I_E = 0	I_{CB0}	–	–	50	nA
Emitter-base cutoff current V_{EB} = 2.5 V, I_C = 0	I_{EB0}	–	–	100	µA
DC current gain I_C = 5 mA, V_{CE} = 6 V I_C = 25 mA, V_{CE} = 6 V	h_{FE}	 40 40	 – –	 – –	–

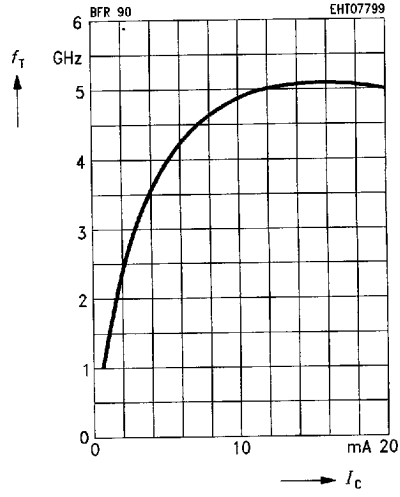
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 10 V, f = 200 MHz	f_T	–	5	–	GHz
Collector-base capacitance V_{CB} = 6 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{cb}	–	0.44	–	pF
Collector-emitter capacitance V_{CE} = 6 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{ce}	–	0.3	–	
Output capacitance V_{CE} = 10 V, V_{BE} = v_{be} = 0, f = 1 MHz	C_{obs}	–	0.75	–	
Noise figure I_C = 2 mA, V_{CE} = 6 V, f = 10 MHz, Z_S = 150 Ω I_C = 2 mA, V_{CE} = 6 V, f = 200 MHz, Z_S = 100 Ω I_C = 2 mA, V_{CE} = 6 V, f = 800 MHz, Z_S = 60 Ω I_C = 3 mA, V_{CE} = 10 V, f = 2 GHz, Z_S = Z_{Sopt}	F	 – – – –	 1.1 2 2 4	 – – – –	dB
Power gain I_C = 15 mA, V_{CE} = 6 V, f = 800 MHz, Z_S = 60 Ω, Z_L = Z_{Lopt}	G_{pe}	–	14	–	
Transducer gain I_C = 5 mA, V_{CE} = 6 V, f = 500 MHz, Z_0 = 50 Ω	$\lvert S_{21e} \rvert^2$	–	17	–	
Linear output voltage two-tone intermodulation test I_C = 15 mA, V_{CE} = 6 V, d_{IM} = 60 dB, f_1 = 806 MHz, f_2 = 810 MHz, Z_S = Z_L = 50 Ω	V_{o1} = V_{o2}	–	100	–	mV
Third order intercept point I_C = 15 mA, V_{CE} = 6 V, f = 800 MHz	IP_3	–	23	–	dBm

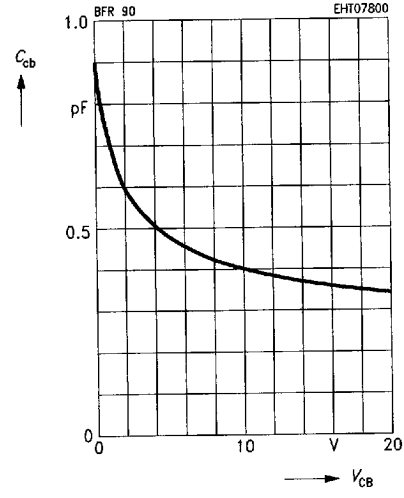
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
*Package mounted on alumina



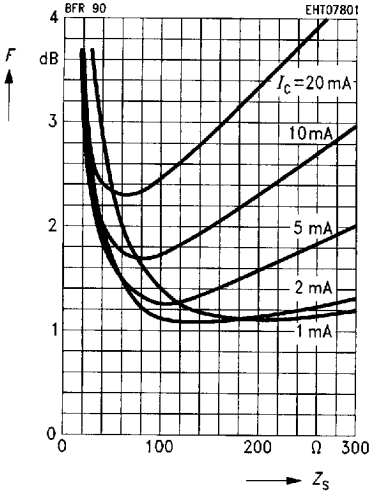
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V, f = 200 MHz



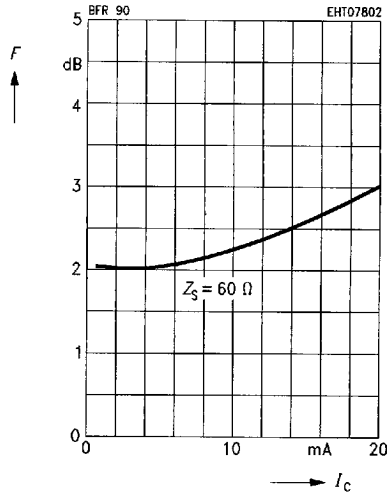
Collector-base capacitance $C_{cb} = f(V_{CB})$
$V_{BE} = v_{be} = 0$, f = 1 MHz



Noise figure $F = f(Z_S)$
V_{CE} = 6 V, f = 10 MHz



Noise figure $F = f(I_C)$
V_{CE} = 6 V, f = 800 MHz, Z_{Lopt} (G)



Common Emitter S Parameters

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**	**MAG**	**ANG**
I_C = 15 mA, V_{CE} = 6 V, Z_0 = 50 Ω								
0.1	0.300	– 35	19.93	146	0.015	78	0.894	– 16
0.2	0.201	– 65	14.93	123	0.027	73	0.695	– 21
0.3	0.139	– 89	11.26	110	0.038	72	0.558	– 29
0.4	0.103	– 109	8.90	102	0.047	76	0.584	– 33
0.5	0.077	– 131	7.23	97	0.058	76	0.599	– 25
0.6	0.074	– 160	6.14	92	0.068	75	0.492	– 21
0.7	0.068	177	5.39	87	0.079	75	0.476	– 32
0.8	0.063	162	4.67	34	0.091	73	0.531	– 33
0.9	0.113	160	4.31	31	0.101	76	0.487	– 23
1.0	0.114	153	3.88	78	0.111	74	0.467	– 33
1.1	0.123	143	3.55	75	0.120	74	0.472	– 34
1.2	0.143	137	3.27	72	0.131	72	0.451	– 36
1.3	0.161	133	2.35	70	0.142	72	0.445	– 36
1.4	0.187	131	2.36	63	0.154	72	0.440	– 42
1.5	0.195	130	2.66	65	0.161	71	0.444	– 42
1.6	0.213	127	2.53	63	0.173	70	0.433	– 43
1.7	0.214	127	2.38	61	0.182	69	0.427	– 44
1.8	0.244	123	2.25	58	0.191	69	0.337	– 50
1.9	0.265	123	2.15	56	0.200	67	0.494	– 53
2.0	0.253	126	2.08	53	0.212	65	0.394	– 51