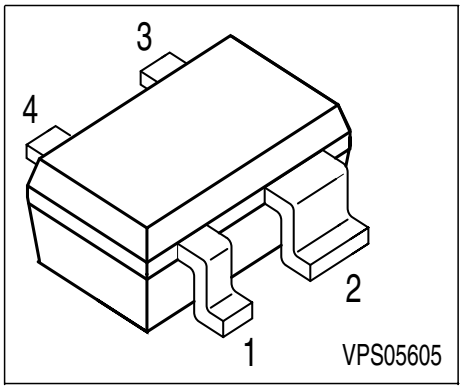
NPN Silicon RF Transistor

Preliminary data

- For highest gain low noise amplifier at 1.8 GHz
  Outstanding G_{ms} = 21 dB
  Noise Figure F = 0.9 dB
- Gold metallization for high reliability
- **SIEGET ® 45 - Line**



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

Type	Marking	Ordering Code	Pin Configuration				Package
BFP 540	ATs	Q62702-F1818	1 = B	2 = E	3 = C	4 = E	SOT-343

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	4.5	V
Collector-base voltage	V_{CBO}	tbd	
Emitter-base voltage	V_{EBO}	tbd	
Collector current	I_C	80	mA
Base current	I_B	tbd	
Total power dissipation, T_S = tbd ˚C	P_{tot}	tbd	mW
Junction temperature	T_j	tbd	˚C
Ambient temperature	T_A	tbd ...+tbd	
Storage temperature	T_{stg}	tbd ...+tbd	

Thermal Resistance

Junction - soldering point 1)	R_{thJS}	≤ tbd	K/W

1) T_S is measured on the emitter 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	$V_{(BR)CEO}$	4.5	5	6.5	V
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	-	200	nA
Emitter-base cutoff current V_{EB} = 1.5 V, I_C = 0	I_{EBO}	-	-	35	µA
DC current gain I_C = 20 mA, V_{CE} = 3.5 V	h_{FE}	70	110	200	-
AC characteristics					
Transition frequency I_C = 50 mA, V_{CE} = 4 V, f = 1 GHz	f_T	-	33	-	GHz
Collector-base capacitance V_{CB} = 2 V, f = 1 MHz	C_{cb}	-	0.13	-	pF
Collector-emitter capacitance V_{CE} = 2 V, f = 1 MHz	C_{ce}	-	0.33	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	0.7	-	
Noise figure I_C = 5 mA, V_{CE} = 2 V, Z_S = Z_{Sopt} , f = 1.8 GHz	F	-	0.9	-	dB
Power gain [1] I_C = 20 mA, V_{CE} = 2 V, Z_S = Z_{Sopt}, Z_L = Z_{Lopt} , f = 1.8 GHz	G_{ms}	-	21	-	
Insertion power gain I_C = 20 mA, V_{CE} = 2 V, f = 1.8 GHz, Z_S = Z_L = 50Ω	$\lvert S_{21}\rvert^2$	-	19	-	
Third order intercept point at output V_{CE} = 2 V, f = 1.8 GHz, Z_S=Z_{Sopt}, Z_L=Z_{Lopt} , I_C = 20 mA I_C = 7 mA	IP_3	 - -	 24 20	 - -	dBm
1dB compression point V_{CE} = 2 V, f = 1.8 GHz, Z_S=Z_{Sopt}, Z_L=Z_{Lopt} , I_C = 20 mA I_C = 7 mA	P_{-1dB}	 - -	 12 4	 - -	

1) $G_{ms} = \lvert S_{21} / S_{12}\rvert$

Common Emitter S-Parameters

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
V_{CE} = 2 V, I_C = 20 mA								
0.01	0.5903	-2.2	42.176	179	0.0008	99.2	0.9567	-0.6
0.1	0.5827	-22.1	40.33	165.1	0.0068	82.2	0.9499	-12.1
0.5	0.4721	-91.8	26.564	121.2	0.0263	62.1	0.6533	-48.1
1	0.4148	-137.4	15.46	96.5	0.0397	56.4	0.3959	-68.2
2	0.413	178	7.897	72.9	0.0646	52.3	0.1912	-90.7
3	0.4426	153	5.257	56.5	0.0892	46.5	0.0982	-117.9
4	0.5064	133.2	3.895	41.6	0.1126	38.1	0.1022	180
5	0.5623	119.5	3.027	28.1	0.1313	29.9	0.1445	147
6	0.5989	109.6	2.471	16.2	0.1525	22.9	0.1764	121.8
V_{CE} = 2V, I_C = 5 mA								
0.01	0.9394	-0.7	7.05	-179.5	0.001	67.1	0.9961	-0.4
0.1	0.937	-7.6	6.922	174.7	0.0087	87.3	0.9976	-3.7
0.5	0.904	-37.9	6.567	152.3	0.0435	70.9	0.9485	-18
1	0.823	-73.1	5.687	128	0.0782	52	0.8283	-33.3
2	0.68	-130	3.983	92.3	0.1073	25.7	0.5958	-52.6
3	0.6308	-170.9	2.913	67	0.1111	12.3	0.4471	-63.7
4	0.6442	156.4	2.251	45.6	0.1076	4.9	0.3504	-78.9
5	0.6757	134.7	1.765	27.5	0.1028	3.7	0.2987	-96.5
6	0.7029	119.7	1.439	12.7	0.1065	7.1	0.2491	-114.9

Common Emitter Noise Parameters

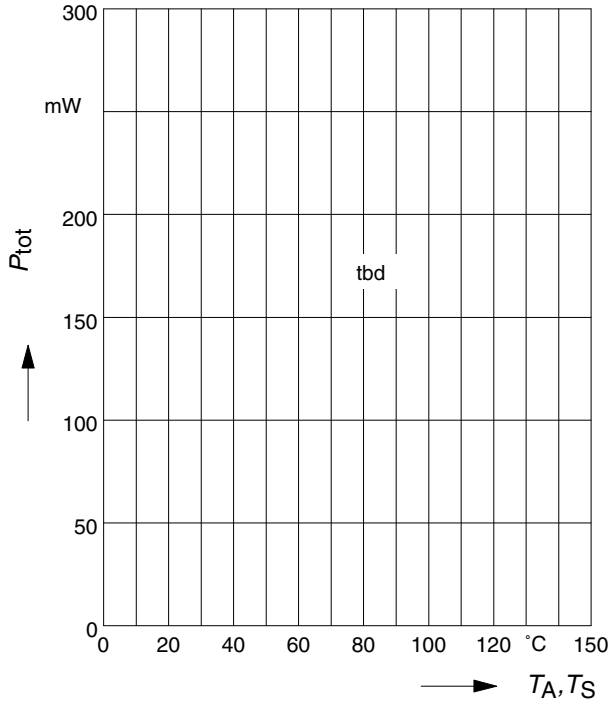
f	F_{min} 1)	G_a 1)	Γ_{opt}		R_N	r_n	$F_{50\Omega}$ 2)	$\lvert S_{21}\rvert^2$ 2)
GHz	dB	dB	MAG	ANG	Ω	-	dB	dB
V_{CE} = 2 V, I_C = 5 mA								
0.9	0.69	22.7	0.29	34	8	0.16	0.86	21.5
1.8	0.9	17.6	0.13	86	6.5	0.13	0.93	17
2.4	1.06	15.2	0.14	127	6.5	0.13	1.13	14.1
3	1.2	13.6	0.22	163	5.5	0.11	1.31	11.9
4	1.47	11.5	0.33	-153	6	0.12	1.67	9.5
5	1.78	10	0.5	-126	9	0.18	2.17	7.9
6	2.11	8.4	0.55	-107	18	0.36	2.98	5.6

1) Input matched for minimum noise figure, output for maximum gain 2) $Z_S = Z_L = 50\Omega$

For more and detailed S- and Noise-parameters please contact your local Siemens distributor or sales office to obtain a Siemens Application Notes CD-ROM or see Internet: http://www.siemens.de/Semiconductor/products/35/35.htm

Total power dissipation $P_{tot} = f(T_A^*, T_S)$

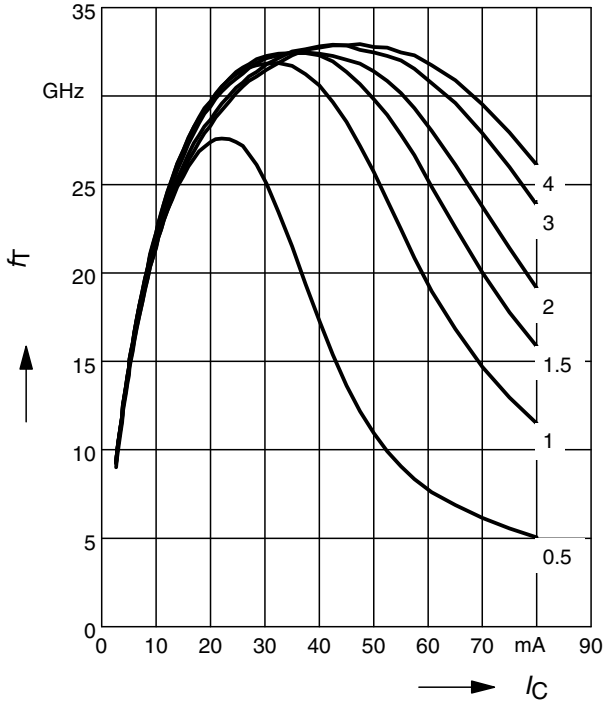
* Package mounted on epoxy



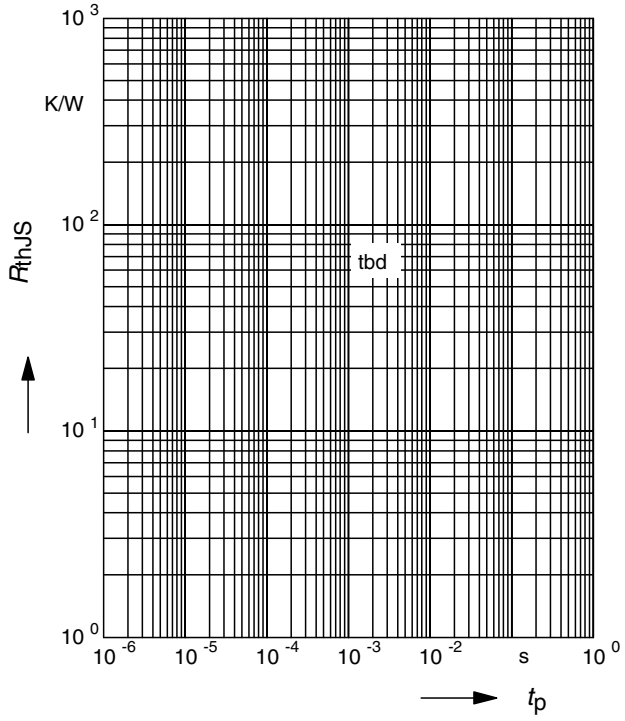
Transition frequency $f_T = f(I_C)$

f = 1 GHz

V_{CE} = parameter in V

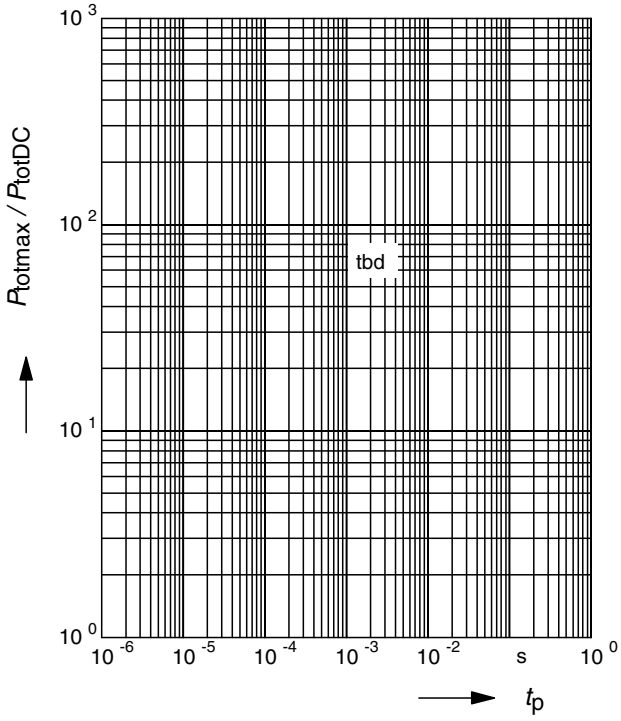


Permissible Pulse Load $R_{thJS} = f(t_p)$



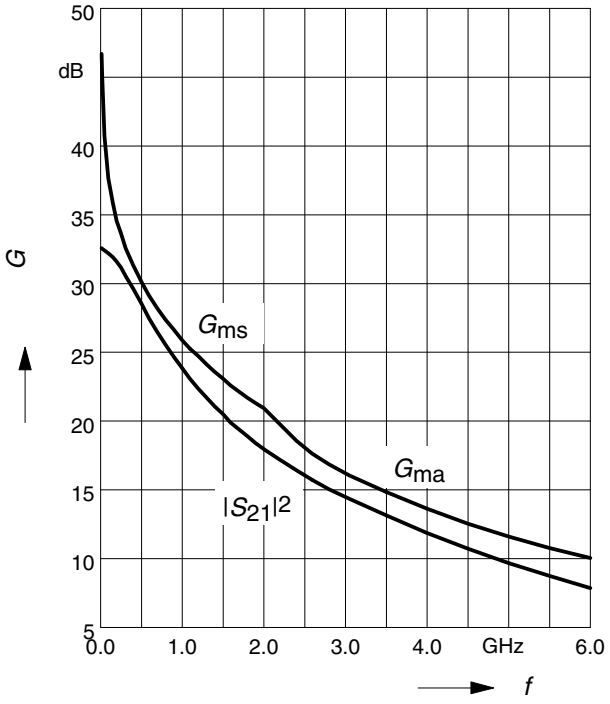
Permissible Pulse Load

$P_{totmax}/P_{totDC} = f(t_p)$



Power gain G_{ma}, G_{ms}, $|S_{21}|^2 = f(f)$

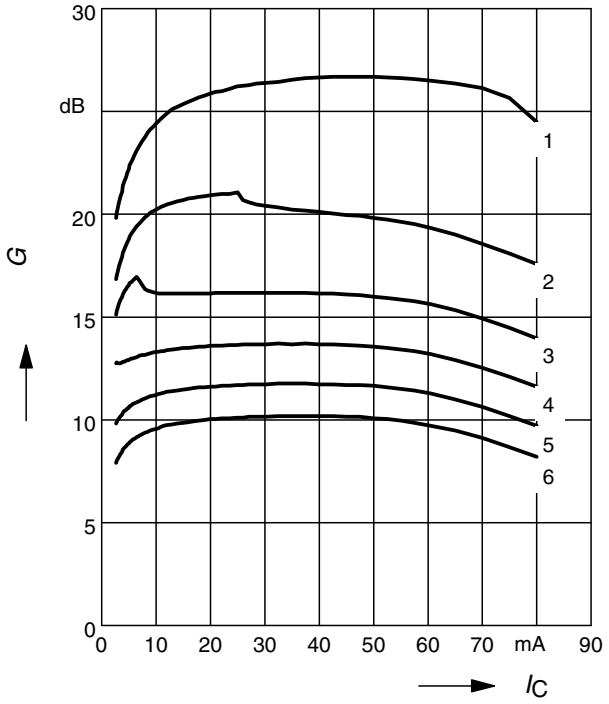
V_{CE} = 2V, I_C = 20 mA



Power gain G_{ma}, $G_{ms} = f(I_C)$

V_{CE} = 2V

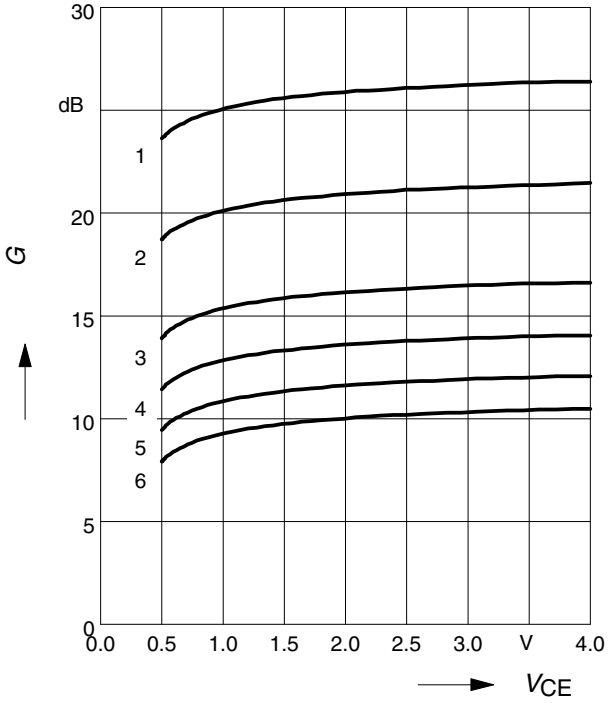
f = parameter in GHz



Power gain G_{ma}, $G_{ms} = f(V_{CE})$

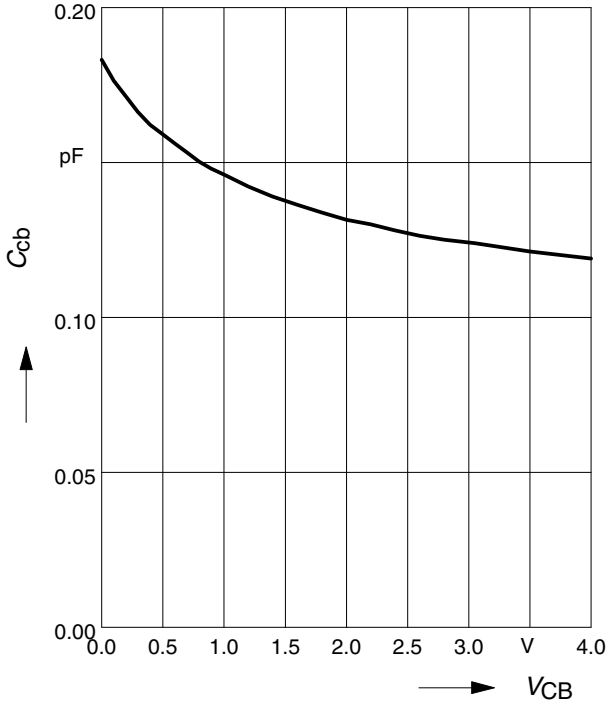
I_C = 20 mA

f = parameter in GHz



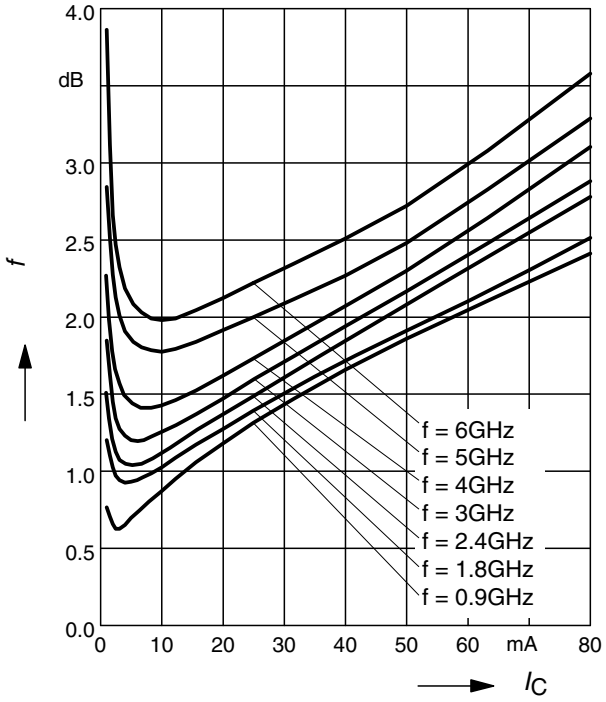
Collector-base capacitance $C_{cb} = f(V_{CB})$

f = 1MHz



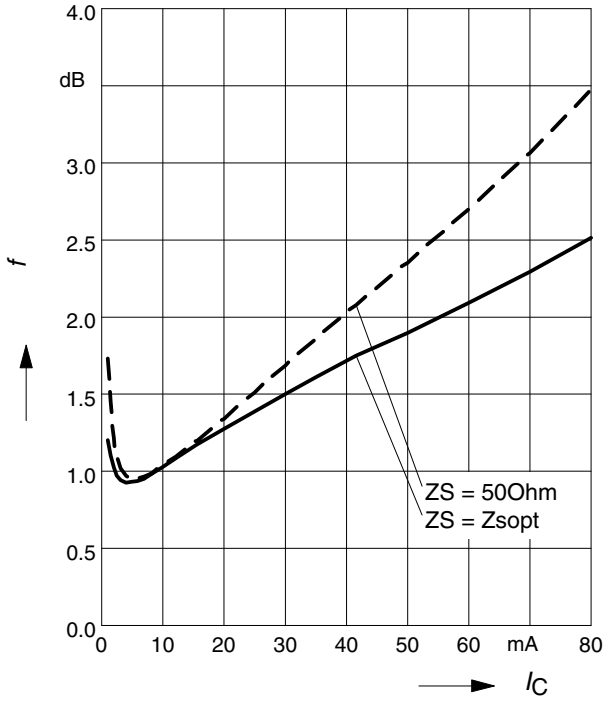
Noise figure $F = f(I_C)$

V_{CE} = 2 V, $Z_S = Z_{Sopt}$



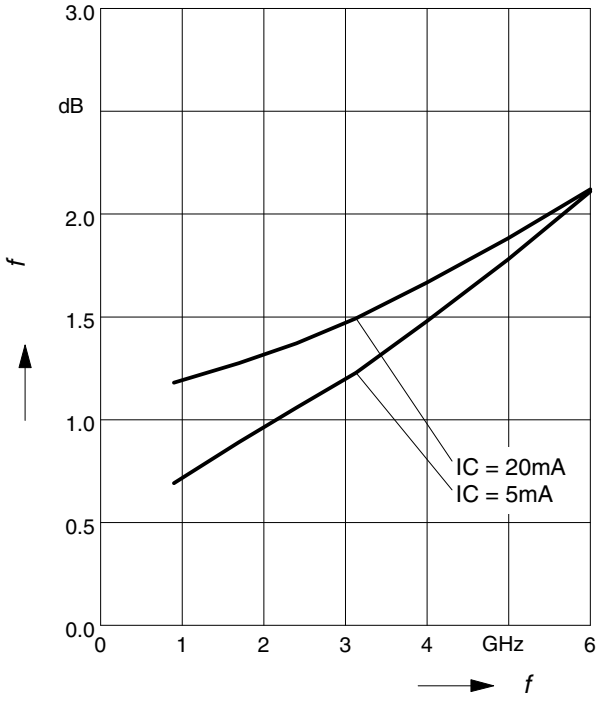
Noise figure $F = f(I_C)$

V_{CE} = 2 V, f = 1.8 GHz



Noise figure $F = f(f)$

V_{CE} = 2 V, $Z_S = Z_{Sopt}$



Source impedance for min. noise figure vs. Frequency

V_{CE} = 2 V, I_C = 5 mA / 20 mA