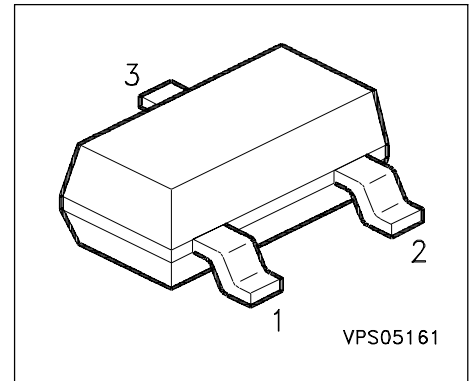


NPN Silicon RF Transistor

- For low-noise amplifiers up to 2GHz and broadband analog and digital applications in telecommunications systems at collector currents from 0.5 mA to 20 mA.



ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Ordering Code	Pin Configuration			Package
BFQ 81	RA5	Q62702-F1049	1 = B	2 = E	3 = C	SOT-23

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CEO}	16	V
Collector-emitter voltage	V_{CES}	25	
Collector-base voltage	V_{CBO}	25	
Emitter-base voltage	V_{EBO}	2	
Collector current	I_C	30	mA
Base current	I_B	4	
Total power dissipation $T_S \leq 59\text{ °C}$	P_{tot}	280	mW
Junction temperature	T_j	150	
Ambient temperature	T_A	- 65 ... + 150	
Storage temperature	T_{stg}	- 65 ... + 150	

Thermal Resistance

Junction - soldering point ¹⁾	R_{thJS}	≤ 325	K/W
--	------------	------------	-----

1) T_S is measured on the collector lead at the soldering point to the pcb.

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	16	-	-	V
Collector-emitter cutoff current $V_{CE} = 25 \text{ V}, V_{BE} = 0$	I_{CES}	-	-	100	μA
Collector-base cutoff current $V_{CB} = 10 \text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 2 \text{ V}, I_C = 0$	I_{EBO}	-	-	10	μA
DC current gain $I_C = 15 \text{ mA}, V_{CE} = 8 \text{ V}$	h_{FE}	50	120	200	-

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency $I_C = 15 \text{ mA}, V_{CE} = 8 \text{ V}, f = 500 \text{ MHz}$	f_T	4.5	5.8	-	GHz
Collector-base capacitance $V_{CB} = 10 \text{ V}, f = 1 \text{ MHz}$	C_{cb}	-	0.39	0.6	pF
Collector-emitter capacitance $V_{CE} = 10 \text{ V}, f = 1 \text{ MHz}$	C_{ce}	-	0.19	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}, f = 1 \text{ MHz}$	C_{eb}	-	0.9	-	
Noise figure $I_C = 5 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_{Sopt}$ $f = 900 \text{ MHz}$ $f = 1.8 \text{ GHz}$	F	-	1.45 2.2	-	dB
Power gain ²⁾ $I_C = 15 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_{Sopt}$ $Z_L = Z_{Lopt}$ $f = 900 \text{ MHz}$ $f = 1.8 \text{ GHz}$	G_{ma}	-	16 10.5	-	
Transducer gain $I_C = 15 \text{ mA}, V_{CE} = 8 \text{ V}, Z_S = Z_L = 50 \Omega$ $f = 900 \text{ MHz}$ $f = 1.8 \text{ GHz}$	$ S_{21e} ^2$	-	13 7.5	-	

2) $G_{ma} = |S_{21}/S_{12}| (k - (k^2 - 1)^{1/2})$

SPICE Parameters (Gummel-Poon Model, Berkeley-SPICE 2G.6 Syntax) :

Transistor Chip Data

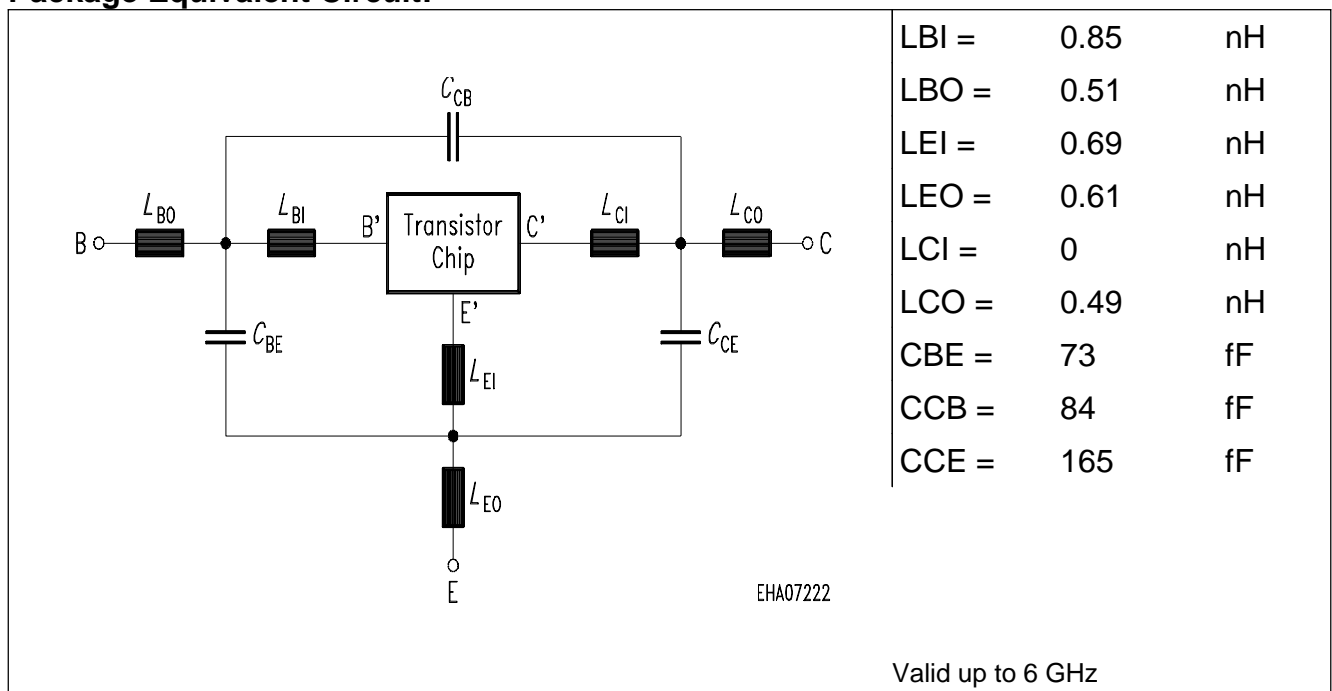
IS =	17.03	fA	BF =	110	-	NF =	0.80846	-
VAF =	35	V	IKF =	0.22241	A	ISE =	5.8728	fA
NE =	1.0668	-	BR =	25.974	-	NR =	0.36321	-
VAR =	2.3785	V	IKR =	0.011566	A	ISC =	169.77	fA
NC =	1.2237	-	RB =	5.7058	Ω	IRB =	0.11894	mA
RBM =	1.5489	Ω	RE =	1.1731	Ω	RC =	0.3715	Ω
CJE =	33.977	fF	VJE =	0.4318	V	MJE =	1.7707	-
TF =	21.842	ps	XTF =	0.26781	-	VTF =	0.48042	V
ITF =	14.701	mA	PTF =	0	deg	CJC =	693.81	fF
VJC =	0.26339	V	MJC =	0.24448	-	XCJC =	0.1254	-
TR =	1.2554	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.74346	-	TNOM	300	K

All parameters are ready to use, no scaling is necessary.

Extracted on behalf of SIEMENS Small Signal Semiconductors by:
Institut für Mobil- und Satellitenfunktechnik (IMST)

© 1996 SIEMENS AG

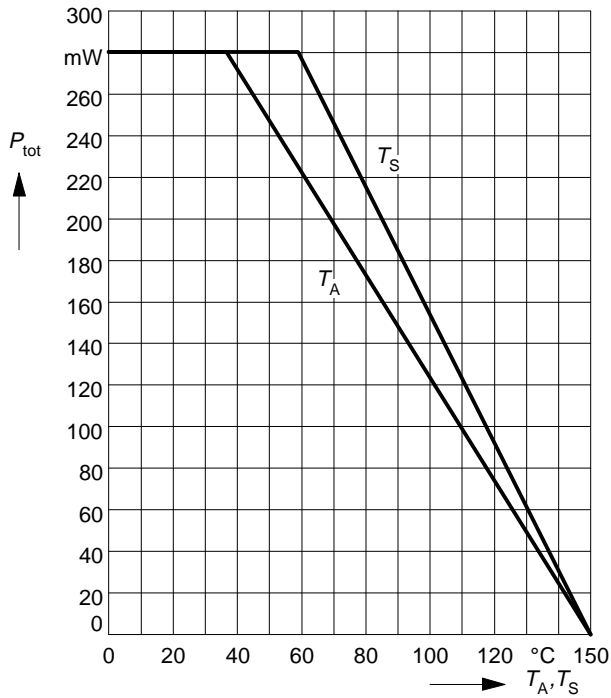
Package Equivalent Circuit:



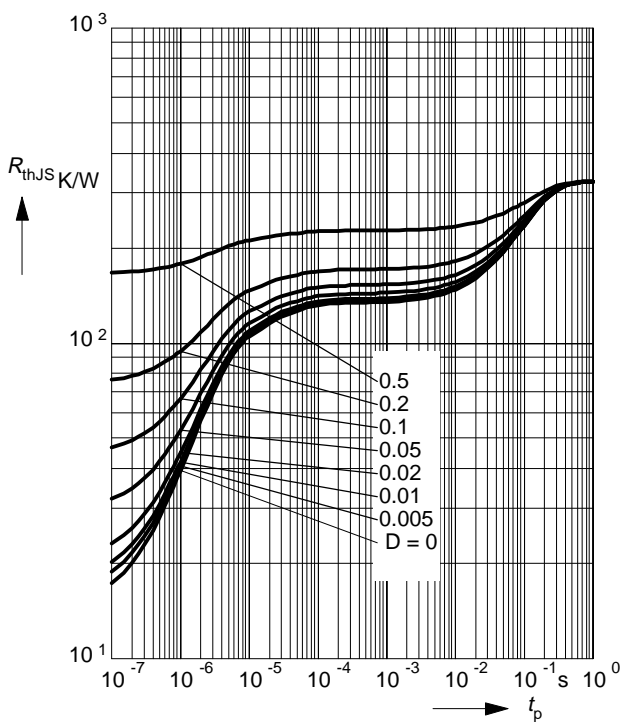
For examples and ready to use parameters please contact your local Siemens distributor or sales office to obtain a Siemens CD-ROM or see Internet: <http://www.siemens.de/Semiconductor/products/35/35.htm>

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

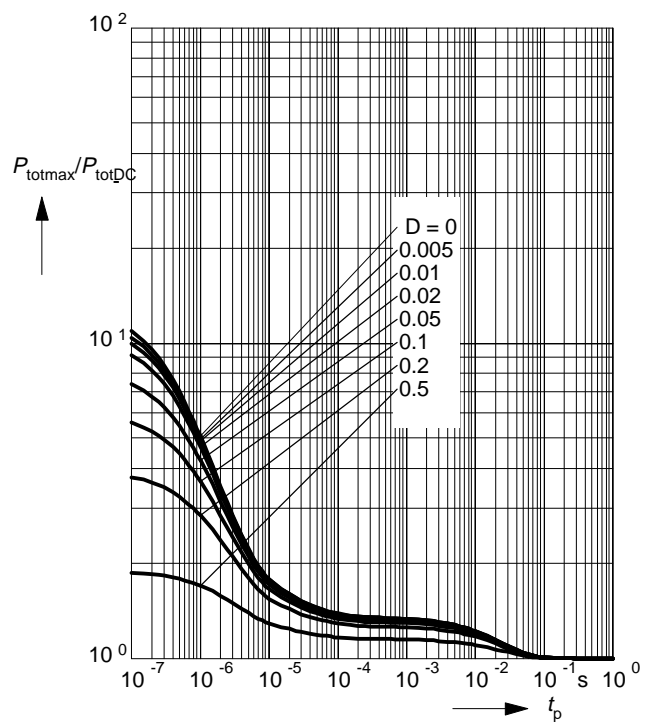
* Package mounted on epoxy



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

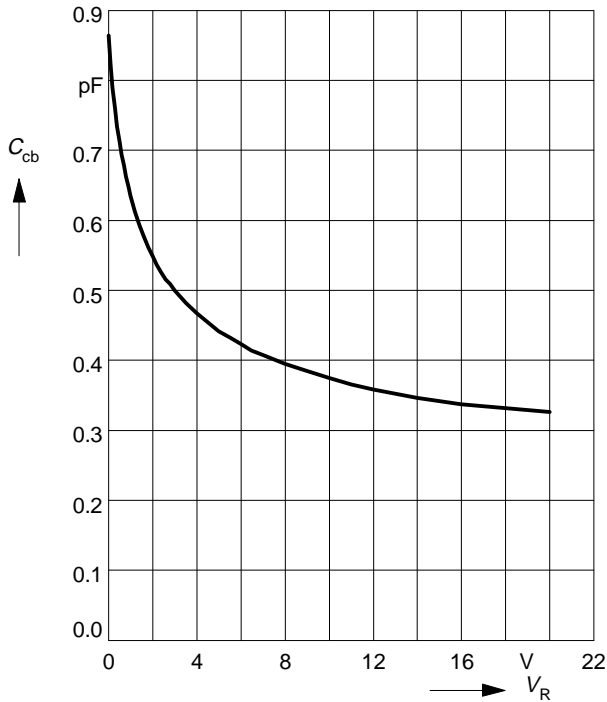


Permissible Pulse Load $P_{totmax}/P_{totDC} = f(t_p)$



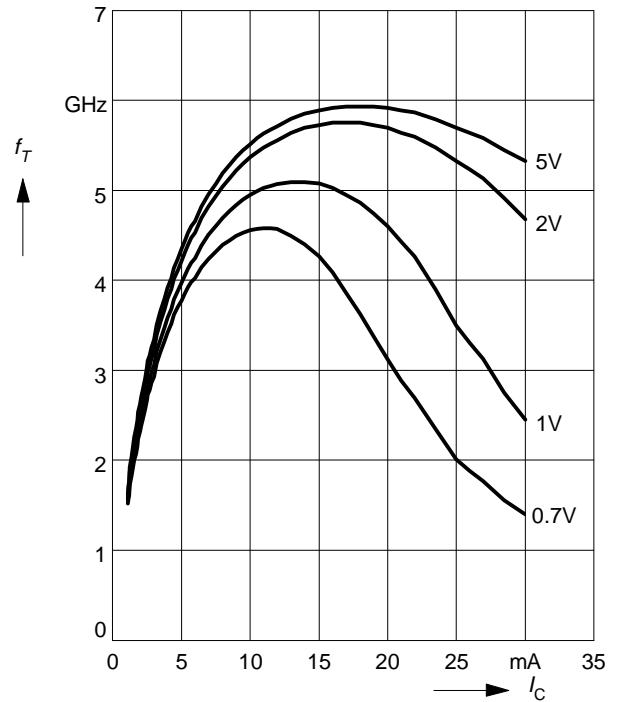
Collector-base capacitance $C_{cb} = f(V_{CB})$

$V_{BE} = v_{be} = 0, f = 1\text{MHz}$



Transition frequency $f_T = f(I_C)$

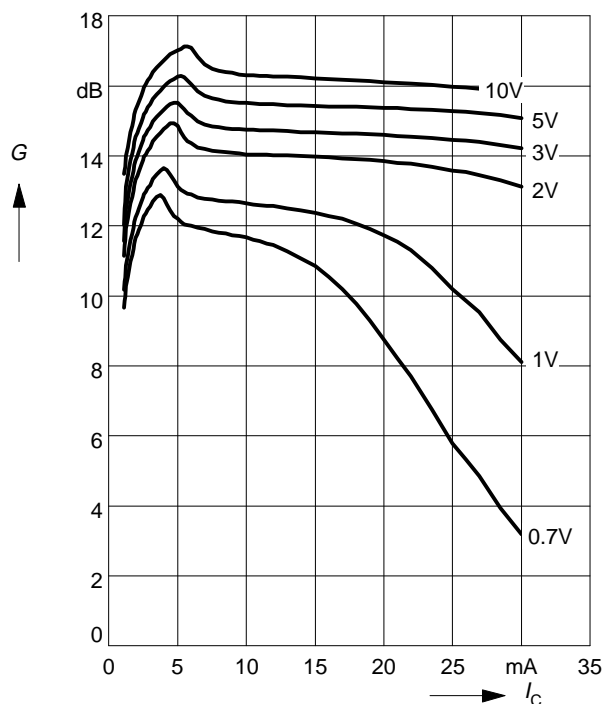
$V_{CE} = \text{Parameter}$



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

$f = 0.9\text{GHz}$

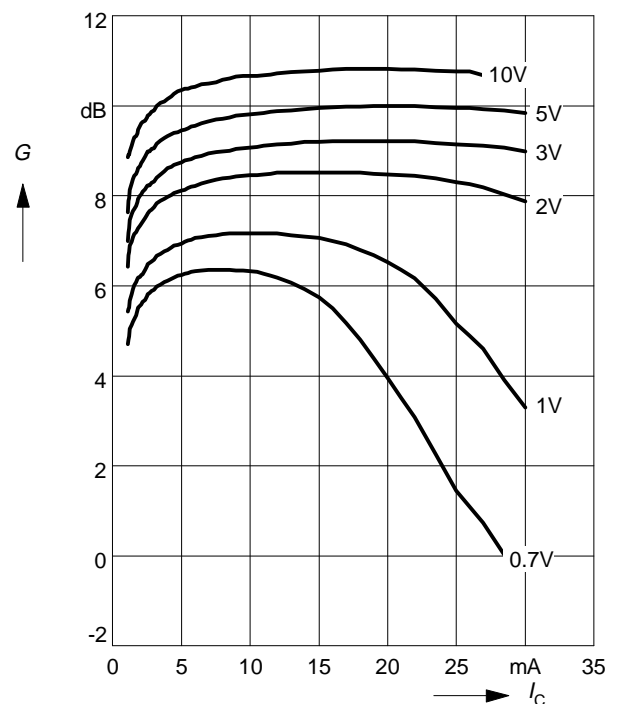
$V_{CE} = \text{Parameter}$



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

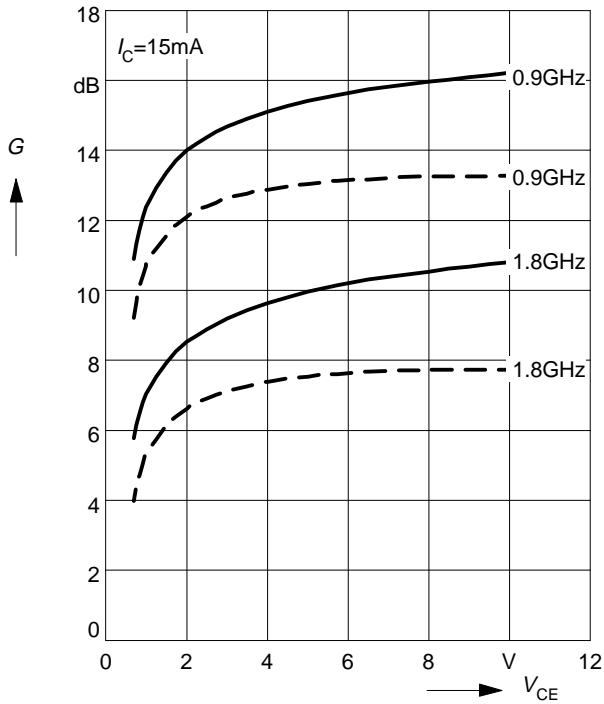
$f = 1.8\text{GHz}$

$V_{CE} = \text{Parameter}$



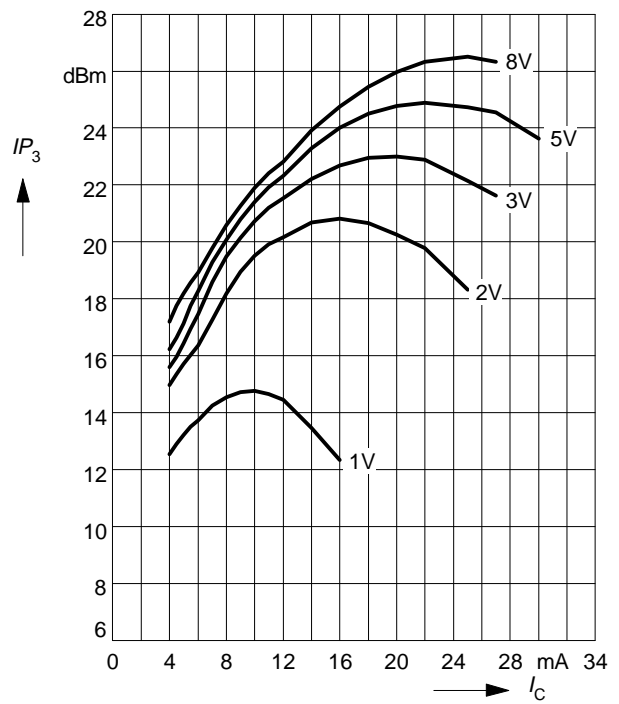
Power Gain $G_{ma}, G_{ms} = f(V_{CE})$: _____
 $|S_{21}|^2 = f(V_{CE})$: - - - - -

$f =$ Parameter



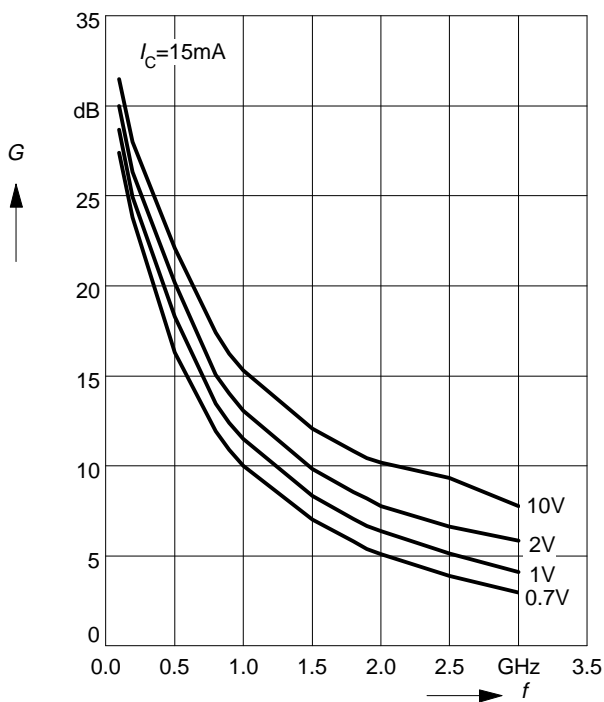
Intermodulation Intercept Point $IP_3 = f(I_C)$
 (3rd order, Output, $Z_S = Z_L = 50\Omega$)

$V_{CE} =$ Parameter, $f = 900\text{MHz}$



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

$V_{CE} =$ Parameter



Power Gain $|S_{21}|^2 = f(f)$

$V_{CE} =$ Parameter

