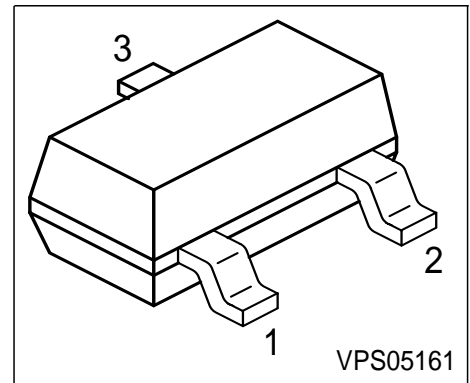


**NPN Silicon RF Transistor**

- For low-power amplifiers in mobile communication systems (pager) at collector currents from 0.2 mA to 2.5 mA
- $f_T = 7$  GHz  
 $F = 2.1$  dB at 900 MHz



**ESD:** Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration			Package
BFR180	RDs	1 = B	2 = E	3 = C	SOT23

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	8	V
Collector-emitter voltage	$V_{CES}$	10	
Collector-base voltage	$V_{CBO}$	10	
Emitter-base voltage	$V_{EBO}$	2	
Collector current	$I_C$	4	mA
Base current	$I_B$	0.5	
Total power dissipation, $T_S \leq 127$ °C <sup>1)</sup>	$P_{tot}$	30	mW
Junction temperature	$T_j$	150	°C
Ambient temperature	$T_A$	-65 ... 150	
Storage temperature	$T_{stg}$	-65 ... 150	

**Thermal Resistance**

Junction - soldering point <sup>2)</sup>	$R_{thJS}$	$\leq 780$	K/W
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<sup>1</sup>  $T_S$  is measured on the collector lead at the soldering point to the pcb

<sup>2</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC characteristics</b>					
Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	8	-	-	V
Collector-emitter cutoff current $V_{CE} = 10\text{ V}, V_{BE} = 0$	$I_{CES}$	-	-	100	$\mu\text{A}$
Collector-base cutoff current $V_{CB} = 8\text{ V}, I_E = 0$	$I_{CBO}$	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1\text{ V}, I_C = 0$	$I_{EBO}$	-	-	1	$\mu\text{A}$
DC current gain $I_C = 1\text{ mA}, V_{CE} = 5\text{ V}$	$h_{FE}$	30	100	200	-

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC characteristics</b> (verified by random sampling)					
Transition frequency $I_C = 3 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $f = 500 \text{ MHz}$	$f_T$	5	7	-	GHz
Collector-base capacitance $V_{CB} = 5 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{cb}$	-	0.25	0.4	pF
Collector-emitter capacitance $V_{CE} = 5 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{ce}$	-	0.18	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{eb}$	-	0.1	-	
Noise figure $I_C = 1 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 900 \text{ MHz}$ $f = 1.8 \text{ GHz}$	$F$	-	2.1 2.25	-	dB
Power gain, maximum stable <sup>1)</sup> $I_C = 1 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 900 \text{ MHz}$ $f = 1.8 \text{ GHz}$	$G_{ms}$	-	13.5 10.5	-	
Transducer gain $I_C = 1 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $Z_S = Z_L = 50\Omega$ , $f = 900 \text{ MHz}$ $f = 1.8 \text{ GHz}$	$ S_{21e} ^2$	-	8 5.5	-	

$$^1G_{ms} = |S_{21} / S_{12}|$$

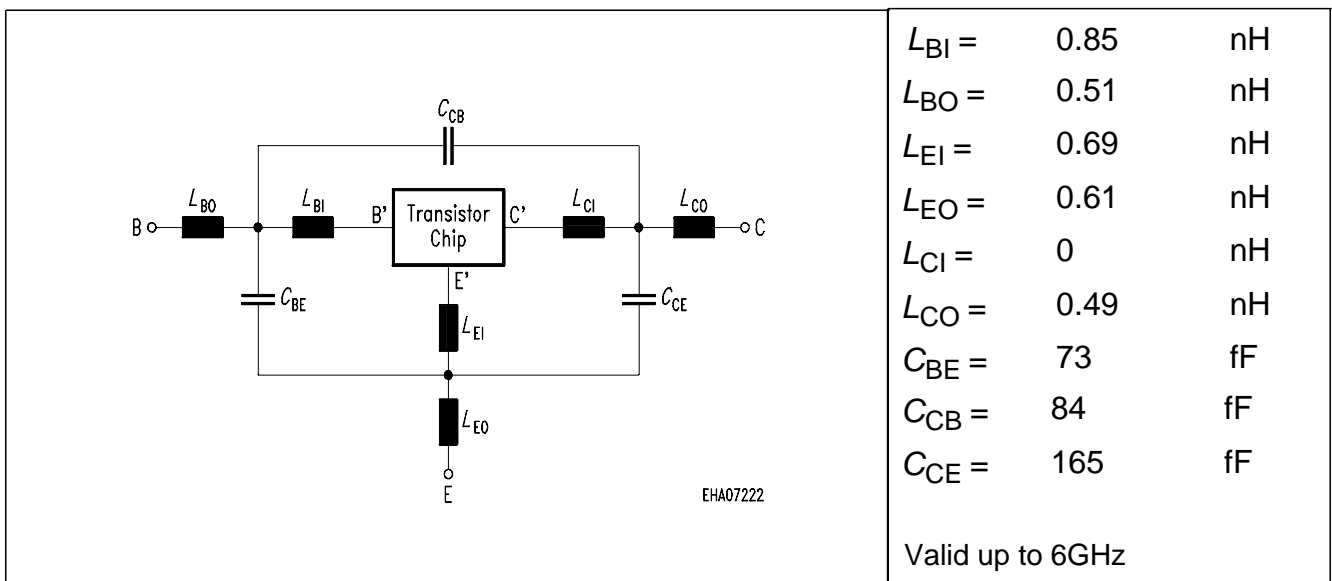
**SPICE Parameters (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax) :**

**Transistor Chip Data**

IS =	0.18519	fA	BF =	94.687	-	NF =	1.0236	-
VAF =	26.867	V	IKF =	0.025252	A	ISE =	130.93	fA
NE =	1.9818	-	BR =	20.325	-	NR =	0.93013	-
VAR =	3.2134	V	IKR =	0.012138	A	ISC =	6.1852	fA
NC =	1.6195	-	RB =	1.4255	$\Omega$	IRB =	0.01	mA
RBM =	60	$\Omega$	RE =	3.7045		RC =	0.56	$\Omega$
CJE =	3.2473	fF	VJE =	1.1812	V	MJE =	0.41827	-
TF =	14.866	ps	XTF =	0.3062	-	VTF =	0.22023	V
ITF =	1.0202	mA	PTF =	0	deg	CJC =	183.69	fF
VJC =	1.1812	V	MJC =	0.30423	-	XCJC =	0.08334	-
TR =	2.2648	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.87906	-	TNOM	300	K

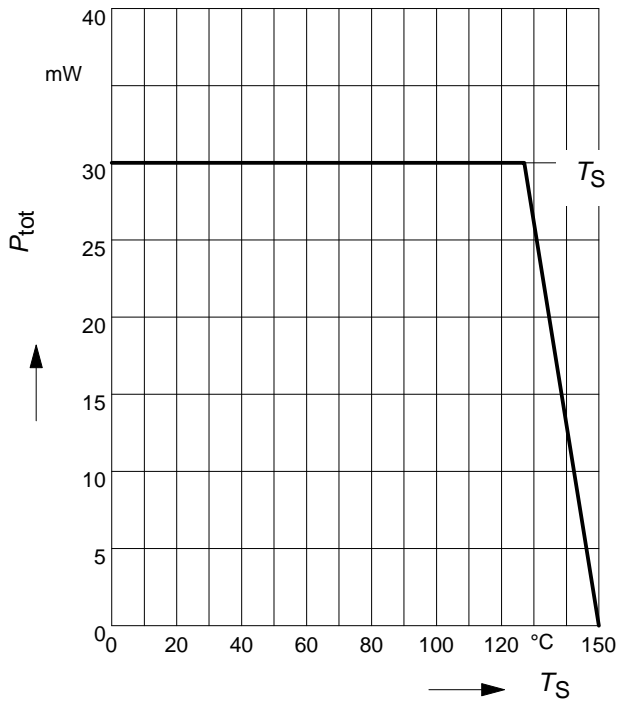
All parameters are ready to use, no scaling is necessary.  
 Extracted on behalf of Infineon Technologies AG by:  
 Institut für Mobil-und Satellitentechnik (IMST)

**Package Equivalent Circuit:**

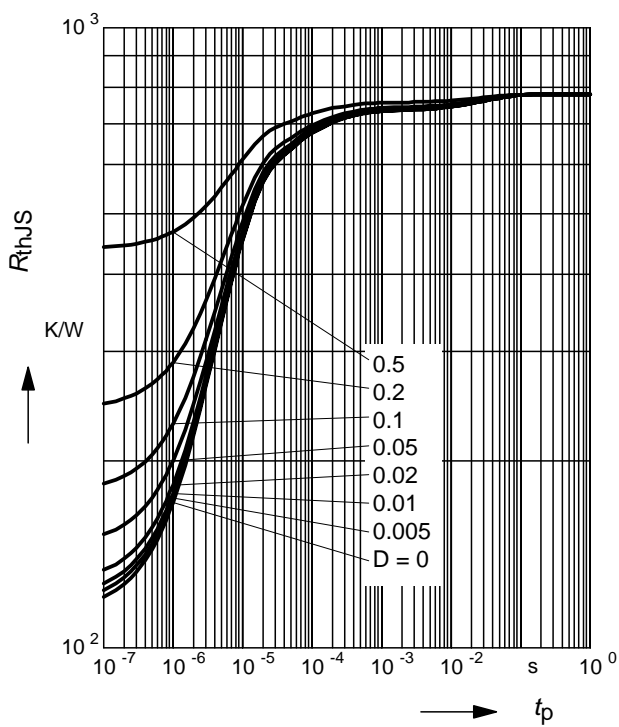


For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet: <http://www.infineon.com/products/discrete/index.htm>

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

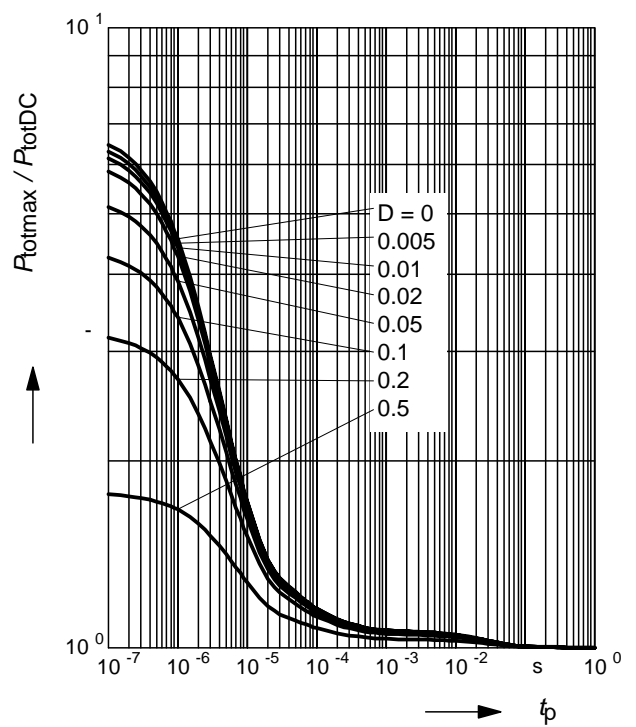


**Permissible Pulse Load  $R_{thJS} = f(t_p)$**



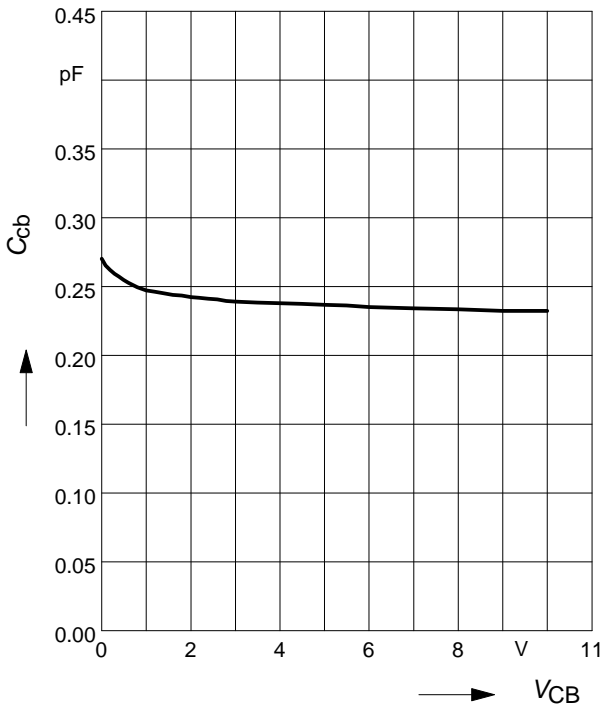
**Permissible Pulse Load**

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



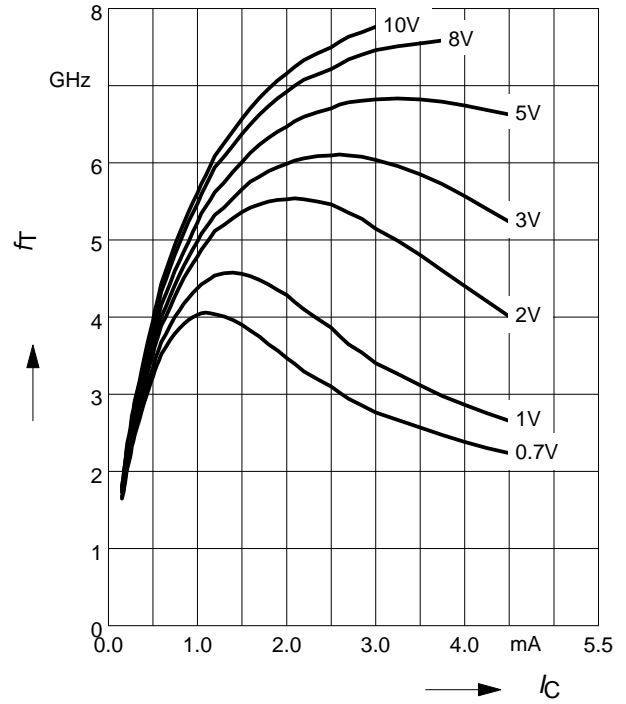
**Collector-base capacitance  $C_{cb} = f(V_{CB})$**

$f = 1\text{MHz}$



**Transition frequency  $f_T = f(I_C)$**

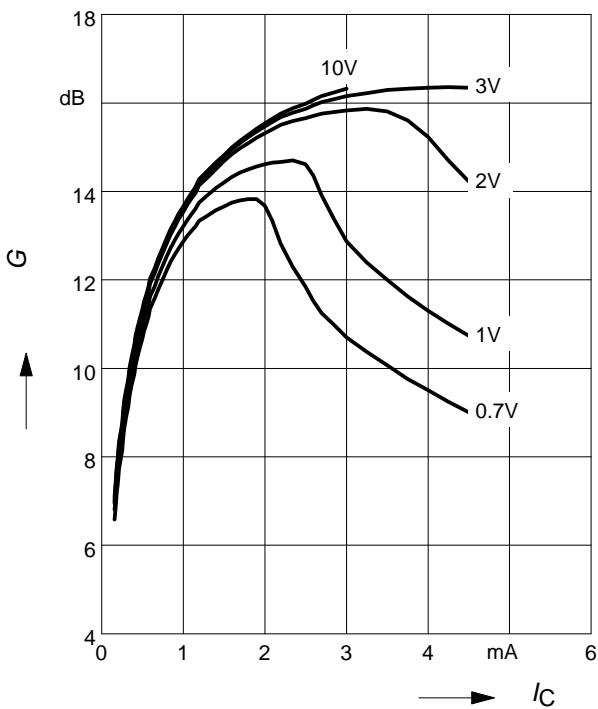
$V_{CE} = \text{Parameter}$



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

$f = 0.9\text{GHz}$

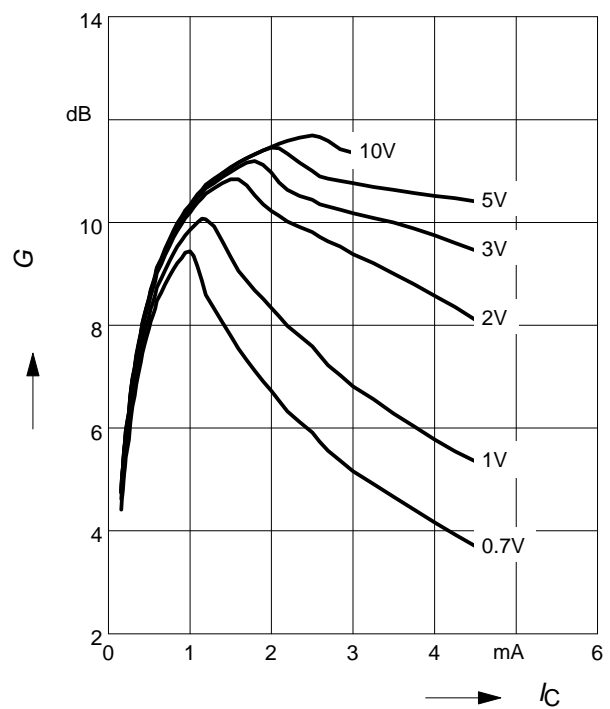
$V_{CE} = \text{Parameter}$



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

$f = 1.8\text{GHz}$

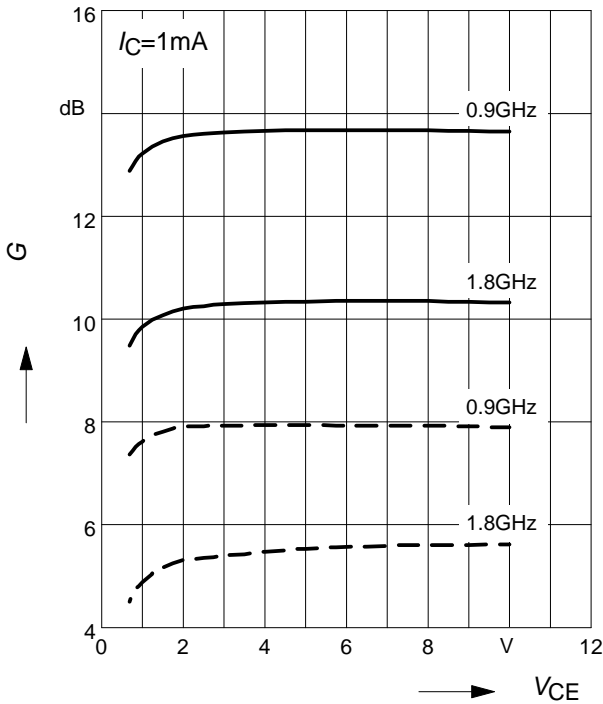
$V_{CE} = \text{Parameter}$



**Power Gain**  $G_{ma}, G_{ms} = f(V_{CE})$ : \_\_\_\_\_

$|S_{21}|^2 = f(V_{CE})$ : -----

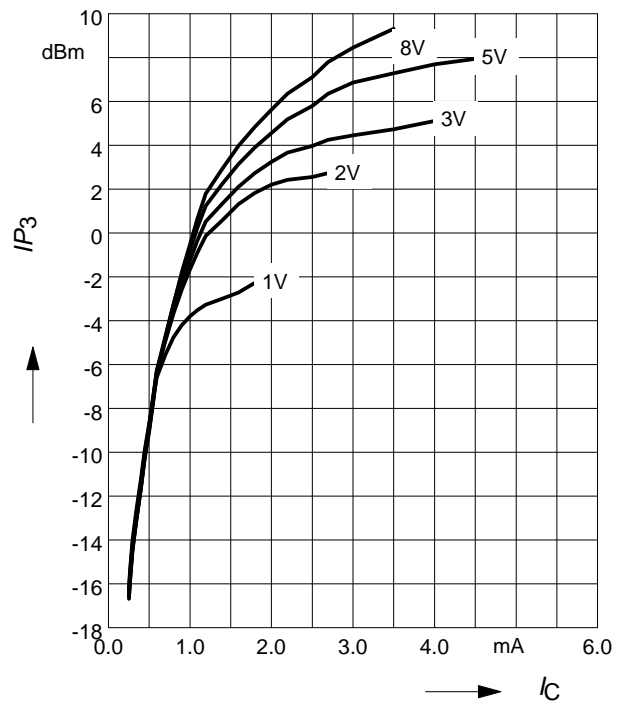
$f$  = Parameter



**Intermodulation Intercept Point**  $IP_3 = f(I_C)$

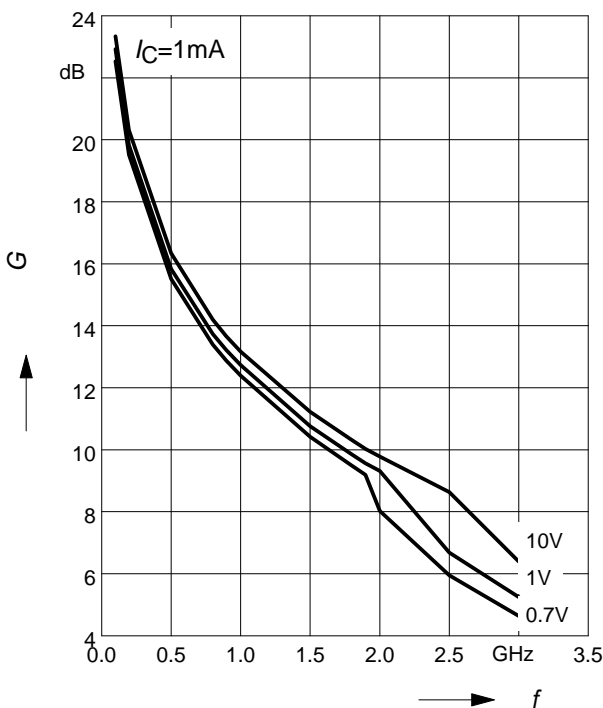
(3rd order, Output,  $Z_S = Z_L = 50\Omega$ )

$V_{CE}$  = 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

