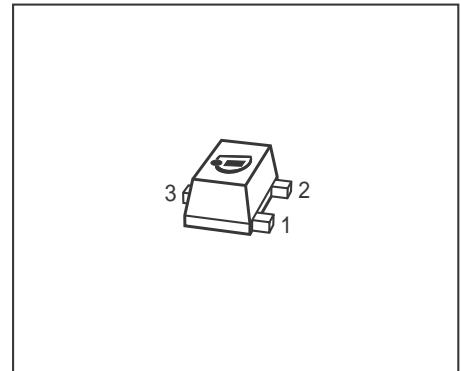


**NPN Silicon RF Transistor**

- High linearity low noise driver amplifier
- Output compression point 19.5 dBm @ 1.8 GHz
- Ideal for oscillators up to 3.5 GHz
- Low noise figure 1.1 dB at 1.8 GHz
- Collector design supports 5V supply voltage
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



**ESD (Electrostatic discharge) sensitive device, observe handling precaution!**

Type	Marking	Pin Configuration			Package
BFR380F	FCs	1 = B	2 = E	3 = C	TSFP-3

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	6	V
Collector-emitter voltage	$V_{CES}$	15	
Collector-base voltage	$V_{CBO}$	15	
Emitter-base voltage	$V_{EBO}$	2	
Collector current	$I_C$	80	mA
Base current	$I_B$	14	
Total power dissipation <sup>1)</sup> $T_S \leq 95^\circ\text{C}$	$P_{tot}$	380	mW
Junction temperature	$T_J$	150	°C
Ambient temperature	$T_A$	-65 ... 150	
Storage temperature	$T_{Stg}$	-65 ... 150	

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>2)</sup>	$R_{thJS}$	$\leq 145$	K/W

<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 AN077 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 $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	6	9	-	V
Collector-emitter cutoff current $V_{CE} = 5 \text{ V}, V_{BE} = 0$ $V_{CE} = 15 \text{ V}, V_{BE} = 0$	$I_{CES}$	-	1	30	nA
		-	-	1000	
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	$I_{CBO}$	-	-	30	
Emitter-base cutoff current $V_{EB} = 1 \text{ V}, I_C = 0$	$I_{EBO}$	-	1	500	
DC current gain $I_C = 40 \text{ mA}, V_{CE} = 3 \text{ V}, \text{ pulse measured}$	$h_{FE}$	90	120	160	-

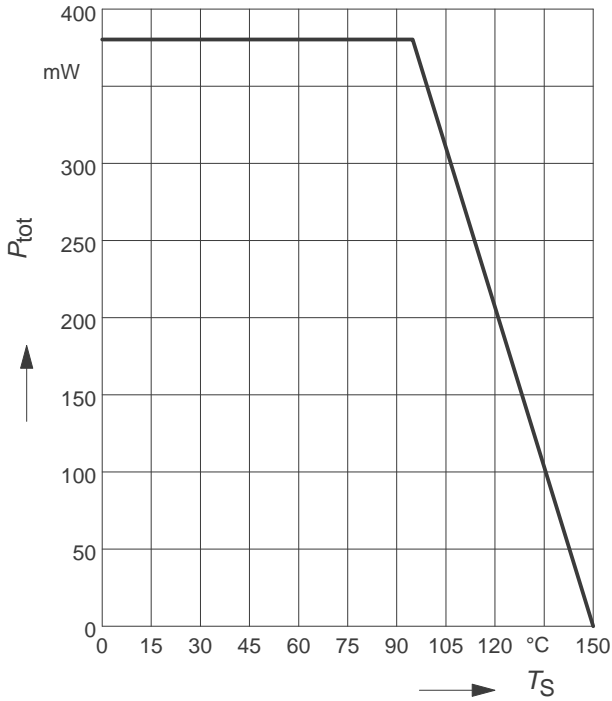
**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b> (verified by random sampling)					
Transition frequency $I_C = 40\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $f = 1\text{ GHz}$	$f_T$	11	14	-	GHz
Collector-base capacitance $V_{CB} = 5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , emitter grounded	$C_{cb}$	-	0.5	0.7	pF
Collector emitter capacitance $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , base grounded	$C_{ce}$	-	0.2	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ , collector grounded	$C_{eb}$	-	1	-	
Minimum noise figure $I_C = 8\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1.8\text{ GHz}$ $I_C = 8\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 3\text{ GHz}$	$NF_{min}$	-	1.1 1.6	-	dB
Power gain, maximum available <sup>1)</sup> $I_C = 40\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$ $I_C = 40\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 3\text{ GHz}$	$G_{ma}$	-	13.5 9.5	-	
Transducer gain $I_C = 40\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ , $f = 1.8\text{ GHz}$ $f = 3\text{ GHz}$	$ S_{21e} ^2$	-	11 7	-	dB
Third order intercept point at output <sup>2)</sup> $V_{CE} = 3\text{ V}$ , $I_C = 40\text{ mA}$ , $Z_S = Z_L = 50\Omega$ , $f = 1.8\text{ GHz}$	$IP_3$	-	29	-	dBm
1dB compression point at output $I_C = 40\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $f = 1.8\text{ GHz}$ $Z_S = Z_L = 50\Omega$ $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$	$P_{-1dB}$	-	17 19.5	-	

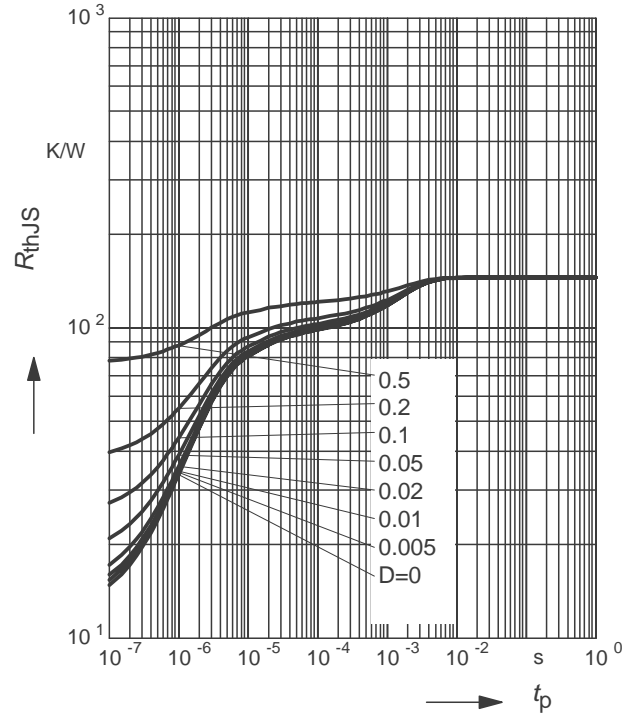
$$^1G_{ma} = |S_{21e} / S_{12e}| (k - (k^2 - 1)^{1/2})$$

<sup>2)</sup>IP3 value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is  $50\Omega$  from 0.1 MHz to 6 GHz

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

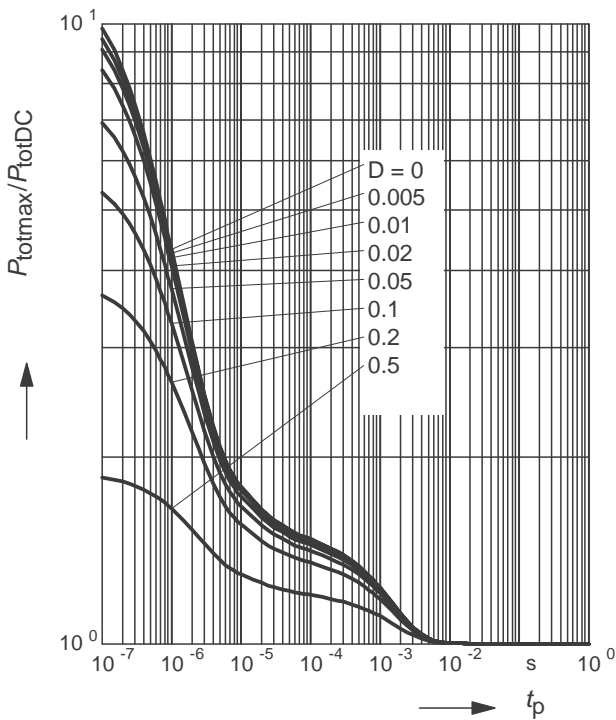


Permissible Pulse Load  $R_{thJS} = f(t_p)$



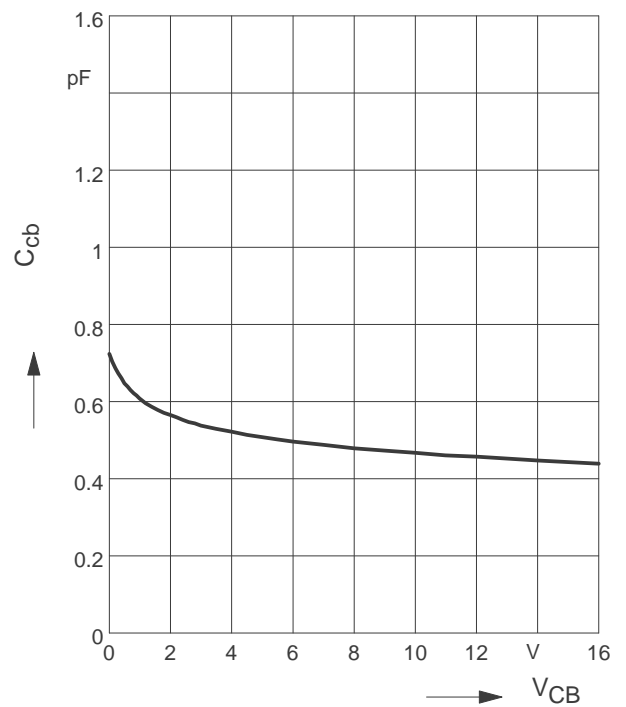
Permissible Pulse Load

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



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

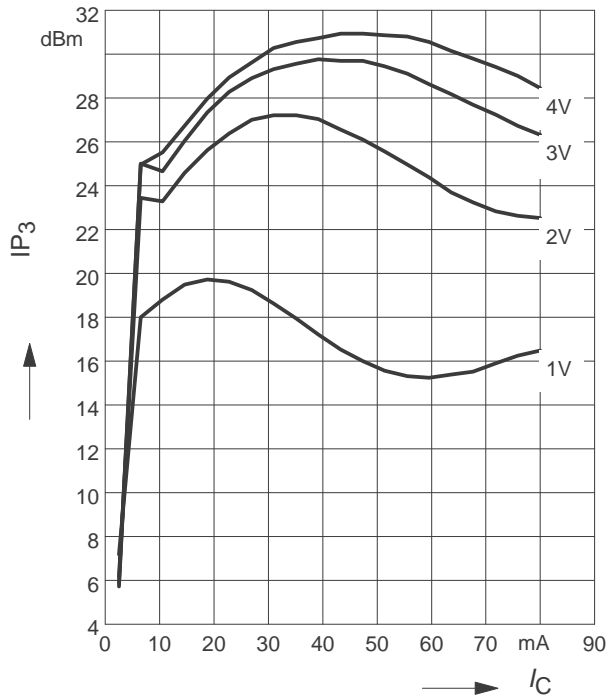
$$f = 1\text{MHz}$$



**Third order Intercept Point  $IP_3 = f(I_C)$**

(Output,  $Z_S = Z_L = 50\Omega$ )

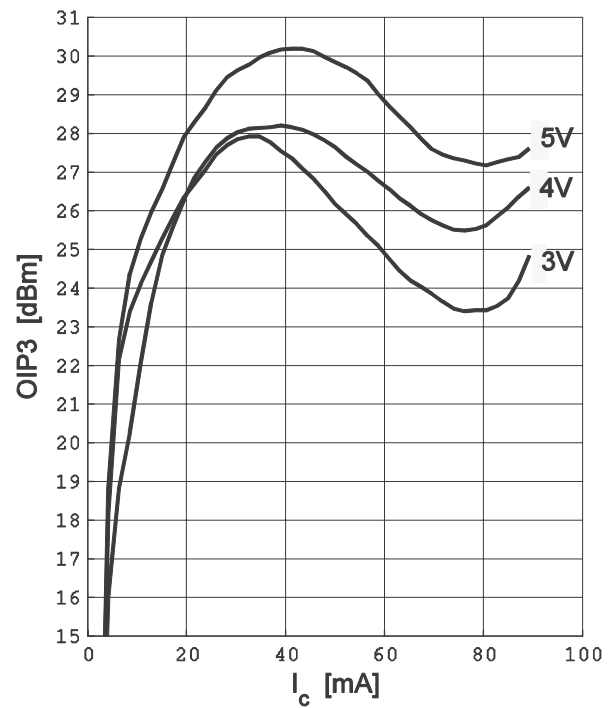
$V_{CE}$  = parameter,  $f = 1.8\text{GHz}$



**Third order Intercept Point  $IP_3 = f(I_C)$**

(Output,  $Z_S = Z_L = 50\Omega$ )

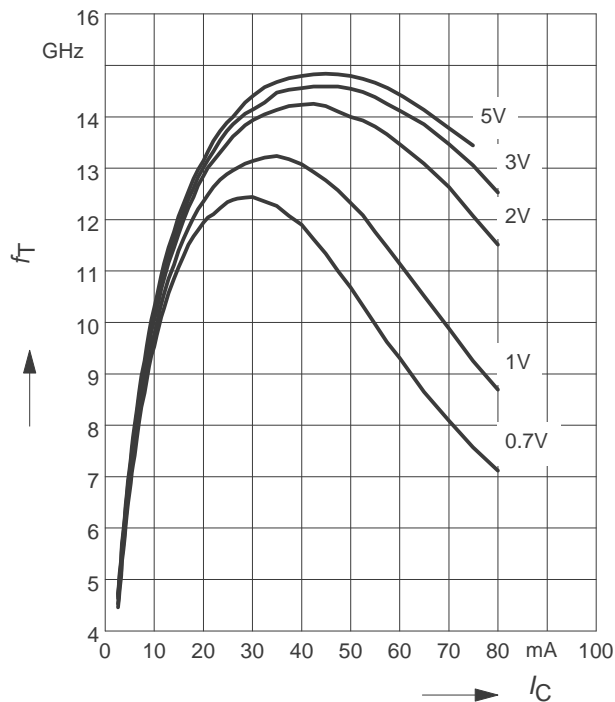
$V_{CE}$  = parameter,  $f = 900\text{MHz}$



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

$f = 1\text{GHz}$

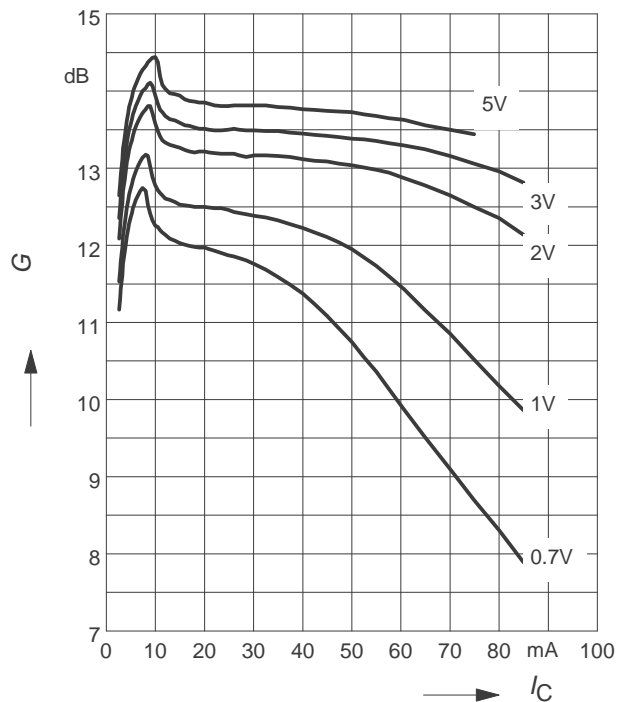
$V_{CE}$  = parameter



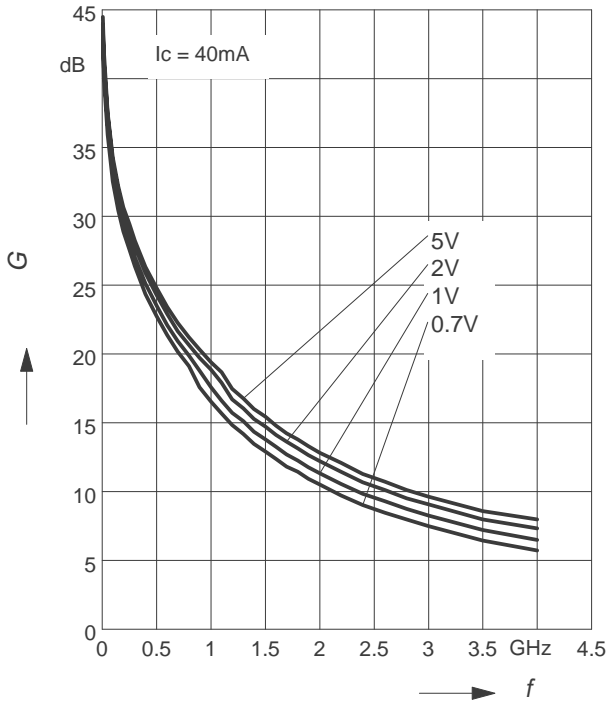
**Power gain  $G_{ma}, G_{ms} = f(I_C)$**

$f = 1.8\text{GHz}$

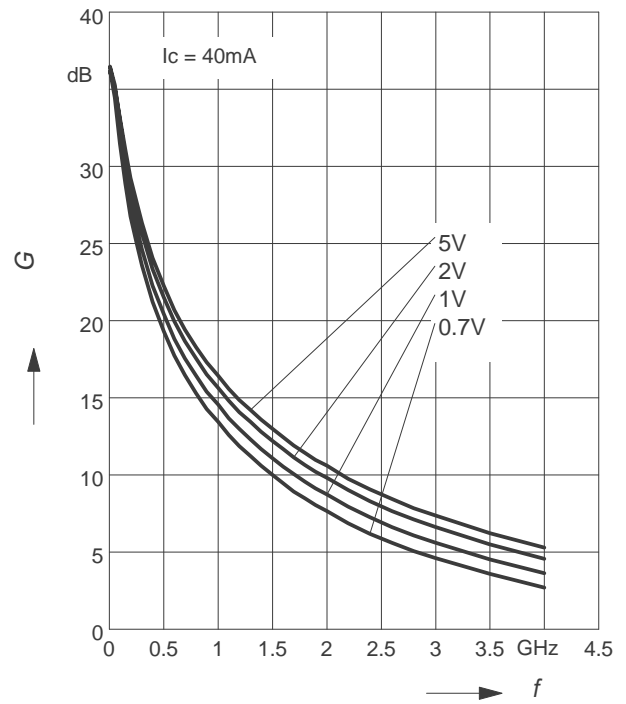
$V_{CE}$  = parameter



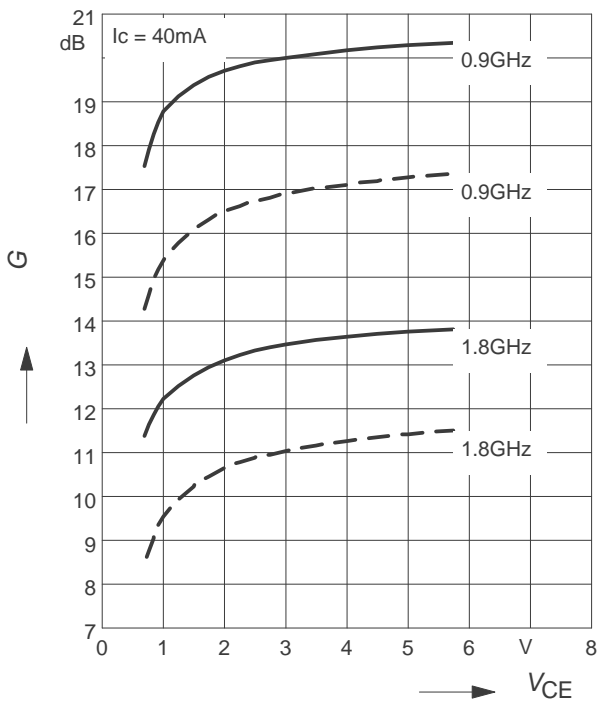
**Power Gain  $G_{ma}, G_{ms} = f(f)$**   
 $V_{CE} = \text{parameter}$



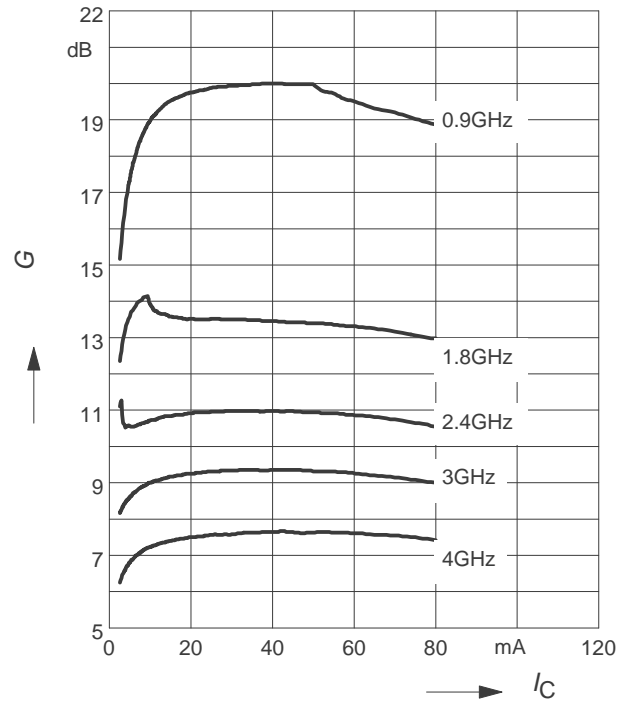
**Power Gain  $|S_{21}|^2 = f(f)$**   
 $V_{CE} = \text{parameter}$



**Power Gain  $G_{ma}, G_{ms} = f(V_{CE})$ : —**  
 $|S_{21}|^2 = f(V_{CE})$ : - - - -  
 $f = \text{parameter}$

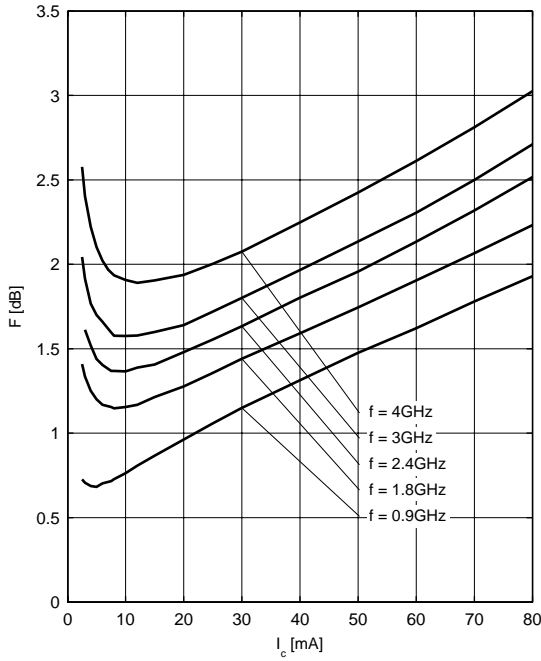


**Power gain  $G_{ma}, G_{ms} = f(I_C)$**   
 $V_{CE} = 3V$   
 $f = \text{parameter}$



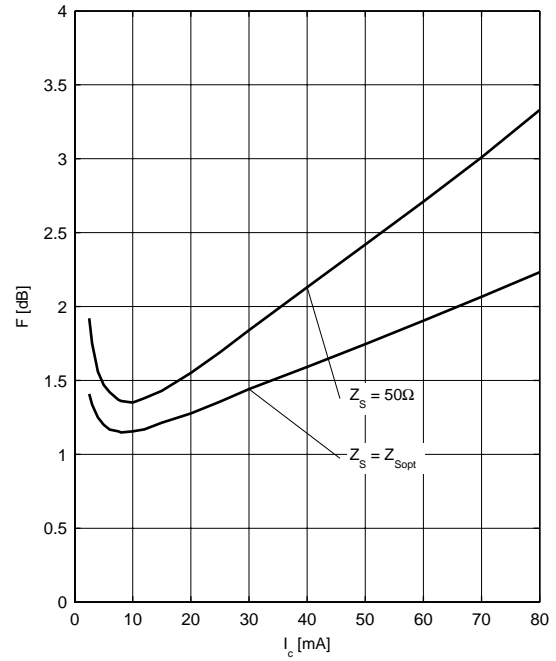
Minimum noise figure  $NF_{min} = f(I_C)$

$V_{CE} = 3V, Z_S = Z_{Sopt}$



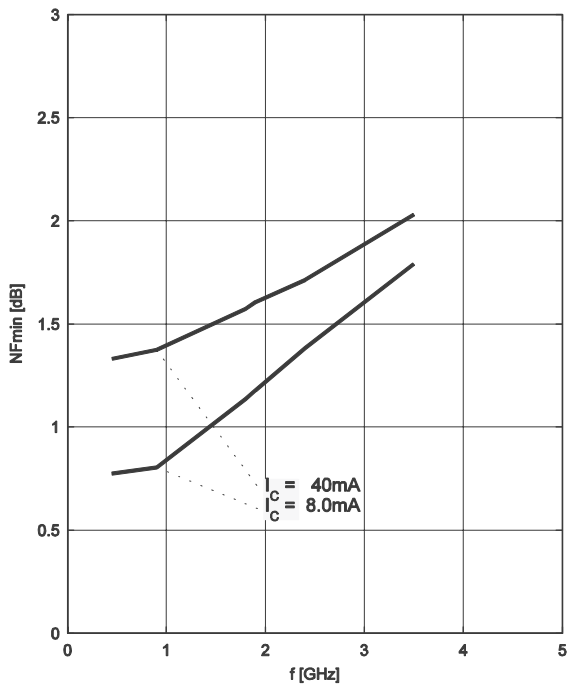
Noise figure  $F = f(I_C)$

$V_{CE} = 3V, f = 1.8\text{ GHz}$



Minimum noise figure  $NF_{min} = f(f)$

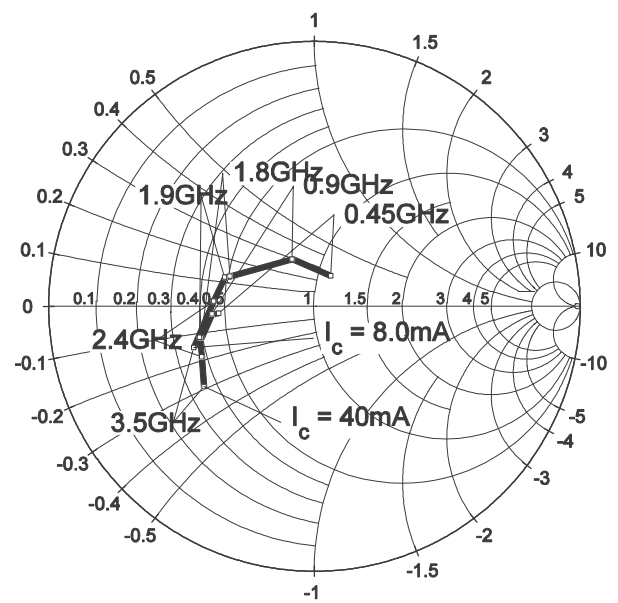
$V_{CE} = 3V, Z_S = Z_{Sopt}$



Source impedance for min.

noise figure vs. frequency

$V_{CE} = 3\text{ V}, I_C = 8.0\text{mA}/40.0\text{mA}$



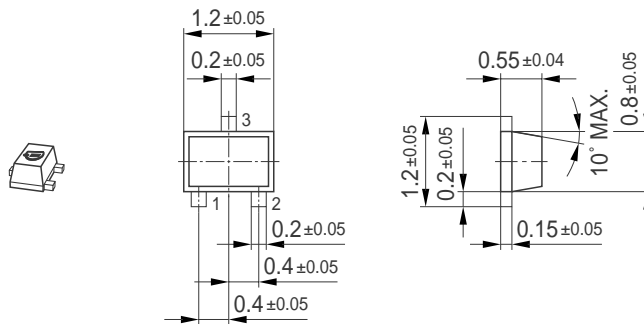
**SPICE GP (Gummel-Poon)**

For the SPICE Gummel Poon (GP) model as well as for the S-parameters (including noise parameters) please refer to our internet website [www.infineon.com/rf.models](http://www.infineon.com/rf.models).

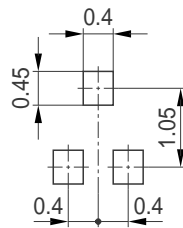
Please consult our website and download the latest versions before actually starting your design. You find the BFR380F SPICE GP model in the internet in MWO- and ADS-format, which you can import into these circuit simulation tools very quickly and conveniently. The model already contains the package parasitics and is ready to use for DC and high frequency simulations. The terminals of the model circuit correspond to the pin configuration of the device. The model parameters have been extracted and verified up to 10 GHz using typical devices. The BFR380F SPICE GP model reflects the typical DC- and RF-performance within the limitations which are given by the SPICE GP model itself. Besides the DC characteristics all S-parameters in magnitude and phase, as well as noise figure (including optimum source impedance, equivalent noise resistance and flicker noise) and intermodulation have been extracted.



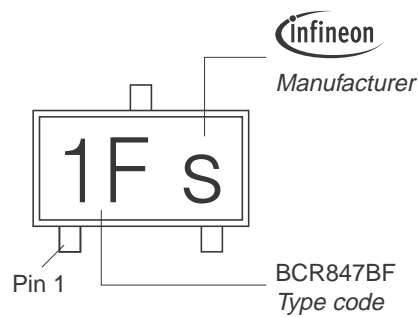
Package Outline



Foot Print

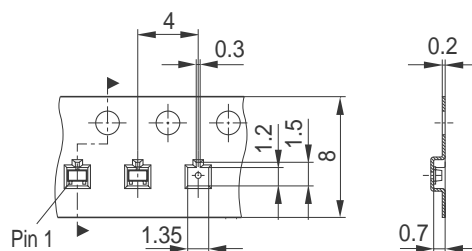


Marking Layout (Example)



Standard Packing

Reel  $\varnothing 180 \text{ mm} = 3.000 \text{ Pieces/Reel}$   
 Reel  $\varnothing 330 \text{ mm} = 10.000 \text{ Pieces/Reel}$



**Datasheet Revision History: 13 September 2010**

This datasheet replaces the revision from 20 May 2010. The product itself has not been changed and the device characteristics remain unchanged. Only the product description and information available in the datasheet has been expanded and updated.

<b>Previous Revision: 20 May 2010</b>	
<b>Page</b>	<b>Subject (changes since last revision)</b>
5	@ 900 MHz OIP3 curve added
8	SPICE model parameters removed from the datasheet, respective link to the internet site added

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- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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