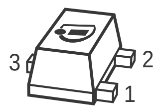
NPN Silicon RF Transistor



- 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

AEC Qualified RoHS

ESD (**E**lectro**s**tatic **d**ischarge) 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[1)] $T_S \leq 95°C$	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[2)]	R_{thJS}	$\leq$ 145	K/W

[1] T_S is measured on the collector lead at the soldering point to the pcb

[2] For calculation of R_{thJA} please refer to Application Note AN077 Thermal Resistance

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

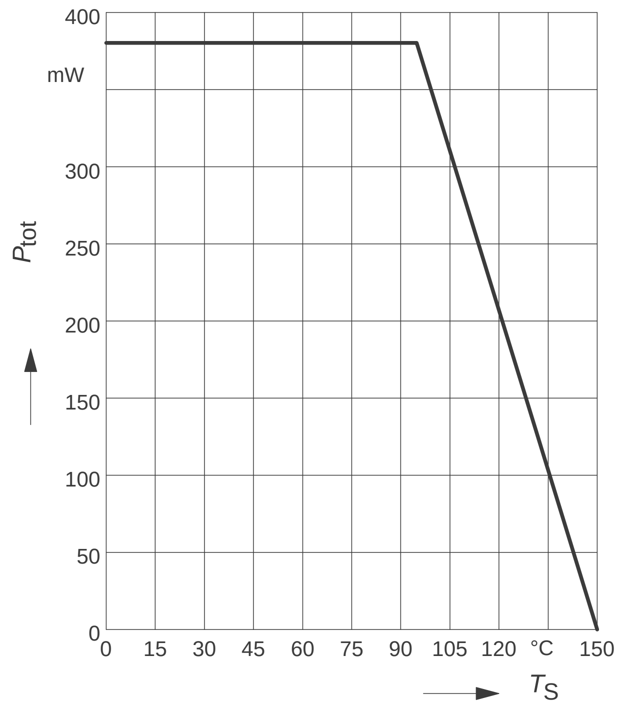
Electrical Characteristics at T_A = 25°C, unless otherwise specified

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

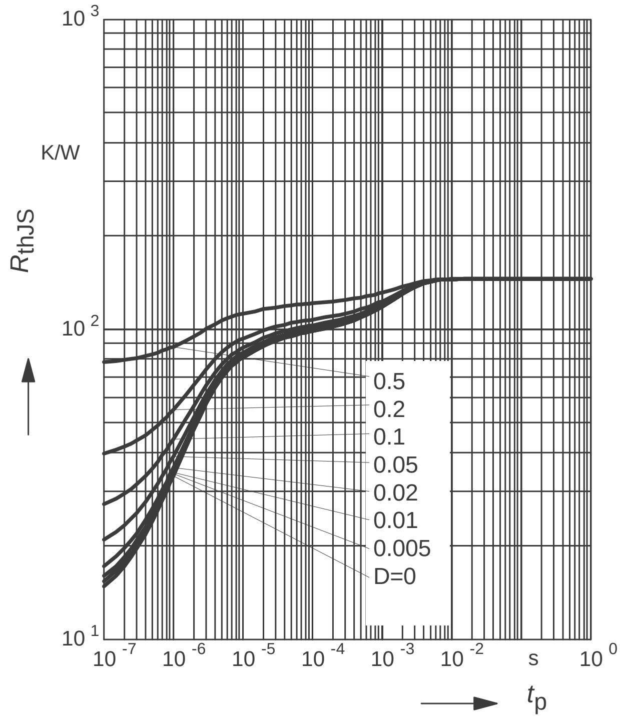
[1] $G_{ma} = |S_{21e} / S_{12e}| (k-(k^2-1)^{1/2})$

[2] IP3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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

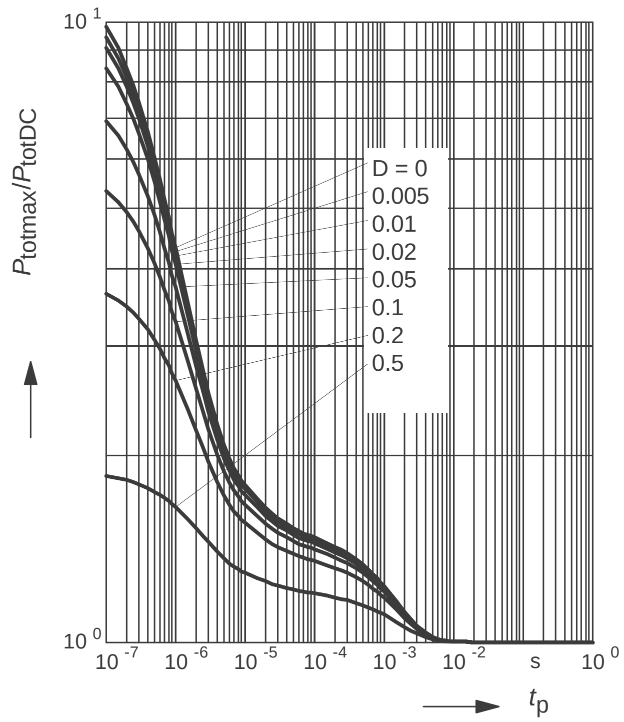


Permissible Pulse Load $R_{thJS} = f(t_p)$



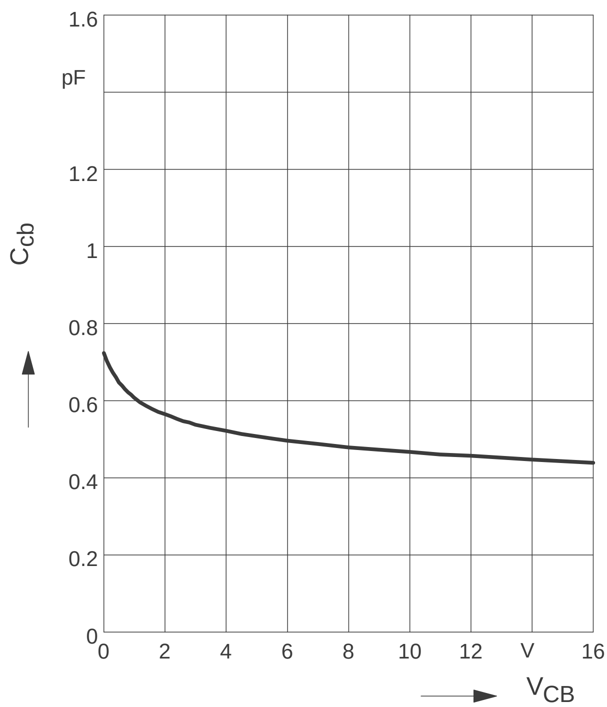
Permissible Pulse Load

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



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

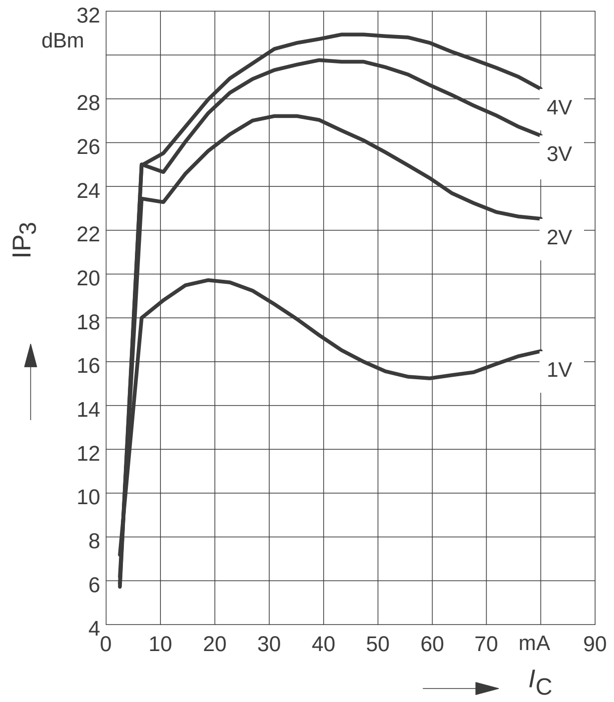
f = 1MHz



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

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

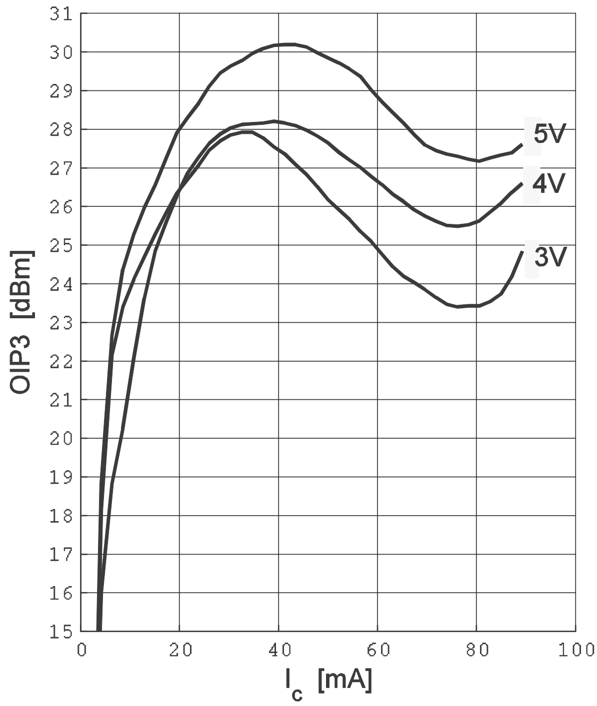
V_{CE} = parameter, f = 1.8GHz



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

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

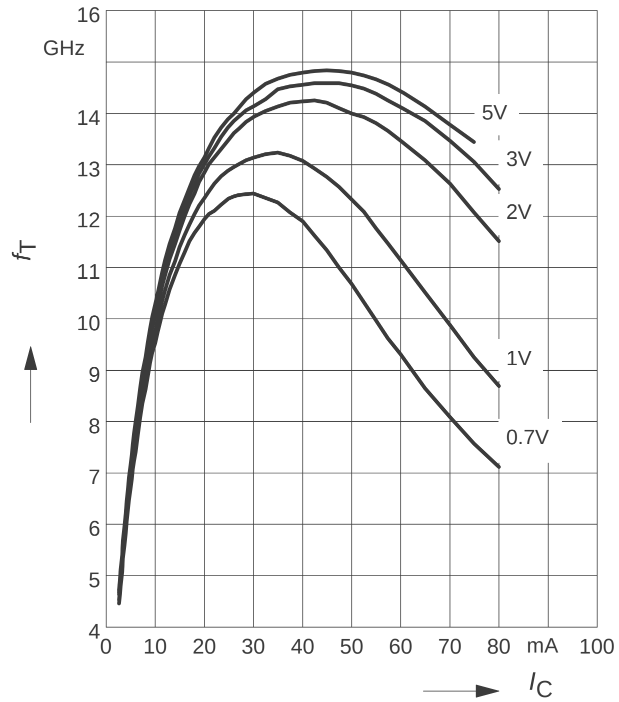
V_{CE} = parameter, f = 900 MHz



Transition frequency $f_T = f(I_C)$

f = 1GHz

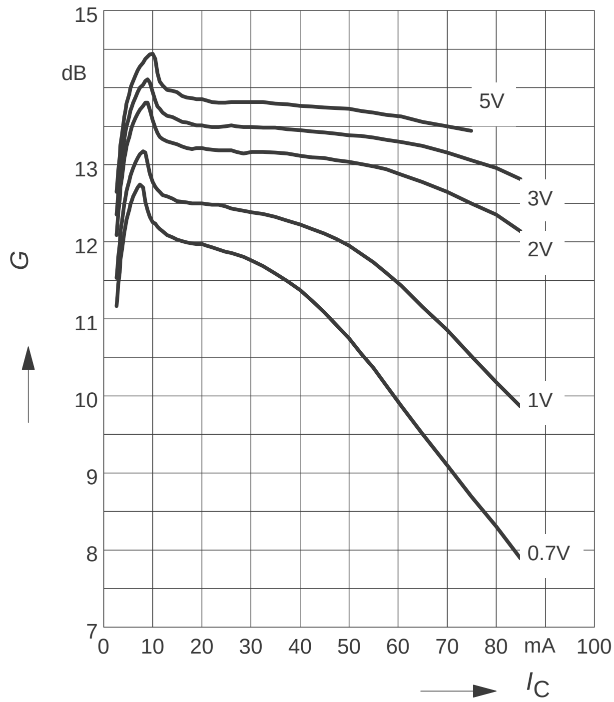
V_{CE} = parameter



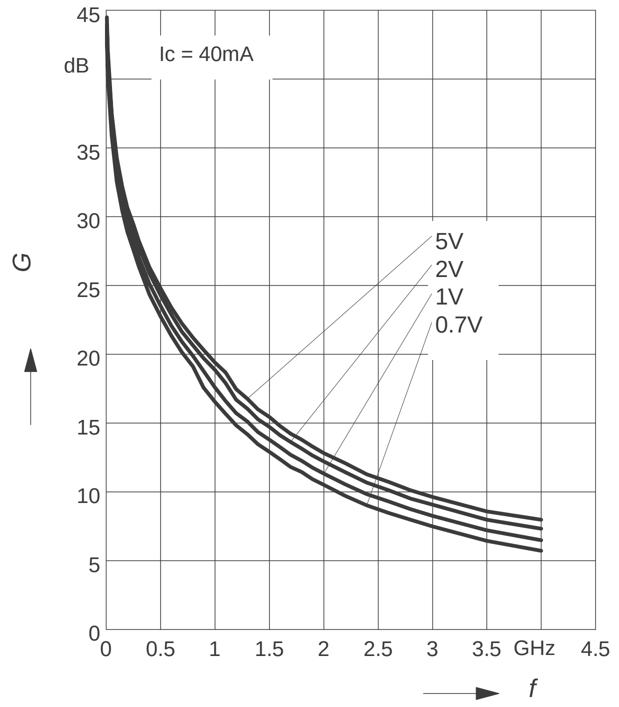
Power gain G_{ma}, $G_{ms} = f(I_C)$

f = 1.8GHz

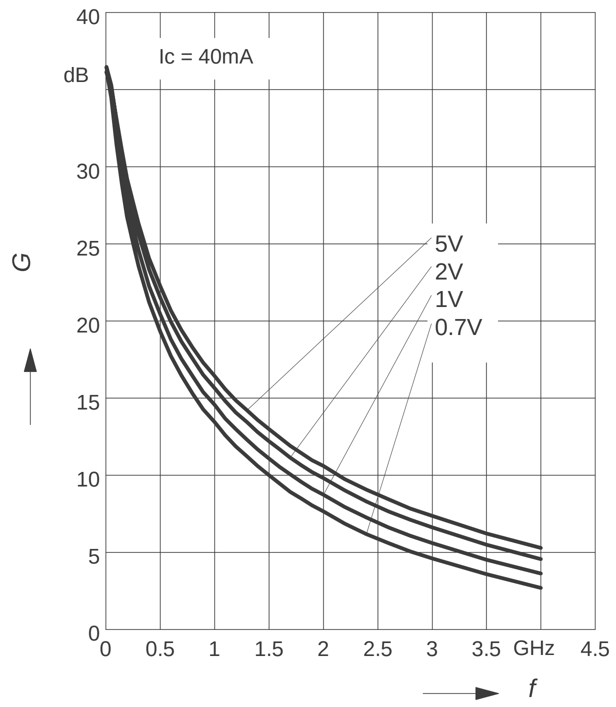
V_{CE} = parameter



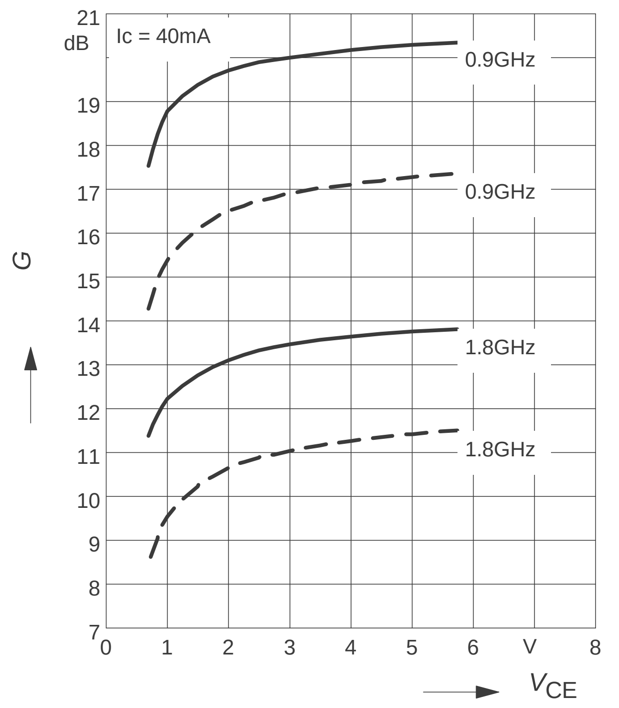
Power Gain G_{ma}, G_{ms} = $f(f)$
V_{CE} = parameter



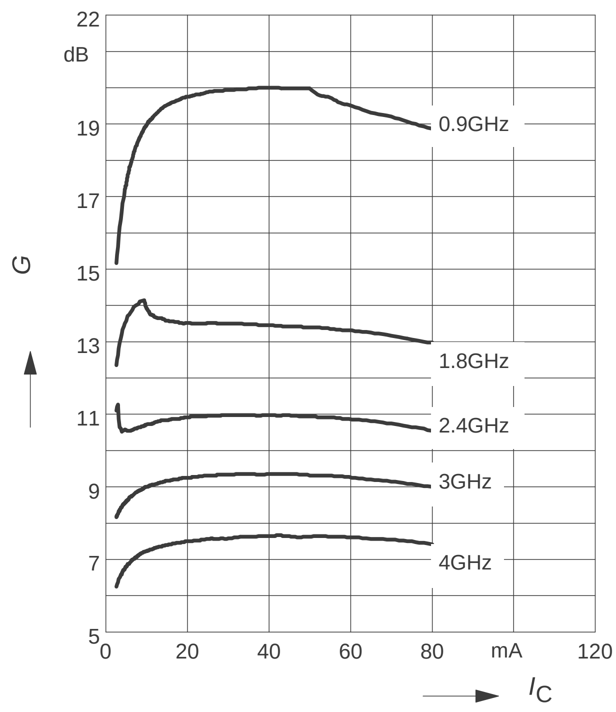
Power Gain $|S_{21}|^2$ = $f(f)$
V_{CE} = parameter



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

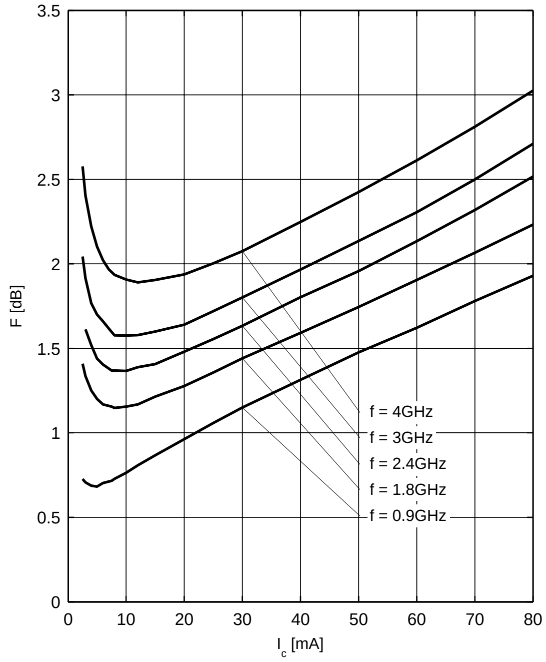


Power gain G_{ma}, G_{ms} = $f(I_C)$
V_{CE} = 3V
f = parameter



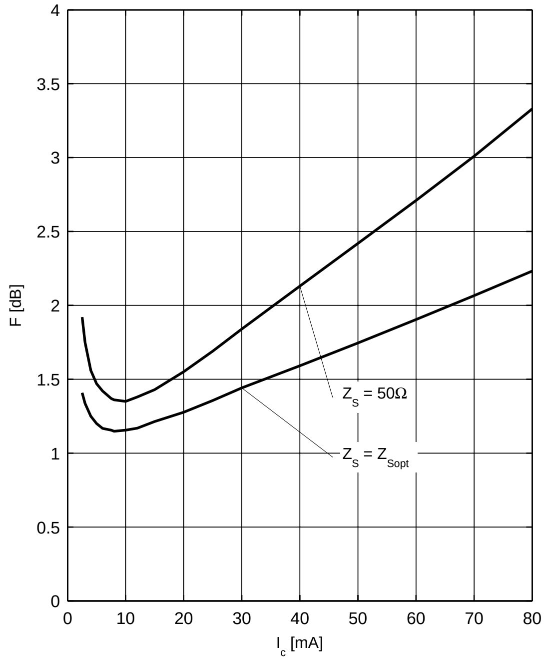
Minimum noise figure $NF_{min} = f(I_C)$

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



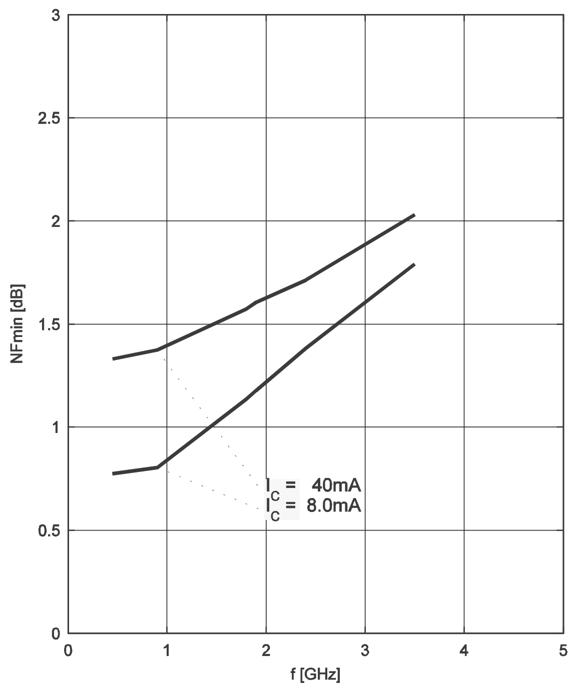
Noise figure $F = f(I_C)$

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



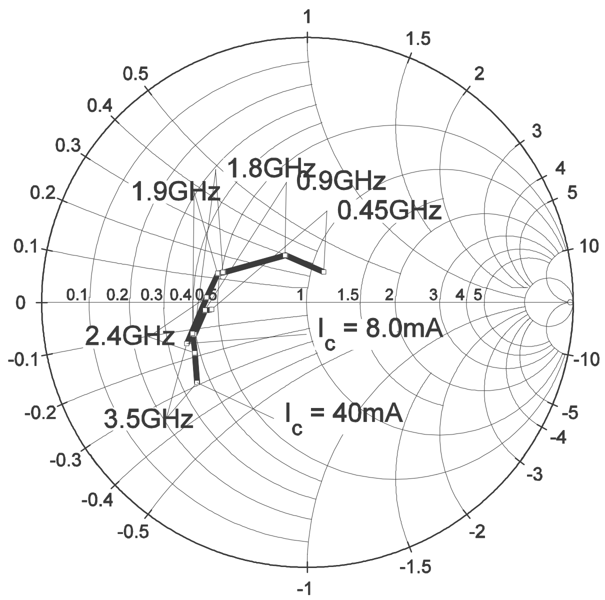
Minimum noise figure $NF_{min} = f(f)$

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



Source impedance for min. noise figure vs. frequency

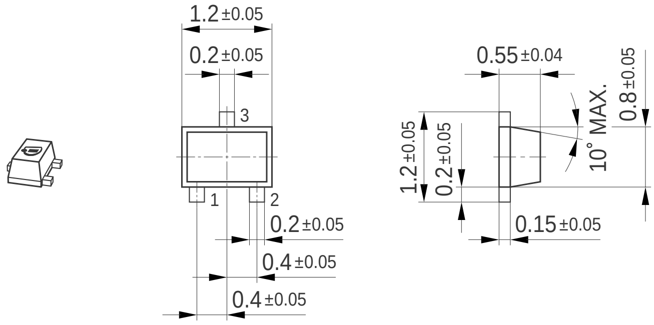
$V_{CE} = 3$ V, $I_C = 8.0$mA/40.0mA



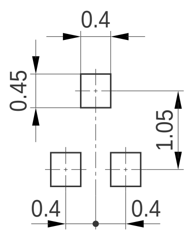
SPICE GP (Gummel-Poon)

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.
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.

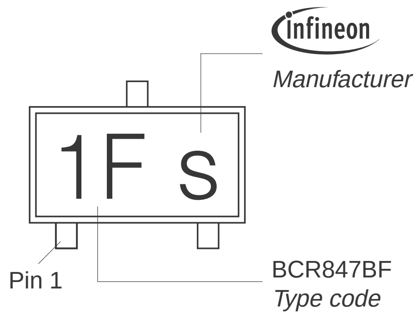
Package Outline



Foot Print

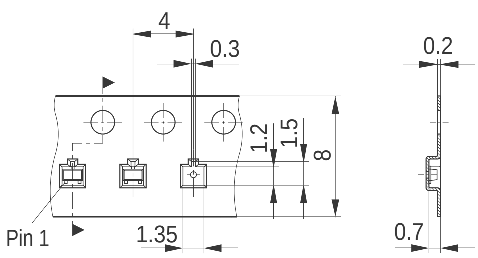


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 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.

Previous Revision: 20 May 2010	
Page	**Subject (changes since last revision)**
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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