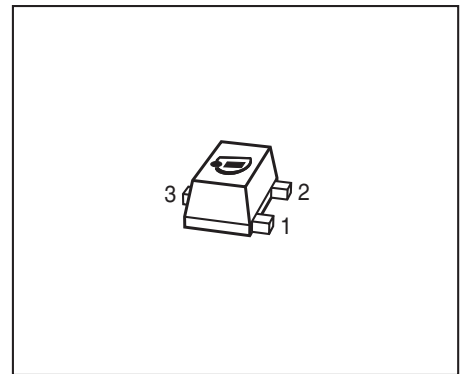


NPN Silicon RF Transistor

- General purpose Low Noise Amplifier
- Ideal for low current operation
- High breakdown voltage enables operation in automotive applications
- Minimum noise figure 1.0 dB @ 1mA, 1.5V, 1.9GHz
- Small package 1,2 x 1,2 mm² with visible leads
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



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

Type	Marking	Pin Configuration			Package
BFR340F	FAs	1 = B	2 = E	3 = C	TSFP-3

Maximum Ratings at $T_A = 25\text{ °C}$, unless otherwise specified

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	20	mA
Base current	I_B	2	
Total power dissipation ¹⁾ $T_S \leq 110\text{ °C}$	P_{tot}	75	mW
Junction temperature	T_J	150	°C
Storage temperature	T_{Stg}	-55 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	≤ 530	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 $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	6	9	-	V
Collector-emitter cutoff current $V_{CE} = 4\text{ V}, V_{BE} = 0, T_A = 25^\circ\text{C}$ $V_{CE} = 10\text{ V}, V_{BE} = 0, T_A = 85^\circ\text{C}$ Verified by random sampling	I_{CES}	-	1 2	30 50	nA
Collector-base cutoff current $V_{CB} = 4\text{ V}, I_E = 0$	I_{CBO}	-	1	30	
Emitter-base cutoff current $V_{EB} = 1\text{ V}, I_C = 0$	I_{EBO}	-	1	500	
DC current gain $I_C = 5\text{ mA}, V_{CE} = 3\text{ V}$, 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.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 6\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$	f_T	11	14	-	GHz
Collector-base capacitance $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	C_{cb}	-	0.21	0.4	pF
Collector emitter capacitance $V_{CE} = 5\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded	C_{ce}	-	0.17	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.11	-	
Minimum noise figure $I_C = 3\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_{Sopt}$, $f = 100\text{ MHz}$ $I_C = 1\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_{Sopt}$, $f = 1.9\text{ GHz}$ $I_C = 1\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_{Sopt}$, $f = 2.4\text{ GHz}$	NF_{min}	-	0.9 1 1.2	-	dB

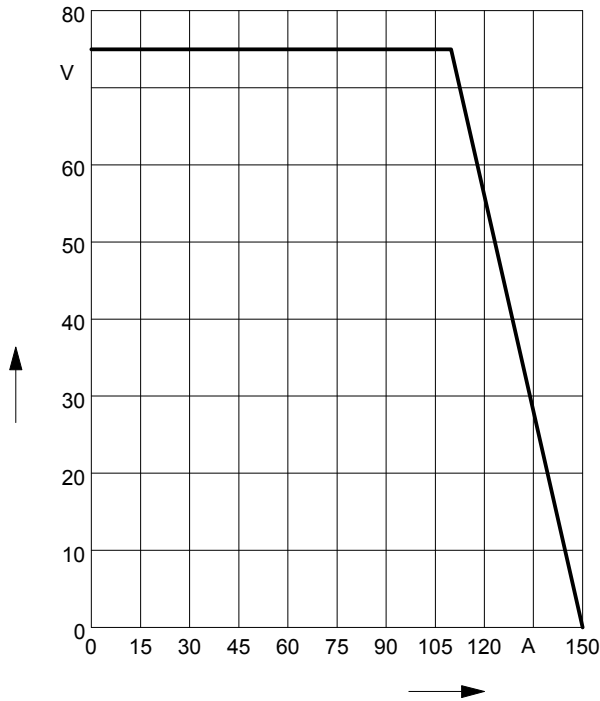
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Maximum power gain ¹⁾ $I_C = 3\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 100\text{ MHz}$ $I_C = 5\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$ $f = 3\text{ GHz}$	G_{max}	-	28	-	dB
Transducer gain $I_C = 3\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 100\text{ MHz}$ $I_C = 5\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$ $f = 3\text{ GHz}$	$ S_{21e} ^2$	-	19	-	dB
Third order intercept point at output ²⁾ $V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA}$, $f = 100\text{ MHz}$, $Z_S = Z_L = 50\Omega$ $V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA}$, $f = 1.8\text{ GHz}$, $Z_S = Z_L = 50\Omega$	IP_3	-	14	-	dBm
1dB compression point at output $V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA}$, $Z_S = Z_L = 50\Omega$, $f = 100\text{ MHz}$ $V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$	P_{-1dB}	-	-3	-	
		-	-1	-	

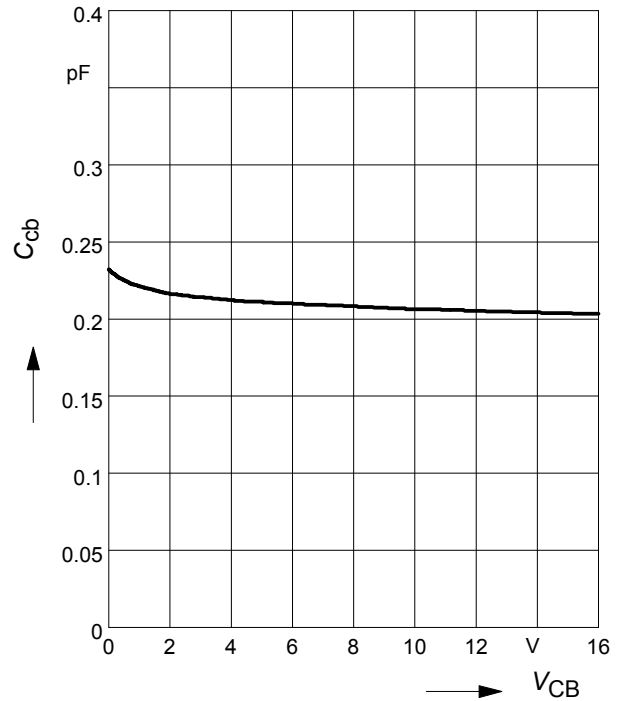
¹⁾ $G_{ma} = |S_{21e} / S_{12e}| (k - (k^2 - 1)^{1/2})$, $G_{ms} = |S_{21e} / S_{12e}|$
²⁾ IP_3 value depends on termination of all intermodulation frequency components.

Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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



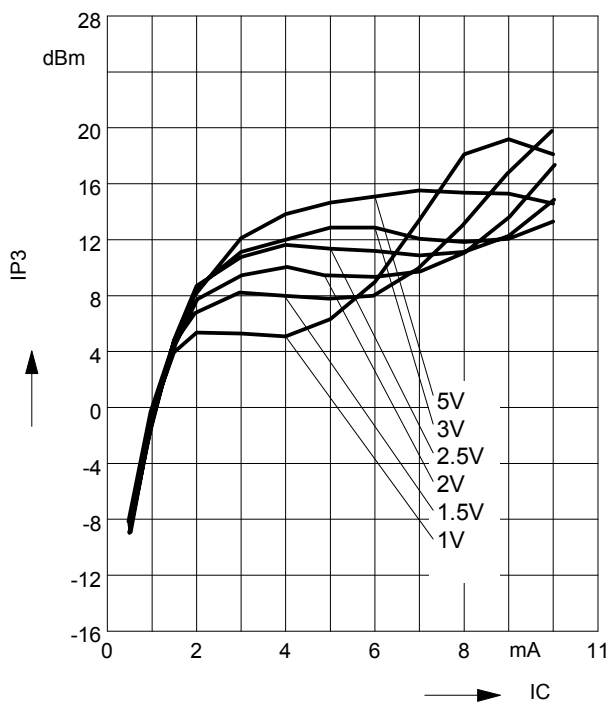
**Collector-base capacitance $C_{cb} = f(V_{CB})$
 $f = 1\text{MHz}$**



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

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

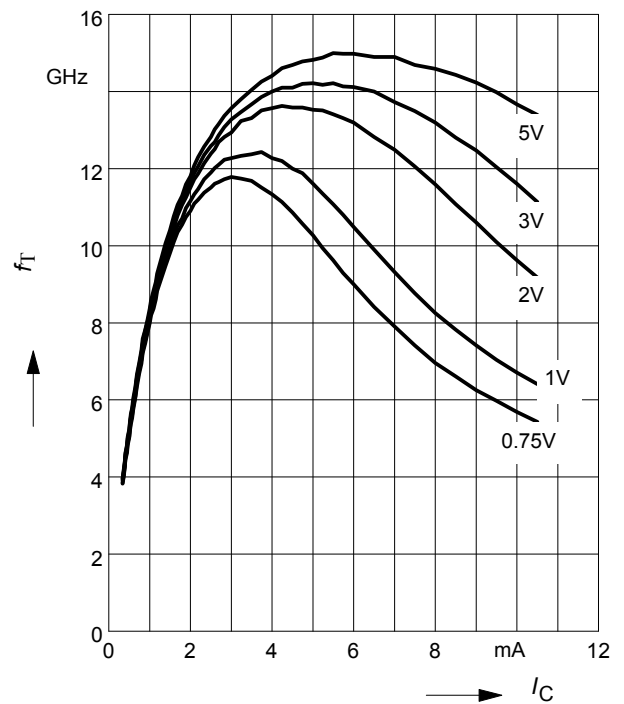
$V_{CE} = \text{parameter}, f = 1.9\text{GHz}$



Transition frequency $f_T = f(I_C)$

$f = 1\text{GHz}$

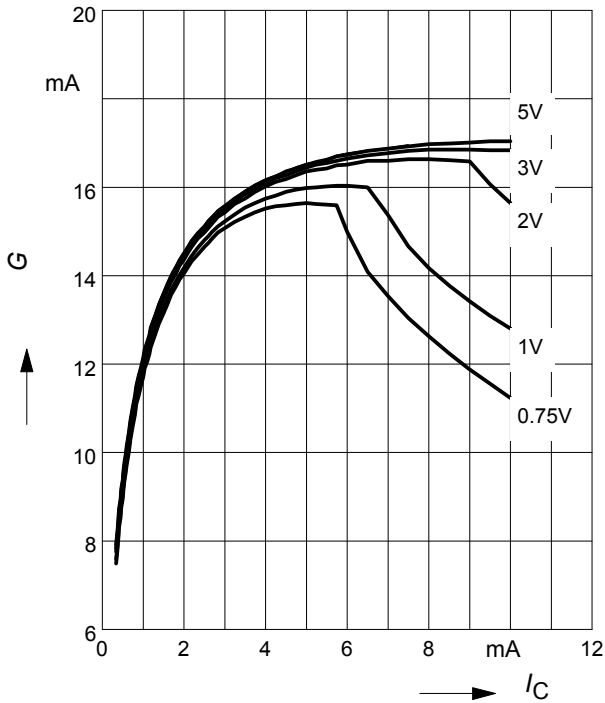
$V_{CE} = \text{parameter}$



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

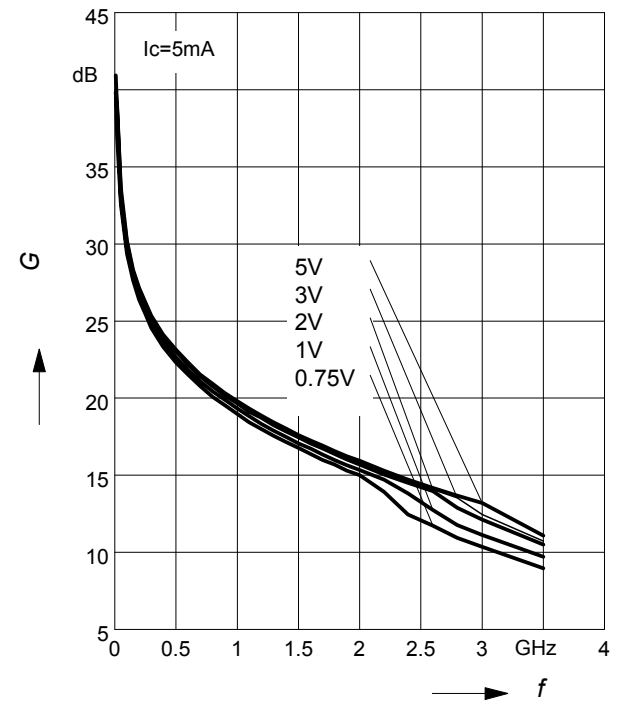
$f = 1.8\text{GHz}$

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



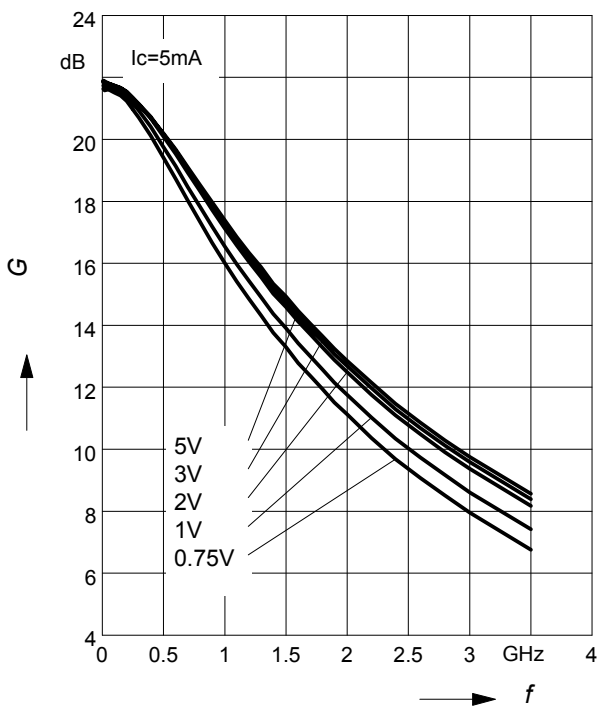
Power Gain $G_{ma}, G_{ms} = f(f)$

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



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

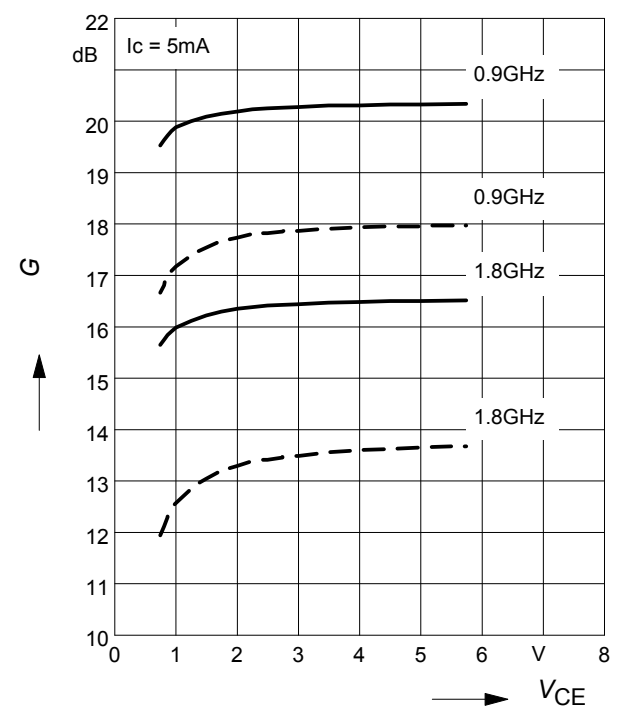
$V_{CE} = \text{parameter}$



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

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

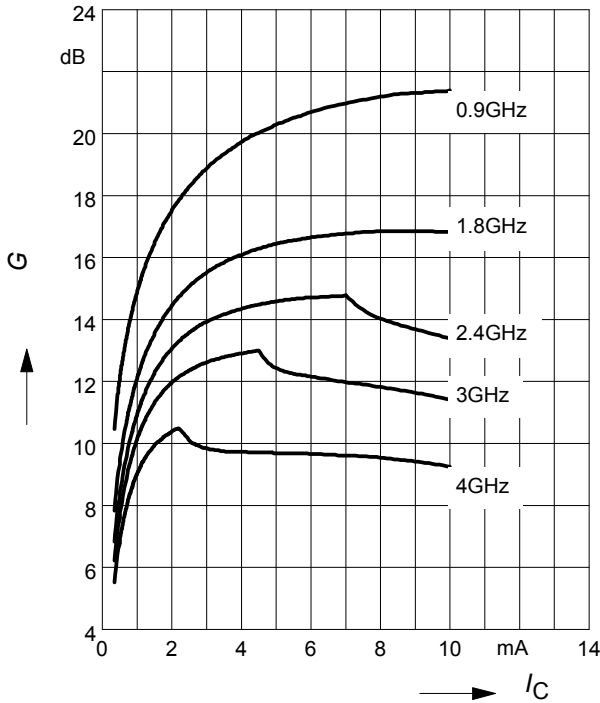
$f = \text{parameter}$



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

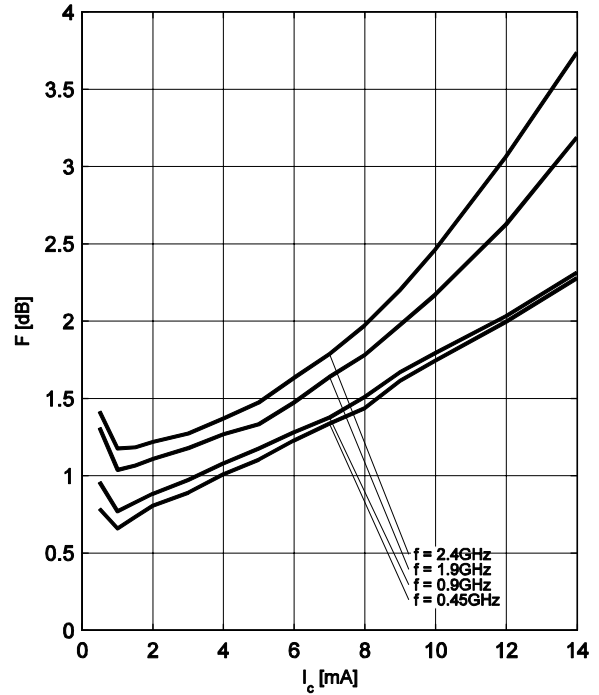
$V_{CE} = 3V$

$f =$ parameter



Noise figure $F = f(I_C)$

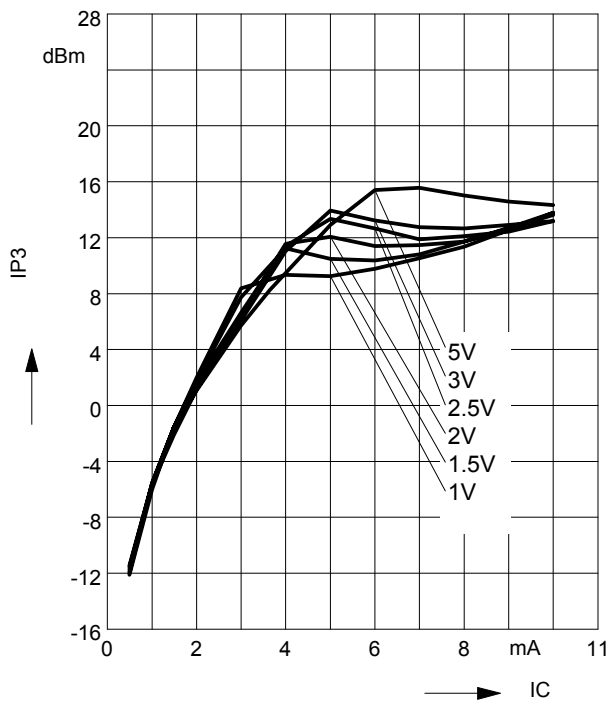
$V_{CE} = 1.5V, Z_S = Z_{Sopt}$



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

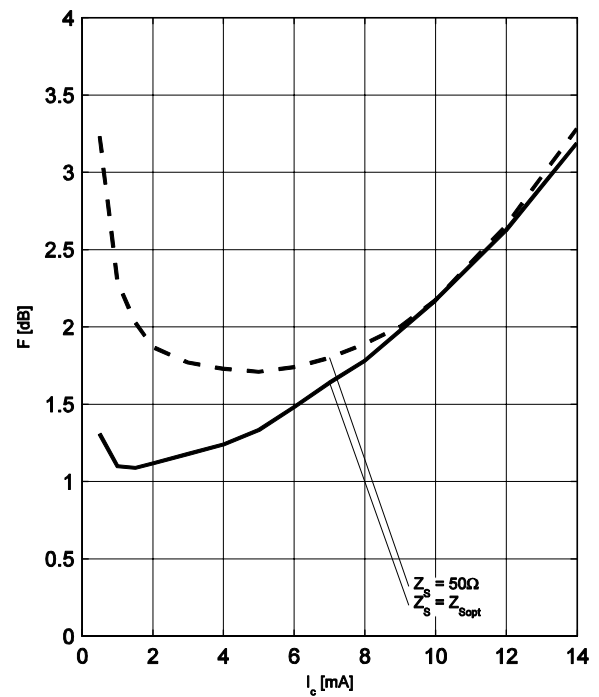
(Output, $Z_S = Z_L = 50\Omega$)

$V_{CE} =$ parameter, $f = 100MHz$



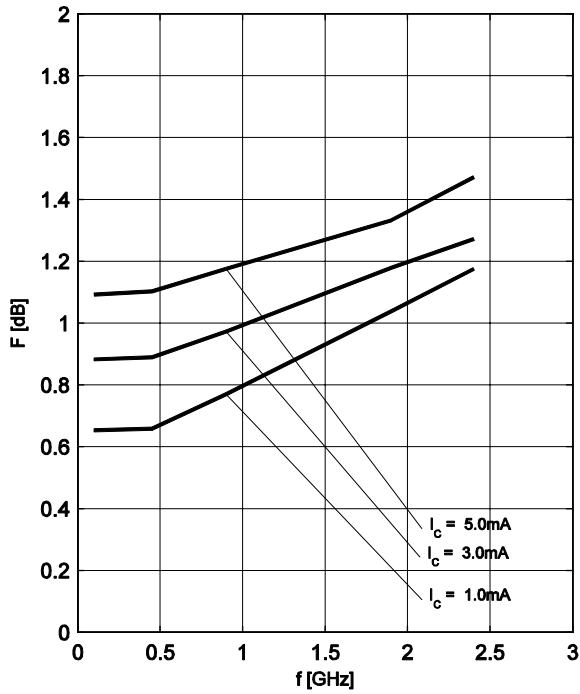
Noise figure $F = f(I_C)$

$V_{CE} = 1.5V, f = 1.9GHz$



Noise figure $F = f(f)$

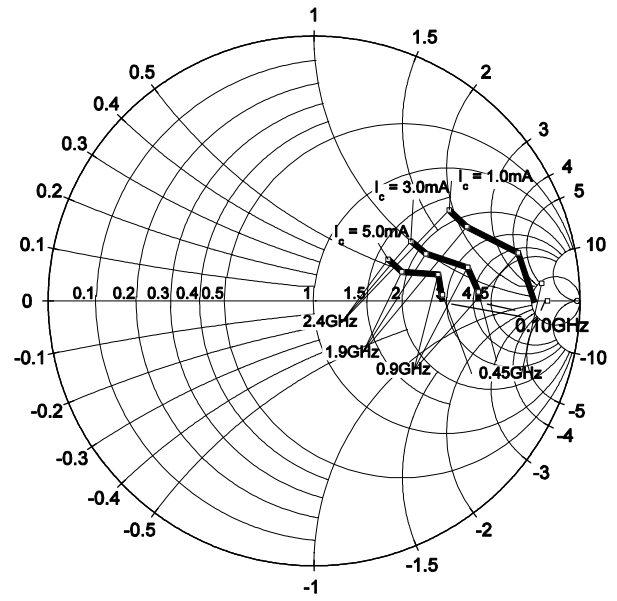
$V_{CE} = 1.5V, Z_S = Z_{Sopt}, I_C = \text{Parameter}$



Source impedance for min.

noise figure vs. frequency

$V_{CE} = 1.5V, I_C = \text{Parameter}$



SPICE Parameter

For the SPICE model as well as for the S-parameters (including noise parameters) please refer to our internet website www.infineon.com/rf.models.

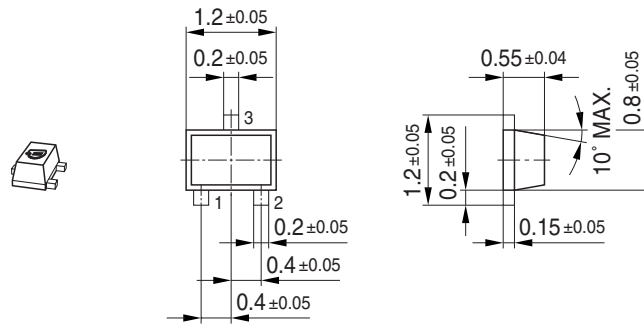
Please consult our website and download the latest versions before actually starting your design.

You find the BFR340F SPICE model in the internet in MWO- and ADS- format which you can import into these circuit simulation tools very quickly and conveniently.

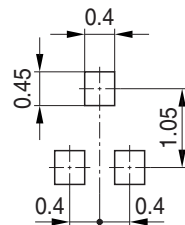
The simulation data have been generated and verified using typical devices.

The BFR340F SPICE model reflects the typical DC- and RF-performance with high accuracy.

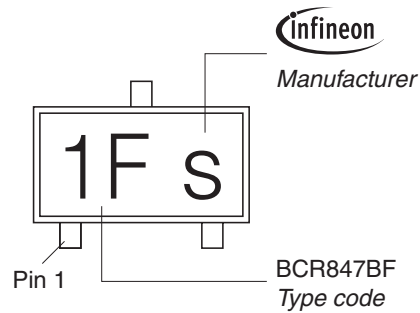
Package Outline



Foot Print

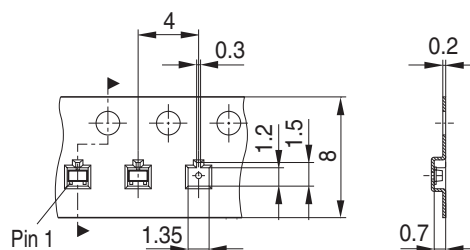


Marking Layout (Example)



Standard Packing

Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel



Datasheet Revision History: 17 May 2010

This datasheet replaces the revisions from 02 February 2010 and 30 March 2007. 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 Revisions: 02 February 2010 and 30 March 2007	
Page	Subject (changes since last revision)
1	Higher maximum collector and base currents, higher total power dissipation
2	Typical values for leakage currents included, maximum leakage currents reduced
3	Noise description at 100 MHz added
4	Gain and linearity description at 100 MHz added
5	P _{tot} curve adjusted to P _{tot} and I _{Cmax} changes
5 - 8	Curves for IP ₃ and noise at 100 MHz added

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