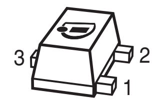
NPN Silicon RF Transistor



- 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 mm^2 with visible leads
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101

ESD (**E**lectro**s**tatic **d**ischarge) 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 °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] $T_S \leq 110°C$	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}	$\leq$ 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°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} = 4 V, V_{BE} = 0, T_A = 25°C V_{CE} = 10 V, V_{BE} = 0, T_A = 85°C Verified by random sampling	I_{CES}	 - -	 1 2	 30 50	nA
Collector-base cutoff current V_{CB} = 4 V, I_E = 0	I_{CBO}	-	1	30	
Emitter-base cutoff current V_{EB} = 1 V, I_C = 0	I_{EBO}	-	1	500	
DC current gain I_C = 5 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 = 6 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}	-	0.21	0.4	pF
Collector emitter capacitance V_{CE} = 5 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.17	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.11	-	
Minimum noise figure	NF_{min}				dB
I_C = 3 mA, V_{CE} = 1.5 V, Z_S = Z_{Sopt}, f = 100 MHz		-	0.9	-	
I_C = 1 mA, V_{CE} = 1.5 V, Z_S = Z_{Sopt}, f = 1.9 GHz		-	1	-	
I_C = 1 mA, V_{CE} = 1.5 V, Z_S = Z_{Sopt}, f = 2.4 GHz		-	1.2	-	

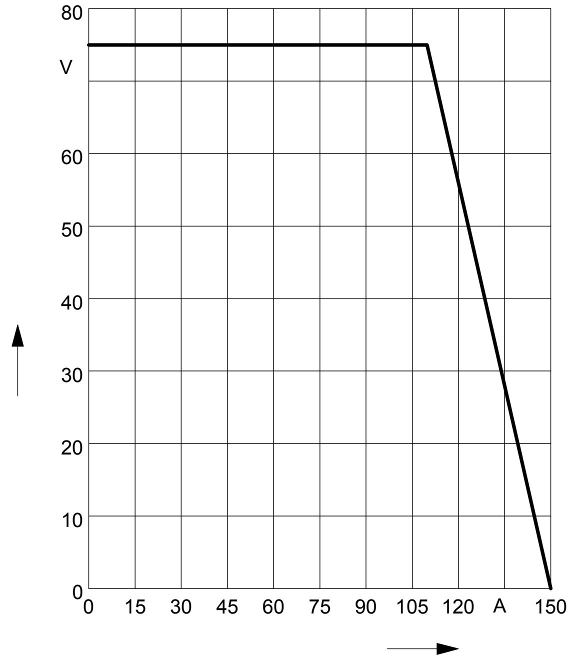
Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Maximum power gain[1)	G_{max}				dB
I_C = 3 mA, V_{CE} = 1.5 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$,					
f = 100 MHz		-	28	-	
I_C = 5 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$,					
f = 1.8 GHz		-	16.5	-	
f = 3 GHz		-	13	-	
Transducer gain	$\|S_{21e}\|^2$				dB
I_C = 3 mA, V_{CE} = 1.5 V, $Z_S = Z_L$ = 50Ω ,					
f = 100 MHz		-	19	-	
I_C = 5 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50Ω ,					
f = 1.8 GHz		-	14	-	
f = 3 GHz		-	10	-	
Third order intercept point at output[2)	IP_3				dBm
V_{CE} = 3 V, I_C = 5 mA, f = 100 MHz,					
$Z_S = Z_L$ = 50Ω		-	14	-	
V_{CE} = 3 V, I_C = 5 mA, f = 1.8 GHz,					
$Z_S = Z_L$ = 50Ω		-	13	-	
1dB compression point at output	P_{-1dB}				
V_{CE} = 3V, I_C = 5 mA, $Z_S = Z_L$ = 50Ω, f = 100 MHz		-	-3	-	
V_{CE} = 3V, I_C = 5 mA, $Z_S = Z_L$ = 50Ω, f = 1.8 GHz		-	-1	-	

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

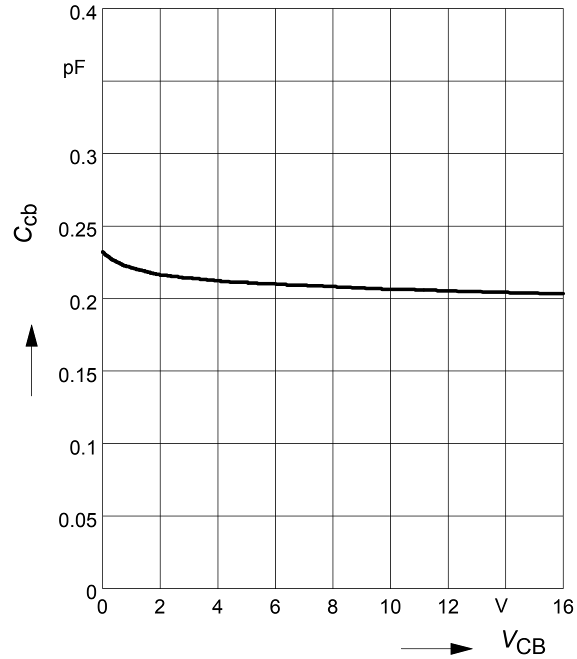
[2] IP3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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



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

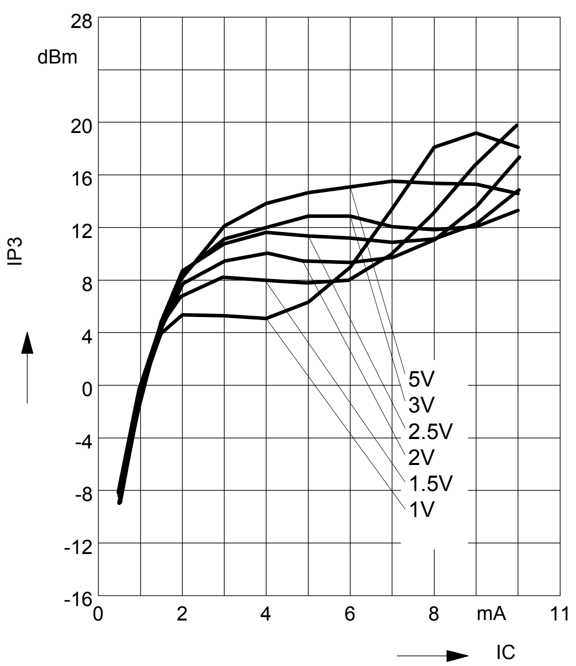
f = 1MHz



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

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

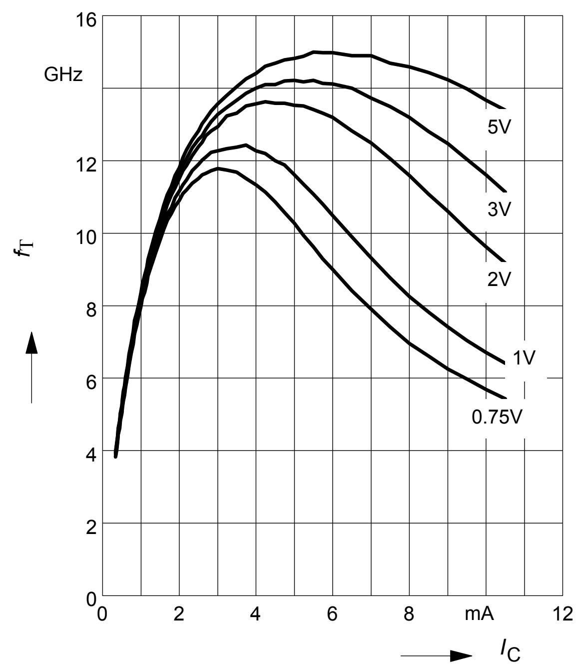
V_{CE} = parameter, f = 1.9GHz



Transition frequency $f_T = f(I_C)$

f = 1GHz

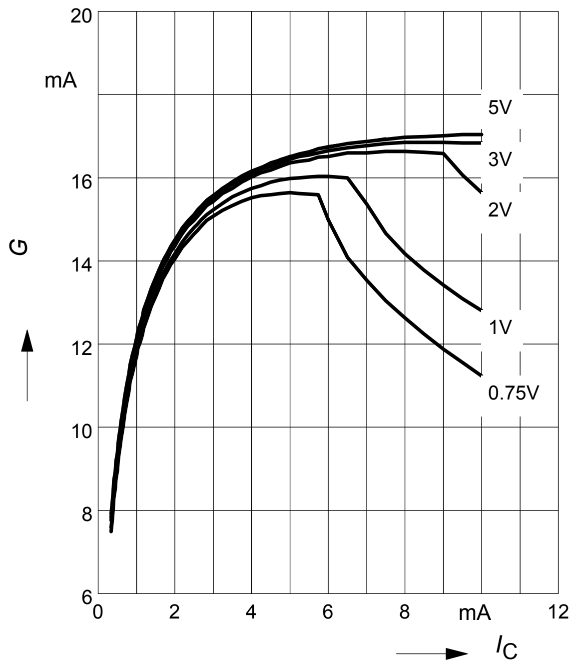
V_{CE} = parameter



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

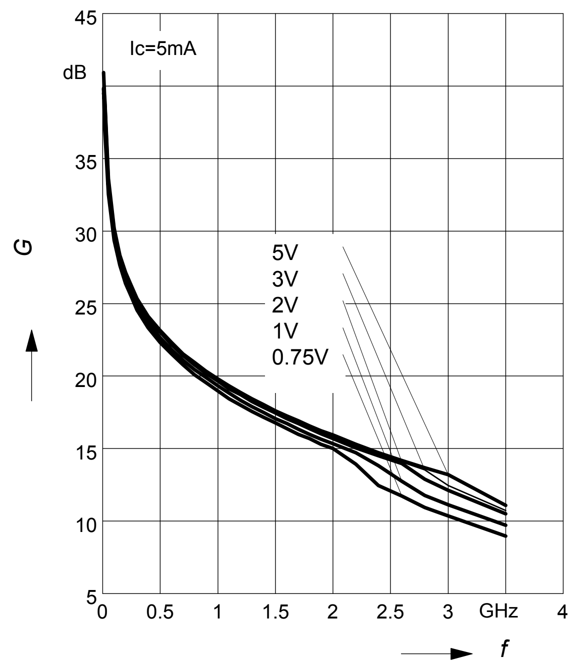
f = 1.8GHz

V_{CE} = parameter



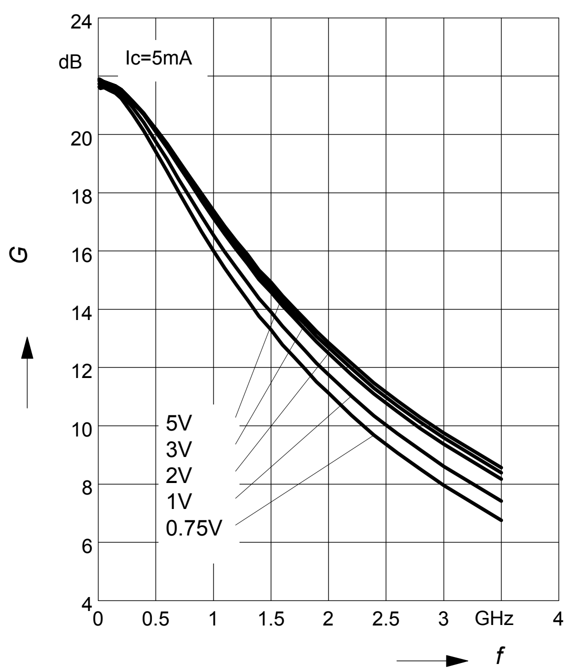
Power Gain G_{ma}, G_{ms} = $f(f)$

V_{CE} = parameter



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

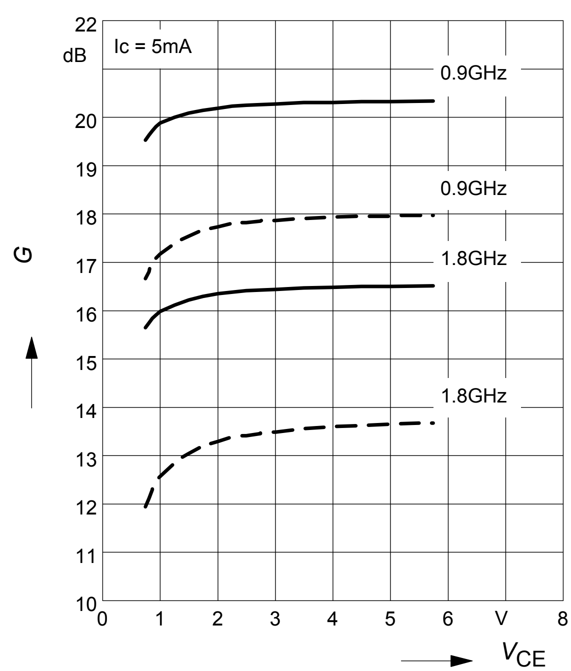
V_{CE} = parameter



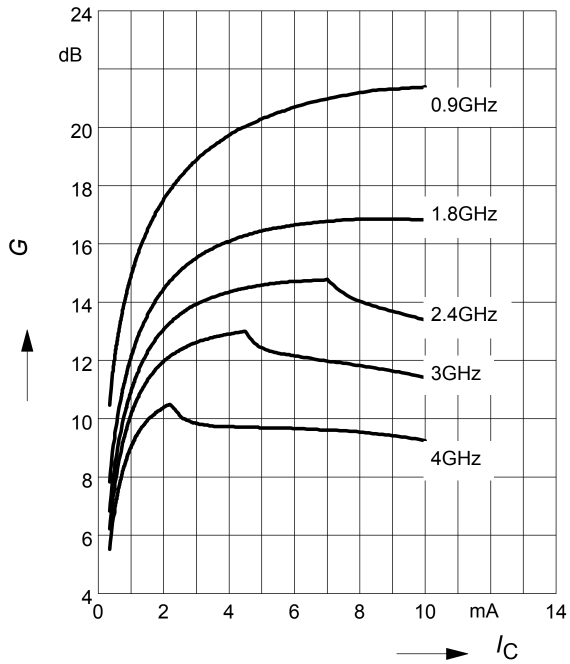
Power Gain G_{ma}, G_{ms} = $f(V_{CE})$: ——

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

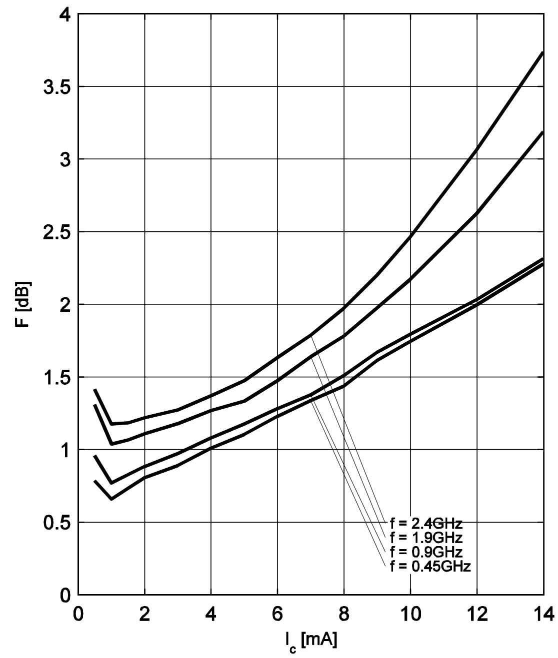
f = parameter



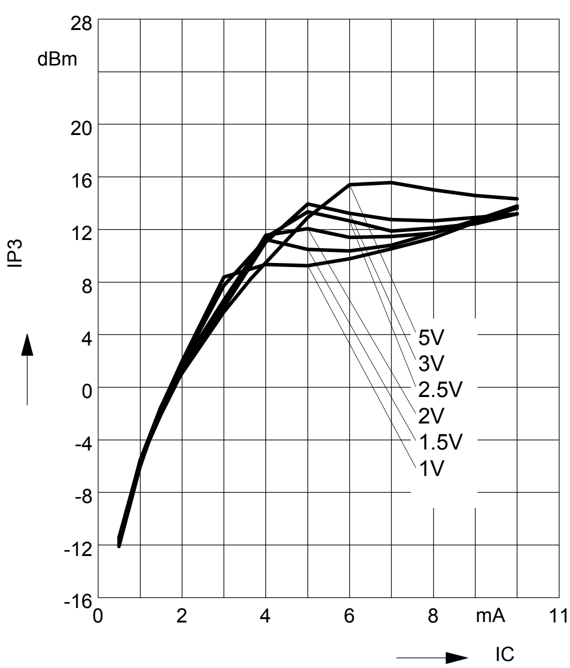
Power gain G_{ma}, G_{ms} = f (I_C)
V_{CE} = 3V
f = parameter



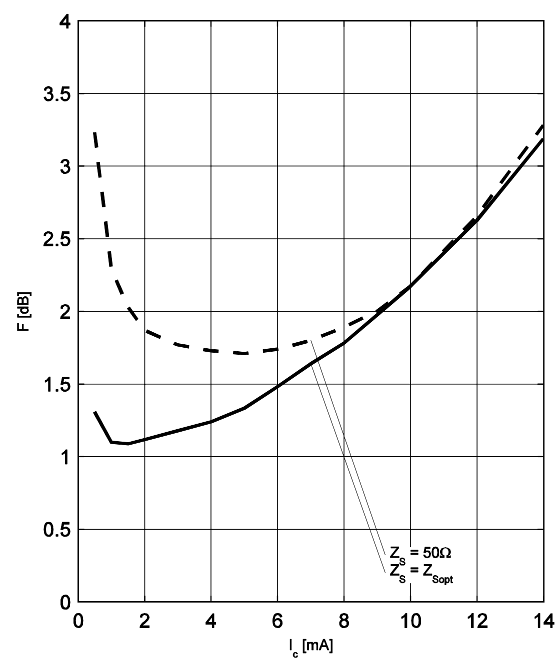
Noise figure F = f(I_C)
V_{CE} = 1.5V, Z_S = Z_{Sopt}



Third order Intercept Point IP_3=f(I_C)
(Output, Z_S=Z_L=50Ω)
V_{CE} = parameter, f = 100MHz

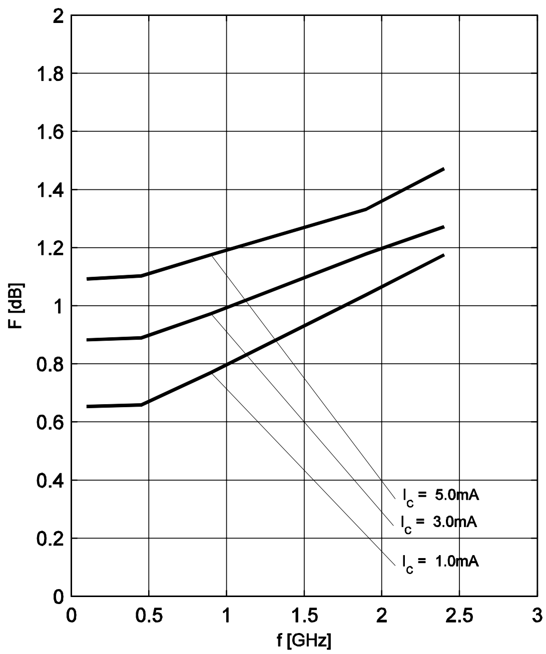


Noise figure F = f(I_C)
V_{CE} = 1.5V, f = 1.9GHz



Noise figure *F* = *ƒ*(f)

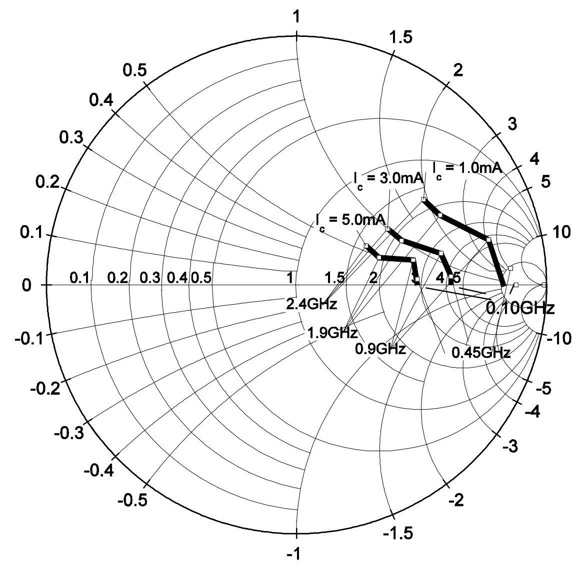
V_{CE} = 1.5V, Z_S=Z_{Sopt}, I_C=Parameter



Source impedance for min.

noise figure vs. frequency

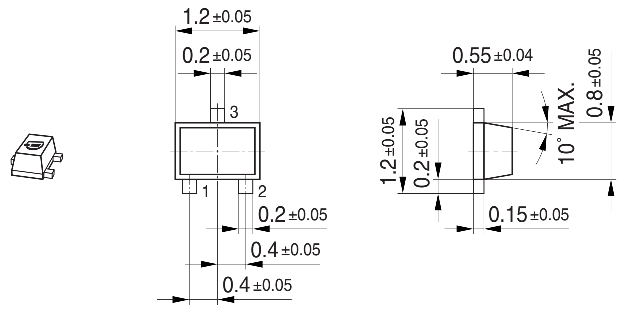
V_{CE} = 1.5V, I_C=Parameter



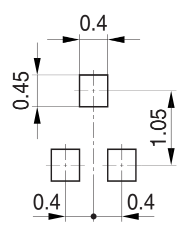
SPICE Parameter

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.

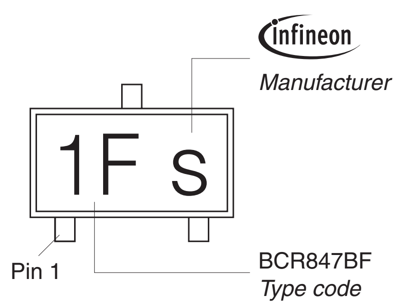
Package Outline



Foot Print

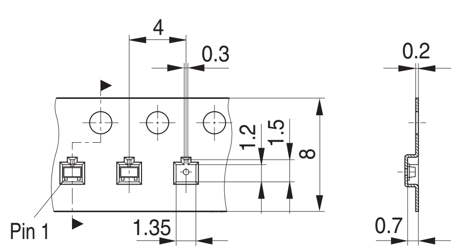


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 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	Ptot curve adjusted to Ptot and ICmax changes
5 - 8	Curves for IP3 and noise at 100 MHz added

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