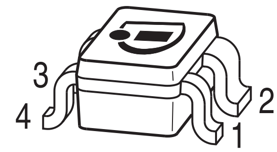
NPN Silicon RF Transistor



- General purpose low noise amplifier
  for low voltage, low current applications
- High ESD robustness, typical 1500V (HBM)
- Low minimum noise figure 1.1 dB at 1.8 GHz
- High linearity: output compression point
  OP1dB = 13 dBm @ 3V, 35mA, 1.8GHz
- Easy to use standard package 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
BFP460	ABs	1 = E	2 = C	3 = E	4=B	-	-	SOT343

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A > 0$ °C $T_A \leq 0$ °C	V_{CEO}	 4.5 4.2	V
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	1.5	
Collector current	I_C	70	mA
Base current	I_B	7	
Total power dissipation[1)] $T_S \leq 92$°C	P_{tot}	230	mW
Junction temperature	T_J	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{Stg}	-65 ... 150	

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

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1]	R_{thJS}	≤ 250	K/W

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	$V_{(BR)CEO}$	4.5	5.8	-	V
Collector-emitter cutoff current V_{CE} = 15 V, V_{BE} = 0 V_{CE} = 2 V, V_{BE} = 0 V_{CE} = 5 V, V_{BE} = 0 , T_A = 85°C Verified by random sampling	I_{CES}	 - - -	 - 1 2	 1000 30 40	nA
Collector-base cutoff current V_{CB} = 2 V, I_E = 0 V_{CB} = 5 V, I_E = 0	I_{CBO}	 - -	 1 -	 30 30	
Emitter-base cutoff current V_{EB} = 0,5 V, I_C = 0	I_{EBO}	-	1	500	
DC current gain V_{CE} = 3 V, I_C = 20 mA , pulse measured	h_{FE}	90	120	160	-

[1]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.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 30 mA, V_{CE} = 3 V, f = 1 GHz	f_T	16	22	-	GHz
Collector-base capacitance V_{CB} = 3 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.32	0.45	pF
Collector emitter capacitance V_{CE} = 3 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.28	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.55	-	
Minimum noise figure	NF_{min}				dB
V_{CE} = 2V, I_C = 3 mA , Z_S = Z_{Sopt}, f = 100 MHz		-	0.7	-	
V_{CE} = 3V, I_C = 5 mA , Z_S = Z_{Sopt}, f = 1.8 GHz		-	1.1	-	
V_{CE} = 3V, I_C = 5 mA , Z_S = Z_{Sopt}, f = 3 GHz		-	1.2	-	

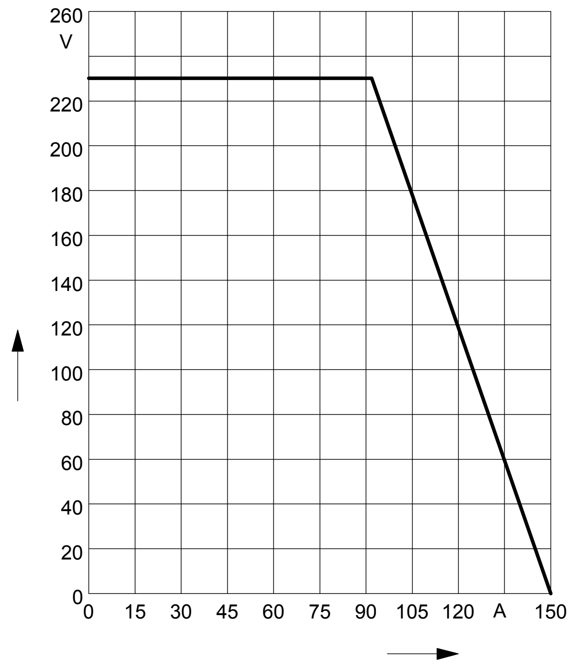
Electrical Characteristics at T_A = 25°C, unless otherwise specified

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		-	26.5	-	
I_C = 20 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$,					
f = 1,8 GHz		-	17.5	-	
f = 3 GHz		-	12.5	-	
Transducer gain	$\|S_{21e}\|^2$				dB
I_C = 3 mA, V_{CE} = 1.5 V, $Z_S = Z_L = 50\Omega$,					
f = 100 MHz		-	20	-	
I_C = 20 mA, V_{CE} = 3 V, $Z_S = Z_L = 50\Omega$,					
f = 1.8 GHz		-	15	-	
f = 3 GHz		-	10.5	-	
Third order intercept point at output[2]	IP_3				dBm
V_{CE} = 3 V, I_C = 20 mA, f = 100 MHz		-	23.5	-	
V_{CE} = 3 V, I_C = 20 mA, f = 1.8 GHz		-	27.5	-	
1dB compression point at output	P_{-1dB}				
V_{CE} = 3V, I_C = 20mA , $Z_S=Z_L = 50\Omega$, f = 100 MHz		-	9.5	-	
V_{CE} = 3V, I_C = 20mA, $Z_S=Z_L = 50\Omega$, f = 1.8 GHz		-	11.5	-	
V_{CE} = 3V, I_C = 35mA, $Z_S=Z_L = 50\Omega$, f = 1.8 GHz		-	13	-	

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

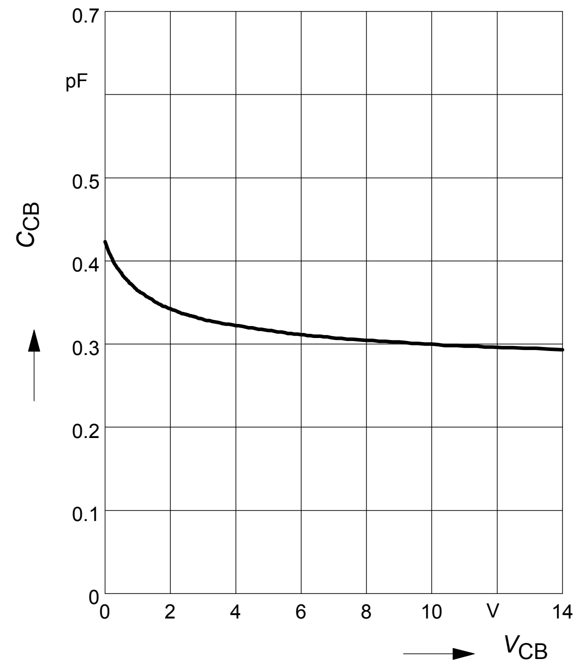
[2] IP3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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



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

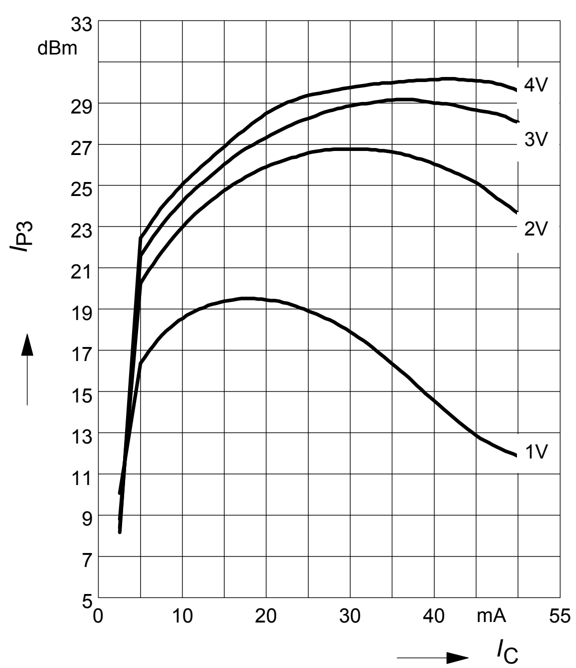
f = 1MHz



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

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

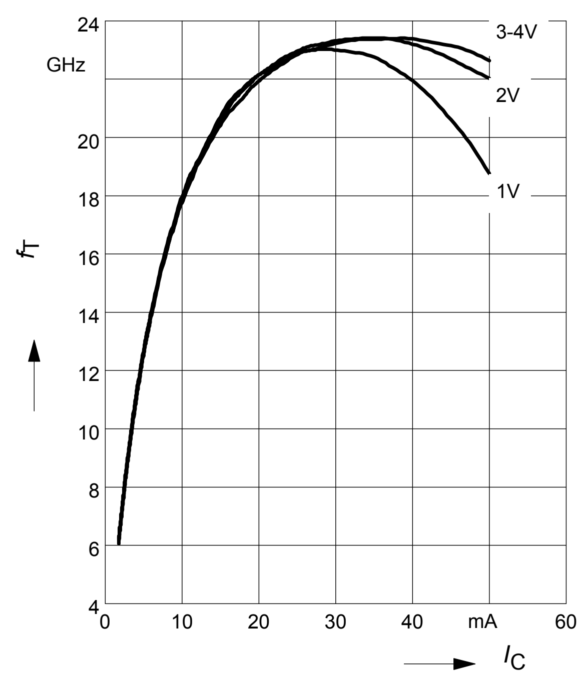
V_{CE} = parameter, f = 1800MHz



Transition frequency $f_T = f(I_C)$

f = 1 GHz

V_{CE} = parameter



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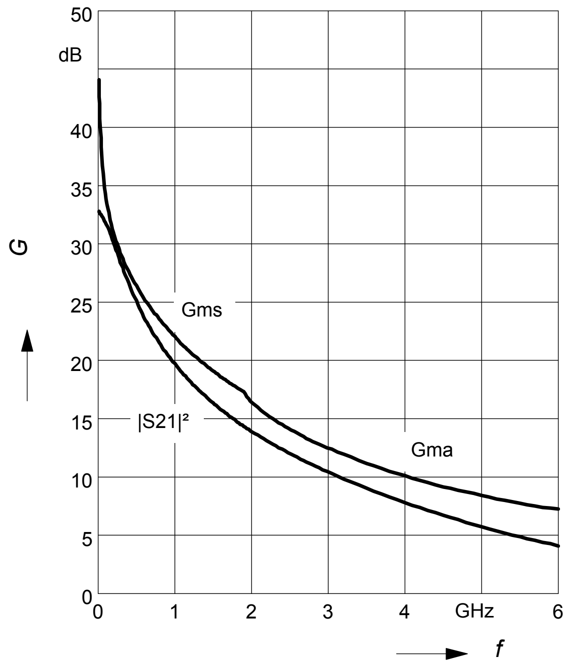
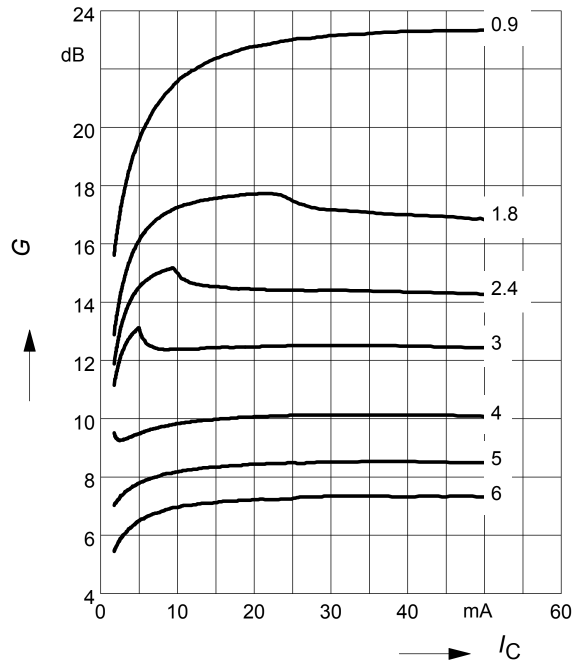
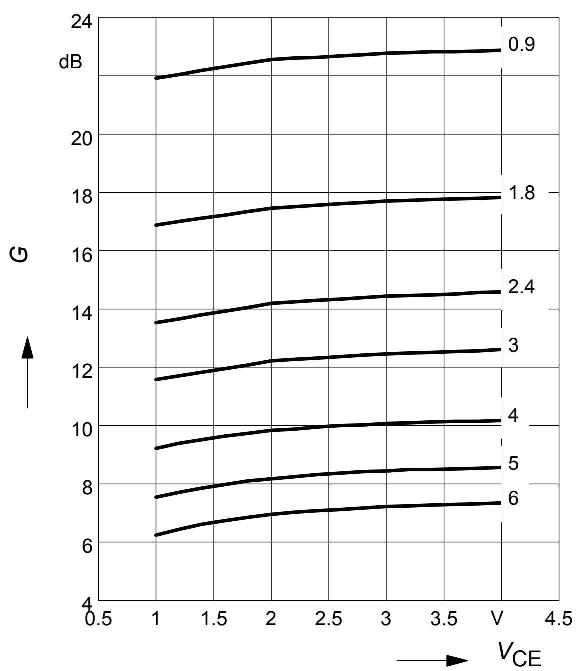
Power gain G_{ma}, G_{ms}, $|S_{21}|^2 = f\,(f)$
V_{CE} = 3 V, I_C = 20 mA



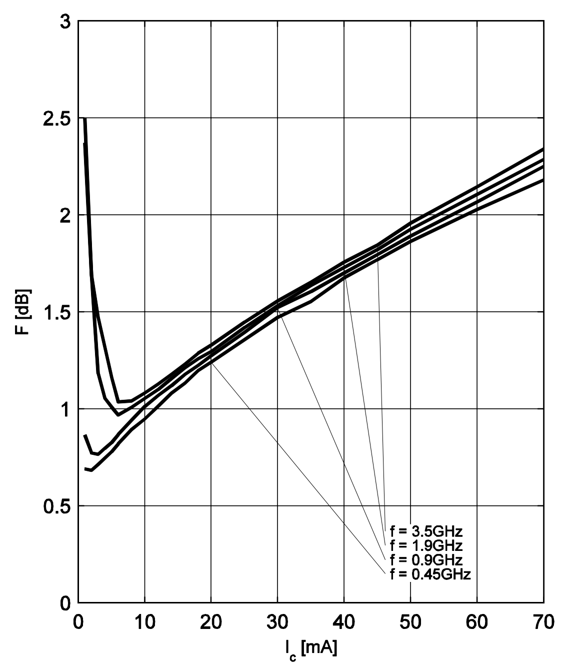
Power gain G_{ma}, G_{ms} = $f\,(I_C)$
V_{CE} = 3V
f = parameter in GHz



Power gain G_{ma}, G_{ms} = $f\,(V_{CE})$
I_C = 20 mA
f = parameter in GHz



Noise figure $F = f(I_C)$
V_{CE} = 2 V, f = parameter
$Z_S = Z_{Sopt}$



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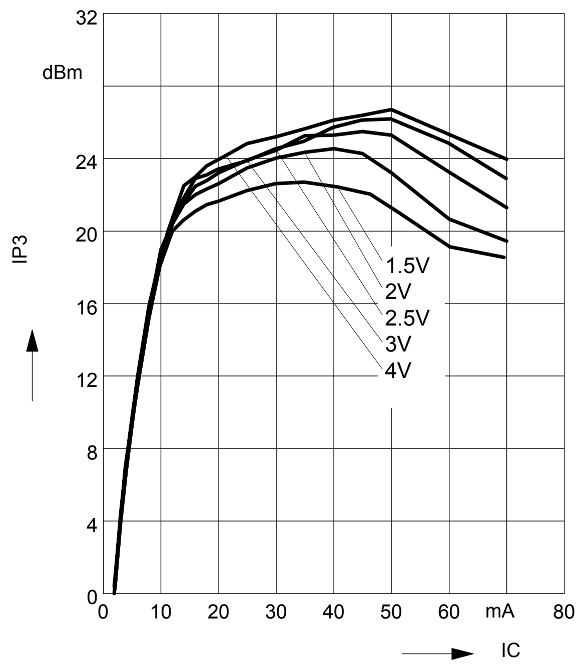
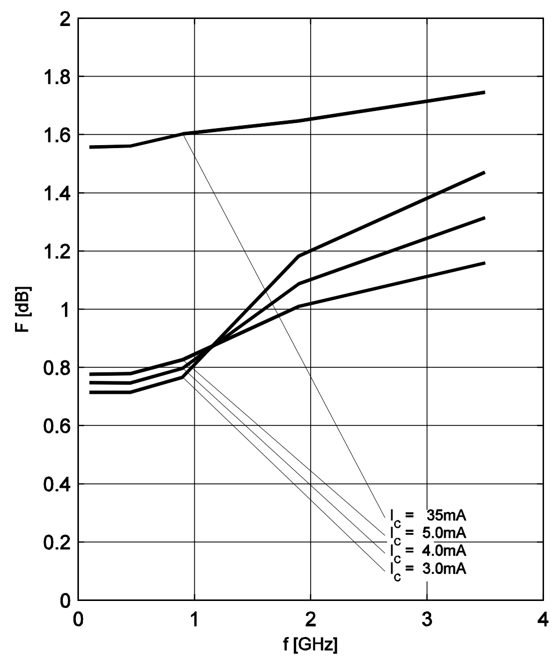
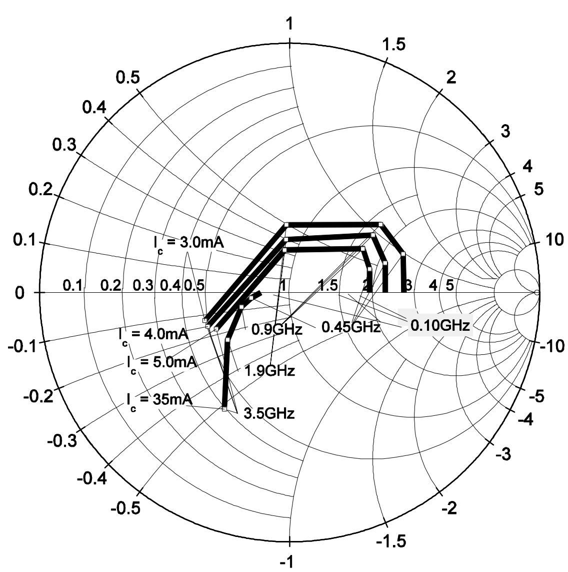
Third order Intercept Point $IP_3 = f(I_C)$
(Output, $Z_S = Z_L = 50\Omega$)
V_{CE} = parameter, f = 100MHz



Noise figure $F = f(f)$
V_{CE} = 2V, $Z_S = Z_{Sopt}$, I_C = parameter



Source impedance for min.
noise figure vs. frequency
V_{CE} = 2V, I_C = parameter



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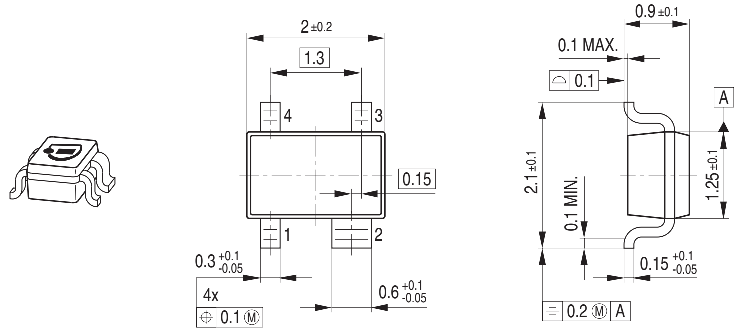
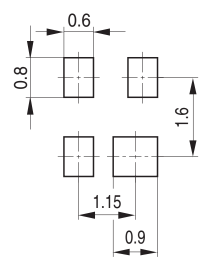
SPICE Parameter

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 BFP460 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 BFP460 SPICE model reflects the typical DC- and RF-performance with high accuracy.

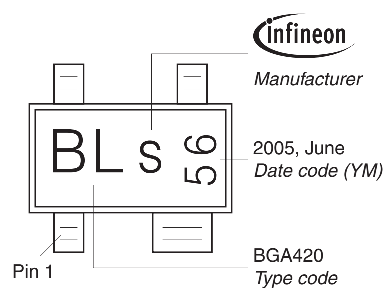
Package Outline



Foot Print

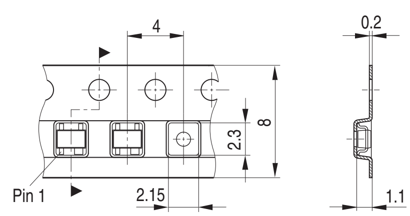


Marking Layout (Example)



Standard Packing

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



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Datasheet Revision History: 17 May 2010

This datasheet replaces the revision from 14 August 2008.
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: 14 August 2008	
Page	**Subject (changes since last revision)**
1	Maximum ratings for collector current ICmax, base current IBmax and total power dissipation Ptot increased
2	Typical values for leakage currents included, maximum leakage current values reduced
3	Noise description at 100 MHz added
4	Gain and linearity description at 100 MHz added
5 - 7	Curves for IP3 and noise at 100 MHz added

Edition 2009-11-16

Published by
Infineon Technologies AG
81726 Munich, Germany

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