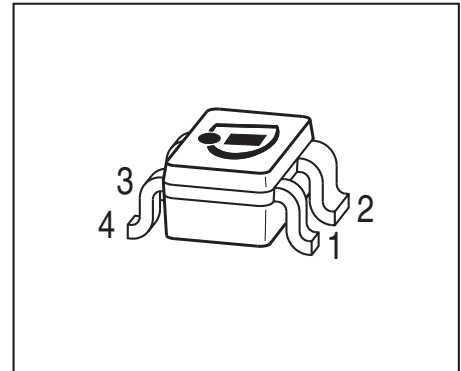


**NPN Silicon RF Transistor**

- For highest gain low noise amplifier at 1.8 GHz
- Outstanding  $G_{ms} = 21.5$  dB  
Noise Figure  $F = 0.9$  dB
- Gold metallization for high reliability
- SIEGET<sup>®</sup> 45 - Line
- Pb-free (RoHS compliant) package<sup>1)</sup>
- Qualified according AEC Q101



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

Type	Marking	Pin Configuration						Package
BFP540	ATs	1=B	2=E	3=C	4=E	-	-	SOT343

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A > 0^\circ\text{C}$ $T_A \leq 0^\circ\text{C}$	$V_{CEO}$	4.5 4	V
Collector-emitter voltage	$V_{CES}$	14	
Collector-base voltage	$V_{CBO}$	14	
Emitter-base voltage	$V_{EBO}$	1	
Collector current	$I_C$	80	mA
Base current	$I_B$	8	
Total power dissipation <sup>2)</sup> $T_S \leq 77^\circ\text{C}$	$P_{tot}$	250	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Ambient temperature	$T_A$	-65 ... 150	
Storage temperature	$T_{stg}$	-65 ... 150	

<sup>1</sup>Pb-containing package may be available upon special request

<sup>2</sup> $T_S$  is measured on the collector lead at the soldering point to the pcb

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	$\leq 290$	K/W

**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 $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	4.5	5	-	V
Collector-emitter cutoff current $V_{CE} = 14 \text{ V}, V_{BE} = 0$	$I_{CES}$	-	-	10	$\mu\text{A}$
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	$I_{CBO}$	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 0.5 \text{ V}, I_C = 0$	$I_{EBO}$	-	-	10	$\mu\text{A}$
DC current gain $I_C = 20 \text{ mA}, V_{CE} = 3.5 \text{ V}$ , pulse measured	$h_{FE}$	50	110	185	-

<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

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

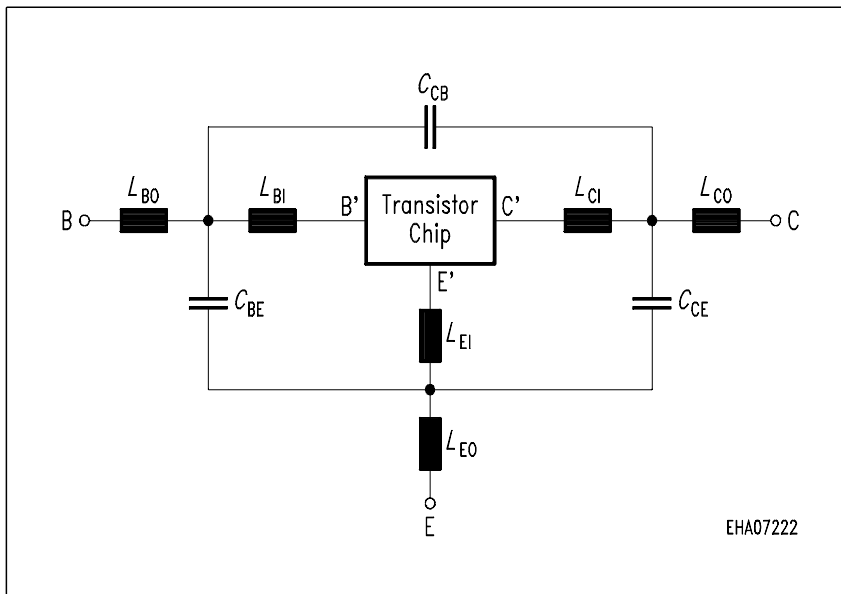
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics (verified by random sampling)</b>					
Transition frequency $I_C = 50\text{ mA}$ , $V_{CE} = 4\text{ V}$ , $f = 1\text{ GHz}$	$f_T$	21	30	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , emitter grounded	$C_{cb}$	-	0.14	0.24	pF
Collector emitter capacitance $V_{CE} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , base grounded	$C_{ce}$	-	0.33	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ , collector grounded	$C_{eb}$	-	0.65	-	
Noise figure $I_C = 5\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $f = 1.8\text{ GHz}$ , $Z_S = Z_{Sopt}$ $I_C = 5\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $f = 3\text{ GHz}$ , $Z_S = Z_{Sopt}$	$F$	-	0.9	1.4	dB
Power gain, maximum stable <sup>1)</sup> $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$	$G_{ms}$	-	21.5	-	dB
Power gain, maximum available <sup>1)</sup> $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 3\text{ GHz}$	$G_{ma}$	-	16	-	dB
Transducer gain $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_L = 50\ \Omega$ , $f = 1.8\text{ GHz}$ $f = 3\text{ GHz}$	$ S_{21e} ^2$	16	18.5	-	dB
Third order intercept point at output <sup>2)</sup> $V_{CE} = 2\text{ V}$ , $I_C = 20\text{ mA}$ , $Z_S = Z_L = 50\ \Omega$ , $f = 1.8\text{ GHz}$	$IP_3$	-	24.5	-	dBm
1dB Compression point at output $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_L = 50\ \Omega$ , $f = 1.8\text{ GHz}$	$P_{-1dB}$	-	11	-	

<sup>1)</sup>  $G_{ma} = |S_{21e} / S_{12e}| (k - (k^2 - 1)^{1/2})$ ,  $G_{ms} = |S_{21e} / S_{12e}|$ 
<sup>2)</sup>  $IP_3$  value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is  $50\ \Omega$  from 0.1 MHz to 6 GHz

**SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):**
**Transistor Chip Data:**

IS =	82.84	aA	BF =	107.5	-	NF =	1	-
VAF =	28.383	V	IKF =	0.48731	A	ISE =	11.15	fA
NE =	3.19	-	BR =	5.5	-	NR =	1	-
VAR =	19.705	V	IKR =	0.02	A	ISC =	19.237	aA
NC =	1.172	-	RB =	5.4	$\Omega$	IRB =	0.72983	mA
RBM =	1.3	$\Omega$	RE =	0.31111	-	RC =	4	$\Omega$
CJE =	1.8063	fF	VJE =	0.8051	V	MJE =	0.46576	-
TF =	6.76	ps	XTF =	0.4219	-	VTF =	0.23794	V
ITF =	1	mA	PTF =	0	deg	CJC =	234	fF
VJC =	0.81969	V	MJC =	0.30232	-	XCJC =	0.3	-
TR =	2.324	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.73234	-	TNOM	300	K

All parameters are ready to use, no scaling is necessary.

**Package Equivalent Circuit:**


$L_{BI} =$	0.47	nH
$L_{BO} =$	0.53	nH
$L_{EI} =$	0.23	nH
$L_{EO} =$	0.05	nH
$L_{CI} =$	0.56	nH
$L_{EO} =$	0.58	nH
$C_{BE} =$	136	fF
$C_{CB} =$	6.9	fF
$C_{CE} =$	134	fF

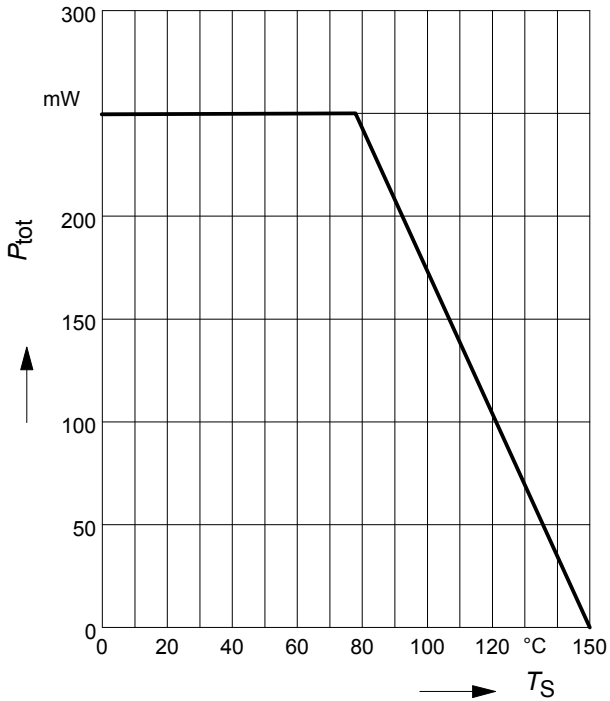
Valid up to 6GHz

For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet: <http://www.infineon.com/silicondiscretes>

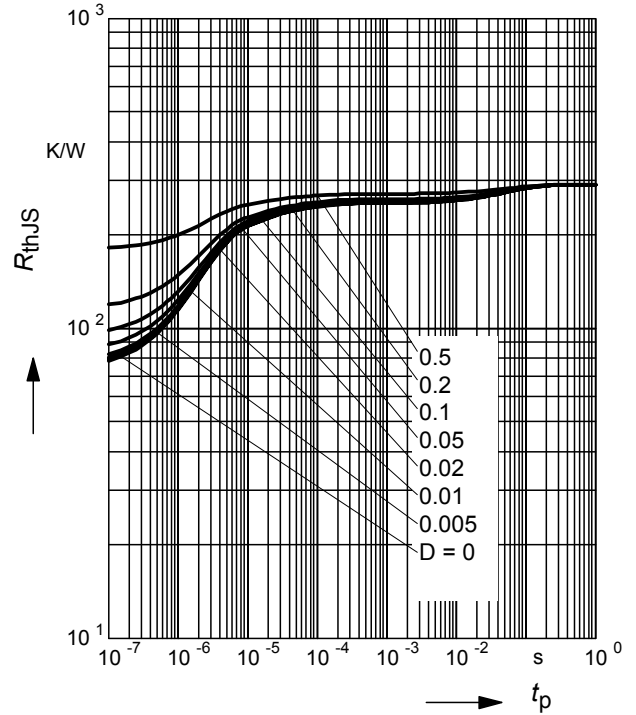
**For non-linear simulation:**

- Use transistor chip parameters in Berkeley SPICE 2G.6 syntax for all simulators.
- Simulation of the package is not necessary for frequencies < 100MHz.  
For higher frequencies please add the wiring of the package equivalent circuit around the non-linear transistor.

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

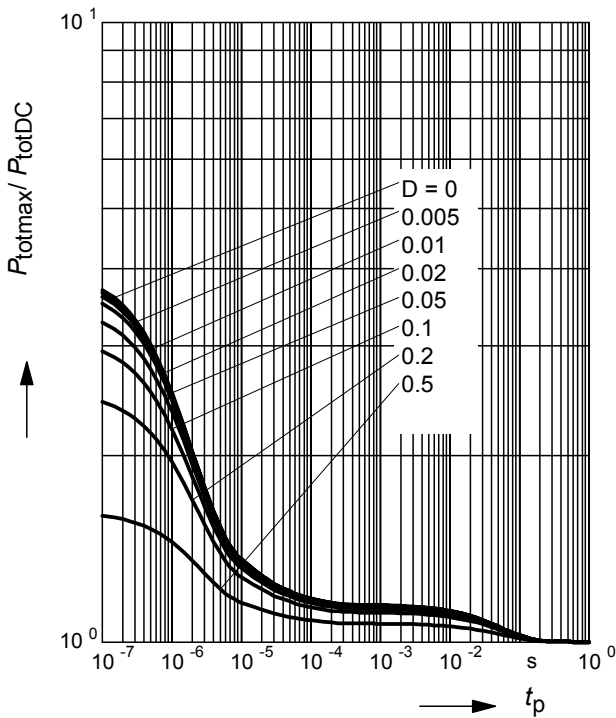


**Permissible Pulse Load  $R_{thJS} = f(t_p)$**



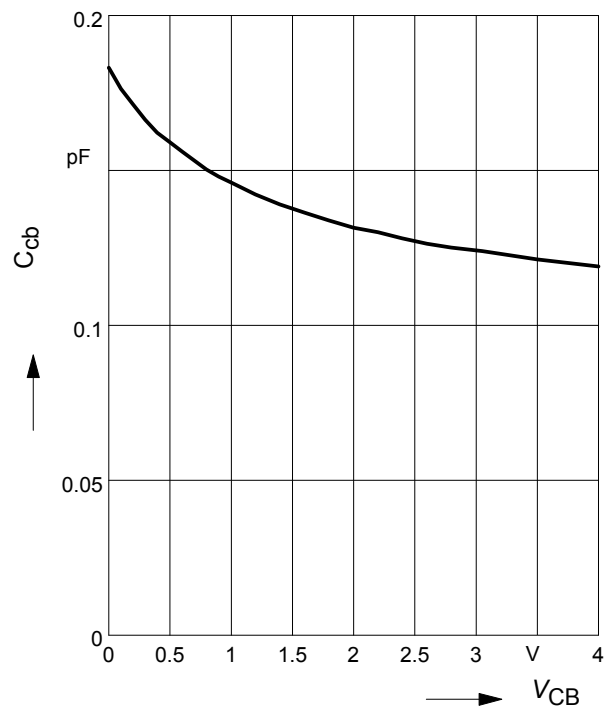
**Permissible Pulse Load**

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



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

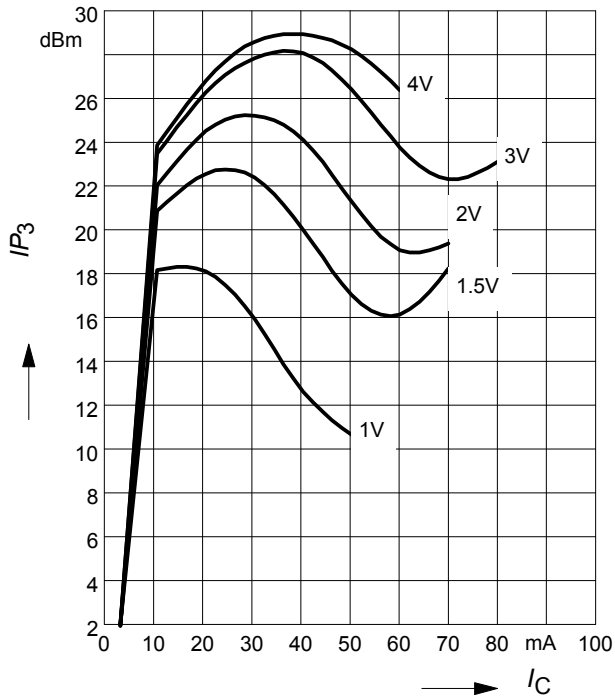
$f = 1\text{MHz}$



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

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

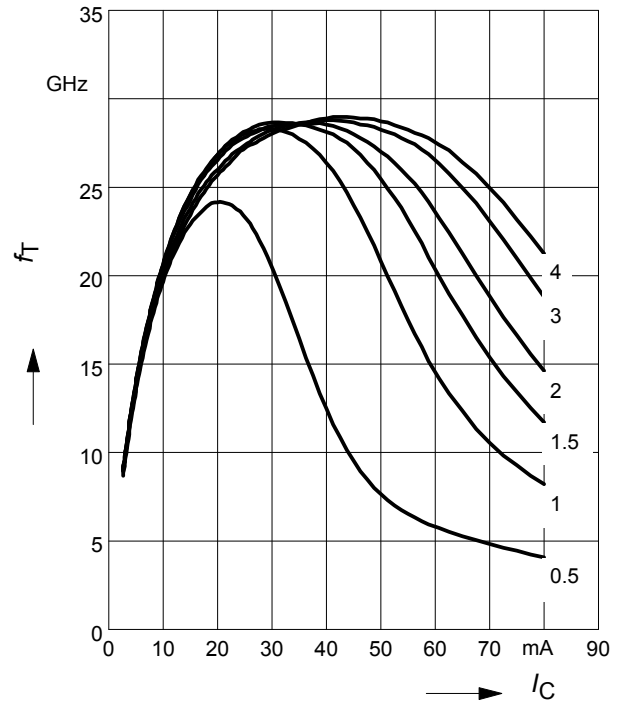
$V_{CE}$  = parameter,  $f = 1.8\text{GHz}$



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

$f = 1\text{GHz}$

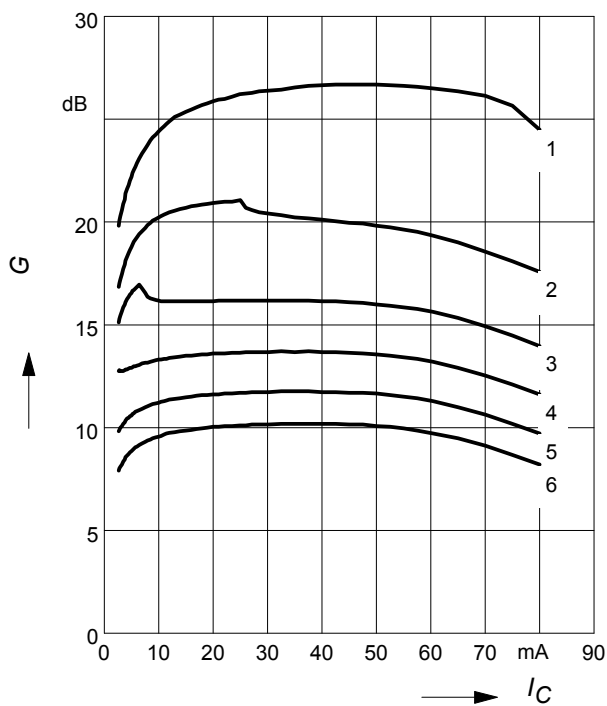
$V_{CE}$  = Parameter in V



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

$V_{CE} = 2\text{V}$

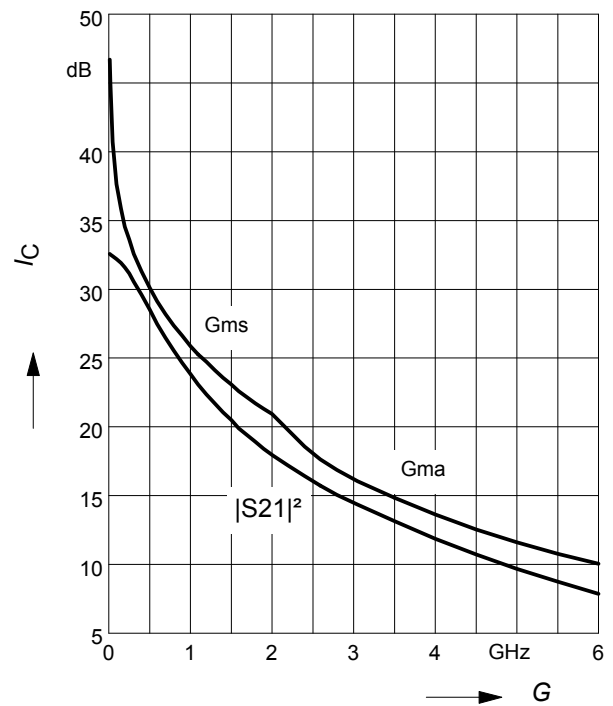
$f$  = Parameter in GHz



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

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

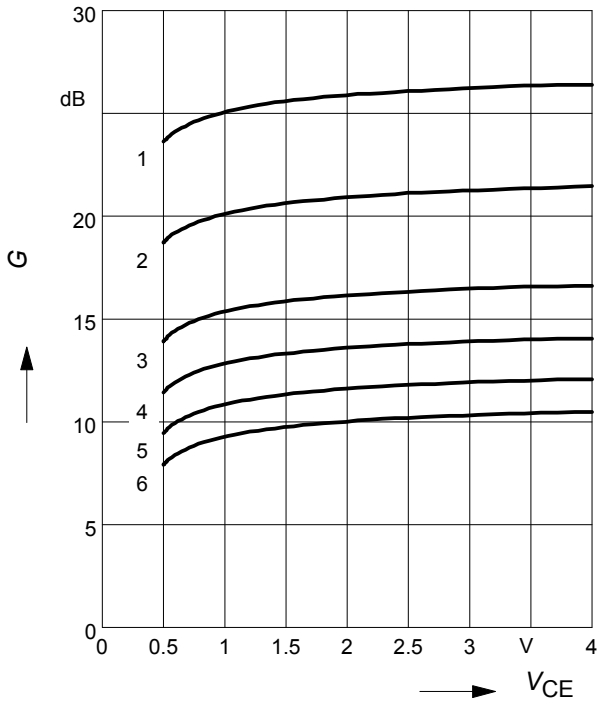
$V_{CE} = 2\text{V}, I_C = 20\text{mA}$



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

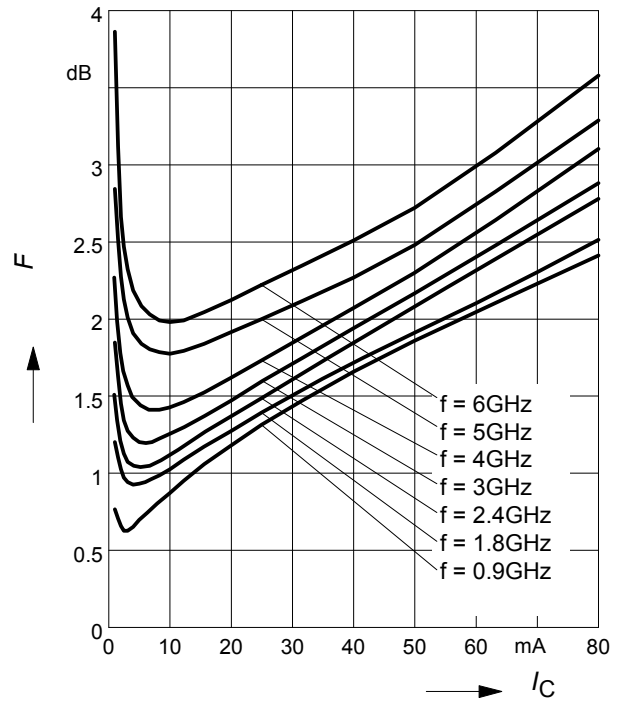
$I_C = 20\text{mA}$

$f = \text{Parameter in GHz}$



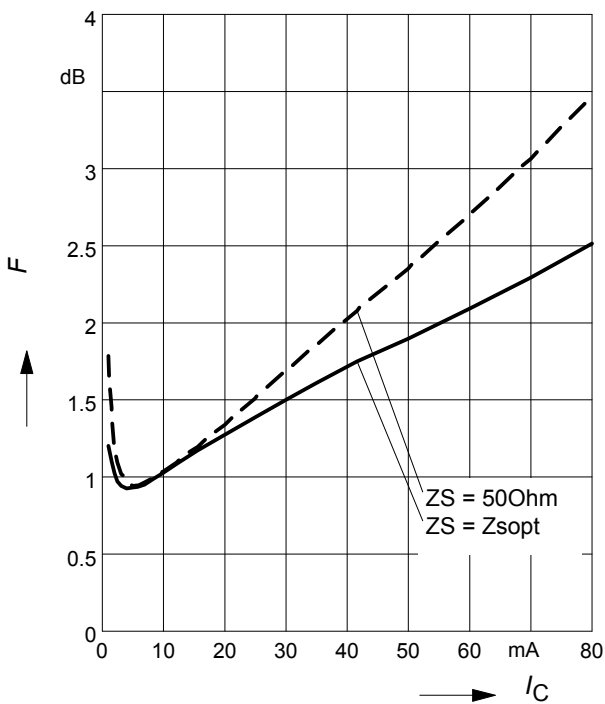
**Noise figure  $F = f(I_C)$**

$V_{CE} = 2\text{V}$ ,  $Z_S = Z_{Sopt}$



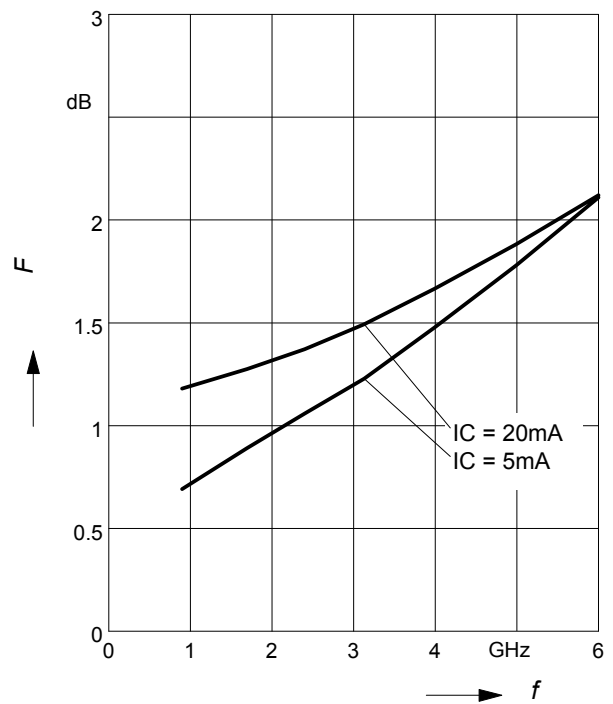
**Noise figure  $F = f(I_C)$**

$V_{CE} = 2\text{V}$ ,  $f = 1.8\text{GHz}$



**Noise figure  $F = f(f)$**

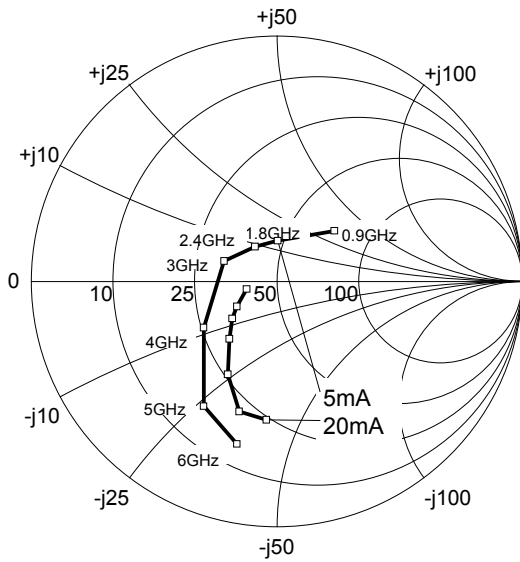
$V_{CE} = 2\text{V}$ ,  $Z_S = Z_{Sopt}$



Source impedance for min.

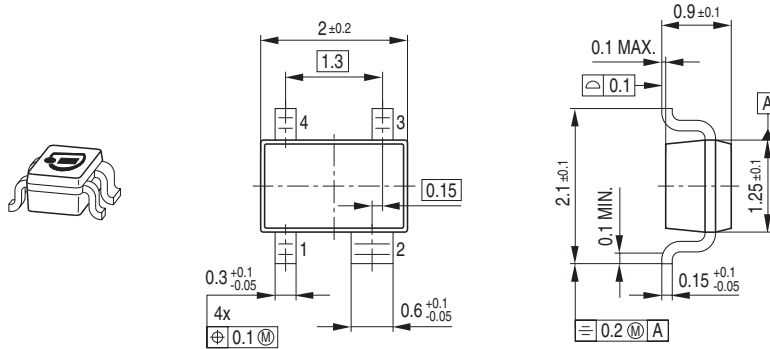
noise figure vs. frequency

$V_{CE} = 2V, I_C = 5mA / 20mA$

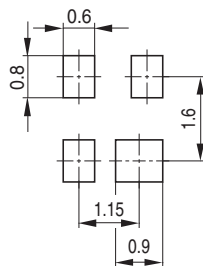




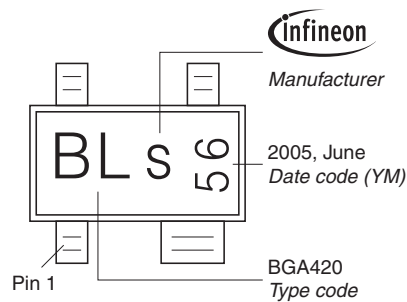
Package Outline



Foot Print

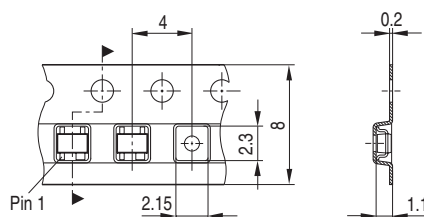


Marking Layout (Example)



Standard Packing

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



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