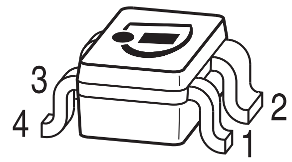
NPN Silicon Germanium RF Transistor



- High gain ultra low noise RF transistor
- Provides outstanding performance for a wide range of wireless applications up to 10 GHz and more
- Ideal for CDMA and WLAN applications
- Outstanding noise figure F = 0.5 dB at 1.8 GHz
  Outstanding noise figure F = 0.85 dB at 6 GHz
- High maximum stable gain
  G_{ms} = 27 dB at 1.8 GHz
- Gold metallization for extra high reliability
- 150 GHz f_T-Silicon Germanium technology
- Pb-free (RoHS compliant) package[1)]
- Qualified according AEC Q101

AEC Qualified RoHS

ESD (**E**lectro**s**tatic **d**ischarge) sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFP740	R7s	1=B	2=E	3=C	4=E	-	-	SOT343

[1]Pb-containing package may be available upon special request

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A > 0°C$ $T_A \leq 0°C$	V_{CEO}	 4 3.5	V
Collector-emitter voltage	V_{CES}	13	
Collector-base voltage	V_{CBO}	13	
Emitter-base voltage	V_{EBO}	1.2	
Collector current	I_C	30	mA
Base current	I_B	3	
Total power dissipation[1)] $T_S \leq 89°C$	P_{tot}	160	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}	$\leq$ 380	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	4.7	-	V
Collector-emitter cutoff current V_{CE} = 13 V, V_{BE} = 0	I_{CES}	-	-	30	µA
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	-	100	nA
Emitter-base cutoff current V_{EB} = 0.5 V, I_C = 0	I_{EBO}	-	-	3	µA
DC current gain I_C = 25 mA, V_{CE} = 3 V, pulse measured	h_{FE}	160	250	400	-

[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 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 = 25 mA, V_{CE} = 3 V, f = 2 GHz	f_T	-	42	-	GHz
Collector-base capacitance V_{CB} = 3 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.08	0.14	pF
Collector emitter capacitance V_{CE} = 3 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.24	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.44	-	
Noise figure	F				dB
I_C = 8 mA, V_{CE} = 3 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$		-	0.5	-	
I_C = 8 mA, V_{CE} = 3 V, f = 6 GHz, $Z_S = Z_{Sopt}$		-	0.85	-	
Power gain, maximum stable[1)] I_C = 25 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1.8 GHz	G_{ms}	-	27	-	dB
Power gain, maximum available[1)] I_C = 25 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 6 GHz	G_{ma}	-	17	-	dB
Transducer gain I_C = 25 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω,	$\|S_{21e}\|^2$				dB
f = 1.8 GHz		-	24.5	-	
f = 6 GHz		-	13.5	-	
Third order intercept point at output[2)] V_{CE} = 3 V, I_C = 25 mA, Z_S=Z_L=50 Ω, f = 1.8 GHz	IP_3	-	25	-	dBm
1dB Compression point at output I_C = 25 mA, V_{CE} = 3 V, Z_S=Z_L=50 Ω, f = 1.8 GHz	P_{-1dB}	-	11	-	

[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

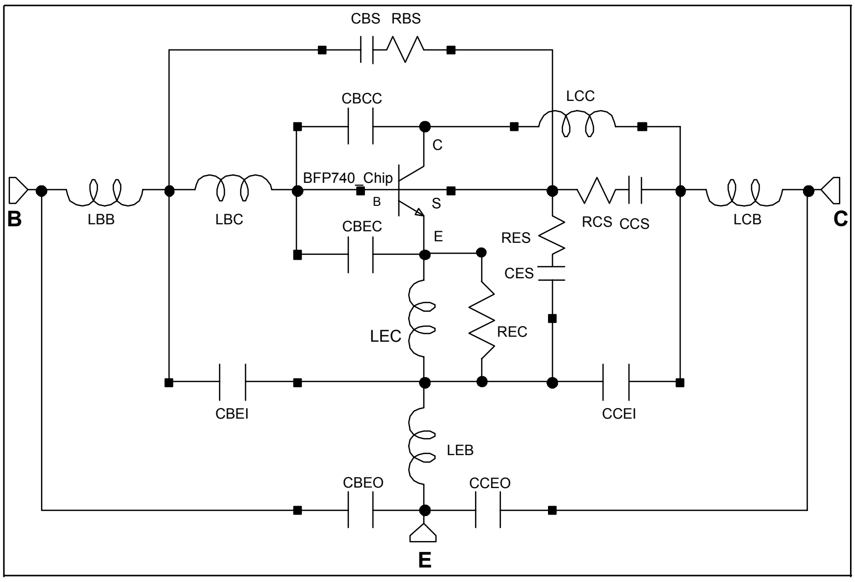
SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

Transistor Chip Data:

IS =	384.4	aA	BF =	1.1	k	NF =	1.018	-
VAF =	400	V	IKF =	512.1	mA	ISE =	4.296	fA
NE =	1.586	-	BR =	62	-	NR =	1	-
VAR =	1.28	V	IKR =	5	mA	ISC =	3.85	fA
NC =	1.5	-	RB =	3.23	Ω	IRB =	10	A
RBM =	1.69	Ω	RE =	90	mΩ	RC =	6.88	Ω
CJE =	220	fF	VJE =	590	mV	MJE =	70	m
TF =	2.1	ps	XTF =	3	-	VTF =	1.32	V
ITF =	290	mA	PTF =	100	mdeg	CJC =	99.5	fF
VJC =	550	mV	MJC =	152	m	XCJC =	10	m
TR =	13	ps	CJS =	79.7	fF	VJS =	570	mV
MJS =	180	m	XTB =	-2.2	-	EG =	1.11	eV
XTI =	910	m	FC =	950	m	TNOM	298	K
AF =	1	-	KF =	0	-			

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

Package Equivalent Circuit:

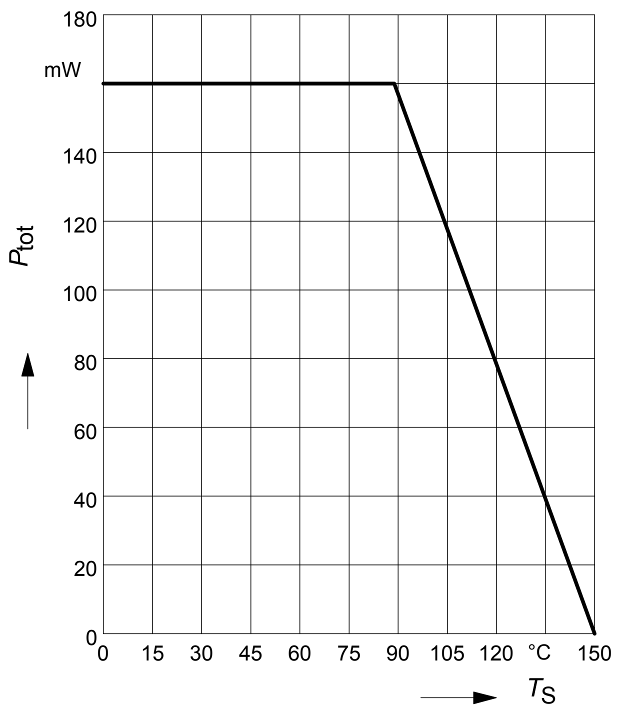


LBC =	0.1	nH
LCC =	0.2	nH
LEC =	20	pH
LBB =	0.6	nH
LCB =	0.88	nH
LEB =	90	pH
CBEC =	0.1	pF
CBCC =	1	fF
CES =	0.34	pF
CBS =	39.3	fF
CCS =	75	fF
CCEO =	0.177	pF
CBEO =	0.102	pF
CCEI =	0.224	pF
CBEI =	0.18	pF
REC =	670	mΩ
RBS =	3.5	kΩ
RCS =	1.65	kΩ
RES =	90	Ω

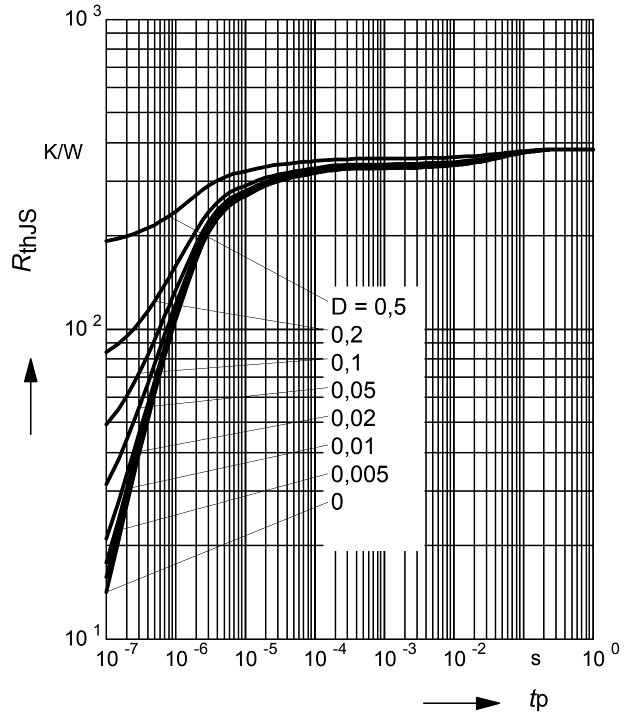
Valid up to 6GHz

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

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

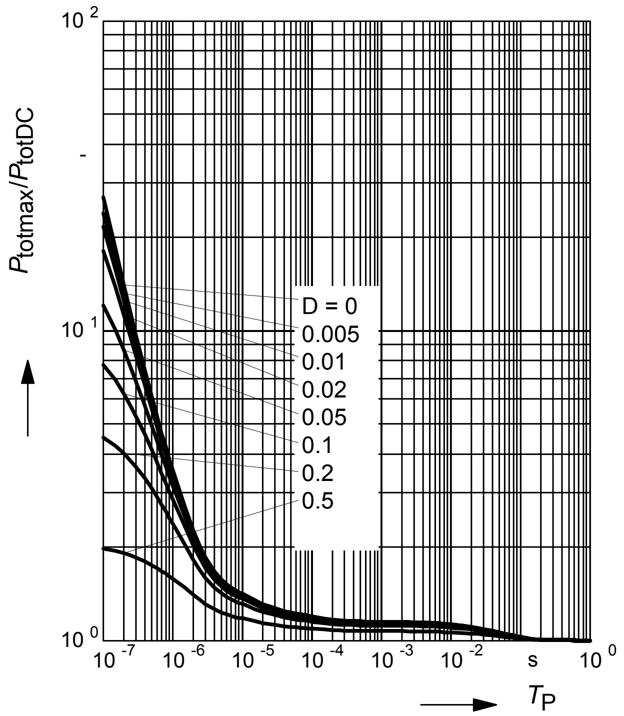


Permissible Pulse Load $R_{thJS} = f(t_p)$



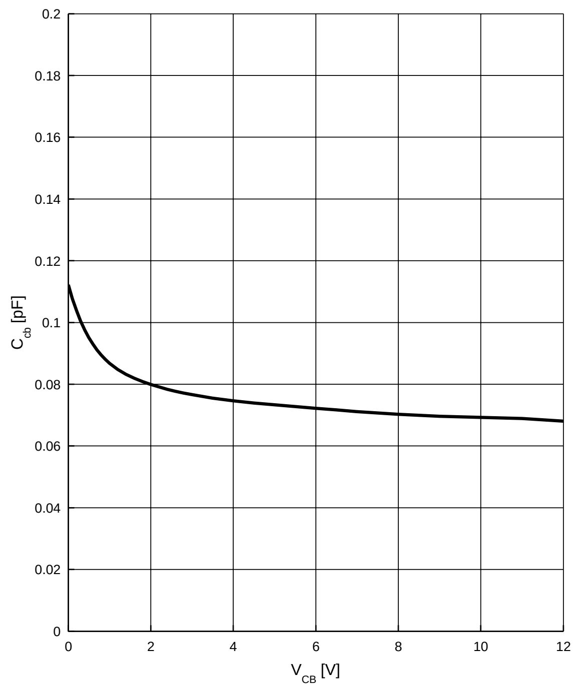
Permissible Pulse Load

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

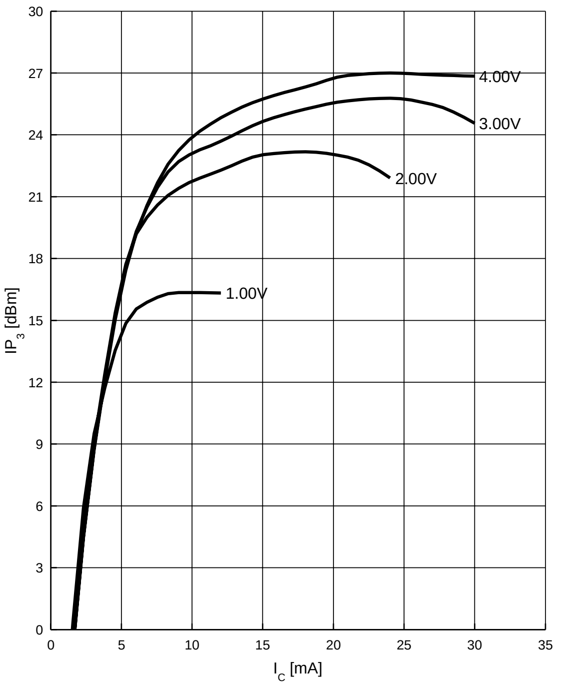


Collector-base capacitance $C_{cb} = f(V_{CB})$

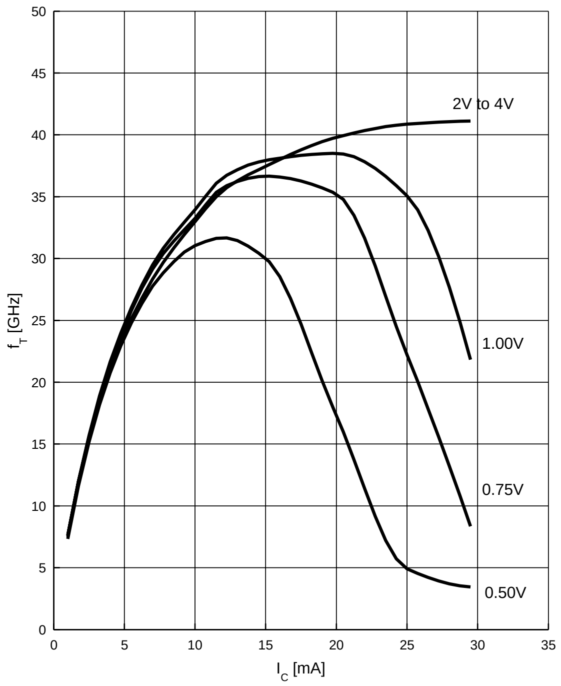
$f = 1$ MHz



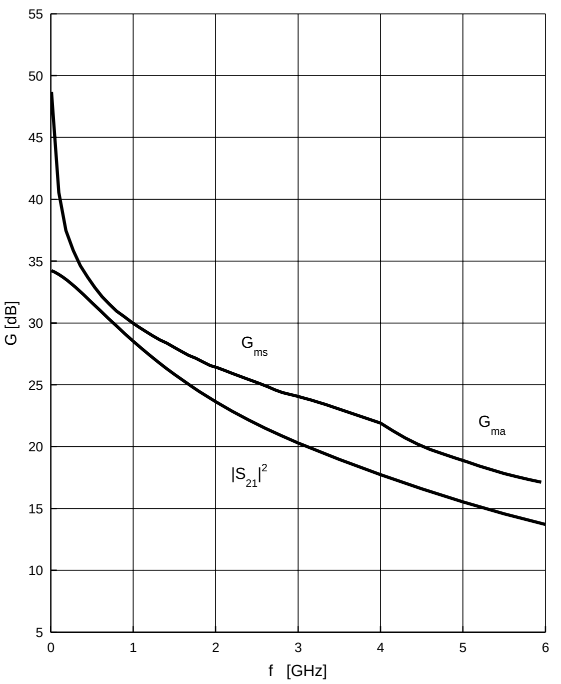
Third order Intercept Point $IP_3 = f(I_C)$
(Output, $Z_S = Z_L = 50\ \Omega$)
V_{CE} = parameter, f = 1.8 GHz



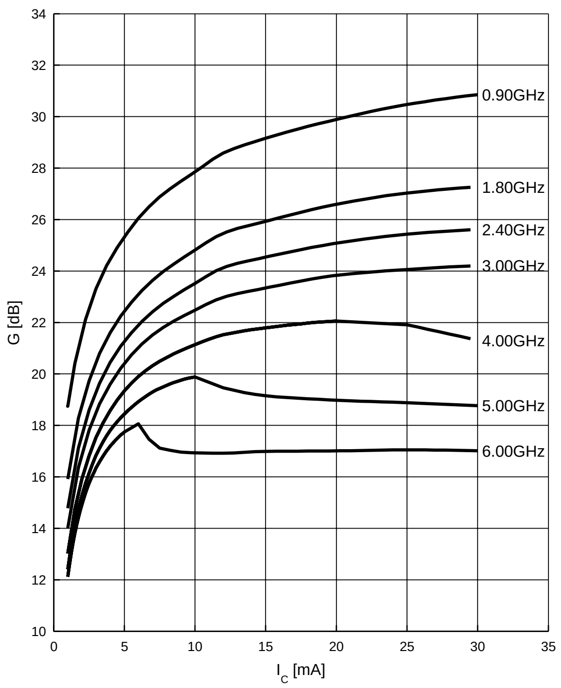
Transition frequency $f_T = f(I_C)$
f = 2 GHz
V_{CE} = parameter



Power gain G_{ma}, $G_{ms} = f(f)$
V_{CE} = 3 V, I_C = 25 mA



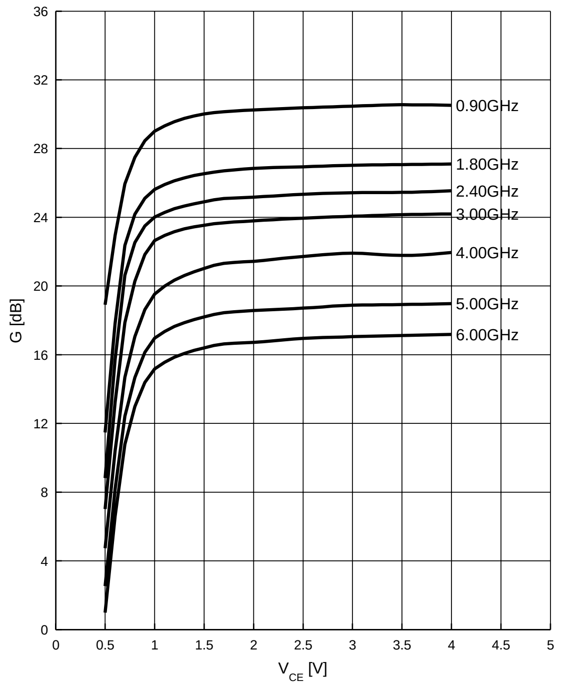
Power gain G_{ma}, $G_{ms} = f(I_C)$
V_{CE} = 3 V
f = parameter



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

I_C = 25 mA

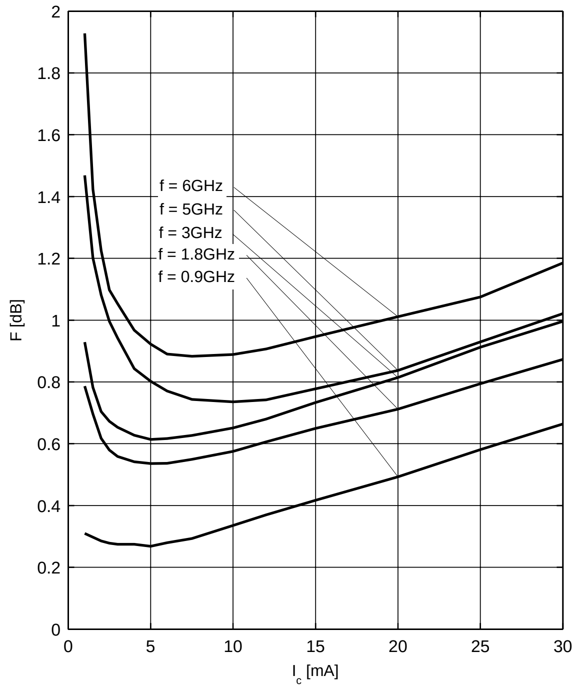
f = parameter



Noise figure $F = f(I_C)$

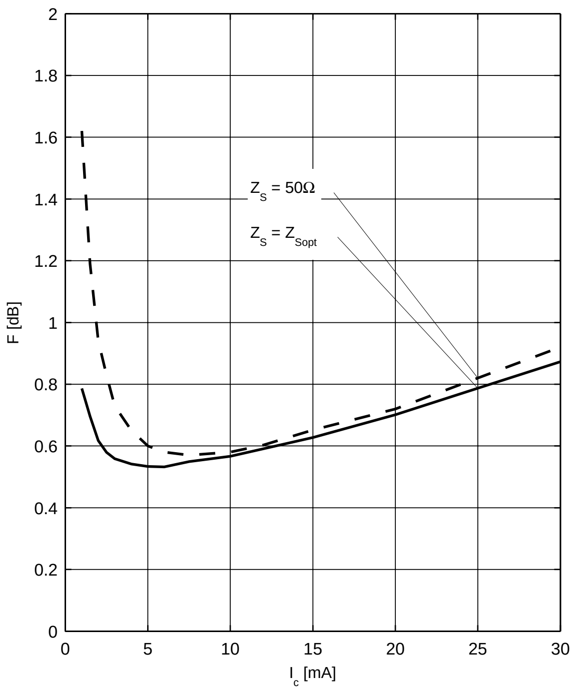
V_{CE} = 3V, f = parameter

$Z_S = Z_{Sopt}$



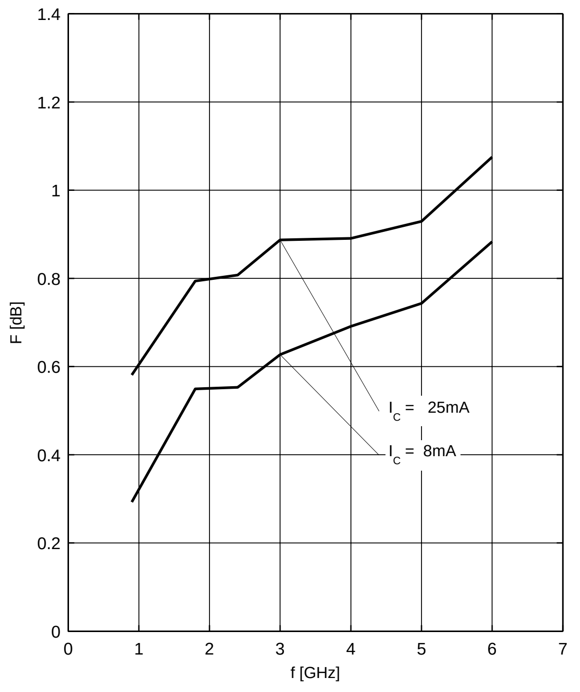
Noise figure $F = f(I_C)$

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

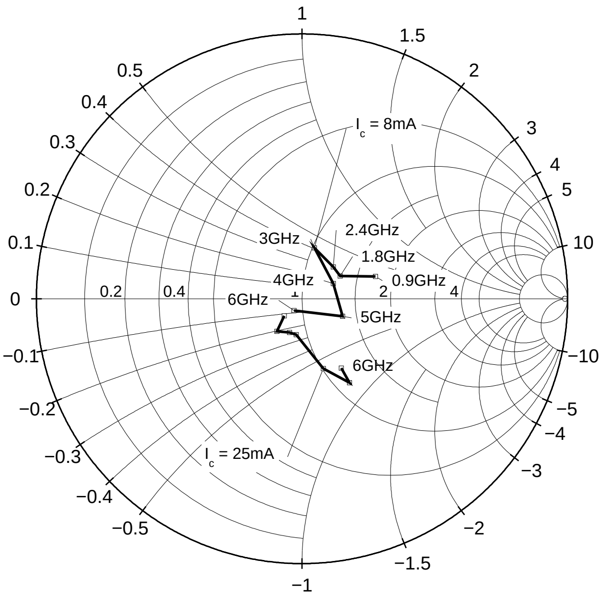


Noise figure $F = f(f)$

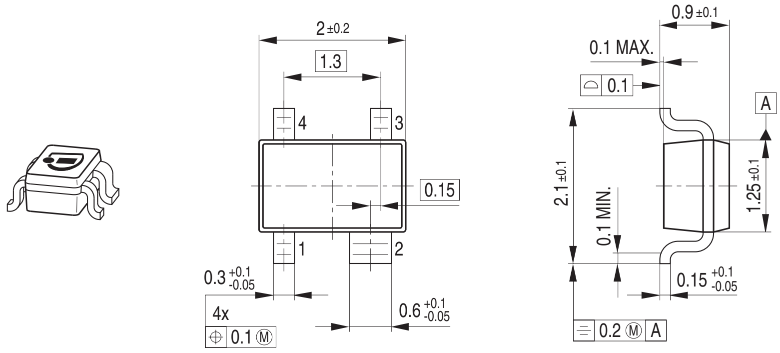
V_{CE} = 3 V, $Z_S = Z_{Sopt}$



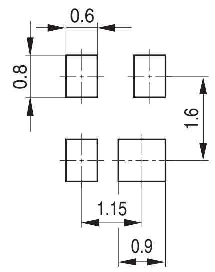
Source impedance for min.
noise figure vs. frequency
V_{CE} = 3 V, I_C = 8 mA / 25 mA



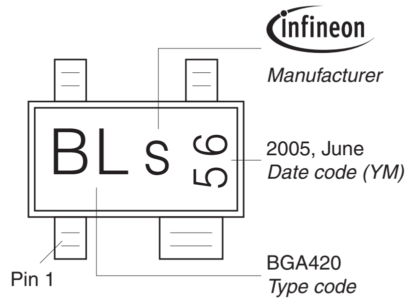
Package Outline



Foot Print

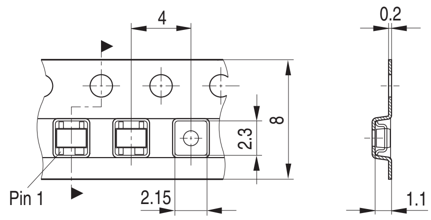


Marking Layout (Example)



Standard Packing

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



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