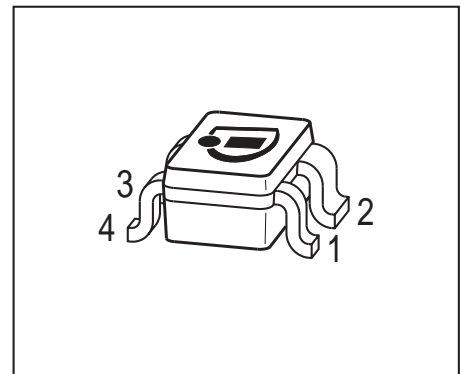


NPN Silicon RF Transistor*

- For ESD protected high gain low noise amplifier
- Excellent ESD performance
typical value 1000 V (HBM)
- Outstanding $G_{ms} = 21.5$ dB
Noise Figure $F = 0.9$ dB
- Gold metallization for high reliability
- SIEGET[®] 45 - Line
- Pb-free (RoHS compliant) package¹⁾
- Qualified according AEC Q101

* Short term description



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

Type	Marking	Pin Configuration						Package
BFP540ESD	AUs	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}	10	
Collector-base voltage	V_{CBO}	10	
Emitter-base voltage	V_{EBO}	1	
Collector current	I_C	80	mA
Base current	I_B	8	
Total power dissipation ²⁾ $T_S \leq 77^\circ\text{C}$	P_{tot}	250	mW
Junction temperature	T_j	150	$^\circ\text{C}$
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

¹Pb-containing package may be available upon special request

² 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}	≤ 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 $V_{CE} = 10 \text{ V}, V_{BE} = 0$	I_{CES}	-	-	10	μA
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	μA
DC current gain $I_C = 20 \text{ mA}, V_{CE} = 3.5 \text{ V}$, pulse measured	h_{FE}	50	110	170	-

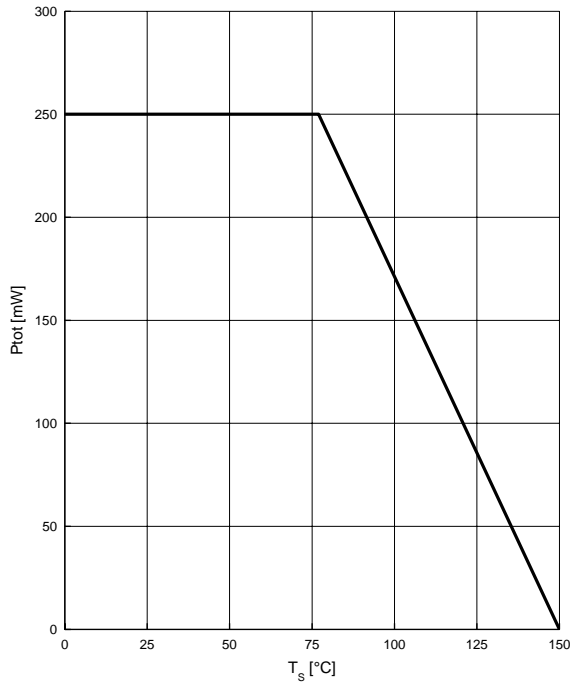
¹⁾For calculation of R_{thJA} please refer to Application Note Thermal Resistance

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

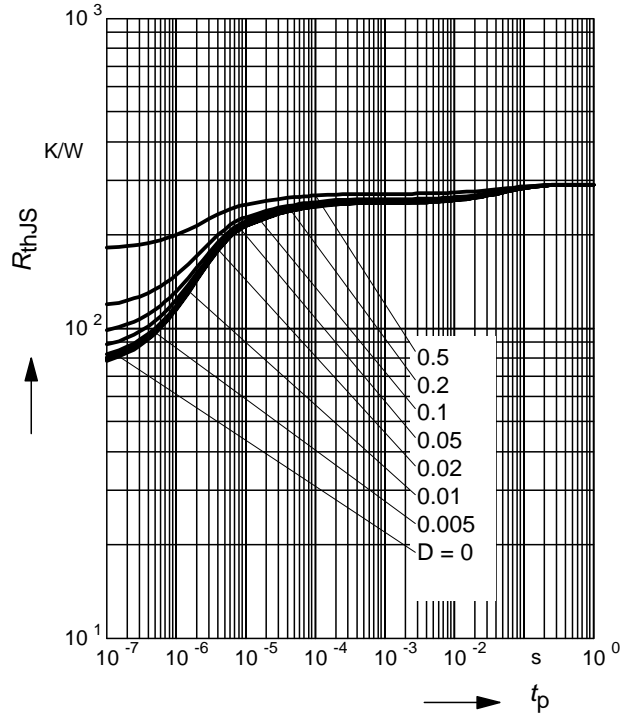
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 50 \text{ mA}$, $V_{CE} = 4 \text{ V}$, $f = 1 \text{ GHz}$	f_T	21	30	-	GHz
Collector-base capacitance $V_{CB} = 2 \text{ V}$, $f = 1 \text{ MHz}$, $V_{BE} = 0$, emitter 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}	-	0.41	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}$, $f = 1 \text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.59	-	
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 1.3	1.4 -	dB
Power gain, maximum stable ¹⁾ $I_C = 20 \text{ mA}$, $V_{CE} = 2 \text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8 \text{ GHz}$	G_{ms}	-	21.5	-	dB
Power gain, maximum available ¹⁾ $I_C = 20 \text{ mA}$, $V_{CE} = 2 \text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 3 \text{ GHz}$	G_{ma}	-	16	-	dB
Transducer gain $I_C = 20 \text{ mA}$, $V_{CE} = 2 \text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{GHz}$ $I_C = 20 \text{ mA}$, $V_{CE} = 2 \text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 3\text{GHz}$	$ S_{21e} ^2$	16 -	18.5 14	- -	dB
Third order intercept point at output ²⁾ $V_{CE} = 2 \text{ V}$, $I_C = 20 \text{ mA}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{GHz}$	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	-	

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 $P_{tot} = f(T_S)$

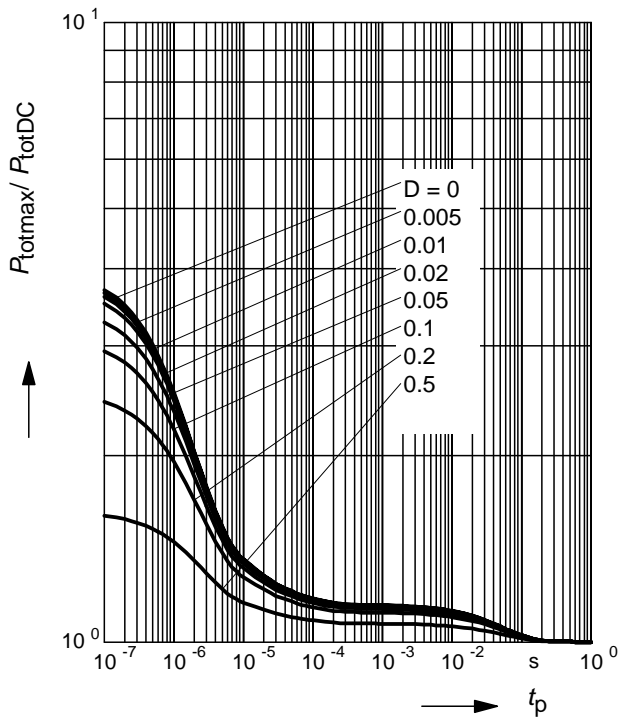


Permissible Pulse Load $R_{thJS} = f(t_p)$



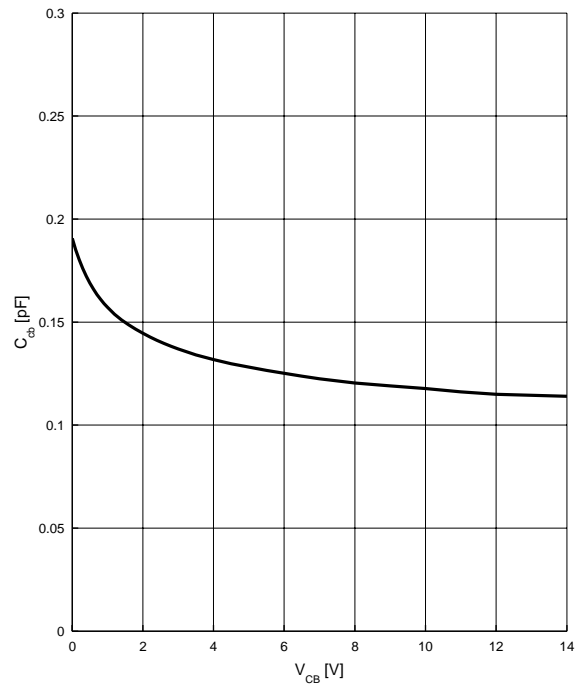
Permissible Pulse Load

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



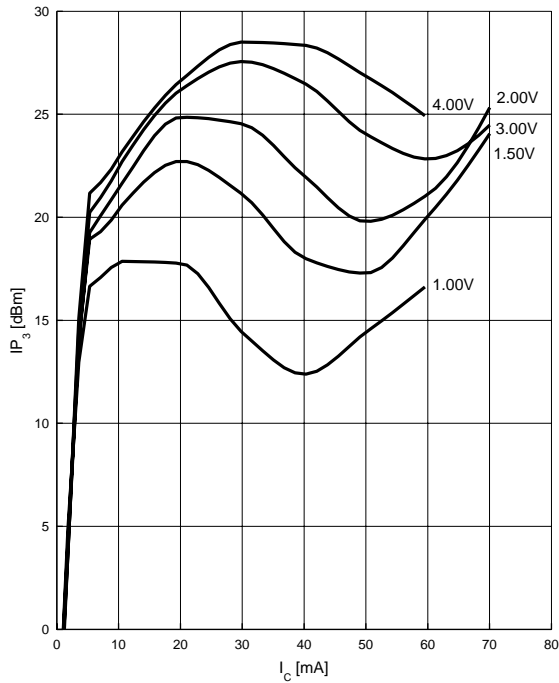
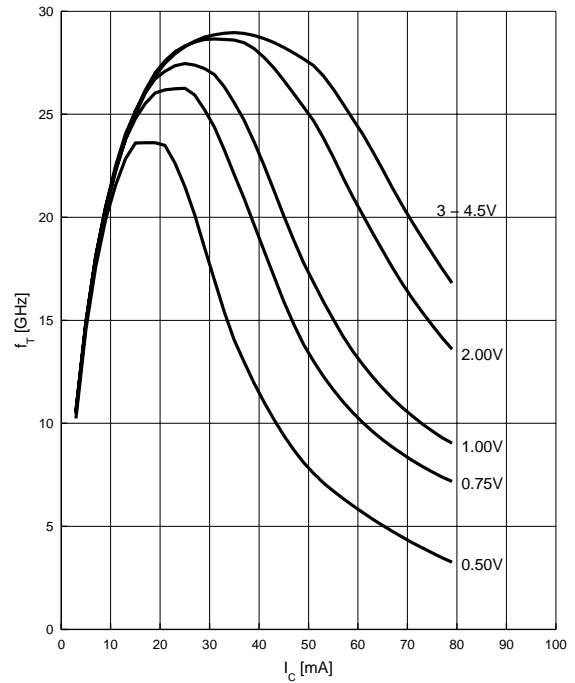
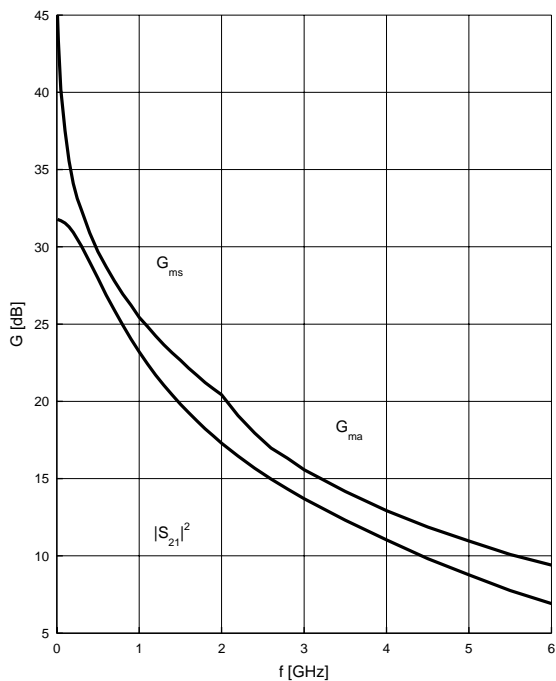
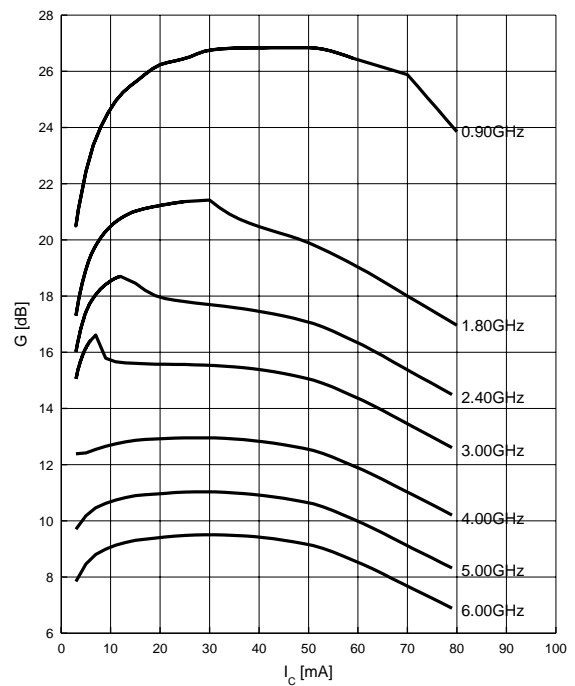
Collector-base capacitance $C_{cb} = f(V_{CB})$

$f = 1 \text{ MHz}$



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

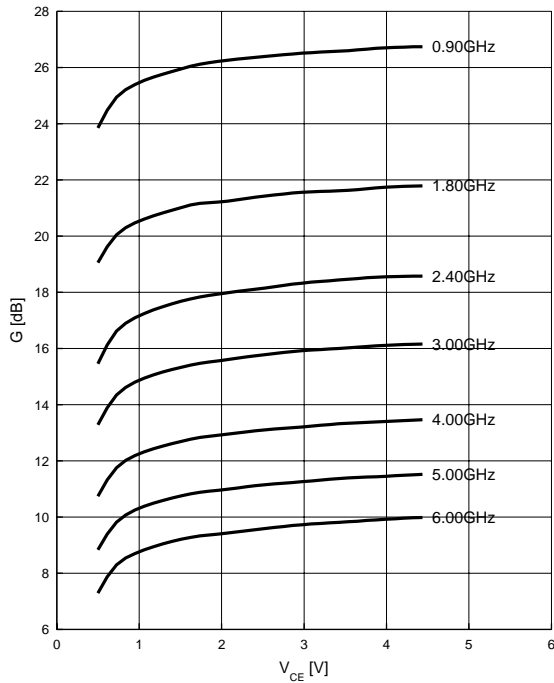
 (Output, $Z_S = Z_L = 50 \Omega$)

 V_{CE} = parameter, $f = 900 \text{ MHz}$

Transition frequency $f_T = f(I_C)$
 V_{CE} = parameter in V, $f = 2 \text{ GHz}$

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

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


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

$I_C = 200 \text{ mA}$

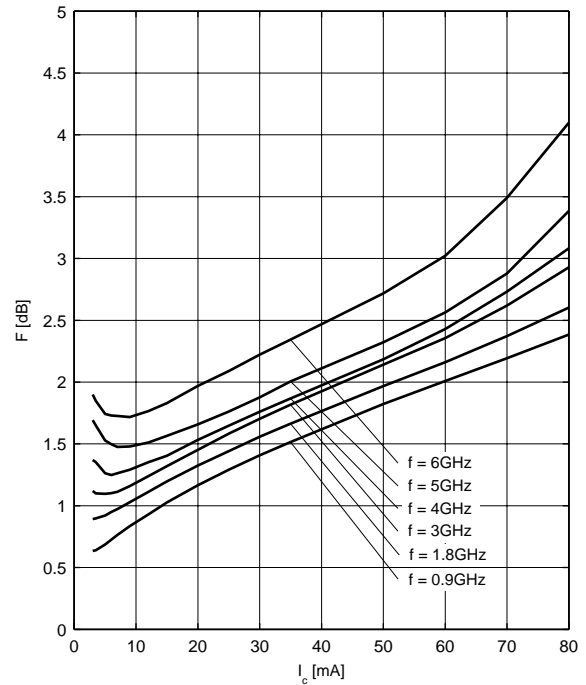
$f = \text{parameter in GHz}$



Noise figure $F = f(I_C)$

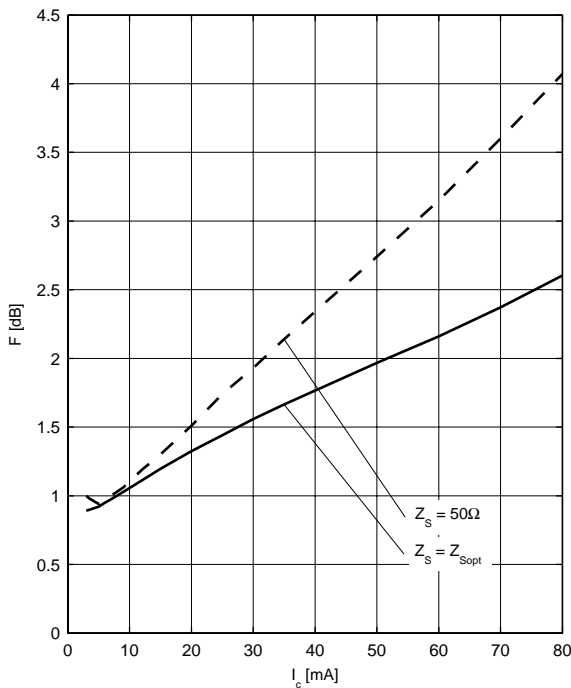
$V_{CE} = 3 \text{ V}$, $f = \text{parameter in GHz}$

$Z_S = Z_{Sopt}$



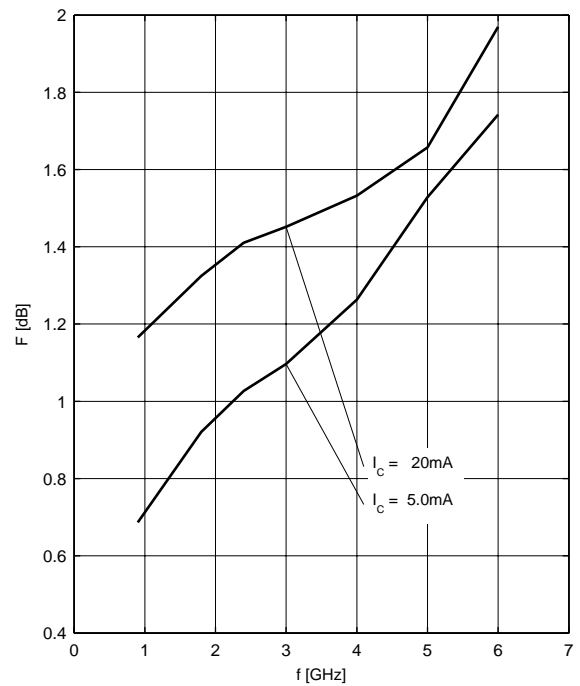
Noise figure $F = f(I_C)$

$V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$



Noise figure $F = f(f)$

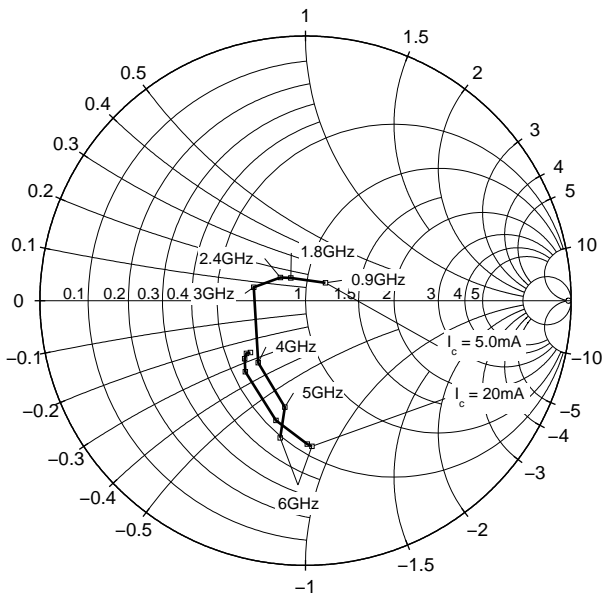
$V_{CE} = 3 \text{ V}$, $Z_S = Z_{Sopt}$



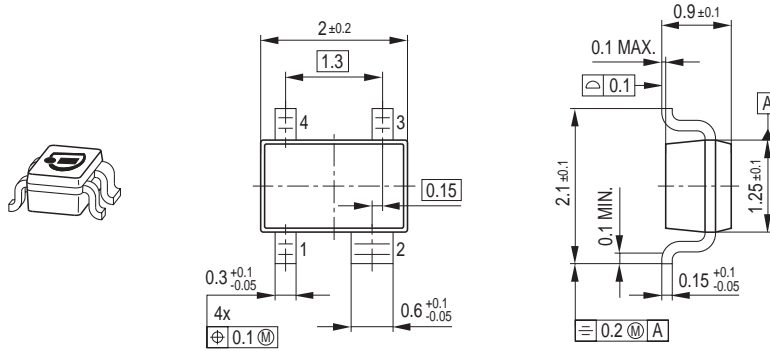
Source impedance for min.

noise figure vs. frequency

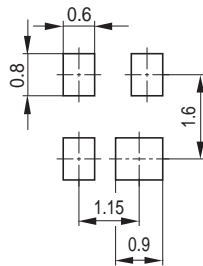
$V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA} / 20\text{ mA}$



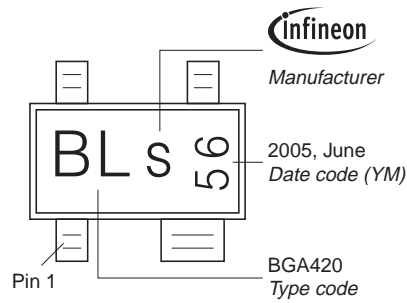
Package Outline



Foot Print

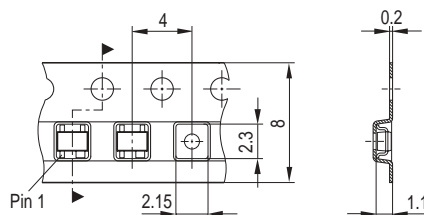


Marking Layout (Example)



Standard Packing

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



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