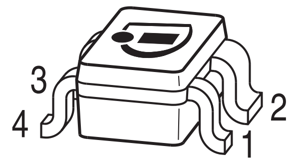
Low Noise Silicon Bipolar RF Transistor



- For ESD protected high gain low noise amplifier
- High ESD robustness
  typical value 1000 V (HBM)
- Outstanding G_{ms} = 21.5 dB @ 1.8 GHz
  Minimum noise figure NF_{min} = 0.9 dB @ 1.8 GHz
- Pb-free (RoHS compliant) and halogen-free package
  with visible leads
- Qualification report according to AEC-Q101 available

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

Type	Marking	Pin Configuration						Package
BFP540ESD	AUs	1=B	2=E	3=C	4=E	-	-	SOT343

Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}		V
T_A = 25 °C		4.5	
T_A = -55 °C		4	
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[1)]	P_{tot}	250	mW
$T_S \leq$ 77°C			
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 emitter 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 °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	-	V
Collector-emitter cutoff current V_{CE} = 10 V, V_{BE} = 0	I_{CES}	-	-	10	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}	-	-	10	µA
DC current gain I_C = 20 mA, V_{CE} = 3.5 V, pulse measured	h_{FE}	50	110	170	-

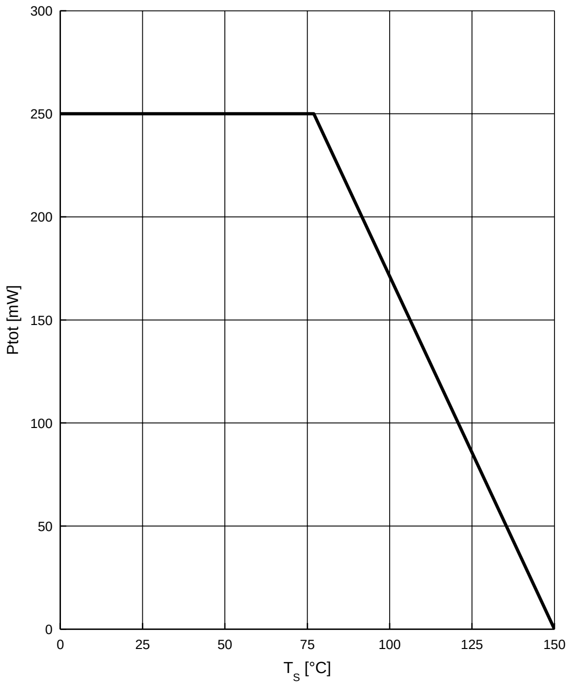
[1]For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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

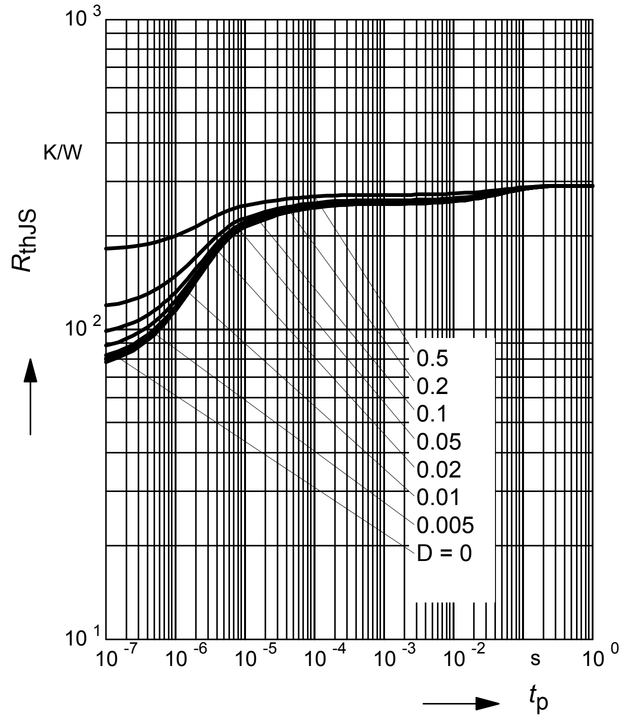
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 50 mA, V_{CE} = 4 V, f = 1 GHz	f_T	21	30	-	GHz
Collector-base capacitance V_{CB} = 2 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.14	0.24	pF
Collector emitter capacitance V_{CE} = 2 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.41	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.59	-	
Minimum noise figure I_C = 5 mA, V_{CE} = 2 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$ I_C = 5 mA, V_{CE} = 2 V, f = 3 GHz, $Z_S = Z_{Sopt}$	NF_{min}	 - -	 0.9 1.3	 1.4 -	dB
Power gain, maximum stable[1)] I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1.8 GHz	G_{ms}	-	21.5	-	dB
Power gain, maximum available[1)] I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 3 GHz	G_{ma}	-	16	-	dB
Transducer gain I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50Ω, f = 1.8GHz I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50Ω, f = 3GHz	$\|S_{21e}\|^2$	 16 -	 18.5 14	 - -	dB
Third order intercept point at output[2)] V_{CE} = 2 V, I_C = 20 mA, $Z_S = Z_L$ = 50Ω, f = 1.8GHz	$IP3$	-	24.5	-	dBm
1dB compression point at output I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50Ω, f = 1.8GHz	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

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

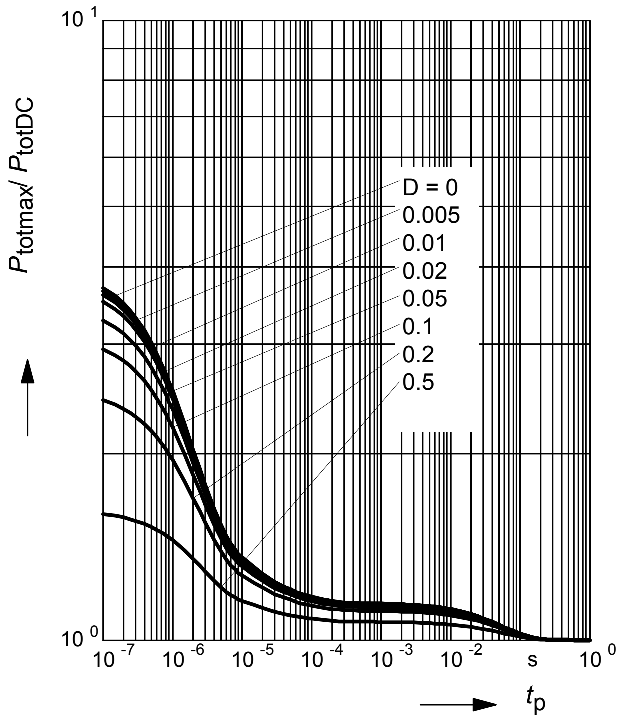


Permissible Pulse Load $R_{thJS} = f(t_p)$



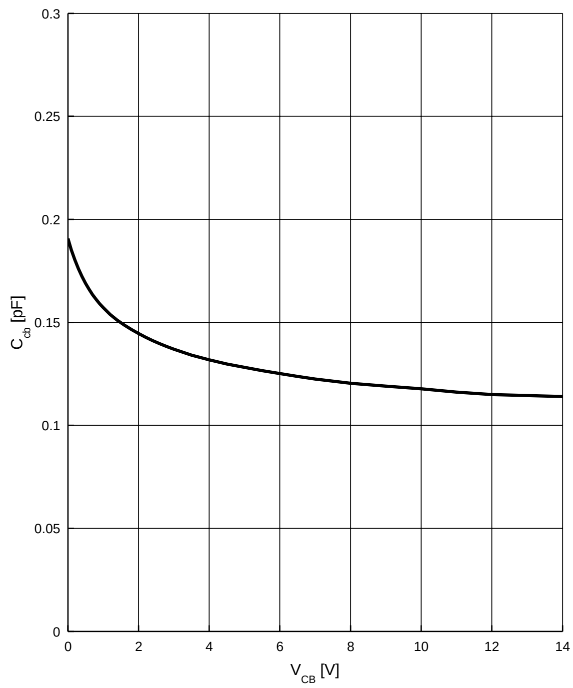
Permissible Pulse Load

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

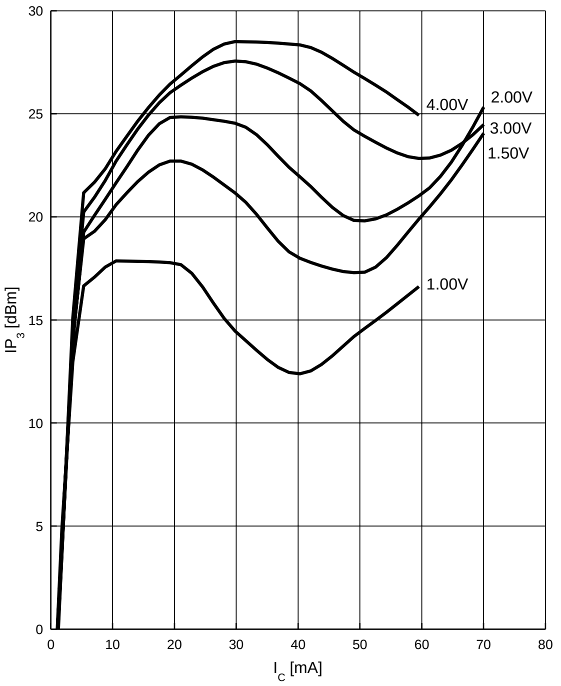


Collector-base capacitance $C_{cb} = f(V_{CB})$

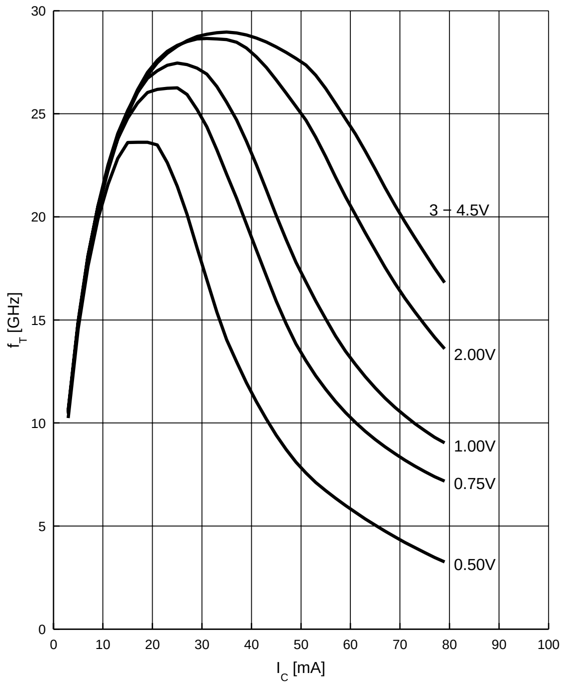
f = 1 MHz



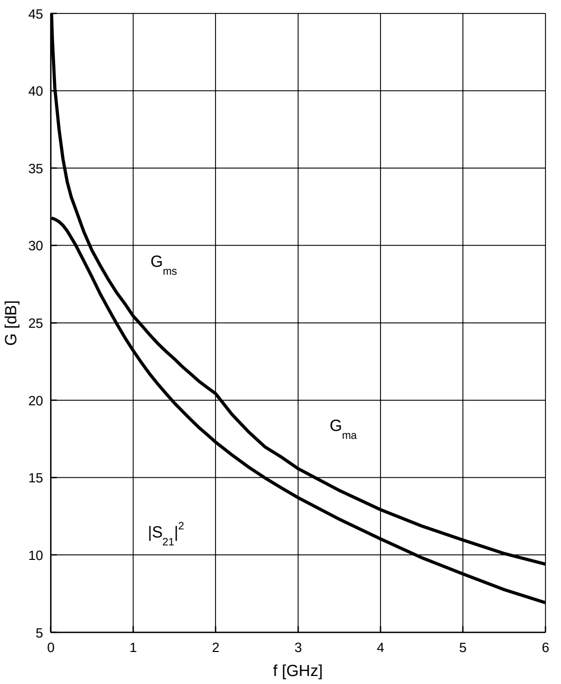
Third order Intercept Point $IP_3 = f\ (I_C)$
(Output, $Z_S = Z_L = 50\ \Omega$)
V_{CE} = parameter, f = 900 MHz



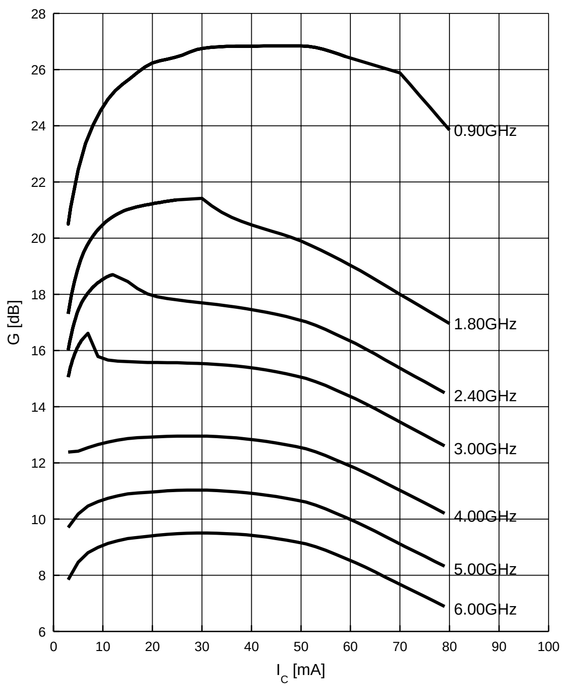
Transition frequency $f_T = f(I_C)$
V_{CE} = parameter in V, f = 2 GHz



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



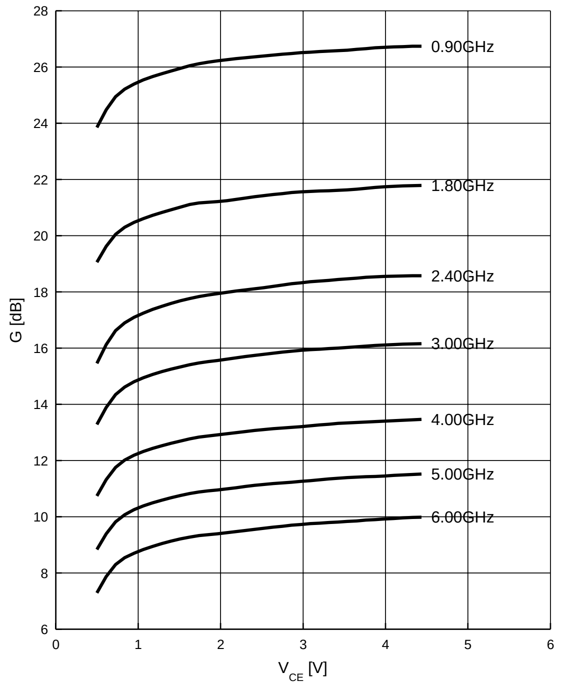
Power gain G_{ma}, $G_{ms} = f\ (I_C)$
V_{CE} = 3 V
f = parameter in GHz



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

I_C = 20 mA

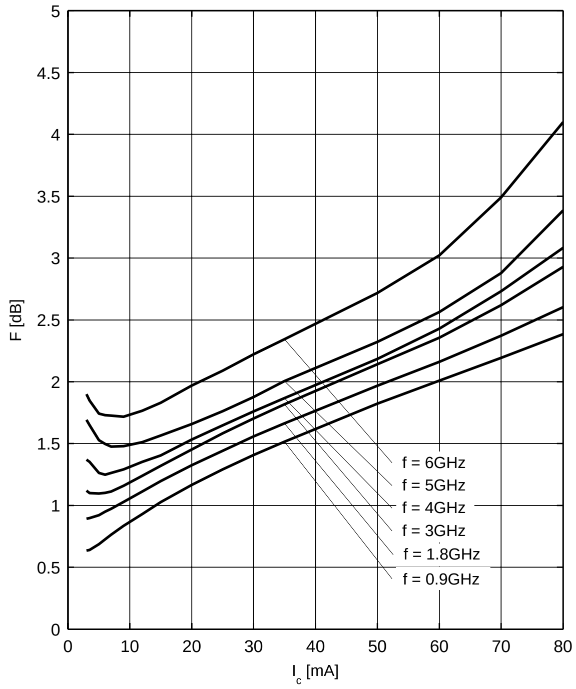
f = parameter in GHz



Noise figure F = f(I_C)

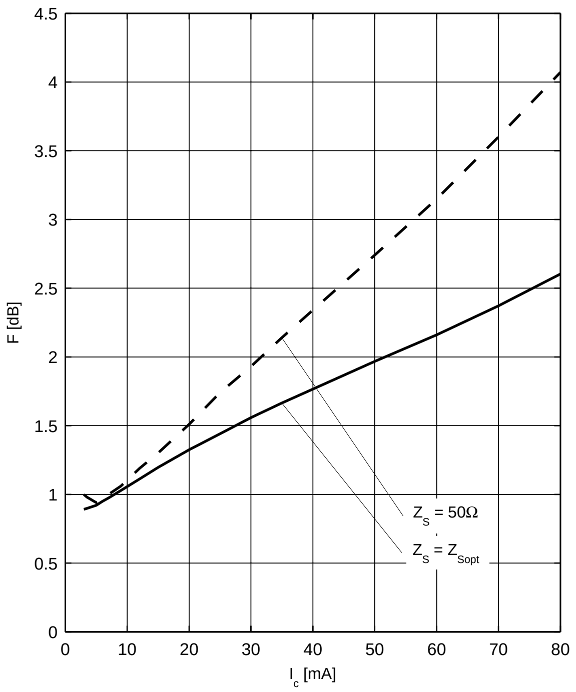
V_{CE} = 3 V, f = parameter in GHz

Z_S = Z_{Sopt}



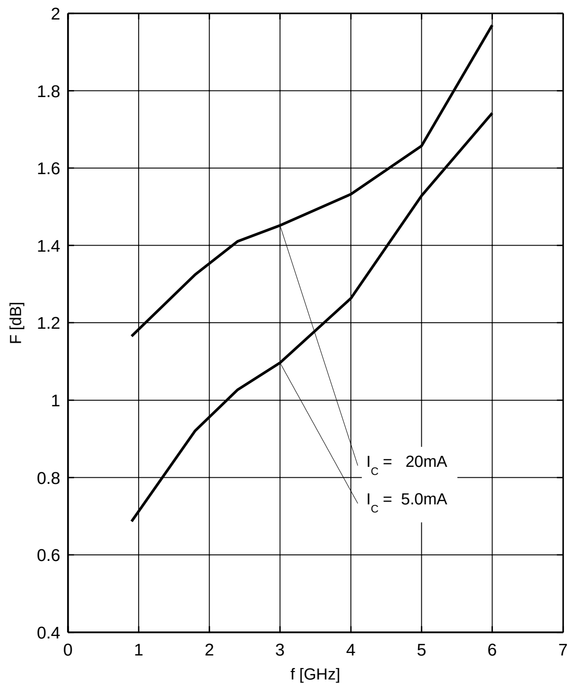
Noise figure F = f(I_C)

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

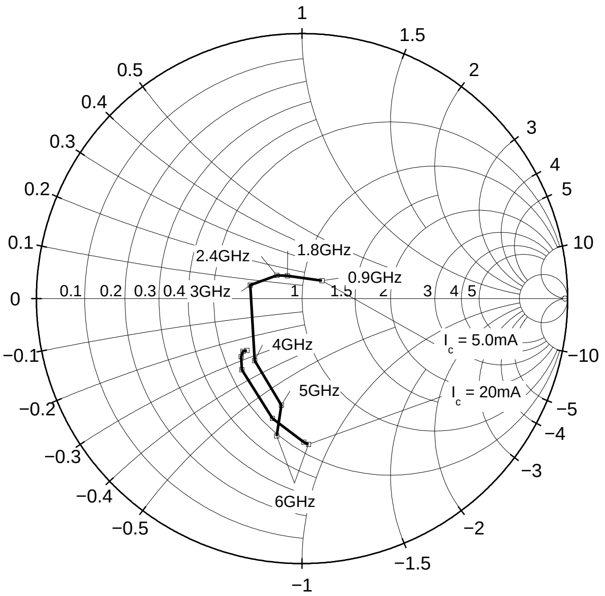


Noise figure F = f(f)

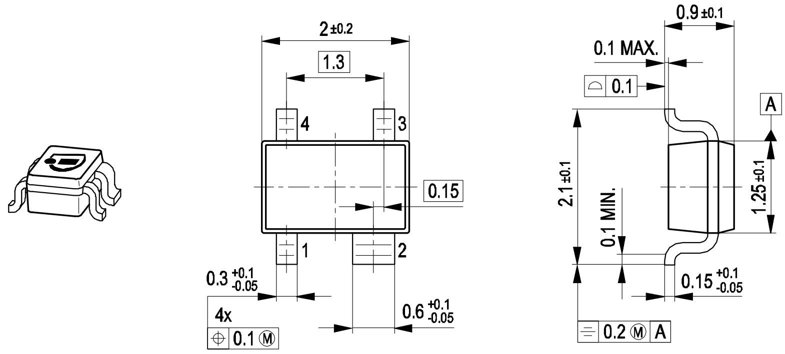
V_{CE} = 3 V, Z_S = Z_{Sopt}



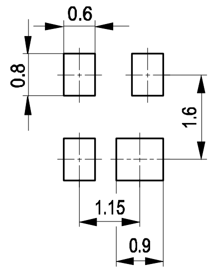
Source impedance for min.
noise figure vs. frequency
V_{CE} = 3 V, I_C = 5 mA / 20 mA



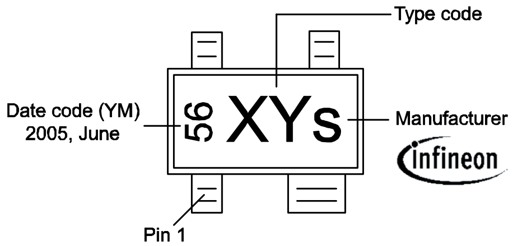
Package Outline



Foot Print

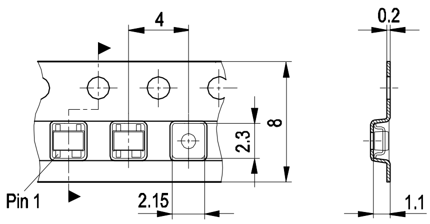


Marking Layout (Example)



Standard Packing

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



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