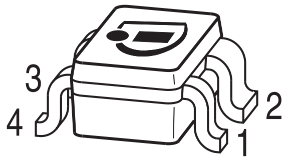
Low Noise Silicon Bipolar RF Transistor



- For low current applications
- For oscillators up to 12 GHz
- Minimum noise figure NF_{min} = 1.25 dB at 1.8 GHz
  Outstanding G_{ms} = 23 dB at 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**
BFP405	ALs	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		4.1	
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	1.5	
Collector current	I_C	25	mA
Base current	I_B	3	
Total power dissipation[1)] $T_S \leq$ 110 °C	P_{tot}	75	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 emitter lead at the soldering point to the pcb

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1]	R_{thJS}	530	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} = 15 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}	-	-	1	µA
DC current gain I_C = 5 mA, V_{CE} = 4 V, pulse measured	h_{FE}	60	95	130	-

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

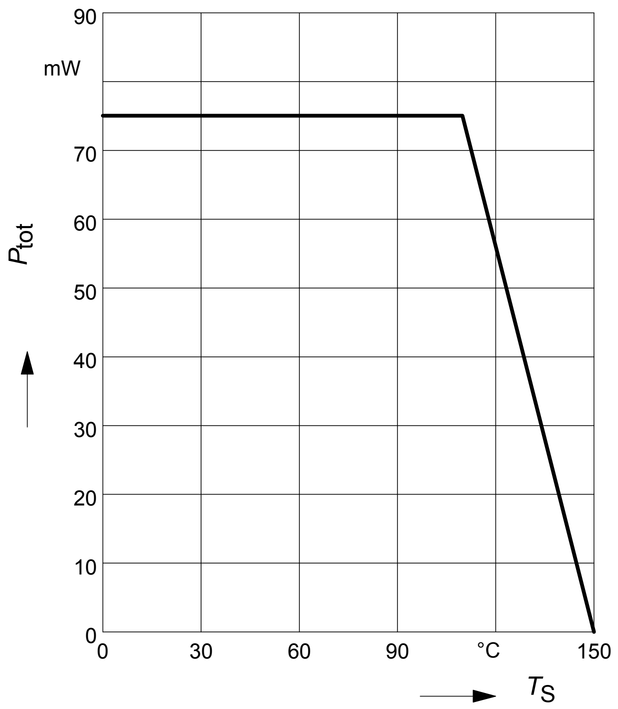
Electrical Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	**Symbol**	**Values**			**Unit**
		min.	**typ.**	**max.**	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 10 mA, V_{CE} = 3 V, f = 2 GHz	f_T	18	25	-	GHz
Collector-base capacitance V_{CB} = 2 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.05	0.1	pF
Collector emitter capacitance V_{CE} = 2 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}	-	0.29	-	
Minimum noise figure I_C = 2 mA, V_{CE} = 2 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$	NF_{min}	-	1.25	-	dB
Power gain, maximum stable[1] I_C = 5 mA, V_{CE} = 2 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1.8 GHz	G_{ms}	-	23	-	dB
Insertion power gain V_{CE} = 2 V, I_C = 5 mA, f = 1.8 GHz, $Z_S = Z_L$ = 50 Ω	$\|S_{21}\|^2$	14	18.5	-	
Third order intercept point at output[2] V_{CE} = 2 V, I_C = 5 mA, f = 1.8 GHz, $Z_S = Z_L$ = 50 Ω	$IP3$	-	15	-	dBm
1dB compression point at output I_C = 5 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz	P_{-1dB}	-	5	-	

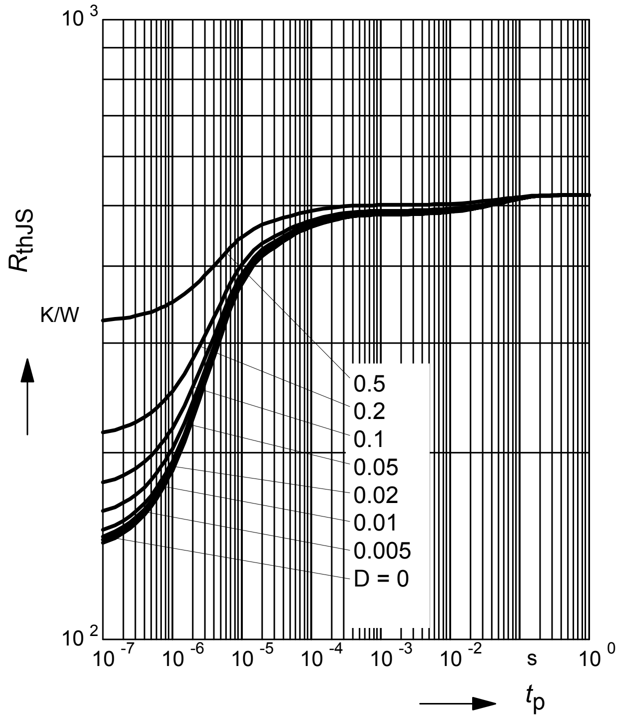
[1] $G_{ms} = |S_{21} / S_{12}|$

[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 $P_{tot} = f(T_S)$

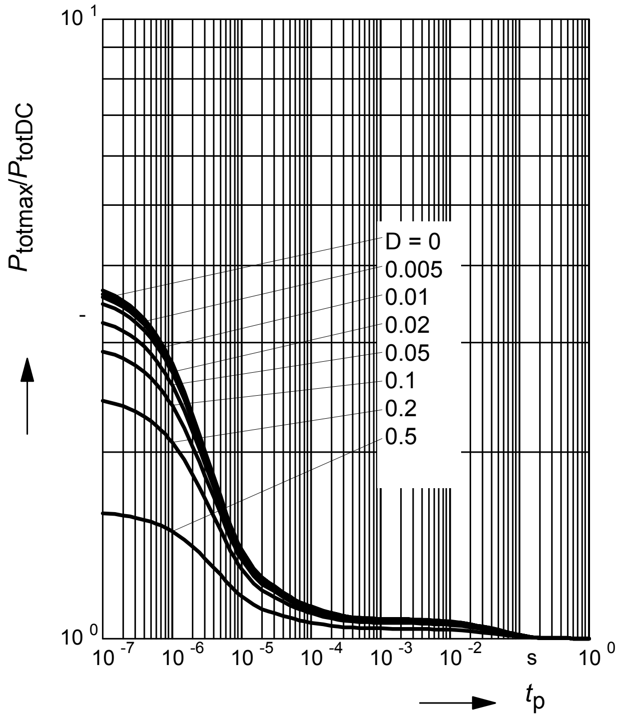


Permissible Pulse Load $R_{thJS} = f(t_p)$



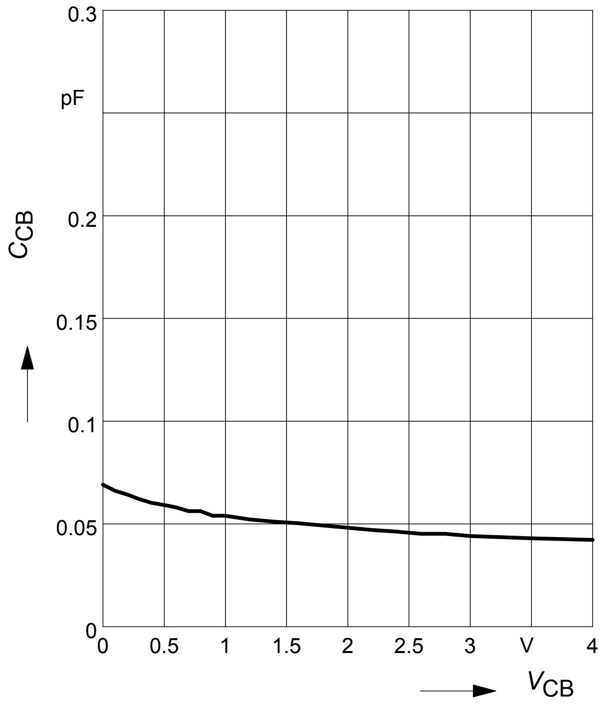
Permissible Pulse Load

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



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

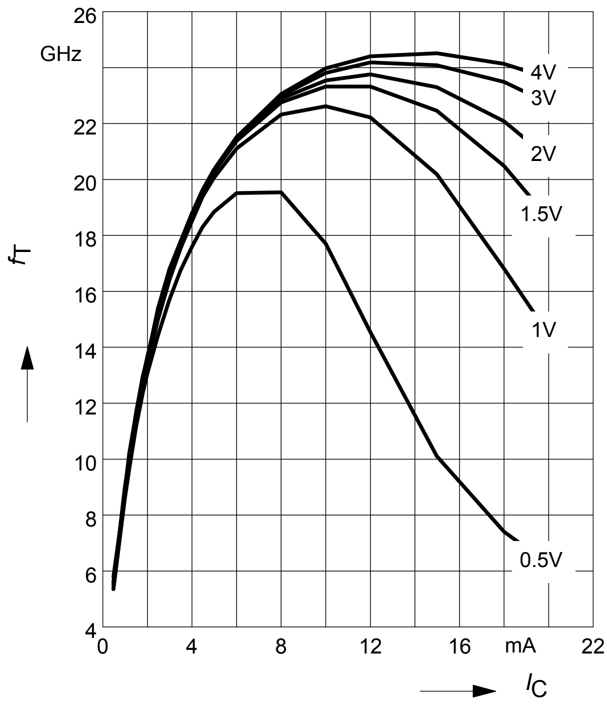
f = 1MHz



Transition frequency $f_T = f(I_C)$

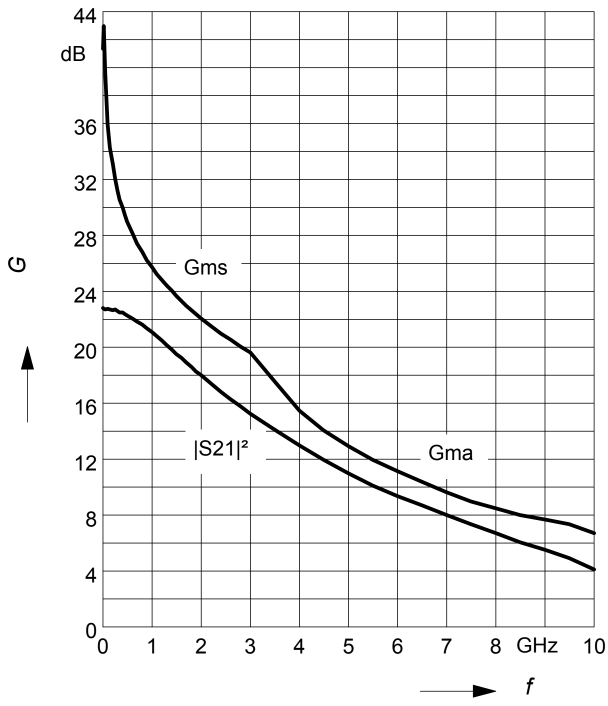
f = 2 GHz

V_{CE} = parameter in V



Power gain G_{ma}, G_{ms}, $|S_{21}|^2 = f(f)$

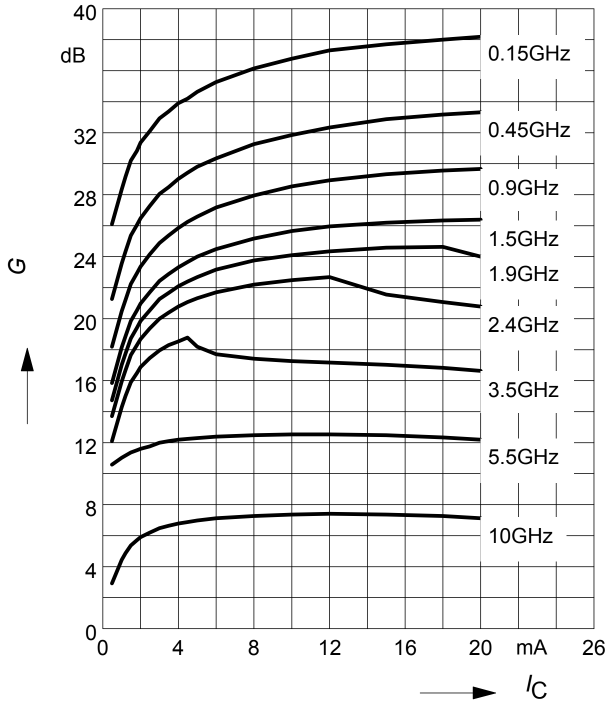
V_{CE} = 3 V, I_C = 5 mA



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

V_{CE} = 3V

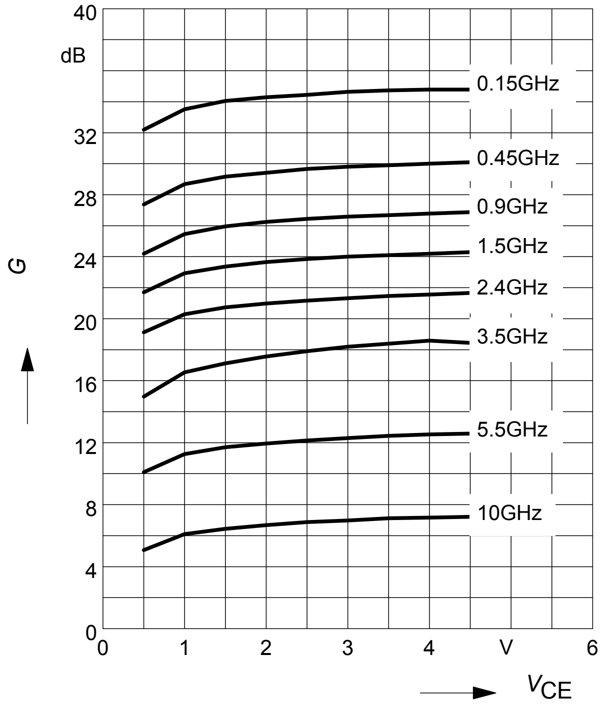
f = parameter in GHz



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

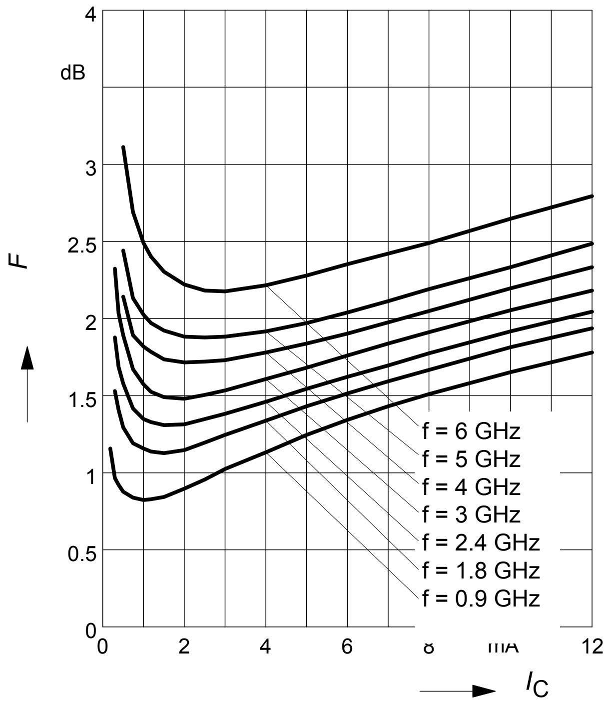
I_C = 5 mA

f = parameter in GHz



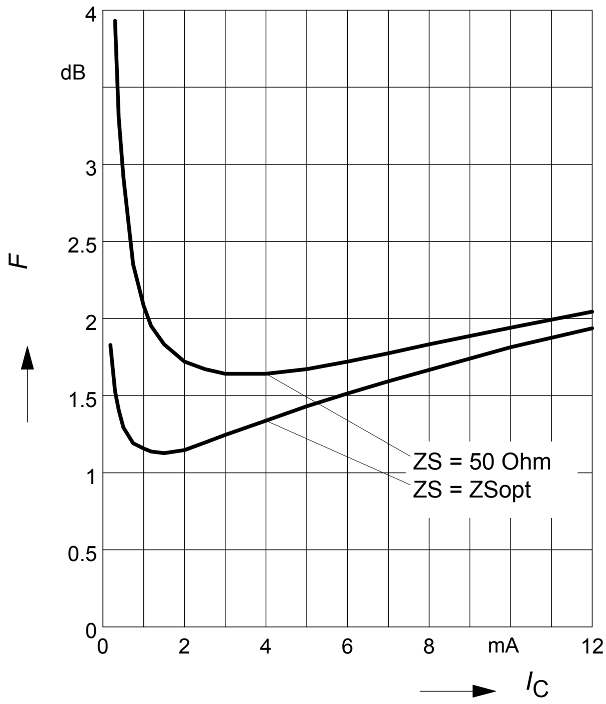
Noise figure $F = f(I_C)$

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



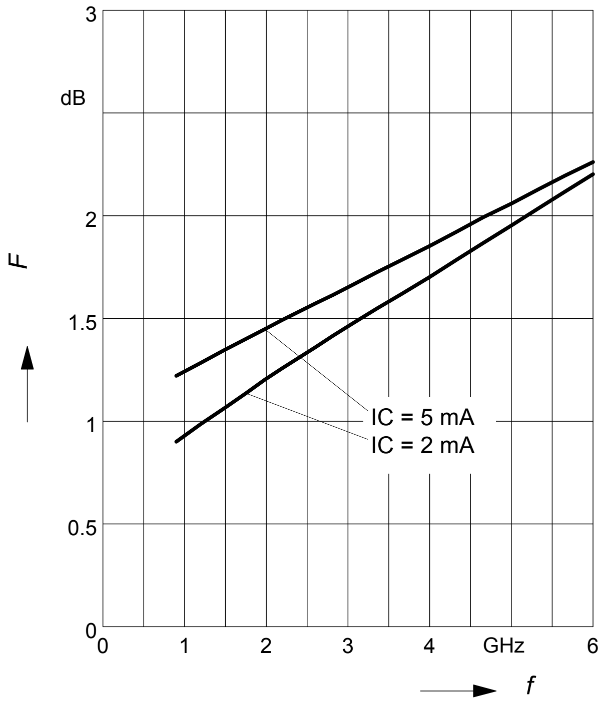
Noise figure $F = f(I_C)$

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



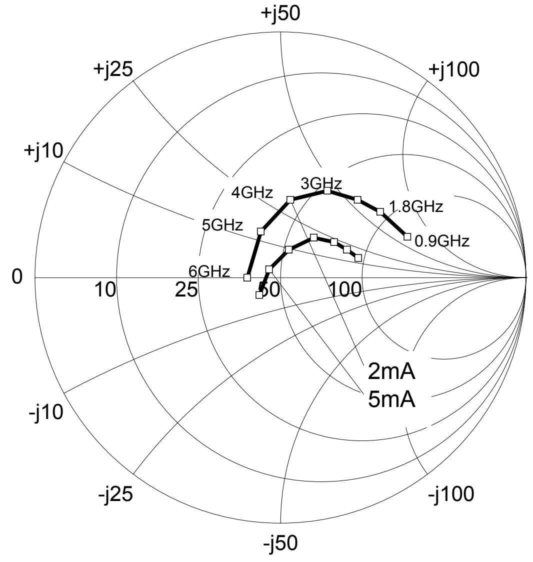
Noise figure $F = f(f)$

$V_{CE} = 1$ V, $Z_S = Z_{Sopt}$



Source impedance for min. noise figure vs. frequency

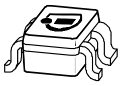
$V_{CE} = 3$ V, $I_C = 2$ mA / 5 mA

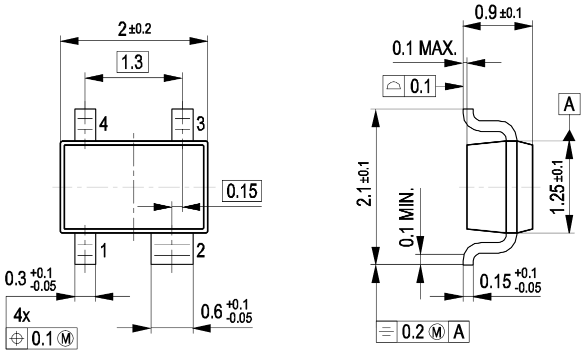


SPICE GP Model

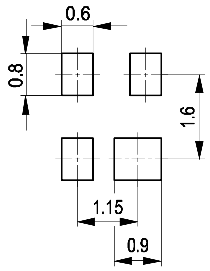
For the SPICE Gummel Poon (GP) model as well as for the S-parameters (including noise parameters) please refer to our internet website www.infineon.com/rf.models.
Please consult our website and download the latest versions before actually starting your design. You find the BFP405 SPICE GP model in the internet in MWO- and ADS-format, which you can import into these circuit simulation tools very quickly and conveniently. The model already contains the package parasitics and is ready to use for DC and high frequency simulations. The terminals of the model circuit correspond to the pin configuration of the device. The model parameters have been extracted and verified up to 6 GHz using typical devices. The BFP405 SPICE GP model reflects the typical DC- and RF-performance within the limitations which are given by the SPICE GP model itself. Besides the DC characteristics all S-parameters in magnitude and phase, as well as noise figure (including optimum source impedance, equivalent noise resistance and flicker noise) and intermodulation have been extracted.

Package Outline

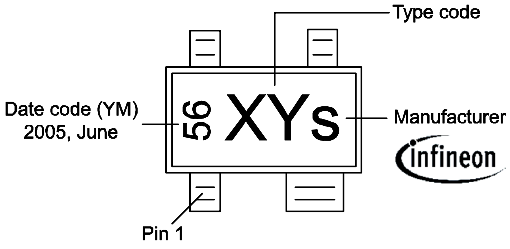




Foot Print

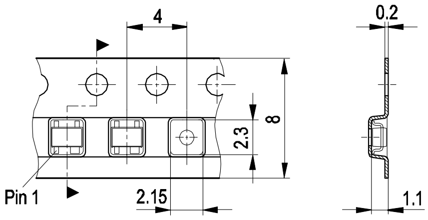


Marking Layout (Example)



Standard Packing

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



Edition 2009-11-05
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85579 Neubiberg, Germany
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