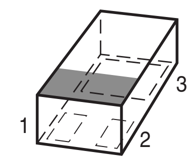
NPN Silicon Germanium RF Transistor



- High gain ultra low noise RF transistor
- Extremly small and flat leadless package, height 0.32 mm, ideal for modules
- Provides outstanding performance for wireless applications up to 10 GHz
- Ideal for WLAN applications, including routers and access points
- Based on Infineon's reliable high volume SiGe:C technology
- Outstanding noise figure NF_{min} 0.5 dB at 1.8 GHz
  Outstanding noise figure NF_{min} 0.8 dB at 6 GHz
- Accurate SPICE GP model enables effective design in process
- High maximum stable and available gain
  G_{ms} = 24.5 dB at 1.8 GHz, G_{ma} = 15 dB at 6 GHz
- Pb-free (RoHS compliant) package

RoHS

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

Type	Marking	Pin Configuration			Package
BFR740L3RH	R9	1=B	2=C	3=E	TSLP-3-9

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] $T_S \leq$ 99°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}	$\leq$ 320	K/W

[1] T_S is measured on the emitter lead at the soldering point to the pcb

[2] For calculation of R_{thJA} please refer to Application Note AN077 Thermal Resistance

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 V_{CE} = 5 V, V_{BE} = 0	I_{CES}	 - -	 - 0.001	 30 0.04	µA
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	1	40	nA
Emitter-base cutoff current V_{EB} = 0.5 V, I_C = 0	I_{EBO}	-	10	900	
DC current gain I_C = 25 mA, V_{CE} = 3 V, pulse measured	h_{FE}	160	250	400	-

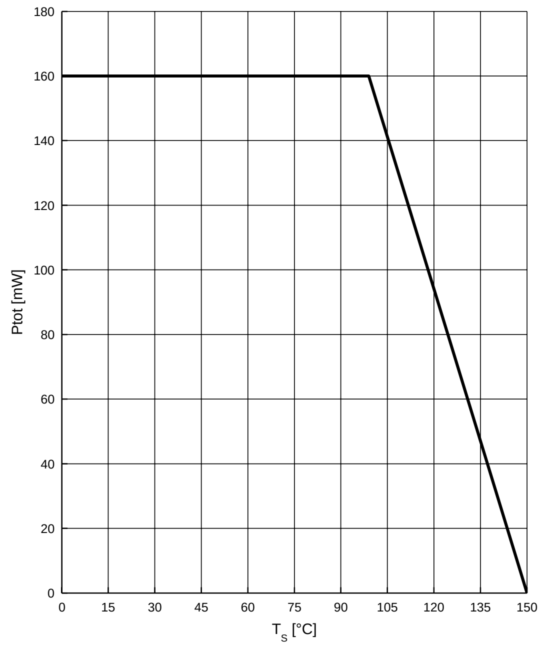
Electrical Characteristics at T_A = 25°C, unless otherwise specified

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}	-	0.09	0.15	pF
Collector emitter capacitance V_{CE} = 3 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.18	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.38	-	
Minimum noise figure I_C = 8 mA, V_{CE} = 3 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$ I_C = 8 mA, V_{CE} = 3 V, f = 6 GHz, $Z_S = Z_{Sopt}$	NF_{min}	 - -	 0.5 0.8	 - -	dB
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}	-	24.5	-	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}	-	15	-	dB
Transducer gain I_C = 25 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz f = 6 GHz	$\|S_{21e}\|^2$	 - -	 22 12.5	 - -	dB
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	-	

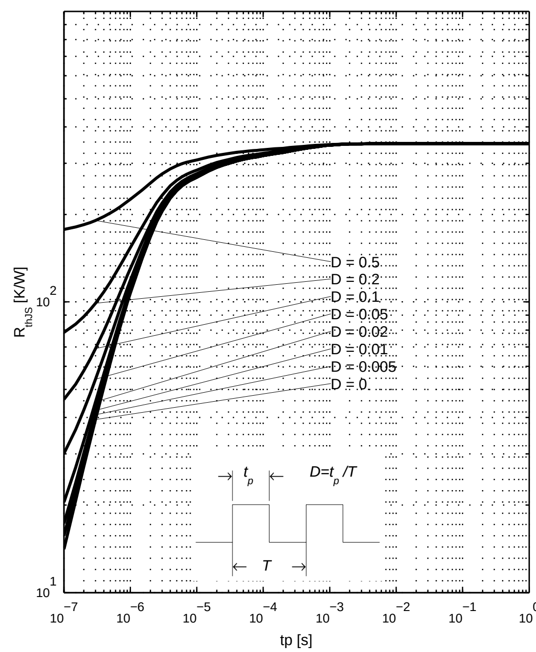
[1] $G_{ma} = |S_{21e} / S_{12e}| (k-(k^2-1)^{1/2})$, $G_{ms} = |S_{21e} / S_{12e}|$

[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

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

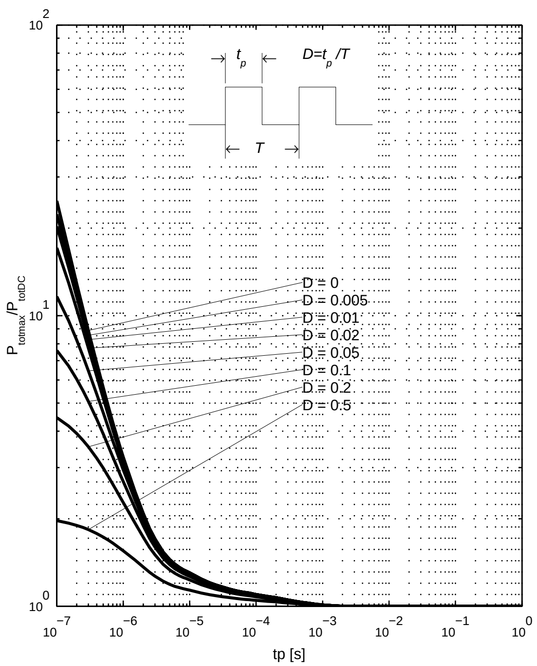


Permissible Puls Load $R_{thJS} = f(t_p)$



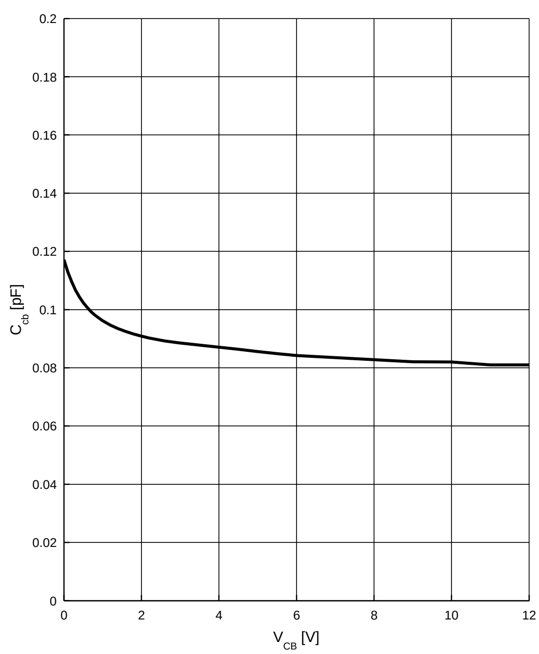
Permissible Pulse Load

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

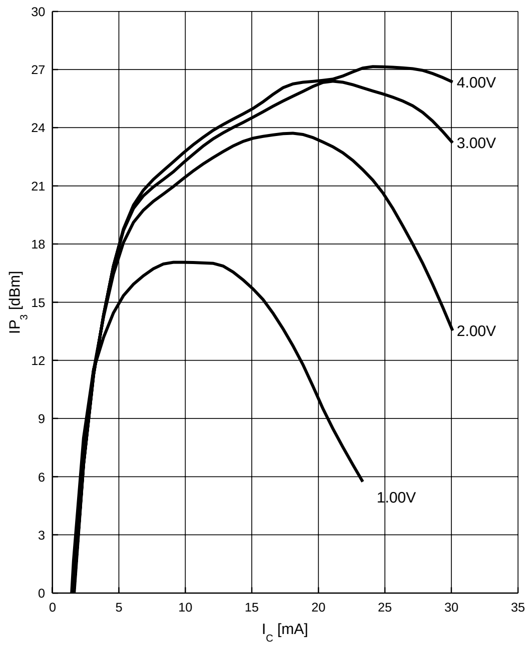


Collector-base capacitance $C_{cb} = f(V_{CB})$

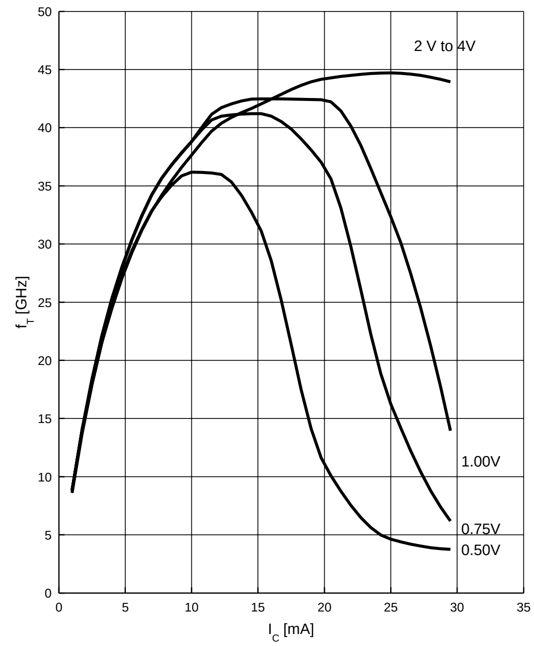
f = 1 MHz



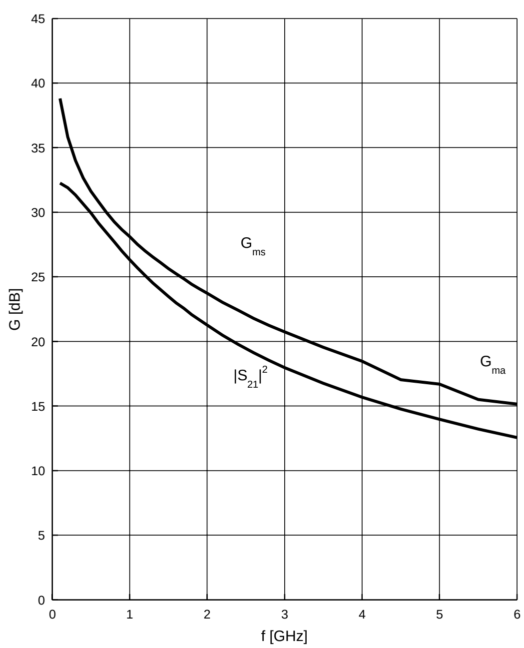
Third order Intercept Point $IP_3 = f\,(I_C)$
(Output, $Z_S = Z_L = 50\ \Omega$)
V_{CE} = parameter, f = 1.8 GHz



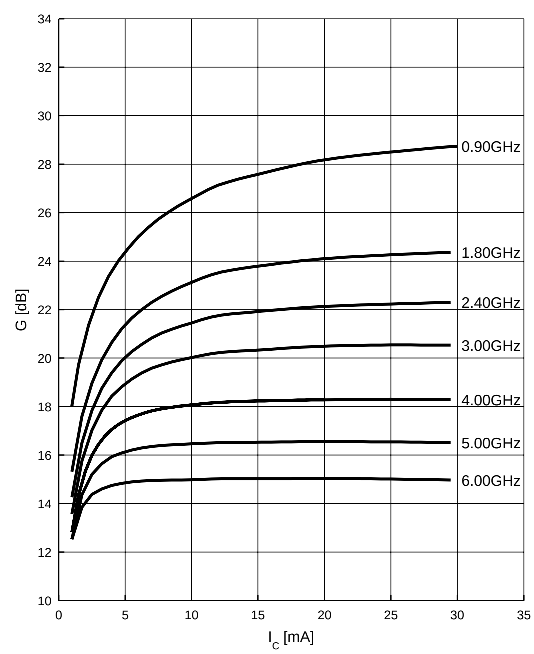
Transition frequency $f_T = f(I_C)$
V_{CE} = parameter, f = 2 GHz



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



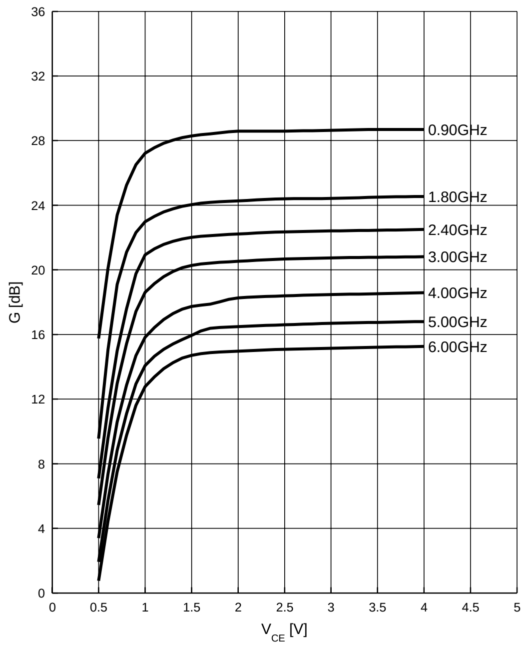
Power gain G_{ma}, $G_{ms} = f\,(I_C)$
V_{CE} = 3 V
f = parameter



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

I_C = 25 mA

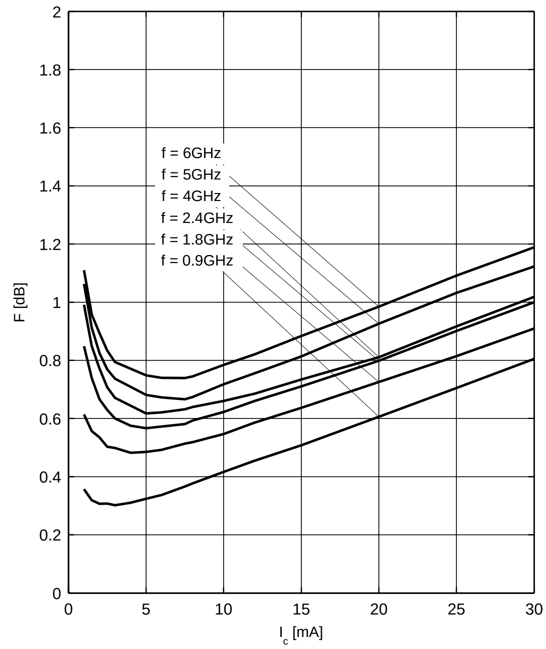
f = parameter



Minimum noise figure $NF_{min} = f(I_C)$

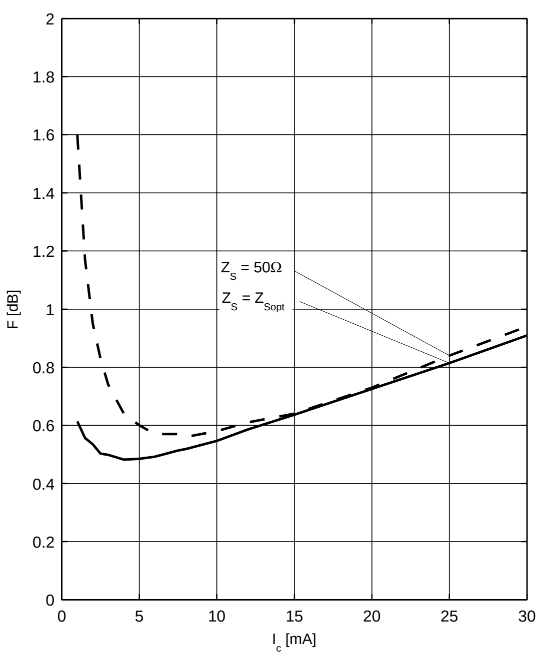
V_{CE} = 3 V, f = parameter

$Z_S = Z_{Sopt}$



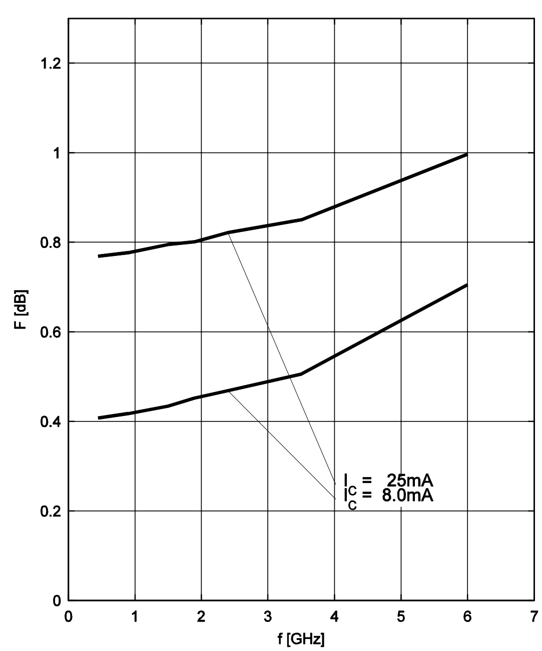
Noise figure $F = f(I_C)$

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

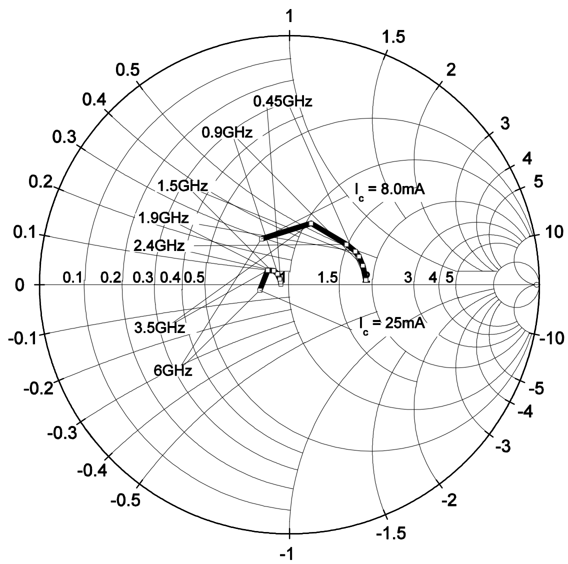


Minimum noise figure $NF_{min} = f(f)$

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



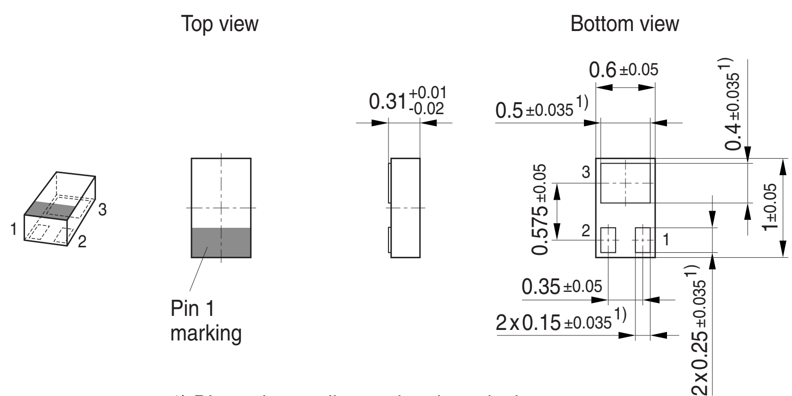
Source impedance for min.
noise figure vs. frequency
V_{CE} = 3 V, I_C = 8 mA / 25 mA



SPICE GP (Gummel-Poon)

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 BFR740L3RH 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 10 GHz using typical devices. The BFR740L3RH 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.

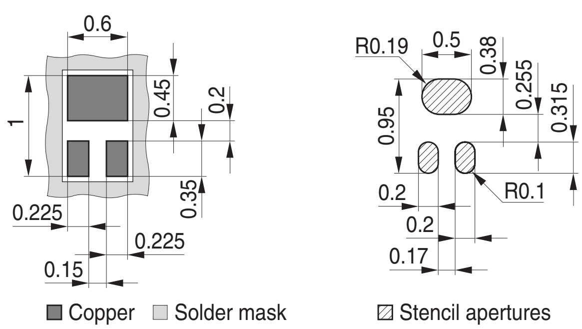
Package Outline



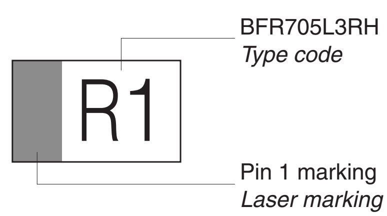
1) Dimension applies to plated terminal

Foot Print

For board assembly information please refer to Infineon website "Packages"

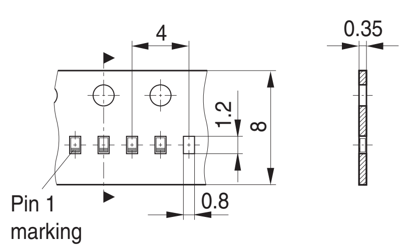


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



Datasheet Revision History: 8 September 2010

This datasheet replaces the revision from 30 March 2007.
The product itself has not been changed and the device characteristics remain unchanged. Only the product description and information available in the datasheet has been expanded and updated.

Previous Revision 30 March 2007	
Page	**Subject (changes since last revision)**
1	AEC Q101 label removed
2	Typical values for leakage currents included, values for maximum leakage currents reduced
4	SPICE model parameters shifted from datasheet to the internet simulation data section
6,7	NFmin and GammaOpt Charts updated

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