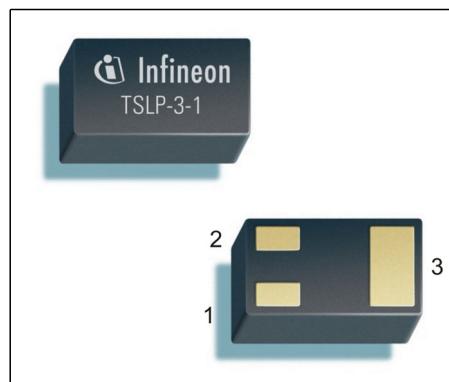


Low Noise Silicon Bipolar RF Transistor

- Low voltage/ Low current operation
- For low noise amplifiers
- For Oscillators up to 3.5 GHz and Pout > 10 dBm
- Low noise figure: 1.0 dB at 1.8 GHz
- Pb-free (RoHS compliant) and halogen-free thin small leadless package
- Qualification report according to AEC-Q101 available



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

Type	Marking	Pin Configuration			Package
BFR360L3	FB	1 = B	2 = E	3 = C	TSLP-3-1

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

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	6	V
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	2	
Collector current	I_C	35	mA
Base current	I_B	4	
Total power dissipation ¹⁾ $T_S \leq 104^\circ\text{C}$	P_{tot}	210	mW
Junction temperature	T_J	150	$^\circ\text{C}$
Storage temperature	T_{Stg}	-55 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	220	K/W

¹ T_S is measured on the collector lead at the soldering point to the pcb

²For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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 $I_C = 1 \text{ mA}, I_B = 0$	$V_{(\text{BR})\text{CEO}}$	6	9	-	V
Collector-emitter cutoff current $V_{CE} = 15 \text{ V}, V_{BE} = 0$	I_{CES}	-	-	10	μA
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1 \text{ V}, I_C = 0$	I_{EBO}	-	-	1	μA
DC current gain $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}$, pulse measured	h_{FE}	90	120	160	-

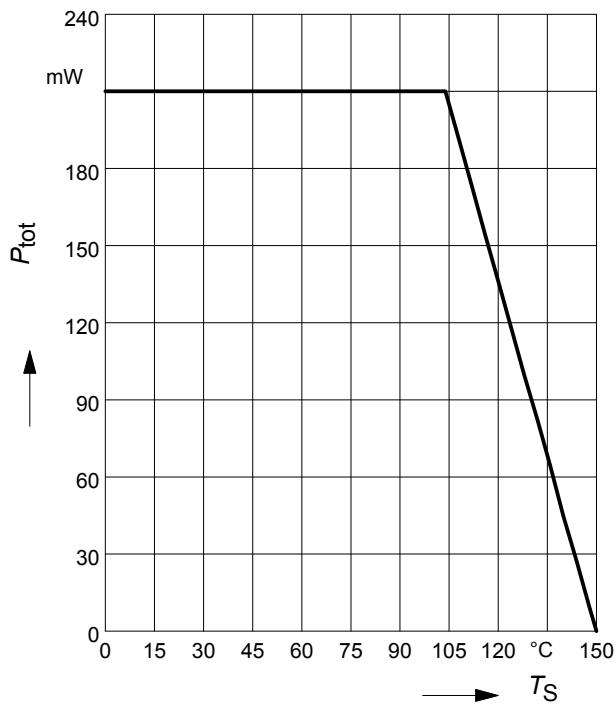
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}, f = 1 \text{ GHz}$	f_T	11	14	-	GHz
Collector-base capacitance $V_{CB} = 5 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0 \text{ , emitter grounded}$	C_{cb}	-	0.26	0.4	pF
Collector emitter capacitance $V_{CE} = 5 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0 \text{ , base grounded}$	C_{ce}	-	0.15	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}, f = 1 \text{ MHz}, V_{CB} = 0 \text{ , collector grounded}$	C_{eb}	-	0.42	-	
Minimum noise figure $I_C = 3 \text{ mA}, V_{CE} = 3 \text{ V}, Z_S = Z_{\text{Sopt}}, f = 1.8 \text{ GHz}$ $I_C = 3 \text{ mA}, V_{CE} = 3 \text{ V}, Z_S = Z_{\text{Sopt}}, f = 3 \text{ GHz}$	NF_{\min}	-	1	-	dB
-		-	1.3	-	
Power gain, maximum available ¹⁾ $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}, Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}} \text{ , } f = 1.8 \text{ GHz}$ $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}, Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}} \text{ , } f = 3 \text{ GHz}$	G_{ma}	-	16	-	
-		-	11.5	-	
Transducer gain $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}, Z_S = Z_L = 50\Omega \text{ , } f = 1.8 \text{ GHz}$ $f = 3 \text{ GHz}$	$ S_{21e} ^2$	-	13.5	-	dB
-		-	9	-	
Third order intercept point at output ²⁾ $V_{CE} = 3 \text{ V}, I_C = 15 \text{ mA}, Z_S=Z_L=50 \Omega, f = 1.8 \text{ GHz}$	$IP3$	-	24	-	dBm
1dB compression point at output $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}, Z_S=Z_L=50 \Omega, f = 1.8 \text{ GHz}$	$P_{-1\text{dB}}$	-	9	-	

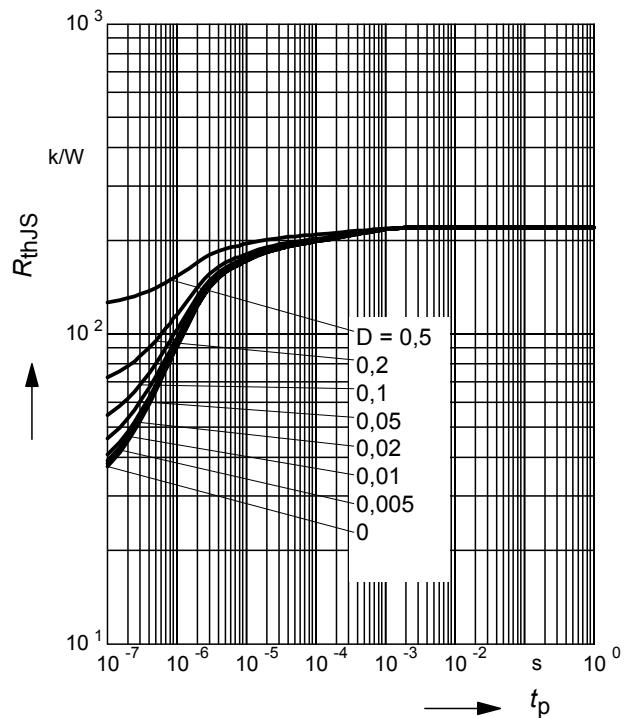
¹ $G_{\text{ma}} = |S_{21e} / S_{12e}| (k - (k^2 - 1)^{1/2})$
²IP3 value depends on termination of all intermodulation frequency components.

Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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

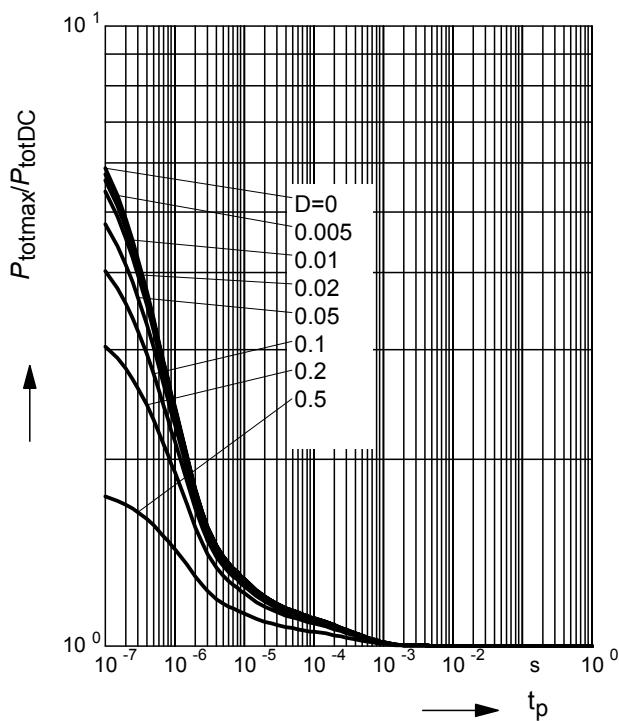


Permissible Pulse Load $R_{\text{thJS}} = f(t_p)$



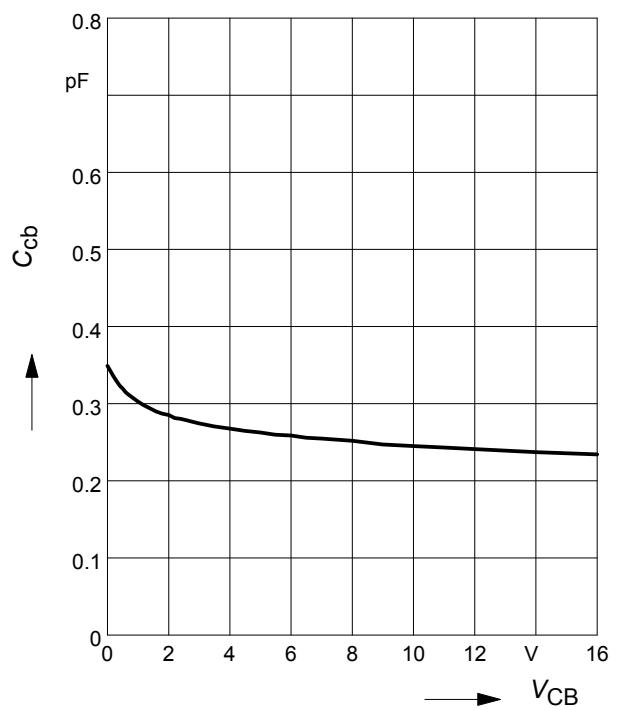
Permissible Pulse Load

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



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

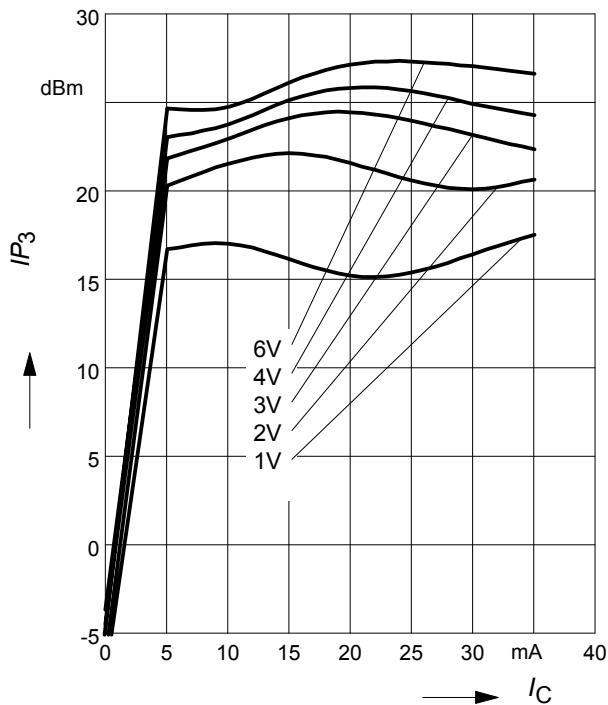
$f = 1\text{MHz}$



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

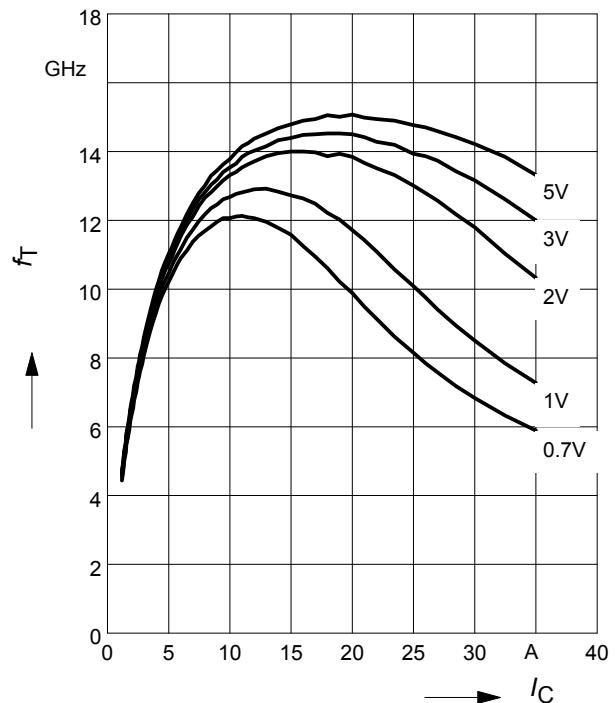
(Output, $Z_S=Z_L=50\Omega$)

V_{CE} = parameter, $f = 1.8$ GHz


Transition frequency $f_T = f(I_C)$

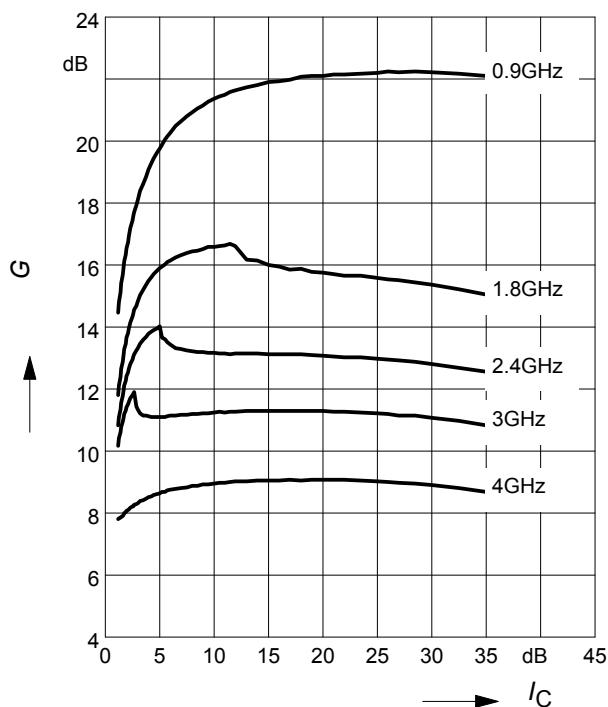
$f = 1$ GHz

V_{CE} = parameter


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

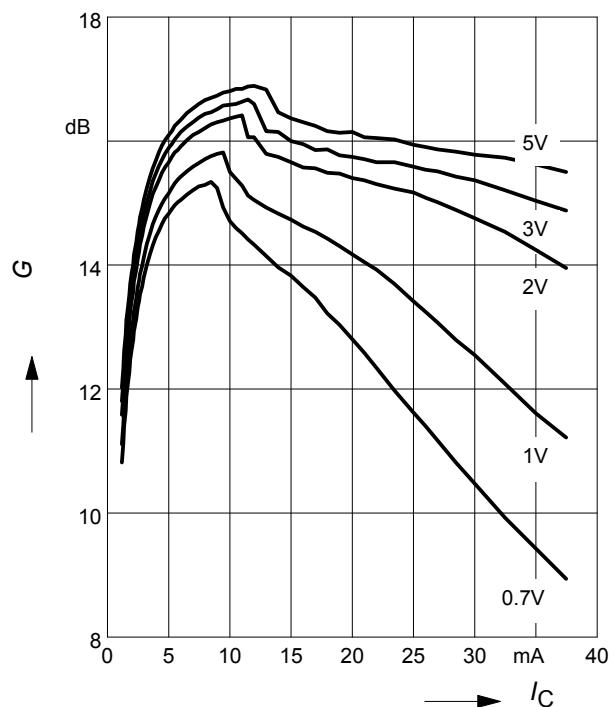
$V_{CE} = 3$ V

f = parameter in GHz


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

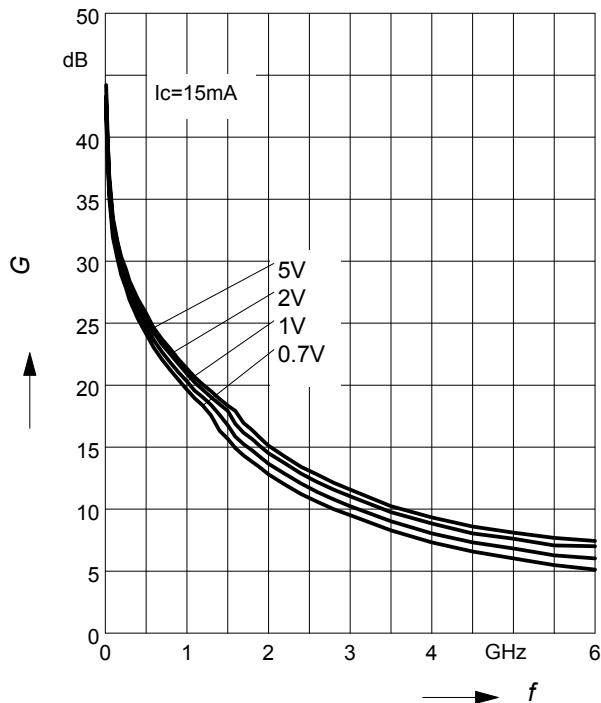
$f = 1.8GHz$

V_{CE} = parameter



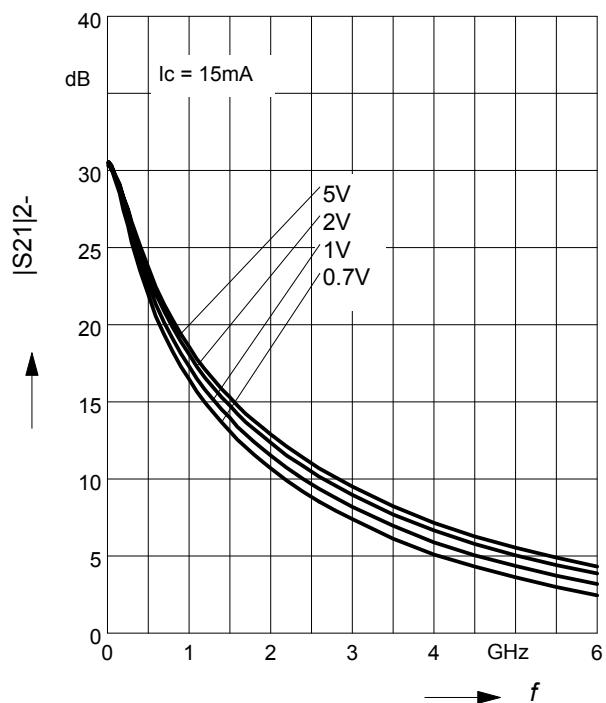
Power Gain G_{ma} , $G_{ms} = f(f)$

V_{CE} = parameter



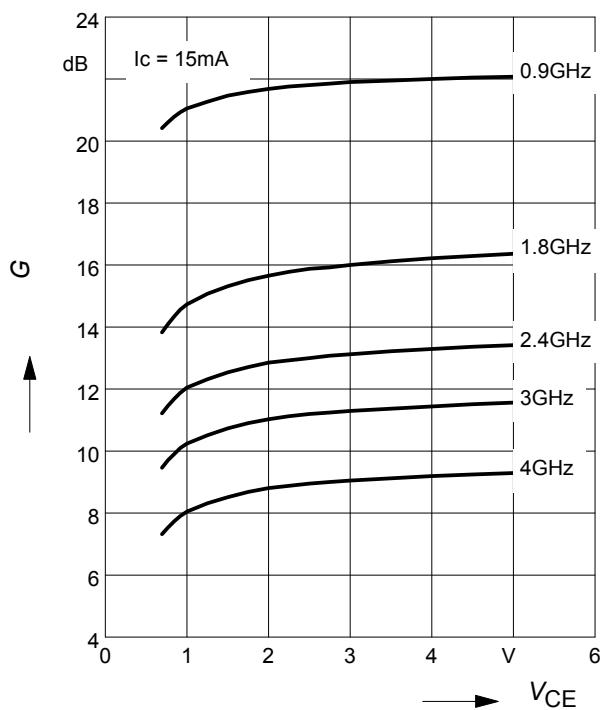
Power Gain $|S_{21}|$ up to 6GHz

V_{CE} = parameter

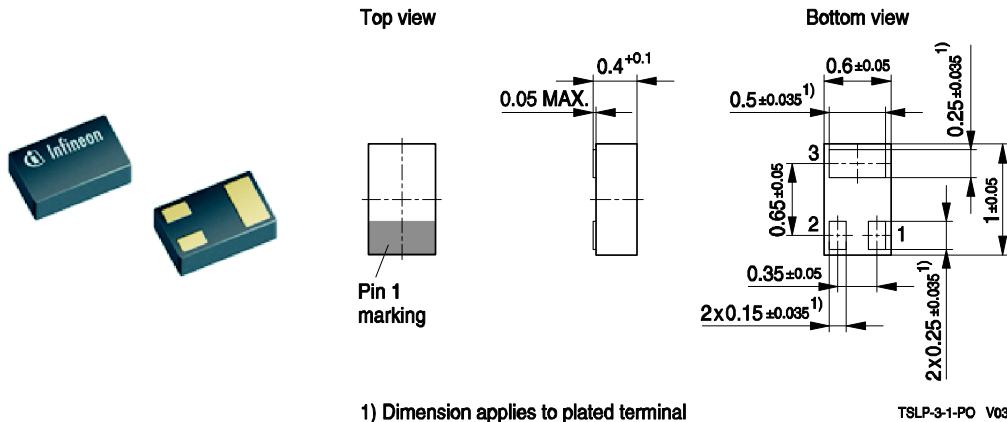


Power Gain G_{ma} , $G_{ms} = f(V_{CE})$:

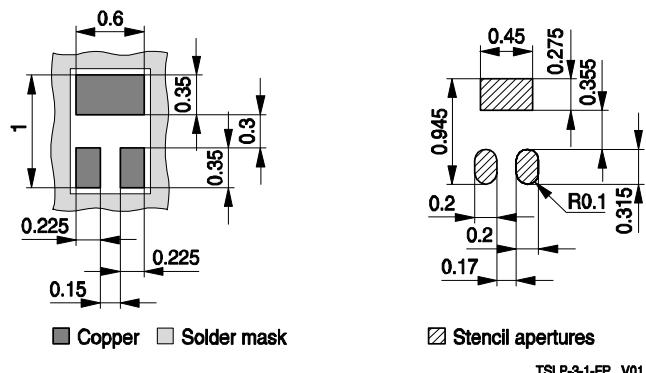
f = parameter



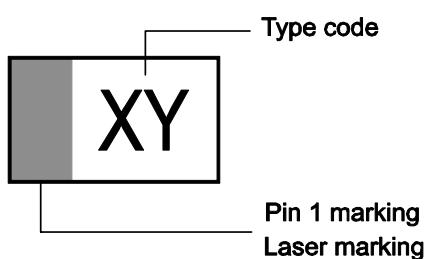
Package Outline



Foot Print

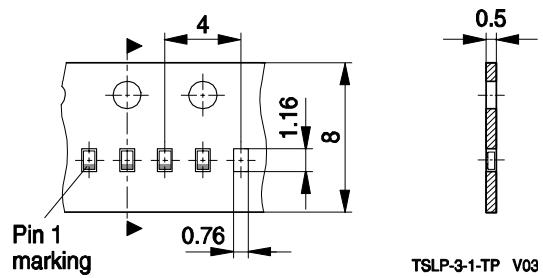


Marking Layout (Example)



Standard Packing

Reel Ø 330 mm: 15.000 Pieces/ Reel



Edition 2009-11-16

Published by
Infineon Technologies AG
81726 Munich, Germany

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