



**THE DATASHEET OF
MMBT2222ATT3G**



MMBT2222ATT1G, NSVMMBT2222ATT1G

General Purpose Transistor

NPN Silicon

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-416/SC-75 package which is designed for low power surface mount applications.

Features

- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CBO}	75	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current – Continuous	I_C	600	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation (Note 1) $T_A = 25^\circ\text{C}$	P_D	150	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

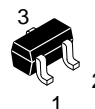
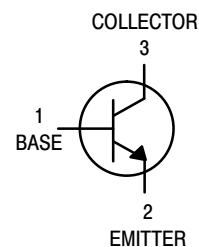
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.



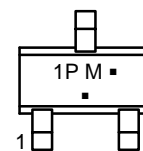
ON Semiconductor®

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CASE 463
SOT-416/SC-75
STYLE 1

MARKING DIAGRAM



1P = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MMBT2222ATT1G	SOT-416 (Pb-Free)	3000 / Tape & Reel
NSVMMBT2222ATT1G	SOT-416 (Pb-Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (Note 1) ($I_C = 10\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	40	–	Vdc
Collector–Base Breakdown Voltage ($I_C = 10\ \mu\text{Adc}$, $I_E = 0$)	$V_{(BR)CBO}$	75	–	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10\ \mu\text{Adc}$, $I_C = 0$)	$V_{(BR)EBO}$	6.0	–	Vdc
Base Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB} = 3.0\text{ Vdc}$)	I_{BL}	–	20	nAdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB} = 3.0\text{ Vdc}$)	I_{CEX}	–	10	nAdc

ON CHARACTERISTICS (Note 2)

DC Current Gain ($I_C = 0.1\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 150\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	H_{FE}	35 50 75 100 40	– – – – –	–
Collector–Emitter Saturation Voltage ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	$V_{CE(sat)}$	– –	0.3 1.0	Vdc
Base–Emitter Saturation Voltage ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	$V_{BE(sat)}$	0.6 –	1.2 2.0	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product ($I_C = 20\text{ mAdc}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	300	–	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	–	8.0	pF
Input Capacitance ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	–	30	pF
Input Impedance ($V_{CE} = 10\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $f = 1.0\text{ kHz}$)	h_{ie}	0.25	1.25	$k\Omega$
Voltage Feedback Ratio ($V_{CE} = 10\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $f = 1.0\text{ kHz}$)	h_{re}	–	4.0	$\times 10^{-4}$
Small–Signal Current Gain ($V_{CE} = 10\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	75	375	–
Output Admittance ($V_{CE} = 10\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $f = 1.0\text{ kHz}$)	h_{oe}	25	200	μmos
Noise Figure ($V_{CE} = 10\text{ Vdc}$, $I_C = 100\ \mu\text{Adc}$, $R_S = 1.0\text{ k ohms}$, $f = 1.0\text{ kHz}$)	NF	–	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = 3.0\text{ Vdc}$, $V_{BE} = -0.5\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = 15\text{ mAdc}$)	t_d	–	10	ns
Rise Time		t_r	–	25	
Storage Time	$(V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = I_{B2} = 15\text{ mAdc}$)	t_s	–	225	ns
Fall Time		t_f	–	60	

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.
2. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

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SWITCHING TIME EQUIVALENT TEST CIRCUITS

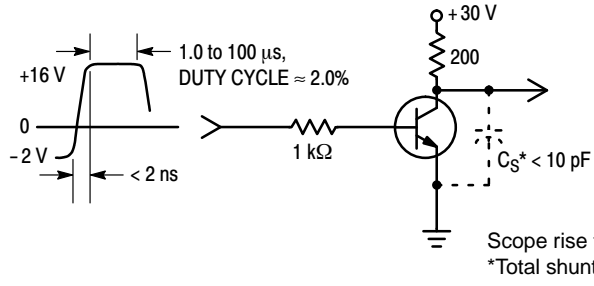


Figure 1. Turn-On Time

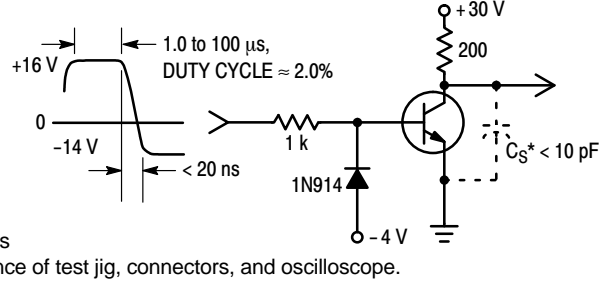


Figure 2. Turn-Off Time

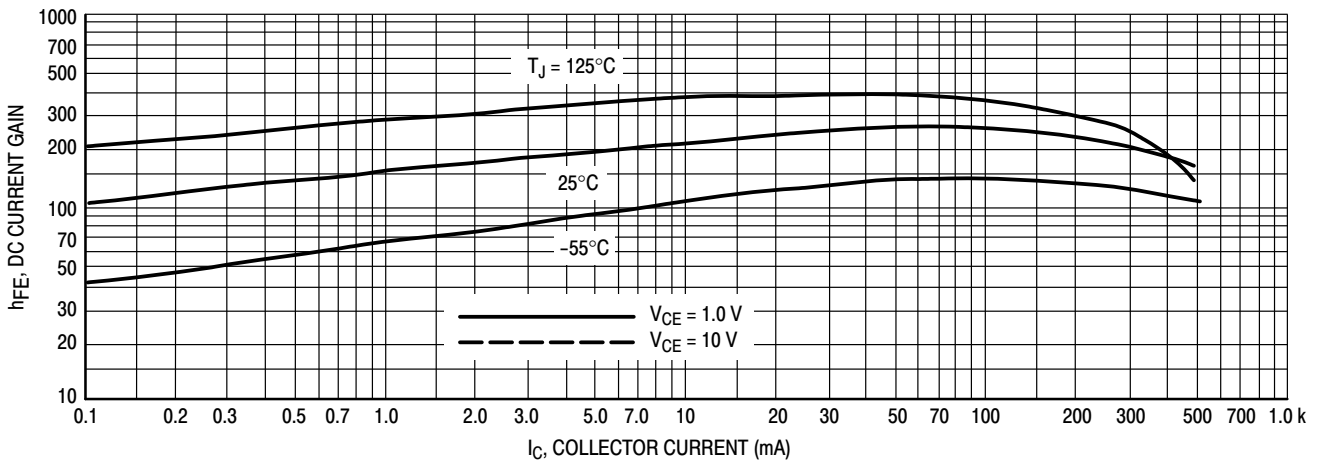


Figure 3. DC Current Gain

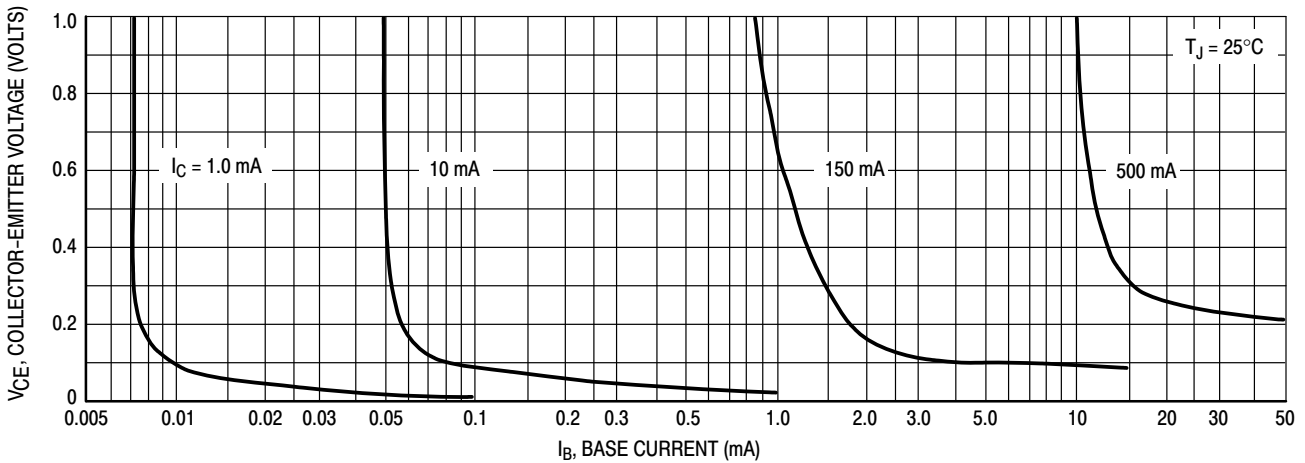


Figure 4. Collector Saturation Region

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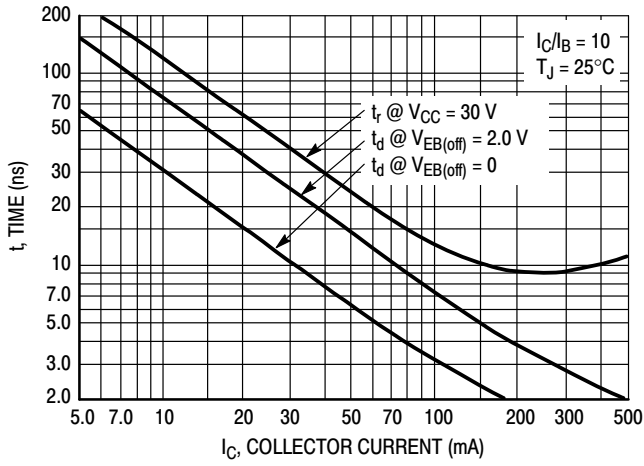


Figure 5. Turn-On Time

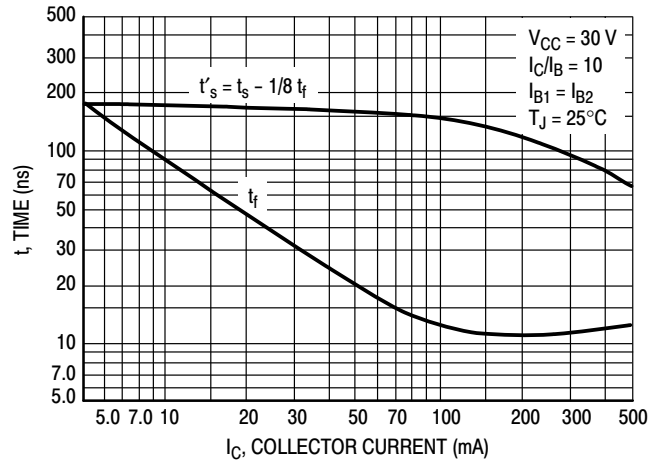


Figure 6. Turn-Off Time

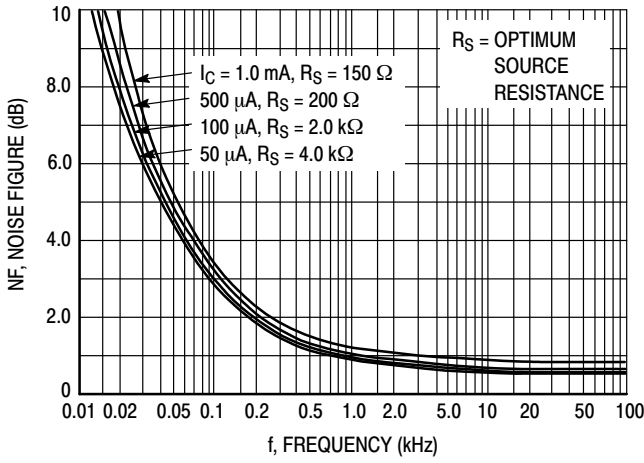


Figure 7. Frequency Effects

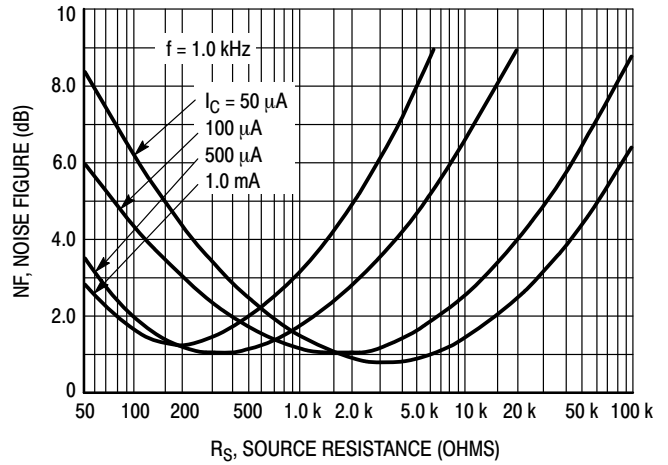


Figure 8. Source Resistance Effects

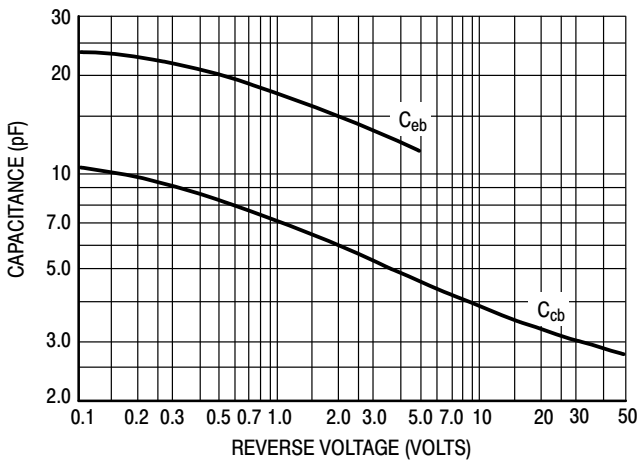


Figure 9. Capacitances

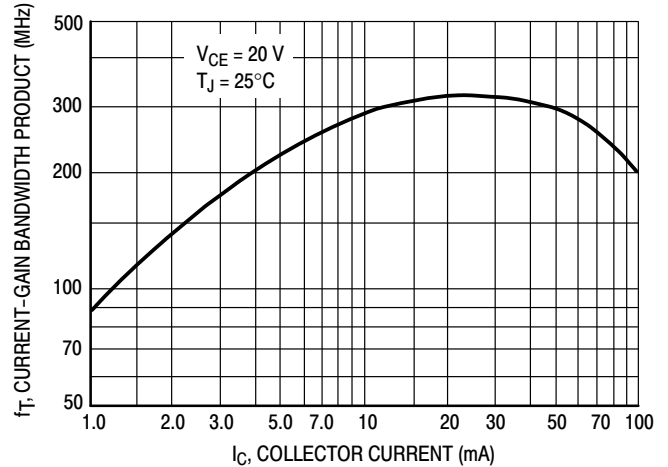


Figure 10. Current-Gain Bandwidth Product

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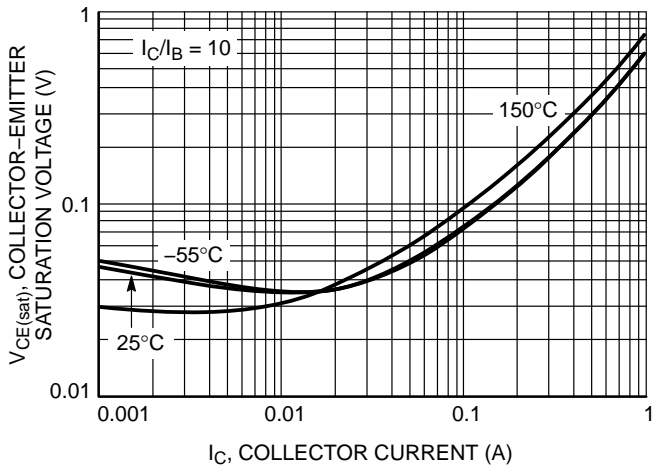


Figure 11. Collector Emitter Saturation Voltage vs. Collector Current

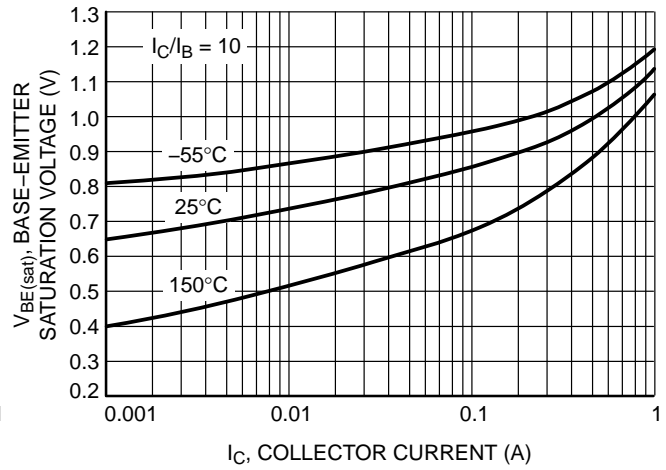


Figure 12. Base Emitter Saturation Voltage vs. Collector Current

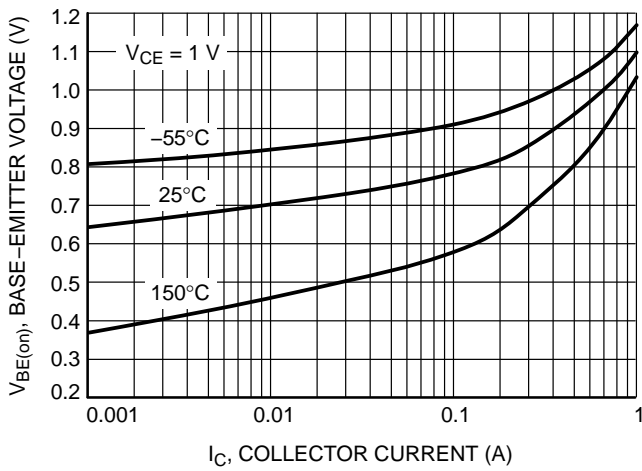


Figure 13. Base Emitter Voltage vs. Collector Current

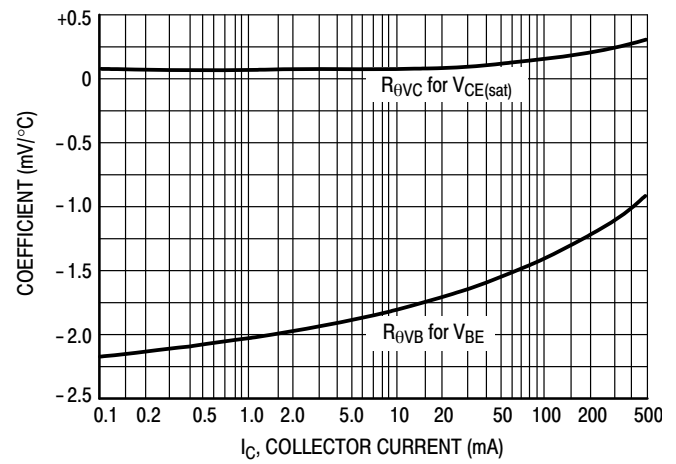


Figure 14. Temperature Coefficients

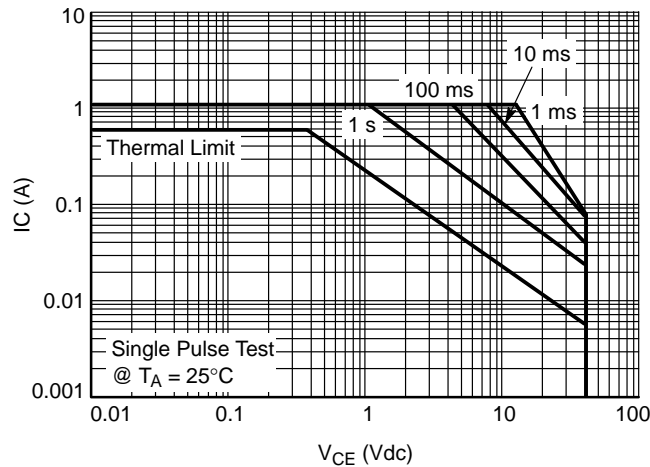


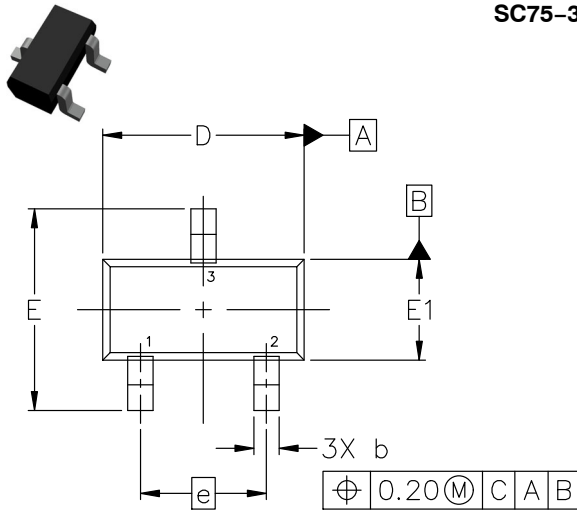
Figure 15. Safe Operating Area

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

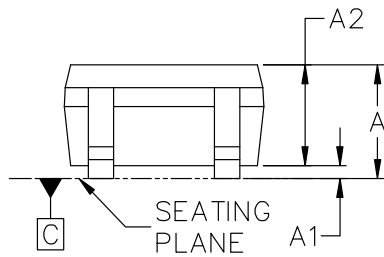


SC75-3 1.60x0.80x0.80, 1.00P
CASE 463
ISSUE H

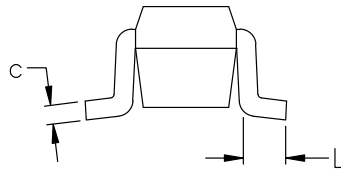
DATE 01 FEB 2024



TOP VIEW

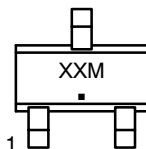


SIDE VIEW



END VIEW

GENERIC MARKING DIAGRAM*



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

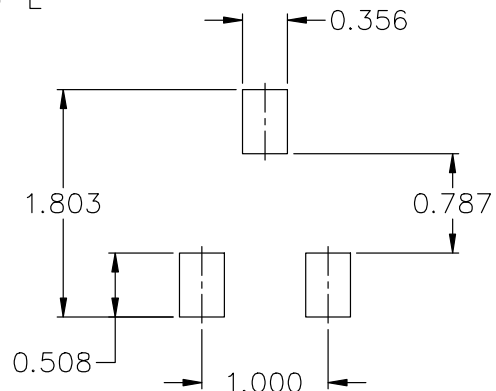
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

- STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
- STYLE 2:
PIN 1. ANODE
2. N/C
3. CATHODE
- STYLE 3:
PIN 1. ANODE
2. ANODE
3. CATHODE
- STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE
- STYLE 5:
PIN 1. GATE
2. SOURCE
3. DRAIN

NOTES:

- DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
- ALL DIMENSION ARE IN MILLIMETERS.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.80	0.90
A1	0.00	0.05	0.10
A2	0.80 REF.		
b	0.15	0.20	0.30
c	0.10	0.15	0.25
D	1.55	1.60	1.65
E	1.50	1.60	1.70
E1	0.70	0.80	0.90
e	1.00 BSC		
L	0.10	0.15	0.20



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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DESCRIPTION:	SC75-3 1.60x0.80x0.80, 1.00P	PAGE 1 OF 1

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