



**THE DATASHEET OF
MMBT2907ALT3**



MMBT2907AL, SMMBT2907AL

General Purpose Transistors

PNP Silicon

Features

- S 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

| Rating | Symbol | Value | Unit |
|-----------------------------------|-----------|-------|------|
| Collector-Emitter Voltage | V_{CEO} | -60 | Vdc |
| Collector-Base Voltage | V_{CBO} | -60 | Vdc |
| Emitter-Base Voltage | V_{EBO} | -5.0 | Vdc |
| Collector Current - Continuous | I_C | -600 | mAdc |
| Collector Current - Peak (Note 3) | I_{CM} | -1200 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-------------|----------------------------|
| Total Device Dissipation - FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 1.8 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation - Alumina Substrate, (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 300 2.4 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 417 | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation - Heat Spreader or equivalent, (Note 4) @ $T_A = 25^\circ\text{C}$ | P_D | 350 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 357 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

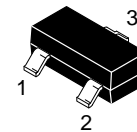
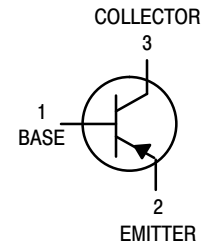
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.
2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.
3. Reference SOA curve.
4. Heat Spreader or equivalent = 450 mm^2 , 2 oz.



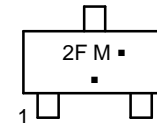
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SOT-23 (TO-236AB)
CASE 318
STYLE 6

MARKING DIAGRAM



2F = Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------------------------|---------------------|-------------------------|
| MMBT2907ALT1G SMMBT2907ALT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| MMBT2907ALT3G SMMBT2907ALT3G | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications 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 5) ($I_C = -1.0\text{ mAdc}$, $I_B = 0$) ($I_C = -10\text{ mAdc}$, $I_B = 0$) | $V_{(BR)CEO}$ | -60 -60 | - | Vdc |
| Collector-Base Breakdown Voltage ($I_C = -10\text{ }\mu\text{Adc}$, $I_E = 0$) | $V_{(BR)CBO}$ | -60 | - | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = -10\text{ }\mu\text{Adc}$, $I_C = 0$) | $V_{(BR)EBO}$ | -5.0 | - | Vdc |
| Collector Cutoff Current ($V_{CE} = -30\text{ Vdc}$, $V_{EB(off)} = -0.5\text{ Vdc}$) | I_{CEX} | - | -50 | nAdc |
| Collector Cutoff Current ($V_{CB} = -50\text{ Vdc}$, $I_E = 0$) ($V_{CB} = -50\text{ Vdc}$, $I_E = 0$, $T_A = 125^\circ\text{C}$) | I_{CBO} | - | -0.010 -10 | μAdc |
| Base Cutoff Current ($V_{CE} = -30\text{ Vdc}$, $V_{EB(off)} = -0.5\text{ Vdc}$) | I_{BL} | - | -50 | nAdc |

ON CHARACTERISTICS

| | | | | |
|---|---------------|-------------------------------|--------------|-----|
| DC Current Gain ($I_C = -0.1\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$) ($I_C = -1.0\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$) ($I_C = -10\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$) ($I_C = -150\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$) ($I_C = -500\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$) (Note 5) | h_{FE} | 75 100 100 100 50 | - | - |
| Collector-Emitter Saturation Voltage (Note 5) ($I_C = -150\text{ mAdc}$, $I_B = -15\text{ mAdc}$) (Note 5) ($I_C = -500\text{ mAdc}$, $I_B = -50\text{ mAdc}$) | $V_{CE(sat)}$ | - | -0.4 -1.6 | Vdc |
| Base-Emitter Saturation Voltage (Note 5) ($I_C = -150\text{ mAdc}$, $I_B = -15\text{ mAdc}$) ($I_C = -500\text{ mAdc}$, $I_B = -50\text{ mAdc}$) | $V_{BE(sat)}$ | - | -1.3 -2.6 | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|--|-----------|-----|-----|-----|
| Current-Gain - Bandwidth Product (Notes 5, 6), ($I_C = -50\text{ mAdc}$, $V_{CE} = -20\text{ Vdc}$, $f = 100\text{ MHz}$) | f_T | 200 | - | MHz |
| Output Capacitance ($V_{CB} = -10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{obo} | - | 8.0 | pF |
| Input Capacitance ($V_{EB} = -2.0\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$) | C_{ibo} | - | 30 | pF |

SWITCHING CHARACTERISTICS

| | | | | | |
|---------------|---|-----------|---|-----|----|
| Turn-On Time | $(V_{CC} = -30\text{ Vdc}$, $I_C = -150\text{ mAdc}$, $I_{B1} = -15\text{ mAdc}$) | t_{on} | - | 45 | ns |
| Delay Time | | t_d | - | 10 | |
| Rise Time | | t_r | - | 40 | |
| Turn-Off Time | $(V_{CC} = -6.0\text{ Vdc}$, $I_C = -150\text{ mAdc}$, $I_{B1} = I_{B2} = -15\text{ mAdc}$) | t_{off} | - | 100 | |
| Storage Time | | t_s | - | 80 | |
| Fall Time | | t_f | - | 30 | |

5. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

6. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

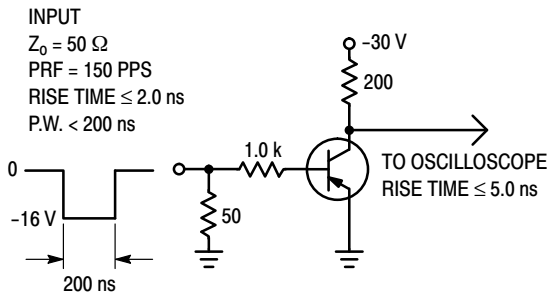


Figure 1. Delay and Rise Time Test Circuit

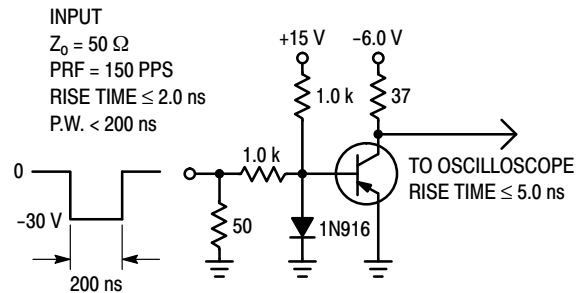


Figure 2. Storage and Fall Time Test Circuit

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TYPICAL CHARACTERISTICS

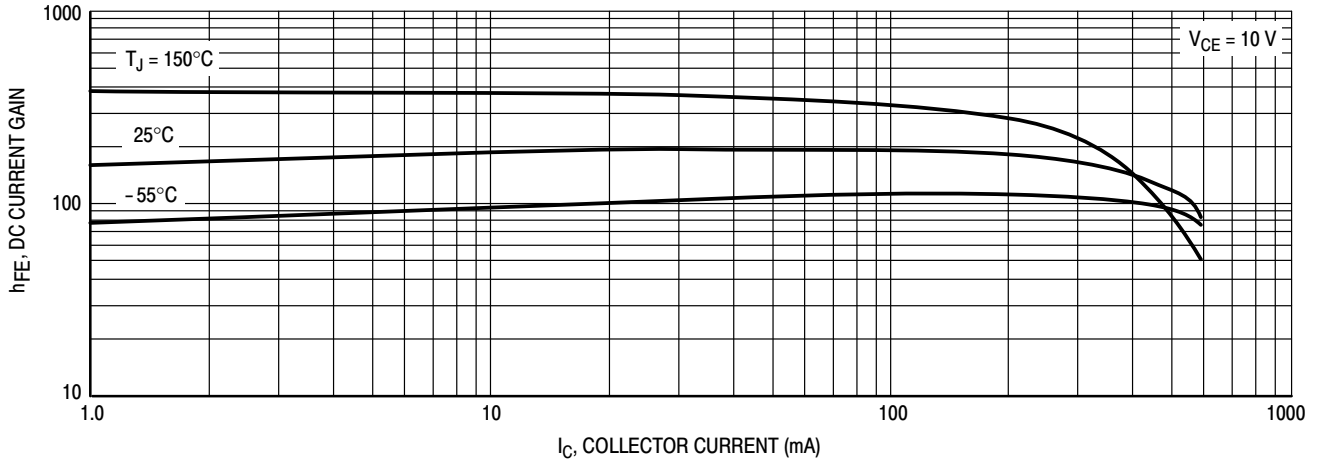


Figure 3. DC Current Gain

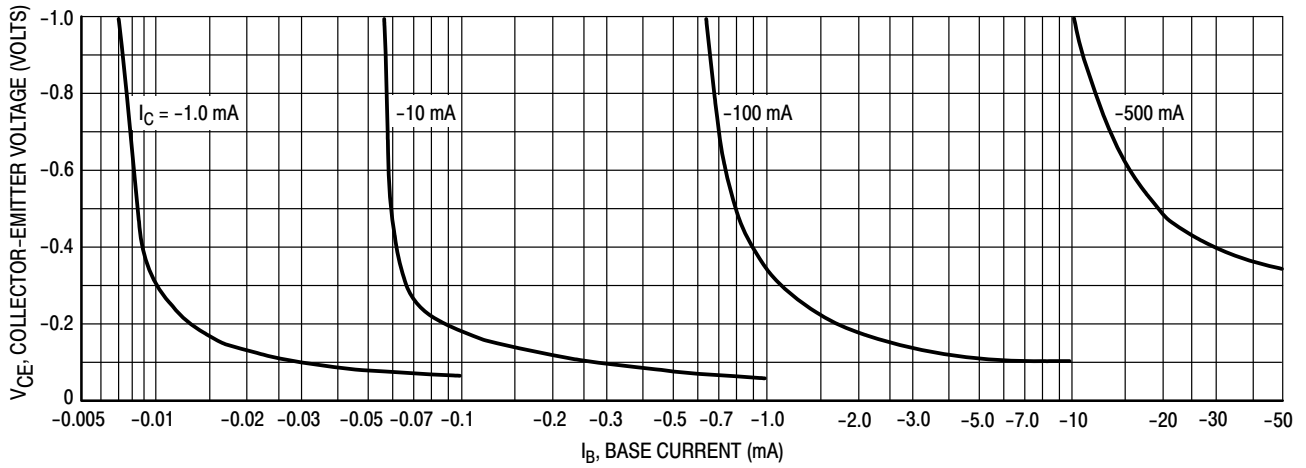


Figure 4. Collector Saturation Region

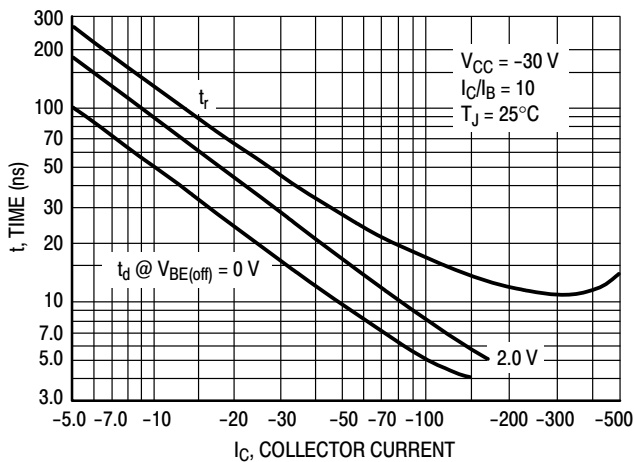


Figure 5. Turn-On Time

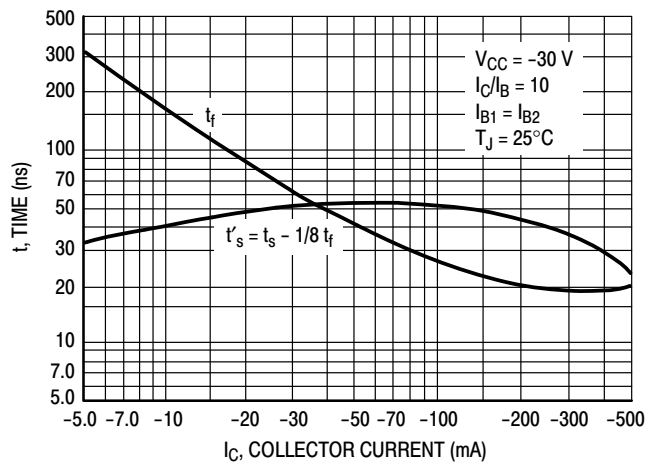


Figure 6. Turn-Off Time

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TYPICAL SMALL-SIGNAL Characteristics NOISE FIGURE

$V_{CE} = 10 \text{ Vdc}$, $T_A = 25^\circ\text{C}$

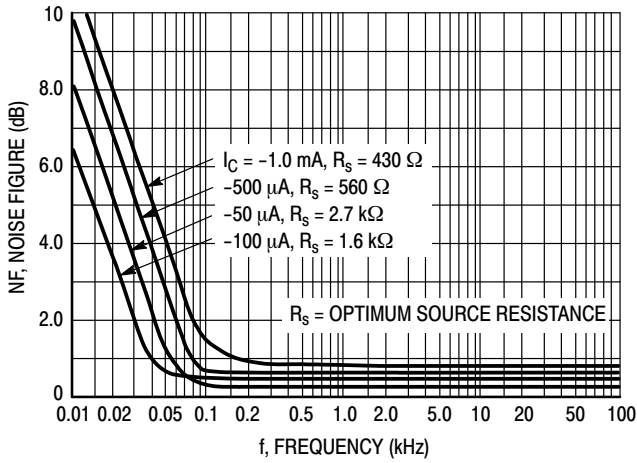


Figure 7. Frequency Effects

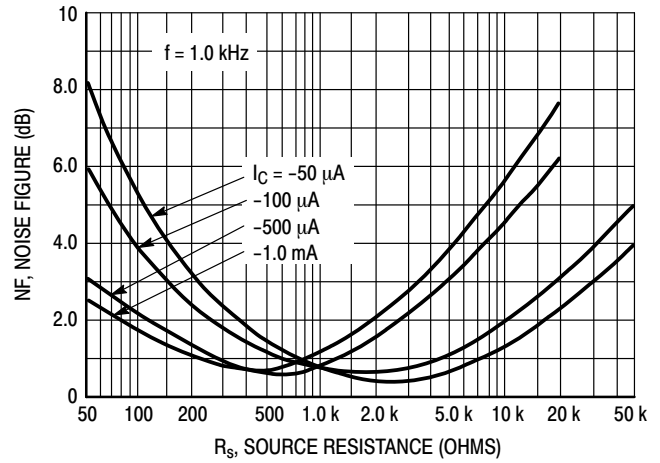


Figure 8. Source Resistance Effects

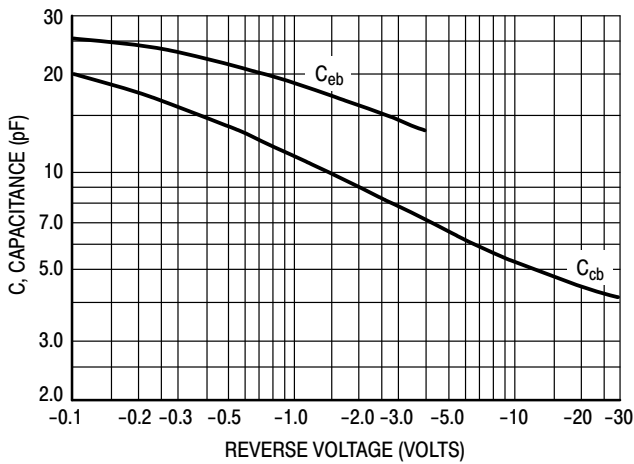


Figure 9. Capacitances

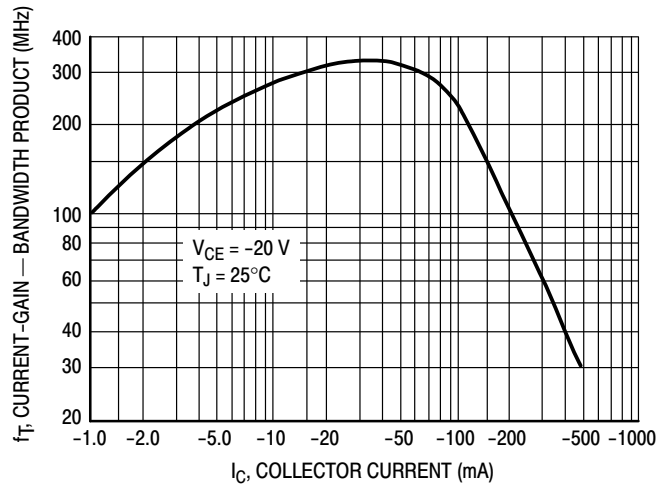


Figure 10. Current-Gain - Bandwidth Product

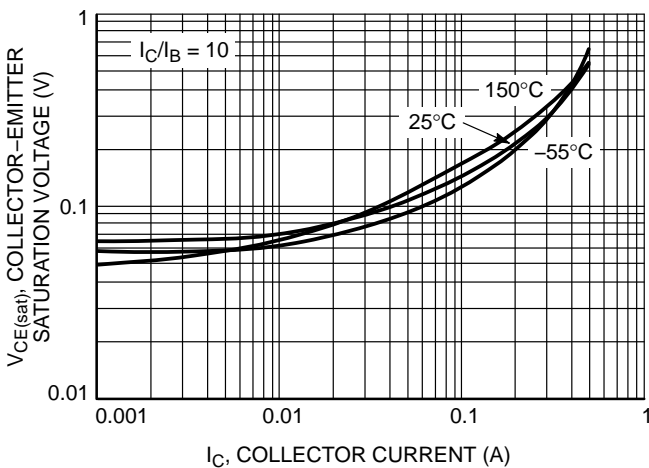


Figure 11. Collector-Emitter Saturation Voltage vs. Collector Current

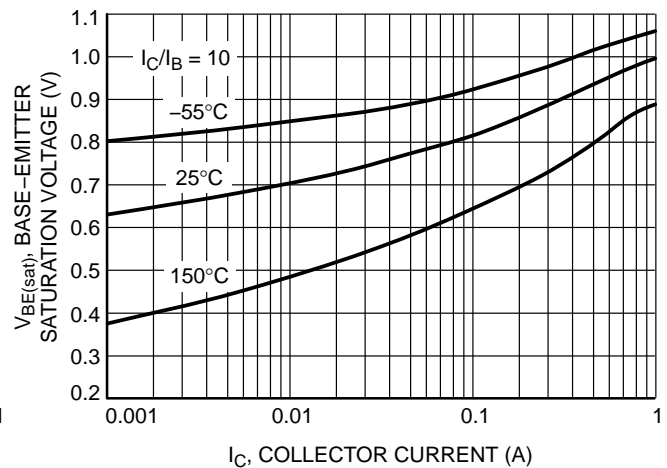


Figure 12. Base-Emitter Saturation Voltage vs. Collector Current

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TYPICAL SMALL-SIGNAL Characteristics NOISE FIGURE

$V_{CE} = 10 \text{ Vdc}$, $T_A = 25^\circ\text{C}$

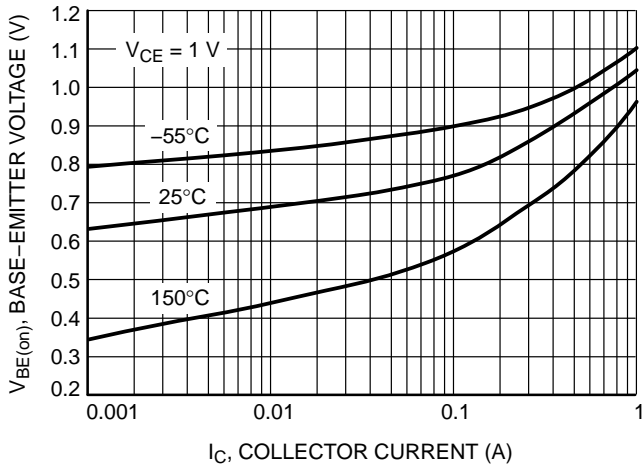


Figure 13. Base Emitter Voltage vs. Collector Current

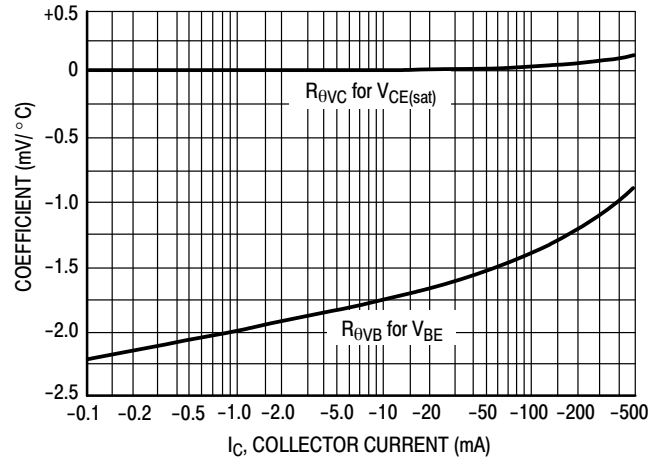


Figure 14. Temperature Coefficients

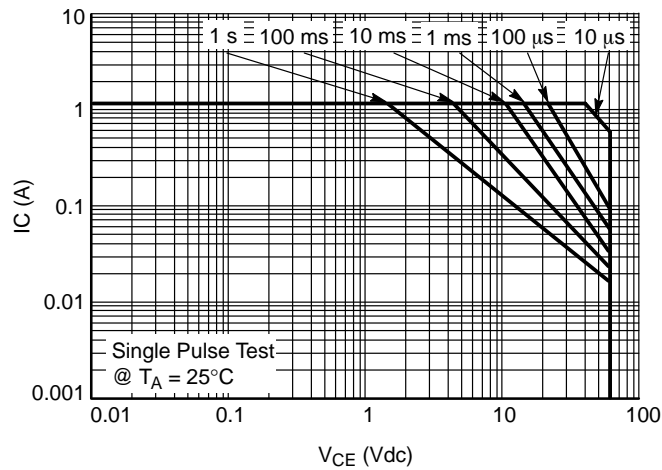
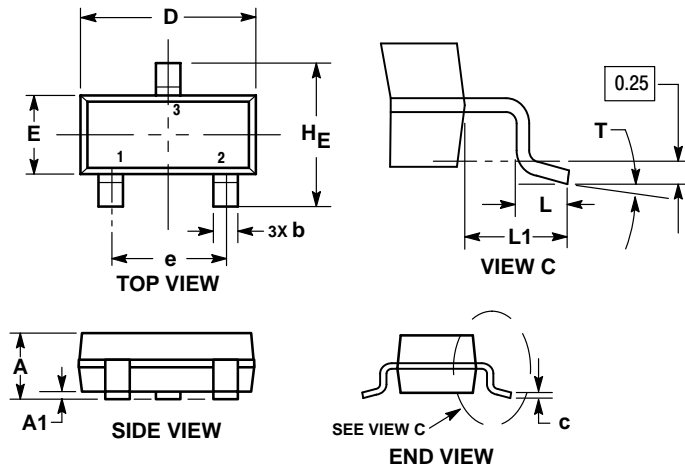


Figure 15. Safe Operating Area

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PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AR



NOTES:

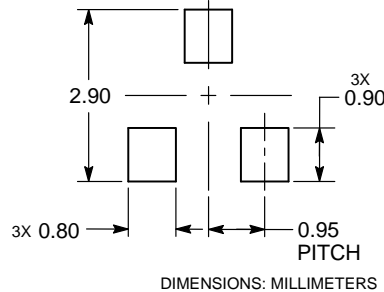
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

STYLE 6:

1. BASE
2. EMITTER
3. COLLECTOR

RECOMMENDED SOLDERING FOOTPRINT



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