

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 | $^\circ\text{C}$ |

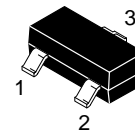
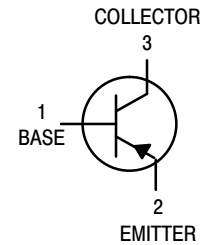
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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.



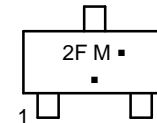
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SOT-23 (TO-236AB)
CASE 318
STYLE 6

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°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|--|----------------------|------------|---------------|------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (Note 5) (I _C = -1.0 mA, I _B = 0) (I _C = -10 mA, I _B = 0) | V _{(BR)CEO} | -60 -60 | - | Vdc |
| Collector-Base Breakdown Voltage (I _C = -10 μA, I _E = 0) | V _{(BR)CBO} | -60 | - | Vdc |
| Emitter-Base Breakdown Voltage (I _E = -10 μA, I _C = 0) | V _{(BR)EBO} | -5.0 | - | Vdc |
| Collector Cutoff Current (V _{CE} = -30 Vdc, V _{EB(off)} = -0.5 Vdc) | I _{CEX} | - | -50 | nAdc |
| Collector Cutoff Current (V _{CB} = -50 Vdc, I _E = 0) (V _{CB} = -50 Vdc, I _E = 0, T _A = 125°C) | I _{CBO} | - | -0.010 -10 | μAdc |
| Base Cutoff Current (V _{CE} = -30 Vdc, V _{EB(off)} = -0.5 Vdc) | I _{BL} | - | -50 | nAdc |

ON CHARACTERISTICS

| | | | | |
|--|----------------------|-------------------------------|--------------|-----|
| DC Current Gain (I _C = -0.1 mA, V _{CE} = -10 Vdc) (I _C = -1.0 mA, V _{CE} = -10 Vdc) (I _C = -10 mA, V _{CE} = -10 Vdc) (I _C = -150 mA, V _{CE} = -10 Vdc) (I _C = -500 mA, V _{CE} = -10 Vdc) (Note 5) | h _{FE} | 75 100 100 100 50 | - | - |
| Collector-Emitter Saturation Voltage (Note 5) (I _C = -150 mA, I _B = -15 mA) (Note 5) (I _C = -500 mA, I _B = -50 mA) | V _{CE(sat)} | - | -0.4 -1.6 | Vdc |
| Base-Emitter Saturation Voltage (Note 5) (I _C = -150 mA, I _B = -15 mA) (I _C = -500 mA, I _B = -50 mA) | V _{BE(sat)} | - | -1.3 -2.6 | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|---|------------------|-----|-----|-----|
| Current-Gain - Bandwidth Product (Notes 5, 6), (I _C = -50 mA, V _{CE} = -20 Vdc, f = 100 MHz) | f _T | 200 | - | MHz |
| Output Capacitance (V _{CB} = -10 Vdc, I _E = 0, f = 1.0 MHz) | C _{obo} | - | 8.0 | pF |
| Input Capacitance (V _{EB} = -2.0 Vdc, I _C = 0, f = 1.0 MHz) | C _{ibo} | - | 30 | pF |

SWITCHING CHARACTERISTICS

| | | | | | |
|---------------|--|------------------|---|-----|----|
| Turn-On Time | (V _{CC} = -30 Vdc, I _C = -150 mA, I _{B1} = -15 mA) | t _{on} | - | 45 | ns |
| Delay Time | | t _d | - | 10 | |
| Rise Time | | t _r | - | 40 | |
| Turn-Off Time | (V _{CC} = -6.0 Vdc, I _C = -150 mA, I _{B1} = I _{B2} = -15 mA) | t _{off} | - | 100 | |
| Storage Time | | t _s | - | 80 | |
| Fall Time | | t _f | - | 30 | |

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

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

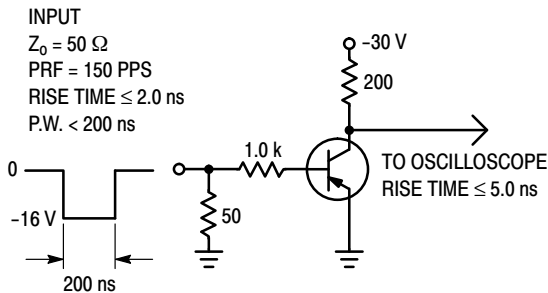


Figure 1. Delay and Rise Time Test Circuit

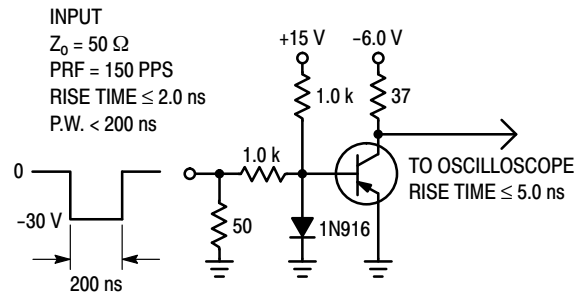


Figure 2. Storage and Fall Time Test Circuit

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TYPICAL CHARACTERISTICS

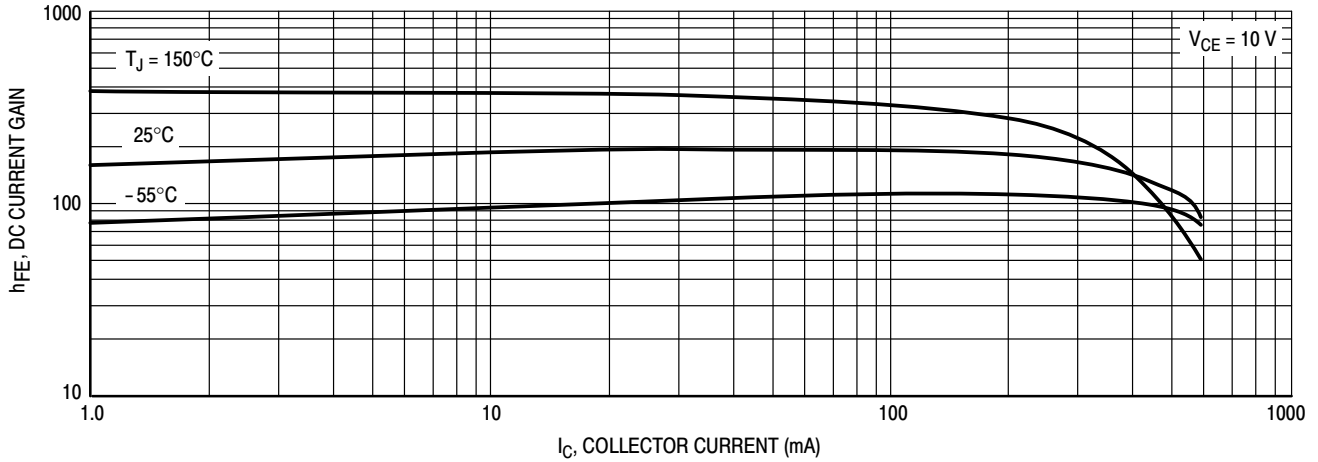


Figure 3. DC Current Gain

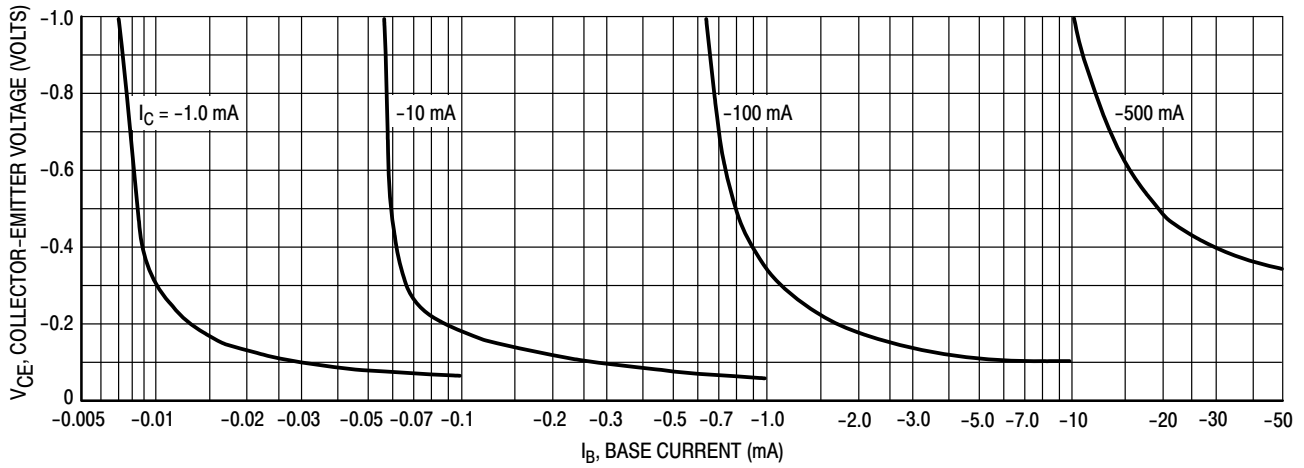


Figure 4. Collector Saturation Region

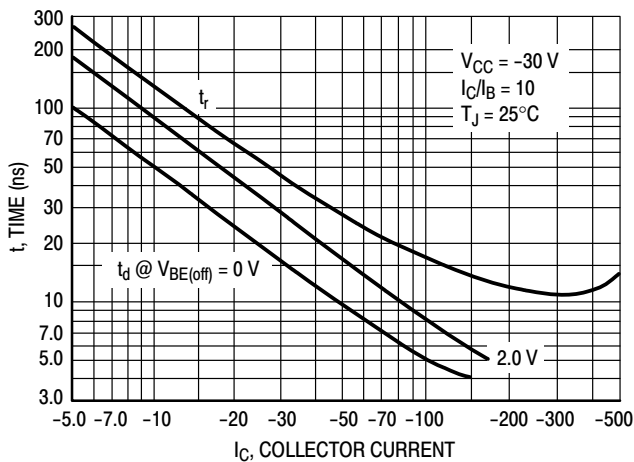


Figure 5. Turn-On Time

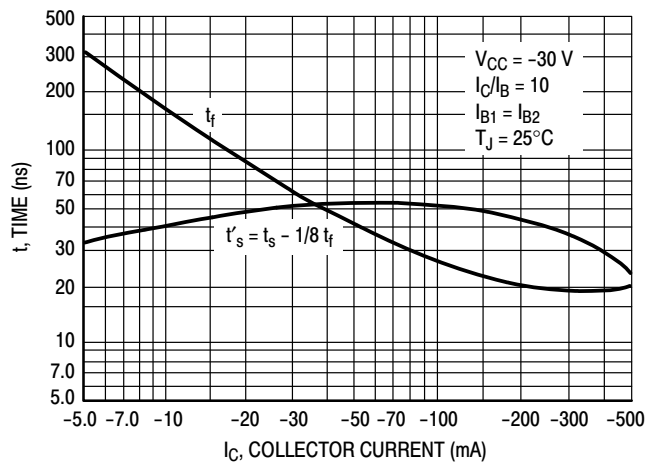


Figure 6. Turn-Off Time

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TYPICAL SMALL-SIGNAL Characteristics NOISE FIGURE

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

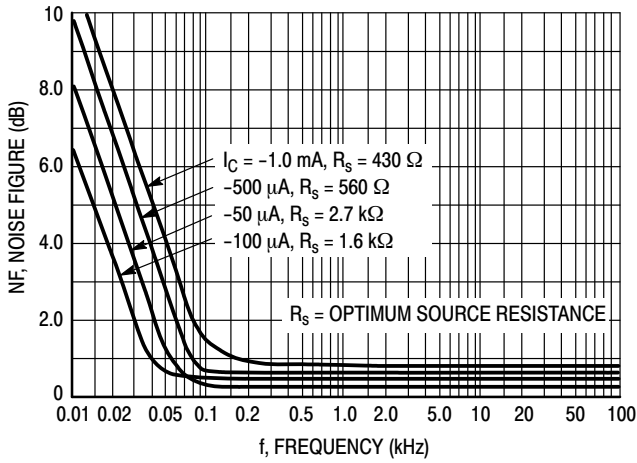


Figure 7. Frequency Effects

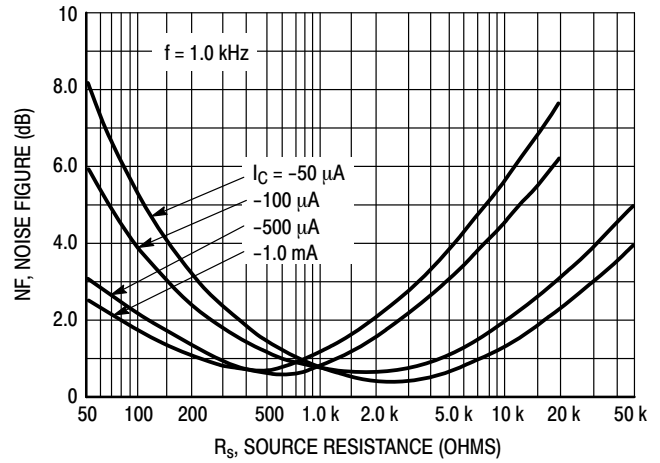


Figure 8. Source Resistance Effects

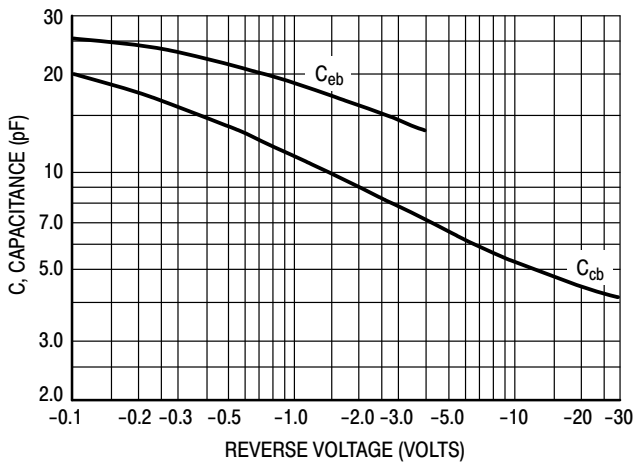


Figure 9. Capacitances

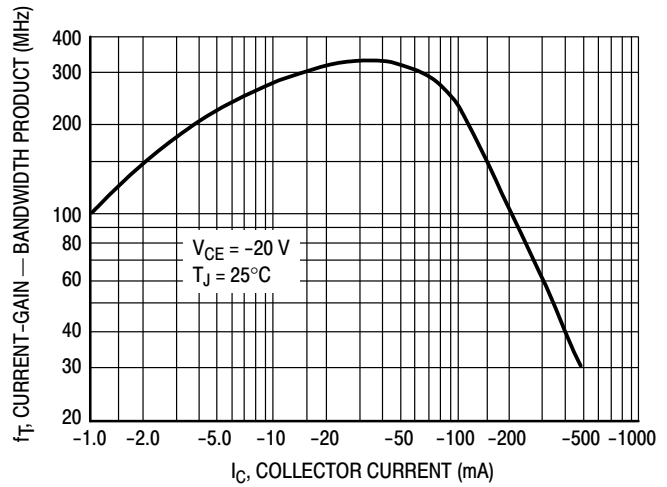


Figure 10. Current-Gain - Bandwidth Product

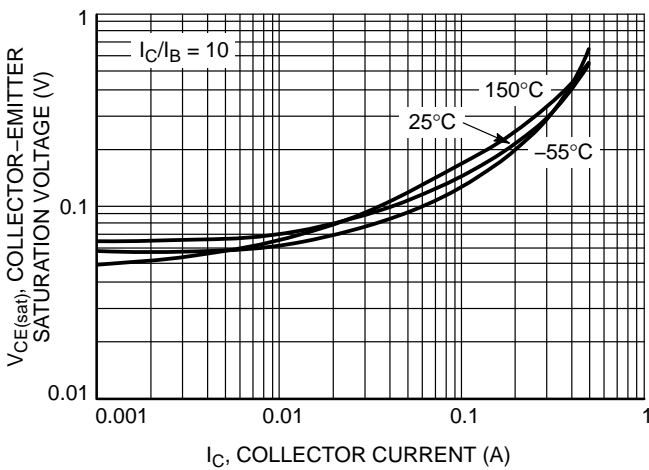


Figure 11. Collector-Emitter Saturation Voltage vs. Collector Current

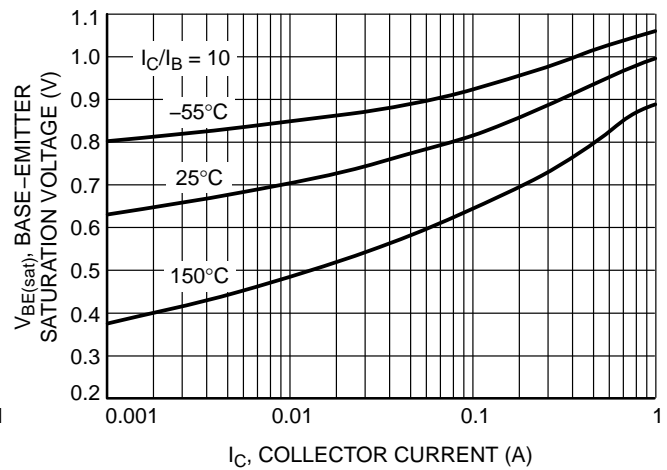


Figure 12. Base-Emitter Saturation Voltage vs. Collector Current

MMBT2907AL, SMMBT2907AL

TYPICAL SMALL-SIGNAL Characteristics NOISE FIGURE

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

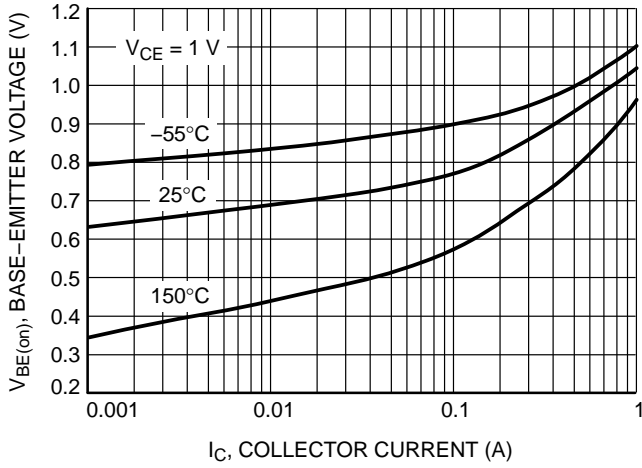


Figure 13. Base Emitter Voltage vs. Collector Current

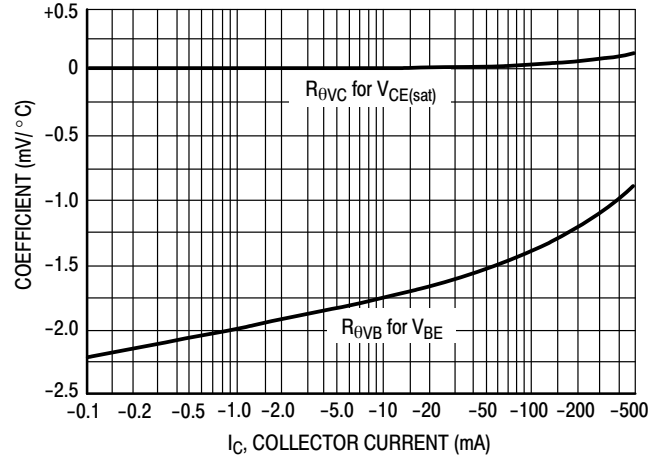


Figure 14. Temperature Coefficients

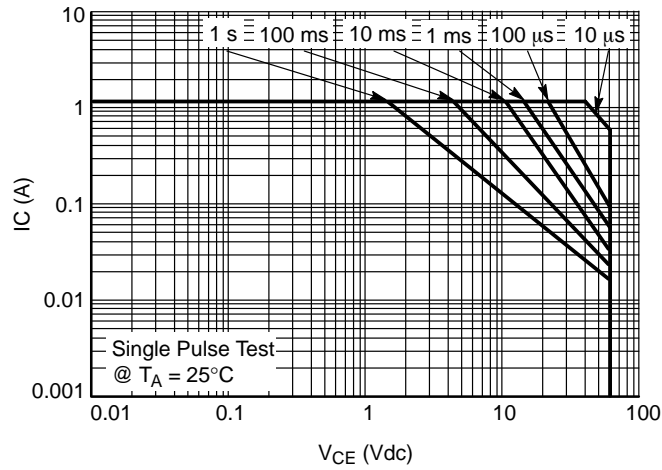


Figure 15. Safe Operating Area

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

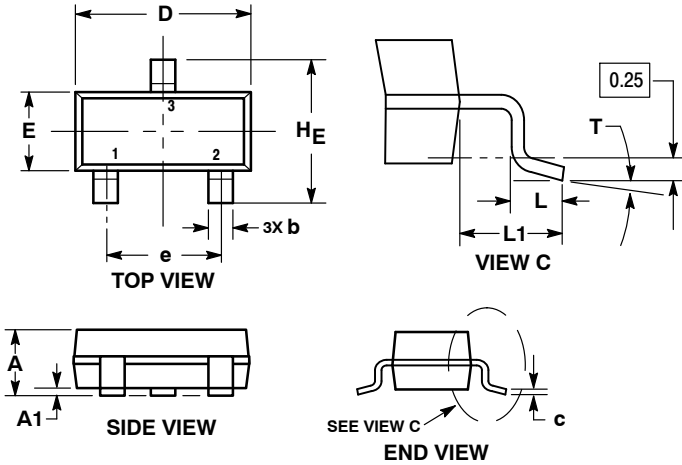
ON Semiconductor®



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

DATE 30 JAN 2018

SCALE 4:1



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° |

RECOMMENDED SOLDERING FOOTPRINT



GENERIC MARKING DIAGRAM*



XXX = 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.

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

| | | |
|-------------------------|------------------------|--|
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