

# MMBT5550L, MMBT5551L, SMMBT5551L

## High Voltage Transistors

### NPN Silicon

#### Features

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

#### MAXIMUM RATINGS

| Rating                                                         | Symbol    | Value           | Unit  |
|----------------------------------------------------------------|-----------|-----------------|-------|
| Collector – Emitter Voltage<br>MMBT5550<br>MMBT5551, SMMBT5551 | $V_{CEO}$ | 140<br>160      | Vdc   |
| Collector – Base Voltage<br>MMBT5550<br>MMBT5551, SMMBT5551    | $V_{CBO}$ | 160<br>180      | Vdc   |
| Emitter – Base Voltage                                         | $V_{EBO}$ | 6.0             | Vdc   |
| Collector Current – Continuous                                 | $I_C$     | 600             | mA dc |
| Electrostatic Discharge<br>Human Body Model<br>Machine Model   | ESD       | > 8000<br>> 400 | V     |

#### THERMAL CHARACTERISTICS

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

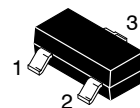
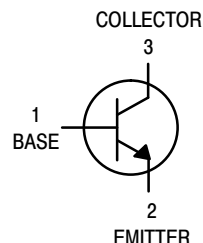
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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.



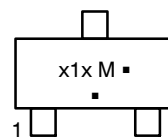
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SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



x1x = Device Code  
M1F = MMBT5550LT  
G1 = MMBT5551LT  
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†           |
|---------------|---------------------|---------------------|
| MMBT5550LT1G  | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel |
| MMBT5551LT1G  | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel |
| SMMBT5551LT1G | SOT-23<br>(Pb-Free) | 10,000/Tape & Reel  |
| MMBT5551LT1G  | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel |
| SMMBT5551LT3G | SOT-23<br>(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.

# MMBT5550L, MMBT5551L, SMMBT5551L

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

| Characteristic                                                                                                                                                                                                                                                       | Symbol        | Min                              | Max                            | Unit                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------|--------------------------------|---------------------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                                                           |               |                                  |                                |                                 |
| Collector – Emitter Breakdown Voltage (Note 3)<br>( $I_C = 1.0\text{ mAdc}$ , $I_B = 0$ )                                                                                                                                                                            | $V_{(BR)CEO}$ | 140<br>160                       | –<br>–                         | Vdc                             |
| Collector – Base Breakdown Voltage<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $I_E = 0$ )                                                                                                                                                                               | $V_{(BR)CBO}$ | 160<br>180                       | –<br>–                         | Vdc                             |
| Emitter – Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )                                                                                                                                                                                  | $V_{(BR)EBO}$ | 6.0                              | –                              | Vdc                             |
| Collector Cutoff Current<br>( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ )<br>( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ ) | $I_{CBO}$     | –<br>–<br>–<br>–                 | 100<br>50<br>100<br>50         | nAdc<br><br><br>$\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 4.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                                                                                                  | $I_{EBO}$     | –                                | 50                             | nAdc                            |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                                                                                                            |               |                                  |                                |                                 |
| DC Current Gain<br>( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 10\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 50\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )                                                                       | $h_{FE}$      | 60<br>80<br>60<br>80<br>20<br>30 | –<br>–<br>250<br>250<br>–<br>– | –                               |
| Collector – Emitter Saturation Voltage<br>( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ )<br>( $I_C = 50\text{ mAdc}$ , $I_B = 5.0\text{ mAdc}$ )                                                                                                               | $V_{CE(sat)}$ | –<br>–<br>–                      | 0.15<br>0.25<br>0.20           | Vdc                             |
| Base – Emitter Saturation Voltage<br>( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ )<br>( $I_C = 50\text{ mAdc}$ , $I_B = 5.0\text{ mAdc}$ )                                                                                                                    | $V_{BE(sat)}$ | –<br>–<br>–                      | 1.0<br>1.2<br>1.0              | Vdc                             |
| Collector Emitter Cut-off<br>( $V_{CB} = 10\text{ V}$ )<br>( $V_{CB} = 75\text{ V}$ )                                                                                                                                                                                | $I_{CES}$     | –<br>–                           | 50<br>100                      | nA                              |

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

# MMBT5550L, MMBT5551L, SMMBT5551L

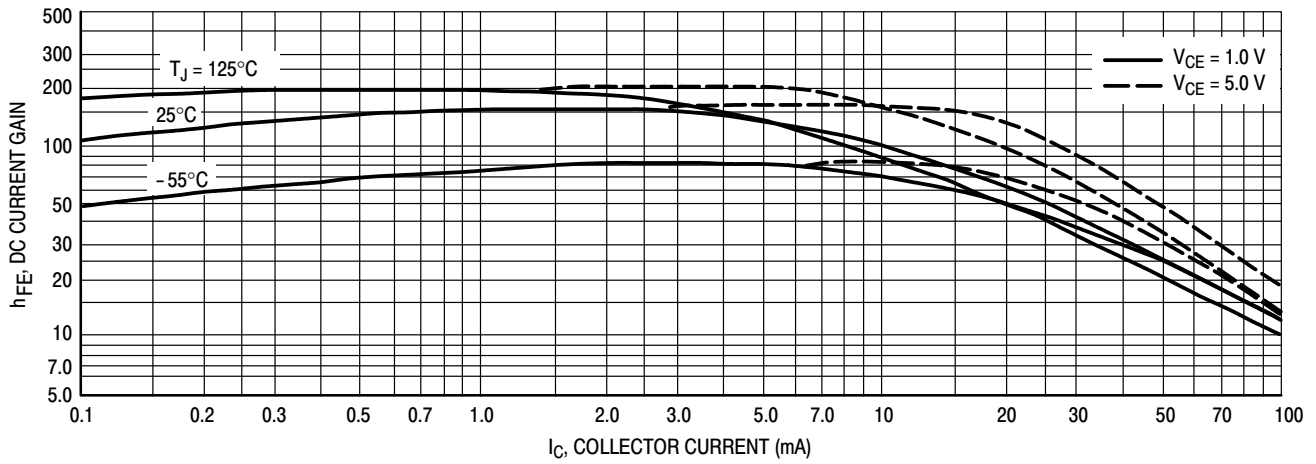


Figure 1. DC Current Gain

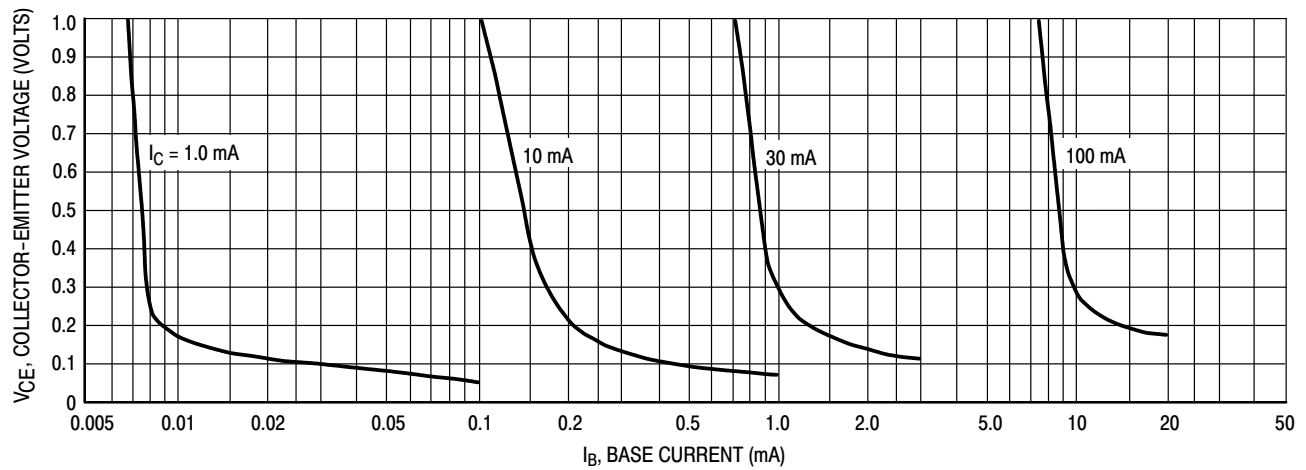


Figure 2. Collector Saturation Region

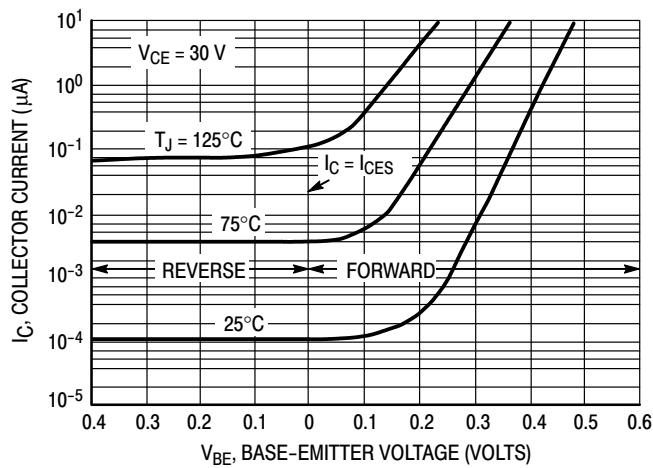


Figure 3. Collector Cut-Off Region

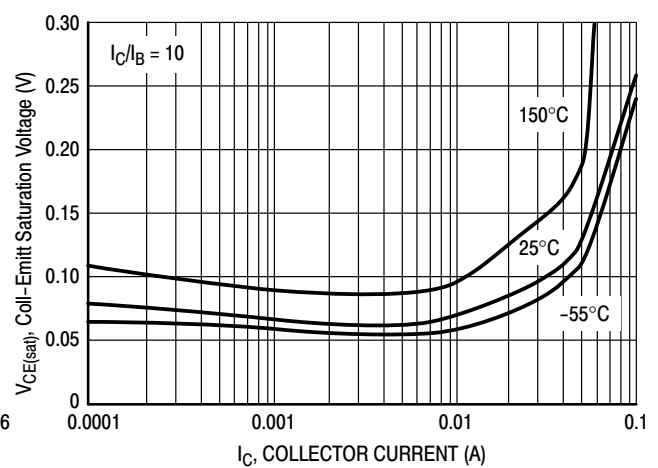


Figure 4.  $V_{CE(sat)}$

# MMBT5550L, MMBT5551L, SMMBT5551L

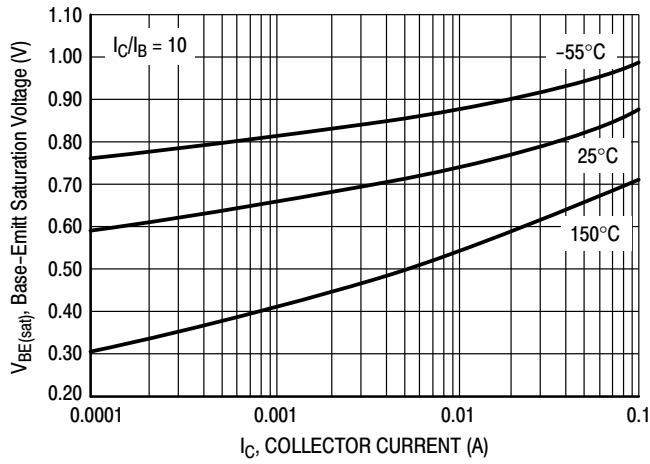


Figure 5.  $V_{BE(sat)}$

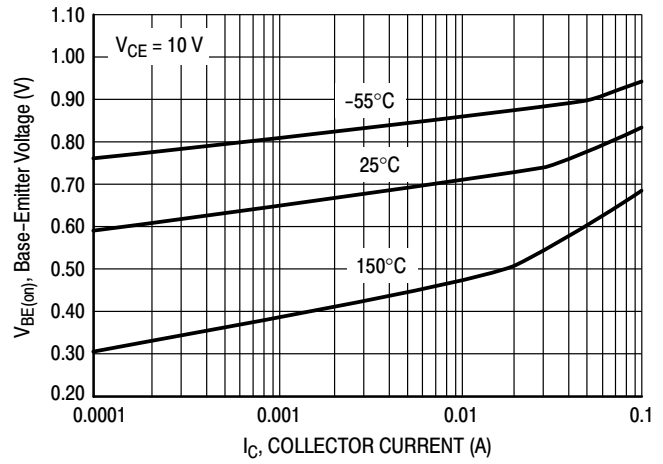


Figure 6.  $V_{BE(on)}$

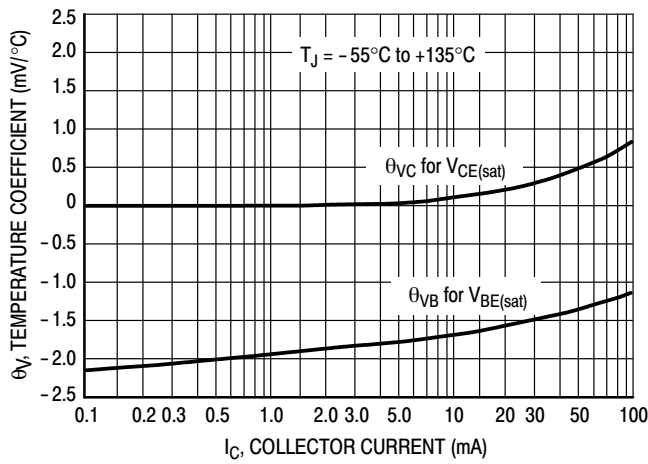


Figure 7. Temperature Coefficients

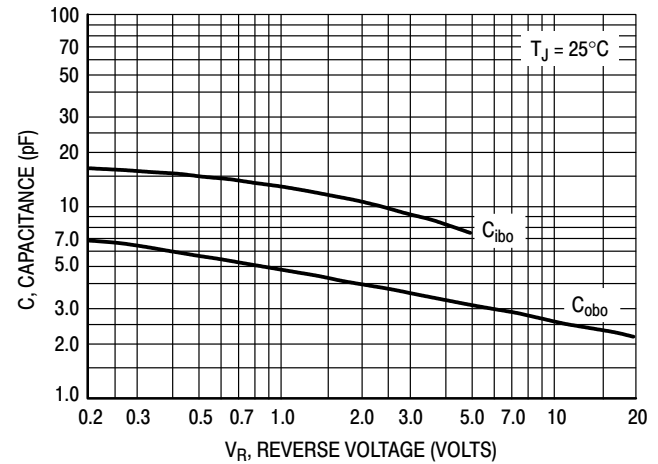
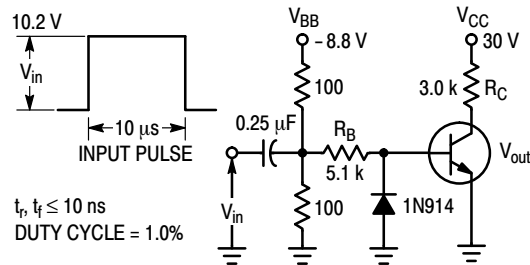


Figure 8. Capacitances



Values Shown are for  $I_C$  @ 10 mA

Figure 9. Switching Time Test Circuit

# MMBT5550L, MMBT5551L, SMMBT5551L

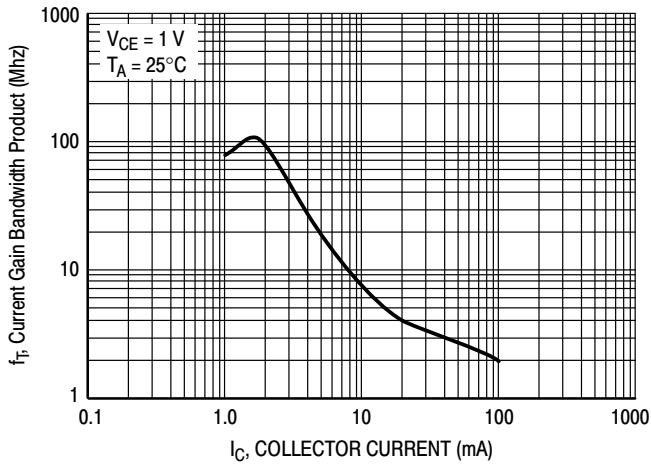


Figure 10. Current Gain Bandwidth Product

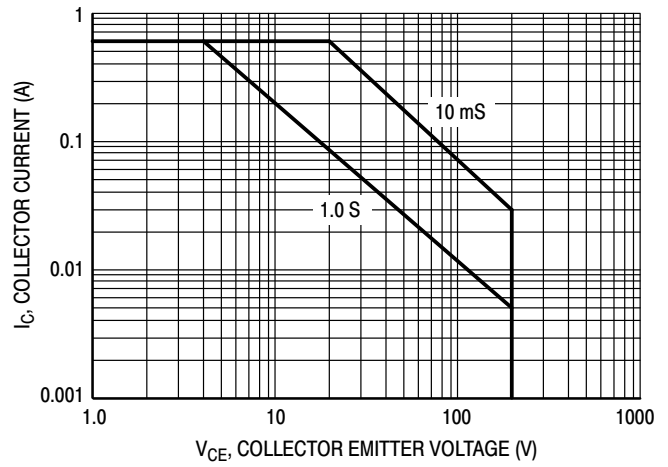


Figure 11. Safe Operating Area

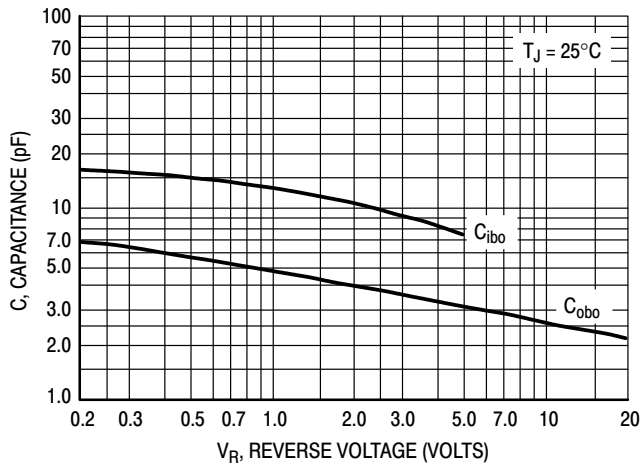


Figure 12. Capacitances

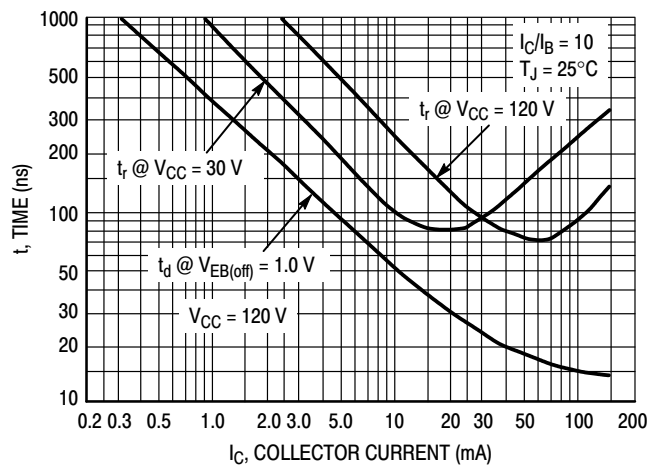


Figure 13. Turn-On Time

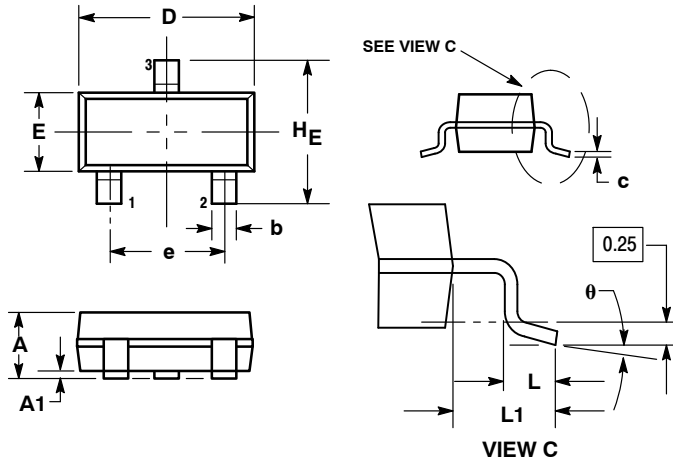
# MMBT5550L, MMBT5551L, SMMBT5551L

## PACKAGE DIMENSIONS

### SOT-23 (TO-236)

CASE 318-08

ISSUE AP



#### NOTES:

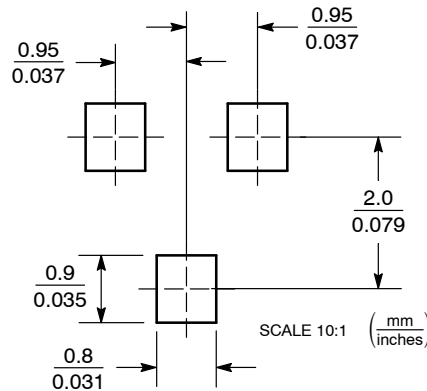
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.040 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.018 | 0.020 |
| c   | 0.09        | 0.13 | 0.18 | 0.003  | 0.005 | 0.007 |
| 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 | 0.081 |
| L   | 0.10        | 0.20 | 0.30 | 0.004  | 0.008 | 0.012 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.029 |
| H_E | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| θ   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

#### STYLE 6:

- PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

### SOLDERING 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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