

# MMBTA05L, MMBTA06L

## Driver Transistors

### NPN Silicon

#### Features

- S and 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

| Rating  | Symbol    | Value                                      | Unit |
|---|-----------|--|------|
| Collector-Emitter Voltage<br>MMBTA05L<br>MMBTA06L | $V_{CEO}$ | 60<br>80                                   | Vdc  |
| Collector-Base Voltage<br>MMBTA05L<br>MMBTA06L    | $V_{CBO}$ | 60<br>80                                   | Vdc  |
| Emitter-Base Voltage                              | $V_{EBO}$ | 4.0  | Vdc  |
| Collector Current – Continuous                    | $I_C$     | 500  | mAdc |
| Electrostatic Discharge                           | ESD       | HBM Class 3B<br>MM Class C<br>CDM Class IV |      |

#### THERMAL CHARACTERISTICS

| Characteristic  | Symbol          | Max         | Unit                       |
|---|-----------------|-------------|----------------------------|
| Total Device Dissipation FR-5<br>Board (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,<br>Junction-to-Ambient  | $R_{\theta JA}$ | 556         | $^\circ\text{C}/\text{W}$  |
| 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,<br>Junction-to-Ambient  | $R_{\theta JA}$ | 417         | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature  | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

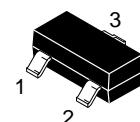
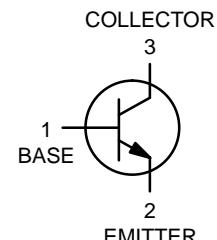
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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.



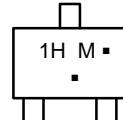
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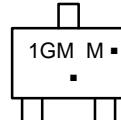


SOT-23  
CASE 318  
STYLE 6

#### MARKING DIAGRAMS



MMBTA05LT1



MMBTA06LT1,  
SMMBTA06L

1H, 1GM = Specific 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

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

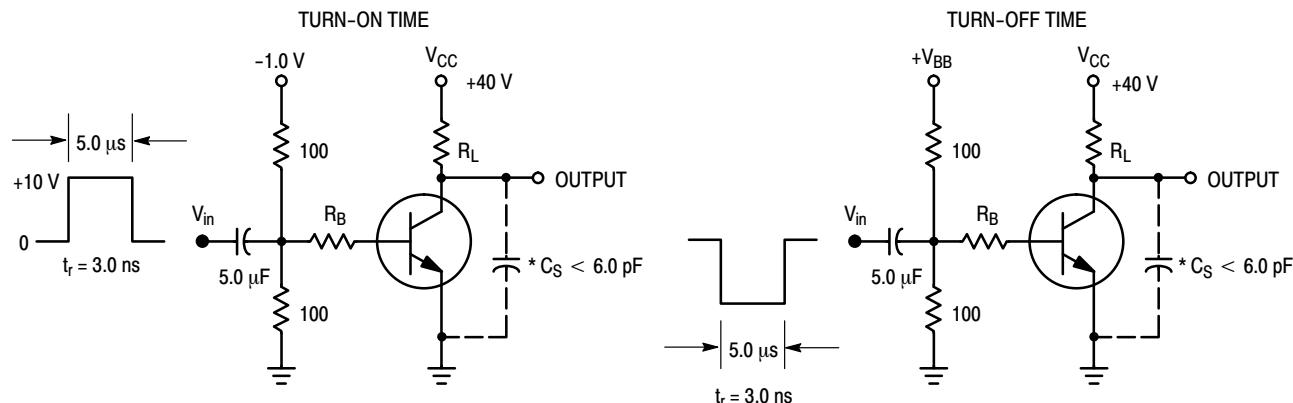
# MMBTA05L, MMBTA06L

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>( $I_C = 1.0 \text{ mA}_\text{dc}$ , $I_B = 0$ )<br>MMBTA05L<br>MMBTA06L                                 | $V_{(\text{BR})\text{CEO}}$ | 60<br>80   | —<br>—     | Vdc                     |
| Emitter-Base Breakdown Voltage<br>( $I_E = 100 \mu\text{A}_\text{dc}$ , $I_C = 0$ )  | $V_{(\text{BR})\text{EBO}}$ | 4.0        | —          | Vdc                     |
| Collector Cutoff Current<br>( $V_{CE} = 60 \text{ Vdc}$ , $I_B = 0$ )  | $I_{CES}$                   | —          | 0.1        | $\mu\text{A}_\text{dc}$ |
| Collector Cutoff Current<br>( $V_{CB} = 60 \text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 80 \text{ Vdc}$ , $I_E = 0$ )<br>MMBTA05L<br>MMBTA06L               | $I_{CBO}$                   | —<br>—     | 0.1<br>0.1 | $\mu\text{A}_\text{dc}$ |
| <b>ON CHARACTERISTICS</b>  |                             |            |            |                         |
| DC Current Gain<br>( $I_C = 10 \text{ mA}_\text{dc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )<br>( $I_C = 100 \text{ mA}_\text{dc}$ , $V_{CE} = 1.0 \text{ Vdc}$ ) | $h_{FE}$                    | 100<br>100 | —<br>—     | —                       |
| Collector-Emitter Saturation Voltage<br>( $I_C = 100 \text{ mA}_\text{dc}$ , $I_B = 10 \text{ mA}_\text{dc}$ )   | $V_{CE(\text{sat})}$        | —          | 0.25       | Vdc                     |
| Base-Emitter On Voltage<br>( $I_C = 100 \text{ mA}_\text{dc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )   | $V_{BE(\text{on})}$         | —          | 1.2        | Vdc                     |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>  |                             |            |            |                         |
| Current-Gain - Bandwidth Product (Note 4)<br>( $I_C = 10 \text{ mA}$ , $V_{CE} = 2.0 \text{ V}$ , $f = 100 \text{ MHz}$ )                                | $f_T$                       | 100        | —          | MHz                     |

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

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



\*Total Shunt Capacitance of Test Jig and Connectors  
For PNP Test Circuits, Reverse All Voltage Polarities

Figure 1. Switching Time Test Circuits

# MMBTA05L, MMBTA06L

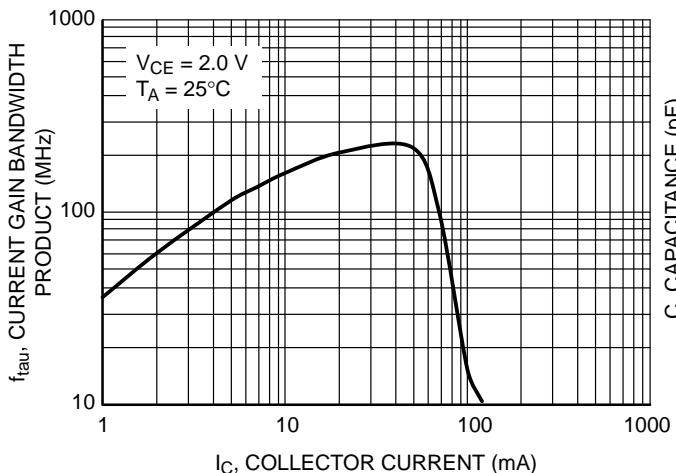


Figure 2. Current Gain Bandwidth Product vs.  
Collector Current

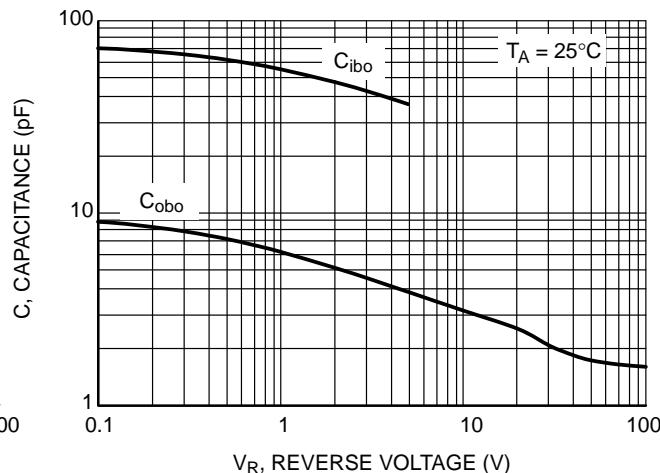


Figure 3. Capacitance

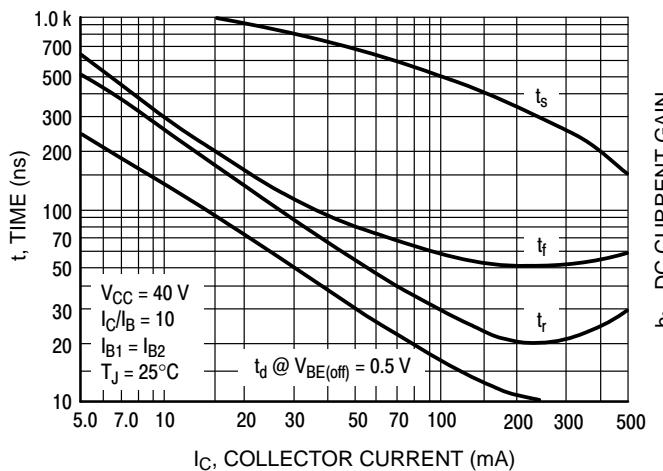


Figure 4. Switching Time

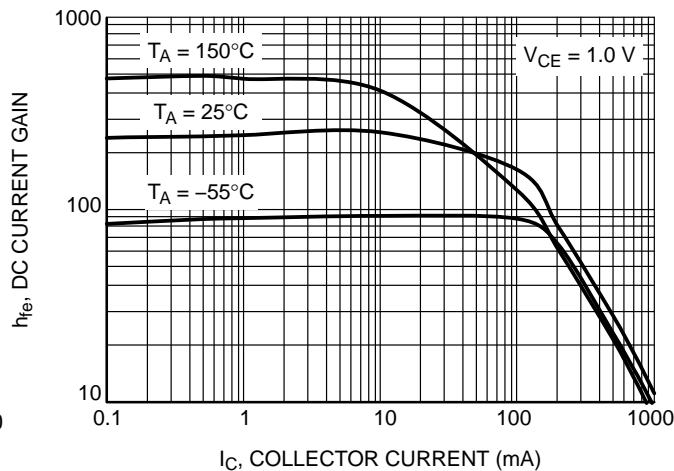


Figure 5. DC Current Gain vs. Collector  
Current

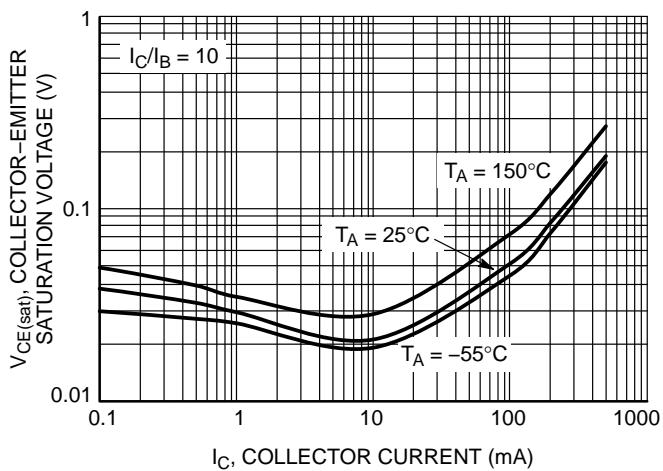


Figure 6. Collector Emitter Saturation Voltage  
vs. Collector Current

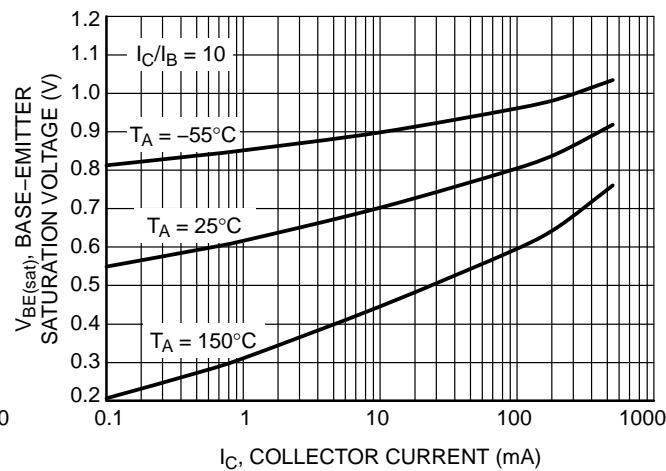


Figure 7. Base Emitter Saturation Voltage vs.  
Collector Current

## MMBTA05L, MMBTA06L

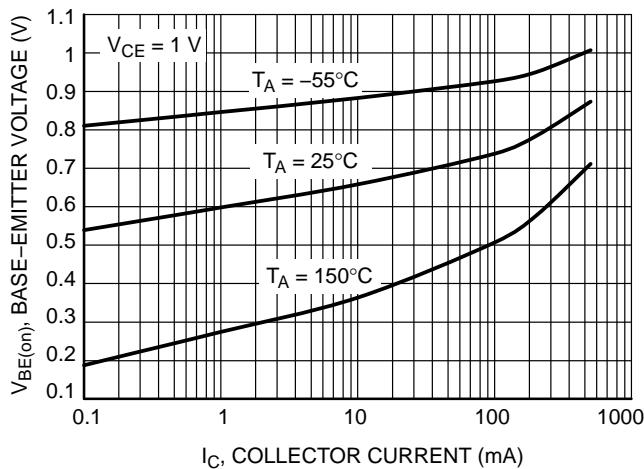


Figure 8. Base Emitter Turn-ON Voltage vs. Collector Current

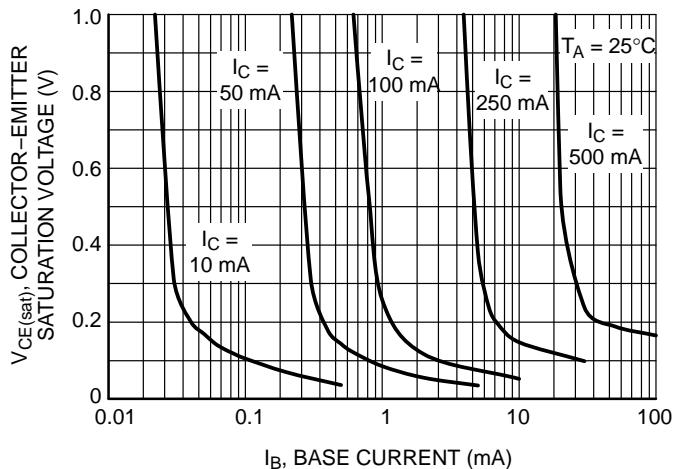


Figure 9. Saturation Region

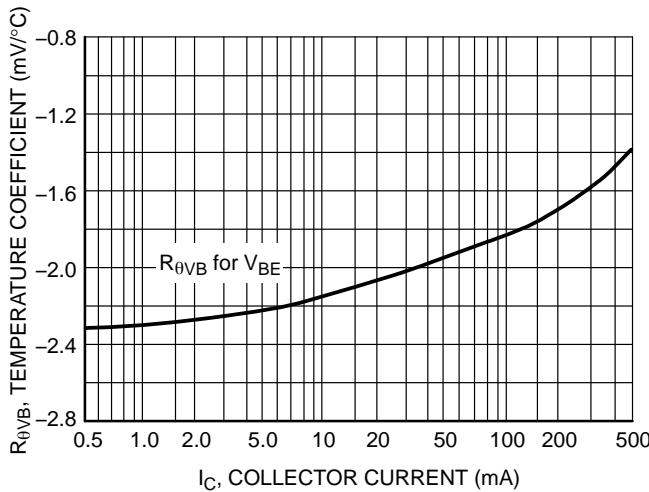


Figure 10. Base-Emitter Temperature Coefficient

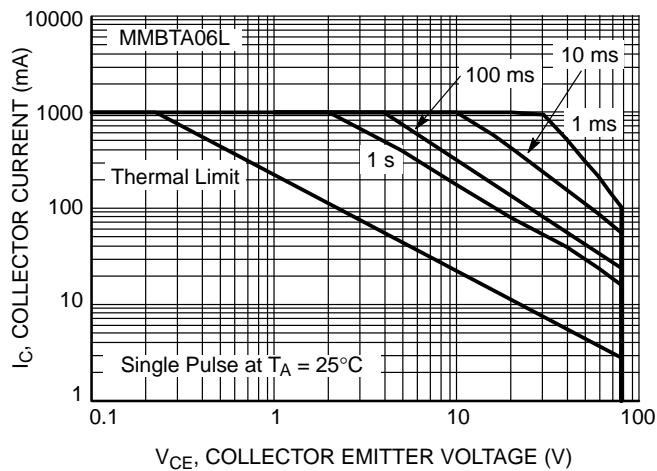


Figure 11. Safe Operating Area

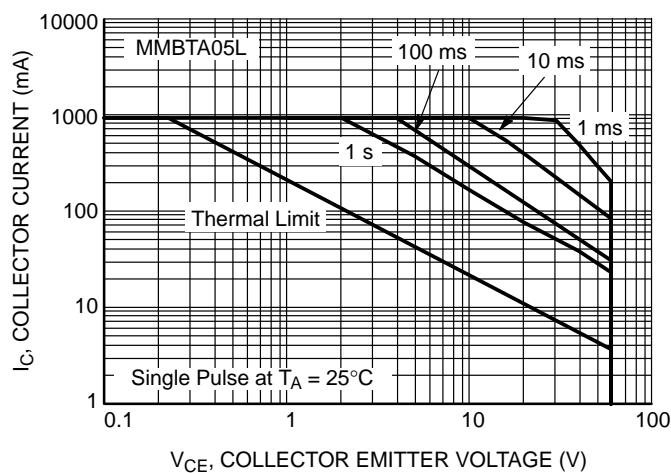


Figure 12. Safe Operating Area

## MMBTA05L, MMBTA06L

### ORDERING INFORMATION

| Device          | Package             | Shipping <sup>†</sup> |
|-----------------|---------------------|-----------------------|
| MMBTA05LT1G     | SOT-23<br>(Pb-Free) | 3000 / Tape & Reel    |
| NSVMMBTA05LT1G* | SOT-23<br>(Pb-Free) | 3000 / Tape & Reel    |
| MMBTA05LT3G     | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| MMBTA06LT1G     | SOT-23<br>(Pb-Free) | 3000 / Tape & Reel    |
| SMMBTA06LT1G*   | SOT-23<br>(Pb-Free) | 3000 / Tape & Reel    |
| MMBTA06LT3G     | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| SMMBTA06LT3G*   | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |

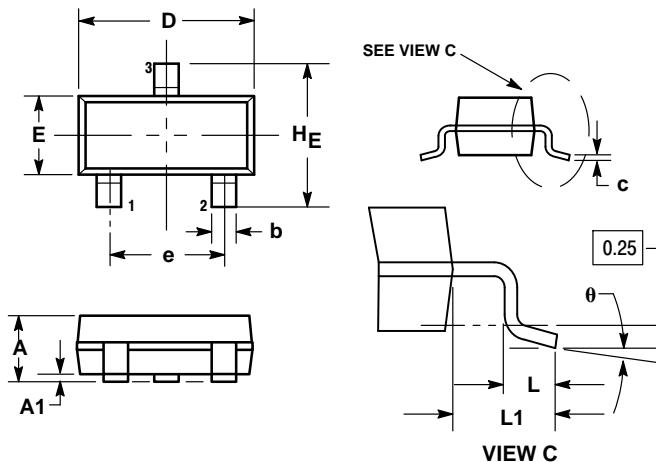
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

# MMBTA05L, MMBTA06L

## PACKAGE DIMENSIONS

### SOT-23 (TO-236) CASE 318-08 ISSUE AP



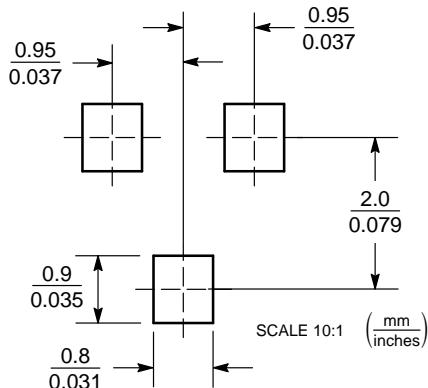
#### NOTES:

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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