

# NJT4031N, NJV4031NT1G, NJV4031NT3G

## Bipolar Power Transistors

### NPN Silicon

#### Features

- Epoxy Meets UL 94, V-0 @ 0.125 in
- NJV 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 ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Rating                         | Symbol    | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | 40    | Vdc  |
| Collector-Base Voltage         | $V_{CB}$  | 40    | Vdc  |
| Emitter-Base Voltage           | $V_{EB}$  | 6.0   | Vdc  |
| Base Current – Continuous      | $I_B$     | 1.0   | Adc  |
| Collector Current – Continuous | $I_C$     | 3.0   | Adc  |
| Collector Current – Peak       | $I_{CM}$  | 5.0   | Adc  |
| ESD – Human Body Model         | HBM       | 3B    | V    |
| ESD – Machine Model            | MM        | C     | V    |

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.

#### THERMAL CHARACTERISTICS

| Characteristic                                                                                                                | Symbol                             | Max            | Unit                      |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------|---------------------------|
| Total Power Dissipation<br>Total $P_D$ @ $T_A = 25^\circ\text{C}$ (Note 1)<br>Total $P_D$ @ $T_A = 25^\circ\text{C}$ (Note 2) | $P_D$                              | 2.0<br>0.80    | W                         |
| Thermal Resistance, Junction-to-Case<br>Junction-to-Ambient (Note 1)<br>Junction-to-Ambient (Note 2)                          | $R_{\theta JA}$<br>$R_{\theta JA}$ | 64<br>155      | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds                                                 | $T_L$                              | 260            | $^\circ\text{C}$          |
| Operating and Storage Junction Temperature Range                                                                              | $T_J, T_{stg}$                     | -55 to<br>+150 | $^\circ\text{C}$          |

1. Mounted on 1" sq. (645 sq. mm) Collector pad on FR-4 bd material.

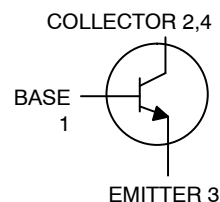
2. Mounted on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 bd material.



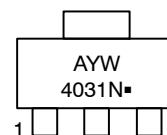
ON Semiconductor®

<http://onsemi.com>

### NPN TRANSISTOR 3.0 AMPERES 40 VOLTS, 2.0 WATTS



#### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
4031N = Specific Device Code  
■ = Pb-Free Package

#### ORDERING INFORMATION

| Device      | Package              | Shipping†          |
|-------------|----------------------|--------------------|
| NJT4031NT1G | SOT-223<br>(Pb-Free) | 1000 / Tape & Reel |
| NJV4031NT1G |                      |                    |
| NJT4031NT3G | SOT-223<br>(Pb-Free) | 4000 / Tape & Reel |
| NJV4031NT3G |                      |                    |

†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.

# NJT4031N, NJV4031NT1G, NJV4031NT3G

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                      |                       |     |   |     |                  |
|----------------------------------------------------------------------------------------------------------------------|-----------------------|-----|---|-----|------------------|
| Collector-Emitter Sustaining Voltage<br>(I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0 A <sub>dc</sub> ) | V <sub>CEO(sus)</sub> | 40  | – | –   | V <sub>dc</sub>  |
| Emitter-Base Voltage<br>(I <sub>E</sub> = 50 μA <sub>dc</sub> , I <sub>C</sub> = 0 A <sub>dc</sub> )                 | V <sub>EBO</sub>      | 6.0 | – | –   | V <sub>dc</sub>  |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 40 V <sub>dc</sub> )                                                  | I <sub>CBO</sub>      | –   | – | 100 | nA <sub>dc</sub> |
| Emitter Cutoff Current<br>(V <sub>BE</sub> = 6.0 V <sub>dc</sub> )                                                   | I <sub>EBO</sub>      | –   | – | 100 | nA <sub>dc</sub> |

### ON CHARACTERISTICS (Note 3)

|                                                                                                                                                                                                                                                                                             |                      |                   |             |                         |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------|-------------|-------------------------|-----------------|
| Collector-Emitter Saturation Voltage<br>(I <sub>C</sub> = 0.5 A <sub>dc</sub> , I <sub>B</sub> = 5.0 mA <sub>dc</sub> )<br>(I <sub>C</sub> = 1.0 A <sub>dc</sub> , I <sub>B</sub> = 10 mA <sub>dc</sub> )<br>(I <sub>C</sub> = 3.0 A <sub>dc</sub> , I <sub>B</sub> = 0.3 A <sub>dc</sub> ) | V <sub>CE(sat)</sub> | –<br>–<br>–       | –<br>–<br>– | 0.100<br>0.150<br>0.300 | V <sub>dc</sub> |
| Base-Emitter Saturation Voltage<br>(I <sub>C</sub> = 1.0 A <sub>dc</sub> , I <sub>B</sub> = 0.1 A <sub>dc</sub> )                                                                                                                                                                           | V <sub>BE(sat)</sub> | –                 | –           | 1.0                     | V <sub>dc</sub> |
| Base-Emitter On Voltage<br>(I <sub>C</sub> = 1.0 A <sub>dc</sub> , V <sub>CE</sub> = 2.0 V <sub>dc</sub> )                                                                                                                                                                                  | V <sub>BE(on)</sub>  | –                 | –           | 1.0                     | V <sub>dc</sub> |
| DC Current Gain<br>(I <sub>C</sub> = 0.5 A <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )<br>(I <sub>C</sub> = 1.0 A <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )<br>(I <sub>C</sub> = 3.0 A <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )                    | h <sub>FE</sub>      | 220<br>200<br>100 | –<br>–<br>– | 500                     |                 |

### DYNAMIC CHARACTERISTICS

|                                                                                                                             |                 |   |     |   |     |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------|---|-----|---|-----|
| Output Capacitance<br>(V <sub>CB</sub> = 10 V <sub>dc</sub> , f = 1.0 MHz)                                                  | C <sub>ob</sub> | – | 25  | – | pF  |
| Input Capacitance<br>(V <sub>EB</sub> = 5.0 V <sub>dc</sub> , f = 1.0 MHz)                                                  | C <sub>ib</sub> | – | 170 | – | pF  |
| Current-Gain – Bandwidth Product (Note 4)<br>(I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 V, F <sub>test</sub> = 1.0 MHz) | f <sub>T</sub>  | – | 215 | – | MHz |

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. f<sub>T</sub> = |h<sub>FE</sub>| • f<sub>test</sub>

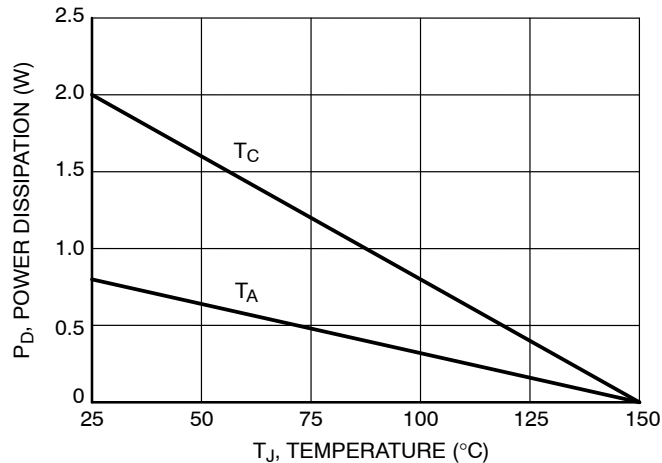


Figure 1. Power Derating

TYPICAL CHARACTERISTICS

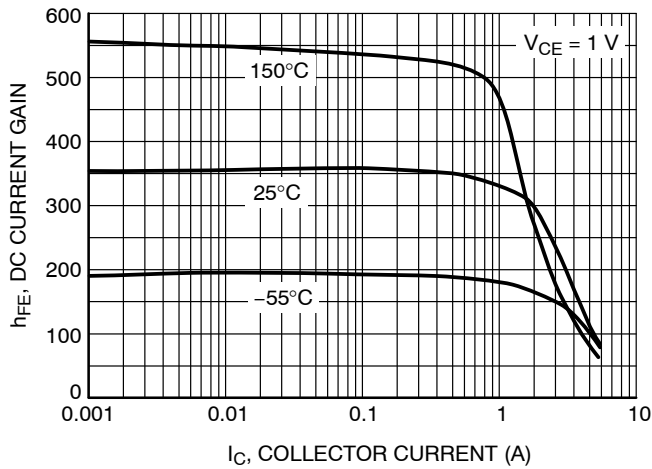


Figure 2. DC Current Gain

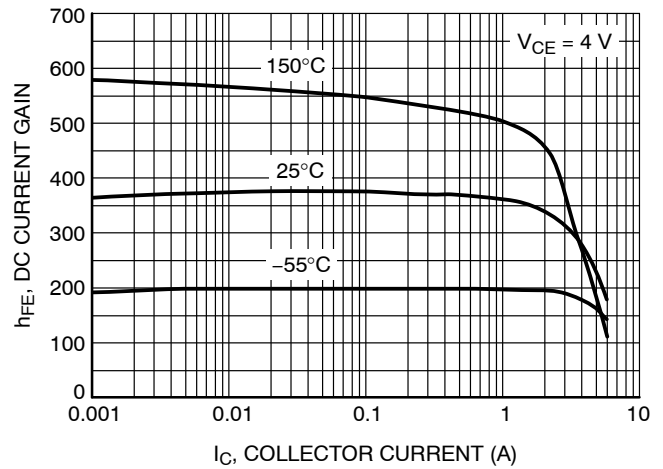


Figure 3. DC Current Gain

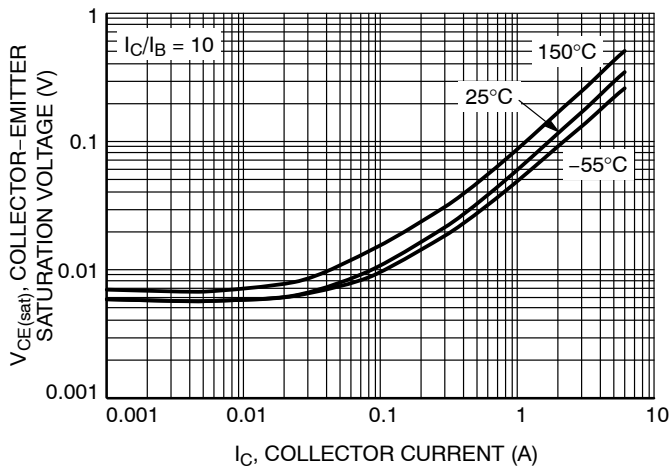


Figure 4. Collector-Emitter Saturation Voltage

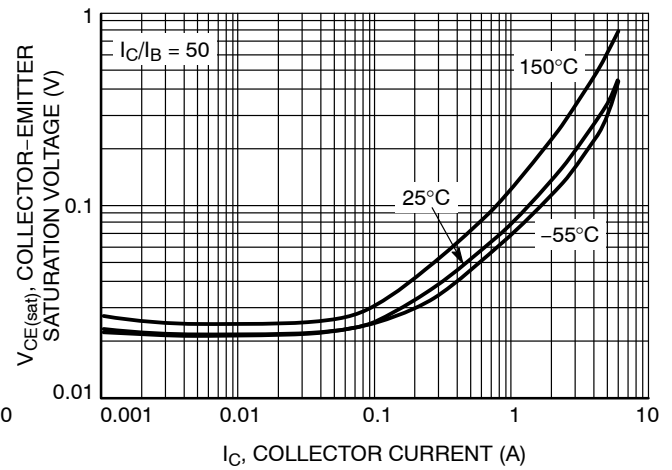


Figure 5. Collector-Emitter Saturation Voltage

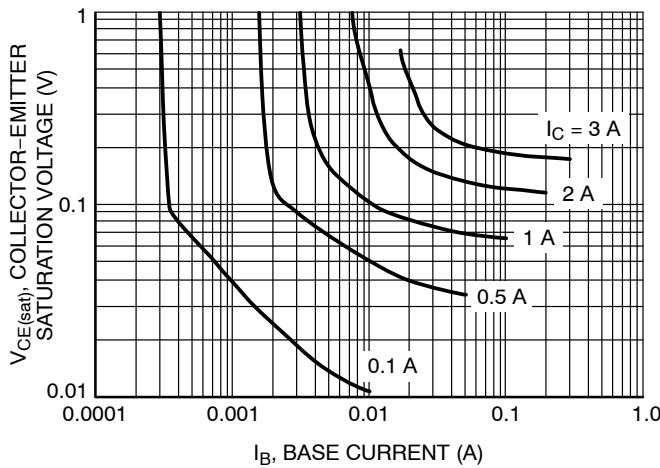


Figure 6. Collector Saturation Region

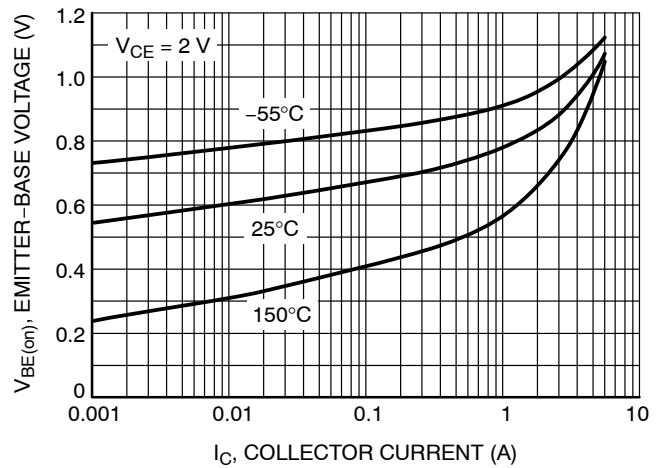


Figure 7.  $V_{BE(on)}$  Voltage

TYPICAL CHARACTERISTICS

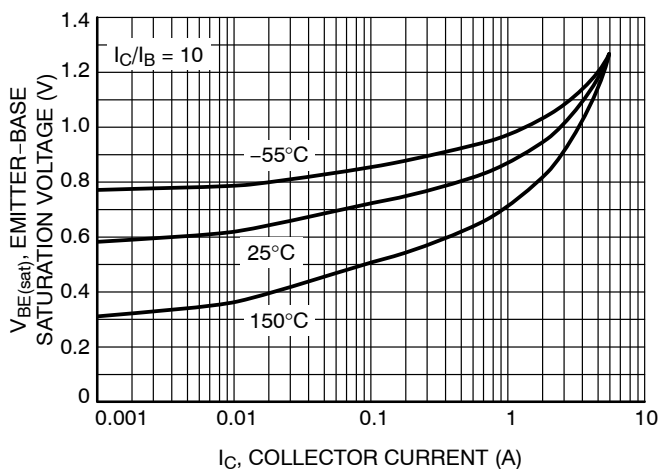


Figure 8. Base-Emitter Saturation Voltage

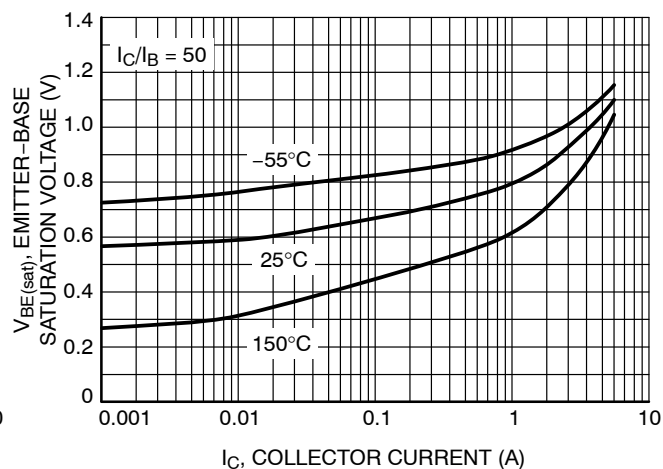


Figure 9. Base-Emitter Saturation Voltage

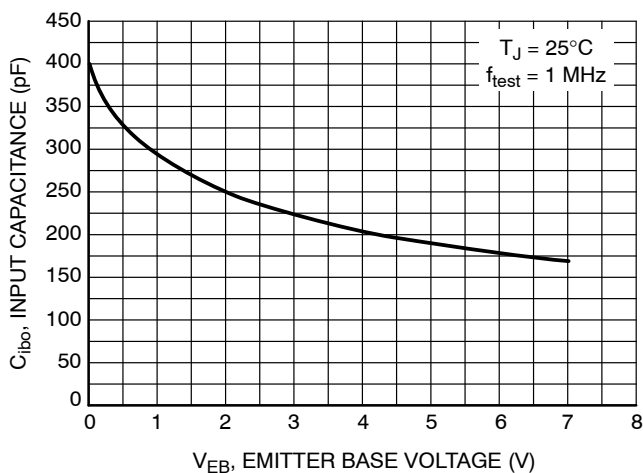


Figure 10. Input Capacitance

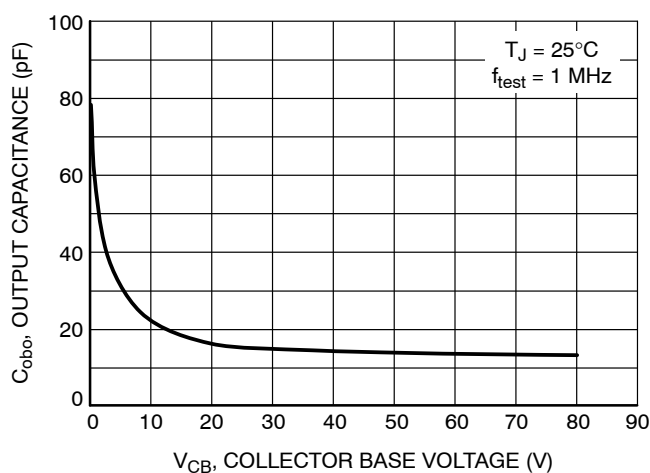


Figure 11. Output Capacitance

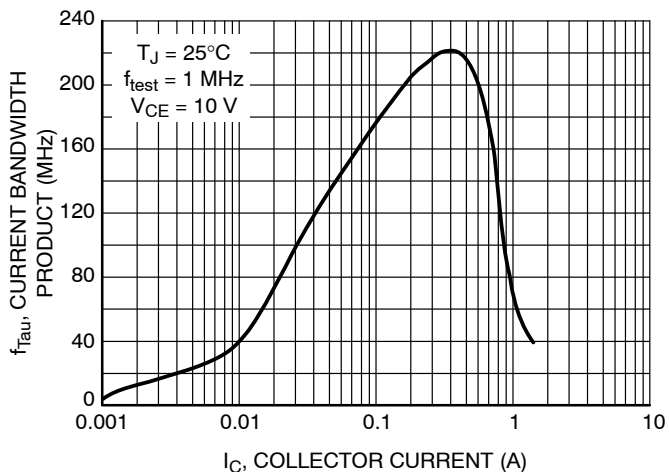


Figure 12. Current-Gain Bandwidth Product

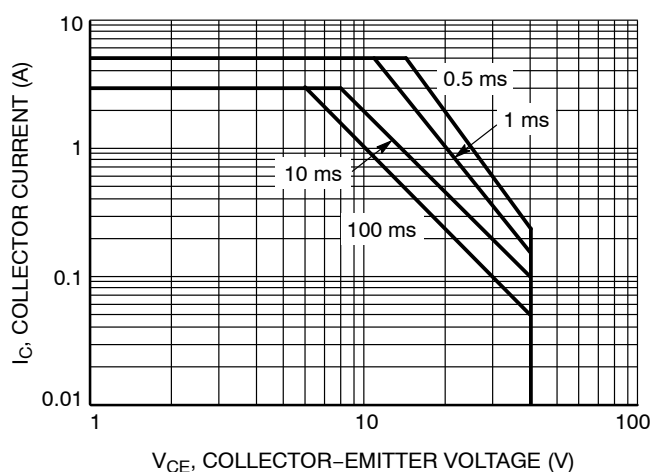


Figure 13. Safe Operating Area

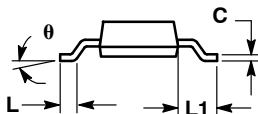
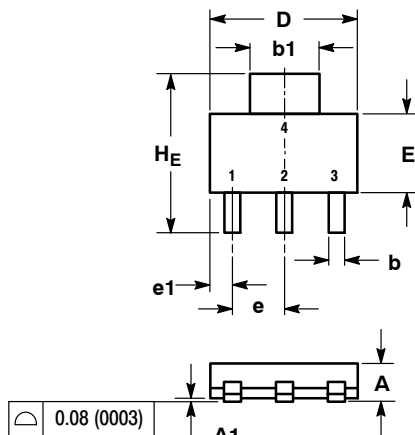
# NJT4031N, NJV4031NT1G, NJV4031NT3G

## PACKAGE DIMENSIONS

SOT-223 (TO-261)

CASE 318E-04

ISSUE N



### NOTES:

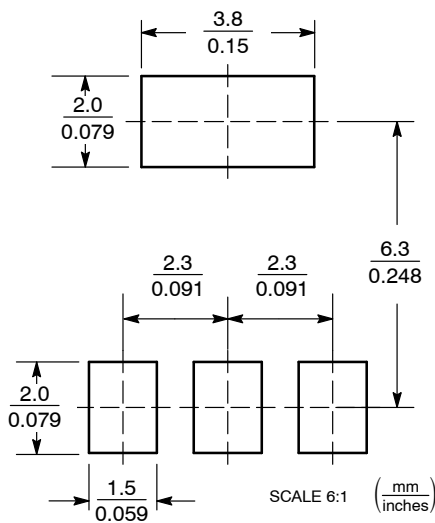
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 1.50        | 1.63 | 1.75 | 0.060  | 0.064 | 0.068 |
| A1  | 0.02        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.60        | 0.75 | 0.89 | 0.024  | 0.030 | 0.035 |
| b1  | 2.90        | 3.06 | 3.20 | 0.115  | 0.121 | 0.126 |
| c   | 0.24        | 0.29 | 0.35 | 0.009  | 0.012 | 0.014 |
| D   | 6.30        | 6.50 | 6.70 | 0.249  | 0.256 | 0.263 |
| E   | 3.30        | 3.50 | 3.70 | 0.130  | 0.138 | 0.145 |
| e   | 2.20        | 2.30 | 2.40 | 0.087  | 0.091 | 0.094 |
| e1  | 0.85        | 0.94 | 1.05 | 0.033  | 0.037 | 0.041 |
| L   | 0.20        | ---  | ---  | 0.008  | ---   | ---   |
| L1  | 1.50        | 1.75 | 2.00 | 0.060  | 0.069 | 0.078 |
| H_E | 6.70        | 7.00 | 7.30 | 0.264  | 0.276 | 0.287 |
| θ   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

### STYLE 1:

- PIN 1. BASE
- COLLECTOR
- EMITTER
- 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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