

MBT2222ADW1T1

General Purpose Transistor

NPN Silicon

Features

- Moisture Sensitivity Level: 1
- Pb-Free Package is Available

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|---------------------------|------|
| Collector-Emitter Voltage | V_{CEO} | 40 | Vdc |
| Collector-Base Voltage | V_{CBO} | 75 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 6.0 | Vdc |
| Collector Current - Continuous | I_C | 600 | mAdc |
| Electrostatic Discharge | ESD | HBM Class 2 MM Class B | |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|-----------------------------------------------------------------|-----------------|-------------|--------------------|
| Total Package Dissipation (Note 1), $T_A = 25^\circ\text{C}$ | P_D | 150 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 833 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

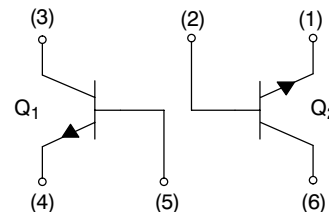
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.



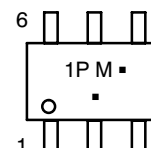
ON Semiconductor®

<http://onsemi.com>



SC-88/SC70-6/SOT-363
CASE 419B
STYLE 1

MARKING DIAGRAM



1P = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|----------------------|------------------|
| MBT2222ADW1T1 | SOT-363 | 3000/Tape & Reel |
| MBT2222ADW1T1G | SOT-363 (Pb-Free) | 3000/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 | (I _C = 10 mAdc, I _B = 0) | V _{(BR)CEO} | 40 | - | Vdc |
| Collector-Base Breakdown Voltage | (I _C = 10 μAdc, I _E = 0) | V _{(BR)CBO} | 75 | - | Vdc |
| Emitter-Base Breakdown Voltage, | (I _E = 10 μAdc, I _C = 0) | V _{(BR)EBO} | 6.0 | - | Vdc |
| Collector Cutoff Current | (V _{CE} = 60 Vdc, V _{EB(off)} = 3.0 Vdc) | I _{CEX} | - | 10 | nAdc |
| Collector Cutoff Current | (V _{CB} = 60 Vdc, I _E = 0) (V _{CB} = 60 Vdc, I _E = 0, T _A = 125°C) | I _{CBO} | - - | 0.01 10 | μAdc |
| Emitter Cutoff Current | (V _{EB} = 3.0 Vdc, I _C = 0) | I _{EBO} | - | 100 | nAdc |
| Base Cutoff Current | (V _{CE} = 60 Vdc, V _{EB(off)} = 3.0 Vdc) | I _{BL} | - | 20 | nAdc |

ON CHARACTERISTICS

| | | | | | |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------|-----------------------------------|-----|
| DC Current Gain | (I _C = 0.1 mAdc, V _{CE} = 10 Vdc) (I _C = 1.0 mAdc, V _{CE} = 10 Vdc) (I _C = 10 mAdc, V _{CE} = 10 Vdc) (I _C = 10 mAdc, V _{CE} = 10 Vdc, T _A = -55°C) (I _C = 150 mAdc, V _{CE} = 10 Vdc) (Note 2) (I _C = 150 mAdc, V _{CE} = 1.0 Vdc) (Note 2) (I _C = 500 mAdc, V _{CE} = 10 Vdc) (Note 2) | h _{FE} | 35 50 75 35 100 50 40 | - - - - 300 - - | - |
| Collector-Emitter Saturation Voltage (Note 2) | (I _C = 150 mAdc, I _B = 15 mAdc) (I _C = 500 mAdc, I _B = 50 mAdc) | V _{CE(sat)} | - - | 0.3 1.0 | Vdc |
| Base-Emitter Saturation Voltage (Note 2) | (I _C = 150 mAdc, I _B = 15 mAdc) (I _C = 500 mAdc, I _B = 50 mAdc) | V _{BE(sat)} | 0.6 - | 1.2 2.0 | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| | | | | | |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------|-------------|--------------------|
| Current-Gain - Bandwidth Product (Note 3) | (I _C = 20 mAdc, V _{CE} = 20 Vdc, f = 100 MHz) | f _T | 300 | - | MHz |
| Output Capacitance | (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz) | C _{obo} | - | 8.0 | pF |
| Input Capacitance | (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz) | C _{ibo} | - | 25 | pF |
| Input Impedance | (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | h _{ie} | 2.0 0.25 | 8.0 1.25 | kΩ |
| Voltage Feedback Ratio | (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | h _{re} | - - | 8.0 4.0 | X 10 ⁻⁴ |
| Small-Signal Current Gain | (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | h _{fe} | 50 75 | 300 375 | - |
| Output Admittance | (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | h _{oe} | 5.0 25 | 35 200 | μmhos |
| Collector Base Time Constant | (I _E = 20 mAdc, V _{CB} = 20 Vdc, f = 31.8 MHz) | rb, C _c | - | 150 | ps |
| Noise Figure | (I _C = 100 μAdc, V _{CE} = 10 Vdc, R _S = 1.0 kΩ, f = 1.0 kHz) | NF | - | 4.0 | dB |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|----------------------------------------------------------------------------------------------------------------------|----------------|---|-----|----|
| Delay Time | (V _{CC} = 30 Vdc, V _{BE(off)} = -0.5 Vdc, I _C = 150 mAdc, I _{B1} = 15 mAdc) | t _d | - | 10 | ns |
| Rise Time | | t _r | - | 25 | |
| Storage Time | (V _{CC} = 30 Vdc, I _C = 150 mAdc, I _{B1} = I _{B2} = 15 mAdc) | t _s | - | 225 | ns |
| Fall Time | | t _f | - | 60 | |

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

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS

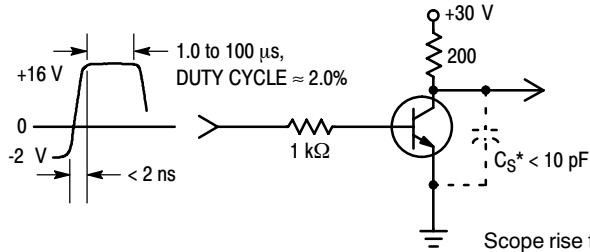


Figure 1. Turn-On Time

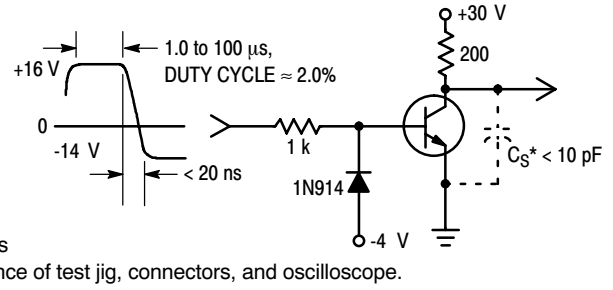


Figure 2. Turn-Off Time

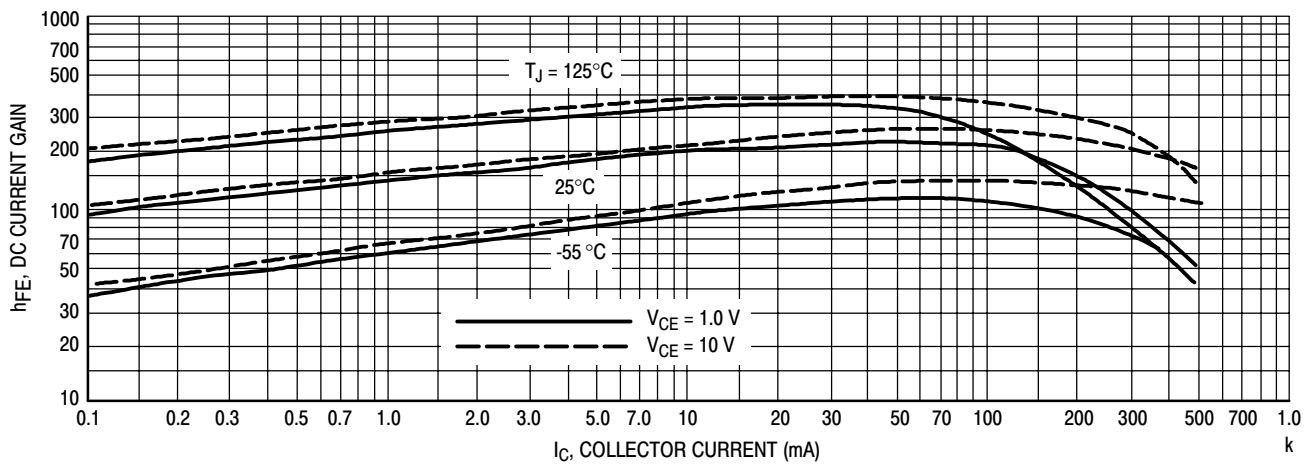


Figure 3. DC Current Gain

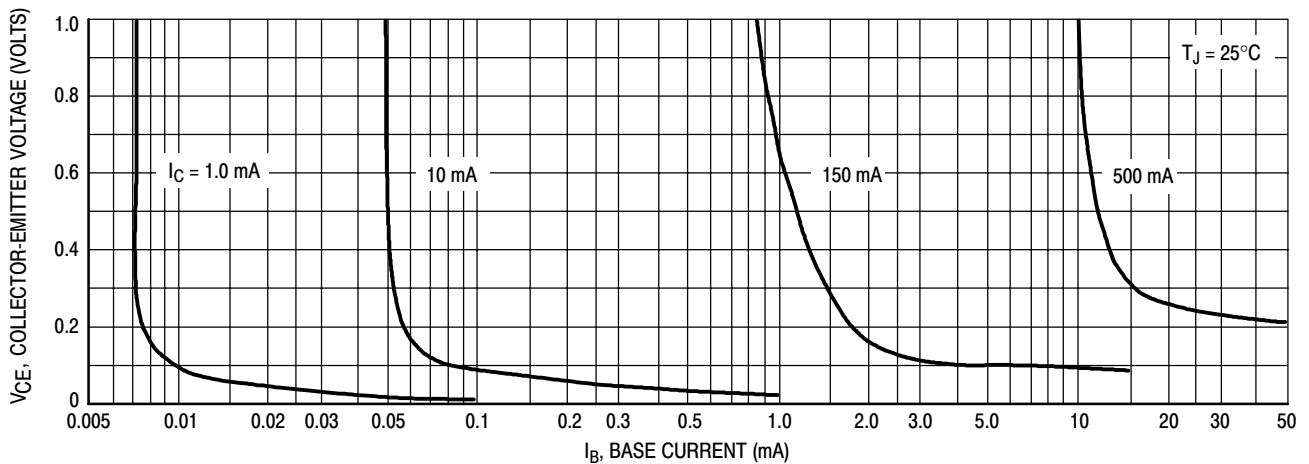


Figure 4. Collector Saturation Region

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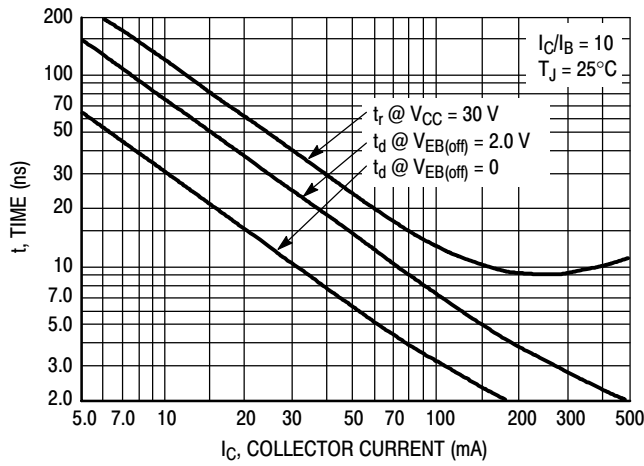


Figure 5. Turn-On Time

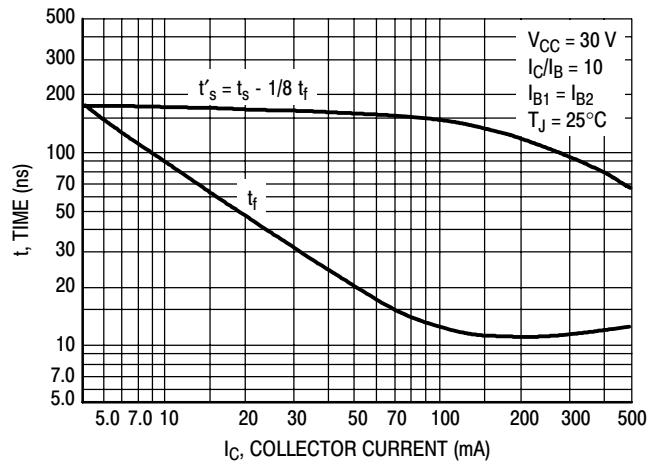


Figure 6. Turn-Off Time

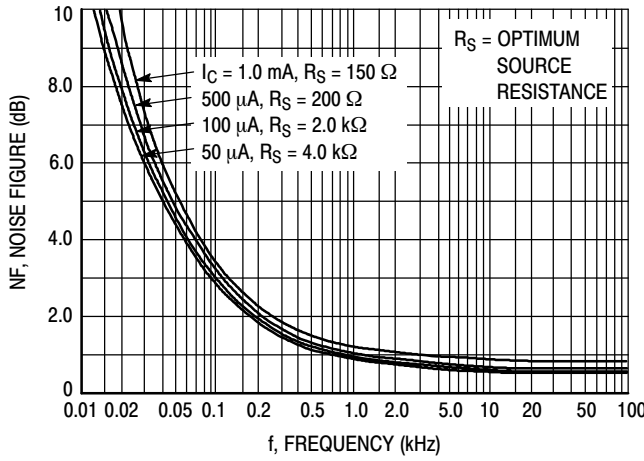


Figure 7. Frequency Effects

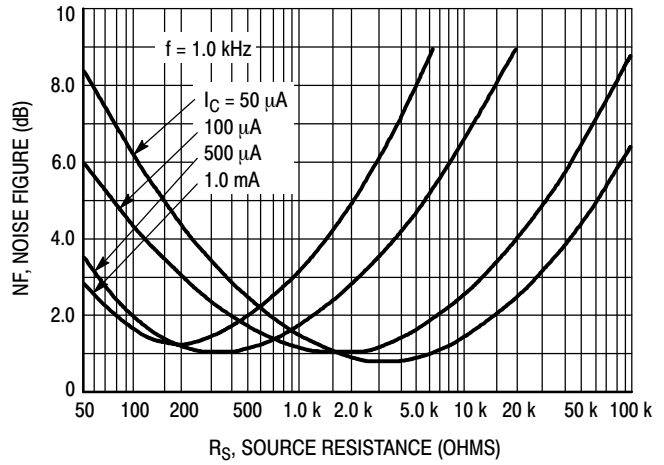


Figure 8. Source Resistance Effects

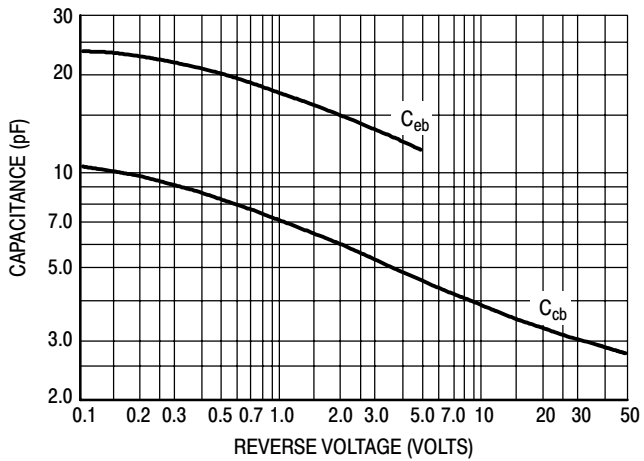


Figure 9. Capacitances

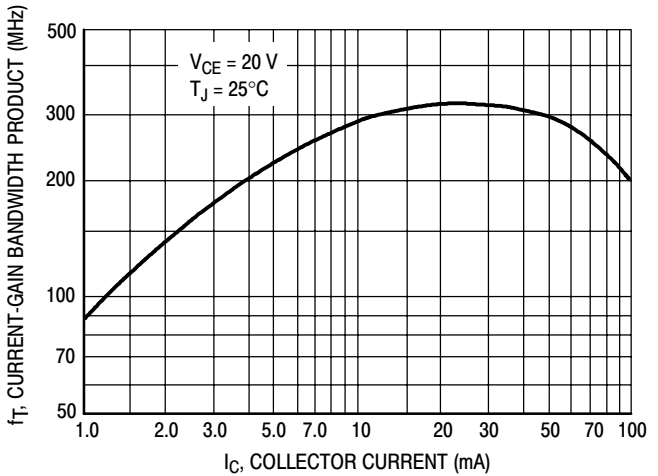


Figure 10. Current-Gain Bandwidth Product

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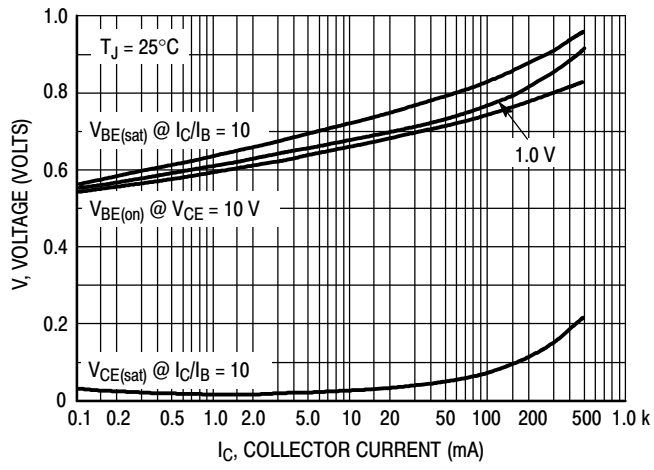


Figure 11. "On" Voltages

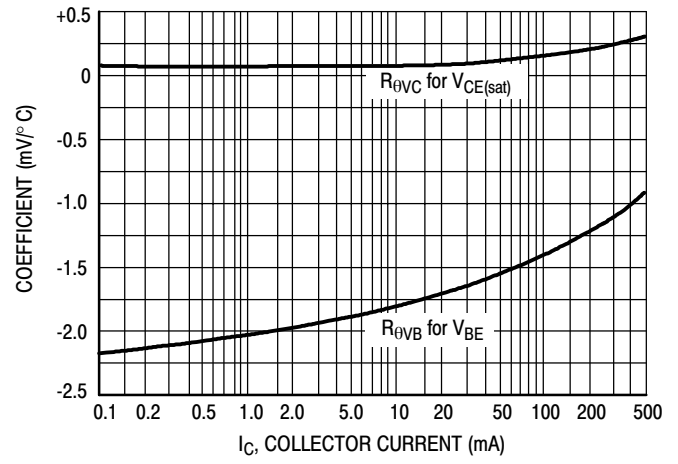
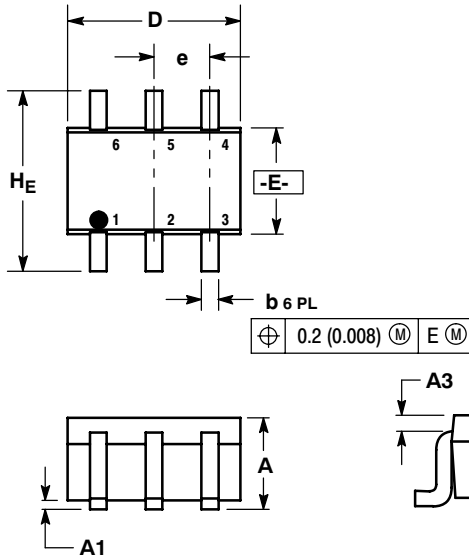


Figure 12. Temperature Coefficients

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PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363
CASE 419B-02
ISSUE W

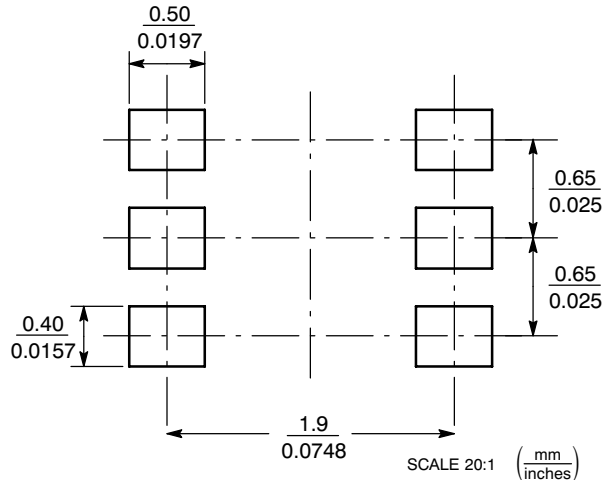


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.80 | 0.95 | 1.10 | 0.031 | 0.037 | 0.043 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A3 | 0.20 REF | | | 0.008 REF | | |
| b | 0.10 | 0.21 | 0.30 | 0.004 | 0.008 | 0.012 |
| C | 0.10 | 0.14 | 0.25 | 0.004 | 0.005 | 0.010 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.078 | 0.086 |
| E | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| H_E | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |

- STYLE 1:
1. EMITTER 2
 2. BASE 2
 3. COLLECTOR 1
 4. EMITTER 1
 5. BASE 1
 6. COLLECTOR 2

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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