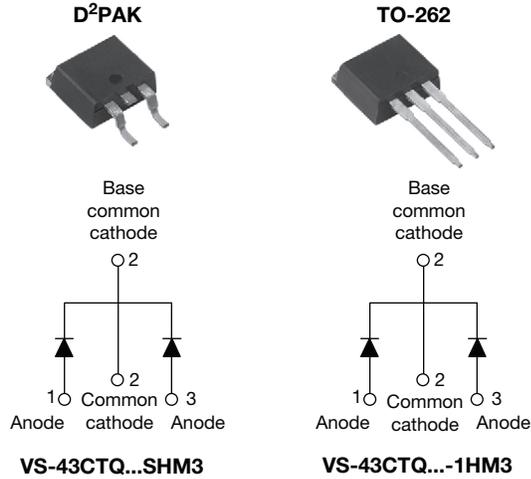


## High Performance Schottky Rectifier, 2 x 20 A



### FEATURES

- 175 °C T<sub>J</sub> operation
- Center tap configuration
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified meets JESD 201 class 1A whisker test
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

| PRODUCT SUMMARY                  |                                         |
|----------------------------------|-----------------------------------------|
| I <sub>F(AV)</sub>               | 2 x 20 A                                |
| V <sub>R</sub>                   | 80 V, 100 V                             |
| V <sub>F</sub> at I <sub>F</sub> | 0.67 V                                  |
| I <sub>RM</sub> max.             | 11 mA at 125 °C                         |
| T <sub>J</sub> max.              | 175 °C                                  |
| E <sub>AS</sub>                  | 7.50 mJ                                 |
| Package                          | TO-263AB (D <sup>2</sup> PAK), TO-262AA |
| Diode variation                  | Common cathode                          |

### DESCRIPTION

This center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, freewheeling diodes, and reverse battery protection.

| MAJOR RATINGS AND CHARACTERISTICS |                                                        |            |       |
|-----------------------------------|--------------------------------------------------------|------------|-------|
| SYMBOL                            | CHARACTERISTICS                                        | VALUES     | UNITS |
| I <sub>F(AV)</sub>                | Rectangular waveform                                   | 40         | A     |
| V <sub>RRM</sub>                  |                                                        | 80/100     | V     |
| I <sub>FSM</sub>                  | t <sub>p</sub> = 5 μs sine                             | 850        | A     |
| V <sub>F</sub>                    | 20 A <sub>pk</sub> , T <sub>J</sub> = 125 °C (per leg) | 0.67       | V     |
| T <sub>J</sub>                    | Range                                                  | -55 to 175 | °C    |

| VOLTAGE RATINGS                      |                  |                                     |                                     |       |
|--------------------------------------|------------------|-------------------------------------|-------------------------------------|-------|
| PARAMETER                            | SYMBOL           | VS-43CTQ080SHM3<br>VS-43CTQ080-1HM3 | VS-43CTQ100SHM3<br>VS-43CTQ100-1HM3 | UNITS |
| Maximum DC reverse voltage           | V <sub>R</sub>   | 80                                  | 100                                 | V     |
| Maximum working peak reverse voltage | V <sub>RWM</sub> |                                     |                                     |       |



| ABSOLUTE MAXIMUM RATINGS                                                  |                       |                                                                                                                           |                                                                             |        |       |   |
|---------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------|-------|---|
| PARAMETER                                                                 | SYMBOL                | TEST CONDITIONS                                                                                                           |                                                                             | VALUES | UNITS |   |
| Maximum average forward current<br>See fig. 5                             | per leg<br>per device | $I_{F(AV)}$                                                                                                               | 50 % duty cycle at $T_C = 135\text{ }^\circ\text{C}$ , rectangular waveform |        | 20    | A |
|                                                                           |                       |                                                                                                                           |                                                                             |        | 40    |   |
| Maximum peak one cycle non-repetitive surge current per leg<br>See fig. 7 | $I_{FSM}$             | 5 $\mu\text{s}$ sine or 3 $\mu\text{s}$ rect. pulse                                                                       | Following any rated load condition and with rated $V_{RRM}$ applied         | 850    |       |   |
|                                                                           |                       | 10 ms sine or 6 ms rect. pulse                                                                                            |                                                                             | 275    |       |   |
| Non-repetitive avalanche energy per leg                                   | $E_{AS}$              | $T_J = 25\text{ }^\circ\text{C}$ , $I_{AS} = 0.50\text{ A}$ , $L = 60\text{ mH}$                                          |                                                                             | 7.50   | mJ    |   |
| Repetitive avalanche current per leg                                      | $I_{AR}$              | Current decaying linearly to zero in 1 $\mu\text{s}$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical |                                                                             | 0.50   | A     |   |

| ELECTRICAL SPECIFICATIONS                             |                |                                                                                   |                                   |        |                  |
|-------------------------------------------------------|----------------|-----------------------------------------------------------------------------------|-----------------------------------|--------|------------------|
| PARAMETER                                             | SYMBOL         | TEST CONDITIONS                                                                   |                                   | VALUES | UNITS            |
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 20 A                                                                              | $T_J = 25\text{ }^\circ\text{C}$  | 0.81   | V                |
|                                                       |                | 40 A                                                                              |                                   | 0.98   |                  |
|                                                       |                | 20 A                                                                              | $T_J = 125\text{ }^\circ\text{C}$ | 0.67   |                  |
|                                                       |                | 40 A                                                                              |                                   | 0.81   |                  |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$                                                  | $V_R = \text{Rated } V_R$         | 1      | mA               |
|                                                       |                | $T_J = 125\text{ }^\circ\text{C}$                                                 |                                   | 11     |                  |
| Threshold voltage                                     | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$                                                       |                                   | 0.71   | V                |
| Forward slope resistance                              | $r_t$          |                                                                                   |                                   | 0.43   | m $\Omega$       |
| Maximum junction capacitance per leg                  | $C_T$          | $V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^\circ\text{C}$ |                                   | 1480   | pF               |
| Typical series inductance per leg                     | $L_S$          | Measured lead to lead 5 mm from package body                                      |                                   | 8.0    | nH               |
| Maximum voltage rate of change                        | dV/dt          | Rated $V_R$                                                                       |                                   | 10 000 | V/ $\mu\text{s}$ |

**Note**

(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS                      |                |                                      |  |             |                        |
|----------------------------------------------------------|----------------|--------------------------------------|--|-------------|------------------------|
| PARAMETER                                                | SYMBOL         | TEST CONDITIONS                      |  | VALUES      | UNITS                  |
| Maximum junction and storage temperature range           | $T_J, T_{Stg}$ |                                      |  | -55 to 175  | $^\circ\text{C}$       |
| Maximum thermal resistance, junction to case per leg     | $R_{thJC}$     | DC operation                         |  | 2.0         | $^\circ\text{C/W}$     |
| Maximum thermal resistance, junction to case per package |                |                                      |  | 1.0         |                        |
| Typical thermal resistance, case to heatsink             | $R_{thCS}$     | Mounting surface, smooth and greased |  | 0.50        |                        |
| Approximate weight                                       |                |                                      |  | 2           | g                      |
|                                                          |                |                                      |  | 0.07        | oz.                    |
| Mounting torque                                          | minimum        |                                      |  | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                          | maximum        |                                      |  | 12 (10)     |                        |
| Marking device                                           |                | Case style D <sup>2</sup> PAK        |  | 43CTQ080SH  |                        |
|                                                          |                |                                      |  | 43CTQ100SH  |                        |
|                                                          |                | Case style TO-262                    |  | 43CTQ080-1H |                        |
|                                                          |                |                                      |  | 43CTQ100-1H |                        |

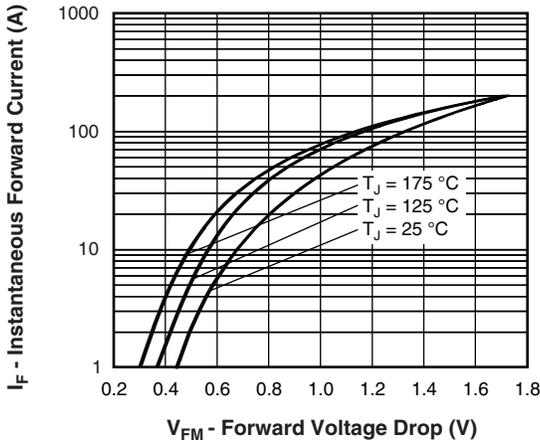


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

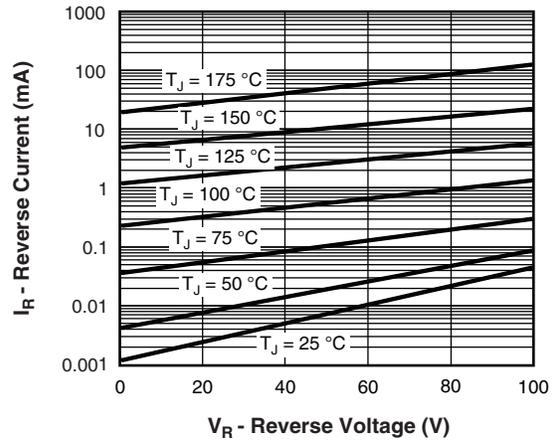


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

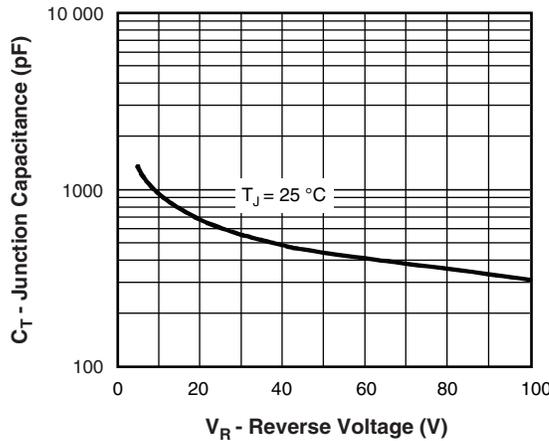


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

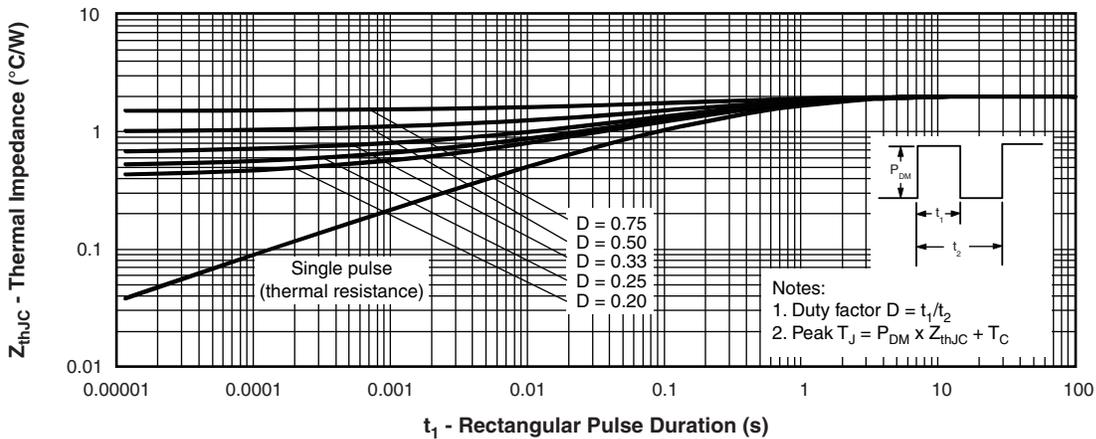


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

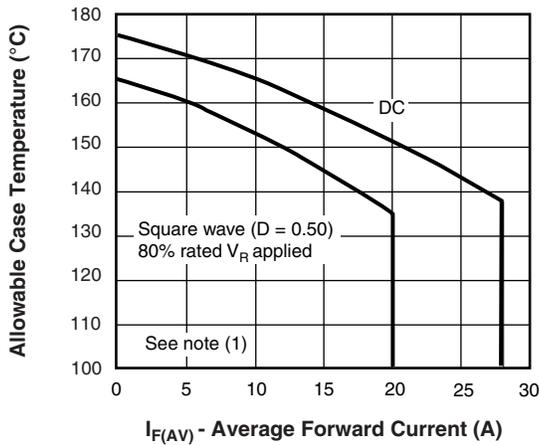


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

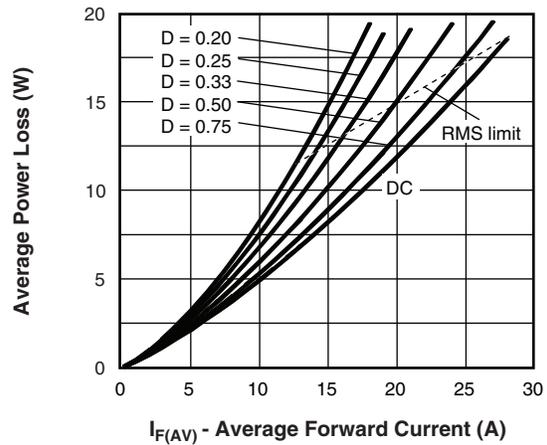


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

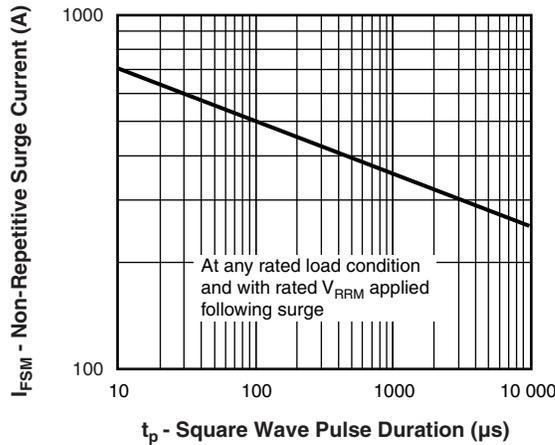


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

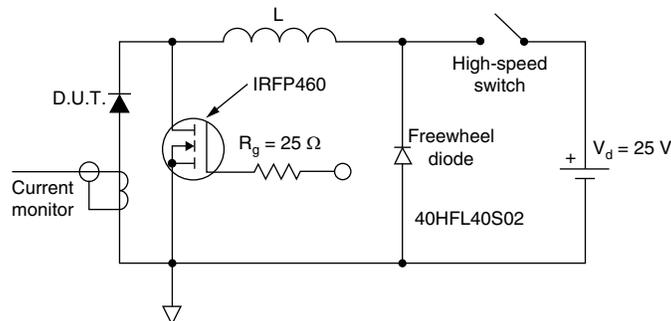


Fig. 8 - Unclamped Inductive Test Circuit

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d = \text{Forward power loss} = I_{F(AV)} \times V_{FM} \text{ at } (I_{F(AV)}/D) \text{ (see fig. 6);}$   
 $P_{d_{REV}} = \text{Inverse power loss} = V_{R1} \times I_R (1 - D); I_R \text{ at } V_{R1} = 10 \text{ V}$



## ORDERING INFORMATION TABLE

|             |            |           |          |          |          |            |          |            |          |           |
|-------------|------------|-----------|----------|----------|----------|------------|----------|------------|----------|-----------|
| Device code | <b>VS-</b> | <b>43</b> | <b>C</b> | <b>T</b> | <b>Q</b> | <b>100</b> | <b>S</b> | <b>TRL</b> | <b>H</b> | <b>M3</b> |
|             | ①          | ②         | ③        | ④        | ⑤        | ⑥          | ⑦        | ⑧          | ⑨        | ⑩         |

- 1** - Vishay Semiconductors product
- 2** - Current rating (40 A)
- 3** - Circuit configuration: C = Common cathode
- 4** - T = TO-220
- 5** - Schottky "Q" series
- 6** - Voltage ratings 080 = 80 V  
100 = 100 V
- 7** -
  - S = D<sup>2</sup>PAK
  - -1 = TO-262
- 8** -
  - None = Tube
  - TRL = Tape and reel (left oriented - for D<sup>2</sup>PAK only)
  - TRR = Tape and reel (right oriented - for D<sup>2</sup>PAK only)
- 9** - H = AEC-Q101 qualified
- 10** - M3 = Halogen-free, RoHS-compliant and termination lead (Pb)-free

| ORDERING INFORMATION |                  |                        |                          |
|----------------------|------------------|------------------------|--------------------------|
| PREFERRED P/N        | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-43CTQ080SHM3      | 50               | 1000                   | Antistatic plastic tubes |
| VS-43CTQ080STRRH3    | 800              | 800                    | 13" diameter reel        |
| VS-43CTQ080STRLH3    | 800              | 800                    | 13" diameter reel        |
| VS-43CTQ080-1HM3     | 50               | 1000                   | Antistatic plastic tubes |
| VS-43CTQ100SHM3      | 50               | 1000                   | Antistatic plastic tubes |
| VS-43CTQ100STRRH3    | 800              | 800                    | 13" diameter reel        |
| VS-43CTQ100STRLH3    | 800              | 800                    | 13" diameter reel        |
| VS-43CTQ100-1HM3     | 50               | 1000                   | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------|
| Dimensions                 | TO-263AB (D <sup>2</sup> PAK) <a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a> |
|                            | TO-262AA <a href="http://www.vishay.com/doc?95419">www.vishay.com/doc?95419</a>                      |
| Part marking information   | TO-263AB (D <sup>2</sup> PAK) <a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a> |
|                            | TO-262AA <a href="http://www.vishay.com/doc?95443">www.vishay.com/doc?95443</a>                      |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>                               |
| SPICE model                | <a href="http://www.vishay.com/doc?95065">www.vishay.com/doc?95065</a>                               |

## D<sup>2</sup>PAK

### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



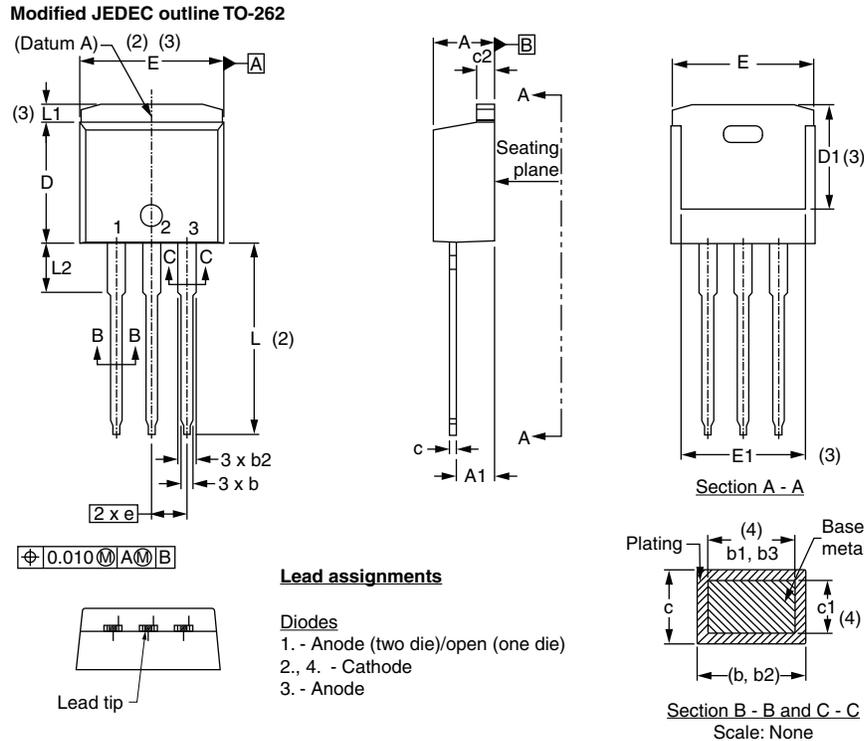
| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES | SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       | D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       | E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       | E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     | e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       | H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     | L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       | L1     | -           | 1.65  | -         | 0.066 | 3     |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     | L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       | L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     | L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC® outline TO-263AB

## TO-262

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160     | 0.190 |       |
| A1     | 2.03        | 3.02  | 0.080     | 0.119 |       |
| b      | 0.51        | 0.99  | 0.020     | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020     | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045     | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045     | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015     | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015     | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045     | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335     | 0.380 | 2     |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| L      | 13.46       | 14.10 | 0.530     | 0.555 |       |
| L1     | -           | 1.65  | -         | 0.065 | 3     |
| L2     | 3.56        | 3.71  | 0.140     | 0.146 |       |

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum) and D1 (minimum) where dimensions derived the actual package outline



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