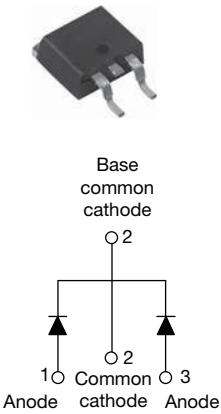
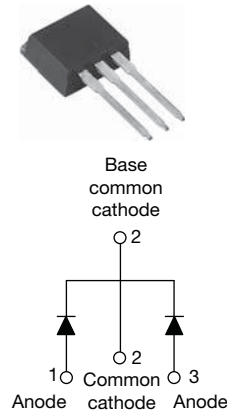


## High Performance Schottky Rectifier, 2 x 8 A

**VS-16CTQ...SPbF**

**D<sup>2</sup>PAK**
**VS-16CTQ...-1PbF**

**TO-262**

### 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
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


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

### 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, converters, freewheeling diodes, and reverse battery protection.

### PRODUCT SUMMARY

|                                  |                                         |
|----------------------------------|-----------------------------------------|
| Package                          | TO-263AB (D <sup>2</sup> PAK), TO-262AA |
| I <sub>F(AV)</sub>               | 2 x 8 A                                 |
| V <sub>R</sub>                   | 60 V to 100 V                           |
| V <sub>F</sub> at I <sub>F</sub> | 0.58 V                                  |
| I <sub>RM</sub>                  | 7 mA at 125 °C                          |
| T <sub>J</sub> max.              | 175 °C                                  |
| Diode variation                  | Common cathode                          |
| E <sub>AS</sub>                  | 7.5 mJ                                  |

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS                          | VALUES     | UNITS |
|--------------------|------------------------------------------|------------|-------|
| I <sub>F(AV)</sub> | Rectangular waveform                     | 16         | A     |
| V <sub>RRM</sub>   |                                          | 60 to 100  | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine               | 850        | A     |
| V <sub>F</sub>     | 8 Apk, T <sub>J</sub> = 125 °C (per leg) | 0.58       | V     |
| T <sub>J</sub>     | Range                                    | -55 to 175 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-16CTQ060SPbF<br>VS-16CTQ060-1PbF | VS-16CTQ080SPbF<br>VS-16CTQ080-1PbF | VS-16CTQ100SPbF<br>VS-16CTQ100-1PbF | UNITS |
|--------------------------------------|------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 60                                  | 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>per leg<br>per device<br>See fig. 5    | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 148 °C, rectangular waveform                                                                       | 8<br>16    | A     |
| Maximum peak one cycle non-repetitive surge current per leg<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse<br>10 ms sine or 6 ms rect. pulse                                                                        | 850<br>275 | A     |
| Non-repetitive avalanche energy per leg                                   | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 0.50 A, L = 60 mH                                                                            | 7.50       | mJ    |
| Repetitive avalanche current per leg                                      | I <sub>AR</sub>    | Current decaying linearly to zero in 1 μs<br>Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical | 0.50       | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                             | SYMBOL         | TEST CONDITIONS                                                                            | VALUES | UNITS      |
|-------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------|--------|------------|
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 8 A                                                                                        | 0.72   | V          |
|                                                       |                | 16 A                                                                                       | 0.88   |            |
|                                                       |                | 8 A                                                                                        | 0.58   |            |
|                                                       |                | 16 A                                                                                       | 0.69   |            |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 0.55   | mA         |
|                                                       |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                        | 7.0    |            |
| Threshold voltage                                     | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$                                                                | 0.415  | V          |
| Forward slope resistance                              | $r_t$          |                                                                                            | 11.07  | m $\Omega$ |
| Maximum junction capacitance per leg                  | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$ | 500    | 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/ $\mu$ s |

**Note**

<sup>(1)</sup> Pulse width < 300  $\mu$ 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                         | 3.25       | $^{\circ}\text{C/W}$ |
| Maximum thermal resistance, junction to case per package |                |                                      | 1.63       |                      |
| 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             |
|                                                          | maximum        |                                      | 12 (10)    | (lbf · in)           |
| Marking device                                           |                | Case style D <sup>2</sup> PAK        | 16CTQ...S  |                      |
|                                                          |                | Case style TO-262                    | 16CTQ...-1 |                      |

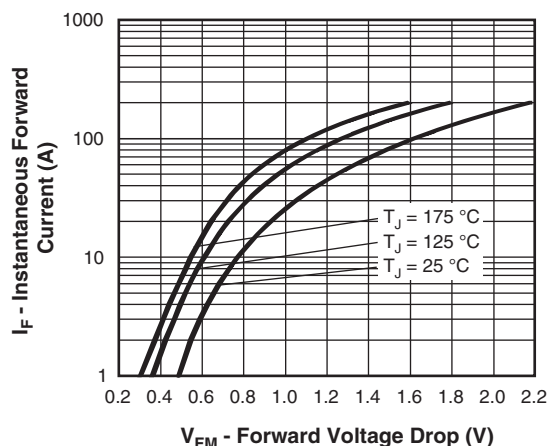


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

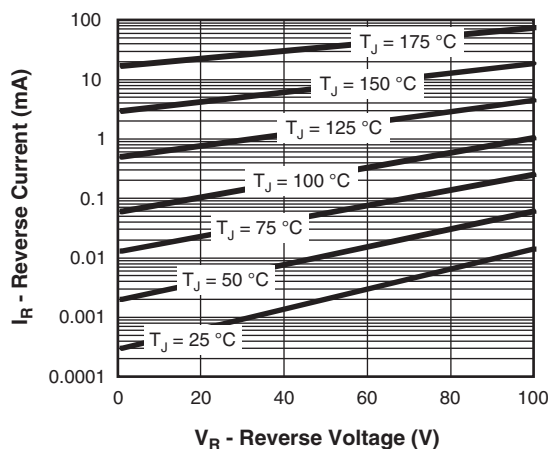


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

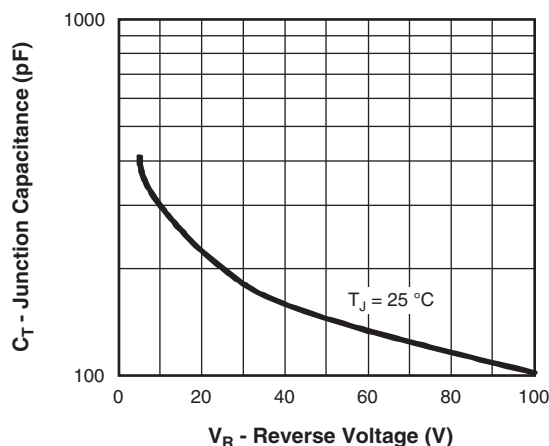


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

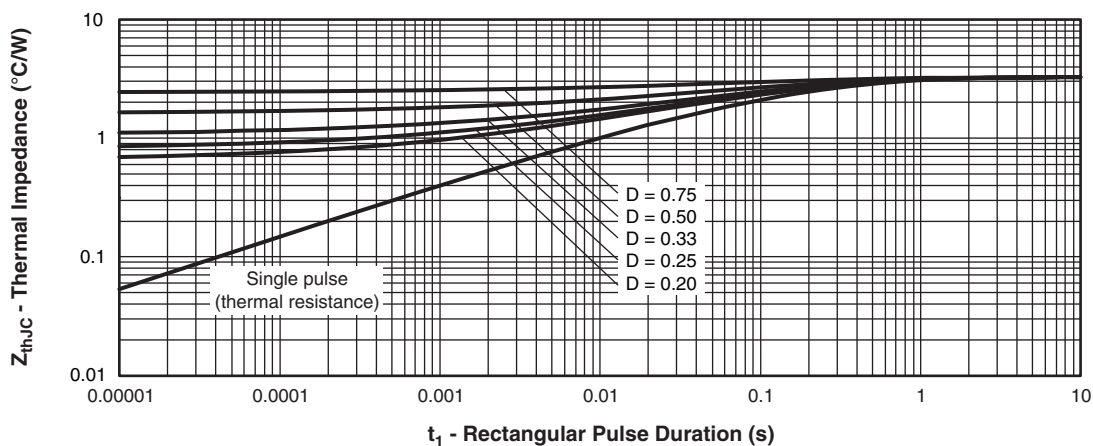


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

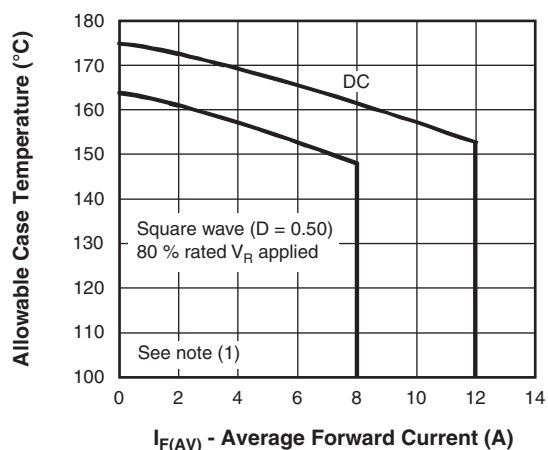


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

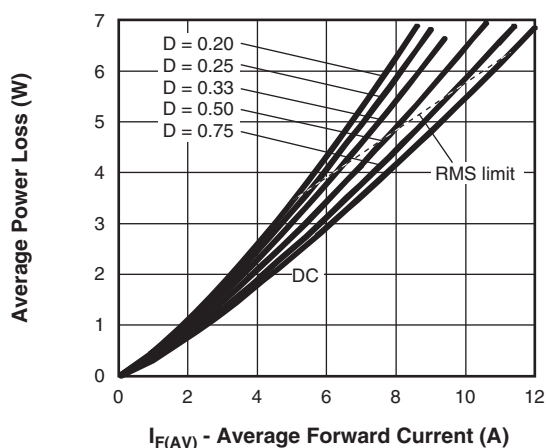


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

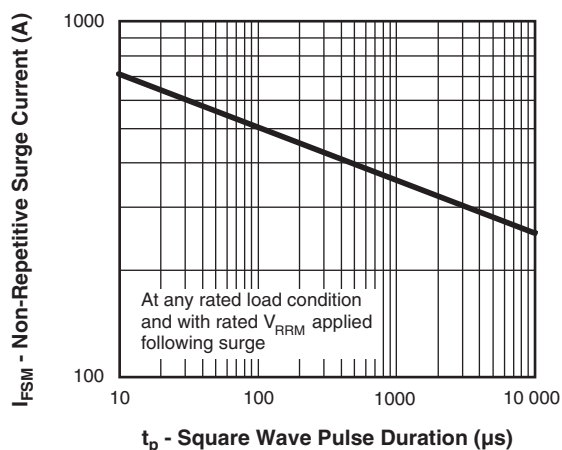


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

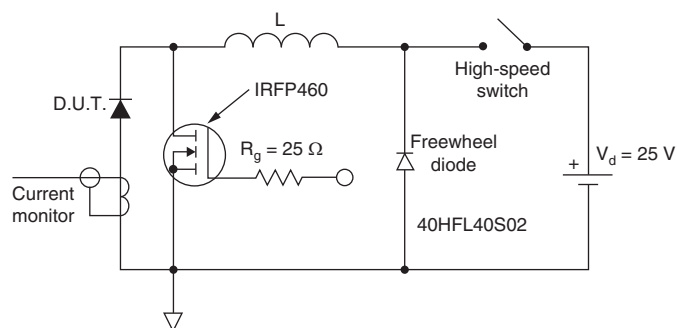


Fig. 8 - Unclamped Inductive Test Circuit

## Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$  applied



## ORDERING INFORMATION TABLE

|             |     |    |   |   |   |     |   |     |     |
|-------------|-----|----|---|---|---|-----|---|-----|-----|
| Device code | VS- | 16 | C | T | Q | 100 | S | TRL | PbF |
|             | 1   | 2  | 3 | 4 | 5 | 6   | 7 | 8   | 9   |

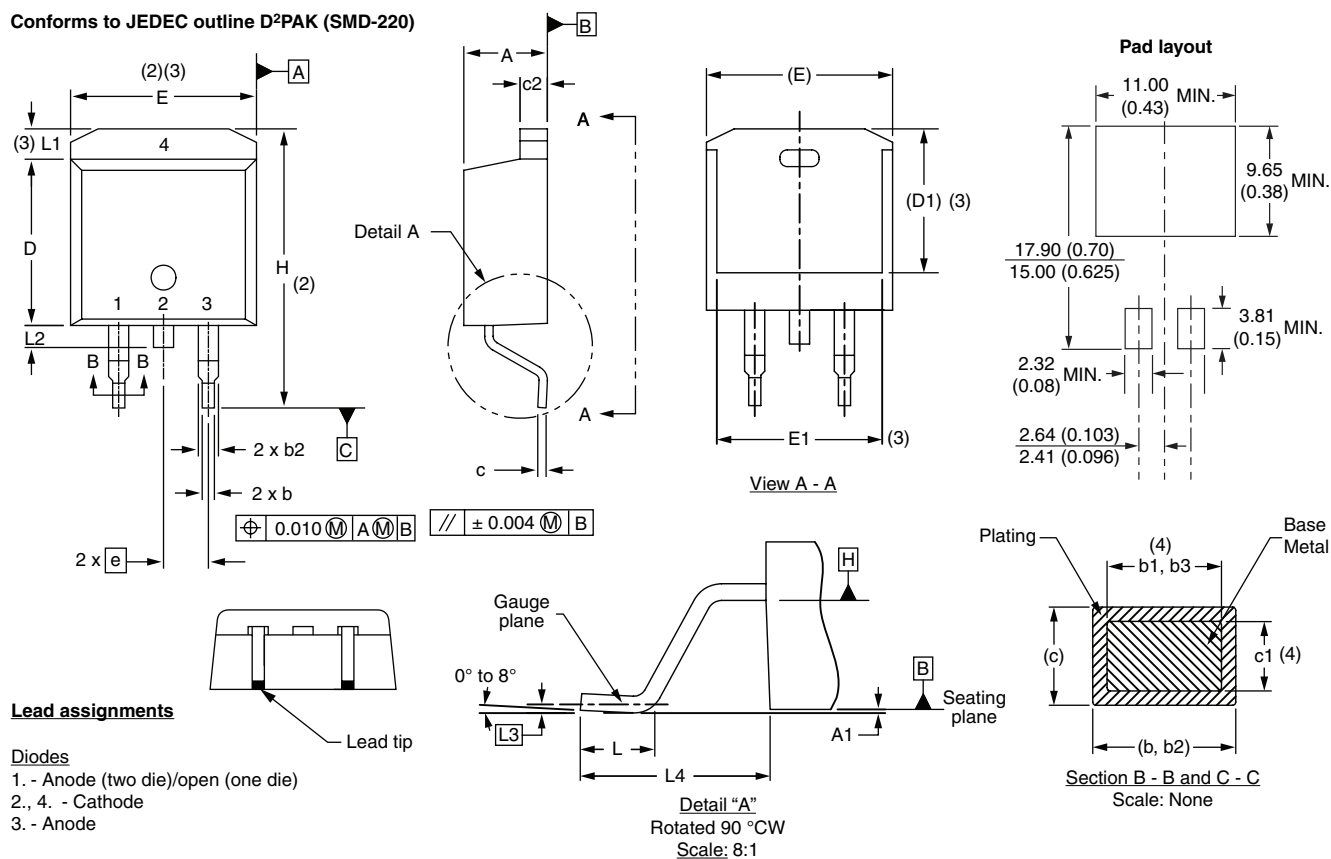
- |          |   |                                                                                                                                                                          |                                         |
|----------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <b>1</b> | - | Vishay Semiconductors product suffix                                                                                                                                     |                                         |
| <b>2</b> | - | Current rating (16 A)                                                                                                                                                    |                                         |
| <b>3</b> | - | Circuit configuration: C = Common cathode                                                                                                                                |                                         |
| <b>4</b> | - | T = TO-220                                                                                                                                                               |                                         |
| <b>5</b> | - | Schottky "Q" series                                                                                                                                                      |                                         |
| <b>6</b> | - | Voltage ratings                                                                                                                                                          | 060 = 60 V<br>080 = 80 V<br>100 = 100 V |
| <b>7</b> | - | • S = D <sup>2</sup> PAK<br>• -1 = TO-262                                                                                                                                |                                         |
| <b>8</b> | - | • None = Tube (50 pieces)<br>• TRL = Tape and reel (left oriented - for D <sup>2</sup> PAK only)<br>• TRR = Tape and reel (right oriented - for D <sup>2</sup> PAK only) |                                         |
| <b>9</b> | - | PbF = Lead (Pb)-free                                                                                                                                                     |                                         |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95014">www.vishay.com/doc?95014</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95008">www.vishay.com/doc?95008</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |
| SPIICE model               | <a href="http://www.vishay.com/doc?95279">www.vishay.com/doc?95279</a> |

## D<sup>2</sup>PAK, TO-262

### DIMENSIONS FOR D<sup>2</sup>PAK in millimeters and inches

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



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       |
| 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     |

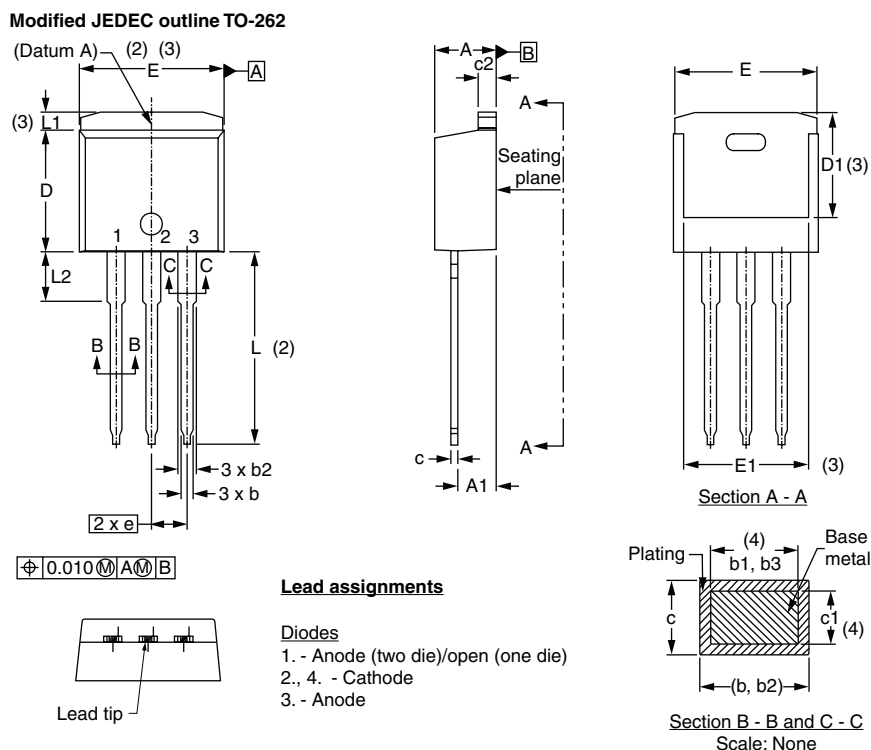
| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| L1     | -           | 1.65  | -         | 0.066 | 3     |
| L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-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) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch

- (7) Outline conforms to JEDEC outline TO-263AB

## DIMENSIONS FOR TO-262 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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