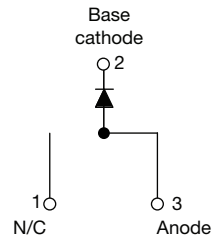


## High Performance Schottky Rectifier, 20 A


 TO-263AB (D<sup>2</sup>PAK)


### FEATURES

- 125 °C T<sub>J</sub> operation (V<sub>R</sub> < 5 V)
- Single diode configuration
- Optimized for OR-ing applications
- Ultralow forward voltage drop
- Guard ring for enhanced ruggedness and long term reliability
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- 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**

### PRODUCT SUMMARY

|                                  |                               |
|----------------------------------|-------------------------------|
| I <sub>F(AV)</sub>               | 20 A                          |
| V <sub>R</sub>                   | 15 V                          |
| V <sub>F</sub> at I <sub>F</sub> | 0.33 V                        |
| I <sub>RM</sub> max.             | 600 mA at 100 °C              |
| T <sub>J</sub> max.              | 125 °C                        |
| E <sub>AS</sub>                  | 10 mJ                         |
| Package                          | TO-263AB (D <sup>2</sup> PAK) |
| Diode variation                  | Single die                    |

### DESCRIPTION

The Schottky rectifier module has been optimized for ultra low forward voltage drop specifically for the OR-ing of parallel power supplies. The proprietary barrier technology allows for reliable operation up to 125 °C junction temperature. Typical applications are in parallel switching power supplies, converters, reverse battery protection, and redundant power subsystems.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS  | VALUES      | UNITS |
|--------------------|--|-------------|-------|
| I <sub>F(AV)</sub> | Rectangular waveform                                   | 20          | A     |
| V <sub>R</sub>     |  | 15          | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine                             | 700         | A     |
| V <sub>F</sub>     | 19 A <sub>pk</sub> , T <sub>J</sub> = 125 °C (typical) | 0.25        | V     |
| T <sub>J</sub>     | Range  | -55 to +125 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | TEST CONDITIONS         | VS-20L15TSPbF | UNITS |
|--------------------------------------|------------------|-------------------------|---------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | T <sub>J</sub> = 100 °C | 15            | 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                     | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 85 °C, rectangular waveform  | 20     | A     |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse  | 700    |       |
|   |                    | 10 ms sine or 6 ms rect. pulse   | 330    |       |
| Non-repetitive avalanche energy                                   | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2 A, L = 6 mH  | 10     | mJ    |
| Repetitive avalanche current                                      | 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 | 2      | A     |



| ELECTRICAL SPECIFICATIONS             |                |  |                                   |      |                  |    |
|---------------------------------------|----------------|--|-----------------------------------|------|------------------|----|
| PARAMETER                             | SYMBOL         | TEST CONDITIONS  | TYP.                              | MAX. | UNITS            |    |
| Forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 19 A   | $T_J = 25\text{ }^\circ\text{C}$  | -    | 0.41             | V  |
|                                       |                | 40 A   |                                   | -    | 0.52             |    |
|                                       |                | 19 A   | $T_J = 125\text{ }^\circ\text{C}$ | 0.25 | 0.33             |    |
|                                       |                | 40 A   |                                   | 0.37 | 0.50             |    |
| Reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$   | $V_R = \text{Rated } V_R$         | -    | 10               | mA |
|                                       |                | $T_J = 100\text{ }^\circ\text{C}$  |                                   | -    | 600              |    |
| Threshold voltage                     | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$  | 0.182                             |      | V                |    |
| Forward slope resistance              | $r_t$          |  | 7.6                               |      | $\text{m}\Omega$ |    |
| Maximum junction capacitance          | $C_T$          | $V_R = 5\text{ }V_{DC}$ , (test signal range 100 kHz to 1 MHz), $25\text{ }^\circ\text{C}$ | -                                 | 2000 | pF               |    |
| Typical series inductance             | $L_S$          | Measured lead to lead 5 mm from package body   | 8                                 | -    | 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 temperature range              | $T_J$      |  | -55 to +125 | $^\circ\text{C}$   |
| Maximum storage temperature range               | $T_{Stg}$  |  | -55 to +150 |  |
| Maximum thermal resistance, junction to case    | $R_{thJC}$ | DC operation<br>See fig. 4                           | 1.5         | $^\circ\text{C}/\text{W}$  |
| Typical thermal resistance, case to heatsink    | $R_{thCS}$ | Mounting surface, smooth and greased<br>(For TO-220) | 0.50        |  |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$ | DC operation   | 40          |  |
| Approximate weight                              |            |  | 2           | g  |
|   |            |  | 0.07        | oz.  |
| Mounting torque                                 | minimum    | Non-lubricated threads                               | 6 (5)       | $\text{kgf} \cdot \text{cm}$<br>( $\text{lbf} \cdot \text{in}$ ) |
|   | maximum    |  | 12 (10)     |  |
| Marking device                                  |            | Case style D <sup>2</sup> PAK                        | 20L15TS     |  |

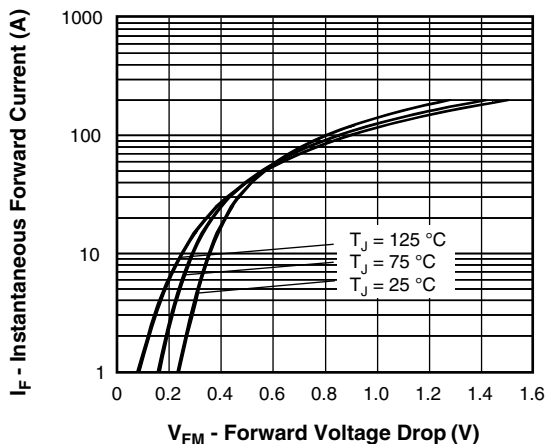


Fig. 1 - Maximum Forward Voltage Drop Characteristics

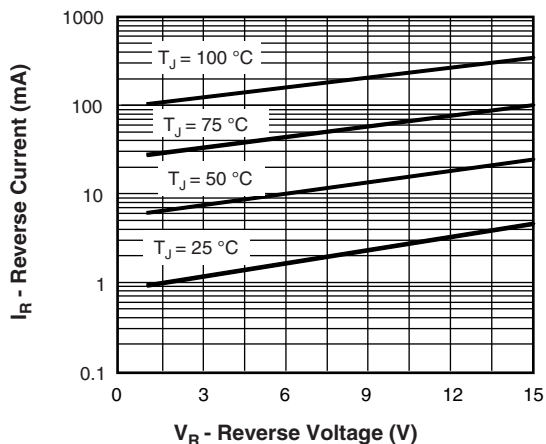


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

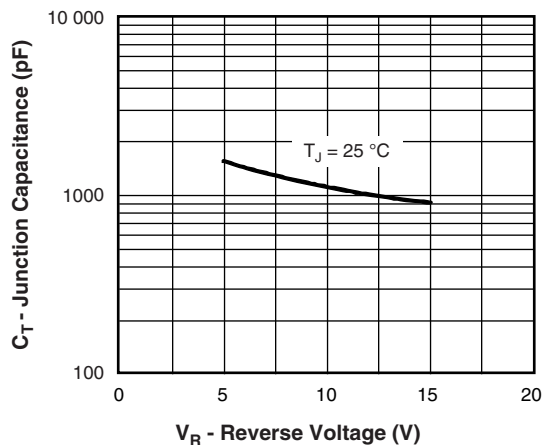


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

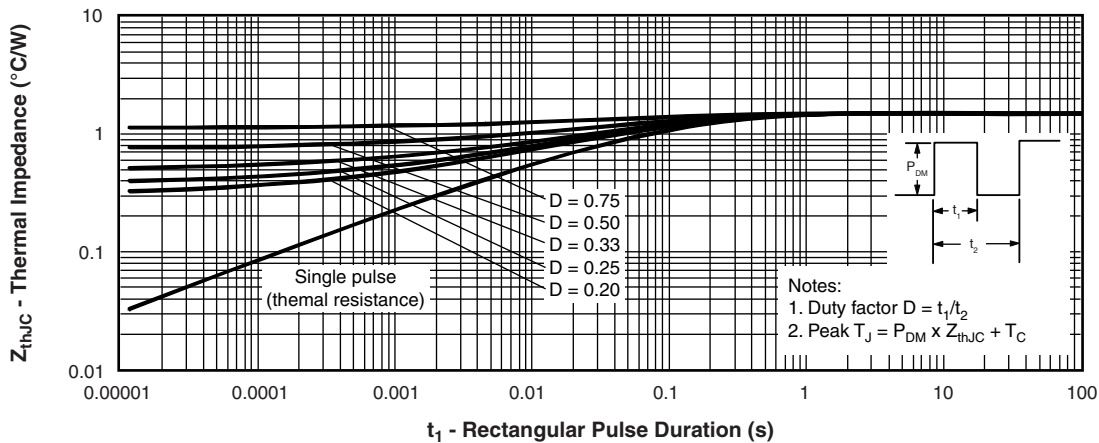


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

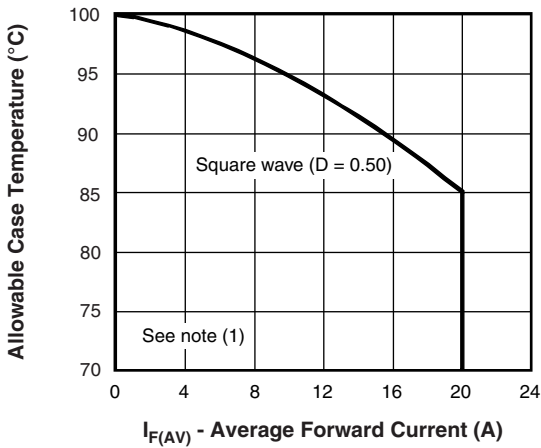


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

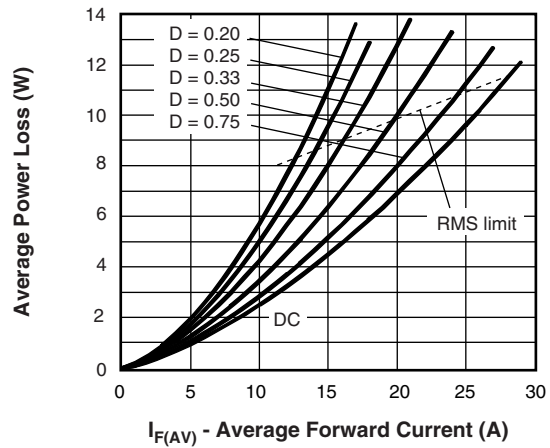


Fig. 6 - Forward Power Loss Characteristics

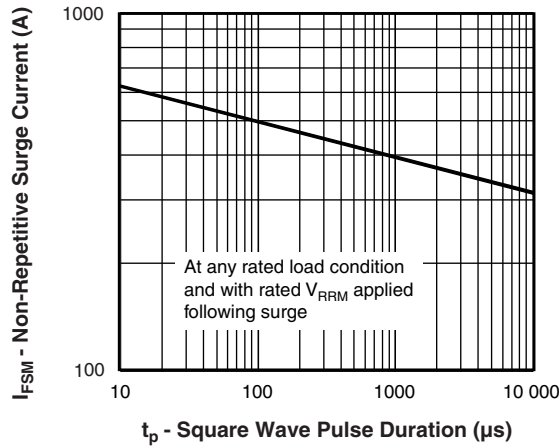


Fig. 7 - Maximum Non-Repetitive Surge Current

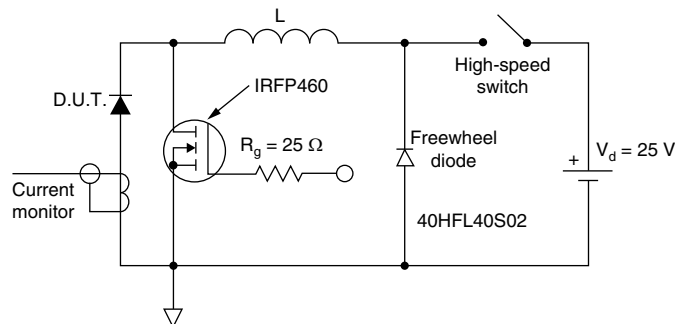


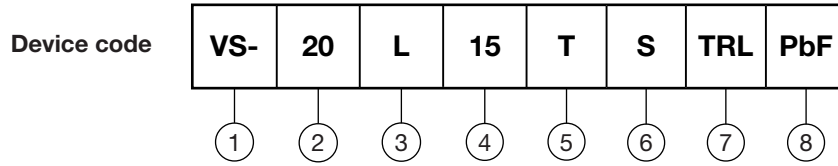
Fig. 8 - Unclamped Inductive Test Circuit

**Note**

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



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (20 A)
- 3** - L = Low  $V_F$
- 4** - Voltage rating (15 = 15 V)
- 5** - T = Schottky series
- 6** - S = D<sup>2</sup>PAK
- 7** -
  - None = tube
  - TRL = tape and reel (left oriented)
  - TRR = tape and reel (right oriented)
- 8** - PbF = lead (Pb)-free

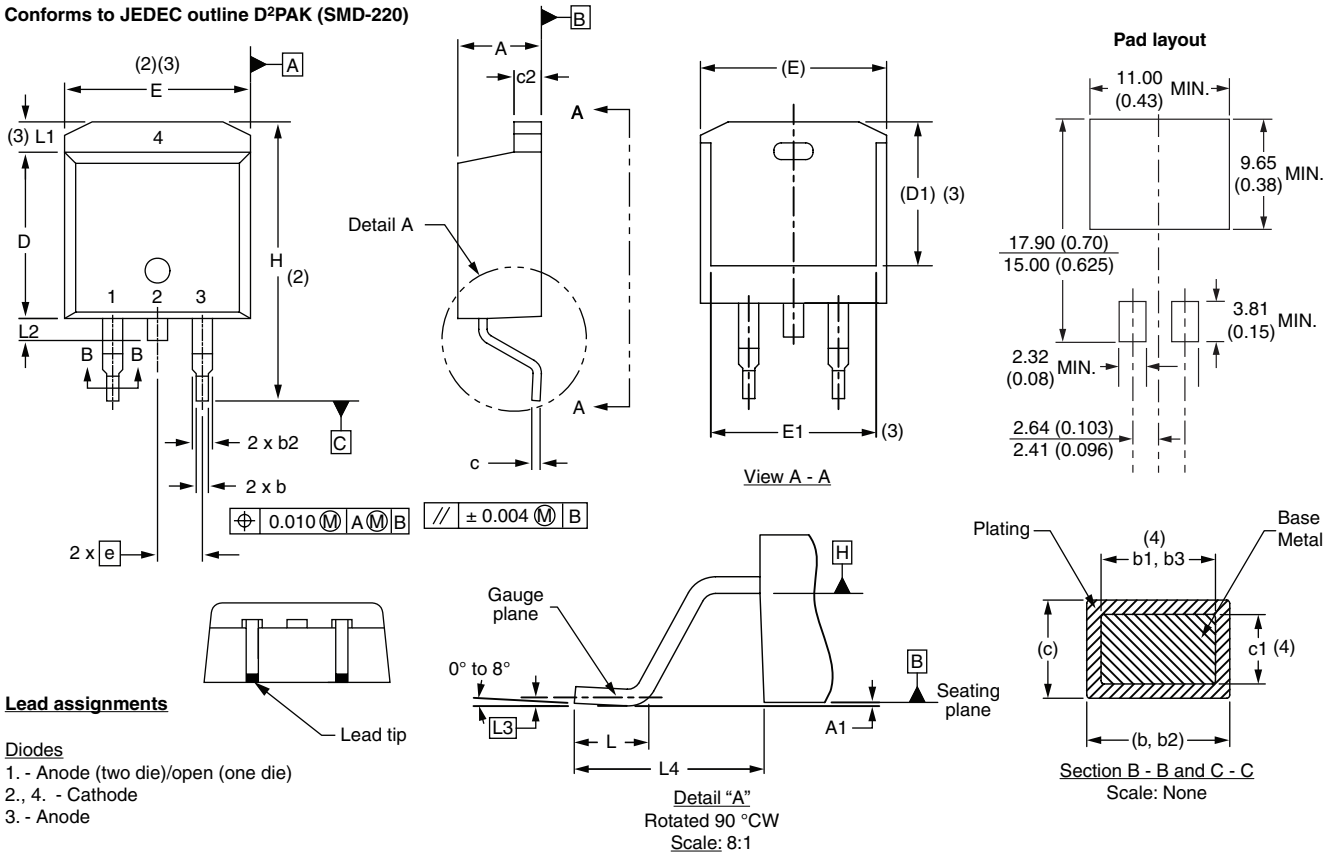
| ORDERING INFORMATION (Example) |                  |                        |                          |
|--------------------------------|------------------|------------------------|--------------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-20L15TSPbF                  | 50               | 1000                   | Antistatic plastic tubes |
| VS-20L15TSTRLPbF               | 800              | 800                    | 13" diameter reel        |
| VS-20L15TSTRRPbF               | 800              | 800                    | 13" diameter reel        |
| VS-20L15T-1PbF                 | 50               | 1000                   | Antistatic plastic tubes |

| 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> |

## 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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