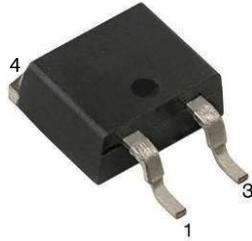
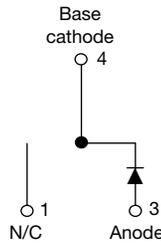


# Hyperfast Rectifier, 30 A FRED Pt® G5


**D²PAK 2L (TO-263AB 2L)**

**FEATURES**

- Hyperfast and optimized  $Q_{rr}$
- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Designed and qualified according JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
 COMPLIANT  
 HALOGEN  
**FREE**
**LINKS TO ADDITIONAL RESOURCES**


3D Models



Application Notes

| PRIMARY CHARACTERISTICS  |                        |
|--------------------------|------------------------|
| $I_{F(AV)}$              | 30 A                   |
| $V_R$                    | 1200 V                 |
| $V_F$ at $I_F$ at 125 °C | 1.7 V                  |
| $t_{rr}$                 | 32 ns                  |
| $T_J$ max.               | 175 °C                 |
| Package                  | D²PAK 2L (TO-263AB 2L) |
| Circuit configuration    | Single                 |

**DESCRIPTION / APPLICATIONS**

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for high frequency converters, both soft switched / resonant.

Specifically designed to improve efficiency of PFC and output rectification stages of EV / HEV battery charging stations, booster stage of solar inverters and UPS applications, these devices are perfectly matched to operate with MOSFETs or high speed IGBTs.

**MECHANICAL DATA**

**Case:** D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002

| ABSOLUTE MAXIMUM RATINGS                   |                   |   |             |       |
|--|-------------------|---|-------------|-------|
| PARAMETER                                  | SYMBOL            | TEST CONDITIONS   | VALUES      | UNITS |
| Repetitive peak reverse voltage            | $V_{RRM}$         |   | 1200        | V     |
| Average rectified forward current          | $I_{F(AV)}$       | $T_C = 96\text{ °C}$ , $D = 0.50$                       | 30          | A     |
| Non-repetitive peak surge current          | $I_{FSM}$         | $T_C = 96\text{ °C}$ , $t_p = 10\text{ ms}$ , sine wave | 240         |       |
| Repetitive peak forward current            | $I_{FRM}$         | $T_C = 45\text{ °C}$ , $D = 0.50$ , $f = 20\text{ kHz}$ | 60          |       |
| Operating junction and storage temperature | $T_J$ , $T_{Stg}$ |   | -55 to +175 | °C    |

| ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified) |                  |   |      |      |      |               |
|--|------------------|---|------|------|------|---------------|
| PARAMETER  | SYMBOL           | TEST CONDITIONS                             | MIN. | TYP. | MAX. | UNITS         |
| Breakdown voltage, blocking voltage  | $V_{BR}$ , $V_R$ | $I_R = 100\text{ }\mu\text{A}$              | 1200 | -    | -    | V             |
| Forward voltage  | $V_F$            | $I_F = 30\text{ A}$                         | -    | 1.9  | 2.5  |               |
|  |                  | $I_F = 30\text{ A}$ , $T_J = 125\text{ °C}$ | -    | 1.7  | -    |               |
| Reverse leakage current  | $I_R$            | $V_R = V_R$ rated                           | -    | -    | 50   | $\mu\text{A}$ |
|  |                  | $T_J = 125\text{ °C}$ , $V_R = V_R$ rated   | -    | -    | 500  |               |
| Junction capacitance   | $C_T$            | $V_R = 200\text{ V}$                        | -    | 17   | -    | pF            |
| Series inductance  | $L_S$            | Measured to lead 5 mm from package body     | -    | 8    | -    | nH            |



| <b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) |           |  |      |      |      |       |
|--|-----------|--|------|------|------|-------|
| PARAMETER  | SYMBOL    | TEST CONDITIONS  | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time  | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$    | -    | 32   | -    | ns    |
|  |           | $T_J = 25\text{ }^\circ\text{C}$   | -    | 113  | -    |       |
|  |           | $T_J = 125\text{ }^\circ\text{C}$  | -    | 175  | -    |       |
| Peak recovery current  | $I_{RRM}$ | $I_F = 20\text{ A}$<br>$di_F/dt = 600\text{ A}/\mu\text{s}$<br>$V_R = 400\text{ V}$  | -    | 17   | -    | A     |
|  |           | $T_J = 125\text{ }^\circ\text{C}$  | -    | 24   | -    |       |
| Reverse recovery charge  | $Q_{rr}$  | $T_J = 25\text{ }^\circ\text{C}$   | -    | 850  | -    | nC    |
|  |           | $T_J = 125\text{ }^\circ\text{C}$  | -    | 2150 | -    |       |
| Reverse recovery time  | $t_{rr}$  | $T_J = 25\text{ }^\circ\text{C}$   | -    | 85   | -    | ns    |
|  |           | $T_J = 125\text{ }^\circ\text{C}$  | -    | 132  | -    |       |
| Peak recovery current  | $I_{RRM}$ | $I_F = 30\text{ A}$<br>$di_F/dt = 1000\text{ A}/\mu\text{s}$<br>$V_R = 800\text{ V}$ | -    | 30   | -    | A     |
|  |           | $T_J = 125\text{ }^\circ\text{C}$  | -    | 43   | -    |       |
| Reverse recovery charge  | $Q_{rr}$  | $T_J = 25\text{ }^\circ\text{C}$   | -    | 1350 | -    | nC    |
|  |           | $T_J = 125\text{ }^\circ\text{C}$  | -    | 3215 | -    |       |

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b>     |                   |  |              |      |            |                           |
|--|-------------------|--|--------------|------|------------|---------------------------|
| PARAMETER                                      | SYMBOL            | TEST CONDITIONS                                | MIN.         | TYP. | MAX.       | UNITS                     |
| Thermal resistance, junction-to-case           | $R_{thJC}$        |  | -            | -    | 1.1        | $^\circ\text{C}/\text{W}$ |
| Weight   |                   |  | -            | 2.0  | -          | g                         |
| Mounting torque                                |                   |  | 6.0<br>(5.0) | -    | 12<br>(10) | kgf · cm<br>(lbf · in)    |
| Maximum junction and storage temperature range | $T_J$ , $T_{Stg}$ |  | -55          | -    | 175        | $^\circ\text{C}$          |
| Marking device                                 |                   | Case style D <sup>2</sup> PAK 2L (TO-263AB 2L) | E5TH3012S    |      |            |                           |

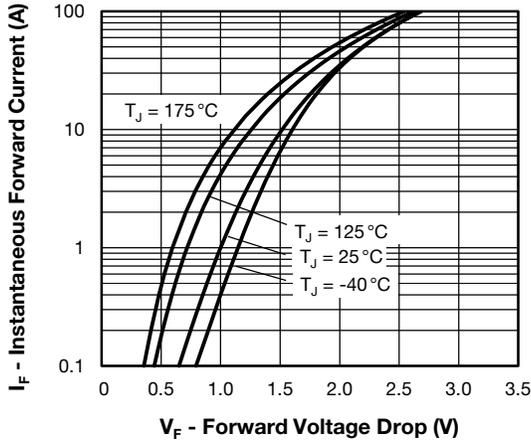


Fig. 1 - Typical Forward Voltage Drop Characteristics

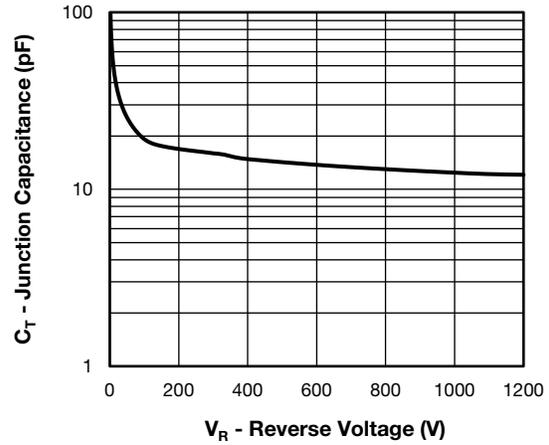


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

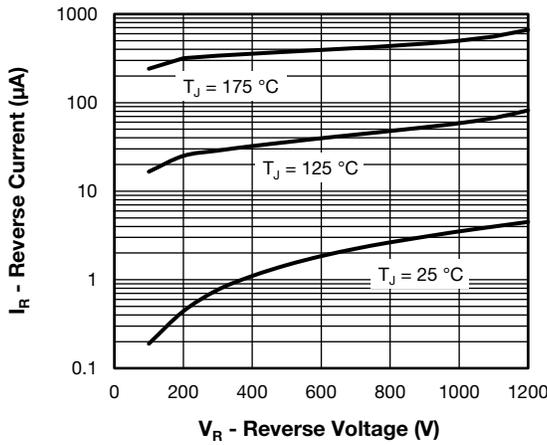


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

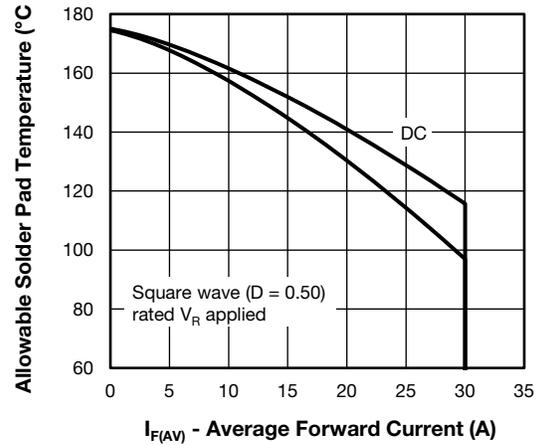


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

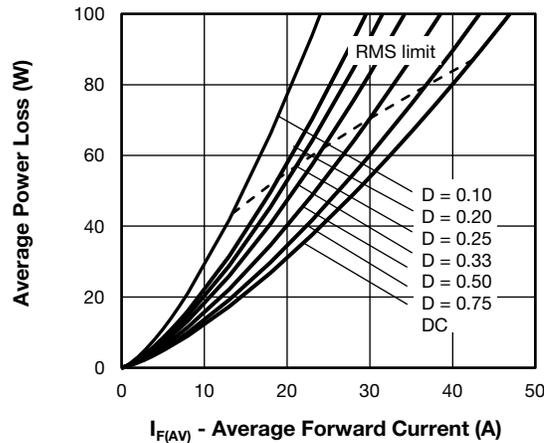


Fig. 5 - Forward Power Loss Characteristics

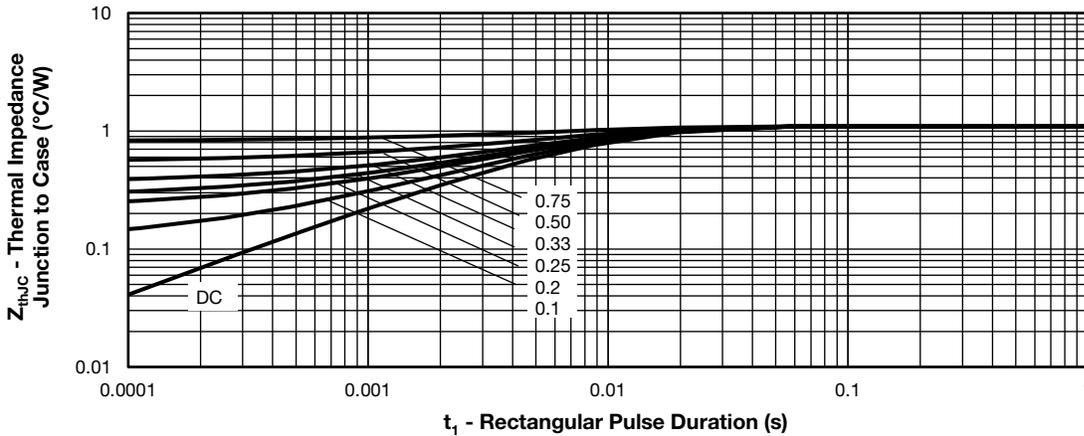


Fig. 6 - Thermal Impedance  $Z_{thJC}$  Characteristics

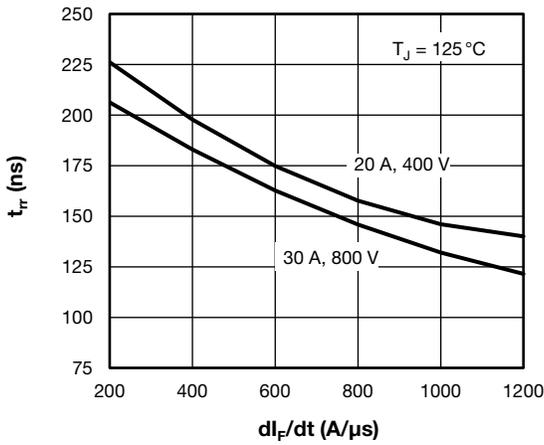


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

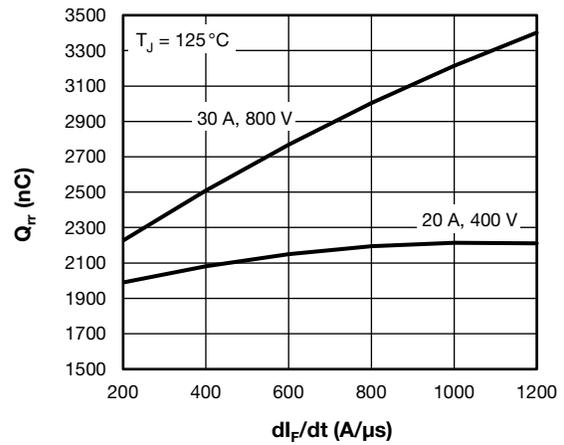


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

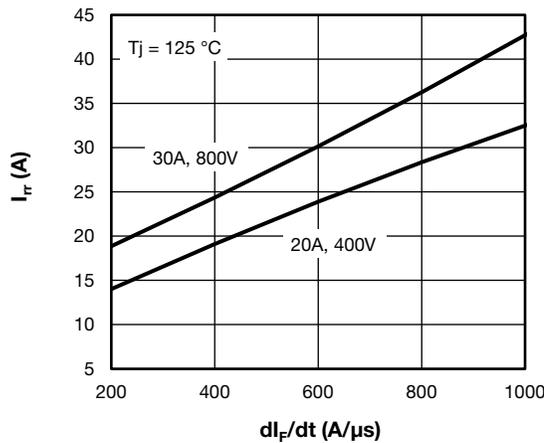


Fig. 9 - Typical Recovery Current vs.  $di_F/dt$

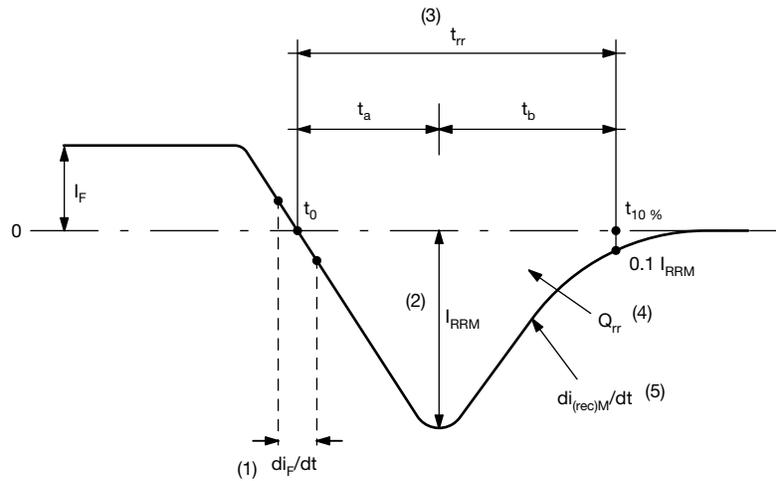


Fig. 10 - Reverse Recovery Waveform and Definitions

**Notes**

- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from  $t_0$ , crossing point of negative going  $I_F$ , to point  $t_{10\%}$ ,  $0.1 I_{RRM}$
- (4)  $Q_{rr}$  - area under curve defined by  $t_0$  and  $t_{10\%}$

$$Q_{rr} = \int_{t_0}^{t_{10\%}} I(t) dt$$

- (5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$



ORDERING INFORMATION TABLE

|             |            |          |          |          |          |           |           |           |          |            |
|-------------|------------|----------|----------|----------|----------|-----------|-----------|-----------|----------|------------|
| Device code | <b>VS-</b> | <b>E</b> | <b>5</b> | <b>T</b> | <b>H</b> | <b>30</b> | <b>12</b> | <b>S2</b> | <b>L</b> | <b>-M3</b> |
|             | ①          | ②        | ③        | ④        | ⑤        | ⑥         | ⑦         | ⑧         | ⑨        | ⑩          |

- 1** - Vishay Semiconductors product
- 2** - E = single diode
- 3** - 5 = FRED generation 5
- 4** - Package:  
T = D<sup>2</sup>PAK (TO-262) package
- 5** - H = hyperfast recovery
- 6** - Current rating (30 = 30 A)
- 7** - Voltage rating (12 = 1200 V)
- 8** - S2 = true 2 pin D<sup>2</sup>PAK
- 9** - None = tube (50 pieces)
  - L = tape and reel (left oriented, for D<sup>2</sup>PAK package)
  - If needed different orientation/packaging, please contact factory
- 10** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

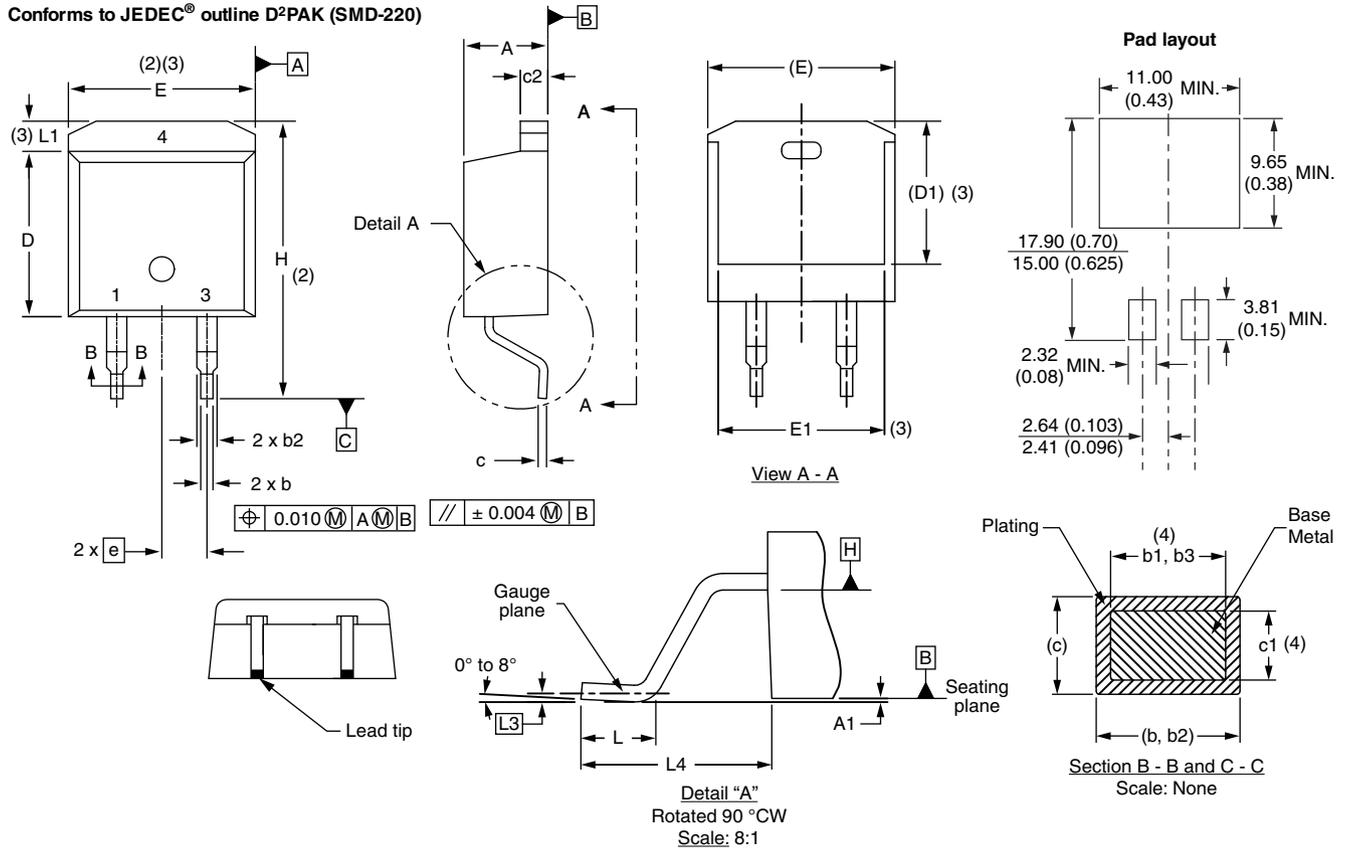
| ORDERING INFORMATION (Example) |               |                       |
|--------------------------------|---------------|-----------------------|
| PREFERRED P/N                  | BASE QUANTITY | PACKAGING DESCRIPTION |
| VS-E5TH3012S2L-M3              | 800           | 13" diameter reel     |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</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?96926">www.vishay.com/doc?96926</a> |

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

### DIMENSIONS in millimeters and inches

Conforms to JEDEC<sup>®</sup> 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     | L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       | L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     |        |             |       |           |       |       |

#### 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<sup>®</sup> outline TO-263AB



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