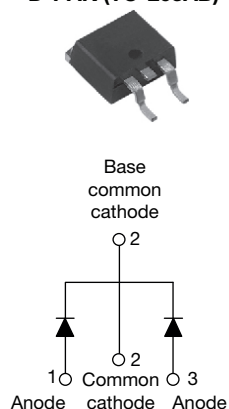
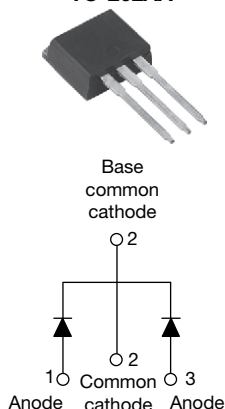


## High Performance Schottky Rectifier, 2 x 20 A

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

**VS-42CTQ030SHM3**
**TO-262AA**

**VS-42CTQ030-1HM3**

### FEATURES

- 150 °C T<sub>J</sub> operation
- Center tap configuration
- Very low forward voltage drop
- High frequency operation
- 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 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**

### PRIMARY CHARACTERISTICS

|                                  |                                         |
|----------------------------------|-----------------------------------------|
| I <sub>F(AV)</sub>               | 2 x 20 A                                |
| V <sub>R</sub>                   | 30 V                                    |
| V <sub>F</sub> at I <sub>F</sub> | 0.38 V                                  |
| I <sub>RM</sub>                  | 183 mA at 125 °C                        |
| T <sub>J</sub> max.              | 150 °C                                  |
| E <sub>AS</sub>                  | 13 mJ                                   |
| Package                          | D <sup>2</sup> PAK (TO-263AB), TO-262AA |
| Circuit configuration            | Common cathode                          |

### DESCRIPTION

This center tap Schottky rectifier module has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 150 °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>   |                                                        | 30         | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine                             | 1100       | A     |
| V <sub>F</sub>     | 20 A <sub>pk</sub> , T <sub>J</sub> = 125 °C (per leg) | 0.38       | V     |
| T <sub>J</sub>     | Range                                                  | -55 to 150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-42CTQ030SHM3<br>VS-42CTQ030-1HM3 | UNITS |
|--------------------------------------|------------------|-------------------------------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 30                                  | 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                             | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 121^\circ\text{C}$ , rectangular waveform                                                       | 20     | A     |
| per leg                                                                   |             |                                                                                                                           | 40     |       |
| per device                                                                |             |                                                                                                                           |        |       |
| 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                                                                       | 1100   | A     |
|                                                                           |             | 10 ms sine or 6 ms rect. pulse                                                                                            | 360    |       |
|                                                                           |             | Following any rated load condition and with rated $V_{RRM}$ applied                                                       |        |       |
| Non-repetitive avalanche energy per leg                                   | $E_{AS}$    | $T_J = 25^\circ\text{C}$ , $I_{AS} = 3\text{ A}$ , $L = 2.90\text{ mH}$                                                   | 13     | 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 | 3      | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                             | SYMBOL         | TEST CONDITIONS                                                                  | VALUES | UNITS            |
|-------------------------------------------------------|----------------|----------------------------------------------------------------------------------|--------|------------------|
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 20 A                                                                             | 0.48   | V                |
|                                                       |                | 40 A                                                                             | 0.57   |                  |
|                                                       |                | $T_J = 25^\circ\text{C}$                                                         |        |                  |
|                                                       |                |                                                                                  |        |                  |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | 20 A                                                                             | 0.38   | mA               |
|                                                       |                | 40 A                                                                             | 0.51   |                  |
|                                                       |                | $T_J = 25^\circ\text{C}$                                                         |        |                  |
|                                                       |                | $T_J = 125^\circ\text{C}$                                                        |        |                  |
| Threshold Voltage                                     | $V_{F(TO)}$    | $T_J = T_J$ maximum                                                              | 0.22   | V                |
| Forward slope resistance                              | $r_t$          |                                                                                  | 6.76   | m $\Omega$       |
| Maximum junction capacitance per leg                  | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25^\circ\text{C}$ | 2840   | 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 150  | $^\circ\text{C}$   |
| 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           |
|                                                          | maximum        |                                          | 12 (10)     | (lbf · in)         |
| Marking device                                           |                | Case style D <sup>2</sup> PAK (TO-263AB) | 42CTQ030SH  |                    |
|                                                          |                | Case style TO-262AA                      | 42CTQ030-1H |                    |

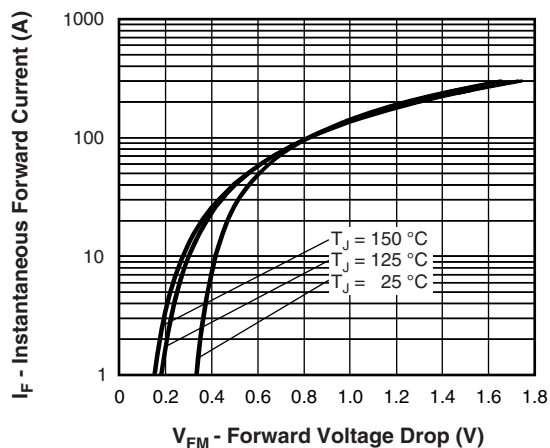


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

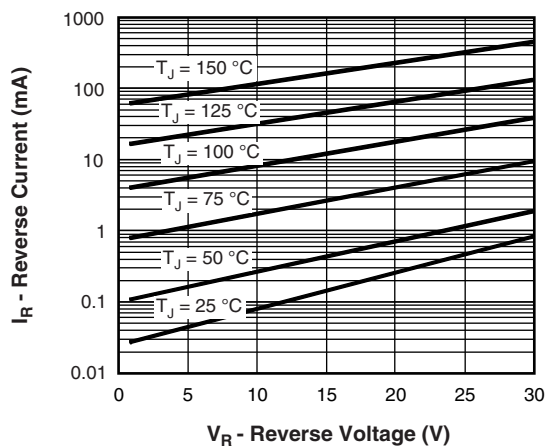


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

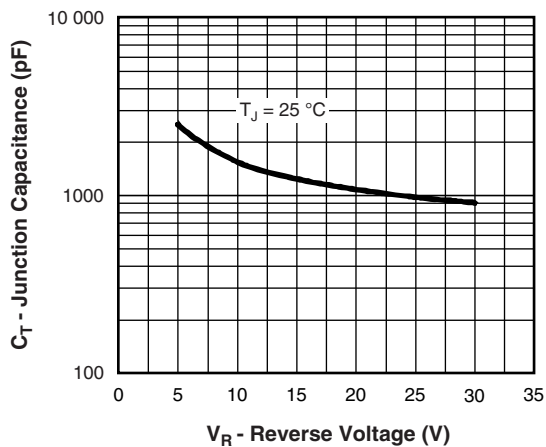


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

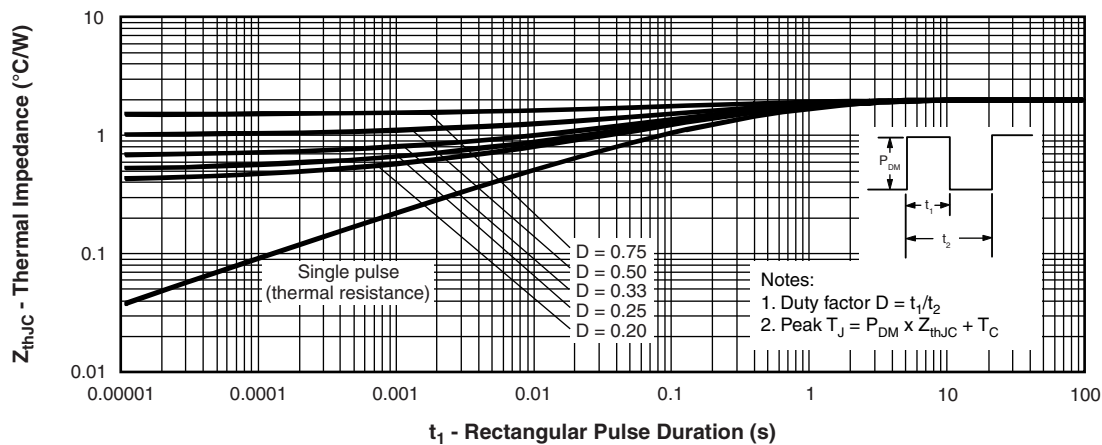


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

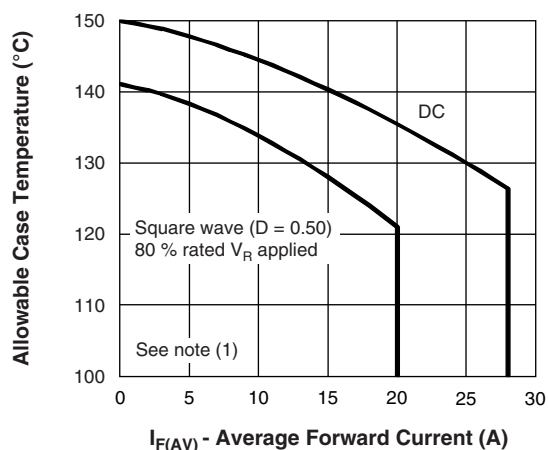


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

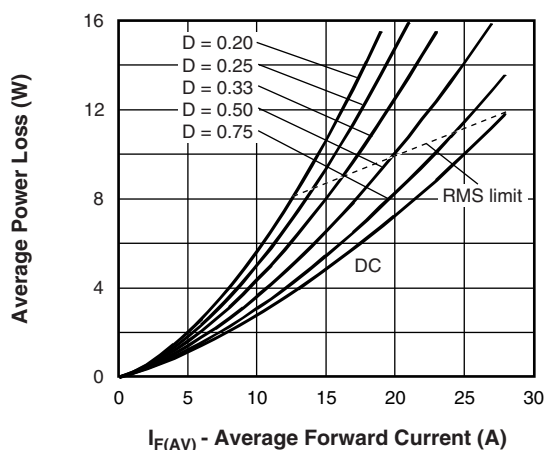


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

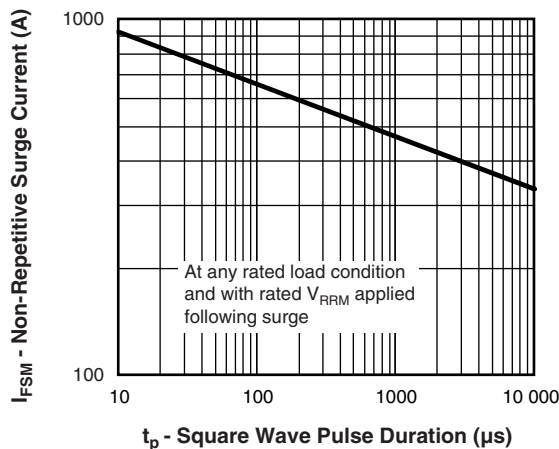


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

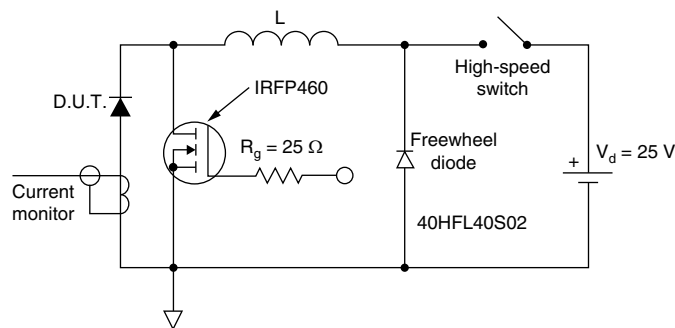


Fig. 8 - Unclamped Inductive Test Circuit

#### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = 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  $V_{R1} = 10\text{ V}$

**ORDERING INFORMATION TABLE**

|             |            |           |          |          |          |            |          |            |          |           |
|-------------|------------|-----------|----------|----------|----------|------------|----------|------------|----------|-----------|
| Device code | <b>VS-</b> | <b>42</b> | <b>C</b> | <b>T</b> | <b>Q</b> | <b>030</b> | <b>S</b> | <b>TRL</b> | <b>H</b> | <b>M3</b> |
|             | 1          | 2         | 3        | 4        | 5        | 6          | 7        | 8          | 9        | 10        |

- |           |   |                                                                                                                                                              |
|-----------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>  | - | Vishay Semiconductors product                                                                                                                                |
| <b>2</b>  | - | Current rating (40 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 rating (030 = 30 V)                                                                                                                                  |
| <b>7</b>  | - | • S = D <sup>2</sup> PAK (TO-263AB)<br>• -1 = TO-262AA                                                                                                       |
| <b>8</b>  | - | • None = Tube<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>  | - | H = AEC-Q101 qualified                                                                                                                                       |
| <b>10</b> | - | M3 = Halogen-free, RoHS-compliant and termination lead (Pb)-free                                                                                             |

| <b>ORDERING INFORMATION</b> |                         |                               |                              |
|-----------------------------|-------------------------|-------------------------------|------------------------------|
| <b>PREFERRED P/N</b>        | <b>QUANTITY PER T/R</b> | <b>MINIMUM ORDER QUANTITY</b> | <b>PACKAGING DESCRIPTION</b> |
| VS-42CTQ030SHM3             | 50                      | 1000                          | Antistatic plastic tubes     |
| VS-42CTQ030STRRHM3          | 800                     | 800                           | 13" diameter reel            |
| VS-42CTQ030STRLHM3          | 800                     | 800                           | 13" diameter reel            |
| VS-42CTQ030-1HM3            | 50                      | 1000                          | Antistatic plastic tubes     |

| <b>LINKS TO RELATED DOCUMENTS</b> |                               |                                                                        |
|-----------------------------------|-------------------------------|------------------------------------------------------------------------|
| 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> |



## 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 |
|--------|-------------|-------|--------|-------|-------|
|        | 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

### TO-262

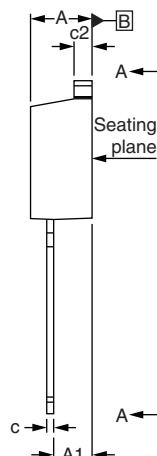
**DIMENSIONS** in millimeters and inches

Modified JEDEC® outline TO-262



#### Lead assignments

- Diodes**  
 1. - Anode (two die)/open (one die)  
 2., 4. - Cathode  
 3. - Anode



Section B - B and C - C  
 Scale: None

| 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     | 3.36        | 3.71  | 0.132     | 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), D1 (minimum) and L2 where dimensions derived the actual package outline



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