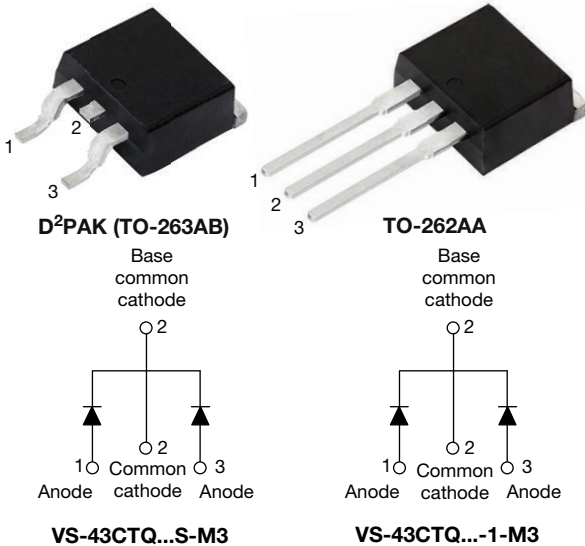




## High Performance Schottky Rectifier, 2 x 20 A



### 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 245 °C
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### 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.

| PRIMARY CHARACTERISTICS          |   |
|----------------------------------|---|
| 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                          | D <sup>2</sup> PAK (TO-263AB), TO-262AA |
| Circuit configuration            | Common cathode                          |

| MAJOR RATINGS AND CHARACTERISTICS |  |             |       |
|-----------------------------------|--|-------------|-------|
| SYMBOL                            | CHARACTERISTICS  | VALUES      | UNITS |
| I <sub>F(AV)</sub>                | Rectangular waveform                                   | 40          | A     |
| V <sub>R</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-43CTQ080S-M3<br>VS-43CTQ080-1-M3 | VS-43CTQ100S-M3<br>VS-43CTQ100-1-M3 | 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                             | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 135 °C, rectangular waveform   | per leg  | 20     | A     |
|   |                    |  | per device   | 40     |       |
| 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  | Following any rated load condition and with rated V <sub>R</sub> applied | 850    |       |
|   |                    |  |  | 275    |       |
| 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 <sub>FM</sub> (1) | 20 A   | T <sub>J</sub> = 25 °C                | 0.81   | V     |
|   |                     |  |                                       | 40 A   |       |
|   |                     | 20 A   | T <sub>J</sub> = 125 °C               | 0.67   |       |
|   |                     |  |                                       | 40 A   |       |
| Maximum reverse leakage current per leg<br>See fig. 2 | I <sub>RM</sub> (1) | T <sub>J</sub> = 25 °C   | V <sub>R</sub> = Rated V <sub>R</sub> | 1      | mA    |
|   |                     | T <sub>J</sub> = 125 °C  |                                       | 11     |       |
| Threshold voltage                                     | V <sub>F(TO)</sub>  | T <sub>J</sub> = T <sub>J</sub> maximum  |                                       | 0.71   | V     |
| Forward slope resistance                              | r <sub>t</sub>      | T <sub>J</sub> = T <sub>J</sub> maximum  |                                       | 0.43   | mΩ    |
| Maximum junction capacitance per leg                  | C <sub>T</sub>      | V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz), 25 °C |                                       | 1480   | pF    |
| Typical series inductance per leg                     | L <sub>S</sub>      | Measured lead to lead 5 mm from package body                                   |                                       | 8.0    | nH    |
| Maximum voltage rate of change                        | dV/dt               | Rated V <sub>R</sub>   |                                       | 10 000 | V/μs  |

**Note**

(1) Pulse width < 300 μs, duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS                      |                                   |  |                                      |                   |                        |
|--|-----------------------------------|--|--------------------------------------|-------------------|------------------------|
| PARAMETER  | SYMBOL                            | TEST CONDITIONS                          |                                      | VALUES            | UNITS                  |
| Maximum junction and storage temperature range           | T <sub>J</sub> , T <sub>Stg</sub> |  |                                      | -55 to 175        | °C                     |
| Maximum thermal resistance, junction to case per leg     | R <sub>thJC</sub>                 | DC operation                             | Mounting surface, smooth and greased | 2.0               | °C/W                   |
| Maximum thermal resistance, junction to case per package |                                   |  |                                      | 1.0               |                        |
| Typical thermal resistance, case to heatsink             |                                   |  |                                      | R <sub>thCS</sub> |                        |
| Approximate weight                                       |                                   |  |                                      | 2                 | g                      |
|  |                                   |  |                                      | 0.07              | oz.                    |
| Mounting torque  | minimum<br>maximum                |  |                                      | 6 (5)             | kgf · cm<br>(lbf · in) |
|  |                                   |  |                                      | 12 (10)           |                        |
| Marking device   |                                   | Case style D <sup>2</sup> PAK (TO-263AB) |                                      | 43CTQ080S         |                        |
|  |                                   |  |                                      | 43CTQ100S         |                        |
|  |                                   |  |                                      | 43CTQ080-1        |                        |
|  |                                   |  |                                      | 43CTQ100-1        |                        |

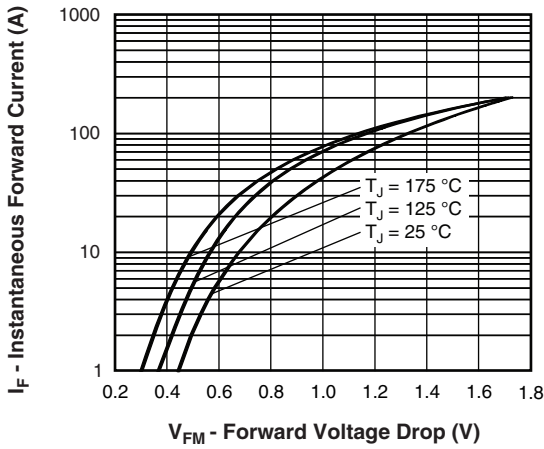


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

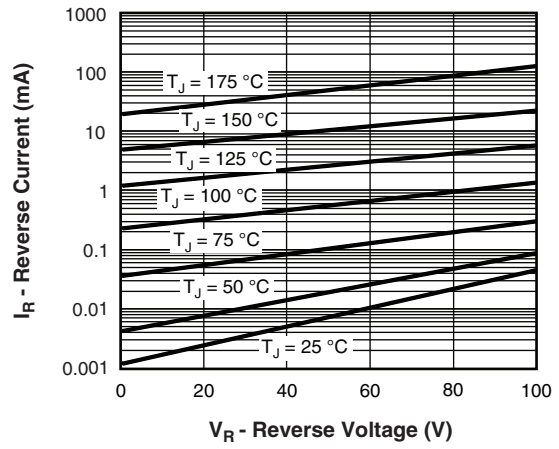


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

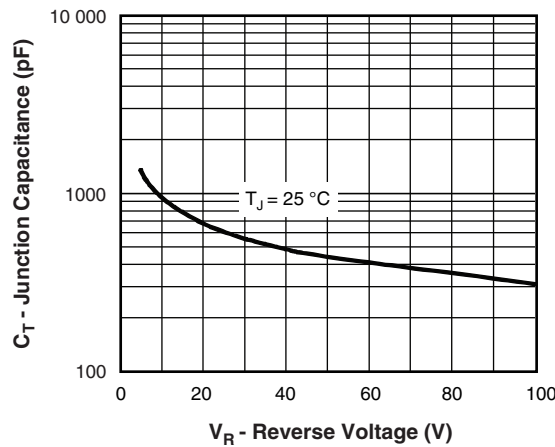


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

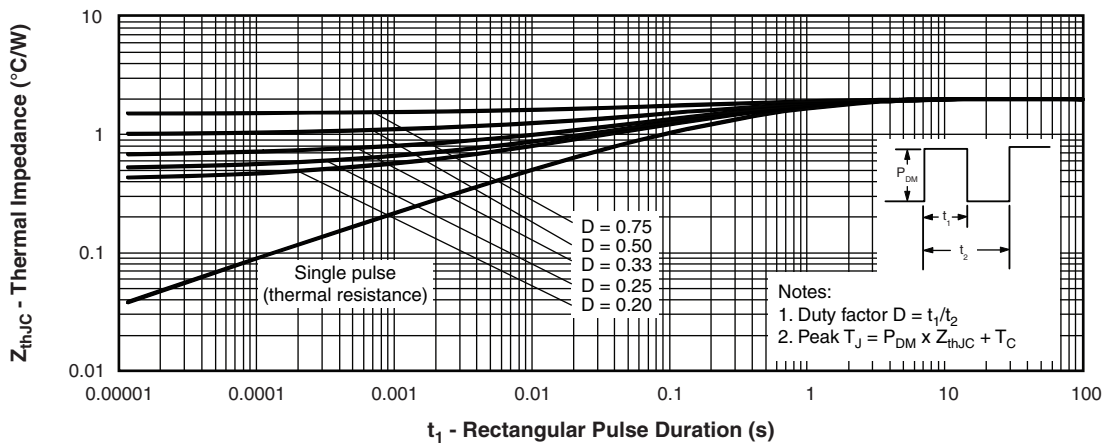


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

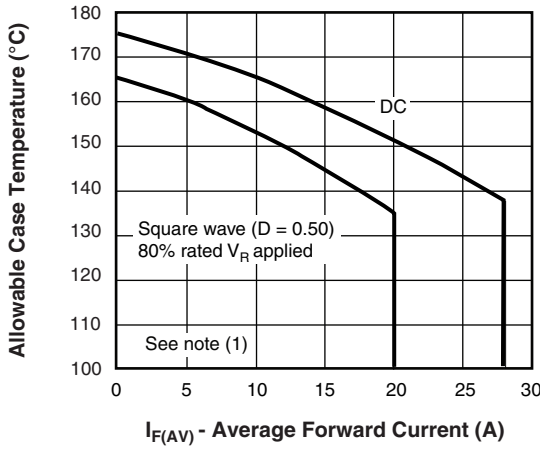


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

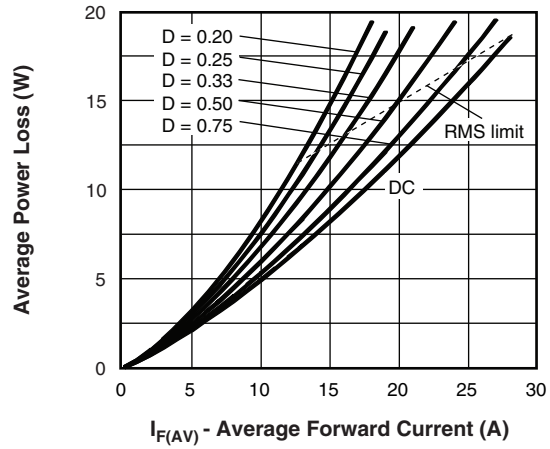


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

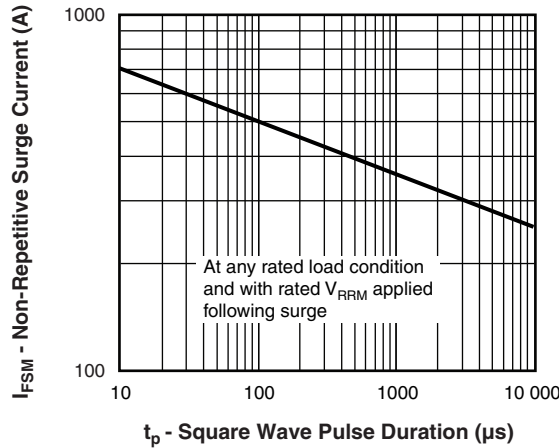


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

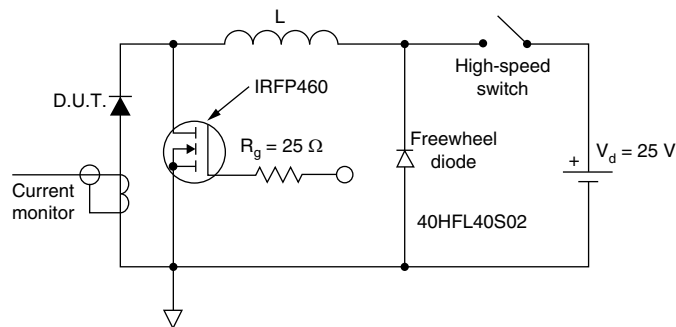


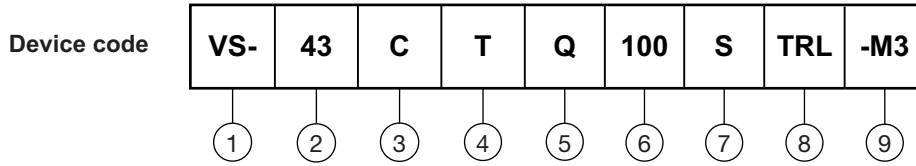
Fig. 8 - Unclamped Inductive Test Circuit

**Note**

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



## ORDERING INFORMATION TABLE



- 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 (TO-263AB)
  - -1 = TO-262AA
- 8** -
  - None = tube
  - TRL = tape and reel (left oriented - for D<sup>2</sup>PAK (TO-263AB) only)
  - TRR = tape and reel (right oriented - for D<sup>2</sup>PAK (TO-263AB) only)
- 9** - -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

| ORDERING INFORMATION |               |                                    |
|----------------------|---------------|------------------------------------|
| PREFERRED P/N        | BASE QUANTITY | PACKAGING DESCRIPTION              |
| VS-43CTQ100S-M3      | 50            | Antistatic plastic tubes           |
| VS-43CTQ100STRL-M3   | 800           | 13" diameter plastic tape and reel |
| VS-43CTQ100STRR-M3   | 800           | 13" diameter plastic tape and reel |
| VS-43CTQ100-1-M3     | 50            | Antistatic plastic tubes           |

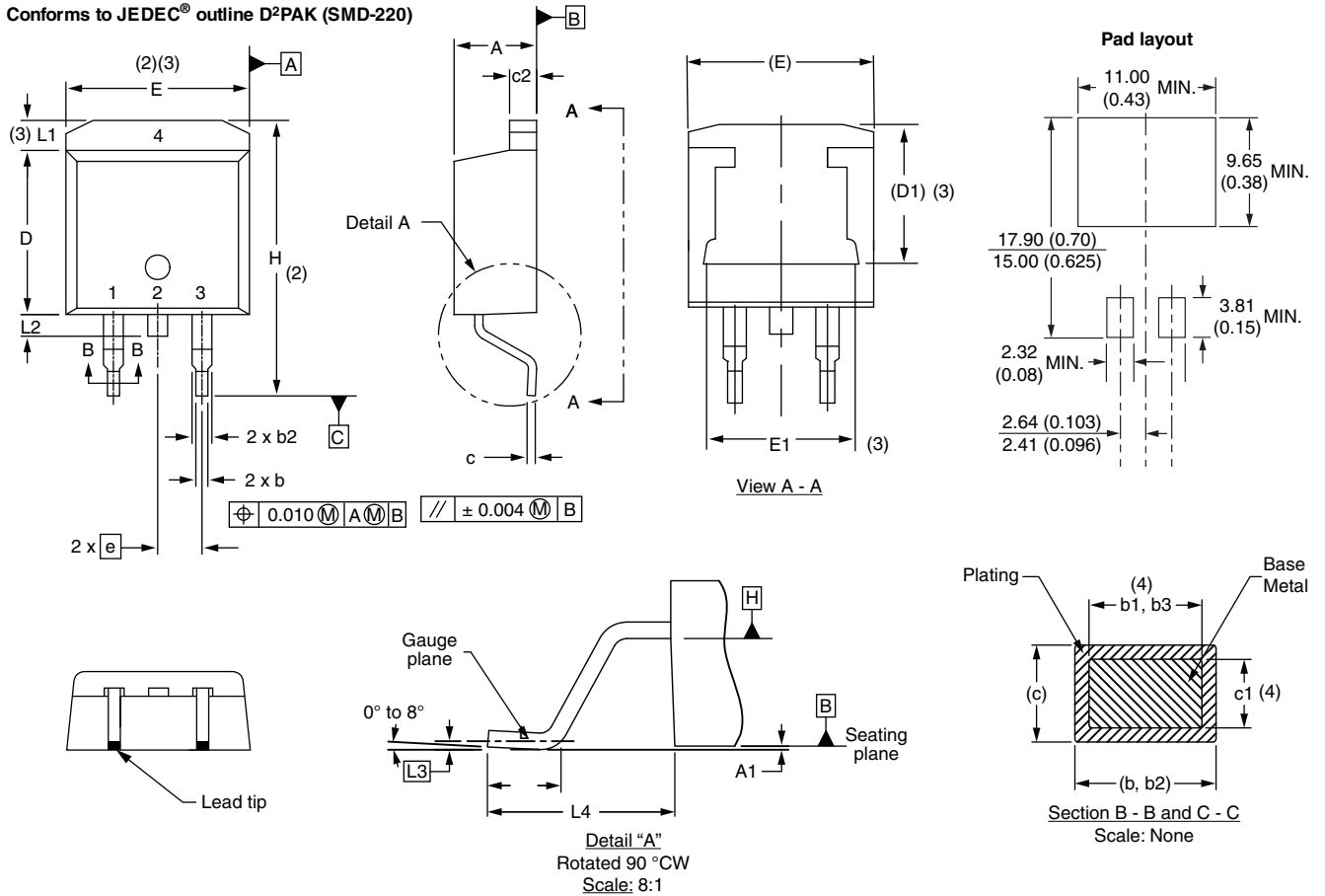
| LINKS TO RELATED DOCUMENTS |                               |  |
|----------------------------|-------------------------------|--|
| Dimensions                 | D <sup>2</sup> PAK (TO-263AB) | <a href="http://www.vishay.com/doc?96164">www.vishay.com/doc?96164</a> |
|                            | TO-262AA                      | <a href="http://www.vishay.com/doc?96165">www.vishay.com/doc?96165</a> |
| Part marking information   | D <sup>2</sup> PAK (TO-263AB) | <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?96424">www.vishay.com/doc?96424</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

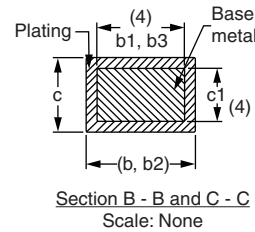
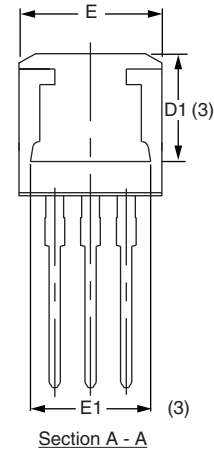
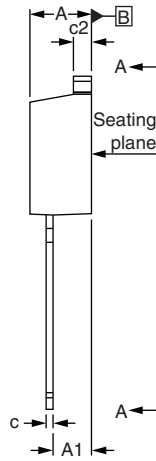
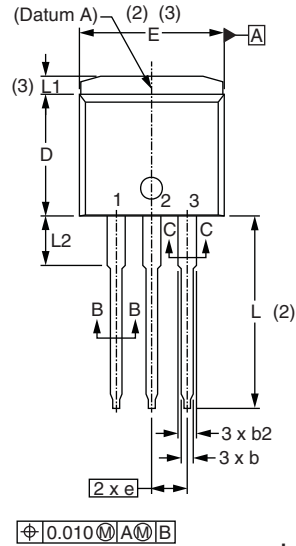
- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and 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: inches
- (7) Outline conforms to JEDEC® outline TO-263AB



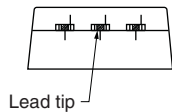
# TO-262AA

**DIMENSIONS** in millimeters and inches

Modified JEDEC® outline TO-262



$\phi 0.010 \text{ (M)} \text{ (A)} \text{ (B)}$



**Lead assignments**

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

| 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 (max.), b (min., max.), b1 (min.), b2 (max.), c (min.), c1 (min.), c2 (max.), D (min.), E (max.), L1 (max.), L2 (min., max.)



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