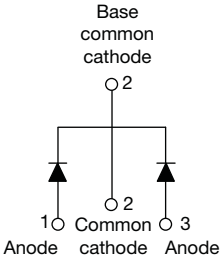
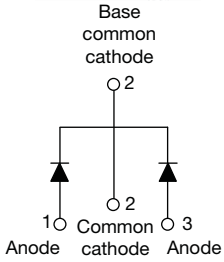
# High Performance Schottky Rectifier, 2 x 10 A

**TO-263AB ($D^2PAK$)**




**VS-MBRB20...CTHM3**

**TO-262AA**




**VS-MBR20 ...CT-1HM3**

## FEATURES

- 150 °C $T_J$ operation
- Low forward voltage drop
- High frequency operation
- Center tap $D^2PAK$ and TO-262 packages
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- 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, meets JESD 201 class 1 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

## DESCRIPTION

This center tap Schottky rectifier has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

| PRODUCT SUMMARY | |
|---|---|
| Package | TO-263AB ($D^2PAK$), TO-262AA |
| $I_{F(AV)}$ | 2 x 10 A |
| $V_R$ | 80 V, 100 V |
| $V_F$ at $I_F$ | 0.70 V |
| $I_{RM}$ | 6 mA at 125 °C |
| $T_J$ max. | 150 °C |
| Diode variation | Common cathode |
| $E_{AS}$ | 24 mJ |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{F(AV)}$ | Rectangular waveform (per device) | 20 | A |
| $I_{FRM}$ | $T_C$ = 133 °C (per leg) | 20 | |
| $V_{RRM}$ | | 80 to 100 | V |
| $I_{FSM}$ | $t_p$ = 5 µs sine | 850 | A |
| $V_F$ | 10 $A_{pk}$, $T_J$ = 125 °C | 0.70 | V |
| $T_J$ | Range | -55 to +150 | °C |

| VOLTAGE RATINGS | | | | | |
|---|---|---|---|---|---|
| PARAMETER | SYMBOL | VS-MBRB2080CTHM3 VS-MBR2080CT-1HM3 | VS-MBRB2090CTHM3 VS-MBR2090CT-1HM3 | VS-MBRB20100CTHM3 VS-MBR20100CT-1HM3 | UNITS |
| Maximum DC reverse voltage | $V_R$ | 80 | 90 | 100 | V |
| Maximum working peak reverse voltage | $V_{RWM}$ | | | | |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|---|
| Maximum average forward current | per leg | $I_{F(AV)}$ | $T_C$ = 133 °C, rated $V_R$ | | 10 | A |
| | per device | | | | 20 | |
| Peak repetitive forward current per leg | | $I_{FRM}$ | Rated $V_R$, square wave, 20 kHz, $T_C$ = 133 °C | | 20 | |
| Non-repetitive peak surge current | | $I_{FSM}$ | 5 µs sine or 3 µs rect. pulse | Following any rated load condition and with rated $V_{RRM}$ applied | 850 | |
| | | | Surge applied at rated load conditions half wave, single phase, 60 Hz | | 150 | |
| Peak repetitive reverse surge current | | $I_{RRM}$ | 2.0 µs, 1.0 kHz | | 0.5 | |
| Non-repetitive avalanche energy per leg | | $E_{AS}$ | $T_J$ = 25 °C, $I_{AS}$ = 2 A, L = 12 mH | | 24 | mJ |

## ELECTRICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum forward voltage drop | $V_{FM}$ (1) | 10 A | $T_J$ = 25 °C | 0.80 | V |
| | | 20 A | | 0.95 | |
| | | 10 A | $T_J$ = 125 °C | 0.70 | |
| | | 20 A | | 0.85 | |
| Maximum instantaneous reverse current | $I_{RM}$ (1) | $T_J$ = 25 °C | Rated DC voltage | 0.10 | mA |
| | | $T_J$ = 125 °C | | 6 | |
| Threshold voltage | $V_{F(TO)}$ | $T_J$ = $T_J$ maximum | | 0.433 | V |
| Forward slope resistance | $r_t$ | | | 15.8 | mΩ |
| Maximum junction capacitance | $C_T$ | $V_R$ = 5 $V_{DC}$ (test signal range 100 kHz to 1 MHz), 25 °C | | 400 | pF |
| Typical series inductance | $L_S$ | Measured from top of terminal to mounting plane | | 8.0 | nH |
| Maximum voltage rate of change | dV/dt | Rated $V_R$ | | 10 000 | V/µs |

**Note**

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

## THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum junction temperature range | | $T_J$ | | -55 to +150 | °C |
| Maximum storage temperature range | | $T_{Stg}$ | | -65 to +150 | |
| Maximum thermal resistance, junction to case per leg | | $R_{thJC}$ | DC operation | 2.0 | °C/W |
| Typical thermal resistance, case to heatsink | | $R_{thCS}$ | Mounting surface, smooth and greased | 0.50 | |
| Maximum thermal resistance, junction to ambient | | $R_{thJA}$ | DC operation | 50 | |
| Approximate weight | | | | 2 | g |
| | | | | 0.07 | oz. |
| Mounting torque | minimum | | Non-lubricated threads | 6 (5) | kgf · cm (lbf · in) |
| | maximum | | | 12 (10) | |
| Marking device | | | Case style $D^2PAK$ | MBRB2090CTH | |
| | | | | MBRB2080CTH | |
| | | | | MBRB20100CTH | |
| | | | Case style TO-262 | MBR2090CT-1H | |
| | | | | MBR2080CT-1H | |
| | | | | MBR20100CT-1H | |

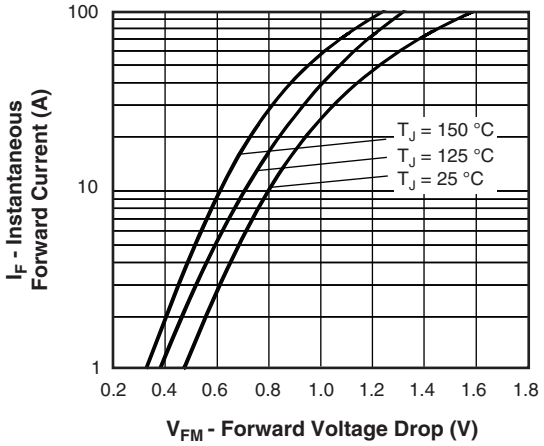



Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

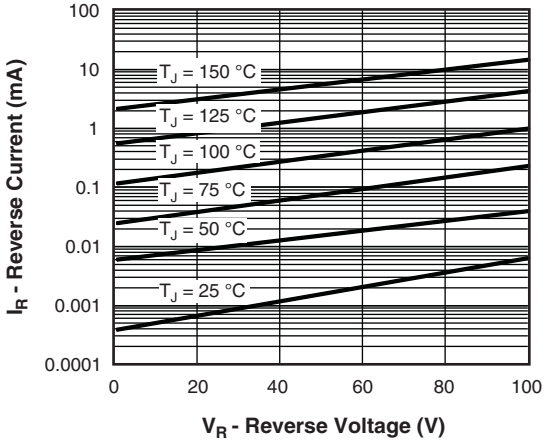



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

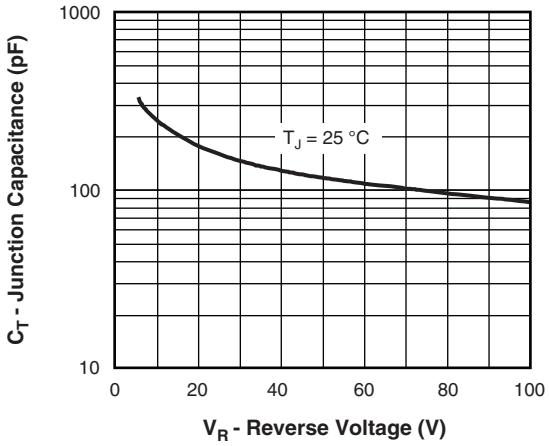



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

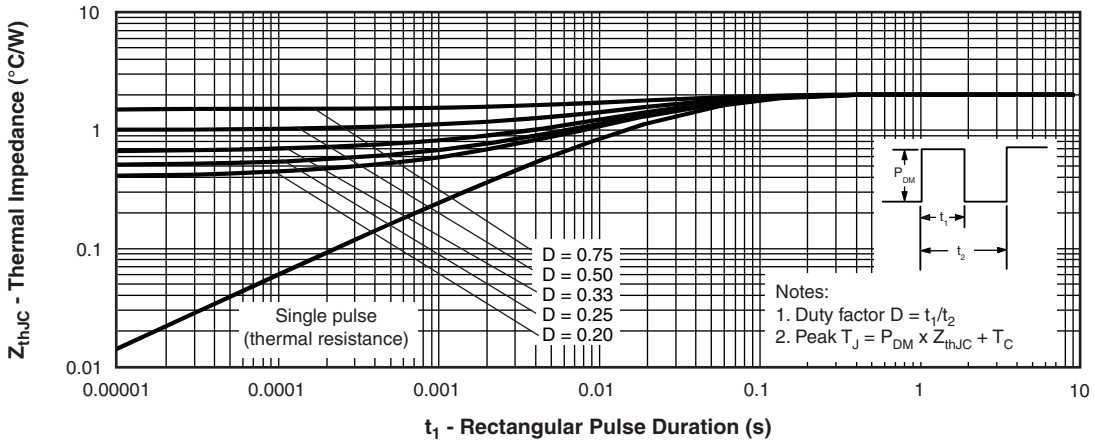



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics (Per Leg)

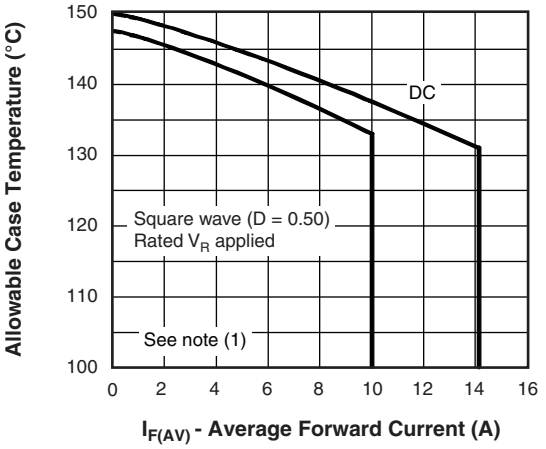



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

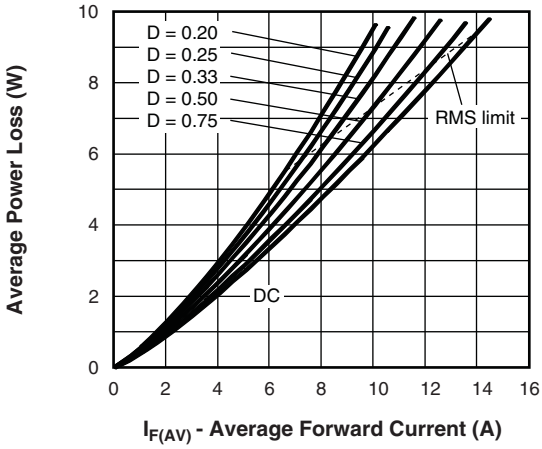



Fig. 6 - Forward Power Loss Characteristics (Per Leg)

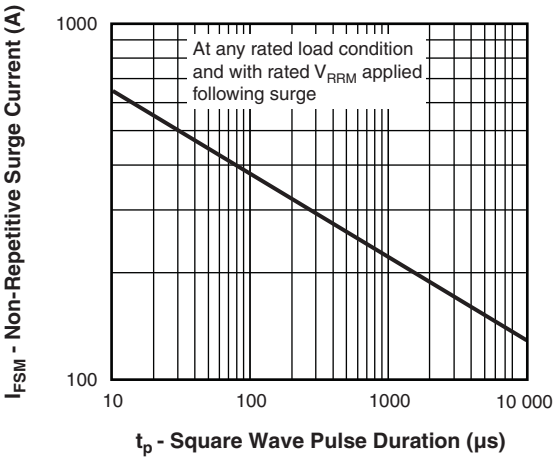


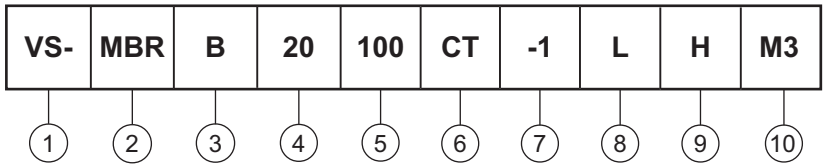

Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

**Note**

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

## ORDERING INFORMATION TABLE

Device code




1 - Vishay Semiconductors product

2 - Essential part number

3 - • B = $D^2PAK$ 7 None
• None = TO-262 7 = -1

4 - Current rating (20 = 20 A)

5 - Voltage ratings — 80 = 80 V, 90 = 90 V, 100 = 100 V

6 - CT = common cathode

7 - • None = $D^2PAK$ 3 = B
• -1 = TO-262 3 None

8 - • None = tube (50 pieces)
• L = tape and reel (left oriented - for $D^2PAK$ only)
• R = tape and reel (right oriented - for $D^2PAK$ only)

9 - • H = AEC-Q101 qualified

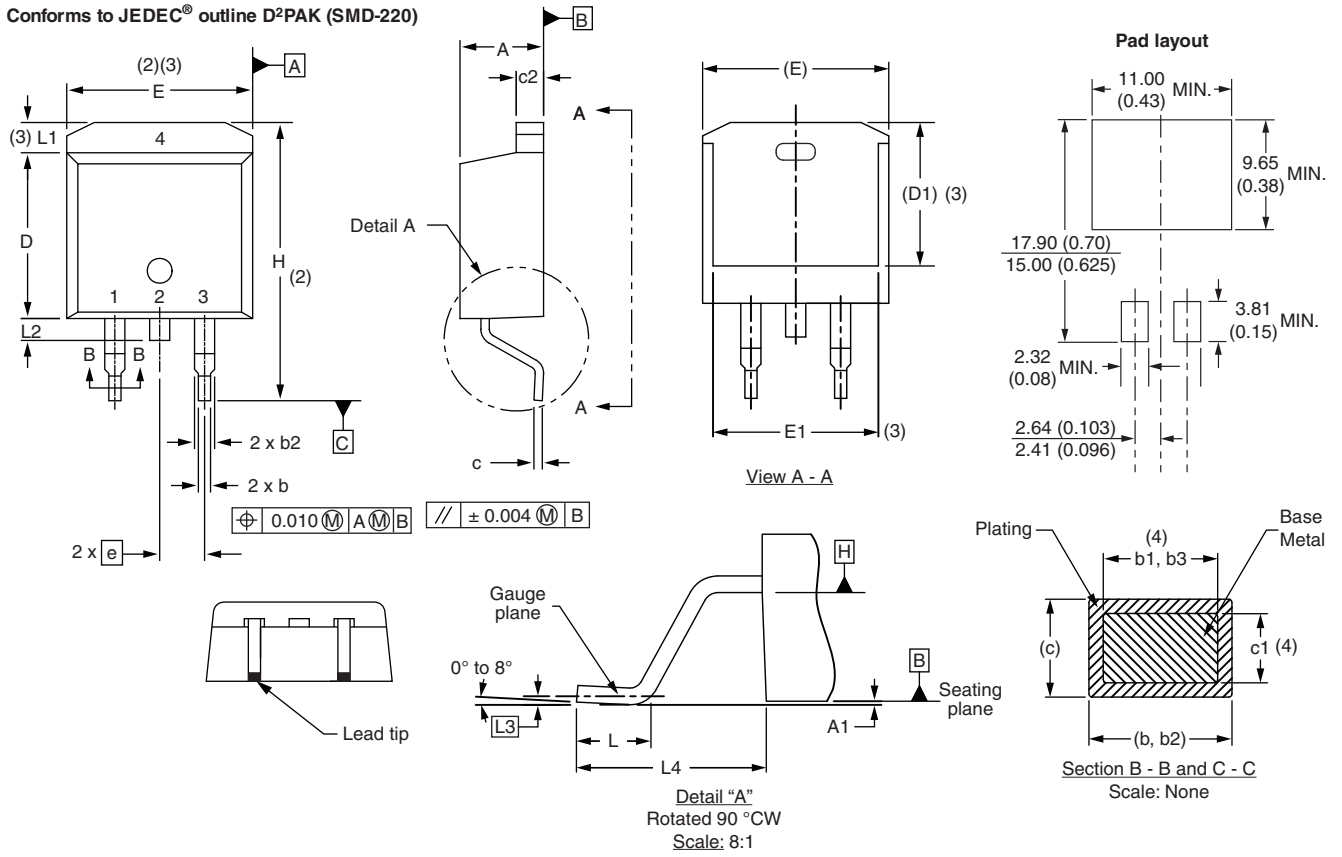
10 - • M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER T/R** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-MBRB2080CTHM3 | 50 | 1000 | Antistatic plastic tube |
| VS-MBRB2090CTHM3 | 50 | 1000 | Antistatic plastic tube |
| VS-MBRB20100CTHM3 | 50 | 1000 | Antistatic plastic tube |
| VS-MBRB2080CTLHM3 | 800 | 800 | 13" diameter reel |
| VS-MBRB2090CTLHM3 | 800 | 800 | 13" diameter reel |
| VS-MBRB20100CTLHM3 | 800 | 800 | 13" diameter reel |
| VS-MBRB2080CTRHM3 | 800 | 800 | 13" diameter reel |
| VS-MBRB2090CTRHM3 | 800 | 800 | 13" diameter reel |
| VS-MBRB20100CTRHM3 | 800 | 800 | 13" diameter reel |
| VS-MBRB2080CT-1HM3 | 50 | 1000 | Antistatic plastic tube |
| VS-MBRB2090CT-1HM3 | 50 | 1000 | Antistatic plastic tube |
| VS-MBRB20100CT-1HM3 | 50 | 1000 | Antistatic plastic tube |

| **LINKS TO RELATED DOCUMENTS** | | |
|---|---|---|
| Dimensions | TO-263AB ($D^2PAK$) | www.vishay.com/doc?95046 |
| | TO-262AA | www.vishay.com/doc?95419 |
| Part marking information | TO-263AB ($D^2PAK$) | www.vishay.com/doc?95444 |
| | TO-262AA | www.vishay.com/doc?95443 |
| Packaging information | TO-263AB ($D^2PAK$) | www.vishay.com/doc?95032 |

# D²PAK

**DIMENSIONS** in millimeters and inches




| 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

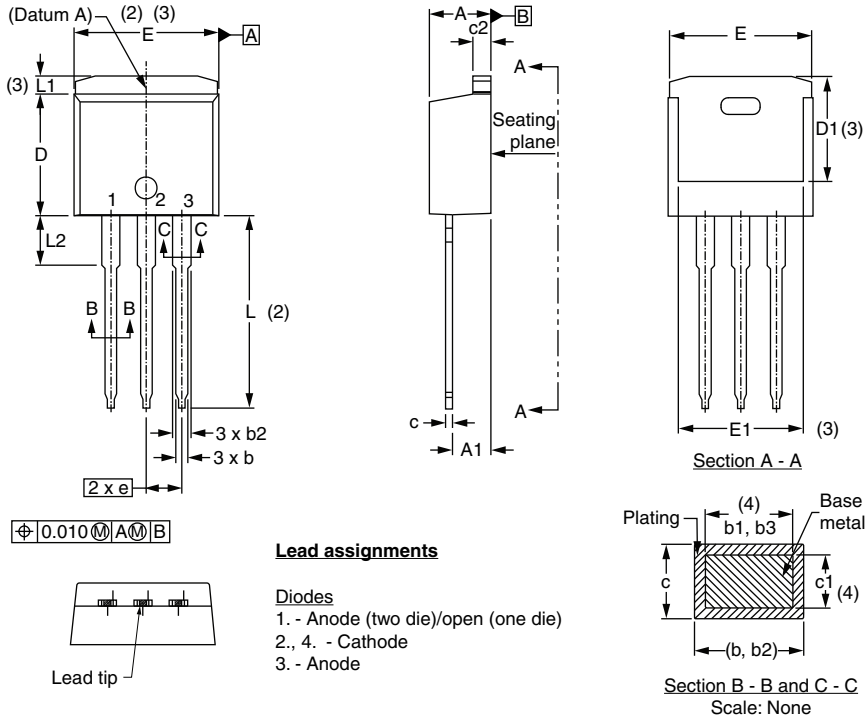
(6) Controlling dimension: inch

(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

| 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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