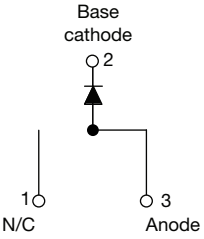
# High Performance Schottky Rectifier, 20 A

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




## FEATURES

- 125 °C $T_J$ operation ($V_R$ < 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

RoHS COMPLIANT
HALOGEN FREE

## 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.

| PRODUCT SUMMARY | |
|---|---|
| $I_{F(AV)}$ | 20 A |
| $V_R$ | 15 V |
| $V_F$ at $I_F$ | 0.33 V |
| $I_{RM}$ max. | 600 mA at 100 °C |
| $T_J$ max. | 125 °C |
| $E_{AS}$ | 10 mJ |
| Package | TO-263AB ($D^2PAK$) |
| Diode variation | Single die |

**MAJOR RATINGS AND CHARACTERISTICS**

| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
|---|---|---|---|
| $I_{F(AV)}$ | Rectangular waveform | 20 | A |
| $V_{RRM}$ | | 15 | V |
| $I_{FSM}$ | $t_p$ = 5 µs sine | 700 | A |
| $V_F$ | 19 $A_{pk}$, $T_J$ = 125 °C (typical) | 0.25 | V |
| $T_J$ | Range | -55 to +125 | °C |

**VOLTAGE RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | VS-20L15TSPbF | UNITS |
|---|---|---|---|---|
| Maximum DC reverse voltage | $V_R$ | $T_J$ = 100 °C | 15 | V |
| Maximum working peak reverse voltage | $V_{RWM}$ | | | |

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum average forward current<br>See fig. 5 | $I_{F(AV)}$ | 50 % duty cycle at $T_C$ = 85 °C, rectangular waveform | | 20 | A |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | $I_{FSM}$ | 5 µs sine or 3 µs rect. pulse | Following any rated load condition and with rated $V_{RRM}$ applied | 700 | |
| | | 10 ms sine or 6 ms rect. pulse | | 330 | |
| Non-repetitive avalanche energy | $E_{AS}$ | $T_J$ = 25 °C, $I_{AS}$ = 2 A, L = 6 mH | | 10 | mJ |
| Repetitive avalanche current | $I_{AR}$ | Current decaying linearly to zero in 1 µs<br>Frequency limited by $T_J$ maximum $V_A$ = 1.5 x $V_R$ 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 °C | - | 0.41 | V |
| | | 40 A | | - | 0.52 | |
| | | 19 A | $T_J$ = 125 °C | 0.25 | 0.33 | |
| | | 40 A | | 0.37 | 0.50 | |
| Reverse leakage current<br>See fig. 2 | $I_{RM}$ (1) | $T_J$ = 25 °C | $V_R$ = Rated $V_R$ | - | 10 | mA |
| | | $T_J$ = 100 °C | | - | 600 | |
| Threshold voltage | $V_{F(TO)}$ | $T_J$ = $T_J$ maximum | | 0.182 | | V |
| Forward slope resistance | $r_t$ | | | 7.6 | | mΩ |
| Maximum junction capacitance | $C_T$ | $V_R$ = 5 $V_{DC}$, (test signal range 100 kHz to 1 MHz), 25 °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/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 +125 | °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 | °C/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) | kgf · cm<br>(lbf · in) |
| | maximum | | | 12 (10) | |
| Marking device | | | Case style $D^2PAK$ | 20L15TS | |

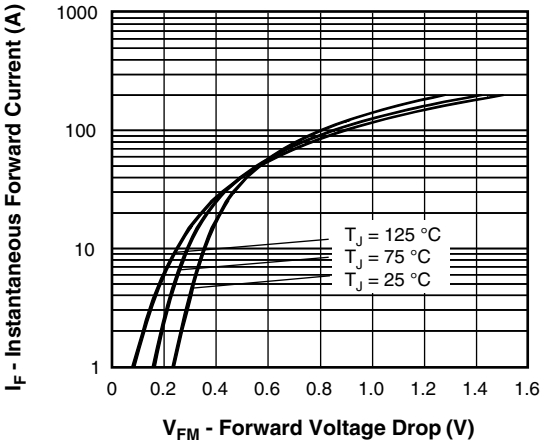



Fig. 1 - Maximum Forward Voltage Drop Characteristics

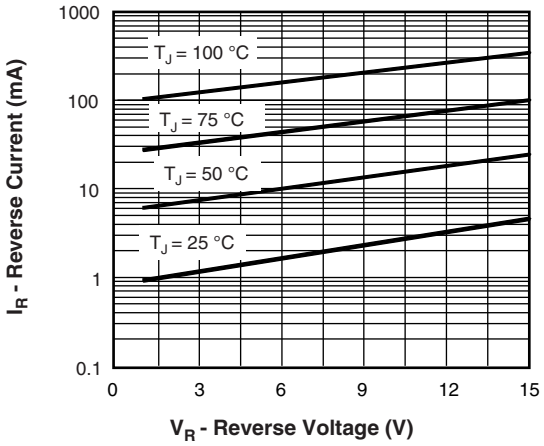



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

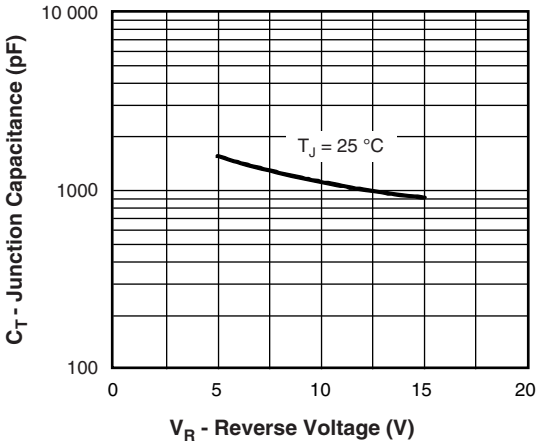



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

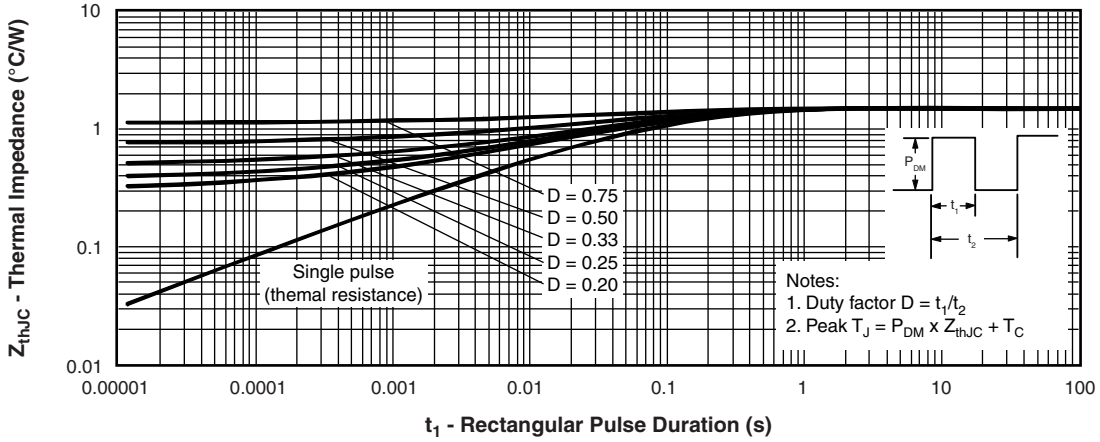



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

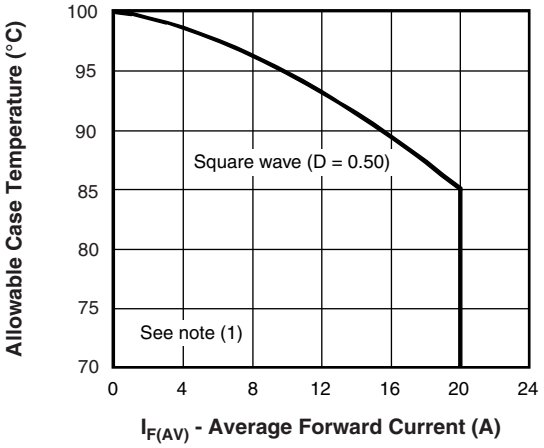



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

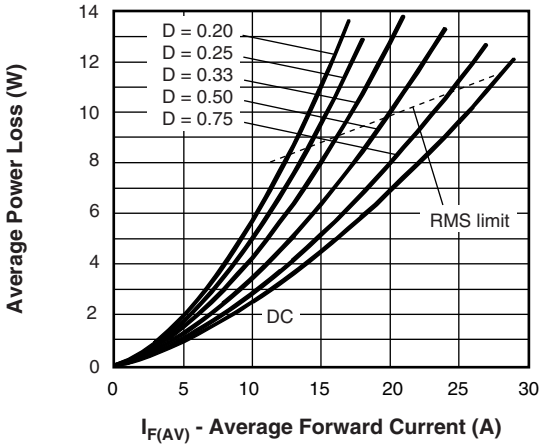



Fig. 6 - Forward Power Loss Characteristics

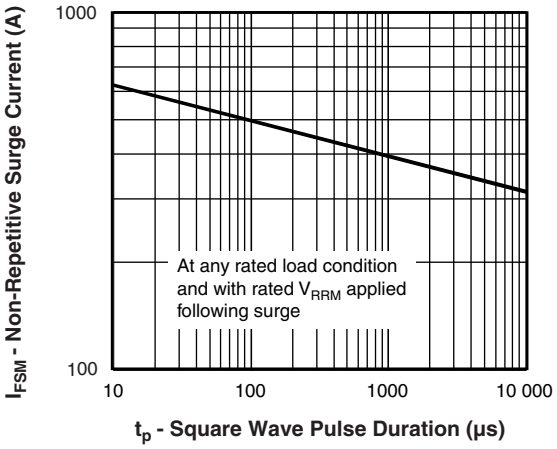



Fig. 7 - Maximum Non-Repetitive Surge Current

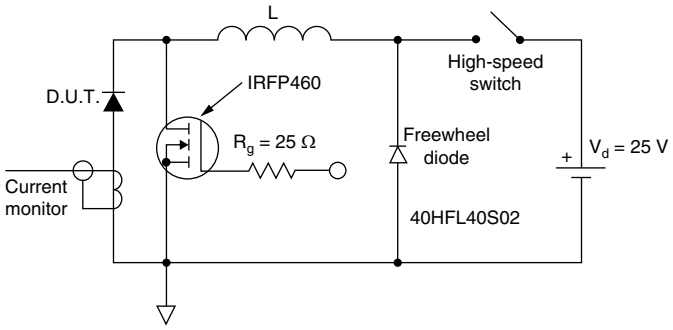



Fig. 8 - Unclamped Inductive Test Circuit

**Note**

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
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 $V_{R1}$ = 80 % rated $V_R$

## ORDERING INFORMATION TABLE

Device code

| VS- | 20 | L | 15 | T | S | TRL | PbF |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

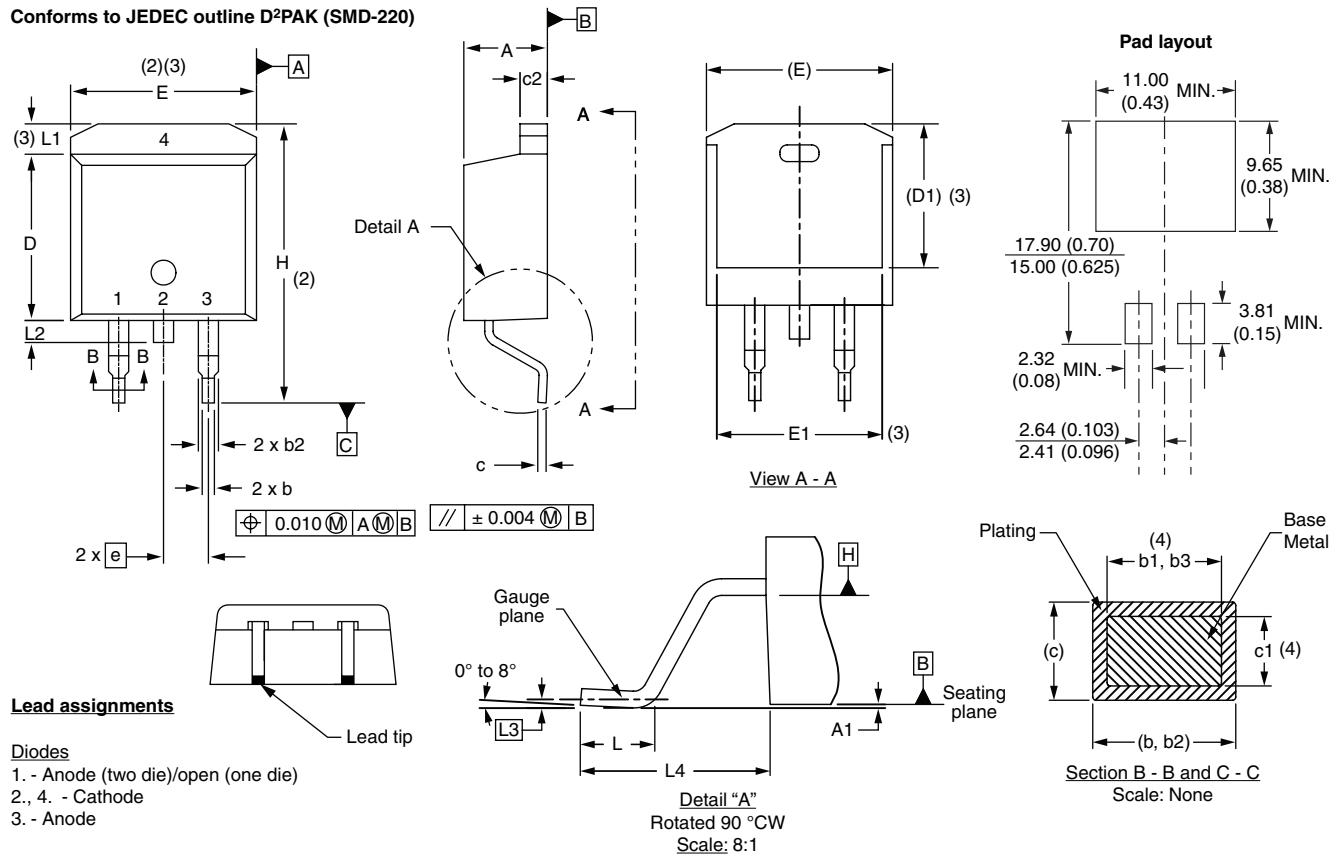
1 - Vishay Semiconductors product
2 - Current rating (20 A)
3 - L = Low $V_F$
4 - Voltage rating (15 = 15 V)
5 - T = Schottky series
6 - S = $D^2PAK$
7 - • None = tube
• TRL = tape and reel (left oriented)
• TRR = tape and reel (right oriented)
8 - PbF = lead (Pb)-free

| **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 | www.vishay.com/doc?95014 |
| Part marking information | www.vishay.com/doc?95008 |
| Packaging information | www.vishay.com/doc?95032 |

# D²PAK, TO-262

## DIMENSIONS FOR D²PAK in millimeters and inches




| 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**

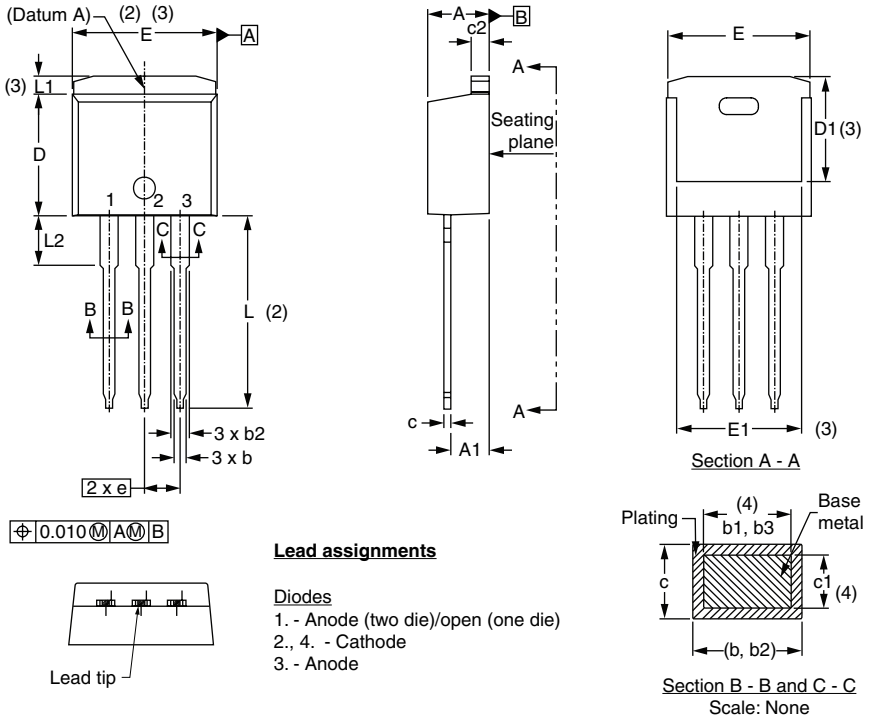
(1) Dimensioning and tolerancing per ASME Y14.5 M-1994
(2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
(3) Thermal pad contour optional within dimension E, L1, D1 and E1
(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

# Outline Dimensions

Vishay High Power Products D²PAK, TO-262

## DIMENSIONS FOR TO-262 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


For technical questions concerning discrete products, contact: diodes-tech@vishay.com
For technical questions concerning module products, contact: ind-modules@vishay.com

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