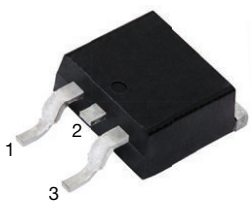
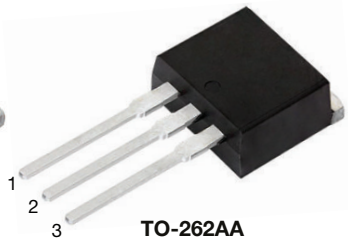
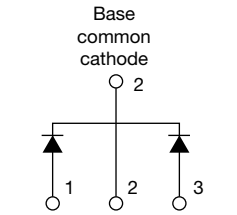
# Ultrafast Rectifier, 2 x 5 A FRED Pt®



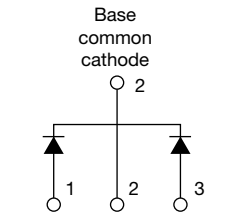

D²PAK (TO-263AB)




TO-262AA




VS-MURB1020CT-M3




VS-MURB1020CT-1-M3

## FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

## DESCRIPTION / APPLICATIONS

MUR.. series are the state of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultrafast recovery time.
The planar structure and the platinum doped life time control, guarantee the best overall performance, ruggedness and reliability characteristics.
These devices are intended for use in the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diode in low voltage inverters and chopper motor drives.
Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 2 x 5 A |
| $V_R$ | 200 V |
| $V_F$ at $I_F$ | 0.87 V |
| $t_{rr}$ | 25 ns |
| $T_J$ max. | 175 °C |
| Package | D²PAK (TO-263AB), TO-262AA |
| Circuit configuration | Common cathode |

| ABSOLUTE MAXIMUM RATINGS | | | | | |
|---|---|---|---|---|---|
| PARAMETER | | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
| Peak repetitive reverse voltage | | $V_{RRM}$ | | 200 | V |
| Average rectified forward current | per leg | $I_{F(AV)}$ | | 5 | A |
| | total device | | Rated $V_R$, $T_C$ = 149 °C | 10 | |
| Non-repetitive peak surge current per leg | | $I_{FSM}$ | | 50 | |
| Peak repetitive forward current per leg | | $I_{FM}$ | Rated $V_R$, square wave, 20 kHz, $T_C$ = 149 °C | 10 | |
| Operating junction and storage temperatures | | $T_J$, $T_{Stg}$ | | -65 to +175 | °C |

| ELECTRICAL SPECIFICATIONS ($T_J$ = 25 °C unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Breakdown voltage, blocking voltage | $V_{BR}$, $V_R$ | $I_R$ = 100 µA | 200 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 5 A, $T_J$ = 25 °C | - | 0.99 | 1.08 | |
| | | $I_F$ = 5 A, $T_J$ = 125 °C | - | 0.87 | 0.99 | |
| | | $I_F$ = 10 A, $T_J$ = 25 °C | - | 1.12 | 1.25 | |
| | | $I_F$ = 10 A, $T_J$ = 125 °C | - | 1.02 | 1.20 | |
| Reverse leakage current | $I_R$ | $V_R$ = $V_R$ rated | - | - | 10 | µA |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 250 | |
| Junction capacitance | $C_T$ | $V_R$ = 200 V | - | 8 | - | pF |
| Series inductance | $L_S$ | Measured lead to lead 5 mm from package body | - | 8.0 | - | nH |


For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

| DYNAMIC RECOVERY CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | $t_{rr}$ | $I_F$ = 1.0 A, $dI_F/dt$ = 50 A/µs, $V_R$ = 30 V | | - | - | 35 | ns |
| | | $I_F$ = 0.5 A, $I_R$ = 1.0 A, $I_{REC}$ = 0.25 V | | - | - | 25 | |
| | | $T_J$ = 25 °C | $I_F$ = 5 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 160 V | - | 24 | - | |
| | | $T_J$ = 125 °C | | - | 35 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 3.3 | - | A |
| | | $T_J$ = 125 °C | | - | 5.0 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 33 | - | nC |
| | | $T_J$ = 125 °C | | - | 76 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Maximum junction and storage temperature range | $T_J$, $T_{Stg}$ | | -65 | - | 175 | °C |
| Thermal resistance, junction to case per leg | $R_{thJC}$ | | - | - | 5 | °C/W |
| Thermal resistance, junction to ambient per leg | $R_{thJA}$ | | - | - | 50 | |
| Thermal resistance, case to heatsink | $R_{thCS}$ | Mounting surface, flat, smooth, and greased | - | 0.5 | - | |
| Weight | | | - | 2.0 | - | g |
| | | | - | 0.07 | - | oz. |
| Mounting torque | | | 6.0 (5.0) | - | 12 (10) | kgf · cm (lbf · in) |
| Marking device | | Case style D²PAK (TO-263AB) | MURB1020CT | | | |
| | | Case style TO-262 | MURB1020CT-1 | | | |

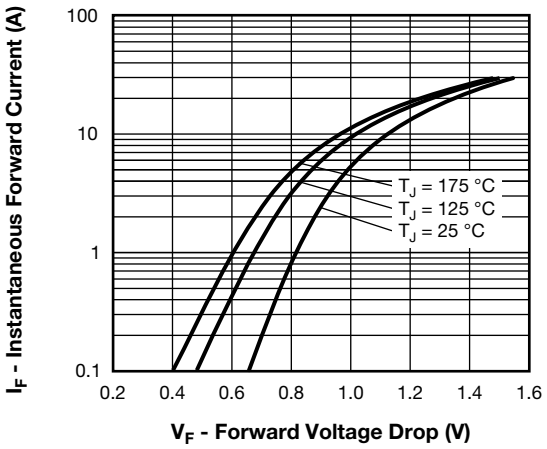



Fig. 1 - Typical Forward Voltage Drop Characteristics

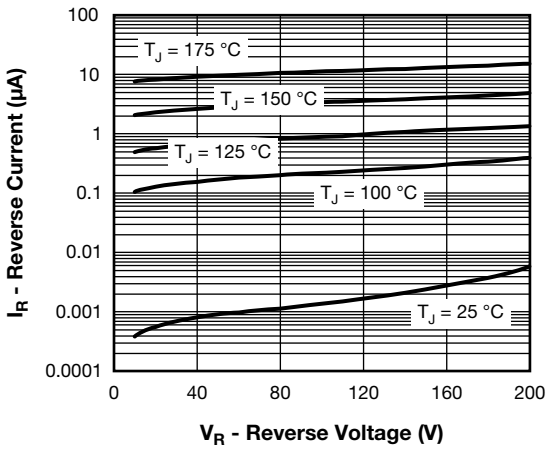



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage


For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

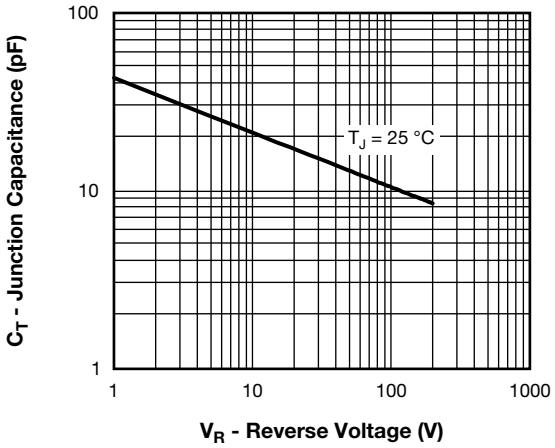



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

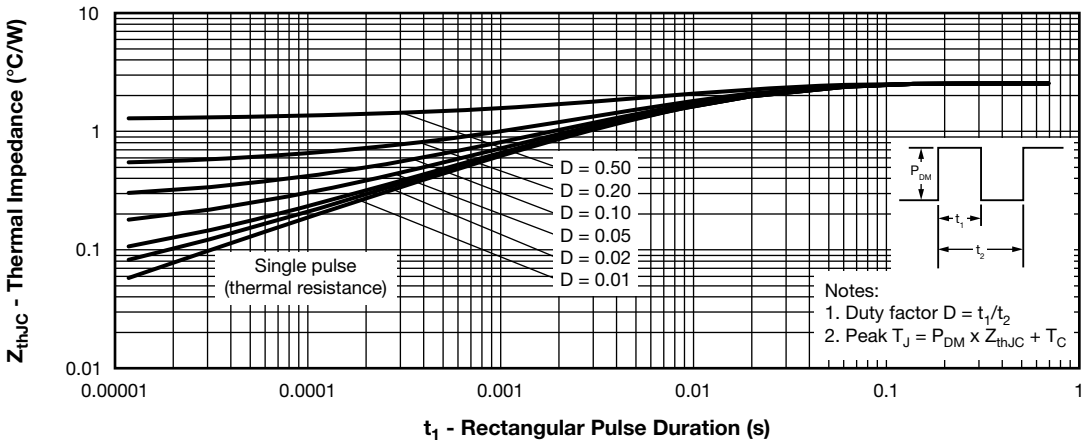



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

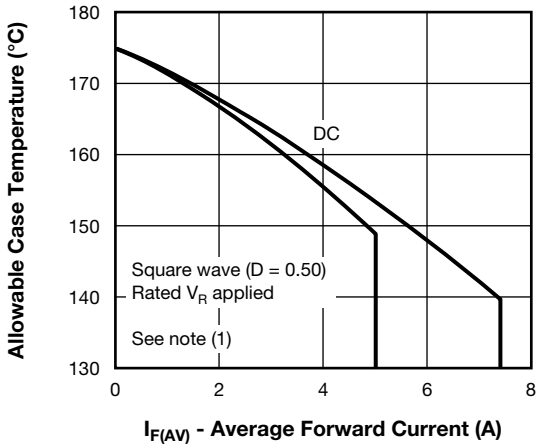



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

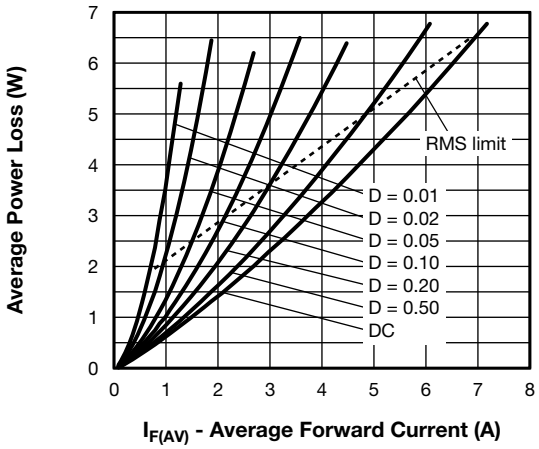



Fig. 6 - Forward Power Loss Characteristics


For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

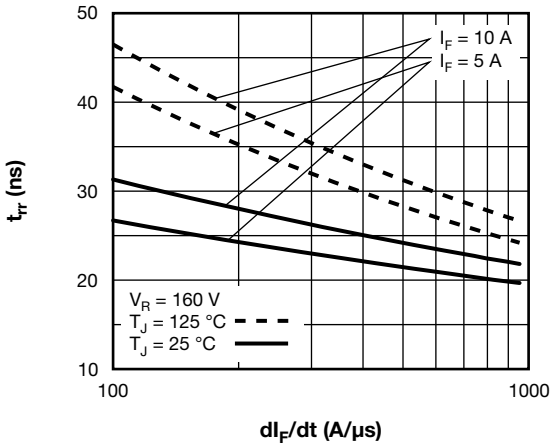



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

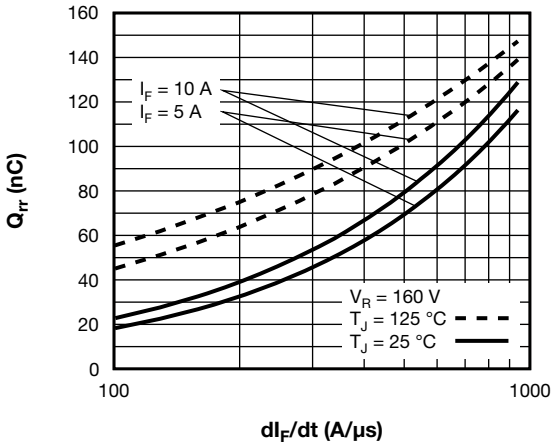
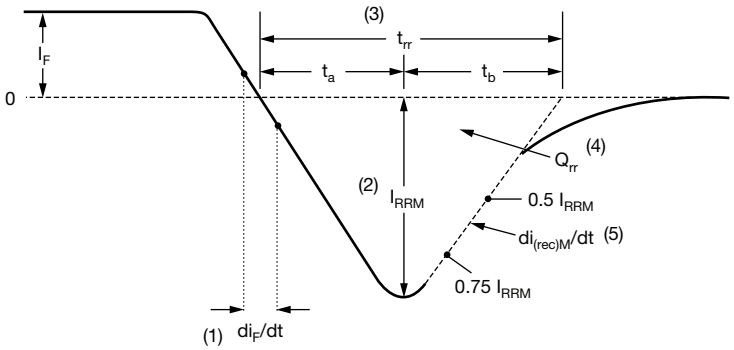



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

**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 $V_R$




(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 zero crossing point of negative going $I_F$ to point where a line passing through 0.75 $I_{RRM}$ and 0.50 $I_{RRM}$ extrapolated to zero current.

(4) $Q_{rr}$ - area under curve defined by $t_{rr}$ and $I_{RRM}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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

Fig. 9 - Reverse Recovery Waveform and Definitions


For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

## ORDERING INFORMATION TABLE

Device code

| VS- | MUR | B | 10 | 20 | CT | -1 | L | -M3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

1 - Vishay Semiconductors product

2 - Ultrafast MUR series

3 - B = $D^2PAK$ (TO-263AB) / TO-262AA

4 - Current rating (10 = 10 A)

5 - Voltage rating (20 = 200 V)

6 - CT = center tap (dual)

7 - • None = $D^2PAK$ (TO-263AB)
• -1 = TO-262AA

8 - • None = tube (50 pieces)
• L = tape and reel (left oriented, for $D^2PAK$ (TO-263AB) package)
• R = tape and reel (right oriented, for $D^2PAK$ (TO-263AB) package)

9 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

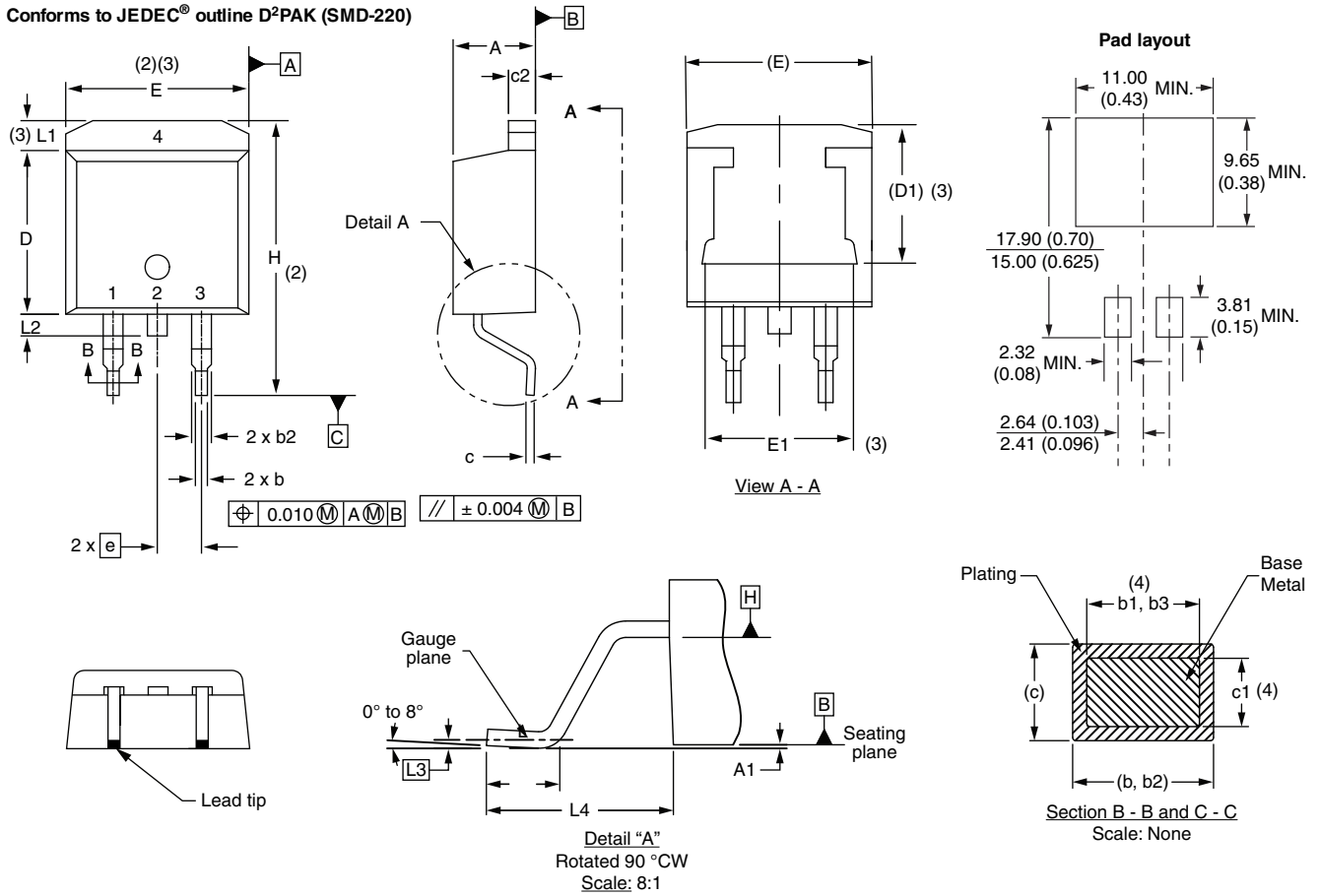
| **ORDERING INFORMATION** (Example) | | |
|---|---|---|
| **PREFERRED P/N** | **BASE QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-MURB1020CTL-M3 | 800 | 13" diameter plastic tape and reel |
| VS-MURB1020CT-M3 | 50 | Antistatic plastic tubes |
| VS-MURB1020CTR-M3 | 800 | 13" diameter plastic tape and reel |
| VS-MURB1020CT-1-M3 | 50 | Antistatic plastic tubes |

| **LINKS TO RELATED DOCUMENTS** | | |
|---|---|---|
| Dimensions | $D^2PAK$ (TO-263AB) | www.vishay.com/doc?96164 |
| | TO-262AA | www.vishay.com/doc?96165 |
| Part marking information | $D^2PAK$ (TO-263AB) | www.vishay.com/doc?95444 |
| | TO-262AA | www.vishay.com/doc?95443 |
| Packaging information | $D^2PAK$ (TO-263AB) | www.vishay.com/doc?96424 |


For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

# $D^2PAK$

**DIMENSIONS** 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: inches

(7) Outline conforms to JEDEC® outline TO-263AB



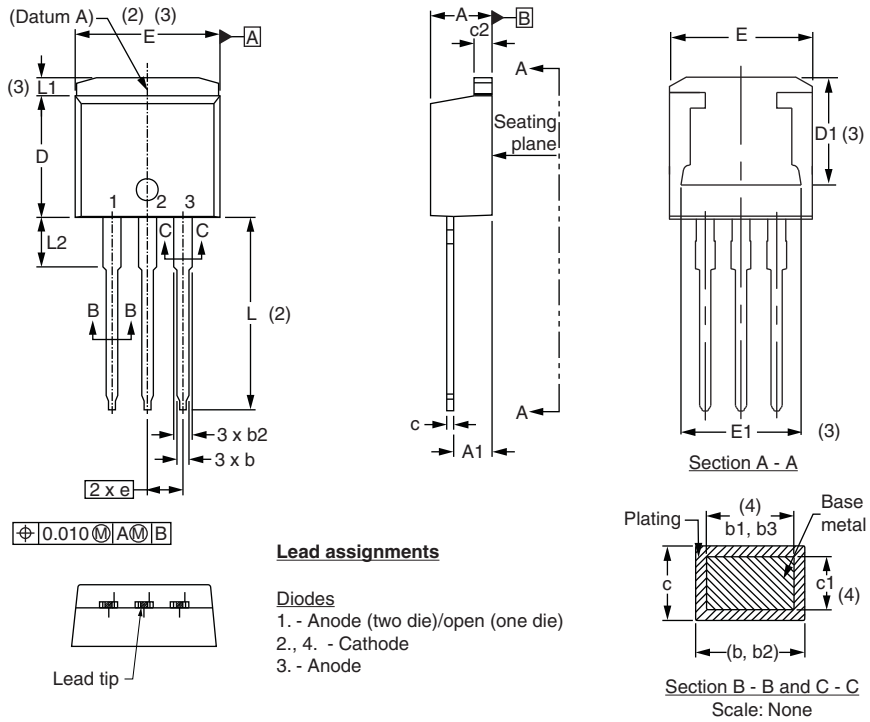
For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

# TO-262AA

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


For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

# Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

***© 2024 VISHAY INTERTECHNOLOGY, INC. ALL RIGHTS RESERVED***



THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000