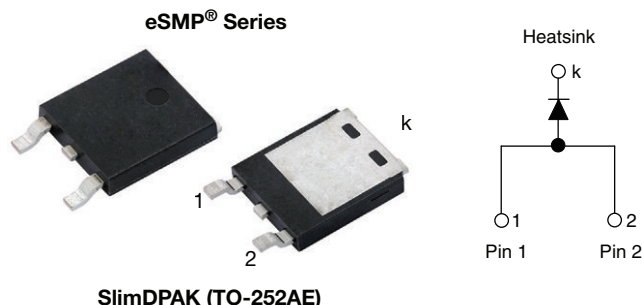


# Hyperfast Rectifier, 4 A FRED Pt®



SlimDPAK (TO-252AE)

## LINKS TO ADDITIONAL RESOURCES



3D Models

| PRIMARY CHARACTERISTICS |                     |
|-------------------------|---------------------|
| $I_{F(AV)}$             | 4 A                 |
| $V_R$                   | 200 V               |
| $V_F$ at $I_F$          | 0.71 V              |
| $t_{rr}$ (typ.)         | 16 ns               |
| $T_J$ max.              | 175 °C              |
| Package                 | SlimDPAK (TO-252AE) |
| Circuit configuration   | Single              |

## FEATURES

- Hyperfast recovery time
- 175 °C max. operating junction temperature
- Low forward voltage drop reduced  $Q_{rr}$  and soft recovery
- Low leakage current
- Very low profile - typical height of 1.3 mm
- Ideal for automated placement
- Polyimide passivation for high reliability standard
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Meets JESD 201 class 2 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

## DESCRIPTION / APPLICATIONS

State of the art hyper fast recovery rectifiers with optimized performance of forward voltage drop and hyper fast 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 PFC boost stage in the AC/DC section of SMPS inverters, or as freewheeling diodes. Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

## MECHANICAL DATA

**Case:** SlimDPAK (TO-252AE)

Molding compound meets UL 94 V-0 flammability rating  
Halogen-free, RoHS-compliant

**Terminals:** matte tin plated leads, solderable per J-STD-002

| ABSOLUTE MAXIMUM RATINGS                    |                |                                              |             |       |
|---------------------------------------------|----------------|----------------------------------------------|-------------|-------|
| PARAMETER                                   | SYMBOL         | TEST CONDITIONS                              | VALUES      | UNITS |
| Peak repetitive reverse voltage             | $V_{RRM}$      |                                              | 200         | V     |
| Average rectified forward current           | $I_{F(AV)}$    | $T_C = 167\text{ °C}$                        | 4           | A     |
| Non-repetitive peak surge current           | $I_{FSM}$      | $T_J = 25\text{ °C}$ , 10 ms sine pulse wave | 100         |       |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                                              | -55 to +175 | °C    |

| ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified) |               |                                            |      |      |      |               |
|------------------------------------------------------------------------------|---------------|--------------------------------------------|------|------|------|---------------|
| PARAMETER                                                                    | SYMBOL        | TEST CONDITIONS                            | MIN. | TYP. | MAX. | UNITS         |
| Breakdown voltage, blocking voltage                                          | $V_{BR}, V_R$ | $I_R = 100\text{ }\mu\text{A}$             | 200  | -    | -    | V             |
| Forward voltage                                                              | $V_F$         | $I_F = 4\text{ A}$                         | -    | 0.88 | 1.0  |               |
|                                                                              |               | $I_F = 4\text{ A}$ , $T_J = 150\text{ °C}$ | -    | 0.71 | 0.80 |               |
| Reverse leakage current                                                      | $I_R$         | $V_R = V_R$ rated                          | -    | -    | 3    | $\mu\text{A}$ |
|                                                                              |               | $T_J = 150\text{ °C}$ , $V_R = V_R$ rated  | -    | -    | 80   |               |
| Junction capacitance                                                         | $C_T$         | $V_R = 200\text{ V}$                       | -    | 17   | -    | pF            |

| <b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |           |                                                                                   |      |      |      |       |
|----------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------|------|------|------|-------|
| PARAMETER                                                                                                | SYMBOL    | TEST CONDITIONS                                                                   | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time                                                                                    | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 16   | -    | ns    |
|                                                                                                          |           | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{RR} = 0.25\text{ A}$              | -    | -    | 25   |       |
|                                                                                                          |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 20   | -    |       |
|                                                                                                          |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 30   | -    |       |
| Peak recovery current                                                                                    | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 2.5  | -    | A     |
|                                                                                                          |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 4    | -    |       |
| Reverse recovery charge                                                                                  | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 25   | -    | nC    |
|                                                                                                          |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 60   | -    |       |

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b>     |                              |                                |        |      |      |                             |
|------------------------------------------------|------------------------------|--------------------------------|--------|------|------|-----------------------------|
| PARAMETER                                      | SYMBOL                       | TEST CONDITIONS                | MIN.   | TYP. | MAX. | UNITS                       |
| Maximum junction and storage temperature range | $T_J$ , $T_{Stg}$            |                                | -55    | -    | 175  | $^{\circ}\text{C}$          |
| Thermal resistance, junction to ambient        | $R_{thJA}$ <sup>(1)(2)</sup> |                                | -      | 73   | 90   | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to mount          | $R_{thJM}$ <sup>(3)</sup>    |                                | -      | 2.1  | 2.5  | $^{\circ}\text{C}/\text{W}$ |
| Weight                                         |                              |                                | -      | 0.20 | -    | g                           |
| Marking device                                 |                              | Case style SlimDPAK (TO-252AE) | 4EVH02 |      |      |                             |

**Notes**

- (1) The heat generated must be less than thermal conductivity from junction to ambient;  $dP_D/dT_J < 1/R_{thJA}$
- (2) Free air, mounted or recommended copper pad area; thermal resistance  $R_{thJA}$  - junction to ambient
- (3) Mounted on infinite heatsink

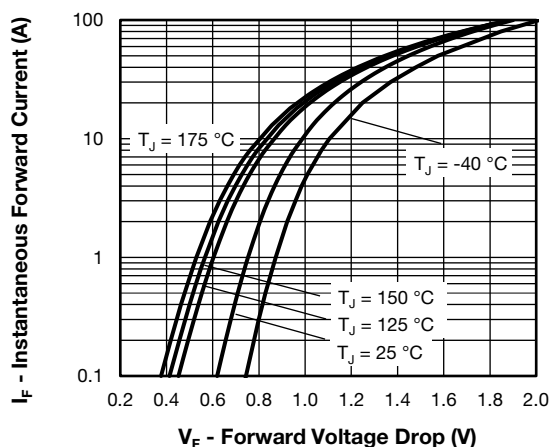


Fig. 1 - Typical Forward Voltage Drop Characteristics

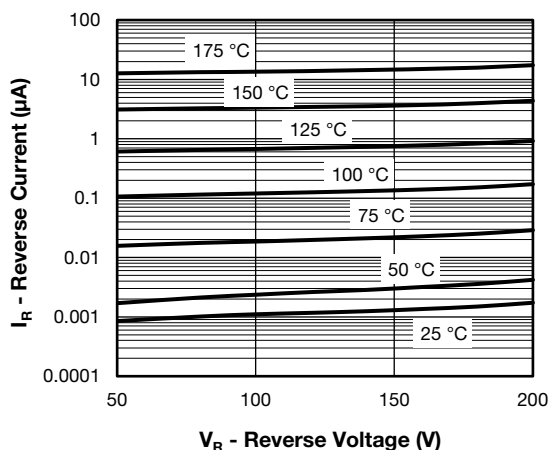


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

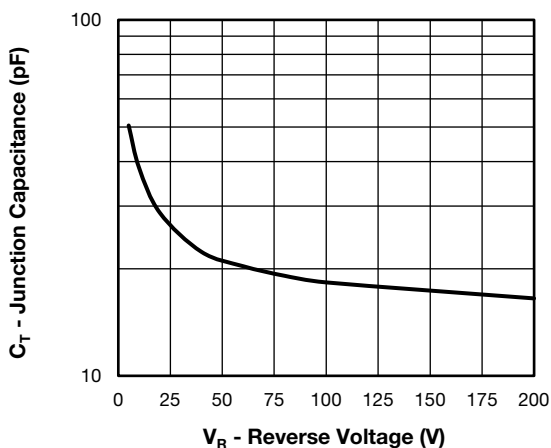


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

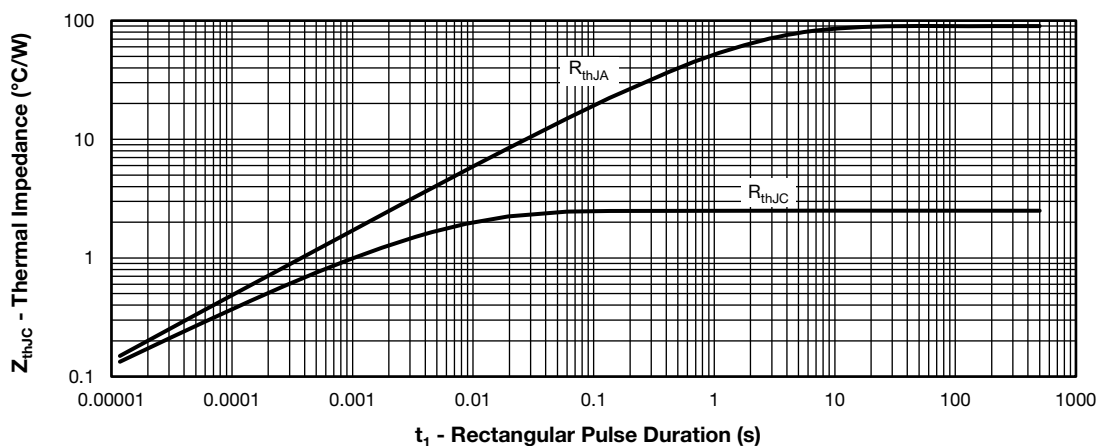
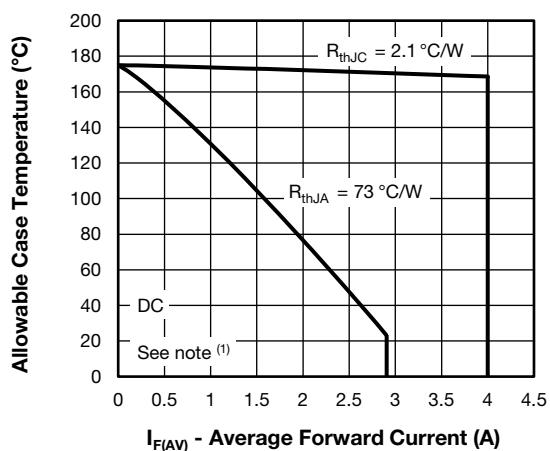

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

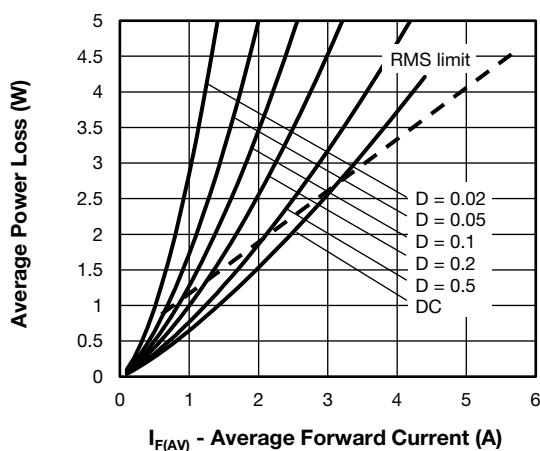


Fig. 6 - Forward Power Loss Characteristics

**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  $V_{R1}$  = rated  $V_R$

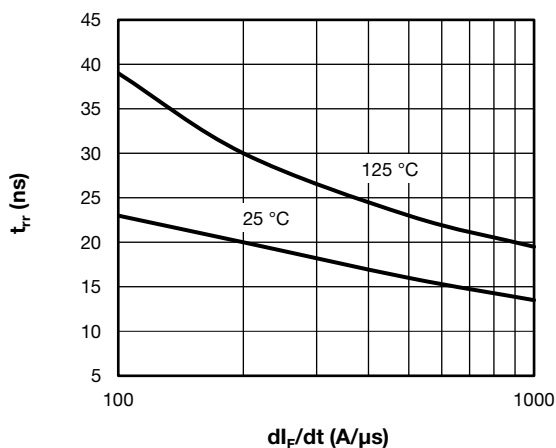
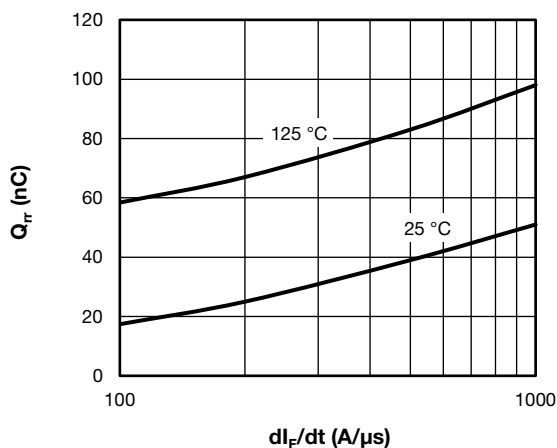
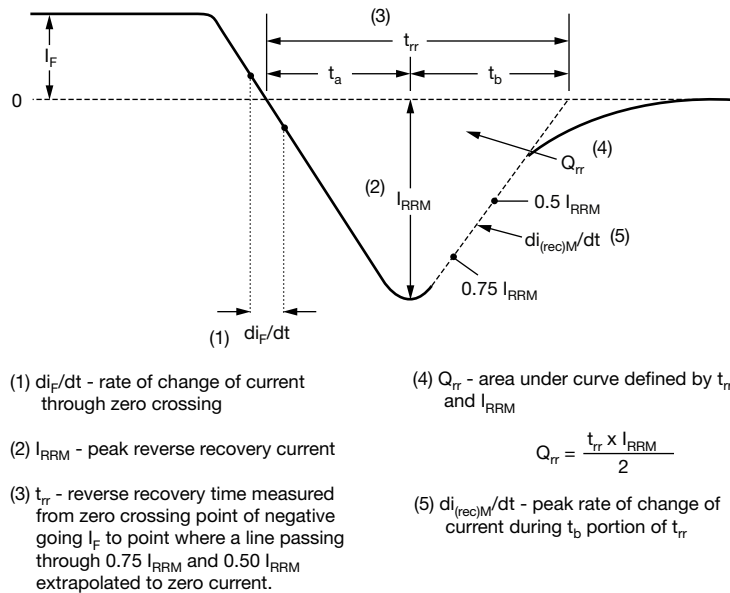

Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$ 

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


Fig. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

|             |                                                                                               |   |   |   |   |    |     |
|-------------|-----------------------------------------------------------------------------------------------|---|---|---|---|----|-----|
| Device code | VS-                                                                                           | 4 | E | V | H | 02 | -M3 |
|             | 1                                                                                             | 2 | 3 | 4 | 5 | 6  | 7   |
| 1           | - Vishay Semiconductors product                                                               |   |   |   |   |    |     |
| 2           | - Current rating (4 = 4 A)                                                                    |   |   |   |   |    |     |
| 3           | - Circuit configuration:<br>E = single die                                                    |   |   |   |   |    |     |
| 4           | - V = SlimDPAK                                                                                |   |   |   |   |    |     |
| 5           | - Process type:<br>H = hyper fast recovery                                                    |   |   |   |   |    |     |
| 6           | - Voltage code (02 = 200 V)                                                                   |   |   |   |   |    |     |
| 7           | - Environmental digit:<br>-M3 = halogen-free, RoHS compliant, and terminations lead (Pb)-free |   |   |   |   |    |     |

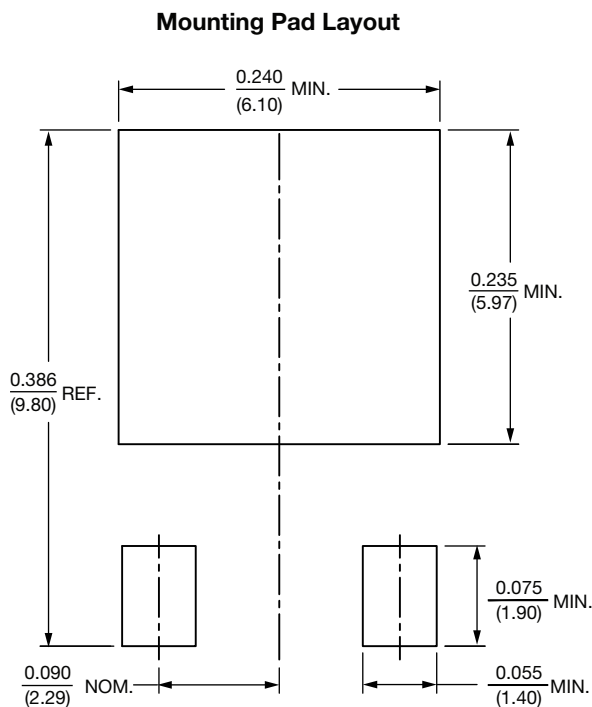
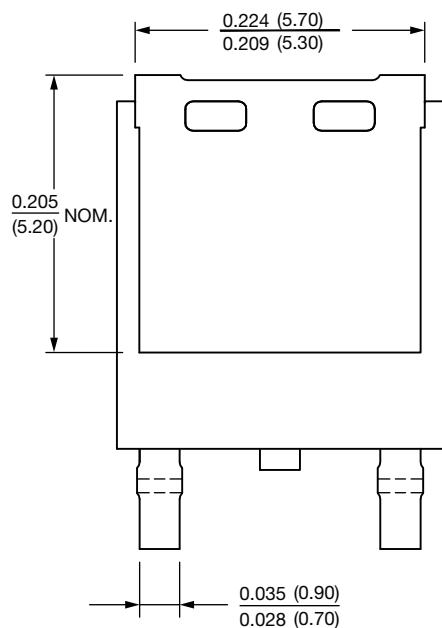
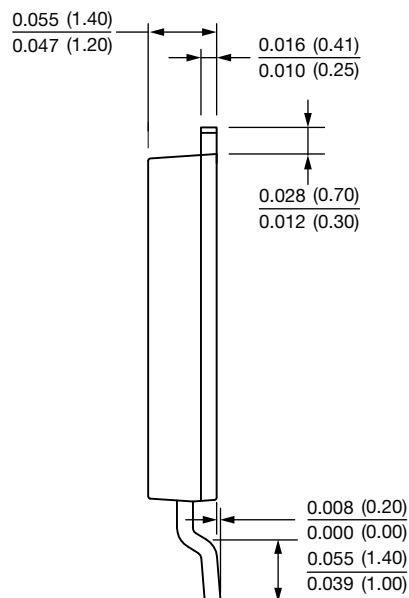
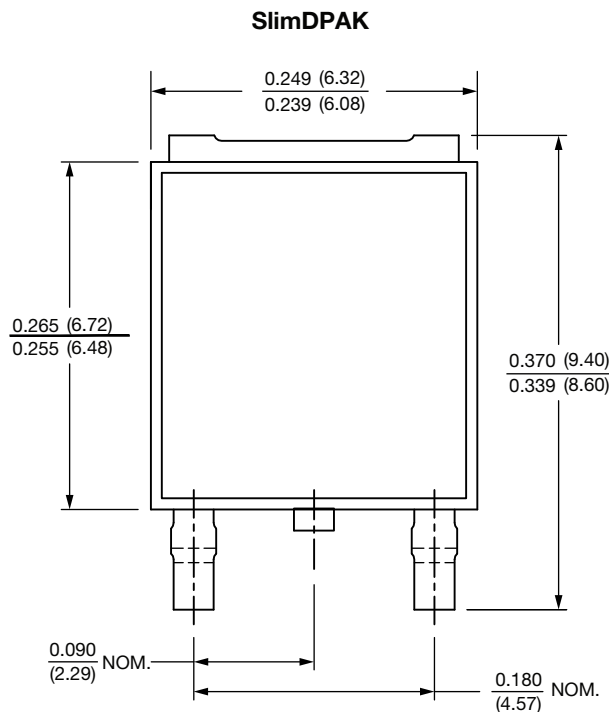
| ORDERING INFORMATION (Example) |                   |                        |                                    |
|--------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N                  | QUANTITY PER REEL | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
| VS-4EVH02-M3/I                 | 4500              | 4500                   | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?96081">www.vishay.com/doc?96081</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?96085">www.vishay.com/doc?96085</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a> |
| SPIICE model               | <a href="http://www.vishay.com/doc?97123">www.vishay.com/doc?97123</a> |



## SlimDPAK

**DIMENSIONS** in inches (millimeters)





## 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.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. 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.