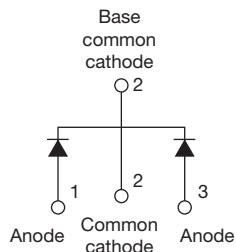


## Hyperfast Rectifier, 2 x 5 A FRED Pt®


**D-PAK (TO-252AA)**


### FEATURES

- Hyperfast recovery time
- 175 °C max. operating junction temperature
- Output rectification freewheeling
- Low forward voltage drop reduced  $Q_{rr}$  and soft recovery
- Low leakage current
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### PRODUCT SUMMARY

|                 |                  |
|-----------------|------------------|
| Package         | D-PAK (TO-252AA) |
| $I_{F(AV)}$     | 2 x 5 A          |
| $V_R$           | 200 V            |
| $V_F$ at $I_F$  | 0.98 V           |
| $t_{rr}$ (typ.) | 23 ns            |
| $T_J$ max.      | 175 °C           |
| Diode variation | Common cathode   |

### DESCRIPTION/APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast recovery time, and soft recovery.

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.

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                   | SYMBOL         | TEST CONDITIONS       | VALUES      | UNITS |
|---------------------------------------------|----------------|-----------------------|-------------|-------|
| Peak repetitive reverse voltage             | $V_{RRM}$      |                       | 200         | V     |
| Average rectified forward current           | $I_{F(AV)}$    | $T_C = 160\text{ °C}$ | 10          | A     |
| Non-repetitive peak surge current           | $I_{FSM}$      | $T_J = 25\text{ °C}$  | 80          |       |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                       | - 65 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                     | $V_F$         | $I_F = 5\text{ A}$                           | -    | 0.90 | 0.98 |               |
|                                     |               | $I_F = 10\text{ A}$                          | -    | 0.98 | 1.15 |               |
|                                     |               | $I_F = 5\text{ A}, T_J = 150\text{ °C}$      | -    | 0.74 | 0.84 |               |
|                                     |               | $I_F = 10\text{ A}, T_J = 150\text{ °C}$     | -    | 0.84 | 1.05 |               |
| Reverse leakage current per leg     | $I_R$         | $V_R = V_R$ rated                            | -    | -    | 4    | $\mu\text{A}$ |
|                                     |               | $T_J = 125\text{ °C}, V_R = V_R$ rated       | -    | -    | 40   |               |
|                                     |               | $T_J = 150\text{ °C}, V_R = V_R$ rated       | -    | -    | 80   |               |
| Junction capacitance per leg        | $C_T$         | $V_R = 600\text{ V}$                         | -    | 17   | -    | pF            |
| Series inductance                   | $L_S$         | Measured lead to lead 5 mm from package body | -    | 8    | -    | nH            |

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ °C}$  unless otherwise specified)

| PARAMETER               | SYMBOL    | TEST CONDITIONS                                                                 | MIN. | TYP. | MAX. | UNITS |
|-------------------------|-----------|---------------------------------------------------------------------------------|------|------|------|-------|
| Reverse recovery time   | $t_{rr}$  | $I_F = 1\text{ A}$ , $di_F/dt = 100\text{ A/}\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 23   | 27   | ns    |
|                         |           | $T_J = 25\text{ °C}$                                                            | -    | 21   | -    |       |
|                         |           | $T_J = 125\text{ °C}$                                                           | -    | 26   | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ °C}$                                                            | -    | 2    | -    | A     |
|                         |           | $T_J = 125\text{ °C}$                                                           | -    | 3.1  | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ °C}$                                                            | -    | 20   | -    | nC    |
|                         |           | $T_J = 125\text{ °C}$                                                           | -    | 41   | -    |       |

**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, $\frac{\text{per leg}}{\text{junction to case}}$ | $R_{thJC}$     |                             | -         | 2.7  | 3.2  | °C/W  |
|                                                                      |                |                             | -         | 1.35 | 1.6  |       |
| Approximate weight                                                   |                |                             | 0.3       |      |      | g     |
|                                                                      |                |                             | 0.01      |      |      | oz.   |
| Marking device                                                       |                | Case style D-PAK (TO-252AA) | 10CWH02FN |      |      |       |

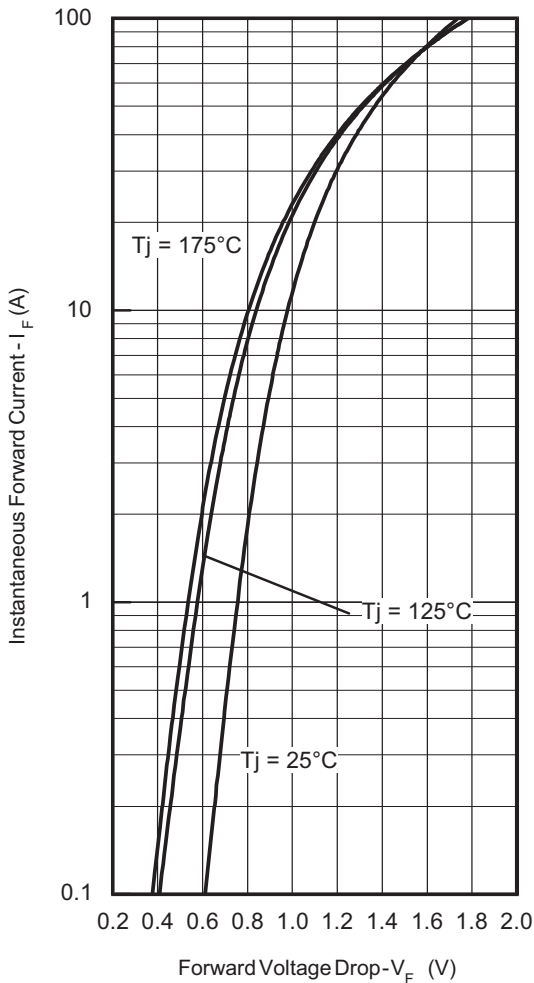


Fig. 1 - Typical Forward Voltage Drop Characteristics

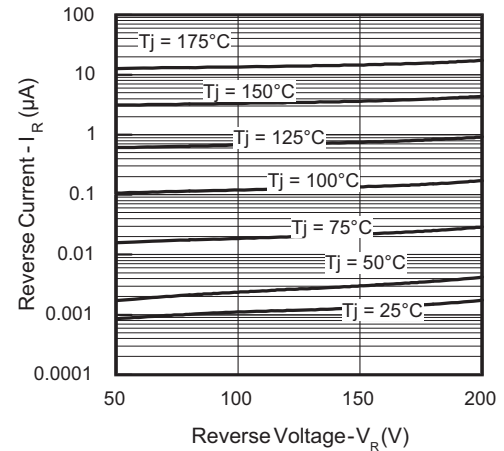


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

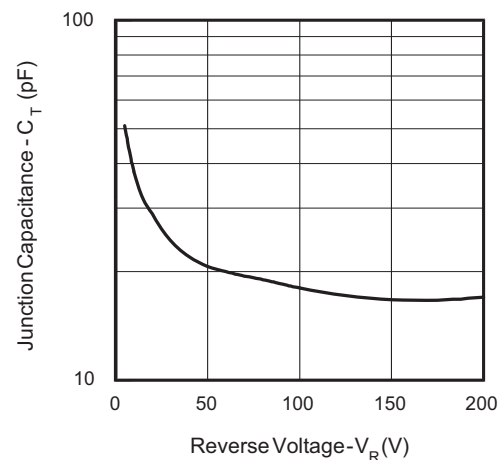
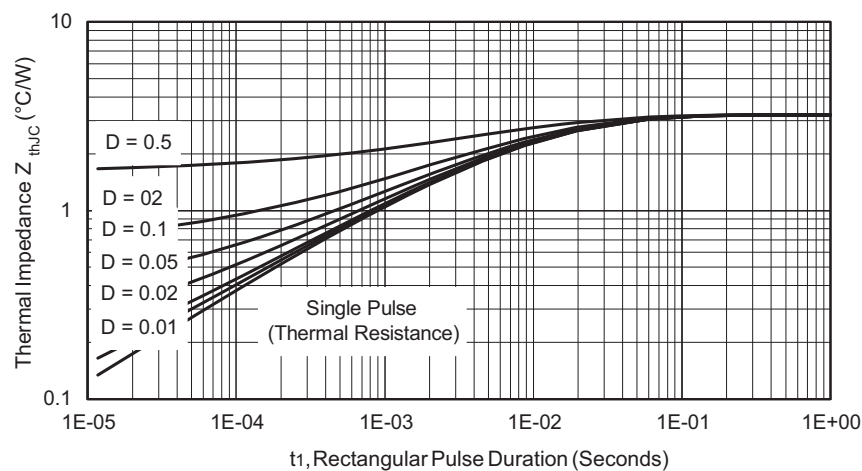


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

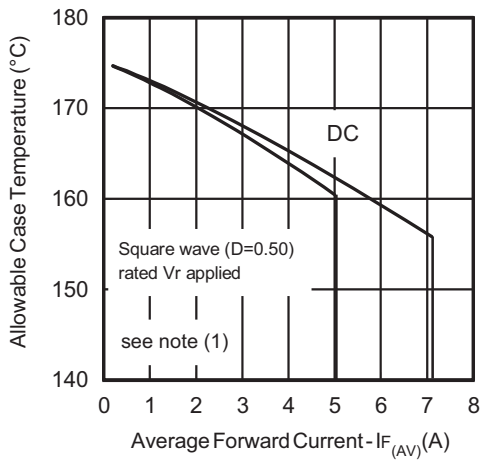


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

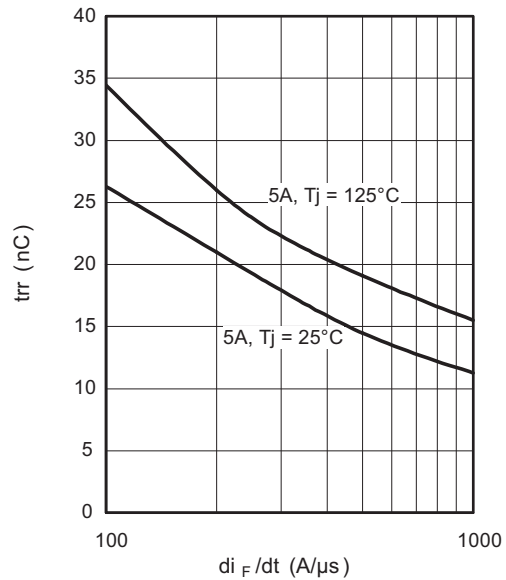


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

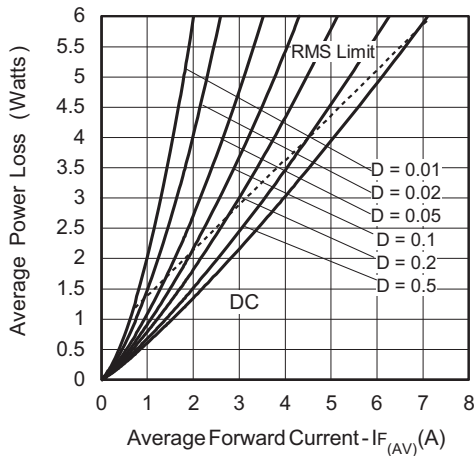


Fig. 6 - Forward Power Loss Characteristics

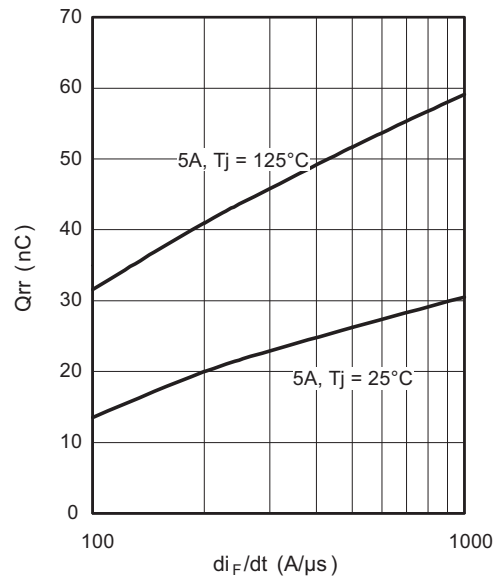


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

### 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  $V_R$

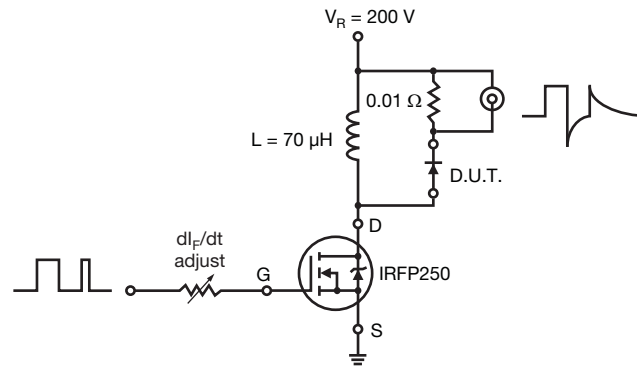


Fig. 9 - Reverse Recovery Parameter Test Circuit

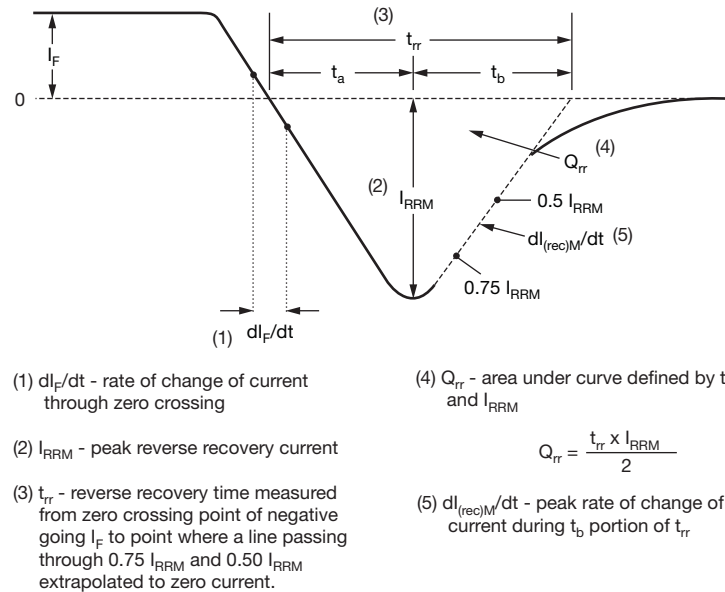


Fig. 10 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

| Device code | VS- | 10 | C | W | H | 02 | FN | TRL | -M3 |
|-------------|-----|----|---|---|---|----|----|-----|-----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7  | 8   | 9   |

- 1** - Vishay Semiconductors product
- 2** - Current rating (10 = 10 A)
- 3** - Circuit configuration:  
C = Common cathode
- 4** - Package identifier:  
W = D-PAK
- 5** - H = Hyperfast recovery
- 6** - Voltage rating (02 = 200 V)
- 7** - FN = TO-252AA
- 8** -
  - None = Tube
  - TR = Tape and reel
  - TRL = Tape and reel (left oriented)
  - TRR = Tape and reel (right oriented)
- 9** - Environmental digit:  
-M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

### ORDERING INFORMATION (Example)

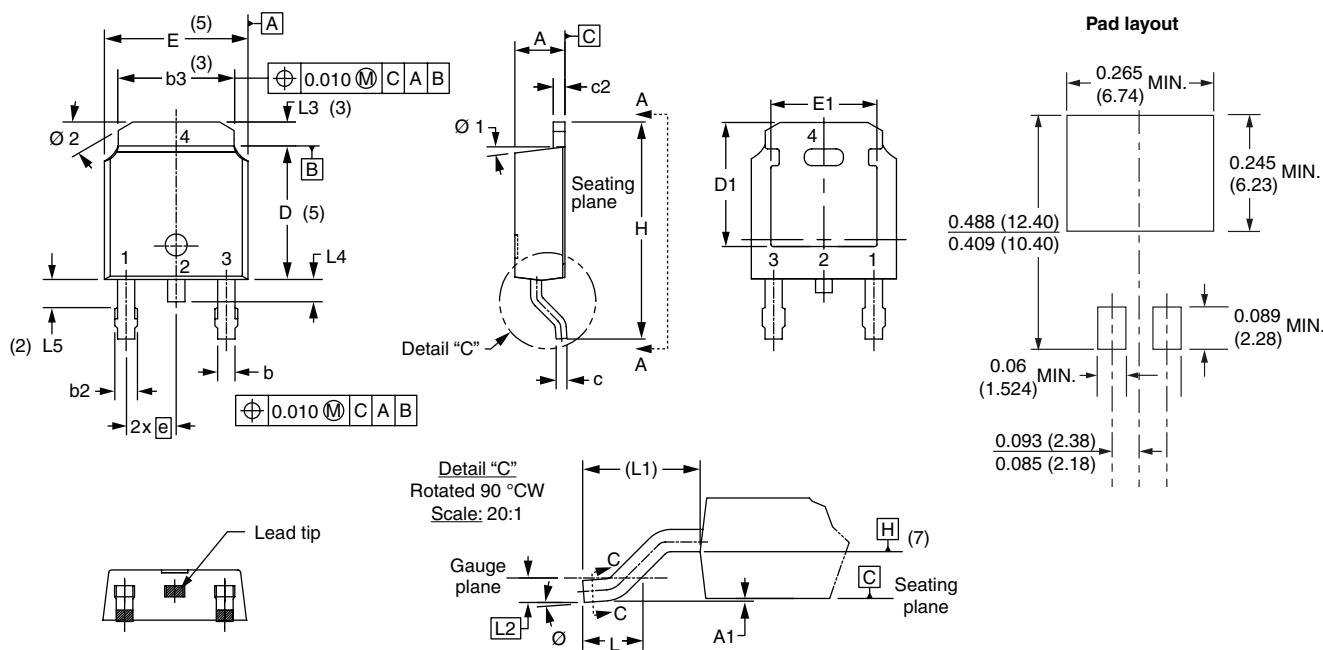
| PREFERRED P/N      | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
|--------------------|------------------|------------------------|-------------------------|
| VS-10CWH02FN-M3    | 75               | 3000                   | Antistatic plastic tube |
| VS-10CWH02FNTR-M3  | 2000             | 2000                   | 13" diameter reel       |
| VS-10CWH02FNTRL-M3 | 3000             | 3000                   | 13" diameter reel       |
| VS-10CWH02FNTRR-M3 | 3000             | 3000                   | 13" diameter reel       |

### LINKS TO RELATED DOCUMENTS

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Dimensions               | <a href="http://www.vishay.com/doc?95016">www.vishay.com/doc?95016</a> |
| Part marking information | <a href="http://www.vishay.com/doc?95176">www.vishay.com/doc?95176</a> |
| Packaging information    | <a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a> |
| SPICE model              | <a href="http://www.vishay.com/doc?95376">www.vishay.com/doc?95376</a> |

## D-PAK (TO-252AA)

### DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS |      | INCHES |       | NOTES |
|--------|-------------|------|--------|-------|-------|
|        | MIN.        | MAX. | MIN.   | MAX.  |       |
| A      | 2.18        | 2.39 | 0.086  | 0.094 |       |
| A1     | -           | 0.13 | -      | 0.005 |       |
| b      | 0.64        | 0.89 | 0.025  | 0.035 |       |
| b2     | 0.76        | 1.14 | 0.030  | 0.045 |       |
| b3     | 4.95        | 5.46 | 0.195  | 0.215 | 3     |
| c      | 0.46        | 0.61 | 0.018  | 0.024 |       |
| c2     | 0.46        | 0.89 | 0.018  | 0.035 |       |
| D      | 5.97        | 6.22 | 0.235  | 0.245 | 5     |
| D1     | 5.21        | -    | 0.205  | -     | 3     |
| E      | 6.35        | 6.73 | 0.250  | 0.265 | 5     |
| E1     | 4.32        | -    | 0.170  | -     | 3     |

| SYMBOL | MILLIMETERS |       | INCHES     |       | NOTES |
|--------|-------------|-------|------------|-------|-------|
|        | MIN.        | MAX.  | MIN.       | MAX.  |       |
| e      | 2.29 BSC    |       | 0.090 BSC  |       |       |
| H      | 9.40        | 10.41 | 0.370      | 0.410 |       |
| L      | 1.40        | 1.78  | 0.055      | 0.070 |       |
| L1     | 2.74 BSC    |       | 0.108 REF. |       |       |
| L2     | 0.51 BSC    |       | 0.020 BSC  |       |       |
| L3     | 0.89        | 1.27  | 0.035      | 0.050 | 3     |
| L4     | -           | 1.02  | -          | 0.040 |       |
| L5     | 1.14        | 1.52  | 0.045      | 0.060 | 2     |
| Ø      | 0°          | 10°   | 0°         | 10°   |       |
| Ø1     | 0°          | 15°   | 0°         | 15°   |       |
| Ø2     | 25°         | 35°   | 25°        | 35°   |       |

#### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension uncontrolled in L5
- (3) Dimension D1, E1, L3 and b3 establish a minimum mounting surface for thermal pad
- (4) Section C - C dimension apply to the flat section of the lead between 0.13 and 0.25 mm (0.005 and 0.010") from the lead tip
- (5) 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 outermost extremes of the plastic body
- (6) Dimension b1 and c1 applied to base metal only
- (7) Datum A and B to be determined at datum plane H
- (8) Outline conforms to JEDEC outline TO-252AA



## 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.

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 and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. 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.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9