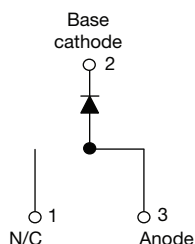


## High Performance Schottky Rectifier, 10 A


D<sup>2</sup>PAK


### FEATURES

- 175 °C T<sub>J</sub> operation
- Low forward voltage drop
- High frequency operation
- 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
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### PRODUCT SUMMARY

|                                  |                    |
|----------------------------------|--------------------|
| Package                          | D <sup>2</sup> PAK |
| I <sub>F(AV)</sub>               | 10 A               |
| V <sub>R</sub>                   | 35 V, 40 V, 45 V   |
| V <sub>F</sub> at I <sub>F</sub> | 0.57 V             |
| I <sub>RM</sub>                  | 15 mA at 125 °C    |
| T <sub>J</sub> max.              | 175 °C             |
| Diode variation                  | Single die         |
| E <sub>AS</sub>                  | 13 mJ              |

### DESCRIPTION

The VS-10TQ...SPbF Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS                              | VALUES      | UNITS |
|--------------------|----------------------------------------------|-------------|-------|
| I <sub>F(AV)</sub> | Rectangular waveform                         | 10          | A     |
| V <sub>RRM</sub>   |                                              | 35/45       | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine                   | 1050        | A     |
| V <sub>F</sub>     | 10 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.49        | V     |
| T <sub>J</sub>     | Range                                        | -55 to +175 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-10TQ035SPbF | VS-10TQ045SPbF | UNITS |
|--------------------------------------|------------------|----------------|----------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 35             | 45             | V     |
| Maximum working peak reverse voltage | V <sub>RWM</sub> |                |                |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                            | SYMBOL             | TEST CONDITIONS                                                                                                                        | VALUES | UNITS |
|----------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current<br>See fig. 5                        | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 151 °C, rectangular waveform                                                                       | 10     | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse                                                                                                          | 1050   | A     |
|                                                                      |                    | 10 ms sine or 6 ms rect. pulse                                                                                                         | 280    |       |
| Non-repetitive avalanche energy                                      | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2 A, L = 6.5 mH                                                                              | 13     | mJ    |
| Repetitive avalanche current                                         | I <sub>AR</sub>    | Current decaying linearly to zero in 1 μs<br>Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical | 2      | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                     | SYMBOL         | TEST CONDITIONS                                                                            |                                     | VALUES | UNITS |
|-----------------------------------------------|----------------|--------------------------------------------------------------------------------------------|-------------------------------------|--------|-------|
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 10 A                                                                                       | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.57   | V     |
|                                               |                | 20 A                                                                                       |                                     | 0.67   |       |
|                                               |                | 10 A                                                                                       | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.49   |       |
|                                               |                | 20 A                                                                                       |                                     | 0.61   |       |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                         | $V_R = \text{Rated } V_R$           | 2      | mA    |
|                                               |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                        |                                     | 15     |       |
| Maximum junction capacitance                  | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$ |                                     | 900    | pF    |
| Typical series inductance                     | $L_S$          | Measured lead to lead 5 mm from package body                                               |                                     | 8.0    | nH    |
| Maximum voltage rate of change                | dV/dt          | Rated $V_R$                                                                                |                                     | 10 000 | V/μs  |

**Note**(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                      | SYMBOL                            | TEST CONDITIONS                      | VALUES      | UNITS                  |
|------------------------------------------------|-----------------------------------|--------------------------------------|-------------|------------------------|
| Maximum junction and storage temperature range | T <sub>J</sub> , T <sub>Stg</sub> |                                      | -55 to +175 | °C                     |
| Maximum thermal resistance, junction to case   | R <sub>thJC</sub>                 | DC operation<br>See fig. 4           | 2.0         | °C/W                   |
| Typical thermal resistance, case to heatsink   | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.50        |                        |
| Approximate weight                             |                                   |                                      | 2           | g                      |
|                                                |                                   |                                      | 0.07        | oz.                    |
| Mounting torque                                | minimum                           |                                      | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                | maximum                           |                                      | 12 (10)     |                        |
| Marking device                                 |                                   | Case style D <sup>2</sup> PAK        | 10TQ045S    |                        |

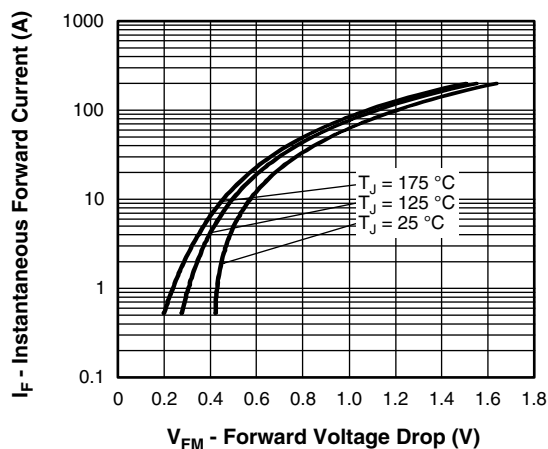


Fig. 1 - Maximum Forward Voltage Drop Characteristics

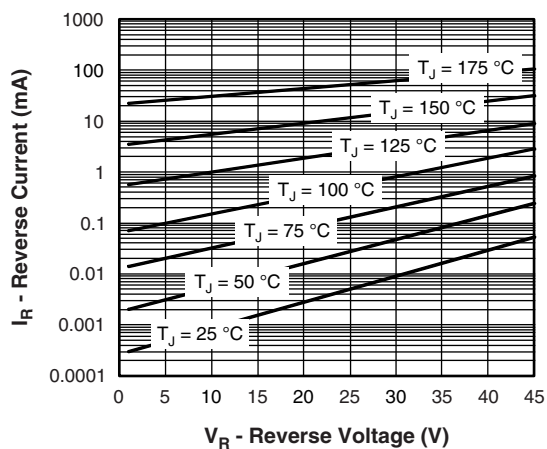


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

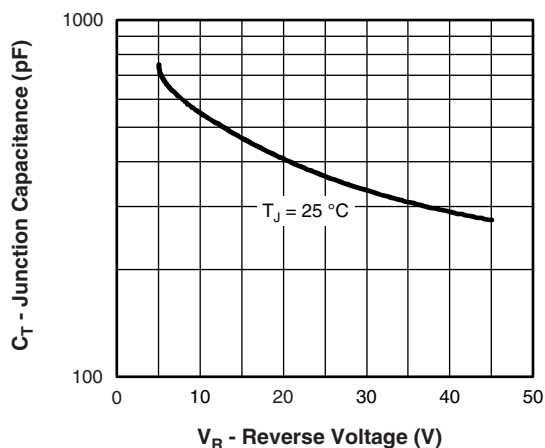


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

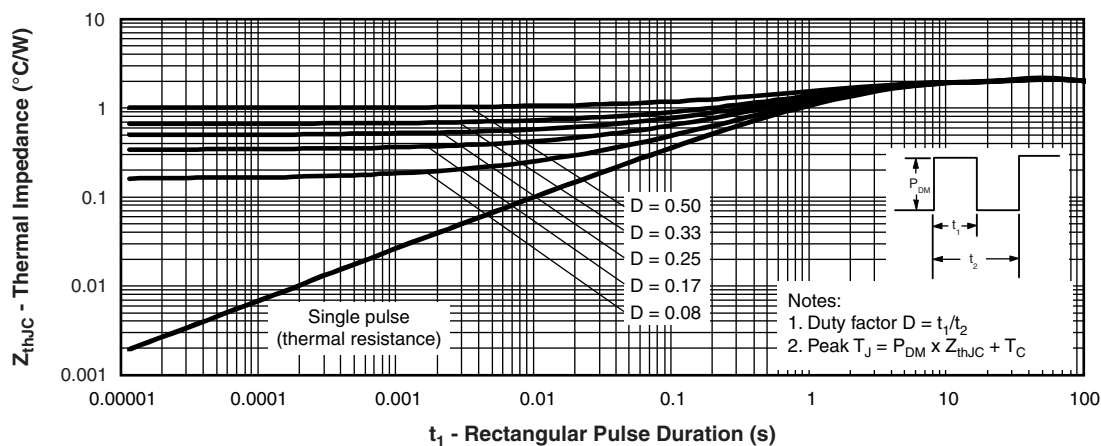


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

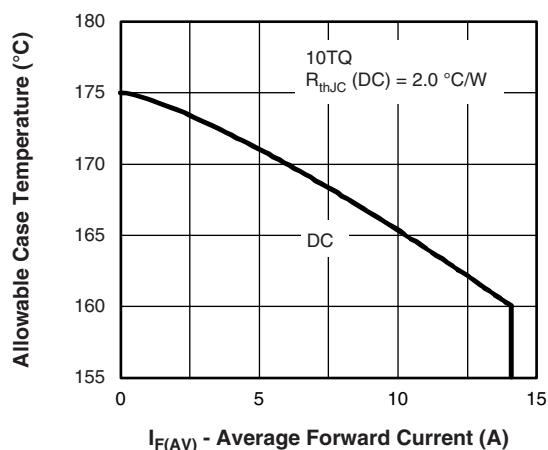


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

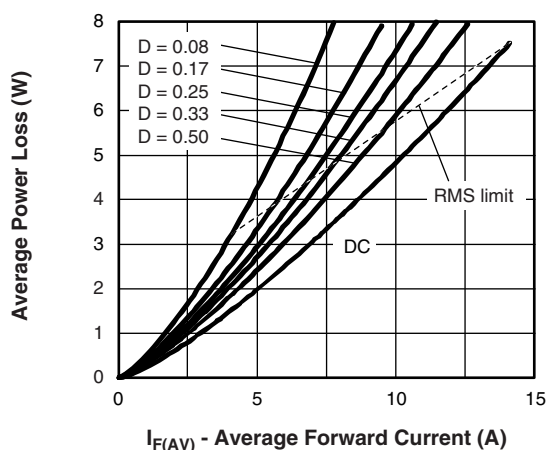


Fig. 6 - Forward Power Loss Characteristics

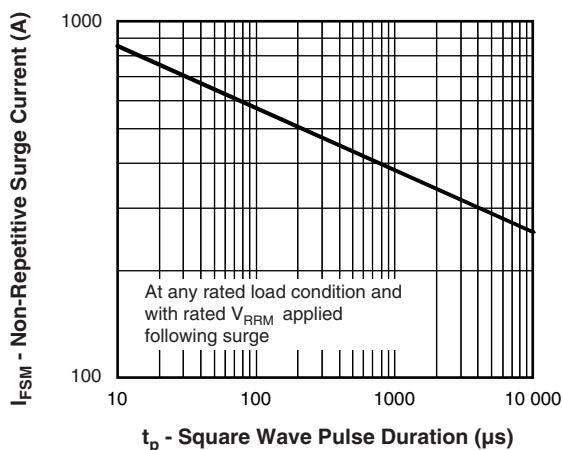


Fig. 7 - Maximum Non-Repetitive Surge Current

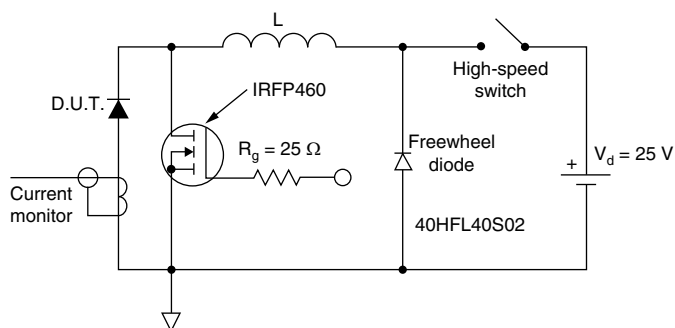


Fig. 8 - Unclamped Inductive Test Circuit



## ORDERING INFORMATION TABLE

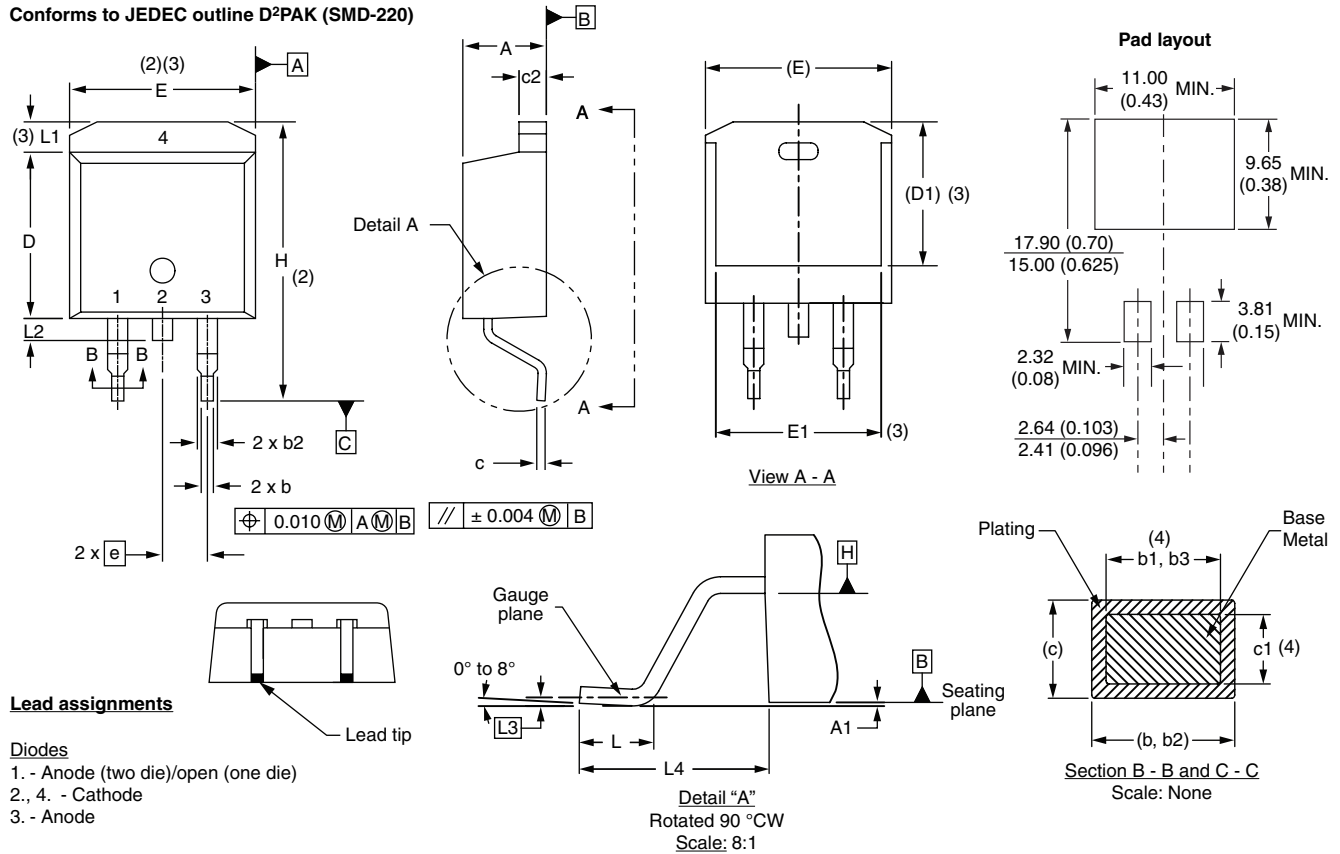
|             |                                                                                                                                                                          |           |          |          |                          |          |            |            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|----------|--------------------------|----------|------------|------------|
| Device code | <b>VS-</b>                                                                                                                                                               | <b>10</b> | <b>T</b> | <b>Q</b> | <b>045</b>               | <b>S</b> | <b>TRL</b> | <b>PbF</b> |
|             | 1                                                                                                                                                                        | 2         | 3        | 4        | 5                        | 6        | 7          | 8          |
| 1           | - Vishay Semiconductors product                                                                                                                                          |           |          |          |                          |          |            |            |
| 2           | - Current rating (10 A)                                                                                                                                                  |           |          |          |                          |          |            |            |
| 3           | - Circuit configuration: T = D <sup>2</sup> PAK                                                                                                                          |           |          |          |                          |          |            |            |
| 4           | - Schottky "Q" series                                                                                                                                                    |           |          |          |                          |          |            |            |
| 5           | - Voltage ratings                                                                                                                                                        |           |          |          | 035 = 35 V<br>045 = 45 V |          |            |            |
| 6           | - S = D <sup>2</sup> PAK                                                                                                                                                 |           |          |          |                          |          |            |            |
| 7           | - <ul style="list-style-type: none"><li>• None = tube (50 pieces)</li><li>• TRL = tape and reel (left oriented)</li><li>• TRR = tape and reel (right oriented)</li></ul> |           |          |          |                          |          |            |            |
| 8           | - PbF = lead (Pb)-free                                                                                                                                                   |           |          |          |                          |          |            |            |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95014">www.vishay.com/doc?95014</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95008">www.vishay.com/doc?95008</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |

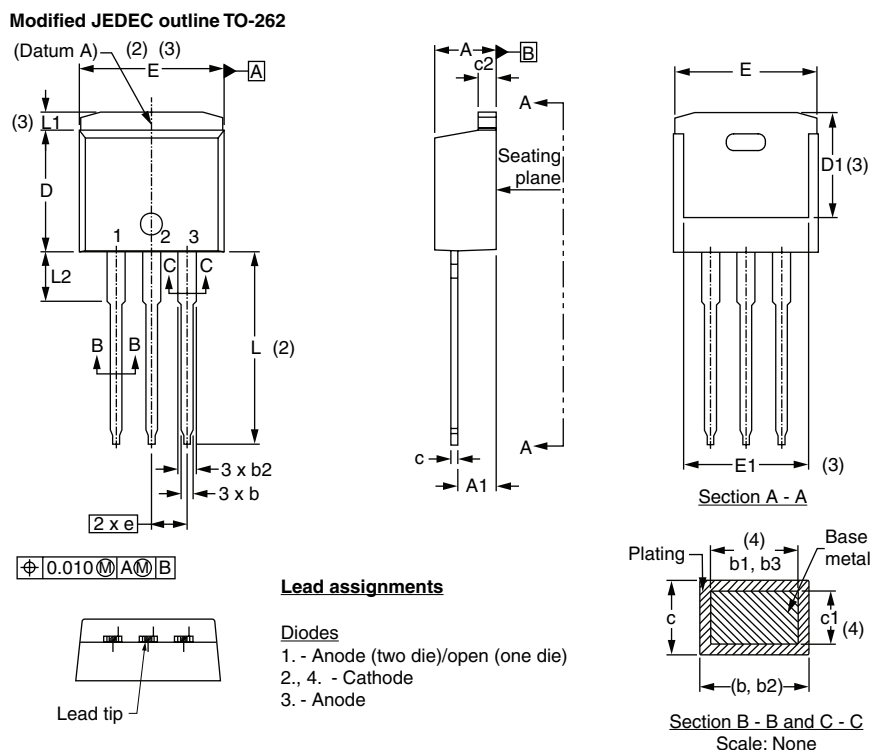
## D<sup>2</sup>PAK, TO-262

### DIMENSIONS FOR D<sup>2</sup>PAK in millimeters and inches

Conforms to JEDEC outline D<sup>2</sup>PAK (SMD-220)



## DIMENSIONS FOR TO-262 in millimeters and inches



| 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



## 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. 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.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**





**ООО «НИОКРсистемс»** - это оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов. Реализуемая нашей компанией продукция насчитывает более полумиллиона наименований.

Благодаря этому наша компания предлагает к поставке практически не ограниченный ассортимент компонентов как оптовыми, мелкооптовыми партиями, так и в розницу.

Благодаря развитой сети поставщиков, помогаем в поиске и приобретении экзотичных или снятых с производства компонентов.

### **Наша компания это:**

- Гарантия качества поставляемой продукции
- Широкий ассортимент
- Минимальные сроки поставок
- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование
- Работаем по 275 ФЗ