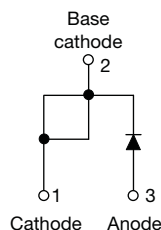




## Schottky Rectifier, 10 A



TO-220AC



## FEATURES

- 175 °C  $T_J$  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
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



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

## PRODUCT SUMMARY

|                 |                  |
|-----------------|------------------|
| Package         | TO-220AC         |
| $I_{F(AV)}$     | 10 A             |
| $V_R$           | 35 V, 40 V, 45 V |
| $V_F$ at $I_F$  | 0.49 V           |
| $I_{RM}$        | 15 mA at 125 °C  |
| $T_J$ max.      | 175 °C           |
| Diode variation | Single die       |
| $E_{AS}$        | 13 mJ            |

## DESCRIPTION

The VS-10TQ... 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 |
|-------------|-------------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                | 10          | A     |
| $V_{RRM}$   |                                     | 35/45       | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                | 1050        | A     |
| $V_F$       | 10 A <sub>pk</sub> , $T_J = 125$ °C | 0.49        | V     |
| $T_J$       | Range                               | - 55 to 175 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-10TQ035PbF | VS-10TQ035-N3 | VS-10TQ040PbF | VS-10TQ040-N3 | VS-10TQ045PbF | VS-10TQ045-N3 | UNITS |
|--------------------------------------|-----------|---------------|---------------|---------------|---------------|---------------|---------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 35            | 35            | 40            | 40            | 45            | 45            | 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 $T_C = 151$ °C, rectangular waveform                                                             | 10     | A     |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 1050   |       |
|                                                                   |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 280    |       |
| Non-repetitive avalanche energy                                   | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 2$ A, $L = 6.5$ mH                                                                         | 13     | mJ    |
| Repetitive avalanche current                                      | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu s$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ 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/ $\mu$ s |

**Note**(1) Pulse width < 300  $\mu$ 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 TO-220AC                  | 10TQ035     |                        |
|                                                |                                   |                                      | 10TQ045     |                        |

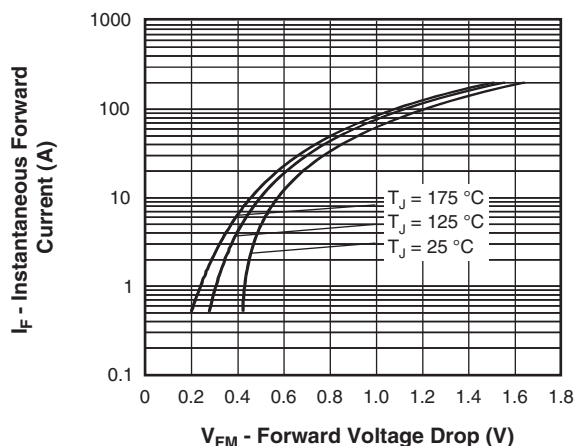


Fig. 1 - Maximum Forward Voltage Drop Characteristics

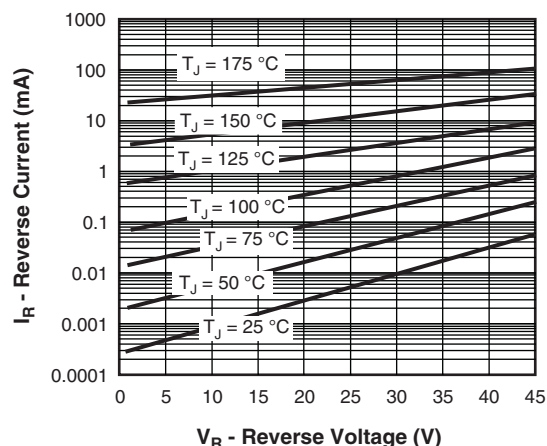


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

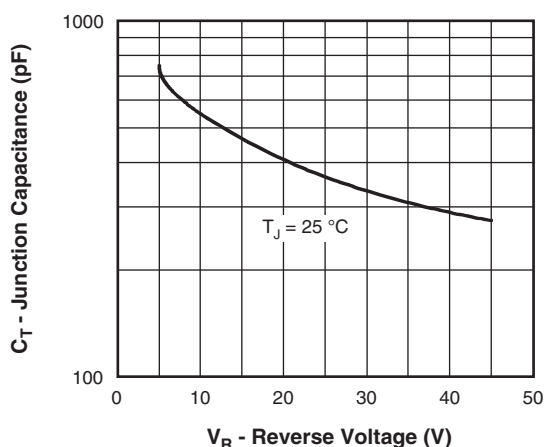
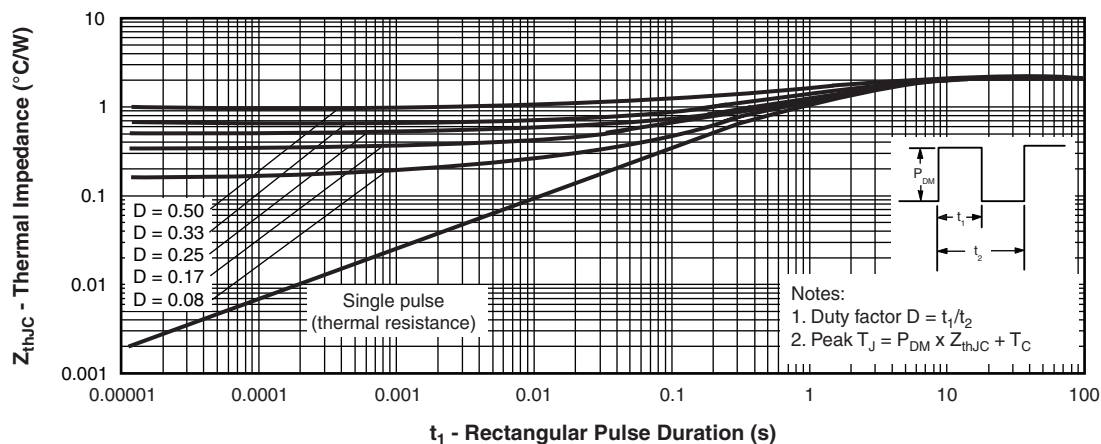


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

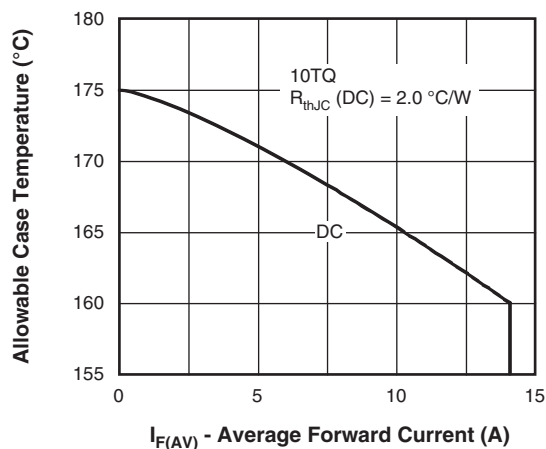


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

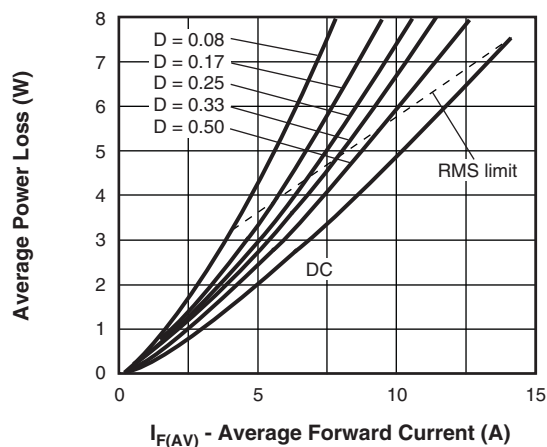


Fig. 6 - Forward Power Loss Characteristics

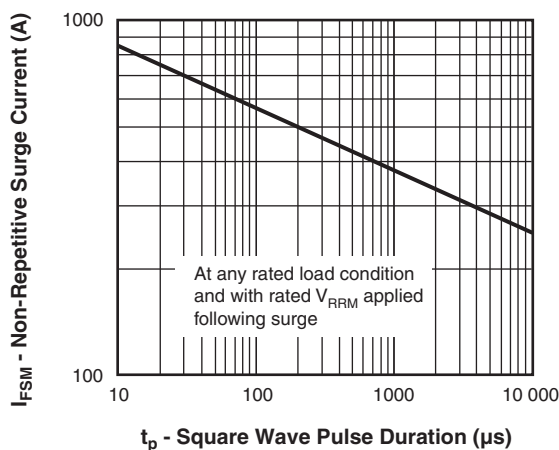


Fig. 7 - Maximum Non-Repetitive Surge Current

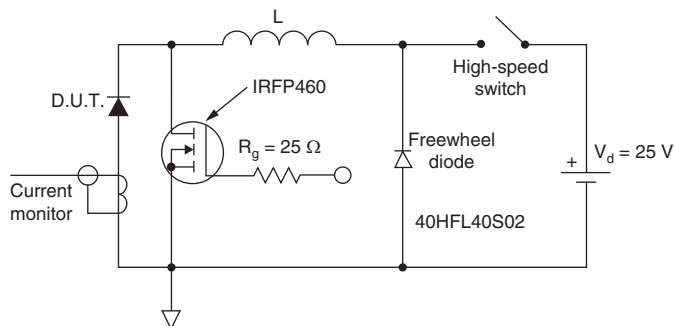


Fig. 8 - Unclamped Inductive Test Circuit

**ORDERING INFORMATION TABLE**

|             |            |           |          |          |            |            |
|-------------|------------|-----------|----------|----------|------------|------------|
| Device code | <b>VS-</b> | <b>10</b> | <b>T</b> | <b>Q</b> | <b>045</b> | <b>PbF</b> |
|             | ①          | ②         | ③        | ④        | ⑤          | ⑥          |

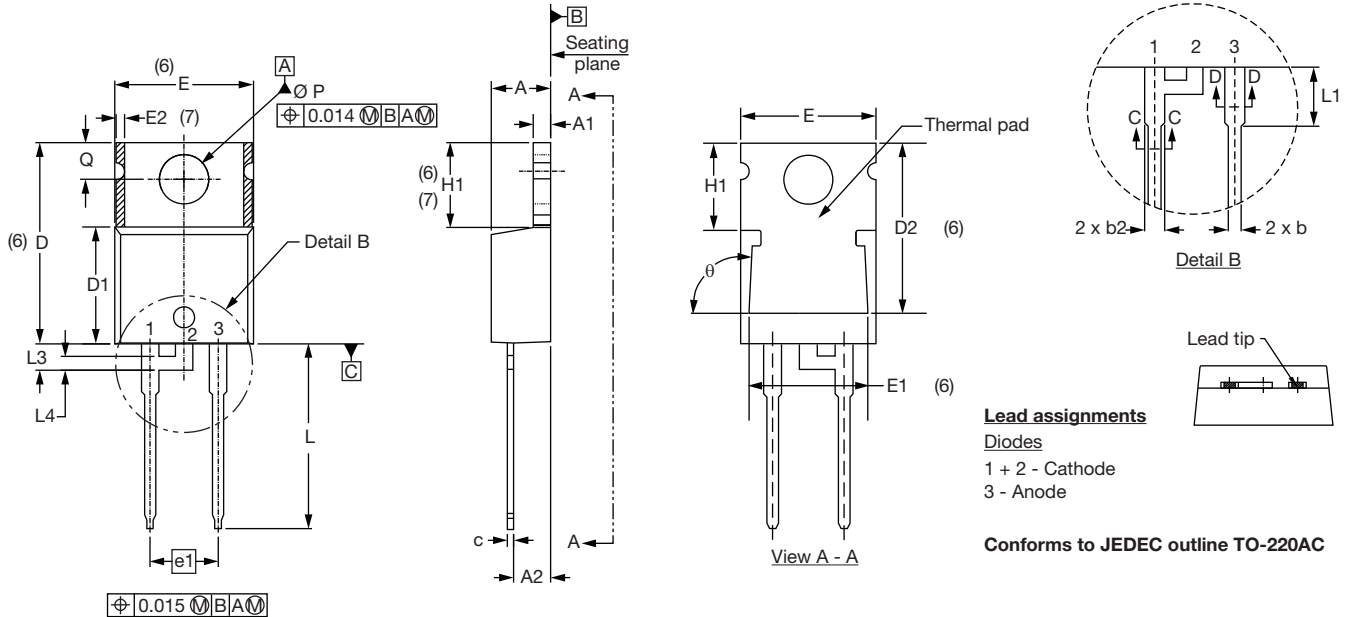
- |          |   |                                                                  |            |
|----------|---|------------------------------------------------------------------|------------|
| <b>1</b> | - | Vishay Semiconductors product                                    |            |
| <b>2</b> | - | Current rating (10 = 10 A)                                       |            |
| <b>3</b> | - | Package:                                                         |            |
|          |   | T = TO-220                                                       |            |
| <b>4</b> | - | Schottky "Q" series                                              | 035 = 35 V |
| <b>5</b> | - | Voltage ratings                                                  | 040 = 40 V |
|          |   |                                                                  | 045 = 45 V |
| <b>6</b> | - | Environmental digit                                              |            |
|          |   | • PbF = Lead (Pb)-free and RoHS compliant                        |            |
|          |   | • -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free |            |

| <b>ORDERING INFORMATION</b> (Example) |                  |                        |                         |
|---------------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N                         | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
| VS-10TQ035PbF                         | 50               | 1000                   | Antistatic plastic tube |
| VS-10TQ035-N3                         | 50               | 1000                   | Antistatic plastic tube |
| VS-10TQ040PbF                         | 50               | 1000                   | Antistatic plastic tube |
| VS-10TQ040-N3                         | 50               | 1000                   | Antistatic plastic tube |
| VS-10TQ045PbF                         | 50               | 1000                   | Antistatic plastic tube |
| VS-10TQ045-N3                         | 50               | 1000                   | Antistatic plastic tube |

| <b>LINKS TO RELATED DOCUMENTS</b> |             |                                                                        |
|-----------------------------------|-------------|------------------------------------------------------------------------|
| Dimensions                        |             | <a href="http://www.vishay.com/doc?95221">www.vishay.com/doc?95221</a> |
| Part marking information          | TO-220ACPbF | <a href="http://www.vishay.com/doc?95224">www.vishay.com/doc?95224</a> |
|                                   | TO-220AC-N3 | <a href="http://www.vishay.com/doc?95068">www.vishay.com/doc?95068</a> |

### TO-220AC

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.25        | 4.65  | 0.167  | 0.183 |       |
| A1     | 1.14        | 1.40  | 0.045  | 0.055 |       |
| A2     | 2.56        | 2.92  | 0.101  | 0.115 |       |
| b      | 0.69        | 1.01  | 0.027  | 0.040 |       |
| b1     | 0.38        | 0.97  | 0.015  | 0.038 | 4     |
| b2     | 1.20        | 1.73  | 0.047  | 0.068 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.36        | 0.61  | 0.014  | 0.024 |       |
| c1     | 0.36        | 0.56  | 0.014  | 0.022 | 4     |
| D      | 14.85       | 15.25 | 0.585  | 0.600 | 3     |
| D1     | 8.38        | 9.02  | 0.330  | 0.355 |       |
| D2     | 11.68       | 12.88 | 0.460  | 0.507 | 6     |
| E      | 10.11       | 10.51 | 0.398  | 0.414 | 3, 6  |

| SYMBOL | MILLIMETERS |       | INCHES     |       | NOTES |
|--------|-------------|-------|------------|-------|-------|
|        | MIN.        | MAX.  | MIN.       | MAX.  |       |
| E1     | 6.86        | 8.89  | 0.270      | 0.350 | 6     |
| E2     | -           | 0.76  | -          | 0.030 | 7     |
| e      | 2.41        | 2.67  | 0.095      | 0.105 |       |
| e1     | 4.88        | 5.28  | 0.192      | 0.208 |       |
| H1     | 6.09        | 6.48  | 0.240      | 0.255 | 6, 7  |
| L      | 13.52       | 14.02 | 0.532      | 0.552 |       |
| L1     | 3.32        | 3.82  | 0.131      | 0.150 | 2     |
| L3     | 1.78        | 2.13  | 0.070      | 0.084 |       |
| L4     | 0.76        | 1.27  | 0.030      | 0.050 | 2     |
| Ø P    | 3.54        | 3.73  | 0.139      | 0.147 |       |
| Q      | 2.60        | 3.00  | 0.102      | 0.118 |       |
| θ      | 90° to 93°  |       | 90° to 93° |       |       |

#### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 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
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from 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.**

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)

[www.lifeelectronics.ru](http://www.lifeelectronics.ru)