

# Ultrafast Rectifier, 3 A FRED Pt®



SMA (DO-214AC)



## FEATURES

- Ultrafast recovery time, reduced  $Q_{rr}$  and soft recovery
- 175 °C maximum operating junction temperature
- For PFC CRM/CCM, snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- 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 ultrafast recovery rectifiers designed with optimized performance of forward voltage drop, ultrafast 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 power dissipation in the switching element and snubbers.

## PRODUCT SUMMARY

|                 |                |
|-----------------|----------------|
| Package         | SMA (DO-214AC) |
| $I_{F(AV)}$     | 3 A            |
| $V_R$           | 600 V          |
| $V_F$ at $I_F$  | 1.35 V         |
| $t_{rr}$ typ.   | 41 ns          |
| $T_J$ max.      | 175 °C         |
| Diode variation | Single die     |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                   | SYMBOL         | TEST CONDITIONS             | VALUES      | UNITS |
|---------------------------------------------|----------------|-----------------------------|-------------|-------|
| Peak repetitive reverse voltage             | $V_{RRM}$      |                             | 600         | V     |
| Average rectified forward current           | $I_{F(AV)}$    | $T_L = 103\text{ °C}^{(1)}$ | 3           |       |
| Non-repetitive peak surge current per leg   | $I_{FSM}$      | $T_J = 25\text{ °C}$        | 55          | A     |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                             | - 55 to 175 | °C    |

### Note

<sup>(1)</sup> Mounted on PCB with minimum pad size

## ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

| PARAMETER                           | SYMBOL        | TEST CONDITIONS                         | MIN. | TYP. | MAX. | UNITS         |
|-------------------------------------|---------------|-----------------------------------------|------|------|------|---------------|
| Breakdown voltage, blocking voltage | $V_{BR}, V_R$ | $I_R = 100\text{ }\mu\text{A}$          | 600  | -    | -    | V             |
| Forward voltage                     | $V_F$         | $I_F = 3\text{ A}$                      | -    | 1.15 | 1.35 |               |
|                                     |               | $I_F = 3\text{ A}, T_J = 150\text{ °C}$ | -    | 0.99 | 1.2  |               |
| Reverse leakage current             | $I_R$         | $V_R = V_R$ rated                       | -    | -    | 3    | $\mu\text{A}$ |
|                                     |               | $T_J = 150\text{ °C}, V_R = V_R$ rated  | -    | -    | 100  |               |
| Junction capacitance                | $C_T$         | $V_R = 600\text{ V}$                    | -    | 3.9  | -    | 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                                                                                    | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 41   | -    | ns    |
|                                                                                                          |           | $I_F = 1.0\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$  | -    | 52   | -    |       |
|                                                                                                          |           | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$              | -    | -    | 65   |       |
|                                                                                                          |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 38   | -    |       |
|                                                                                                          |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 52   | -    |       |
| Peak recovery current                                                                                    | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 5.6  | -    | A     |
|                                                                                                          |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 7.3  | -    |       |
| Reverse recovery charge                                                                                  | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 108  | -    | nC    |
|                                                                                                          |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 193  | -    |       |

| <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 case           | $R_{thJC}^{(1)}$ |                           | -     | -    | 20   | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient        | $R_{thJA}^{(1)}$ |                           | -     | -    | 95   |                             |
| Approximate Weight                             |                  |                           | 0.07  |      |      | g                           |
|                                                |                  |                           | 0.002 |      |      | oz.                         |
| Marking device                                 |                  | Case style SMA (DO-214AC) | 3U6   |      |      |                             |

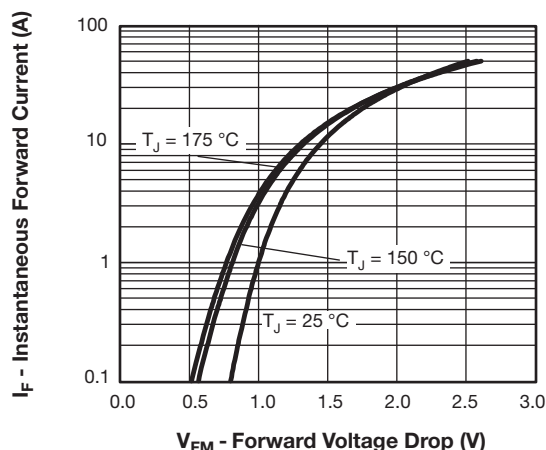
**Note**
<sup>(1)</sup> Mounted on PCB with minimum pad size


Fig. 1 - Typical Forward Voltage Drop Characteristics

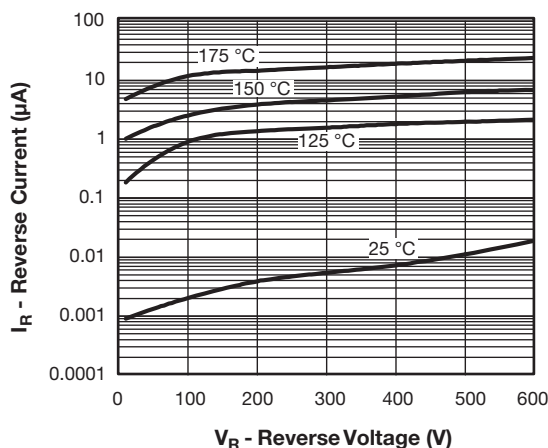


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

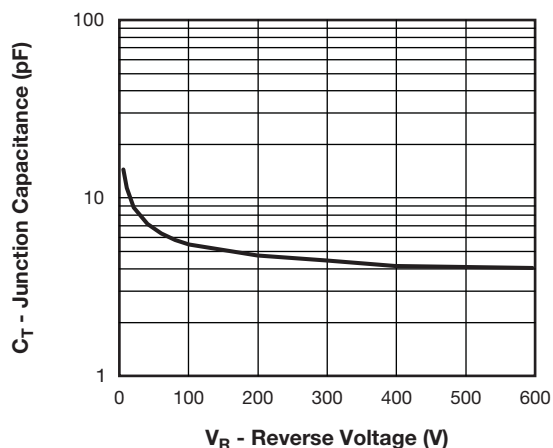


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

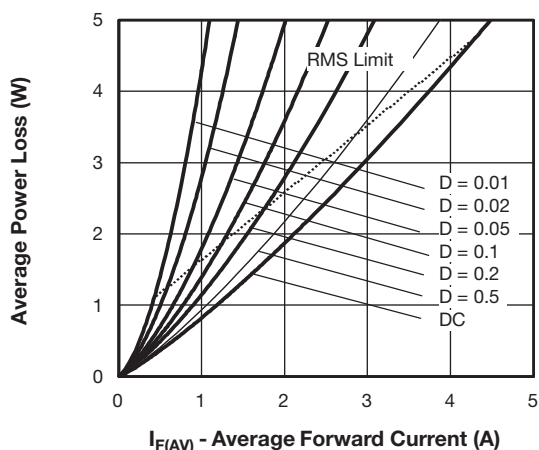


Fig. 5 - Forward Power Loss Characteristics

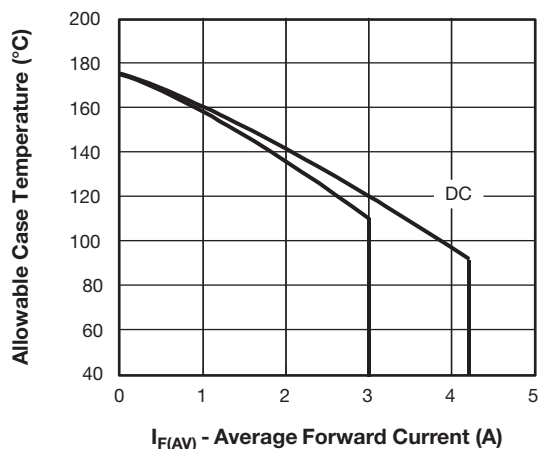
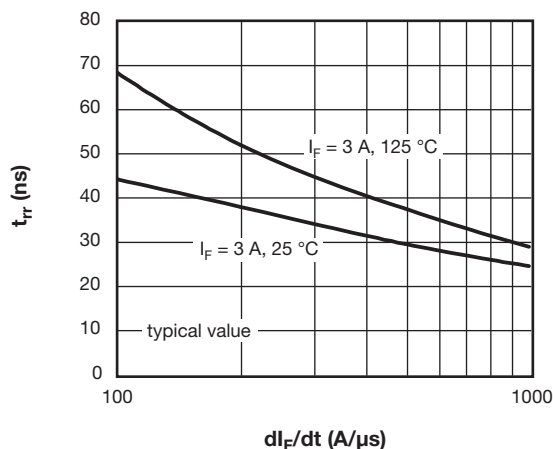
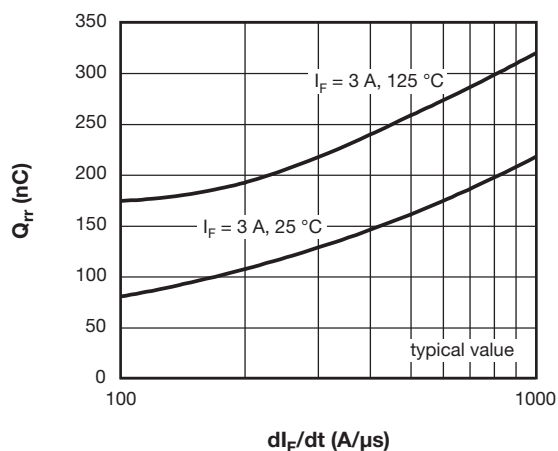
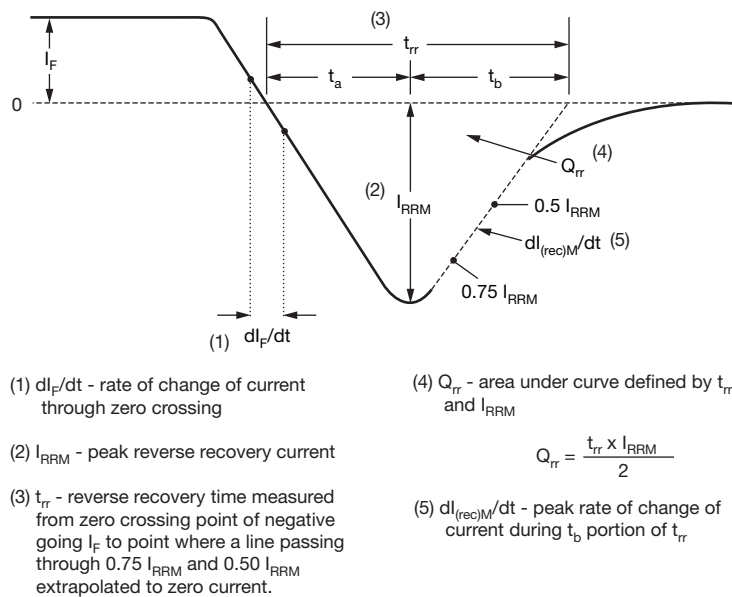


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current


Fig. 6 - Typical Reverse Recovery Time vs.  $dI_F/dt$ 

Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$



### Fig. 8 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

|             |            |          |          |          |          |           |            |
|-------------|------------|----------|----------|----------|----------|-----------|------------|
| Device code | <b>VS-</b> | <b>3</b> | <b>E</b> | <b>M</b> | <b>U</b> | <b>06</b> | <b>-M3</b> |
|             | 1          | 2        | 3        | 4        | 5        | 6         | 7          |

- 1 - Vishay Semiconductors product
- 2 - Current rating (3 = 3 A)
- 3 - Circuit configuration:  
E = Single diode
- 4 - M = SMA package
- 5 - Process type,  
U = Ultrafast recovery
- 6 - Voltage code (06 = 600 V)
- 7 - M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

| ORDERING INFORMATION (Example) |                   |                        |                                    |
|--------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N                  | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
| VS-3EMU06-M3/5AT               | 5AT               | 7500                   | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95400">www.vishay.com/doc?95400</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95472">www.vishay.com/doc?95472</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95404">www.vishay.com/doc?95404</a> |

## SMA

**DIMENSIONS** in inches (millimeters)

**DO-214AC (SMA)**



**Mounting Pad Layout**





## 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.**

## 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