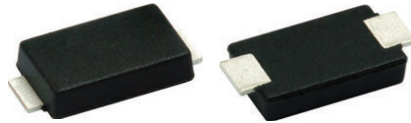


## Ultrafast Rectifier, 3 A FRED Pt<sup>®</sup>

### eSMP<sup>®</sup> Series



Top View

Bottom View

### SlimSMA (DO-221AC)

Cathode Anode

### FEATURES

- Ultrafast recovery time, reduced  $Q_{rr}$ , and soft recovery
- 175 °C maximum operating junction temperature
- 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 and ultrafast recovery time, and fast 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 snubber, output operation, inverters or as freewheeling diodes.

The extremely optimized stored charge and low recovery current minimize the switching losses and reduce power dissipation in the switching element.

### MECHANICAL DATA

**Case:** SlimSMA (DO-221AC)

Molding compound meets UL 94 V-0 flammability rating

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

**Polarity:** color band denotes cathode end

### LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS |                    |
|-------------------------|--------------------|
| $I_{F(AV)}$             | 3 A                |
| $V_R$                   | 600 V              |
| $V_F$ at $I_F$          | 0.99 V             |
| $t_{rr}$                | 50 ns              |
| $T_J$ max.              | 175 °C             |
| Package                 | SlimSMA (DO-221AC) |
| Circuit configuration   | Single             |

| ABSOLUTE MAXIMUM RATINGS                    |                |                             |             |       |
|---|----------------|-----------------------------|-------------|-------|
| PARAMETER                                   | SYMBOL         | TEST CONDITIONS             | VALUES      | UNITS |
| Peak repetitive reverse voltage             | $V_{RRM}$      |                             | 600         | V     |
| Average rectified forward current           | $I_{F(AV)}$    | $T_C = 117\text{ °C}^{(1)}$ | 3           | A     |
| Non-repetitive peak surge current           | $I_{FSM}$      | $T_J = 25\text{ °C}$        | 43          |       |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                             | -55 to +175 | °C    |

#### Note

<sup>(1)</sup> Device on PCB with 8 mm x 16 mm soldering lands

| 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   | $C_T$         | $V_R = 600\text{ V}$                    | -    | 6.2  | -    | pF            |



| DYNAMIC RECOVERY CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise specified) |                  |  |      |      |      |       |
|--|------------------|--|------|------|------|-------|
| PARAMETER  | SYMBOL           | TEST CONDITIONS  | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time  | t <sub>rr</sub>  | I <sub>F</sub> = 1.0 A, di <sub>F</sub> /dt = 50 A/μs, V <sub>R</sub> = 30 V | -    | 45   | -    | ns    |
|  |                  | I <sub>F</sub> = 0.5 A, I <sub>R</sub> = 1 A, I <sub>rr</sub> = 0.25 A       | -    | -    | 50   |       |
|  |                  | T <sub>J</sub> = 25 °C   | -    | 52   | -    |       |
|  |                  | T <sub>J</sub> = 125 °C  | -    | 82   | -    |       |
| Peak recovery current  | I <sub>RRM</sub> | T <sub>J</sub> = 25 °C   | -    | 7.3  | -    | A     |
|  |                  | T <sub>J</sub> = 125 °C  | -    | 10   | -    |       |
| Reverse recovery charge  | Q <sub>rr</sub>  | T <sub>J</sub> = 25 °C   | -    | 210  | -    | nC    |
|  |                  | T <sub>J</sub> = 125 °C  | -    | 400  | -    |       |

| THERMAL - MECHANICAL SPECIFICATIONS            |                                   |   |        |      |      |       |
|--|-----------------------------------|---|--------|------|------|-------|
| PARAMETER                                      | SYMBOL                            | TEST CONDITIONS   | MIN.   | TYP. | MAX. | UNITS |
| Maximum junction and storage temperature range | T <sub>J</sub> , T <sub>Stg</sub> |   | -55    | -    | 175  | °C    |
| Thermal resistance, junction to mount          | R <sub>thJM</sub>                 | Device mounted on PCB with 8 mm x 16 mm soldering lands | -      | 16   | -    | °C/W  |
| Thermal resistance, junction to ambient        | R <sub>thJA</sub>                 | Device mounted on PCB with 3 mm x 3 mm soldering lands  | -      | 115  | -    |       |
| Approximate Weight                             |                                   |   | 0.03   |      |      | g     |
|  |                                   |   | 0.0011 |      |      | oz.   |
| Marking device                                 |                                   | Case style SlimSMA (DO-221AC)                           | 3U6    |      |      |       |

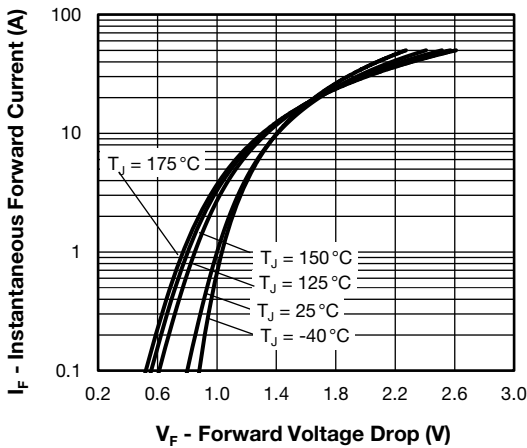


Fig. 1 - Typical Forward Voltage Drop Characteristics

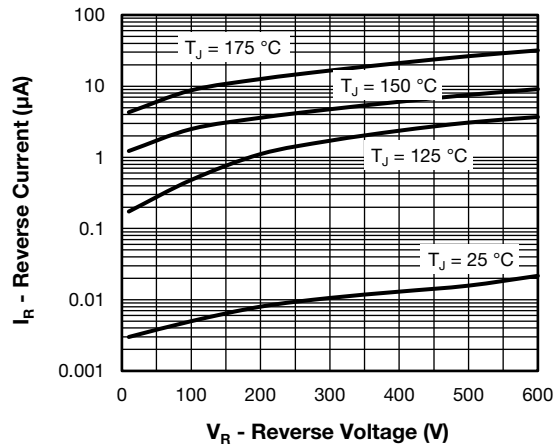


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

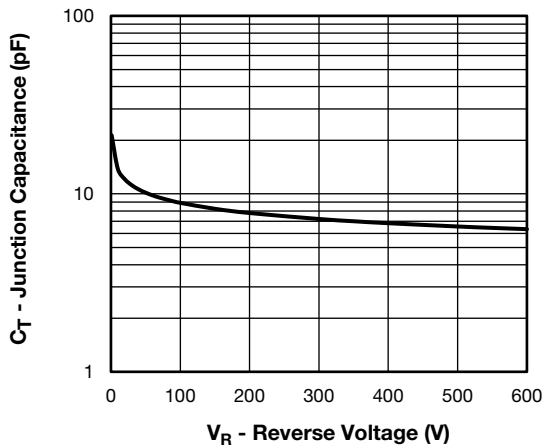


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

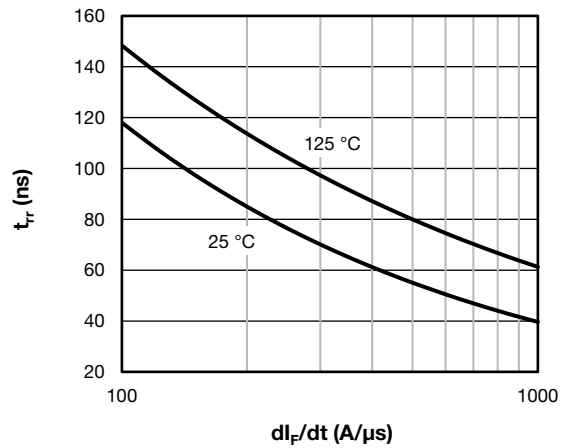


Fig. 6 - Typical Reverse Recovery vs.  $dI_F/dt$

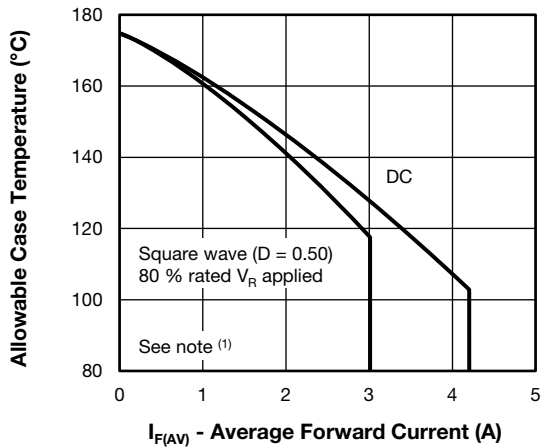


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

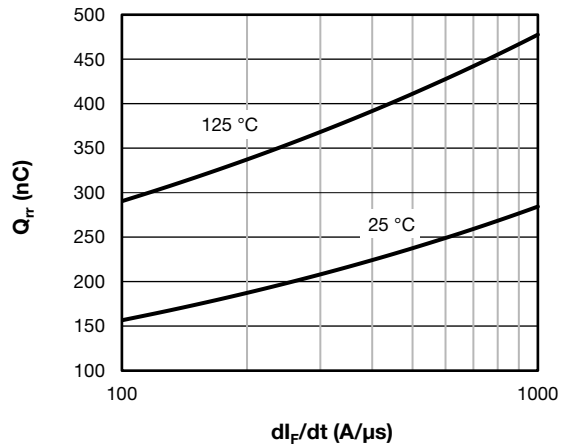


Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$

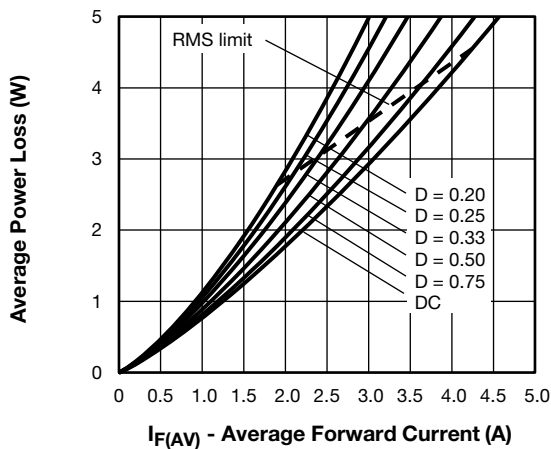


Fig. 5 - Forward Power Loss Characteristic

**Note**

(1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see Fig. 6);  
 $P_{d_{REV}}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

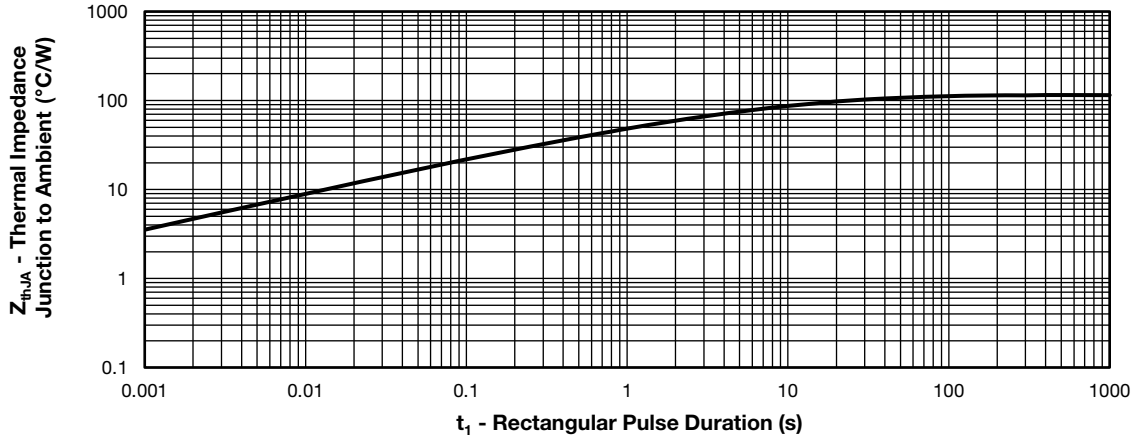
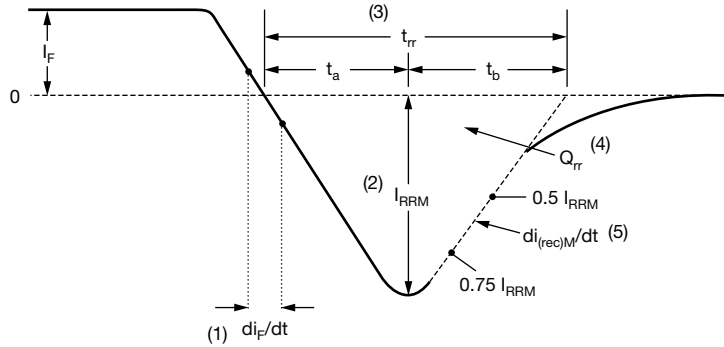


Fig. 8 - Thermal Impedance  $Z_{thJA}$



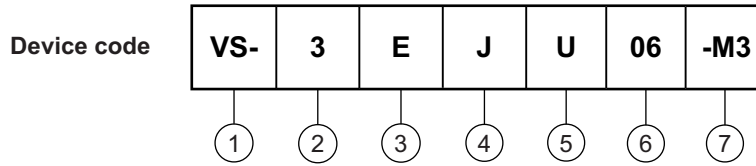
- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.
- (4)  $Q_{rr}$  - area under curve defined by  $t_{tr}$  and  $I_{RRM}$
- (5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{tr}$

$$Q_{rr} = \frac{t_{tr} \times I_{RRM}}{2}$$

Fig. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (3 = 3 A)
- 3** - Circuit configuration:  
E = single diode
- 4** - J = SlimSMA package
- 5** - Process type,  
U = ultrafast recovery
- 6** - Voltage code (06 = 600 V)
- 7** - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

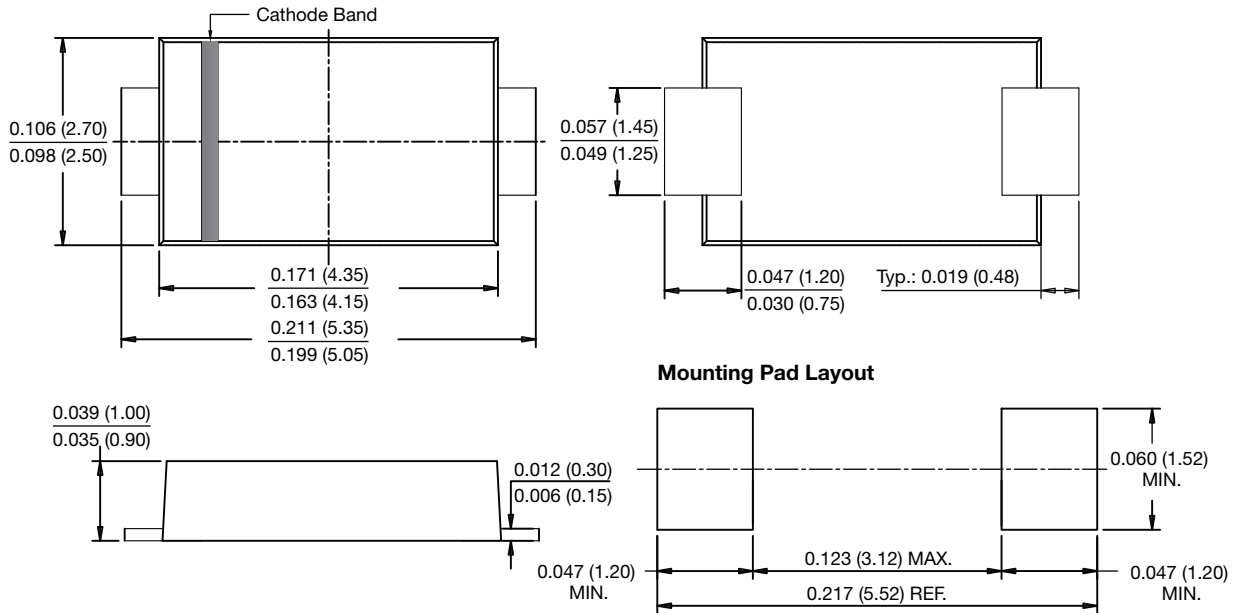
| ORDERING INFORMATION (Example) |                   |                        |                                    |
|--------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N                  | QUANTITY PER REEL | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
| VS-3EJU06-M3/6A                | 3500              | 3500                   | 7" diameter plastic tape and reel  |
| VS-3EJU06-M3/6B                | 14 000            | 14 000                 | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95571">www.vishay.com/doc?95571</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95562">www.vishay.com/doc?95562</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a> |
| SPICE model                | <a href="http://www.vishay.com/doc?96589">www.vishay.com/doc?96589</a> |



## DO-221AC (SlimSMA)

**DIMENSIONS** in inches (millimeters)





## Disclaimer

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