

Ultrafast Rectifier, 1 A FRED Pt[®]

eSMP[®] Series



Top view

Bottom view

SMF (DO-219AB)

Cathode Anode

FEATURES

- Ultrafast recovery time, reduced Q_{rr} , and soft recovery
- 175 °C maximum operating junction temperature
- For PCF CRM, snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Meets JESD 201 class 2 whisker test
- Wave and reflow solderable
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE

DESIGN SUPPORT TOOLS

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3D
Models
Available

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, lighting, in the AC/DC section of SMPS, freewheeling and clamp diodes.

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

PRIMARY CHARACTERISTICS

| | |
|-----------------------|----------------|
| $I_{F(AV)}$ | 1 A |
| V_R | 600 V |
| V_F at I_F | 0.83 V |
| t_{rr} | 55 ns |
| T_J max. | 175 °C |
| Package | SMF (DO-219AB) |
| Circuit configuration | Single |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|--|----------------|--|-------------|-------|
| Peak repetitive reverse voltage | V_{RRM} | | 600 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C = 158\text{ °C}^{(1)}$ | 1 | A |
| Non-repetitive peak surge current | I_{FSM} | $T_J = 25\text{ °C}$, 6 ms square pulse | 30 | |
| Operating junction and storage temperature range | T_J, T_{Stg} | | -55 to +175 | °C |

Note

⁽¹⁾ 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 | $I_F = 1\text{ A}$ | - | 1.0 | 1.2 | |
| | | $I_F = 1\text{ A}, T_J = 150\text{ °C}$ | - | 0.83 | 1 | |
| Reverse leakage current | I_R | $V_R = V_R$ rated | - | - | 3 | μA |
| | | $T_J = 150\text{ °C}, V_R = V_R$ rated | - | 20 | 100 | |
| Junction capacitance | C_T | $V_R = 600\text{ V}$ | - | 5 | - | pF |

| DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) | | | | | | |
|---|-----------|--|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | t_{rr} | $I_F = 1\text{ A}$, $dI_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 42 | - | ns |
| | | $I_F = 0.5\text{ A}$, $I_R = 1\text{ A}$, $I_{rr} = 0.25\text{ A}$ | - | - | 55 | |
| | | $T_J = 25\text{ }^\circ\text{C}$ | - | 32 | - | |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 47 | - | |
| Peak recovery current | I_{RRM} | $T_J = 25\text{ }^\circ\text{C}$ | - | 4.8 | - | A |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 6.8 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^\circ\text{C}$ | - | 77 | - | nC |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 160 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|--|----------------|--|--------|------|------|---------------------------|
| 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} | Device mounted on PCB with 8 mm x 16 mm soldering lands | - | - | 15 | $^\circ\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient | R_{thJA} | Device mounted on PCB with 2 mm x 3.5 mm soldering lands | - | - | 130 | $^\circ\text{C}/\text{W}$ |
| Approximate weight | | | 0.015 | | | g |
| | | | 0.0005 | | | oz. |
| Marking device | | Case style SMF (DO-219AB) | MNU | | | |

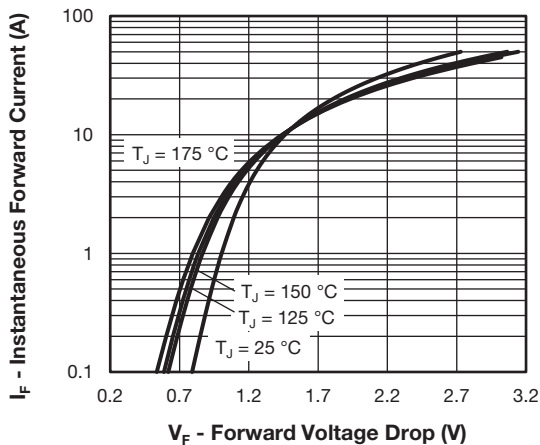


Fig. 1 - Typical Forward Voltage Drop Characteristics

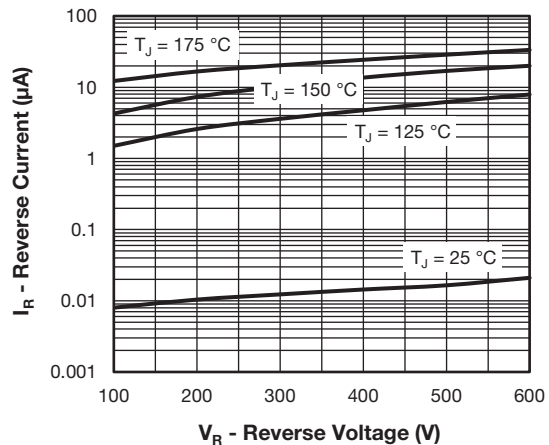


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

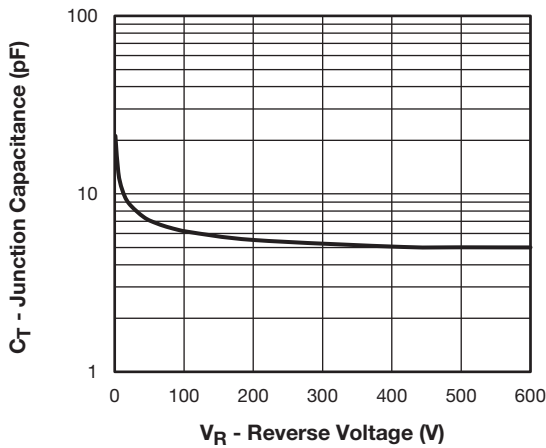


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

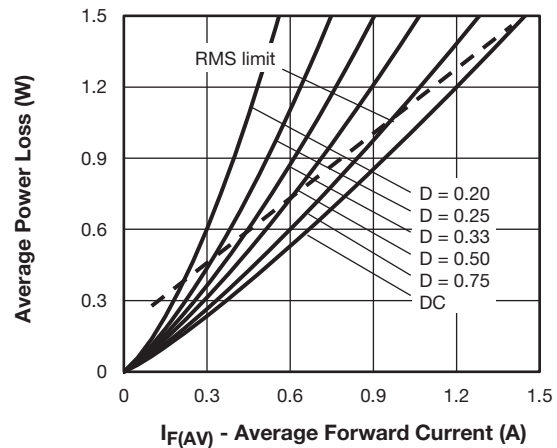


Fig. 5 - Forward Power Loss Characteristics

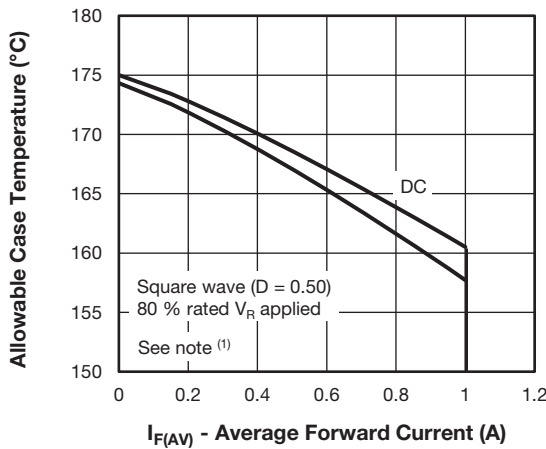


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

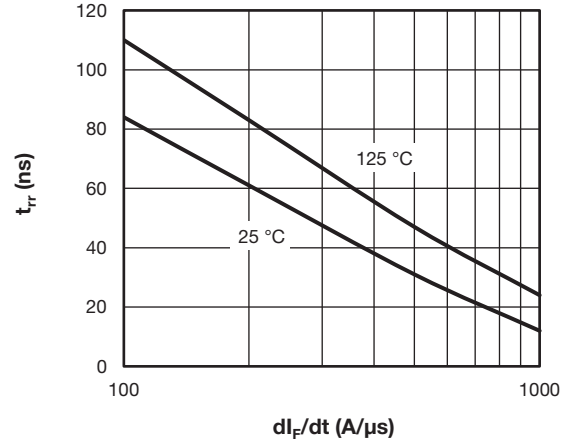


Fig. 6 - Typical Reverse Recovery Time vs. di_F/dt

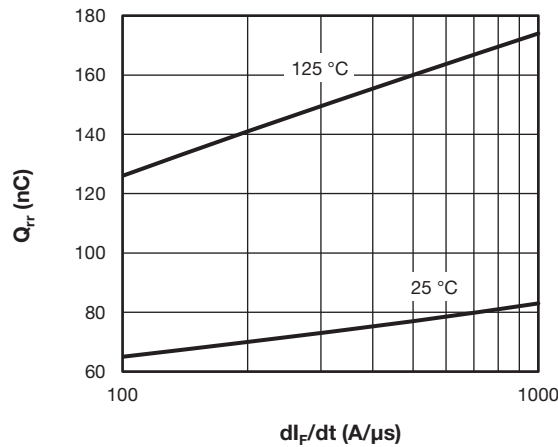
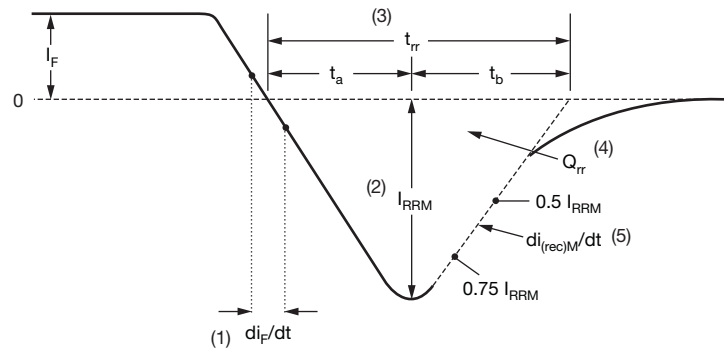


Fig. 7 - Typical Stored Charge vs. di_F/dt

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. 5);
 P_{dREV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = rated V_R



- (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_{rr} and I_{RRM}
- (5) $di_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

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

Fig. 8 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

| | | | | | | | |
|-------------|------------|----------|----------|----------|----------|-----------|------------|
| Device code | VS- | 1 | E | F | U | 06 | -M3 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- 1** - Vishay Semiconductors product
- 2** - Current rating (1 = 1 A)
- 3** - Circuit configuration:
E = single diode
- 4** - F = SMF 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-1EFU06-M3/I | 10 000 | 10 000 | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS | |
|-----------------------------------|--|
| Dimensions | www.vishay.com/doc?95572 |
| Part marking information | www.vishay.com/doc?95618 |
| Packaging information | www.vishay.com/doc?95577 |
| SPICE model | www.vishay.com/doc?95639 |

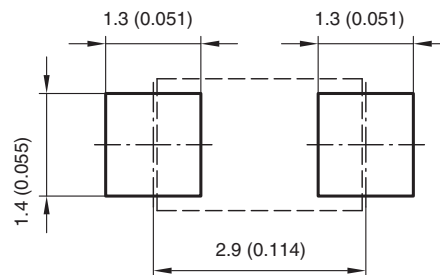


SMF (DO-219AB)

DIMENSIONS in millimeters (inches)



Foot print recommendation:



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17247



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