

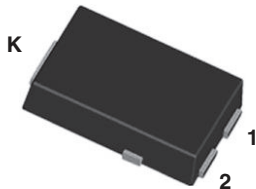


**THE DATASHEET OF
VS-6ESU06-M3/86A**

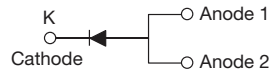


Ultrafast Rectifier, 6 A FRED Pt®

eSMP® Series



SMPC (TO-277A)



FEATURES

- Ultrafast recovery time, reduced Q_{rr} , and soft recovery
- 175 °C maximum operating junction temperature
- For PFC, 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
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS

| | |
|-----------------------|----------------|
| $I_{F(AV)}$ | 6 A |
| V_R | 600 V |
| V_F at I_F | 0.95 V |
| t_{rr} (typ.) | 42 ns |
| T_J max. | 175 °C |
| Package | SMPC (TO-277A) |
| Circuit configuration | Single |

DESCRIPTION / APPLICATIONS

State of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultra fast recovery time.

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.

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

MECHANICAL DATA

Case: SMPC (TO-277A)

Molding compound meets UL 94 V-0 flammability rating
Halogen-free, RoHS-compliant

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

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|----------------|--------------------------|-------------|-------|
| Peak repetitive reverse voltage | V_{RRM} | | 600 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_{Sp} = 150\text{ °C}$ | 6 | A |
| Non-repetitive peak surge current | I_{FSM} | $T_J = 25\text{ °C}$ | 120 | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -65 to +175 | °C |

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 | $I_F = 6\text{ A}$ | - | 1.10 | 1.30 | |
| | | $I_F = 6\text{ A}, T_J = 150\text{ °C}$ | - | 0.95 | 1.15 | |
| Reverse leakage current | I_R | $V_R = V_R$ rated | - | - | 5 | μA |
| | | $T_J = 150\text{ °C}, V_R = V_R$ rated | - | 25 | 150 | |
| Junction capacitance | C_T | $V_R = 600\text{ V}$ | - | 8 | - | pF |



| DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified) | | | | | | |
|--|------------------|--|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | t _{rr} | I _F = 1 A, di _F /dt = 50 A/μs, V _R = 30 V | - | 42 | - | ns |
| | | I _F = 0.5 A, I _R = 1 A, I _{rr} = 0.25 A | - | - | 60 | |
| | | T _J = 25 °C | - | 58 | - | |
| | | T _J = 125 °C | - | 85 | - | |
| Peak recovery current | I _{RRM} | T _J = 25 °C | - | 10 | - | A |
| | | T _J = 125 °C | - | 15 | - | |
| Reverse recovery charge | Q _{rr} | T _J = 25 °C | - | 290 | - | nC |
| | | T _J = 125 °C | - | 620 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|--|-----------------------------------|---------------------------|--------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Maximum junction and storage temperature range | T _J , T _{Stg} | | -65 | - | 175 | °C |
| Thermal resistance, junction to mount | R _{thJM} | | - | 2.4 | 3.5 | °C/W |
| Approximate weight | | | 0.1 | | | g |
| | | | 0.0035 | | | oz. |
| Marking device | | Case style SMPC (TO-277A) | NEU6 | | | |

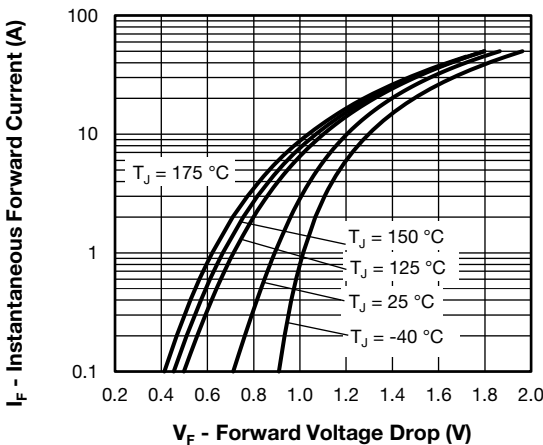


Fig. 1 - Typical Forward Voltage Drop Characteristics

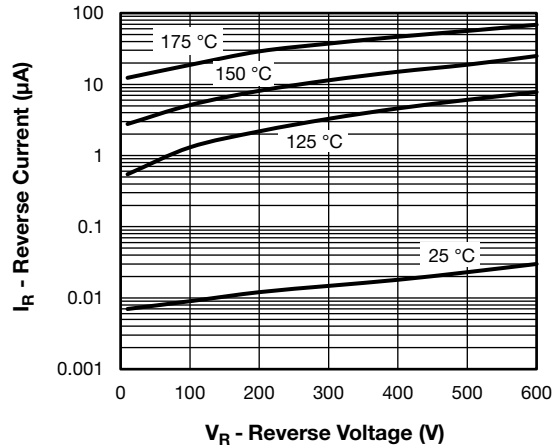


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

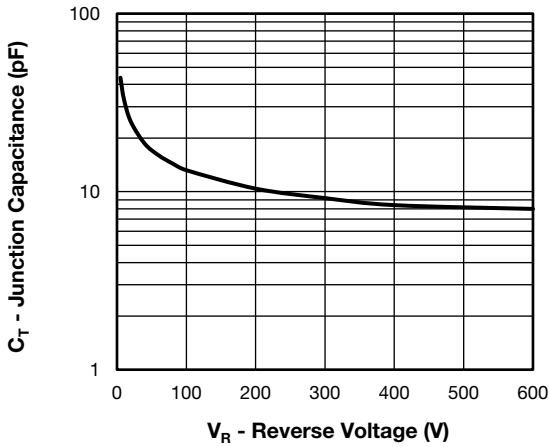


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

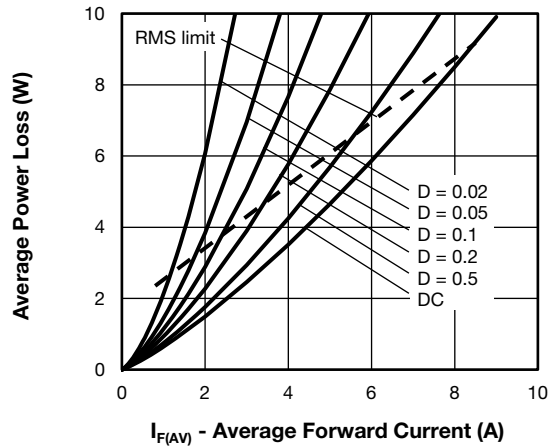


Fig. 5 - Forward Power Loss Characteristics

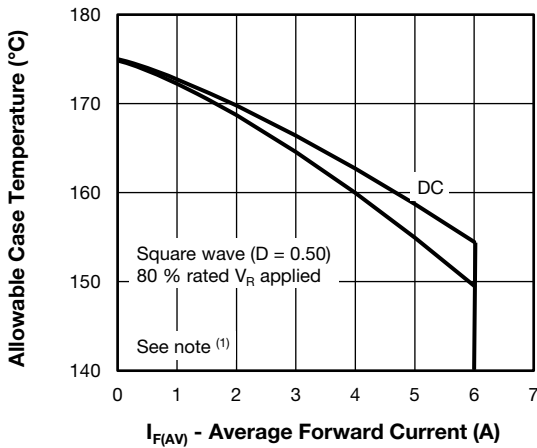


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

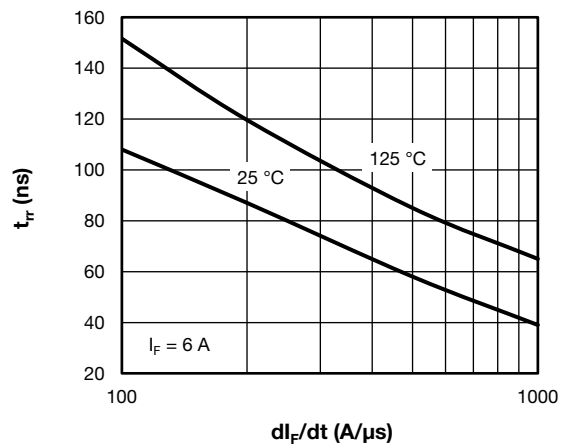


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

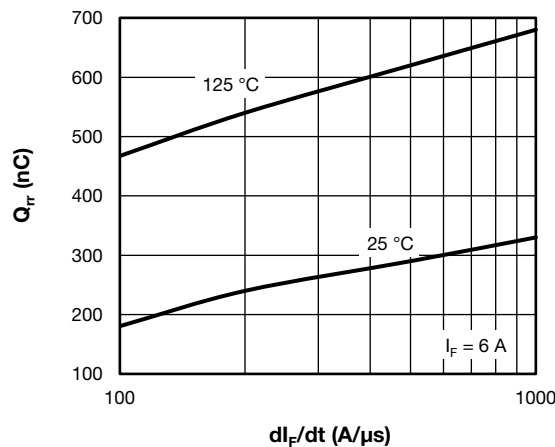
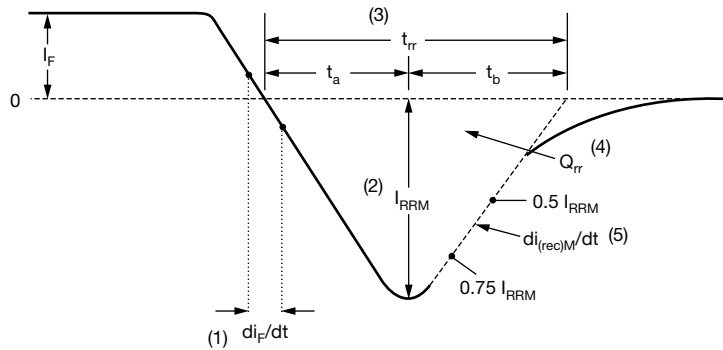


Fig. 7 - Typical Stored Charge vs. dI_F/dt

Note

(1) Formula used: $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$;
 P_d = forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 5);
 $P_{d_{REV}}$ = 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- | 6 | E | S | U | 06 | -M3 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

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

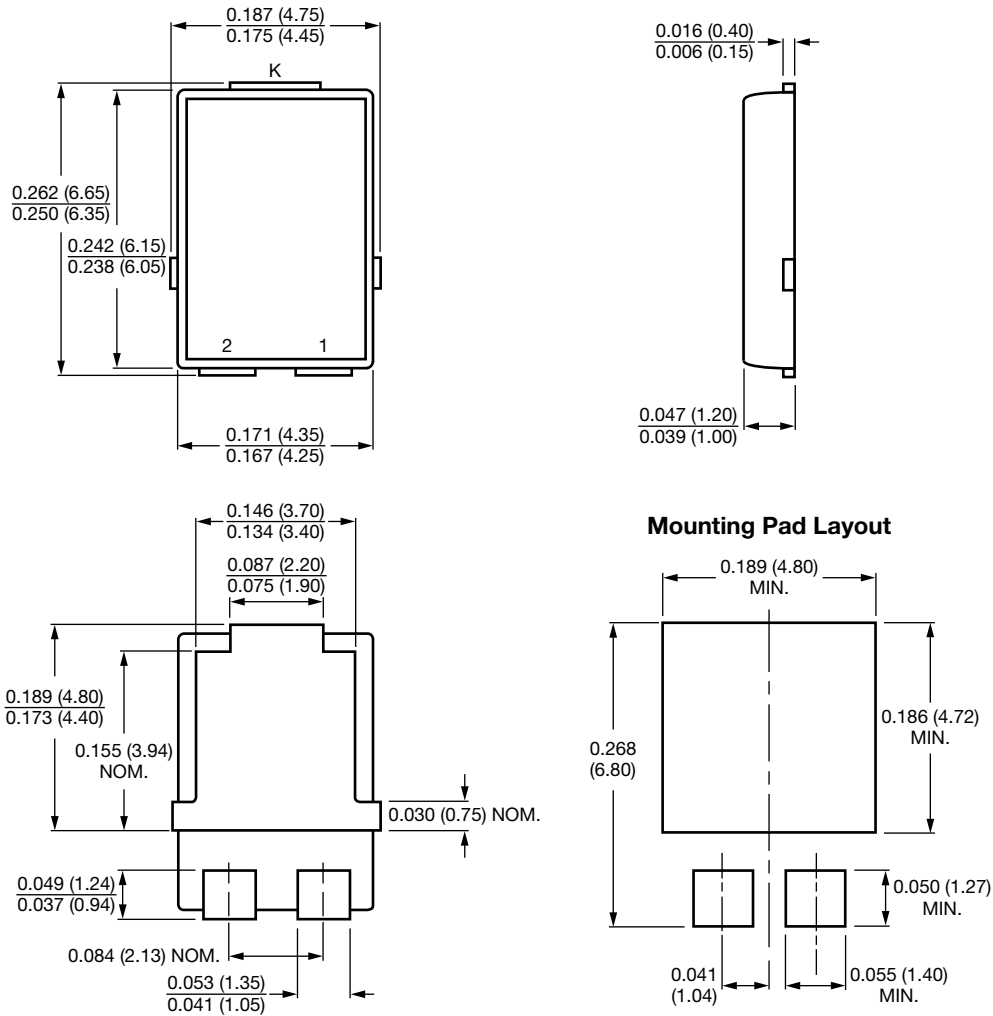
| ORDERING INFORMATION (Example) | | | |
|---------------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N | QUANTITY PER REEL | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-6ESU06-M3/86A | 1500 | 1500 | 7" diameter plastic tape and reel |
| VS-6ESU06-M3/87A | 6500 | 6500 | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS | |
|-----------------------------------|--|
| Dimensions | www.vishay.com/doc?95570 |
| Part marking information | www.vishay.com/doc?95565 |
| Packaging information | www.vishay.com/doc?88869 |
| SPICE model | www.vishay.com/doc?96703 |



SMPC (TO-277A)

DIMENSIONS in inches (millimeters)



Conform to JEDEC® TO-277A



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