

Ultrafast Rectifier, 1 A FRED Pt[®]

eSMP[®] Series

SMP (DO-220AA)

Cathode Anode


RoHS
 COMPLIANT
 HALOGEN
FREE
FEATURES

- Very low profile - typical height of 1.0 mm
- Ideal for automated placement
- Low forward voltage drop, low power losses
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- For PFC, CRM snubber operation
- Material categorization: for definitions of compliance please see www.vishay.com/doc?999912

TYPICAL APPLICATIONS

For use in high frequency, freewheeling, DC/DC converters, PFC, and in snubber industrial and automotive applications.

MECHANICAL DATA
Case: SMP (DO-220AA)

Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002, meets JESD 201 class 2 whisker test

Polarity: color band denotes cathode end

LINKS TO ADDITIONAL RESOURCES


3D Models

| PRIMARY CHARACTERISTICS | |
|-------------------------|----------------|
| $I_{F(AV)}$ | 1 A |
| V_R | 100 V, 200 V |
| V_F at I_F | 0.69 V |
| I_{FSM} | 40 A |
| t_{rr} (typ.) | 23 ns |
| T_J max. | 175 °C |
| Package | SMP (DO-220AA) |
| Circuit configuration | Single |

| ABSOLUTE MAXIMUM RATINGS | | | | | |
|---|----------------|---|-------------|-------|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS | |
| Peak repetitive reverse voltage | VS-1ENH01-M3 | V_{RRM} | | 100 | V |
| | VS-1ENH02-M3 | | | 200 | |
| Average rectified forward current | $I_{F(AV)}$ | $T_C = 168\text{ °C}$ | 1 | A | |
| Non-repetitive peak surge current | I_{FSM} | $T_J = 25\text{ °C}$, 10 ms sine pulse | 40 | | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -55 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 | VS-1ENH01-M3 | V_{BR}, V_R | $I_R = 100\text{ }\mu\text{A}$ | 100 | - | - | V |
| | VS-1ENH02-M3 | | | 200 | - | - | |
| Forward voltage | V_F | $I_F = 1\text{ A}$ | - | 0.86 | 0.92 | | |
| | | $I_F = 1\text{ A}, T_J = 150\text{ °C}$ | - | 0.69 | 0.74 | | |
| Reverse leakage current | I_R | $V_R = V_R$ rated | - | - | 2 | μA | |
| | | $T_J = 150\text{ °C}, V_R = V_R$ rated | - | - | 20 | | |
| Junction capacitance | C_T | $V_R = 200\text{ V}$ | - | 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 = 1.0 A, di _F /dt = 100 A/μs, V _R = 30 V | - | 23 | - | ns |
| | | I _F = 0.5 A, I _R = 1 A, I _{rr} = 0.25 A | - | - | 28 | |
| | | T _J = 25 °C | - | 14 | - | |
| | | T _J = 125 °C | - | 22 | - | |
| Peak recovery current | I _{RRM} | T _J = 25 °C | - | 1.7 | - | A |
| | | T _J = 125 °C | - | 2.7 | - | |
| Reverse recovery charge | Q _{rr} | T _J = 25 °C | - | 10 | - | nC |
| | | T _J = 125 °C | - | 29 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|--|-----------------------------------|-------------------------------|-------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Maximum junction and storage temperature range | T _J , T _{Stg} | | -55 | - | 175 | °C |
| Thermal resistance, junction mount | R _{thJM} ⁽¹⁾ | Infinite heatsink | - | 7 | 9 | °C/W |
| Thermal resistance, junction to ambient | R _{thJA} | PCB footprint 4.8 mm x 4.8 mm | - | 107 | - | |
| Approximate weight | | | 0.024 | | | g |
| Marking device | VS-1ENH01-M3 | Case style SMP (DO-220AA) | 1H1 | | | |
| | VS-1ENH02-M3 | | 1H2 | | | |

Note

(1) Thermal resistance junction to mount follows JEDEC® 51-14 transient dual interface test method (TDIM)

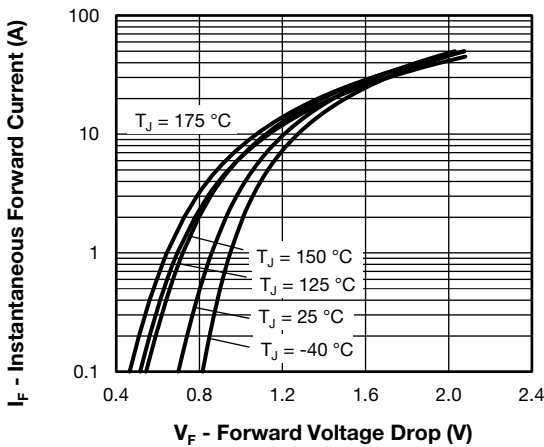


Fig. 1 - Typical Forward Voltage Drop Characteristics

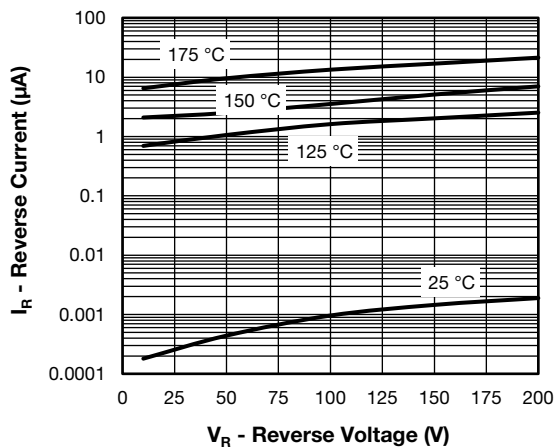


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

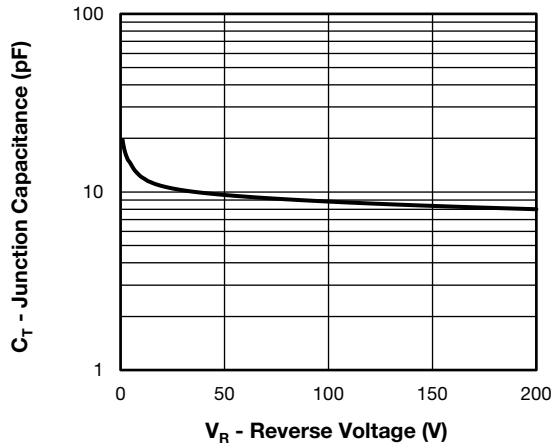


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

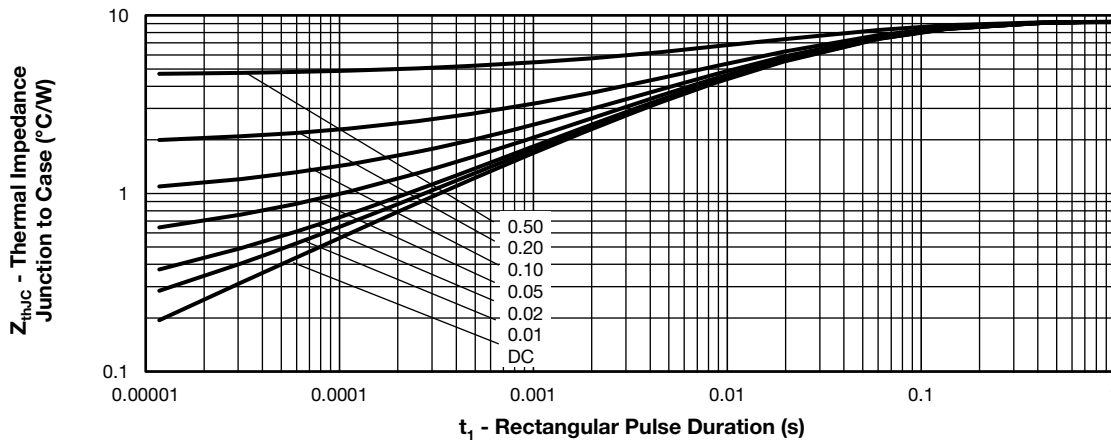


Fig. 4 - Transient Thermal Impedance, Junction to Case

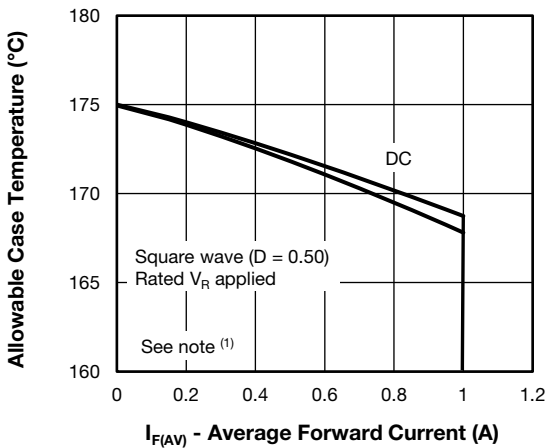


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

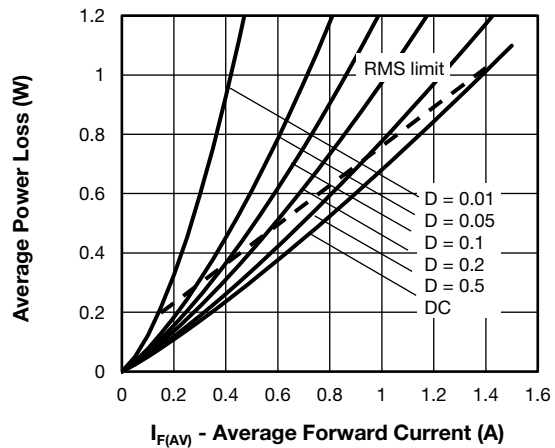


Fig. 6 - Forward Power Loss Characteristics

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

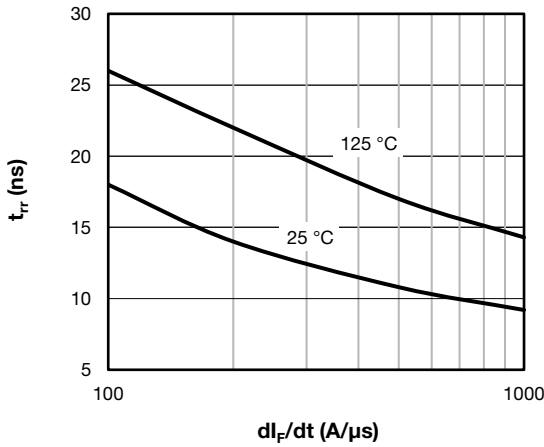


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

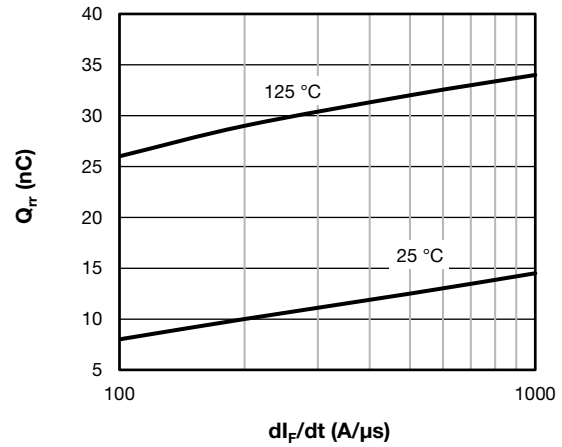
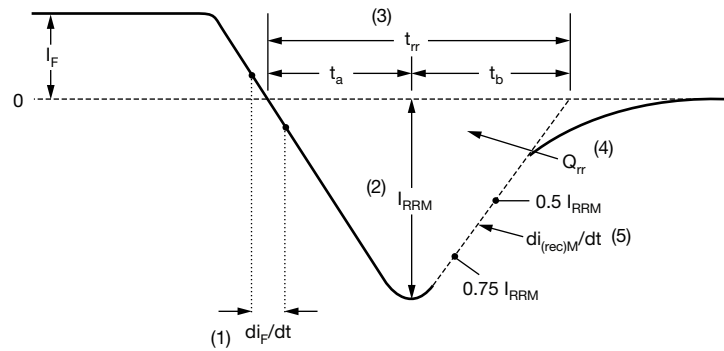


Fig. 8 - Typical Stored Charge vs. di_F/dt



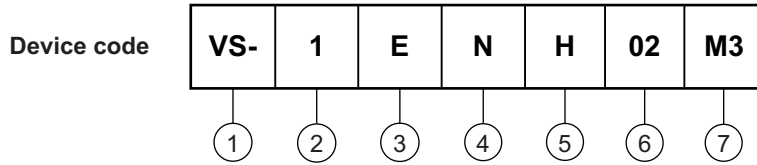
- (1) di_F/dt - rate of change of current through zero crossing
- (2) I_{RRM} - peak reverse recovery current
- (3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through $0.75 I_{RRM}$ and $0.50 I_{RRM}$ extrapolated to zero current.
- (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. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (1 = 1 A)
- 3** - Circuit configuration:
E = single diode
- 4** - N = SMP package
- 5** - Process type,
H = ultrafast recovery
- 6** - Voltage code (02 = 200 V)
- 7** - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

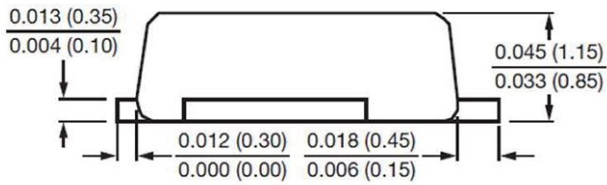
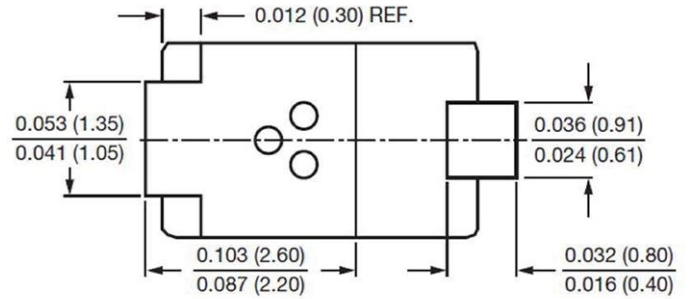
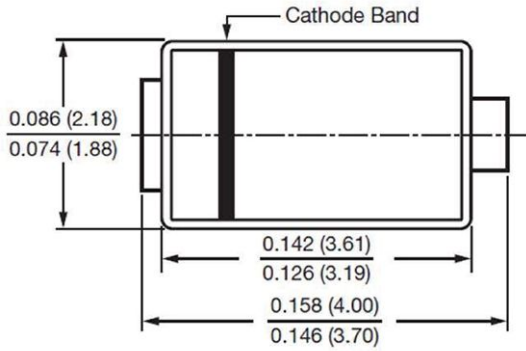
| ORDERING INFORMATION (Example) | | | |
|--------------------------------|------------------------|------------------------|------------------------------------|
| PREFERRED P/N | PREFERRED PACKAGE CODE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-1ENH01-M3/84A | 84A | 3000 | 7" diameter plastic tape and reel |
| VS-1ENH01-M3/85A | 85A | 10 000 | 13" diameter plastic tape and reel |
| VS-1ENH02-M3/84A | 84A | 3000 | 7" diameter plastic tape and reel |
| VS-1ENH02-M3/85A | 85A | 10 000 | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?96547 |
| Part marking information | www.vishay.com/doc?96574 |
| Packaging information | www.vishay.com/doc?88869 |
| SPICE model | www.vishay.com/doc?96550 |

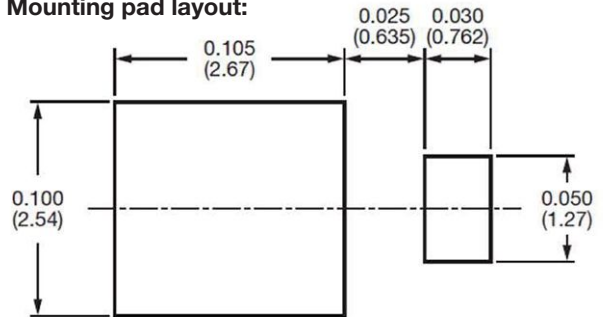


SMP (DO-220AA)

DIMENSIONS in inches (millimeters)



Mounting pad layout:





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