# Ultrafast Rectifier, 2 A FRED Pt®

**eSMP® Series**

**SMP (DO-220AA)**

Cathode ○—|◀—○ Anode

## 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
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE

## LINKS TO ADDITIONAL RESOURCES

3D Models

## 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

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 2 A |
| $V_R$ | 100 V, 200 V |
| $V_F$ at $I_F$ | 0.79 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-2ENH01HM3 | $V_{RRM}$ | | 100 | V |
| | VS-2ENH02HM3 | | | 200 | |
| Average rectified forward current | | $I_{F(AV)}$ | $T_C$ = 158 °C | 2 | A |
| Non-repetitive peak surge current | | $I_{FSM}$ | $T_J$ = 25 °C, 10 ms sine pulse | 40 | |
| Operating junction and storage temperatures | | $T_J$, $T_{Stg}$ | | -55 to +175 | °C |

| ELECTRICAL SPECIFICATIONS ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Breakdown voltage, blocking voltage | VS-2ENH01HM3 | $V_{BR}$, $V_R$ | $I_R$ = 100 µA | 100 | - | - | V |
| | VS-2ENH02HM3 | | | 200 | - | - | |
| Forward voltage | | $V_F$ | $I_F$ = 2 A | - | 0.94 | 1.00 | |
| | | | $I_F$ = 2 A, $T_J$ = 150 °C | - | 0.79 | 0.84 | |
| Reverse leakage current | | $I_R$ | $V_R$ = $V_R$ rated | - | - | 2 | µA |
| | | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 20 | |
| Junction capacitance | | $C_T$ | $V_R$ = 200 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 | $I_F$ = 2 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 100 V | - | 16 | - | |
| | | $T_J$ = 125 °C | | - | 25 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 2.0 | - | A |
| | | $T_J$ = 125 °C | | - | 3.1 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 15 | - | nC |
| | | $T_J$ = 125 °C | | - | 37 | - | |

| 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 to 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-2ENH01HM3 | | Case style SMP (DO-220AA) | 2H1 | | | |
| | VS-2ENH02HM3 | | | 2H2 | | | |

**Note**

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

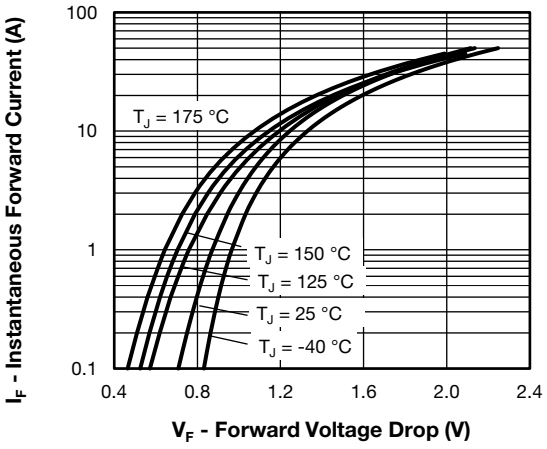



Fig. 1 - Typical Forward Voltage Drop Characteristics

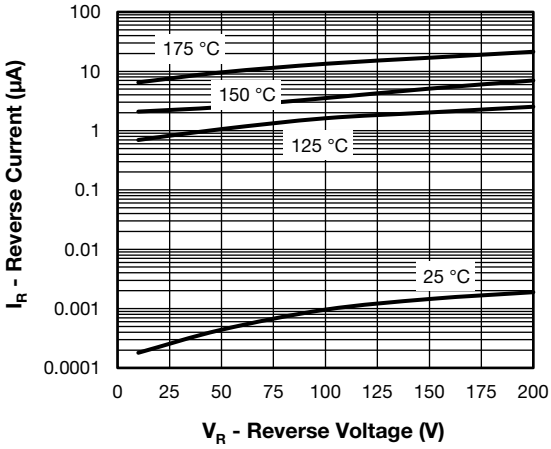



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

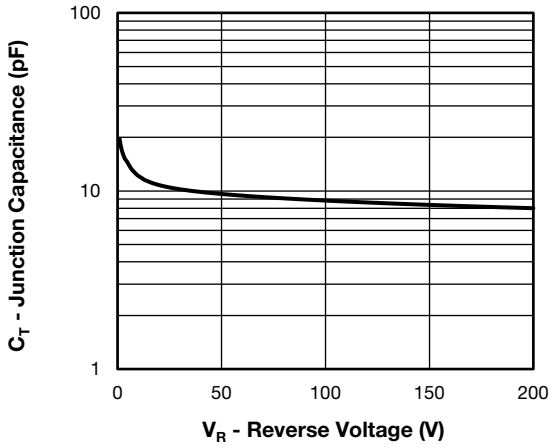



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

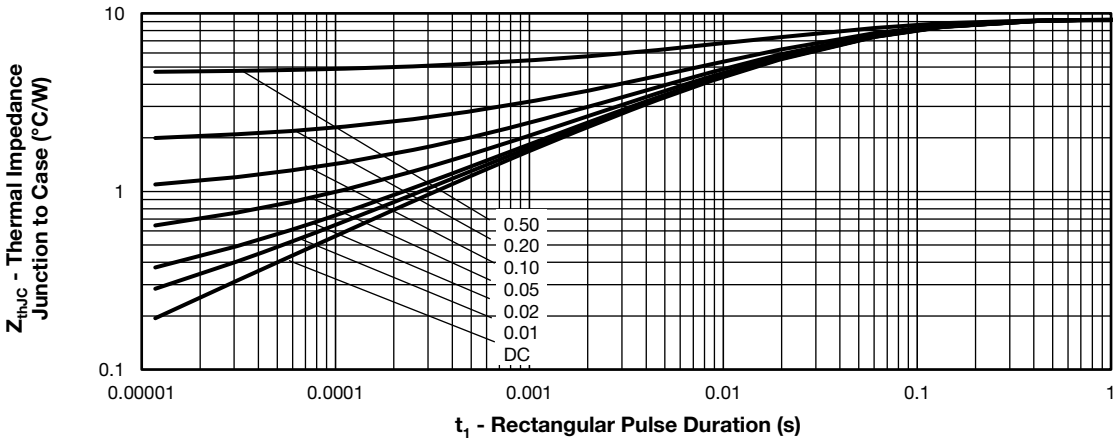



Fig. 4 - Transient Thermal Impedance, Junction to Case

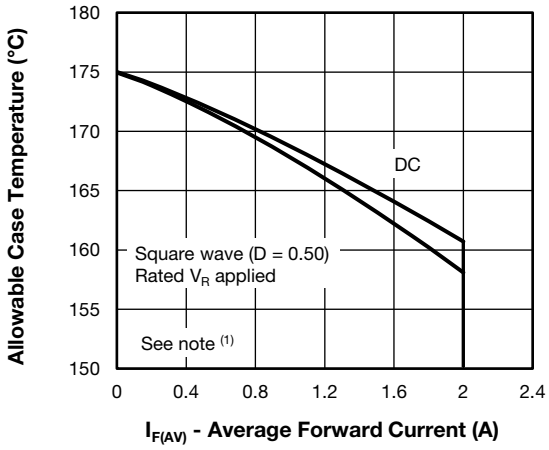



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

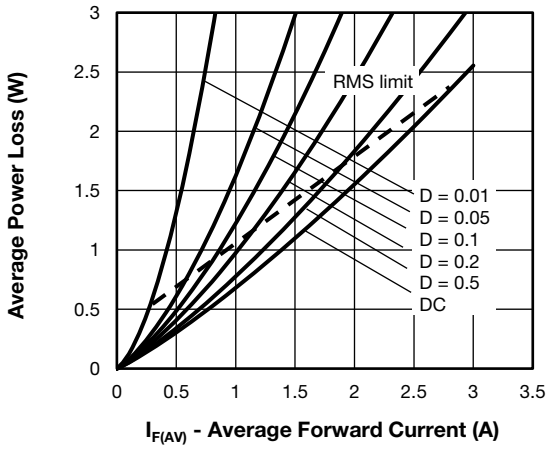



Fig. 6 - Forward Power Loss Characteristics

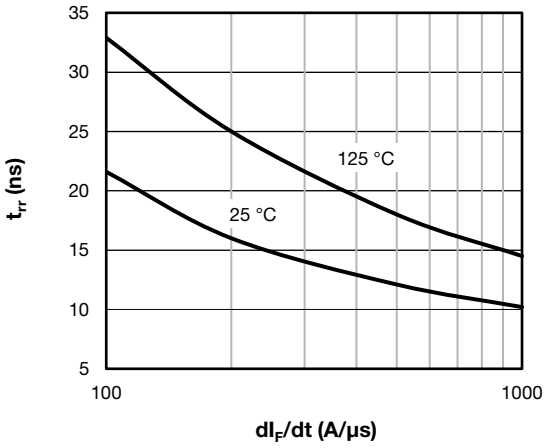



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

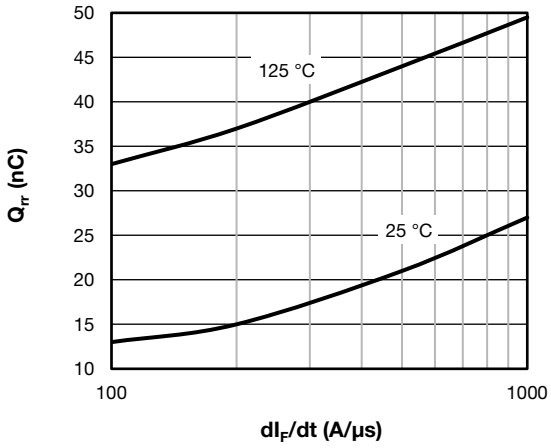
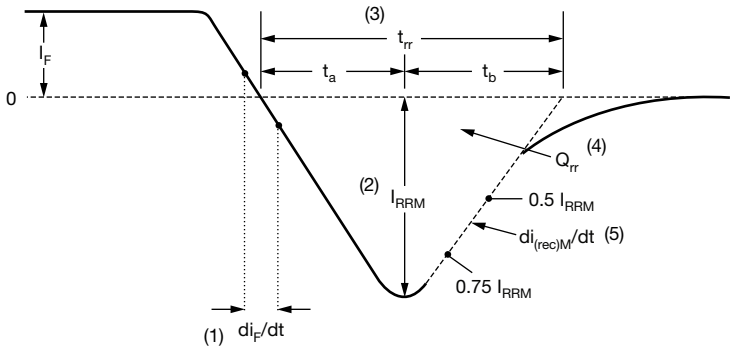



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

**Note**

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 5);
$Pd_{REV}$ = 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 $I_{RRM}$

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

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

Fig. 9 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code

| VS- | 2 | E | N | H | 02 | H | M3 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

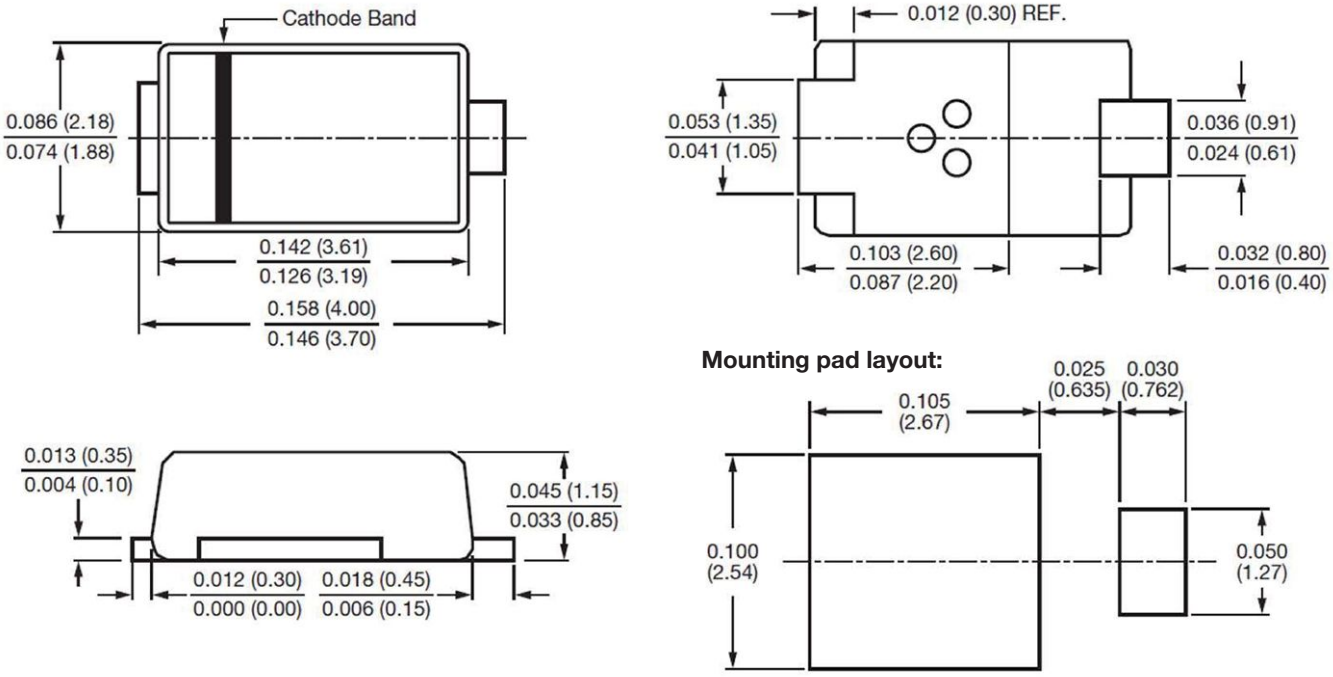
1 - Vishay Semiconductors product
2 - Current rating (2 = 2 A)
3 - Circuit configuration:
E = single diode
4 - N = SMP package
5 - Process type,
H = ultrafast recovery
6 - Voltage code (02 = 200 V)
7 - H = AEC-Q101 qualified
8 - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **PREFERRED PACKAGE CODE** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-2ENH01HM3/84A | 84A | 3000 | 7" diameter plastic tape and reel |
| VS-2ENH01HM3/85A | 85A | 10 000 | 13" diameter plastic tape and reel |
| VS-2ENH02HM3/84A | 84A | 3000 | 7" diameter plastic tape and reel |
| VS-2ENH02HM3/85A | 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?96551 |

# SMP (DO-220AA)

**DIMENSIONS** in inches (millimeters)



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