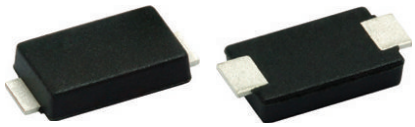
# Hyperfast Rectifier, 3 A FRED Pt®

**eSMP® Series**



Top View Bottom View

**SlimSMA (DO-221AC)**

Cathode ○—▶|—○ Anode

## LINKS TO ADDITIONAL RESOURCES

3D Models

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 3 A |
| $V_R$ | 100 V |
| $V_F$ at $I_F$ | 0.74 V |
| $t_{rr}$ | 30 ns |
| $T_J$ max. | 175 °C |
| Package | SlimSMA (DO-221AC) |
| Circuit configuration | Single |

## FEATURES

- Hyperfast recovery time, reduced $Q_{rr}$, and soft recovery
- 175 °C maximum operating junction temperature
- Low forward voltage drop
- Low leakage current
- Specific for output and snubber operation
- 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

## DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers specifically designed with optimized performance of forward voltage drop and hyperfast 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 snubber, boost, lighting, as high frequency rectifiers and 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

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Peak repetitive reverse voltage | $V_{RRM}$ | | 100 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C$ = 145 °C (1) | 3 | A |
| Non-repetitive peak surge current | $I_{FSM}$ | $T_J$ = 25 °C | 85 | |
| Operating junction and storage temperatures | $T_J$, $T_{Stg}$ | | -65 to +175 | °C |

**Note**

(1) Device on PCB with 8 mm x 16 mm soldering lands

**ELECTRICAL SPECIFICATIONS** ($T_J$ = 25 °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Breakdown voltage, blocking voltage | $V_{BR}$, $V_R$ | $I_R$ = 100 μA | 100 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 3 A | - | 0.86 | 0.93 | |
| | | $I_F$ = 3 A, $T_J$ = 125 °C | - | 0.74 | 0.78 | |
| Reverse leakage current | $I_R$ | $V_R$ = $V_R$ rated | - | - | 2 | μA |
| | | $T_J$ = 125 °C, $V_R$ = $V_R$ rated | - | 0.5 | 8 | |
| Junction capacitance | $C_T$ | $V_R$ = 100 V | - | 13 | - | pF |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| 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, $dI_F/dt$ = 50 A/μs, $V_R$ = 30 V | | - | 26 | - | ns |
| | | $I_F$ = 0.5 A, $I_R$ = 1 A, $I_{rr}$ = 0.25 A | | - | - | 30 | |
| | | $T_J$ = 25 °C | $I_F$ = 3 A<br>$dI_F/dt$ = 200 A/μs<br>$V_R$ = 160 V | - | 18 | - | |
| | | $T_J$ = 125 °C | | - | 26 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 2.5 | - | A |
| | | $T_J$ = 125 °C | | - | 4 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 23 | - | nC |
| | | $T_J$ = 125 °C | | - | 50 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS ($T_J$ = 25 °C unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| 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 | $R_{thJM}$ | Device mounted on PCB with 8 mm x 16 mm soldering lands | - | 8 | 10 | °C/W |
| Thermal resistance, junction to ambient | $R_{thJA}$ | Device mounted on PCB with 2 mm x 3.5 mm soldering lands | - | 91 | 110 | |
| Approximate Weight | | | 0.032 | | | g |
| | | | 0.0011 | | | oz. |
| Marking device | | Case style SlimSMA (DO-221AC) | 3H1 | | | |

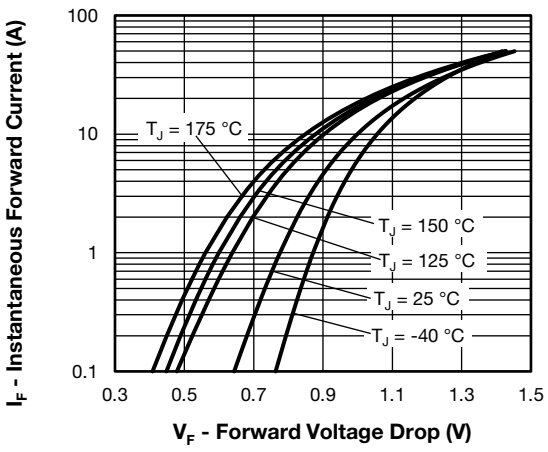


Fig. 1 - Typical Forward Voltage Drop Characteristics

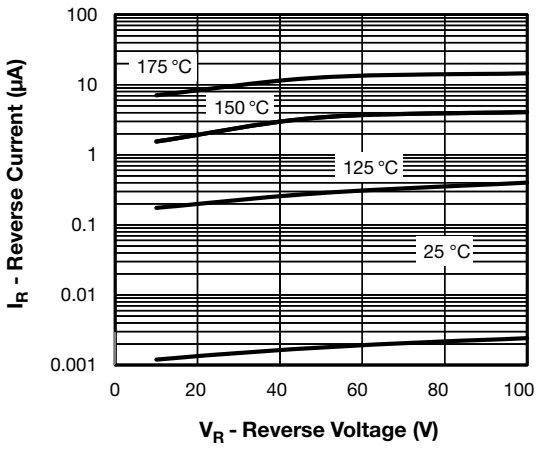


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage


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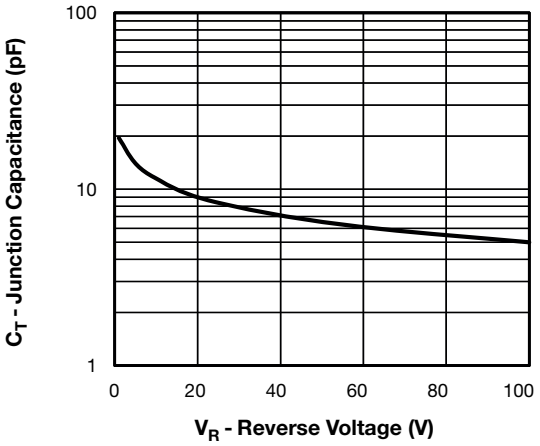


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

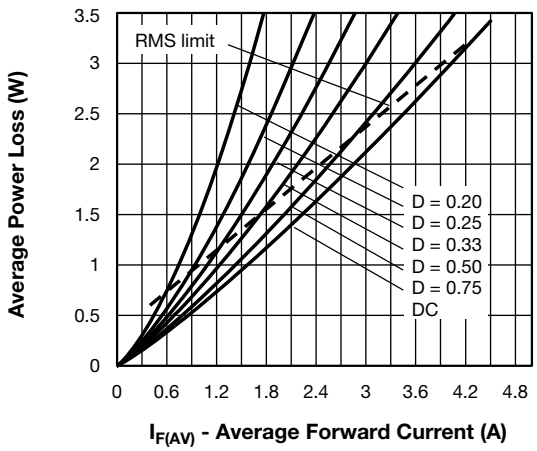


Fig. 5 - Forward Power Loss Characteristics

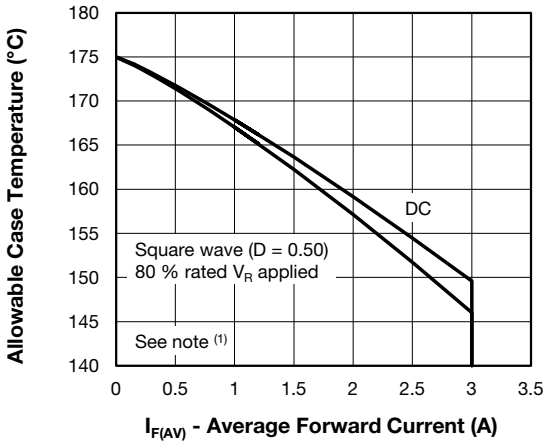


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

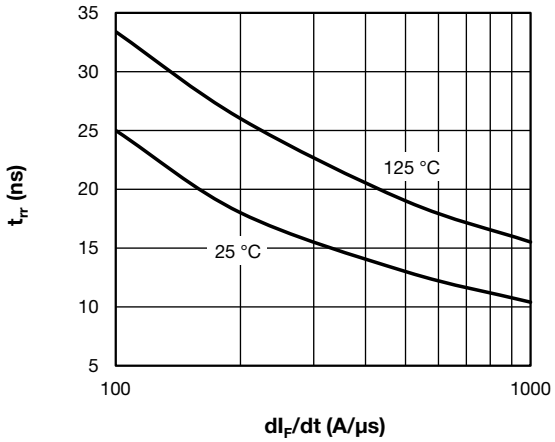


Fig. 6 - Typical Reverse Recovery vs. $dI_F/dt$

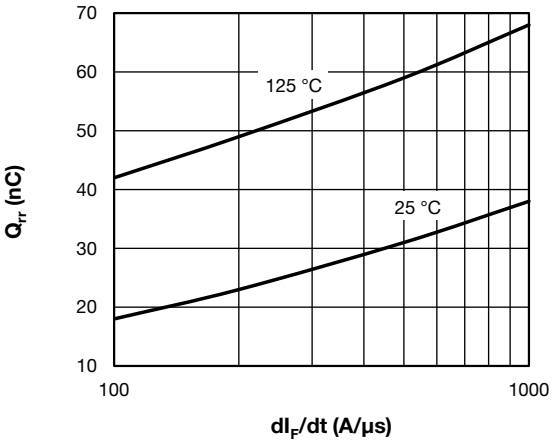


Fig. 7 - Typical Stored Charge vs. $dI_F/dt$

**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. 6);
$Pd_{REV}$ = inverse power loss = $V_{R1} \times I_R$ (1 - D); $I_R$ at $V_{R1}$ = rated $V_R$


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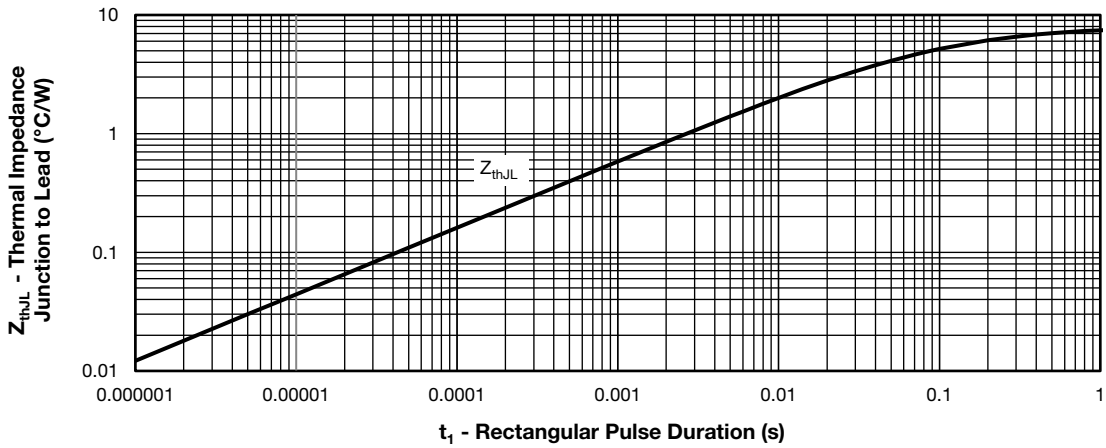



Fig. 8 - Typical Thermal Impedance $Z_{thJL}$ Junction-to-Lead

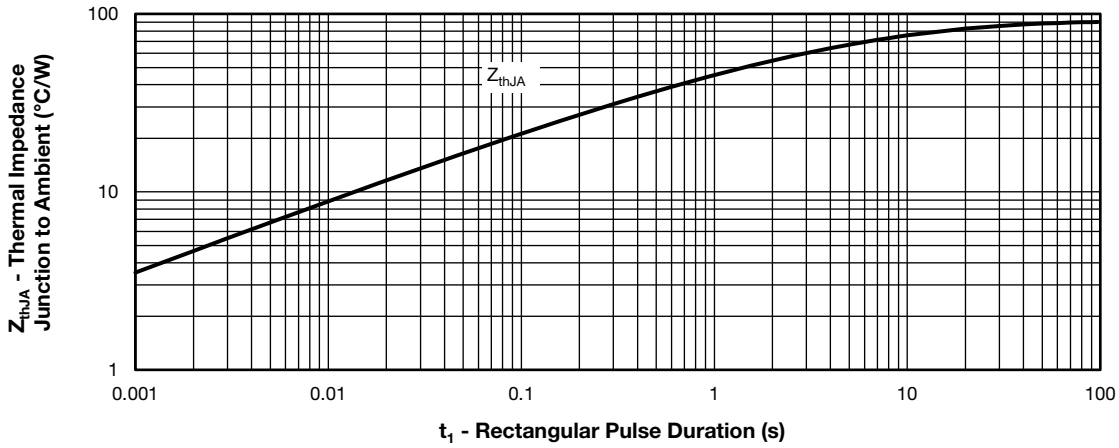
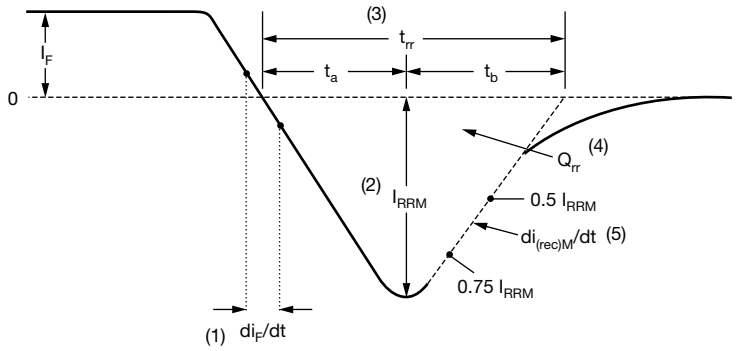



Fig. 9 - Typical Thermal Impedance $Z_{thJA}$ Junction-to-Ambient




(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. 10 - Reverse Recovery Waveform and Definitions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## ORDERING INFORMATION TABLE

| Device code | VS- | 3 | E | J | H | 01 | -M3 |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

1 - Vishay Semiconductors product
2 - Current rating (3 = 3 A)
3 - Circuit configuration:
E = single diode
4 - J = SlimSMA package
5 - Process type,
H = hyperfast recovery
6 - Voltage code (01 = 100 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-3EJH01-M3/6A | 3500 | 3500 | 7"diameter plastic tape and reel |
| VS-3EJH01-M3/6B | 14 000 | 14 000 | 13"diameter plastic tape and reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?95771 |
| Part marking information | www.vishay.com/doc?95562 |
| Packaging information | www.vishay.com/doc?88869 |


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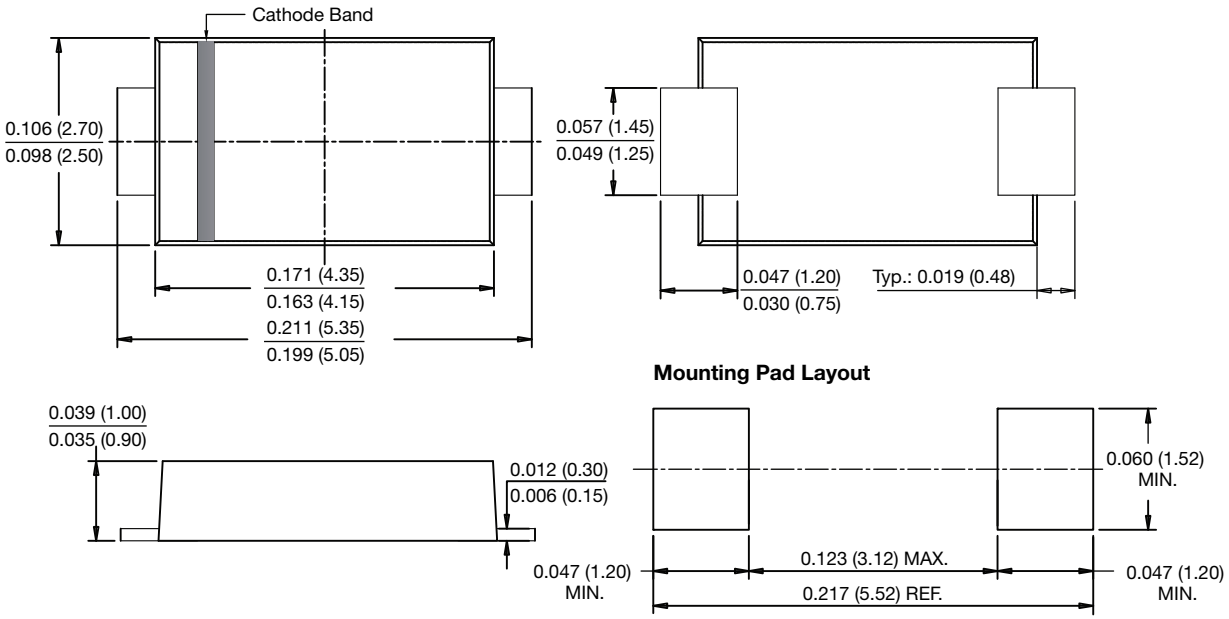
# DO-221AC (SlimSMA)

**DIMENSIONS** in inches (millimeters)



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