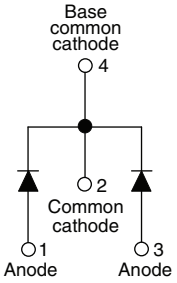
# Hyperfast Rectifier, 2 x 5 A FRED Pt®


## FEATURES

- Hyperfast recovery time
- 175 °C max. operating junction temperature
- Low forward voltage drop reduced $Q_{rr}$ and soft recovery
- Low leakage current
- Very low profile - typical height of 1.3 mm
- Ideal for automated placement
- Polyimide passivation for high reliability standard
- 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

3D Models

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 2 x 5 A |
| $V_R$ | 200 V |
| $V_F$ at $I_F$ | 0.74 V |
| $t_{rr}$ (typ.) | 16 ns |
| $T_J$ max. | 175 °C |
| Package | SlimDPAK (TO-252AE) |
| Circuit configuration | Common cathode |

## DESCRIPTION / APPLICATIONS

State of the art hyper fast recovery rectifiers designed with optimized performance of forward voltage drop, hyper fast 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 stage in the AC/DC section of SMPS inverters or as freewheeling diodes. Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

## MECHANICAL DATA

**Case:** SlimDPAK (TO-252AE)

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 | | $V_{RRM}$ | | 200 | V |
| Average rectified forward current | per leg | $I_{F(AV)}$ | $T_C$ = 165 °C | 5 | A |
| | per device | | | 10 | |
| Non-repetitive peak surge current | per leg | $I_{FSM}$ | $T_J$ = 25 °C, 10 ms sine pulse wave | 100 | |
| 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 | $V_{BR}$, $V_R$ | $I_R$ = 100 µA | 200 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 5 A | - | 0.90 | 1.04 | |
| | | $I_F$ = 10 A | - | 1.0 | 1.17 | |
| | | $I_F$ = 5 A, $T_J$ = 150 °C | - | 0.74 | 0.84 | |
| | | $I_F$ = 10 A, $T_J$ = 150 °C | - | 0.85 | 1.05 | |
| Reverse leakage current per leg | $I_R$ | $V_R$ = $V_R$ rated | - | - | 4 | µA |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 80 | |
| Junction capacitance per leg | $C_T$ | $V_R$ = 200 V | - | 17 | - | 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, $dI_F/dt$ = 100 A/µs, $V_R$ = 30 V | | - | 16 | - | ns |
| | | $I_F$ = 0.5 A, $I_R$ = 1 A, $I_{RR}$ = 0.25 A | | - | - | 25 | |
| | | $T_J$ = 25 °C | $I_F$ = 5 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 160 V | - | 21 | - | |
| | | $T_J$ = 125 °C | | - | 30 | - | |
| 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 | | - | 25 | - | nC |
| | | $T_J$ = 125 °C | | - | 60 | - | |

| 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 ambient | $R_{thJA}$ (1)(2) | | - | 73 | 90 | °C/W |
| Thermal resistance, junction to mount, per diode | $R_{thJM}$ (3) | | - | 2.1 | 2.5 | |
| Weight | | | - | 0.20 | - | g |
| Marking device | | Case style SlimDPAK (TO-252AE) | 10CVH02 | | | |

**Notes**

(1) The heat generated must be less than thermal conductivity from junction to ambient; $dP_D/dT_J < 1R_{thJA}$

(2) Free air, mounted or recommended copper pad area; thermal resistance $R_{thJA}$ - junction to ambient

(3) Mounted on infinite heatsink

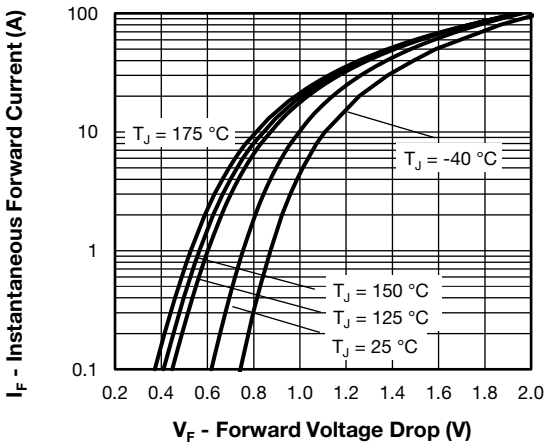



Fig. 1 - Typical Forward Voltage Drop Characteristics

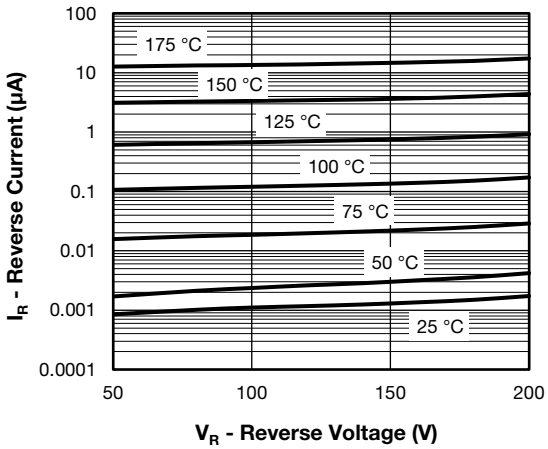



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

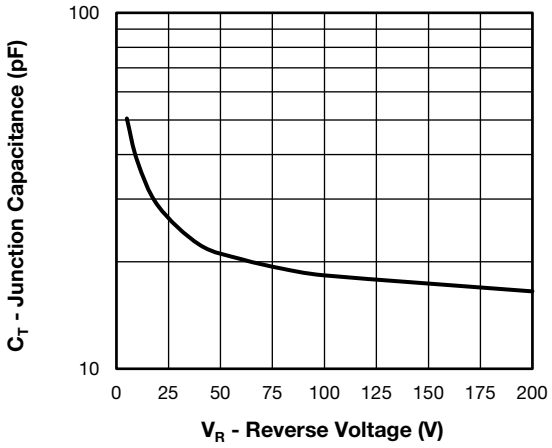



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

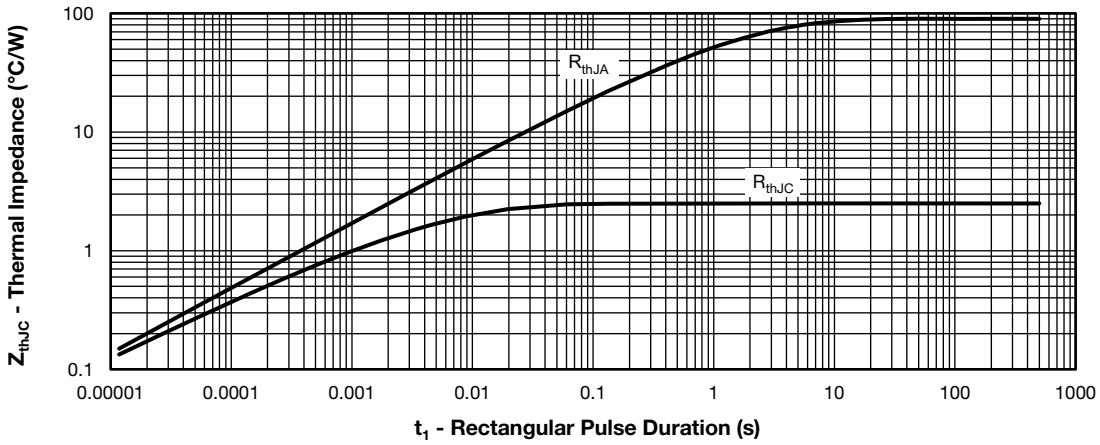



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

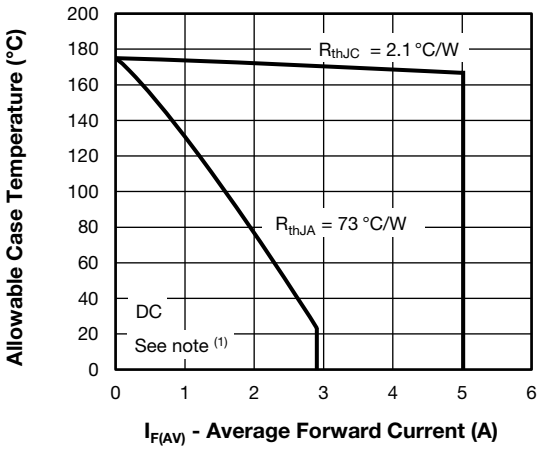



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

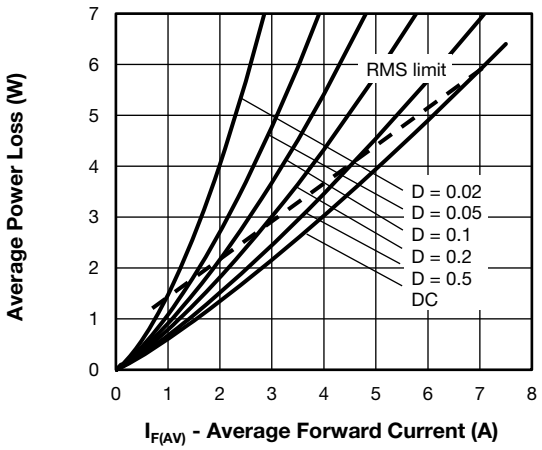



Fig. 6 - Forward Power Loss Characteristics

**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 $V_R$

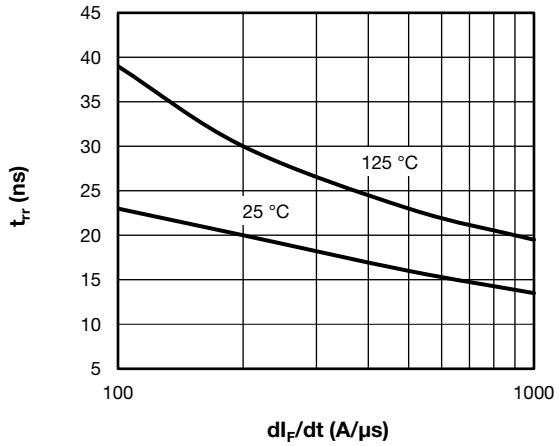



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

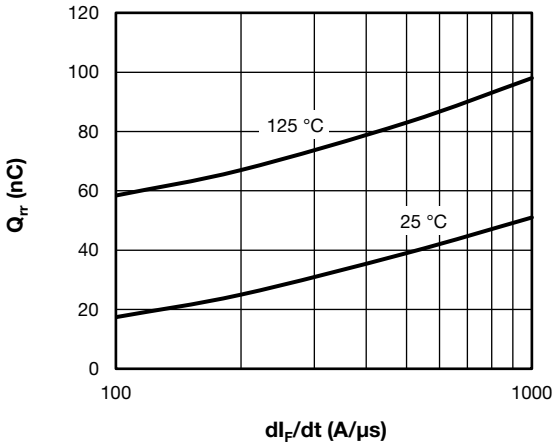
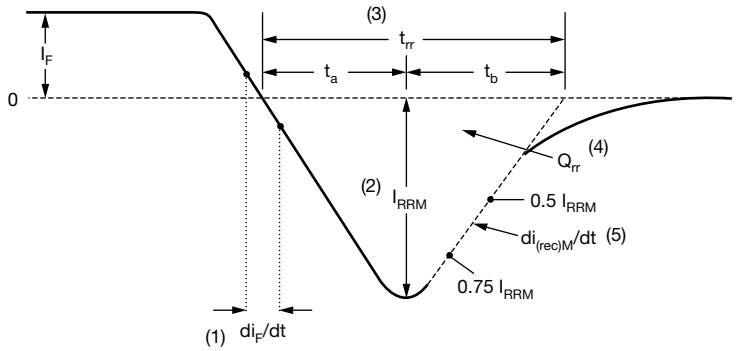



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$




(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 $I_{RRM}$

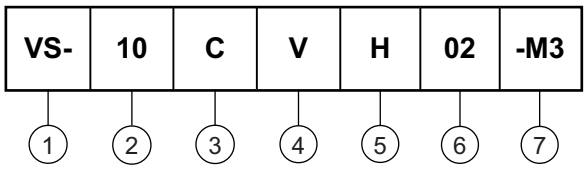
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(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




1 - Vishay Semiconductors product

2 - Current rating (10 = 10 A)

3 - Circuit configuration:
C = common cathode

4 - V = SlimDPAK

5 - Process type,
H = hyper fast recovery

6 - Voltage code (02 = 200 V)

7 - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

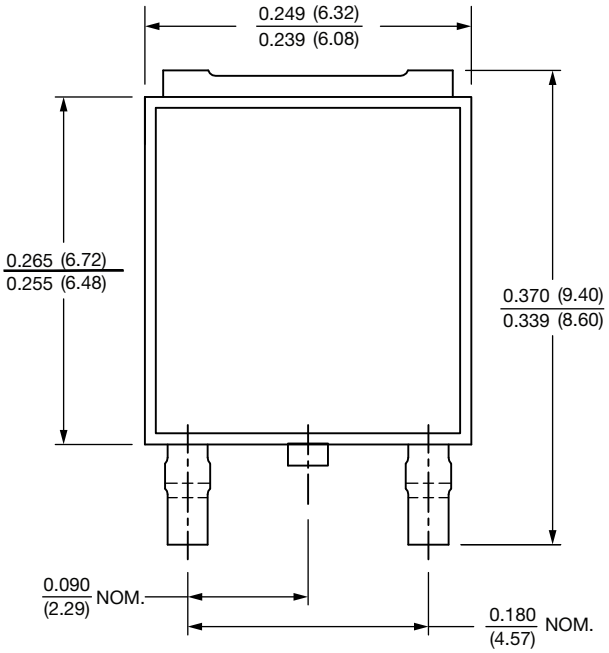
| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER REEL** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-10CVH02-M3/I | 4500 | 4500 | 13"diameter plastic tape and reel |

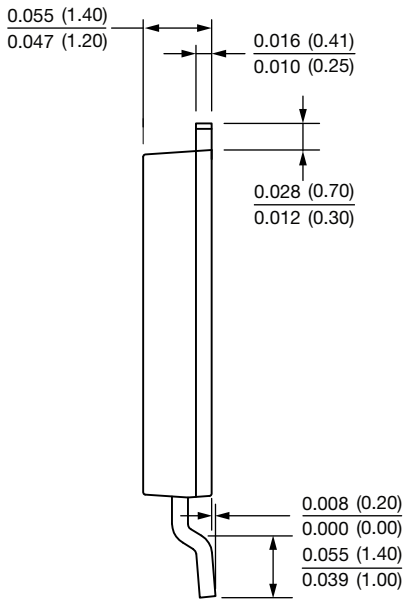
| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?96081 |
| Part marking information | www.vishay.com/doc?96085 |
| Packaging information | www.vishay.com/doc?88869 |

# SlimDPAK

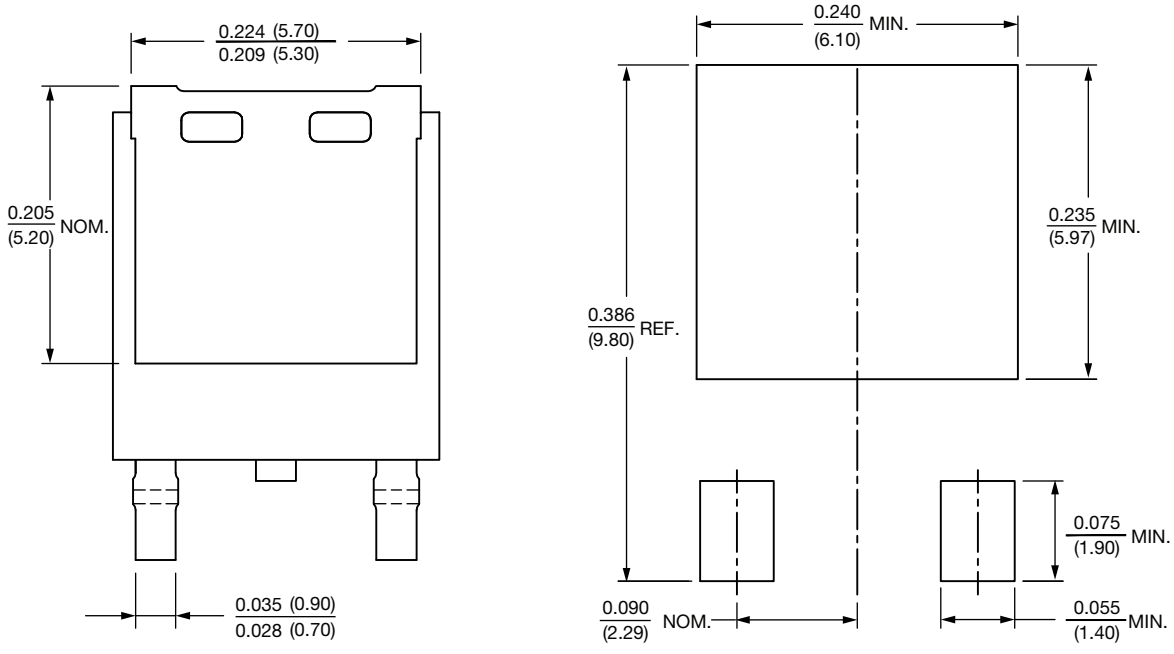
**DIMENSIONS** in inches (millimeters)

**SlimDPAK**




**Mounting Pad Layout**



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