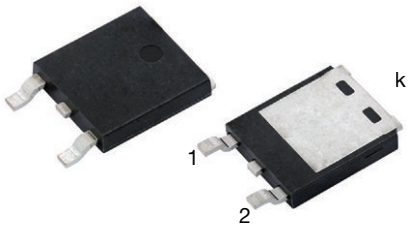
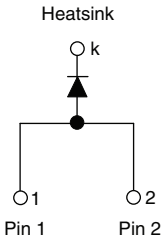
# Hyperfast Rectifier, 6 A FRED Pt®

**eSMP® Series**




**SlimDPAK (TO-252AE)**




## FEATURES

- Hyperfast recovery time, reduced $Q_{rr}$ recovery
- For PFC CCM operation
- Low forward voltage drop, low power losses
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
  - Automotive ordering code: base P/NHM3, meets JESD 201 class 2 whisker test
- 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

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

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

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 6 A |
| $V_R$ | 600 V |
| $V_F$ at $I_F$ | 1.26 V |
| $t_{rr}$ (typ.) | 14 ns |
| $T_J$ max. | 175 °C |
| Package | SlimDPAK (TO-252AE) |
| Circuit configuration | Single |

| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Peak repetitive reverse voltage | $V_{RRM}$ | | 600 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C$ = 140 °C | 6 | A |
| Non-repetitive peak surge current | $I_{FSM}$ | $T_J$ = 25 °C, 10 ms sine pulse wave | 50 | |
| 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 | 600 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 6 A | - | 2.5 | 3.10 | |
| | | $I_F$ = 6 A, $T_J$ = 150 °C | - | 1.65 | 1.90 | |
| Reverse leakage current | $I_R$ | $V_R$ = $V_R$ rated | - | - | 5 | µA |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 250 | |
| Junction capacitance | $C_T$ | $V_R$ = 600 V | - | 10 | - | 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 | | - | 16 | - | ns |
| | | $I_F$ = 1 A, $dI_F/dt$ = 100 A/µs, $V_R$ = 30 V | | - | 14 | - | |
| | | $I_F$ = 0.5 A, $I_R$ = 1 A, $I_{RR}$ = 0.25 A | | - | - | 18 | |
| | | $T_J$ = 25 °C | $I_F$ = 6 A<br>$dI_F/dt$ = 500 A/µs<br>$V_R$ = 400 V | - | 19 | - | |
| | | $T_J$ = 125 °C | | - | 40 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 3.8 | - | A |
| | | $T_J$ = 125 °C | | - | 6.3 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 40 | - | nC |
| | | $T_J$ = 125 °C | | - | 140 | - | |

| 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 | $R_{thJM}$ | | - | - | 2.5 | °C/W |
| Weight | | | - | 0.20 | - | g |
| Marking device | | Case style SlimDPAK (TO-252AE) | 6EVX06 | | | |

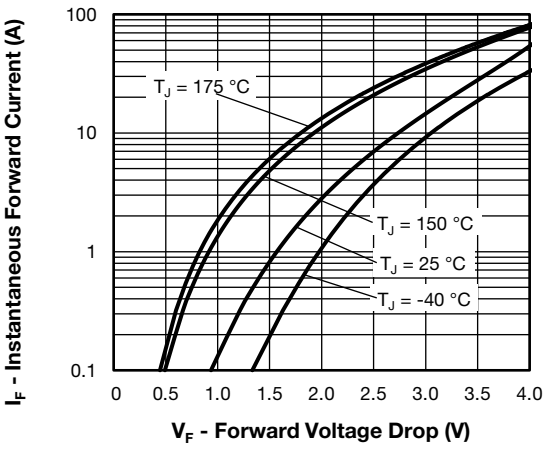



Fig. 1 - Typical Forward Voltage Drop Characteristics

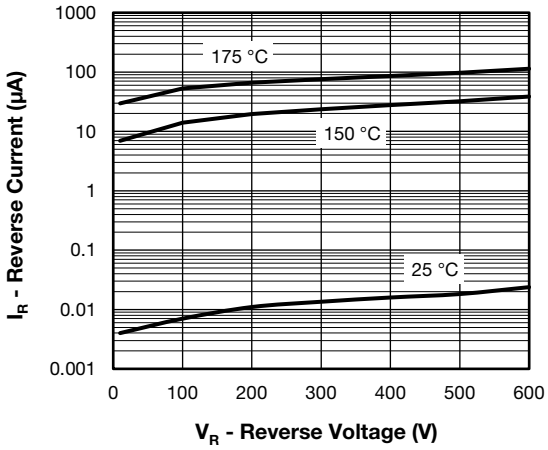



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

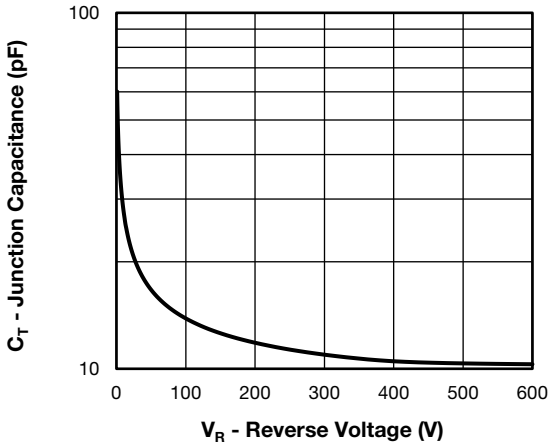



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

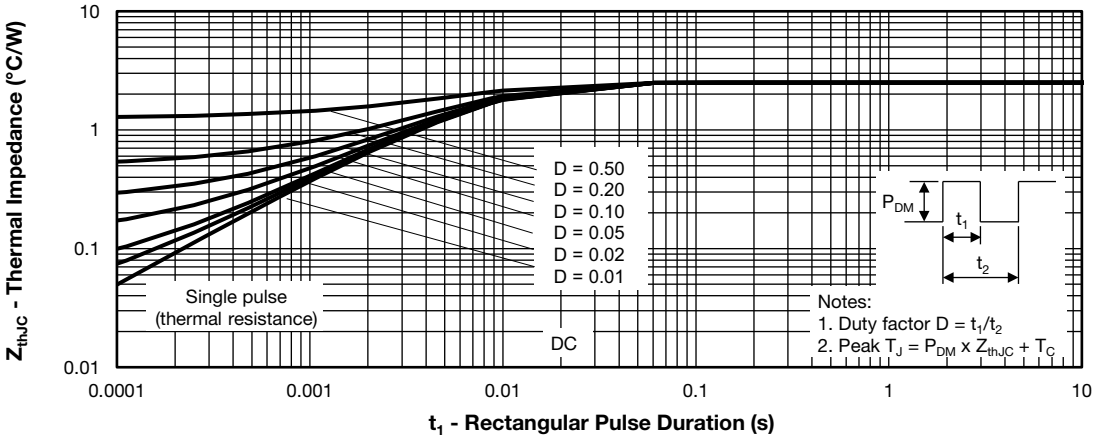



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

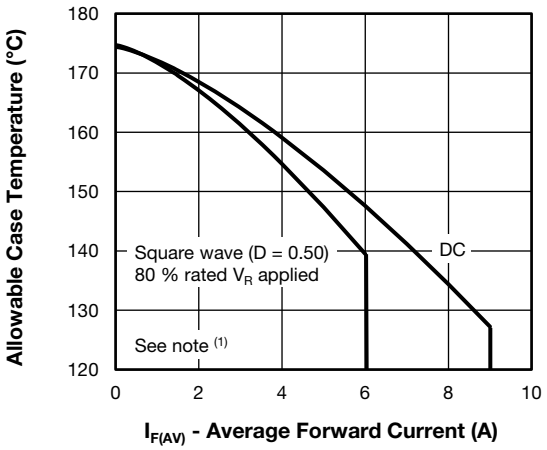



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

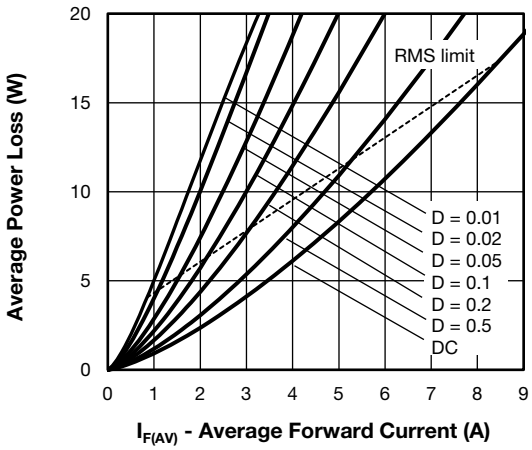



Fig. 6 - Forward Power Loss Characteristics

**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 $V_R$

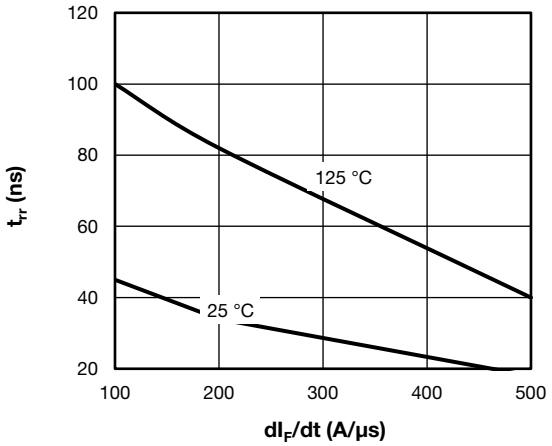



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

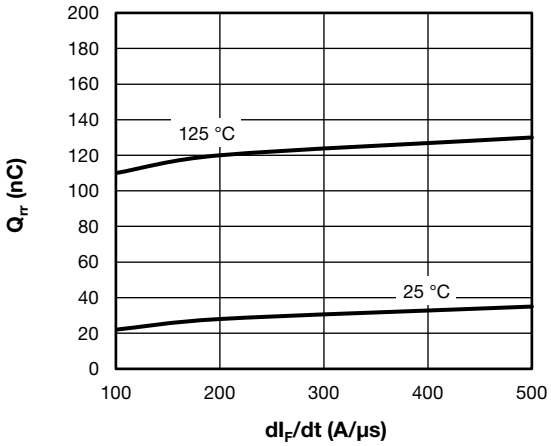
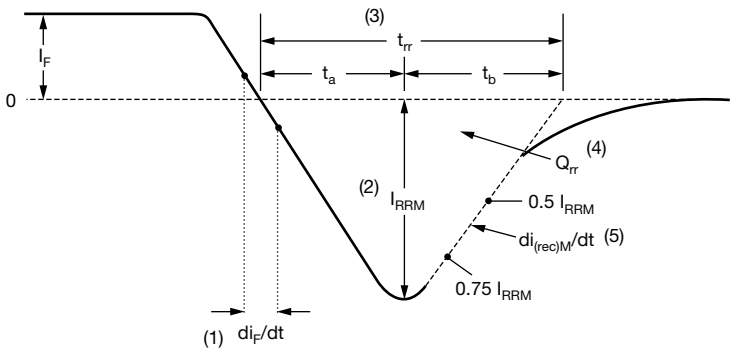



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$




(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 $I_{RRM}$

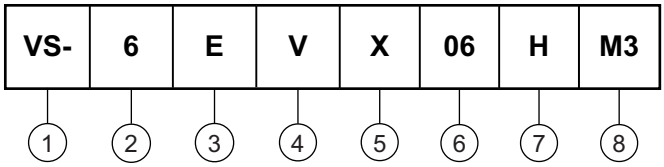
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(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 (6 = 6 A)

3 - Circuit configuration:
E = single die

4 - V = SlimDPAK

5 - Process type:
X = hyperfast recovery

6 - Voltage code (06 = 600 V)

7 - H = AEC-Q101 qualified

8 - Environmental digit:
M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

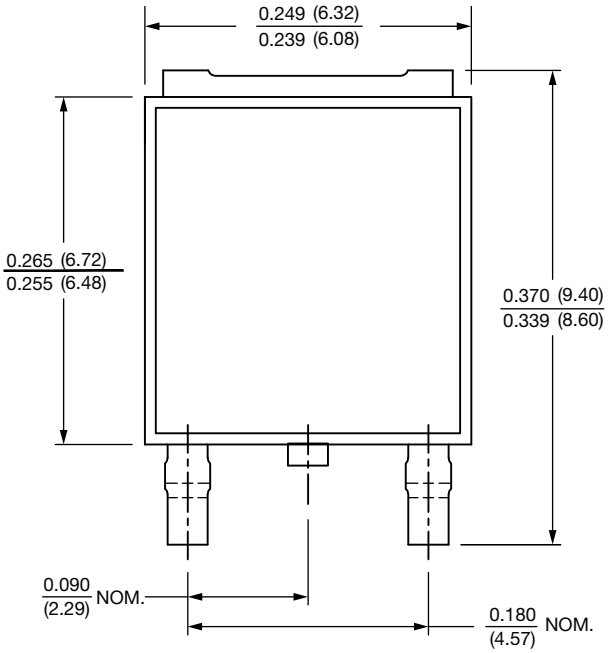
| **ORDERING INFORMATION** (Example) | | | | |
|---|---|---|---|---|
| **PREFERRED P/N** | **UNIT WEIGHT (g)** | **PREFERRED PACKAGE CODE** | **BASE QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-6EVX06HM3/I | 0.20 | I | 4500 | 13"diameter plastic tape and reel |

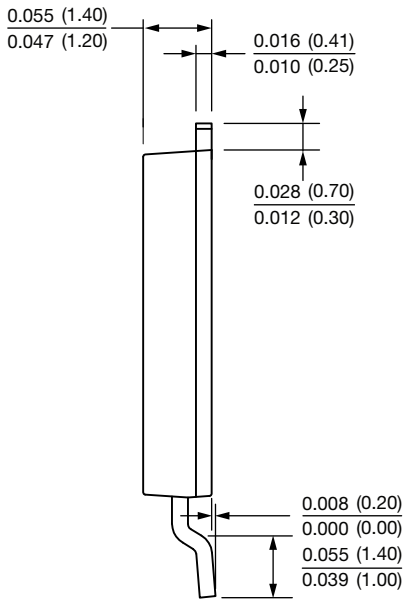
| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?96081 |
| Part marking information | www.vishay.com/doc?96085 |
| Packaging information | www.vishay.com/doc?88869 |

# SlimDPAK

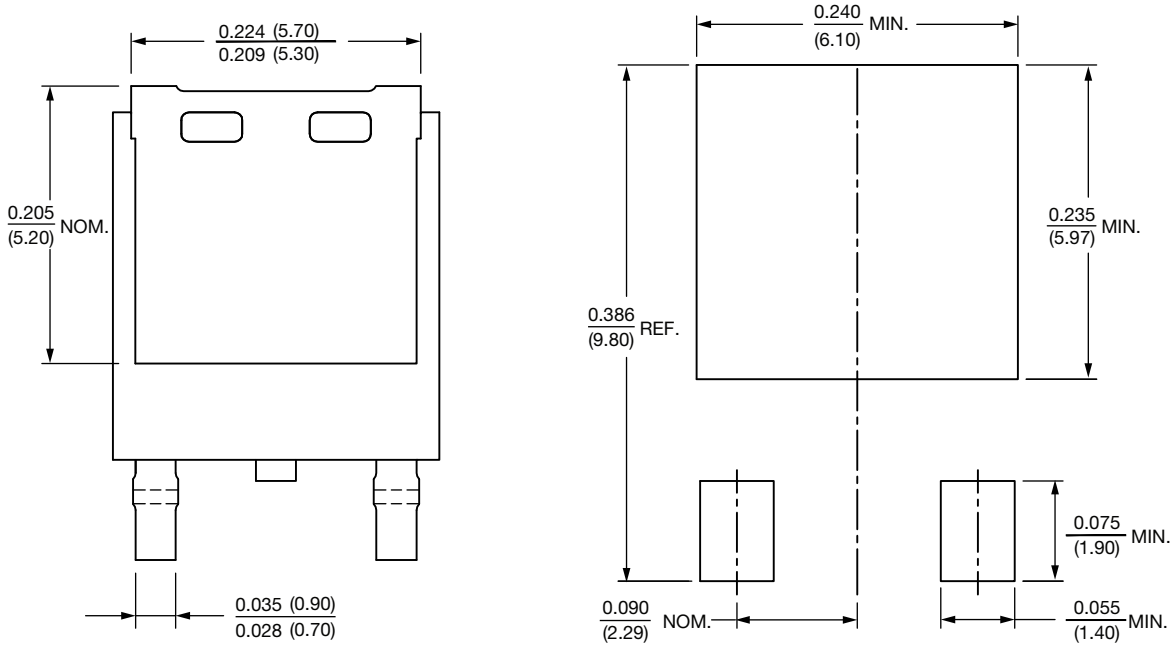
**DIMENSIONS** in inches (millimeters)

**SlimDPAK**




**Mounting Pad Layout**



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