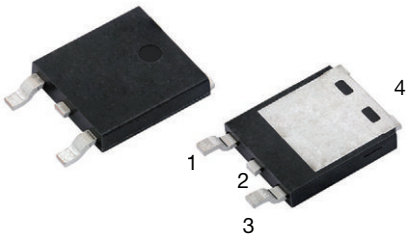
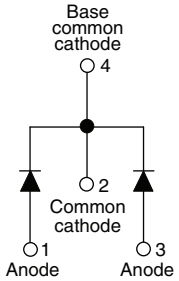
# Hyperfast Rectifier, 2 x 3 A FRED Pt®

eSMP® Series




SlimDPAK (TO-252AE)




## LINKS TO ADDITIONAL RESOURCES

3D Models

## PRIMARY CHARACTERISTICS

| | |
|---|---|
| $I_{F(AV)}$ | 2 x 3 A |
| $V_R$ | 100 V |
| $V_F$ at $I_F$ | 0.75 V |
| $t_{rr}$ (typ.) | 20 ns |
| $T_J$ max. | 175 °C |
| Package | SlimDPAK (TO-252AE) |
| Circuit configuration | Common cathode |

## FEATURES

- Hyperfast recovery time
- Low forward voltage drop reduced $Q_{rr}$ and soft recovery
- Low leakage current
- Very low profile - typical height of 1.3 mm
- 175 °C operating junction temperature
- Ideal for automated placement
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Polyimide passivation for high reliability standard
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb

e3

RoHS COMPLIANT

HALOGEN FREE

## DESCRIPTION / APPLICATIONS

State of the art hyper fast recovery rectifiers designed with optimized performance of forward voltage drop and hyper fast 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 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 | MAX. | UNITS |
|---|---|---|---|---|---|
| Peak repetitive reverse voltage | | $V_{RRM}$ | | 100 | V |
| Average rectified forward current | per leg | $I_{F(AV)}$ | Total device, rated $V_R$, $T_C$ = 166 °C | 3 | A |
| | per device | | | 6 | |
| Non-repetitive peak surge current | per leg | $I_{FSM}$ | $T_J$ = 25 °C, 10 ms sine pulse wave | 70 | |
| 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 | 100 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 3 A | - | 0.9 | 1.04 | |
| | | $I_F$ = 3 A, $T_J$ = 150 °C | - | 0.75 | 0.82 | |
| | | $I_F$ = 6 A | - | 1 | 1.2 | |
| | | $I_F$ = 6 A, $T_J$ = 150 °C | - | 0.85 | 1.01 | |
| Reverse leakage current | $I_R$ | $V_R$ = $V_R$ rated | - | - | 5 | μA |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 80 | |
| Junction capacitance | $C_T$ | $V_R$ = 100 V | - | 12 | - | 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 | | - | 20 | - | ns |
| | | $I_F$ = 0.5 A, $I_R$ = 1 A, $I_{RR}$ = 0.25 A | | - | - | 25 | |
| | | $T_J$ = 25 °C | $I_F$ = 3 A<br>$dI_F/dt$ = 200 A/μs<br>$V_R$ = 160 V | - | 17 | - | |
| | | $T_J$ = 125 °C | | - | 26 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 1.8 | - | A |
| | | $T_J$ = 125 °C | | - | 3.2 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 15 | - | nC |
| | | $T_J$ = 125 °C | | - | 41 | - | |

| 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) | | - | 75 | 90 | °C/W |
| Thermal resistance, junction to mount per leg | $R_{thJM}$ (3) | | - | 3.2 | 4 | °C/W |
| Weight | | | - | 0.20 | - | g |
| Marking device | | Case style SlimDPAK (TO-252AE) | 6CVH01 | | | |

**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

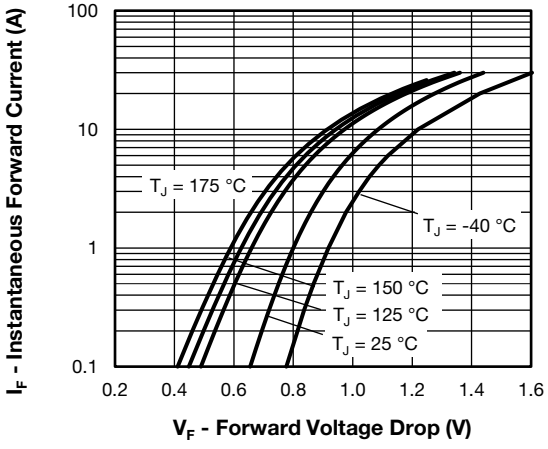


Fig. 1 - Typical Forward Voltage Drop Characteristics

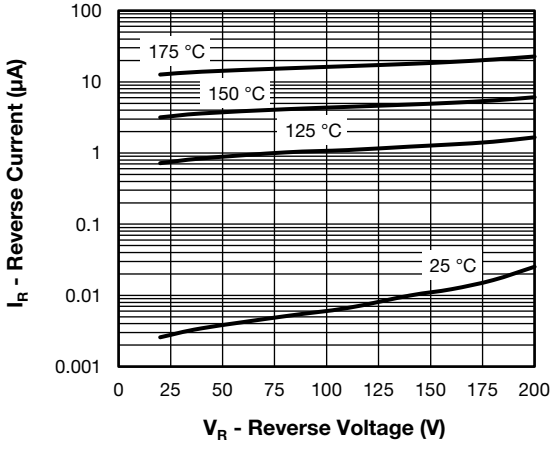


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage


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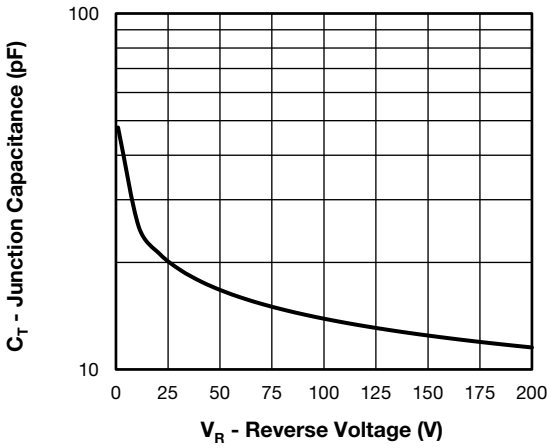


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

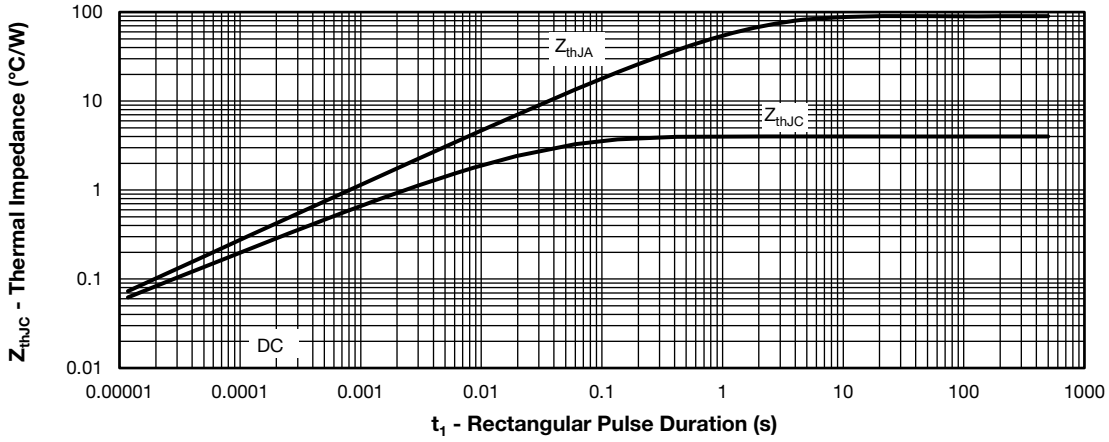


Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

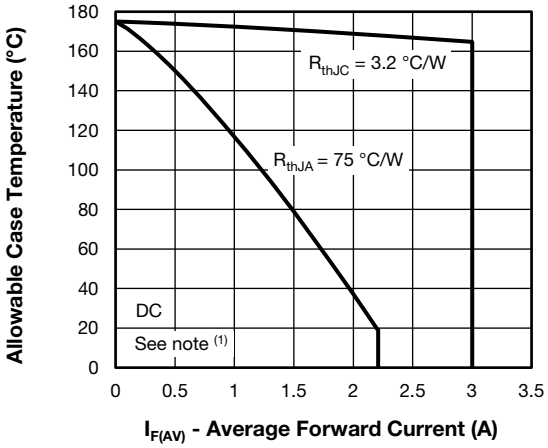


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

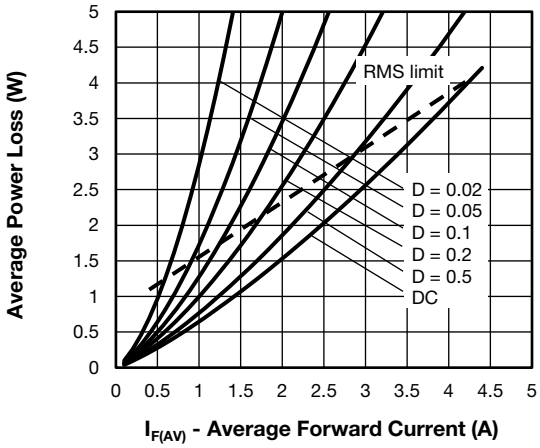


Fig. 6 - Forward Power Loss Characteristics

**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 $V_R$


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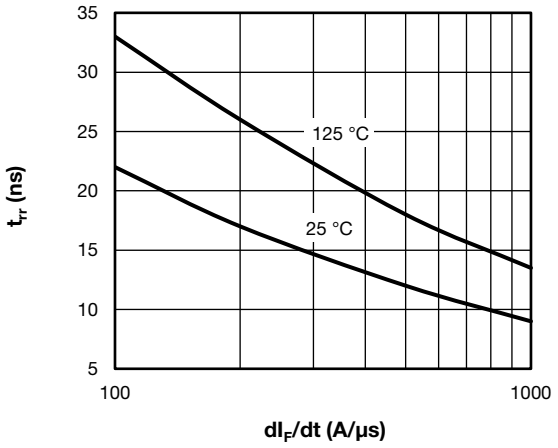



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

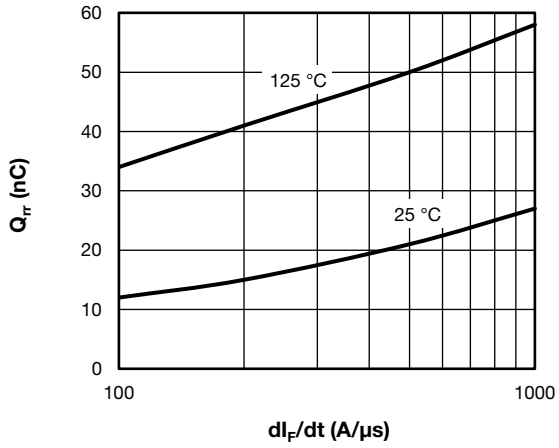
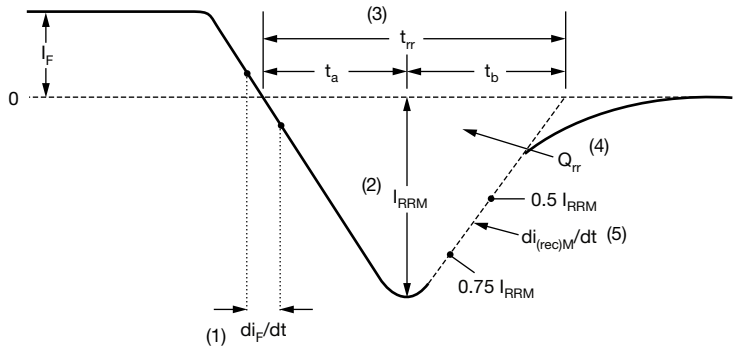



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$




(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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## ORDERING INFORMATION TABLE

| Device code | VS- | 6 | C | V | H | 01 | H | M3 |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

1 - Vishay Semiconductors product
2 - Current rating (6 = 6 A)
3 - Circuit configuration:
C = common cathode
4 - V = SlimDPAK
5 - Process type,
H = hyper fast recovery
6 - Voltage code (01 = 100 V)
7 - H = AEC-Q101 qualified
8 - 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-6CVH01HM3/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 |


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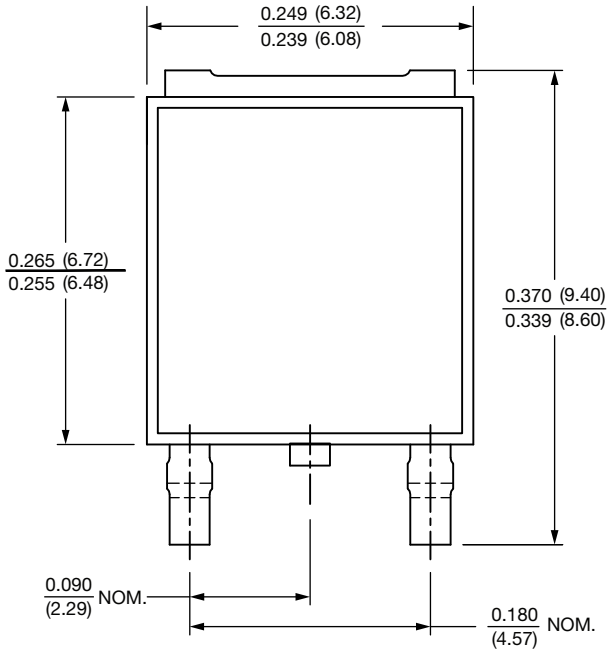
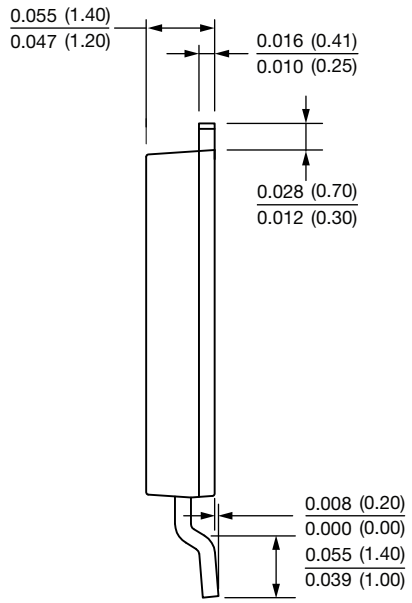
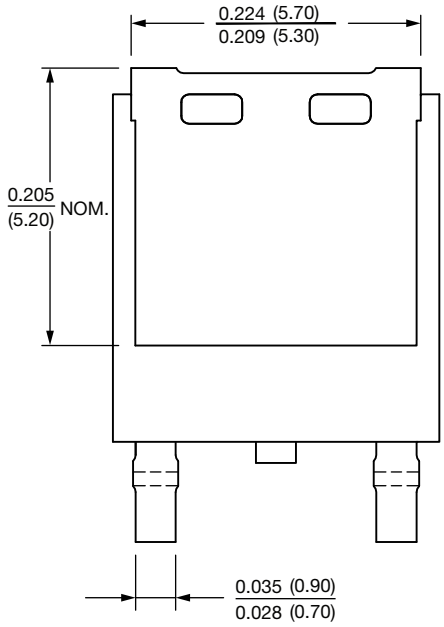
# SlimDPAK

**DIMENSIONS** in inches (millimeters)

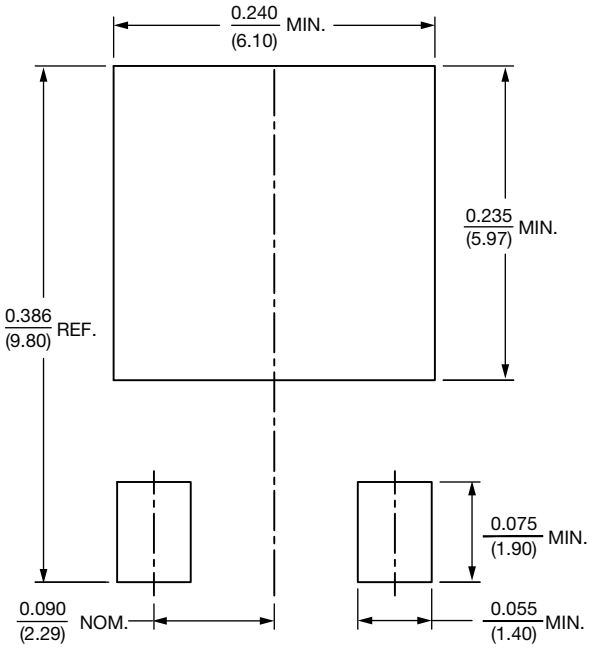
**SlimDPAK**




**Mounting Pad Layout**



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