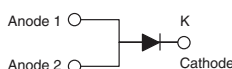
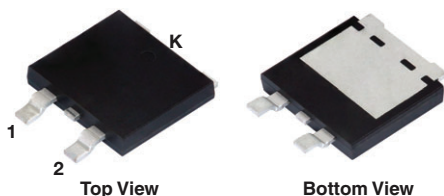


# Hyperfast Rectifier, 16 A FRED Pt®

## eSMP® Series SMPD (TO-263AC)



## LINKS TO ADDITIONAL RESOURCES



3D Models

## PRIMARY CHARACTERISTICS

|  |                        |
|--|------------------------|
| $I_{F(AV)}$  | 16 A                   |
| $V_R$  | 600 V                  |
| $V_F$ at $I_F$ ( $T_J = 150\text{ }^{\circ}\text{C}$ ) | 1.24 V                 |
| $t_{rr}$   | 30 ns                  |
| $T_J$ max.   | 175 $^{\circ}\text{C}$ |
| Package  | SMPD (TO-263AC)        |
| Circuit configuration                                  | Single                 |

## FEATURES

- Hyperfast recovery time, reduced  $Q_{rr}$ , and soft recovery
- 175  $^{\circ}\text{C}$  maximum operating junction temperature
- For PFC CRM, snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260  $^{\circ}\text{C}$
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop and ultrafast 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, lighting, in the AC/DC section of SMPS, freewheeling and clamp diodes.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce power dissipation in the switching element and snubbers.

## MECHANICAL DATA

**Case:** SMPD (TO-263AC)

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   | $V_{RRM}$         |   | 600    | V     |
| Average rectified forward current | $I_{F(AV)}^{(1)}$ | $T_C = 127\text{ }^{\circ}\text{C}$                   | 16     | A     |
| Non-repetitive peak surge current | $I_{FSM}$         | $T_J = 25\text{ }^{\circ}\text{C}$ , 10 ms sine pulse | 160    |       |

## ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

| PARAMETER                           | SYMBOL           | TEST CONDITIONS   | MIN. | TYP. | MAX. | UNITS         |
|-------------------------------------|------------------|---|------|------|------|---------------|
| Breakdown voltage, blocking voltage | $V_{BR}$ , $V_R$ | $I_R = 100\text{ }\mu\text{A}$                            | 600  | -    | -    | V             |
| Forward voltage                     | $V_F$            | $I_F = 16\text{ A}$                                       | -    | 1.65 | 2.15 |               |
|                                     |                  | $I_F = 16\text{ A}$ , $T_J = 150\text{ }^{\circ}\text{C}$ | -    | 1.24 | 1.65 |               |
| Reverse leakage current             | $I_R$            | $V_R = V_R$ rated   | -    | -    | 20   | $\mu\text{A}$ |
|                                     |                  | $T_J = 150\text{ }^{\circ}\text{C}$ , $V_R = V_R$ rated   | -    | -    | 500  |               |
| Junction capacitance                | $C_T$            | $V_R = 600\text{ V}$                                      | -    | 16   | -    | pF            |

### Note

<sup>(1)</sup> Mounted on infinite heatsink

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| PARAMETER               | SYMBOL    | TEST CONDITIONS  | MIN. | TYP. | MAX. | UNITS         |
|-------------------------|-----------|--|------|------|------|---------------|
| Reverse recovery time   | $t_{rr}$  | $I_F = 1\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 30   | -    | ns            |
|                         |           | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$           | -    | -    | 30   |               |
|                         |           | $T_J = 25\text{ }^{\circ}\text{C}$   | -    | 43   | -    |               |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$  | -    | 92   | -    |               |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$   | -    | 7.7  | -    | A             |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$  | -    | 13.8 | -    |               |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$   | -    | 150  | -    | $\mu\text{C}$ |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$  | -    | 600  | -    |               |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                      | SYMBOL            | TEST CONDITIONS            | MIN. | TYP.    | MAX. | UNITS                       |
|--|-------------------|----------------------------|------|---------|------|-----------------------------|
| Maximum junction and storage temperature range | $T_J$ , $T_{Stg}$ |                            | -55  | -       | +175 | $^{\circ}\text{C}$          |
| Thermal resistance, junction to mount          | $R_{thJM}$        |                            | -    | 1.2     | 1.7  | $^{\circ}\text{C}/\text{W}$ |
| Approximate weight                             |                   |                            |      | 0.55    |      | g                           |
| Marking device                                 |                   | Case style SMPD (TO-263AC) |      | 16EDH06 |      |                             |

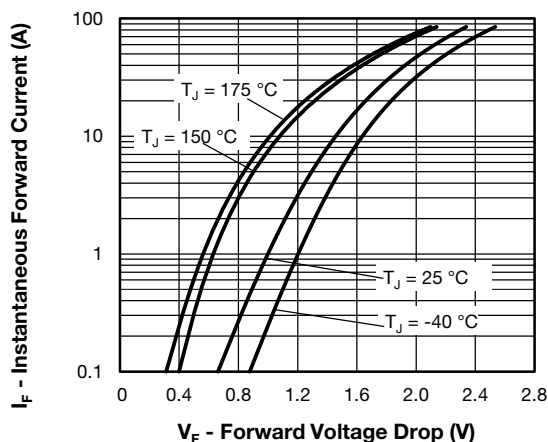


Fig. 1 - Typical Forward Voltage Drop Characteristics

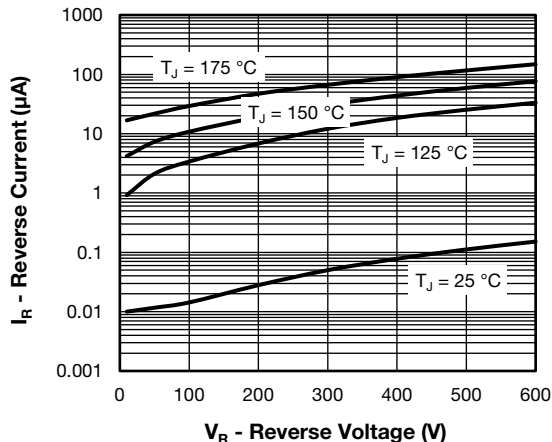


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

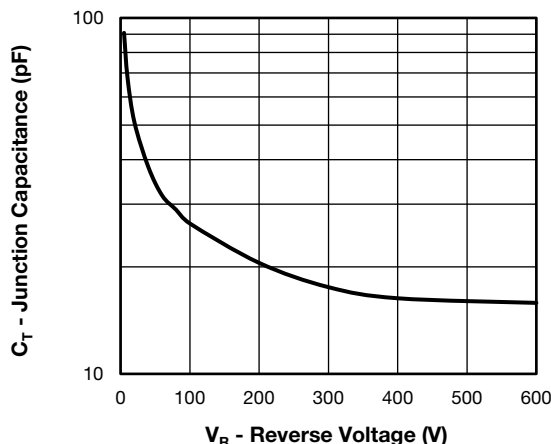


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

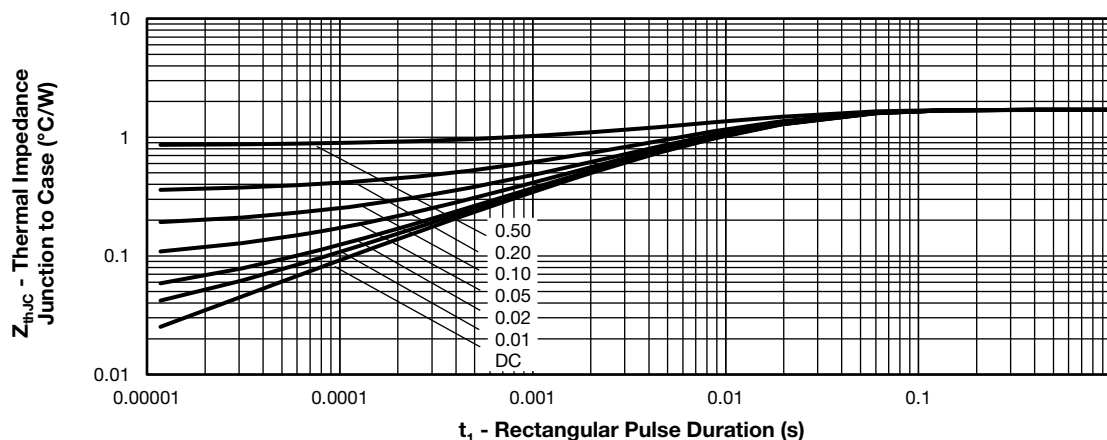


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

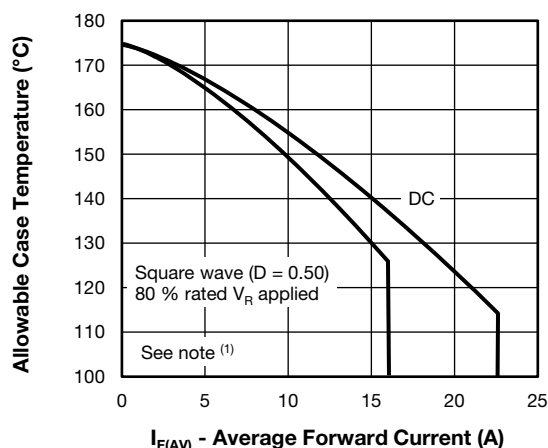


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

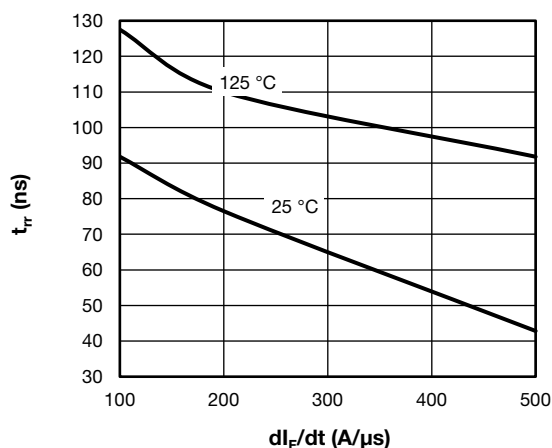


Fig. 6 - Typical Reverse Recovery Time vs.  $dI_F/dt$

### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 5);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

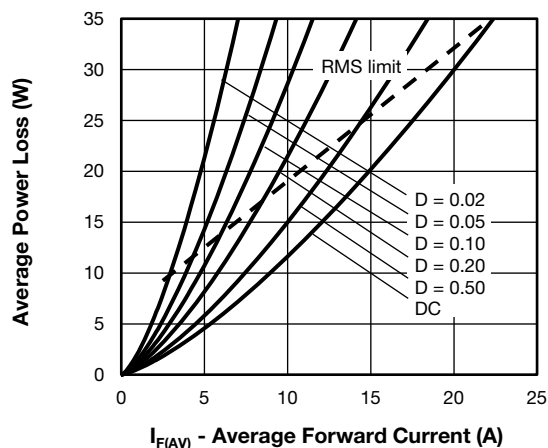


Fig. 7 - Forward Power Loss Characteristics

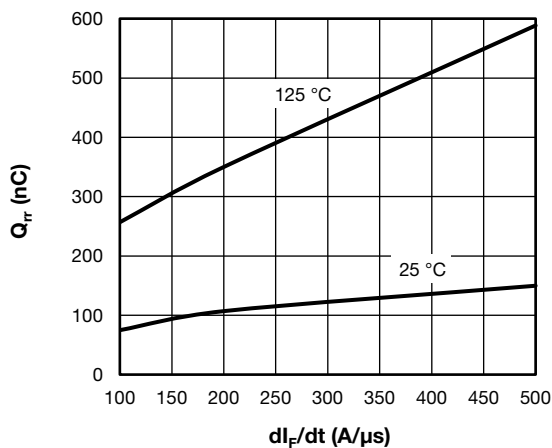
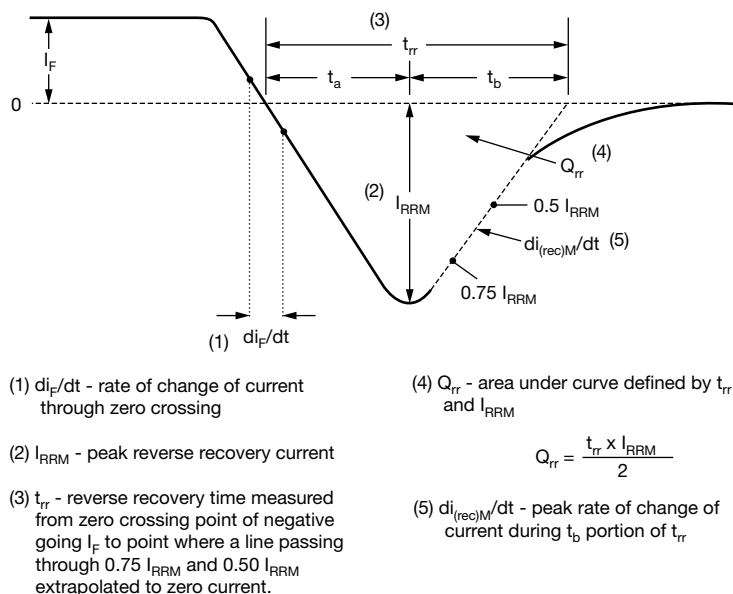


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$



### Fig. 9 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

|             |     |    |   |   |   |    |   |    |
|-------------|-----|----|---|---|---|----|---|----|
| Device code | VS- | 16 | E | D | H | 06 | H | M3 |
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7 | 8  |

- 1 - Vishay Semiconductors product
- 2 - Current rating (16 A)
- 3 - Circuit configuration:  
E = single die
- 4 - D = SMPD package
- 5 - Process type,  
H = hyperfast recovery
- 6 - Voltage code (06 = 600 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-16EDH06HM3/I <sup>(1)</sup> | 2000              | 2000                   | 13" diameter plastic tape and reel |

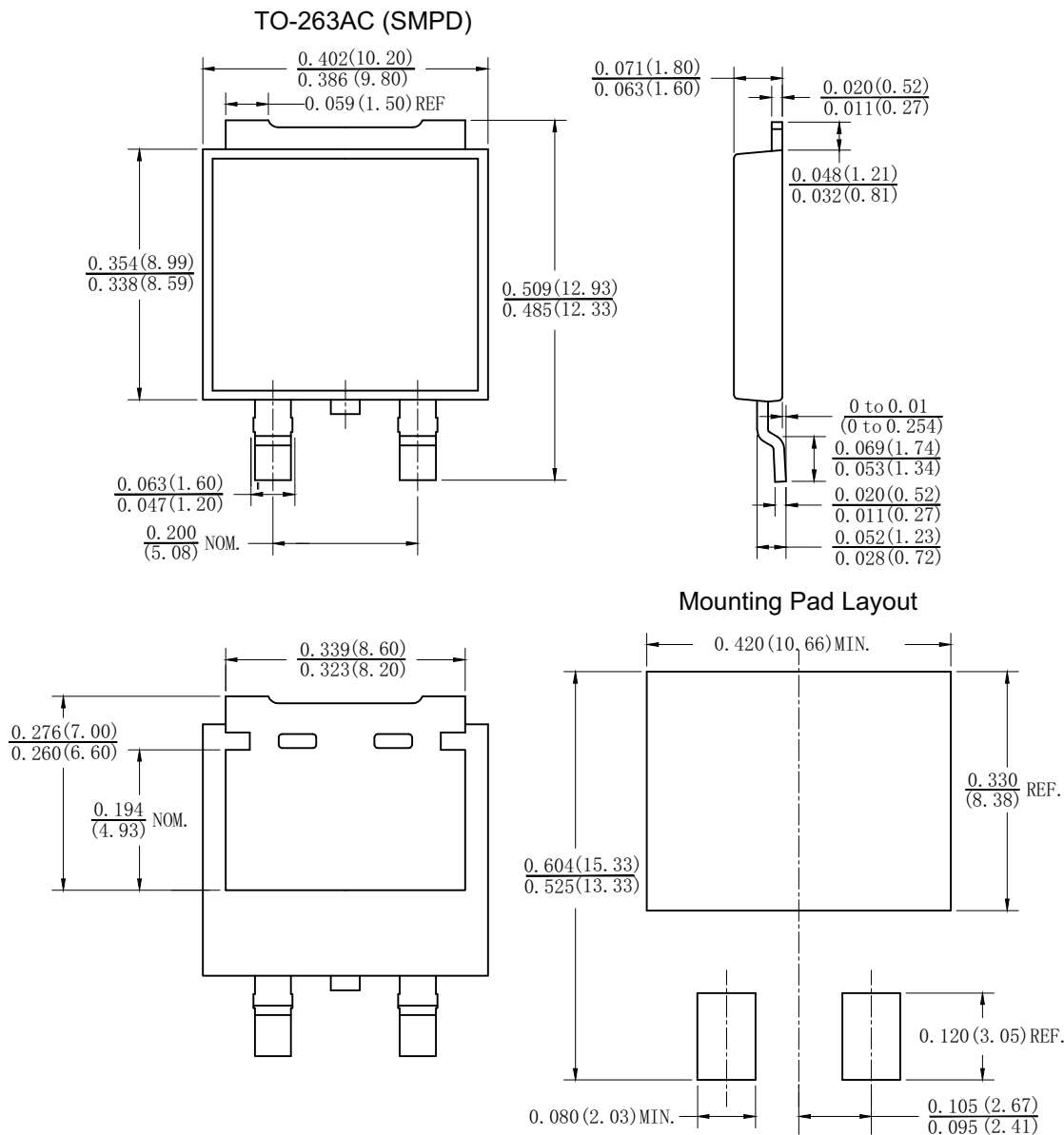
### Note

(1) AEC-Q101 qualified

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95604">www.vishay.com/doc?95604</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95566">www.vishay.com/doc?95566</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a> |

## TO-263AC (SMPD)

**DIMENSIONS** in inches (millimeters)





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