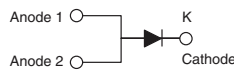
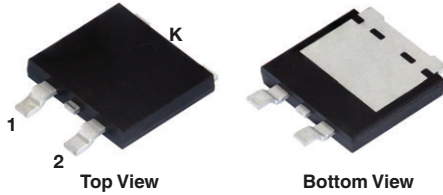


# Hyperfast Rectifier, 16 A FRED Pt<sup>®</sup>

## eSMP<sup>®</sup> 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 °C
Package	SMPD (TO-263AC)
Circuit configuration	Single

### FEATURES

- Hyperfast recovery time, reduced  $Q_{rr}$ , and soft recovery
- 175 °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 °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)

AUTOMOTIVE GRADE


**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	$I_{F(AV)}$ <sup>(1)</sup>	$T_C = 127\text{ }^\circ\text{C}$	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 <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 1 A, di <sub>F</sub> /dt = 50 A/μs, V <sub>R</sub> = 30 V	-	30	-	ns
		I <sub>F</sub> = 0.5 A, I <sub>R</sub> = 1 A, I <sub>rr</sub> = 0.25 A	-	-	30	
		T <sub>J</sub> = 25 °C	-	43	-	
		T <sub>J</sub> = 125 °C	-	92	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	-	7.7	-	A
		T <sub>J</sub> = 125 °C	-	13.8	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	-	150	-	μC
		T <sub>J</sub> = 125 °C	-	600	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-55	-	+175	°C
Thermal resistance, junction to mount	R <sub>thJM</sub>		-	1.2	1.7	°C/W
Approximate weight				0.55		g
Marking device		Case style SMPD (TO-263AC)		16EDH06		

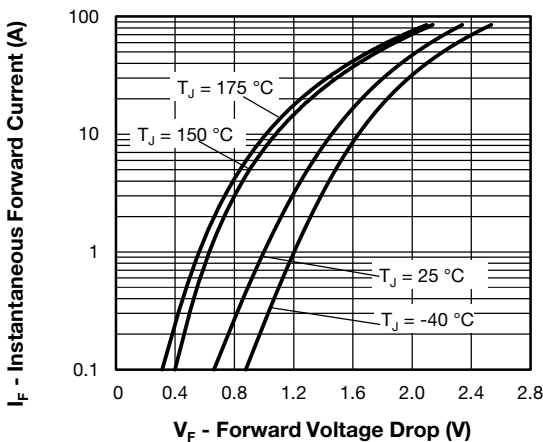


Fig. 1 - Typical Forward Voltage Drop Characteristics

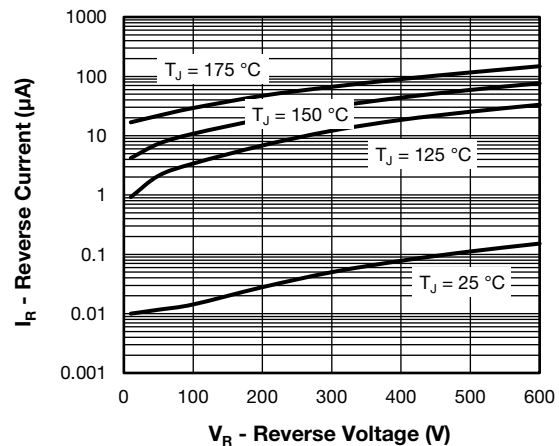


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

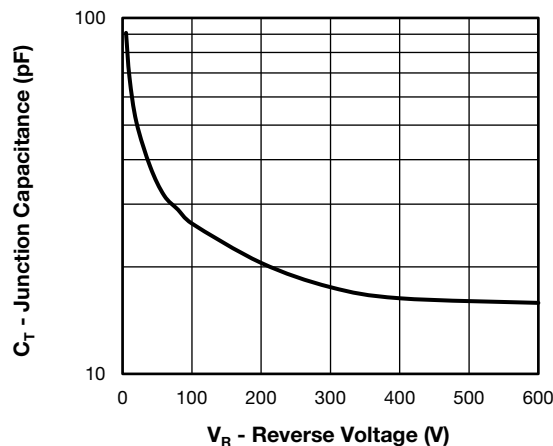


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

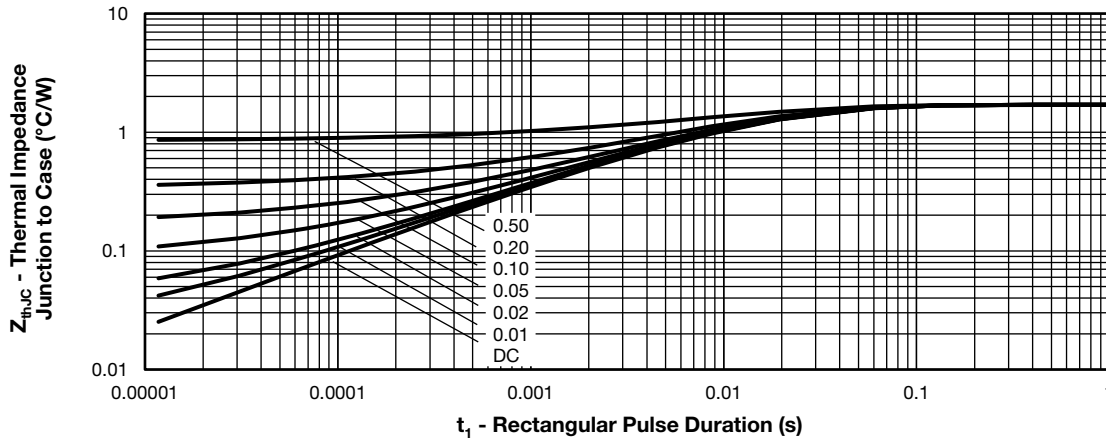


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

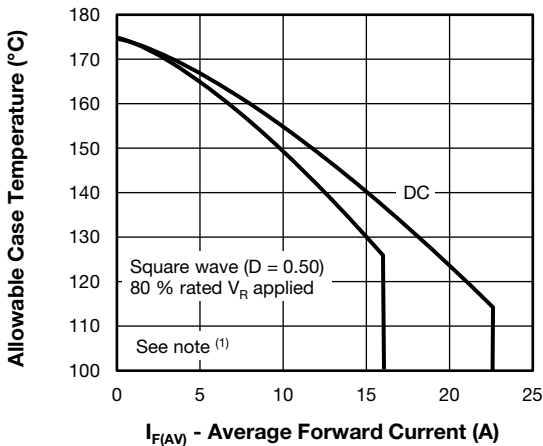


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

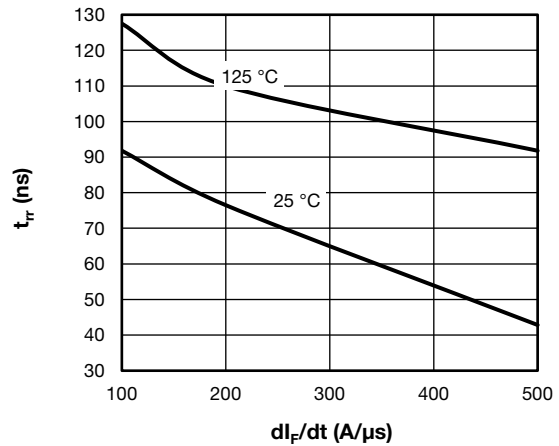


Fig. 6 - Typical Reverse Recovery Time vs.  $dI_F/dt$

**Note**

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

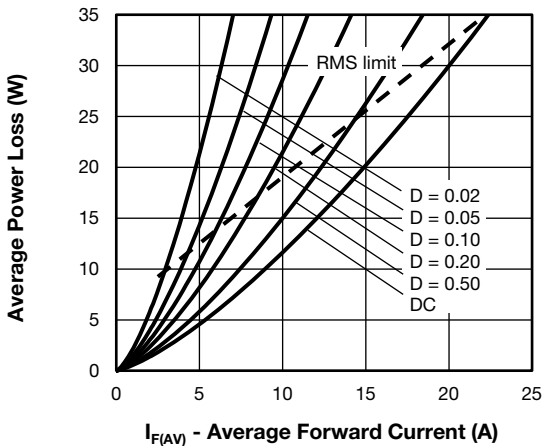


Fig. 7 - Forward Power Loss Characteristics

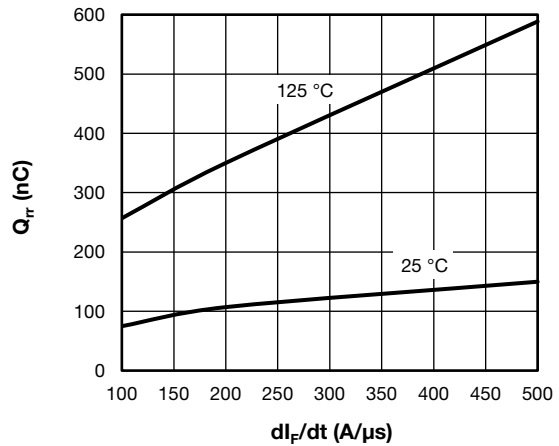
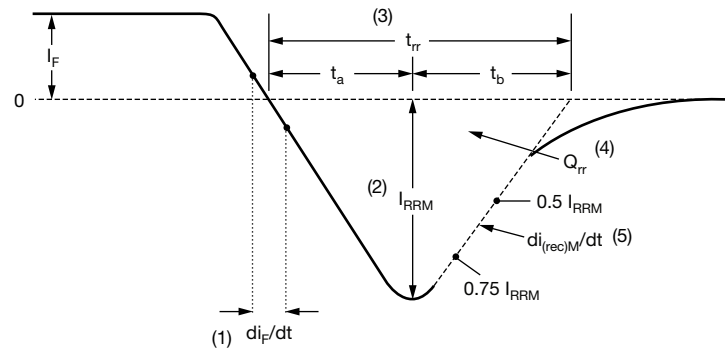


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$



(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	<b>VS-</b>	<b>16</b>	<b>E</b>	<b>D</b>	<b>H</b>	<b>06</b>	<b>H</b>	<b>M3</b>
	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

<b>ORDERING INFORMATION</b> (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**

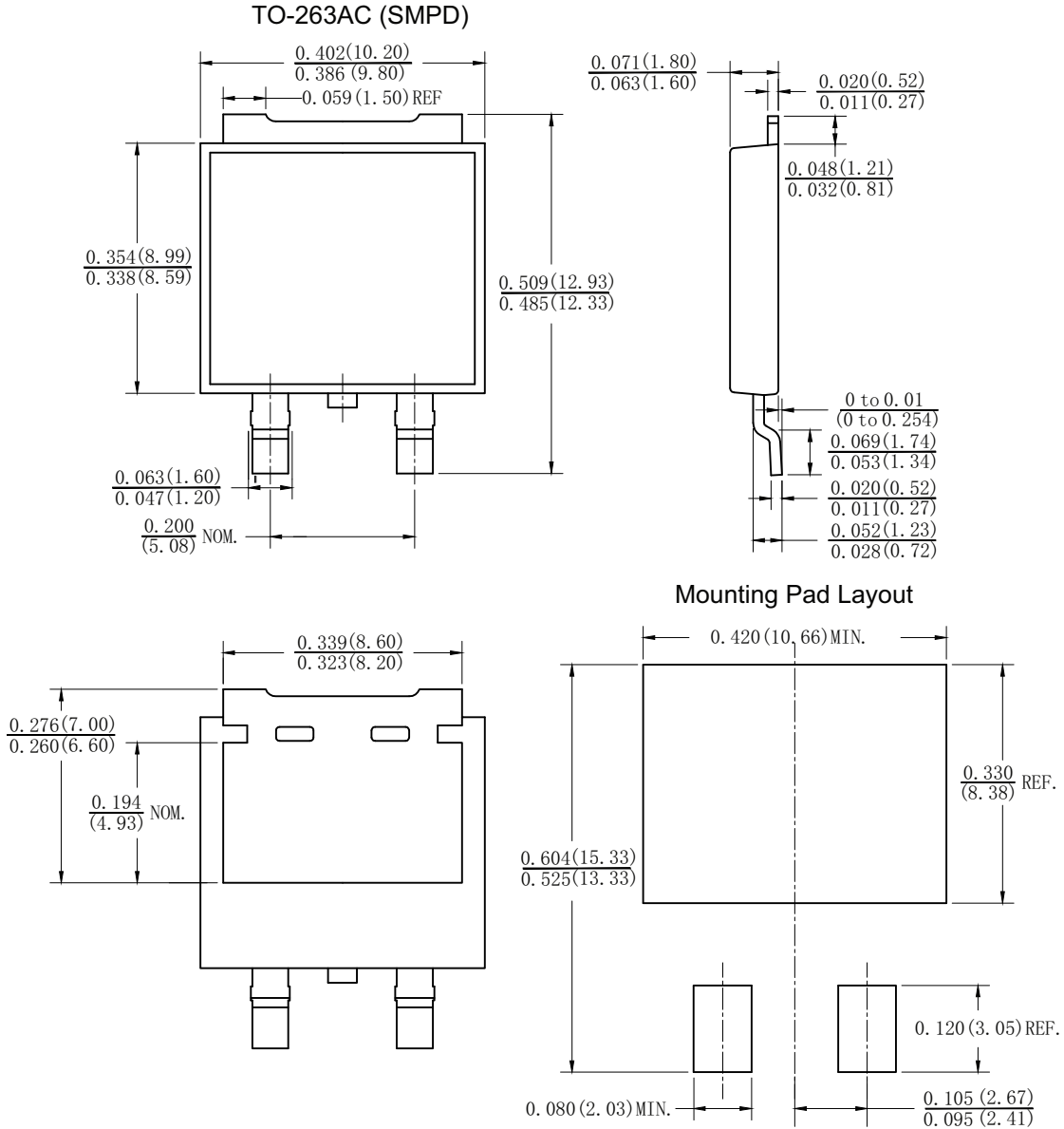
<sup>(1)</sup> AEC-Q101 qualified

<b>LINKS TO RELATED DOCUMENTS</b>	
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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