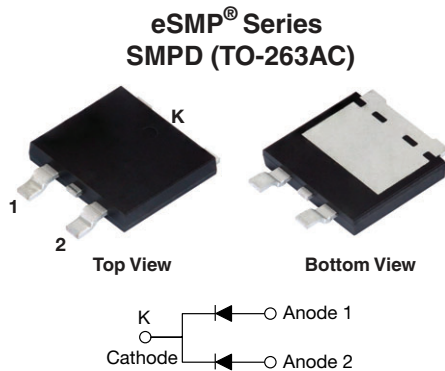


## Ultrafast Rectifier, 2 x 5 A FRED Pt<sup>®</sup>



### LINKS TO ADDITIONAL RESOURCES



3D Models

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	2 x 5 A
$V_R$	600 V
$V_F$ at $I_F$	1 V
$t_{rr}$	35 ns
$T_J$ max.	175 °C
Package	SMPD (TO-263AC)
Circuit configuration	Common cathode

### FEATURES

- Ultrafast recovery time, reduced  $Q_{rr}$ , and soft recovery
- 175 °C maximum operating junction temperature
- For PFC CRM / CCM, 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 ultrafast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast 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, 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	$I_{F(AV)}$	$T_{solder\ pad} = 153\text{ °C}$	10 5	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$ , 6 ms square pulse	110 60	

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\ \mu\text{A}$	600	-	-	V
Forward voltage, per diode	$V_F$	$I_F = 5\text{ A}$ $I_F = 5\text{ A}, T_J = 150\text{ °C}$	-	1.2 1	1.5 1.25	
Reverse leakage current, per diode	$I_R$	$V_R = V_R$ rated $T_J = 150\text{ °C}, V_R = V_R$ rated	-	-	3 15	$\mu\text{A}$
Junction capacitance, per diode	$C_T$	$V_R = 600\text{ V}$	-	6	-	pF



<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Reverse recovery time	$t_{rr}$	$I_F = 1\text{ A}$ , $di_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	35	-	ns	
		$I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$	-	-	35		
		$T_J = 25\text{ }^\circ\text{C}$	-	45	-		
		$T_J = 125\text{ }^\circ\text{C}$	-	70	-		
Peak recovery current	$I_{RRM}$	$I_F = 5\text{ A}$ , $di_F/dt = 500\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	7	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	10	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$T_J = 25\text{ }^\circ\text{C}$	-	160	-	nC
			$T_J = 125\text{ }^\circ\text{C}$	-	370	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
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, per diode junction to mount	$R_{thJM}$		-	2.4	3.3	$^\circ\text{C}/\text{W}$
Approximate weight			0.55			g
Marking device		Case style SMPD (TO-263AC)	10CDU06			

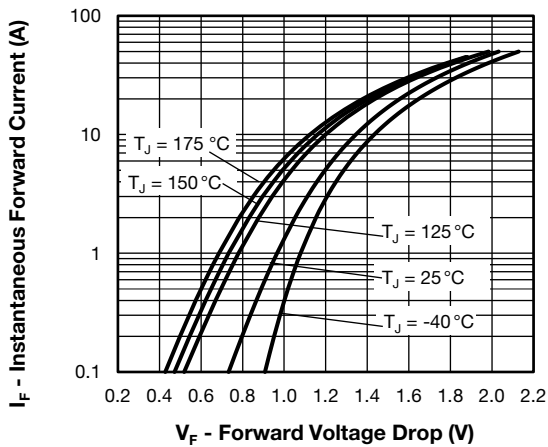


Fig. 1 - Typical Forward Voltage Drop Characteristics

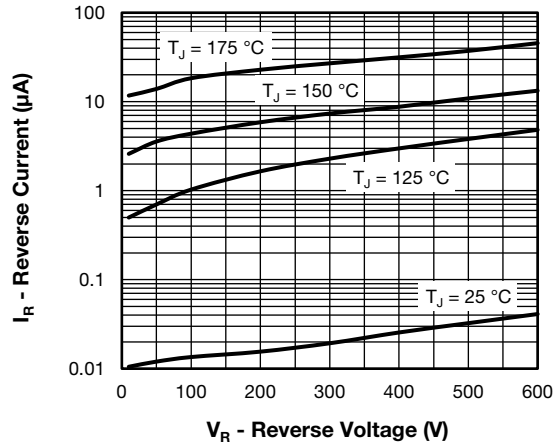


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

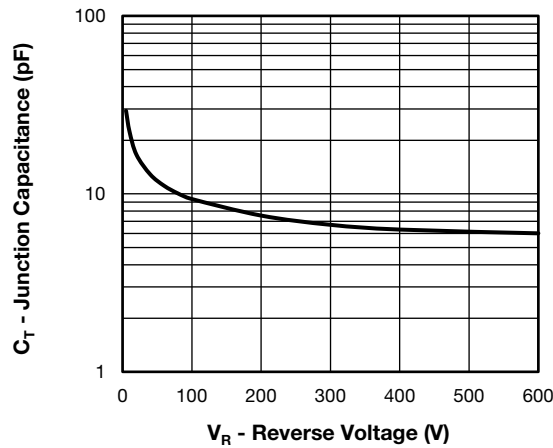


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

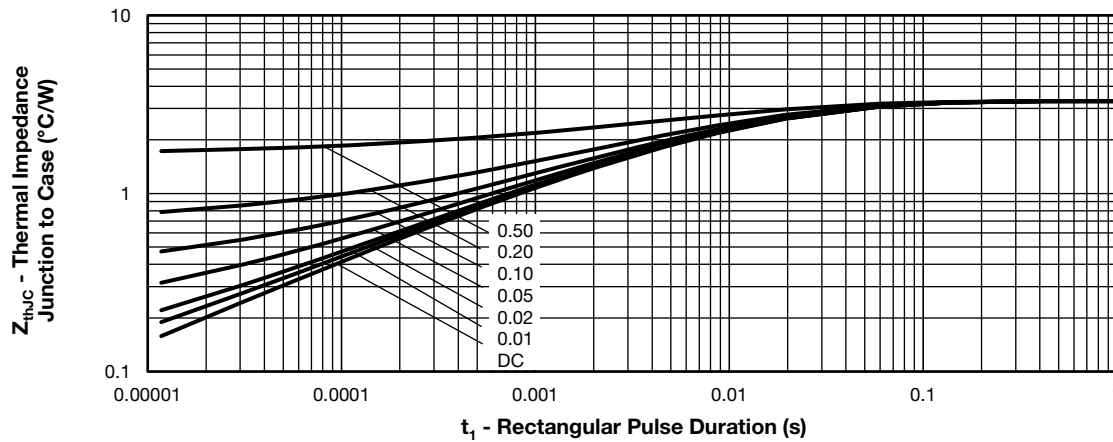


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

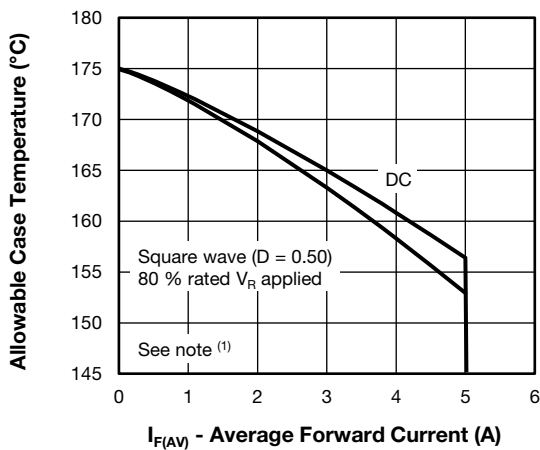


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

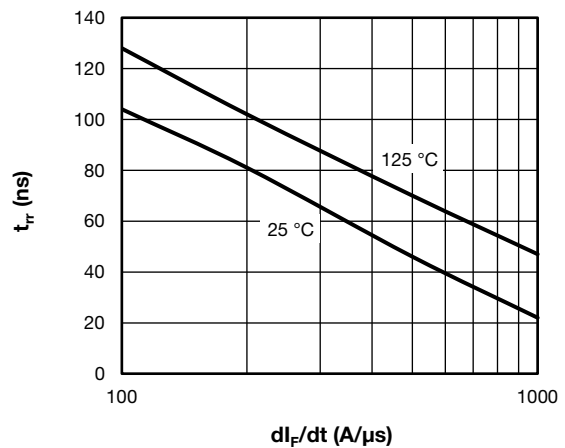


Fig. 6 - Typical Reverse Recovery Time vs.  $dI_F/dt$

**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  $V_R$

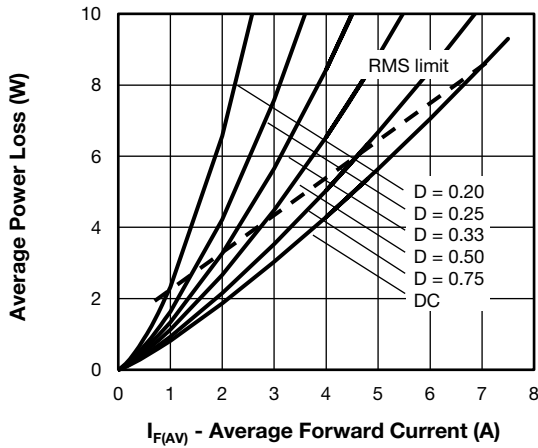


Fig. 7 - Forward Power Loss Characteristics

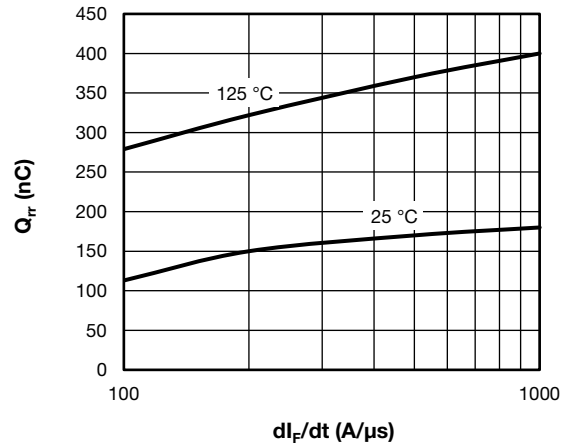
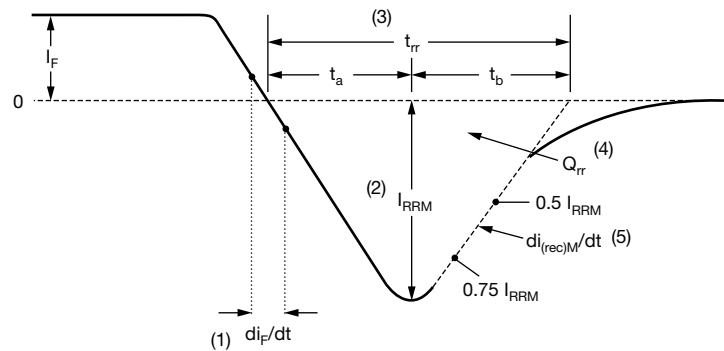


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$



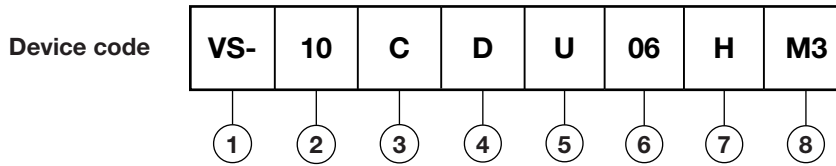
- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.
- (4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$
- (5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

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

Fig. 9 - Reverse Recovery Waveform and Definitions



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (10 A)
- 3** - Circuit configuration:  
C = common cathode
- 4** - D = SMPD package
- 5** - Process type,  
U = ultrafast 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-10CDU06HM3/I	2000	2000	13" diameter plastic tape and reel

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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