AUTOMOTIVE

RoHS

COMPLIANT

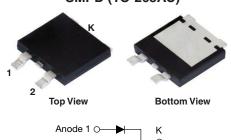
HALOGEN FREE



### Vishay Semiconductors

# Ultrafast Rectifier, 2 x 6 A FRED Pt®





Cathode

#### **LINKS TO ADDITIONAL RESOURCES**

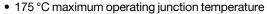
Anode 2 O



PRIMARY CHARACTERISTICS				
I <sub>F(AV)</sub>	2 x 6 A			
$V_{R}$	600 V			
V <sub>F</sub> at I <sub>F</sub>	0.89 V			
t <sub>rr</sub>	45 ns			
T <sub>J</sub> max.	175 °C			
Package	SMPD (TO-263AC)			
Circuit configuration	Common cathode			

#### **FEATURES**

 Ultrafast recovery time, reduced Q<sub>rr</sub>, and soft recovery



- 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 <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

#### **DESCRIPTION / APPLICATIONS**

State of the art ultrafast recovery rectifiers specifically 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, 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	per device	I <sub>F(AV)</sub>	T <sub>solder pad</sub> = 156 °C	12	А
	per diode			6	
Non-repetitive peak surge current	per device	I <sub>FSM</sub>	T <sub>J</sub> = 25 °C, 6 ms square pulse	200	A
	per diode			105	

<b>ELECTRICAL SPECIFICATIONS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_{R}$	I <sub>R</sub> = 100 μA	600		-	
Forward voltage, per diode	V <sub>F</sub>	I <sub>F</sub> = 6 A	-	1.05	1.3	V
		I <sub>F</sub> = 6 A, T <sub>J</sub> = 150 °C	-	0.89	1.1	
Reverse leakage current, per diode	I <sub>R</sub>	V <sub>R</sub> = V <sub>R</sub> rated	-	-	5	
		$T_J = 150 ^{\circ}\text{C},  V_R = V_R  \text{rated}$	-	20	150	μΑ
Junction capacitance, per diode	C <sub>T</sub>	V <sub>R</sub> = 600 V	-	8	-	pF



<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
		$I_F = 1 \text{ A}, dI_F/dt = 50$	$A/\mu s$ , $V_R = 30 V$	-	45	-	
Reverse recovery time		$I_F = 0.5 \text{ A}, I_R = 1 \text{ A}, I_{rr} = 0.25 \text{ A}$		-	-	60	no
	leverse recovery time t <sub>rr</sub>	T <sub>J</sub> = 25 °C		-	65	-	ns
		T <sub>J</sub> = 125 °C		-	90	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	$I_F = 6 \text{ A},$ $dI_F/dt = 500 \text{ A/µs},$ $V_R = 400 \text{ V}$	-	10	-	Α
		T <sub>J</sub> = 125 °C		-	15	-	
Reverse recovery charge Q <sub>rr</sub>	0	T <sub>J</sub> = 25 °C		-	350	-	nC
	T <sub>J</sub> = 125 °C	]	-	680	-	110	

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, per diode junction to mount	$R_{thJM}$		-	1.8	2.5	°C/W
Approximate weight				0.55		g
Approximate weight				0.02		oz.
Marking device		Case style SMPD (TO-263AC)	12CDU06			

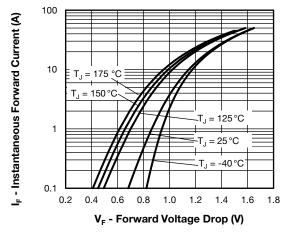


Fig. 1 - Typical Forward Voltage Drop Characteristics

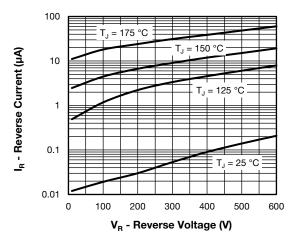


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

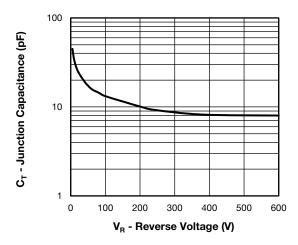


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

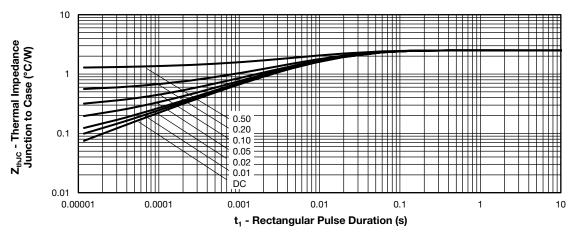


Fig. 4 - Maximum Thermal Impedance Z<sub>thJC</sub> Characteristics

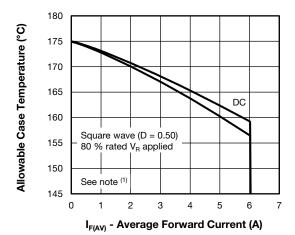


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

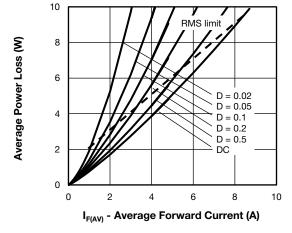


Fig. 6 - Forward Power Loss Characteristics

#### Note

 $<sup>\</sup>begin{array}{ll} \text{(1)} & \text{Formula used: } T_C = T_J - (\text{Pd} + \text{Pd}_{\text{REV}}) \times R_{\text{thJC}}; \\ \text{Pd} = & \text{forward power loss} = I_{\text{F(AV)}} \times V_{\text{FM}} \text{ at } (I_{\text{F(AV)}}/D) \text{ (see fig. 5)}; \\ \text{Pd}_{\text{REV}} = & \text{inverse power loss} = V_{\text{R1}} \times I_{\text{R}} \text{ (1 - D)}; I_{\text{R}} \text{ at } V_{\text{R1}} = \text{rated } V_{\text{R}} \\ \end{array}$ 



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## Vishay Semiconductors

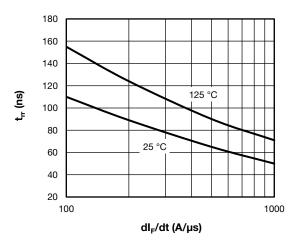


Fig. 7 - Typical Reverse Recovery Time vs. dl<sub>F</sub>/dt

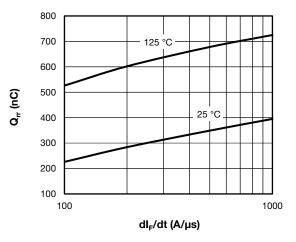
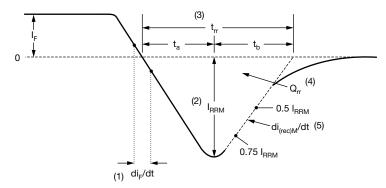


Fig. 8 - Typical Stored Charge vs. dl<sub>F</sub>/dt



- (1) di<sub>F</sub>/dt rate of change of current through zero crossing
- (2)  $I_{RRM}$  peak reverse recovery current
- (3) t<sub>rr</sub> reverse recovery time measured from zero crossing point of negative going I<sub>F</sub> to point where a line passing through 0.75 I<sub>RRM</sub> and 0.50 I<sub>RRM</sub> extrapolated to zero current.
- (4)  $\mathbf{Q}_{\rm rr}$  area under curve defined by  $\mathbf{t}_{\rm rr}$  and  $\mathbf{I}_{\rm RRM}$

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

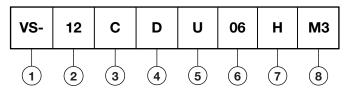
(5) di<sub>(rec)M</sub>/dt - peak rate of change of current during t<sub>b</sub> portion of t<sub>rr</sub>

Fig. 9 - Reverse Recovery Waveform and Definitions



#### **ORDERING INFORMATION TABLE**

**Device code** 



1 - Vishay Semiconductors product

2 - Current rating (12 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

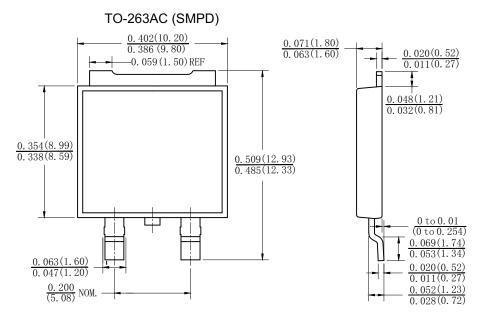
ORDERING INFORMATION (Example)						
PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION			
VS-12CDU06HM3/I	2000	2000	13" diameter plastic tape and reel			

LINKS TO RELATED DOCUMENTS					
Dimensions <u>www.vishay.com/doc?95604</u>					
Part marking information	www.vishay.com/doc?95566				
Packaging information	www.vishay.com/doc?88869				

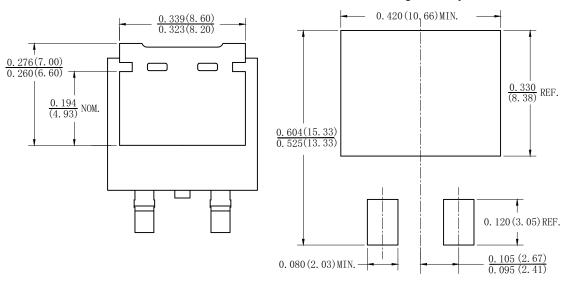


# TO-263AC (SMPD)

### **DIMENSIONS** in inches (millimeters)



#### Mounting Pad Layout





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Vishay

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