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### Vishay Semiconductors

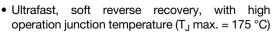
# **Insulated Ultrafast Rectifier Module, 280 A**



PRIMARY CHARACTERISTICS						
$V_{R}$	200 V					
I <sub>F(AV)</sub> per module at T <sub>C</sub> = 100 °C	280 A					
t <sub>rr</sub>	45 ns					
Type	Modules - diode FRED Pt®					
Package	SOT-227					

#### **FEATURES**

- Two fully independent diodes
- Fully insulated package





RoHS COMPLIANT

- Low forward voltage drop
- Optimized for power conversion: welding and industrial SMPS applications
- Easy to use and parallel
- Industry standard outline
- UL approved file E78996



 Material categorization: for definitions of compliance please see <a href="https://www.vishav.com/doc?99912">www.vishav.com/doc?99912</a>

#### **DESCRIPTION / APPLICATIONS**

The VS-UFB280FA20 insulated modules integrate two state of the art ultrafast recovery rectifiers in the compact, industry standard SOT-227 package. The diodes structure, and its life time control, provide an ultrasoft recovery current shape, together with the best overall performance, ruggedness and reliability characteristics.

These devices are thus intended for high frequency applications in which the switching energy is designed not to be predominant portion of the total energy, such as in the output rectification stage of welding machines, SMPS, DC/DC converters. Their extremely optimized stored charge and low recovery current reduce both over dissipation in the switching elements (and snubbers) and FMI/RFI.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_{R}$		200	V
Continuous forward current per diode	I <sub>F</sub>	T <sub>C</sub> = 95 °C	175	۸
Single pulse forward current per diode	I <sub>FSM</sub>	T <sub>C</sub> = 25 °C	1700	Α
Maximum power dissipation per module	$P_{D}$	T <sub>C</sub> = 95 °C	372	W
RMS isolation voltage	V <sub>ISOL</sub>	Any terminal to case, t = 1 min	2500	V
Operating junction and storage temperatures	T <sub>J</sub> , T <sub>Stg</sub>		-55 to +175	°C



<b>ELECTRICAL SPECIFICATIONS PER DIODE</b> (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	I <sub>R</sub> = 100 μA	200	-	-	
Forward voltage V <sub>FM</sub>	V	I <sub>F</sub> = 120 A	-	1.0	1.1	V
	I <sub>F</sub> = 120 A, T <sub>J</sub> = 175 °C	-	0.8	0.95		
Reverse leakage current		V <sub>R</sub> = V <sub>R</sub> rated	-	2	50	μA
Reverse leakage current	T <sub>J</sub> = 175 °C, V <sub>R</sub> = V <sub>R</sub> rated	-	0.65	2	mA	
Junction capacitance	C <sub>T</sub>	V <sub>R</sub> = 200 V	-	200	-	pF

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
	$I_F = 1.0 \text{ A}, dI_F/dt = 200 \text{ A/}\mu\text{s}, V_R = 30 \text{ A/}\mu\text{s}$		$= 200 \text{ A/}\mu\text{s}, V_{R} = 30 \text{ V}$	-	-	45	
Reverse recovery time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C	I <sub>F</sub> = 150 A dI <sub>F</sub> /dt = 200 A/μs V <sub>R</sub> = 160 V	-	34	-	ns
		T <sub>J</sub> = 125 °C		-	58	-	
Peak recovery current I <sub>RRM</sub>	1	T <sub>J</sub> = 25 °C		-	5.1	-	А
	IRRM	T <sub>J</sub> = 125 °C		-	10.3	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C		-	87	-	nC
		T <sub>J</sub> = 125 °C		-	300	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	D		-	-	0.43	
Junction to case, both leg conducting	$R_{thJC}$		-	-	0.215	°C/W
Case to heatsink	R <sub>thCS</sub>	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque		Torque to terminal	-	-	1.1 (9.7)	Nm (lbf.in)
Mounting torque		Torque to heatsink	-	-	1.8 (15.9)	Nm (lbf.in)
Case style				S	OT-227	

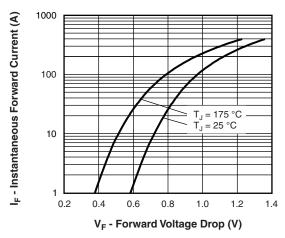


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Diode)

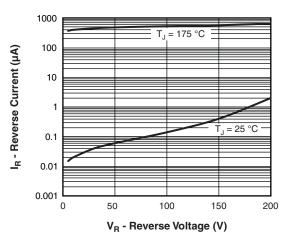


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

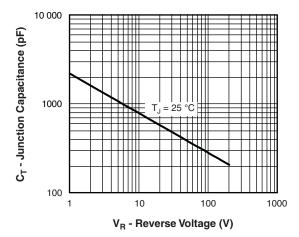


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

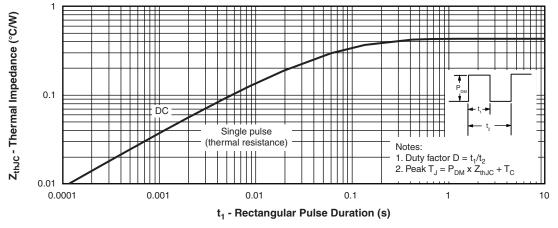
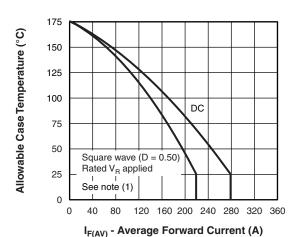


Fig. 4 - Maximum Thermal Impedance Z<sub>thJC</sub> Characteristics (Per Diode)



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Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

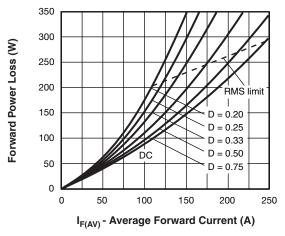


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

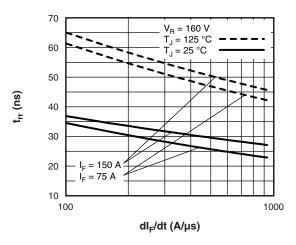


Fig. 7 - Typical Reverse Recovery Time vs. dl<sub>F</sub>/dt

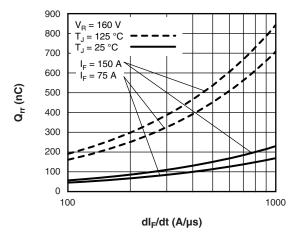


Fig. 8 - Typical Stored Charge vs. dl<sub>F</sub>/dt

#### Note

<sup>(1)</sup> Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{th,JC}$ ;  $Pd = forward power loss = I_{F(AV)} \times V_{FM} at (I_{F(AV)}/D)$  (see fig. 6);  $Pd_{REV} = inverse power loss = V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80 \%$  rated  $V_R$ 



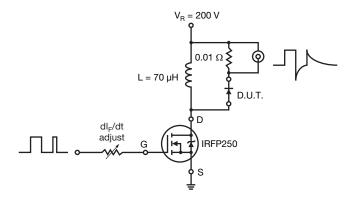
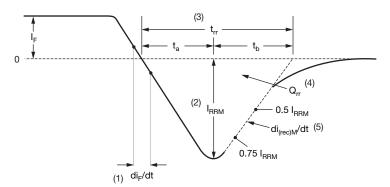


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

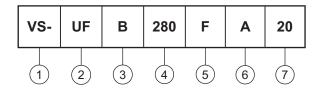
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$ 

Fig. 10 - Reverse Recovery Waveform and Definitions

#### **ORDERING INFORMATION TABLE**

**Device code** 



Vishay Semiconductors product

Ultrafast rectifier

Ultrafast Pt diffused

- Current rating (280 = 280 A)

5 - Circuit configuration (two separate diodes, parallel pin-out)

6 - Package indicator (SOT-227 standard insulated base)

7 - Voltage rating (20 = 200 V)

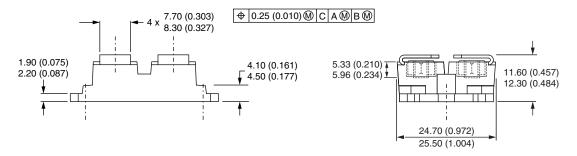
CIRCUIT CONFIC	CIRCUIT CONFIGURATION					
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING				
Two separate diodes, parallel pin-out	F	Lead Assignment  4 0 0 3 4 1 0 0 2 1				

LINKS TO RELATED DOCUMENTS				
Dimensions <u>www.vishay.com/doc?95423</u>				
Packaging information	www.vishay.com/doc?95425			

### SOT-227 Generation 2

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





#### Note

· Controlling dimension: millimeter



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