

Insulated Ultrafast Rectifier Module, 250 A



SOT-227

FEATURES

- Two fully independent diodes
- Fully insulated package
- Ultrafast, soft reverse recovery, with high operation junction temperature (T_J max. = 175 °C)
- Very 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 
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

DESCRIPTION

The VS-UFB250FA60 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 EMI/RFI.

PRODUCT SUMMARY	
V_R	600 V
$I_{F(AV)}$ ⁽¹⁾ per module at $T_C = 113$ °C	250 A
t_{rr}	166 ns
Type	Modules - Diode FRED Pt®
Package	SOT-227

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	V_R		600	V
Continuous forward current per diode	I_F ⁽¹⁾	$T_C = 90$ °C	168	A
Single pulse forward current per diode	I_{FSM}	$T_C = 25$ °C	1300	
Maximum power dissipation per module	P_D	$T_C = 90$ °C	395	W
RMS isolation voltage	V_{ISOL}	Any terminal to case, $t = 1$ minute	2500	V
Operating junction and storage temperatures	T_J, T_{Stg}		- 55 to 175	°C

Note

⁽¹⁾ Maximum continuous forward current must be limited to 100 A to do not exceed the maximum temperature of power terminals.

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V_{BR}	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Forward voltage	V_{FM}	$I_F = 100\text{ A}$	-	1.02	1.19	
		$I_F = 100\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$	-	0.87	1.02	
Reverse leakage current	I_{RM}	$V_R = V_R\text{ rated}$	-	1.3	50	μA
		$T_J = 175\text{ }^{\circ}\text{C}, V_R = V_R\text{ rated}$	-	-	4	mA
Junction capacitance	C_T	$V_R = 600\text{ V}$	-	72	-	pF

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}	$T_J = 25\text{ }^{\circ}\text{C}$	-	166	-	ns
		$T_J = 150\text{ }^{\circ}\text{C}$	-	291	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	41	-	A
		$T_J = 150\text{ }^{\circ}\text{C}$	-	64	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	3.5	-	μC
		$T_J = 150\text{ }^{\circ}\text{C}$	-	10.0	-	

$I_F = 50\text{ A}$
 $di_F/dt = 500\text{ A}/\mu\text{s}$
 $V_R = 200\text{ V}$

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	R_{thJC}		-	-	0.43	$^{\circ}\text{C}/\text{W}$
Junction to case, both leg conducting			-	-	0.215	
Case to heatsink	R_{thCS}	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque			-	-	1.3	Nm
Case style			SOT-227			

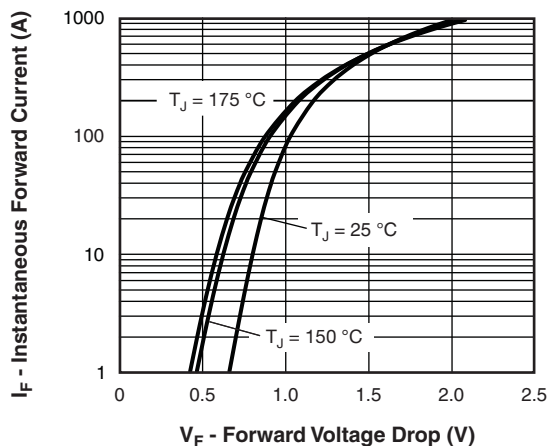


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

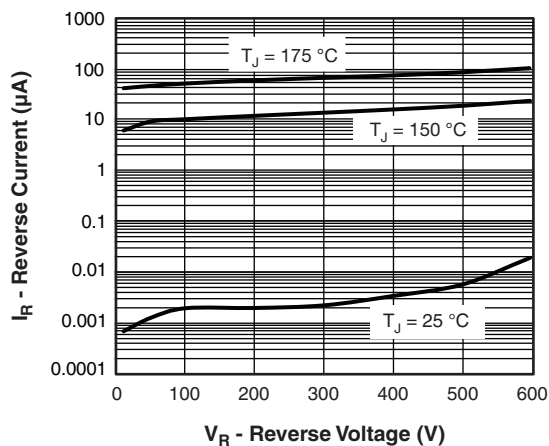


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

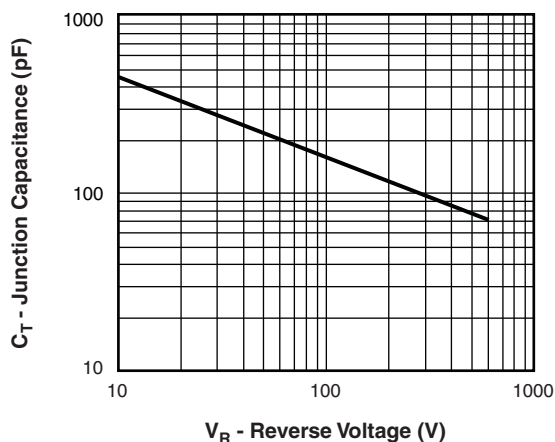


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

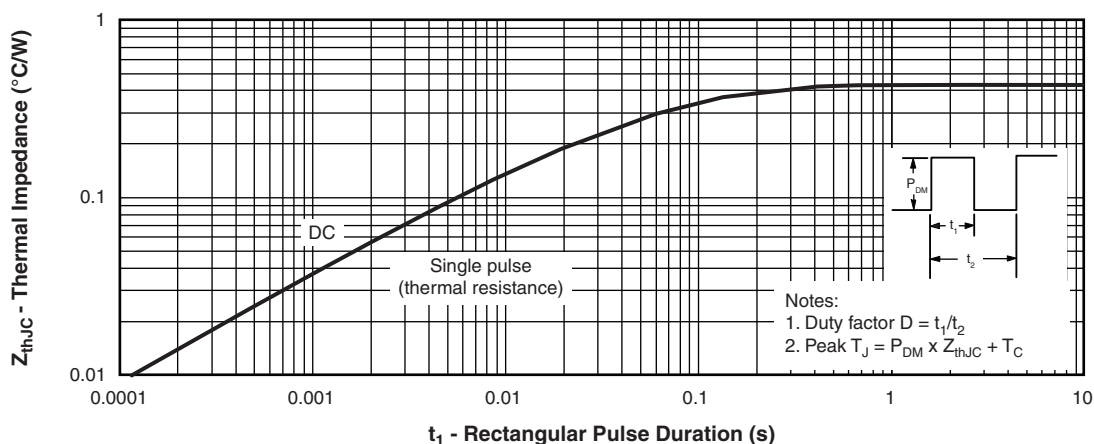


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

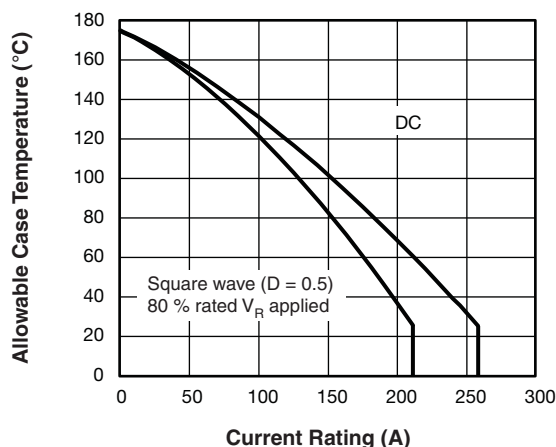


Fig. 5 - Maximum Current Rating (Per Leg)

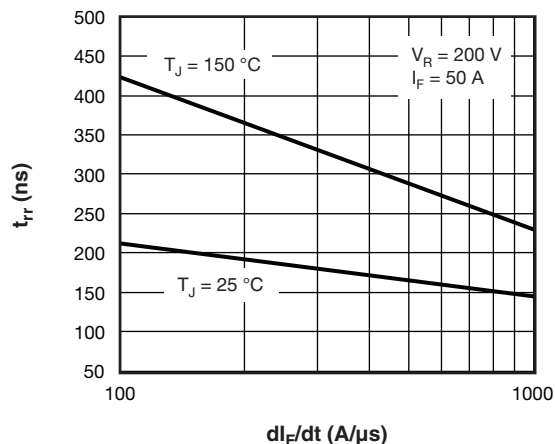
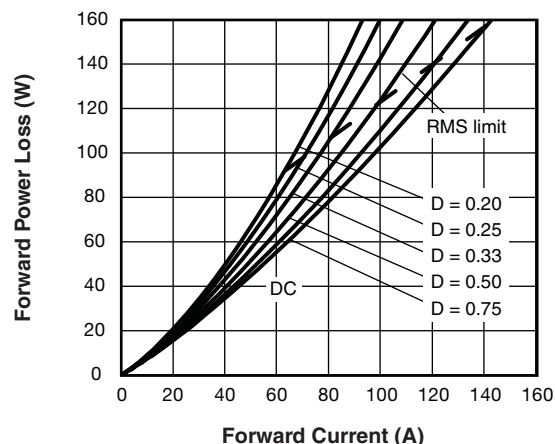
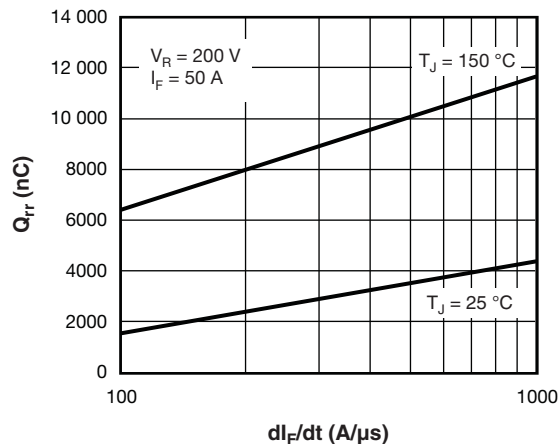
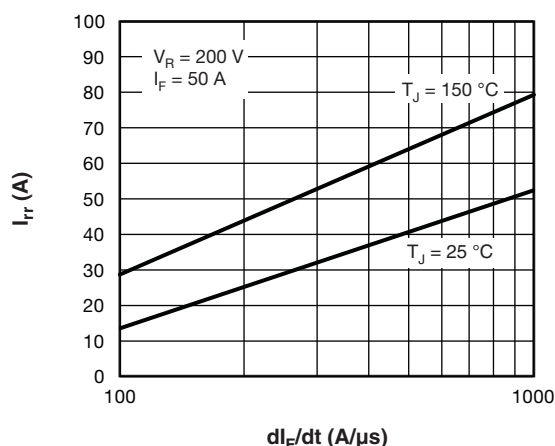

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt


Fig. 6 - Forward Power Loss Characteristics


Fig. 8 - Typical Recovery Charge vs. dI_F/dt

Fig. 9 - Typical Recovery Current 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. 6);
 P_{dREV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at $V_{R1} = 80\%$ rated V_R

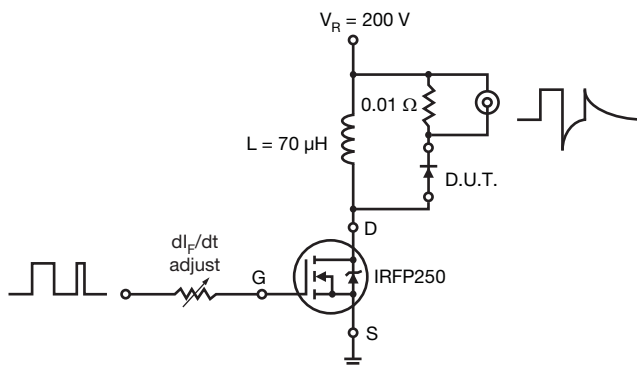
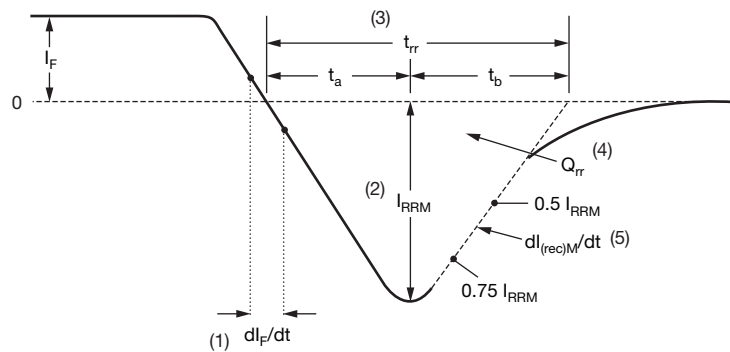


Fig. 10 - Reverse Recovery Parameter Test Circuit



- (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. 11 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

VS-	UF	B	250	F	A	60
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1 2 3 4 5 6 7

- 1** - Vishay Semiconductors product
- 2** - Ultrafast rectifier
- 3** - Ultrafast Pt diffused
- 4** - Current rating (250 = 250 A)
- 5** - Circuit configuration (2 separate diodes, parallel pin-out)
- 6** - Package indicator (SOT-227 standard insulated base)
- 7** - Voltage rating (60 = 600 V)

Circuit Configuration		
Circuit	Circuit Configuration Code	Circuit Drawing
2 separate diodes, parallel pin-out	F	The circuit drawing for configuration F consists of two parts. On the left is a schematic diagram showing two diodes connected in parallel. The input terminals are labeled 4 (top) and 1 (bottom), and the output terminals are labeled 3 (top) and 2 (bottom). On the right is a physical component drawing of a rectangular package with four hexagonal solder pads. The pads are arranged in two rows and two columns. The top-left pad is labeled 4, the top-right pad is labeled 3, the bottom-left pad is labeled 1, and the bottom-right pad is labeled 2. A circular feature is visible on the left side of the package.

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



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