


## Insulated Ultrafast Rectifier Module, 170 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](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

PRIMARY CHARACTERISTICS	
$V_R$	600 V
$I_{F(AV)}$ per module at $T_C = 76$ °C	170 A
$t_{rr}$	60 ns
Type	Modules - diode FRED Pt®
Package	SOT-227

### DESCRIPTION / APPLICATIONS

The VS-UFB170FA60 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.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		600	V
Continuous forward current per diode	$I_F$	$T_C = 90$ °C	94	A
Single pulse forward current per diode	$I_{FSM}$	$T_C = 25$ °C	850	
Maximum power dissipation per module	$P_D$	$T_C = 90$ °C	233	W
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1$ min	2500	V
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C



<b>ELECTRICAL SPECIFICATIONS PER DIODE</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	$I_R = 100\ \mu\text{A}$	600	-	-	V
Forward voltage, per leg	$V_{FM}$	$I_F = 50\ \text{A}$	-	1.02	1.19	
		$I_F = 50\ \text{A}, T_J = 175\text{ }^\circ\text{C}$	-	0.87	-	
		$I_F = 100\ \text{A}$	-	1.17	1.43	
Reverse leakage current, per leg	$I_{RM}$	$V_R = V_R$ rated	-	0.5	50	$\mu\text{A}$
		$T_J = 175\text{ }^\circ\text{C}, V_R = V_R$ rated	-	0.1	2	mA
Junction capacitance, per leg	$C_T$	$V_R = 600\ \text{V}$	-	43	-	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, per leg	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 1\ \text{A}, di_F/dt = 200\ \text{A}/\mu\text{s}, V_R = 30\ \text{V}$	-	60	-	ns
		$T_J = 25\text{ }^\circ\text{C}$	-	170	-	
		$T_J = 125\text{ }^\circ\text{C}$	-	270	-	
Peak recovery current, per leg	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	-	40	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	54	-	
Reverse recovery charge, per leg	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	-	3.4	-	$\mu\text{C}$
		$T_J = 125\text{ }^\circ\text{C}$	-	6.8	-	
Reverse recovery time, per leg	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	-	220	-	ns
		$T_J = 125\text{ }^\circ\text{C}$	-	300	-	
Peak recovery current, per leg	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	-	47	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	61	-	
Reverse recovery charge, per leg	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	-	5.2	-	$\mu\text{C}$
		$T_J = 125\text{ }^\circ\text{C}$	-	9.1	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	$R_{thJC}$		-	-	0.73	$^\circ\text{C}/\text{W}$
Junction to case, both leg conducting		-	-	0.365		
Case to heatsink	$R_{thCS}$	Flat, greased surface	-	0.10	-	
Weight			-	30	-	g
Mounting torque		Torque to terminal	-	-	1.1 (9.7)	Nm (lbf.in)
		Torque to heatsink	-	-	1.8 (15.9)	Nm (lbf.in)
Case style			SOT-227			

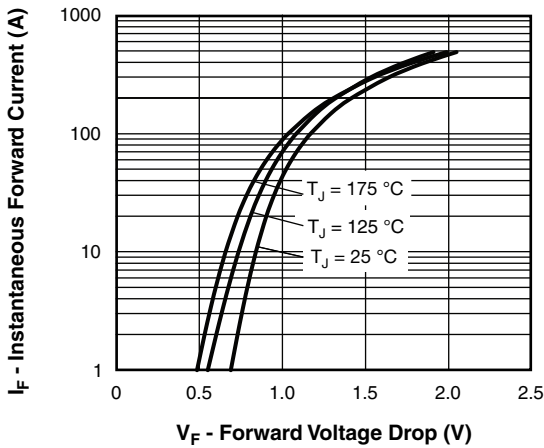


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Leg)

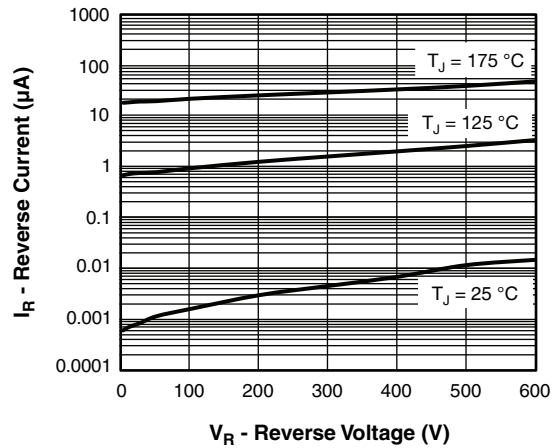


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

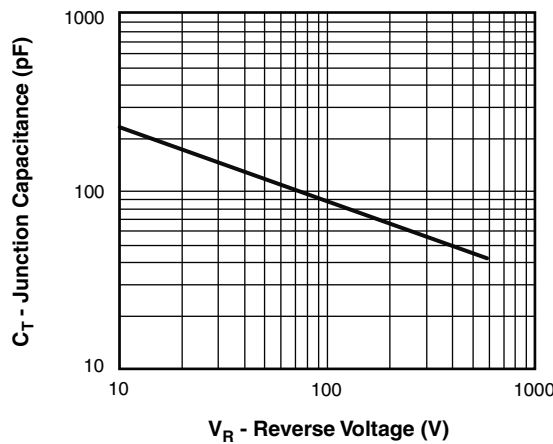


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

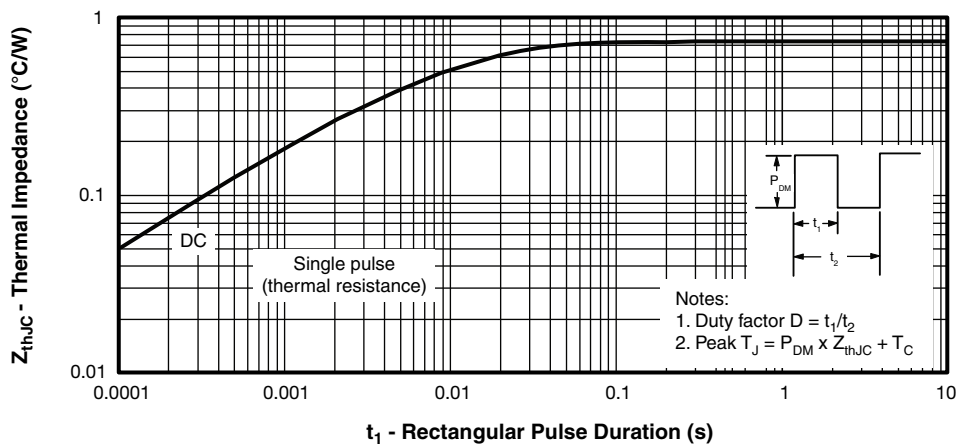


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

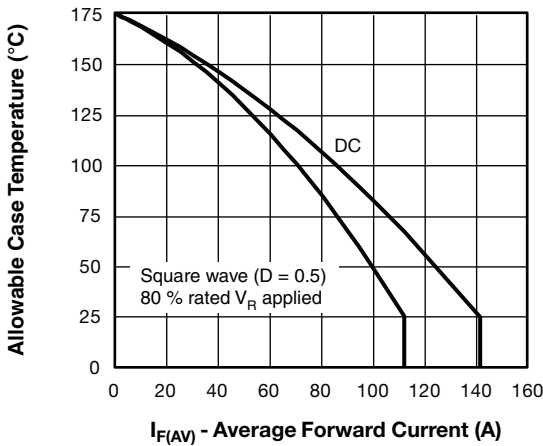


Fig. 5 - Allowable Case Temperature vs. Average Forward Current (Per Leg)

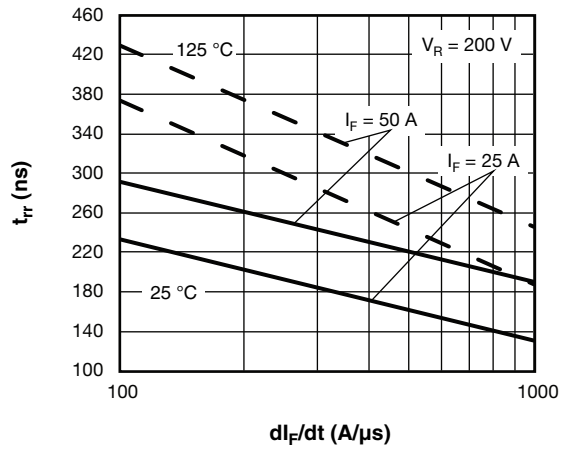


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$  (Per Leg)

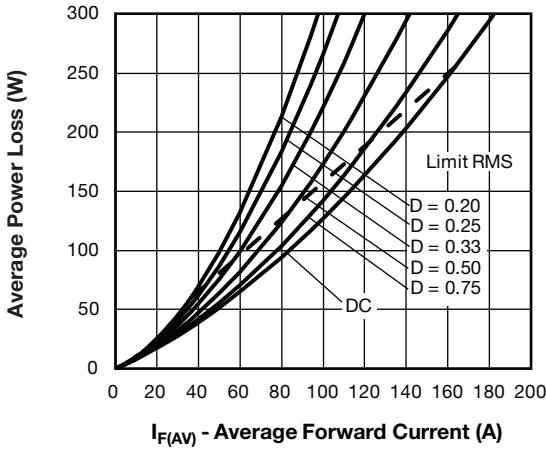


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

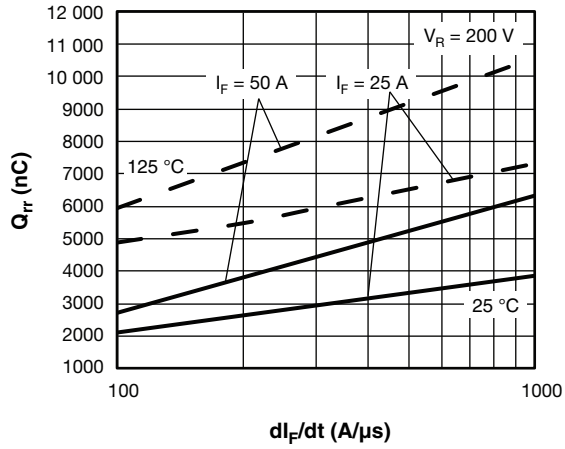


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$  (Per Leg)

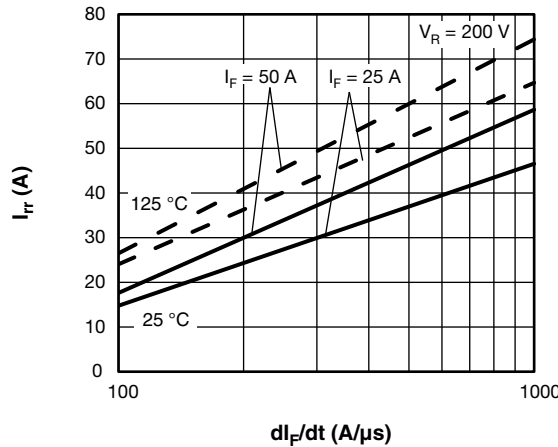


Fig. 9 - Typical Recovery Current vs.  $di_F/dt$  (Per Leg)

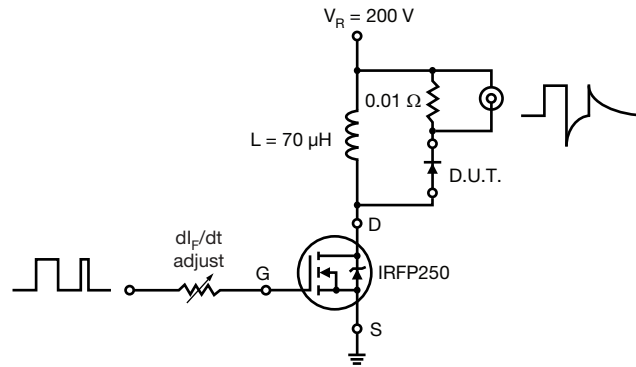
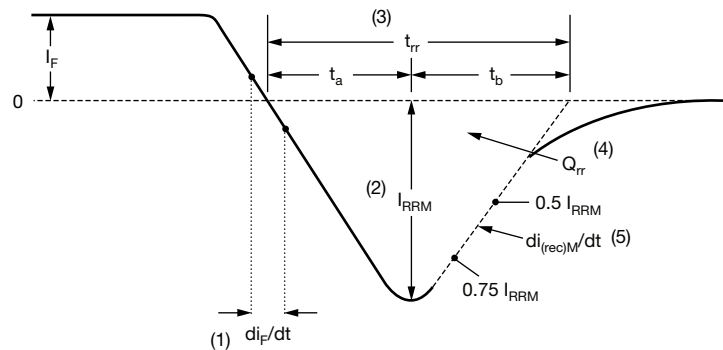


Fig. 10 - Reverse Recovery Parameter Test Circuit



- (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  $I_{RRM}$
- (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. 11 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>UF</b>	<b>B</b>	<b>170</b>	<b>F</b>	<b>A</b>	<b>60</b>
	①	②	③	④	⑤	⑥	⑦

- 1** - Vishay Semiconductors product
- 2** - Ultrafast rectifier
- 3** - Ultrafast FRED Pt<sup>®</sup> diffused
- 4** - Current rating (170 = 170 A)
- 5** - Circuit configuration (two 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
Two separate diodes, parallel pin-out	F	 

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95423">www.vishay.com/doc?95423</a>
Packaging information	<a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a>



## SOT-227 Generation 2

**DIMENSIONS** in millimeters (inches)



**Note**

- Controlling dimension: millimeter



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