




## Insulated Ultrafast Rectifier Module, 60 A



SOT-227

### FEATURES

- Two fully independent diodes
- Ceramic fully insulated package ( $V_{ISOL} = 2500 V_{AC}$ )
- Ultrafast reverse recovery
- Ultrasoft reverse recovery current shape
- Low forward voltage
- Optimized for power conversion: welding and industrial SMPS applications
- Industry standard outline
- Plug-in compatible with other SOT-227 packages
- Easy to assemble
- Direct mounting to heatsink
- UL approved file E78996 
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level



RoHS  
COMPLIANT

PRODUCT SUMMARY	
$V_R$	400 V
$I_{F(AV)}$ at $T_C = 90\text{ }^\circ\text{C}$	60 A
$t_{rr}$	46 ns

### DESCRIPTION

The UFB60FA40P insulated modules integrate two state of the art Vishay Semiconductors ultrafast recovery rectifiers in the compact, industry standard SOT-227 package. The planar structure of the diodes, and the platinum doping life time control, provide a 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	$V_R$		400	V
Continuous forward current per diode	$I_F$	$T_C = 90\text{ }^\circ\text{C}$	30	A
Single pulse forward current per diode	$I_{FSM}$	$T_C = 25\text{ }^\circ\text{C}$	250	
Maximum power dissipation per module	$P_D$	$T_C = 90\text{ }^\circ\text{C}$	64	W
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1\text{ minute}$	2500	V
Operating junction and storage temperatures	$T_J, T_{Stg}$		- 55 to 150	$^\circ\text{C}$

# UFB60FA40P



Vishay Semiconductors

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<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	$V_{BR}$	$I_R = 100\text{ }\mu\text{A}$	400	-	-	V
Forward voltage	$V_{FM}$	$I_F = 30\text{ A}$	-	1.13	1.39	
		$I_F = 30\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	0.93	1.07	
Reverse leakage current	$I_{RM}$	$V_R = V_R\text{ rated}$	-	-	100	$\mu\text{A}$
		$T_J = 150\text{ }^\circ\text{C}, V_R = V_R\text{ rated}$	-	-	1.0	mA
Junction capacitance	$C_T$	$V_R = 400\text{ V}$	-	68	-	pF

<b>DYNAMIC RECOVERY CHARACTERISTICS PER DIODE</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	-	32	46	ns
		$T_J = 25\text{ }^\circ\text{C}$	-	67	-	
		$T_J = 125\text{ }^\circ\text{C}$	-	120	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	-	6.8	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	15	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	-	228	-	nC
		$T_J = 125\text{ }^\circ\text{C}$	-	900	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	$R_{thJC}$		-	-	1.9	$^\circ\text{C}/\text{W}$
Junction to case, both leg conducting			-	-	0.95	K/W
Case to heatsink	$R_{thCS}$	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque			-	1.3	-	Nm



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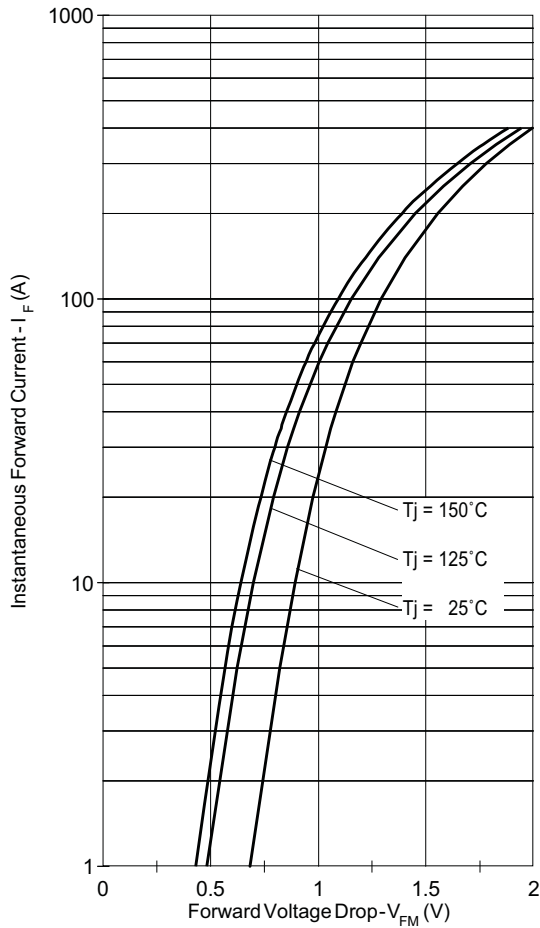


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Diode)

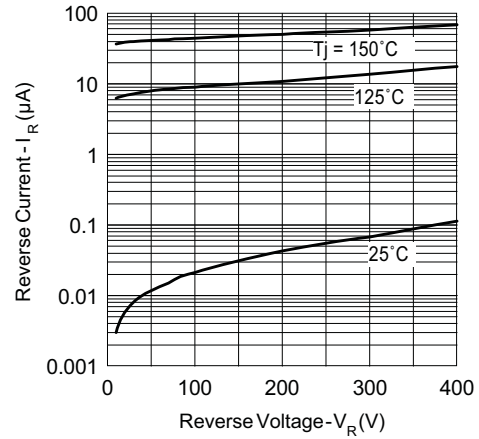


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

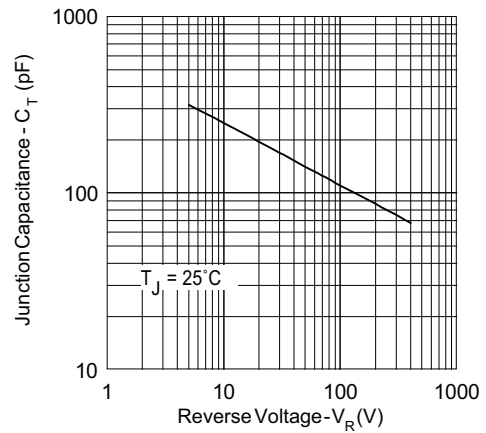


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

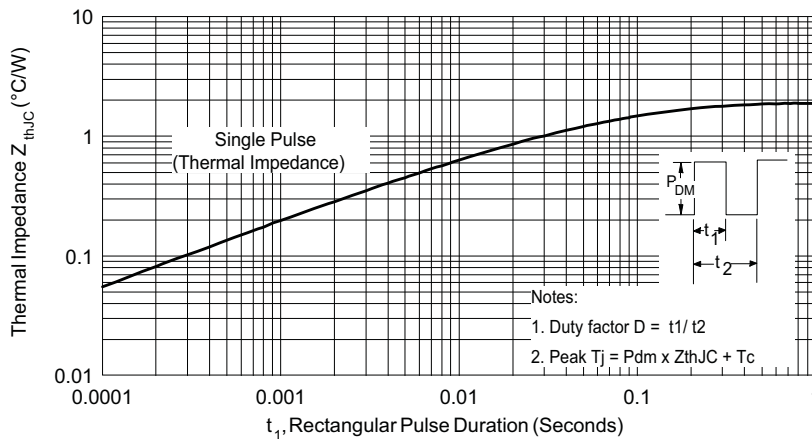


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Diode)

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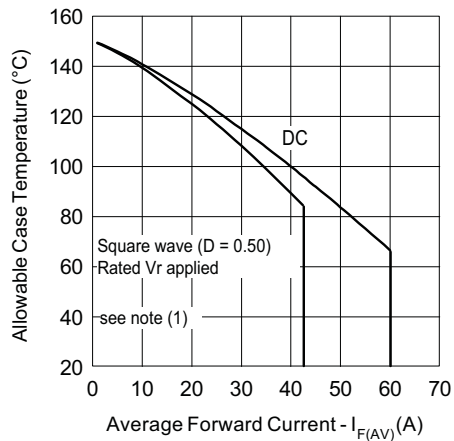


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

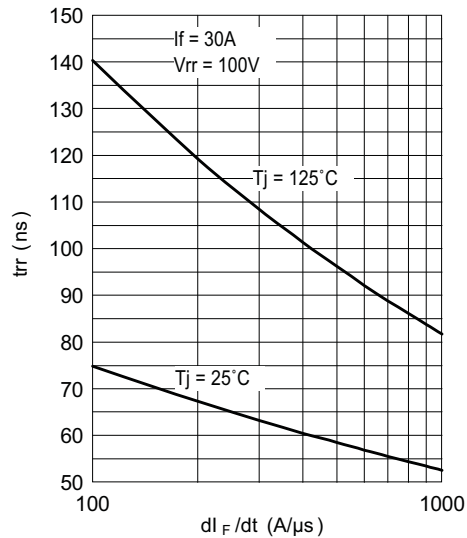


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

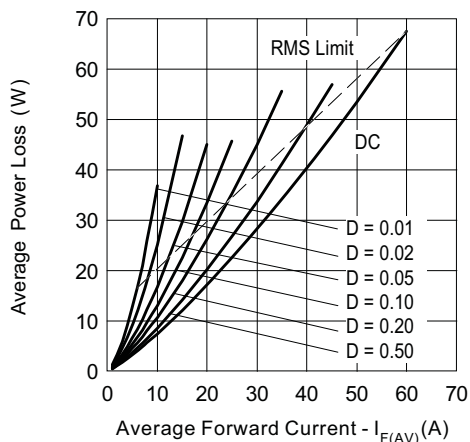


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

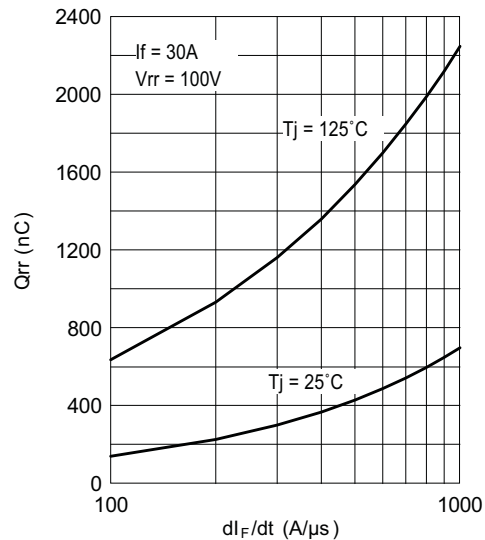


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{d_{REV}}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$



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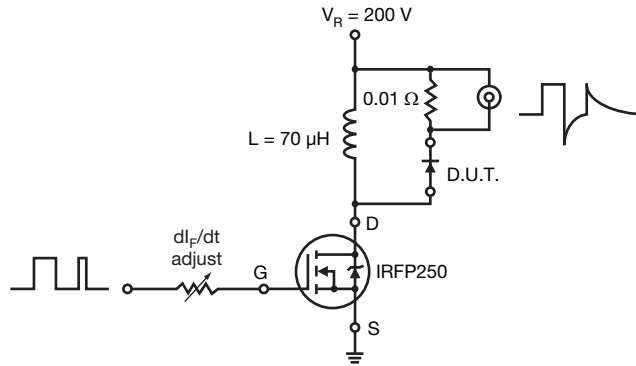
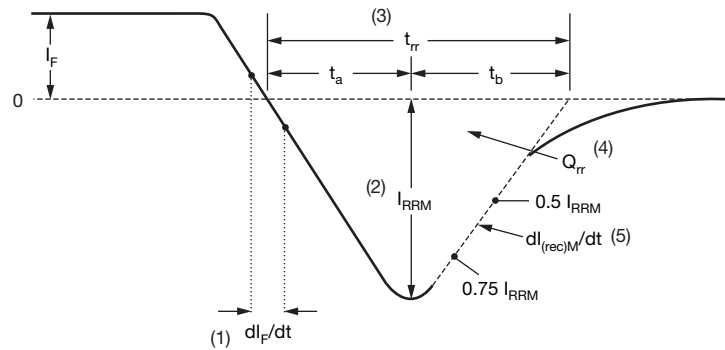


Fig. 9 - Reverse Recovery Parameter Test Circuit



- (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  $0.5 I_{RRM}$  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. 10 - Reverse Recovery Waveform and Definitions

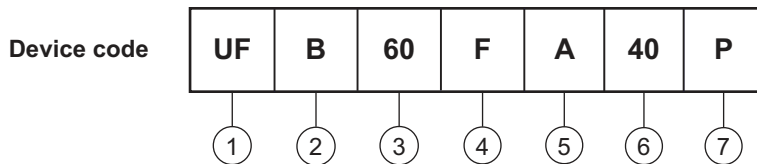
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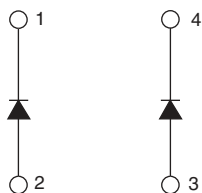


## ORDERING INFORMATION TABLE



- 1** - Ultrafast rectifier
- 2** - Ultrafast Pt diffused
- 3** - Current rating (60 = 60 A)
- 4** - Circuit configuration (2 separate diodes, parallel pin-out)
- 5** - Package indicator (SOT-227 standard isolated base)
- 6** - Voltage rating (40 = 400 V)
- 7** - P = Lead (Pb)-free

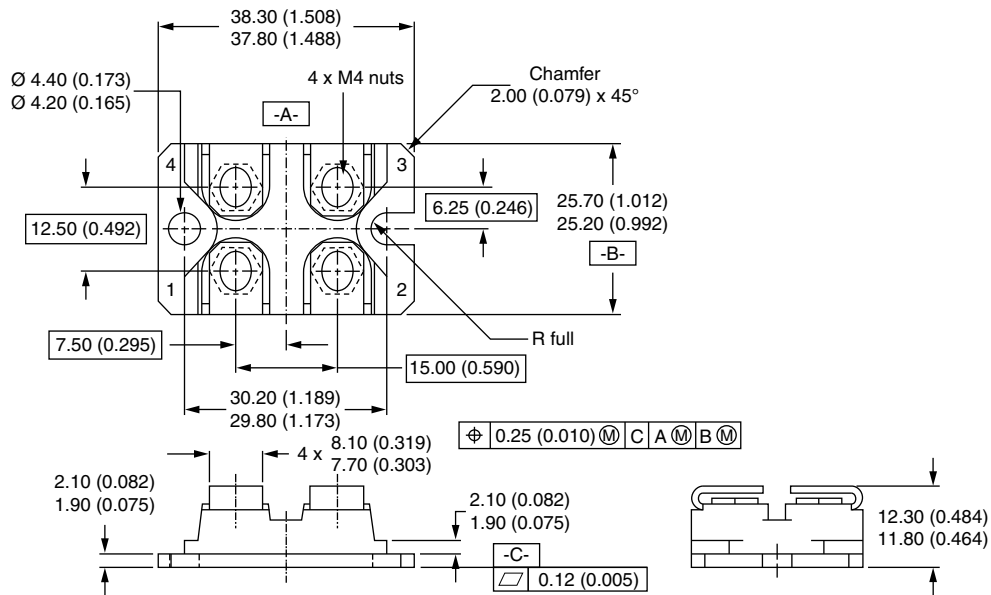
## CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95036">www.vishay.com/doc?95036</a>
Packaging information	<a href="http://www.vishay.com/doc?95037">www.vishay.com/doc?95037</a>

## SOT-227

**DIMENSIONS** in millimeters (inches)



**Notes**

- Dimensioning and tolerancing per ANSI Y14.5M-1982
- Controlling dimension: millimeter



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