

## FRED Pt<sup>®</sup> Gen 5

### Ultrafast Rectifier Diode, 600 V, 120 A




SOT-227



**RoHS**  
COMPLIANT

#### FEATURES

- Ultrafast and optimized  $Q_{rr}$
- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Electrically isolated base plate
- Large creepage distance between terminal
- Simplified mechanical designs, rapid assembly
- Designed and qualified for industrial level
- UL approved file E78996 
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

#### DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, the VS-U5FH120FA60 is the right choice for high frequency converters, both soft switched / resonant. The semiconductor in the SOT-227 package is isolated from the copper base plate, allowing for common heatsinks and compact assemblies to be built.

These modules are specifically designed to improve efficiency of PFC and output rectification stages of EV / HEV battery charging stations, booster stage of solar inverters, and UPS applications, these devices are perfectly matched to operate with MOSFETs or high speed IGBTs.

#### PRIMARY CHARACTERISTICS

$V_R$	600 V
$V_F$ (typical) at 60 A, per diode	1.36 V
$t_{rr}$ (typical) at 60 A, per diode	67 ns
$I_{F(DC)}$ per module at $T_C = 115\text{ °C}$	120 A
Type	Modules - diode, FRED Pt <sup>®</sup>
Package	SOT-227
Circuit configuration	Two separate diodes, parallel pin-out

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		600	V
Continuous forward current per diode	$I_F$	$T_C = 115\text{ °C}$	60	A
Single pulse forward current per diode	$I_{FSM}$	$T_J = 25\text{ °C}$	485	
Maximum power dissipation per module	$P_D$	$T_C = 115\text{ °C}$	171	W
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1\text{ min}$	2500	V
Operating junction and storage temperature range	$T_J, T_{Stg}$		-55 to +175	°C

#### ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ 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	$V_{FM}$	$I_F = 60\text{ A}$	-	1.36	1.7	
		$I_F = 60\text{ A}, T_J = 150\text{ °C}$	-	1.14	-	
Reverse leakage current	$I_{RM}$	$V_R = 600\text{ V}$	-	0.3	40	$\mu\text{A}$
		$T_J = 125\text{ °C}, V_R = 600\text{ V}$	-	21	-	
		$T_J = 150\text{ °C}, V_R = 600\text{ V}$	-	90	-	

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	67	-	ns
		$T_J = 125\text{ }^{\circ}\text{C}$	-	88	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	19	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	37	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	0.6	-	$\mu\text{C}$
		$T_J = 125\text{ }^{\circ}\text{C}$	-	2.2	-	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$ , $f = 1\text{ MHz}$	-	46.2	-	pF

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance junction to case, per diode	$R_{thJC}$		-	-	0.70	$^{\circ}\text{C/W}$
Thermal resistance junction to case, per module			-	-	0.35	
Thermal resistance case to heatsink, per module	$R_{thCS}$	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque		Torque per diode	-	-	1.1 (9.7)	Nm (lbf.in)
		Torque to heatsink	-	-	1.8 (15.9)	Nm (lbf.in)
Case style			SOT-227			

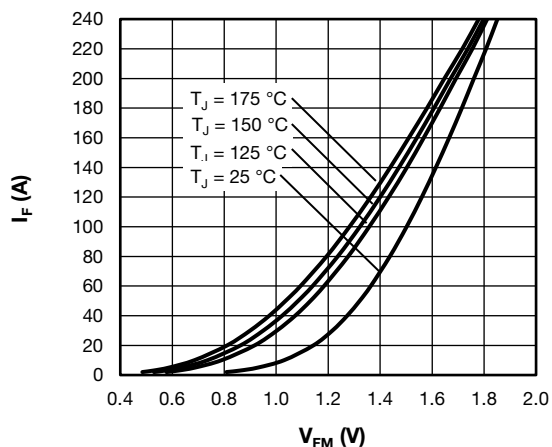


Fig. 1 - Typical Forward Voltage Drop Characteristics

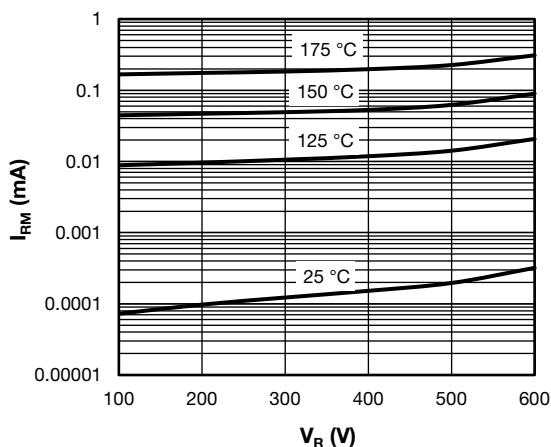


Fig. 2 - Typical Values of Reverse Current

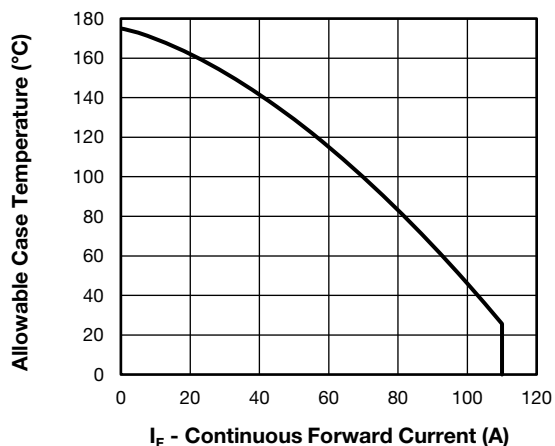


Fig. 3 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Diode)

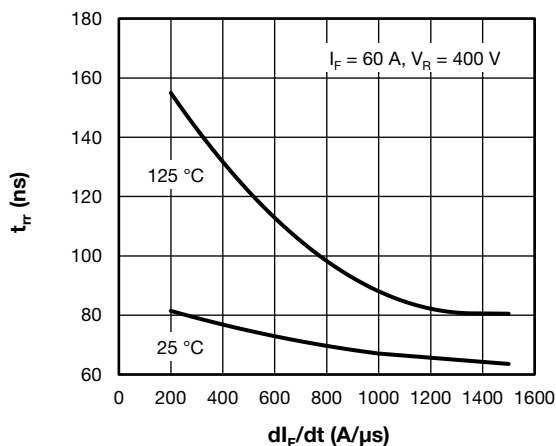


Fig. 6 - Diode Reverse Recovery Time vs.  $dI_F/dt$

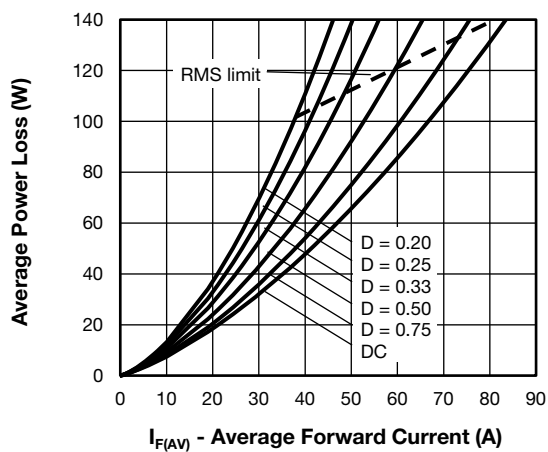


Fig. 4 - Average Power Loss vs. Average Forward Current

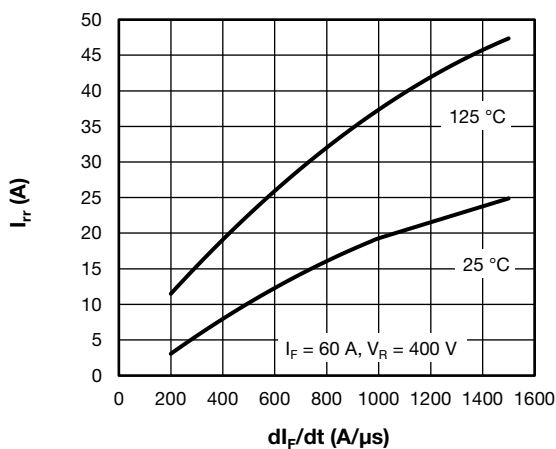


Fig. 7 - Diode Reverse Recovery Current vs.  $dI_F/dt$

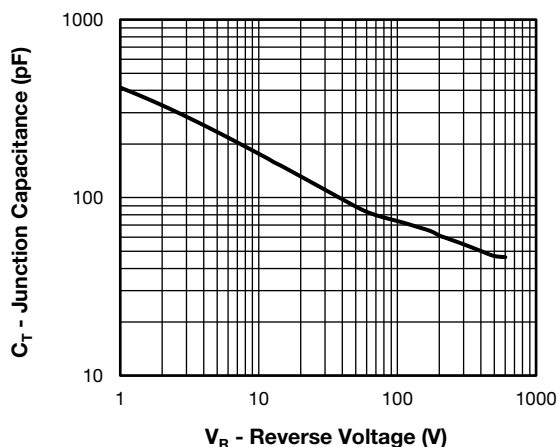


Fig. 5 - Typical Junction Capacitance vs. Reverse Voltage

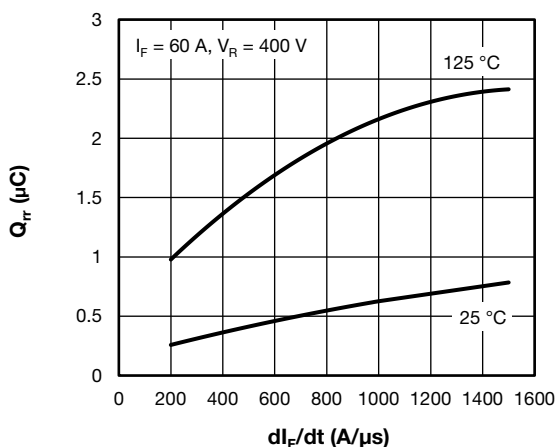


Fig. 8 - Diode Reverse Recovery Charge vs.  $dI_F/dt$

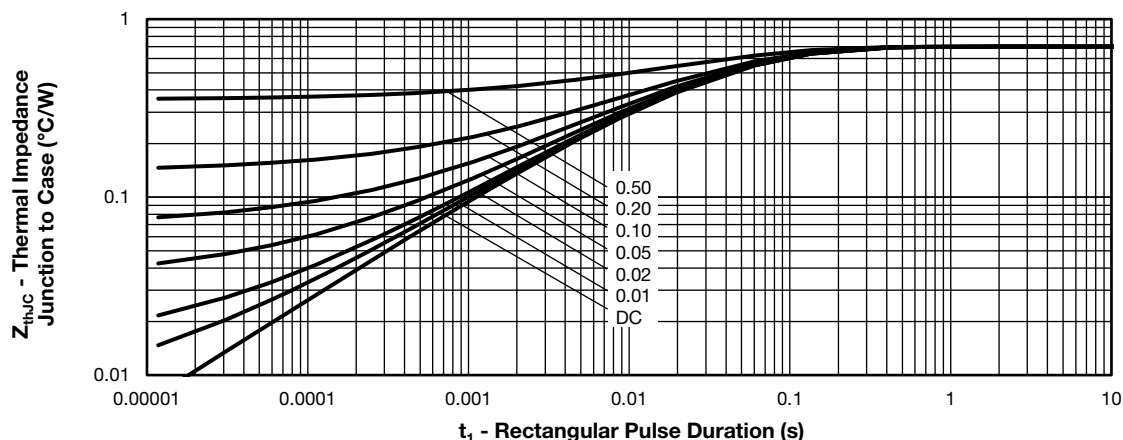


Fig. 9 - Maximum Thermal Impedance Junction to Case

## ORDERING INFORMATION TABLE

Device code

VS-	U5F	H	120	F	A	60
1	2	3	4	5	6	7

- 1** - Vishay Semiconductors product
- 2** - U5F = Gen 5 FRED Pt<sup>®</sup> family
- 3** - H = Ultrafast FRED Pt<sup>®</sup> diode
- 4** - Current rating per module (120 = 120 A)
- 5** - F = circuit configuration (two separate diodes, parallel pin-out)
- 6** - Package indicator (SOT-227 standard insulated base)
- 7** - Voltage rating (60 = 600 V)

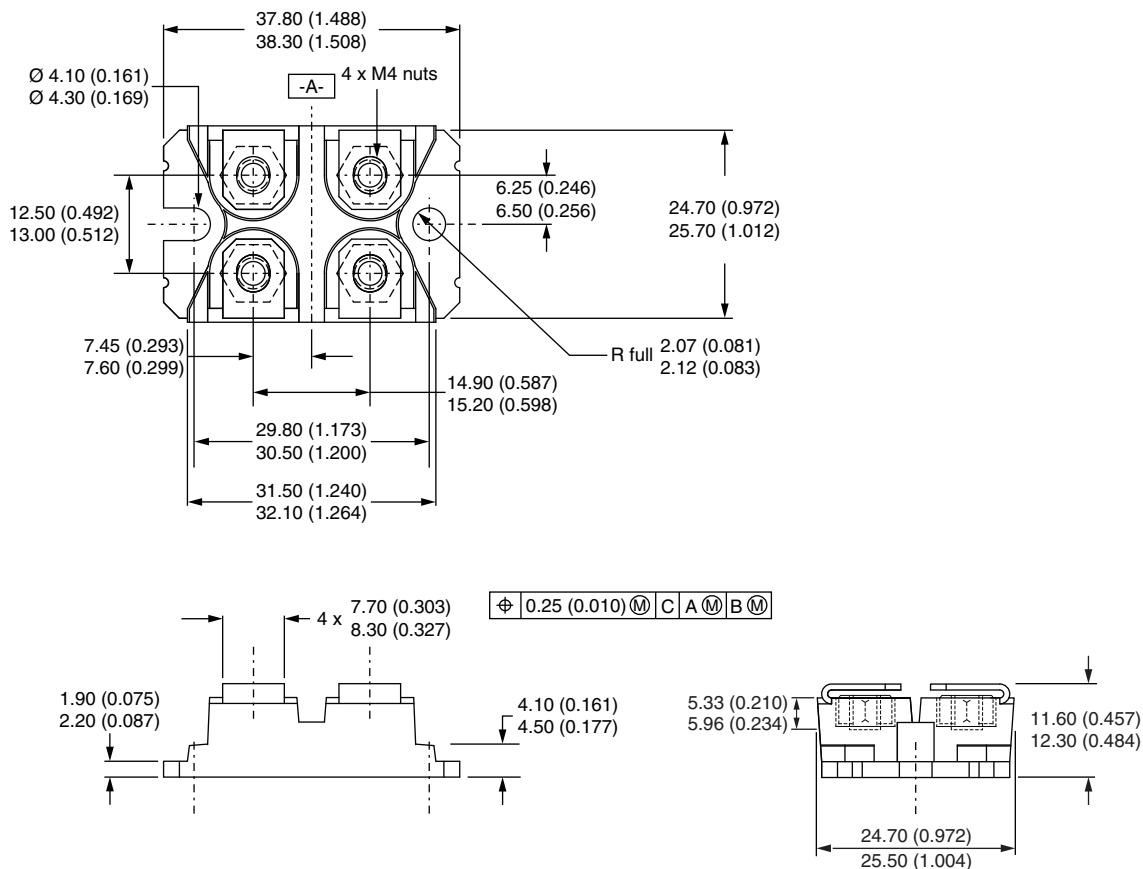
CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two separate diodes, parallel pin-out	F	<p>Lead Assignment</p>

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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