


# **FRED Pt® Gen 5** **Ultrafast Single Phase Bridge (Power Modules), 600 V, 30 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/doc299912](http://www.vishay.com/doc299912)

**DESCRIPTION / APPLICATIONS**

Featuring a unique combination of low conduction and switching losses, the VS-U5FH30BA60 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**

$V_{RRM}$	600 V
$I_O$ at $T_C = 131\text{ °C}$	30 A
$V_F$ (typical) at 30 A, per diode	1.6 V
$t_{rr}$ (typical) at 30 A, per diode	63 ns
Type	Modules - Bridge, Hyperfast
Package	SOT-227
Circuit configuration	Single phase bridge

**MAJOR RATINGS AND CHARACTERISTICS**

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_O$		30	A
	$T_C$	131	°C
$I_{FSM}$	50 Hz	290	A
	60 Hz	305	
$I^2t$	50 Hz	424	A²s
	60 Hz	387	
$V_{RRM}$		650	V
$T_J$		-55 to +175	°C

**ELECTRICAL SPECIFICATIONS**
**VOLTAGE RATINGS**

TYPE NUMBER	VOLTAGE CODE	$V_{RRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V
VS-U5FH30BA60	60	600	600

**ELECTRICAL SPECIFICATIONS** ( $T_J = 25\text{ }^{\circ}\text{C}$  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	$V_{FM}$	$I_F = 30\text{ A}$	-	1.6	2.1	
		$I_F = 30\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$	-	1.26	-	$\mu\text{A}$
Reverse leakage current	$I_{RM}$	$V_R = 600\text{ V}$	-	0.1	30	
		$T_J = 125\text{ }^{\circ}\text{C}, V_R = 600\text{ V}$	-	14	-	
		$T_J = 150\text{ }^{\circ}\text{C}, V_R = 600\text{ V}$	-	53	-	V
RMS isolation voltage base plate	$V_{ISOL}$	$f = 50\text{ Hz}$ , any terminal to case, $t = 1\text{ min}$	2500	-	-	

**FORWARD CONDUCTION**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum DC output current at case temperature	I <sub>O</sub>	Resistive or inductive load		30	A
				131	°C
Maximum peak, one-cycle non-repetitive forward current	I <sub>FSM</sub>	t = 10 ms	No voltage reapplied	291	A
		t = 8.3 ms		305	
		t = 10 ms	100 % V <sub>RRM</sub> reapplied	245	
		t = 8.3 ms		256	
Maximum I <sup>2</sup> t for fusing	I <sup>2</sup> t	t = 10 ms	No voltage reapplied	424	A <sup>2</sup> s
		t = 8.3 ms		387	
		t = 10 ms	100 % V <sub>RRM</sub> reapplied	300	
		t = 8.3 ms		274	
Maximum I <sup>2</sup> √t for fusing	I <sup>2</sup> √t	I <sup>2</sup> t for time t <sub>x</sub> = I <sub>2</sub> √t x √t <sub>x</sub> ; 0.1 ≤ t <sub>x</sub> ≤ 10 ms, V <sub>RRM</sub> = 0 V		4244	kA <sup>2</sup> √s
Low level of threshold voltage, per leg	V <sub>F(TO)1</sub>	(16.7 % x π x I <sub>F(AV)</sub> ) < I < π x I <sub>F(AV)</sub> , T <sub>J</sub> = T <sub>J</sub> maximum		0.96	V
Low level value of forward slope resistance	r <sub>f1</sub>			25.02	mΩ
High level of threshold voltage, per leg	V <sub>F(TO)2</sub>	(I > π x I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum		1.31	V
High level value of forward slope resistance	r <sub>f2</sub>			23.71	mΩ
Maximum forward voltage, per diode	V <sub>FM</sub>	I <sub>F</sub> = 30 A		2.1	V

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$ $T_J = 125\text{ }^{\circ}\text{C}$	-	57	-	ns
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$ $T_J = 125\text{ }^{\circ}\text{C}$	-	12	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$ $T_J = 125\text{ }^{\circ}\text{C}$	-	0.3	-	$\mu\text{C}$
			-	0.9	-	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$ , $f = 1\text{ MHz}$	-	29	-	pF

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance junction to case, per diode	$R_{thJC}$		-	-	1.39	$^{\circ}\text{C/W}$
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			

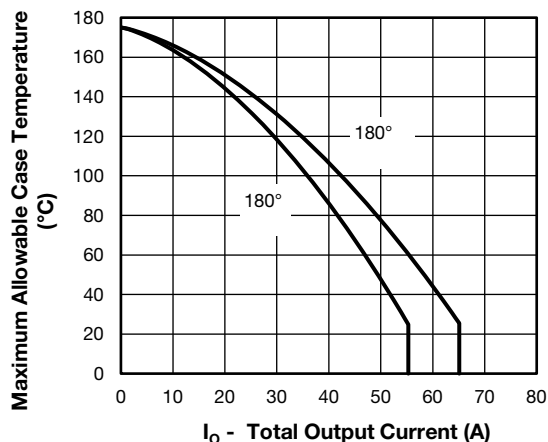


Fig. 1 - Current Rating Characteristics

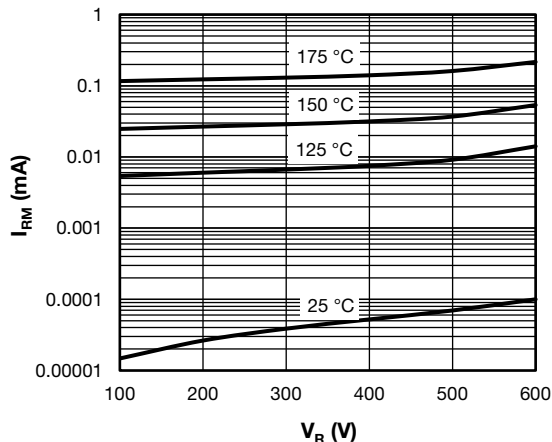


Fig. 4 - Typical Values of Reverse Current

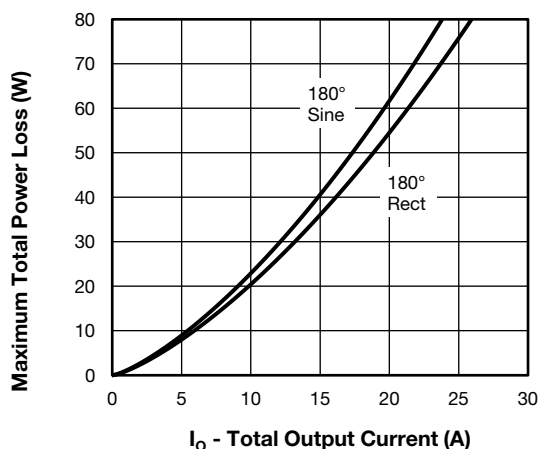


Fig. 2 - Total Power Loss Characteristics

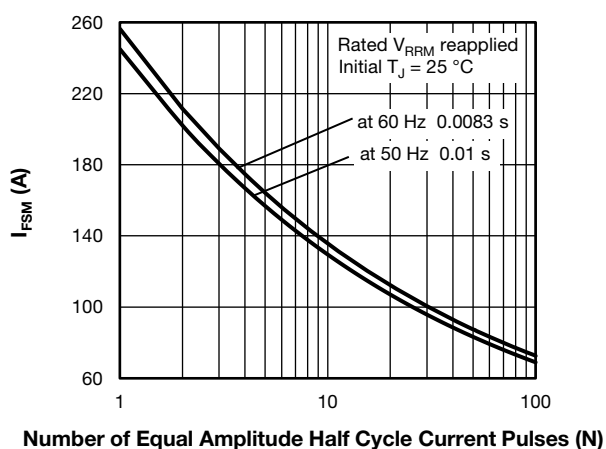


Fig. 5 - Non-Repetitive Peak Forward Surge Current vs. Number Pulses

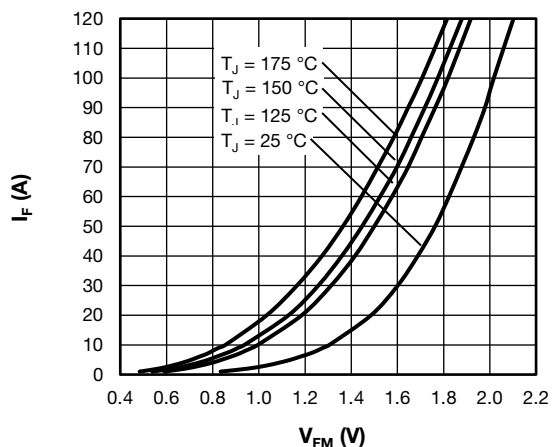


Fig. 3 - Typical Forward Voltage Drop Characteristics

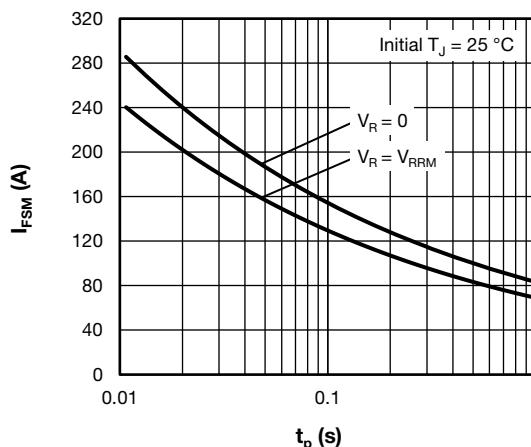


Fig. 6 - Non-Repetitive peak Forward Surge Current vs. Pulse Duration

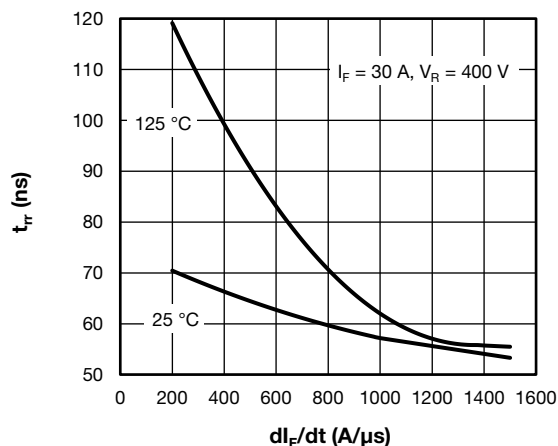
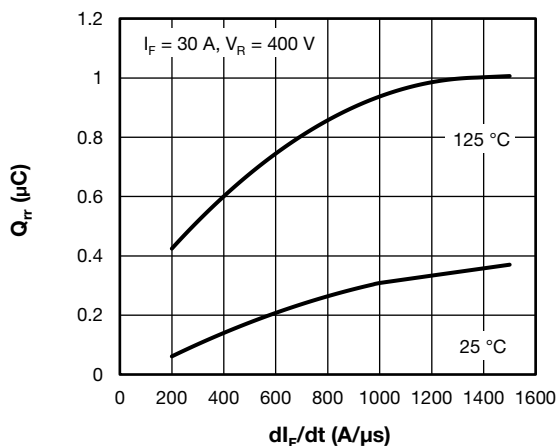
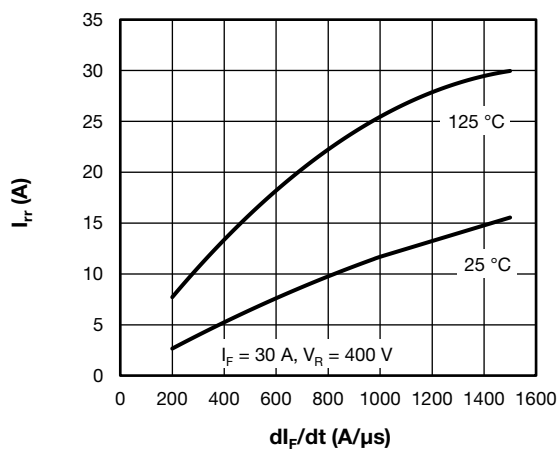
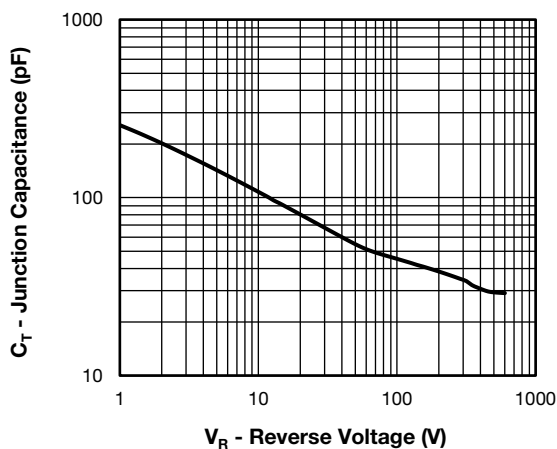

Fig. 7 - Diode Reverse Recovery Time vs.  $dI_F/dt$ 

Fig. 9 - Diode Reverse Recovery Charge vs.  $dI_F/dt$ 

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


Fig. 10 - Junction Capacitance

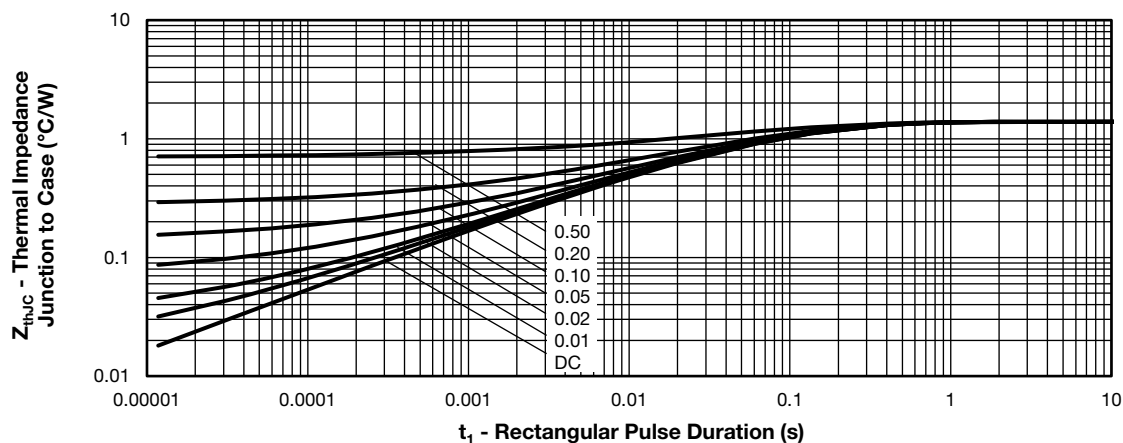
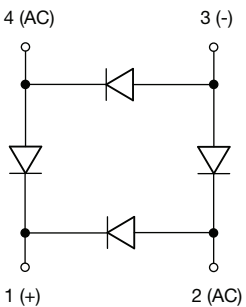
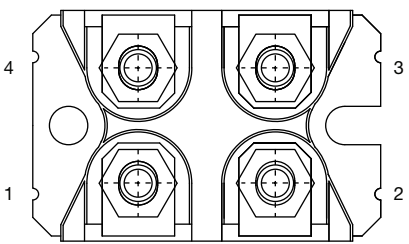


Fig. 11 - Maximum Thermal Impedance Junction to Case

**ORDERING INFORMATION TABLE**

Device code	VS-	U5F	H	30	B	A	60
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-

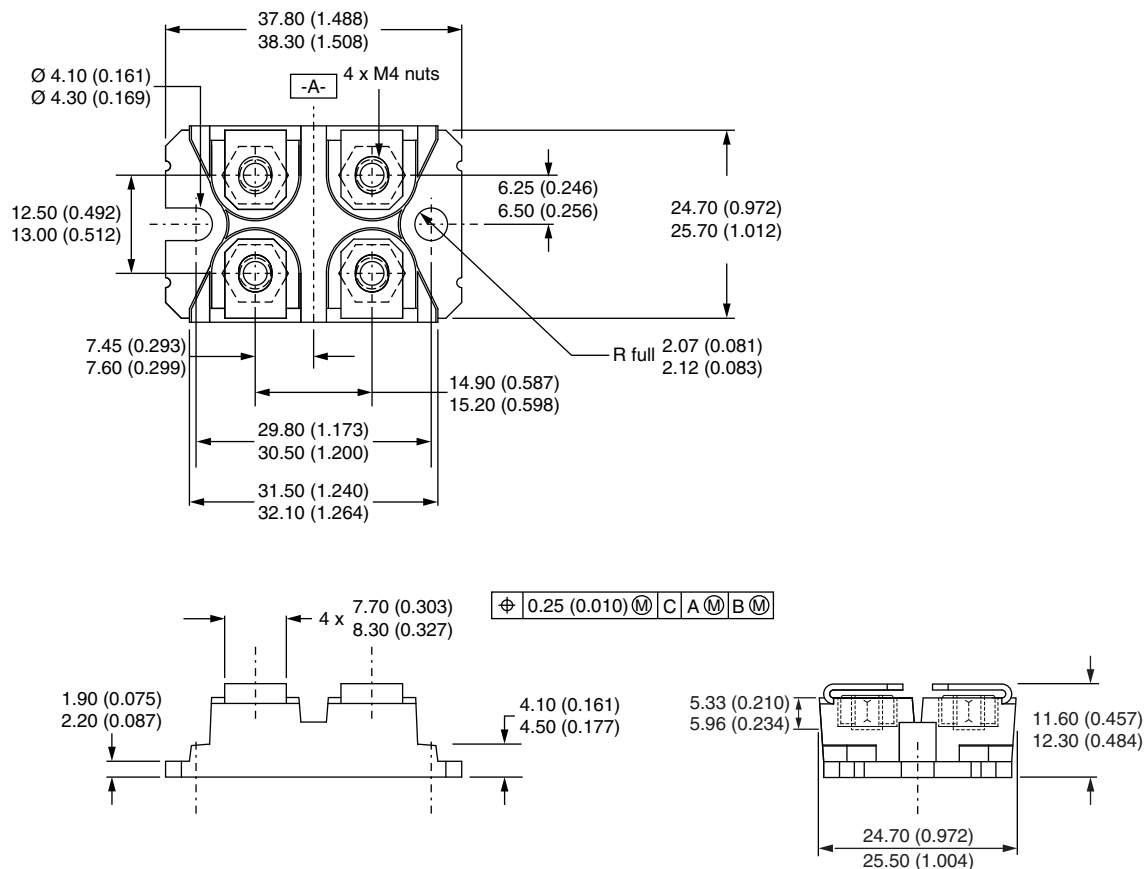
- 1 - Vishay Semiconductors product
- 2 - U5F = Gen 5 FRED Pt® family
- 3 - H = Ultrafast FRED Pt® diode
- 4 - Current rating per module (30 = 30 A)
- 5 - B = circuit configuration (Single phase bridge)
- 6 - Package indicator (SOT-227 standard insulated base)
- 7 - Voltage rating (60 = 600 V)

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single phase bridge	B	<div> <div> 4 (AC)   1 (+)  2 (AC)  3 (-) </div> <div> Lead Assignment   </div> </div>

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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