

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

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	-	
Reverse leakage current	I_{RM}	$V_R = 600\text{ V}$	-	0.1	30	μA
		$T_J = 125\text{ }^{\circ}\text{C}, V_R = 600\text{ V}$	-	14	-	
		$T_J = 150\text{ }^{\circ}\text{C}, V_R = 600\text{ V}$	-	53	-	
RMS isolation voltage base plate	V_{ISOL}	$f = 50\text{ Hz}$, any terminal to case, $t = 1\text{ min}$	2500	-	-	V

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum DC output current at case temperature	I _O	Resistive or inductive load		30	A
				131	°C
Maximum peak, one-cycle non-repetitive forward current	I _{FSM}	t = 10 ms	No voltage reapplied	291	A
		t = 8.3 ms		305	
		t = 10 ms	100 % V _{RRM} reapplied	245	
		t = 8.3 ms		256	
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied	424	A ² s
		t = 8.3 ms		387	
		t = 10 ms	100 % V _{RRM} reapplied	300	
		t = 8.3 ms		274	
Maximum I ² √t for fusing	I ² √t	I ² t for time t _x = I ₂ √t x √t _x ; 0.1 ≤ t _x ≤ 10 ms, V _{RRM} = 0 V		4244	kA ² √s
Low level of threshold voltage, per leg	V _{F(TO)1}	(16.7 % x π x I _{F(AV)}) < I < π x I _{F(AV)} , T _J = T _J maximum		0.96	V
Low level value of forward slope resistance	r _{f1}			25.02	mΩ
High level of threshold voltage, per leg	V _{F(TO)2}	(I > π x I _{F(AV)}), T _J = T _J maximum		1.31	V
High level value of forward slope resistance	r _{f2}			23.71	mΩ
Maximum forward voltage, per diode	V _{FM}	I _F = 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}	$T_J = 25\text{ }^{\circ}\text{C}$	-	57	-	ns
		$T_J = 125\text{ }^{\circ}\text{C}$	-	62	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	12	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	25	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	0.3	-	μC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	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			

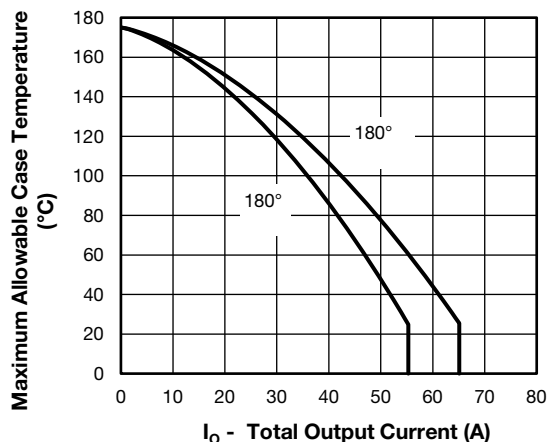


Fig. 1 - Current Rating Characteristics

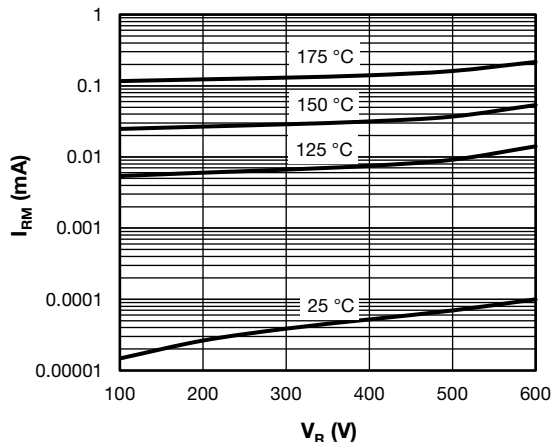


Fig. 4 - Typical Values of Reverse Current

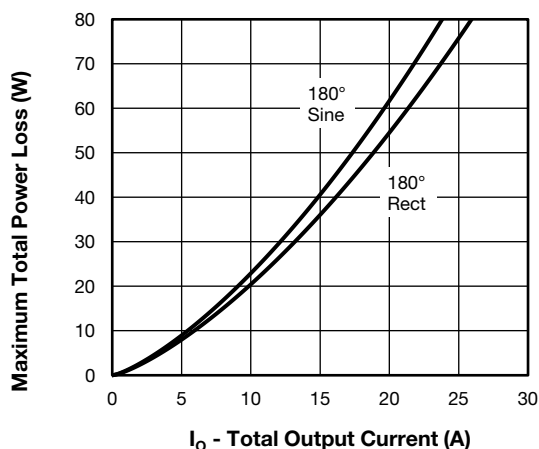


Fig. 2 - Total Power Loss Characteristics

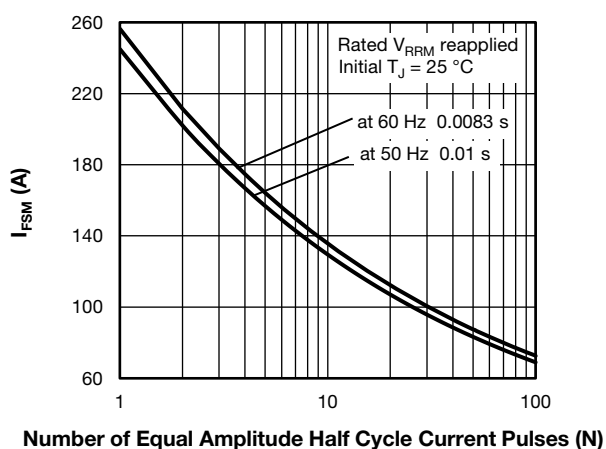


Fig. 5 - Non-Repetitive Peak Forward Surge Current vs. Number Pulses

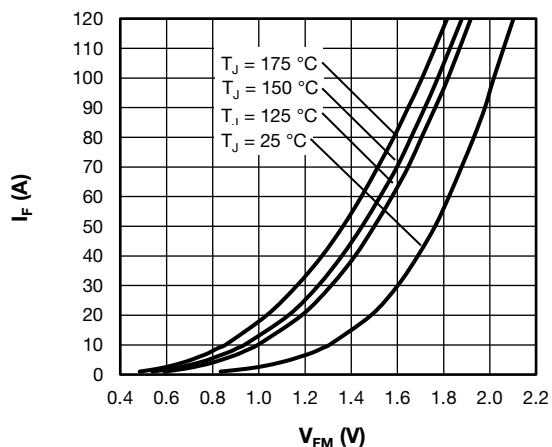


Fig. 3 - Typical Forward Voltage Drop Characteristics

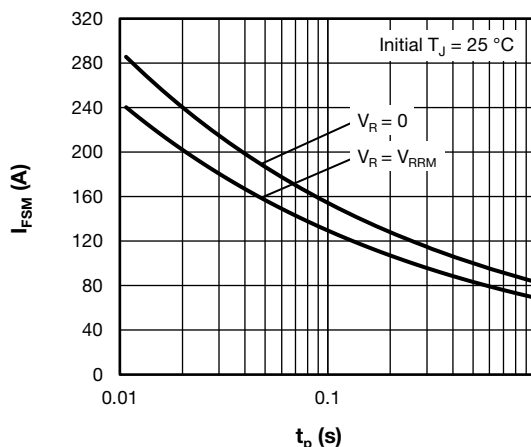


Fig. 6 - Non-Repetitive peak Forward Surge Current vs. Pulse Duration

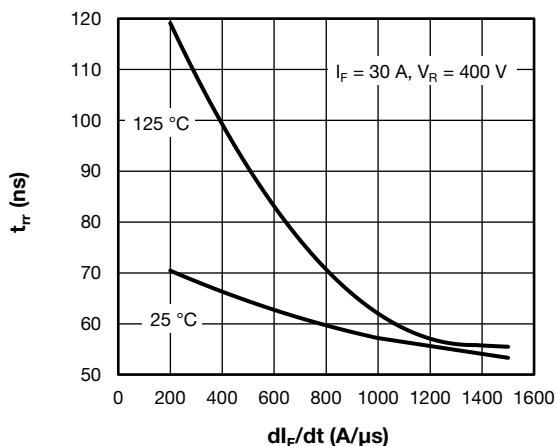


Fig. 7 - Diode Reverse Recovery Time vs. dI_F/dt

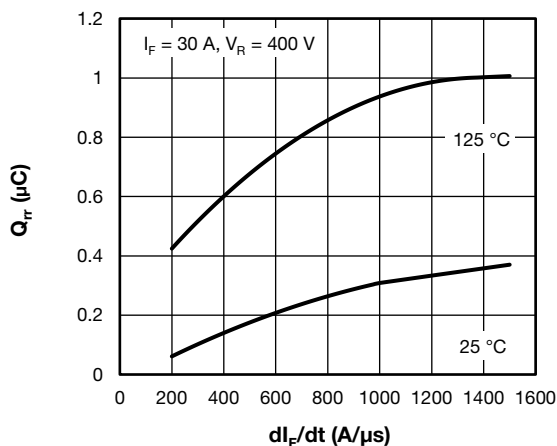


Fig. 9 - Diode Reverse Recovery Charge vs. dI_F/dt

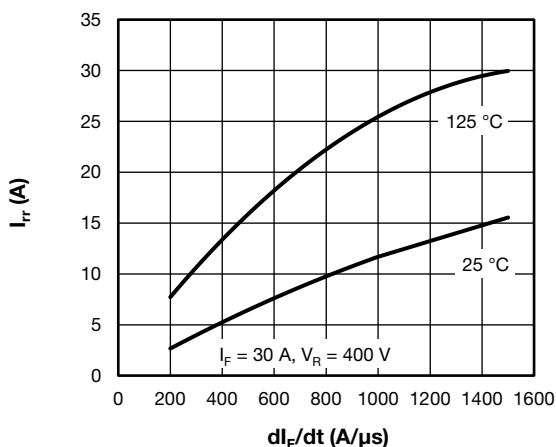


Fig. 8 - Diode Reverse Recovery Current vs. dI_F/dt

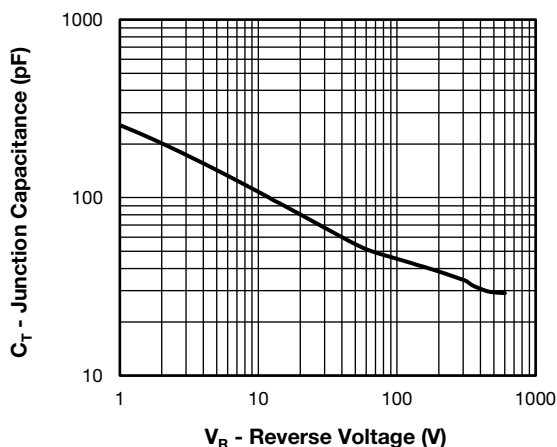


Fig. 10 - Junction Capacitance

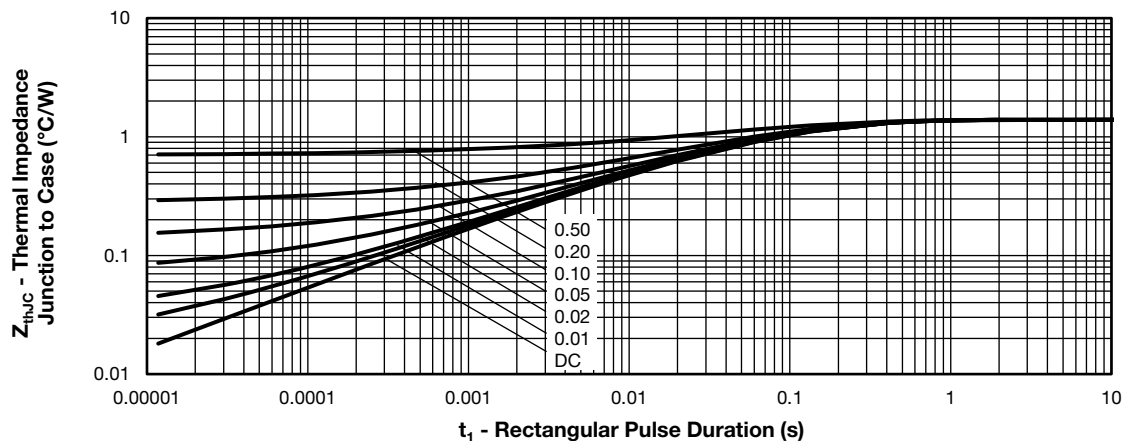
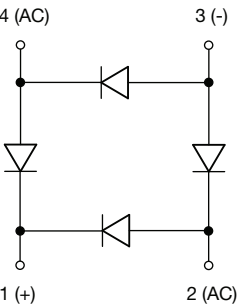
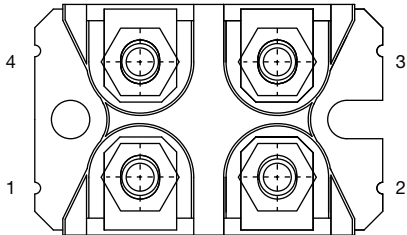


Fig. 11 - Maximum Thermal Impedance Junction to Case

ORDERING INFORMATION TABLE

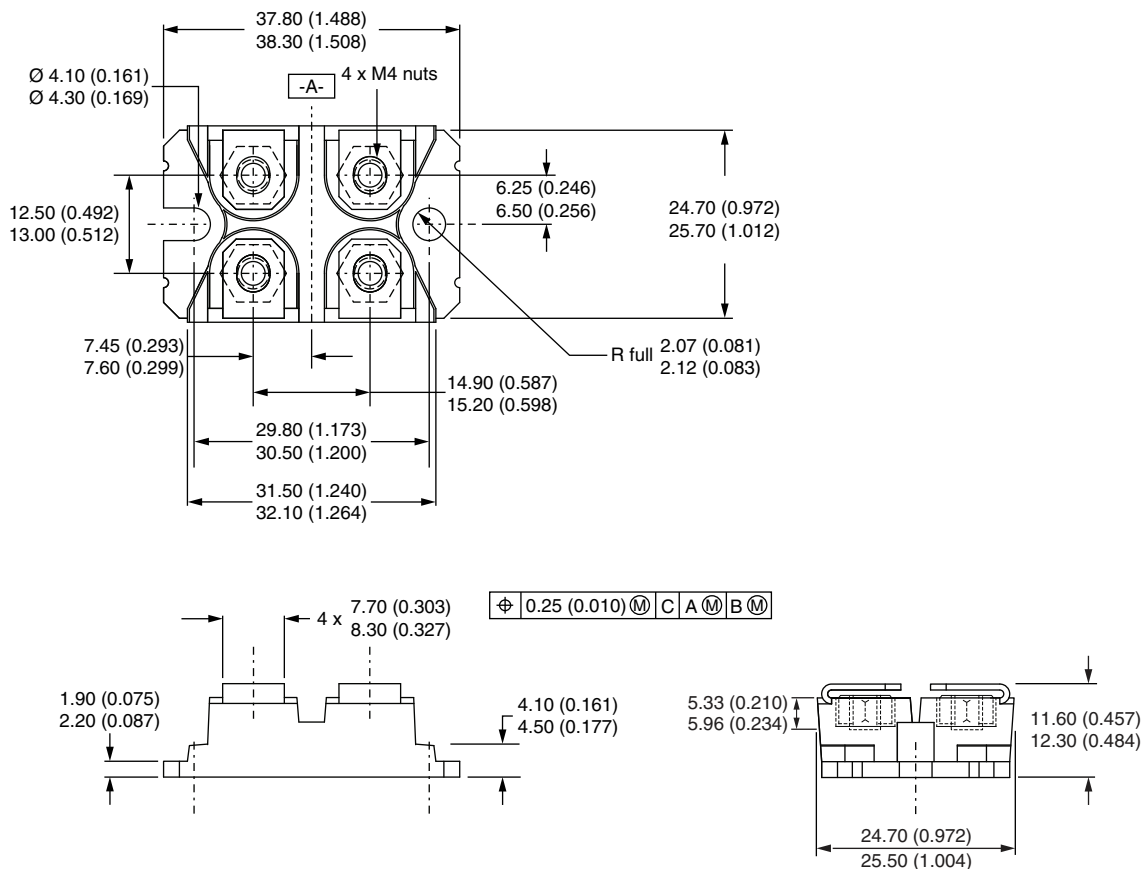
Device code	VS-	U5F	H	30	B	A	60
	1	2	3	4	5	6	7
1	- Vishay Semiconductors product						
2	- U5F = Gen 5 FRED Pt [®] family						
3	- H = Ultrafast FRED Pt [®] diode						
4	- Current rating per module (30 = 30 A)						
5	- B = circuit configuration (Single phase bridge)						
6	- Package indicator (SOT-227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

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

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

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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