

## FRED Pt<sup>®</sup> Gen 4 Doubler Ultrafast Diode, 400 A (INT-A-PAK Power Modules)



INT-A-PAK

### FEATURES

- Gen 4 FRED Pt<sup>®</sup> dices technology
- Ultrasoft reverse recovery characteristics
- Low  $I_{RRM}$  and reverse recovery charge
- Very low forward voltage drop
- 175 °C operating junction temperature
- UL approved file E78996 for application with maximum case temperature up to 140 °C
- Large creepage distances
- 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
$I_{F(AV)}$ at $T_C$	375 A at 50 °C
$t_{rr}$ at 25 °C	159 ns
Type	Modules - diode, FRED Pt <sup>®</sup>
Package	INT-A-PAK
Circuit configuration	Diode doubler circuit

### DESCRIPTION

Gen 4 FRED Pt technology, state of the art, ultra low  $V_F$ , soft switching optimized for IGBT F/W diode.

The minimized conduction loss, optimized storage charge, and low recovery current, minimized the switching losses and reduce the over dissipation in the switching element and snubbers.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		600	V
Continuous forward current	$I_F$	$T_C = 25\text{ °C}$	540	A
		$T_C = 80\text{ °C}$	400	
Single pulse forward current	$I_{FSM}$	$t_p = 10\text{ ms}$ , 50 Hz, sine half wave, initial $T_J = 175\text{ °C}$	4140	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	1153	W
		$T_C = 90\text{ °C}$	653	
Operating junction temperature range	$T_J$		-40 to +175	°C
Storage temperature range	$T_{Stg}$		-40 to +150	
RMS insulation voltage	$V_{INS}$	50 Hz, circuit to base, all terminals shorted, $t = 1\text{ s}$	3500	V

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	$I_R = 500\text{ }\mu\text{A}$	600	-	-	V
Forward voltage drop	$V_{FM}$	$I_F = 200\text{ A}$	-	1.28	-	
		$I_F = 400\text{ A}$	-	1.51	1.67	
		$I_F = 200\text{ A}$ , $T_J = 150\text{ °C}$	-	1.04	-	
		$I_F = 400\text{ A}$ , $T_J = 150\text{ °C}$	-	1.35	-	
Reverse leakage current	$I_{RM}$	$V_R = 600\text{ V}$	-	12	-	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = 600\text{ V}$	-	2.2	-	mA



DYNAMIC RECOVERY CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C	I <sub>F</sub> = 150 A di/dt = 200 A/μs V <sub>R</sub> = 400 V	-	159	-	ns
		T <sub>J</sub> = 125 °C		-	320	-	
Peak recovery current	I <sub>rr</sub>	T <sub>J</sub> = 25 °C		-	14	-	A
		T <sub>J</sub> = 125 °C		-	32	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C		-	0.9	-	μC
		T <sub>J</sub> = 125 °C		-	4.3	-	

THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum thermal resistance, junction to case per leg	R <sub>thJC</sub>	DC operation	0.147	K/W
Typical thermal resistance, case to heat sink	R <sub>thCS</sub>	Mounting surface, flat, smooth and greased	0.035	
Mounting torque ± 10 %	to heat sink busbar	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow the spread of the compound.	4 to 6	Nm
Approximate weight			200	g
			7.1	oz.
Case style			INT-A-PAK	

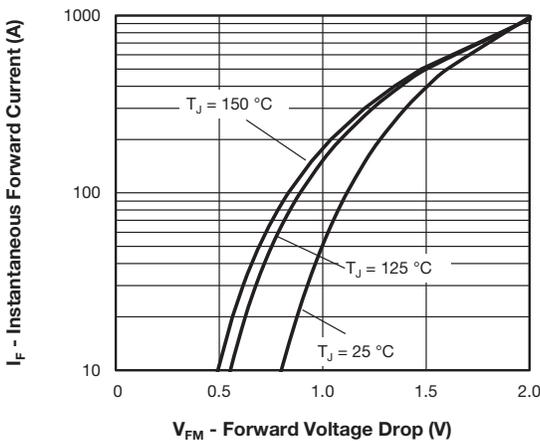


Fig. 1 - Typical Forward Voltage Drop Characteristics

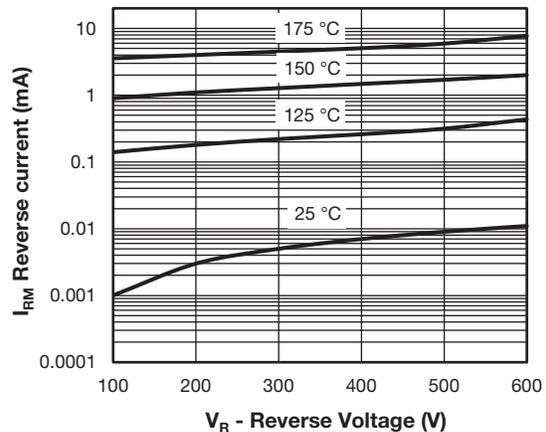


Fig. 2 - Typical Value of Reverse Current vs. Reverse Voltage

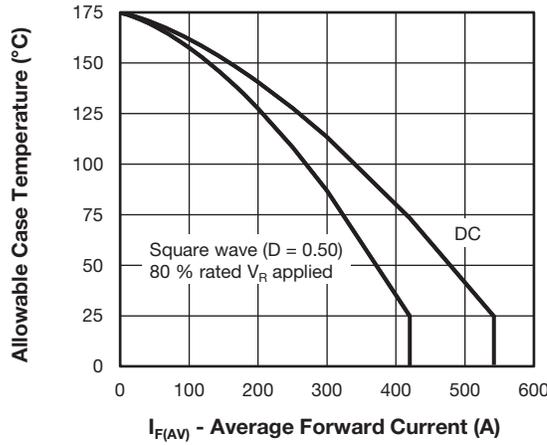


Fig. 3 - Maximum Allowable Case Temperature vs. Average Forward Current

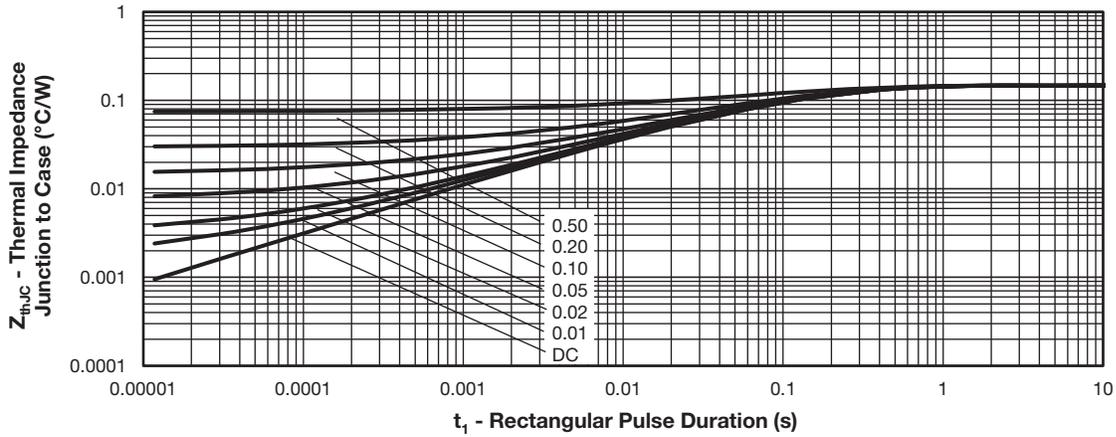


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

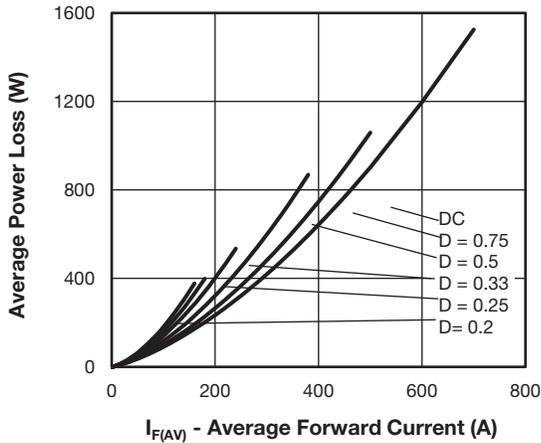


Fig. 5 - Forward Power Loss Characteristics

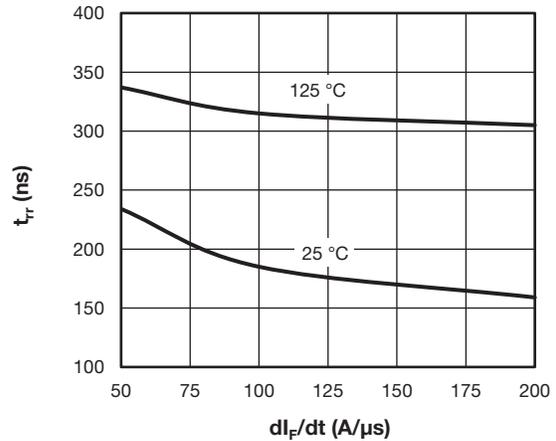
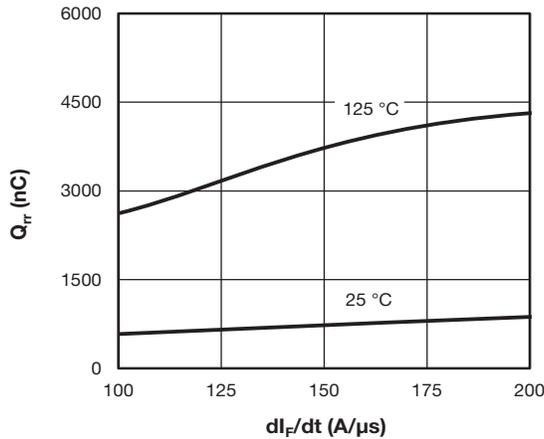
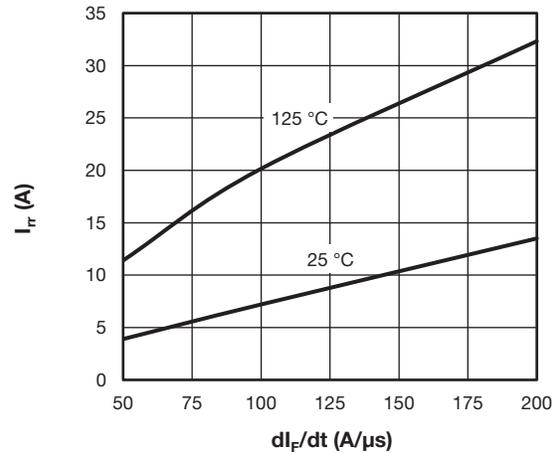


Fig. 6 - Typical Reverse Recovery Time vs.  $di_F/dt$   
 $I_{FM} = 150\text{ A}$ ,  $V_R = 400\text{ V}$


 Fig. 7 - Typical Reverse Recovery Charge vs.  $di_F/dt$   
 $I_{FM} = 150 \text{ A}$ ,  $V_R = 400 \text{ V}$ 

 Fig. 8 - Typical Reverse Recovery Current vs.  $di_F/dt$   
 $I_{FM} = 150 \text{ A}$ ,  $V_R = 400 \text{ V}$ 
**ORDERING INFORMATION TABLE**

Device code	<b>VS-VS</b>	<b>KD</b>	<b>F</b>	<b>400</b>	<b>06</b>	<b>PbF</b>
	①	②	③	④	⑤	⑥

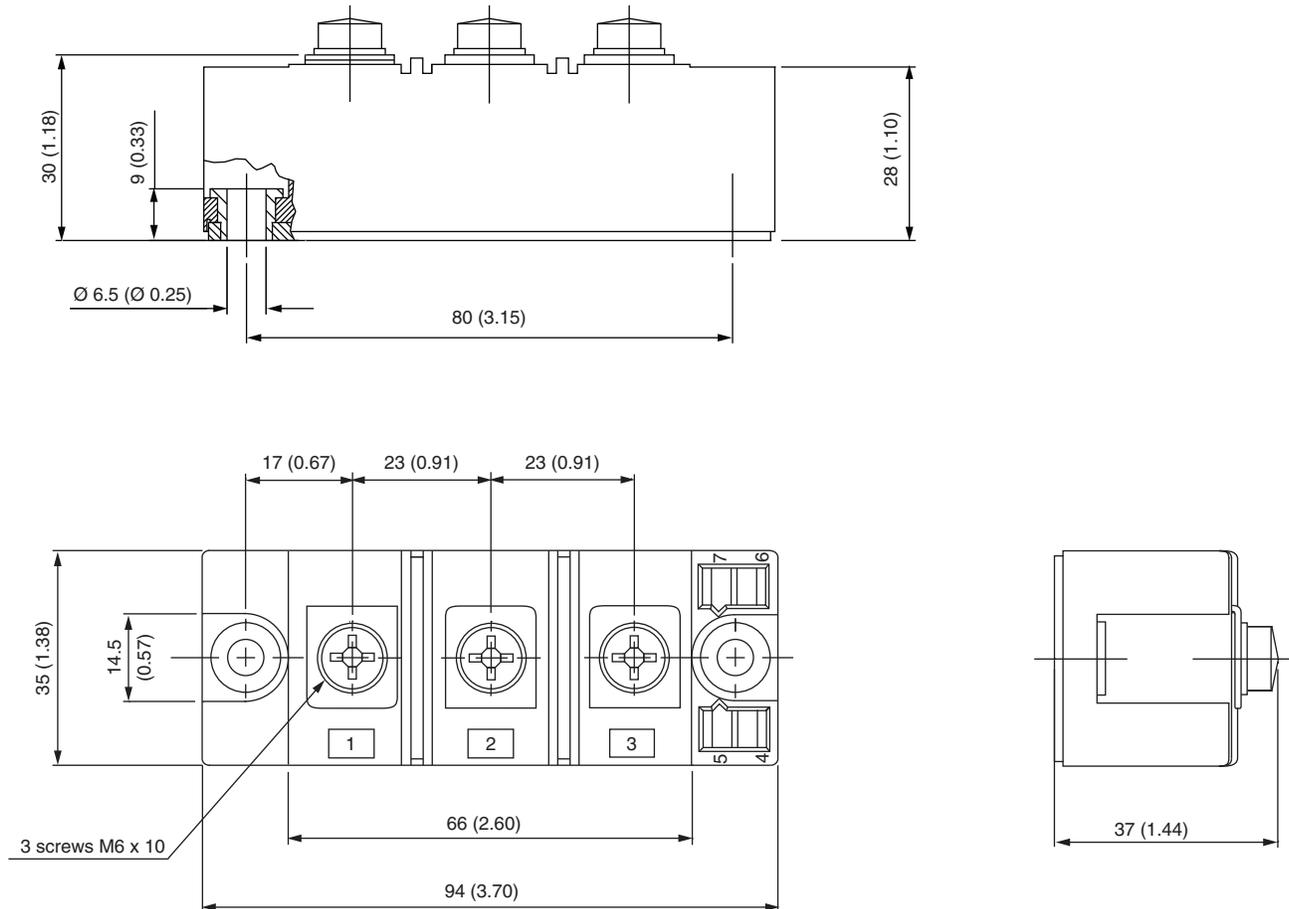
- 1** - Vishay Semiconductors product
- 2** - Circuit configuration: KD = doubler circuit
- 3** - F = FRED Pt<sup>®</sup> ultrafast diode
- 4** - Current rating (400 = 400 A)
- 5** - Voltage rating (06 = 600 V)
- 6** - PbF = lead (Pb)-free

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Diode doubler circuit	KD	KD reversed polarity 



## INT-A-PAK DBC

**DIMENSIONS** in millimeters (inches)





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