

## FRED Pt<sup>®</sup> Gen 4 Doubler Ultrafast Diode, 500 A (INT-A-PAK Power Modules)



INT-A-PAK


**RoHS  
COMPLIANT**

### 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)

### 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.

PRIMARY CHARACTERISTICS	
$V_R$	600 V
$I_{F(AV)}$ at $T_C$	500 A at 55 °C
$t_{rr}$ at 25 °C	104 ns
Type	Modules - diode, FRED Pt <sup>®</sup>
Package	INT-A-PAK
Circuit configuration	Diode doubler circuit

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		600	V
Continuous forward current	$I_F$	$T_C = 25\text{ °C}$	772	A
		$T_C = 90\text{ °C}$	519	
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	$P_D$	$T_C = 25\text{ °C}$	1363	W
		$T_C = 90\text{ °C}$	772	
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	$V_{FM}$	$I_F = 250\text{ A}$	-	1.25	-	
		$I_F = 500\text{ A}$	-	1.45	1.66	
		$I_F = 250\text{ A}$ , $T_J = 150\text{ °C}$	-	1.06	-	
		$I_F = 500\text{ A}$ , $T_J = 150\text{ °C}$	-	1.35	-	
Reverse leakage current	$I_{RM}$	$V_R = 600\text{ V}$	-	10	-	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = 600\text{ V}$	-	2.5	-	mA

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 150\text{ A}$ $di/dt = 1000\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	-	104	-	ns
		$T_J = 125\text{ }^\circ\text{C}$		-	193	-	
Peak recovery current	$I_{rr}$	$T_J = 25\text{ }^\circ\text{C}$		-	59	-	A
		$T_J = 125\text{ }^\circ\text{C}$		-	122	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$		-	3.5	-	$\mu\text{C}$
		$T_J = 125\text{ }^\circ\text{C}$		-	13.8	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum thermal resistance, junction to case per leg	$R_{thJC}$	DC operation	0.11	K/W
Typical thermal resistance, case to heat sink	$R_{thCS}$	Mounting surface, flat, smooth, and greased	0.035	
Mounting torque $\pm 10\%$	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	

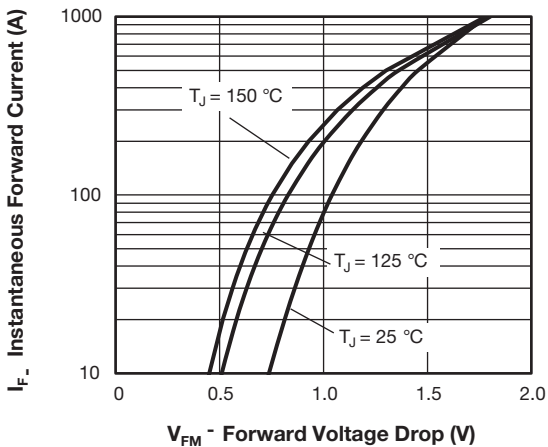


Fig. 1 - Typical Forward Voltage Drop Characteristics

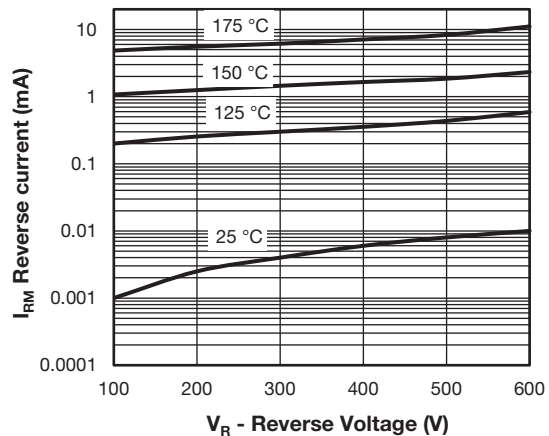


Fig. 2 - Typical Value of Reverse Current vs. Reverse Voltage

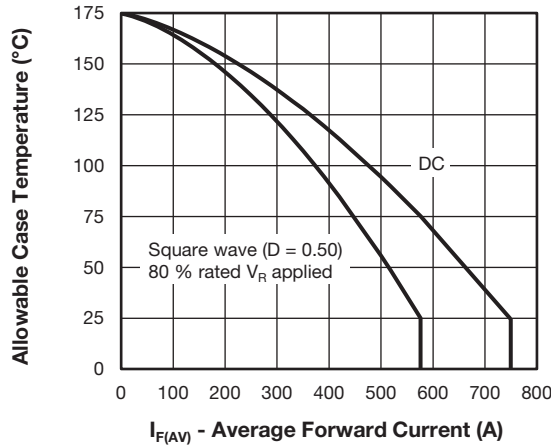


Fig. 3 - Maximum Allowable Case Temperature vs. Average Forward Current

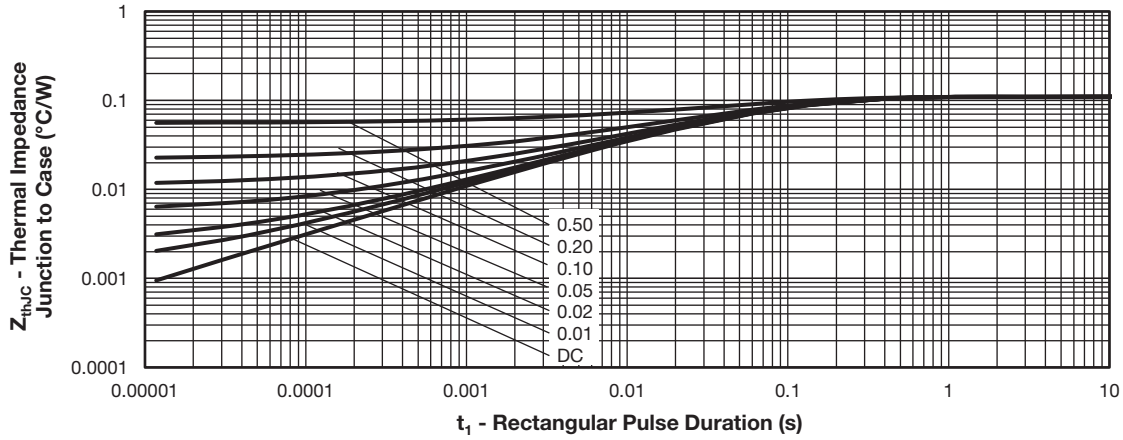


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

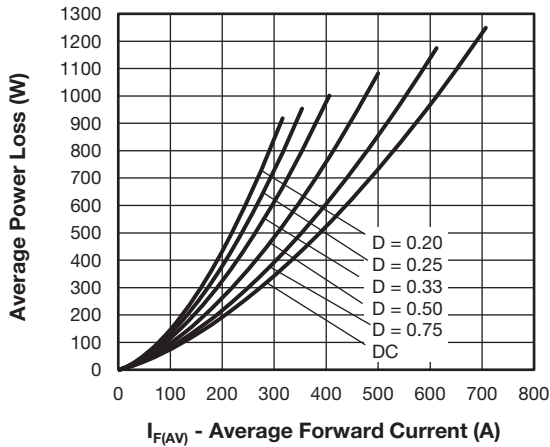


Fig. 5 - Forward Power Loss Characteristics

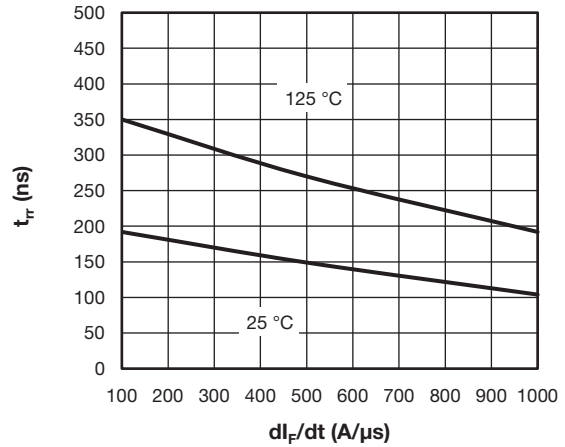
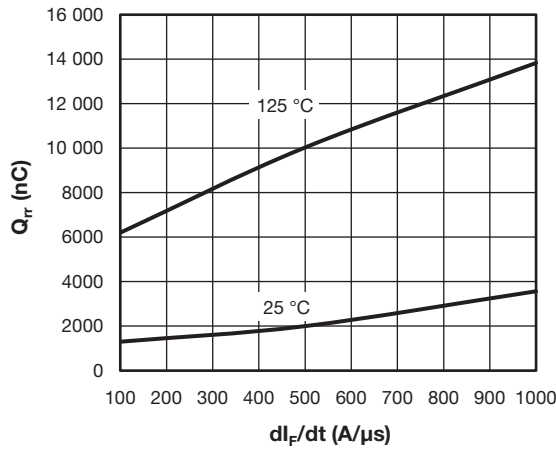
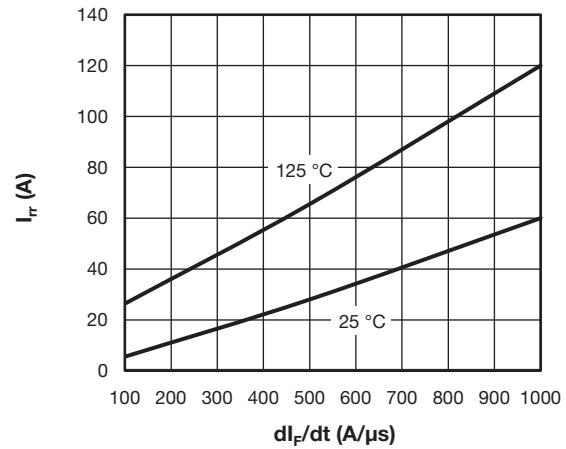


Fig. 6 - Typical Reverse Recovery Time vs.  $di_F/dt$   
 $I_{FM} = 150 \text{ A}, V_R = 300 \text{ V}$


 Fig. 7 - Typical Reverse Recovery Charge vs.  $di_F/dt$   
 $I_{FM} = 150 \text{ A}$ ,  $V_R = 300 \text{ V}$ 

 Fig. 8 - Typical Reverse Recovery Current vs.  $di_F/dt$   
 $I_{FM} = 150 \text{ A}$ ,  $V_R = 300 \text{ V}$ 
**ORDERING INFORMATION TABLE**

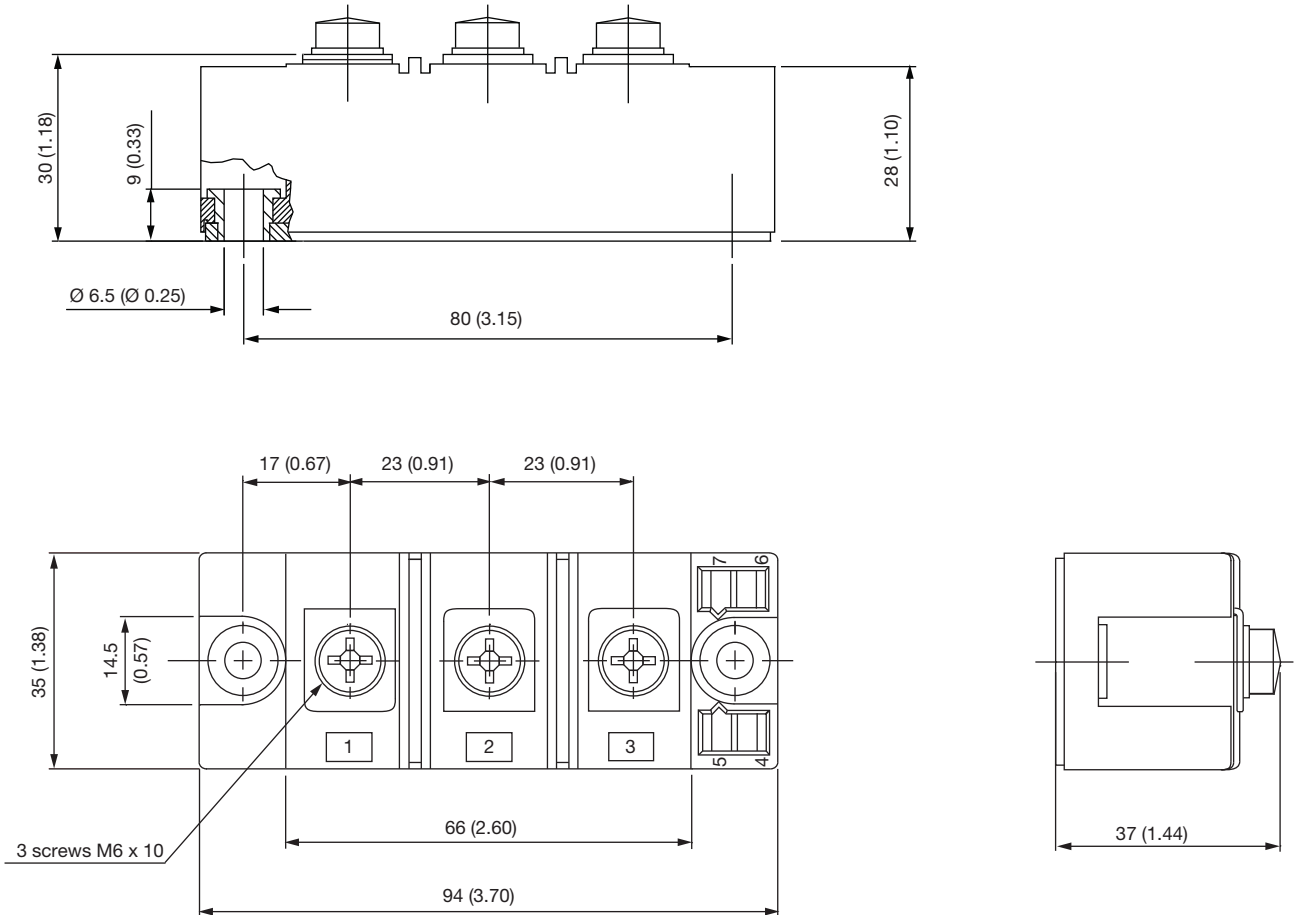
Device code	<b>VS-VS</b>	<b>KD</b>	<b>F</b>	<b>500</b>	<b>06</b>	<b>PbF</b>
	①	②	③	④	⑤	⑥

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration: KD = doubler circuit
- 3** - F = FRED Pt<sup>®</sup> ultrafast diode
- 4** - Current rating (500 = 500 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 

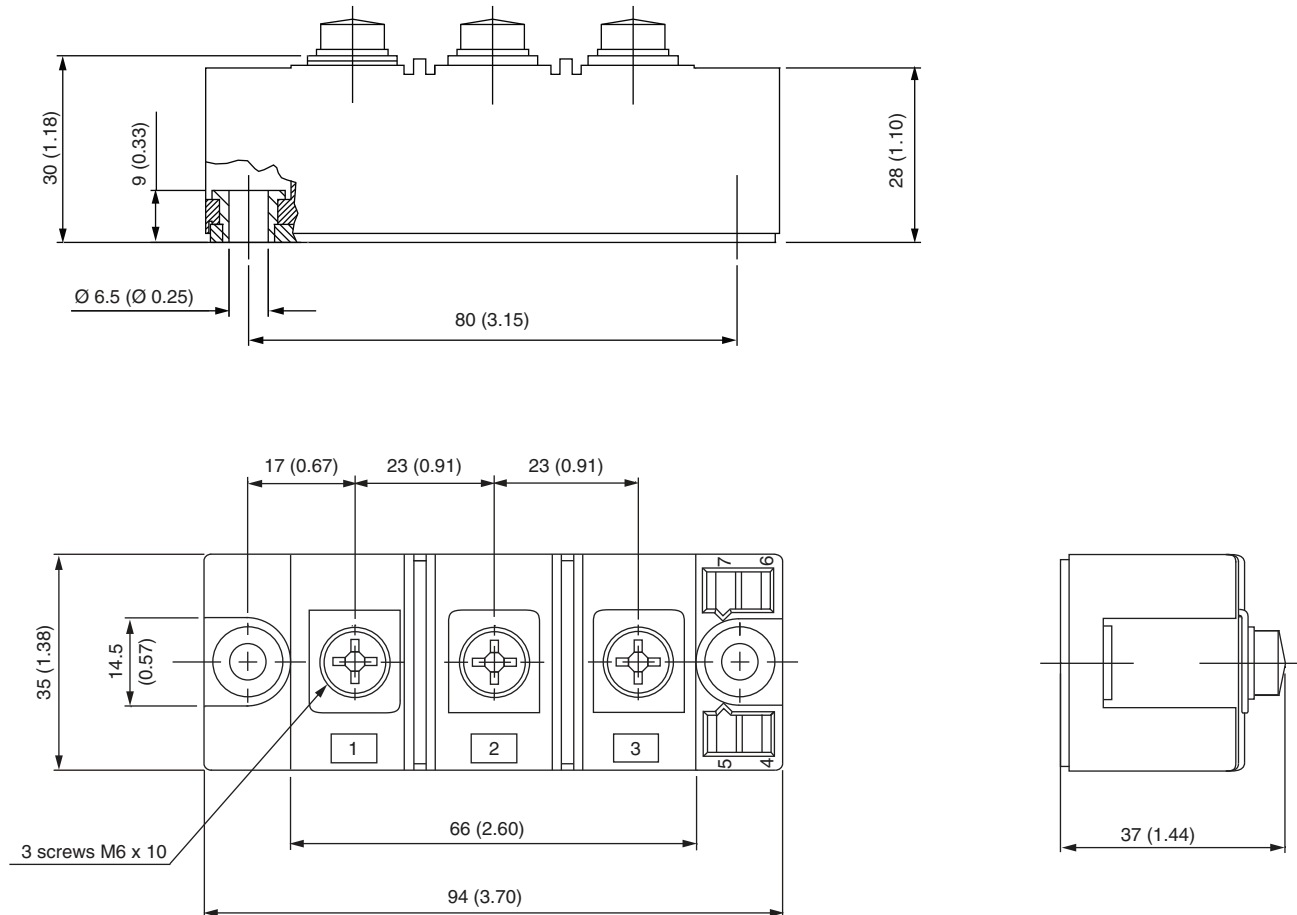


**DIMENSIONS** in millimeters (inches)



## INT-A-PAK DBC

**DIMENSIONS** in millimeters (inches)





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