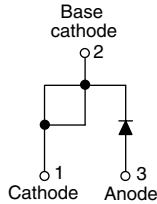
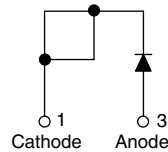


## Hyperfast Rectifier, 15 A FRED Pt™



TO-220AC



TO-220 FULL-PAK

### FEATURES

- Benchmark ultralow forward voltage drop
- Hyperfast recovery time
- Low leakage current
- 175 °C operating junction temperature
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- Lead (Pb)-free ("PbF" suffix)
- Designed and qualified for industrial level



**RoHS\***  
COMPLIANT

### DESCRIPTION/APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast recovery time, and soft recovery.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in PFC boost stage in the AC-DC section of SMPS, inverters or as freewheeling diodes.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

### PRODUCT SUMMARY

$t_{rr}$	18 ns
$I_{F(AV)}$	15 A
$V_R$	600 V

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 133\text{ °C}$	15	A
		$T_C = 62\text{ °C (FULL-PAK)}$		
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$	170	
Peak repetitive forward current	$I_{FM}$		30	
Operating junction and storage temperatures	$T_J, T_{Stg}$		- 65 to 175	°C

### ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\ \mu A$	600	-	-	V
		$I_F = 15\text{ A}$	-	2.3	3.2	
Forward voltage	$V_F$	$I_F = 15\text{ A}, T_J = 150\text{ °C}$	-	1.5	1.8	$\mu A$
		$V_R = V_R\text{ rated}$	-	0.1	50	
Reverse leakage current	$I_R$	$T_J = 150\text{ °C}, V_R = V_R\text{ rated}$	-	40	300	
			-	20	-	pF
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	20	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

\* Pb containing terminations are not RoHS compliant, exemptions may apply

# 15ETX06PbF, 15ETX06FPPbF



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DYNAMIC RECOVERY CHARACTERISTICS (T <sub>C</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 1 A, di <sub>F</sub> /dt = 100 A/μs, V <sub>R</sub> = 30 V	-	18	22	ns	
		I <sub>F</sub> = 15 A, di <sub>F</sub> /dt = 100 A/μs, V <sub>R</sub> = 30 V	-	20	32		
		T <sub>J</sub> = 25 °C	-	22	-		
		T <sub>J</sub> = 125 °C	-	52	-		
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	-	2.4	-	A	
		T <sub>J</sub> = 125 °C	-	5.1	-		
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	-	25	-	μC	
		T <sub>J</sub> = 125 °C	-	150	-		
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 15 A di <sub>F</sub> /dt = 800 A/μs V <sub>R</sub> = 390 V	-	37	-	ns	
Peak recovery current	I <sub>RRM</sub>		T <sub>J</sub> = 125 °C	-	16	-	A
Reverse recovery charge	Q <sub>rr</sub>		T <sub>J</sub> = 125 °C	-	350	-	nC

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		- 65	-	175	°C
Thermal resistance, junction to case (FULL-PAK)	R <sub>thJC</sub>		-	1.0	1.3	°C/W
			-	3.0	3.5	
Thermal resistance, junction to ambient per leg	R <sub>thJA</sub>	Typical socket mount	-	-	70	
Thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220AC	15ETX06			
		Case style TO-220 FULL-PAK	15ETX06FP			



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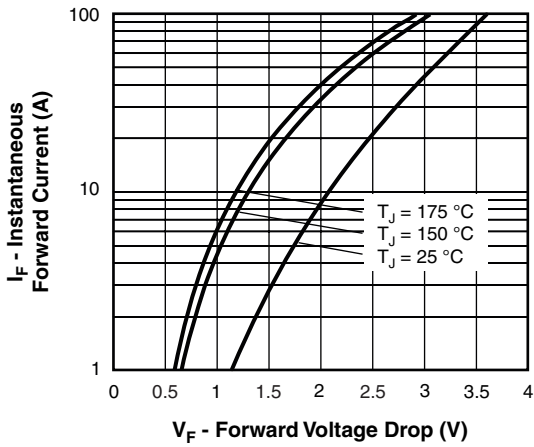


Fig. 1 - Typical Forward Voltage Drop Characteristics

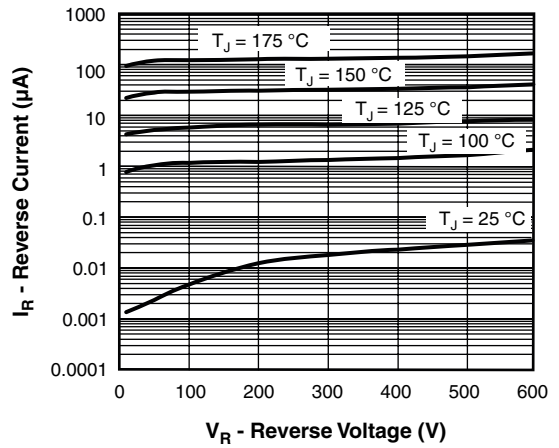


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

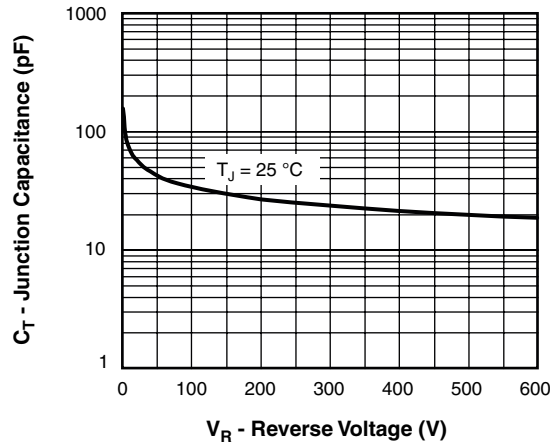


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

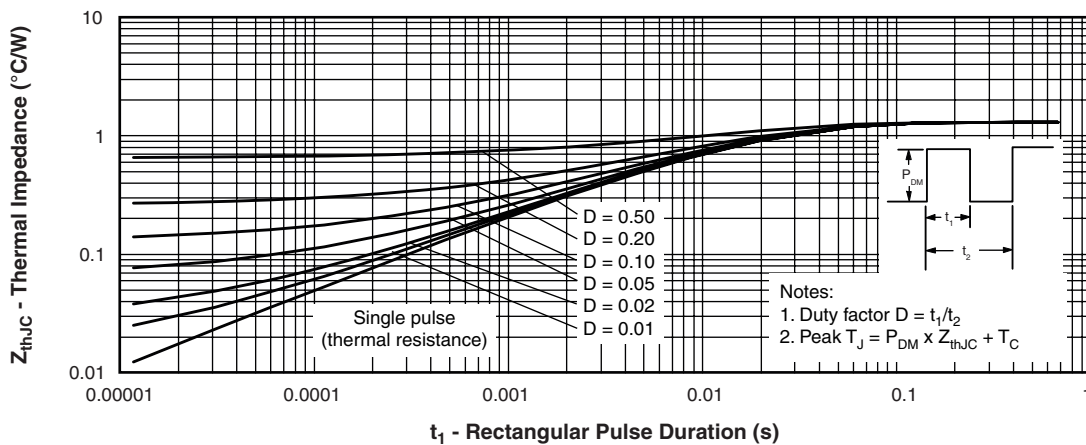


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

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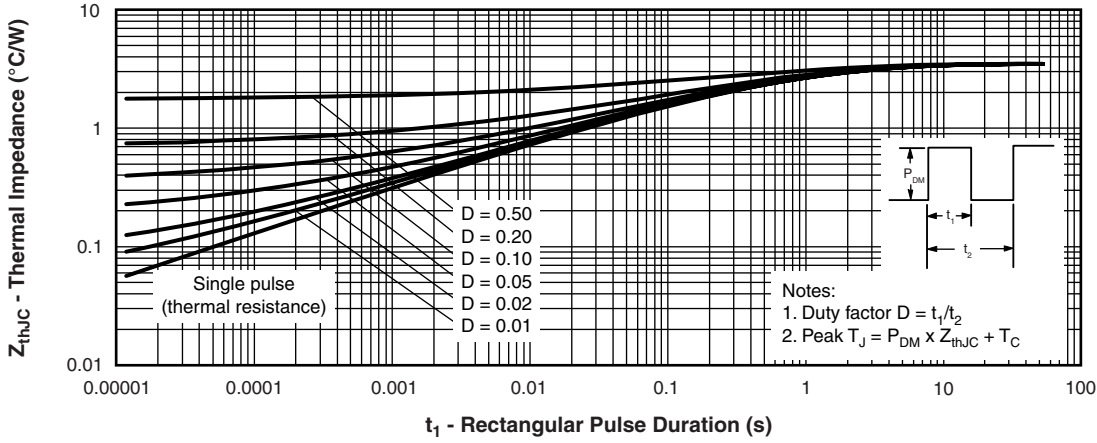


Fig. 5 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (FULL-PAK)

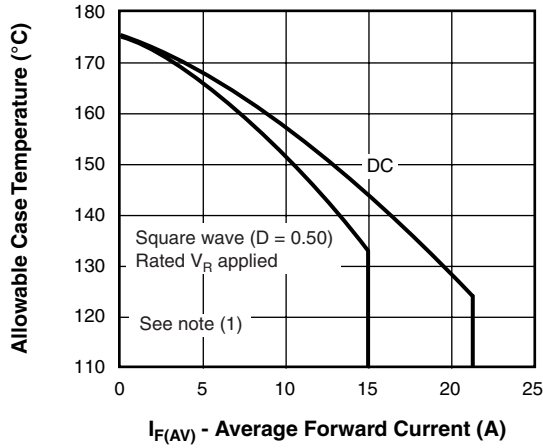


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

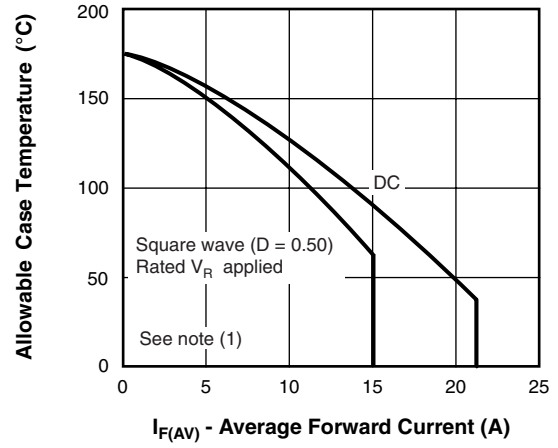


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

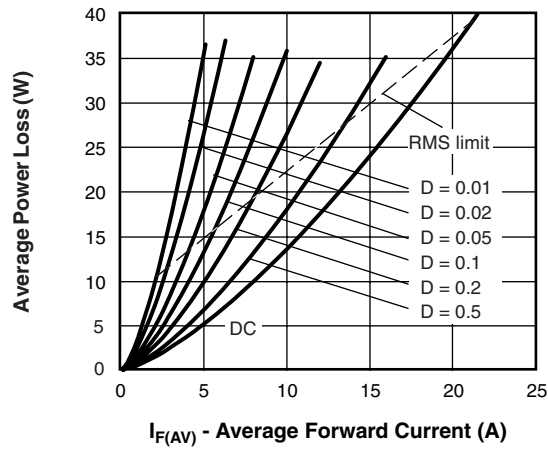


Fig. 8 - Forward Power Loss Characteristics

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;
- $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 8);
- $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$

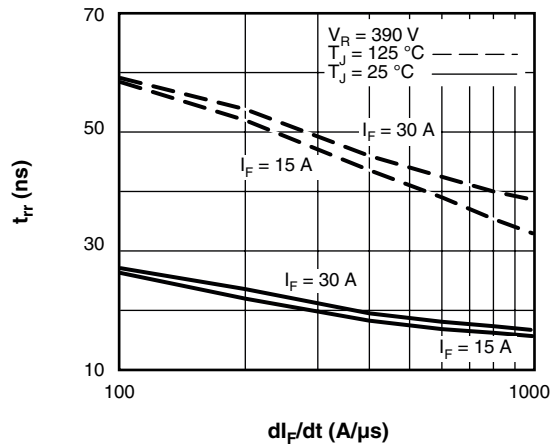


Fig. 9 - Typical Reverse Recovery Time vs.  $di_F/dt$

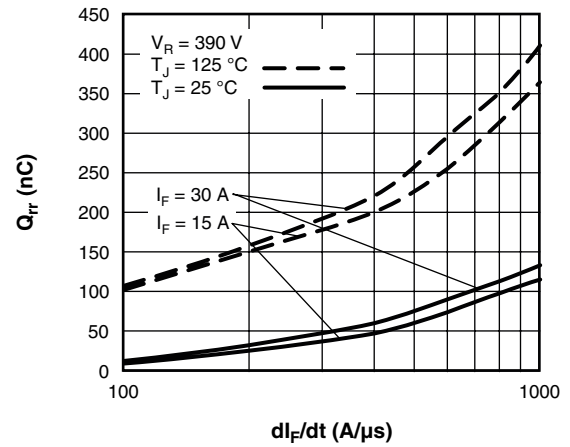


Fig. 10 - Typical Stored Charge vs.  $di_F/dt$

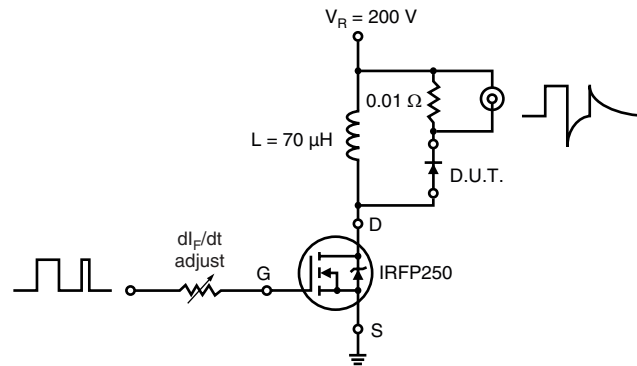
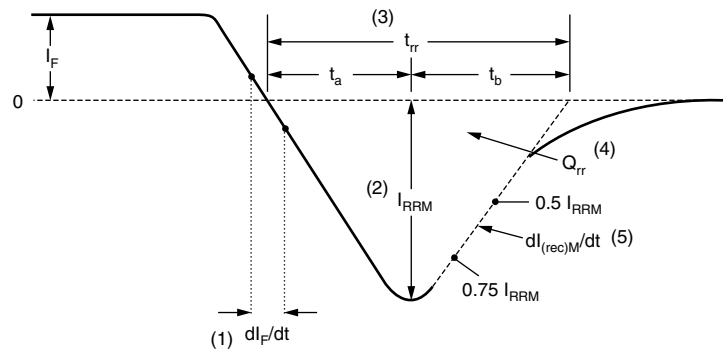


Fig. 11 - Reverse Recovery Parameter Test Circuit



- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.
- (4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$
- (5)  $dl_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

Fig. 12 - Reverse Recovery Waveform and Definitions

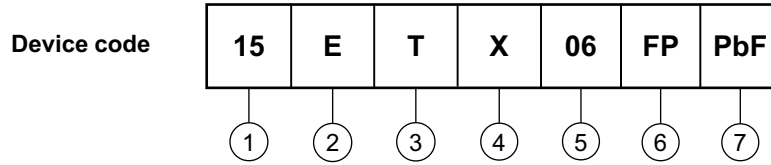
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## ORDERING INFORMATION TABLE



- 1** - Current rating (15 = 15 A)
- 2** - E = Single diode
- 3** - T = TO-220, D<sup>2</sup>PAK
- 4** - X = Hyperfast recovery
- 5** - Voltage rating (06 = 600 V)
- 6** -
  - None = TO-220AC
  - FP = TO-220 FULL-PAK
- 7** -
  - None = Standard production
  - PbF = Lead (Pb)-free

Tube standard pack quantity: 50 pieces

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95039">http://www.vishay.com/doc?95039</a>
Part marking information	<a href="http://www.vishay.com/doc?95045">http://www.vishay.com/doc?95045</a>



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