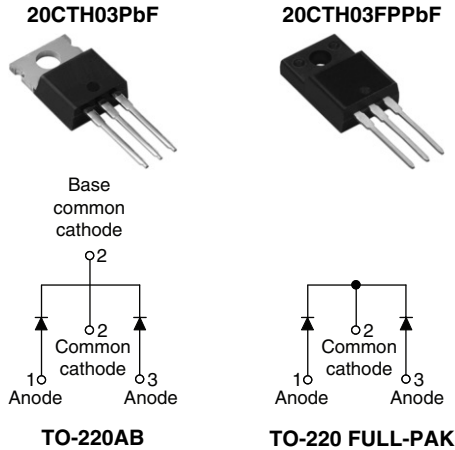


## Hyperfast Rectifier, 2 x 10 A FRED Pt™



### FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- Lead (Pb)-free ("PbF" suffix)
- TO-220 designed and qualified for AEC Q101 level
- TO-220FP designed and qualified for industrial level



**RoHS\***  
COMPLIANT

### DESCRIPTION/APPLICATIONS

300 V series are the state of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop and hyperfast recovery time.

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 the output rectification stage of SMPS, UPS, dc-to-dc converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.

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	
$t_{rr}$ (maximum)	35 ns
$I_{F(AV)}$	2 x 10 A
$V_R$	300 V

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		300	V
Average rectified forward current	$I_{F(AV)}$	per diode $T_C = 160\text{ °C}$	10	A
		(FULL-PAK) per diode $T_C = 135\text{ °C}$	20	
		per device		
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$	120	
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	$V_{BR}, V_R$	$I_R = 100\ \mu A$	300	-	-	V
Forward voltage	$V_F$	$I_F = 10\text{ A}$	-	1.05	1.25	
		$I_F = 10\text{ A}, T_J = 125\text{ °C}$	-	0.85	0.95	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	20	$\mu A$
		$T_J = 125\text{ °C}, V_R = V_R$ rated	-	6	200	
Junction capacitance	$C_T$	$V_R = 300\text{ V}$	-	30	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8	-	nH

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

# 20CTH03PbF/20CTH03FPPbF



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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/dt = 50 A/μs, V <sub>R</sub> = 30 V	-	-	35	ns
		I <sub>F</sub> = 1 A, di/dt = 100 A/μs, V <sub>R</sub> = 30 V	-	-	30	
		T <sub>J</sub> = 25 °C	-	31	-	
		T <sub>J</sub> = 125 °C	-	42	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	-	2.4	-	A
		T <sub>J</sub> = 125 °C	-	5.6	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	-	36	-	nC
		T <sub>J</sub> = 125 °C	-	120	-	

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, _____ per diode junction to case (FULL-PAK) per diode	R <sub>thJC</sub>	Mounting surface, flat, smooth and greased	-	-	1.5	°C/W
			-	-	3.9	
Marking device		Case style TO-220AB	20CTH03			
		Case style TO-220 FULL-PAK	20CTH03FP			

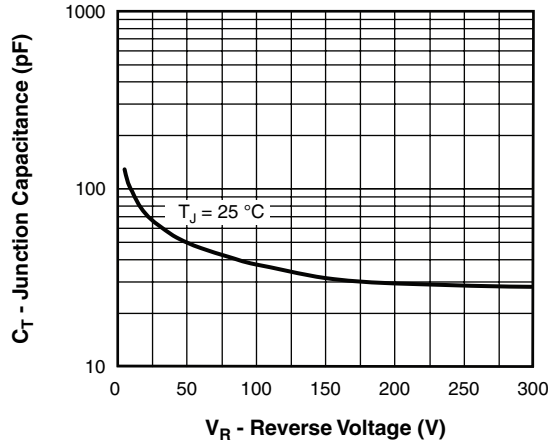
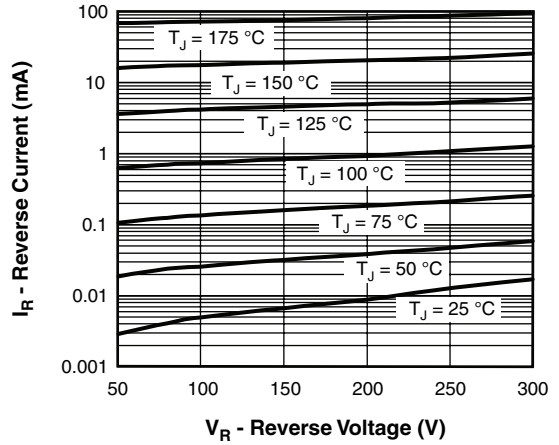
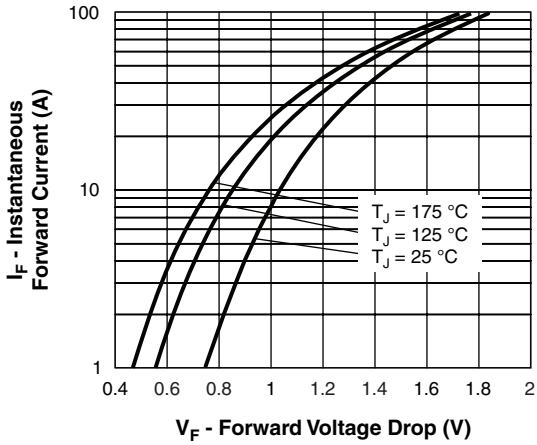
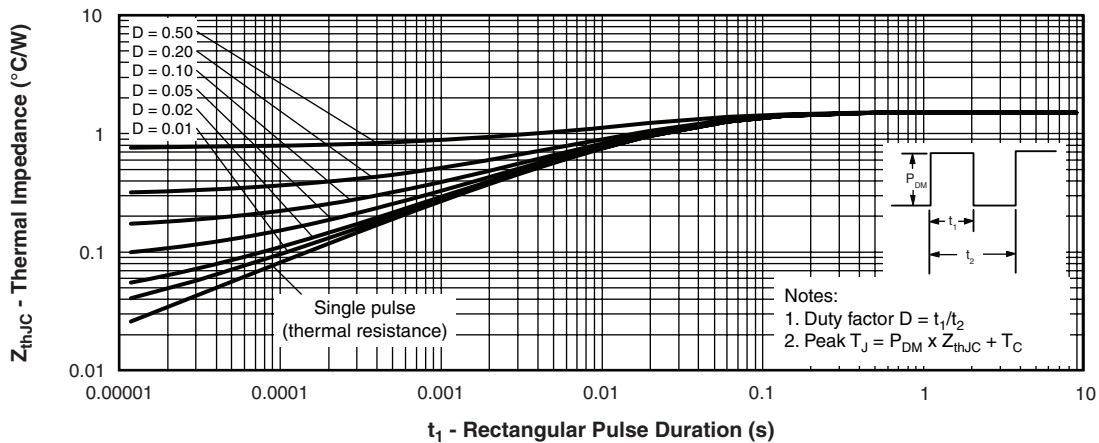


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage



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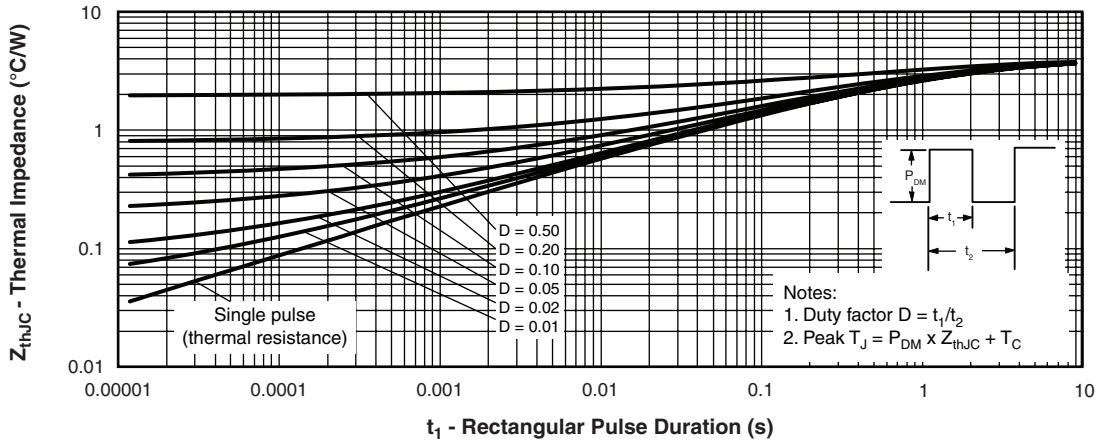


Fig. 5 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (FULL-PAK)

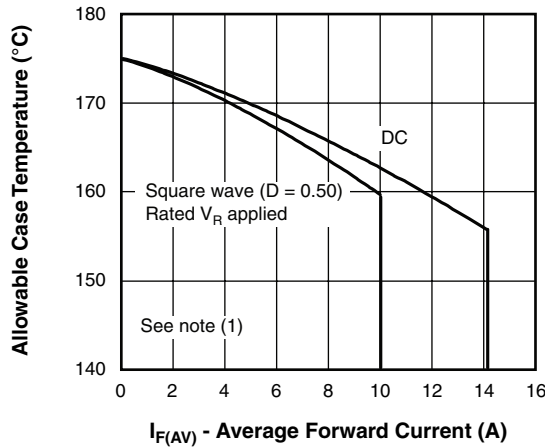


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

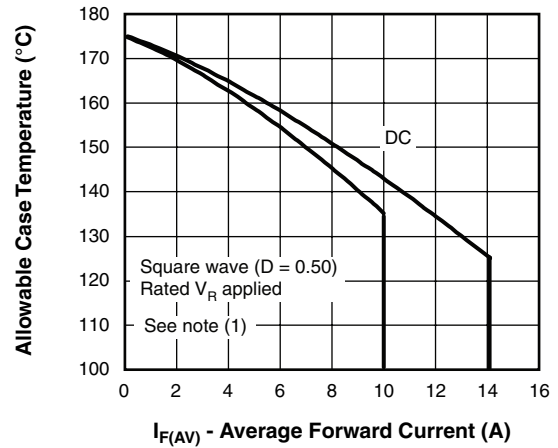


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

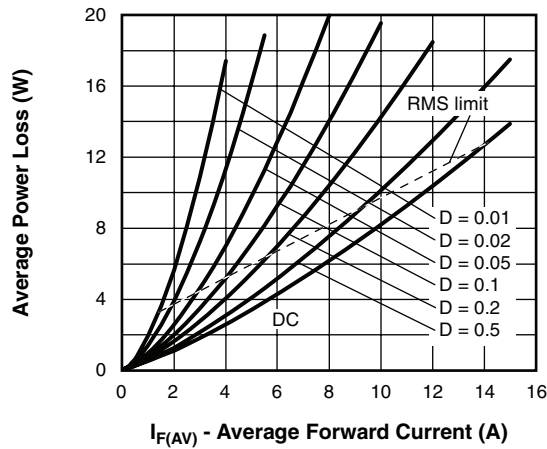


Fig. 8 - Forward Power Loss Characteristics

**Note**

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

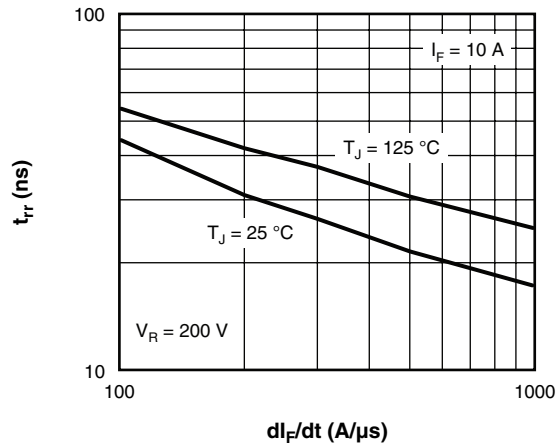


Fig. 9 - Typical Reverse Recovery Time vs.  $di_F/dt$

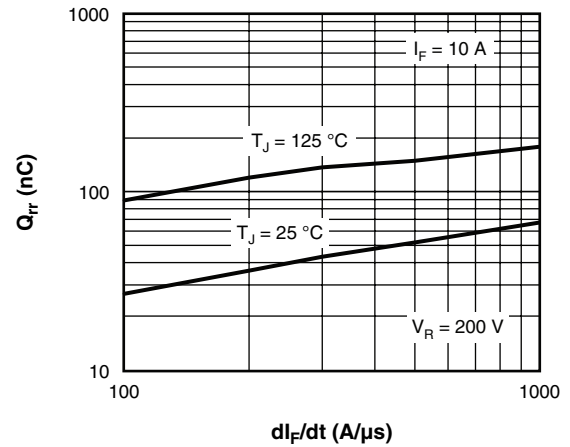


Fig. 10 - Typical Stored Charge vs.  $di_F/dt$

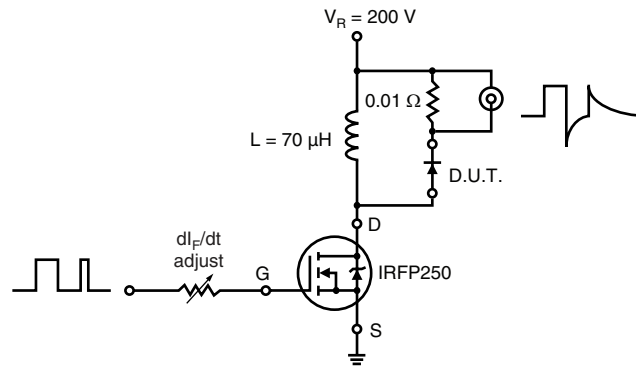
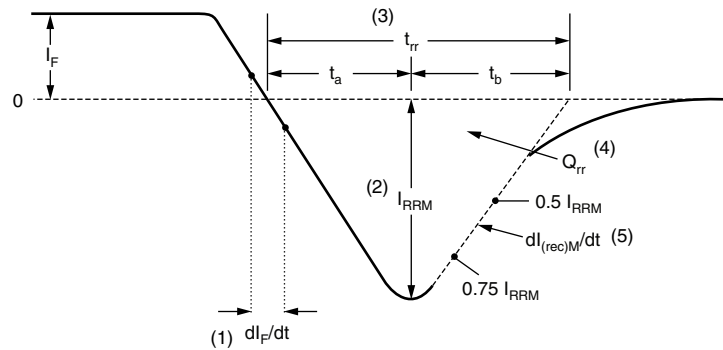


Fig. 11 - Reverse Recovery Parameter Test Circuit



(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  $I_{RRM}$

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

(5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

Fig. 12 - Reverse Recovery Waveform and Definitions

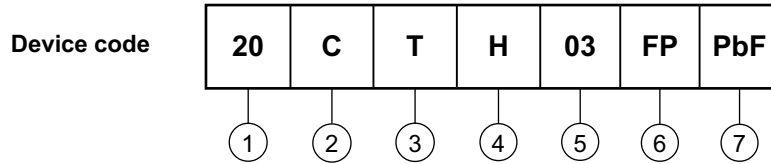
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## ORDERING INFORMATION TABLE



- 1** - Current rating (20 = 20 A)
- 2** - C = Common cathode
- 3** - T = TO-220, D<sup>2</sup>PAK
- 4** - H = Hyperfast recovery
- 5** - Voltage rating (03 = 300 V)
- 6** -
  - None = TO-220AB
  - 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?95040">http://www.vishay.com/doc?95040</a>
Part marking information	<a href="http://www.vishay.com/doc?95042">http://www.vishay.com/doc?95042</a>



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