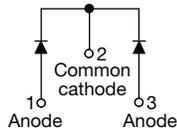


## Hyperfast Rectifier, 2 x 10 A FRED Pt<sup>®</sup>


**TO-220 FullPAK 3L**

**VS-20CTH03FP-N3**

### FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- Designed and qualified according to JEDEC<sup>®</sup>-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
 COMPLIANT  
 HALOGEN  
**FREE**

### 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/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.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	2 x 10 A
$V_R$	300 V
$V_F$ at $I_F$	0.85 V
$t_{rr}$ typ.	See Recovery table
$T_J$ max.	175 °C
Package	TO-220 FullPAK 3L
Circuit configuration	Common cathode

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		300	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 135\text{ °C}$	10	A
			20	
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	V
		$I_F = 10\text{ A}, T_J = 125\text{ °C}$	-	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



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 = 50 A/μs, V <sub>R</sub> = 30 V	-	-	35	ns
		I <sub>F</sub> = 1 A, di <sub>F</sub> /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, junction-to-case per diode	R <sub>thJC</sub>	Mounting surface, flat, smooth, and greased	-	-	3.9	°C/W
Marking device		Case style TO-220 FullPAK 3L	20CTH03FP			

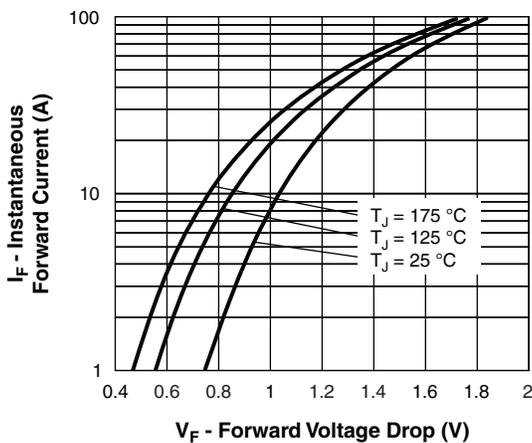


Fig. 1 - Typical Forward Voltage Drop Characteristics

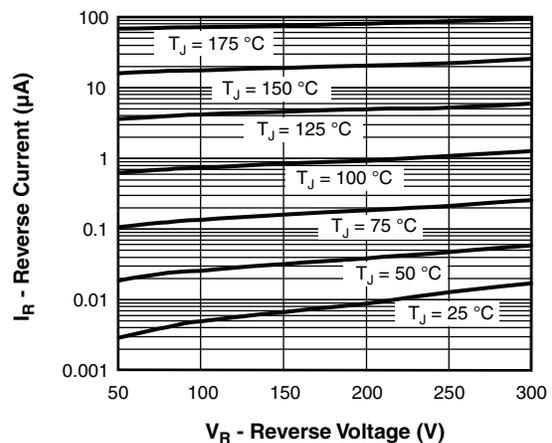


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

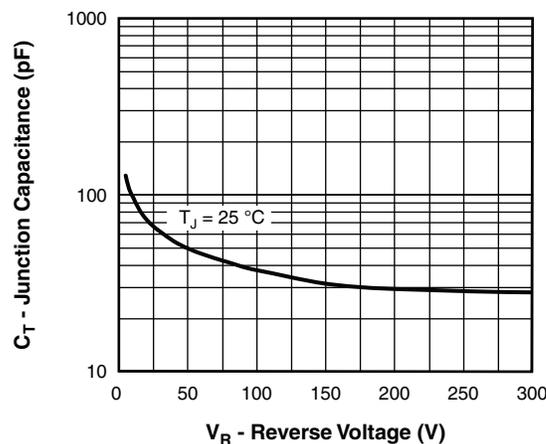


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

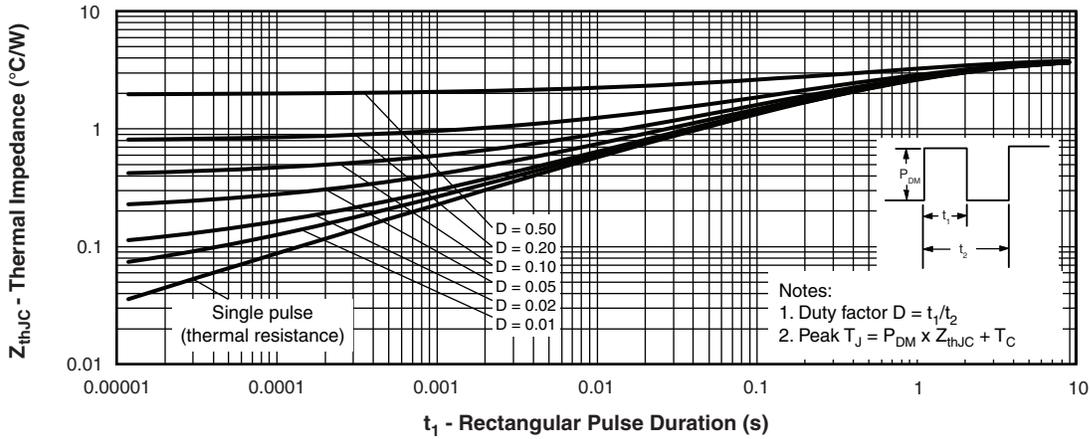


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

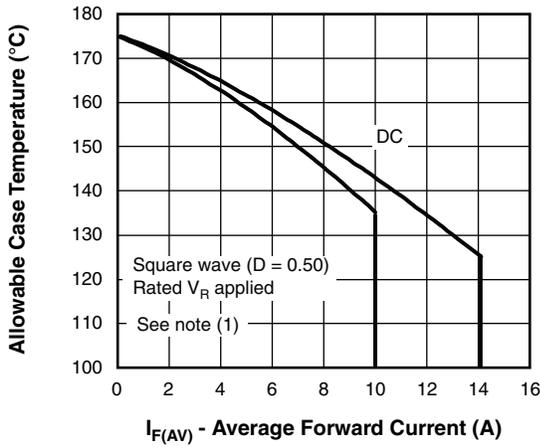


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

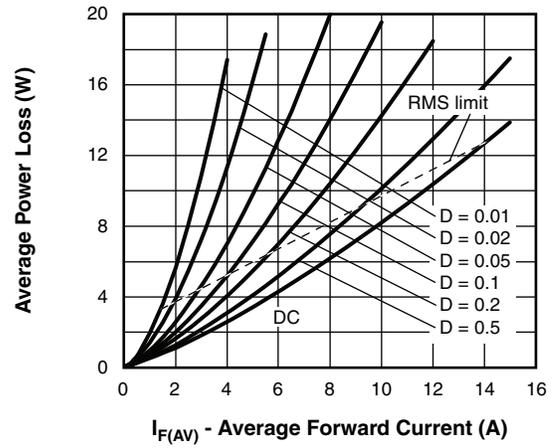


Fig. 6 - Forward Power Loss Characteristics

**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. 5);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

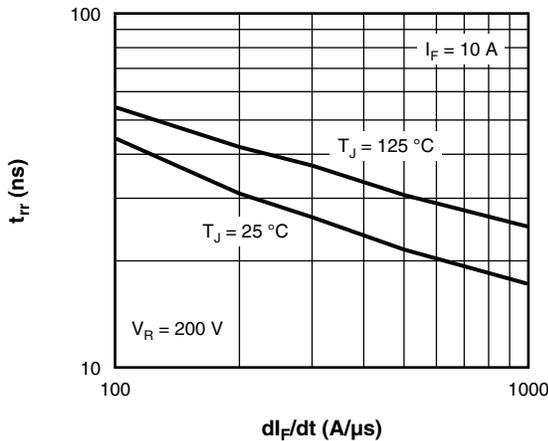


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

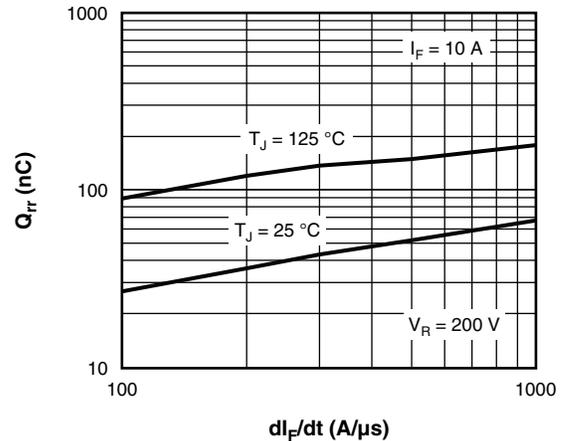
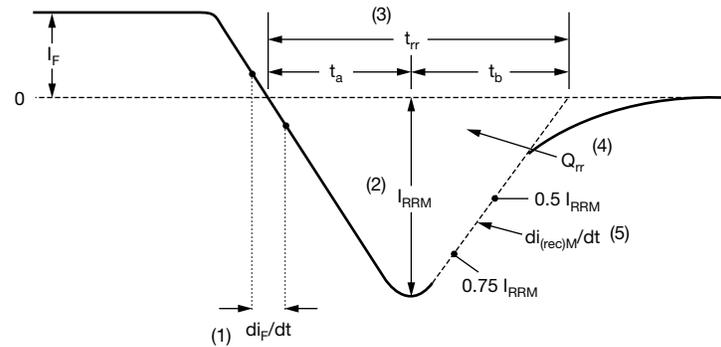


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$



- (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. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>20</b>	<b>C</b>	<b>T</b>	<b>H</b>	<b>03</b>	<b>FP</b>	<b>-N3</b>
	①	②	③	④	⑤	⑥	⑦	⑧

- |   |                                                                                          |
|---|------------------------------------------------------------------------------------------|
| 1 | - Vishay Semiconductors product                                                          |
| 2 | - Current rating (20 = 20 A)                                                             |
| 3 | - C = common cathode                                                                     |
| 4 | - T = TO-220, D <sup>2</sup> PAK (TO-263AB)                                              |
| 5 | - H = hyperfast recovery                                                                 |
| 6 | - Voltage rating (03 = 300 V)                                                            |
| 7 | - FP = TO-220 FullPAK 3L                                                                 |
| 8 | - Environmental digit:<br>-N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free |

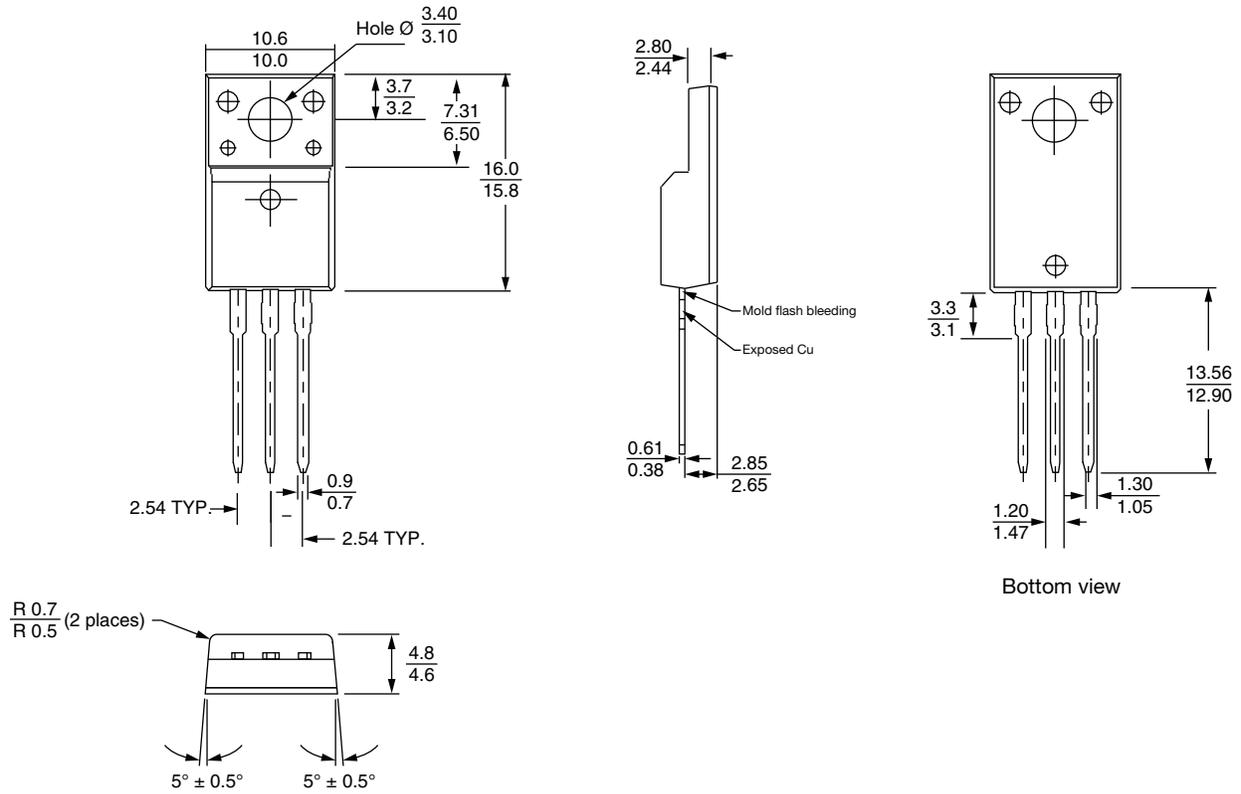
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20CTH03FP-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96155">www.vishay.com/doc?96155</a>
Part marking information	<a href="http://www.vishay.com/doc?95456">www.vishay.com/doc?95456</a>
SPICE model	<a href="http://www.vishay.com/doc?96584">www.vishay.com/doc?96584</a>



## 3L TO-220 FullPAK

**DIMENSIONS** in millimeters



### Notes

- (1) All dimensions are in mm
- (2) Package body size exclude mold flash and burrs. Moldflash should be less than 6 mils



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