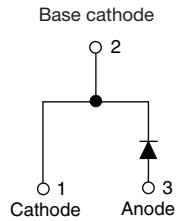


## Hyperfast Rectifier, 30 A FRED Pt® G5



### FEATURES

- Hyperfast and optimized  $Q_{rr}$
- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	30 A
$V_R$	1200 V
$V_F$ at $I_F$ at 125 °C	2.1 V
$t_{rr}$	26 ns
$T_J$ max.	175 °C
Package	2L TO-220AC
Circuit configuration	Single

### DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for high frequency converters, both soft switched / resonant. Specifically designed to improve efficiency of PFC and output rectification stages of EV / HEV battery charging stations, booster stage of solar inverters and UPS applications, these devices are perfectly matched to operate with MOSFETs or high speed IGBTs.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	$V_{RRM}$		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 90\text{ °C}$ , $D = 0.50$	30	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 45\text{ °C}$ , $t_p = 10\text{ ms}$ , sine wave	210	
Repetitive peak forward current	$I_{FRM}$	$T_C = 90\text{ °C}$ , $D = 0.50$ , $f = 20\text{ kHz}$	60	
Operating junction and storage temperature	$T_J, T_{Stg}$		-55 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	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	1200	-	-	V
Forward voltage	$V_F$	$I_F = 30\text{ A}$ $I_F = 30\text{ A}$ , $T_J = 125\text{ °C}$	-	2.6 2.1	3.15 -	
Reverse leakage current	$I_R$	$V_R = V_R$ rated $T_J = 125\text{ °C}$ , $V_R = V_R$ rated	-	-	50 500	$\mu\text{A}$
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	17	-	pF
Series inductance	$L_S$	Measured to lead 5 mm from package body	-	8	-	nH

<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	$t_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	26	-	ns	
		$T_J = 25\text{ }^\circ\text{C}$	-	100	-		
		$T_J = 125\text{ }^\circ\text{C}$	-	150	-		
Peak recovery current	$I_{RRM}$	$I_F = 20\text{ A}$ $di_F/dt = 600\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	12	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	22	-	
			$T_J = 25\text{ }^\circ\text{C}$	-	530	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$T_J = 25\text{ }^\circ\text{C}$	-	1550	-	nC
			$T_J = 125\text{ }^\circ\text{C}$	-	2300	-	
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$T_J = 25\text{ }^\circ\text{C}$	-	80	-	ns
			$T_J = 125\text{ }^\circ\text{C}$	-	120	-	
Peak recovery current	$I_{RRM}$	$I_F = 30\text{ A}$ $di_F/dt = 1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	22	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	37	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$T_J = 25\text{ }^\circ\text{C}$	-	900	-	nC
			$T_J = 125\text{ }^\circ\text{C}$	-	2300	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction-to-case	$R_{thJC}$		-	-	1.2	$^\circ\text{C}/\text{W}$
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-55	-	175	$^\circ\text{C}$
Marking device		Case style: 2L TO-220AC	E5TX3012			

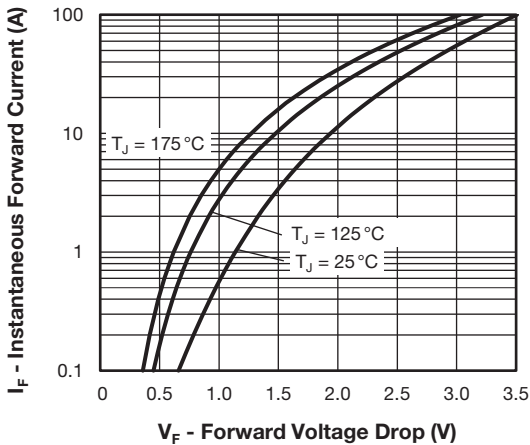


Fig. 1 - Typical Forward Voltage Drop Characteristics

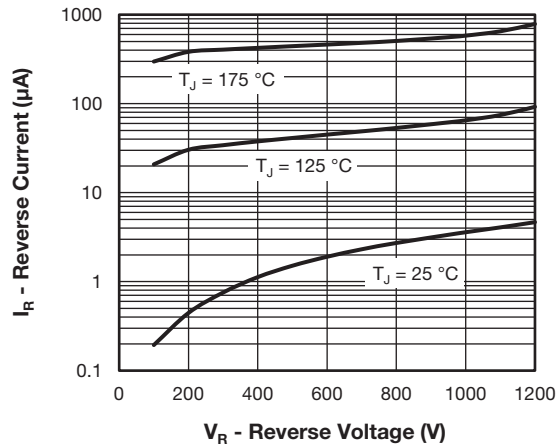


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

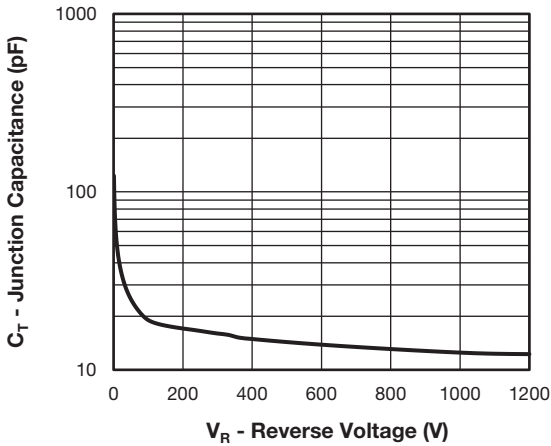


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

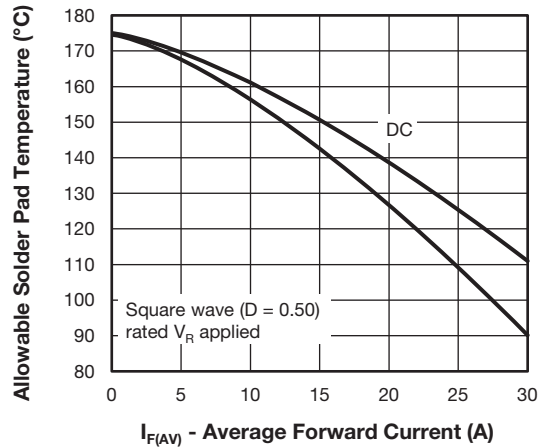


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

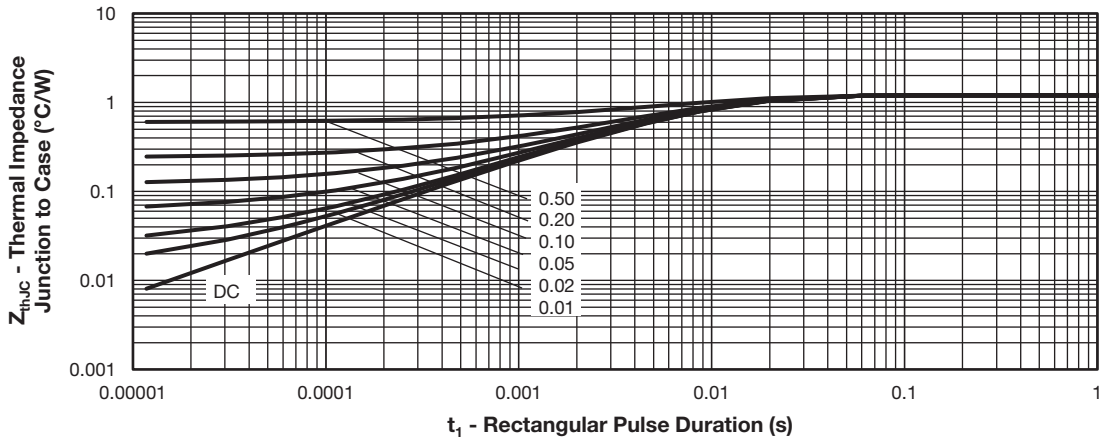


Fig. 5 - Thermal Impedance  $Z_{thJC}$  Characteristics

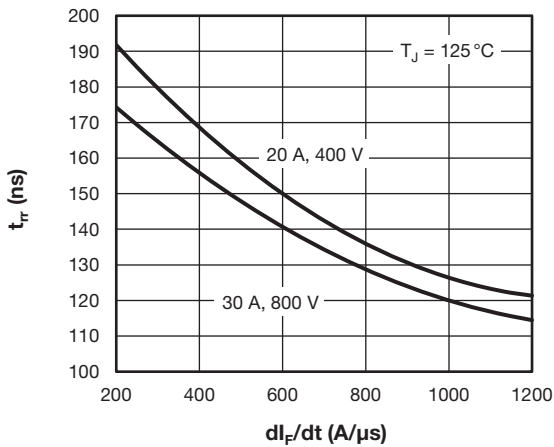


Fig. 6 - Typical Reverse Recovery Time vs.  $di/dt$

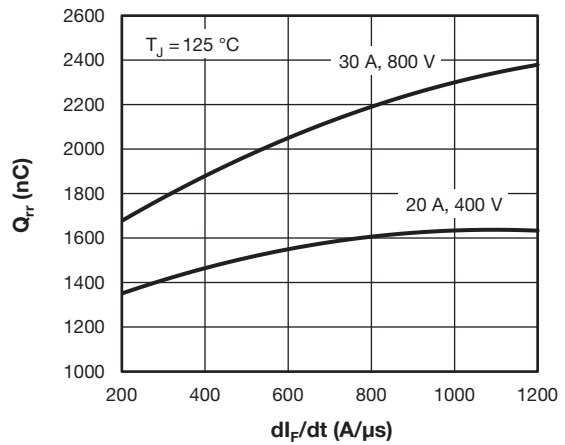


Fig. 7 - Typical Stored Charge vs.  $di/dt$

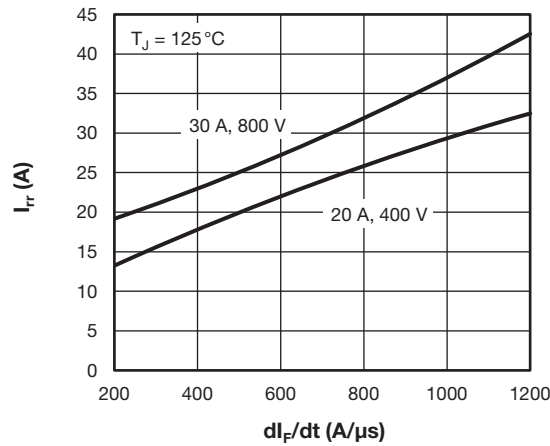


Fig. 8 - Typical Recovery Current vs.  $di_F/dt$

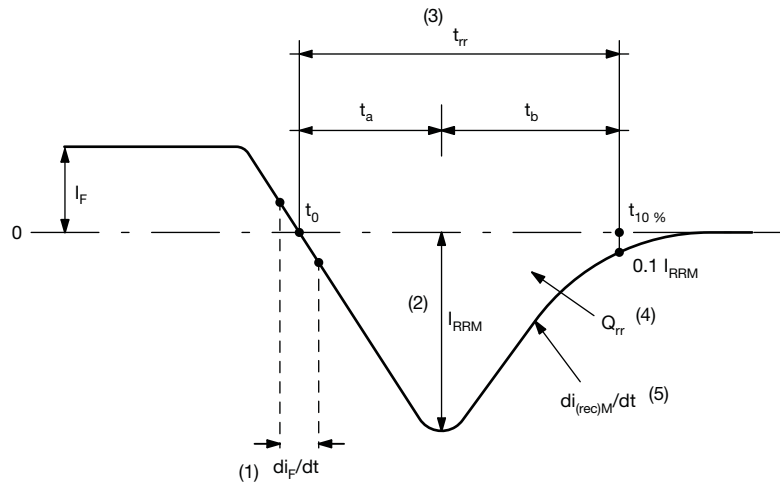


Fig. 9 - Reverse Recovery Waveform and Definitions

**Notes**

- (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  $t_0$ , crossing point of negative going  $I_F$ , to point  $t_{10\%}$ ,  $0.1 I_{RRM}$
- (4)  $Q_{rr}$  - area under curve defined by  $t_0$  and  $t_{10\%}$

$$Q_{rr} = \int_{t_0}^{t_{10\%}} I(t) dt$$

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

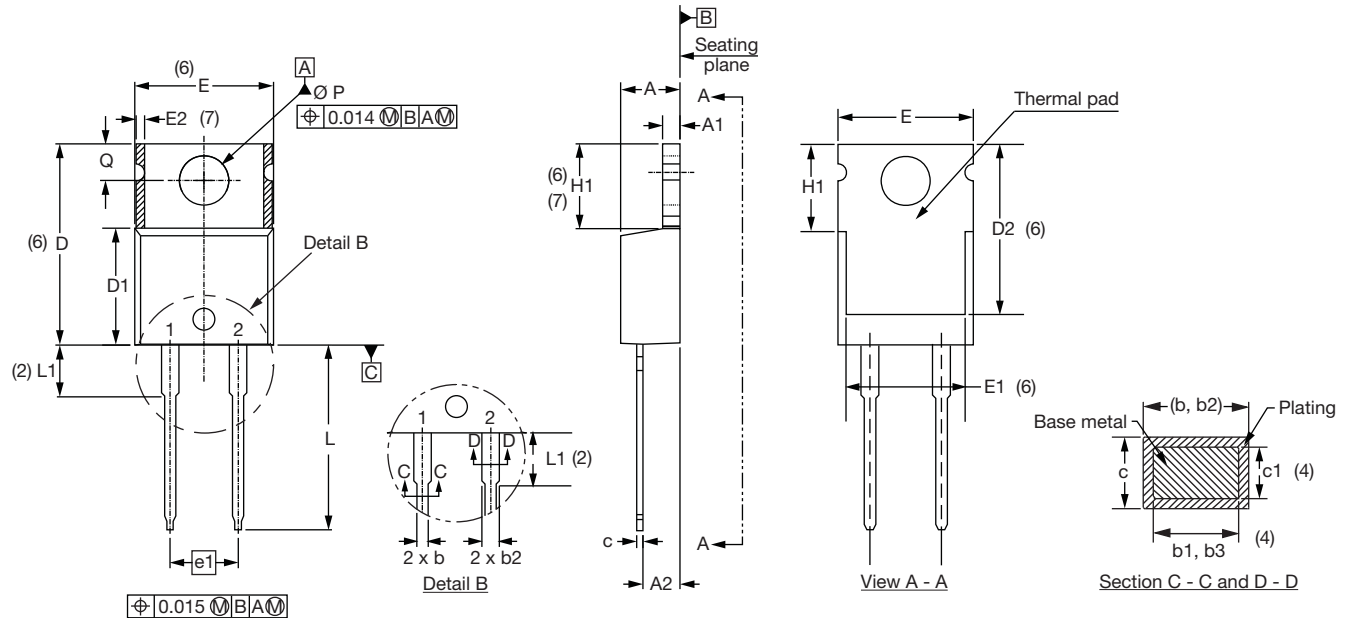
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-E5TX3012-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96069">www.vishay.com/doc?96069</a>
Part marking information	<a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a>



# 2L TO-220AC

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC® TO-220, except D2, where JEDEC® minimum is 0.480".



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