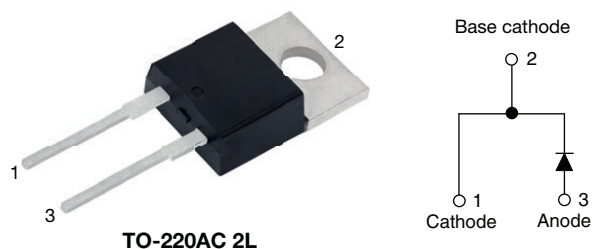


Hyperfast Rectifier, 15 A FRED Pt® G5



TO-220AC 2L



RoHS
COMPLIANT
HALOGEN
FREE

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
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

LINKS TO ADDITIONAL RESOURCES



3D Models



Application Notes

SPICE

Models

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	15 A
V_R	1200 V
V_F at I_F at 125 °C	2.1 V
t_{rr}	29 ns
T_J max.	175 °C
Package	TO-220AC 2L
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.

MECHANICAL DATA

Case: TO-220AC 2L

Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	V_{RRM}		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 98\text{ °C}$, $D = 0.50$	15	A
Repetitive peak forward current	I_{FRM}	$T_C = 98\text{ °C}$, $D = 0.50$, $f = 20\text{ kHz}$	30	
Non-repetitive peak surge current	I_{FSM}	$T_C = 45\text{ °C}$, $t_p = 10\text{ ms}$, sine wave	110	
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	$I_F = 15\text{ A}$	-	2.5	3.3	
		$I_F = 15\text{ A}$, $T_J = 125\text{ °C}$	-	2.1	-	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	-	50	μA
		$T_J = 125\text{ °C}$, $V_R = V_R$ rated	-	-	500	
Junction capacitance	C_T	$V_R = 200\text{ V}$	-	10	-	pF
Series inductance	L_S	Measured to lead 5 mm from package body	-	8	-	nH

**DYNAMIC RECOVERY CHARACTERISTICS** ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	1 A, 30 V, 100 A/ μs	-	29	-	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	$I_F = 10\text{ A}$ $di_F/dt = 600\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	-	96	-	
		$T_J = 125\text{ }^{\circ}\text{C}$		-	137	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$		-	11.5	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$		-	16	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$		-	375	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$		-	900	-	
Reverse recovery time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	$I_F = 15\text{ A}$ $di_F/dt = 1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$	-	77.5	-	ns
		$T_J = 125\text{ }^{\circ}\text{C}$		-	106	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$		-	21	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$		-	29	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$		-	680	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$		-	1600	-	

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction-to-case	R_{thJC}		-	-	1.7	$^{\circ}\text{C}/\text{W}$
Weight			-	2.0	-	g
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 TO-220AC 2L	E5TX1512TH			

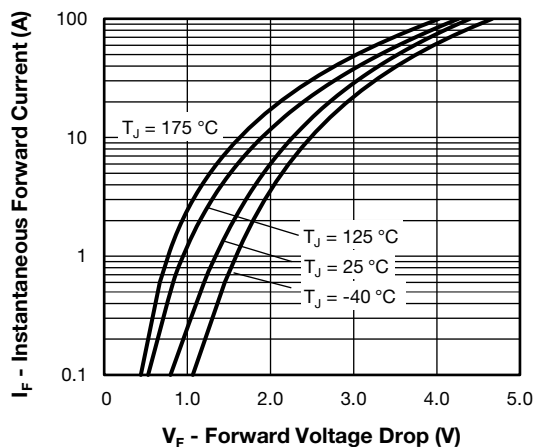


Fig. 1 - Forward Voltage Drop Characteristics

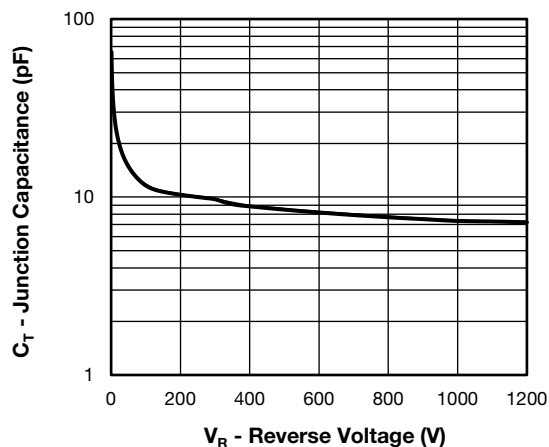


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

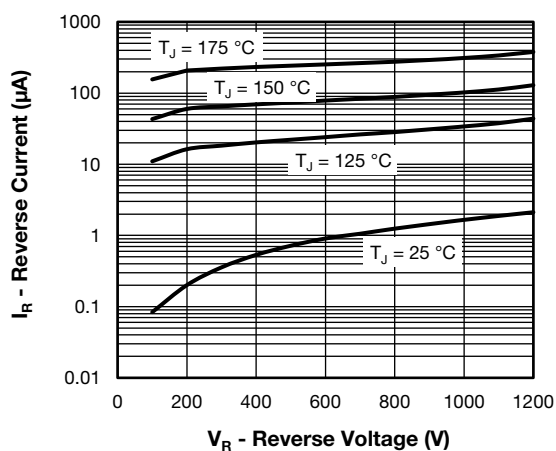


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

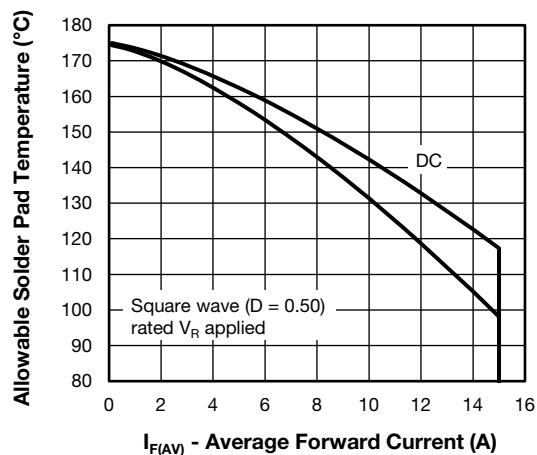


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

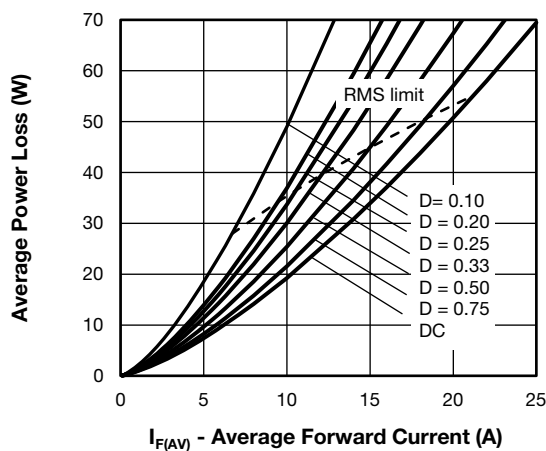


Fig. 5 - Forward Power Loss Characteristics

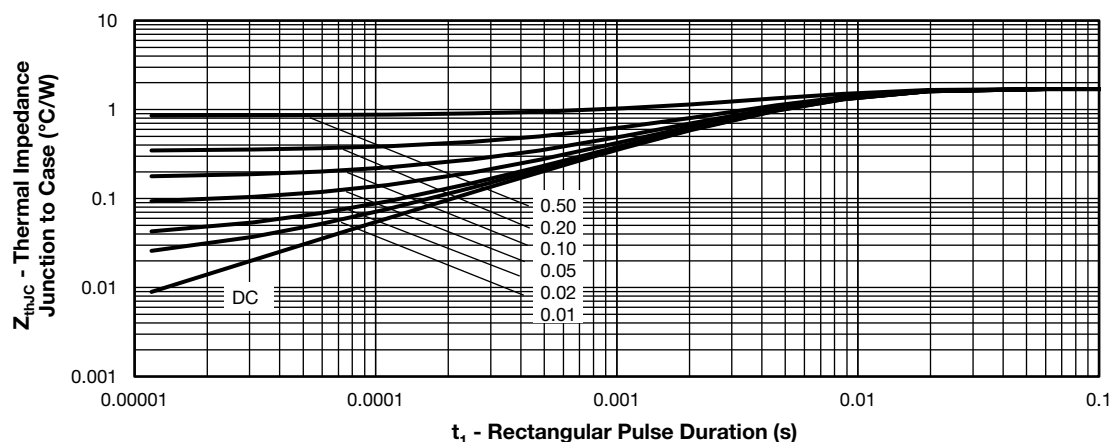


Fig. 6 - Transient Thermal Impedance, Junction to Case

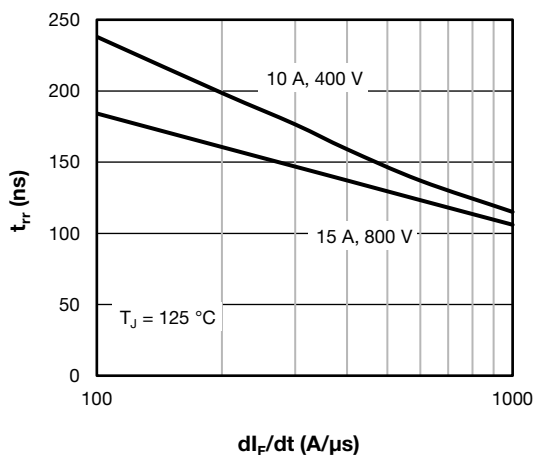
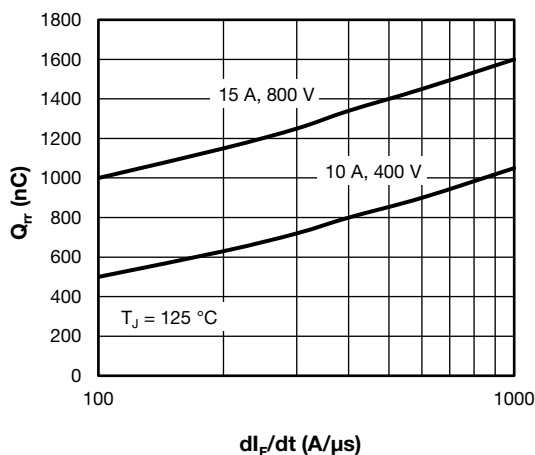
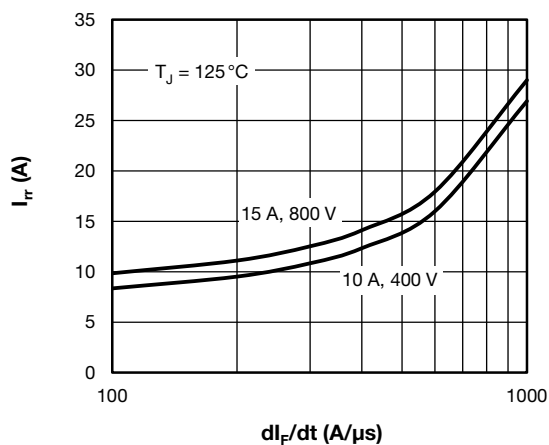

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

Fig. 8 - Typical Reverse Recovery Charge vs. dI_F/dt

Fig. 9 - Typical Reverse Recovery Current vs. dI_F/dt



Fig. 10 - 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 TABLE**

Device code	VS-	E	5	T	X	15	12	T	H	N3
	1	2	3	4	5	6	7	8	9	10
1	-	Vishay Semiconductors product								
2	-	E = single diode								
3	-	5 = FRED generation 5								
4	-	Package: T = TO-220AC 2L								
5	-	X = hyperfast recovery								
6	-	Current rating (15 = 15 A)								
7	-	Voltage rating (12 = 1200 V)								
8	-	T = true 2 pin TO-220								
9	-	H = AEC-Q101 qualified								
10	-	Environmental digit: N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free								

ORDERING INFORMATION (Example)

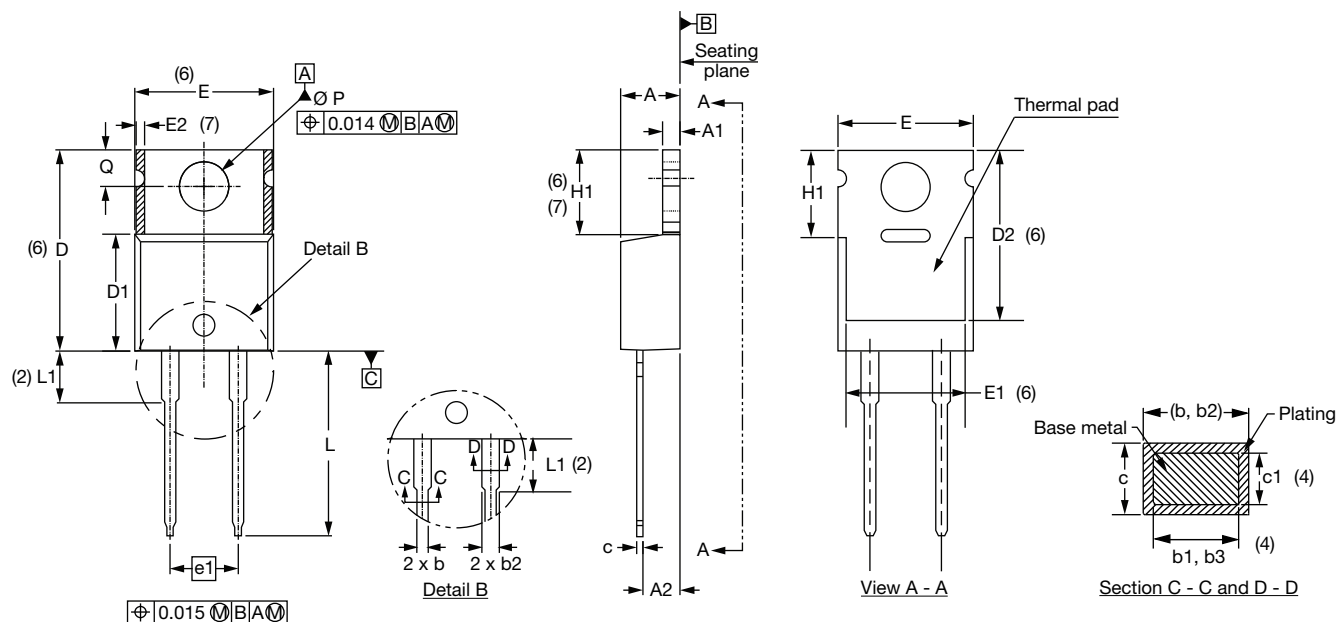
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-E5TX1512THN3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?96069
Part marking information	www.vishay.com/doc?95391
SPIICE Model	www.vishay.com/doc?97160

TO-220AC 2L

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
e1	4.88	5.28	0.192	0.208	
H1	5.84	6.86	0.230	0.270	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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