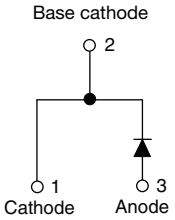
Hyperfast Rectifier, 15 A FRED Pt® G5

TO-220AC 2L



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

RoHS COMPLIANT

HALOGEN FREE

LINKS TO ADDITIONAL RESOURCES

3D Models

Application Notes

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	15 A
V_R	1200 V
V_F at I_F at 125 °C	1.7 V
t_{rr}	37 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

Polarity: as per marking device details

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 = 110 °C, D = 0.50	15	A
Repetitive peak forward current	I_{FRM}	T_C = 110 °C, D = 0.50, f = 20 kHz	30	
Non-repetitive peak surge current	I_{FSM}	T_C = 45 °C, t_p = 10 ms, sine wave	125	
Operating junction and storage temperature	T_J, T_{Stg}		-55 to +175	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 µA	1200	-	-	V
Forward voltage	V_F	I_F = 15 A	-	1.9	2.5	
		I_F = 15 A, T_J = 125 °C	-	1.7	-	
Reverse leakage current	I_R	V_R = V_R rated	-	-	50	µA
		T_J = 125 °C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R = 200 V	-	10	-	pF
Series inductance	L_S	Measured to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	37	50	ns
		T_J = 25 °C	I_F = 10 A dI_F/dt = 600 A/µs V_R = 400 V	-	95	-	
		T_J = 125 °C		-	146	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	14	-	A
		T_J = 125 °C		-	19	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	545	-	nC
		T_J = 125 °C		-	1200	-	
Reverse recovery time	t_{rr}	T_J = 25 °C	I_F = 15 A dI_F/dt = 1000 A/µs V_R = 800 V	-	75.5	-	ns
		T_J = 125 °C		-	100	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	23	-	A
		T_J = 125 °C		-	35	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	935	-	nC
		T_J = 125 °C		-	1985	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction-to-case	R_{thJC}		-	-	1.7	°C/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	°C
Marking device		Case style TO-220AC 2L	E5TH1512			

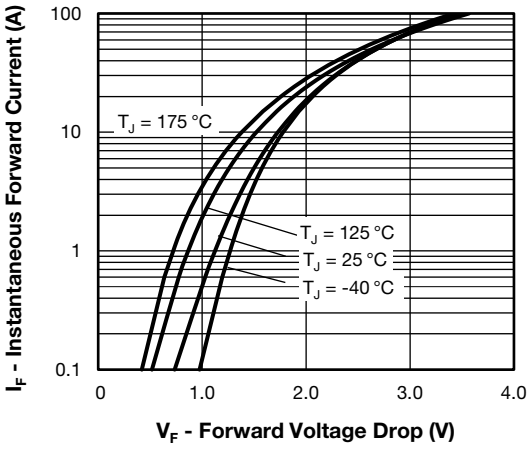


Fig. 1 - Forward Voltage Drop Characteristics

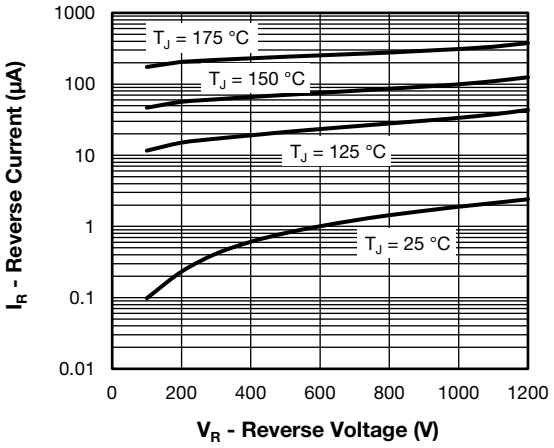


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

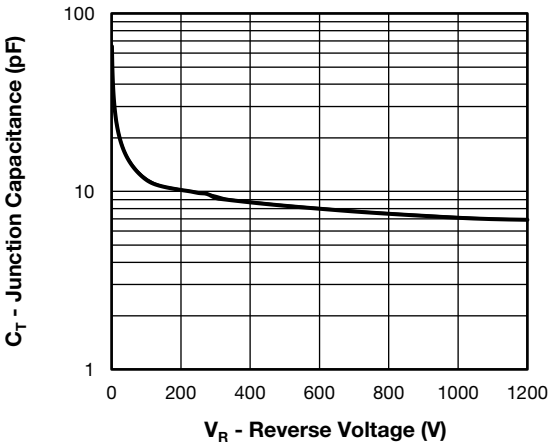


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

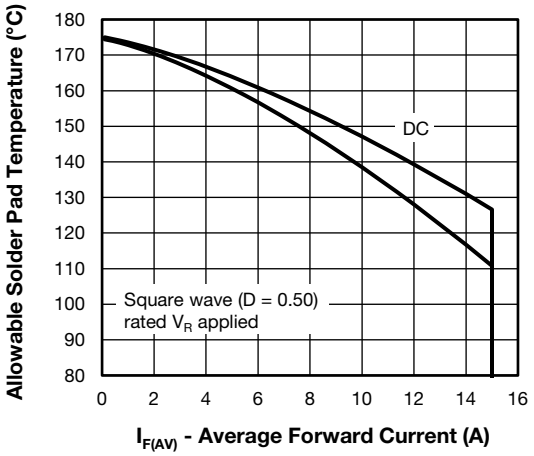


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

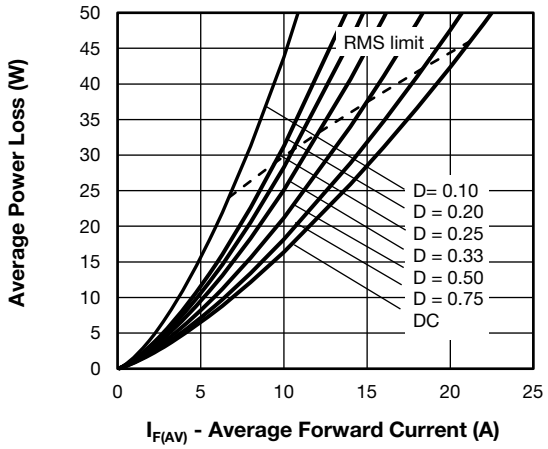


Fig. 5 - Forward Power Loss Characteristics

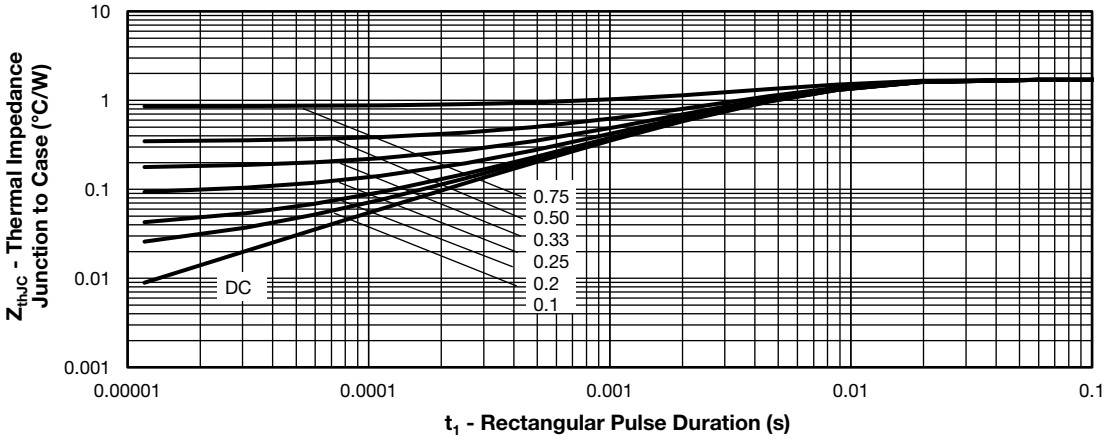


Fig. 6 - Transient Thermal Impedance, Junction to Case

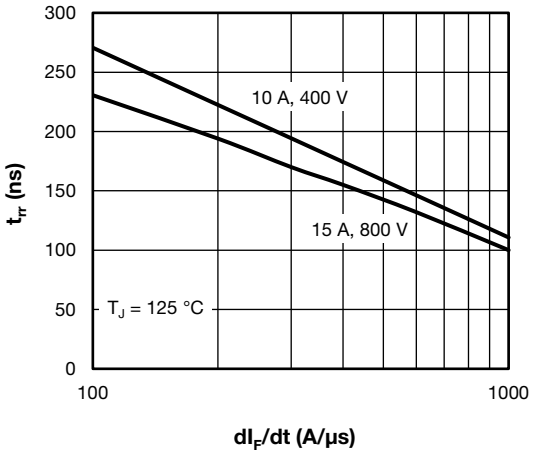


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

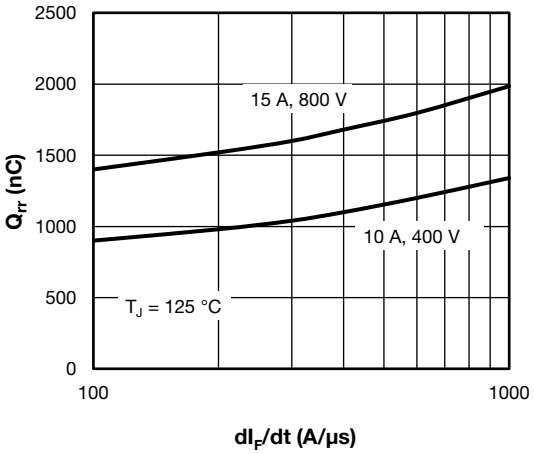


Fig. 8 - Typical Stored Charge vs. dI_F/dt

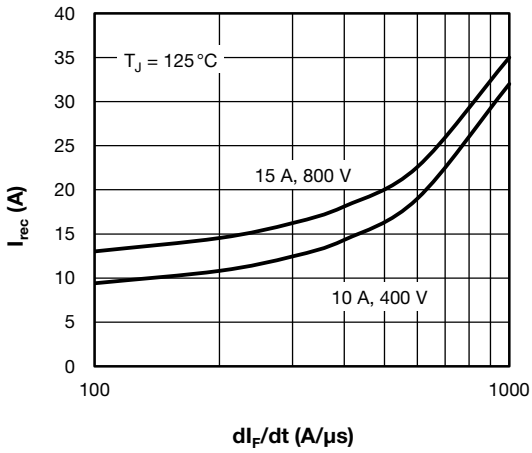


Fig. 9 - Typical Stored Charge vs. dI_F/dt

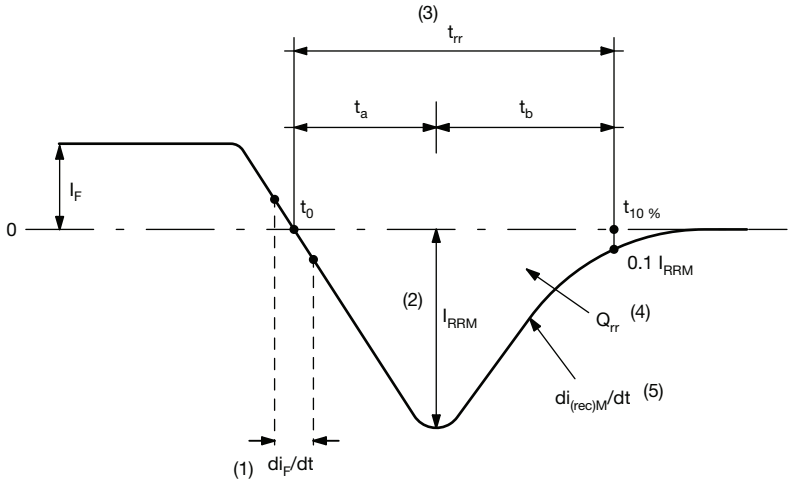


Fig. 10 - Reverse Recovery Waveform and Definitions

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	H	15	12	-M3
1	2	3	4	5	6	7	8

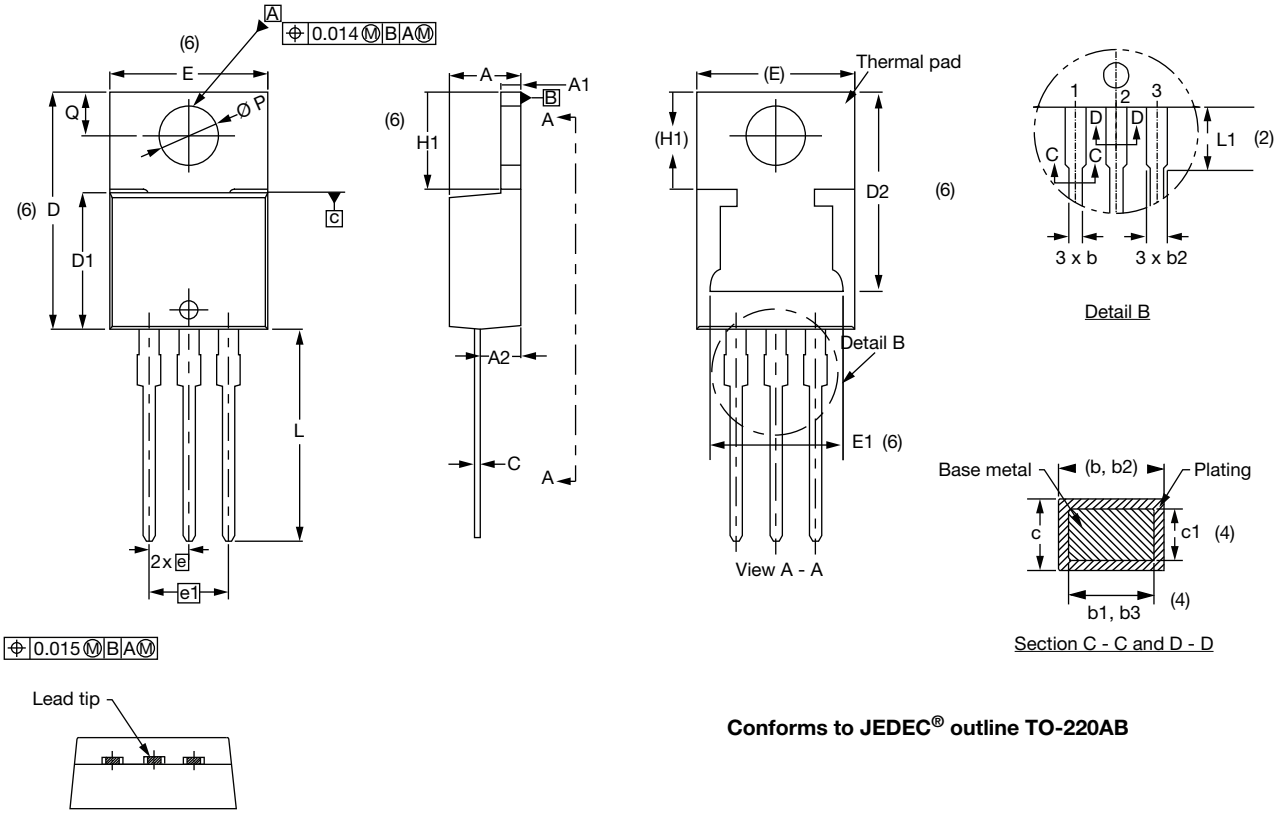
- **1** - Vishay Semiconductors product
- **2** - E = single diode
- **3** - 5 = FRED generation 5
- **4** - Package:
  T = TO-220AC 2L
- **5** - H = hyperfast recovery
- **6** - Current rating (15 = 15 A)
- **7** - Voltage rating (12 = 1200 V)
- **8** - Environmental digit:
  -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION (Example)		
PREFERRED P/N	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-E5TH1512-M3	50	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96156
Part marking information	www.vishay.com/doc?95391

TO-220AB 3L

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AB

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	2.50	2.92	0.098	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	15.35	0.585	0.604	3
D1	8.38	9.02	0.330	0.355	

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	11.68	13.30	0.460	0.524	6, 7
E	10.11	10.51	0.398	0.414	3, 6
E1	6.86	8.89	0.270	0.350	6
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
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
Ø P	3.54	3.91	0.139	0.154	
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 dimensions: inches
(6) Thermal pad contour optional within dimensions E, H1, D2, and E1
(7) Outline conforms to JEDEC® TO-220, except D2

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