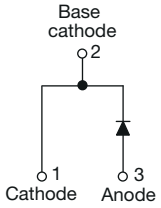
Ultrafast Rectifier, 15 A FRED Pt®

TO-220AC 2L



FEATURES

- Ultrafast and soft recovery time
- Optimized forward voltage drop
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Rugged design
- Good thermal performance
- Meets JESD 201 class 1A whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	15 A
V_R	1200 V
V_F at I_F at 125 °C	2.25 V
t_{rr}	44 ns
T_J max.	175 °C
Package	TO-220AC 2L
Circuit configuration	Single

DESCRIPTION / APPLICATIONS

Ultrafast recovery rectifiers designed with optimized performance of forward voltage drop, recovery time, and soft recovery.

Polyimide passivated, planar structure, and the platinum doped life time control guarantee, ruggedness, reliability characteristics, and solid value position for efficiency and thermal performance.

These devices are intended for use in boost stage in the AC/DC section of SMPS, high frequency output rectification of battery charger, inverters of solar inverters, or as freewheeling diodes in motor drive.

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 = 115 °C, D = 0.50	15	A
Non-repetitive peak surge current	I_{FSM}	T_C = 25 °C, t_p = 10 ms, sine wave	150	
Repetitive peak forward current	I_{FRM}		30	
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 = 250 µA	1200	-	-	V
Forward voltage	V_F	I_F = 15 A	-	2.3	2.78	
		I_F = 15 A, T_J = 125 °C	-	2.25	2.7	
Reverse leakage current	I_R	V_R = V_R rated	-	-	80	µA
		T_J = 125 °C, V_R = V_R rated	-	-	150	
Junction capacitance	C_T	V_R = 200 V	-	13	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

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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		-	44	-	ns
		T_J = 25 °C	I_F = 15 A dI_F/dt = 100 A/μs V_R = 390 V	-	167	-	
		T_J = 125 °C		-	248	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	6	-	A
		T_J = 125 °C		-	9	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	507	-	nC
		T_J = 125 °C		-	1110	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R_{thJC}		-	1.1	1.3	°C/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	54	60	
Thermal resistance, case to heat sink	R_{thCS}	Mounting surface, flat, smooth, and greased	-	0.2	0.4	
Weight			-	0.2	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style: TO-220AC 2L	15ETU12			
Maximum junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C

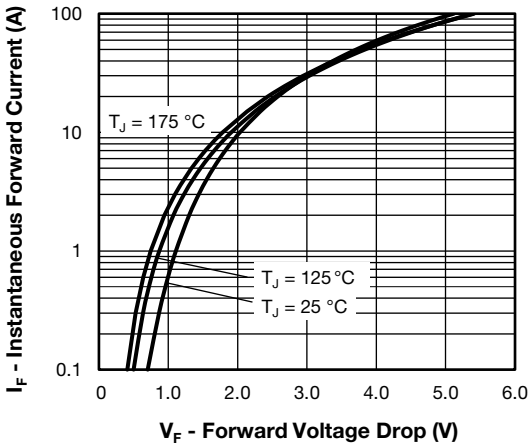

Fig. 1 - Typical Forward Voltage Drop Characteristics

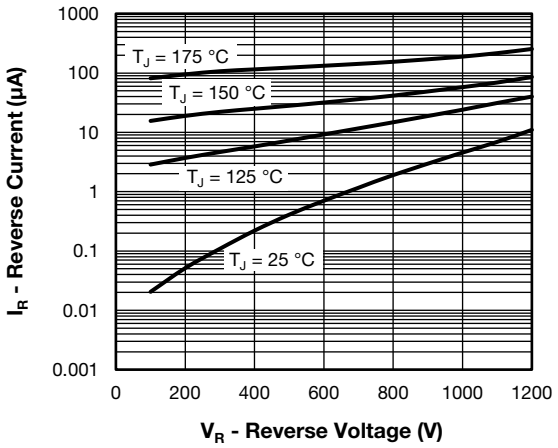

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

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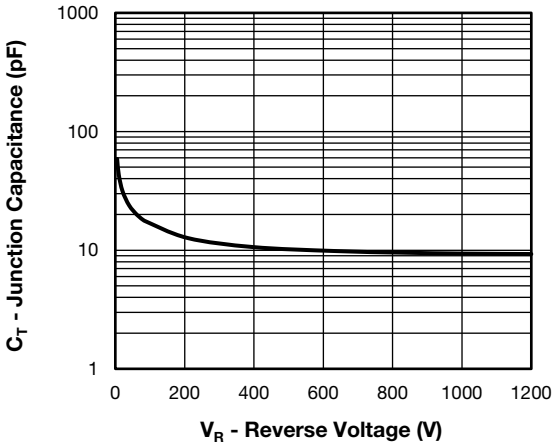

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

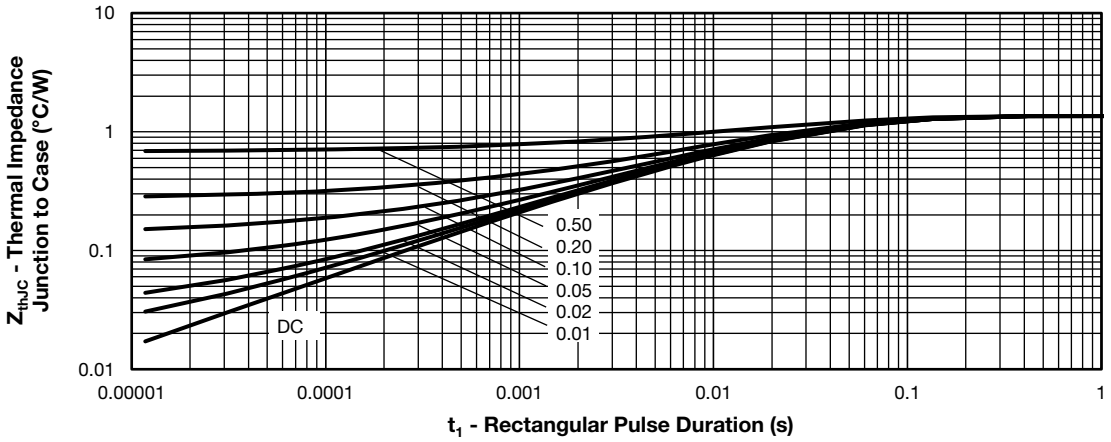

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

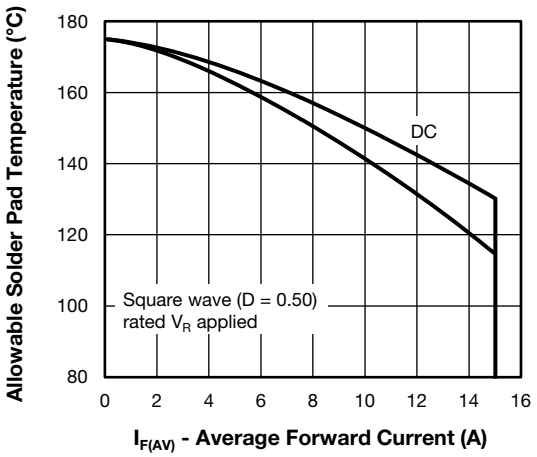

Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

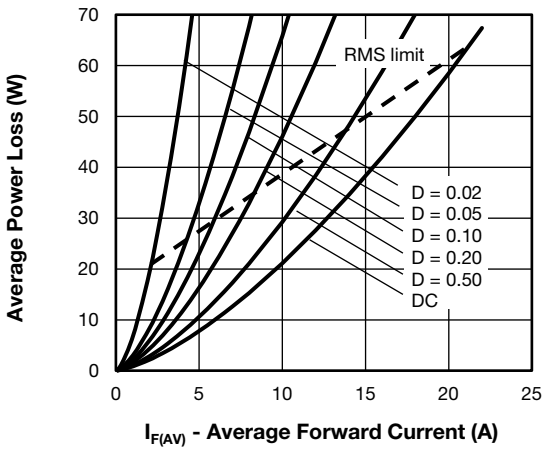

Fig. 6 - Forward Power Loss Characteristics

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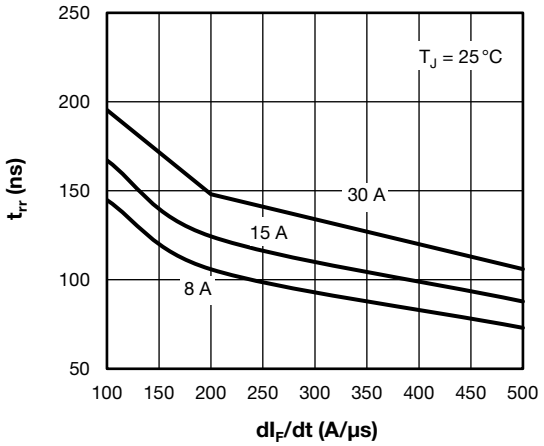

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

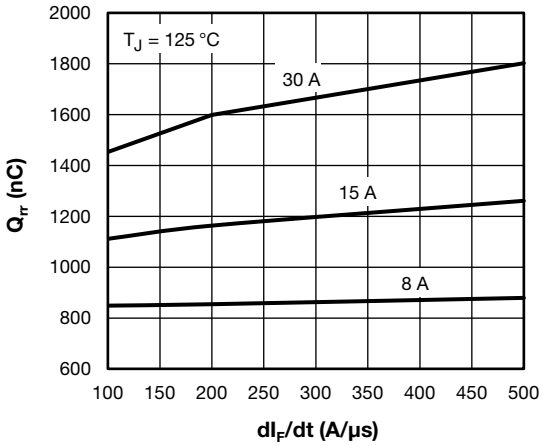

Fig. 10 - Typical Stored Charge vs. dI_F/dt

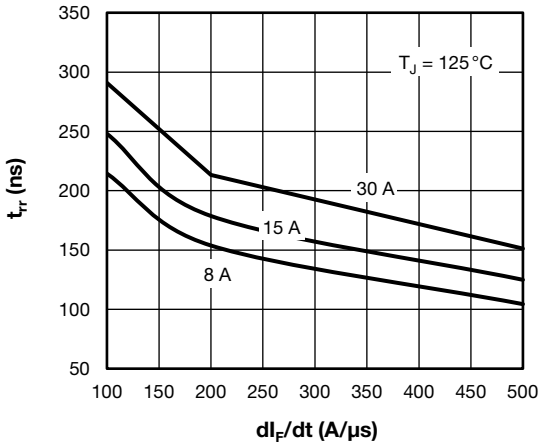

Fig. 8 - Typical Reverse Recovery Time vs. dI_F/dt

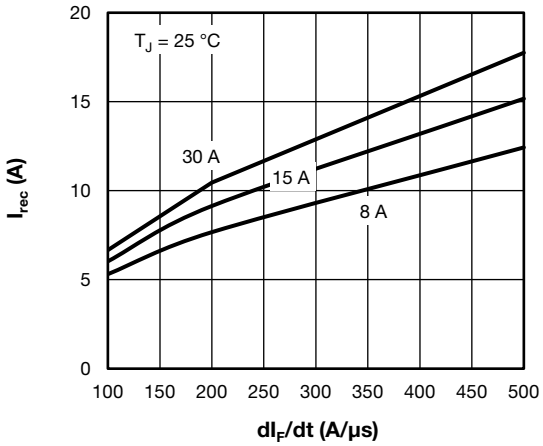

Fig. 11 - Typical Reverse Current vs. dI_F/dt

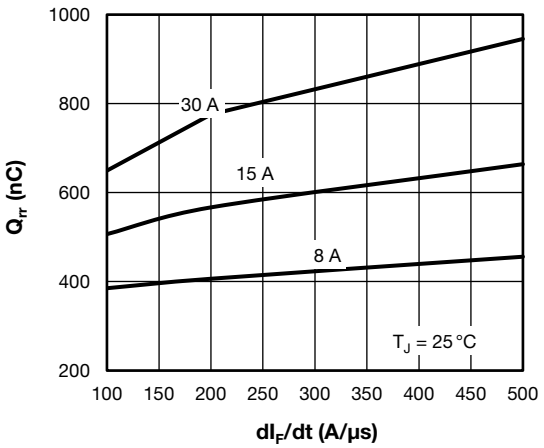

Fig. 9 - Typical Stored Charge vs. dI_F/dt

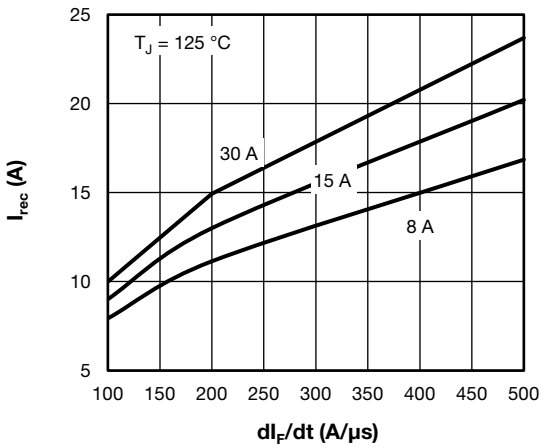

Fig. 12 - Typical Reverse Current vs. dI_F/dt

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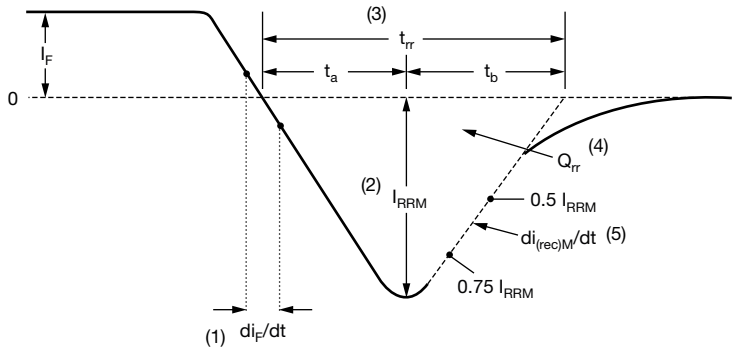

(1) di_F/dt - rate of change of current through zero crossing

(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. 13 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	15	E	T	U	12	-M3
	1	2	3	4	5	6	7

1 - Vishay Semiconductors product

2 - Current rating (15 = 15 A)

3 - E = single

4 - Package:

4 T = TO-220AC 2L

5 - U = ultrafast recovery

6 - Voltage rating (12 = 1200 V)

7 - Environmental digit:

-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION (Example)		
PREFERRED P/N	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-15ETU12-M3	50	Antistatic plastic tubes

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

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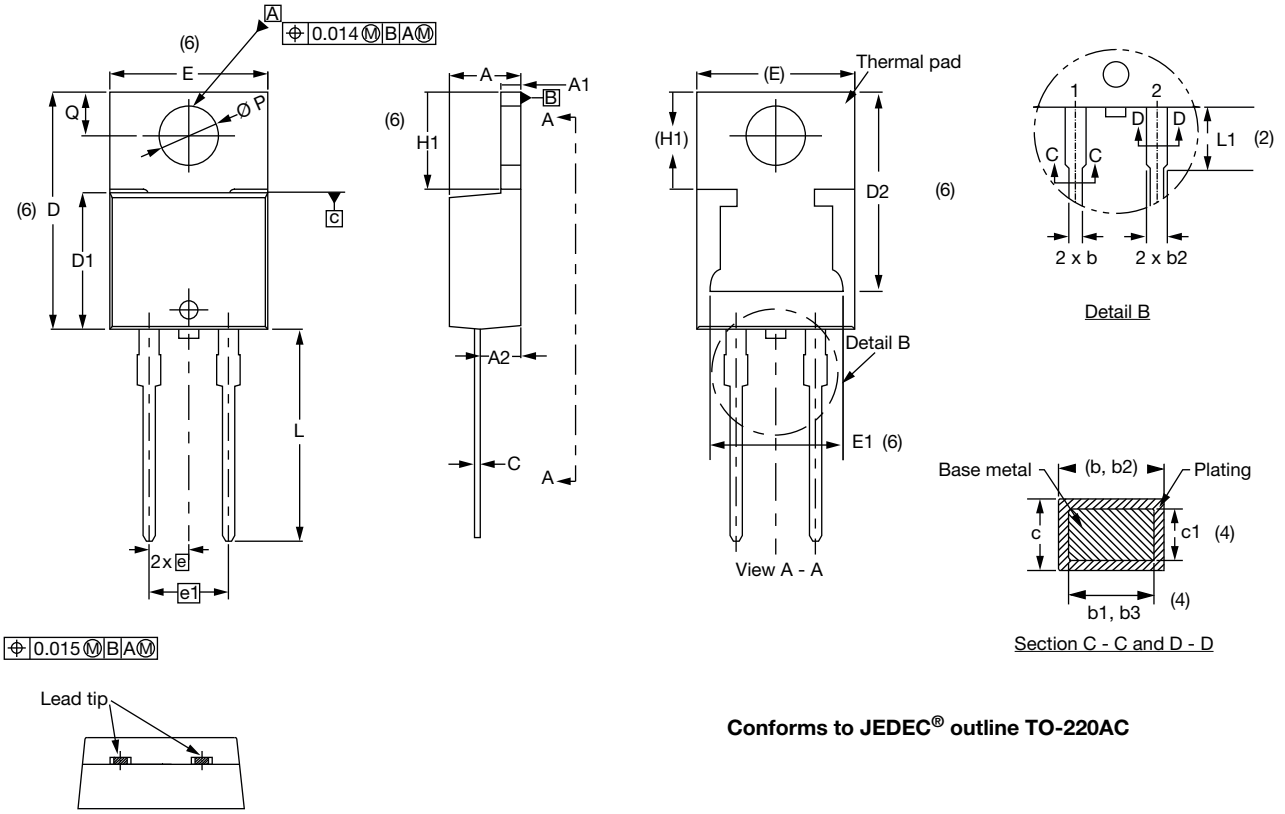
TO-220AC 2L

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AC

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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