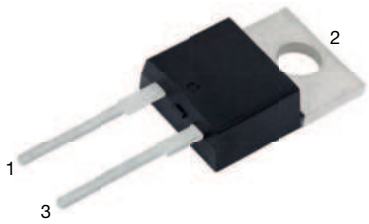
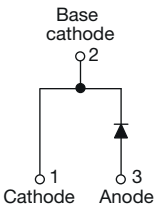
Ultrafast Rectifier, 15 A FRED Pt®



TO-220AC 2L



FEATURES

- Low forward voltage drop
- Ultrafast soft recovery time
- 175 °C operating junction temperature
- Low leakage current
- True 2 pin package
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

DESCRIPTION

State of the art, ultralow V_F, soft-switching ultrafast rectifiers optimized for Discontinuous (Critical) Mode (DCM) Power Factor Correction (PFC).

The minimized conduction loss, optimized stored charge and low recovery current minimized the switching losses and reduce over dissipation in the switching element and snubbers.

The device is also intended for use as a freewheeling diode in power supplies and other power switching applications.

APPLICATIONS

AC/DC SMPS 70 W to 400 W
e.g. laptop and printer AC adaptors, desktop PC, TV and monitor, games units and DVD AC/DC power supplies.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	15 A
V_R	600 V
V_F at I_F	1.1 V
t_{rr} (typ.)	24 ns
T_J max.	175 °C
Package	TO-220AC 2L
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	V_{RRM}		600	V
Average rectified forward current in DC	$I_{F(AV)}$	T_C = 151 °C	15	A
Non-repetitive peak surge current	I_{FSM}	T_J = 25 °C	160	
Operating junction and storage temperatures	T_J, T_{Stg}		-65 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	600	-	-	V
Forward voltage	V_F	I_F = 15 A	-	1.35	1.9	V
		I_F = 15 A, T_J = 150 °C	-	1.1	1.3	
Reverse leakage current	I_R	V_R = V_R rated	-	0.01	15	µA
		T_J = 150 °C, V_R = V_R rated	-	20	200	
Junction capacitance	C_T	V_R = 600 V	-	12	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	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 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	24	28	ns
		I_F = 15 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	36	47	
		T_J = 25 °C	I_F = 15 A, dI_F/dt = 200 A/µs, V_R = 390 V	-	40	-	
		T_J = 125 °C		-	87	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	5	-	A
		T_J = 125 °C		-	9	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	107	-	nC
		T_J = 125 °C		-	430	-	
Reverse recovery time	t_{rr}	T_J = 125 °C	I_F = 15 A, dI_F/dt = 800 A/µs, V_R = 390 V	-	53	-	ns
Peak recovery current	I_{RRM}			-	25	-	A
Reverse recovery charge	Q_{rr}			-	730	-	nC

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		-65	-	175	°C
Thermal resistance, junction-to-case	R_{thJC}		-	1.2	1.4	°C/W
Thermal resistance, junction-to-ambient	R_{thJA}	Typical socket mount	-	-	70	
Typical thermal resistance, case-to-heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2	-	g
			-	0.07	-	oz.
Mounting torque			6 (5)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220AC 2L	ETU1506			

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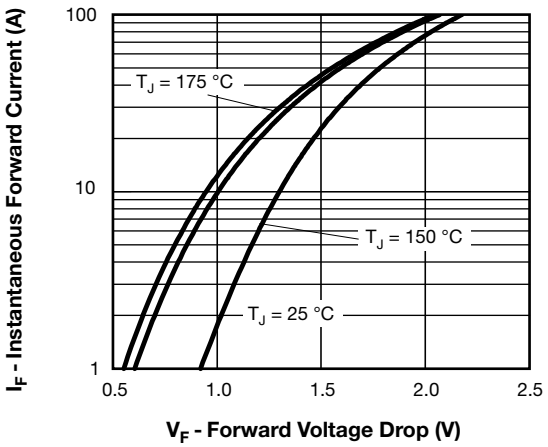


Fig. 1 - Typical Forward Voltage Drop Characteristics

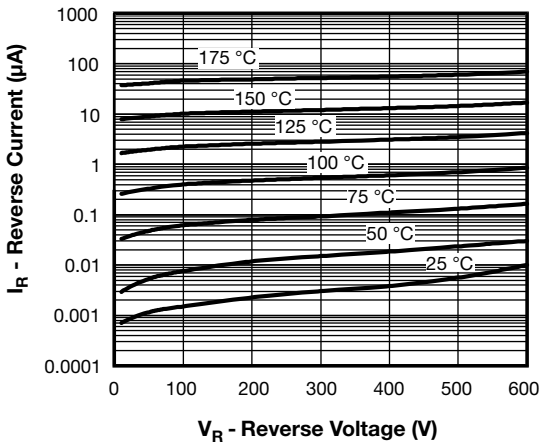


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

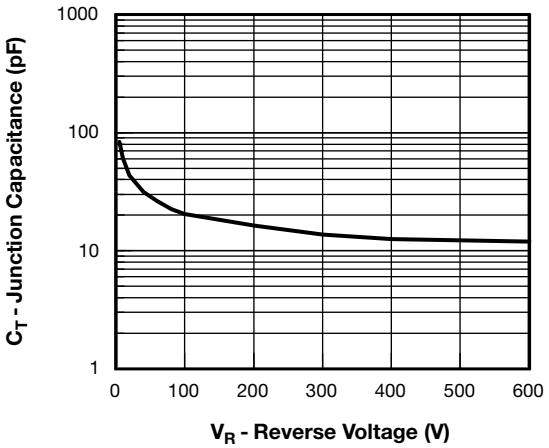


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

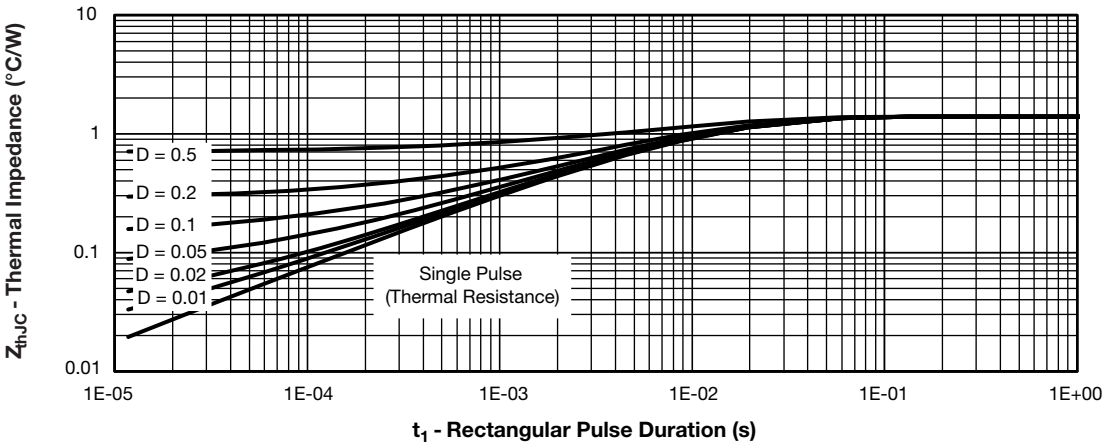


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

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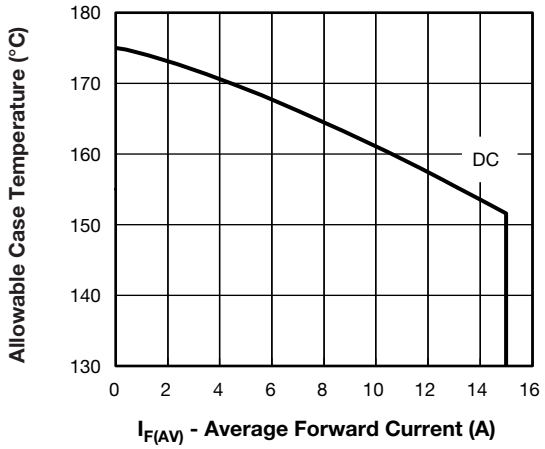


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

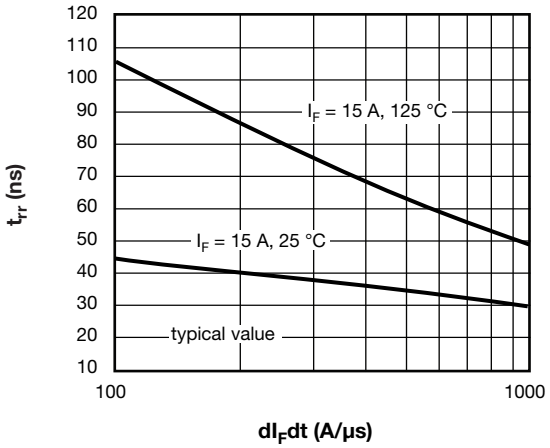


Fig. 7 - Typical Reverse Recovery vs. dI_F/dt

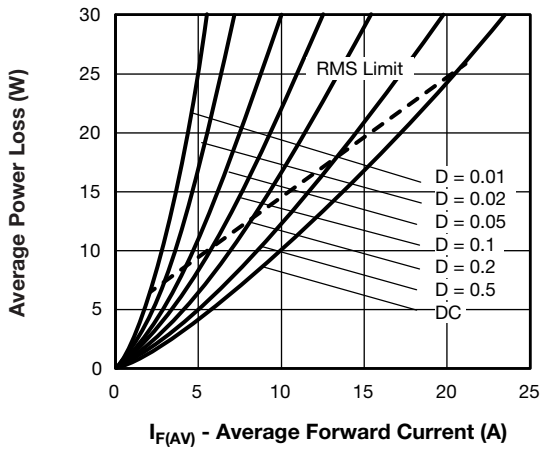


Fig. 6 - Forward Power Loss Characteristics

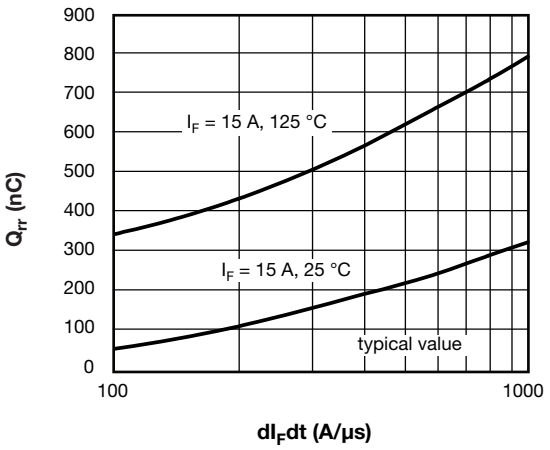
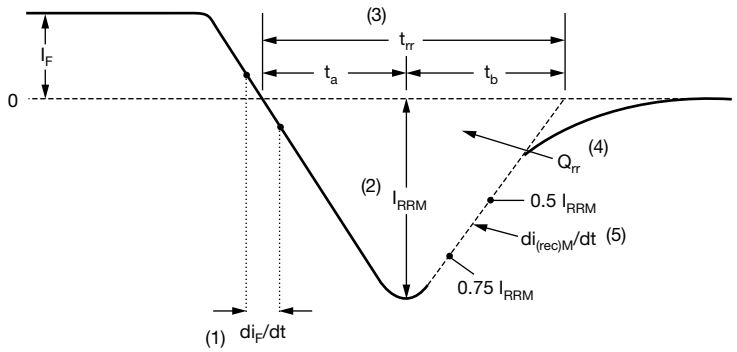


Fig. 8 - Typical Stored Charge vs. dI_F/dt



(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

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ORDERING INFORMATION TABLE

Device code

VS-	E	T	U	15	06	-M3
1	2	3	4	5	6	7

1 - Vishay Semiconductors product
2 - Circuit configuration:
E = single
3 - T = 2L TO-220AC
4 - U = hyperfast recovery time
5 - Current code: 15 = 15 A
6 - Voltage code: 06 = 600 V
7 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

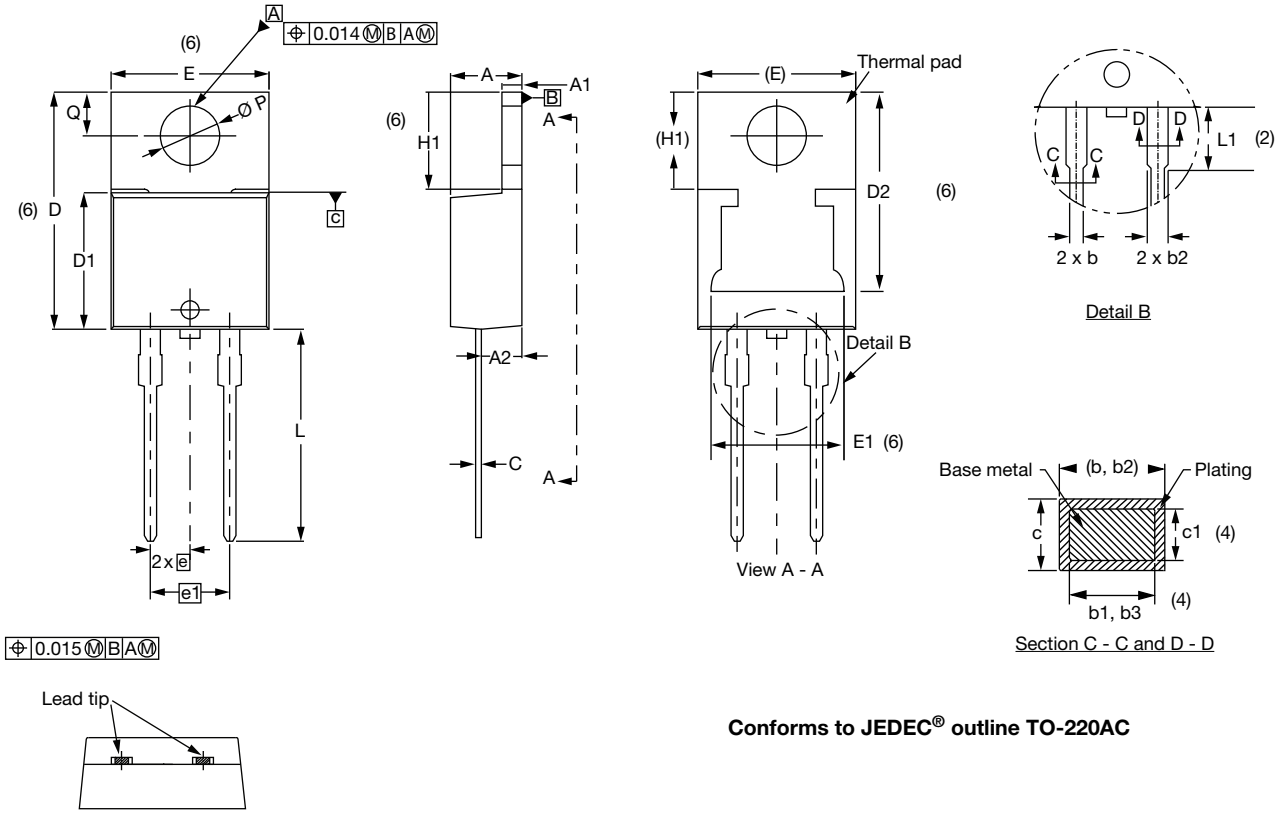
ORDERING INFORMATION (Example)		
PREFERRED P/N	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-ETU1506-M3	50	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96156
Part marking information	www.vishay.com/doc?95391
SPICE model	www.vishay.com/doc?96130

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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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