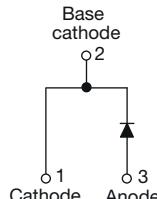


## Ultrafast Rectifier, 15 A FRED Pt®


**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](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### 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.

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

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	$V_{RRM}$		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 115^\circ\text{C}$ , $D = 0.50$	15	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25^\circ\text{C}$ , $t_p = 10$ 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 ( $T_J = 25^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}$ , $V_R$	$I_R = 250$ $\mu\text{A}$	1200	-	-	V
Forward voltage	$V_F$	$I_F = 15$ A	-	2.3	2.78	
		$I_F = 15$ A, $T_J = 125^\circ\text{C}$	-	2.25	2.7	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	80	$\mu\text{A}$
		$T_J = 125^\circ\text{C}$ , $V_R = V_R$ 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

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0 \text{ A}$ , $dI_F/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$	-	44	-	ns
		$T_J = 25^\circ\text{C}$	-	167	-	
		$T_J = 125^\circ\text{C}$	-	248	-	
Peak recovery current	$I_{RRM}$	$T_J = 25^\circ\text{C}$	-	6	-	A
		$T_J = 125^\circ\text{C}$	-	9	-	
		$T_J = 25^\circ\text{C}$	-	507	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 125^\circ\text{C}$	-	1110	-	nC
		$T_J = 25^\circ\text{C}$	-	-	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	$R_{thJC}$	Typical socket mount	-	1.1	1.3	°C/W
Thermal resistance, junction to ambient	$R_{thJA}$		-	54	60	
Thermal resistance, case to heat sink	$R_{thCS}$		-	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

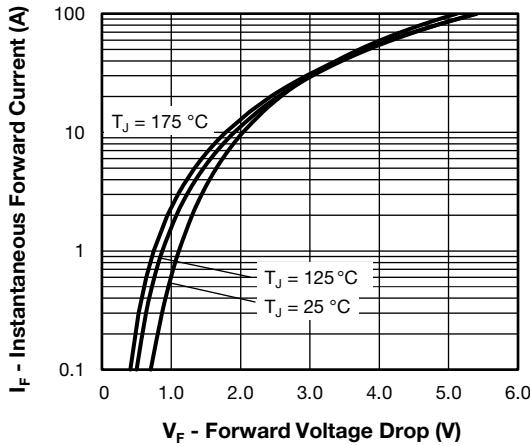


Fig. 1 - Typical Forward Voltage Drop Characteristics

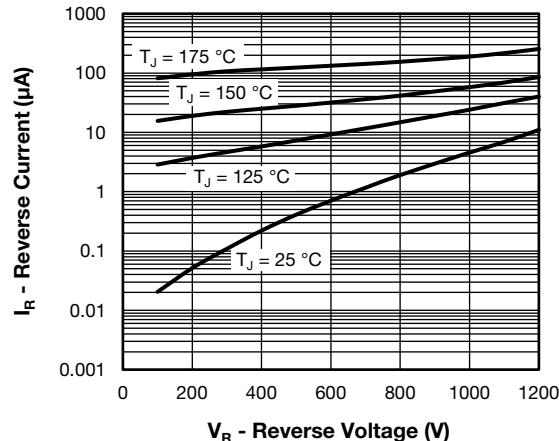


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

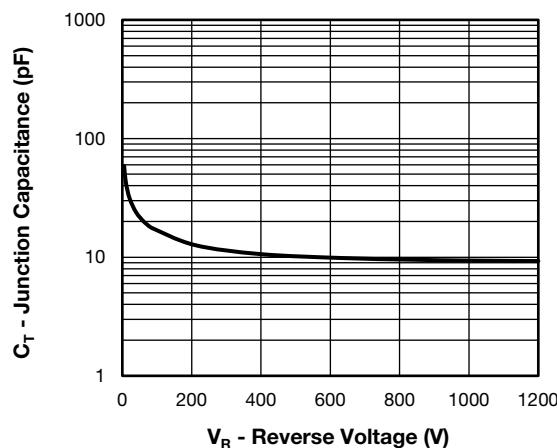


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

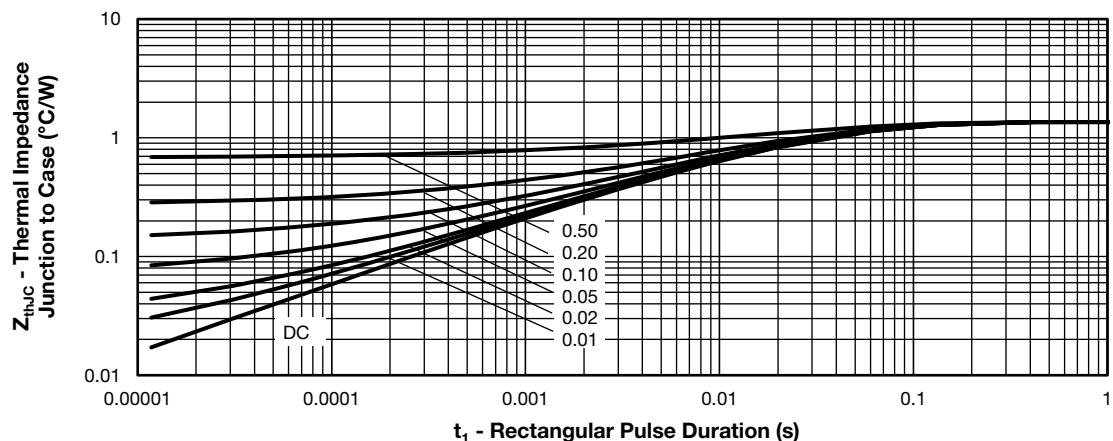


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

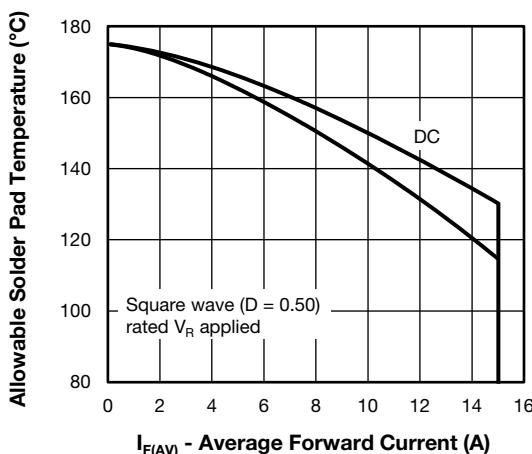


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

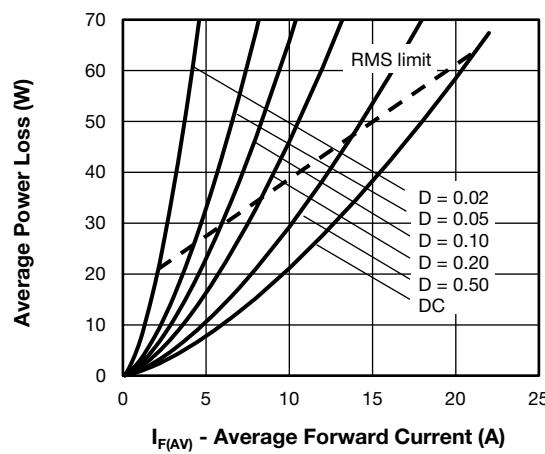


Fig. 6 - Forward Power Loss Characteristics

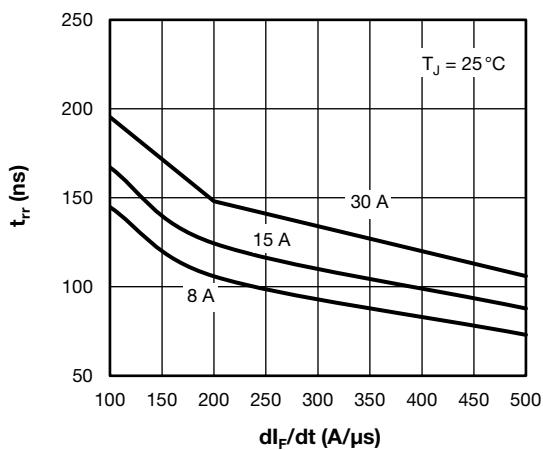


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

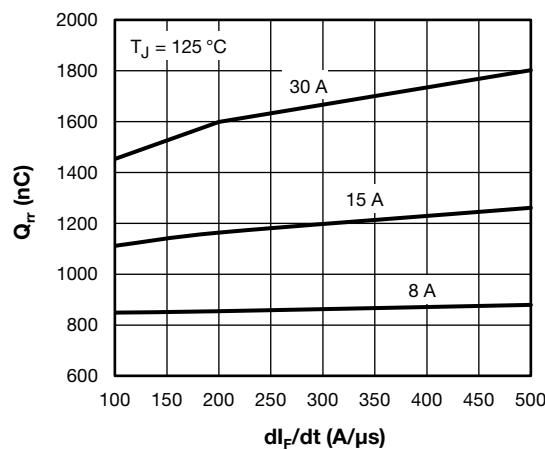


Fig. 10 - Typical Stored Charge vs.  $dI_F/dt$

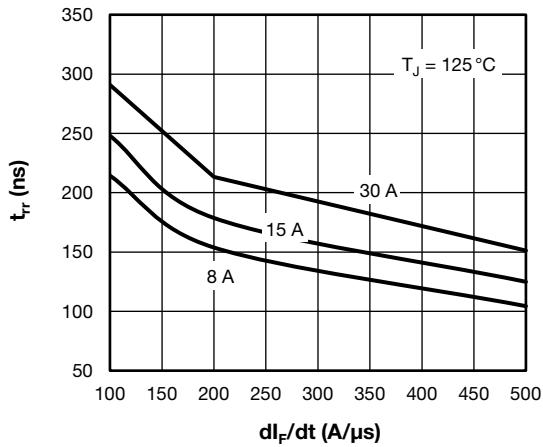


Fig. 8 - Typical Reverse Recovery Time vs.  $dI_F/dt$

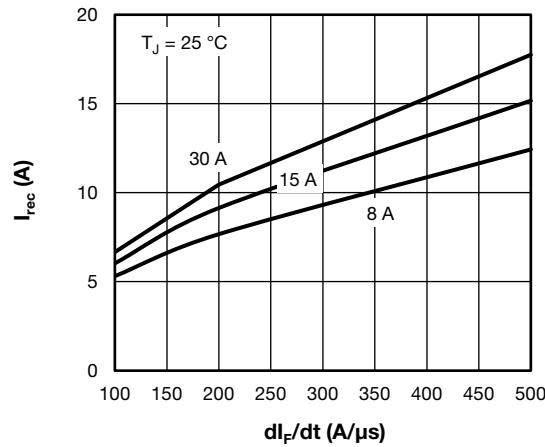


Fig. 11 - Typical Reverse Current vs.  $dI_F/dt$

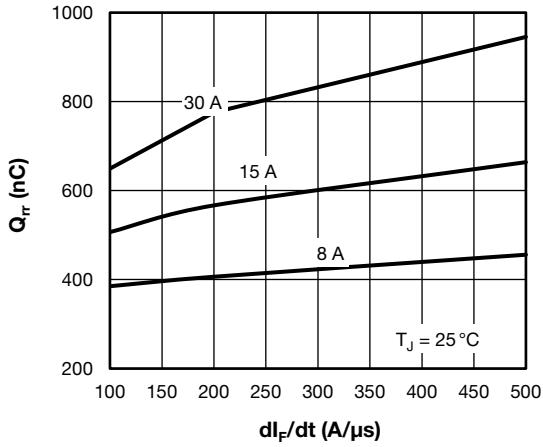


Fig. 9 - Typical Stored Charge vs.  $dI_F/dt$

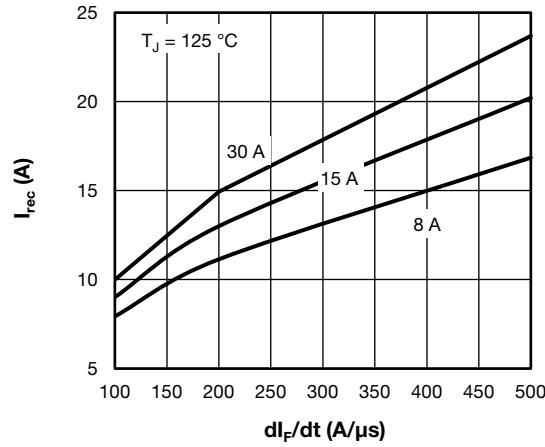
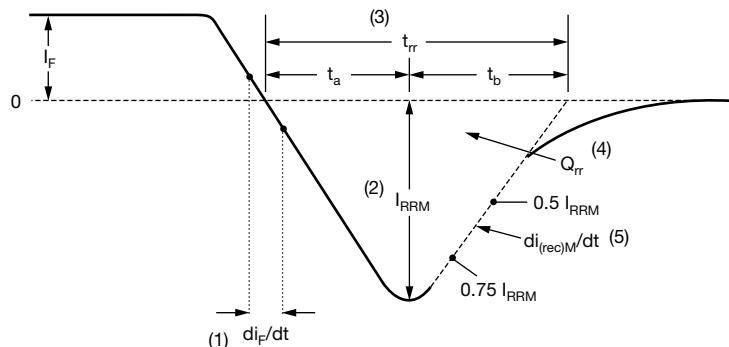


Fig. 12 - Typical Reverse Current vs.  $dI_F/dt$



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

(4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$

(2)  $I_{RRM}$  - peak reverse recovery current

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(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.

(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:  
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)

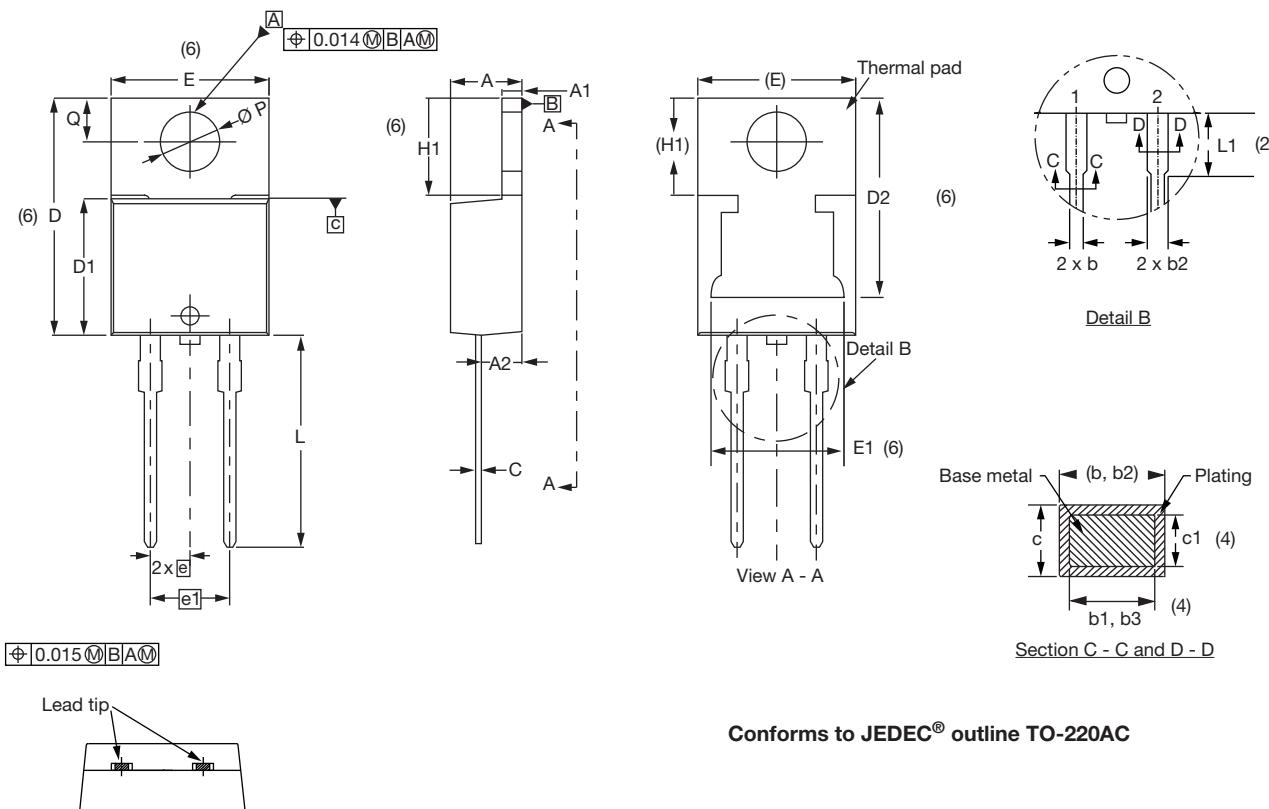
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-15ETU12-M3	50	Antistatic plastic tubes

## LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?96156">www.vishay.com/doc?96156</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



Conforms to JEDEC® outline TO-220AC

## Notes

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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