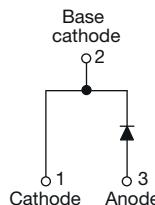


## Ultrafast Rectifier, 8 A FRED Pt®


**TO-220AC 2L**

### FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Designed and qualified according to JEDEC®-JESD 47
- 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

FRED Pt® series are the state of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultrafast recovery time.

The planar structure and the platinum doped life time control, guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diode in low voltage inverters and chopper motor drives.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	8 A
$V_R$	400 V
$V_F$ at $I_F$	0.94 V
$t_{rr}$ typ.	See Recovery table
$T_J$ max.	175 °C
Package	TO-220AC 2L
Circuit configuration	Single

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	$V_{RRM}$		400	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 155$ °C	8	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25$ °C	100	
Repetitive peak forward current	$I_{FRM}$		16	
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	400	-	-	V
Forward voltage	$V_F$	$I_F = 8$ A	-	1.19	1.3	
		$I_F = 8$ A, $T_J = 150$ °C	-	0.94	1.0	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.2	10	µA
		$T_J = 150$ °C, $V_R = V_R$ rated	-	20	500	
Junction capacitance	$C_T$	$V_R = 400$ V	-	14	-	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	$t_{rr}$	$I_F = 1.0 \text{ A}$ , $dI_F/dt = 50 \text{ A}/\mu\text{A}$ , $V_R = 30 \text{ V}$	-	35	60	ns
		$T_J = 25^\circ\text{C}$	-	43	-	
		$T_J = 125^\circ\text{C}$	-	67	-	
Peak recovery current	$I_{RRM}$	$T_J = 25^\circ\text{C}$	-	2.8	-	A
		$T_J = 125^\circ\text{C}$	-	6.3	-	
		$V_R = 200 \text{ V}$	-	60	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25^\circ\text{C}$	-	210	-	nC
		$T_J = 125^\circ\text{C}$	-	-	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	$R_{thJC}$	Typical socket mount	-	1.8	2	°C/W
Thermal resistance, junction to ambient	$R_{thJA}$		-	-	50	
Thermal resistance, case to heatsink	$R_{thCS}$		-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220AC 2L			8ETU04	

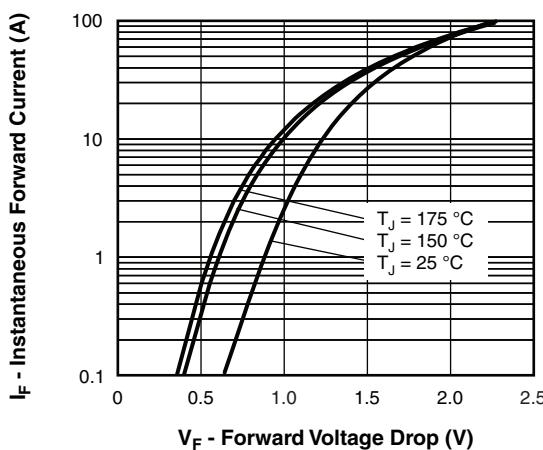


Fig. 1 - Typical Forward Voltage Drop Characteristics

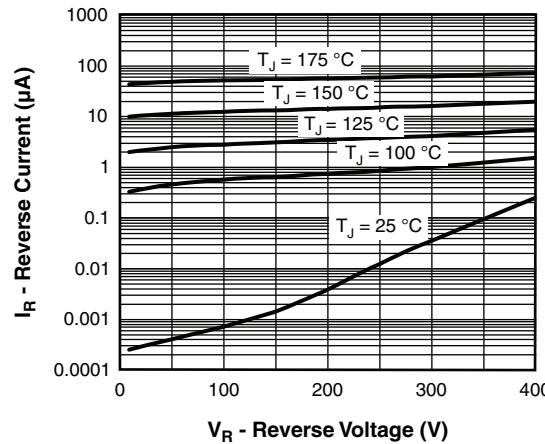


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

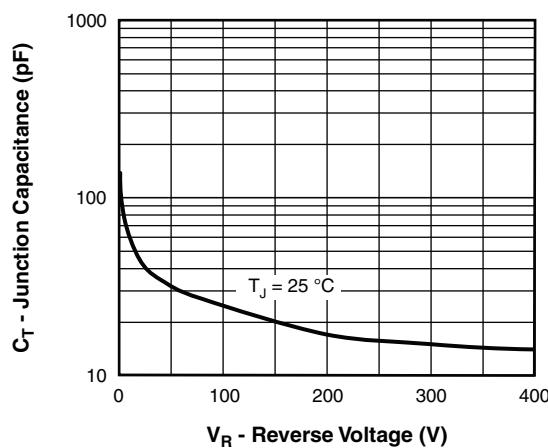


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

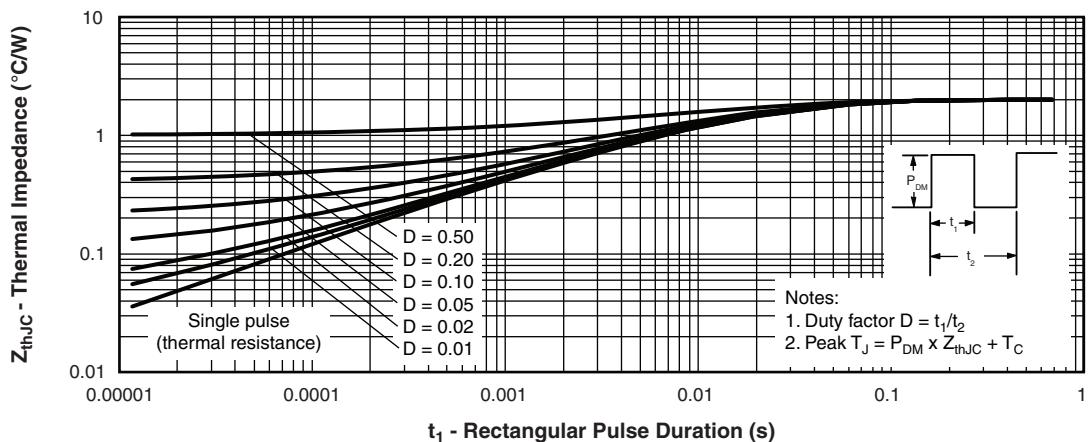


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

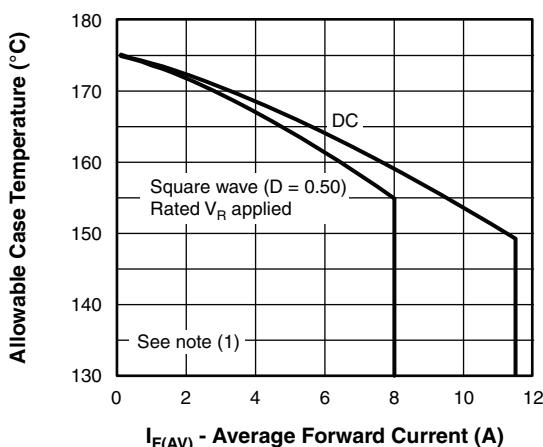


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

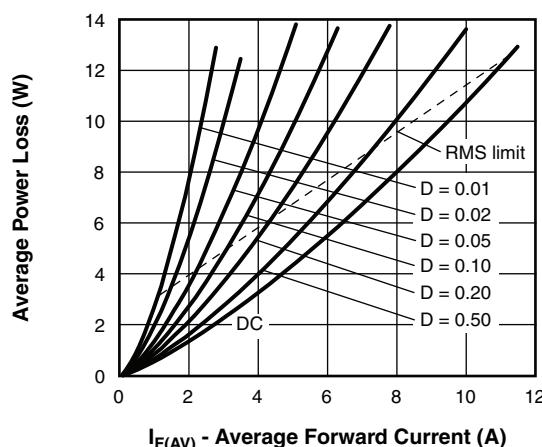


Fig. 6 - Forward Power Loss Characteristics

#### Note

(1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d = \text{forward power loss} = I_{F(AV)} \times V_{FM} \text{ at } (I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV} = \text{inverse power loss} = V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

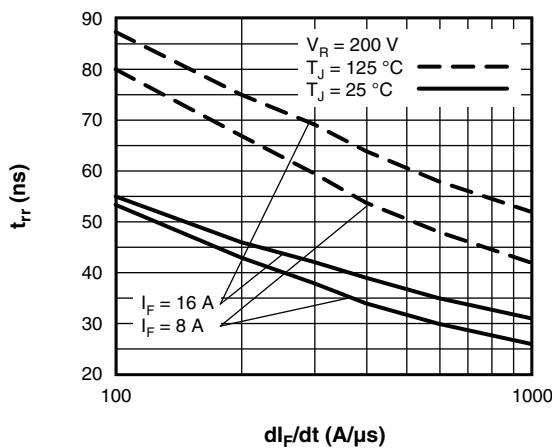


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

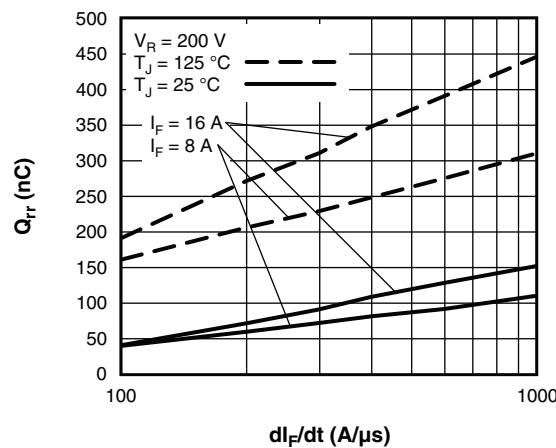
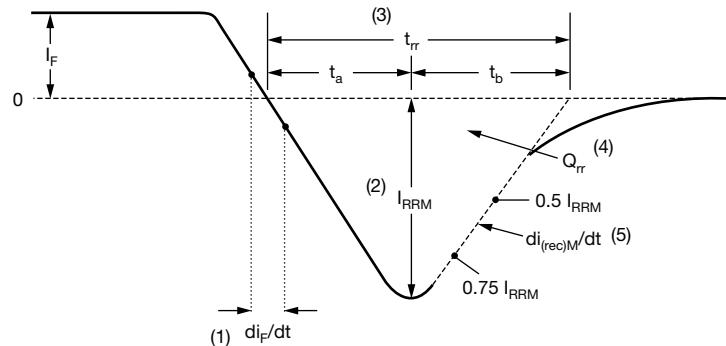
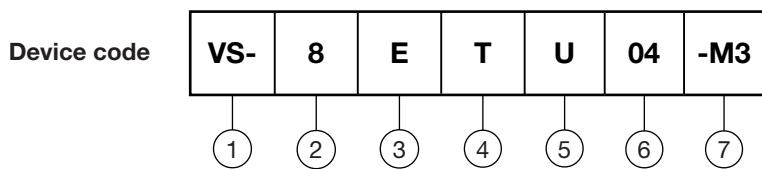


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$



- (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 current to the 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  $I_{RRM}$
- (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

**ORDERING INFORMATION TABLE**


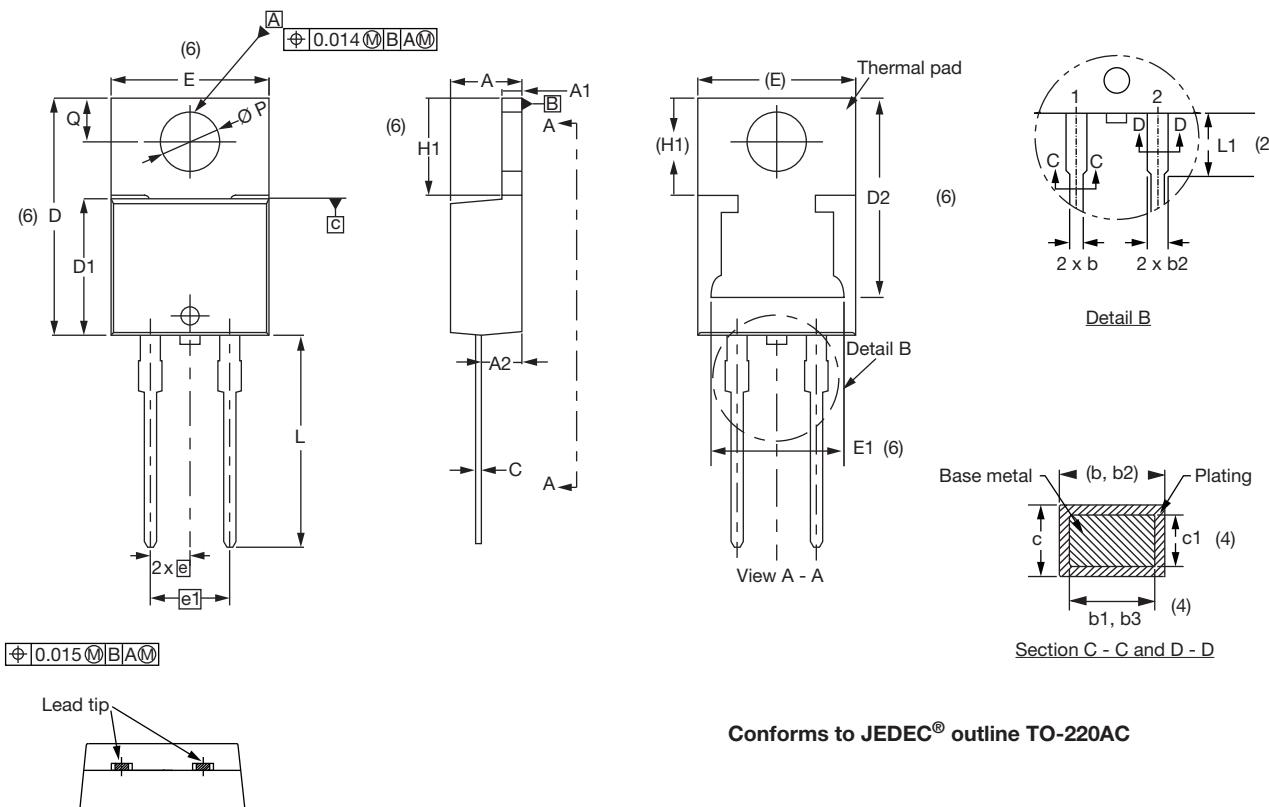
- 1** - Vishay Semiconductors product
- 2** - Current rating (8 = 8 A)
- 3** - E = single
- 4** - Package:  
T = 2L TO-220AC
- 5** - U = ultrafast recovery
- 6** - Voltage rating (04 = 400 V)
- 7** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

<b>ORDERING INFORMATION</b> (Example)		
<b>PREFERRED P/N</b>	<b>BASE QUANTITY</b>	<b>PACKAGING DESCRIPTION</b>
VS-8ETU04-M3	50	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>	
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>
SPICE model	<a href="http://www.vishay.com/doc?95441">www.vishay.com/doc?95441</a>

## 2L TO-220AC

**DIMENSIONS** in millimeters and inches



Conforms to JEDEC® outline TO-220AC

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## 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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