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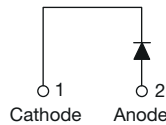
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## Ultrafast Rectifier, 20 A FRED Pt<sup>®</sup>



2L TO-220 FullPAK



### FEATURES

- Low forward voltage drop
- Ultrafast soft recovery time
- 175 °C operating junction temperature
- Low leakage current
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- Designed and qualified according to JEDEC<sup>®</sup>-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

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	
$I_{F(AV)}$	20 A
$V_R$	600 V
$V_F$ at $I_F$	1.26 V
$t_{rr}$ (typ.)	61 ns
$T_J$ max.	175 °C
Package	2L TO-220 FullPAK
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	$I_{F(AV)}$	$T_C = 102\text{ °C}$	20	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$	190	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Forward voltage	$V_F$	$I_F = 20\text{ A}$	-	1.4	1.63	
		$I_F = 20\text{ A}, T_J = 125\text{ °C}$	-	1.26	1.49	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.3	15	$\mu\text{A}$
		$T_J = 125\text{ °C}, V_R = V_R$ rated	-	50	500	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	18	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8	-	nH



<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 20\text{ A}$ $di_F/dt = 1000\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	-	61	-	ns
		$T_J = 125\text{ }^\circ\text{C}$		-	87	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$		-	13	-	A
		$T_J = 125\text{ }^\circ\text{C}$		-	21	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$		-	480	-	nC
		$T_J = 125\text{ }^\circ\text{C}$		-	1080	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$			-55	-	175	$^\circ\text{C}$
Thermal resistance, junction to case	$R_{thJC}$			-	2.5	3	$^\circ\text{C}/\text{W}$
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: 2L TO-220 FullPAK		E4TU2006FP			

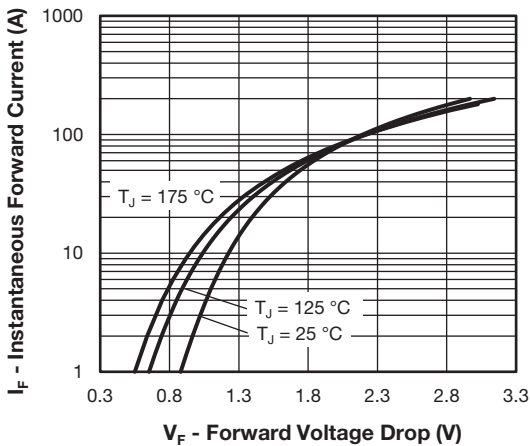


Fig. 1 - Typical Forward Voltage Drop Characteristics

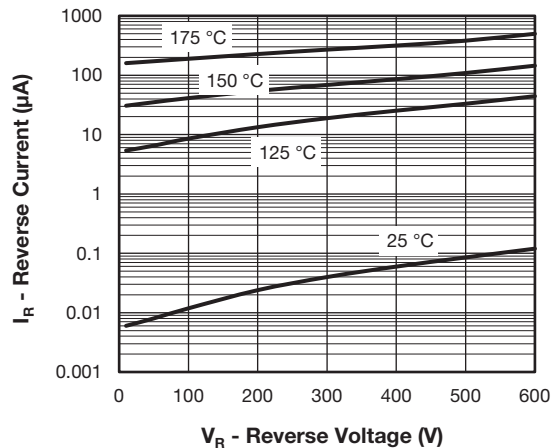


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

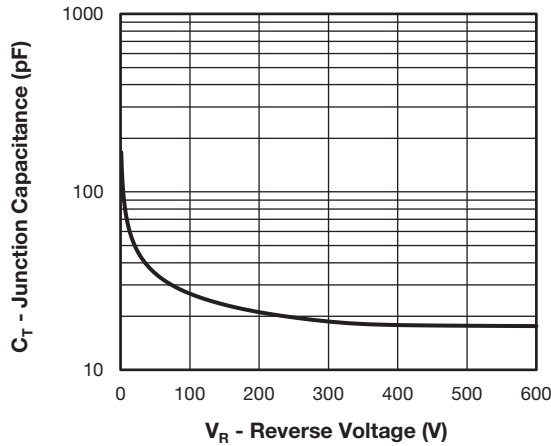


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

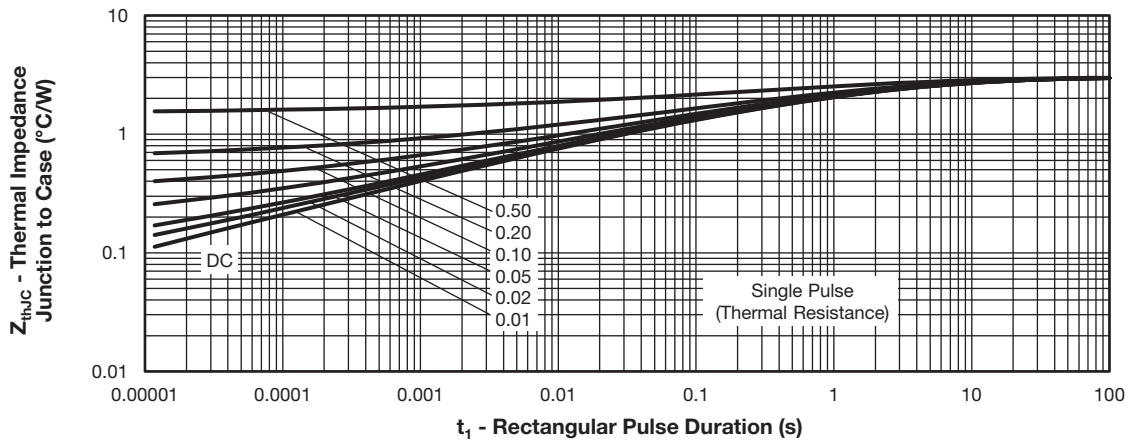


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

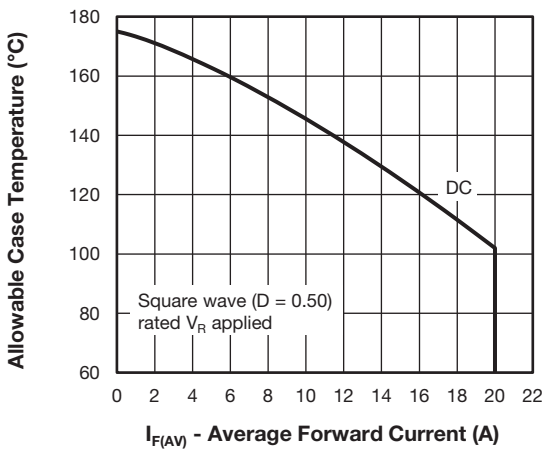


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

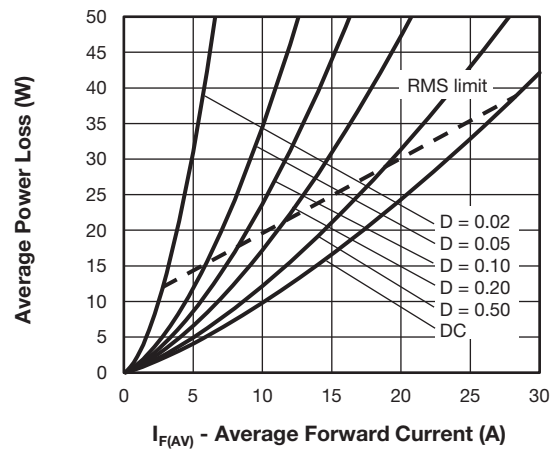
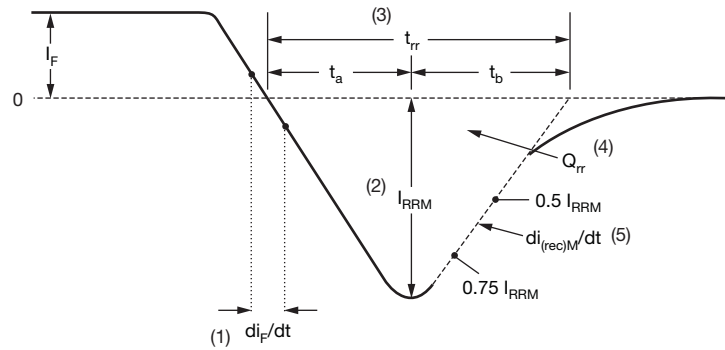


Fig. 6 - Forward Power Loss Characteristics



- (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  $I_{RRM}$
- (5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

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

Fig. 7 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>E</b>	<b>4</b>	<b>T</b>	<b>U</b>	<b>20</b>	<b>06</b>	<b>FP</b>	<b>-N3</b>
	1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:  
E = single diode
- 3** - 4 = Gen 4 FRED Pt
- 4** - T = TO-220
- 5** - U = ultrafast recovery time
- 6** - Current code: 20 = 20 A
- 7** - Voltage code: 06 = 600 V
- 8** - FP = FullPAK
- 9** - Environmental digit:  
-N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

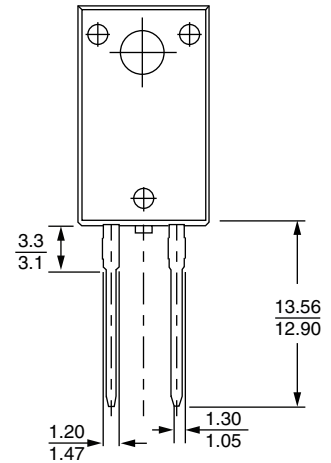
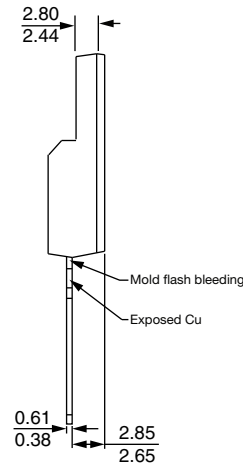
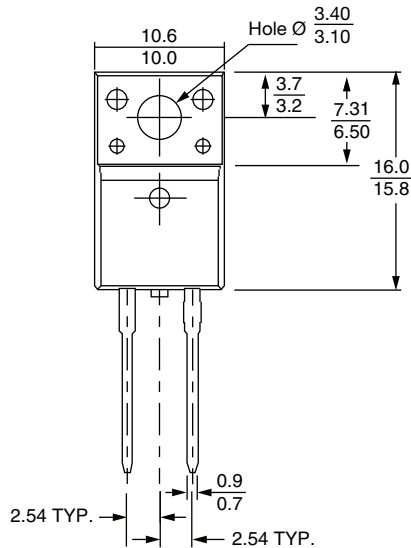
<b>ORDERING INFORMATION (Example)</b>			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-E4TU2006FP-N3	50	1000	Antistatic plastic tube

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?96157">www.vishay.com/doc?96157</a>
Part marking information	<a href="http://www.vishay.com/doc?95392">www.vishay.com/doc?95392</a>

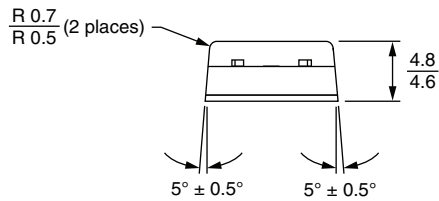


## 2L TO-220 FullPAK

**DIMENSIONS** in millimeters



Bottom view





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