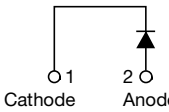
Ultrafast Rectifier, 20 A FRED Pt®

2L TO-220 FULL-PAK



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})
- 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

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.

PRODUCT SUMMARY	
Package	2L TO-220FP
$I_{F(AV)}$	20 A
V_R	600 V
V_F at I_F	1.26 V
t_{rr} (typ.)	61 ns
T_J max.	175 °C
Diode variation	Single die

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 °C	20	A
Non-repetitive peak surge current	I_{FSM}	T_J = 25 °C	190	
Operating junction and storage temperatures	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 = 100 µA	600	-	-	V
Forward voltage	V_F	I_F = 20 A	-	1.4	1.63	
		I_F = 20 A, T_J = 125 °C	-	1.26	1.49	
Reverse leakage current	I_R	V_R = V_R rated	-	0.3	15	µA
		T_J = 125 °C, V_R = V_R rated	-	50	500	
Junction capacitance	C_T	V_R = 600 V	-	18	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	T_J = 25 °C	I_F = 20 A dI_F/dt = 1000 A/µs V_R = 400 V	-	61	-	ns
		T_J = 125 °C		-	87	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	13	-	A
		T_J = 125 °C		-	21	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	480	-	nC
		T_J = 125 °C		-	1080	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C
Thermal resistance, junction to case	R_{thJC}		-	2.5	3	°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: 2L TO-220FP	E4TU2006TFP			

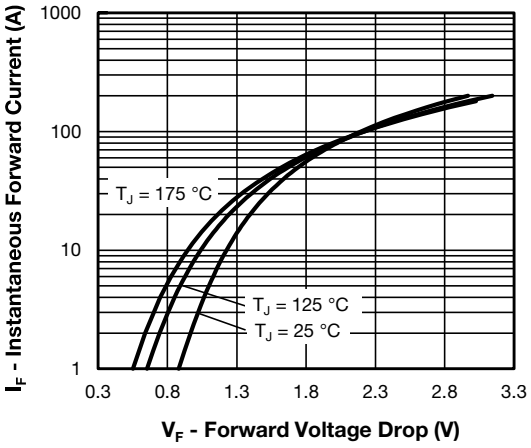


Fig. 1 - Typical Forward Voltage Drop Characteristics

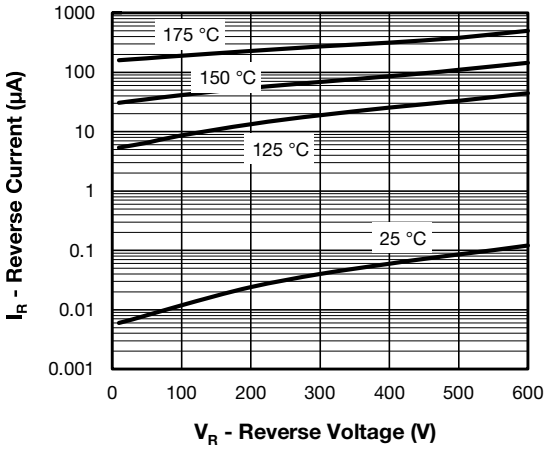


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

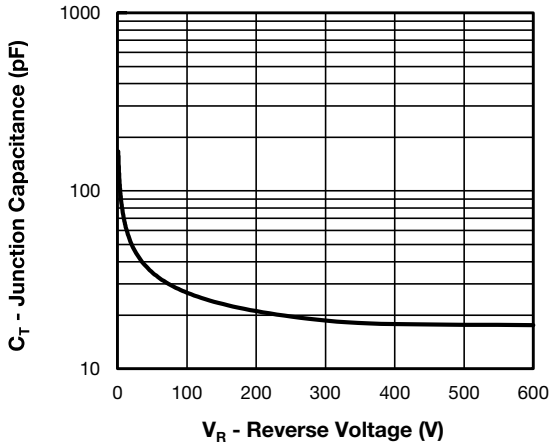


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

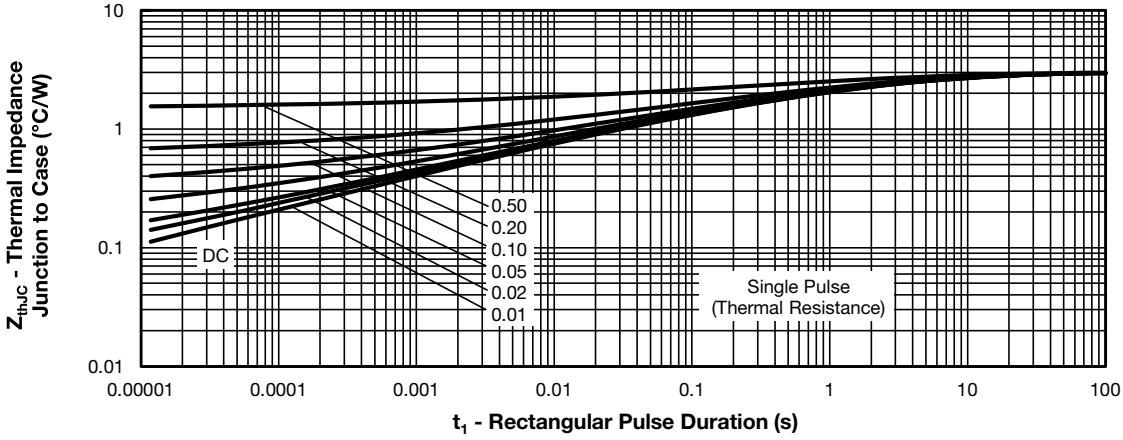


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

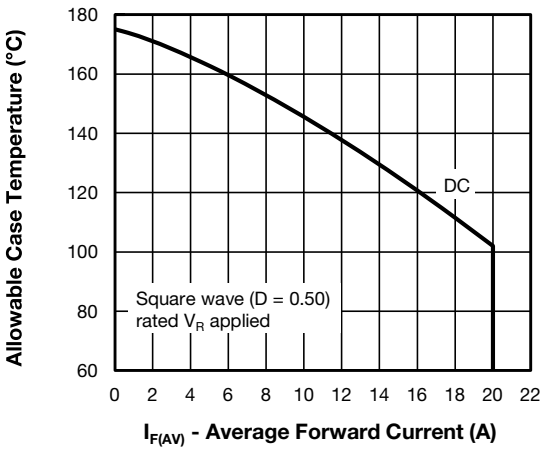


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

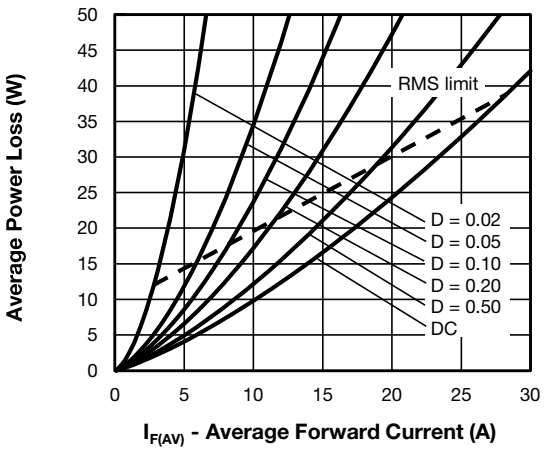
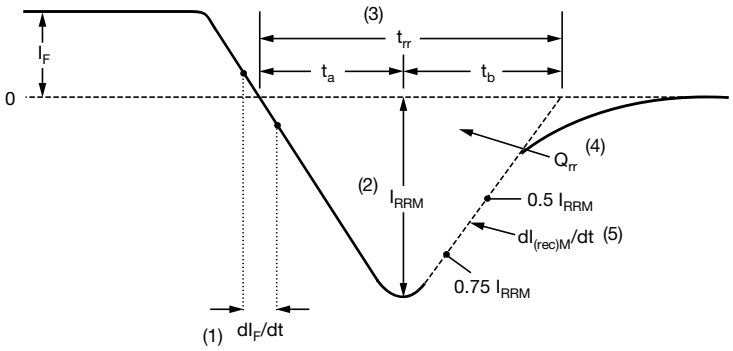


Fig. 6 - Forward Power Loss Characteristics



(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}

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

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

Fig. 7 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

VS-	E	4	T	U	20	06	T	FP	-N3
1	2	3	4	5	6	7	8	9	10

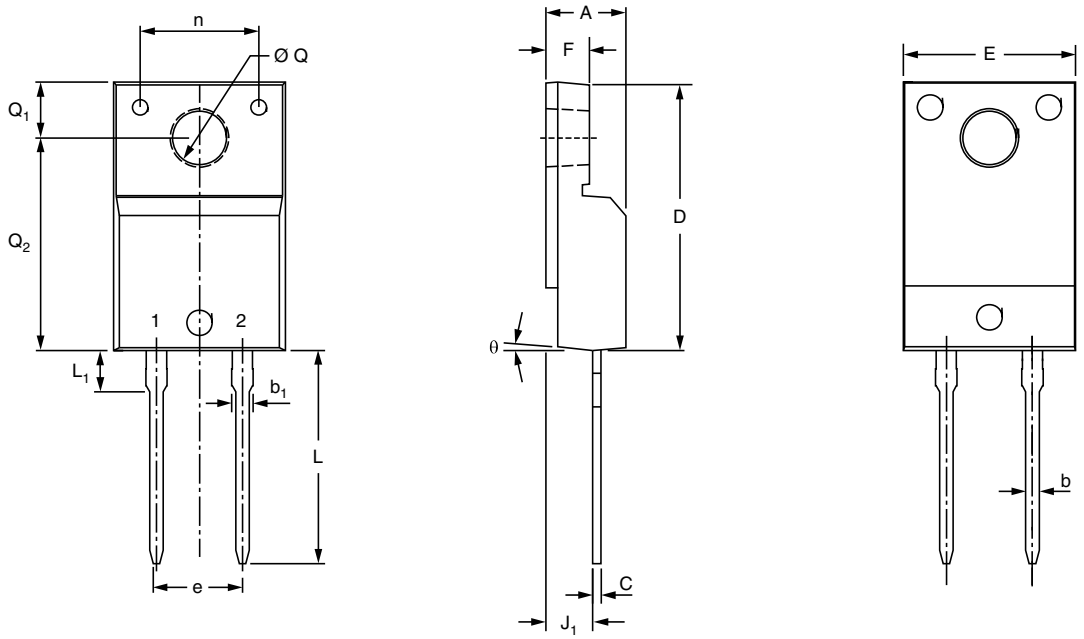
- 1 - Vishay Semiconductors product
- 2 - Circuit configuration:
  E = single diode
- 3 - 4 = Gen 4 FRED Pt
- 4 - T = TO-220
- 5 - U = ultrafast recovery time
- 6 - Current code: 20 = 20 A
- 7 - Voltage code: 06 = 600 V
- 8 - • None = TO-220
  • T = True 2 Pin TO-220
- 9 - FP = FULL-PAK
- 10 - Environmental digit:
  -N3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER TUBE**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-E4TU2006TFP-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	2L TO-220FP	www.vishay.com/doc?95681
Part marking information	2L TO-220FP	www.vishay.com/doc?95392

2L TO-220 FULL-PAK

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.57	4.83	0.180	0.190
b	0.62	0.89	0.024	0.035
b_1	1.23	1.40	0.048	0.055
C	0.44	0.63	0.017	0.025
D	15.88	16.12	0.625	0.635
E	10.36	10.63	0.408	0.418
e	5.08 typical		0.200 typical	
F	2.57	2.83	0.101	0.111
J_1	2.51	2.85	0.099	0.112
L	14	14.2	0.551	0.559
L_1	3.1	3.57	0.122	0.141
Ø Q	3.05	3.45	0.120	0.136
Q_1	2.96	3.82	0.117	0.150
Q_2	12.3	12.92	0.484	0.509
θ	0°	5°	0°	5°
n	6.05	6.15	0.238	0.242

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.