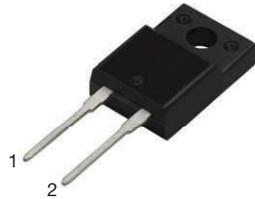
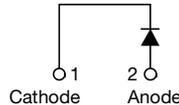


Ultrafast Rectifier, 20 A FRED Pt®


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	$I_{F(AV)}$	$T_C = 102\text{ °C}$	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	$I_R = 100\ \mu A$	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	μA
		$T_J = 125\text{ °C}, V_R = V_R$ 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



DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ 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	-	

THERMAL - MECHANICAL SPECIFICATIONS						
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-220FP	E4TU2006TFP			

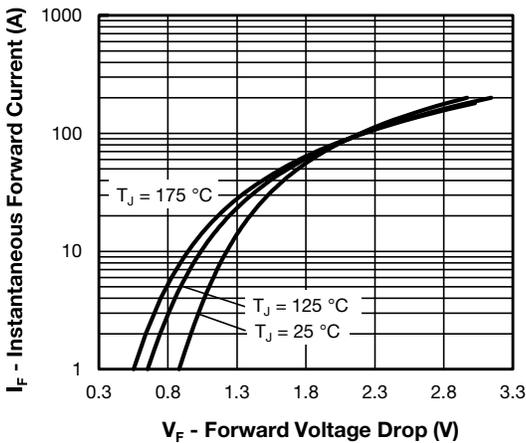


Fig. 1 - Typical Forward Voltage Drop Characteristics

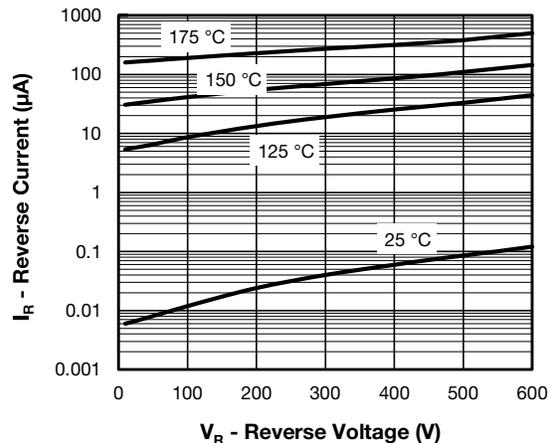


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

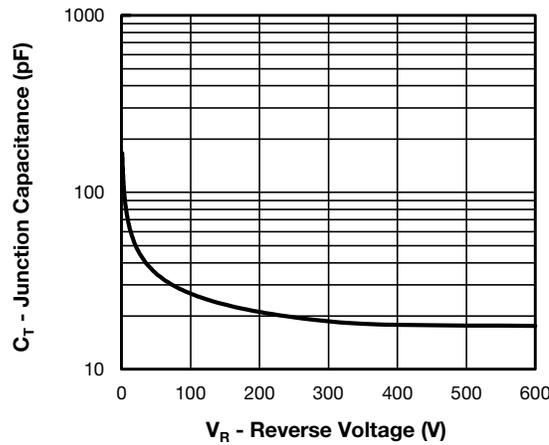


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

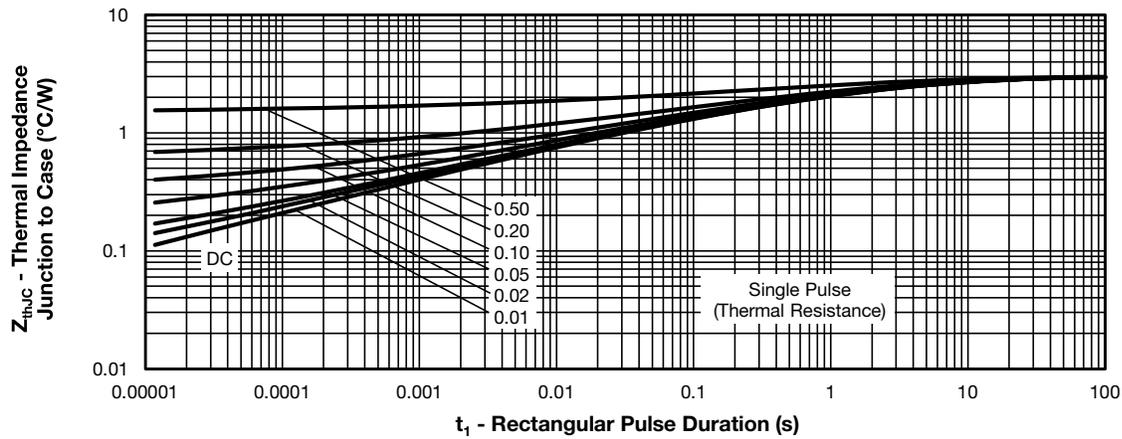


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

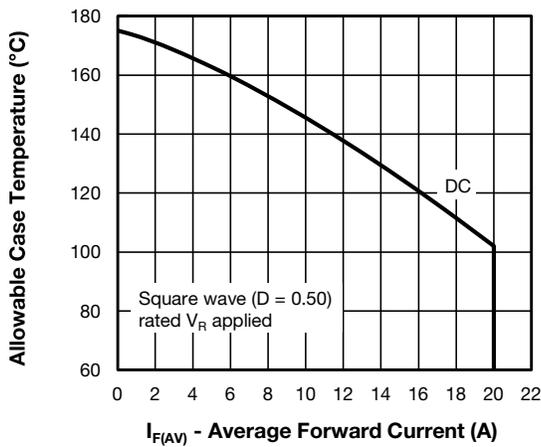


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

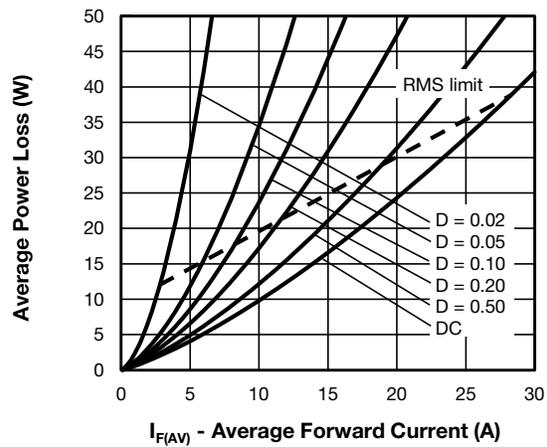
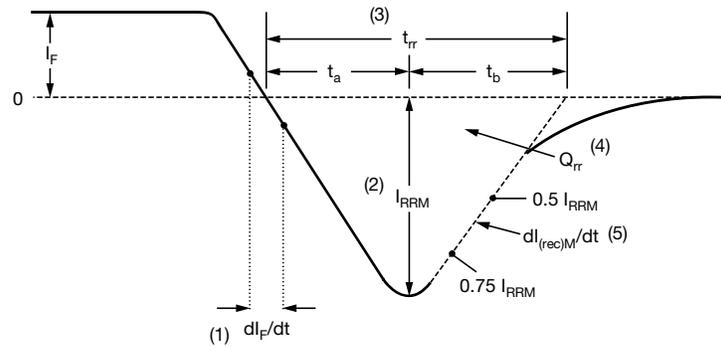


Fig. 6 - Forward Power Loss Characteristics



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

- 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

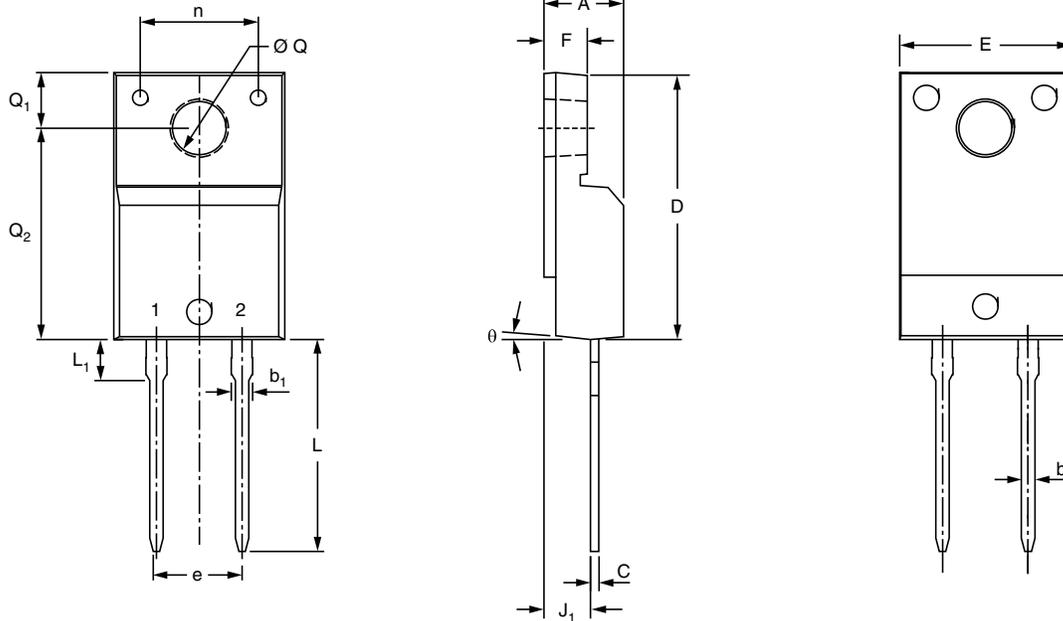
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-E4TU2006TFP-N3	50	1000	Antistatic plastic tube

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



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