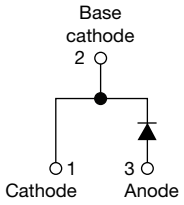
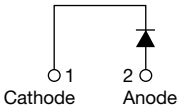
Ultrafast Rectifier, 15 A FRED Pt®

2L TO-220AC

2L TO-220 FULL-PAK



VS-ETU1506-M3



VS-ETU1506FP-M3

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
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Designed and qualified according to JEDEC-JESD47

Pb e3 RoHS COMPLIANT HALOGEN FREE

DESCRIPTION

State of the art, 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-220AC, 2L TO-220FP
$I_{F(AV)}$	15 A
V_R	600 V
V_F at I_F	1.9 V
t_{rr} (typ.)	24 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 = 151 °C	15	A
FULL-PAK		T_C = 103 °C		
Non-repetitive peak surge current	I_{FSM}	T_J = 25 °C	160	
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	600	-	-	V
Forward voltage	V_F	I_F = 15 A	-	1.35	1.9	
		I_F = 15 A, T_J = 150 °C	-	1.1	1.3	
Reverse leakage current	I_R	V_R = V_R rated	-	0.01	15	µA
		T_J = 150 °C, V_R = V_R rated	-	20	200	
Junction capacitance	C_T	V_R = 600 V	-	12	-	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}	I_F = 1 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	24	28	ns
		I_F = 15 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	36	47	
		T_J = 25 °C	I_F = 15 A dI_F/dt = 200 A/µs V_R = 390 V	-	40	-	
		T_J = 125 °C		-	87	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	5	-	A
		T_J = 125 °C		-	9	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	107	-	nC
		T_J = 125 °C		-	430	-	
Reverse recovery time	t_{rr}	T_J = 125 °C	I_F = 15 A dI_F/dt = 800 A/µs V_R = 390 V	-	53	-	ns
Peak recovery current	I_{RRM}			-	25	-	A
Reverse recovery charge	Q_{rr}			-	730	-	nC

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		- 65	-	175	°C
Thermal resistance, junction to case	R_{thJC}		-	1.2	1.4	°C/W
FULL-PAK			-	3.7	4.3	
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-220AC	ETU1506			
		Case style 2L TO-220 FULL-PAK	ETU1506FP			

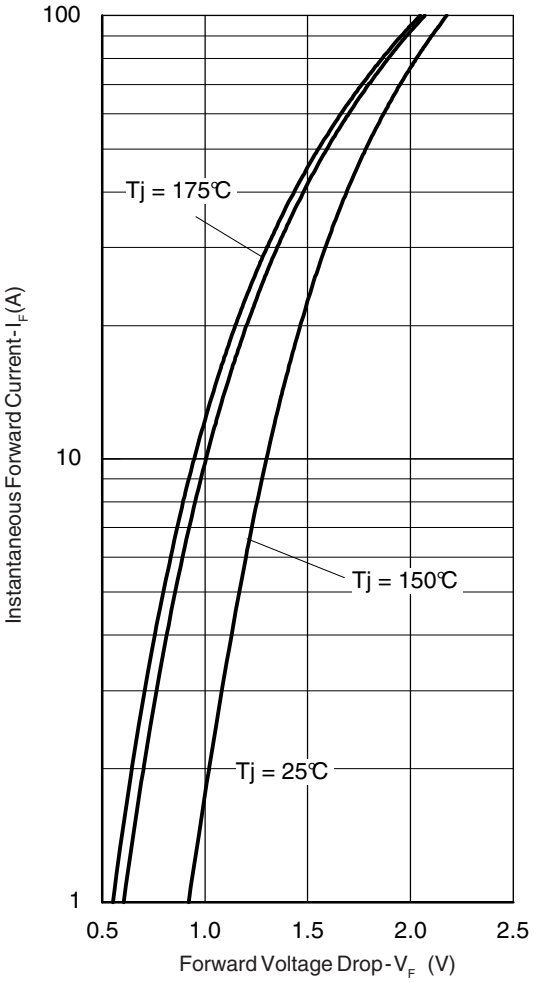


Fig. 1 - Typical Forward Voltage Drop Characteristics

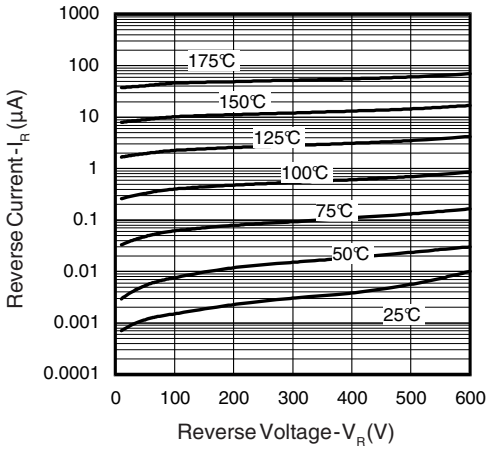


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

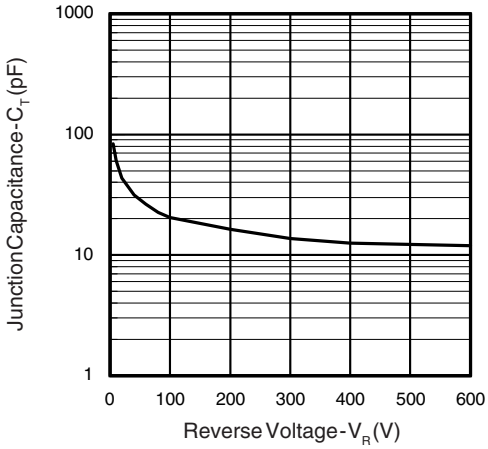


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

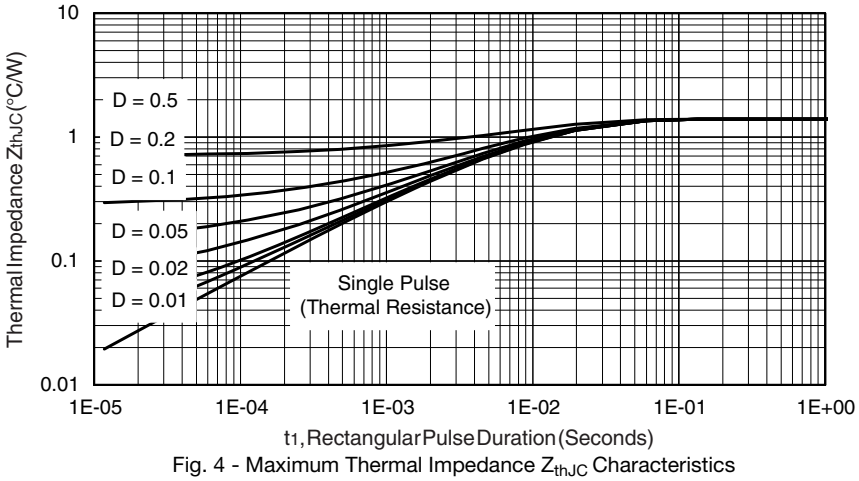


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

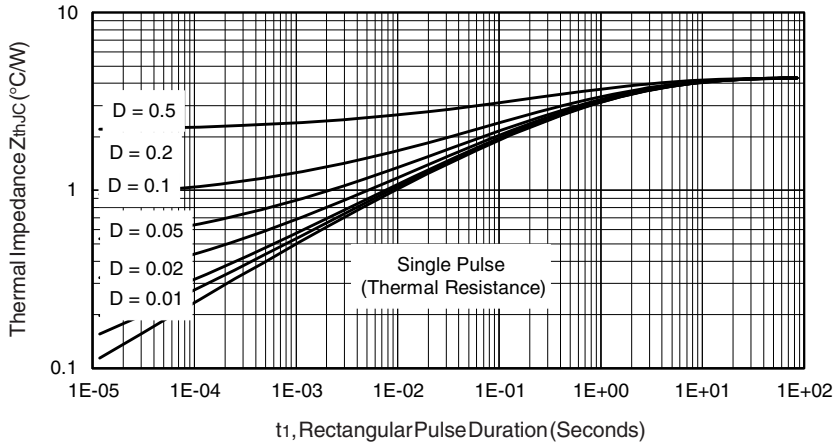


Fig. 5 - Maximum Thermal Impedance Z_{thJC} Characteristics (FULL-PAK)

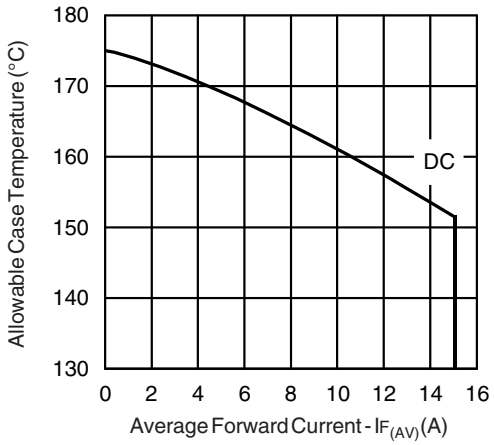


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

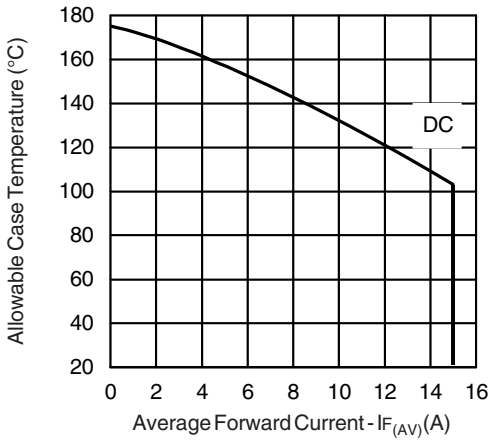


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

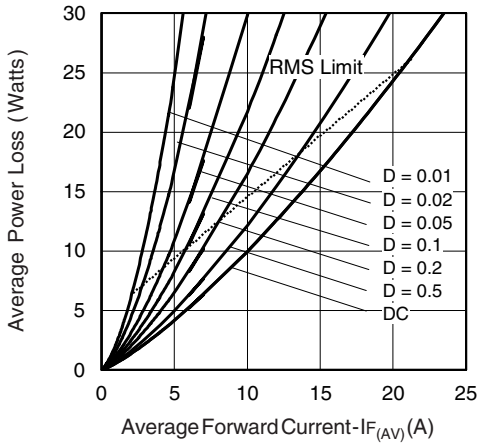


Fig. 8 - Forward Power Loss Characteristics

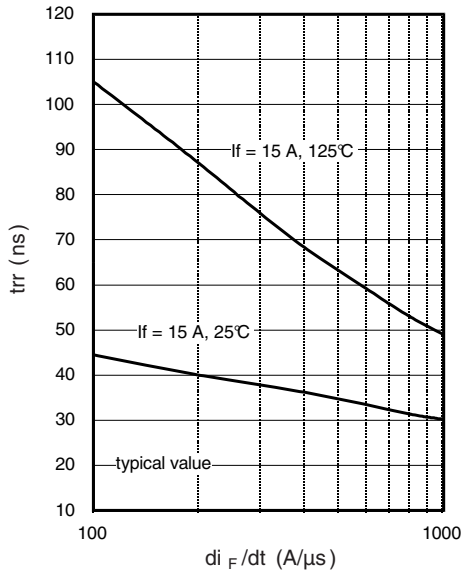


Fig. 9 - Typical Reverse Recovery vs. dI_F/dt

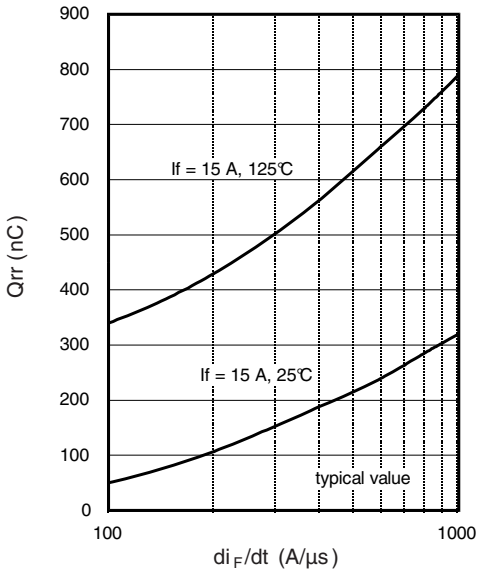


Fig. 10 - Typical Stored Charge vs. dI_F/dt

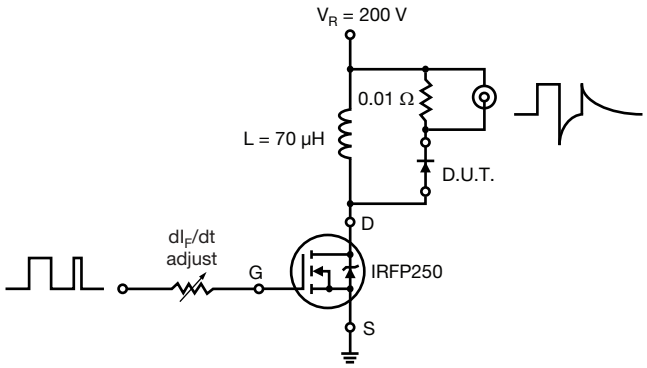
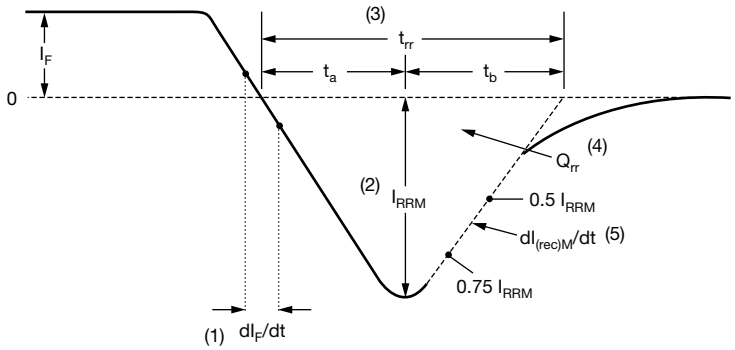


Fig. 11 - Reverse Recovery Parameter Test Circuit



(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}

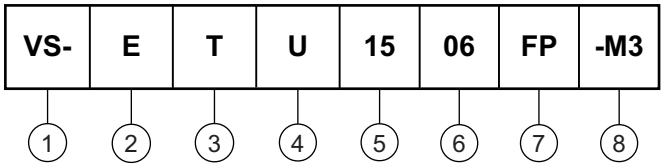
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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

Fig. 12 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Circuit configuration:
E = Single diode

3 - T = TO-220

4 - U = Hyperfast recovery time

5 - Current code: 15 = 15 A

6 - Voltage code: 06 = 600 V

7 - • None = TO-220
• FP = FULL-PAK

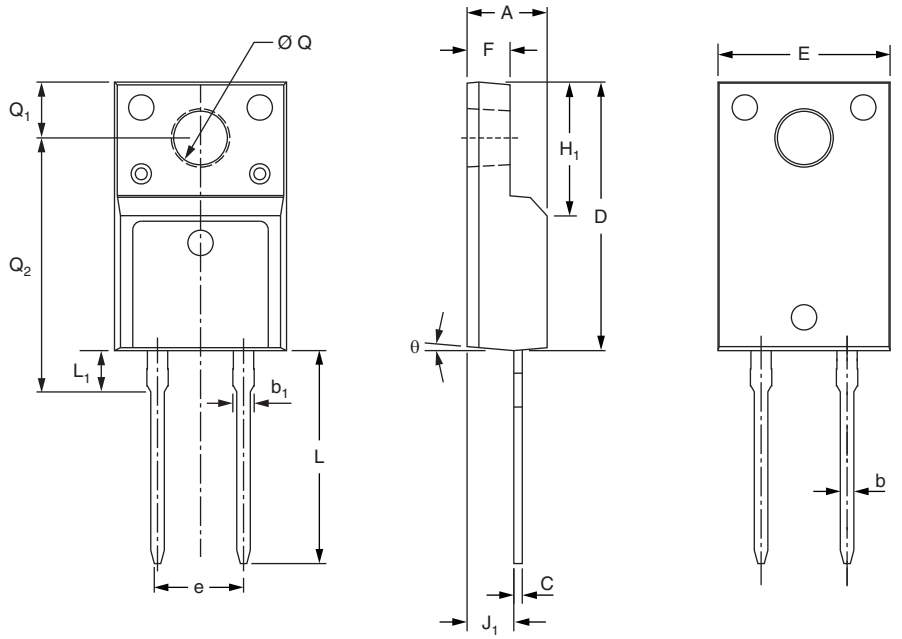
8 - Environmental digit:
-M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER TUBE**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-ETU1506-M3	50	1000	Antistatic plastic tube
VS-ETU1506FP-M3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	2L TO-220AC	www.vishay.com/doc?95259
	2L TO-220 FULL-PAK	www.vishay.com/doc?95260
Part marking information	2L TO-220AC	www.vishay.com/doc?95391
	2L TO-220 FULL-PAK	www.vishay.com/doc?95392

True 2 Pin TO-220 FULL-PAK

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.53	4.93	0.178	0.194
b	0.71	0.91	0.028	0.036
b_1	1.15	1.39	0.045	0.055
C	0.36	0.53	0.014	0.021
D	15.67	16.07	0.617	0.633
E	9.96	10.36	0.392	0.408
e	5.08 typical		0.200 typical	
F	2.34	2.74	0.092	0.107
H_1	6.50	6.90	0.256	0.272
J_1	2.56	2.96	0.101	0.117
L	12.78	13.18	0.503	0.519
L_1	2.23	2.63	0.088	0.104
Ø Q	2.98	3.38	0.117	0.133
Q_1	3.10	3.50	0.122	0.138
Q_2	14.80	15.20	0.583	0.598
θ	0°	5°	0°	5°

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