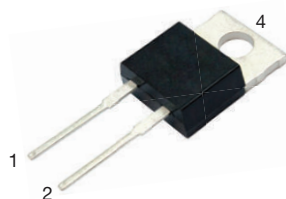
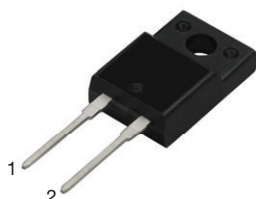
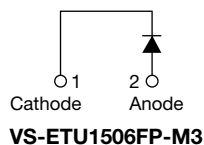
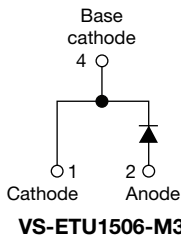


Ultra Fast Rectifier, 15 A FRED Pt®


TO-220AC 2L

TO-220 FullPAK 2L


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

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.

PRIMARY CHARACTERISTICS

Package	TO-220AC 2L, TO-220FullPAK 2L
$I_{F(AV)}$	15 A
V_R	600 V
V_F at I_F	1.1 V
t_{rr} (typ.)	24 ns
T_J max.	175 °C
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	$I_{F(AV)}$	$T_C = 151\text{ °C}$	15	A
FullPAK		$T_C = 103\text{ °C}$		
Non-repetitive peak surge current	I_{FSM}	$T_J = 25\text{ °C}$	160	
Operating junction and storage temperatures	T_J, T_{Stg}		-65 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	$I_F = 15\text{ A}$	-	1.35	1.9	
		$I_F = 15\text{ A}, T_J = 150\text{ °C}$	-	1.1	1.3	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	0.01	15	μA
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	20	200	
Junction capacitance	C_T	$V_R = 600\text{ V}$	-	12	-	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}	$I_F = 1\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	24	28	ns
		$I_F = 15\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	36	47	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	40	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	87	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	5	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	9	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	107	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	430	-	
Reverse recovery time	t_{rr}	$I_F = 15\text{ A}$ $di_F/dt = 800\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	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	$^{\circ}\text{C}$
Thermal resistance, junction to case FULL-PAK	R_{thJC}		-	1.2	1.4	$^{\circ}\text{C}/\text{W}$
			-	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 TO-220AC 2L	ETU1506			
		Case style TO-220 FullPAK 2L	ETU1506FP			

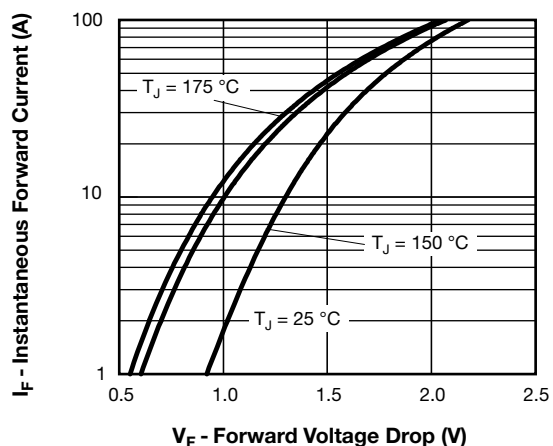


Fig. 1 - Typical Forward Voltage Drop Characteristics

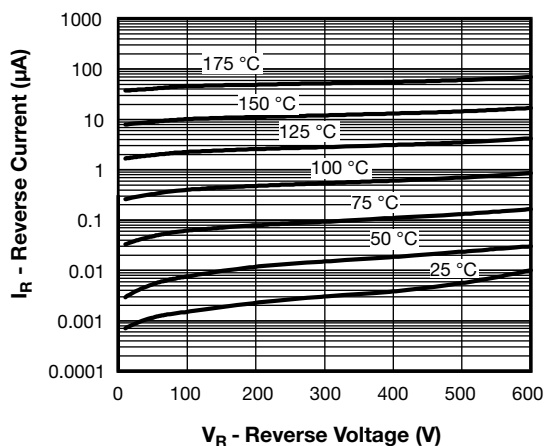


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

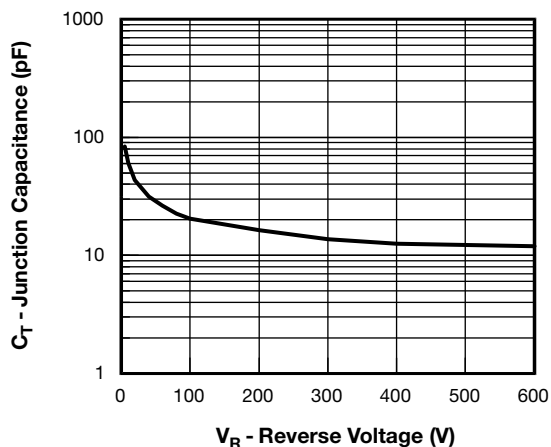
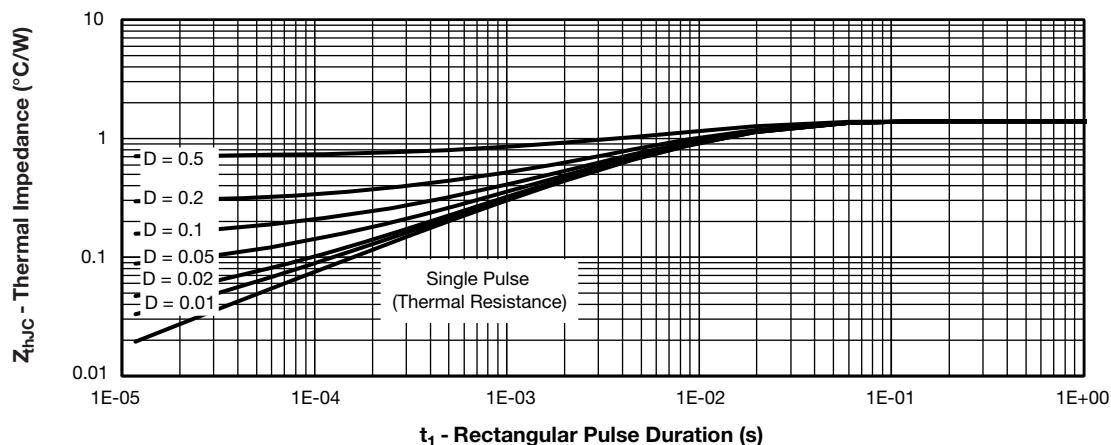


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

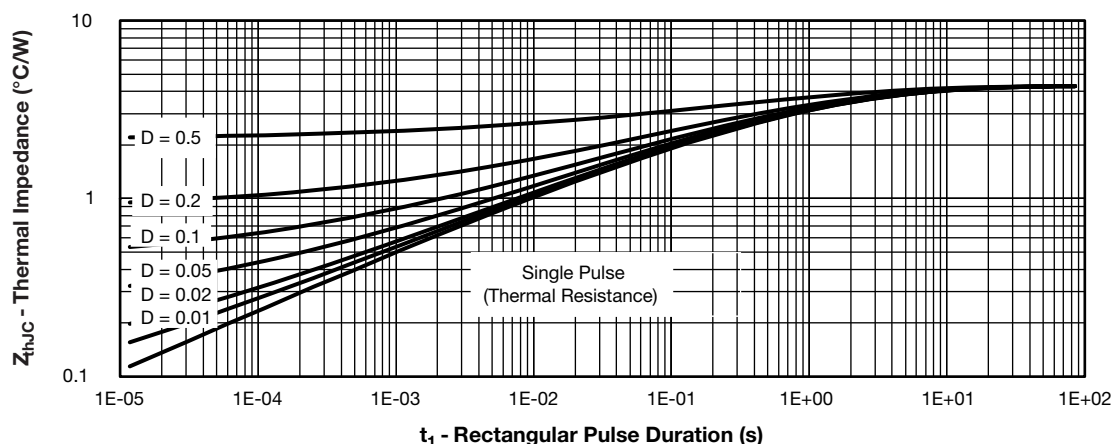
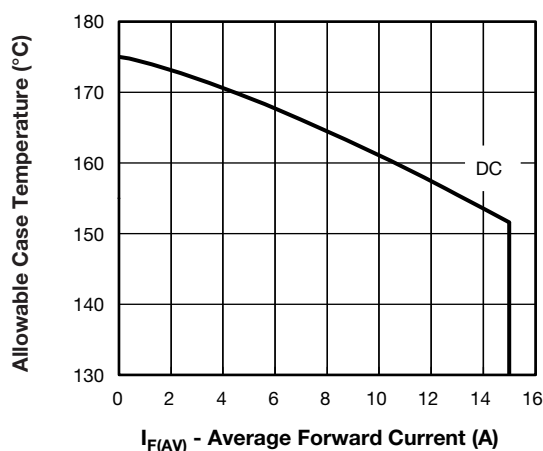

Fig. 5 - Maximum Thermal Impedance Z_{thJC} Characteristics (FullPAK)


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

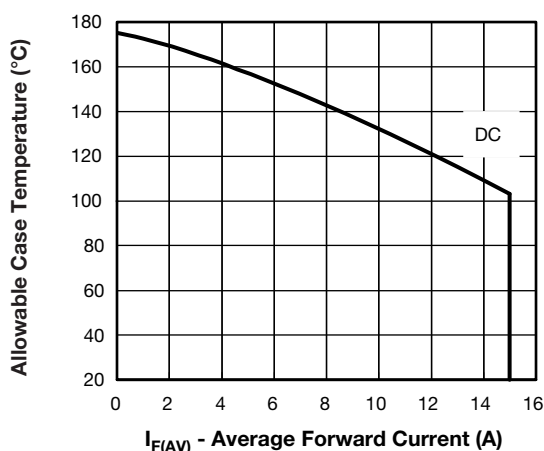


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FullPAK)

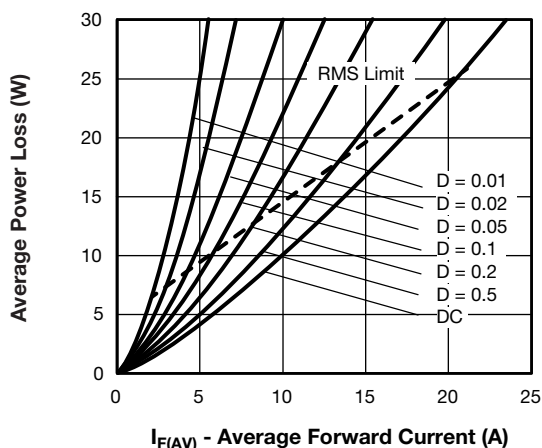


Fig. 8 - Forward Power Loss Characteristics

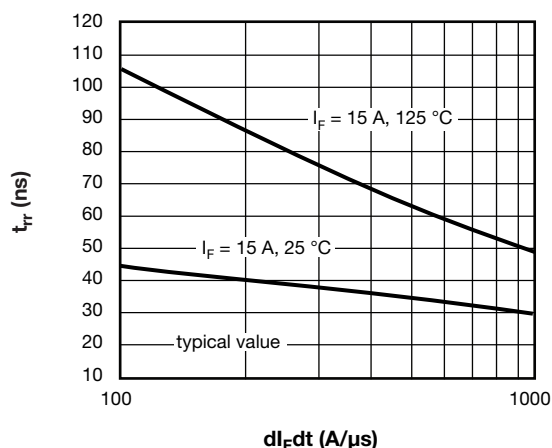
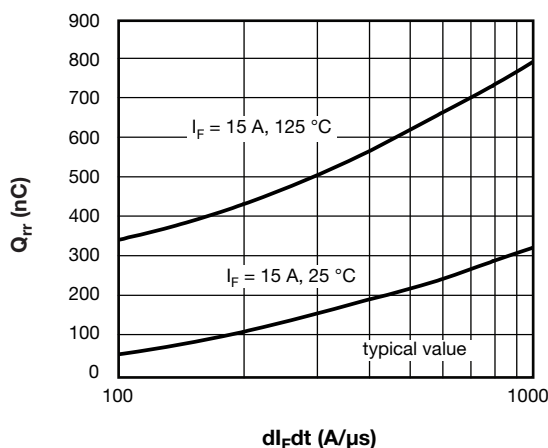
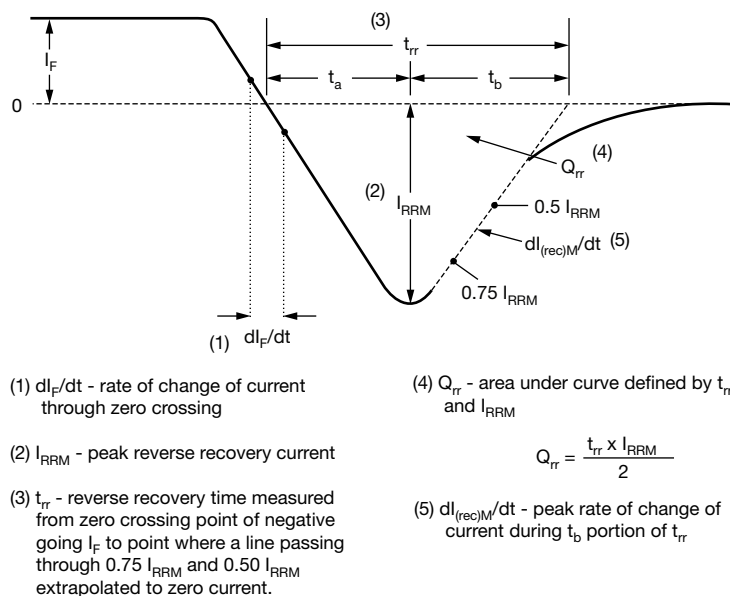

Fig. 9 - Typical Reverse Recovery vs. dI_F/dt

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


Fig. 11 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	VS-	E	T	U	15	06	FP	-M3
	①	②	③	④	⑤	⑥	⑦	⑧
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 = FullPAK							
⑧	- Environmental digit: -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free							

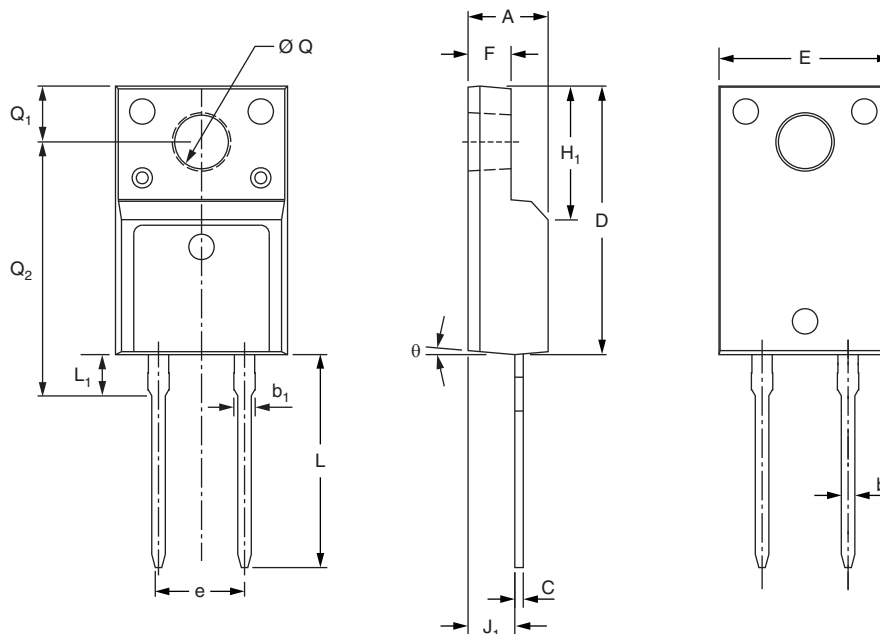
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-ETU1506-M3	50	1000	Antistatic plastic tube
VS-ETU1506FP-M3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-220AC 2L	www.vishay.com/doc?95259
	TO-220 FullPAK 2L	www.vishay.com/doc?95260
Part marking information	TO-220AC 2L	www.vishay.com/doc?95391
	TO-220 FullPAK 2L	www.vishay.com/doc?95392
SPICE model	TO-220AC 2L	www.vishay.com/doc?96130
	TO-220 FullPAK 2L	www.vishay.com/doc?96131



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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