

Vishay Semiconductors

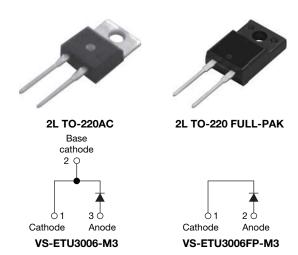
RoHS

COMPLIANT

HALOGEN

FREE

Ultrafast Rectifier, 30 A FRED Pt®



PRODUCT SUMMARY					
Package	2L TO-220AC, 2L TO-220FP				
I _{F(AV)}	30 A				
V_{R}	600 V				
V _F at I _F	2 V				
t _{rr} (typ.)	30 ns				
T _J max.	175 °C				
Diode variation	Single die				

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

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.

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 = 130 °C	30	А			
Average rectified forward current in DC FULL-PAK		T _C = 72 °C	30				
Non-repetitive peak surge current	I _{FSM}	T _J = 25 °C	200				
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	-	-	
Forward voltage	V _F	_F = 30 A - 1.4 2.0		V		
		I _F = 30 A, T _J = 150 °C	-	1.15	1.35	
Poverse leekage current	1	$V_R = V_R$ rated	-	0.02	30	
Reverse leakage current I _R		$T_J = 150 ^{\circ}\text{C}, V_R = V_R \text{rated}$	-	30	250	μA
Junction capacitance	C _T	V _R = 600 V	ı	20	-	pF
Series inductance	L _S	Measured lead to lead 5 mm from package body	ı	8	-	nH

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VS-ETU3006-M3, VS-ETU3006FP-M3





DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CO	MIN.	TYP.	MAX.	UNITS	
		$I_F = 1 \text{ A}, dI_F/dt = 50$	0 A/μs, V _R = 30 V	-	30	45	
Reverse recovery time	t _{rr}	T _J = 25 °C		-	45	-	ns
		T _J = 125 °C	$I_F = 30 \text{ A}$ $dI_F/dt = 200 \text{ A/}\mu\text{s}$ $V_R = 200 \text{ V}$	-	100	-	
Peak recovery current I	I _{RRM}	T _J = 25 °C		-	5.6	-	Α
		T _J = 125 °C		-	10	-	_ ^
Reverse recovery charge	Q _{rr}	T _J = 25 °C		=	127	-	nC
		T _J = 125 °C		-	580	-	

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,	D		-	0.84	1.3		
junction to case FULL-PAK	R_{thJC}		-	3.2	3.8		
Thermal resistance, junction to ambient	R _{thJA}	Typical socket mount	-	-	70	°C/W	
Typical thermal resistance, case to heatsink	R _{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-		
Maight			-	2	-	g	
Weight			-	0.07	-	OZ.	
Mounting torque			6 (5)	-	12 (10)	kgf · cm (lbf · in)	
Madina dovice		Case style 2L TO-220AC	ETU3006		•		
Marking device		Case style 2L TO-220 FULL-PAK		ETU3	006FP		



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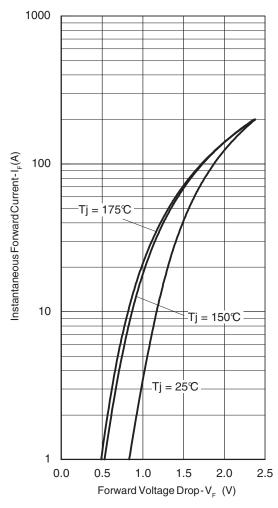


Fig. 1 - Typical Forward Voltage Drop Characteristics

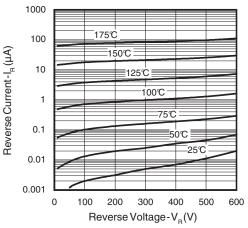


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

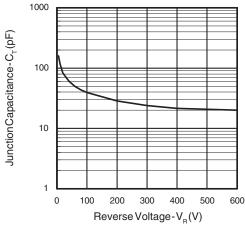


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

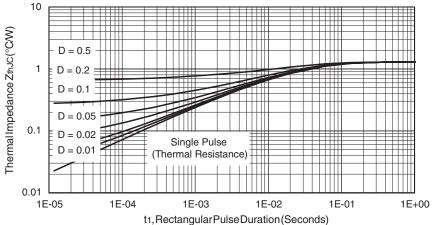


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

Vishay Semiconductors Ultrafast Rectifier, 30 A FRED Pt®



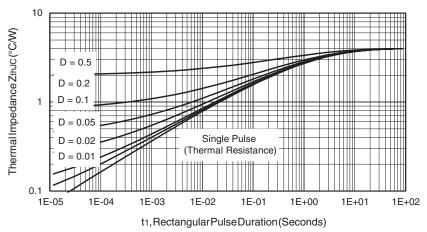


Fig. 5 - Maximum Thermal Impedance Z_{thJC} Characteristics (FULL-PAK)

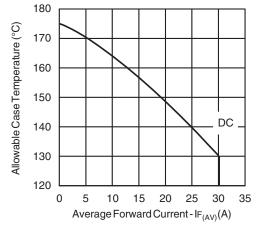


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

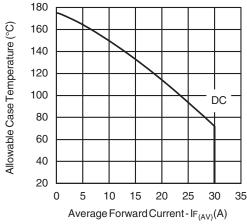


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

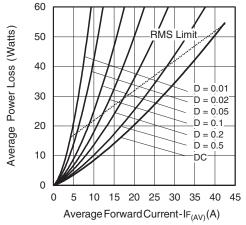


Fig. 8 - Forward Power Loss Characteristics





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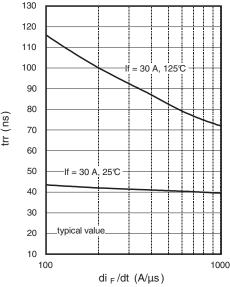


Fig. 9 - Typical Reverse Recovery vs. dl_F/dt

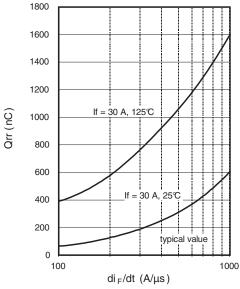


Fig. 10 - Typical Stored Charge vs. dl_F/dt

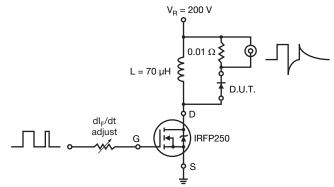
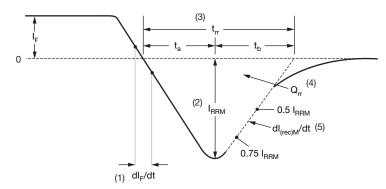


Fig. 11 - Reverse Recovery Parameter Test Circuit



- (1) dl_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 $\rm I_{RRM}$ and 0.50 $\rm I_{RRM}$ 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}

Fig. 12 - Reverse Recovery Waveform and Definitions

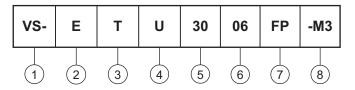
VS-ETU3006-M3, VS-ETU3006FP-M3

Vishay Semiconductors Ultrafast Rectifier, 30 A FRED Pt®



ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Circuit configuration:

E = Single diode

3 - T = TO-220

U = Hyperfast recovery time

5 - Current code: 30 = 30 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

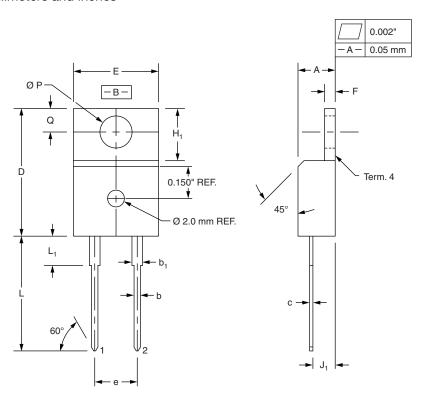
ORDERING INFORMATION (Example)						
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION			
VS-ETU3006-M3	50	1000	Antistatic plastic tube			
VS-ETU3006FP-M3	50	1000	Antistatic plastic tube			

LINKS TO RELATED DOCUMENTS				
Dimensions	2L TO-220AC	www.vishay.com/doc?95259		
Dimensions	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		

Vishay Semiconductors

True 2 Pin TO-220

DIMENSIONS in millimeters and inches



SYMBOL	MILLIM	METERS	INC	HES
STMBOL	MIN.	MAX.	MIN.	MAX.
А	4.32	4.57	0.170	0.180
b	0.71	0.91	0.028	0.036
b ₁	1.15	1.39	0.045	0.055
С	0.36	0.53	0.014	0.021
D	14.99	15.49	0.590	0.610
E	10.04	10.41	0.395	0.410
е	5.08	BSC	0.200 BSC	
F	1.22	1.37	0.048	0.054
H ₁	5.97	6.47	0.235	0.255
J ₁	2.54	2.79	0.100	0.110
L	13.47	13.97	0.530	0.550
L ₁ (1)	3.31	3.81	0.130	0.150
Ø P	3.79	3.88	0.149	0.153
Q	2.60	2.84	0.102	0.112

Notes

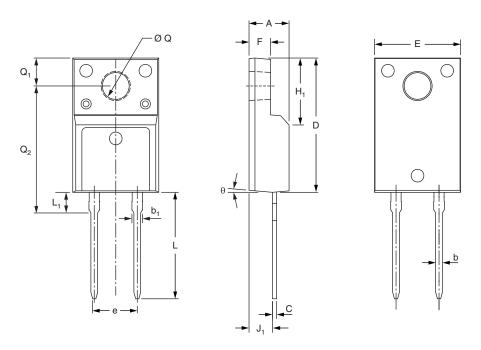
- $^{(1)}$ Lead dimension and finish uncontrolled in L_1
- These dimensions are within allowable dimensions of JEDEC TO-220AB rev. J outline dated 3-24-87
- Controling dimension: Inch



Vishay Semiconductors

True 2 Pin TO-220 FULL-PAK

DIMENSIONS in millimeters and inches



CVMDOL	MILLIM	METERS	INCH	IES
SYMBOL	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
С	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
е	5.08 t	ypical	0.200 ty	ypical
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
ØQ	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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Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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