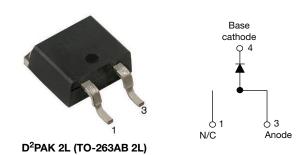


RoHS

COMPLIANT HALOGEN

FREE

Hyperfast Rectifier, 20 A FRED Pt® G5



LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS					
I _{F(AV)}	20 A				
V _R	600 V				
V _F at I _F at 125 °C	1.23 V				
t _{rr} (typ.)	22 ns				
T _J max.	175 °C				
Package	D ² PAK 2L (TO-263AB 2L)				
Circuit configuration	Single				

FEATURES

- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- \bullet Meets MSL level 1, per J-STD-020, LF maximum peak of 245 $^{\circ}\text{C}$
- AEC-Q101 qualified meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for soft switched and resonant converters, as well as medium frequency hard switching converters. This device is specifically designed to improve efficiency of high speed LLC output rectification stages of EV / HEV battery charging stations and high frequency stages of UPS applications.

MECHANICAL DATA

Case: D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per

J-STD-002

ABSOLUTE MAXIMUM RATINGS							
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS			
Repetitive peak reverse voltage	V_{RRM}		600	V			
Average rectified forward current	I _{F(AV)}	T _C = 119 °C, D = 0.50	20				
Repetitive peak forward current	I _{FRM}	T _C = 119 °C, D = 0.50, f = 20 kHz	40	Α			
Non-repetitive peak surge current	I _{FSM}	$T_C = 25$ °C, $t_p = 10$ ms, sine wave	200				
Operating junction and storage temperature	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	-	-	.,		
Forward voltage	V _F	I _F = 20 A	-	1.37	1.68	V		
		I _F = 20 A, T _J = 125 °C	-	1.23	-			
Reverse leakage current	I _R	$V_R = V_R$ rated	-	-	10			
neverse leakage current		$T_J = 125 ^{\circ}\text{C}, V_R = V_R \text{rated}$ 5		500	- μΑ			
Junction capacitance	C _T	V _R = 200 V	-	25	-	pF		
Series inductance	L _S	Measured to lead 5 mm from package body	-	8	-	nH		



DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)								
PARAMETER	SYMBOL	TEST CO	MIN.	TYP.	MAX.	UNITS		
	$I_F = 1.0 \text{ A,dI}_F/\text{dt} = 100 \text{ A/}\mu\text{s}, V_R = 30 \text{ V}$		100 A/μs, V _R = 30 V	-	22	-		
Reverse recovery time	t _{rr}	T _J = 25 °C		-	39	-	ns	
		T _J = 125 °C		-	49	-	1	
Dook roomen ourrent	ı	T _J = 25 °C	$I_F = 12 \text{ A}$ $dI_F/dt = 1000 \text{ A/}\mu\text{s}$ $V_R = 400 \text{ V}$	-	15	-	А	
Peak recovery current	I _{RRM}	T _J = 125 °C		-	23	-		
Daylerge receivery charge	Q _{rr}	T _J = 25 °C		-	290	-	nC	
Reverse recovery charge		T _J = 125 °C		-	730	-		
Daylerge receiver time	t _{rr}	T _J = 25 °C	I _F = 20 A dI _F /dt = 1000 A/μs V _R = 400 V	-	47	-	ns	
Reverse recovery time		T _J = 125 °C		-	62	-		
Dools was a summant	I _{RRM}	T _J = 25 °C		-	15	-	А	
Peak recovery current		T _J = 125 °C		-	23	-		
Reverse recovery charge	Q _{rr}	T _J = 25 °C		-	400	-	nC	
		T _J = 125 °C		-	1000	-		

THERMAL - MECHANICAL SPECIFICATIONS								
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS		
Thermal resistance, junction-to-case	R _{thJC}		-	-	1.72	°C/W		
Weight			-	2.0	-	g		
			-	0.07	-	OZ.		
Maximum junction and storage temperature range	T _J , T _{Stg}		-55	-	175	°C		
Marking device		Case style D ² PAK 2L (TO-263AB 2L)	E5TH2106SH					

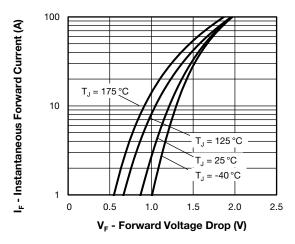


Fig. 1 - Forward Voltage Drop Characteristics

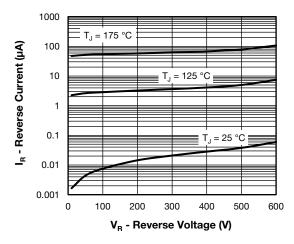


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

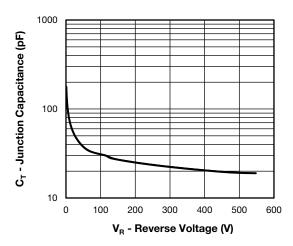


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

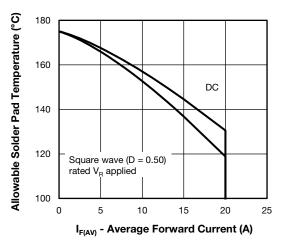


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

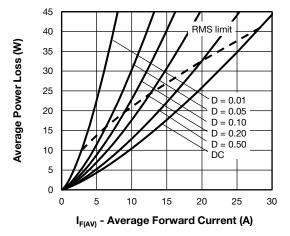


Fig. 5 - Forward Power Loss Characteristics

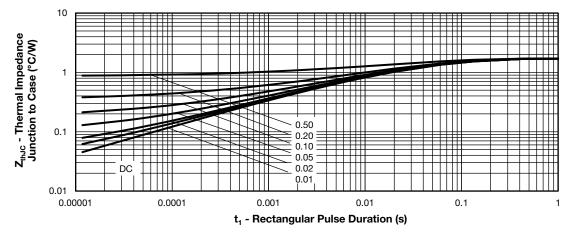


Fig. 6 - Transient Thermal Impedance, Junction to Case



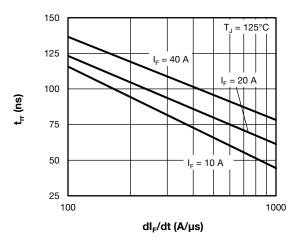


Fig. 7 - Typical Reverse Recovery Time vs. dl_F/dt

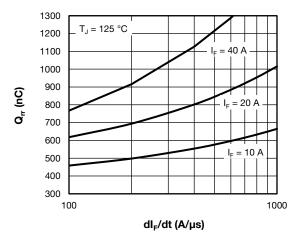


Fig. 8 - Typical Reverse Recovery Charge vs. dl_F/dt

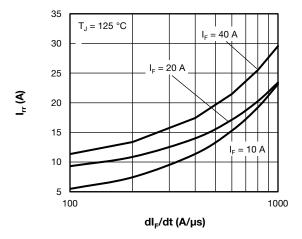


Fig. 9 - Typical Reverse Recovery Current vs. dl_F/dt

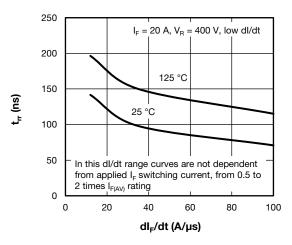


Fig. 10 - Typical Reverse Recovery Time vs. dl_F/dt

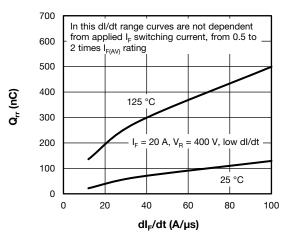


Fig. 11 - Typical Reverse Recovery Charge vs. dl_F/dt

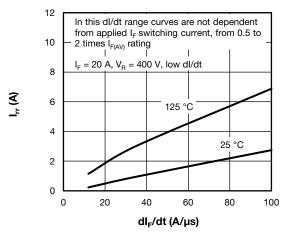


Fig. 12 - Typical Reverse Recovery Current vs. dl_F/dt



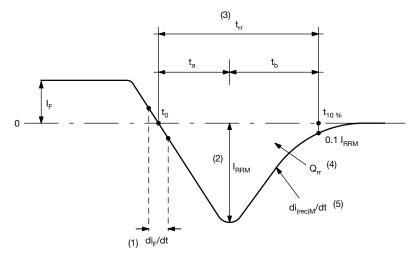


Fig. 13 - Reverse Recovery Waveform and Definitions

Notes

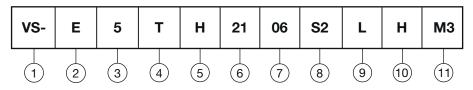
- (1) di_F/dt rate of change of current through zero crossing
- (2) I_{RRM} peak reverse recovery current
- $^{(3)}$ t_{rr} reverse recovery time measured from t₀, crossing point of negative going I_F, to point t_{10%}, 0.1 I_{RRM}
- $^{(4)}$ $\,$ Q_{rr} area under curve defined by t_0 and $t_{10\,\%}$

$$Q_{rr} = \int_{t_0}^{t_{10}\%} I(t)dt$$

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

ORDERING INFORMATION TABLE





- Vishay Semiconductors product
- 2 E = single diode
- **3** 5 = FRED generation 5
- 4 Package:

 $T = D^2PAK$ (TO-263) package

- 5 H = hyperfast recovery
- 6 Current rating (21 = 20 A)
- 7 Voltage rating (06 = 600 V)
- |8| S2 = true 2 pin D²PAK
- 9 None = tube (50 pieces)
 - L = tape and reel (left oriented, for D²PAK package)

If needed different orientation/packaging, please contact factory

- **10** H = AEC-Q101 qualified
- 11 Environmental digit:

M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free



VS-E5TH2106S2LHM3

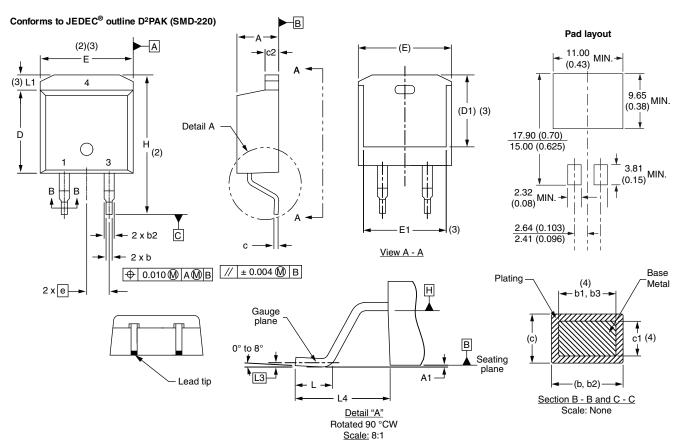
ORDERING INFORMATION (Example)						
PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION			
VS-E5TH2106S2LHM3	800	800	13" diameter reel			

LINKS TO RELATED DOCUMENTS					
Dimensions	www.vishay.com/doc?96683				
Part marking information	www.vishay.com/doc?96693				
Packaging information	www.vishay.com/doc?95032				



2L-D²PAK

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
STINIBUL	MIN.	MAX.	MIN.	MAX.	NOTES
Α	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
С	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2

SYMBOL	MILLIM	ETERS	INCHES		NOTES
STIVIBUL	MIN.	MAX.	MIN.	MAX.	NOTES
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
е	2.54 BSC		0.100		
Н	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L3	0.25 BSC		0.010) BSC	
L4	4.78	5.28	0.188	0.208	

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch
- (7) Outline conforms to JEDEC® outline TO-263AB



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