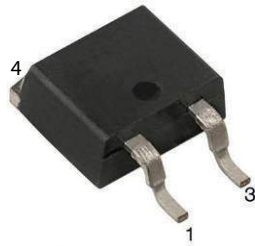
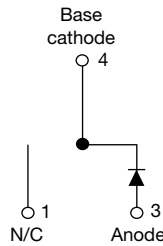


## Ultrafast Rectifier, 15 A FRED Pt®


**D²PAK 2L (TO-263AB 2L)**


### FEATURES

- Low forward voltage drop
- Ultrafast recovery time
- 175 °C operating junction temperature
- Low leakage current
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://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 adapters, desktop PC, TV and monitor, games units, and DVD AC/DC power supplies.

### 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

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	15 A
$V_R$	600 V
$V_F$ at $I_F$	1.1 V
$t_{rr}$ (typ.)	24 ns
$T_J$ max.	175 °C
Package	D²PAK 2L (TO-263AB 2L)
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 143\text{ °C}$	15	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25\text{ °C}$	160	
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	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Forward voltage	$V_F$	$I_F = 15\text{ A}$ $I_F = 15\text{ A}, T_J = 150\text{ °C}$	-	1.35 1.1	1.9 1.3	
Reverse leakage current	$I_R$	$V_R = V_R$ rated $T_J = 150\text{ °C}, V_R = V_R$ rated	-	0.01 20	15 200	$\mu\text{A}$
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	12	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH



DYNAMIC RECOVERY CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 1 A, di <sub>F</sub> /dt = 100 A/μs, V <sub>R</sub> = 30 V	-	-	-	ns	
		T <sub>J</sub> = 25 °C	-	40	-		
		T <sub>J</sub> = 125 °C	-	87	-		
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	-	5	-	A	
		T <sub>J</sub> = 125 °C	-	9.0	-		
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	-	107	-	C	
		T <sub>J</sub> = 125 °C	-	430	-		
Reverse recovery time	t <sub>rr</sub>	T <sub>J</sub> = 125 °C	I <sub>F</sub> = 15 A di <sub>F</sub> /dt = 800 A/μs V <sub>R</sub> = 390 V	-	53	-	ns
Peak recovery current	I <sub>RRM</sub>			-	25	-	A
Reverse recovery charge	Q <sub>rr</sub>			-	730	-	nC

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-55	-	175	°C
Thermal resistance, junction to case	R <sub>thJC</sub>		-	-	1.51	°C/W
Thermal resistance, junction to ambient	R <sub>thJA</sub>	Typical socket mount	-	-	70	
Thermal resistance, case to heat sink	R <sub>thCS</sub>	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6 (5)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D <sup>2</sup> PAK 2L (TO-263AB 2L)	ETU1506SH			

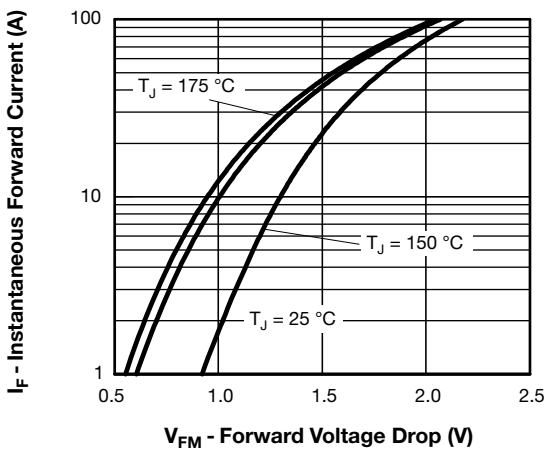


Fig. 1 - Typical Forward Voltage Drop Characteristics

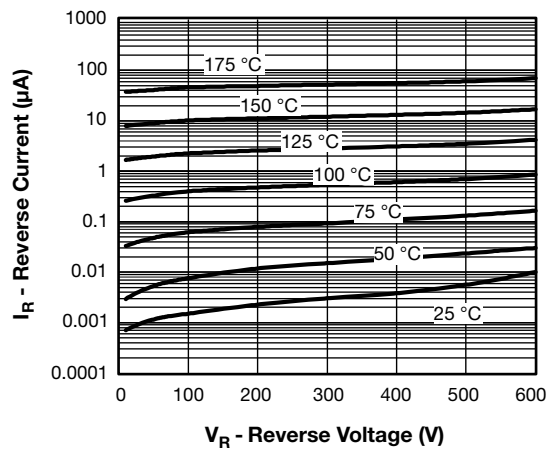


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

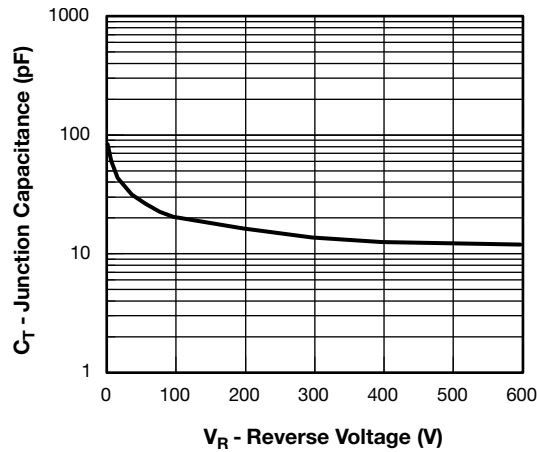


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

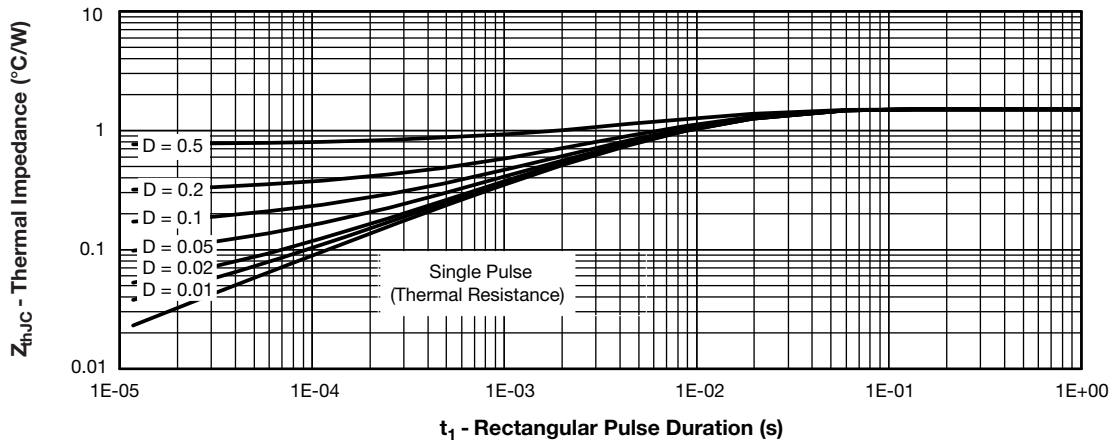


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics

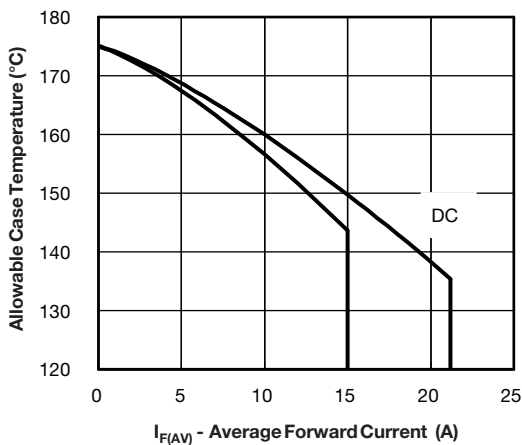


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

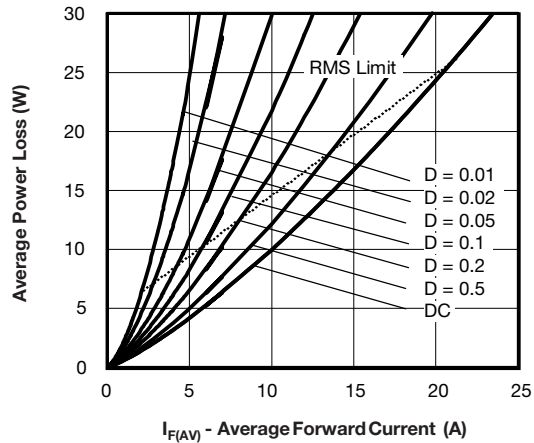


Fig. 6 - Forward Power Loss Characteristics

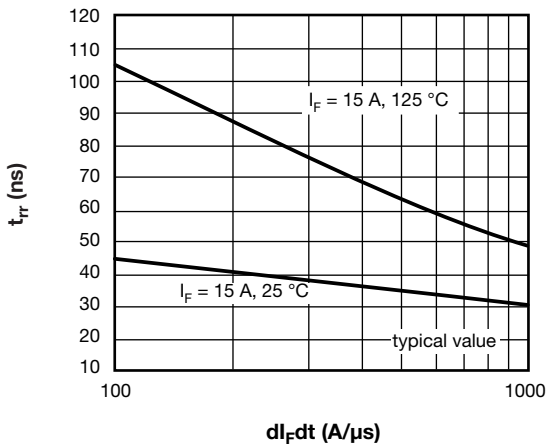


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

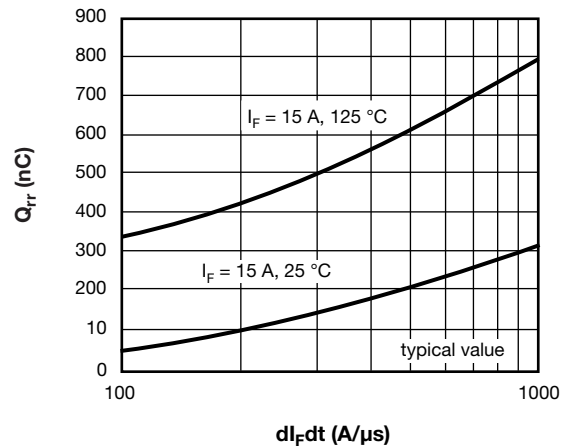
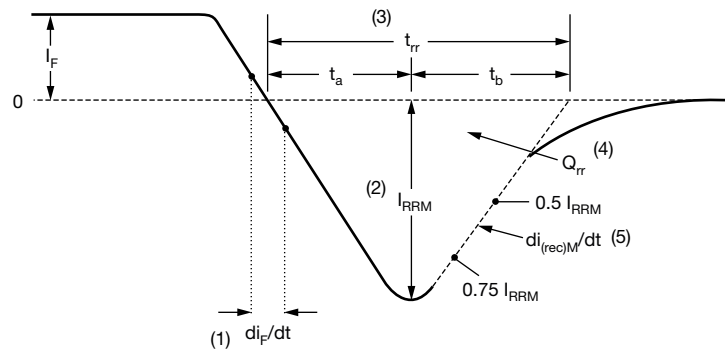


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$



- (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. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>E</b>	<b>T</b>	<b>U</b>	<b>15</b>	<b>06</b>	<b>S2</b>	<b>L</b>	<b>H</b>	<b>M3</b>
	1	2	3	4	5	6	7	8	9	10

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration  
E = single diode
- 3** - T = D<sup>2</sup>PAK (TO-262) package
- 4** - U = ultrafast recovery time
- 5** - Current code (15 = 15 A)
- 6** - Voltage code (06 = 600 V)
- 7** - S2 = true 2 pin D<sup>2</sup>PAK
- 8** - • None = tube (50 pieces)  
• L = tape and reel (left oriented, for D<sup>2</sup>PAK package)  
If needed different orientation/packaging, please contact factory
- 9** - H = AEC-Q101 qualified
- 10** - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

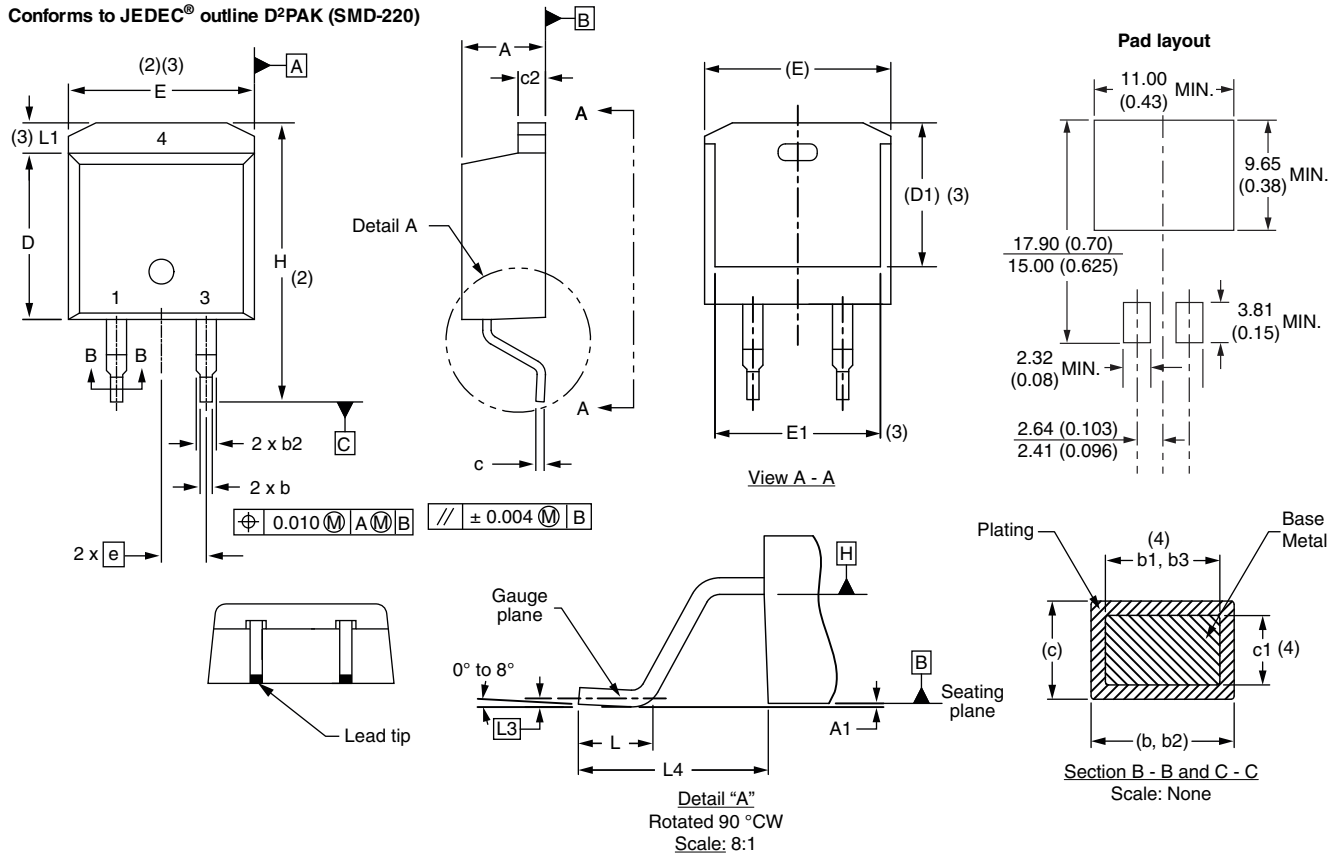
ORDERING INFORMATION (Example)		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-ETU1506S2LHM3	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a>
Part marking information	<a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</a>
Packaging information	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>
SPIICE model	<a href="http://www.vishay.com/doc?96132">www.vishay.com/doc?96132</a>

## D<sup>2</sup>PAK 2L (TO-263AB 2L)

### DIMENSIONS in millimeters and inches

Conforms to JEDEC<sup>®</sup> outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190		D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010		E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039		E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4	e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070		H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4	L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029		L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4	L3	0.25 BSC		0.010 BSC		
c2	1.14	1.65	0.045	0.065		L4	4.78	5.28	0.188	0.208	
D	8.51	9.65	0.335	0.380	2						

#### 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<sup>®</sup> outline TO-263AB



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