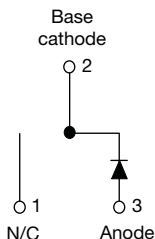


# Ultralow $V_F$ Hyperfast Rectifier for Discontinuous Mode PFC, 8 A FRED Pt®


**D2PAK (TO-263AB)**


## FEATURES

- Benchmark ultralow forward voltage drop
- Hyperfast recovery time
- Low leakage current
- 175 °C operating junction temperature
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Meets JESD 201 class 1 whisker test
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	8 A
$V_R$	600 V
$V_F$ at $I_F$	0.81 V
$t_{rr}$ typ.	60 ns
$T_J$ max.	175 °C
Package	D2PAK (TO-263AB)
Circuit configuration	Single

## DESCRIPTION

State of the art, ultralow  $V_F$ , soft-switching hyperfast rectifiers optimized for discontinuous (critical) mode (DCM) power factor correction (PFC).

The minimized conduction loss, optimized stored charge and low recovery current minimize 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	MAX.	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 160$ °C	8	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25$ °C	175	
Peak repetitive forward current	$I_{FM}$		16	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-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	$V_{BR}, V_R$	$I_R = 100$ $\mu$ A	600	-	-	V
Forward voltage	$V_F$	$I_F = 8$ A	-	0.96	1.05	
		$I_F = 8$ A, $T_J = 150$ °C	-	0.81	0.86	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.05	5	$\mu$ A
		$T_J = 150$ °C, $V_R = V_R$ rated	-	20	100	
Junction capacitance	$C_T$	$V_R = 600$ V	-	17	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_C = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	60	100	ns
		$I_F = 8\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	150	250	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	170	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	250	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	15	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	20	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	1.3	-	$\mu\text{C}$
		$T_J = 125\text{ }^{\circ}\text{C}$	-	2.6	-	

**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 per leg	$R_{thJC}$		-	1.4	2	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient per leg	$R_{thJA}$	Typical socket mount	-	-	70	
Thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	8ETL06SH			

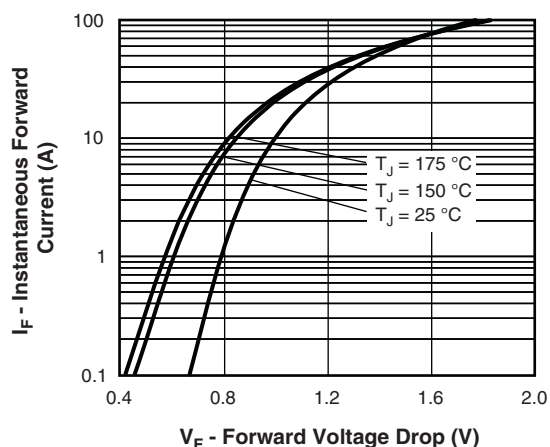


Fig. 1 - Typical Forward Voltage Drop Characteristics

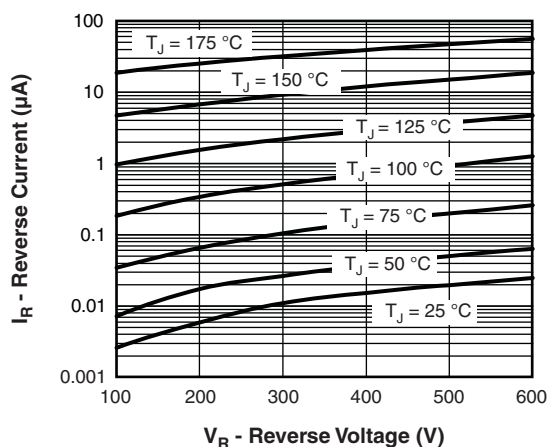


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

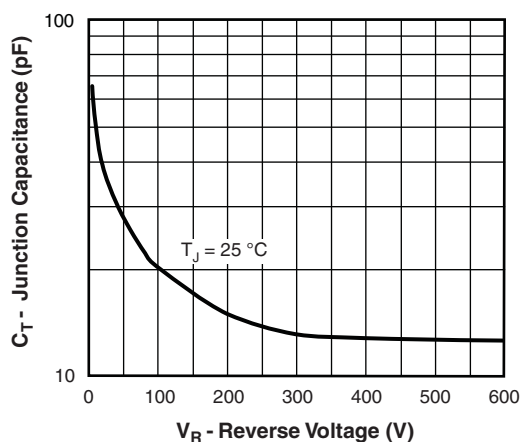


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

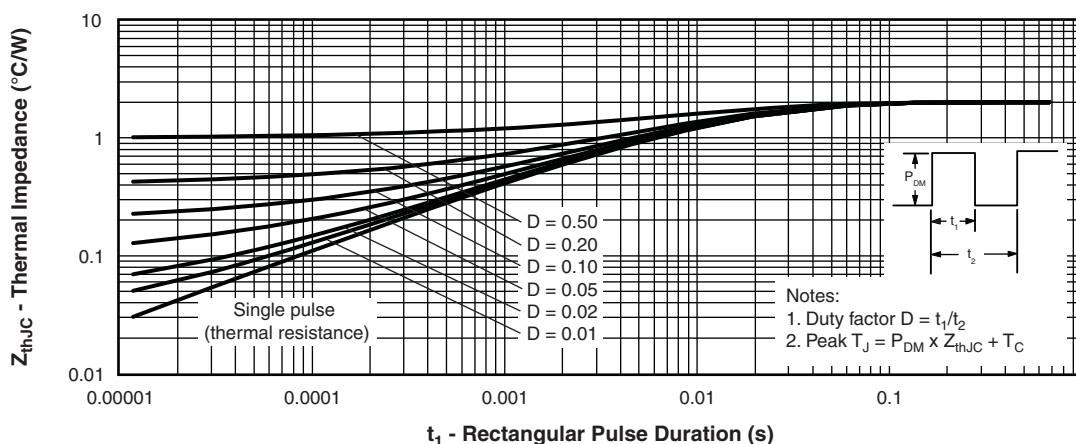
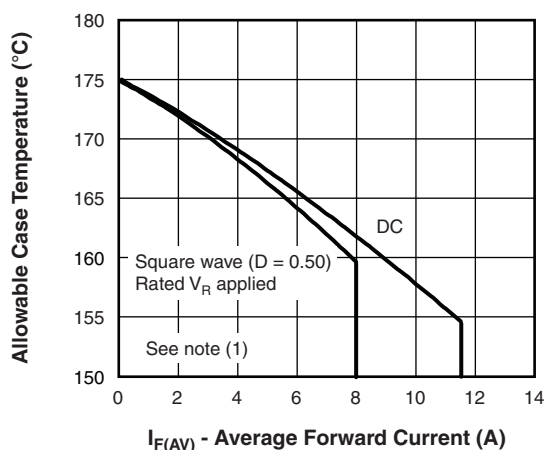

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

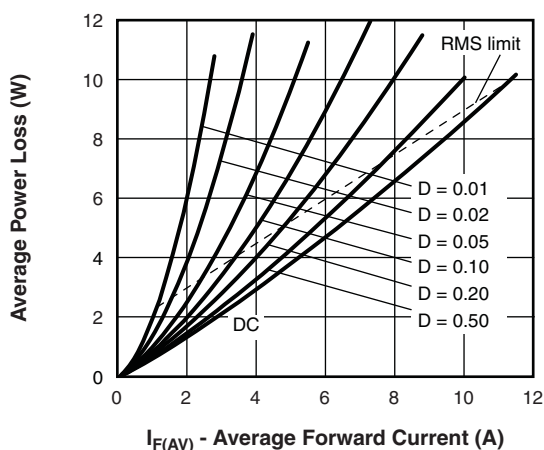


Fig. 6 - Forward Power Loss Characteristics

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

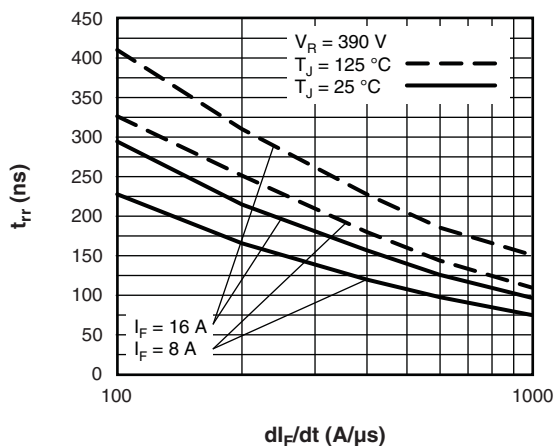
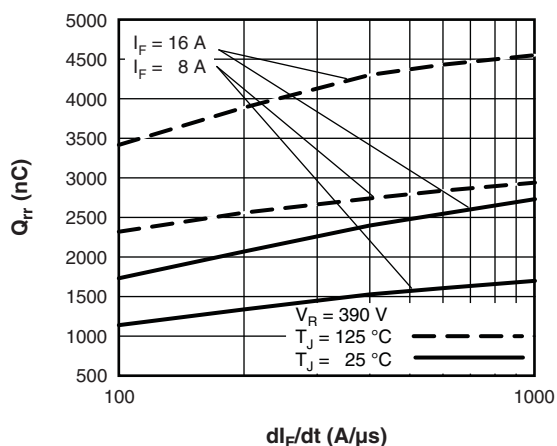
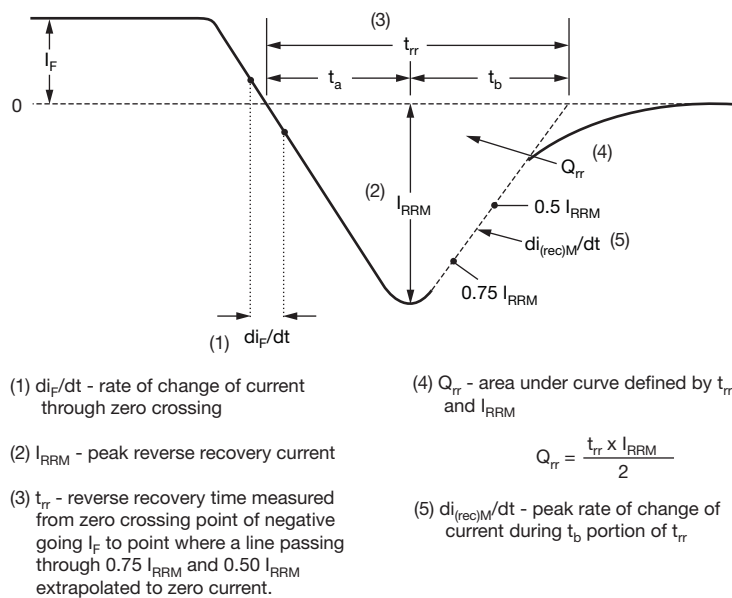

Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$ 

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


Fig. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

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

- |           |   |  |
|-----------|---|--|
| <b>1</b>  | - | Vishay Semiconductors product  |
| <b>2</b>  | - | Current rating (8 A)   |
| <b>3</b>  | - | E = single diode   |
| <b>4</b>  | - | T = TO-220, D <sup>2</sup> PAK   |
| <b>5</b>  | - | L = ultralow $V_F$ hyperfast recovery                                  |
| <b>6</b>  | - | Voltage rating (06 = 600 V)  |
| <b>7</b>  | - | • S = D <sup>2</sup> PAK   |
| <b>8</b>  | - | • None = tube (50 pieces)  |
|           |   | • TRL = tape and reel (left oriented, for D <sup>2</sup> PAK package)  |
|           |   | • TRR = tape and reel (right oriented, for D <sup>2</sup> PAK package) |
| <b>9</b>  | - | H = lead (Pb)-free   |
| <b>10</b> | - | M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free     |

<b>ORDERING INFORMATION</b>			
<b>PREFERRED P/N</b>	<b>QUANTITY PER TUBE</b>	<b>MINIMUM ORDER QUANTITY</b>	<b>PACKAGING DESCRIPTION</b>
VS-8ETL06SHM3	50	1000	Antistatic plastic tube
VS-8ETL06STRRHM3	800	800	13" diameter reel
VS-8ETL06STRLHM3	800	800	13" diameter reel

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a>
Part marking information	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</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?96055">www.vishay.com/doc?96055</a>

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

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



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	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
c	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	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
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
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- 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
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC® outline TO-263AB



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