

# Ultralow $V_F$ Ultrafast Rectifier, 6 A FRED Pt®

## eSMP® Series



SlimDPAK (TO-252AE)



## FEATURES

- Ultrafast recovery time, extremely low  $V_F$  and soft recovery
- For PFC CCM operation
- Low forward voltage drop, low power losses
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
  - Automotive ordering code: base P/NHM3, meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## LINKS TO ADDITIONAL RESOURCES



## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	6 A
$V_R$	600 V
$V_F$ at $I_F$	0.98 V
$t_{rr}$ (typ.)	34 ns
$T_J$ max.	175 °C
Package	SlimDPAK (TO-252AE)
Circuit configuration	Single

## TYPICAL APPLICATIONS

These devices are intended for use in PFC boost stage in the AC/DC section of SMPS inverters, or as freewheeling diodes. Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

## MECHANICAL DATA

**Case:** SlimDPAK (TO-252AE)

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
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 158\text{ °C}$	6	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$ , 10 ms sine pulse wave	80	
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	$V_F$	$I_F = 6\text{ A}$	-	1.15	1.35	
		$I_F = 6\text{ A}$ , $T_J = 150\text{ °C}$	-	0.98	1.15	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	5	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = V_R$ rated	-	-	125	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	10	-	pF

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	45	-	ns
		$I_F = 1\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	34	-	
		$I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{RR} = 0.25\text{ A}$	-	-	50	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	65	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	90	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	9.5	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	13.5	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	320	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	620	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-55	-	175	$^{\circ}\text{C}$
Thermal resistance, junction to mount	$R_{thJM}$		-	-	2.5	$^{\circ}\text{C}/\text{W}$
Weight			-	0.20	-	g
Marking device		Case style SlimDPAK (TO-252AE)	6EVL06			

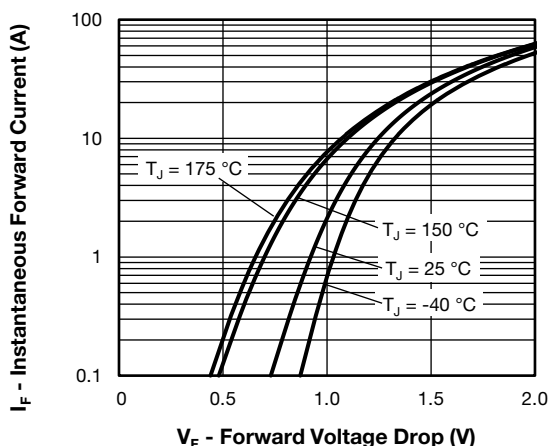


Fig. 1 - Typical Forward Voltage Drop Characteristics

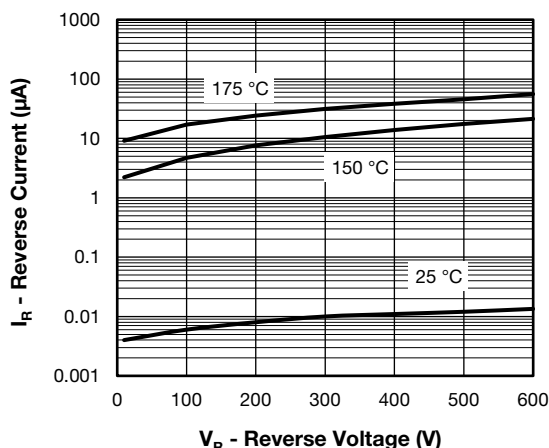


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

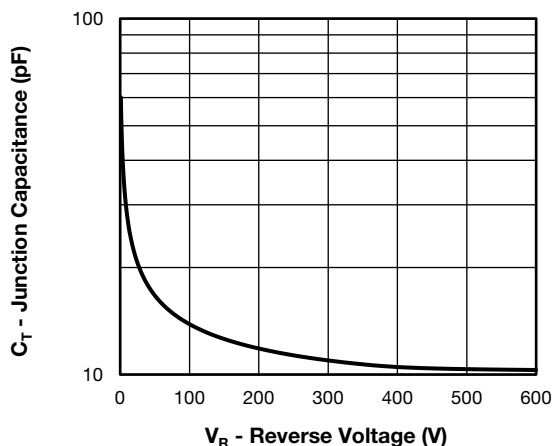


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

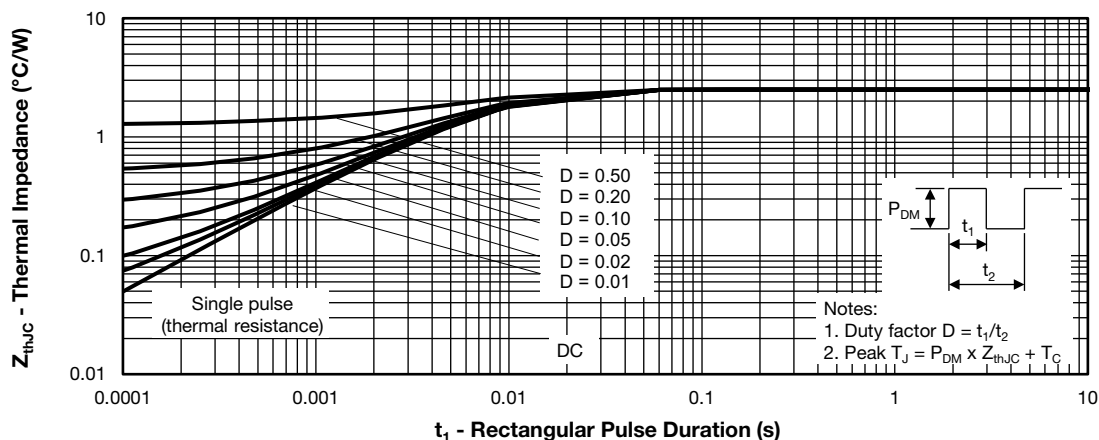
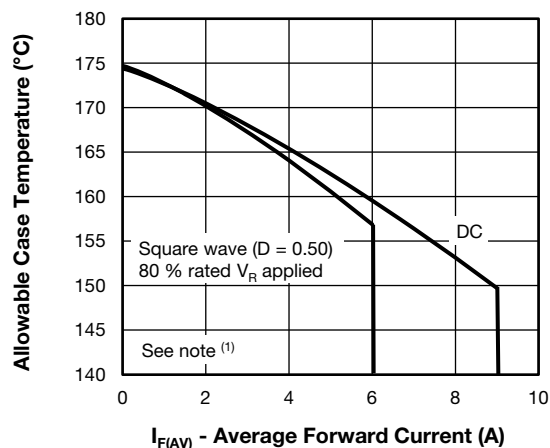

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

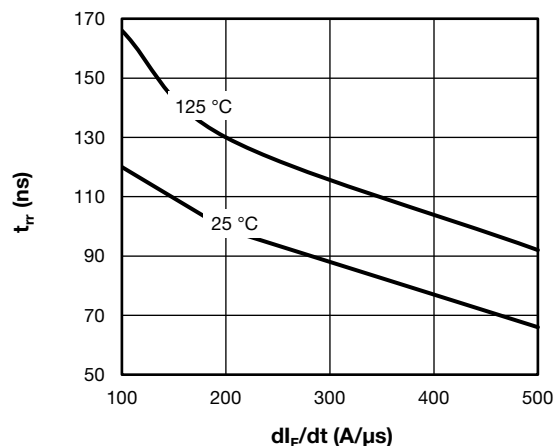
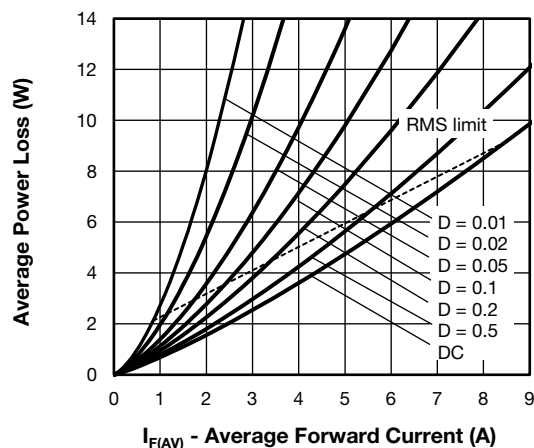
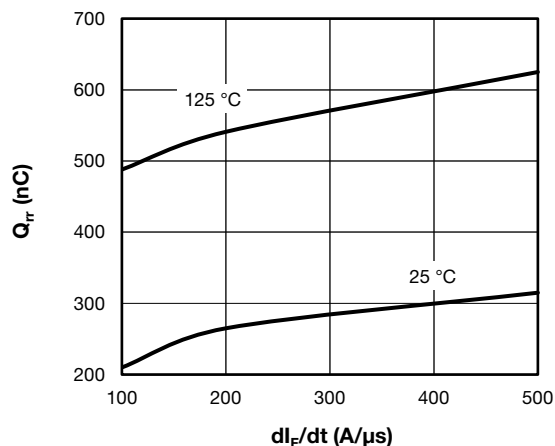

Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$ 


Fig. 6 - Forward Power Loss Characteristics


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

#### 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  $V_R$

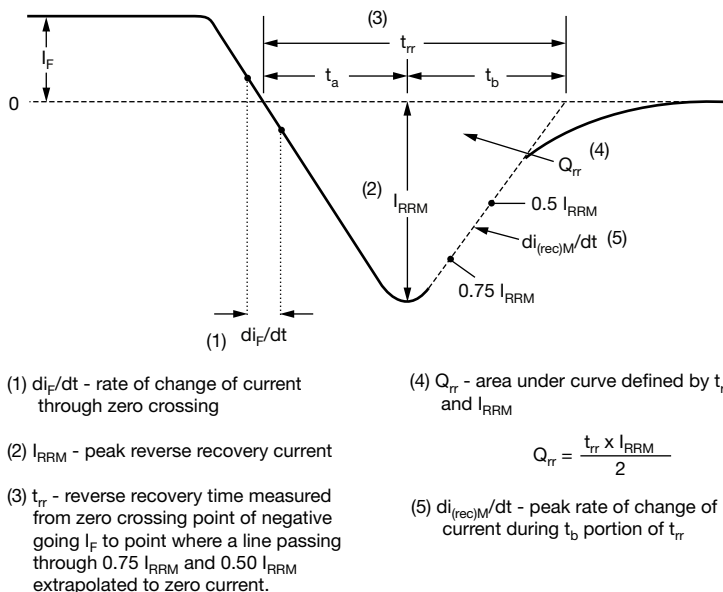


Fig. 9 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	VS-	6	E	V	L	06	H	M3
	1	2	3	4	5	6	7	8

- 1** - Vishay Semiconductors product
- 2** - Current rating (6 = 6 A)
- 3** - Circuit configuration:  
E = single die
- 4** - V = SlimDPAK
- 5** - Process type:  
L = ultralow  $V_F$  ultrafast rectifier
- 6** - Voltage code (06 = 600 V)
- 7** - H = AEC-Q101 qualified
- 8** - Environmental digit:  
M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

## ORDERING INFORMATION (Example)

PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	PACKAGING DESCRIPTION
VS-6EVL06HM3/I	0.20	I	4500	13" diameter plastic tape and reel

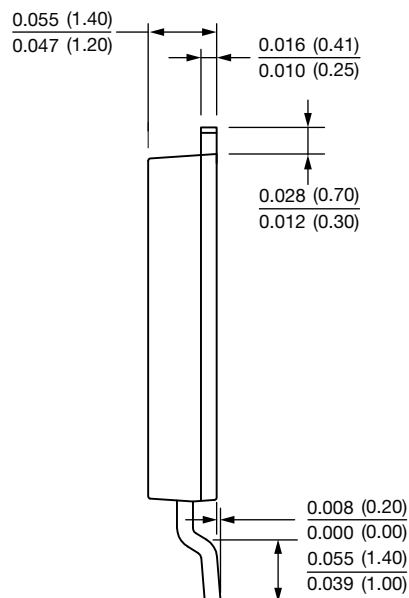
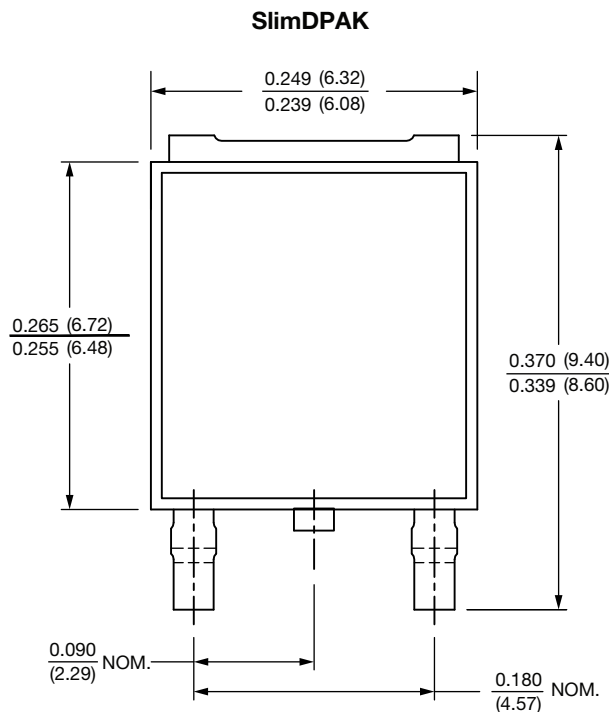
## LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?96081">www.vishay.com/doc?96081</a>
Part marking information	<a href="http://www.vishay.com/doc?96085">www.vishay.com/doc?96085</a>
Packaging information	<a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a>

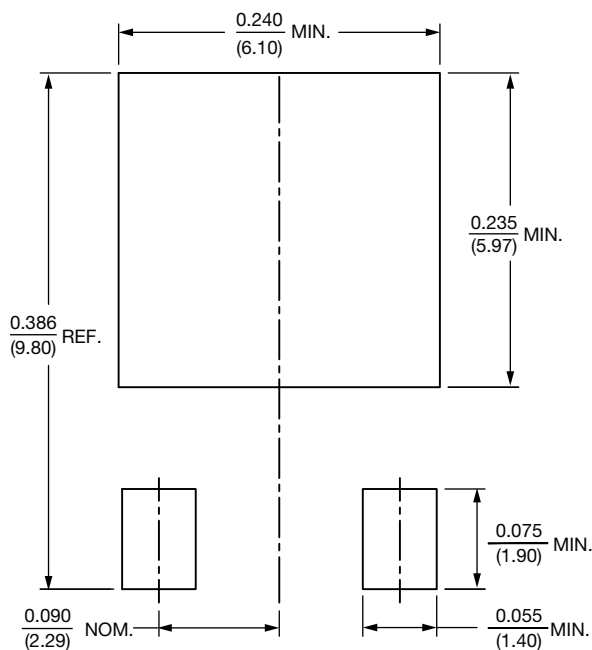
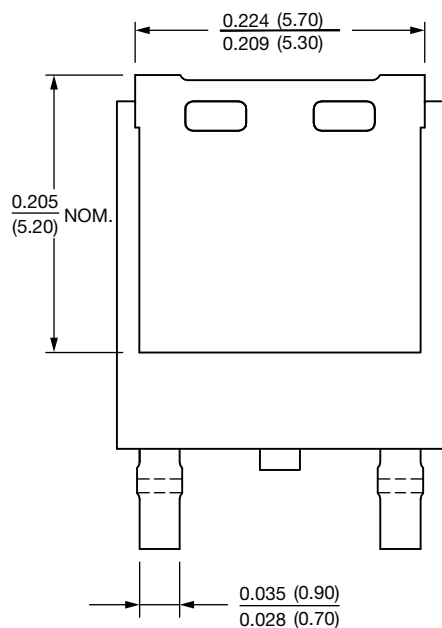


## SlimDPAK

**DIMENSIONS** in inches (millimeters)



### Mounting Pad Layout





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