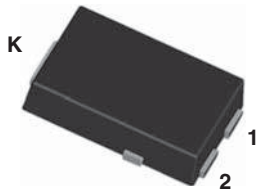
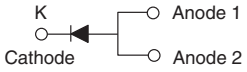
Ultrafast Rectifier, 6 A FRED Pt®



TO-277A (SMPC)



FEATURES

- Ultrafast recovery time, reduced Q_{rr}, and soft recovery
- 175 °C maximum operating junction temperature
- For PFC, CRM snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified according to JEDEC®-JESD 17
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

HALOGEN FREE

PRODUCT SUMMARY	
Package	TO-277A (SMPC)
$I_{F(AV)}$	6 A
V_R	600 V
V_F at I_F	1.3 V
t_{rr} (typ.)	42 ns
T_J max.	175 °C
Diode variation	Single die

DESCRIPTION / APPLICATIONS

State of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultrafast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness, and reliability characteristics.

These devices are intended for use in PFC, boost, lighting, in the AC/DC section of SMPS, freewheeling and clamp diodes.

The extremely optimized stored charge and low recovery current minimize the switching losses and reduce power dissipation in the switching element and snubbers.

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_{Sp} = 150 °C	6	A
Non-repetitive peak surge current	I_{FSM}	T_J = 25 °C	120	
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	-	-	V
Forward voltage	V_F	I_F = 6 A	-	1.10	1.30	
		I_F = 6 A, T_J = 150 °C	-	0.95	1.15	
Reverse leakage current	I_R	V_R = V_R rated	-	-	5	µA
		T_J = 150 °C, V_R = V_R rated	-	25	150	
Junction capacitance	C_T	V_R = 600 V	-	8	-	pF

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DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	I_F = 1 A, dI_F/dt = 50 A/µs, V_R = 30 V		-	42	-	ns
		I_F = 0.5 A, I_R = 1 A, I_{rr} = 0.25 A		-	-	60	
		T_J = 25 °C	I_F = 6 A dI_F/dt = 500 A/µs V_R = 400 V	-	58	-	
		T_J = 125 °C		-	85	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	10	-	A
		T_J = 125 °C		-	15	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	290	-	nC
		T_J = 125 °C		-	620	-	

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, junction to solder pad	R_{thJ-Sp}		-	2.4	3.5	°C/W
Approximate weight			0.1			g
			0.0035			oz.
Marking device		Case style TO-277A (SMPC)	NEU6			

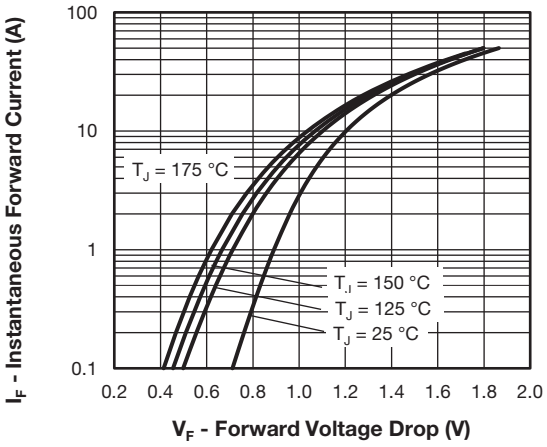

Fig. 1 - Typical Forward Voltage Drop Characteristics

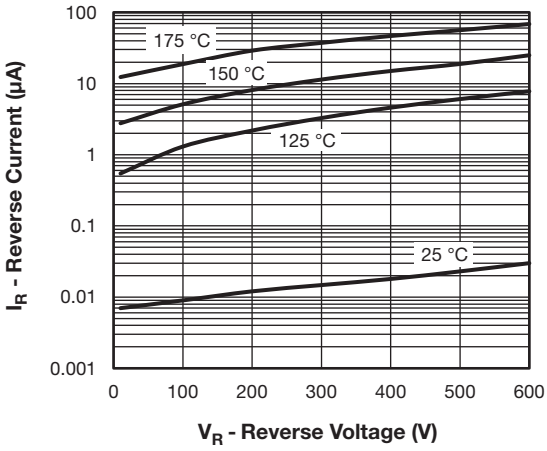

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

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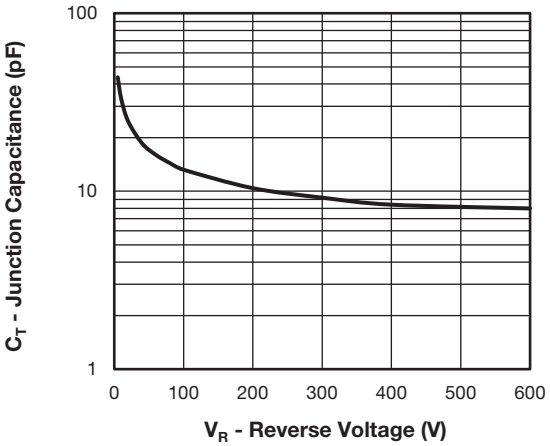

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

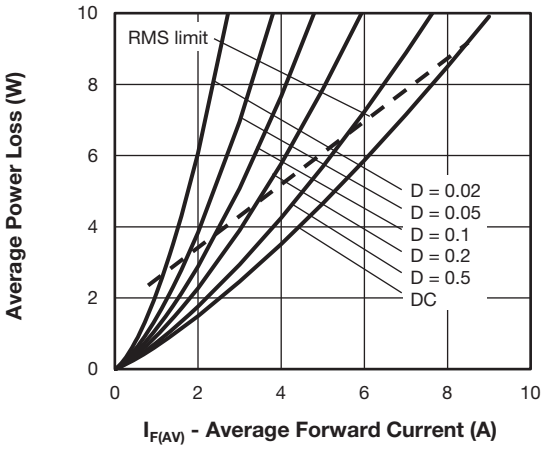

Fig. 5 - Forward Power Loss Characteristics

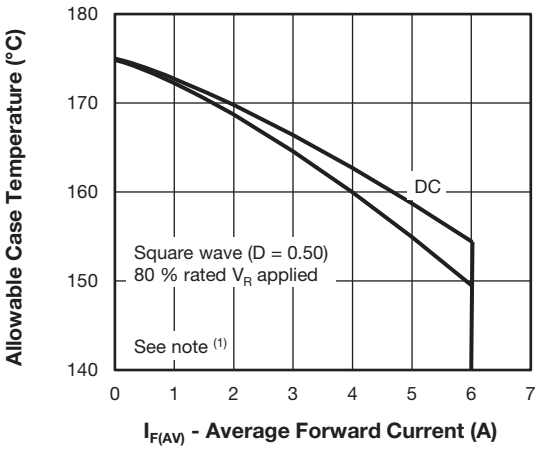

Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

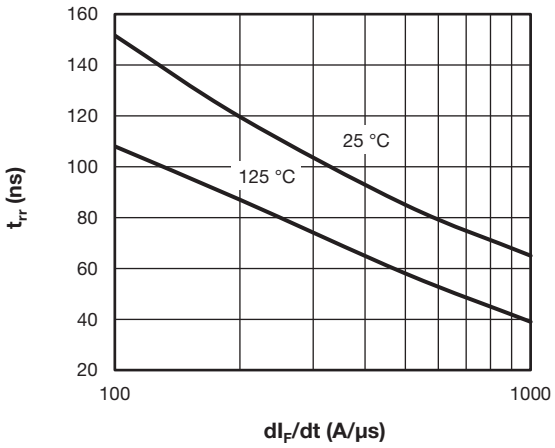

Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

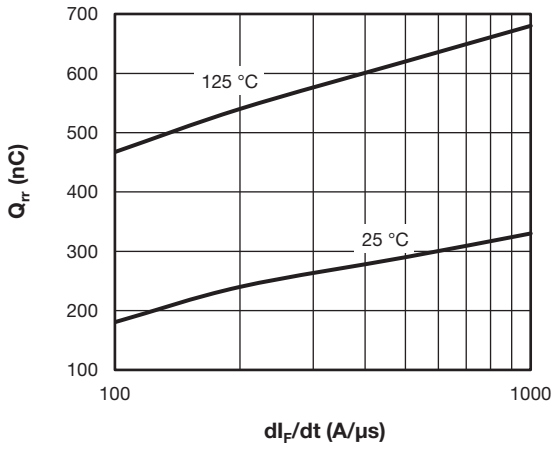

Fig. 7 - Typical Stored Charge vs. dI_F/dt

Note

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 5);
Pd_{REV} = Inverse power loss = $V_{R1} \times I_R$ (1 - D); I_R at V_{R1} = rated V_R

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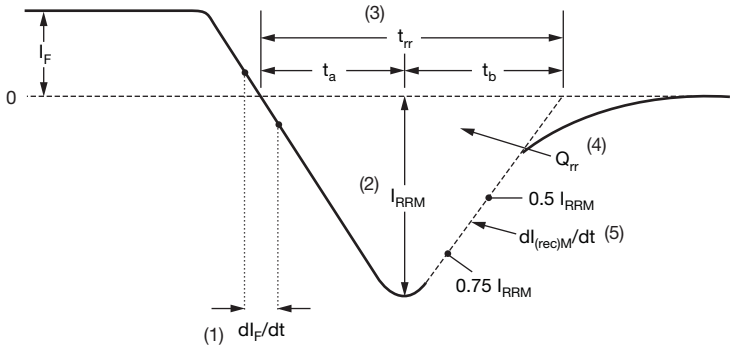

(1) dI_F/dt - rate of change of current through zero crossing

(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}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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

Fig. 8 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

VS-	6	E	S	U	06	-M3
1	2	3	4	5	6	7

1 - Vishay Semiconductors product

2 - Current rating (6 = 6 A)

3 - Circuit configuration:
E = single diode

4 - S = SMPC package

5 - Process type,
U = ultrafast recovery

6 - Voltage code (06 = 600 V)

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

ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER REEL**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-6ESU06-M3/86A	1500	1500	7" diameter plastic tape and reel
VS-6ESU06-M3/87A	6500	6500	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95570
Part marking information	www.vishay.com/doc?95565
Packaging information	www.vishay.com/doc?88869

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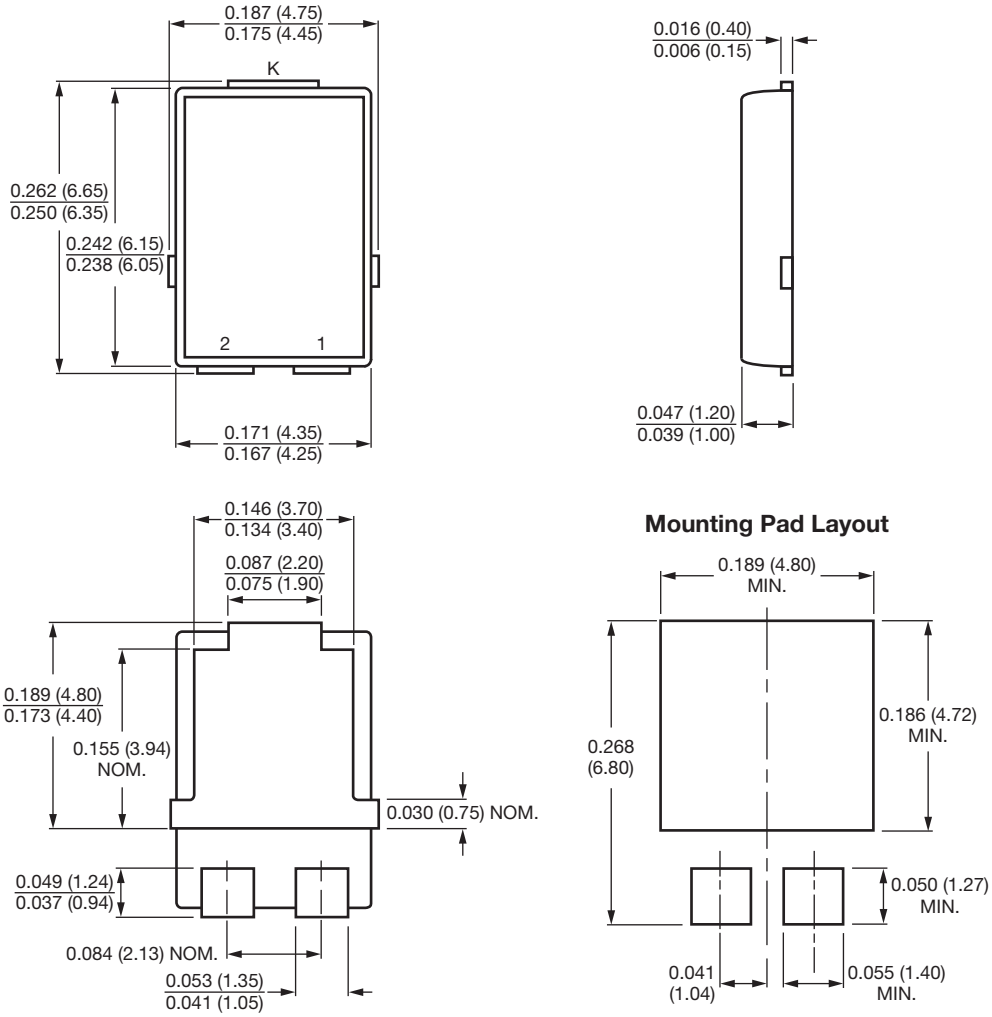
TO-277A (SMPC)

DIMENSIONS in inches (millimeters)



Conform to JEDEC® TO-277A

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