Ultrafast Rectifier, 6 A FRED Pt®

eSMP® Series

SMPC (TO-277A)

ADDITIONAL RESOURCES

3D Models

PRIMARY CHARACTERISTICS

$I_{F(AV)}$	6 A
V_R	600 V
V_F at I_F	0.95 V
$t_{rr\ (typ.)}$	42 ns
T_J max.	175 °C
Package	SMPC (TO-277A)
Circuit configuration	Single
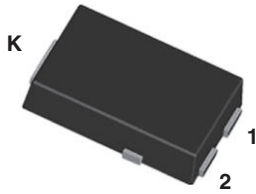
FEATURES

- Ultra fast 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
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free · e3 · RoHS COMPLIANT · HALOGEN FREE

DESCRIPTION / APPLICATIONS

State of the art ultra fast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultra fast 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	V
		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

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

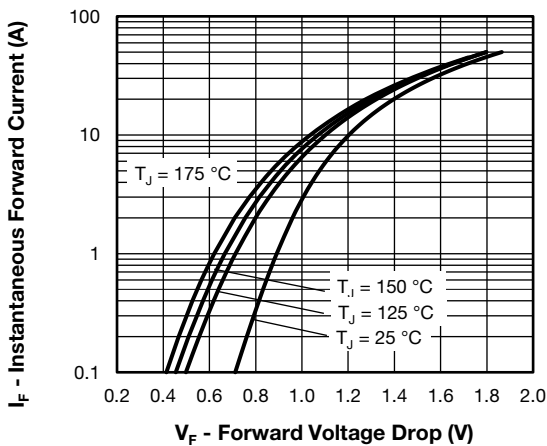| PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}		-65	-	175	°C
Thermal resistance, junction to solder pad	R_{thJ-Sp}		-	2.4	3.5	°C/W
Approximate weight				0.1		g
				0.0035		oz.
Marking device		Case style SMPC (TO-277A)		NEU6		

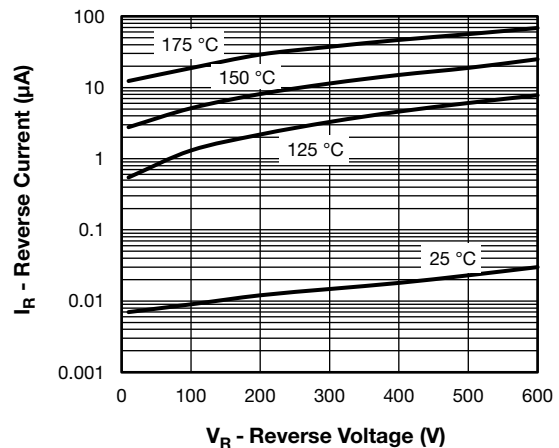Fig. 1 - Typical Forward Voltage Drop Characteristics

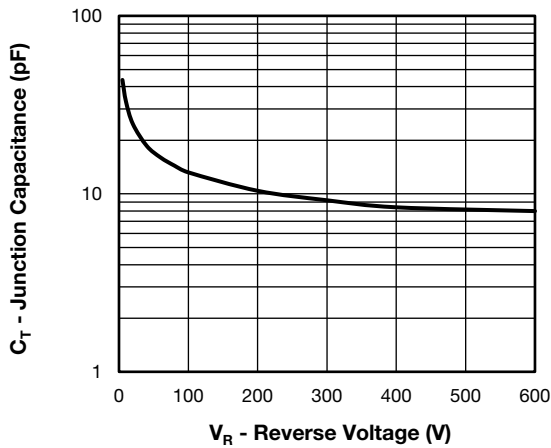Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

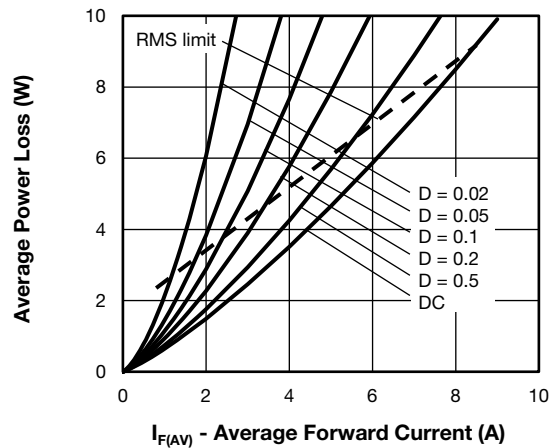Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage
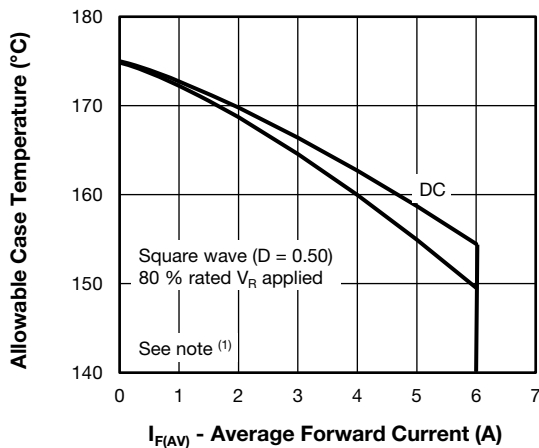

Fig. 5 - Forward Power Loss Characteristics

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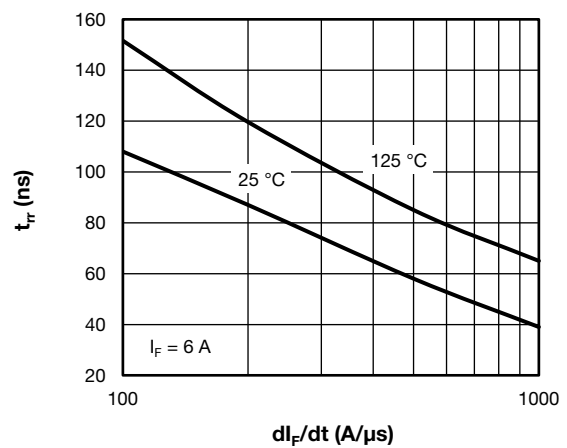vs. Average Forward Current

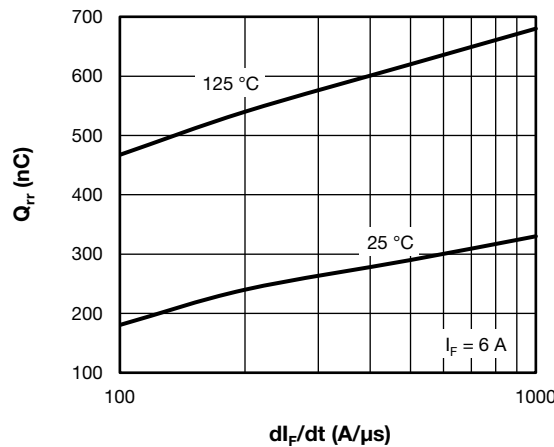Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

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

(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

VS-	6	E	S	U	06	H	M3
1	2	3	4	5	6	7	8

Device code

1 - Vishay Semiconductors product

2 - Current rating (6 = 6 A)

3 - Circuit configuration:
E = single diode

4 - S = SMPC package

5 - Process type,
U = ultra fast recovery

6 - Voltage code (06 = 600 V)

7 - H = AEC-Q101 qualified

8 - 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-6ESU06HM3/86A	1500	1500	7" diameter plastic tape and reel
VS-6ESU06HM3/87A	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
SPICE model	www.vishay.com/doc?96703

TO-277A (SMPC)

DIMENSIONS in inches (millimeters)

0.187 (4.75)
0.175 (4.45)

K

0.262 (6.65)
0.250 (6.35)

0.242 (6.15)
0.238 (6.05)

2   1

0.171 (4.35)
0.167 (4.25)

0.016 (0.40)
0.006 (0.15)

0.047 (1.20)
0.039 (1.00)

0.146 (3.70)
0.134 (3.40)

0.087 (2.20)
0.075 (1.90)

0.189 (4.80)
0.173 (4.40)

0.155 (3.94)
NOM.

0.030 (0.75) NOM.

0.049 (1.24)
0.037 (0.94)

0.084 (2.13) NOM.

0.053 (1.35)
0.041 (1.05)

Conform to JEDEC® TO-277A

Mounting Pad Layout

0.189 (4.80)
MIN.

0.268
(6.80)

0.186 (4.72)
MIN.

0.050 (1.27)
MIN.

0.041
(1.04)

0.055 (1.40)
MIN.

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