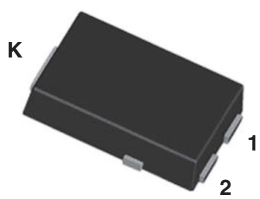
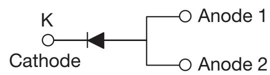
Hyperfast Rectifier, 4 A FRED Pt®

eSMP® Series





SMPC (TO-277A)

LINKS TO ADDITIONAL RESOURCES

3D Models

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	4 A
V_R	100 V
V_F at I_F	0.73 V
$t_{rr\ (typ.)}$	27 ns
T_J max.	175 °C
Package	SMPC (TO-277A)
Circuit configuration	Single

FEATURES

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE

- Hyperfast recovery time, reduced Q_{rr}, and soft recovery
- 175 °C maximum operating junction temperature
- Specified for output and 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

DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers specifically designed with optimized performance of forward voltage drop and hyperfast 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 snubber, boost, lighting, piezo-injection, as high frequency rectifiers and freewheeling diodes.

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

MECHANICAL DATA

Case: SMPC (TO-277A)

Molding compound meets UL 94 V-0 flammability rating Halogen-free, RoHS compliant

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}		100	V
Average rectified forward current	$I_{F(AV)}$	T_{Sp} = 165 °C	4	A
Non-repetitive peak surge current	I_{FSM}	T_J = 25 °C	130	
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 µA	100	-	-	V
Forward voltage	V_F	I_F = 4 A	-	0.86	0.93	
		I_F = 4 A, T_J = 125 °C	-	0.73	0.79	
Reverse leakage current	I_R	V_R = V_R rated	-	-	2	µA
		T_J = 125 °C, V_R = V_R rated	-	1	10	
Junction capacitance	C_T	V_R = 100 V	-	24	-	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	-	27	-	ns
		I_F = 0.5 A, I_R = 1 A, I_{rr} = 0.25 A	-	-	25	
		T_J = 25 °C; I_F = 4 A, dI_F/dt = 200 A/μs, V_R = 160 V	-	20	-	
		T_J = 125 °C	-	31	-	
Peak recovery current	I_{RRM}	T_J = 25 °C	-	2.2	-	A
		T_J = 125 °C	-	4.4	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C	-	22	-	nC
		T_J = 125 °C	-	70	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C
Thermal resistance, junction to mount	R_{thJM}		-	2.2	3	°C/W
Thermal resistance, junction to ambient	R_{thJA}		-	85	-	
Approximate weight				0.1		g
				0.0035		oz.
Marking device		Case style SMPC (TO-277A)		JEH1		

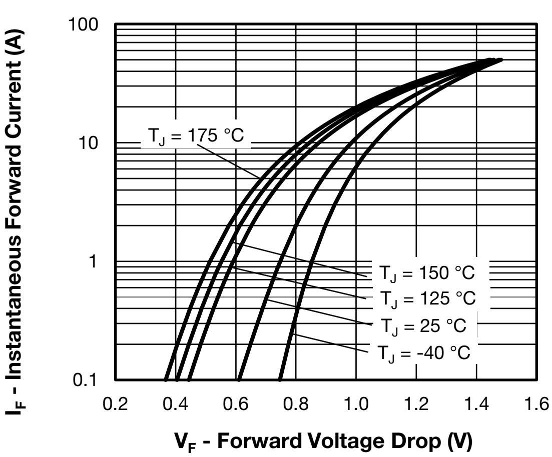


Fig. 1 - Typical Forward Voltage Drop Characteristics

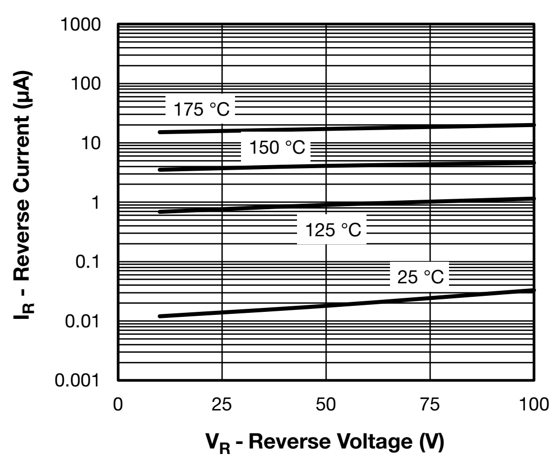


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

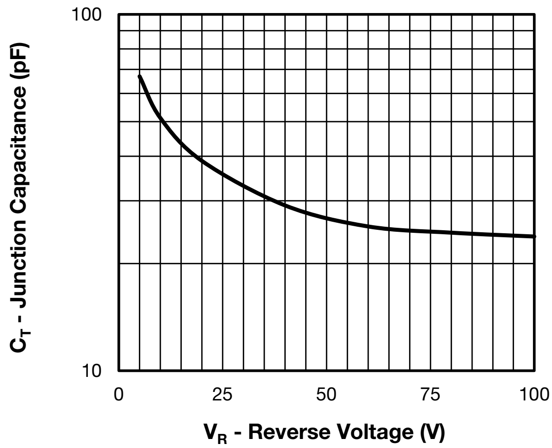


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

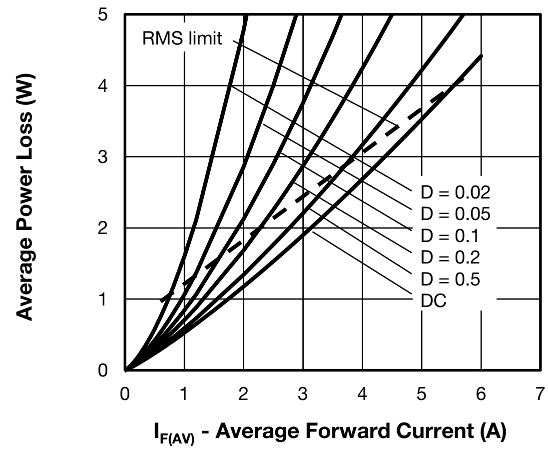


Fig. 5 - Forward Power Loss Characteristics

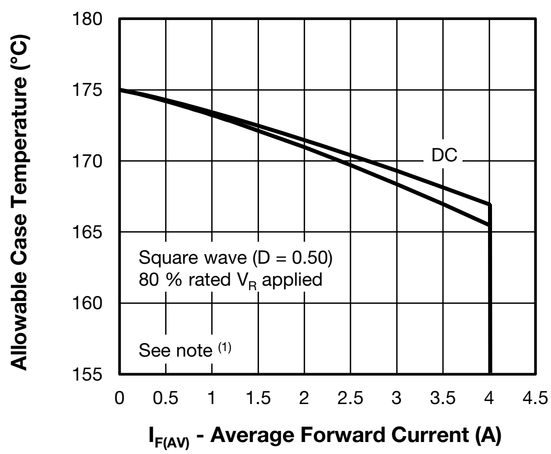


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

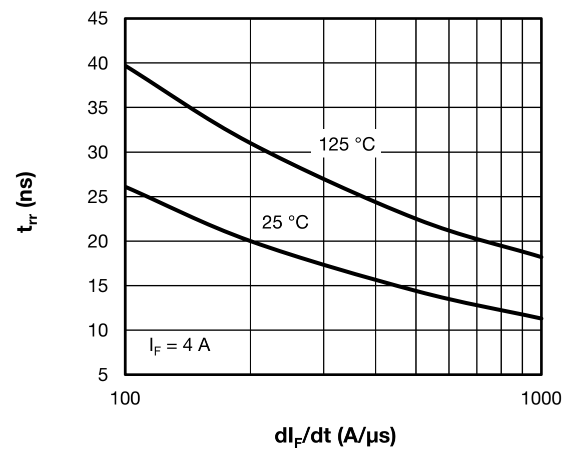


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

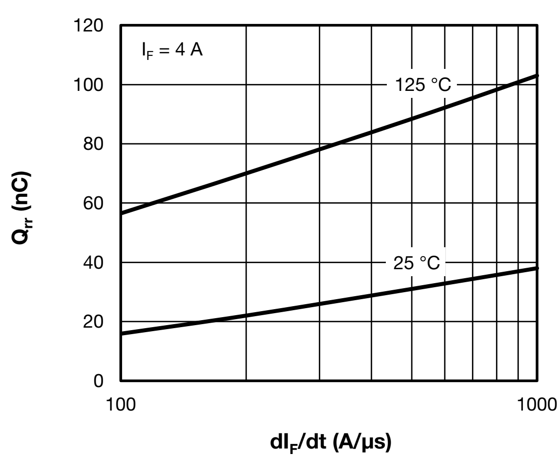


Fig. 7 - Typical Stored Charge vs. dI_F/dt

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

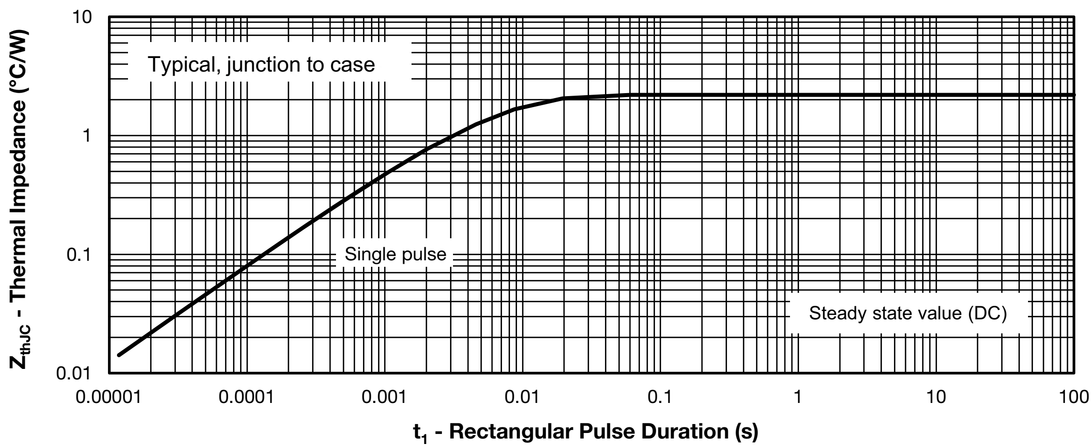


Fig. 8 - Transient Thermal Impedance, Junction to Case

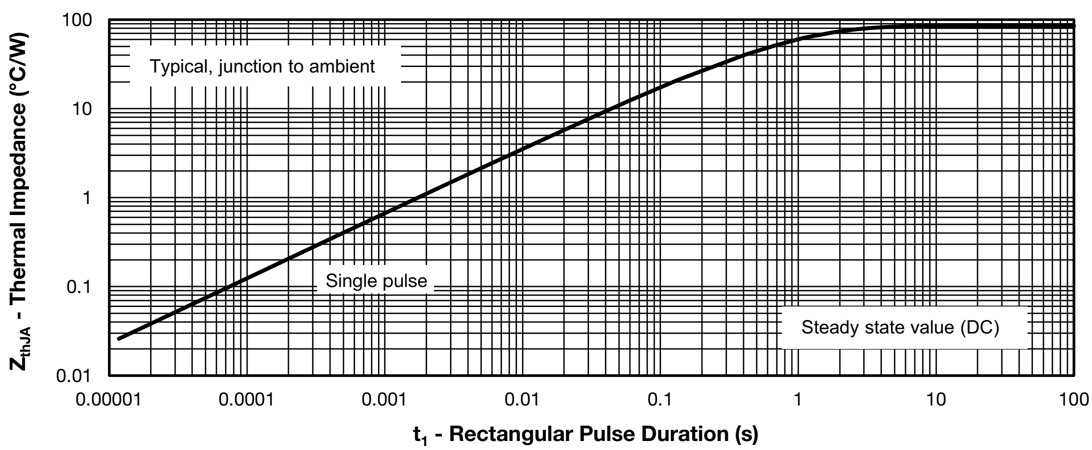
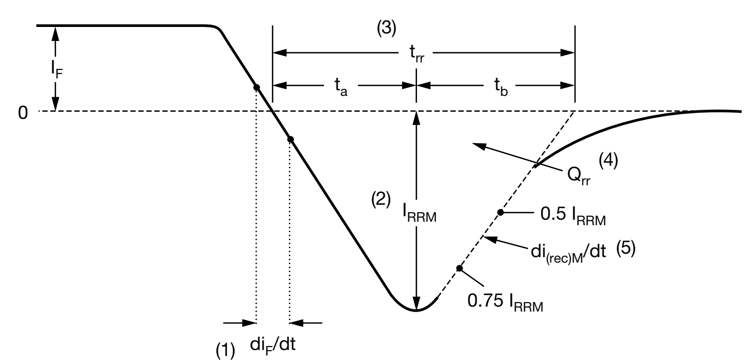


Fig. 9 - Transient Thermal Impedance, Junction to Ambient



(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. 10 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	4	E	S	H	01	H	M3
	1	2	3	4	5	6	7	8

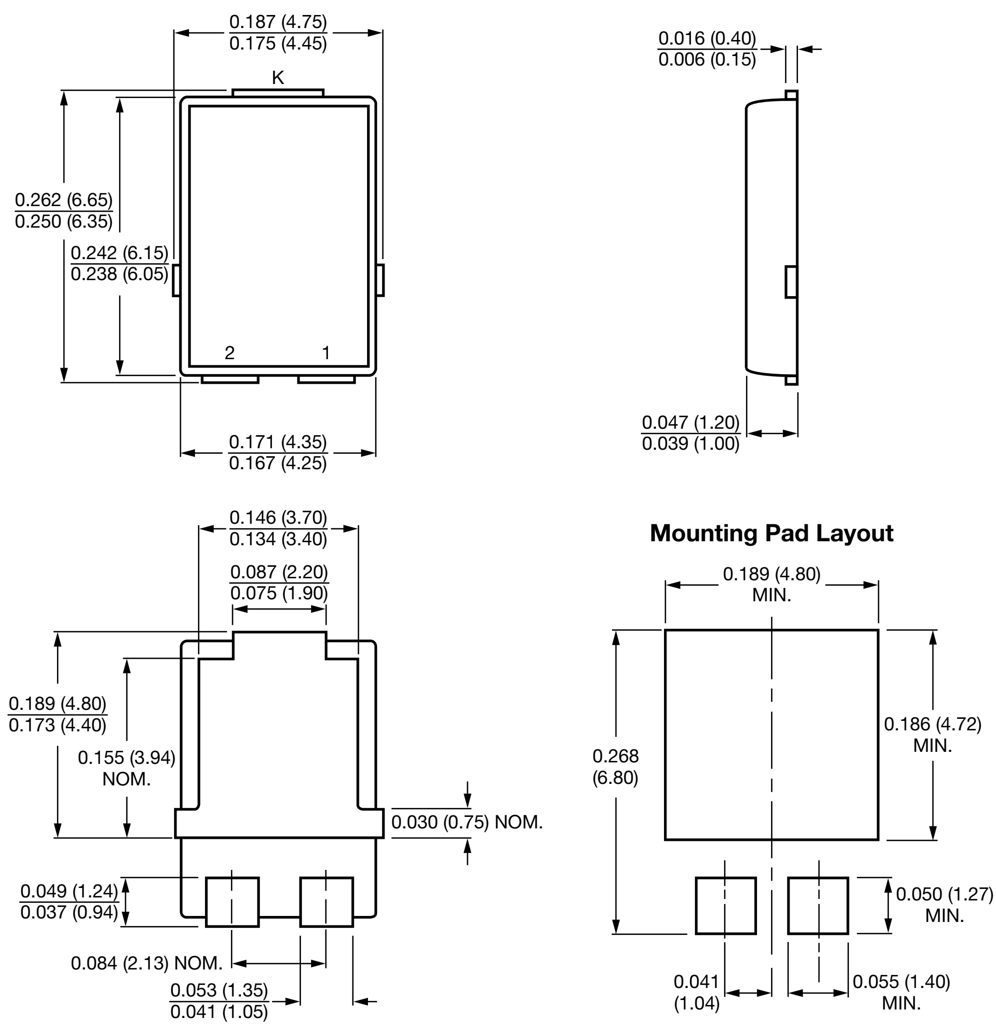
- **1** - Vishay Semiconductors product
- **2** - Current rating (4 = 4 A)
- **3** - Circuit configuration:
  E = single diode
- **4** - S = SMPC package
- **5** - Process type,
  H = hyperfast recovery
- **6** - Voltage code (01 = 100 V)
- **7** - H = AEC-Q101 qualified
- **8** - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER REEL**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-4ESH01HM3/86A	1500	1500	7" diameter plastic tape and reel
VS-4ESH01HM3/87A	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?96073

SMPC (TO-277A)

DIMENSIONS in inches (millimeters)



Conform to JEDEC® TO-277A

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