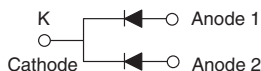


# Hyper Fast Rectifier, 2 x 2 A FRED Pt®


**SMPC (TO-277A)**


## FEATURES

- Hyper fast recovery time, reduced  $Q_{rr}$ , and soft recovery
- 175 °C maximum operating junction temperature
- Specific 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
- 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**

## DESCRIPTION / APPLICATIONS

State of the art hyper fast recovery rectifiers specifically designed with optimized performance of forward voltage drop and hyper 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 snubber, boost, lighting, 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.

## PRODUCT SUMMARY

Package	SMPC (TO-277A)
$I_{F(AV)}$	2 x 2 A
$V_R$	200 V
$V_F$ at $I_F$	0.75 V
$t_{rr}$ (typ.)	24 ns
$T_J$ max.	175 °C
Diode variation	Dual die

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		200	V
Average rectified forward current	$I_{F(AV)}$	$T_{Sp} = 165$ °C	4	A
			2	
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25$ °C	90	
			50	
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	$V_{BR}, V_R$	$I_R = 100$ $\mu$ A	200	-	-	V
Forward voltage, per diode	$V_F$	$I_F = 2$ A	-	0.88	0.95	
		$I_F = 2$ A, $T_J = 125$ °C	-	0.75	0.82	
Reverse leakage current, per diode	$I_R$	$V_R = V_R$ rated	-	-	2	$\mu$ A
		$T_J = 125$ °C, $V_R = V_R$ rated	-	1	8	
Junction capacitance	$C_T$	$V_R = 200$ V	-	8	-	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	$t_{rr}$	$I_F = 1\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	24	-	ns
		$I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$	-	-	25	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	16	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	22	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	2	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	3	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	16	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	30	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
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 solder pad, per diode	$R_{thJ-Sp}$		-	4.5	5.5	$^{\circ}\text{C}/\text{W}$
Approximate weight			0.1			g
			0.0035			oz.
Marking device		Case style SMPC (TO-277A)	JCH2			

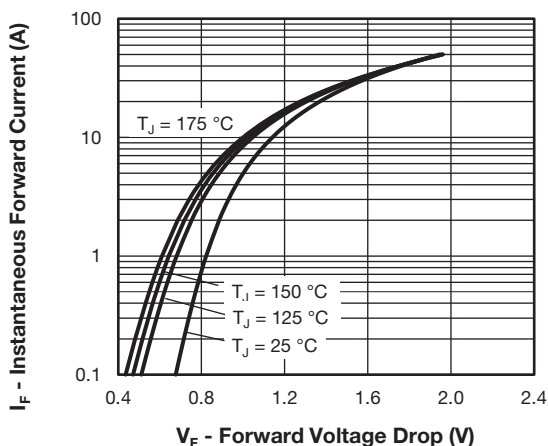


Fig. 1 - Typical Forward Voltage Drop Characteristics

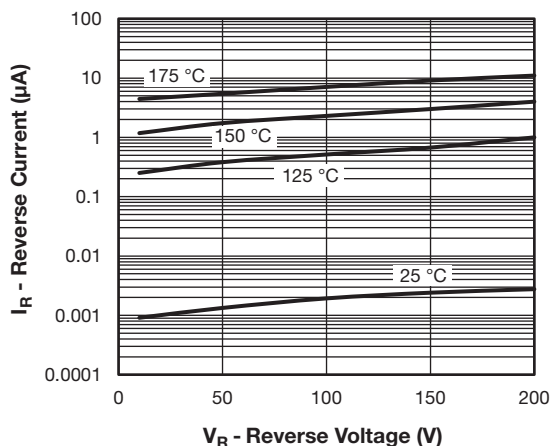


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

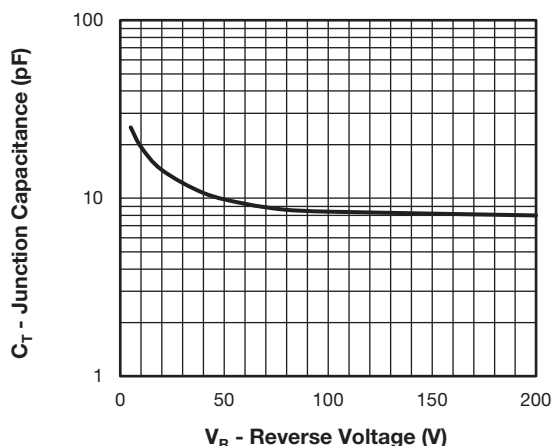


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

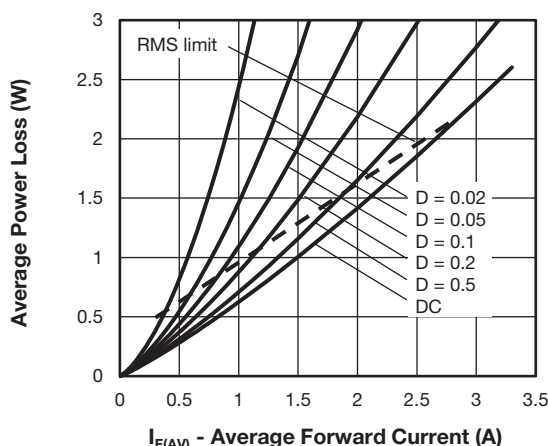


Fig. 5 - Forward Power Loss Characteristics

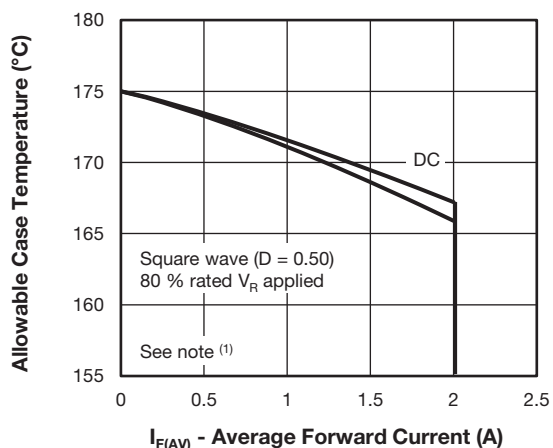
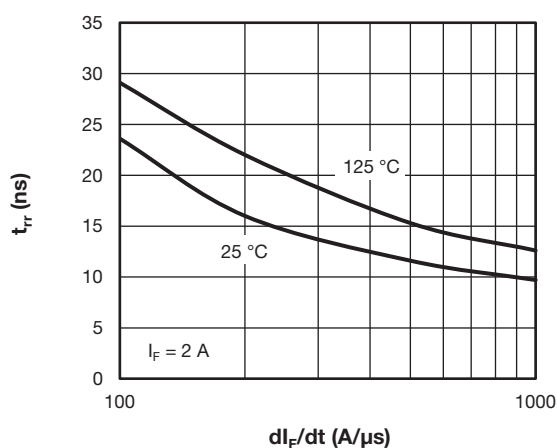
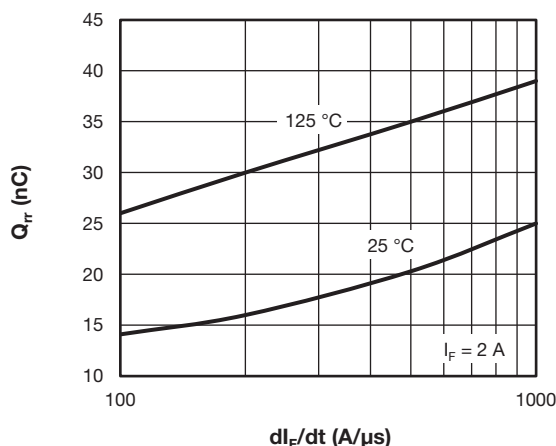


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current


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

Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$ 
**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 5);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

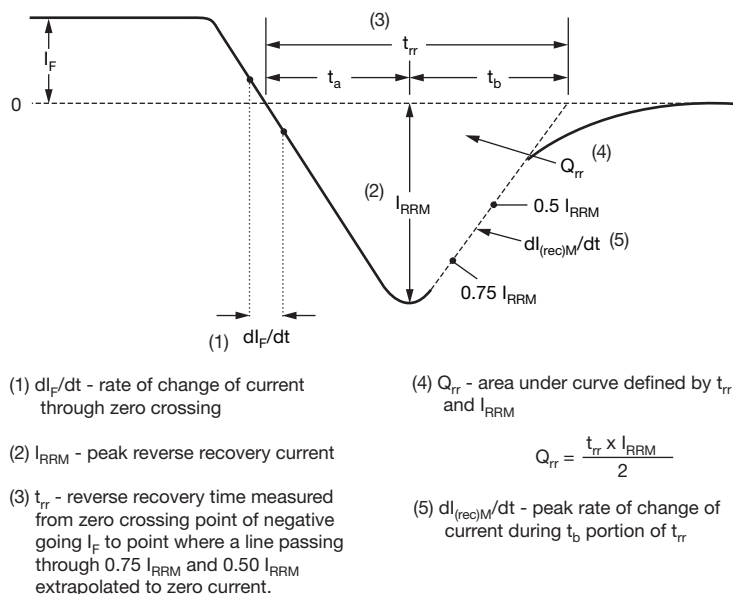


Fig. 8 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	VS-	4	C	S	H	02	-M3
	1	2	3	4	5	6	7

- 1** - Vishay Semiconductors product
- 2** - Current rating (4 = 4 A)
- 3** - Circuit configuration:  
C = common cathode
- 4** - S = SMPC package
- 5** - Process type,  
H = hyper fast recovery
- 6** - Voltage code (02 = 200 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-4CSH02-M3/86A	1500	1500	7" diameter plastic tape and reel
VS-4CSH02-M3/87A	6500	6500	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95570">www.vishay.com/doc?95570</a>
Part marking information	<a href="http://www.vishay.com/doc?95565">www.vishay.com/doc?95565</a>
Packaging information	<a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a>

## TO-277A (SMPC)

**DIMENSIONS** in inches (millimeters)



### Mounting Pad Layout



Conform to JEDEC® TO-277A



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