

## Ultrafast Rectifier, 4 A FRED Pt®



#### LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS				
I <sub>F(AV)</sub>	4 A			
V <sub>R</sub>	600 V			
V <sub>F</sub> at I <sub>F</sub>	0.88 V			
t <sub>rr</sub> typ.	45 ns			
T <sub>J</sub> max.	175 °C			
Package	SMC (DO-214AB)			
Circuit configuration	Single			

#### **FEATURES**

 $\bullet$  Ultrafast recovery time, reduced  $\mathsf{Q}_{rr}$  and soft recovery



• 175 °C maximum operating junction temperature

• For PFC CRM / CCM, snubber operation

COMPLIANT HALOGEN FREE

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 47
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

### **DESCRIPTION / APPLICATIONS**

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

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 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 power dissipation in the switching element and snubbers.

### **MECHANICAL DATA**

Case: SMC (DO-214AB)

Molding compound meets UL 94 V-0 flammability rating

Halogen-free, RoHS-compliant

Terminals: matte tin plated leads, solderable per

J-STD-002

Polarity: color band denotes cathode end

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	I <sub>F(AV)</sub>	T <sub>L</sub> = 117 °C <sup>(1)</sup>	4	۸
Non-repetitive peak surge current	I <sub>FSM</sub>	T <sub>J</sub> = 25 °C, 6 ms square pulse	120	A
Operating junction and storage temperatures	T <sub>J</sub> , T <sub>Stg</sub>		-55 to +175	°C

#### Note

(1) Mounted on PCB with minimum pad size

<b>ELECTRICAL SPECIFICATIONS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_{R}$	I <sub>R</sub> = 100 μA	600	-	-	
Command valtage	V	I <sub>F</sub> = 4 A	-	1.07	1.3	V
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 4 A, T <sub>J</sub> = 150 °C	-	0.88	1.1	
Deviage legisere evigent	,	V <sub>R</sub> = V <sub>R</sub> rated	-	-	3	
Reverse leakage current	I <sub>R</sub>	T <sub>J</sub> = 150 °C, V <sub>R</sub> = V <sub>R</sub> rated	-	-	100	μA
Junction capacitance	C <sub>T</sub>	V <sub>R</sub> = 600 V	-	7.8	-	pF



<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
		$I_F = 1.0 \text{ A}, dI_F/dt$	$= 100 \text{ A/}\mu\text{s}, V_{R} = 30 \text{ V}$	1	45	-	
			$I_F = 1.0 \text{ A}, dI_F/dt = 50 \text{ A/}\mu\text{s}, V_R = 30 \text{ V}$		50	-	1
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 0.5 A, I <sub>R</sub> = 1 A, I <sub>rr</sub> = 0.25 A		1	-	65	ns
		T <sub>J</sub> = 25 °C		-	41	-	
		T <sub>J</sub> = 125 °C		-	72	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	$I_F = 4 \text{ A}$	-	5.8	-	Α
reak recovery current		T <sub>J</sub> = 125 °C	dl <sub>F</sub> /dt = 200 A/µs V <sub>R</sub> = 390 V	-	8.0	-	_ ^
Reverse recovery charge Q <sub>rr</sub>	T <sub>J</sub> = 25 °C		1	121	-	nC	
	T <sub>J</sub> = 125 °C		-	300	-	IIC	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-55	-	+175	°C
Thermal resistance, junction to mount	R <sub>thJM</sub> <sup>(1)</sup>		-	-	14	°C/W
Thermal resistance, junction to ambient	R <sub>thJA</sub> (1)		-	-	80	C/VV
Approximate Weight			0.24			g
Approximate weight				0.008		OZ.
Marking device		Case style SMC (DO-214AB)		41	J6	

#### Note

<sup>(1)</sup> Mounted on PCB with minimum pad size

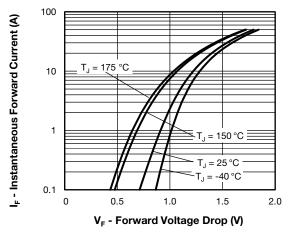


Fig. 1 - Typical Forward Voltage Drop Characteristics

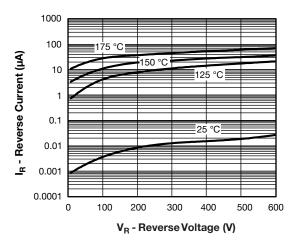


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

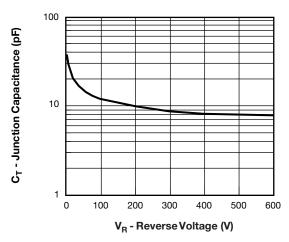


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

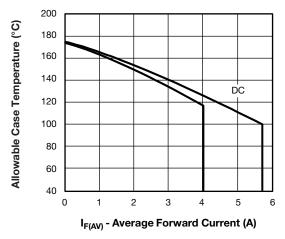


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

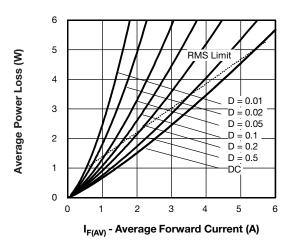


Fig. 5 - Forward Power Loss Characteristics

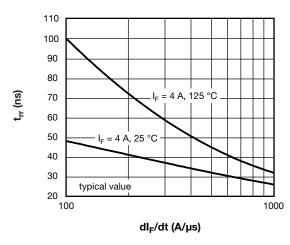


Fig. 6 - Typical Reverse Recovery vs. dl<sub>F</sub>/dt

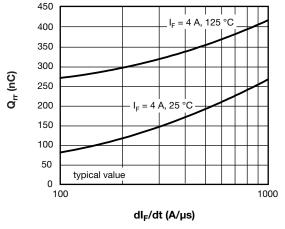
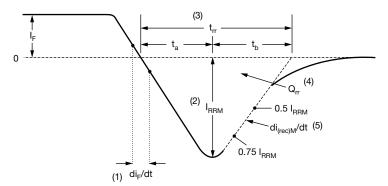


Fig. 7 - Typical Stored Charge vs. dl<sub>F</sub>/dt





- (1) di<sub>F</sub>/dt rate of change of current through zero crossing
- (2) I<sub>RRM</sub> peak reverse recovery current
- (3) t<sub>rr</sub> reverse recovery time measured from zero crossing point of negative going I<sub>F</sub> to point where a line passing through 0.75 I<sub>RRM</sub> and 0.50 I<sub>RRM</sub> extrapolated to zero current.
- (4)  $\mathbf{Q}_{rr}$  area under curve defined by  $\mathbf{t}_{rr}$  and  $\mathbf{I}_{RBM}$

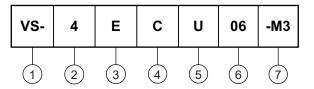
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(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** 



- Vishay Semiconductors product
- **2** Current rating (4 = 4 A)
- 3 Circuit configuration:

E = single diode

- 4 C = SMC 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 TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION			
VS-4ECU06-M3/9AT	9AT	3500	13"diameter plastic tape and reel			

LINKS TO RELATED DOCUMENTS					
Dimensions	www.vishay.com/doc?95402				
Part marking information	www.vishay.com/doc?95472				
Packaging information	www.vishay.com/doc?95404				



## **SMC**

### **DIMENSIONS** in inches (millimeters)

### **DO-214AB (SMC)**



### **Mounting Pad Layout**





### **Legal Disclaimer Notice**

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