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### Vishay Semiconductors

# Ultrafast Rectifier, 3 A FRED Pt®



SlimSMA (DO-221AC)



#### **LINKS TO ADDITIONAL RESOURCES**



PRIMARY CHARACTERISTICS				
I <sub>F(AV)</sub>	3 A			
V <sub>R</sub>	600 V			
V <sub>F</sub> at I <sub>F</sub>	0.99 V			
t <sub>rr</sub>	50 ns			
T <sub>J</sub> max.	175 °C			
Package	SlimSMA (DO-221AC)			
Circuit configuration	Single			

#### **FEATURES**

- Ultrafast recovery time, reduced Q<sub>rr</sub>, and soft
- 175 °C maximum operating junction temperature
- Low forward voltage drop
- · Low leakage current
- J-STD-020, Meets MSL level 1, per 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.vishav.com/doc?99912

### **DESCRIPTION / APPLICATIONS**

State of the art ultrafast recovery rectifiers designed with optimized performance of forward voltage drop and ultrafast recovery time, and fast 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 snubber, output operation, inverters or as 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: SlimSMA (DO-221AC)

Molding compound meets UL 94 V-0 flammability rating

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>C</sub> = 117 °C <sup>(1)</sup>	3	Δ.
Non-repetitive peak surge current	I <sub>FSM</sub>	T <sub>J</sub> = 25 °C	43	Α
Operating junction and storage temperatures	T <sub>J</sub> , T <sub>Stg</sub>		-55 to +175	°C

#### Note

(1) Device on PCB with 8 mm x 16 mm soldering lands

<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	-	-	
Forward voltage	V	I <sub>F</sub> = 3 A	-	1.15	1.35	V
	V <sub>F</sub>	I <sub>F</sub> = 3 A, T <sub>J</sub> = 150 °C	-	0.99	1.2	
Reverse leakage current		V <sub>R</sub> = V <sub>R</sub> rated	-	-	3	
	I <sub>R</sub>	T <sub>J</sub> = 150 °C, V <sub>R</sub> = V <sub>R</sub> rated	-	-	100	μΑ
Junction capacitance	C <sub>T</sub>	V <sub>R</sub> = 600 V	-	6.2	-	pF



<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
		$I_F = 1.0 \text{ A}, dI_F/dt = 50 \text{ A/}\mu\text{s}, V_R = 30 \text{ V}$		-	45	-	
Reverse recovery time t <sub>rr</sub>		$I_F = 0.5 \text{ A}, I_R = 1 \text{ A}, I_{rr} = 0.25 \text{ A}$		-	-	50	
	L <sub>rr</sub>	T <sub>J</sub> = 25 °C		-	52	-	ns
		T <sub>J</sub> = 125 °C		-	82	-	
Peak recovery current I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	I <sub>F</sub> = 3 A dI <sub>F</sub> /dt = 500 A/µs V <sub>B</sub> = 400 V	-	7.3	-	Α	
	T <sub>J</sub> = 125 °C		-	10	-		
Reverse recovery charge Q <sub>rr</sub>	0	T <sub>J</sub> = 25 °C	••	-	210	-	nC
	T <sub>J</sub> = 125 °C		-	400	ı	110	

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>	Device mounted on PCB with 8 mm x 16 mm soldering lands	-	16	-	°C/W
Thermal resistance, junction to ambient	R <sub>thJA</sub>	Device mounted on PCB with 3 mm x 3 mm soldering lands	-	115	-	C/VV
Approximate Weight				0.032		g
Approximate weight				0.0011		OZ.
Marking device		Case style SlimSMA (DO-221AC)		31	J6	

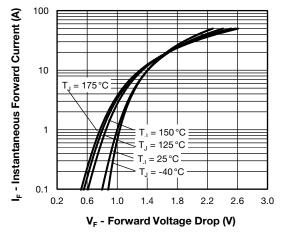


Fig. 1 - Typical Forward Voltage Drop Characteristics

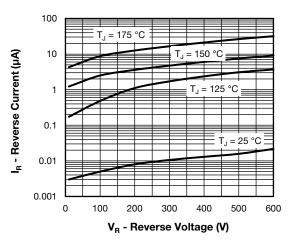


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

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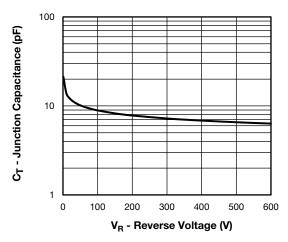


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

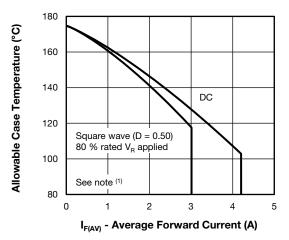
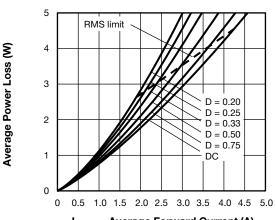


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current



I<sub>F(AV)</sub> - Average Forward Current (A)

Fig. 5 - Forward Power Loss Characteristics

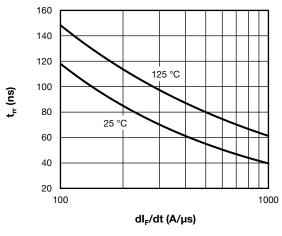


Fig. 6 - Typical Reverse Recovery vs. dl<sub>F</sub>/dt

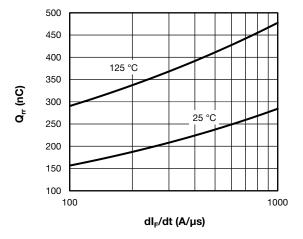


Fig. 7 - Typical Stored Charge vs. dl<sub>F</sub>/dt

#### Note

 $\begin{array}{ll} \text{(1)} & \text{Formula used: } T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}; \\ Pd = \text{forward power loss} = I_{F(AV)} \times V_{FM} \text{ at } (I_{F(AV)}/D) \text{ (see Fig. 6)}; \\ Pd_{REV} = \text{inverse power loss} = V_{R1} \times I_R \text{ (1 - D); } I_R \text{ at } V_{R1} = \text{rated } V_R \\ \end{array}$ 

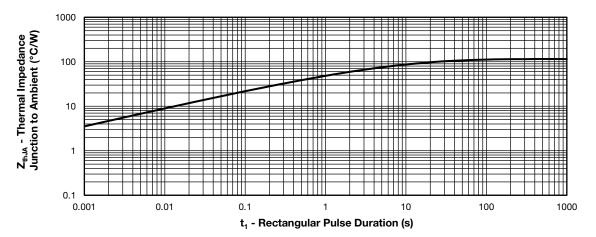
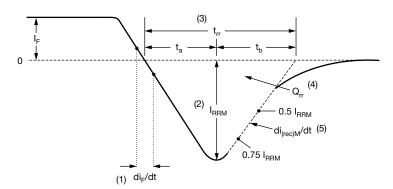


Fig. 8 - Thermal Impedance  $Z_{thJA}$ 



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

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

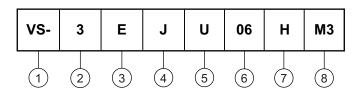
(5) di<sub>(rec)M</sub>/dt - peak rate of change of current during t<sub>b</sub> portion of t<sub>rr</sub>

Fig. 9 - Reverse Recovery Waveform and Definitions



### **ORDERING INFORMATION TABLE**

Device code



1 - Vishay Semiconductors product

Current rating (3 = 3 A)

3 - Circuit configuration:

E = single diode

4 - J = SlimSMA package

5 - Process type,

U = ultrafast recovery

• Voltage code (06 = 600 V)

7 - H = AEC-Q101 qualified

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

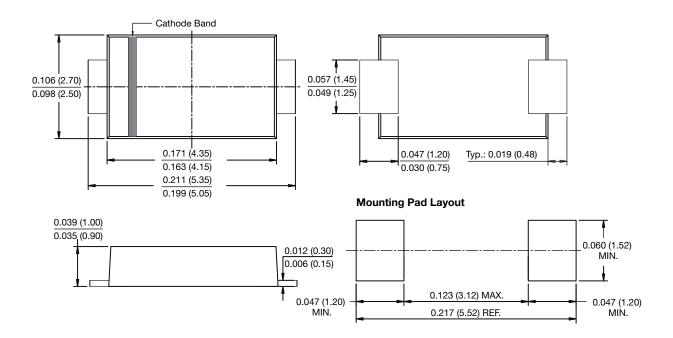
ORDERING INFORMATION (Example)				
PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION	
VS-3EJU06HM3/6A	3500	3500	7" diameter plastic tape and reel	
VS-3EJU06HM3/6B	14 000	14 000	13" diameter plastic tape and reel	

LINKS TO RELATED DOCUMENTS				
Dimensions <u>www.vishay.com/doc?95571</u>				
Part marking information	www.vishay.com/doc?95562			
Packaging information	www.vishay.com/doc?88869			
SPICE model	www.vishay.com/doc?96589			



# DO-221AC (SlimSMA)

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





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