AUTOMOTIVE

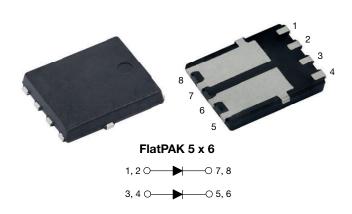
ROHS

HALOGEN FREE



### Vishay Semiconductors

# Hyperfast Rectifier, 2 x 3 A FRED Pt®



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



PRIMARY CHARACTERISTICS							
Package FlatPAK 5 x 6							
I <sub>F(AV)</sub>	2 x 3 A						
V <sub>R</sub>	200 V						
V <sub>F</sub> at I <sub>F</sub>	0.71 V						
t <sub>rr (typ.)</sub>	25 ns						
T <sub>J</sub> max.	175 °C						
Circuit configuration	Separated cathode						

#### **FEATURES**

- Hyperfast recovery time, reduced Q<sub>rr</sub>, and soft recovery
- 175 °C maximum operating junction temperature
- Specific for output and snubber operation
- Low forward voltage drop
- Low leakage current
- AEC-Q101 qualified
- Meets MSL level 1 per J-STD-020, LF maximum peak of 260 °C
- 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 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, 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: FlatPAK 5 x 6

Molding compound meets UL 94 V-0 flammability rating

Halogen-free, RoHS-compliant

Terminals: matte tin plated leads, solderable per

J-STD-002, meets JESD 201 class 2 whisker test

ABSOLUTE MAXIMUM RATINGS							
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS		
Peak repetitive reverse voltage		V <sub>RRM</sub>		200	V		
Average rectified forward current	per	I <sub>F(AV)</sub>	T <sub>Solderpad</sub> = 170 °C, DC	- 6			
	device		T <sub>Solderpad</sub> = 169 °C, D = 0.5				
Non-repetitive peak surge current	per device	I <sub>ESM</sub>	$T_J = 25$ °C, 10 ms sinusoidal pulse	173	А		
	per diode	. 5	,	87			
Operating junction and storage temperatures		T <sub>J</sub> , T <sub>Stg</sub>		-55 to +175	°C		



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<b>ELECTRICAL SPECIFICATIONS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)								
PARAMETER	TER SYMBOL TEST CONDITIONS MIN. TYP. MAX. UNI							
Breakdown voltage, blocking voltage	V <sub>BR</sub> , V <sub>R</sub>	I <sub>R</sub> = 100 μA	200	-	-	.,		
Forward voltage, per diode	V-	I <sub>F</sub> = 3 A	-	0.88	0.94	V		
	$V_{F}$	I <sub>F</sub> = 3 A, T <sub>J</sub> = 150 °C	-	0.71	0.74			
Reverse leakage current, per diode	I <sub>R</sub>	V <sub>R</sub> = V <sub>R</sub> rated	-	-	2			
		$T_J = 150  ^{\circ}\text{C},  V_R = V_R  \text{rated}$	-	2	40	μA		
Junction capacitance	C <sub>T</sub>	V <sub>R</sub> = 200 V	-	14	-	pF		

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)									
PARAMETER	SYMBOL	TEST CO	MIN.	TYP.	MAX.	UNITS			
Reverse recovery time		$I_F = 1.0 \text{ A, } dI_F/dt =$	= 50 A/ $\mu$ s, V <sub>R</sub> = 30 V	ı	20	-			
	+	$I_F = 0.5 \text{ A}, I_R = 1 \text{ A}, I_{rr} = 0.25 \text{ A}$		ı	-	25	no		
	t <sub>rr</sub>	T <sub>J</sub> = 25 °C		-	15	-	ns		
		T <sub>J</sub> = 125 °C		-	25	-			
Dook recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	$I_F = 3 A$	=	2	-	Α		
Peak recovery current		T <sub>J</sub> = 125 °C	dl <sub>F</sub> /dt = 200 A/μs V <sub>B</sub> = 160 V	-	3	-			
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	]	ı	12	-	nC		
		T <sub>J</sub> = 125 °C		-	40	-	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 ambient, per diode	R <sub>thJA</sub> (1)(2)		-	90	103	°C/W			
Thermal resistance, junction to mount, per diode	R <sub>thJM</sub> (3)		-	2.3	2.6	C/VV			

#### Notes

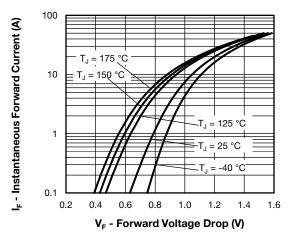
 $<sup>^{(1)}</sup>$  The heat generated must be less than the thermal conductivity from junction to ambient:  $dP_D/dT_J < 1/P_{thJA}$ 

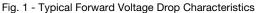
 $<sup>^{(2)}</sup>$  Free air, mounted or recommended copper pad area; thermal resistance  $R_{thJA}$  - junction to ambient

<sup>(3)</sup> Mounted on infinite heatsink



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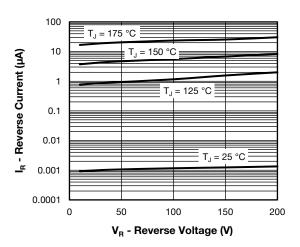


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

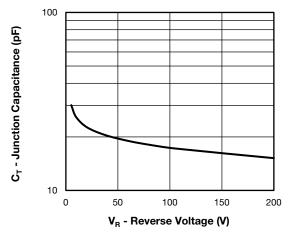


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

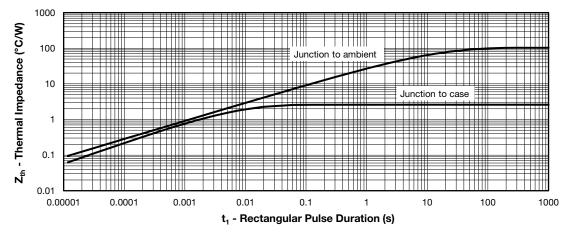


Fig. 4 - Maximum Thermal Impedance Z<sub>thJC</sub> Characteristics

Average Power Loss (W)

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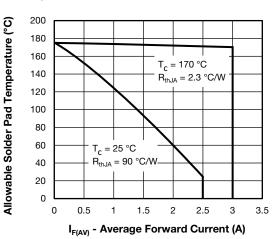
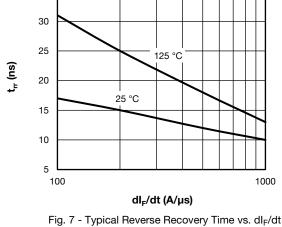


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current



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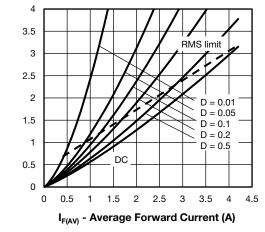


Fig. 6 - Forward Power Loss Characteristics

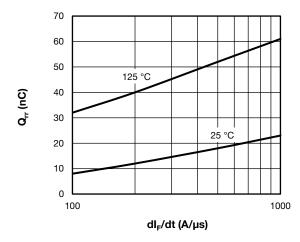
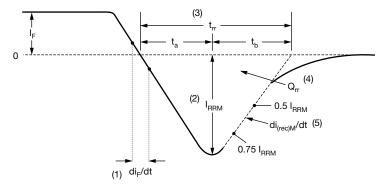


Fig. 8 - Typical Stored Charge vs. dl<sub>F</sub>/dt



- (1) di<sub>F</sub>/dt rate of change of current through zero crossing
- (2)  $I_{RRM}$  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  $I_{\text{RRM}}$  and 0.50  $I_{\text{RRM}}$ extrapolated to zero current.
- (4) Q<sub>rr</sub> area under curve defined by t<sub>rr</sub> and I<sub>RRM</sub>

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

(5)  $di_{(rec)M}/dt$  - peak rate of change of current during tb portion of tr

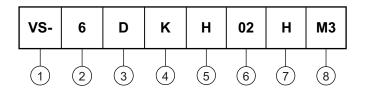
Fig. 9 - Reverse Recovery Waveform and Definitions



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### **ORDERING INFORMATION TABLE**

Device code



1 - Vishay Semiconductors product

2 - Current rating (6 = 6 A)

3 - Circuit configuration:

D = separated cathode

4 - K = FlatPAK package

**5** - Process type,

H = hyperfast recovery

6 - Voltage code (02 = 200 V)

7 - H = AEC-Q101 qualified

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

ORDERING INFORMATION (example)									
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE   BASE QUANTITY   PACKAGING DESCRIPTION							
VS-6DKH02HM3/H	0.10	Н	1500	7"diameter plastic tape and reel					

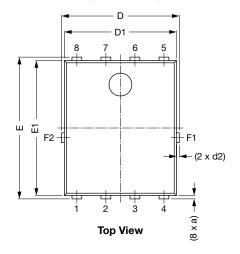
LINKS TO RELATED DOCUMENTS						
Dimensions	www.vishay.com/doc?96056					
Part marking information	www.vishay.com/doc?96059					
Packaging information	www.vishay.com/doc?88869					
SPICE model	www.vishay.com/doc?96882					

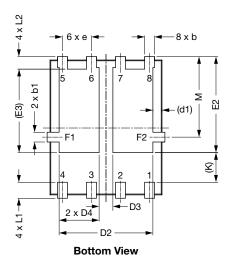


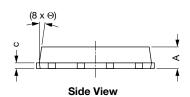
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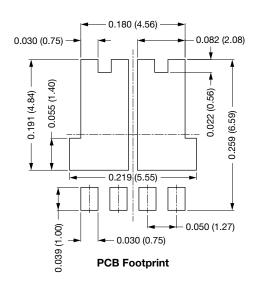
# FlatPAK 5 x 6 (Dual)

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









DIM		INCHES			MILLIMETERS	
DIM.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
Α	0.035	0.039	0.043	0.89	0.99	1.09
(a)	-	0.006	=	=	0.15	=
b	0.013	0.017	0.020	0.32	0.43	0.52
b1	0.013	0.017	0.020	0.32	0.43	0.52
С	0.008	-	0.014	0.20	=	0.35
D	0.197	0.203	0.209	5.00	5.15	5.30
D1	0.189	0.193	0.197	4.80	4.90	5.00
D2	0.154	0.161	0.169	3.90	4.10	4.30
D3	0.020	0.024	0.031	0.50	0.60	0.80
D4	0.063	0.069	0.075	1.60	1.75	1.90
(d1)	-	0.016	=	=	0.40	=
(d2)	-	0.005	-	=	0.125	-
E	0.238	0.244	0.250	6.05	6.20	6.35

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## **Outline Dimensions**

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DIM.		INCHES			MILLIMETERS			
DIM.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.		
E1	0.228	0.232	0.236	5.80	5.90	6.00		
E2	0.157	0.165	0.173	4.00	4.20	4.40		
(E3)	-	0.144	=	-	3.65	=		
е		0.050 BSC			1.27 BSC			
(K)	0.039	-	-	1.00	-	-		
L1	0.019	-	0.043	0.48	-	1.10		
L2	0.012	-	0.031	0.30	-	0.80		
M	0.128	0.138	0.148	3.25	3.50	3.75		
Θ	0°	-	10°	0°	-	10°		

#### Notes

- Dimensioning and tolerancing per ASME Y14.5-2009
- Dimensions D1 and E1 do not include mold flash or gate burrs
- Dimension (XX) means reference only



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