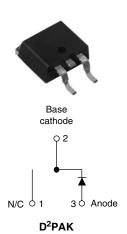


### Vishay High Power Products

# HEXFRED® Ultrafast Soft Recovery Diode, 15 A



PRODUCT SUMMARY					
V <sub>R</sub>	600 V				
V <sub>F</sub> at 15 A at 25 °C	1.7 V				
I <sub>F(AV)</sub>	15 A				
t <sub>rr</sub> (typical)	23 ns				
T <sub>J</sub> (maximum)	150 °C				
Q <sub>rr</sub>	84 nC				
dI <sub>(rec)M</sub> /dt	188 A/μs				

#### **FEATURES**

- Ultrafast recovery
- Ultrasoft recovery
- Very low I<sub>RRM</sub>
- Very low Q<sub>rr</sub>
- · Specified at operating conditions
- · Designed and qualified for industrial level

#### **BENEFITS**

- Reduced RFI and EMI
- · Reduced power loss in diode and switching transistor
- · Higher frequency operation
- Reduced snubbing
- · Reduced parts count

#### **DESCRIPTION**

HFA15TB60S is a state of the art ultrafast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600 V and 15 A continuous current, the HFA15TB60S is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultrafast recovery time, the HEXFRED® product line features extremely low values of peak recovery current (I<sub>RRM</sub>) and does not exhibit any tendency to "snap-off" during the tb portion of recovery. The HEXFRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These HEXFRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The HEXFRED HFA15TB60S is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Cathode to anode voltage	V <sub>R</sub>		600	V	
Maximum continuous forward current	I <sub>F</sub>	T <sub>C</sub> = 100 °C	15		
Single pulse forward current	I <sub>FSM</sub>		150	Α	
Maximum repetitive forward current	I <sub>FRM</sub>		60		
Maximum navier discinction	P <sub>D</sub>	T <sub>C</sub> = 25 °C	74	W	
Maximum power dissipation		T <sub>C</sub> = 100 °C	29	]	
Operating junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		- 55 to + 150	°C	

### HFA15TB60S

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<b>ELECTRICAL SPECIFICATIONS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V <sub>BR</sub>	Ι <sub>R</sub> = 100 μΑ		600	-	-	
		I <sub>F</sub> = 15 A		-	1.3	1.7	V
Maximum forward voltage V <sub>FM</sub>	$V_{FM}$	I <sub>F</sub> = 30 A	See fig. 1	-	1.5	2.0	
		I <sub>F</sub> = 15 A, T <sub>J</sub> = 125 °C		-	1.2	1.6	
Maximum reverse		V <sub>R</sub> = V <sub>R</sub> rated	See fig. 2	-	1.0	10	
leakage current	I <sub>RM</sub>	$T_J = 125  ^{\circ}\text{C},  V_R = 0.8  \text{x}  V_R  \text{rated}$	d See lig. 2	-	400	1000	μΑ
Junction capacitance	C <sub>T</sub>	V <sub>R</sub> = 200 V	See fig. 3	=	25	50	pF
Series inductance	L <sub>S</sub>	Measured lead to lead 5 mm from package body		-	8.0	-	nH

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
	t <sub>rr</sub>	$I_F = 1.0 \text{ A}, dI_F/dt = 200 \text{ A/}\mu\text{s}, V_R = 30 \text{ V}$		-	23	-	
Reverse recovery time See fig. 5	t <sub>rr1</sub>	T <sub>J</sub> = 25 °C		-	50	60	ns
occ fig. o	t <sub>rr2</sub> T <sub>J</sub> = 125 °C	-	105	120			
Peak recovery current See fig. 6	I <sub>RRM1</sub>	T <sub>J</sub> = 25 °C	$I_F = 15 \text{ A}$ $dI_F/dt = 200 \text{ A/}\mu\text{s}$ $V_R = 200 \text{ V}$	-	4.5	6.0	A nC
	I <sub>RRM2</sub>	T <sub>J</sub> = 125 °C		-	6.5	10	
Reverse recovery charge	Q <sub>rr1</sub>	T <sub>J</sub> = 25 °C		-	84	180	
See fig. 7	Q <sub>rr2</sub>	T <sub>J</sub> = 125 °C		-	241	600	
Peak rate of fall of recovery current during t <sub>b</sub>	of recovery	-	188	-	A/us		
See fig. 8		-	160	-	-7/μ3		

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Lead temperature	T <sub>lead</sub>	0.063" from case (1.6 mm) for 10 s	-	-	300	°C
Thermal resistance, junction to case	R <sub>thJC</sub>		-	-	1.7	K/W
Thermal resistance, junction to ambient	R <sub>thJA</sub>	Typical socket mount	-	-	80	N/VV
Weight			-	2.0	-	g
vveigni			-	0.07	-	oz.
Marking device		Case style D <sup>2</sup> PAK		HFA15	TB60S	

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## HEXFRED® Vishay High Power Products Ultrafast Soft Recovery Diode, 15 A

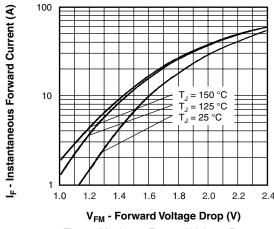


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

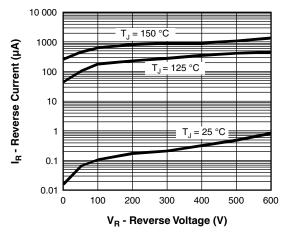


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

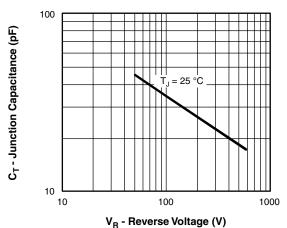


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

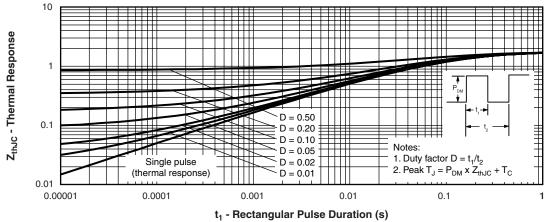


Fig. 4 - Maximum Thermal Impedance Z<sub>thJC</sub> Characteristics

## Vishay High Power Products

### HEXFRED® Ultrafast Soft Recovery Diode, 15 A



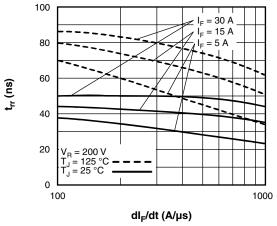


Fig. 5 - Typical Reverse Recovery Time vs. dI<sub>F</sub>/dt

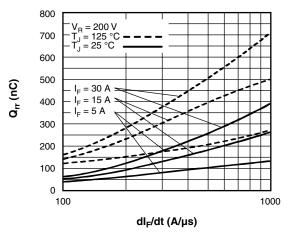


Fig. 7 - Typical Stored Charge vs. dI<sub>F</sub>/dt

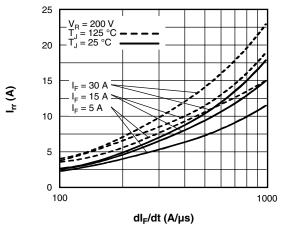


Fig. 6 - Typical Recovery Current vs. dI<sub>F</sub>/dt

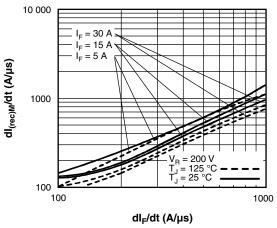


Fig. 8 - Typical  $dI_{(rec)M}/dt$  vs.  $dI_F/dt$ 



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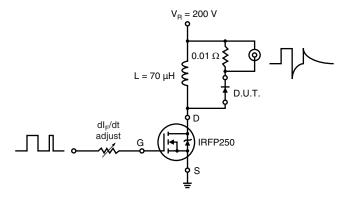
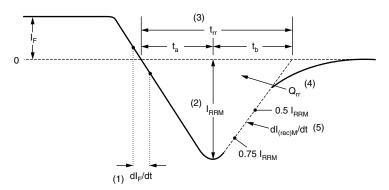


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

LINKS TO RELATED DOCUMENTS				
Dimensions http://www.vishay.com/doc?95046				
Part marking information	http://www.vishay.com/doc?95054			
Packaging information	http://www.vishay.com/doc?95032			
SPICE model	http://www.vishay.com/doc?95357			



Vishay

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