

## HEXFRED® Ultrafast Soft Recovery Diode, 60 A


**SOT-227**
**FEATURES**

- Fast recovery time characteristic
- Electrically isolated base plate
- Large creepage distance between terminal
- Simplified mechanical designs, rapid assembly
- UL approved file E78996
- Compliant to RoHS directive 2002/95/EC
- Designed for industrial level


**RoHS  
COMPLIANT**
**DESCRIPTION**

This SOT-227 modules with HEXFRED® rectifier are available in two basic configurations. They are the antiparallel and the parallel configurations. The antiparallel configuration (HFA120EA60) is used for simple series rectifier and high voltage application. The parallel configuration (HFA120FA60) is used for simple parallel rectifier and high current application. The semiconductor in the SOT-227 package is isolated from the copper base plate, allowing for common heatsinks and compact assemblies to be built. These modules are intended for general applications such as power supplies, battery chargers, electronic welders, motor control, DC chopper, and inverters.

**PRODUCT SUMMARY**

$V_R$	600 V
$V_F$ (typical) at 125 °C	1.4 V
$Q_{rr}$ (typical)	270 nC
$I_{RRM}$ (typical)	7.0 A
$t_{rr}$ (typical)	65 ns
$di_{(rec)M}/dt$ (typical) at 125 °C	270 A/ $\mu$ s
$I_{F(DC)}$ at $T_C$	40 A at 100 °C

**ABSOLUTE MAXIMUM RATINGS PER LEG**

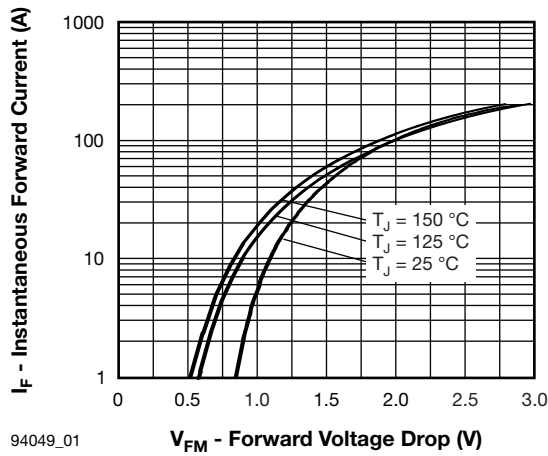
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		600	V
Continuous forward current	$I_F$	$T_C = 25\text{ °C}$	75	A
		$T_C = 100\text{ °C}$	40	
Single pulse forward current	$I_{FSM}$	$T_J = 25\text{ °C}$	800	
Maximum repetitive forward current	$I_{FRM}$	Rated $V_R$ , square wave, 20 kHz, $T_C = 60\text{ °C}$	180	
RMS isolation voltage, any terminal to case	$V_{ISOL}$	$t = 1$ minute	2500	V
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	180	W
		$T_C = 100\text{ °C}$	71	
Operating junction and storage temperature range	$T_J, T_{Stg}$		- 55 to 150	°C

**ELECTRICAL SPECIFICATIONS PER LEG ( $T_J = 25\text{ °C}$  unless otherwise specified)**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	$I_R = 100\text{ }\mu$ A	600	-	-	V
Maximum forward voltage	$V_{FM}$	$I_F = 60\text{ A}$	-	1.5	1.7	
		$I_F = 120\text{ A}$	-	1.9	2.1	
		$I_F = 60\text{ A}, T_J = 125\text{ °C}$	-	1.4	1.6	
Maximum reverse leakage current	$I_{RM}$	$V_R = V_R$ rated	-	2.5	20	$\mu$ A
		$T_J = 125\text{ °C}, V_R = 0.8 \times V_R$ rated	-	130	2000	
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	120	170	pF

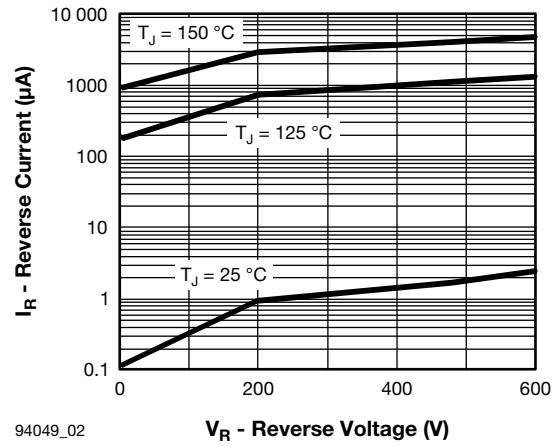
<b>DYNAMIC RECOVERY CHARACTERISTICS PER LEG</b> ( $T_J = 25\text{ °C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5, 6 and 16	$t_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$		-	34	-	ns
	$t_{rr1}$	$T_J = 25\text{ °C}$	$I_F = 60\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$	-	65	98	
	$t_{rr2}$	$T_J = 125\text{ °C}$		-	130	200	
Peak recovery current See fig. 7 and 8	$I_{RRM1}$	$T_J = 25\text{ °C}$		-	7.0	13	A
	$I_{RRM2}$	$T_J = 125\text{ °C}$		-	13	23	
Reverse recovery charge See fig. 9 and 10	$Q_{rr1}$	$T_J = 25\text{ °C}$		-	270	410	nC
	$Q_{rr2}$	$T_J = 125\text{ °C}$		-	490	740	
Peak rate of recovery current during $t_b$ See fig. 11 and 12	$di_{(rec)M}/dt1$	$T_J = 25\text{ °C}$		-	350	-	A/ $\mu\text{s}$
	$di_{(rec)M}/dt2$	$T_J = 125\text{ °C}$		-	270	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	$R_{thJC}$	-	-	0.70	°C/W K/W
Junction to case, both legs conducting		-	-	0.35	
Case to sink, flat, greased surface	$R_{thCS}$	-	0.05	-	
Weight		-	30	-	g
Mounting torque		-	1.3	-	Nm



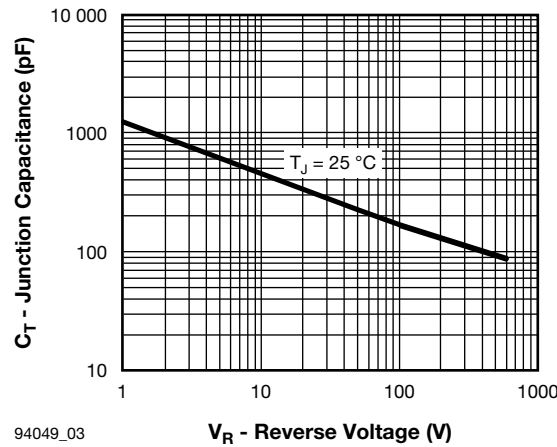
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**V<sub>FM</sub> - Forward Voltage Drop (V)**  
Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)



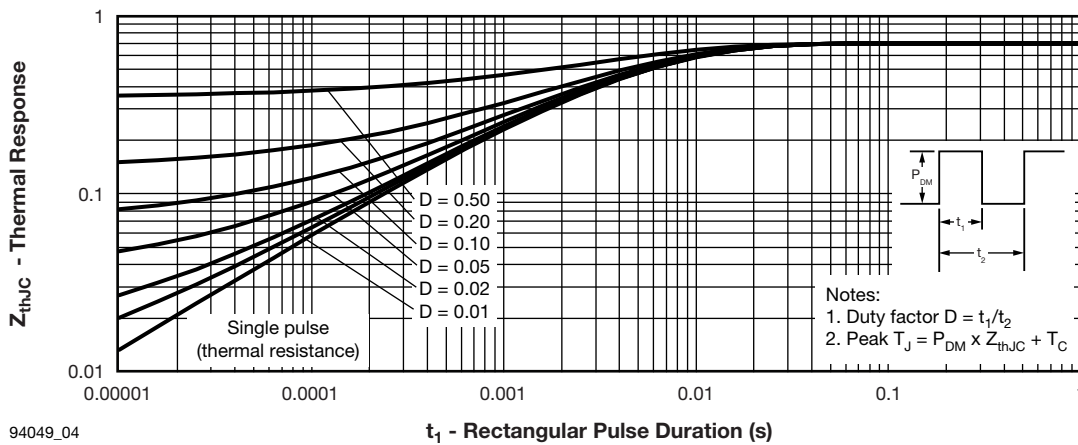
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**V<sub>R</sub> - Reverse Voltage (V)**  
Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)



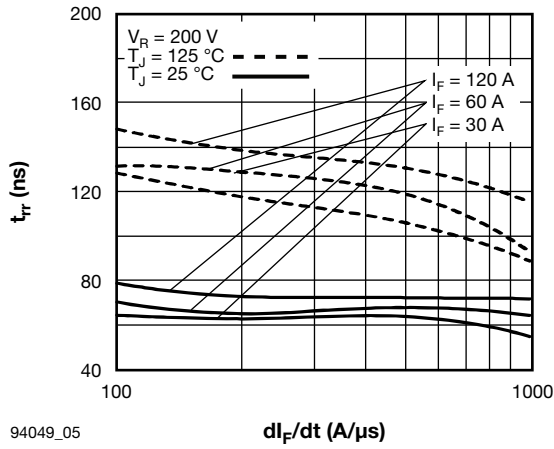
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**V<sub>R</sub> - Reverse Voltage (V)**  
Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)



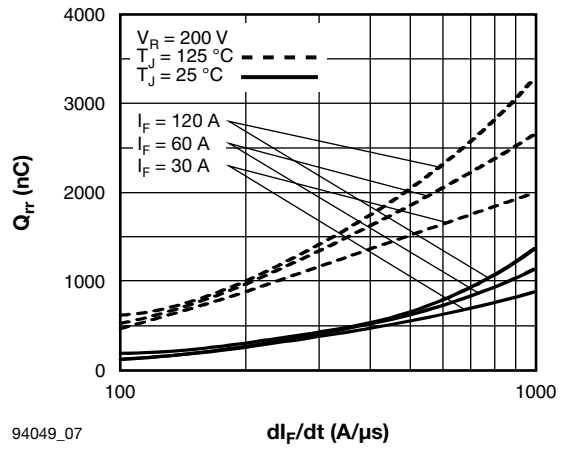
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**t<sub>1</sub> - Rectangular Pulse Duration (s)**  
Fig. 4 - Maximum Thermal Impedance Z<sub>thJC</sub> Characteristics (Per Leg)



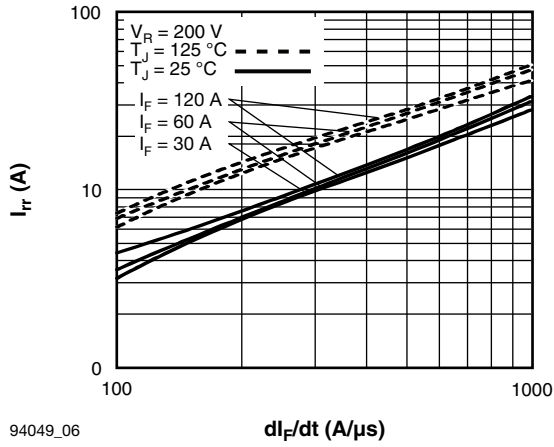
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Fig. 5 - Typical Reverse Recovery Time vs.  $di_F/dt$  (Per Leg)



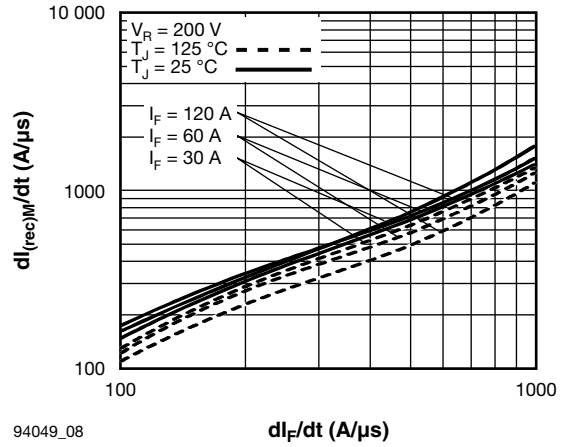
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Fig. 7 - Typical Stored Charge vs.  $di_F/dt$  (Per Leg)



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Fig. 6 - Typical Recovery Current vs.  $di_F/dt$  (Per Leg)



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Fig. 8 - Typical  $di_{(rec)M}/dt$  vs.  $di_F/dt$  (Per Leg)

**HEXFRED®**  
 Ultrafast Soft Recovery Diode, 60 A

Vishay Semiconductors

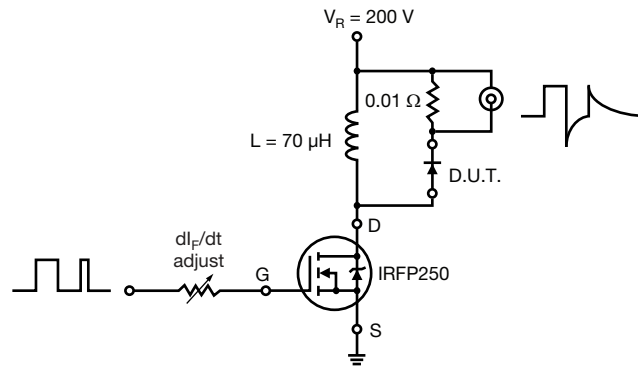
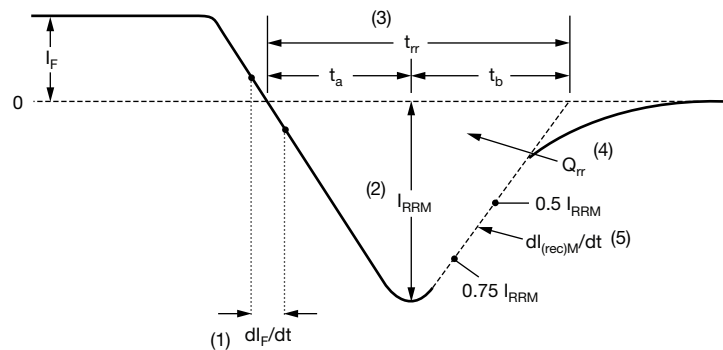


Fig. 9 - Reverse Recovery Parameter Test Circuit


 (1)  $dl_F/dt$  - rate of change of current through zero crossing

 (2)  $I_{RRM}$  - peak reverse recovery current

 (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.

 (4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$ 

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

 (5)  $dl_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$ 

Fig. 10 - Reverse Recovery Waveform and Definitions

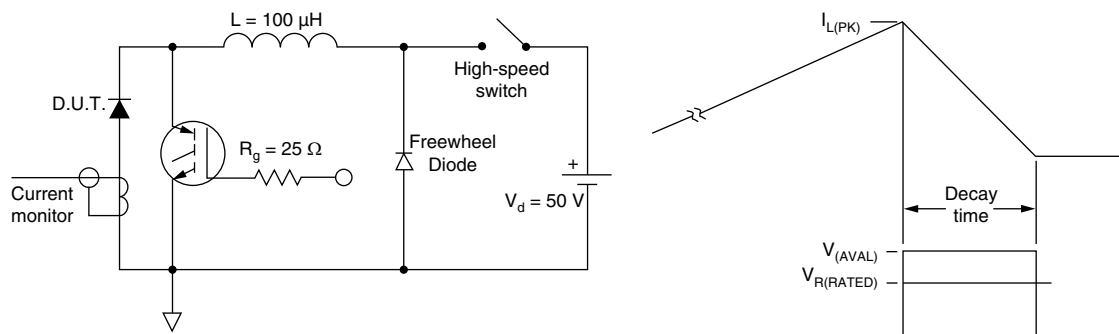
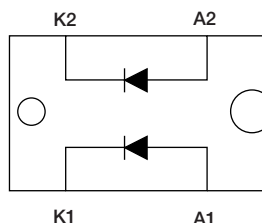


Fig. 11 - Avalanche Test Circuit and Waveforms

## CIRCUIT CONFIGURATION



## ORDERING INFORMATION TABLE

Device code	<b>HF</b>	<b>A</b>	<b>120</b>	<b>FA</b>	<b>60</b>	<b>P</b>
	①	②	③	④	⑤	⑥

- 1** - HEXFRED® family
- 2** - Process: A electron irradiated
- 3** - Current rating (120 = 120 A)
- 4** - Package indicator (SOT-227)
- 5** - Voltage rating (60 = 600 V)
- 6** - P = Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95036">www.vishay.com/doc?95036</a>
Packaging information	<a href="http://www.vishay.com/doc?95037">www.vishay.com/doc?95037</a>





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