

## HEXFRED®

### Ultrafast Soft Recovery Diode, 140 A



SOT-227

**FEATURES**

- Fast recovery time characteristic
- Electrically isolated base plate
- Large creepage distance between terminal
- Simplified mechanical designs, rapid assembly
- Designed and qualified for industrial level
- UL approved file E78996
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

PRODUCT SUMMARY	
$V_R$	1200 V
$V_F$ (typical)	2.8 V
$t_{rr}$ (typical)	48 ns
$I_{F(DC)}$ at $T_C$ , per module	140 A at 74 °C
$I_{F(AV)}$ at $T_C$ , per module	140 A at 46 °C

**DESCRIPTION/APPLICATIONS**

The dual diode series configuration VS-HFA140FA120 is used for output rectification or freewheeling/clamping operation and high voltage 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 HV power supplies, electronic welders, motor control and inverters.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		1200	V
Continuous forward current	$I_F$	$T_C = 74\text{ °C}$	70	A
			140	
Single pulse forward current	$I_{FSM}$	$T_J = 25\text{ °C}$	350	
Maximum power dissipation, per leg	$P_D$	$T_C = 25\text{ °C}$	357	W
		$T_C = 100\text{ °C}$	143	
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1$ minute	2500	V
Operating junction and storage temperature range	$T_J, T_{Stg}$		- 55 to + 150	°C

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	$I_R = 100\text{ }\mu\text{A}$	1200	-	-	V
Forward voltage, per leg	$V_{FM}$	$I_F = 60\text{ A}$	-	2.8	4.0	
		$I_F = 120\text{ A}$	-	3.6	5.3	
		$I_F = 60\text{ A}, T_J = 125\text{ °C}$	-	2.7	-	
		$I_F = 60\text{ A}, T_J = 150\text{ °C}$	-	2.65	-	
Reverse leakage current, per leg	$I_{RM}$	$V_R = V_R$ rated	-	2.0	75	$\mu\text{A}$
		$T_J = 125\text{ °C}, V_R = V_R$ rated	-	1.6	5	mA
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	5	10	



<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time, per leg	$t_{rr}$	$I_F = 1\text{ A}$ ; $di_F/dt = 200\text{ A}/\mu\text{s}$ ; $V_R = 30\text{ V}$	-	48	-	ns
		$T_J = 25\text{ }^\circ\text{C}$	-	145	-	
		$T_J = 125\text{ }^\circ\text{C}$	-	218	-	
Peak recovery current, per leg	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	-	13	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	18	-	
Reverse recovery charge, per leg	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	-	910	-	nC
		$T_J = 125\text{ }^\circ\text{C}$	-	1920	-	
Junction capacitance, per leg	$C_T$	$V_R = 1200\text{ V}$	-	27	-	pF

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	$R_{thJC}$		-	-	0.35	$^\circ\text{C}/\text{W}$
Junction to case, both legs conducting			-	-	0.175	
Case to heatsink, per leg	$R_{thCS}$	Flat, greased and surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque, on terminals and heatsink	T		-	-	1.3	Nm

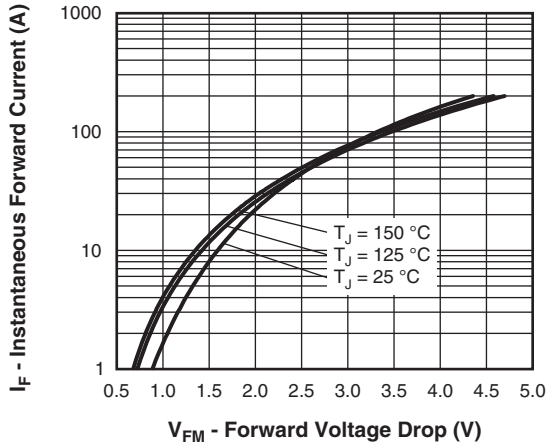


Fig. 1 - Typical Forward Voltage Drop Characteristics

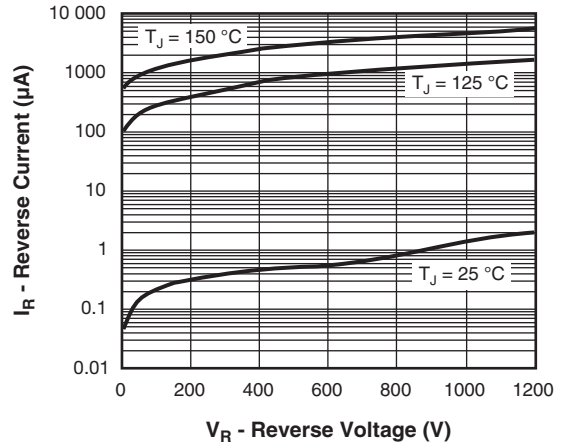


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

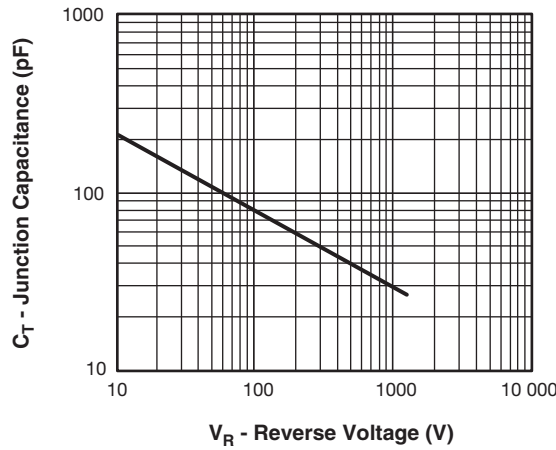


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

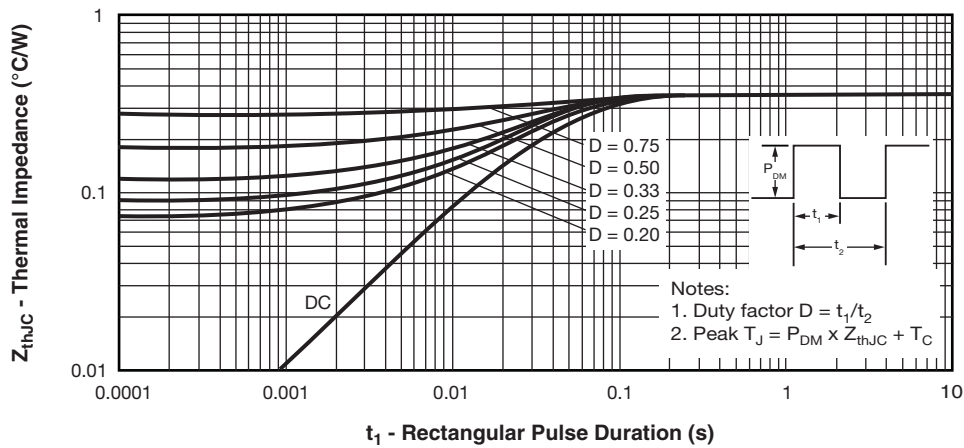


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

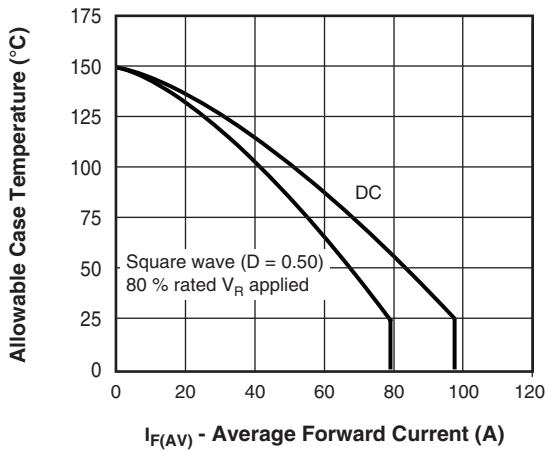


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

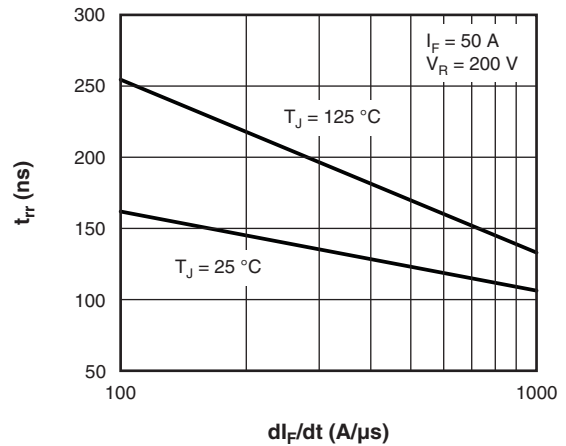


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

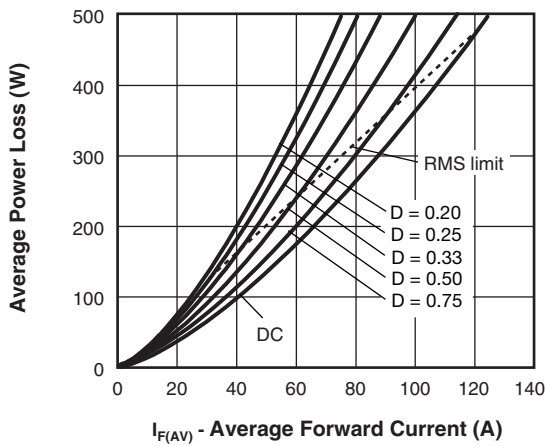


Fig. 6 - Forward Power Loss Characteristics

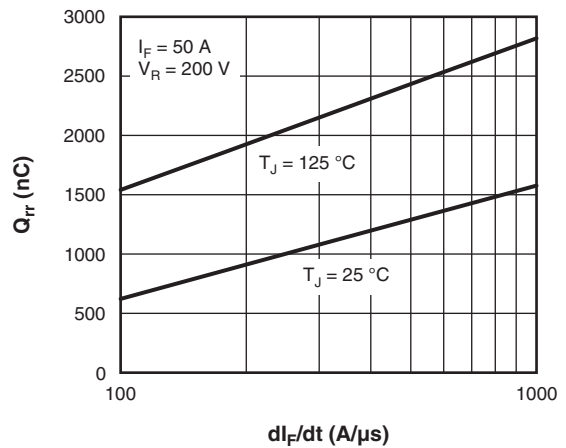


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

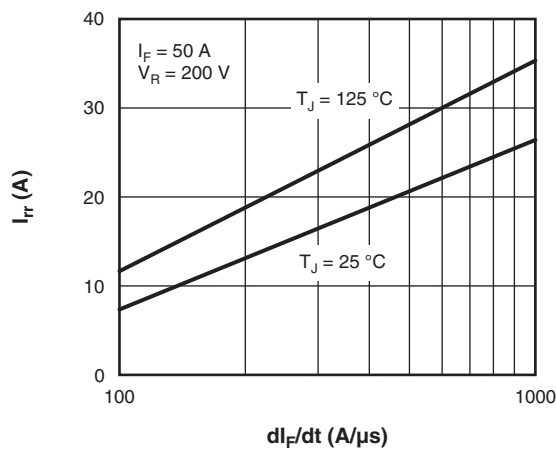


Fig. 9 - Typical Peak Recovery Current vs.  $dI_F/dt$

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;
- $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 5);
- $P_{d_{REV}}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$

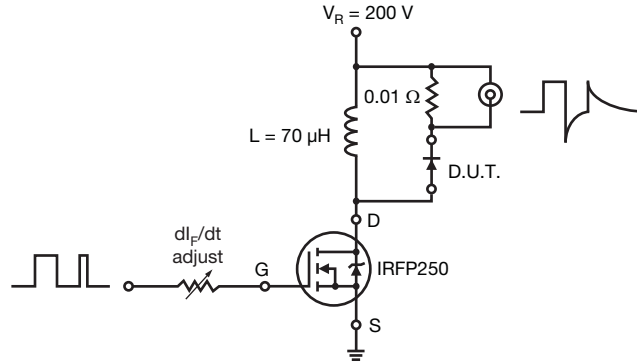
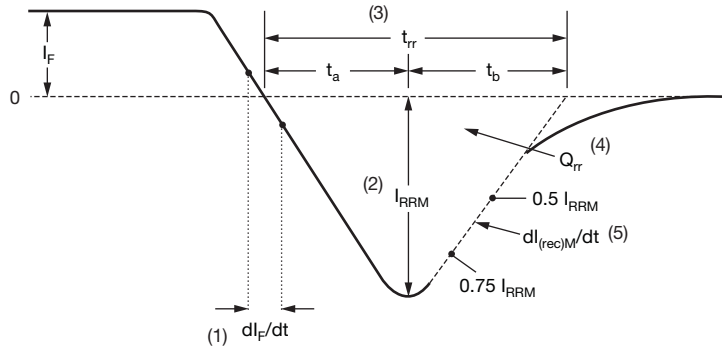


Fig. 10 - Reverse Recovery Parameter Test Circuit



- (1)  $di_F/dt$  - 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  $I_{RRM}$
- (5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

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

Fig. 11 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>HF</b>	<b>A</b>	<b>140</b>	<b>F</b>	<b>A</b>	<b>120</b>
	①	②	③	④	⑤	⑥	⑦

- 1** - Vishay Semiconductors product
- 2** - HEXFRED® family
- 3** - Process designator (A = Electron irradiated)
- 4** - Average current (140 = 140 A)
- 5** - Circuit configuration (2 separate diodes, parallel pin-out)
- 6** - Package indicator (SOT-227 standard isolated base)
- 7** - Voltage rating (120 = 1200 V)

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
2 separate diodes, parallel pin-out	F	<p>Lead Assignment</p>

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95423">www.vishay.com/doc?95423</a>
Part marking information	<a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a>



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