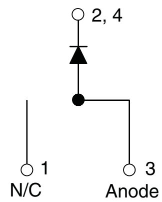
HEXFRED®, Ultrafast Soft Recovery Diode, 4 A

D-PAK (TO-252AA)



FEATURES

- Ultrafast recovery time
- Ultrasoft recovery
- Very low I_{RRM}
- Very low Q_{rr}
- Guaranteed avalanche
- Specified at operating temperature
- AEC-Q101 qualified
- Meets JESD 201 class 2 whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

PRODUCT SUMMARY	
Package	TO-252AA (D-PAK)
$I_{F(AV)}$	4 A
V_R	600 V
V_F at I_F	1.8 V
t_{rr} typ.	17 ns
T_J max.	150 °C
Diode variation	Single die

BENEFITS

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

DESCRIPTION/APPLICATIONS

These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for freewheeling, flyback, power converters, motor drives, and other applications where high speed and reduced switching losses are design requirements.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_{RRM}		600	V
Maximum continuous forward current	$I_{F(AV)}$	T_C = 100 °C	4	A
Single pulse forward current	I_{FSM}		25	
Repetitive peak forward current	I_{FRM}	T_C = 116 °C	16	
Maximum power dissipation	P_D	T_C = 100 °C	10	W
Operating junction and storage temperatures	T_J, T_{Stg}		- 55 to 150	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 μA	600	-	-	V
Forward voltage See fig. 1	V_F	I_F = 4 A	-	1.5	1.8	
		I_F = 8 A	-	1.8	2.2	
		I_F = 4 A, T_J = 125 °C	-	1.4	1.7	
Maximum reverse leakage current	I_R	V_R = V_R rated	-	0.17	3.0	μA
		T_J = 125 °C, V_R = 0.8 x V_R rated	-	44	300	
Junction capacitance	C_T	V_R = 200 V	-	4	8	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_C = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 200 A/μA, V_R = 30 V		-	17	-	ns
		T_J = 25 °C	I_F = 4 A dI_F/dt = 200 A/μs V_R = 200 V	-	28	42	
		T_J = 125 °C		-	38	57	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	2.9	5.2	A
		T_J = 125 °C		-	3.7	6.7	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	40	60	nC
		T_J = 125 °C		-	70	105	
Rate of fall of recovery current	$dI_{(rec)M}/dt$	T_J = 25 °C		-	280	-	A/μs
		T_J = 125 °C		-	235	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		- 55	-	150	°C
Thermal resistance, junction to case	R_{thJC}		-	-	5.0	°C/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	80	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D-PAK	HFA04SD60SH			

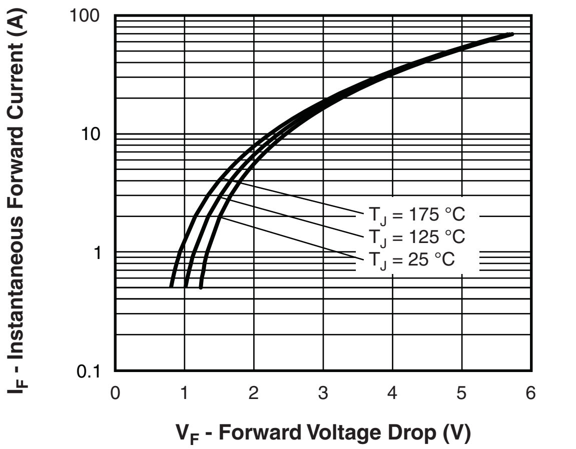


Fig. 1 - Typical Forward Voltage Drop Characteristics

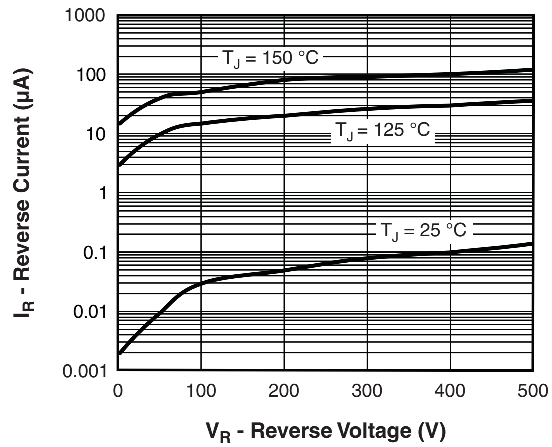


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

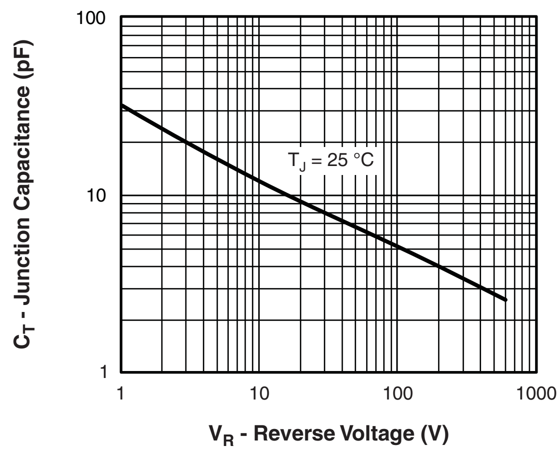


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

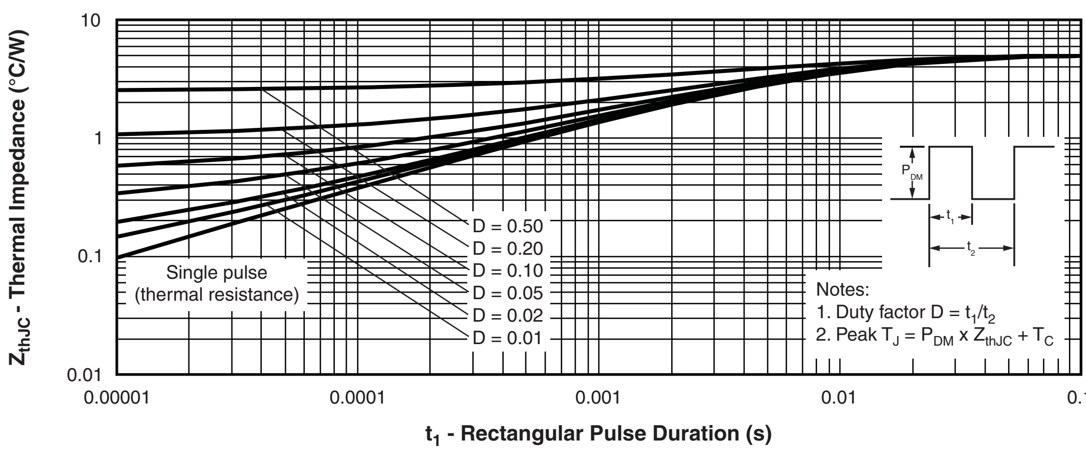


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

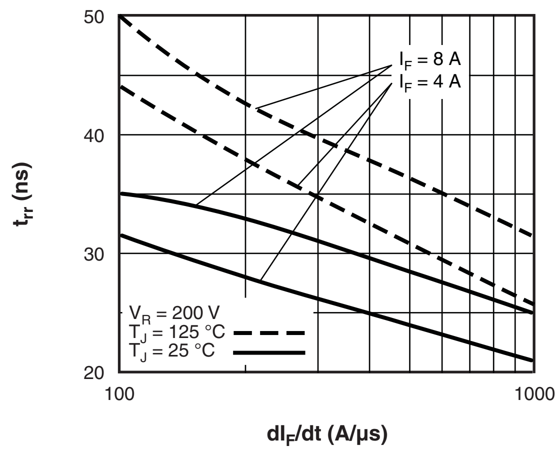


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt

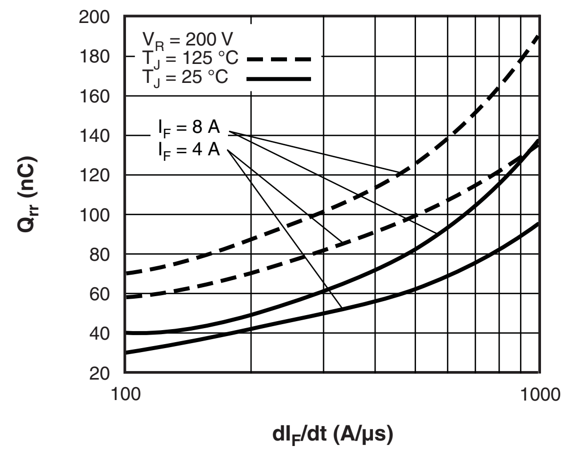


Fig. 7 - Typical Stored Charge vs. dI_F/dt

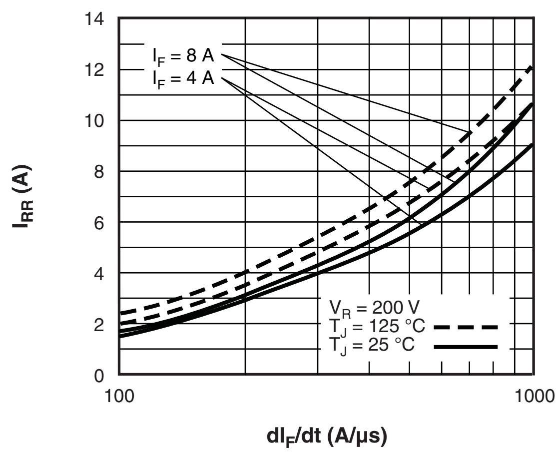


Fig. 6 - Typical Recovery Current vs. dI_F/dt

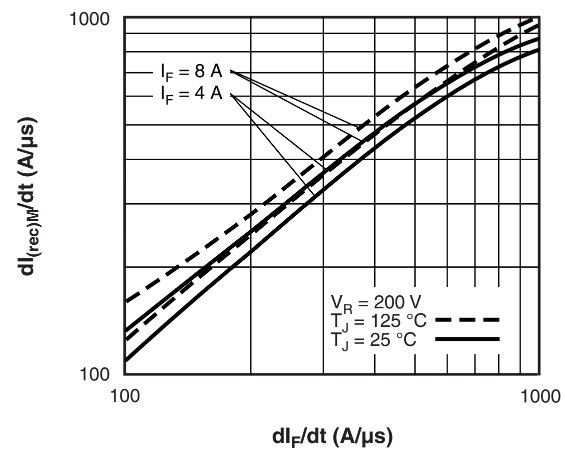


Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

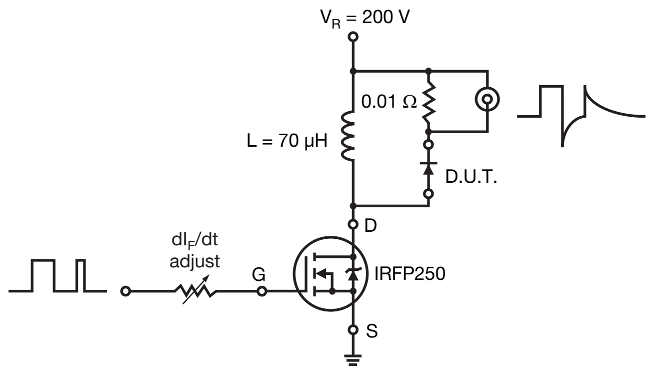
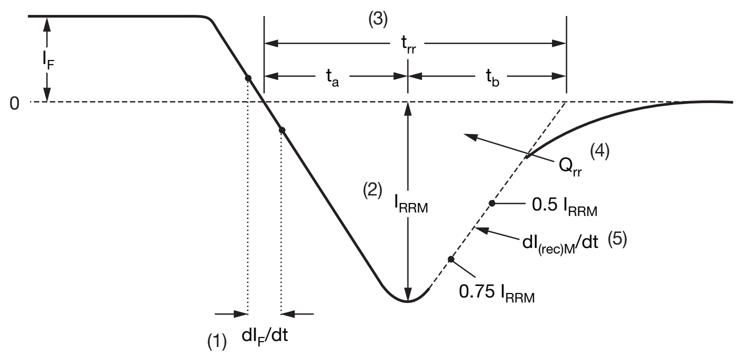


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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}

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

(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

ORDERING INFORMATION TABLE

Device code	VS-	HF	A	04	SD	60	S	TR	H	M3
	1	2	3	4	5	6	7	8	9	10

1 - Vishay Semiconductors product
2 - HEXFRED® family
3 - Electron irradiated
4 - Current rating (04 = 4 A)
5 - D-PAK
6 - Voltage rating (60 = 600 V)
7 - S = D-PAK
8 -
- TR = Tape and reel
- R = Tape and reel (right oriented)
- L = Tape and reel (left oriented)

9 - H = AEC-Q101 qualified
10 - Environmental digit:
M3 = Halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER T/R**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-HFA04SD60SHM3	75	3000	Antistatic plastic tube
VS-HFA04SD60STRHM3	2000	2000	13" diameter reel
VS-HFA04SD60STRRHM3	3000	3000	13" diameter reel
VS-HFA04SD60STRLHM3	3000	3000	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95519
Part marking information	www.vishay.com/doc?95518
Packaging information	www.vishay.com/doc?95033

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