FRED
Ultrafast Soft Recovery Diode, 16 A

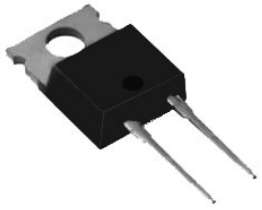
Pb Available RoHS* COMPLIANT

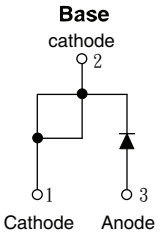
FEATURES

- Ultrafast recovery
- Ultrasoft recovery
- Very low I_{RRM}
- Very low Q_{rr}
- Specified at operating conditions
- Lead (Pb)-free
- 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





TO-220AC

DESCRIPTION

HFA16TB120 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 1200V and 16 A continuous current, the HFA16TB120 is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultrafast recovery time, the FRED product line features extremely low values of peak recovery current (I_{RRM}) and does not exhibit any tendency to "snap-off" during the t_b portion of recovery. The FRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These FRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The FRED HFA16TB120 is ideally suited for applications in power supplies and conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

PRODUCT SUMMARY	
V_R	1200 V
V_F at 16A at 25 ºC	3.0 V
$I_{F(AV)}$	16 A
t_{rr} (typical)	30 ns
T_J (maximum)	150 ºC
Q_{rr} (typical)	260 nC
$dI_{(rec)M}/dt$ (typical) at 125 ºC	76 A/µS
I_{RRM} (typical)	5.8 A

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_R		1200	V
Maximum continuous forward current	I_F	Tc = 100 ºC	16	A
Single pulse forward current	I_{FSM}		190	
Maximum repetitive forward current	I_{FRM}		64	
Maximum power dissipation	P_D	Tc = 25 ºC	151	W
		Tc = 100 ºC	60	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 ºC unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Cathode to anode breakdown voltage	V_{BR}	I_R = 100 µA	1200	-	-	V
Maximum forward voltage	V_{FM}	I_F = 16 A	-	2.5	3.0	
		I_F = 32 A	-	3.0	3.5	
		I_F = 16 A, T_J = 125 ºC	-	2.3	2.8	
Maximum reverse leakage current	I_{RM}	V_R = V_R rated	-	0.75	20	µA
		T_J = 125°C, V_R = V_R rated	-	375	2000	
Junction capacitance	C_T	V_R = 200V	-	27	40	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS PERLEG (T_J = 25 ºC unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 0.5A, I_R = 1.0A, I_{RR} = 250mA (RG#1 CKT)		-	28	35	ns
		I_F = 1.0 A, dI_F/dt = -200 A/µs, V_R =30 V, T_J = 25°C		-	30	-	
	t_{rr1}	T_J = 25 ºC	I_F= 16A dI_F/dt = -200 A/µs V_R = 200 V	-	90	135	
	t_{rr2}	T_J = 125 ºC		-	164	245	
Peak recovery current	I_{RRM1}	T_J = 25 ºC		-	5.8	10	A
	I_{RRM2}	T_J = 125 ºC		-	8.3	15	
Reverse recovery charge	Q_{rr1}	T_J = 25 ºC		-	260	675	nC
	Q_{rr2}	T_J = 125 ºC		-	680	1838	
Peak rate of fall of recovery current during t_b	$dI_{(rec)M}/dt1$	T_J = 25 ºC		-	120	-	A/µs
	$dI_{(rec)M}/dt2$	T_J = 125 ºC		-	76	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Lead temperature	T_{lead}	0.063" from case (1.6 mm) for 10 s	-	-	300	ºC
Thermal resistance, junction to case	R_{thJC}		-	-	0.83	K/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	80	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.50	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220AC	HFA16TB120			

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

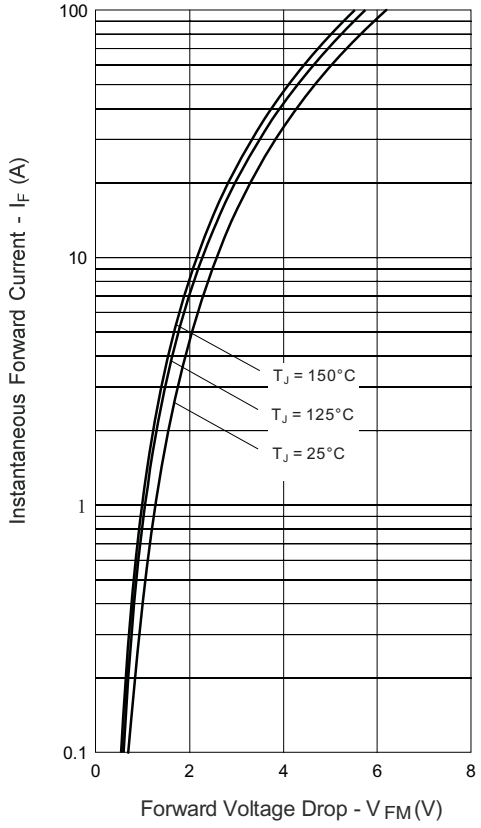


Fig.2 Typical Reverse Current vs. Reverse Voltage

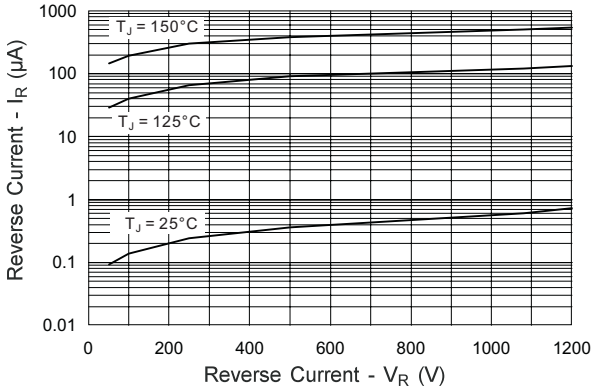


Fig.3 Typical Junction C apacitance vs. Reverse Voltage

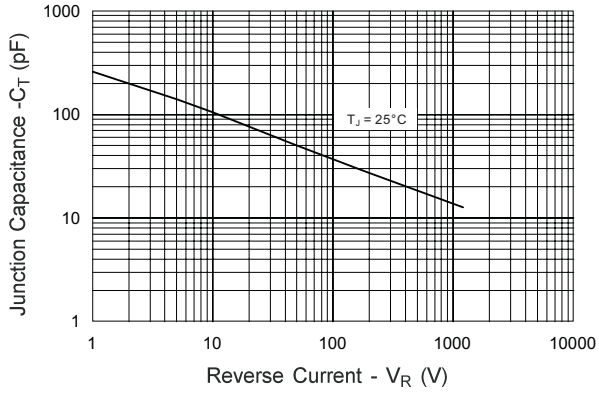


Fig.4 Maximum Thermal Impedance Z_{thJC} Characteristics

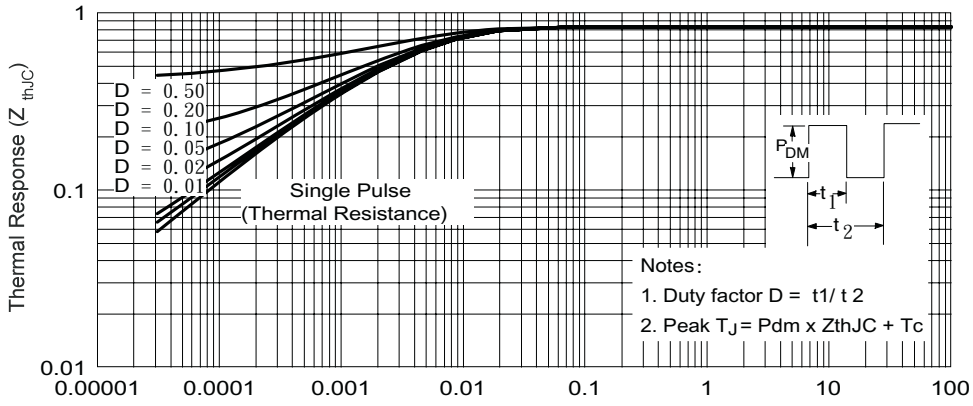


Fig.5 Typical Reverse Recovery Time vs. dI_F/dt (Per Leg)

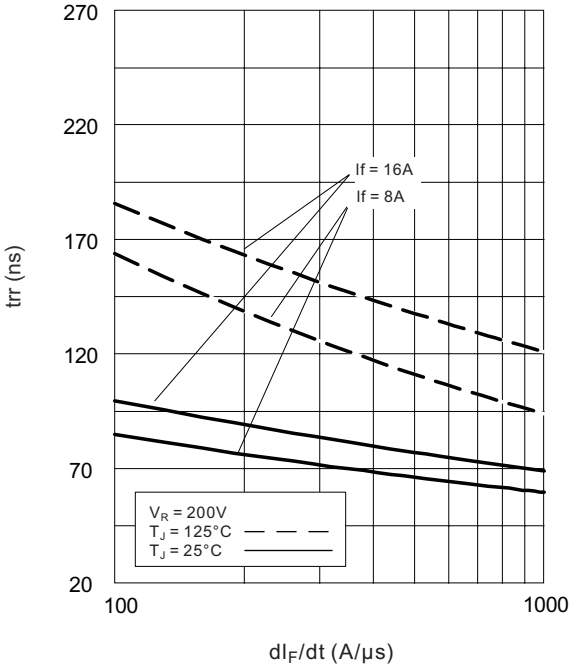


Fig.6 Typical Recovery Current vs. dI_F/dt (Per Leg)

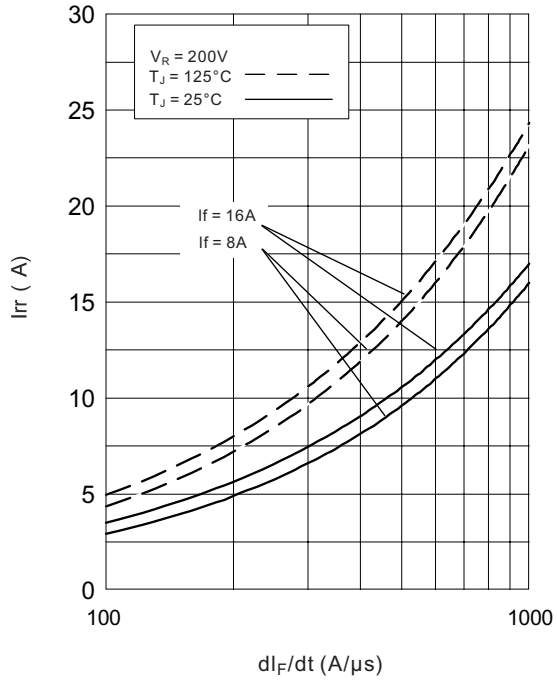


Fig.7 Typical Stored Charge vs. dI_F/dt (Per Leg)

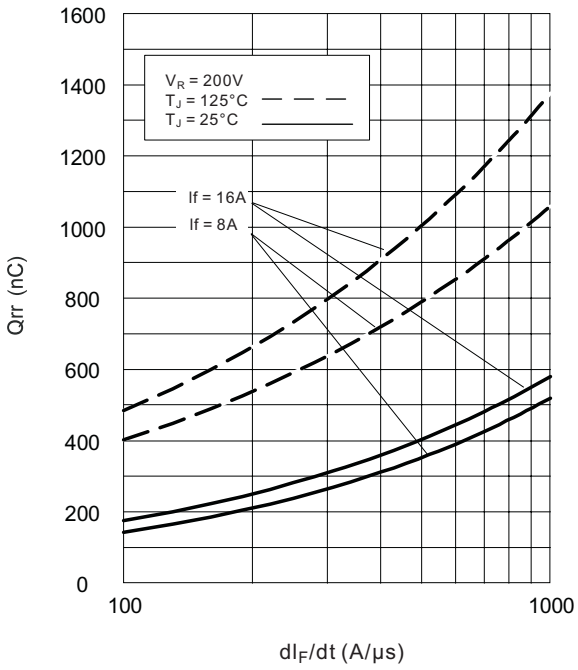


Fig.8 Typical $dI_{(rec)M}/dt$ vs. dI_F/dt (Per Leg)

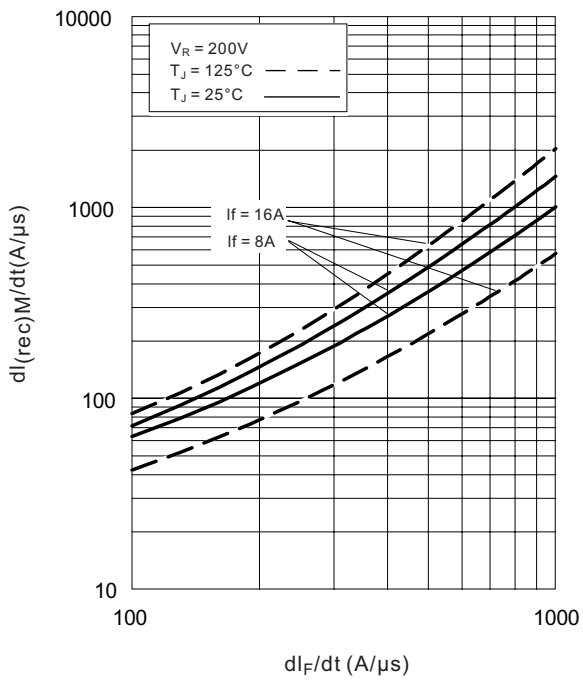


Fig.9 Reverse Recovery Parameter Test Circuit

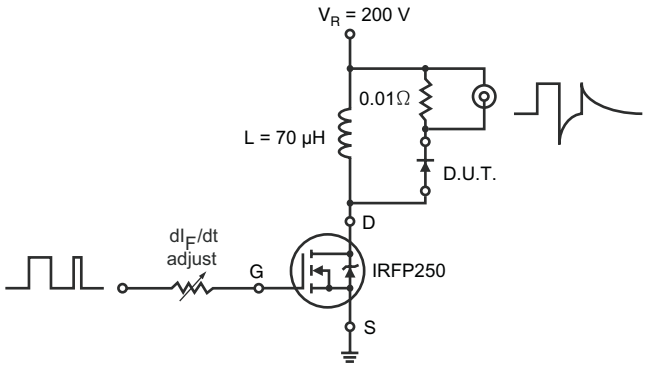
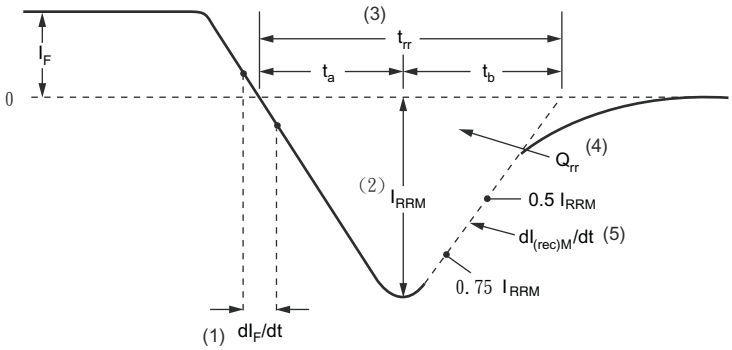


Fig.10 Reverse Recovery Waveform and Definitions



(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}

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

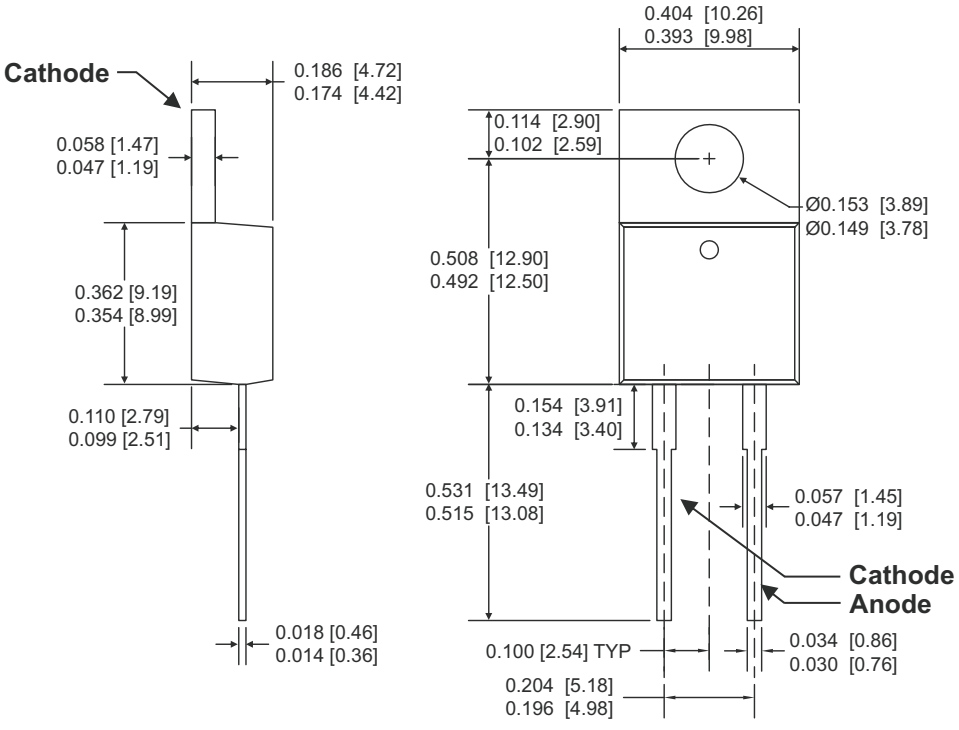
(5) $dI_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

ORDERING INFORMATION TABLE

Device code	N	–	HFA	16	TB	120
	①		②	③	④	⑤

1 - Nell Semiconductors product
2 - FRED family
3 - Current rating (16 = 16 A)
4 - Package : TB = TO-220AC
5 - Voltage rating (120 = 1200 V)

TO-220AC **Package Outline**



Dimensions in Millimeters and (Inches)