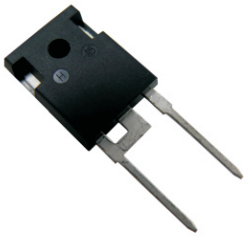
FRED
Ultrafast Soft Recovery Diode
15A / 1200V

FEATURES

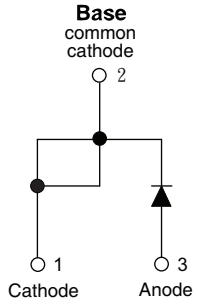
- Ultrafast and ultrasoft recovery
- Very low I_{RRM} and Q_{rr}
- Compliant to RoHS
- Designed and qualified for industrial level
- Planar FRED Chip



TO-247 AC modified

BENEFITS

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



DESCRIPTION

HFA15PB120 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 15A continuous current,the HFA15PB120 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 tb 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 HFA15PB120 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.

PRODUCT SUMMARY	
Package	TO-247AC modified (2 pins)
$I_{F(AV)}$	15A
V_R	1200 V
V_F at I_F, at 25°C	2.3 V
t_{rr} (typ.)	33 ns
T_J max.	150°C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
Cathode to anode voltage	V_R		600	V
Maximum continuous forward current	I_F	T_C = 100 ºC	15	A
Single pulse forward current	I_{FSM}		180	
Maximum repetitive forward current	I_{FRM}		60	
Maximum power dissipation	P_D	T_C = 25 ºC	151	W
		T_C = 100 ºC	60	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	ºC

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 = 15 A	-	1.8	2.3	V
		I_F = 30 A	-	2.7	3.2	
		I_F = 15 A, T_J = 125 ºC	-	1.8	2.3	
Maximum reverse leakage current	I_{RM}	V_R = V_R rated	-	1.00	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	-	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} = 0.25A (RG#1 CKT)	-	38	45	ns
		I_F = 1.0 A, dI_F/dt = 200 A/µs, V_R =30 V, T_J = 25°C	-	33	-	
	t_{rr1}	T_J = 25 ºC	-	240	60	
	t_{rr2}	T_J = 125 ºC	-	290	120	
Peak recovery current	I_{RRM1}	T_J = 25 ºC	-	3	6.0	A
	I_{RRM2}	T_J = 125 ºC	-	6	10	
Reverse recovery charge	Q_{rr1}	T_J = 25 ºC	-	260	180	nC
	Q_{rr2}	T_J = 125 ºC	-	960	600	
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	-	

I_F= 15A
dI_F/dt = 200 A/µs
V_R = 800 V

THERMAL - MECHANICAL SPECIFICATIONS PER LEG						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Lead temperature	T_{lead}	0.063" from case (1.6 mm) for 10 s	-	-	300	°C
Junction to case, single leg conduction	R_{thJC}		-	-	1.18	K/W
Junction to case, both legs conducting			-	-	41	
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	41	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.25	-	
Weight			-	6.0	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf . cm (lbf . in)
Marking device		Case style TO-247AC Modified	HFA15PB120			

Fig.1 Maximum effective transient thermal impedance, junction-to-case vs. pulse duration

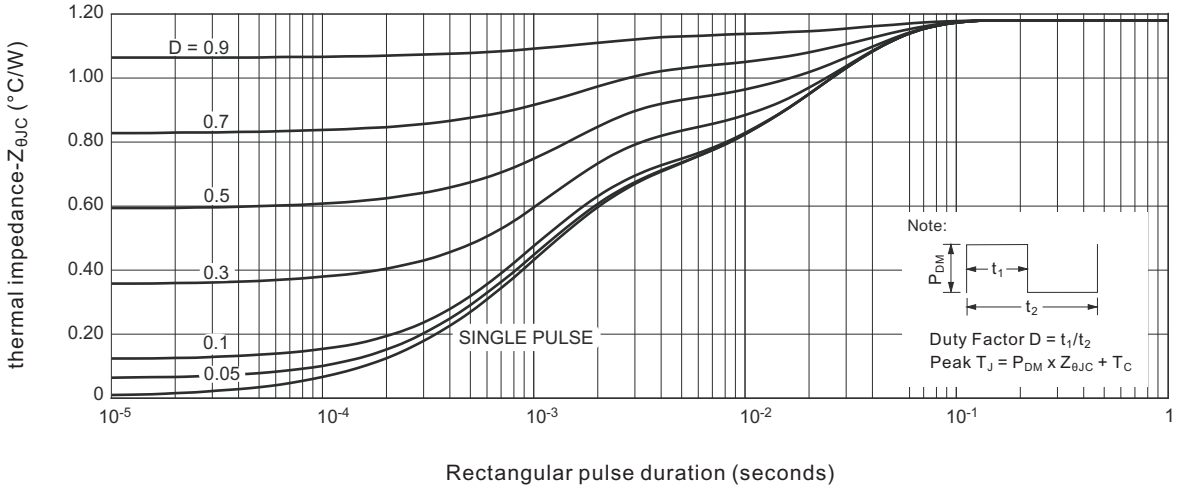


Fig.2 Forward current vs. forward voltage

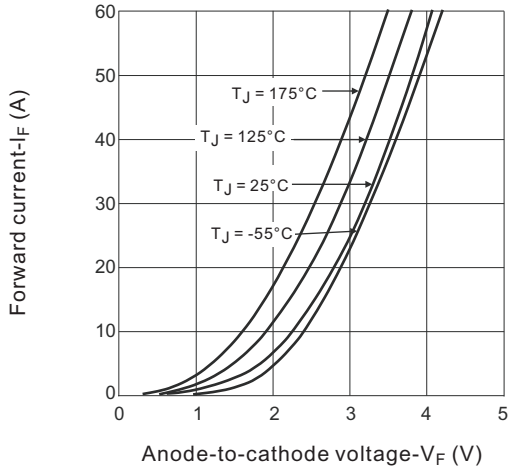


Fig3. Reverse recovery time vs. current rate of change

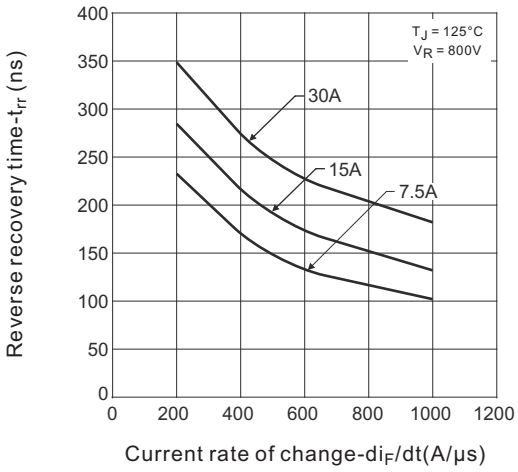


Fig.4 Reverse recovery charge vs. current rate of change

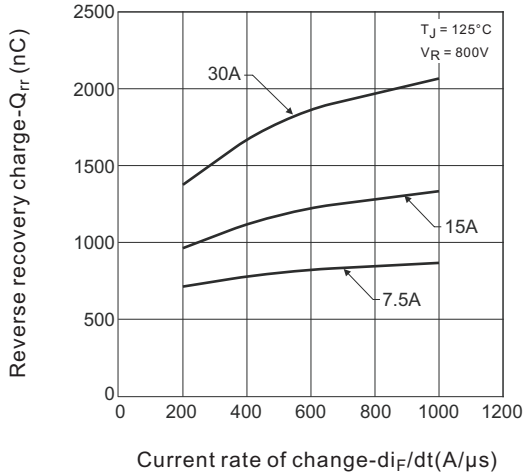


Fig.5 Reverse recovery current vs. current rate of change

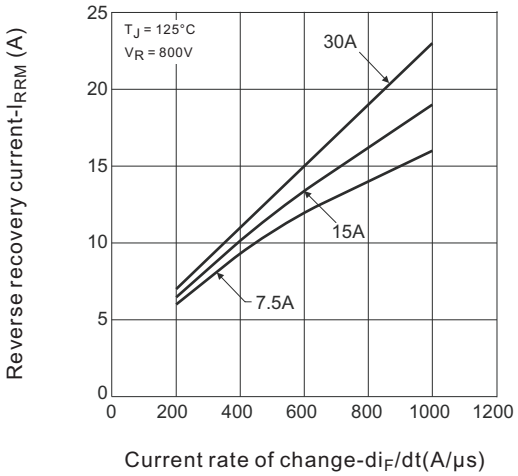


Fig6. Dynamic parameters vs. junction temperature

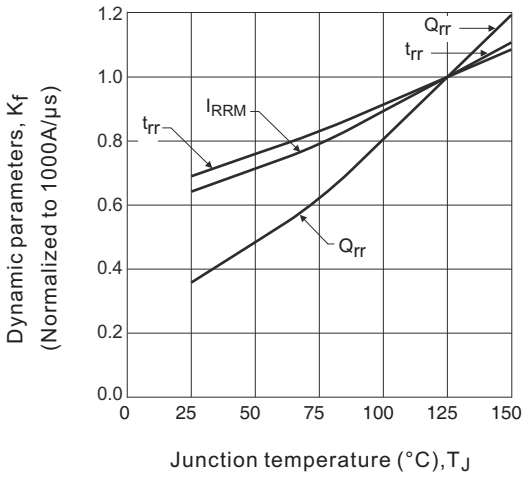


Fig.7 Maximum average forward current vs. case temperature

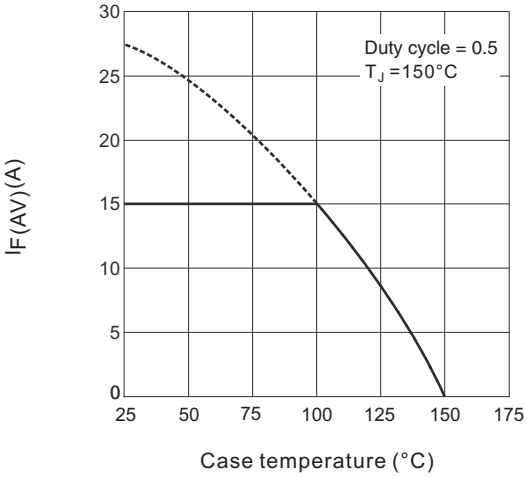


Fig.8 Junction capacitance vs. reverse voltage

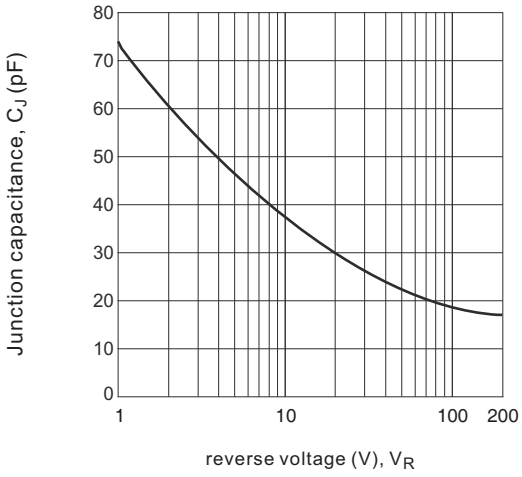


Fig.9 Reverse recovery parameter test circuit

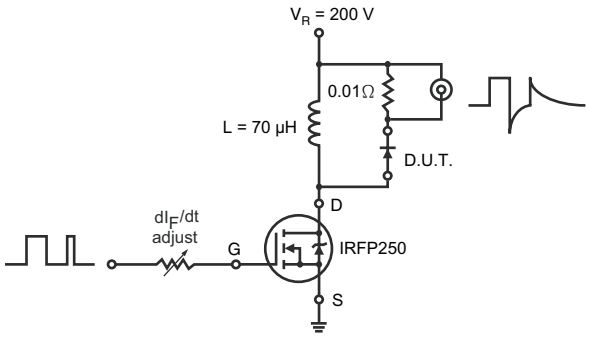
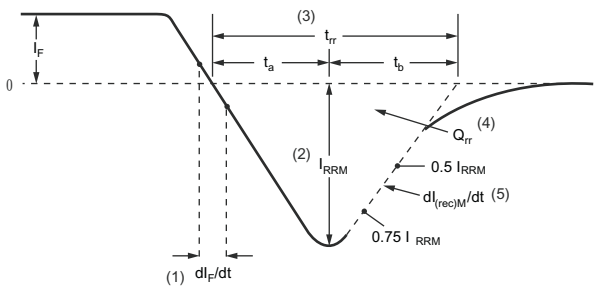


Fig.10 Reverse recovery waveform and definitions



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

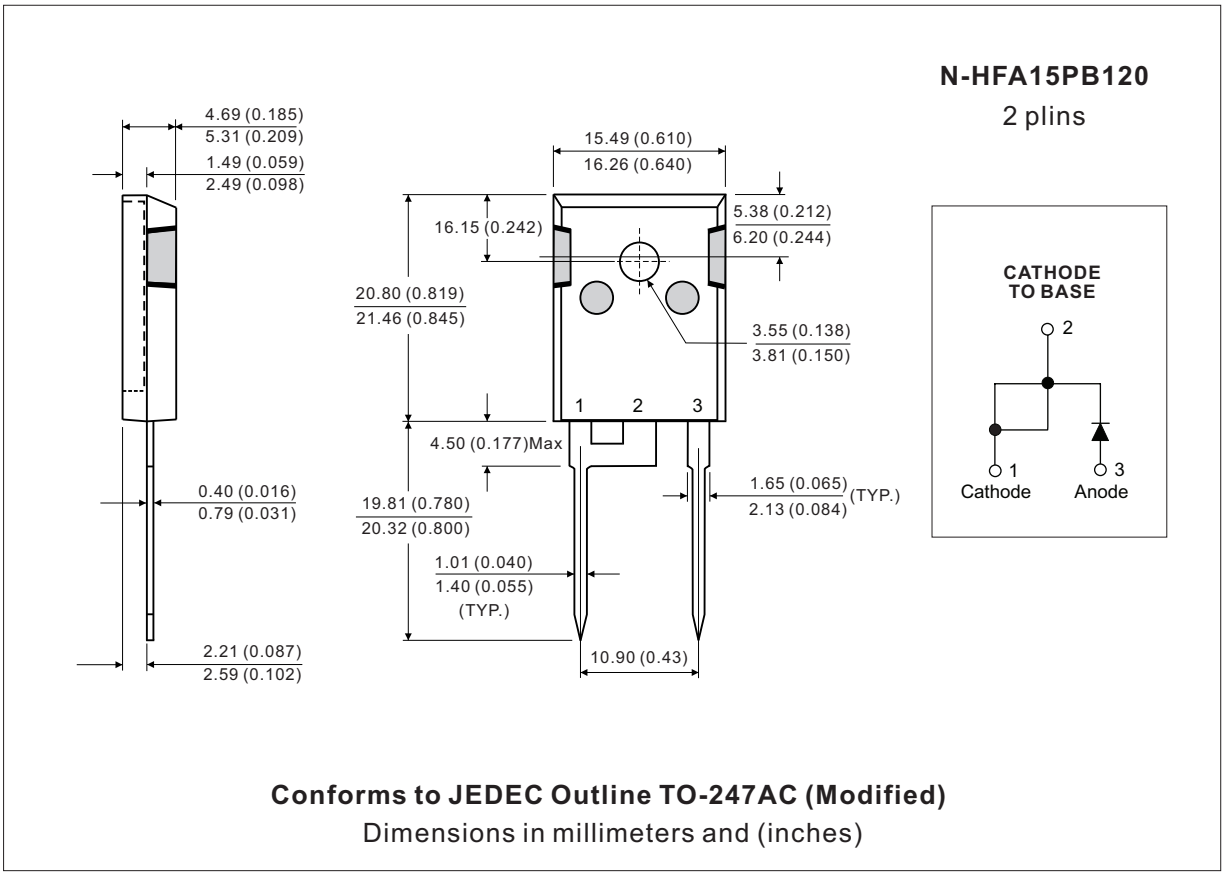
(2) I_{RRM} - peak reverse recovery current

(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}



Conforms to JEDEC Outline TO-247AC (Modified)

Dimensions in millimeters and (inches)

ORDERING INFORMATION TABLE

Device code

HFA	15	PB	120
①	②	③	④

1 - FRED family

2 - Current rating (15 =15A)

3 - PB = TO-247AC modified

4 - Voltage rating: (120 = 1200 V)