

FRED Ultrafast Soft Recovery Diode, 15 A

FEATURES

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

BENEFITS

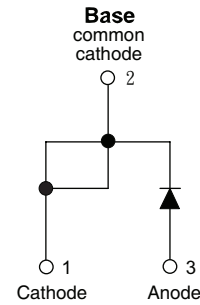
- Reduced RFI and EMI
- Reduced power loss in diode and switching transistor
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

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 15 A 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 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 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.



TO-247 AC modified



PRODUCT SUMMARY	
Package	TO-247AC modified (2 pins)
$I_{F(AV)}$	15A
V_R	1200 V
V_F at I_F , at 25°C	3.0 V
t_{rr} (typ.)	30 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	$T_C = 120\text{ °C}$	15	A
Single pulse forward current	I_{FSM}		140	
Maximum repetitive forward current	I_{FRM}		60	
Maximum power dissipation	P_D	$T_C = 25\text{ °C}$	75	W
		$T_C = 100\text{ °C}$	30	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°C

Nell High Power Products

ELECTRICAL SPECIFICATIONS (T _J = 25 °C 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	-	2.5	3.0	
		I _F = 30 A	-	3.0	-	
		I _F = 15 A, T _J = 125 °C	-	2.3	-	
Maximum reverse leakage current	I _{RM}	V _R = V _R rated	-	1	20	μA
		T _J = 125 °C, V _R = V _R rated	-	-	500	
Junction capacitance	C _T	V _R = 200V	-	17	-	pF
Series inductance	L _S	Measured lead to lead 5 mm from package body	-	12	-	nH

DYNAMIC RECOVERY CHARACTERISTICS PERLEG (T _J = 25 °C 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	33	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 °C	-	240	60	
	t _{rr2}	T _J = 125 °C	-	290	120	
Peak recovery current	I _{RRM1}	T _J = 25 °C	-	3	6.0	A
	I _{RRM2}	T _J = 125 °C	-	6	10	
Reverse recovery charge	Q _{rr1}	T _J = 25 °C	-	260	180	nC
	Q _{rr2}	T _J = 125 °C	-	960	600	
Peak rate of fall of recovery current during t _b	di _(rec) /dt1	T _J = 25 °C	-	120	-	A/μs
	di _(rec) /dt2	T _J = 125 °C	-	76	-	

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}		-	-	1.20	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	-	0.26	-	
Weight			-	6.0	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf . cm (lb . in)
Marking device		Case style TO-247AC (JEDEC)	HFA15PA120			

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

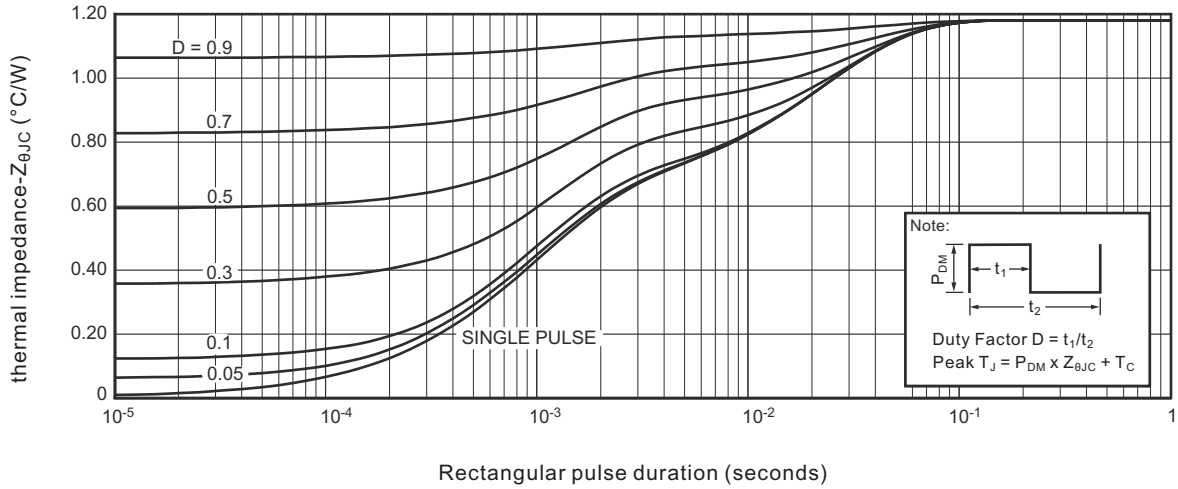


Fig.2 Forward current vs. forward voltage

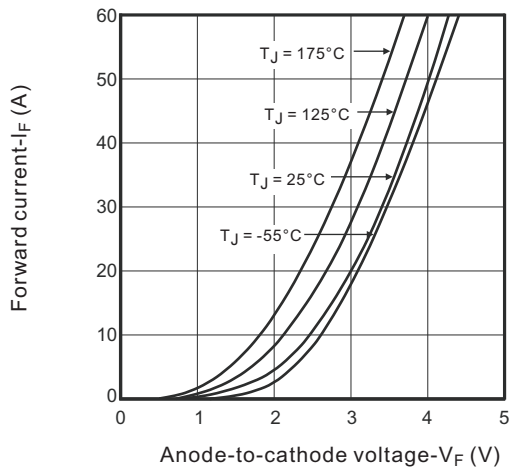


Fig.3 Reverse recovery time vs. current rate of change

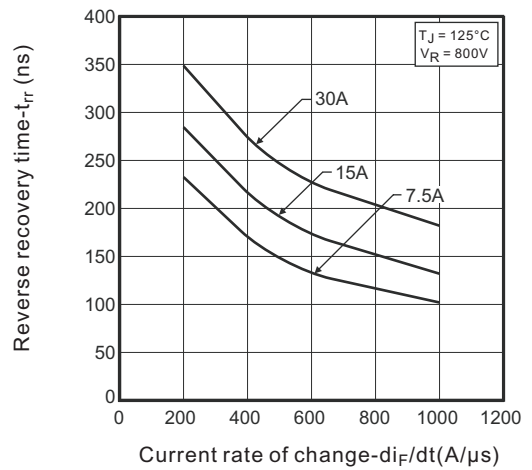


Fig.4 Reverse recovery charge vs. current rate of change

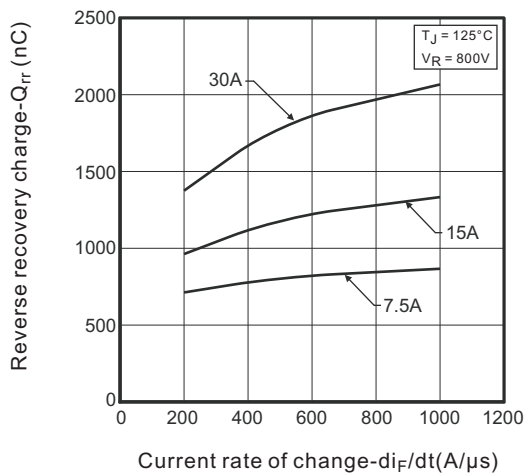


Fig.5 Reverse recovery current vs. current rate of change

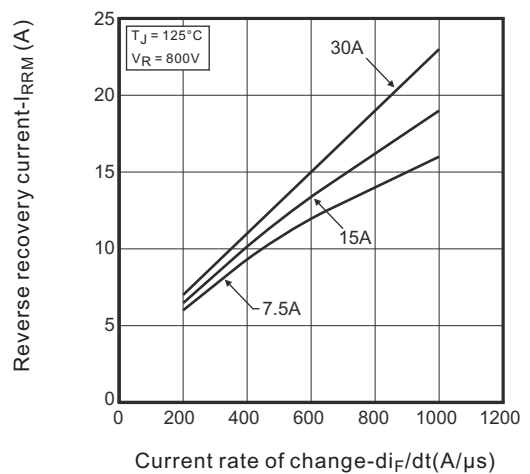


Fig.6. Dynamic parameters vs. junction temperature

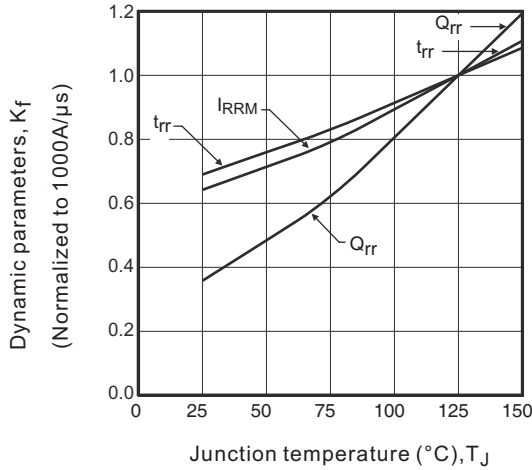


Fig.7 Maximum average forward current vs. case temperature

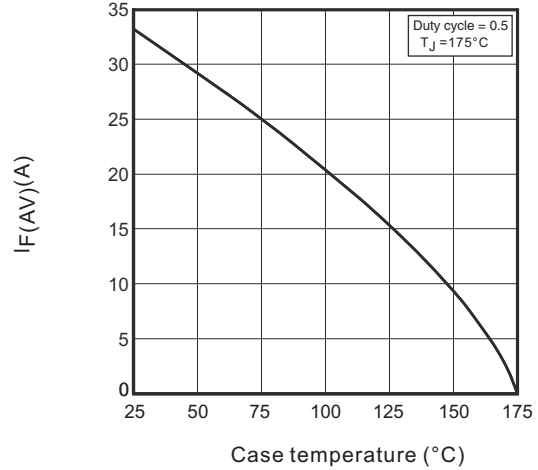


Fig.8 Junction capacitance vs. reverse voltage

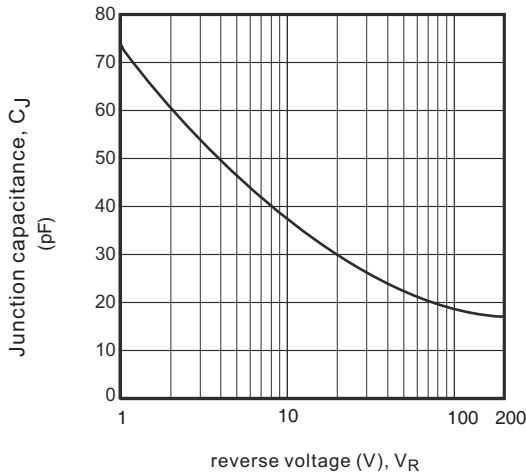


Fig.9 Reverse recovery parameter test circuit

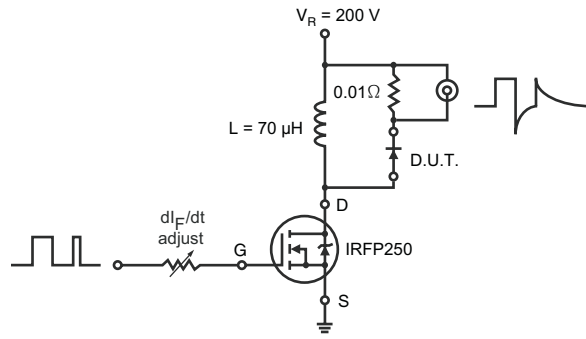
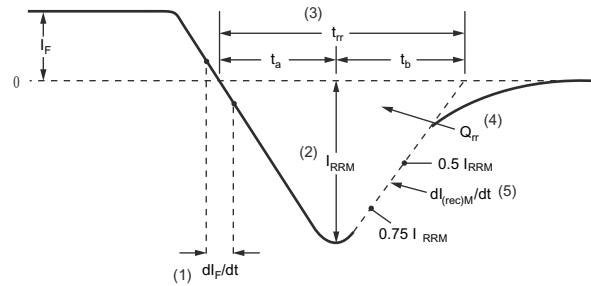
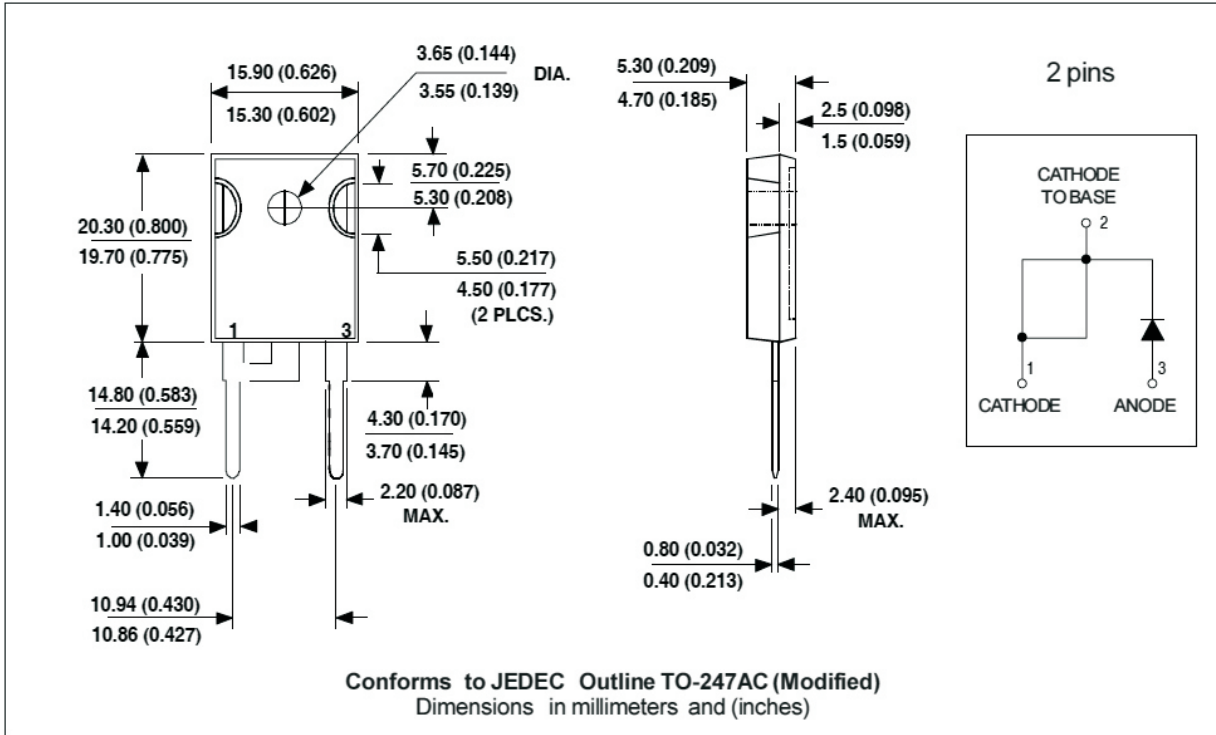


Fig.10 Reverse recovery waveform and definitions



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

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



ORDERING INFORMATION TABLE

Device code	N	-	HFA	15	PB	120
	①		②	③	④	⑤

- ① - Nell Semiconductors product
- ② - FRED family
- ③ - Current rating (15 = 15A)
- ④ - PB = TO-247AC modified
- ⑤ - Voltage rating: (120 = 1200 V)