Nell High Power Products

FRED
Ultrafast Soft Recovery Diode
60A / 1200V

FEATURES

- Ultrafast recovery
- 150 °C operating junction temperature
- Designed and qualified for industrial level
- Planar FRED Chip

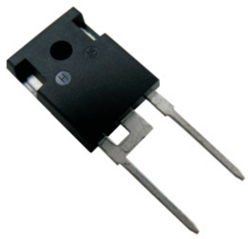
BENEFITS

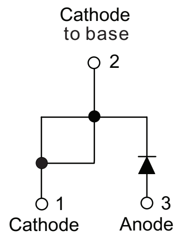
- Reduced RFI and EMI
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

DESCRIPTION/APPLICATIONS

- Anti-parallel diode for switching mode power supply and inverters.
- Free wheeling diode for motor controllers and inverters.
- Snubber diode
- Uninterruptible power supply (UPS)
- HF welder
- Induction heating
- High speed rectifiers

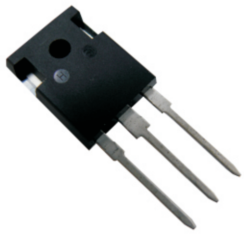
60EPU12

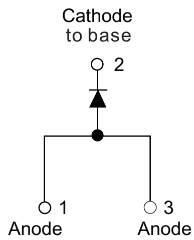




TO-247AC modified

60APU12





TO-247AB

PRODUCT SUMMARY	
t_{rr}	45 ns
$I_{F(AV)}$	60 A
V_R	1200 V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_R		1200	V
Continuous forward current	$I_{F(AV)}$	T_C = 60 °C	60	A
Single pulse forward current	I_{FSM}	T_C = 25 °C	570	
Maximum repetitive forward current	I_{FRM}	Square wave, 20 kHz	100	
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_R	I_R = 100μA	1200	-	-	V
Forward voltage	V_F	I_F = 60A	-	2.1	2.3	
		I_F = 120A	-	-	3.0	
		I_F = 60A, T_J = 125°C	-	-	2.0	
Reverse leakage current	I_R	V_R = V_R rated	-	1.0	10	μA
		T_J = 150°C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R = 200V	-	37	-	pF
Series inductance	L_S	Measure lead to lead 5mm from package body	-	10	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (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 = 1A, I_{RR}=0.25A (RG#1 CKT)		-	65	70	ns
		I_F = 1A, dI_F/dt = 200 A/μs, V_R=30V		-	45	-	
		T_J = 25°C	I_F = 60 A, dI_F/dt = 200 A/μs, V_R = 800 V	-	330	-	
		T_J = 125°C		-	430	-	
Peak recovery current	I_{RRM}	T_J = 25°C		-	5	-	A
		T_J = 125°C		-	12	-	
Reverse recovery charge	Q_{rr}	T_J = 25°C		-	650	-	nC
		T_J = 125°C		-	2800	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R_{thJC}		-	65	0.40	°C/W
Thermal resistance, junction to ambient	R_{thJA}		-	45	40	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	5.5	-	g
			-	0.2	-	oz.
Mounting torque			0.6 (5)	-	1.2 (10)	N · m (lbf . in)
Marking device		Case style TO-247AC modified	60EPU12			
		Case style TO-247AC	60APU12			

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

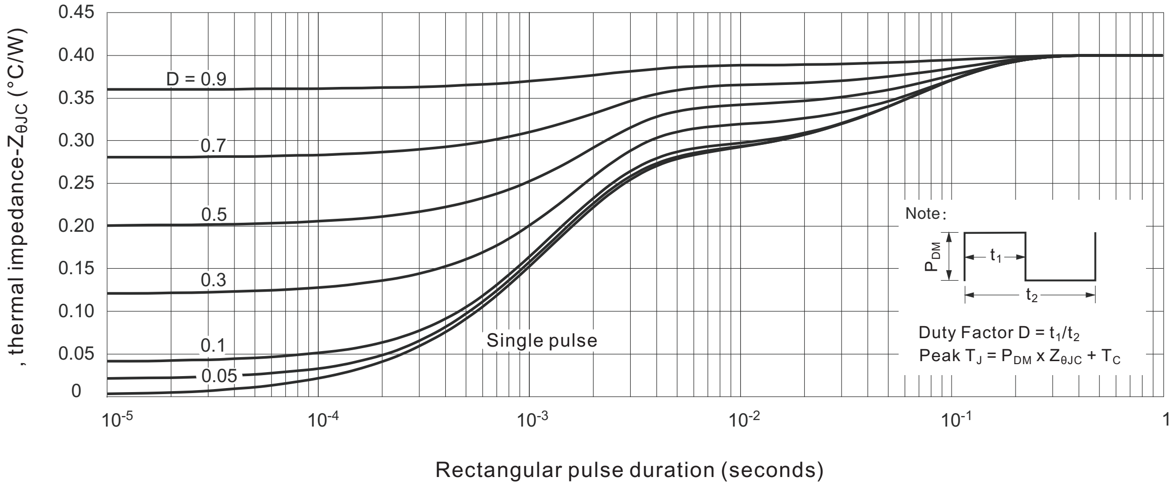


Fig.2 Forward current vs. forward voltage

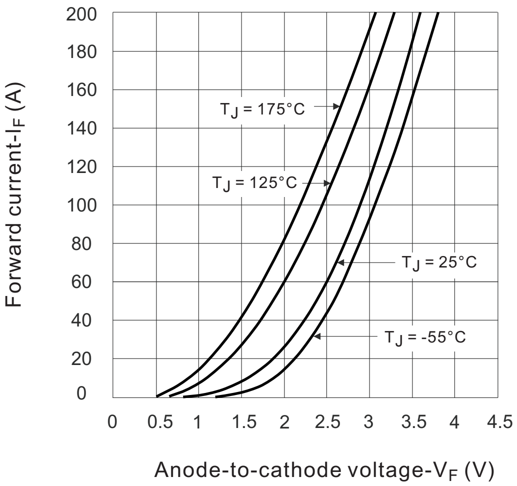


Fig3. Reverse recovery time vs. current rate of change

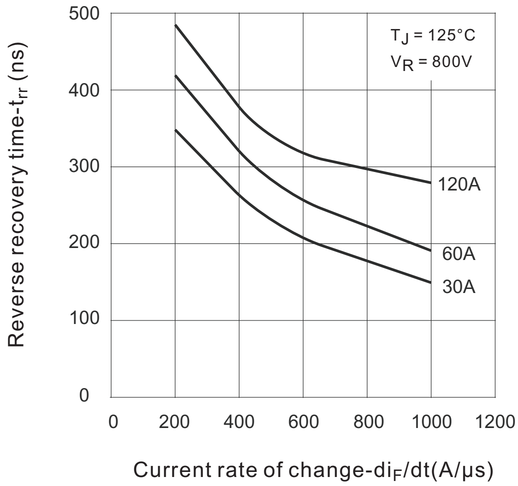


Fig.4 Reverse recovery charge vs. current rate of change

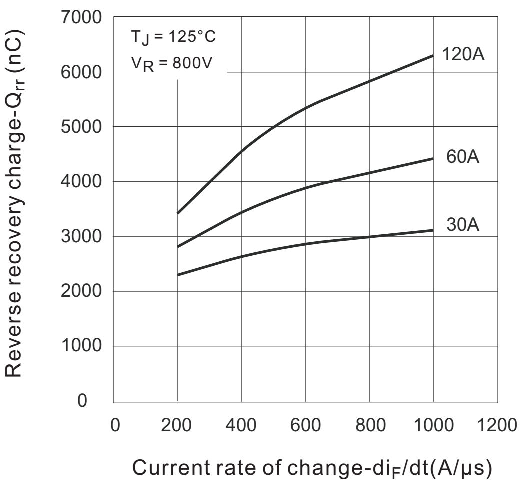


Fig.5 Reverse recovery current vs. current rate of change

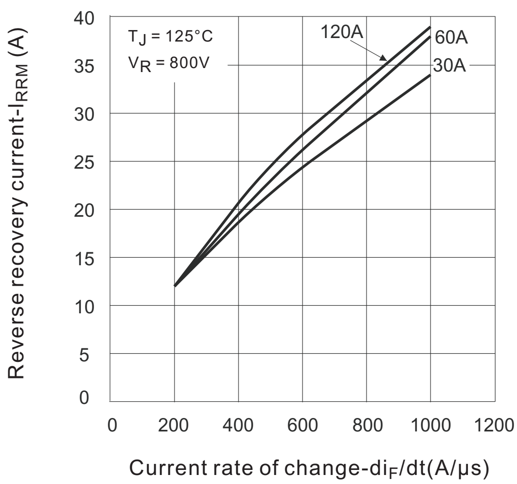


Fig.6 Dynamic parameters vs. junction temperature

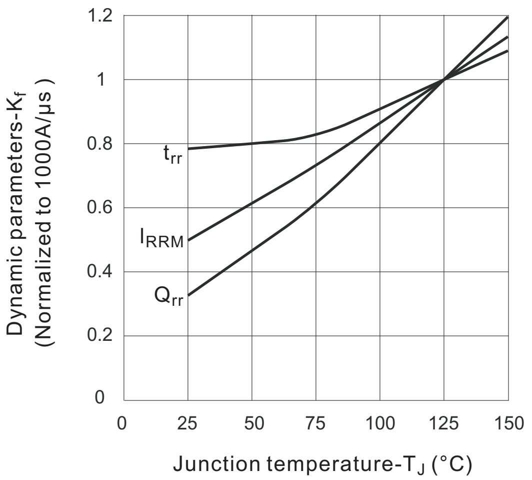


Fig.7 Maximum average forward current vs. case temperature

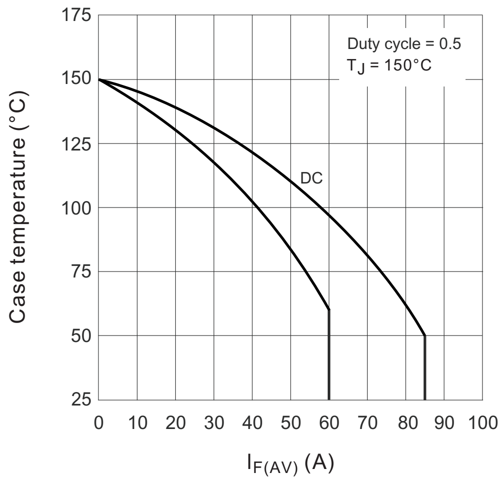
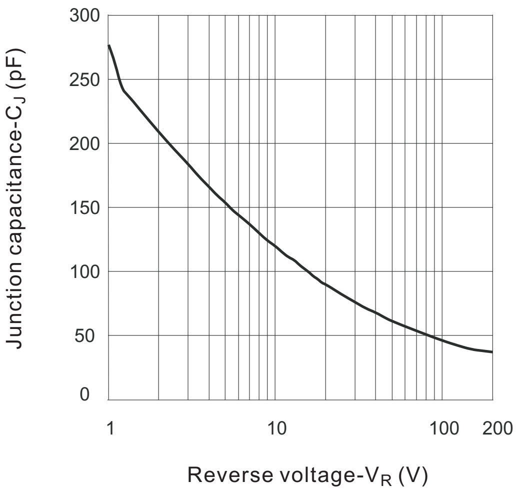


Fig.8 Junction capacitance vs. reverse voltage



Ordering Information Table

Device code

60	E	P	U	12
1	2	3	4	5

1 - Current rating (60 = 60A)

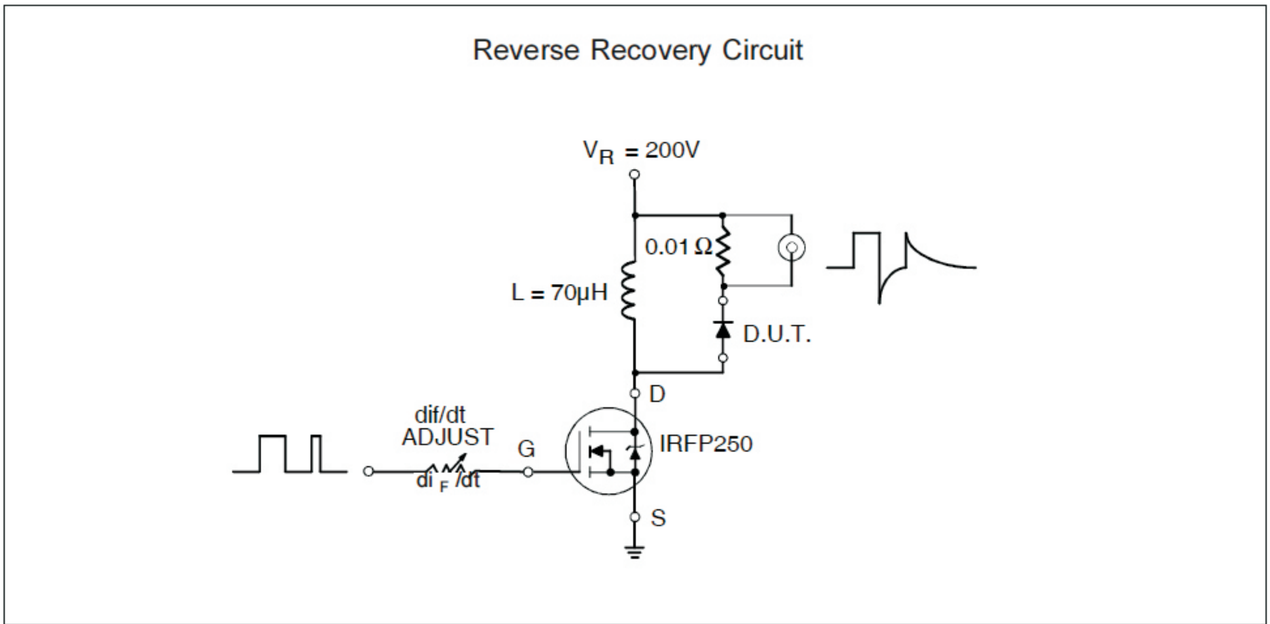
2 - Single Diode — E = 2 pins, A = 3 pins

3 - TO-247AC (Modified) or TO-247AB

4 - Ultrafast Recovery

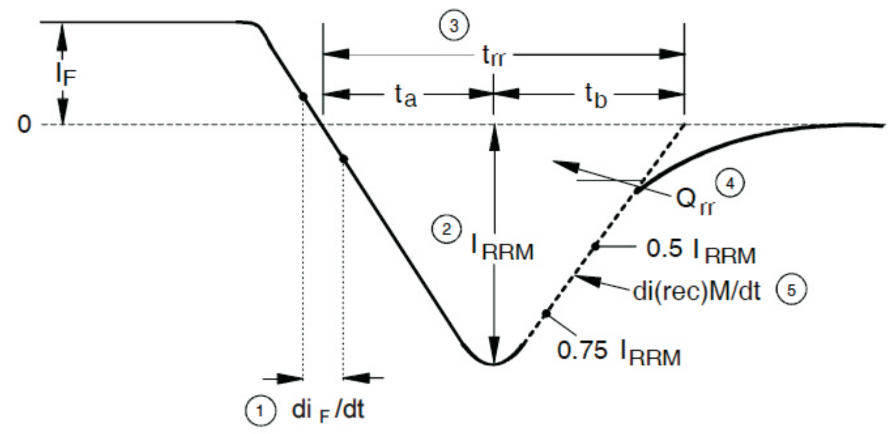
5 - Voltage Rating (12 = 1200 V)

Fig.9 Reverse recovery parameter test circuit



(3) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward Power Loss = $I_{F(AV)} \times V_{FM}$ @ $(I_{F(AV)} / D)$ (see Fig. 6);
Pd_{REV} = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$; I_R @ V_{R1} = 80% rated V_R

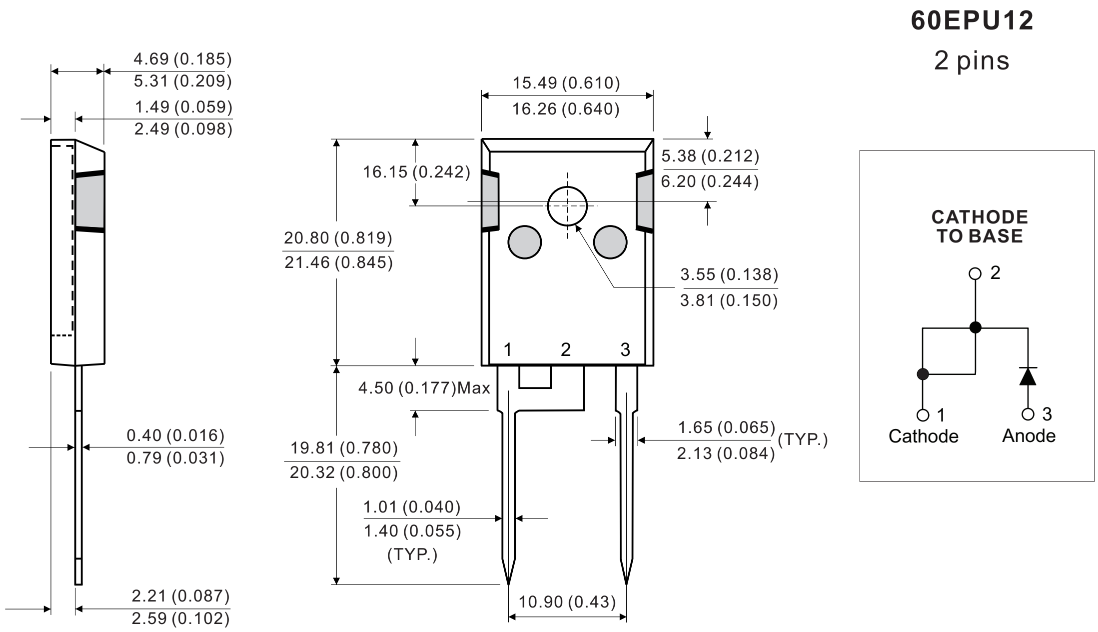
Fig.10 Reverse recovery waveform and definitions



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}

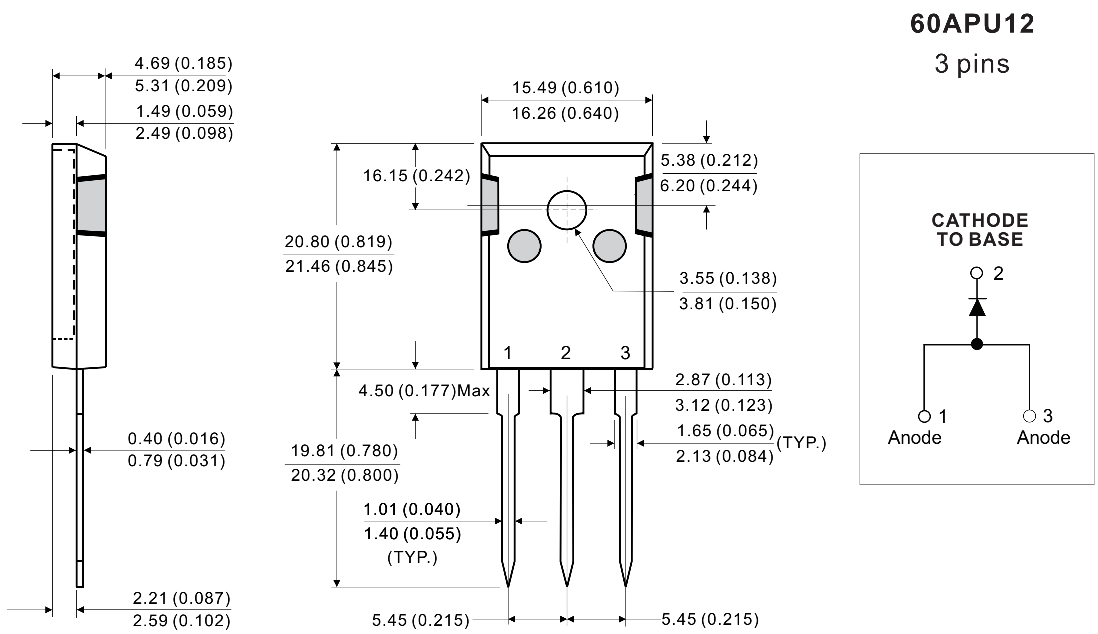
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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)



Conforms to JEDEC Outline TO-247AB

Dimensions in millimeters and (inches)