FRED
Ultrafast Soft Recovery Diode, 60 A

FEATURES

- Ultrafast recovery
- 175 °C operating junction temperature
- Designed and qualified for industrial level

BENEFITS

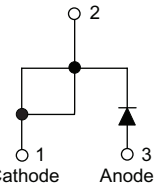
- Reduced RFI and EMI
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

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 HF welding, power converters and other applications where switching losses are not significant portion of the total losses.

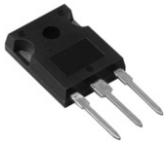
N-60EPU06

Cathode to base

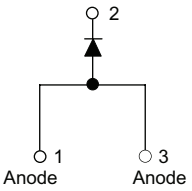


TO-247AC modified

N-60APU06



Cathode to base



TO-247AB

PRODUCT SUMMARY	
t_{rr}	34 ns
$I_{F(AV)}$	60 A
V_R	600 V

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
Cathode to anode voltage	V_R		600	V
Continuous forward current	$I_{F(AV)}$	T_C = 116 °C	60	A
Single pulse forward current	I_{FSM}	T_C = 25 °C	600	
Maximum repetitive forward current	I_{FRM}	Square wave, 20 kHz	120	
Operating junction and storage temperatures	T_J, T_{Stg}		- 55 to 175	°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	V_F	I_F = 60 A	-	1.50	1.75	
		I_F = 60 A, T_J = 125 °C	-	1.30	1.55	
		I_F = 60 A, T_J = 175 °C	-	1.20	1.40	
Reverse leakage current	I_R	V_R= V_R rated	-	-	50	µA
		T_J = 150 °C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R= 600 V	-	39	-	pF

DYNAMIC RECOVERY CHARACTERISTICS (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 = 1A, I_{RR}=0.25A (RG#1 CKT)		-	38	45	ns
		I_F = 1A, dI_F/dt = 200 A/µs, V_R=30V		-	30	45	
		T_J = 25°C	I_F = 60 A dI_F/dt = 200 A/µs V_R = 200 V	-	81	-	
		T_J = 125°C		-	164	-	
Peak recovery current	I_{RRM}	T_J = 25°C		-	7.4	-	A
		T_J = 125°C		-	17	-	
Reverse recovery charge	Q_{rr}	T_J = 25°C		-	300	-	nC
		T_J = 125°C		-	1394	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction to case	R_{thJC}		-	-	0.63	°C/W
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.2	-	
Weight			-	5.5	-	g
			-	0.2	-	oz.
Mounting torque			1.2 (10)	-	2.4 (20)	N · m (lbf . in)
Marking device		Case style TO-247AC modified	**60EPU06**			
		Case style TO-247AC	**60APU06**			

Fig.1 Typical forward voltage drop characteristics

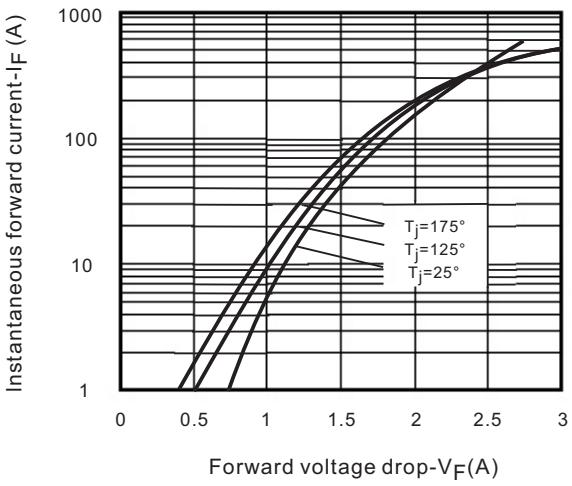


Fig.2 Typical values of reverse current vs. reverse voltage

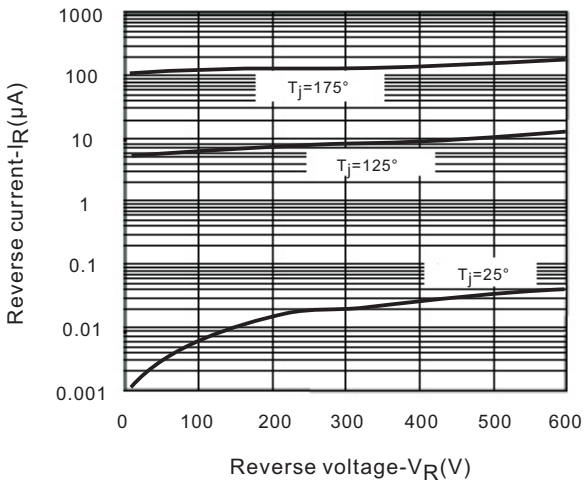


Fig.3 Typical junction capacitance vs. reverse voltage

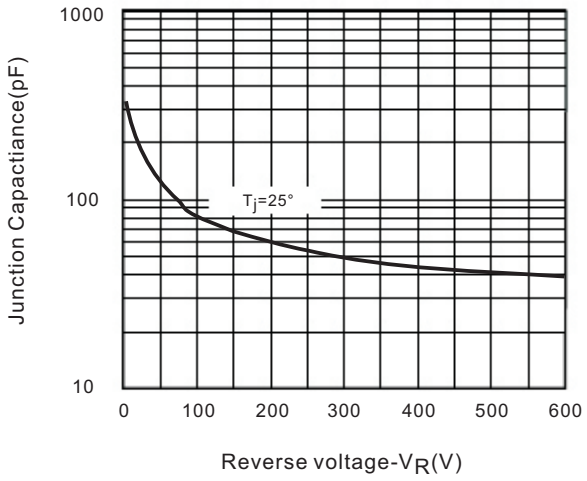


Fig4. Maximum thermal impedance Z_{thJC} characteristics

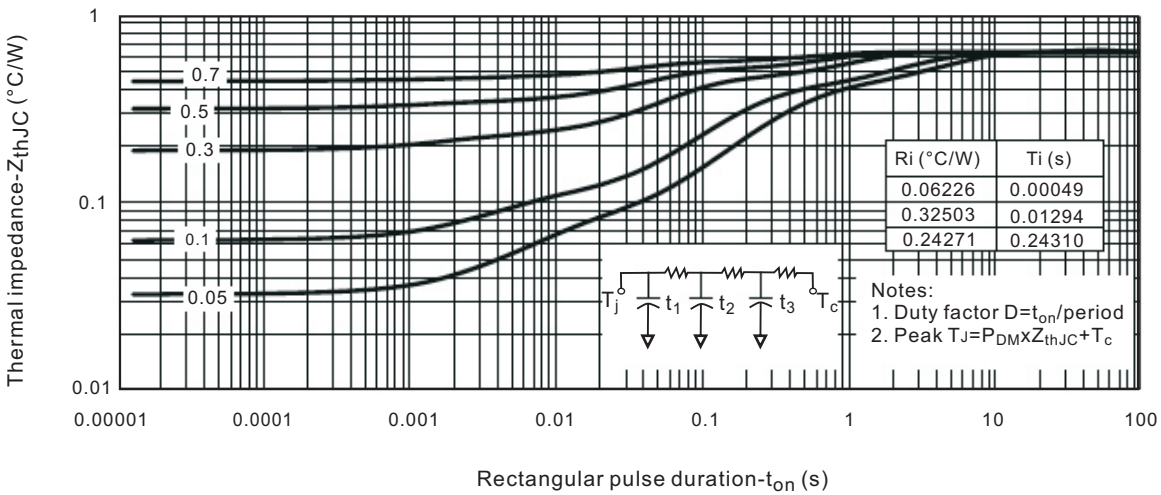


Fig.5 Max. Allowable Case Temperature Vs. Average Forward Current

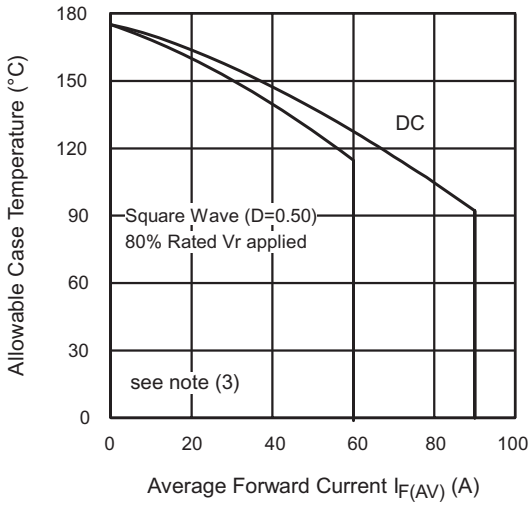


Fig.6 Forward Power Loss Characteristics

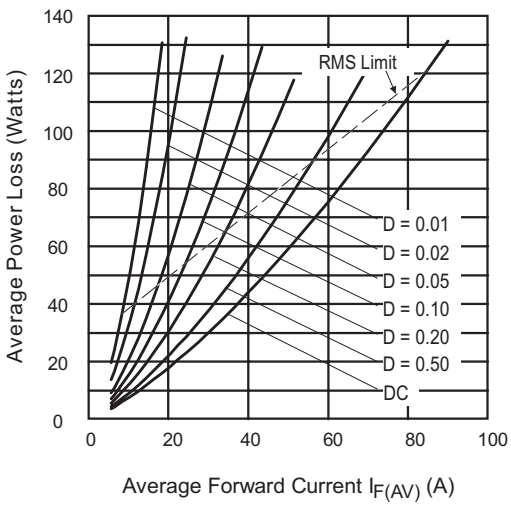


Fig.7 Typical Stored Charge vs. dI_F/dt

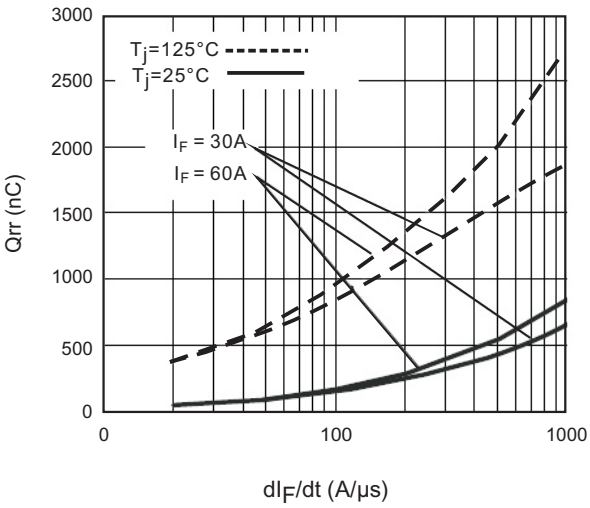
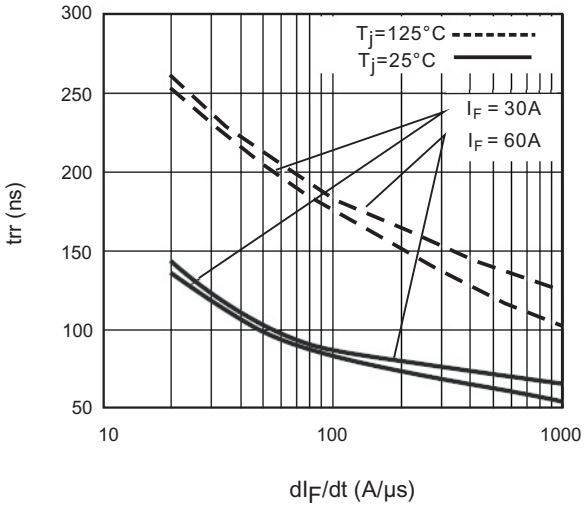


Fig.8 Typical Reverse Recovery Time vs. dI_F/dt



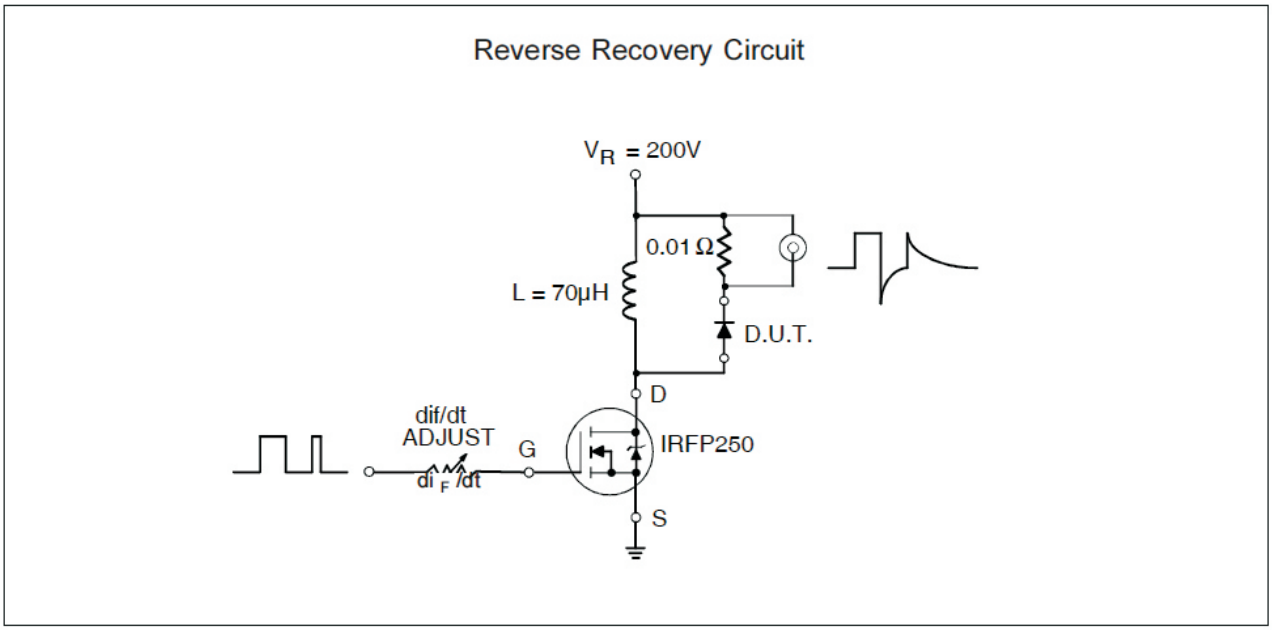
Ordering Information Tabel

Device code

N	–	60	E	P	U	06
①		②	③	④	⑤	⑥

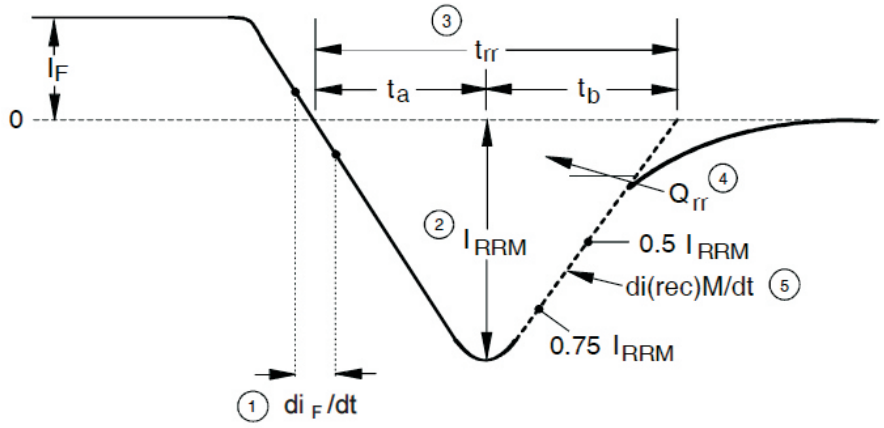
1 - Nell
2 - Current rating (60 = 60A)
3 - Single Diode (E = 2 pins, A = 3 pins)
4 - TO-247AC (Modified)
5 - Ultrafast Recovery
6 - Voltage Rating (06 = 600 V)

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

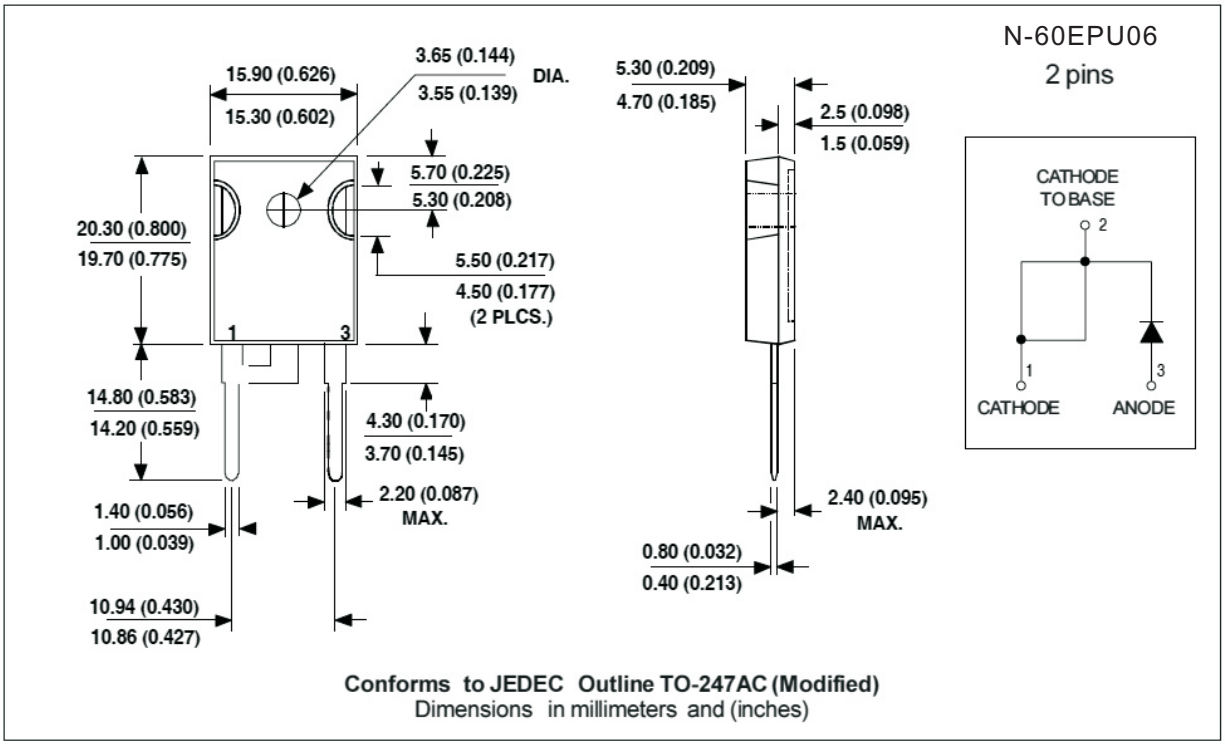


1. di_F/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr} - 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}

Outine Table



Outine Table