FRED
Ultrafast Soft Recovery Diode
30A / 600V

Pb Available RoHS* COMPLIANT

FEATURES

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

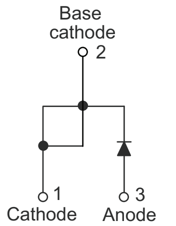
BENEFITS

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

DESCRIPTION

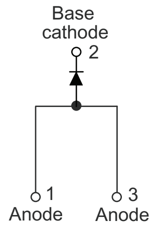
30ETU06 is a state of the art ultrafast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600V and 30A continuous current, the 30ETU06 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 30ETU06 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.

30ETU06



TO-220AC Modified

30ATU06



TO-220AB

PRODUCT SUMMARY	
V_R	600 V
V_F at 30A at 25 °C	1.7 V
$I_{F(AV)}$	30 A
t_{rr} (typical)	25 ns
T_J (maximum)	175 °C
Q_{rr}	130 nC
$dI_{(rec)M}/dt$	260 A/µs

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= 116 ºC	30	A
Single pulse forward current	I_{FSM}	T_C= 25 ºC	300	
Maximum repetitive forward current	I_{FRM}		110	
Maximum power dissipation	P_D	T_C= 25 ºC	145	W
		T_C= 100 ºC	57	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to 175	ºC

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	600	-	-	V
Maximum forward voltage	V_{FM}	I_F = 30 A	-	1.40	1.70	
		I_F = 60 A	-	1.75	2.0	
		I_F = 30 A, T_J = 125 °C	-	1.15	1.40	
Maximum reverse leakage current	I_{RM}	V_R = V_R rated	-	1.0	10	μA
		T_J = 150°C, V_R = V_R rated	-	20	500	
Junction capacitance	C_T	V_R = 200V	-	35	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	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} = 0.25A (RG#1 CKT)		-	32	38	ns
		I_F = 1.0 A, dI_F/dt = 100 A/μs, V_R =30 V, T_J = 25°C		-	25	-	
	t_{rr1}	T_J = 25 °C	I_F= 30A dI_F/dt = 200 A/μs V_R = 400 V	-	30	60	
	t_{rr2}	T_J = 125 °C		-	175	125	
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		-	130	180	nC
	Q_{rr2}	T_J = 125 °C		-	485	600	
Peak rate of fall of recovery current during t_b	$dI_{(rec)M}/dt1$	T_J = 25 °C		-	260	-	A/μs
	$dI_{(rec)M}/dt2$	T_J = 125 °C		-	160	-	

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	°C
Thermal resistance, junction to case	R_{thJC}		-	0.5	0.8	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 gerased	-	0.4	-	
Weight			-	2	-	g
			-	0.07	-	oz.
Mounting torque			6 (5)	-	12 (10)	kgf . cm (lbf . in)
Marking device		Case style TO-220AC Modified	30ETU06			
		Case style TO-220AB	30ATU06			

Nell High Power Products

Fig.1 Typical forward voltage drop characteristics

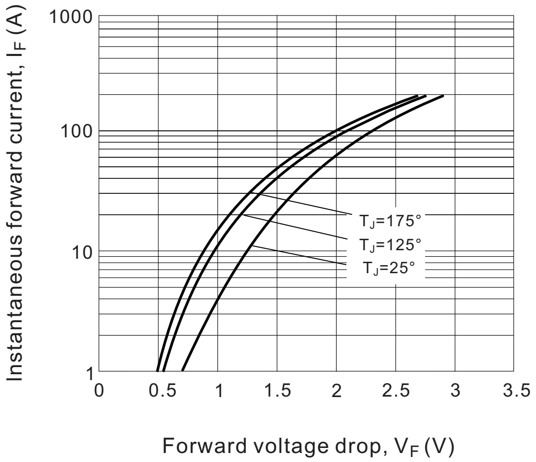


Fig.2 Typical values of reverse current vs. reverse voltage

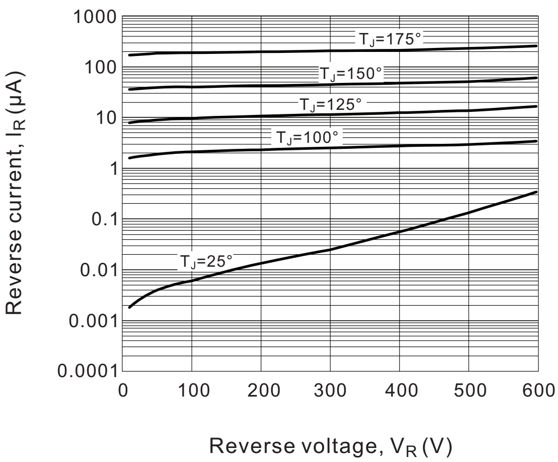


Fig.3 Typical junction capacitance vs. reverse voltage

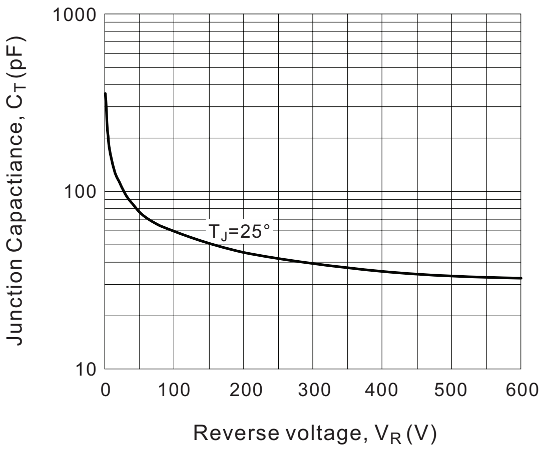


Fig.4 Junction capacitance vs. reverse voltage

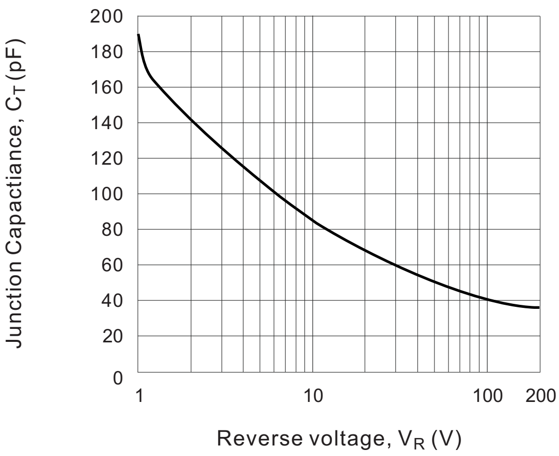


Fig.5 Maximum effective transient thermal impedance, junction-to-case vs. pulse duration

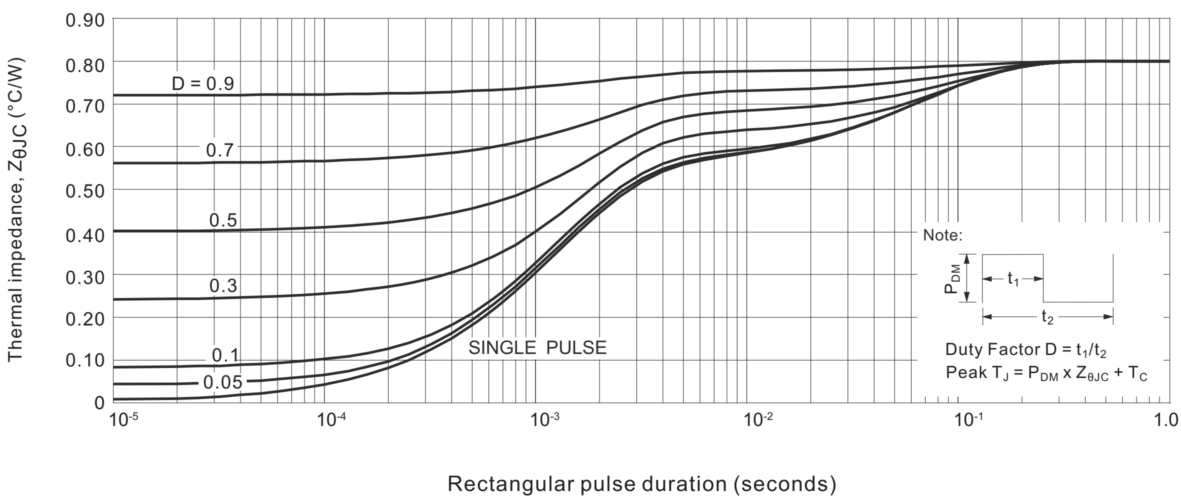


Fig.6 Max. allowable case temperature Vs. average forward current

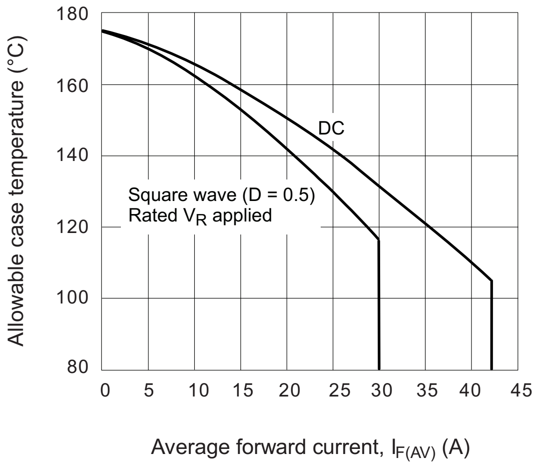


Fig.7 Reverse recovery time vs. current rate of change

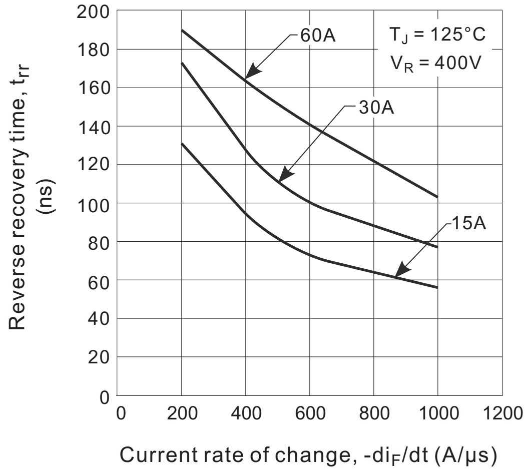


Fig.8 Maximum average forward current vs. case temperature

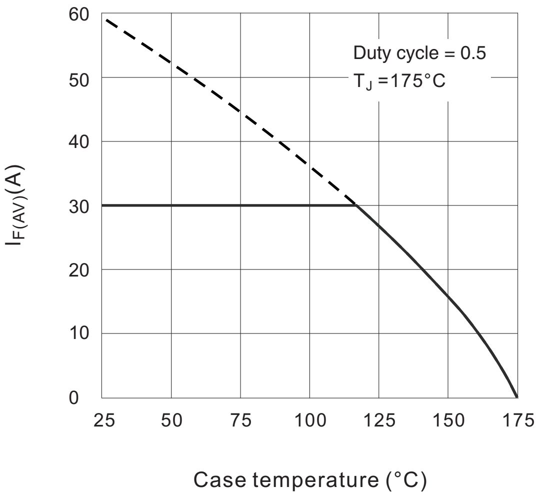
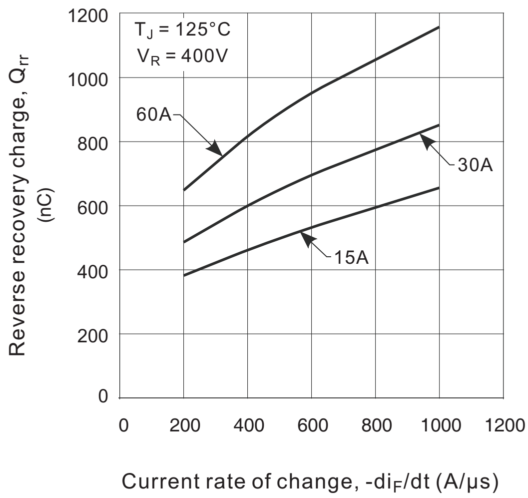


Fig.9 Reverse recovery charge vs. current rate of change



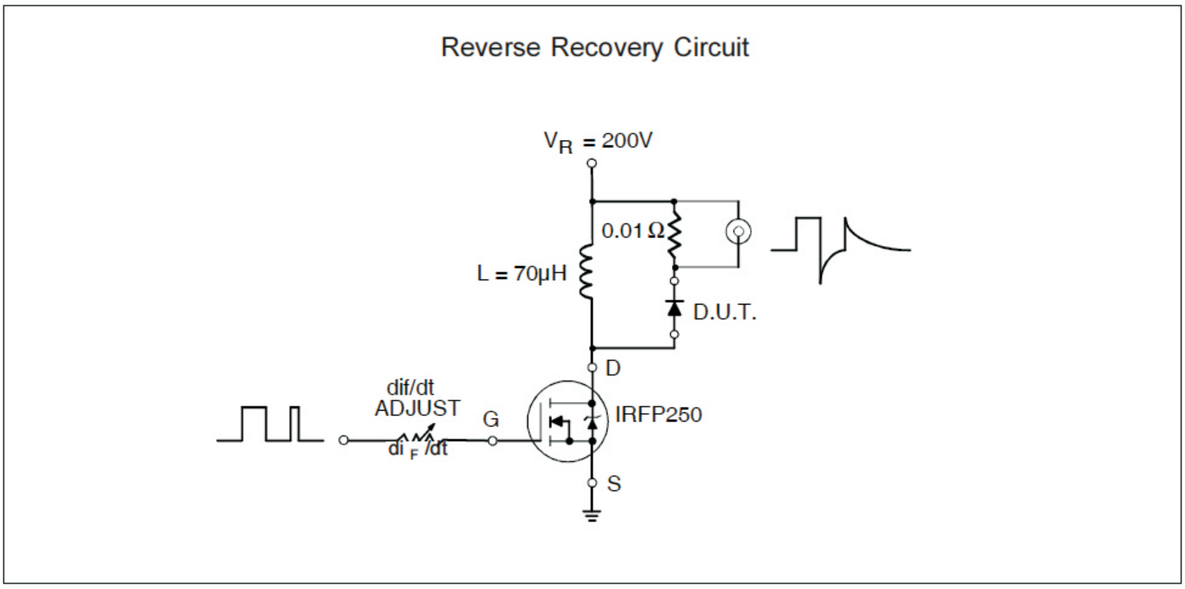
Ordering Information Table

Device code

30	E	T	U	06
1	2	3	4	5

1 - Current rating (30 = 30A)
2 - Single Diode — E = 2 pins, A = 3 pins
3 - TO-220AC Modified or TO-220AB
4 - Ultrafast Recovery
5 - Voltage Rating (06 = 600 V)

Fig.9 Reverse recovery parameter test circuit

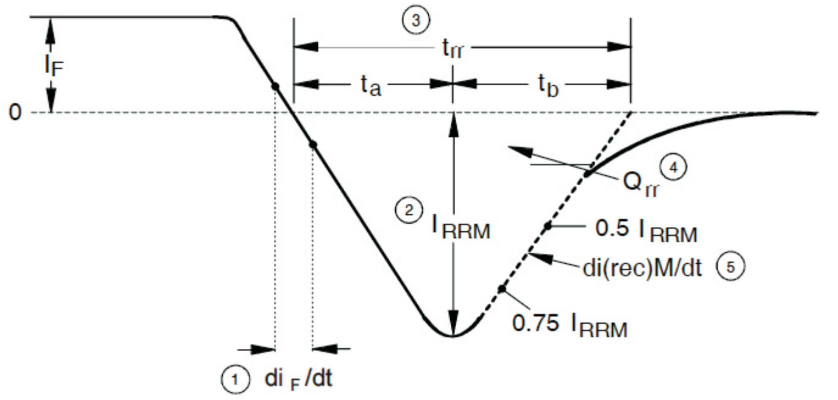


(3) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;

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



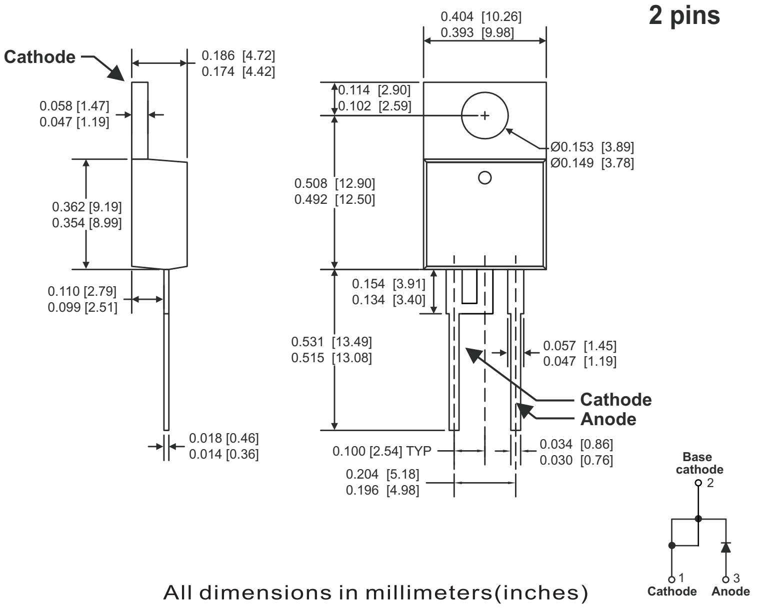
1. di_F/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr}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

TO-220AC Modified Package Outline

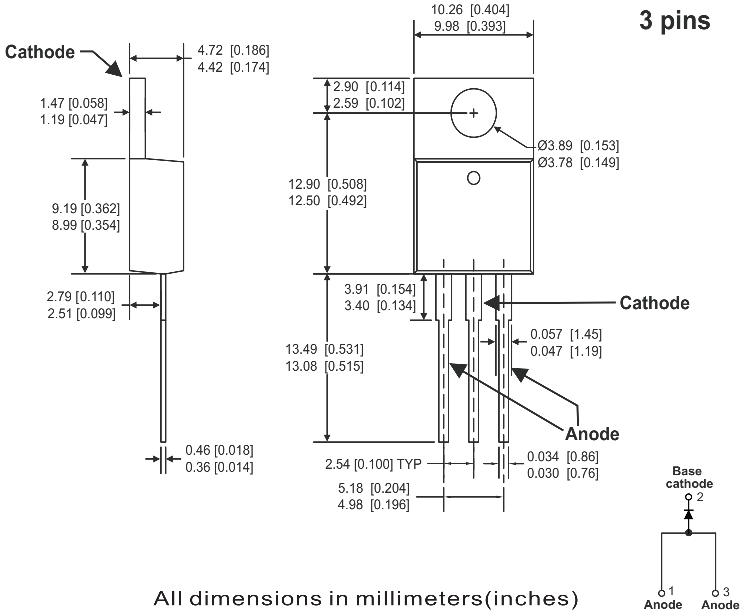
30ETU06
2 pins



All dimensions in millimeters(inches)

TO-220AB Package Outline

30ATU06
3 pins



All dimensions in millimeters(inches)