

### FRED Ultrafast Soft Recovery Diode, 40 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

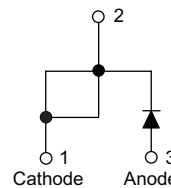
These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems.

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-40EPU06

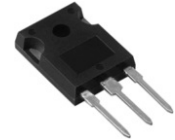


Cathode to base

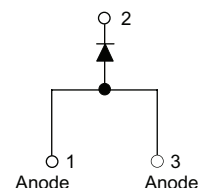


TO-247AC modified

N-40APU06



Cathode to base



TO-247AB

#### PRODUCT SUMMARY

$t_{rr}$	40 ns
$I_{F(AV)}$	40 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	$I_{F(AV)}$	$T_C = 116\text{ °C}$	40	A
Single pulse forward current	$I_{FSM}$	$T_C = 25\text{ °C}$	360	
Operating junction and storage temperatures	$T_j, T_{Stg}$		- 55 to 175	°C

#### ELECTRICAL SPECIFICATIONS (T<sub>J</sub> = 25 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_f$	$I_R = 100\mu A$	600	-	-	V
Forward voltage	$V_F$	$I_F = 40A$	-	1.50	1.70	
		$I_F = 80A$	-	1.8	-	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	25	$\mu A$
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	-	500	
Junction capacitance	$C_T$	$V_R = 200V$	-	36	-	pF

DYNAMIC RECOVERY CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 0.5A, I <sub>R</sub> = 1A, I <sub>RR</sub> =0.25A (RG#1 CKT)	-	36	45	ns
		I <sub>F</sub> = 1A, dI <sub>F</sub> /dt = -100 A/μs, V <sub>R</sub> =30V, T <sub>J</sub> =25°C	-	22	-	
		T <sub>J</sub> = 25°C	-	25	-	
		T <sub>J</sub> = 125°C	-	160	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25°C	-	3	-	A
		T <sub>J</sub> = 125°C	-	6	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25°C	-	35	-	nC
		T <sub>J</sub> = 125°C	-	480	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R <sub>thJC</sub>		-	-	0.67	°C/W
Thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, flat, smooth and greased	-	0.3	-	
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	<b>40EPU06</b>			
		Case style TO-247AC	<b>40APU06</b>			

Fig.1 Forward current vs. forward voltage

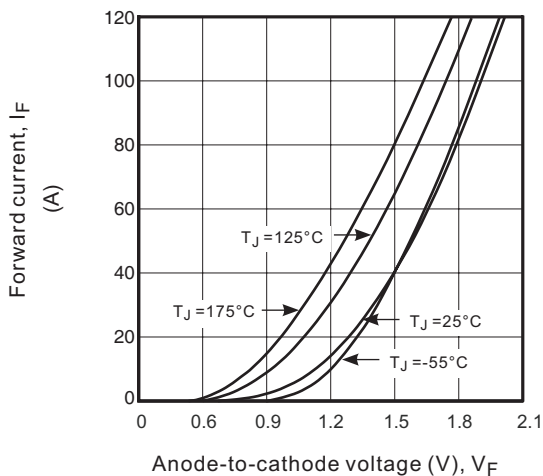
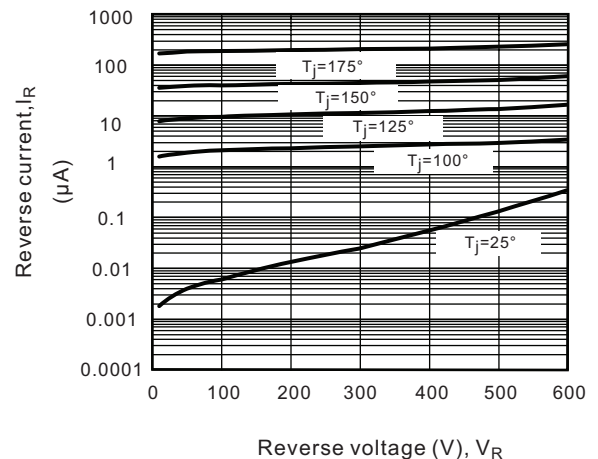
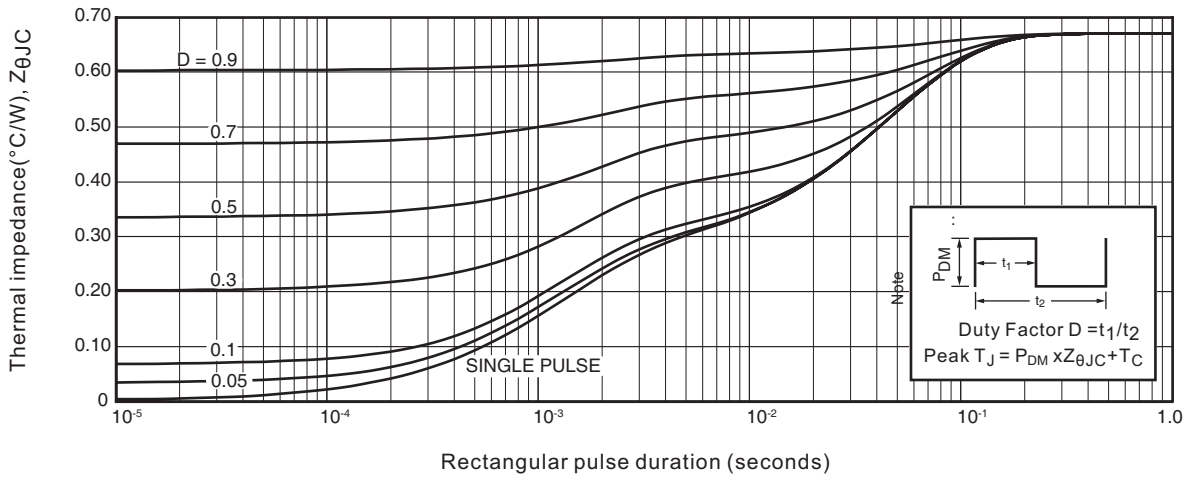


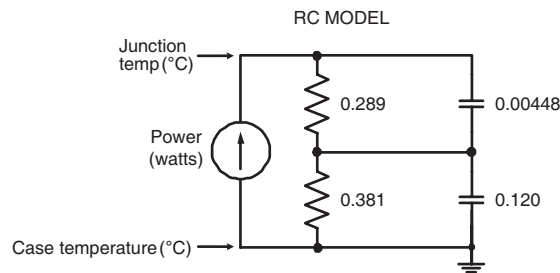
Fig.2 Typical values of reverse current vs. reverse voltage



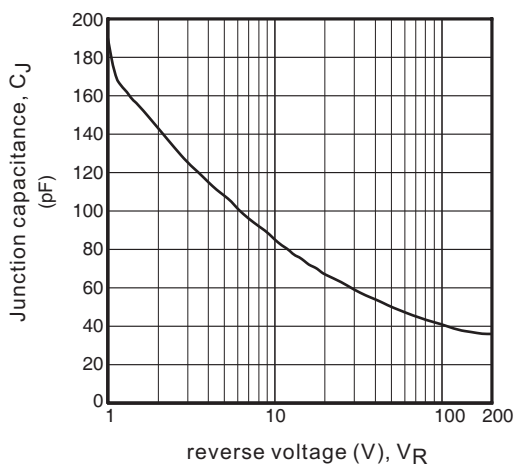
**Fig.3a Maximum effective transient thermal impedance, junction-to-case vs. pulse duration**



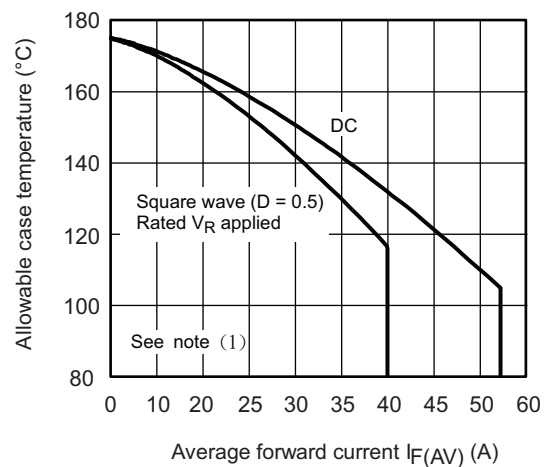
**Fig.3b transient thermal impedance model**



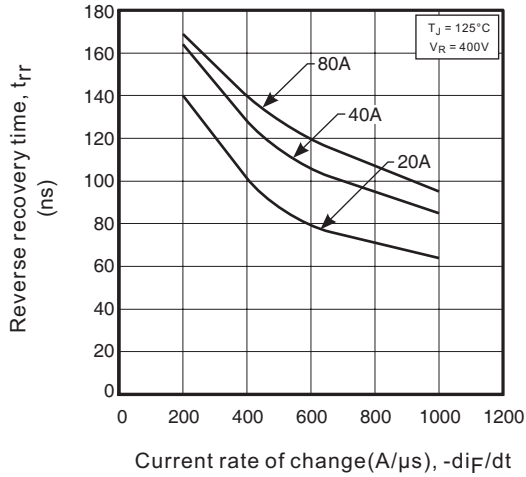
**Fig.4 Junction capacitance vs. reverse voltage**



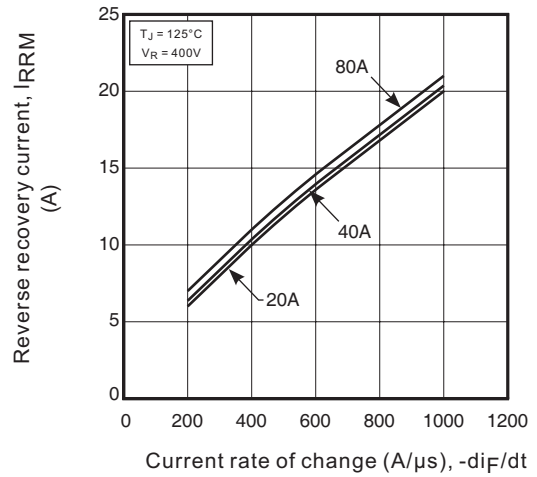
**Fig.5 Max. allowable case temperature Vs. average forward current**



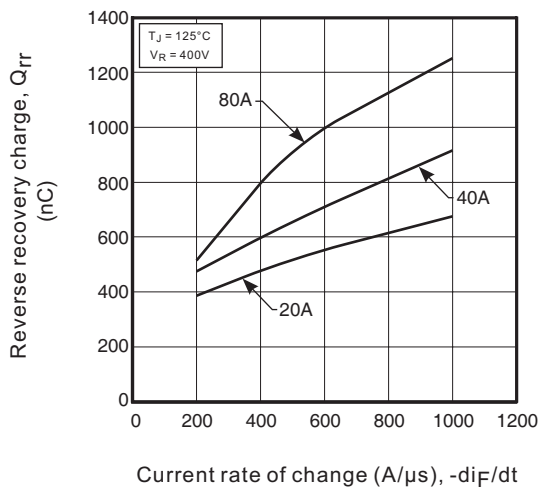
**Fig.6 Reverse recovery time vs. current rate of change**



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

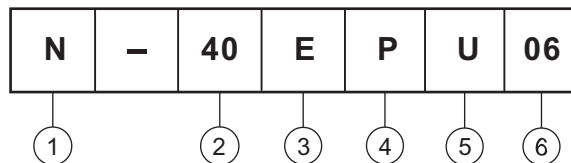


**Fig.8 Reverse recovery charge vs. current rate of change**



### Ordering Information Tabel

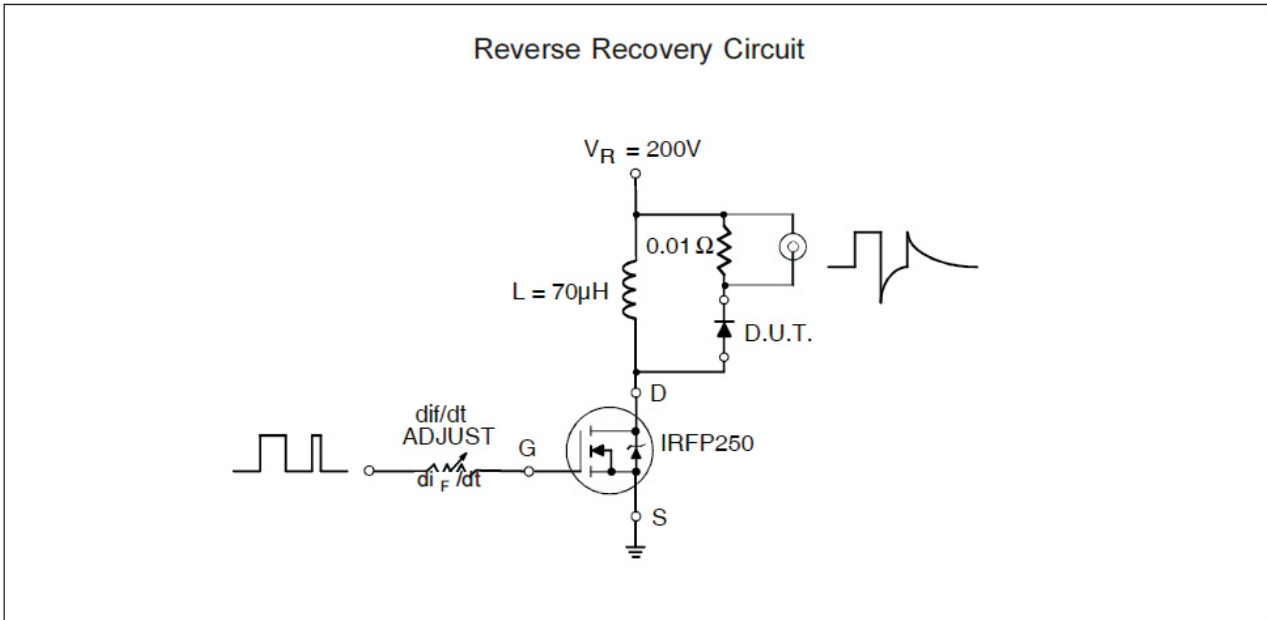
Device code



- 1 - Nell
- 2 - Current rating (40 = 40A)
- 3 - Single Diode
- 4 - TO-247AC (Modified)
- 5 - Ultrafast Recovery
- 6 - Voltage Rating (06 = 600 V)

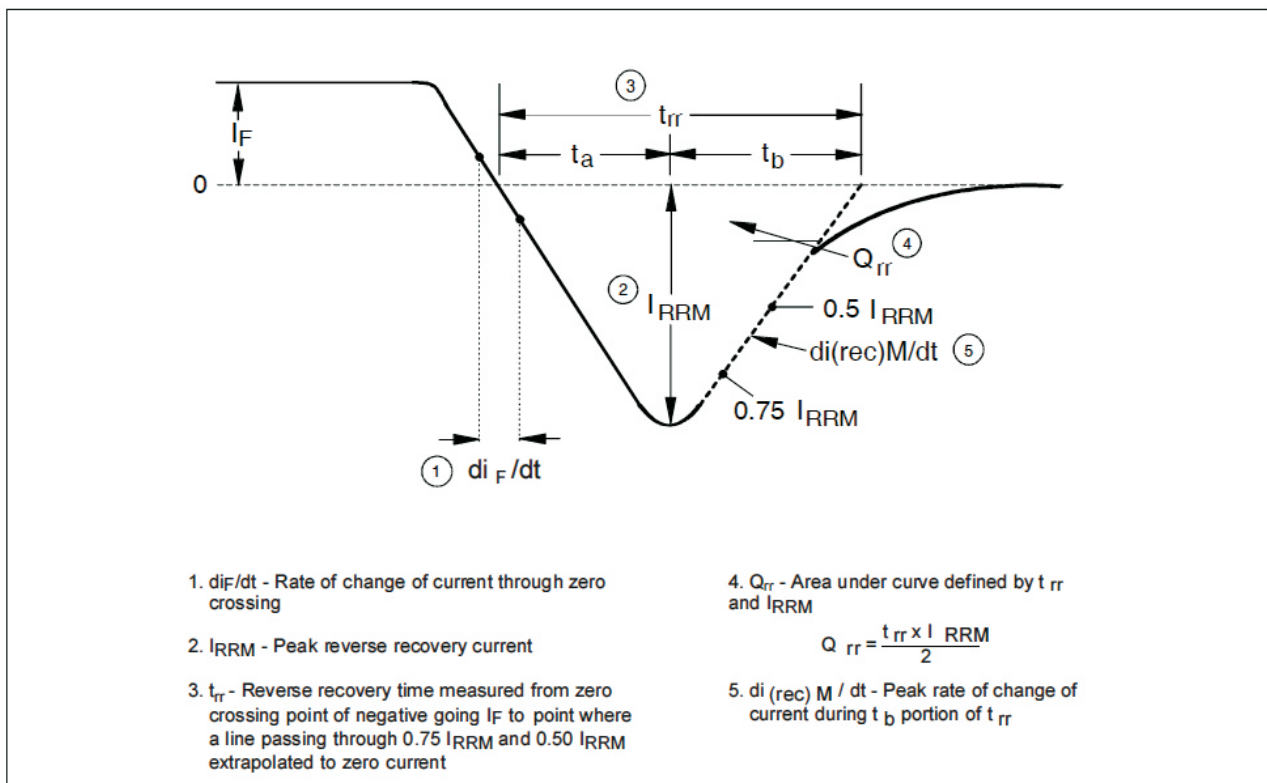
E = 2 pins  
A = 3 pins

Fig.9 Reverse recovery parameter test circuit

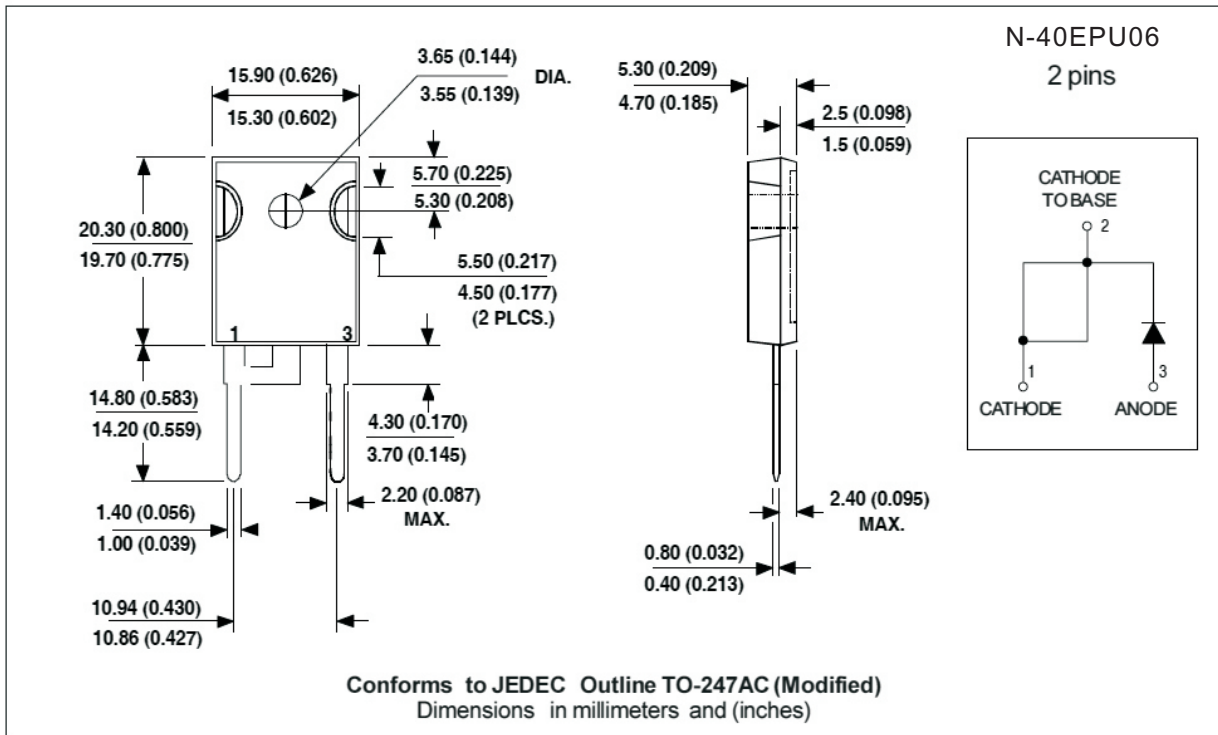


- (3) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;  
 $Pd = \text{Forward Power Loss} = I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);  
 $Pd_{REV} = \text{Inverse Power Loss} = V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = 80\% \text{ rated } V_R$

Fig.10 Reverse recovery waveform and definitions



### Outline Table



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