

## FRED Ultrafast Soft Recovery Diode 60A × 2 / 400V



### FEATURES

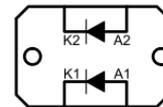
- Fast recovery time characteristic
- Electrically isolated base plate
- Large creepage distance between terminal
- Simplified mechanical designs, rapid assembly
- Compliant to RoHS
- Designed and for industrial level
- Planar FRED Chip
- Low  $I_{RM}$  value
- Soft recovery behaviour



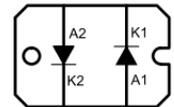
### APPLICATIONS

- Switching power supplies
- Inverters
- Motor controllers
- Converters
- Snubber diodes
- Uninterruptible power supplies (UPS)
- Induction heating
- High speed rectifiers
- Ultrasonic cleaners and welders
- Anti-saturation diodes

### CIRCUIT CONFIGURATION



Parallel  
NST120F04



Anti-Parallel  
NST120F04-A

### PRODUCT SUMMARY

$V_R$	400 V
$V_F(\text{max.})$ at 125 °C	1.20V
$Q_{rr}$ (typical)	125nC
$I_{RRM}$ (typical)	5A
$t_{rr}$ (typical)	30 ns
$I_{F(DC)}$ at $T_C$ per diode	60A at 110 °C

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		400	V
Maximum continuous forward current <small>per leg per module</small>	$I_F$	$T_c = 110\text{ °C}$	60	A
			120	
Single pulse forward current	$I_{FSM}$	$T_J = 25\text{ °C}$ , 50Hz	600	
RMS isolation voltage, any terminal to case	$V_{ISO}$	$t = 1\text{ minute}$	2500	V
Maximum power dissipation per diode	$P_D$	$T_c = 25\text{ °C}$	214	W
		$T_c = 100\text{ °C}$	107	
Operating junction and storage temperature range	$T_J, T_{Stg}$		- 55 to 175	°C

## Nell High Power Products

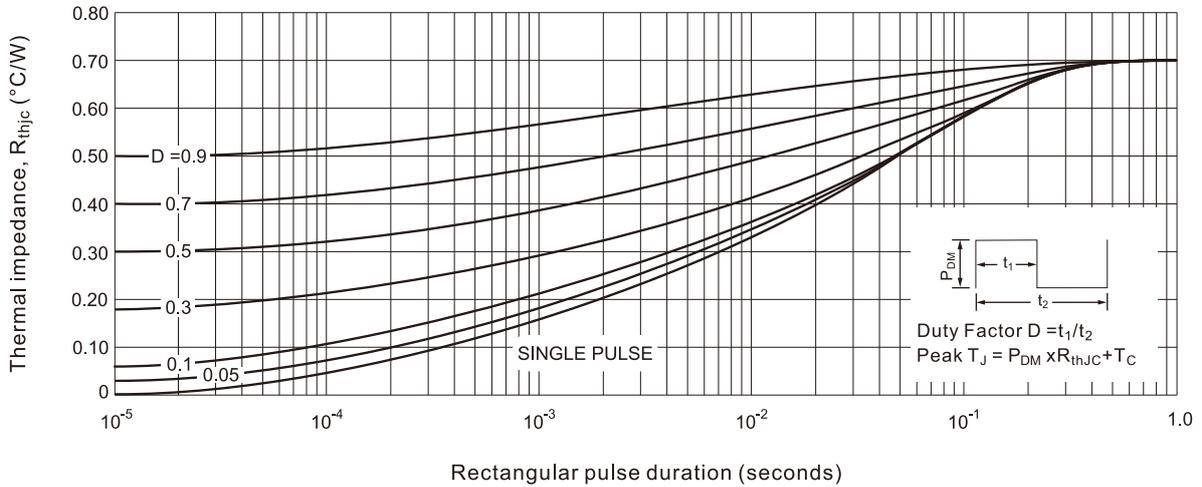
ELECTRICAL SPECIFICATIONS (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V <sub>BR</sub>	I <sub>R</sub> = 100 μA	400	-	-	V
Maximum forward voltage	V <sub>FM</sub>	I <sub>F</sub> = 60 A	-	1.21	1.35	
		I <sub>F</sub> = 60 A, T <sub>J</sub> = 125 °C	-	-	1.20	
Maximum reverse leakage current	I <sub>RM</sub>	V <sub>R</sub> = V <sub>R</sub> rated	-	0.10	10	μA
		T <sub>J</sub> = 125 °C, V <sub>R</sub> = V <sub>R</sub> rated	-	-	250	

DYNAMIC RECOVERY CHARACTERISTICS PERLEG (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> = 1.0A, I <sub>RR</sub> = 250mA (RG#1 CKT)	-	40	50	ns
		I <sub>F</sub> = 1.0 A, dI <sub>F</sub> /dt = -200 A/μs, V <sub>R</sub> = 30 V, T <sub>J</sub> = 25 °C	-	30	-	
	t <sub>rr1</sub>	T <sub>J</sub> = 25 °C	-	50	-	
	t <sub>rr2</sub>	T <sub>J</sub> = 125 °C	-	150	-	
Reverse recovery current	I <sub>RRM1</sub>	T <sub>J</sub> = 25 °C	-	5	-	A
	I <sub>RRM2</sub>	T <sub>J</sub> = 125 °C	-	11	-	
Reverse recovery charge	Q <sub>rr1</sub>	T <sub>J</sub> = 25 °C	-	125	-	nC
	Q <sub>rr2</sub>	T <sub>J</sub> = 125 °C	-	825	-	

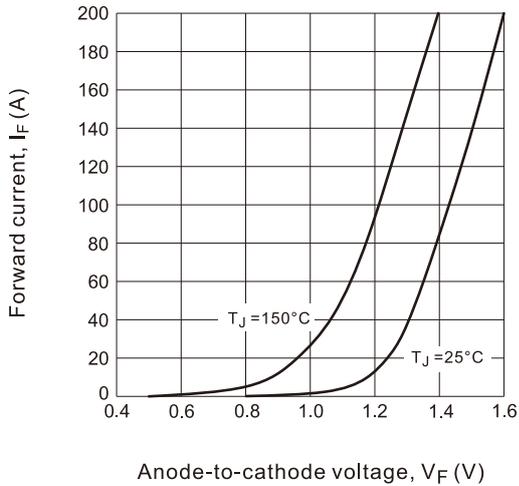
THERMAL - MECHANICAL SPECIFICATIONS (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	
Junction to case, single leg conducting	R <sub>thJC</sub>	-	-	0.70	°C/W K/W	
Junction to case, both legs conducting		-	-	0.35		
Case to sink, flat, greased surface	R <sub>thCS</sub>	-	0.05	-		
Isolation RMS voltage ( 50~60Hz sinusoidal waveform from terminals to mounting base for 1 Min.)	V <sub>ISO</sub>	2500	-	-	V	
Weight		-	30	-	g	
Mounting torque		-	-	1.1	N·m	
		-	-	10	lb·in	

## Nell High Power Products

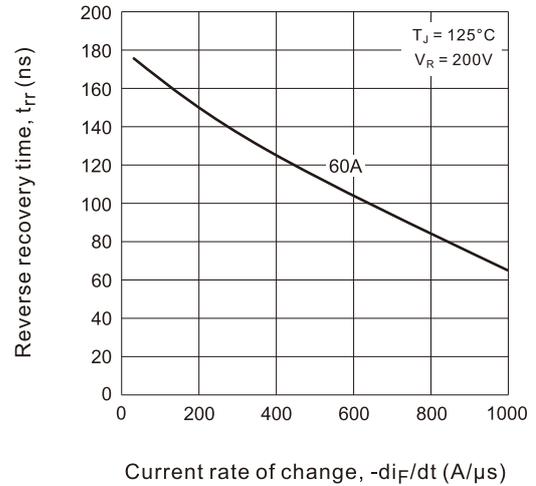
**Fig.1 Maximum effective transient thermal impedance, junction-to-case vs. pulse duration**



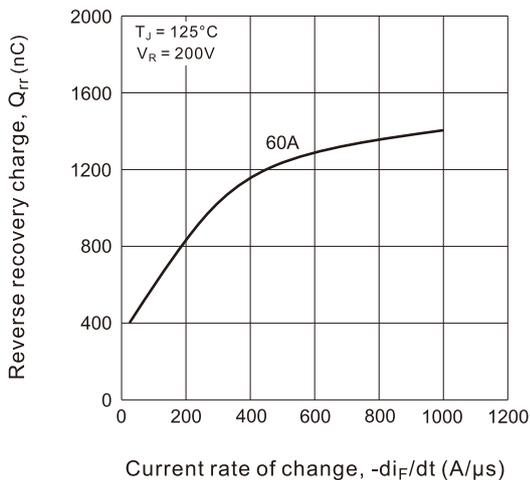
**Fig.2 Forward current vs. forward voltage**



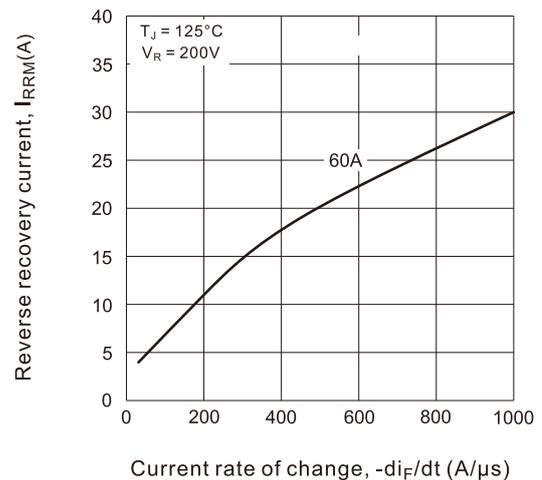
**Fig.3 Reverse recovery time vs. current rate of change**



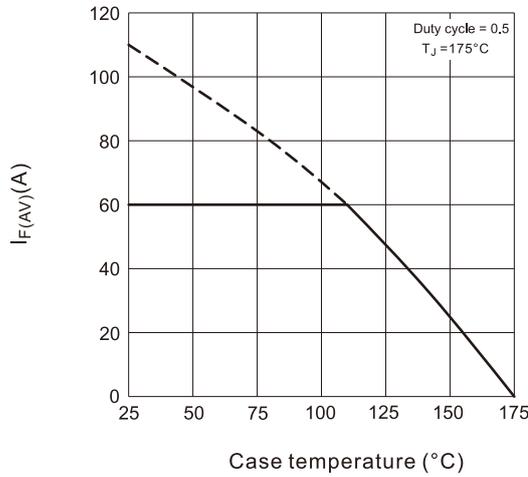
**Fig.4 Reverse recovery charge vs. current rate of change**



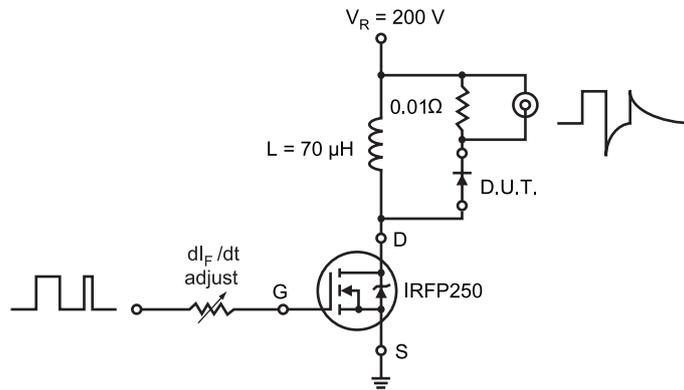
**Fig.5 Reverse recovery current vs. current rate of change**



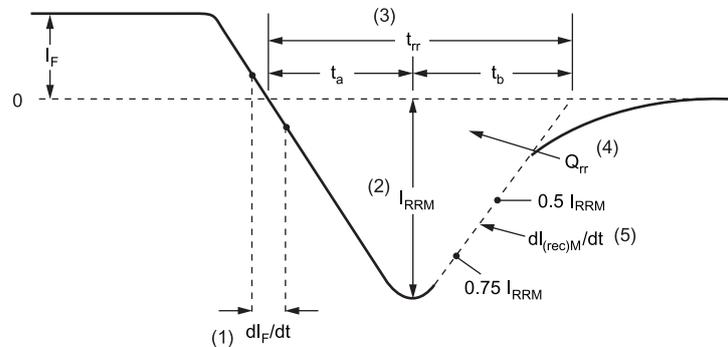
**Fig.6 Maximum average forward current vs. case temperature**



**Fig.7 Reverse recovery parameter test circuit**



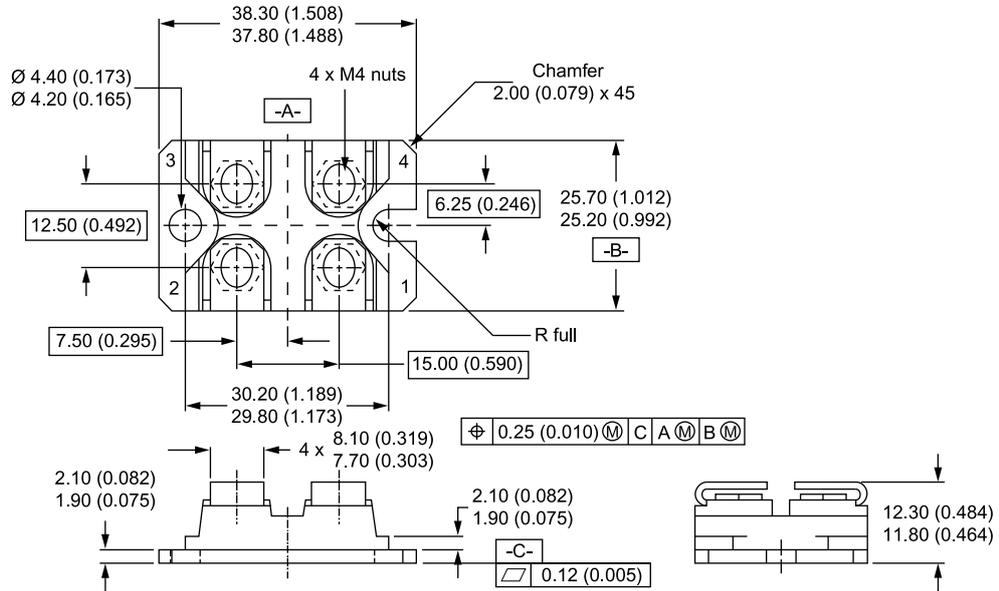
**Fig.8 Reverse recovery waveform and definitions**



- (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  $t_{rr}$

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

### SOT-227



All dimensions in millimeters (inches)

#### Notes

- Dimensioning and tolerancing per ANSI Y14.5M-1982
- Controlling dimension: millimeter

### ORDERING INFORMATION TABLE

Device code	<b>N</b>	<b>ST</b>	<b>120</b>	<b>F</b>	<b>04</b>	<b>-</b>	<b>A</b>
	①	②	③	④	⑤		⑥

- 1** - Nell High Power Products
- 2** - Package indicator (SOT-227)
- 3** - Current rating (120 = 120A, 60A x 2)
- 4** - F = FRED family, planar passivated chips
- 5** - Voltage rating (04 = 400 V)
- 6** - Circuit type, A for Anti-Parallel type  
Blank for parallel type.