FRED
Ultrafast Soft Recovery Diode
100A / 600V

FEATURES

- 150°C T_J operation
- Low Q_{rr} and t_{rr}
- High frequency operation
- Lead (Pb)-free
- Designed and qualified for industrial level

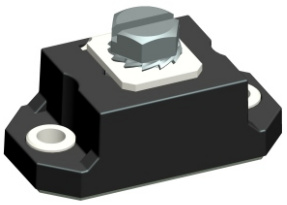
DESCRIPTION

The NKF100-60 FRED diode module series has been optimized to reduce losses and EMI/RFI in high frequency power conditioning system.

An extensive characterization of the recovery behavior for different values of current, temperature and dI/dt simplifies the calculations of losses in the operating conditions. The softness of the recovery eliminates the need for a snubber in most applications.

TYPICAL APPLICATIONS

- High current switching power supplies
- Power converters
- Motor drives



D-67（Half-Pak）



PRODUCT SUMMARY	
I_F Maximum	210A
V_R	600V
$I_{F(DC)\ at}\ T_C$	100A @ 110°C

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNIT
Cathode to anode voltage, minimum	V_R		600	V
Continuous forward current	I_F	T_C = 25°C	210	A
		T_C = 110°C	100	
Single pulse forward surge current	I_{FSM}	Limited by junction temeperature	1200	
Non- repetitive avalanche energy	E_{AS}	L = 100μH, duty cycle limited by maximum T_J	1.4	mJ
Maximum power dissipation	P_D	T_C = 25°C	315	W
		T_C=110°C	130	
Operating junction and storage temperature range	T_J,T_{Stg}		-55 to 150	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Cathode to anode breakdown voltage	V_{BR}	I_R = 100μA	600	-	-	V
Maximum forward voltage	V_{FM}	I_F= 100A	-	1.20	1.50	
		I_F= 200A	-	1.40	1.70	
		I_F= 100A, T_J = 125°C	-	1.00	1.30	
Maximum reverse leakage current	I_{RM}	V_R= 600V, T_J = 25°C	-	2.0	5.0	μA
		V_R= 600V, T_J = 125°C	-	0.5	2.0	mA
Maximum junction capacitance per leg	C_T	V_R = 200V	-	200	300	pF
Typical series inductance per leg	L_S	From top of terminal hole to mounting plane	-	7.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Reverse recovery time	t_{rr}	T_J = 25°C	I_F = 0.5A, I_R = 1.0A, I_{RR} = 0.25A	-	83	90	nS
		T_J = 25°C	I_F= 100A dI_F/dt = 200A/μs V_R= 200V	-	100	150	
		T_J = 125°C		-	170	245	
Peak recovery current	I_{RRM}	T_J = 25°C		-	10	18	A
		T_J = 125°C		-	15	30	
Reverse recovery charge	Q_{rr}	T_J = 25°C		-	450	1300	nC
		T_J = 125°C		-	1200	3600	
Peak rate of recovery current	$dI_{(rec)M}/dt$	T_J = 25°C		-	310	-	A/μs
		T_J = 125°C		-	240	-	

THERMAL-MECHANICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum junction and storage temperature range	T_J,T_{Stg}	-55	-	150	°C
Thermal resistance, junction to case	R_{thJC}	-	-	0.30	°C/W
Thermal resistance, case to heatsink	R_{thCS}	-	0.05	-	
Weight		-	30 (1.06)	-	g(oz.)
Mounting torque		3 (26.5)	-	4 (35.4)	N•m (lbf • in)
Terminal torque		3.4 (30)	-	5 (44.2)	
Case style		JEDEC D-67 Half-Pak module			

Ordering Information Tabel

Device code

NK	F	100	–	60
1	2	3		4

1 - Nell's power module
2 - F for FRED Diode, single diode, D-67 package (Half-Pack)
3 - Maximum average forward current,100 = 100A
4 - Voltage rating (60 = 600V)

Fig.1 Maximum forward voltage drop vs. instantaneous forward current

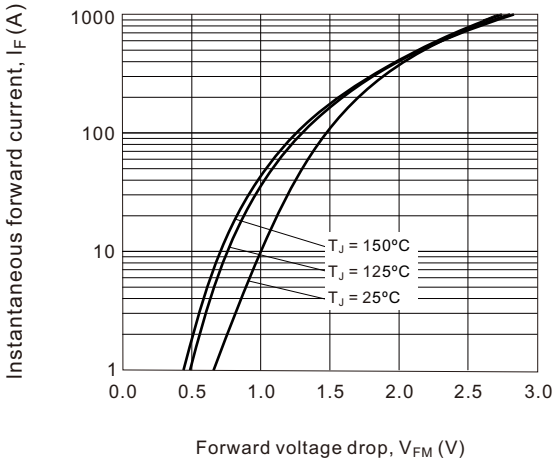


Fig.2 Typical reverse current vs reverse voltage

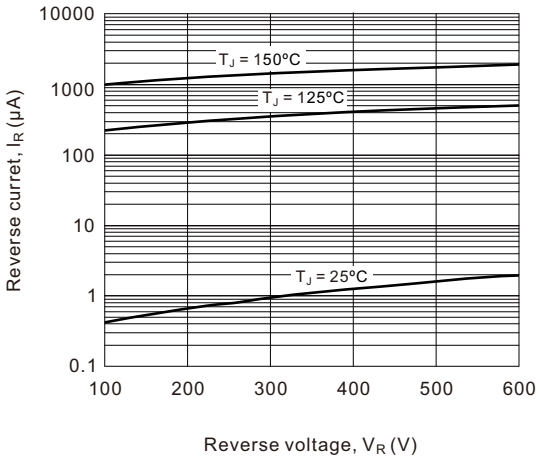


Fig.3 Maximum thermal impedance $R_{th(j-c)}$ characteristics

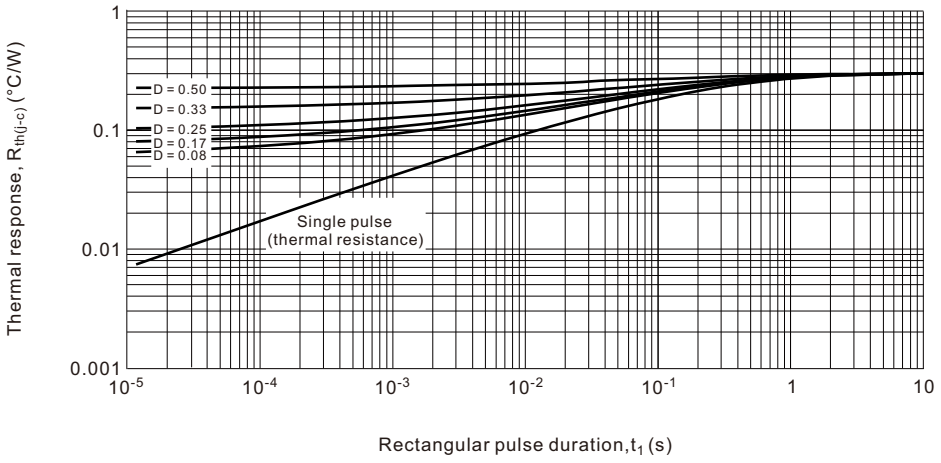


Fig.4 Typical junction capacitance vs. Reverse voltage

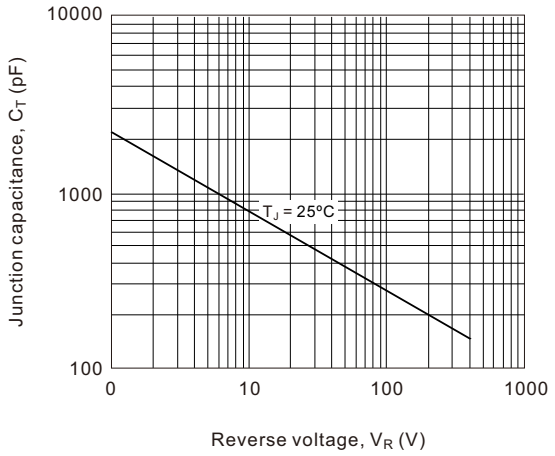


Fig.5 Maximum allowable case temperature vs. DC forward current

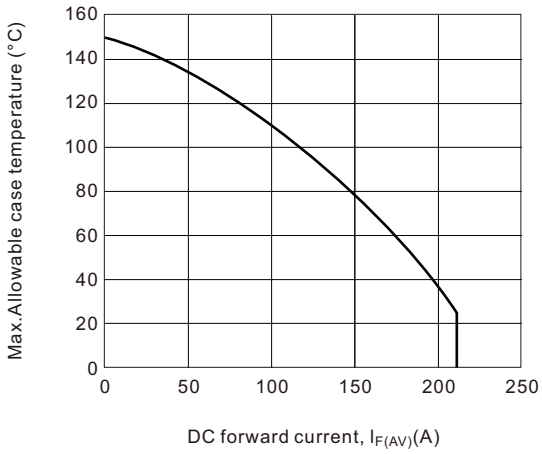


Fig.6 Typical reverse recovery time vs. dI_F/dt

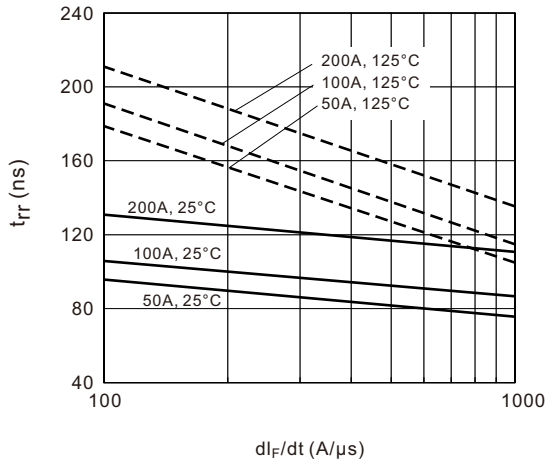


Fig.7 Typical stored charge vs. dI_F/dt

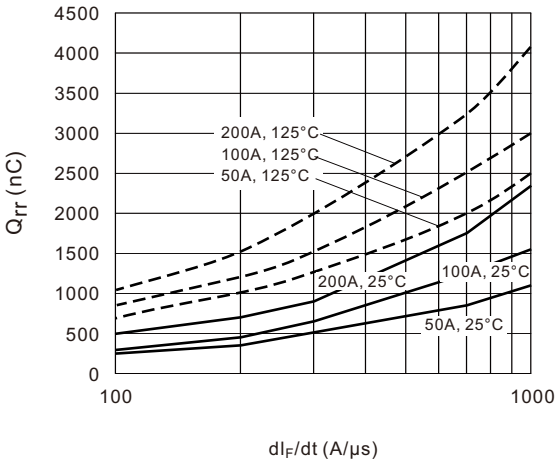


Fig.8 Typical recovery current vs. dI_F/dt

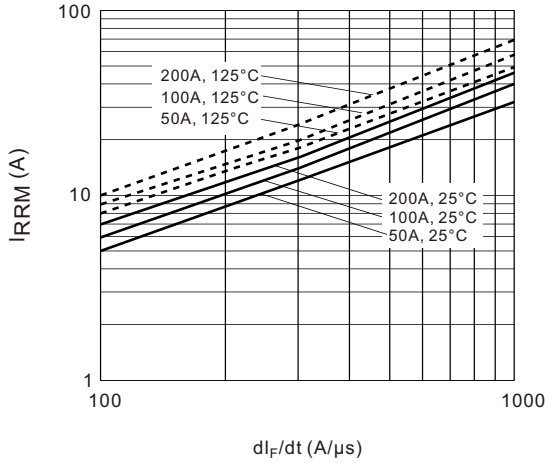


Fig.9 Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

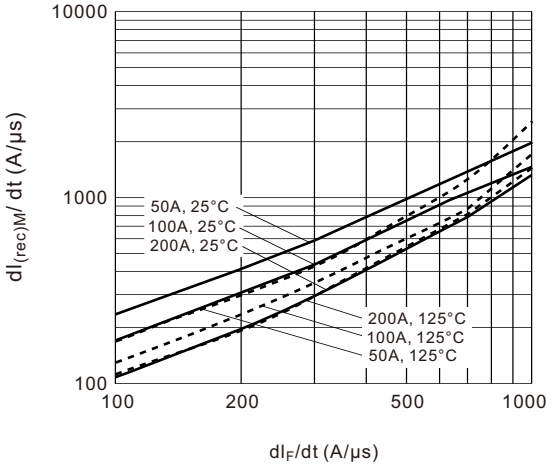


Fig.10 Reverse Recovery Parameter Test Circuit

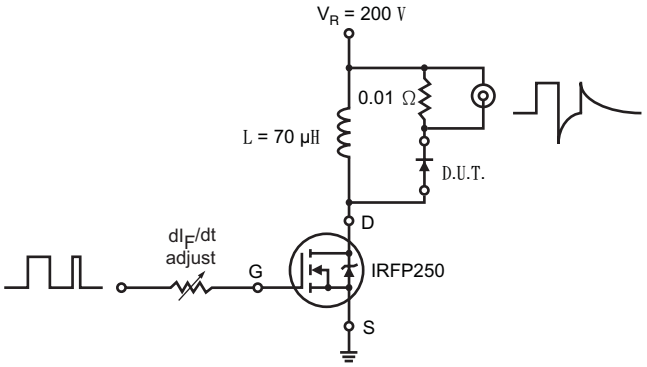
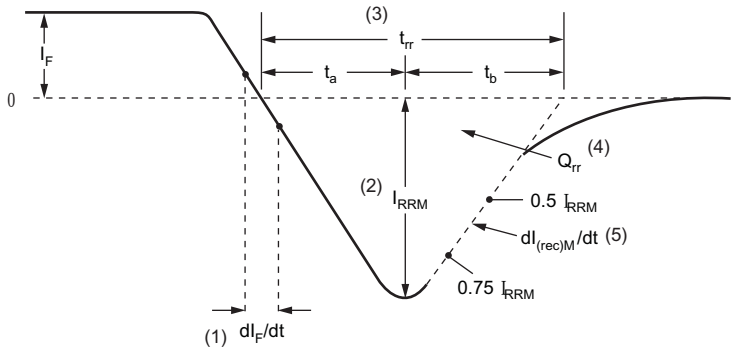


Fig.11 Reverse Recovery Waveform and Definitions



(1) dI_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

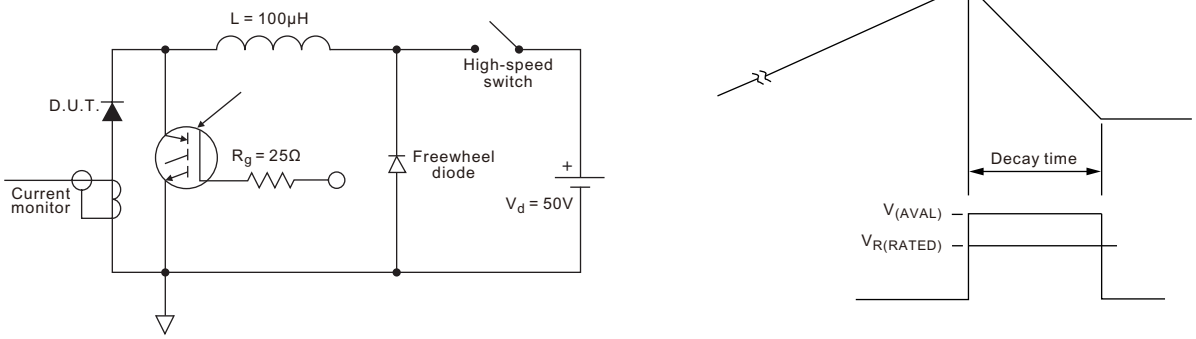
(3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current.

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

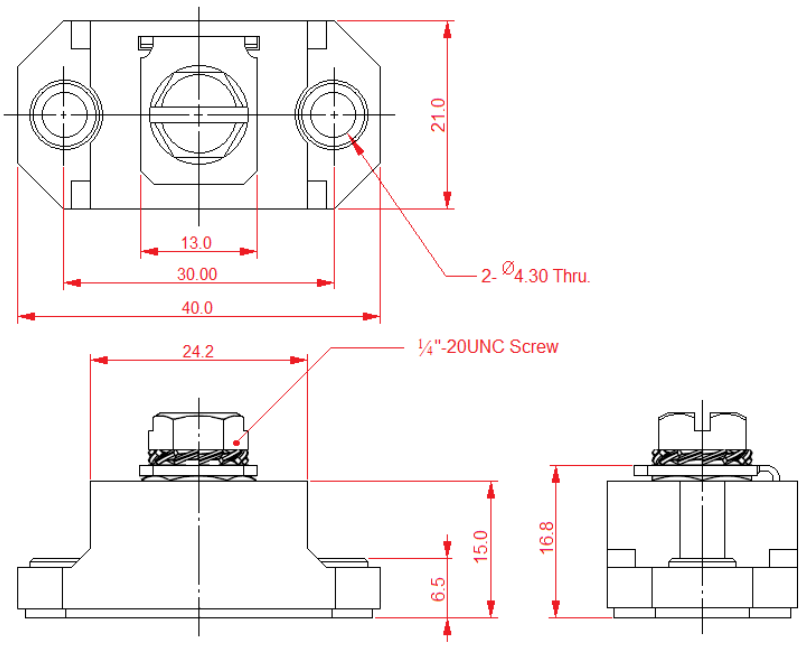
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5) $dI_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig.12 Avalanche test circuit and waveforms



D-67 (Half-Pak)



All dimensions in millimeters