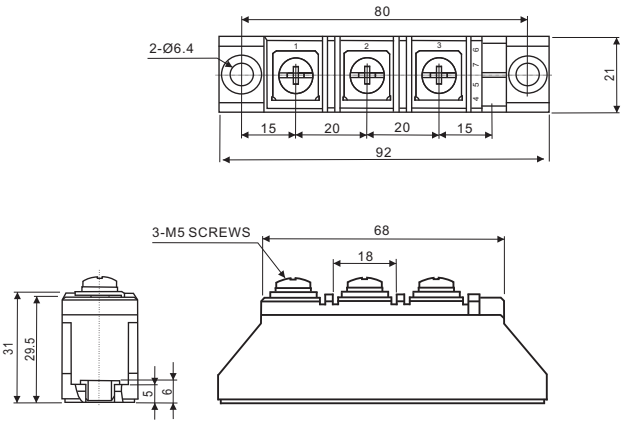
Fast Recovery Diodes, 90A
(ADD-A-PAK Power Modules)

ADD-A-PAK



All dimensions in millimeters

FEATURES

- High voltage
- 3000 V_{RMS} isolating voltage
- Industrial standard package
- UL approved file E320098
- Glass passivated chips
- Low thermal resistance
- Designed and qualified for industrial level
- Compliant to RoHs

BENEFITS

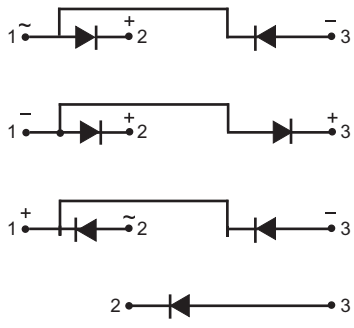
- Excellent thermal performances obtained by the usage of exposed direct bonded copper substrate
- Up to 1600V
- High surge capability
- Easy mounting on heatsink

ELECTRICAL DESCRIPTION (APPLICATIONS)

These modules are intended for general purpose high voltage applications such as high voltage regulated power supplies, inverters, converters, ultrasonic system, free wheeling diodes.

MECHANICAL DESCRIPTION

The new generation of ADD-A-PAK module, combines the excellent thermal performances obtained by the usage of exposed direct bonded copper substrate, with advanced compact simple package solution and simplified internal structure with minimized number of interfaces.



PRODUCT SUMMARY	
$I_{F(AV)}$	90A
Type	Modules-Diode, High Voltage

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNIT
$I_{F(AV)}$	T_C = 100°C	90	A
$I_{F(RMS)}$		141	
I_{FSM}	50 HZ	2300	
	60 HZ	2408	
I^2t	50 HZ	26.45	kA^2s
	60 HZ	24.10	
$I^2\sqrt{t}$		264.5	$kA^2\sqrt{s}$
V_{RRM}	Range	400 to 1600	V
t_{rr}		See recovery characteristics table	ns
T_J		-40 to 150	°C
T_{stg}			

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	V_{RRM}, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM}, MAXIMUM AT T_J = 150°C mA
NKDF90 NKJF90 NKCF90 NKEF90	06	600	700	15
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNIT
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			90	A
					100	°C
Maximum RMS forward current	$I_{F(RMS)}$	DC at 100°C case temperature			141	A
Maximum peak, one-cycle forward, non-reptitive surge current	I_{FSM}	t = 10ms	No voltage reapplied	Sinusoidal half wave, initial T_J = T_J maximum	2300	A
		t = 8.3ms			2408	
		t = 10ms	100%V_{RRM} reapplied		1936	
		t = 8.3ms			2027	
Maximum I^2t for fusing	I^2t	t = 10ms	No voltage reapplied		26.45	kA^2s
		t = 8.3ms			24.10	
		t = 10ms	100%V_{RRM} reapplied		18.74	
		t = 8.3ms			17.05	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			264.5	$kA^2\sqrt{s}$
Maximum value of threshold voltage	$V_{F(TO)2}$	T_J = T_J maximum			1.10	V
Maximum value of forward slope resistance	r_{f2}	T_J = T_J maximum			2.10	mΩ
Maximum forward voltage drop	V_{FM}	I_{FM} =270A, T_J = 25°C, t_p = 400 µs square wave			1.75	V

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	Voltage code		UNIT
			06 to 12	14 to 16	
Typical reverse recovery time	t_{rr}	T_J = 25°C, I_F = 0.5A, I_R = 1.0A, I_{RR} = 250mA (RG#1 CKT)	500	1000	ns
		T_J = 25°C, I_F = 1A to V_R = 30V, $-dI_F/dt$ = 100 A/µs	120	300	
		T_J = 25°C, $-dI_F/dt$ = 25 A/µs, I_{FM} = π x rated $I_{F(AV)}$	500	1000	
Typical reverse recovered charge	Q_{rr}	T_J = 25°C, I_F = 1A to V_R = 30V, $-dI_F/dt$ = 100 A/µs	340	1500	nC
		T_J = 25°C, $-dI_F/dt$ = 25 A/µs, I_{FM} = π x rated $I_{F(AV)}$	1300	7000	

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak reverse leakage current	I_{RRM}	T_J = 150°C	15	mA
Maximum RMS insulation Voltage	V_{INS}	50 Hz	3000 (1 min) 3600 (1 s)	V

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNIT
Junction and storage temperature range	T_J, T_{stg}		-40 to 150	°C
Maximum internal thermal resistance, junction to case per leg	R_{thJC}	DC operation	0.22	°C/W
Typical thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface flat, smooth and greased	0.1	°C/W
Mounting force, ±10% to heatsink, M6		A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound.	4	Nm
Mounting force, ±10% busbar, M5			3	Nm
Approximate weight			115	g
			4.06	oz.
Case style		JEDEC	ADD-A-PAK (TO-240AA)	

ΔR_{thJC} CONDUCTION											
DEVICES	SINE HALF WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
NKDF90/NKJF90 NKCF90/NKEF90	0.057	0.068	0.087	0.12	0.177	0.045	0.073	0.093	0.123	0.178	°C/W

Note
• Table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

Ordering Information Tabel

Device code

NKD	F	90	/	16	A
①	②	③		④	⑤

1 - Module type, NKD/NKJ/NKC for (Diode + Diode) module
NKE for single diode
2 - F for fast recovery type.
3 - Current rating : $I_{F(AV)}$
4 - Voltage code x 100 = V_{RRM}
5 - Assembly type, "A" for soldering type

Fig.1 Current ratings characteristics

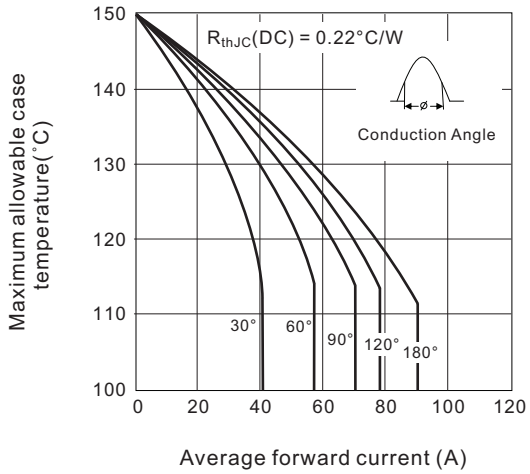


Fig.2 Current ratings characteristics

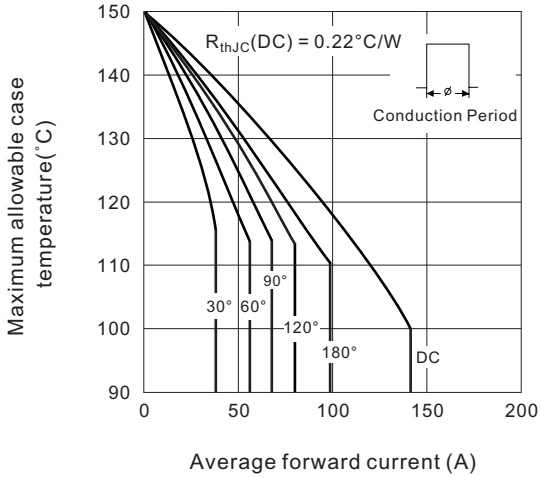


Fig.3 Forward Power Loss characteristics

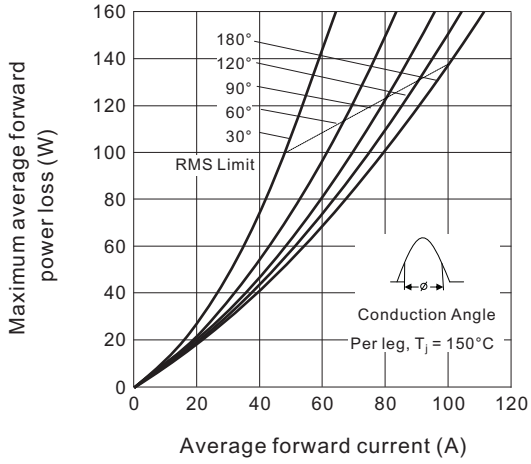


Fig.4 On-state power loss characteristics

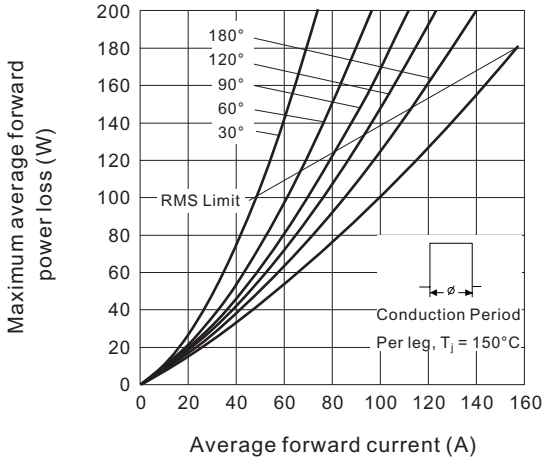


Fig.5 Maximum non-repetitive surge current

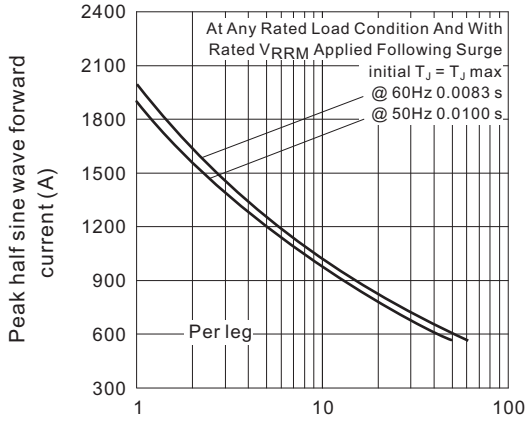


Fig.6 Maximum non-repetitive surge current

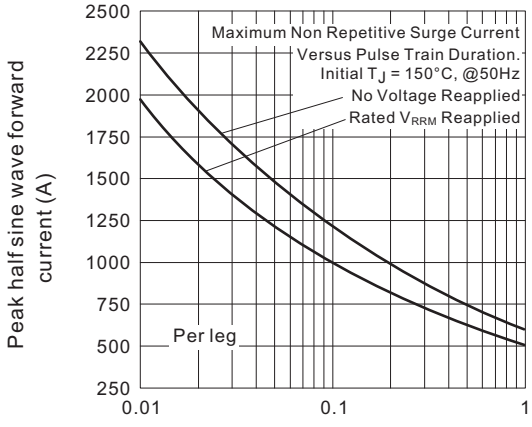


Fig.7 Forward power loss characteristics

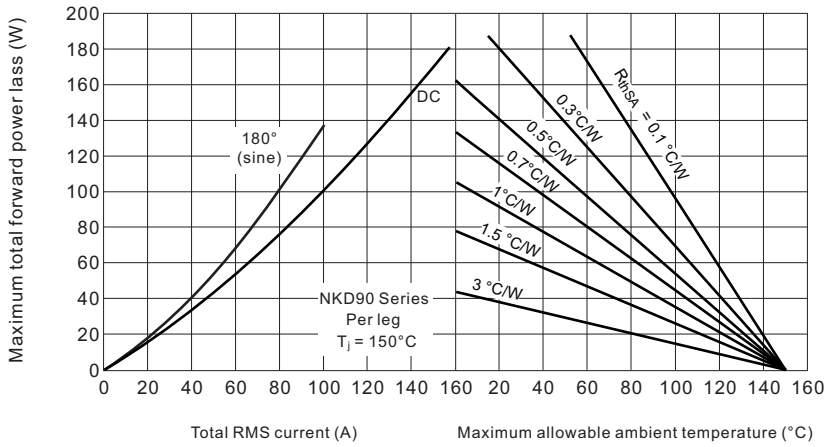


Fig.8 Forward power loss characteristics

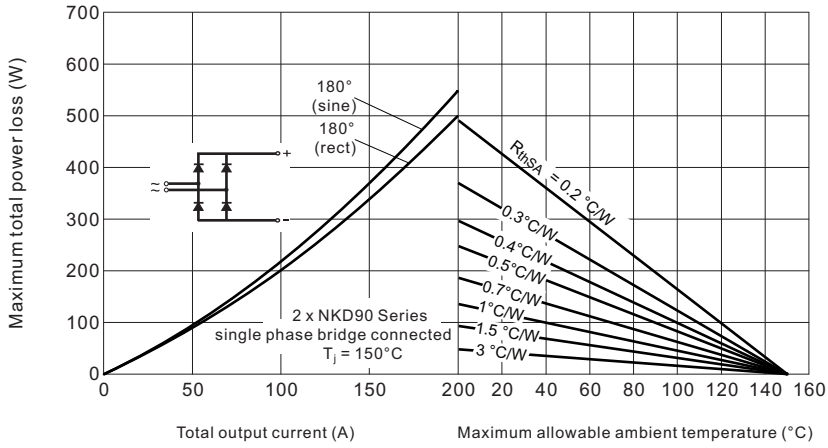


Fig.9 Forward power loss characteristics

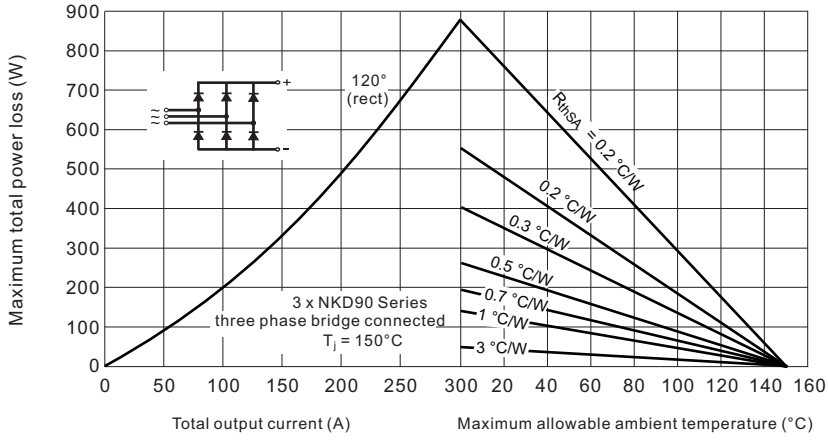


Fig.10 Forward voltage characteristics

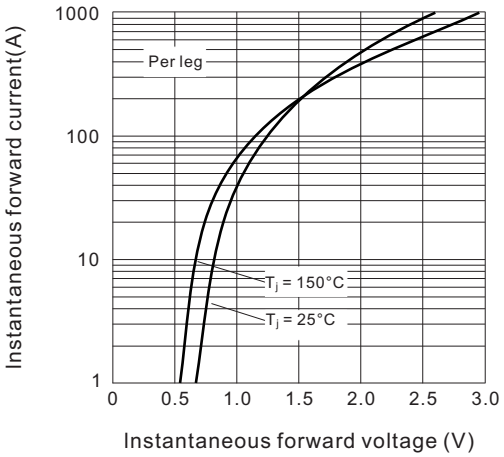


Fig.11 Thermal Impedance Z_{thJC} characteristics

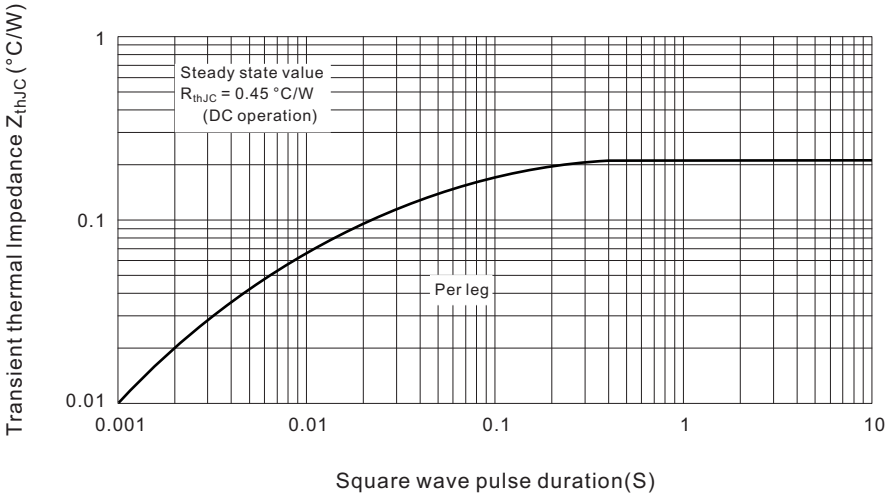


Fig .12 Typical reverse recovery time vs. rate of fall of forward current.

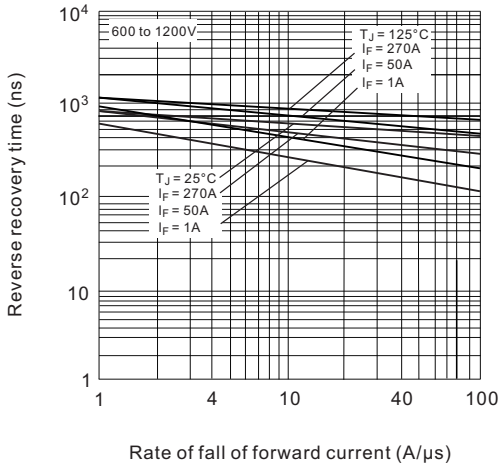


Fig .13 Typical recovered charge vs. rate of fall of forward current.

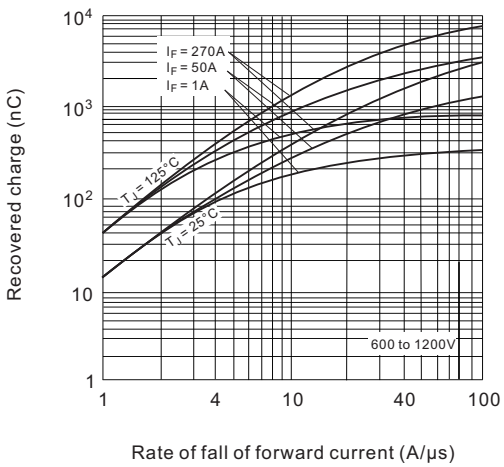


Fig .14 Typical reverse recovery time vs. rate of fall of forward current.

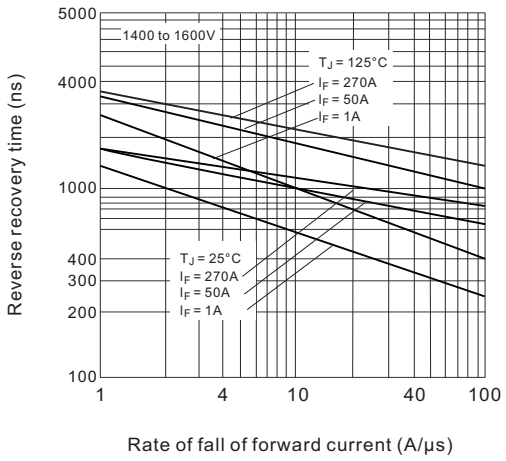


Fig .15 Typical recovered charge vs. rate of fall of forward current.