

## Standard Recovery Diodes, 110A (ADD-A-PAK Power Modules)



ADD-A-PAK

### FEATURES

- High voltage
- 3000 V<sub>RMS</sub> isolating voltage
- Industrial standard package
- UL approved file E320098
- Glass passivated chips
- Low thermal resistance
- Designed and qualified for industrial level
- Compliant to RoHs



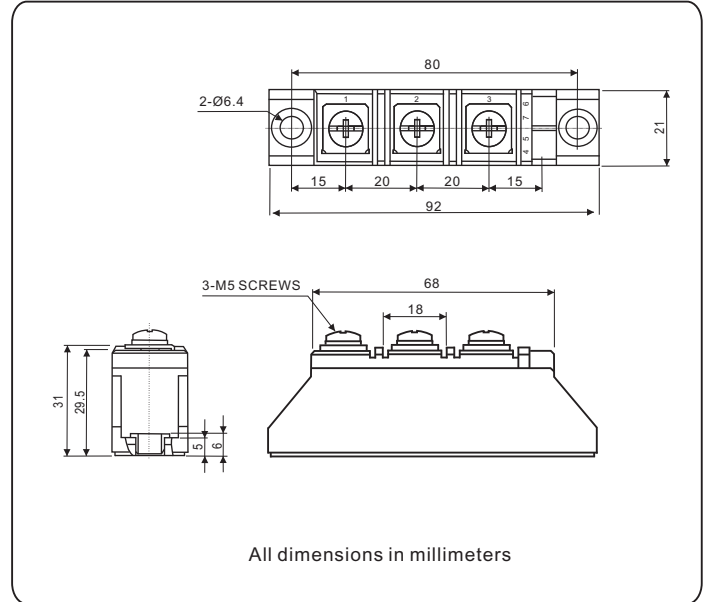
### BENEFITS

- 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)

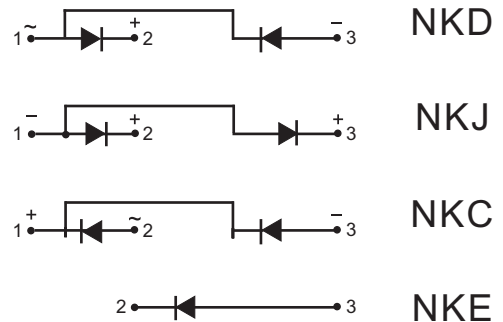
These modules are intended for general purpose high voltage applications such as high voltage regulated power supplies, lighting circuits, temperature and motor speed control circuits, UPS and battery charger.

PRODUCT SUMMARY	
I <sub>F(AV)</sub>	110A
Type	Modules-Diode, High Voltage



### 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.



MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNIT
I <sub>F(AV)</sub>	T <sub>C</sub> = 100°C	110	A
I <sub>F(RMS)</sub>		173	
I <sub>FSM</sub>	50 HZ	2600	
	60 HZ	2722	
I <sup>2</sup> t	50 HZ	33.8	kA <sup>2</sup> s
	60 HZ	30.7	
I <sup>2</sup> √t		338	kA <sup>2</sup> √s
V <sub>R</sub> RM	Range	400 to 1600	V
t <sub>J</sub>		-40 to 150	°C
T <sub>stg</sub>			

**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 $T_J = 150^\circ\text{C}$ mA
NKD110..A NKJ110..A NKC110..A NKE110..A	04	400	500	8
	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		110	A
				100	°C
Maximum RMS forward current	$I_{F(RMS)}$	DC at 100°C case temperature		173	A
Maximum peak, one-cycle forward, non-reptitive surge current	$I_{FSM}$	t = 10ms	No voltage reapplied	2600	A
		t = 8.3ms		2722	
		t = 10ms	100% $V_{RRM}$ reapplied	2189	
		t = 8.3ms		2291	
Maximum $I^2t$ for fusing	$I^2t$	t = 10ms	No voltage reapplied	33.8	kA <sup>2</sup> s
		t = 8.3ms		30.7	
		t = 10ms	100% $V_{RRM}$ reapplied	23.9	
		t = 8.3ms		21.8	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied		338	kA <sup>2</sup> √s
Low level value of threshold voltage	$V_{F(TO)1}$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		0.78	V
High level value of threshold voltage	$V_{F(TO)2}$	$(I > \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		0.92	
Low level value of forward slope resistance	$r_{f1}$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		2.0	mΩ
High level value of forward slope resistance	$r_{f2}$	$(I > \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		1.65	
Maximum forward voltage drop	$V_{FM}$	$I_{FM} = 330\text{A}$ , $T_J = 25^\circ\text{C}$ , $t_p = 400 \mu\text{s}$ square wave		1.35	V

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse leakage current	$I_{RRM}$	$T_J = 150^\circ\text{C}$		8	mA
Maximum RMS insulation Voltage	$V_{INS}$	50 Hz		3000 (1 min) 3600 (1 s)	V

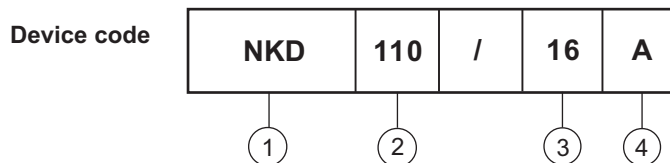
THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNIT
Junction and storage temperature range	$T_J, T_{stg}$		-40 to 150	°C
Maximum internal thermal resistance, junction to case per leg	$R_{thJC}$	DC operation	0.18	°C/W
Typical thermal resistance, case to heatsink per module	$R_{thCS}$	Mounting surface flat, smooth and greased	0.1	
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
	busbar, M5		3	
Approximate weight			115	g
			4.06	oz.
Case style		JEDEC	ADD-A-PAK (TO-240AA)	

$\Delta R_{thJC}$ CONDUCTION											
DEVICES	SINE HALF WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
NKD110/NKJ110 NKC110/NKE110	0.039	0.048	0.061	0.085	0.152	0.030	0.062	0.080	0.106	0.152	°C/W

**Note**

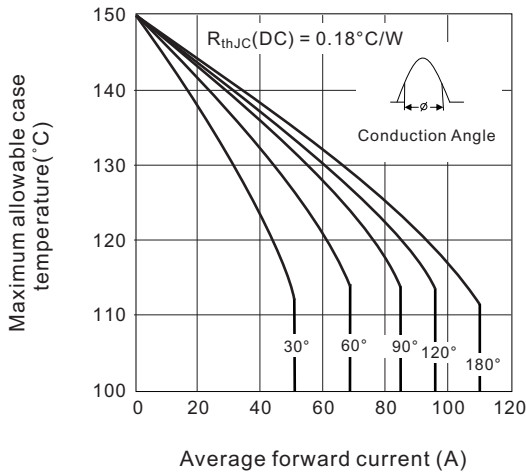
- Table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

### Ordering Information Tabel

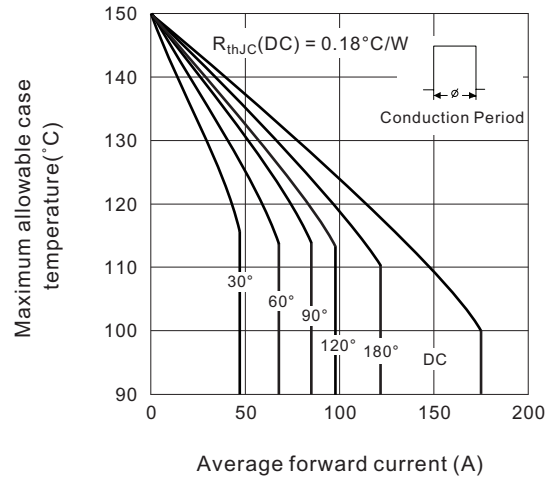


- 1 - Module type, NKD, NKJ, NKC for ( Diode + Diode ) module  
NKE for single diode
- 2 - Current rating :  $I_{F(AV)}$
- 3 - Voltage code x 100 =  $V_{RRM}$
- 4 - Assembly type, "A" for soldering type

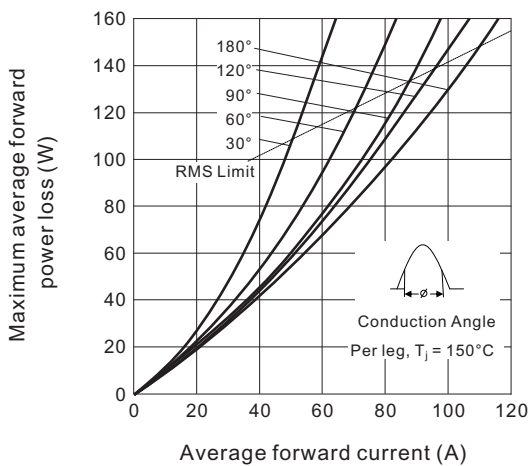
**Fig.1 Current ratings characteristics**



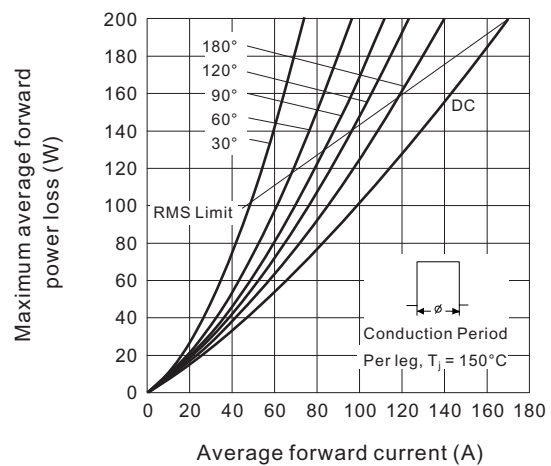
**Fig.2 Current ratings characteristics**



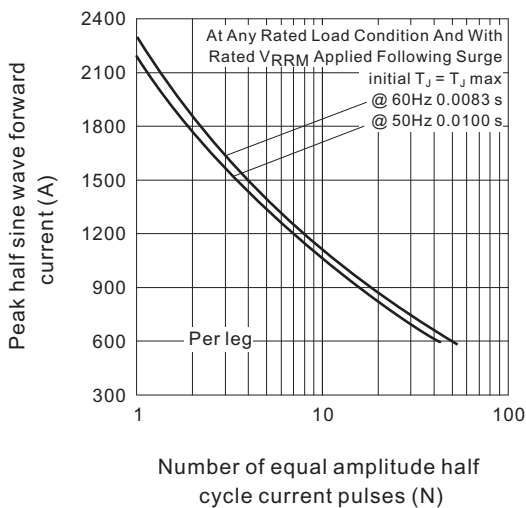
**Fig.3 Forward Power Loss characteristics**



**Fig.4 On-state power loss characteristics**



**Fig.5 Maximum non-repetitive surge current**



**Fig.6 Maximum non-repetitive surge current**

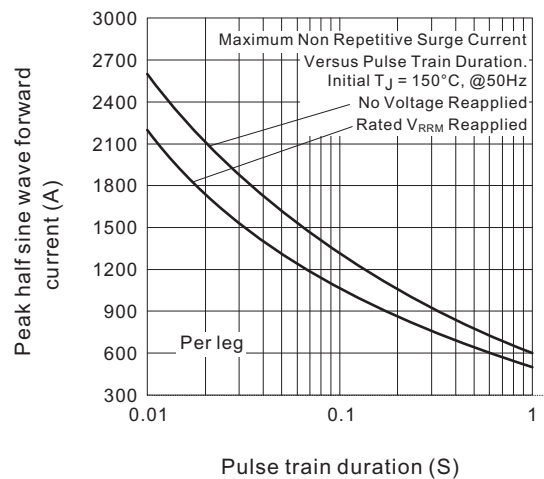


Fig.7 Forward power loss characteristics

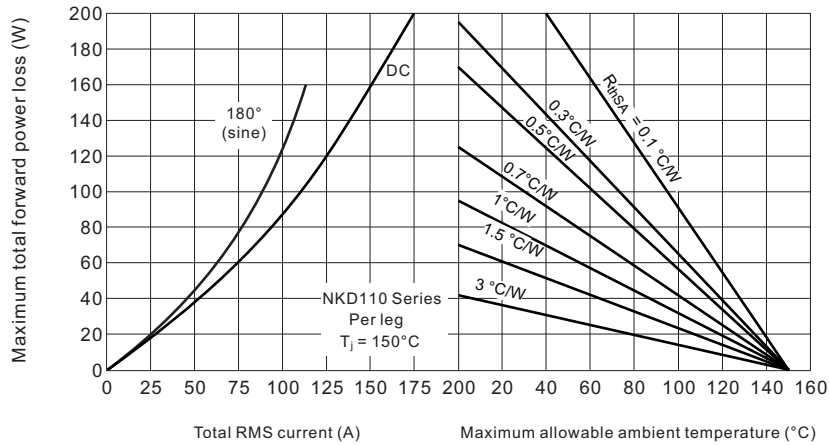


Fig.8 Forward power loss characteristics

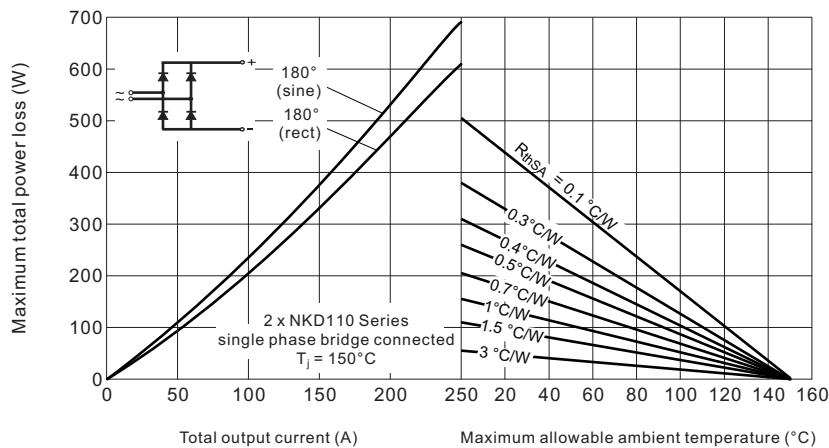
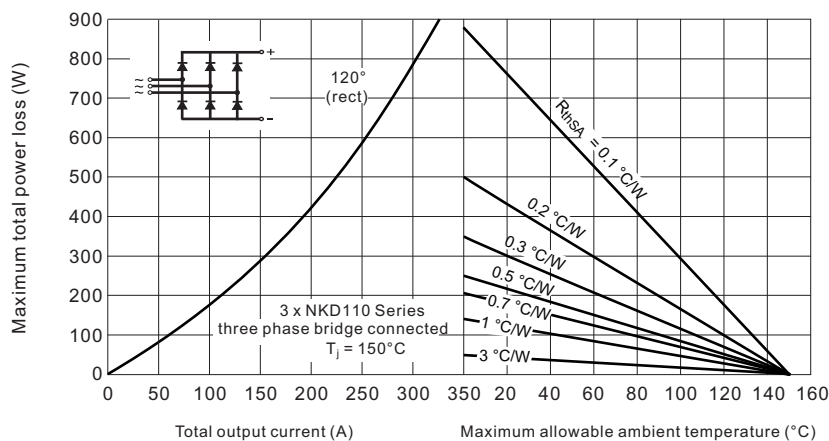
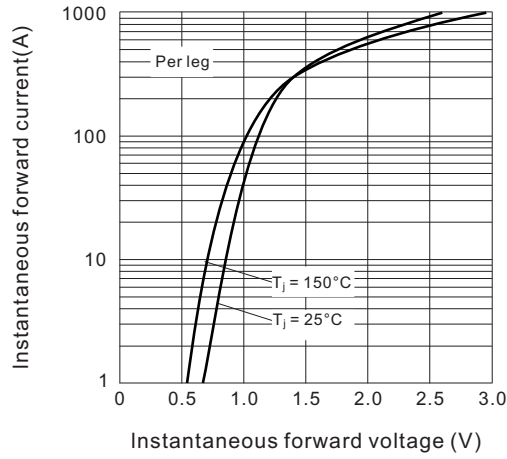


Fig.9 Forward power loss characteristics



**Fig.10 Forward voltage characteristics**



**Fig.11 Thermal Impedance  $Z_{thJC}$  characteristics**

