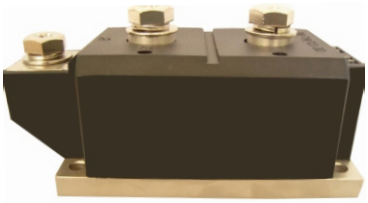
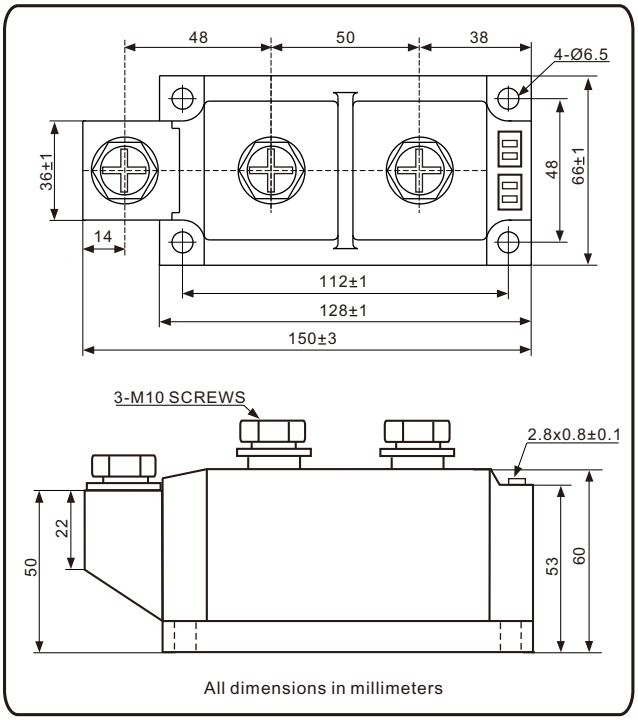
Thyristor/Diode and Thyristor/Thyristor, 600A
(SUPER MAGN-A-PAK Power Modules)



SUPER MAGN-A-PAK



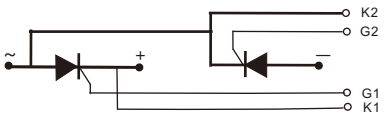
FEATURES

- High voltage
- Electrically isolated by DBC ceramic (Al_2O_3)
- 3500 V_{RMS} isolating voltage
- Industrial standard package
- High surge capability
- Modules uses high voltage power thyristor/diodes in two basic configurations
- Simple mounting
- UL approved file E320098
- Compliant to RoHS
- Designed and qualified for multiple level

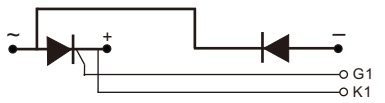
RoHS COMPLIANT

APPLICATIONS

- DC motor control and drives
- Battery charges
- Welders
- Power converters
- Lighting control
- Heat and temperature control
- Ups



NKT



NKH

PRODUCT SUMMARY	
$I_{T(AV)}$	600 A

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUE	UNITS
$I_{T(AV)}$	85 °C	600	A
$I_{T(RMS)}$	85 °C	942	A
I_{TSM}	50 Hz	18000	A
	60 Hz	18900	A
I^2t	50 Hz	1620	kA^2s
	60 Hz	1478	kA^2s
$I^2\sqrt{t}$		16200	$kA^2\sqrt{s}$
V_{DRM} / V_{RRM}	Range	400 to 1600	V
T_J	Range	-40 to 125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	V_{RRM}/V_{DRM}, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM}/V_{DSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM}/I_{DRM} AT 125 °C mA
NKT600 NKH600	04	400	500	50
	08	800	900	
	10	1000	1100	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at case temperature	$I_{T(AV)}$	180° conduction, half sine wave ,50Hz			600	A
					85	°C
Maximum RMS on-state current	$I_{T(RMS)}$	180° conduction, half sine wave ,50Hz ,T_C = 85°C			942	A
Maximum peak, one-cycle, on-state non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Sine half wave, initial T_J = T_J maximum	18000	
		t = 8.3 ms			18900	
Maximum I^2t for fusing	I^2t	t = 10 ms			1620	kA^2s
		t = 8.3 ms			1478	
		t = 10 ms	100%V_{RRM} reapplied		1134	
		t = 8.3 ms			1033	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			16200	$kA^2\sqrt{s}$
Maximum on-state voltage drop	V_{TM}	I_{TM}= 1800A, T_J = 25 °C, 180° conduction			1.9	V
Maximum forward voltage drop	V_{FM}	I_{FM} = 1800A, T_J = 25 °C, 180° conduction			1.6	
Maximum holding current	I_H	Anode supply = 12 V initial I_T = 30 A, T_J = 25 °C			300	mA
Maximum latching current	I_L	Anode supply = 12 V resistive load = 1 Ω Gate pulse: 10 V, 100 µs, T_J = 25 °C			500	

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical delay time	t_d	T_J = 25°C, gate current = 1A, dI_g/dt= 1 A/µs V_d = 0.67 V_{DRM}	2.0	µs
Typical rise time	t_r		4.0	
Typical turn-off time	t_q	I_{TM} = 750A, dI/dt = -60 A/µs, T_J = T_J maximum V_R = 50V, dV/dt = 20 V/dt, gate 0V, 100Ω	200	

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak reverse and off-state leakage current	I_{RRM}, I_{DRM}	T_J = 125°C	50	mA
RMS isolation Voltage	V_{ISO}	50 Hz, circuit to base, all terminals shorted, 25°C, 1s	3500	V
Critical rate of rise of off-state voltage	dV/dt	T_J = T_J maximum, linear to V_D = 80% V_{DRM}	1000	V/µs

TRIGGERING					
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**VALUES**	**UNITS**
Maximum peak gate power	P_{GM}	$t_p \leq 5$ ms, $T_J = T_J$ maximum		10	W
Maximum average gate power	$P_{G(AV)}$	f = 50 Hz, $T_J = T_J$ maximum		3	
Maximum peak gate current	I_{GM}	$t_p \leq 5$ ms, $T_J = T_J$ maximum		3	A
Maximum peak positive gate voltage	$+V_{GM}$			20	V
Maximum peak negative gate voltage	$-V_{GM}$			5.0	
Maximum required DC gate voltage to trigger	V_{GT}	T_J = 25 °C	Anode supply = 12 V, resistive load; R_a = 1 Ω	2	
Maximum required DC gate current to trigger	I_{GT}			200	mA
Maximum gate voltage that will not trigger	V_{GD}	$T_J = T_J$ maximum, 67% V_{DRM} applied		0.25	V
Maximum gate current that will not trigger	I_{GD}			10	mA
Maximum rate of rise of turned-on current	dI/dt	$T_J = T_J$ maximum, I_{TM} = 400A rated V_{DRM} applied		1000	A/µs

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
junction operating and storage temperature range	T_J, T_{stg}		- 40 to 125	°C
Maximum thermal resistance, junction to case per junction	R_{thJC}	DC operation	0.06	°C/W
Typical thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface, smooth , flat and greased	0.010	
Mounting torque ± 10 % — SMAP to heatsink , M6		A mounting compound is recommended and the torque should be rechecked after a period of about 3 hours to allow for the spread of the compound.	6 to 8	N.m
Mounting torque ± 10 % — busbar to SMAP , M10			12 to 15	
Approximate weight			1800	g
			63.5	oz.
Case style			SUPER MAGN-A-PAK	

ORDERING INFORMATION TABLE

Device code

NKT	600	/	16
①	②		③

1 - Module type: NKT for (Thyristor + Thyristor) module
NKH for (Thyristor + Diode) module

2 - Current rating: $I_{T(AV)}$

3 - Voltage code x 100 = V_{RRM}

Fig.1 On-state current vs. voltage characteristics

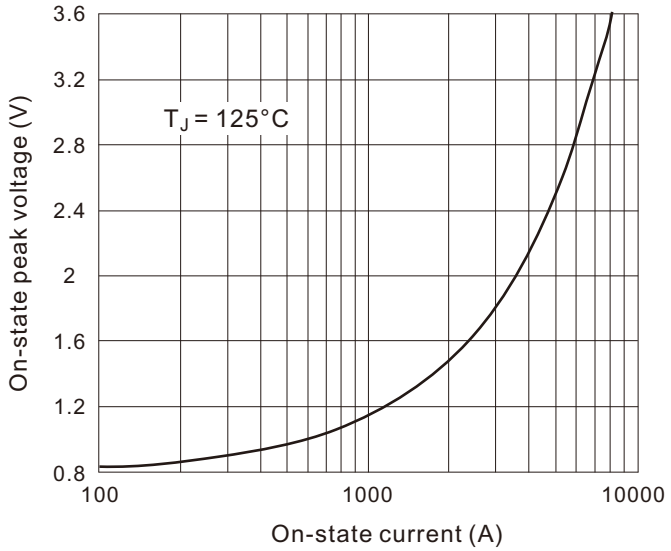


Fig.2 Transient thermal impedance(junction-case)

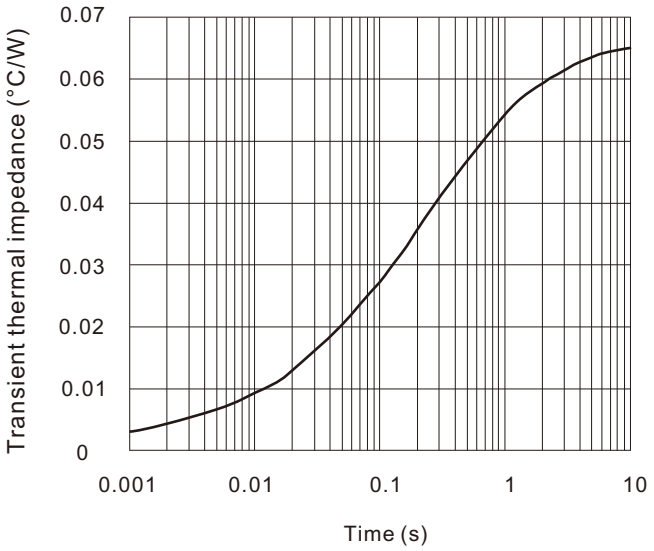


Fig.3 Power consumption vs. average current

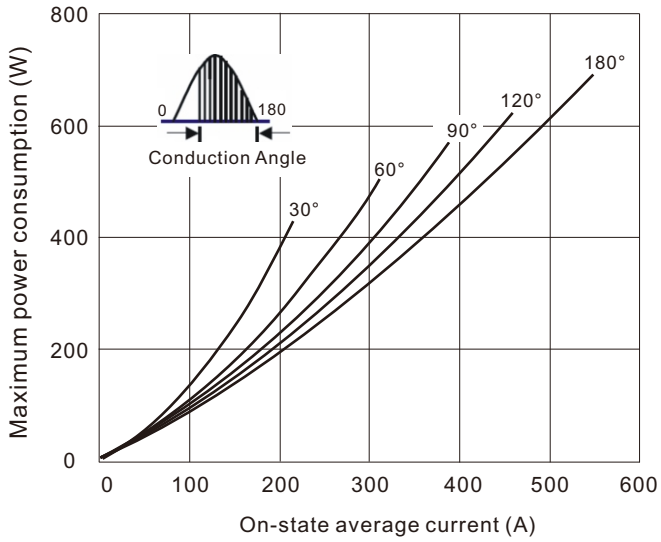


Fig.4 Case temperature vs. on-state average current

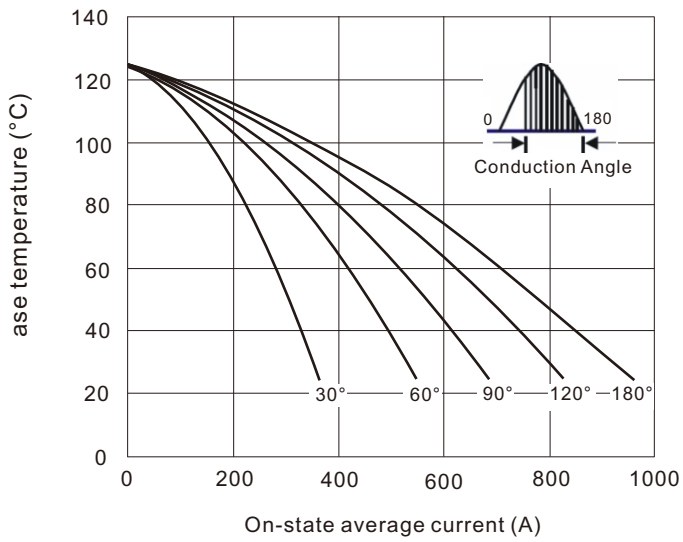


Fig.5 On-state surge current vs cycles

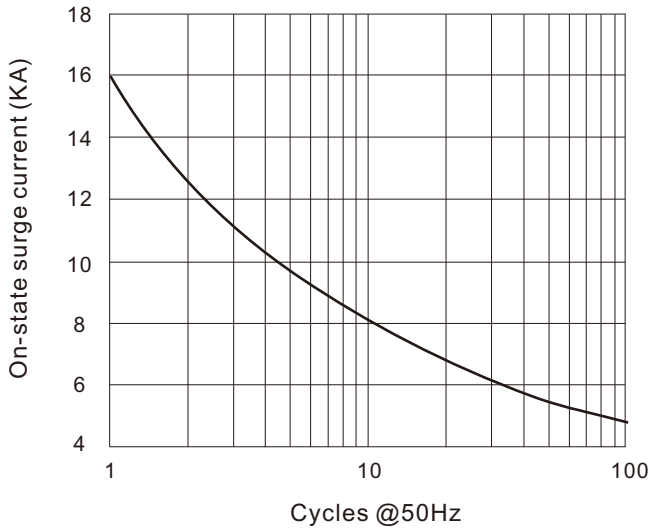


Fig.6 I^2t characteristics