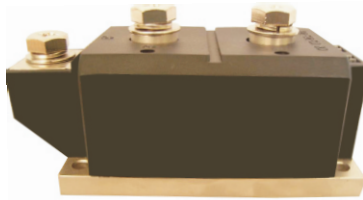


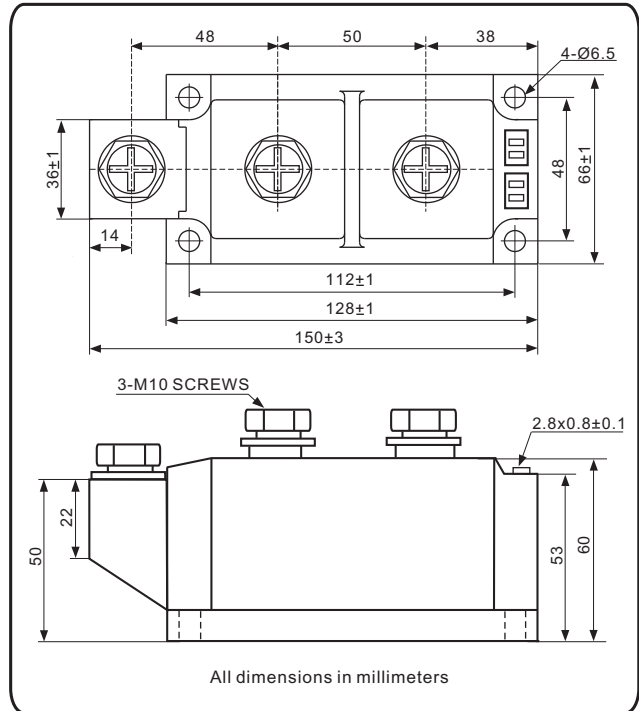
### Thyristor/Diode and Thyristor/Thyristor, 500A (SUPER MAGN-A-PAK Power Modules)



SUPER MAGN-A-PAK

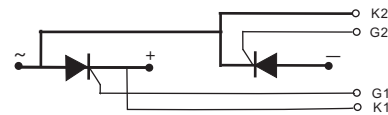
#### FEATURES

- High voltage
- Electrically isolated by DBC ceramic ( $Al_2O_3$ )
- 3500  $V_{RMS}$  isolating voltage
- Industrial standard package
- High surge capability
- Glass passivated chips
- 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

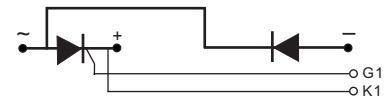


#### APPLICATIONS

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



NKT



NKH

#### PRODUCT SUMMARY

$I_{T(AV)}$	500 A
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#### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	85 °C	500	A
$I_{T(RMS)}$	85 °C	785	A
$I_{TSM}$	50 Hz	16000	
	60 Hz	16800	
$I^2t$	50 Hz	1280	$kA^2s$
	60 Hz	1167	
$I^2\sqrt{t}$		12800	$kA^2\sqrt{s}$
$V_{DRM}/V_{RRM}$	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
NKT500 NKH500	04	400	500	40
	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		500	A			
				85	°C			
Maximum RMS on-state current	$I_{T(RMS)}$	180° conduction, half sine wave ,50Hz , $T_C = 85^\circ\text{C}$		785				
Maximum peak, one-cycle, on-state non-repetitive surge current	$I_{TSM}$	t = 10 ms	No voltage reappplied	Sine half wave, initial $T_J = T_J$ maximum	16000	A		
		t = 8.3 ms			16800			
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms			100% $V_{RRM}$ reappplied		1280	kA <sup>2</sup> s
		t = 8.3 ms					1167	
		t = 10 ms	896					
		t = 8.3 ms	818					
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reappplied		12800	kA <sup>2</sup> $\sqrt{s}$			
Maximum on-state voltage drop	$V_{TM}$	$I_{TM} = 1500\text{A}$ , $T_J = 25^\circ\text{C}$ , 180° conduction		1.7	V			
Maximum forward voltage drop	$V_{FM}$	$I_{FM} = 1500\text{A}$ , $T_J = 25^\circ\text{C}$ , 180° conduction		1.4				
Maximum holding current	$I_H$	Anode supply = 12 V initial $I_T = 30\text{A}$ , $T_J = 25^\circ\text{C}$		300	mA			
Maximum latching current	$I_L$	Anode supply = 12 V resistive load = 1 $\Omega$ Gate pulse: 10 V, 100 $\mu\text{s}$ , $T_J = 25^\circ\text{C}$		500				

SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Typical delay time	$t_d$	$T_J = 25^\circ\text{C}$ ,gate current = 1A $dI_g/dt = 1\text{A}/\mu\text{s}$		1	$\mu\text{s}$
Typical rise time	$t_r$	$V_d = 0.67\% V_{DRM}$		2	
Typical turn-off time	$t_q$	$I_{TM} = 300\text{A}$ ; $dI/dt = 15\text{A}/\mu\text{s}$ ; $T_J = T_J$ maximum, $V_R = 50\text{V}$ ; $dV/dt = 20\text{V}/\mu\text{s}$ ; gate 0V ,100 $\Omega$		50 to 150	

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current	$I_{RRM}, I_{DRM}$	$T_J = 125\text{ }^\circ\text{C}$		40	mA
RMS isolation Voltage	$V_{ISO}$	50 Hz, circuit to base, all terminals shorted, $25\text{ }^\circ\text{C}$ , 1s		3500	V
Critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, exponential to 67 % rated $V_{DRM}$		500	V/ $\mu\text{s}$

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	$P_{GM}$	$t_p \leq 5\text{ ms}$ , $T_J = T_J$ maximum		15	W
Maximum average gate power	$P_{G(AV)}$	$f = 50\text{ Hz}$ , $T_J = T_J$ maximum		5	
Maximum peak gate current	$I_{GM}$	$t_p \leq 5\text{ ms}$ , $T_J = T_J$ maximum		3	A
Maximum peak negative gate voltage	$-V_{GT}$			10	V
Maximum required DC gate voltage to trigger	$V_{GT}$	$T_J = 25\text{ }^\circ\text{C}$	Anode supply = 12 V, resistive load; $R_a = 1\text{ }\Omega$	2	mA
Maximum required DC gate current to trigger	$I_{GT}$			200	
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	$T_J = 25\text{ }^\circ\text{C}$ , $I_{GM} = 1.5\text{ A}$ , $t_r \leq 0.5\text{ }\mu\text{s}$		150	A/ $\mu\text{s}$

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
junction operating and storage temperature range	$T_J, T_{stg}$			- 40 to 125	$^\circ\text{C}$
Maximum thermal resistance, junction to case per junction	$R_{thJC}$	DC operation		0.065	$^\circ\text{C/W}$
Typical thermal resistance, case to heatsink per module	$R_{thCS}$	Mounting surface, smooth, flat and greased		0.01	
Mounting torque $\pm 10\%$	IAP to heatsink, M6 busbar to IAP, M10	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.		4	N.m
				12	
Approximate weight				1800	g
				63.5	oz.
Case style				SUPER MAGN-A-PAK	

Fig.1 On-state current vs. voltage characteristics

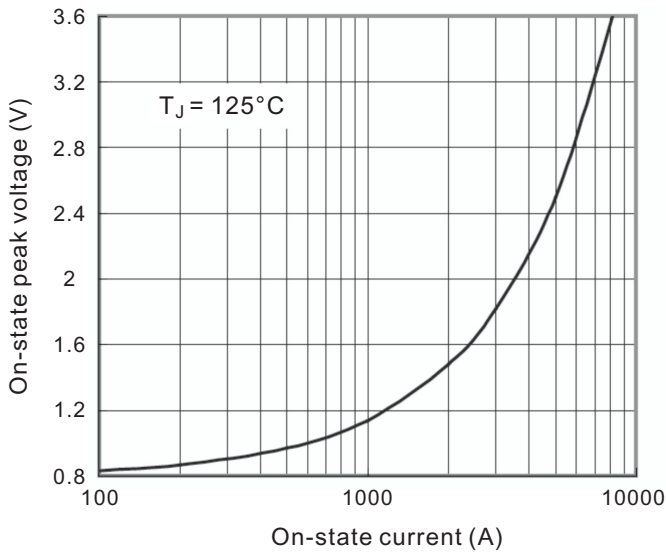


Fig.2 Transient thermal impedance(junction-case)

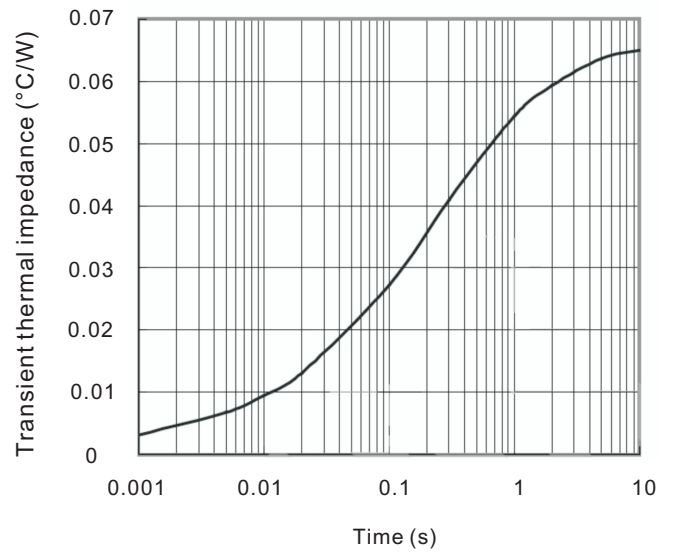


Fig.3 Power consumption vs. average current

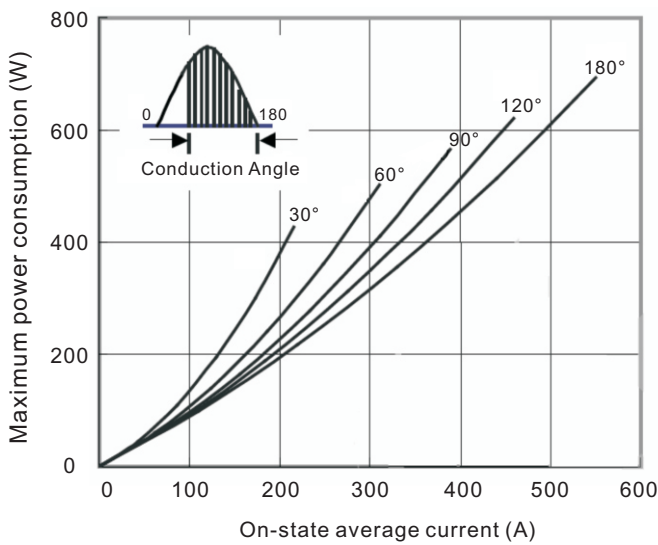


Fig.4 Case temperature vs. on-state average current

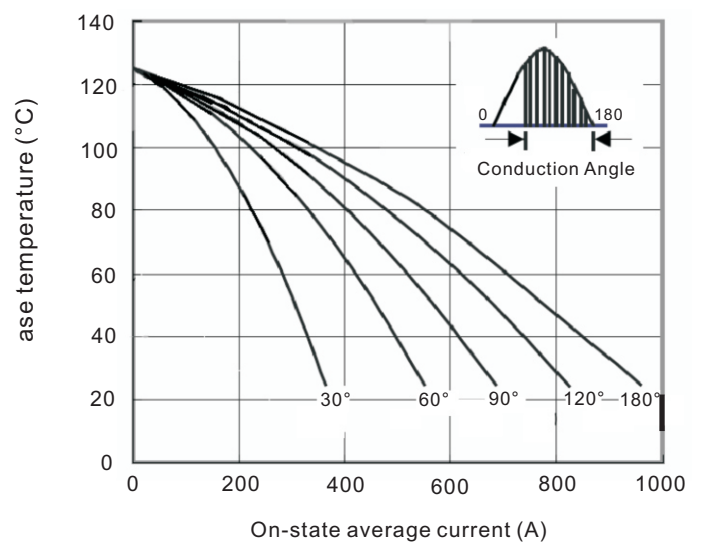


Fig.5 On-state surge current vs cycles

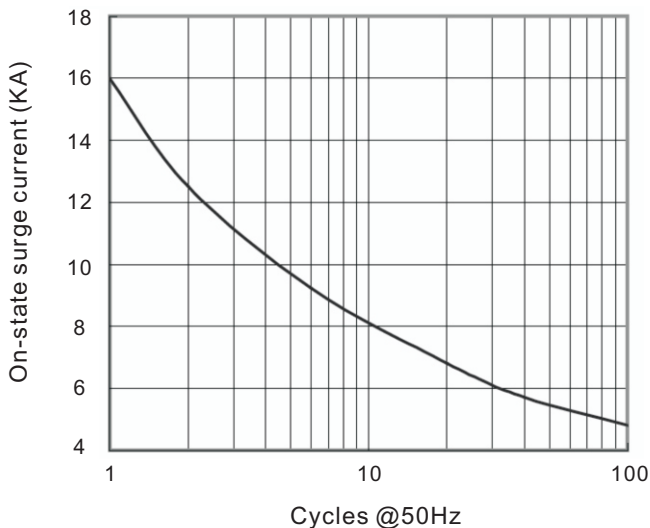


Fig.6  $I^2t$  characteristics

