

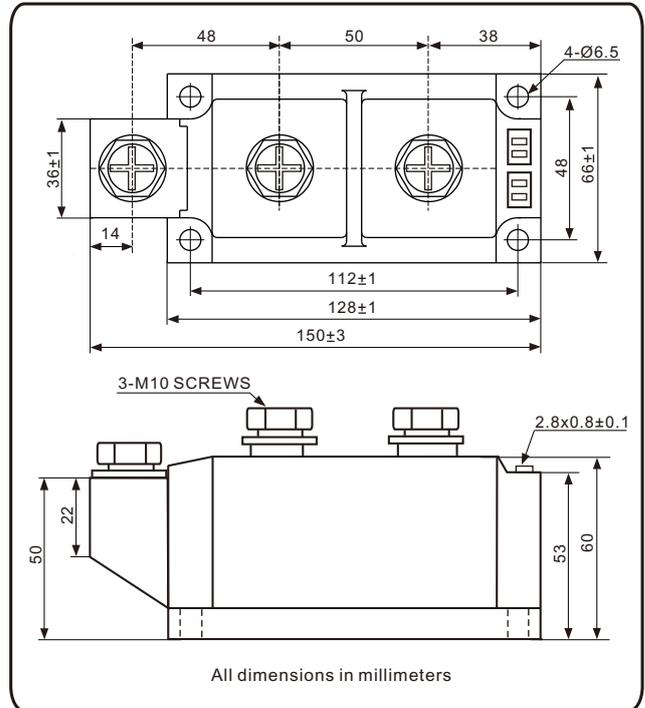
## Thyristor/Diode and Thyristor/Thyristor, 500A (SUPER MAGN-A-PAK Power Modules)



**SUPER MAGN-A-PAK**

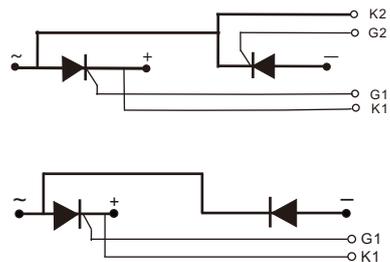
### FEATURES

- High voltage
- Electrically isolated by DBC ceramic ( $Al_2O_3$ )
- 3500 V<sub>RMS</sub> 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



### 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

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUE	UNITS
$I_{T(AV)}$	85 °C	500	A
$I_{T(RMS)}$	85 °C	785	A
$I_{TSM}$	50 Hz	16000	
	60 Hz	16800	
$i^2_t$	50 Hz	1280	kA <sup>2</sup> s
	60 Hz	1167	
$i^2_{\sqrt{t}}$		12800	kA <sup>2</sup> /√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	A
		t = 8.3 ms			
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	100% $V_{RRM}$ reappplied		kA <sup>2</sup> s
		t = 8.3 ms			
		t = 10 ms			
		t = 8.3 ms			
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> √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 Ω Gate pulse: 10 V, 100 μs, $T_J = 25^\circ\text{C}$		500	

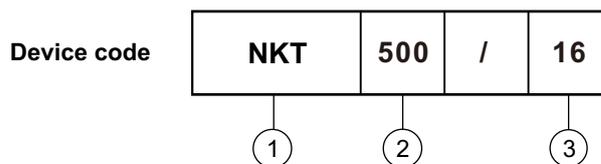
SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Typical delay time	$t_d$	$T_J = 25^\circ\text{C}$ ,gate current = 1A, $dI_g/dt = 1\text{A}/\mu\text{s}$		2	μs
Typical rise time	$t_r$	$V_d = 0.67 V_{DRM}$		4	
Typical tum-off time	$t_q$	$I_{TM} = 750\text{A}$ ; $dI/dt = -60\text{A}/\mu\text{s}$ ; $T_J = T_J$ maximum, $V_R = 50\text{V}$ ; $dV/dt = 20\text{V}/\mu\text{s}$ ; gate 0V ,100Ω		200	

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current	$I_{RRM}$ , $I_{DRM}$	$T_J = 125^\circ\text{C}$		40	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	$P_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		10	W
Maximum average gate power	$P_{G(AV)}$	$f = 50 \text{ Hz}$ , $T_J = T_J \text{ maximum}$		3	
Maximum peak gate current	$I_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		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	$V_{GT}$	$T_J = 25 \text{ }^\circ\text{C}$	Anode supply = 12 V, resistive load; $R_a = 1 \Omega$	2	
Maximum required DC gate current to trigger	$I_{GT}$			200	mA
Maximum gate voltage that will not trigger	$V_{GD}$	$T_J = T_J \text{ maximum}$ , 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	$di/dt$	$T_J = T_J \text{ maximum}$ , $I_{TM} = 400\text{A}$ rated $V_{DRM}$ applied		1000	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 $\pm 10 \%$ SMAP to heatsink , M6 busbar to SMAP , 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.		6 to 8	N.m
				12 to 15	
Approximate weight				1800	g
				63.5	oz.
Case style				SUPER MAGN-A-PAK	

### ORDERING INFORMATION TABLE



- 1 - Module type: NKT for (Thyristor + Thyristor) module  
NKH for (Thyristor + Diode) module
- 2 - Current rating:  $I_{T(AV)}$
- 3 - Voltage code x 100 =  $V_{RRM}$

## Nell High Power Products

Fig.1 On-state current vs. voltage characteristics

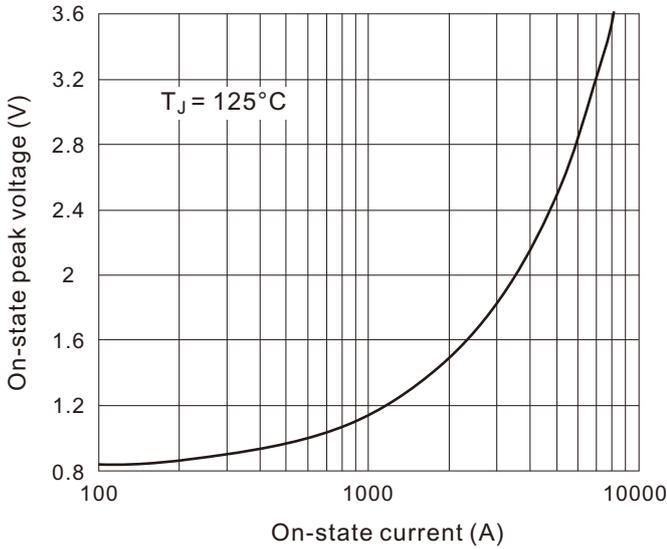


Fig.2 Transient thermal impedance(junction-case)

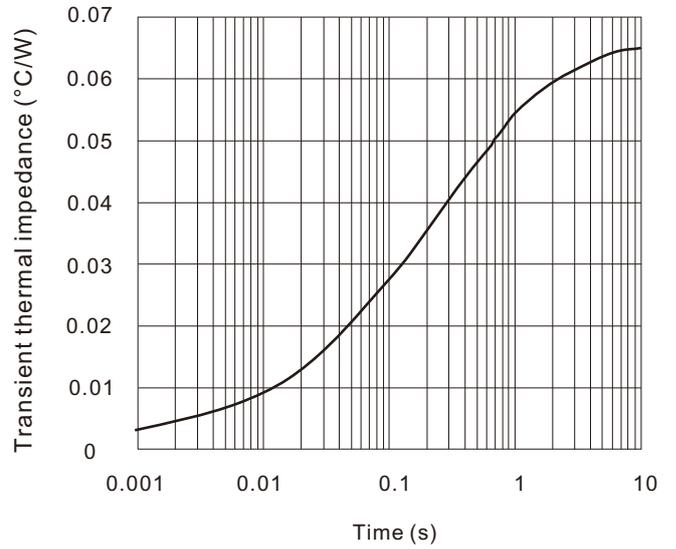


Fig.3 Power consumption vs. average current

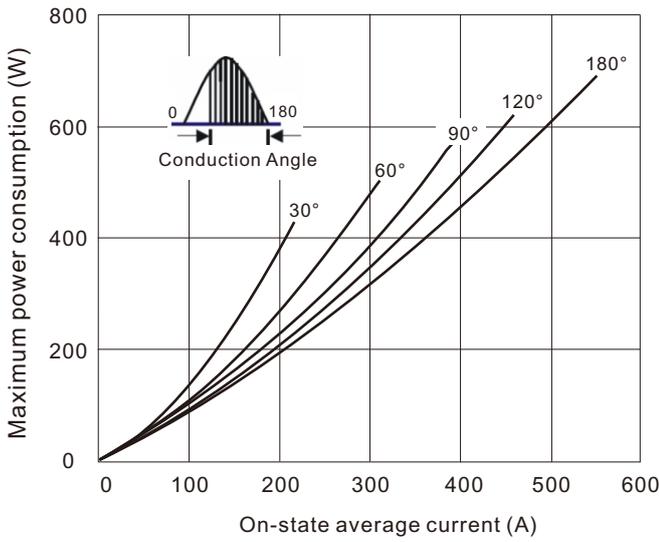


Fig.4 Case temperature vs. on-state average current

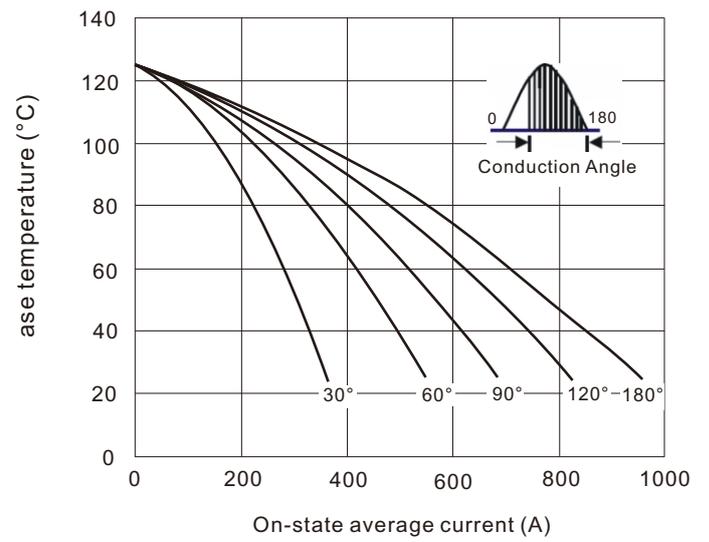


Fig.5 On-state surge current vs cycles

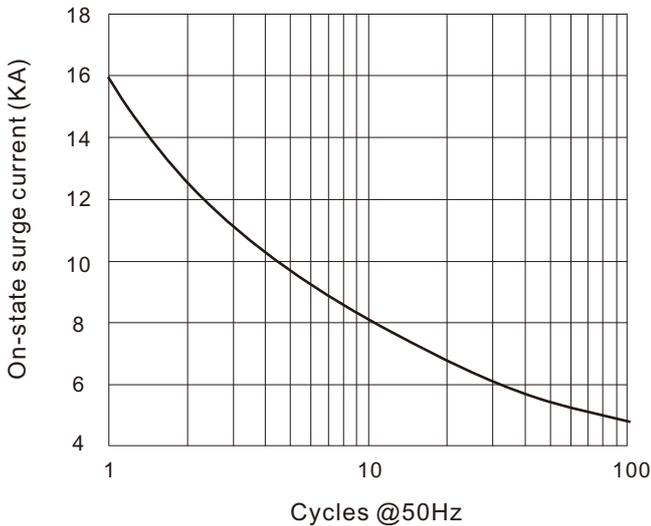


Fig.6  $I^2t$  characteristics

