

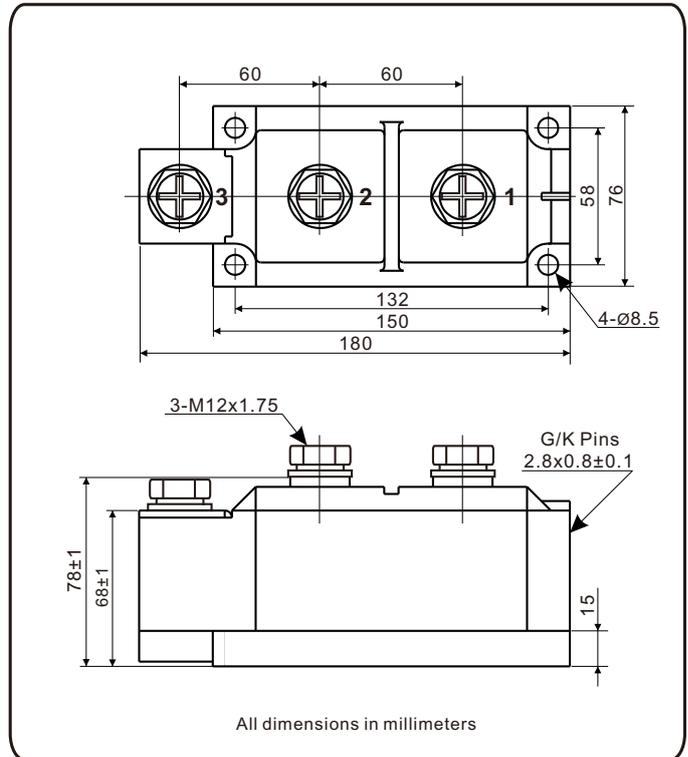
## Thyristor/Diode and Thyristor/Thyristor, 1000A (SUPER MAGN-A-PAK Power Modules)



SUPER MAGN - A - PAK(1)

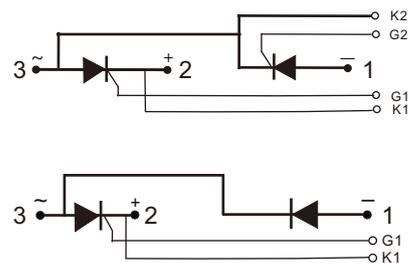
### FEATURES

- 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



### APPLICATIONS

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



NKT

NKH

### PRODUCT SUMMARY

$I_{T(AV)}/I_{F(AV)}$	800 A
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### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUE	UNITS
$I_{T(AV)}/I_{F(AV)}$	85 °C	1000/1000	A
$I_{T(RMS)}/I_{F(RMS)}$	85 °C	1570/1570	A
$I_{TSM}/I_{FSM}$	50 Hz	30000/40000	
	60 Hz	31410/41880	
$I^2t$ (SCR/Diode)	50 Hz	4500/8000	kA <sup>2</sup> s
	60 Hz	4090 / 7280	
$I^2\sqrt{t}$ (SCR/Diode)		45000/80000	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
NKT1000 NKH1000	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	$I_{T(AV)}$ $I_{F(AV)}$	180° conduction, half sine wave ,50Hz		1000	A
				85	°C
Maximum RMS on-state current	$I_{T(RMS)}$ $I_{F(RMS)}$	180° conduction, half sine wave ,50Hz , $T_C = 85^\circ\text{C}$		1570	A
Maximum peak, one-cycle, on-state non-repetitive surge current	$I_{TSM}/I_{FSM}$	t = 10 ms t = 8.3 ms	No voltage reapplied	30000/40000	A
				t = 10 ms t = 8.3 ms	
		Sine half wave, initial $T_J = T_J$ maximum	25200/33600		
			26380/35180		
Maximum $I^2t$ for fusing	$I^2t$ (SCR/Diode)	t = 10 ms t = 8.3 ms	No voltage reapplied	4500/8000	kA <sup>2</sup> s
				t = 10 ms t = 8.3 ms	
		3180/5640			
		2890/5140			
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$ (SCR/Diode)	t = 0.1 ms to 10 ms, no voltage reapplied		45000/80000	kA <sup>2</sup> √s
Maximum on-state voltage drop	$V_{TM}$	$I_{TM} = 3000\text{A}$ , $T_J = 25^\circ\text{C}$ , 180° conduction		2.0	V
Maximum forward voltage drop	$V_{FM}$	$I_{FM} = 3000\text{A}$ , $T_J = 25^\circ\text{C}$ , 180° conduction		1.7	
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	

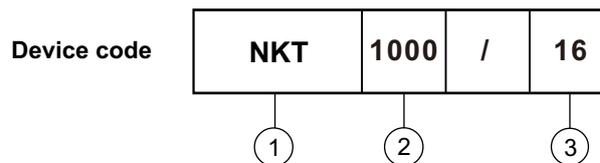
SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Typical delay time	$t_d$	$T_J = 25^\circ\text{C}$ , gate current = 1A, $dI_g/dt = 1\text{A}/\mu\text{s}$ $V_d = 0.67 V_{DRM}$		2.0	μs
Typical rise time	$t_r$			4.0	
Typical turn-off time	$t_q$	$I_{TM} = 750\text{A}$ , $dI/dt = -60\text{A}/\mu\text{s}$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

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current	$I_{RRM}$ $I_{DRM}$	$T_J = 125^\circ\text{C}$		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	$P_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		10	W
Maximum average gate power	$P_{G(AV)}$	$f = 50 \text{ Hz}$ , $T_J = T_J \text{ maximum}$		2	
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	mA
Maximum required DC gate current to trigger	$I_{GT}$			200	
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		0.043	$^\circ\text{C/W}$	
Typical thermal resistance, case to heatsink per module	$R_{thCS}$	Mounting surface, smooth , flat and greased		0.008		
Mounting torque $\pm 10 \%$	SMAP to heatsink , M8 busbar to SMAP , M12	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	
				13 to 16		
Approximate weight					3500	g
					123	oz.
Case style					SUPER MAGN-A-PAK(1)	

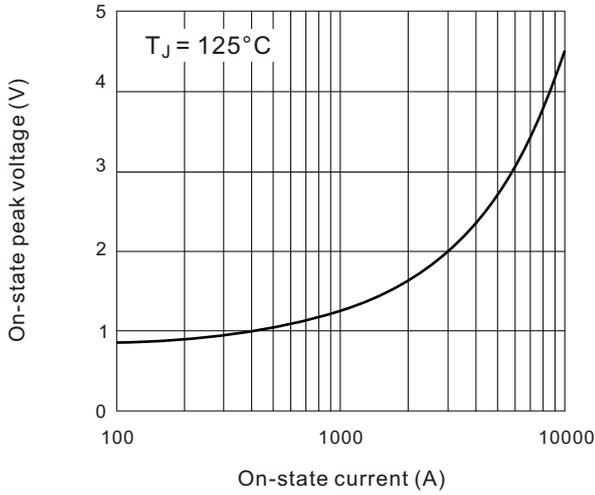
### ORDERING INFORMATION TABLE



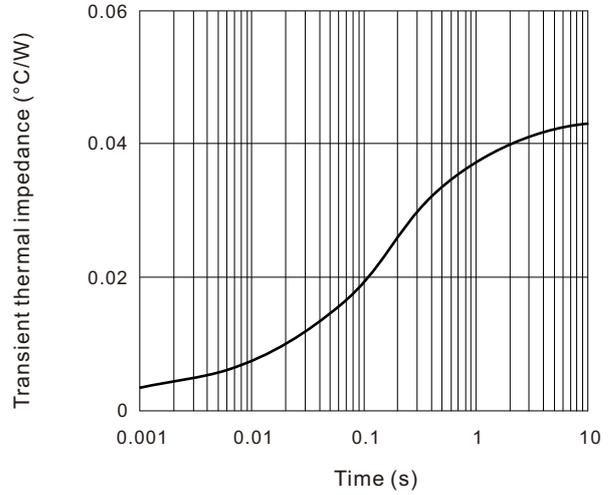
- 1 - Module type: NKT for (Thyristor + Thyristor) module  
NKH for (Thyristor + Diode) module
- 2 - Current rating:  $I_{T(AV)}$  /  $I_{F(AV)}$
- 3 - Voltage code x 100 =  $V_{RRM}$

## Nell High Power Products

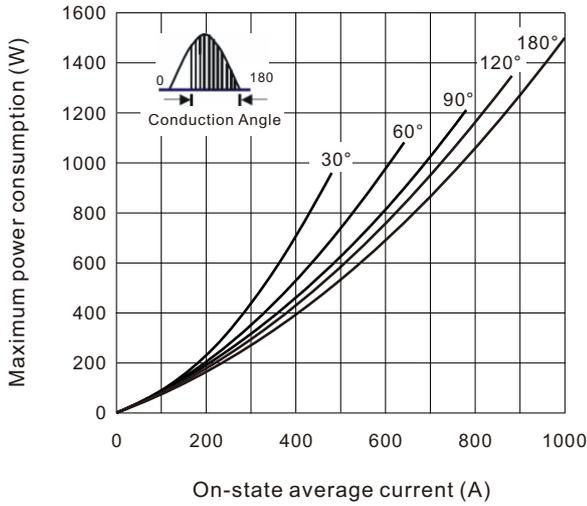
**Fig.1 On-state current vs. voltage characteristics**



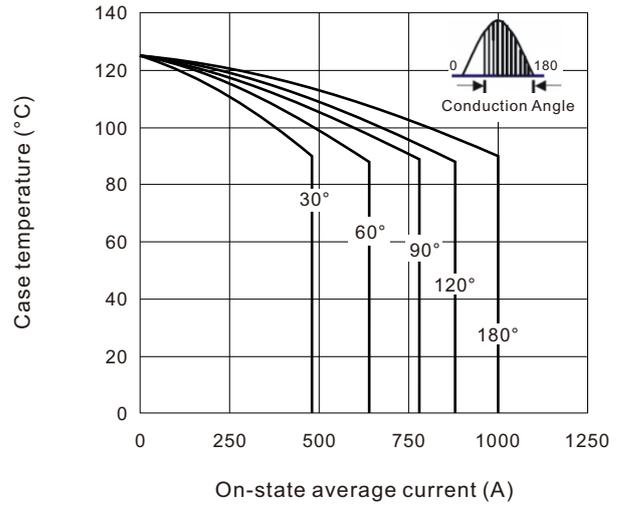
**Fig.2 Transient thermal impedance (junction-case)**



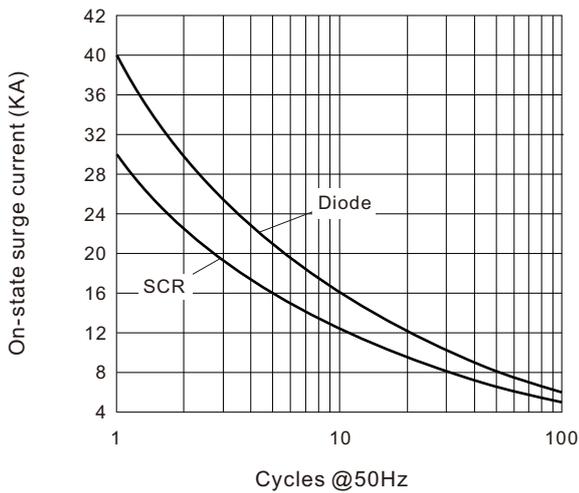
**Fig.3 Power consumption vs. average current**



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



**Fig.5 On-state surge current vs cycles**



**Fig.6 I<sup>2</sup>t characteristics**

