

Three-Phase Bridge + Thyristor, 60A (Low Profile Package)

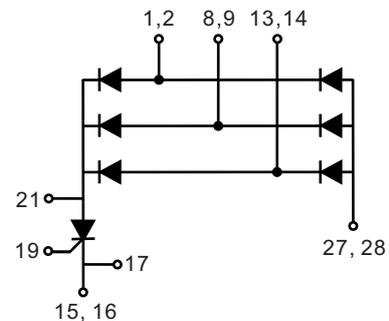
FEATURES

- Three-phase bridge and a thyristor
- High surge current capability
- Planar thyristor chip
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DBC)
- Low thermal resistance
- Compliant to RoHS
- Isolation voltage up to 2500V
- Compact package, one screw mounting



Applications

- Inverter for AC or DC motor control
- Soft starters
- Switching power supply
- Light control
- Temperature control



ADVANTAGE

- International standard package
Epoxy meets UL 94 V-O flammability rating
- Small volume, light weight
- Small thermal resistance
- Weight: 30g (1.06 oz.)

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	60A
V_{RRM}	1200V to 1600V
I_{FSM}	1000A
I_R	10 μ A
V_{FM}/V_{TM}	1.45V / 1.6V
$T_{Jmax.}$	150°C

© Maximum Ratings for Diodes

MAJOR RATINGS AND CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)				
PARAMETER	SYMBOL	NK60TP		UNIT
		12	16	
Maximum repetitive peak reverse voltage	V_{RRM}/V_{RRM}	1200	1600	V
Peak reverse non-repetitive voltage	V_{RSM}	1300	1700	V
Output DC current three-phase full wave, $T_C = 80^\circ\text{C}$	I_O	60		A
Peak forward surge current single sine-wave superimposed on rated load	I_{FSM}	1000		A
Rating (non-repetitive, for t greater than 1 ms and less than 8.3 ms) for fusing	I^2t	5000		A^2s
Operating junction temperature range	T_J	-40 to 150		$^\circ\text{C}$
Storage temperature range	T_{STG}	-40 to 125		$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS (T _C = 25°C unless otherwise noted)					
PARAMETER	TEST CONDITIONS	SYMBOL	NK60TP		UNIT
			12	16	
Maximum instantaneous forward drop per diode	I _F = 75A	V _F	1.45		V
Maximum reverse DC current at rated DC blocking voltage per diod	T _C = 25°C	I _R	10		μA
	T _C = 150°C		6		mA

Maximum Ratings fo Thyristor

FORWARD CONDUCTION					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNIT
Maximum average on-state current at case temperature	I _{T(AV)}	180° conduction, half sine wave, 50Hz		60	A
				80	°C
Maximum peak, one-cycle, on-state non-repetitive surge current	I _{TSM}	t = 10ms	No voltage reapplied	Sine half wave, initial T _J = T _J maximum	A
		t = 8.3ms			
Maximum I ² t for fusing	I ² t	t = 10ms	100%V _R RM reapplied	A ² s	
		t = 8.3ms			
		t = 10ms	100%V _R RM reapplied		
		t = 8.3ms			
Maximum I ² √t for fusing	I ² √t	t = 0.1 to 10 ms, no voltage reapplied		112.5	kA ² √s
Maximum on-state voltage drop	V _{TM}	I _{TM} = 200A, T _J = 25°C, 180° conduction		1.8	V
Maximum holding current	I _H	Anode supply = 6V, resistive load, T _J = 25°C		150	mA
Maximum latching current	I _L			250	

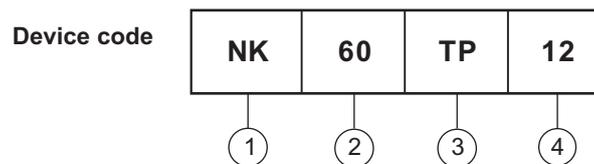
SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNIT
Typical turn-off time	t _q	I _{TM} = 300A, dI/dt = 15 A/μs, T _J = T _J maximum V _R = 50V, dV/dt = 20 V/dt, gate 0V, 100Ω	50 to 120	μs

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNIT
Maximum peak reverse and off-state leakage current	I _{RRM} I _{DRM}	T _J = 125°C	20	mA
RMS isolation Voltage	V _{ISO}	60 Hz, circuit to base, all terminals shorted, 25°C, 60s	2500	V
Critical rate of rise of off-state voltage	dV/dt	T _J = T _J maximum, exponential to 67% V _{DRM}	1000	V/μs

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNIT
Maximum peak gate power	P_{GM}	$t_p \leq 5\text{ms}$, $T_J = T_J \text{ maximum}$		10	W
Maximum average gate power	$P_{G(AV)}$	$f = 50\text{Hz}$, $T_J = T_J \text{ maximum}$		5	
Maximum peak positive gate current	I_{GM}	$t_p \leq 5\text{ms}$, $T_J = T_J \text{ maximum}$		3	A
Maximum peak negative gate voltage	$-V_{GT}$			10	V
Maximum required DC gate voltage to trigger	V_{GT}	$T_J = 25^\circ\text{C}$	Anode supply = 6V, resistive load; $R_a = 1\Omega$	2	
Maximum required DC gate current to trigger	I_{GT}			100	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}			5	mA
Maximum rate of rise of turned-on current	di/dt	$T_J = 25^\circ\text{C}$, $I_{GM} = 1.5\text{A}$, $t_r \leq 0.5 \mu\text{s}$		150	A/ μs

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Operating junction temperature range	T_J			-40 to 150	°C
Storage temperature range	T_{stg}			-40 to 125	
Maximum thermal resistance, junction to case per junction	$R_{th(j-c)}$	DC operation		1.0	°C/W
Typical thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface, smooth, flat and greased		0.30	
Mounting torque, $\pm 10\%$ module to heatsink, M4		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.		2	N·m
Approximate weight				30	g
				1.06	oz.

Ordering Information Tabel



- 1 - Nell's Low Profile Module
- 2 - Current rating : $I_{(TAV)} / I_O$
- 3 - Circuit configuration type : "TP" for 3-phase bridge + thyristor
- 4 - Voltage code : code x 100 = V_{RRM}

Fig.1 Power dissipation per module vs. bridge output current

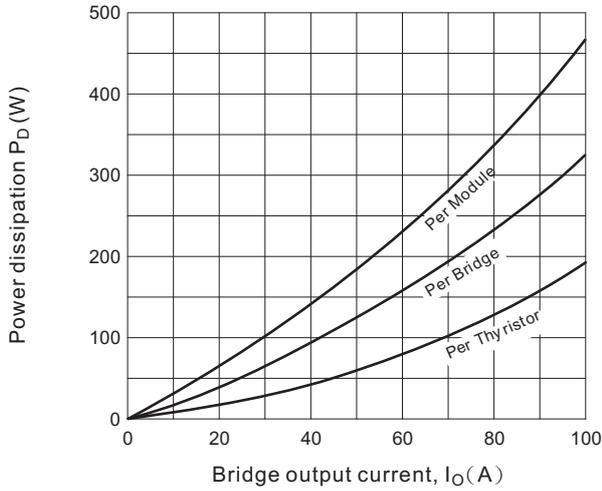


Fig.2 Forward current derating curve

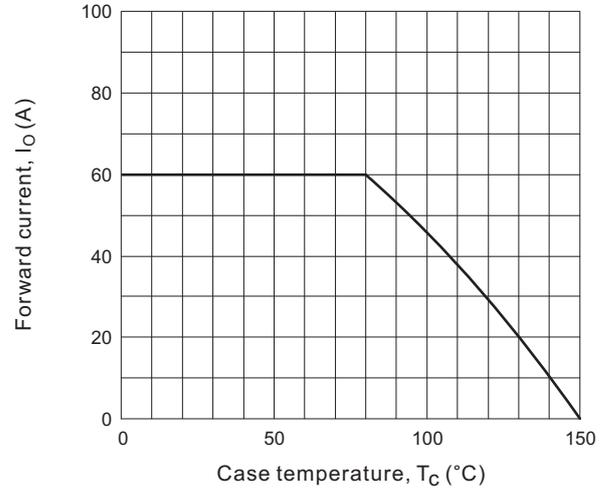


Fig.3 Transient thermal impedance

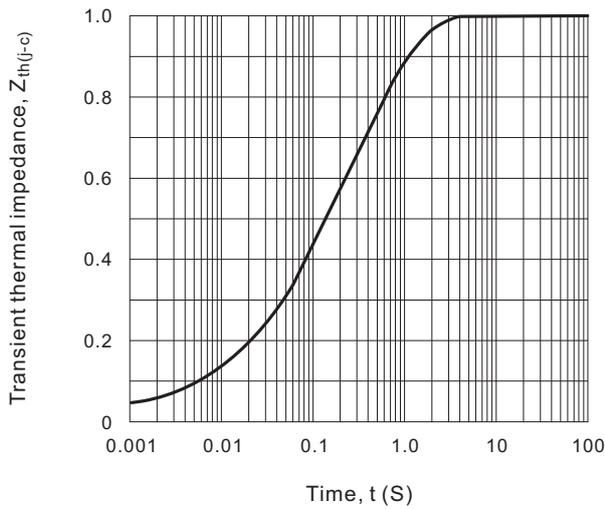


Fig.4 Max non-repetitive forward surge current

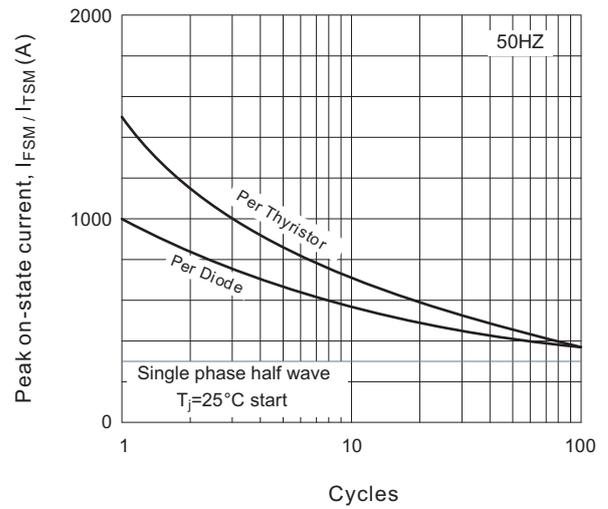


Fig.5 On-state characteristics

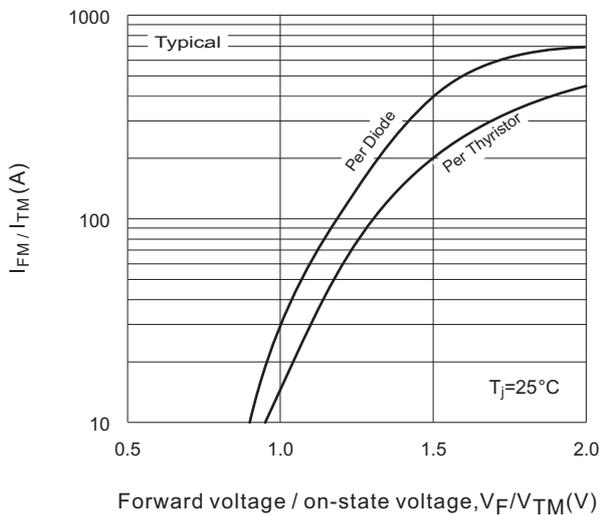
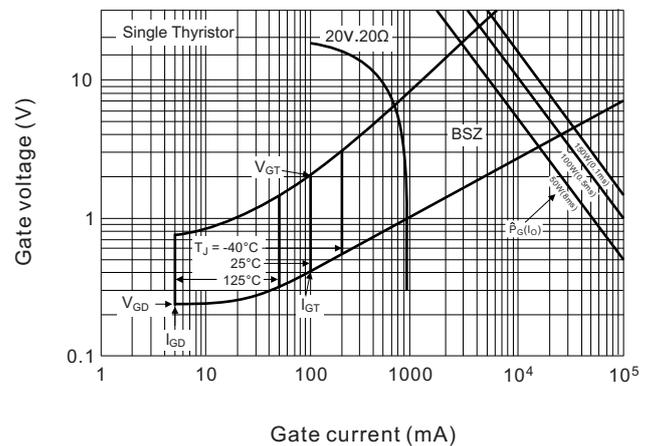
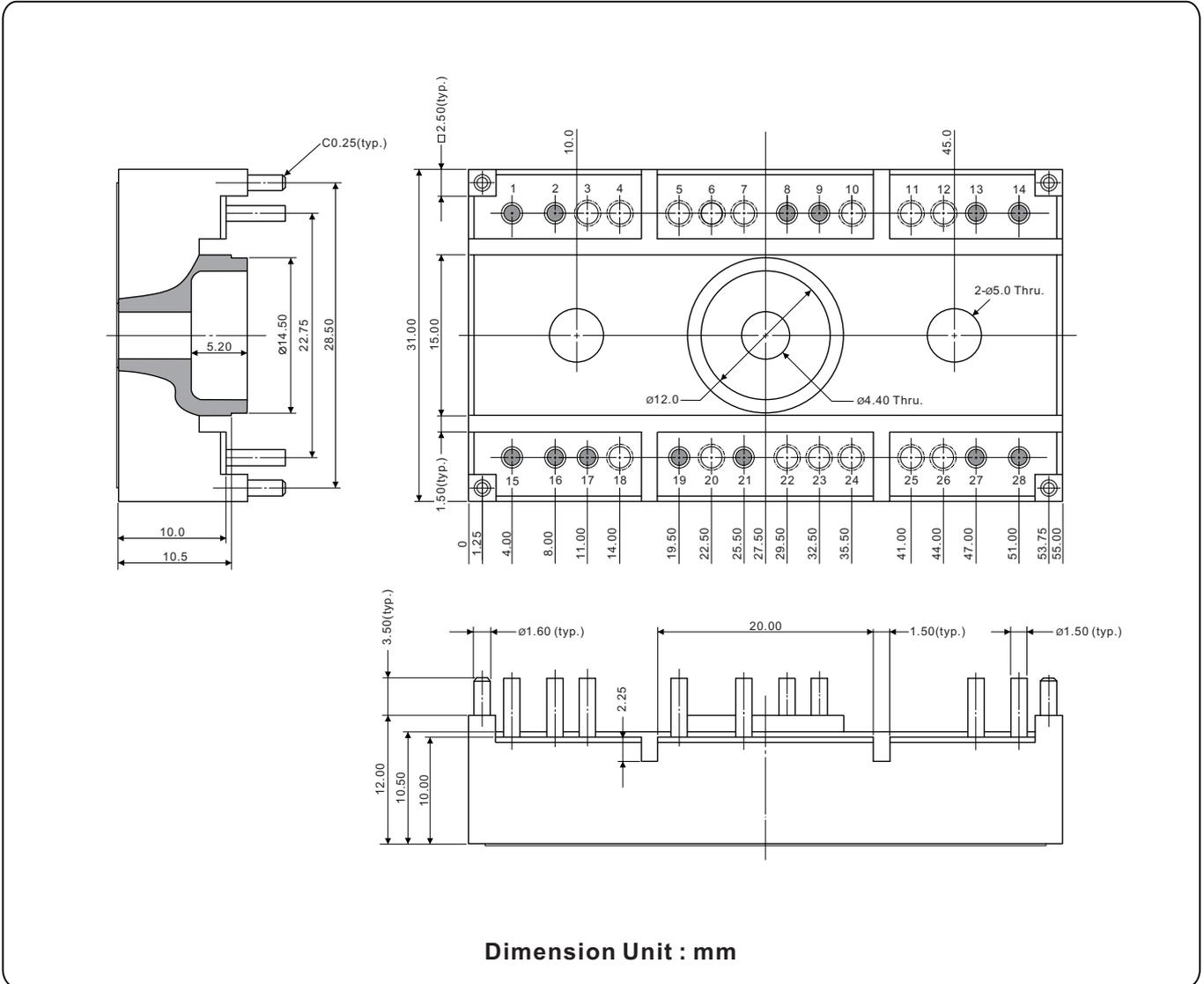


Fig.6 Gate trigger characteristics





“TP” Circuit Configuration:

