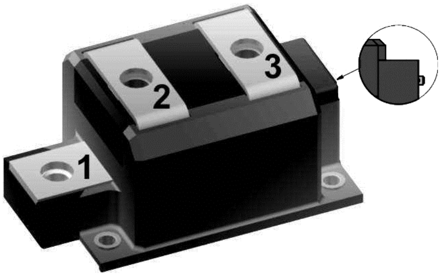
High Voltage Thyristor \ Diode Module

V_{RRM} = 2x 2200 V
I_{TAV} = 650 A
V_T = 1.16 V

Phase leg

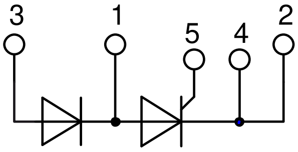
Part number

MCNA650PD2200CB



Backside: isolated

E72873



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al2O3-ceramic

Applications:

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

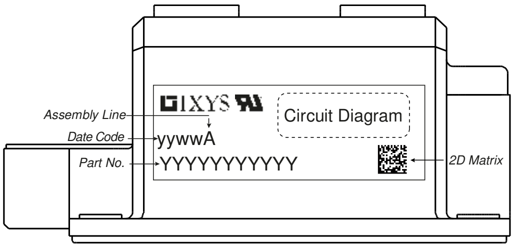
Package: ComPack

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

Rectifier

Symbol	Definition	Conditions		Ratings min.	 typ.	 max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			2300	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			2200	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 2200 V	T_{VJ} = 25°C			2	mA
		$V_{R/D}$ = 2200 V	T_{VJ} = 125°C			40	mA
V_T	*forward voltage drop*	I_T = 650 A	T_{VJ} = 25°C			1.19	V
		I_T = 1300 A				1.53	V
		I_T = 650 A	T_{VJ} = 125°C			1.16	V
		I_T = 1300 A				1.59	V
I_{TAV}	*average forward current*	T_C = 85°C	T_{VJ} = 140°C			650	A
		180° sine					
V_{T0}	*threshold voltage* } *for power loss calculation only*		T_{VJ} = 140°C			0.75	V
r_T	*slope resistance*					0.63	mΩ
R_{thJC}	*thermal resistance junction to case*					0.045	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.02		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			2555	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			16.0	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			17.3	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			13.6	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			14.7	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1.28	MA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.24	MA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			924.8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			897.7	kA²s
C_J	*junction capacitance*	V_R = 700 V f = 1 MHz	T_{VJ} = 25°C		620		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 140°C			120	W
		t_P = 300 µs				60	W
P_{GAV}	*average gate power dissipation*					30	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 140°C; f = 50 Hz	repetitive, I_T = 1950 A			100	A/µs
		t_P = 200 µs; di_G/dt = 1 A/µs;					
		I_G = 1 A; V = ⅔ V_{DRM}	non-repet., I_T = 650 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V = ⅔ V_{DRM}	T_{VJ} = 140°C			1000	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			2	V
			T_{VJ} = -40°C			3	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			300	mA
			T_{VJ} = -40°C			400	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 140°C			0.25	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 30 µs	T_{VJ} = 25°C			400	mA
		I_G = 1 A; di_G/dt = 1 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			300	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 1 A; di_G/dt = 1 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 650A; V = ⅔ V_{DRM}	T_{VJ} = 125 °C		350		µs
		di/dt = 10 A/µs dv/dt = 50 V/µs	t_p = 200 µs				

Package	**ComPack**			**Ratings**			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal				1200	A
T_{VJ}	*virtual junction temperature*			-40		140	°C
T_{op}	*operation temperature*			-40		125	°C
T_{stg}	*storage temperature*			-40		125	°C
Weight					500		g
M_D	*mounting torque*			3		5	Nm
M_T	*terminal torque*			12		14	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*		*terminal to terminal*	21.0			mm
$d_{Spb/Apb}$			*terminal to backside*	18.0			mm
V_{ISOL}	*isolation voltage*	t = 1 second	50/60 Hz, RMS; $I_{ISOL} \le 1$ mA	4800			V
		t = 1 minute		4000			V



Part description

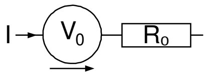
M = Module
C = Thyristor (SCR)
N = High Voltage Thyristor
A = (>= 2000V)
650 = Current Rating [A]
PD = Phase leg
2200 = Reverse Voltage [V]
CB = ComPack

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCNA650PD2200CB	MCNA650PD2200CB	Box	3	516103

Equivalent Circuits for Simulation

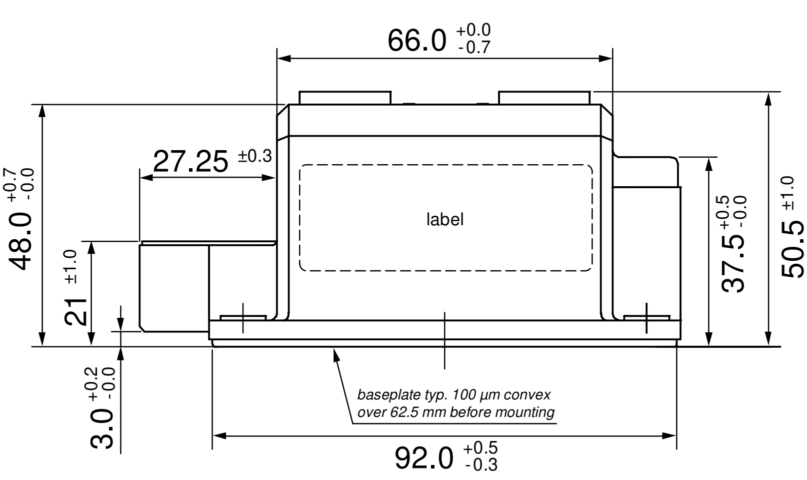
** on die level*

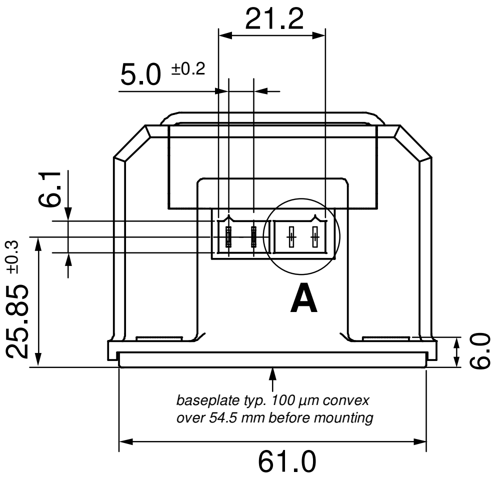
$T_{VJ} = 140$°C



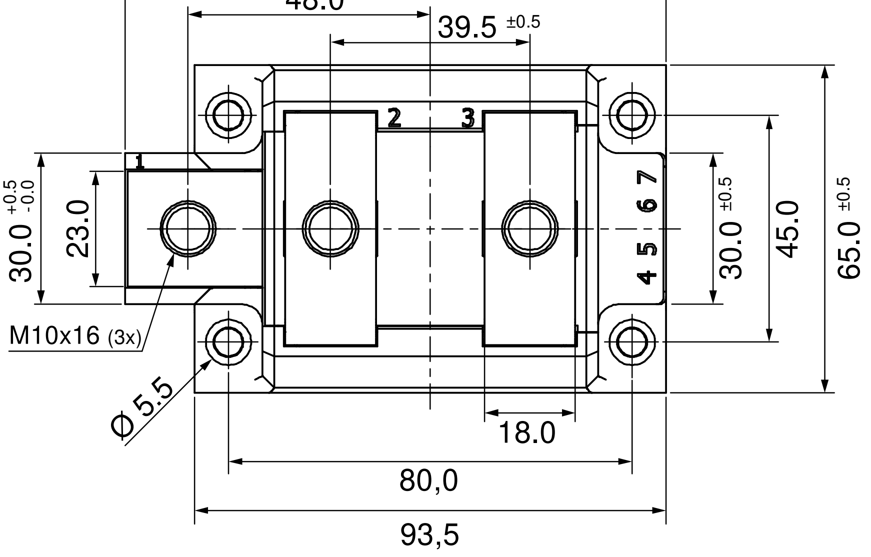
		Thyristor	
$V_{0\ max}$	*threshold voltage*	0.75	V
$R_{0\ max}$	*slope resistance **	0.44	mΩ

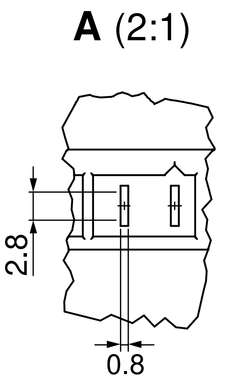
Outlines ComPack

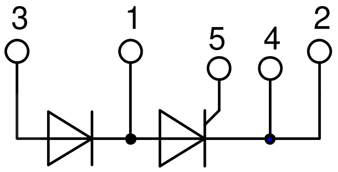




Optional accessories for modules
Keyed gate/cathode twin plug with
wire length = 350 mm, gate = white, cathode = red
Type ZY 180L (L = Left for pin pair 4/5) UL 758, style 3751







Thyristor

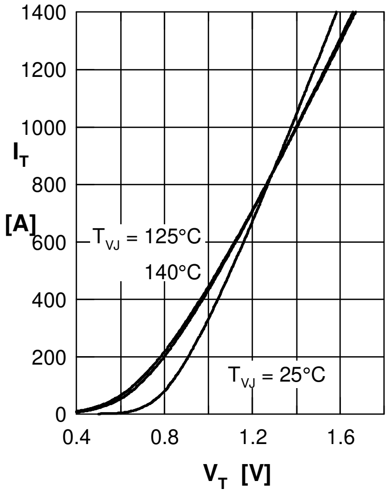


Fig. 1 Forward characteristics

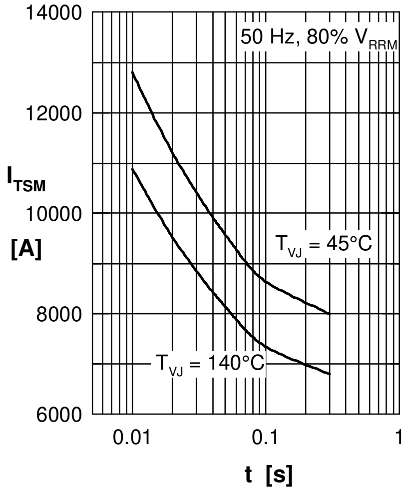


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

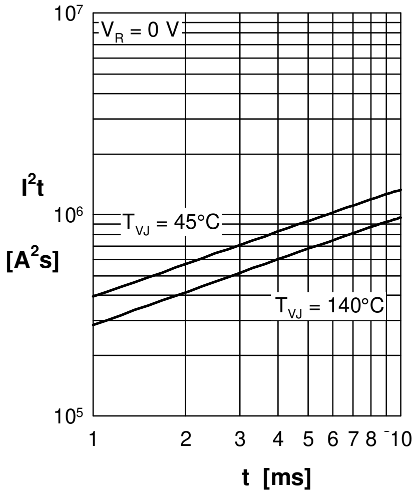


Fig. 3 I^2t versus time (1-10 s)

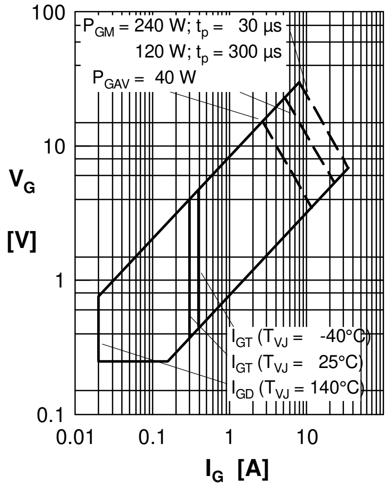


Fig. 4 Gate voltage & gate current

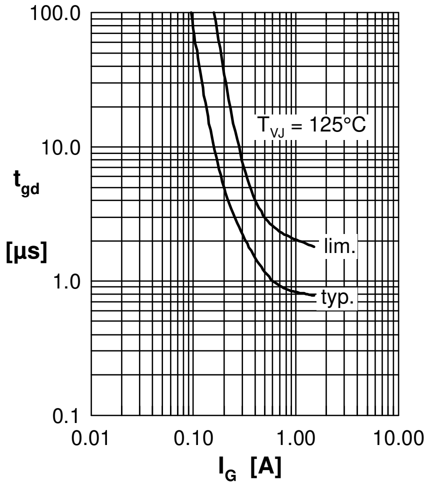


Fig. 5 Gate controlled delay time t_{gd}

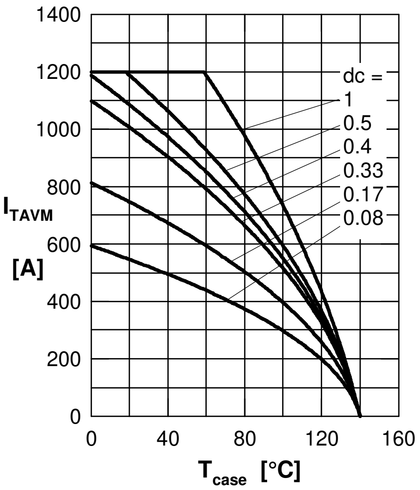


Fig. 6 Max. forward current at case temperature

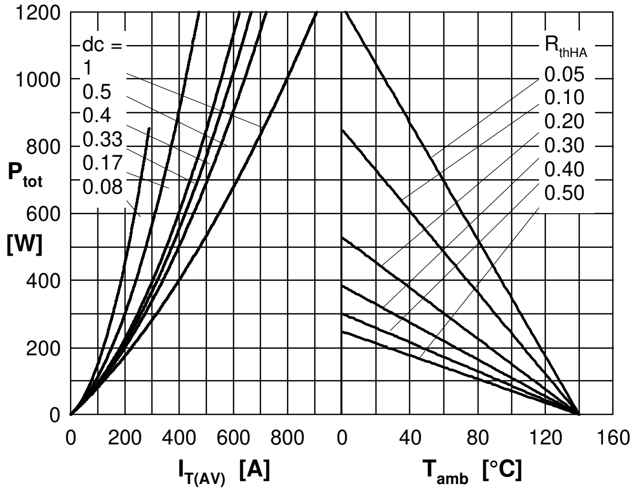
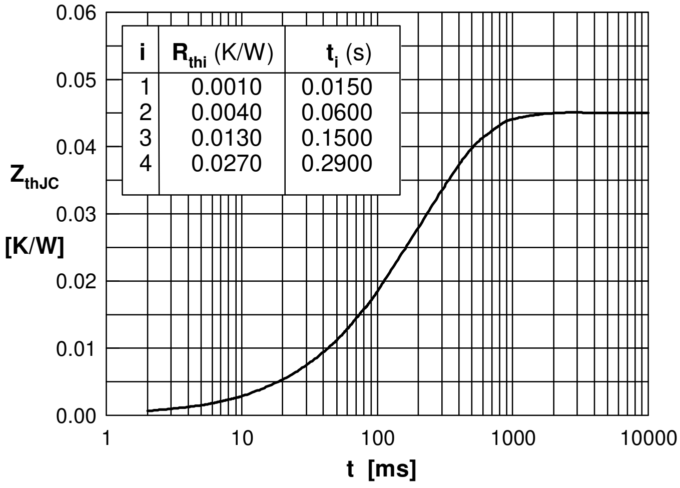


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.0010	0.0150
2	0.0040	0.0600
3	0.0130	0.1500
4	0.0270	0.2900

Fig. 8 Transient thermal impedance junction to case