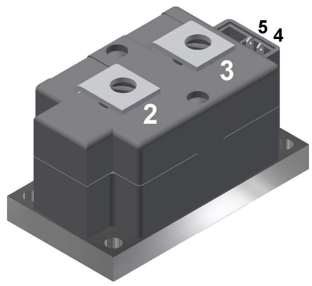
Thyristor Module

V_{RRM} = 1400 V
I_{TAV} = 300 A
V_T = 1.02 V

1~ Triac

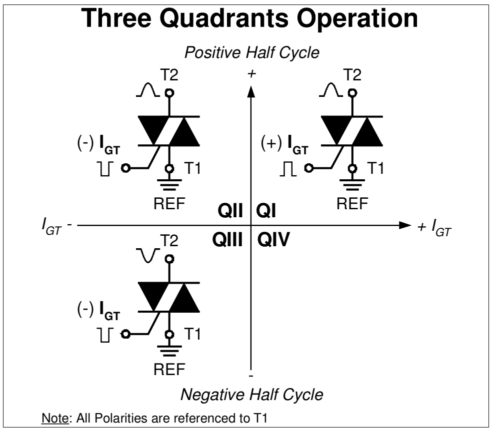
Part number

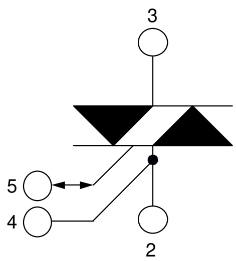
MCMA650MT1400NKD



Backside: isolated

E72873





Features / Advantages:

- Triac for line frequency
- Three Quadrants Operation
  - QI - QIII
- Planar passivated chip
- Long-term stability of blocking currents and voltages

Applications:

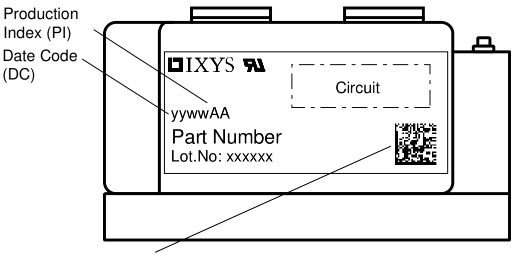
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: Y1

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper internally DCB isolated
- Advanced power cycling

Rectifier				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1500	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1400	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1400 V	T_{VJ} = 25°C			1	mA
		$V_{R/D}$ = 1400 V	T_{VJ} = 125°C			40	mA
V_T	*forward voltage drop*	I_T = 300 A	T_{VJ} = 25°C			1.09	V
		I_T = 600 A				1.26	V
		I_T = 300 A	T_{VJ} = 125°C			1.02	V
		I_T = 600 A				1.23	V
I_{TAV}	*average forward current*	T_C = 85°C	T_{VJ} = 140°C			300	A
I_{RMS}	*RMS forward current per phase*	180° sine				650	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 140°C			0.81	V
r_T	*slope resistance*					0.68	mΩ
R_{thJC}	*thermal resistance junction to case*					0.12	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.04		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			960	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			9.60	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			10.4	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			8.16	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			8.82	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			460.8	kA^2s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			447.4	kA^2s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			332.9	kA^2s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			323.3	kA^2s
C_J	*junction capacitance*	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		438		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*					20	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 140 °C; f = 50 Hz	repetitive, I_T = 900 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 = 300 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			220	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			200	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			150	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 = 300 A; 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 Y1			Ratings			
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			600	A
T_{VJ}	*virtual junction temperature*		-40		140	°C
T_{op}	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		125	°C
Weight				650		g
M_D	*mounting torque*		4.5		7	Nm
M_T	*terminal torque*		11		13	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*	*terminal to terminal*	16.0			mm
$d_{Spb/Apb}$		*terminal to backside*	25.0			mm
V_{ISOL}	*isolation voltage*	t = 1 second; 50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	3600			V
		t = 1 minute	3000			V



Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

Part description

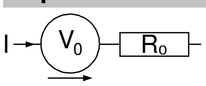
M = Module
C = Thyristor (SCR)
M = Thyristor
A = (up to 1800V)
650 = Current Rating [A]
MT = 1~ Triac
1400 = Reverse Voltage [V]
N = Three Quadrants operation: QI - QIII
KD = Y1-2-CU

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA650MT1400NKD	MCMA650MT1400NKD	Box	2	518703

Similar Part	Package	Voltage class
MCMA650MT1800NKD	Y1-2-CU	1800

Equivalent Circuits for Simulation

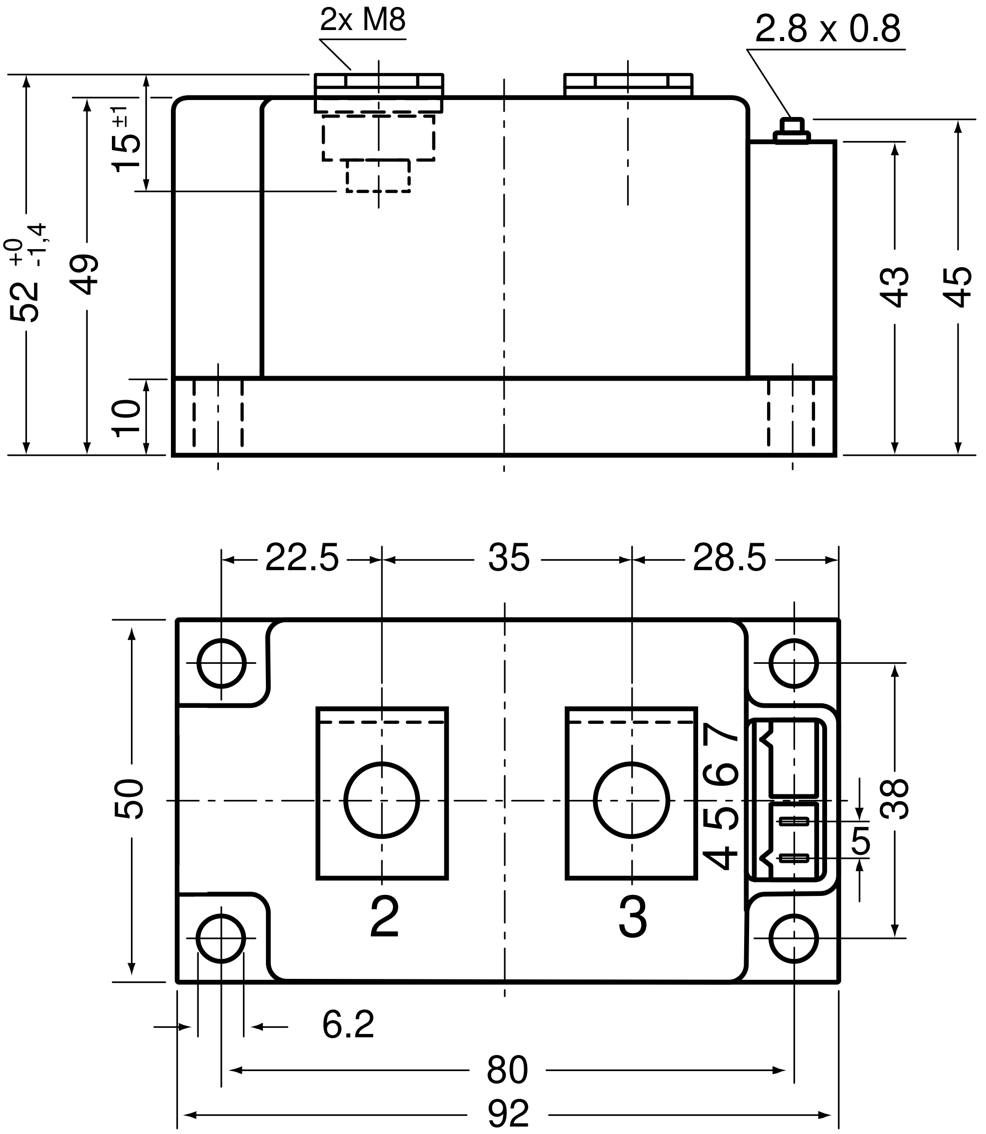
** on die level* $T_{VJ} = 140\,°C$



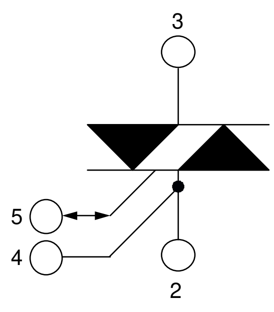
Thyristor

$V_{0\,max}$	*threshold voltage*	0.81	V
$R_{0\,max}$	*slope resistance **	0.5	mΩ

Outlines Y1



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



Thyristor

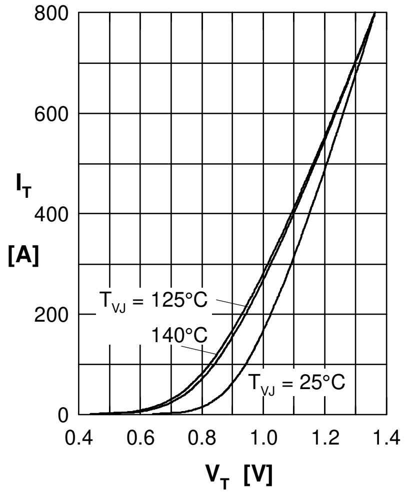


Fig. 1 Forward characteristics

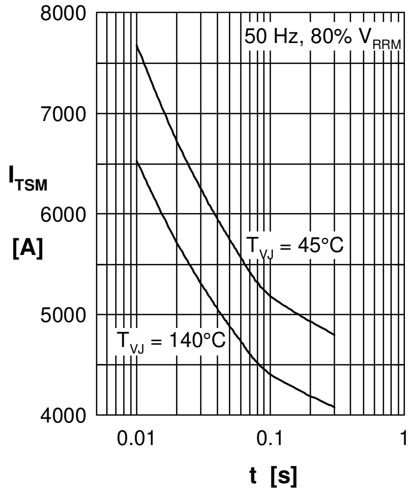


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

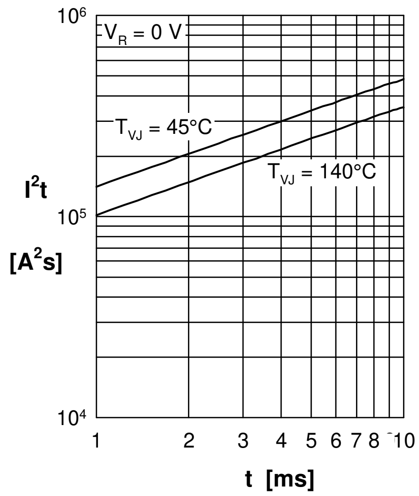


Fig. 3 I^2t versus time (1-10 s)

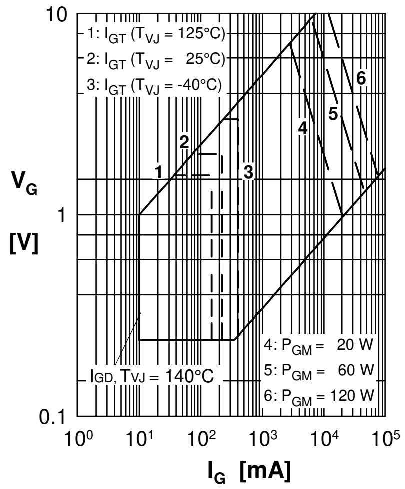


Fig. 4 Gate voltage & gate current

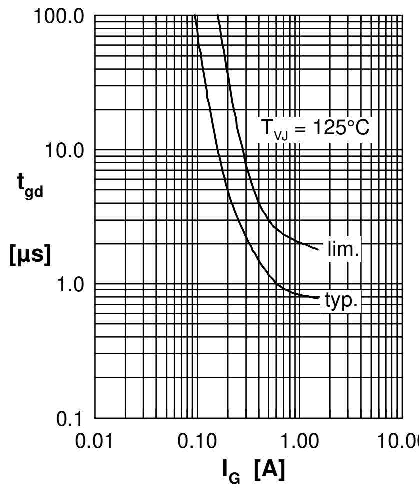


Fig. 5 Gate controlled delay time t_{gd}

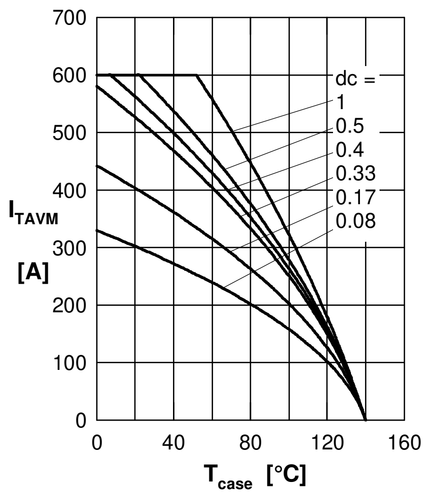


Fig. 6 Max. forward current at case temperature

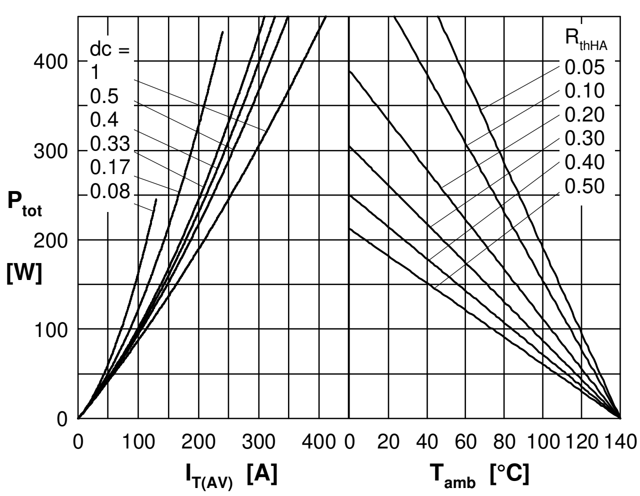
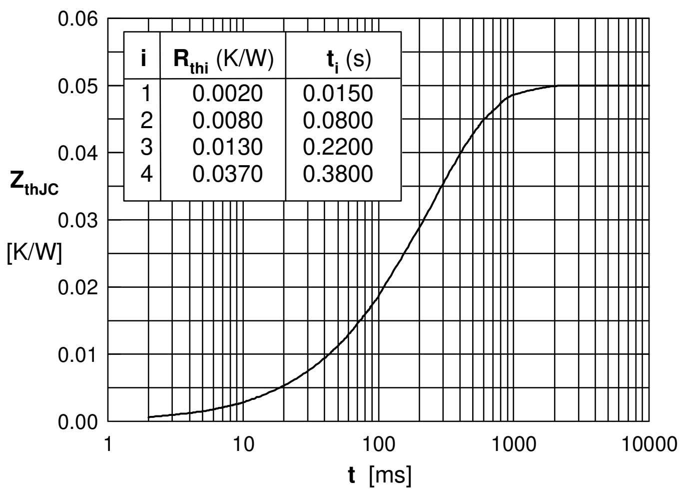


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.0020	0.0150
2	0.0080	0.0800
3	0.0130	0.2200
4	0.0370	0.3800

Fig. 8 Transient thermal impedance junction to case