

Thyristor Module

$$V_{RRM} = 1400\text{ V}$$

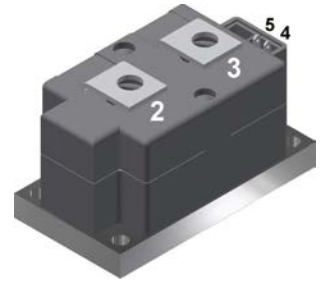
$$I_{TAV} = 300\text{ A}$$

$$V_T = 1,02\text{ V}$$

1~ Triac

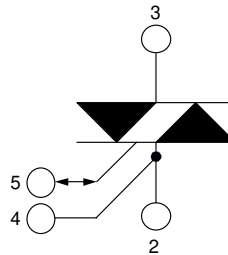
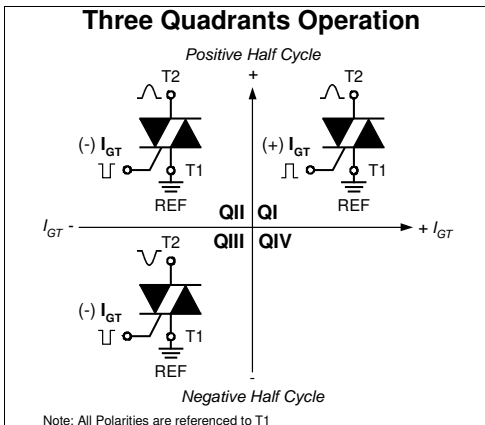
Part number

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

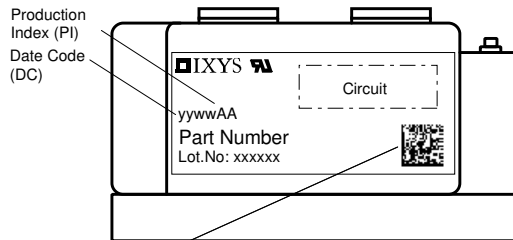
- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper internally DCB isolated
- Advanced power cycling

Disclaimer Notice

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Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1400	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 25^{\circ}C$		1	mA
		$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 125^{\circ}C$		40	mA
V_T	forward voltage drop	$I_T = 300\text{ A}$	$T_{VJ} = 25^{\circ}C$		1,09	V
		$I_T = 600\text{ A}$			1,26	V
		$I_T = 300\text{ A}$	$T_{VJ} = 125^{\circ}C$		1,02	V
		$I_T = 600\text{ A}$			1,23	V
I_{TAV}	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		300	A
I_{RMS}	RMS forward current per phase	180° sine			650	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		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		$T_C = 25^{\circ}C$		960	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		9,60	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		10,4	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		8,16	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		8,82	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		460,8	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		447,4	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		332,9	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		323,3	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$	438		pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 140^{\circ}C$		120	W
		$t_p = 300\text{ }\mu\text{s}$			60	W
P_{GAV}	average gate power dissipation				20	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C; f = 50\text{ Hz}$ repetitive, $I_T = 900\text{ A}$			100	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 1\text{ A}/\mu\text{s};$ $I_G = 1\text{ A}; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 300\text{ A}$			500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 140^{\circ}C$		1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		2	V
			$T_{VJ} = -40^{\circ}C$		3	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		220	mA
			$T_{VJ} = -40^{\circ}C$		400	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		0,25	V
I_{GD}	gate non-trigger current				10	mA
I_L	latching current	$t_p = 30\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}C$		200	mA
		$I_G = 1\text{ A}; di_G/dt = 1\text{ A}/\mu\text{s}$				
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		150	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	μs
		$I_G = 1\text{ A}; di_G/dt = 1\text{ A}/\mu\text{s}$				
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 300\text{ A}; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}; dv/dt = 50\text{ V}/\mu\text{s}; t_p = 200\text{ }\mu\text{s}$	$T_{VJ} = 125^{\circ}C$	350		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	4800			V
		t = 1 minute	4000			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

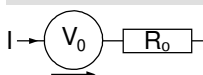
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA650MT1400NKD	MCMA650MT1400NKD	Box	2	518703

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

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 140^{\circ}\text{C}$

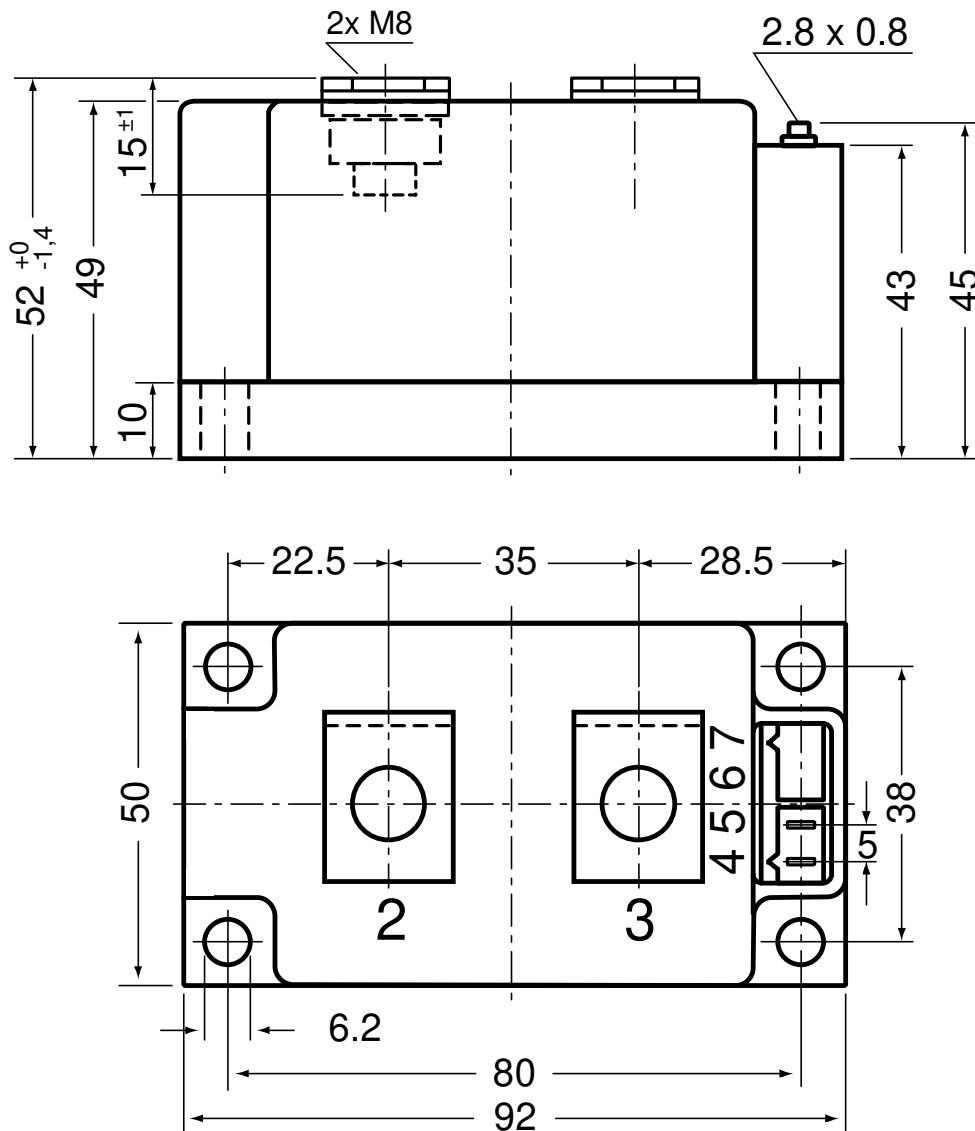


Thyristor

$V_{0\ max}$	threshold voltage	0,81	V
$R_{0\ max}$	slope resistance *	0,5	mΩ

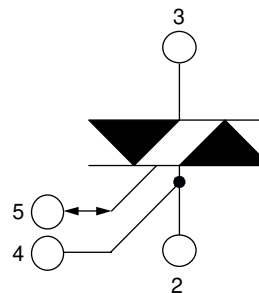


Outlines Y1



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

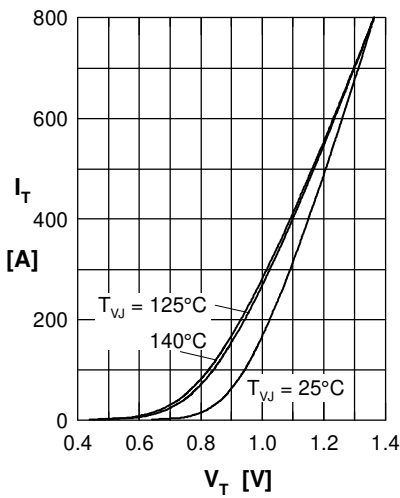


Fig. 1 Forward characteristics

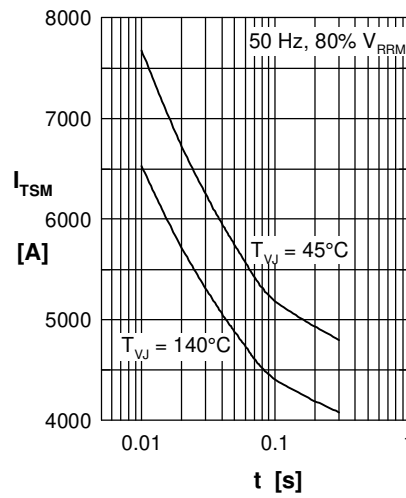


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

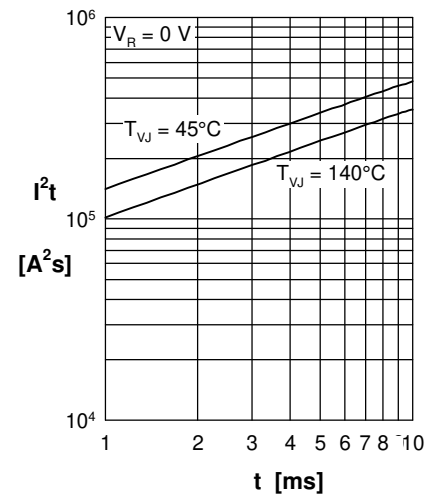


Fig. 3 I^2t versus time (1-10 s)

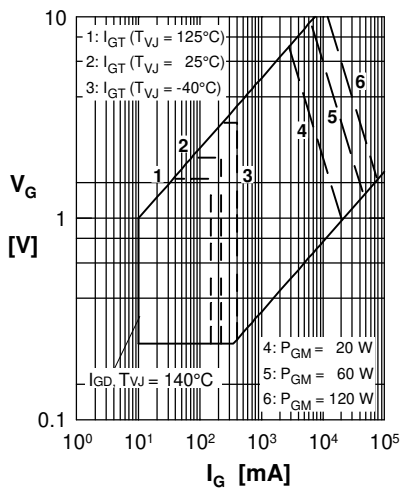


Fig. 4 Gate voltage & gate current

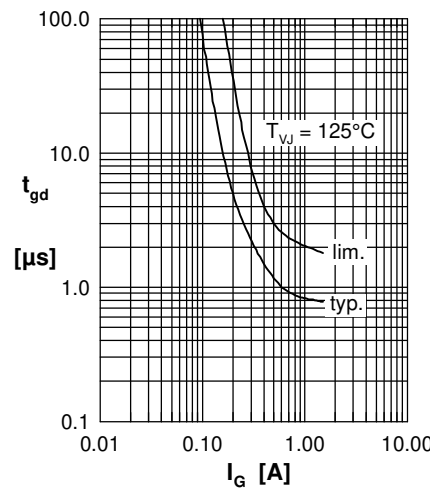


Fig. 5 Gate controlled delay time t_{gd}

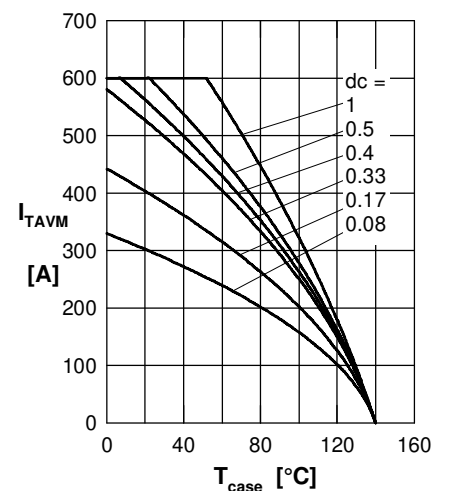


Fig. 6 Max. forward current at case temperature

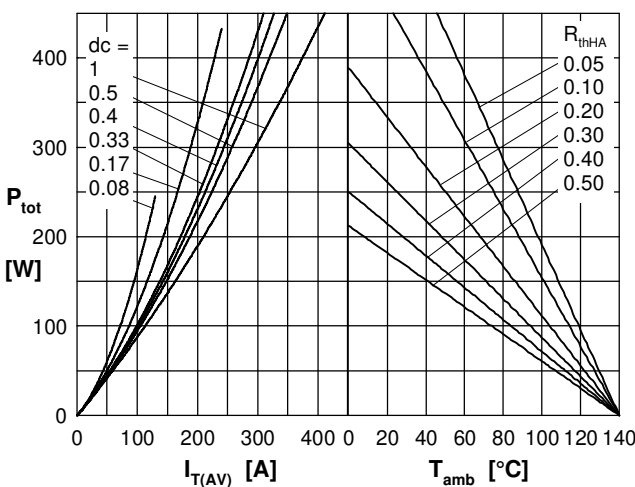


Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature

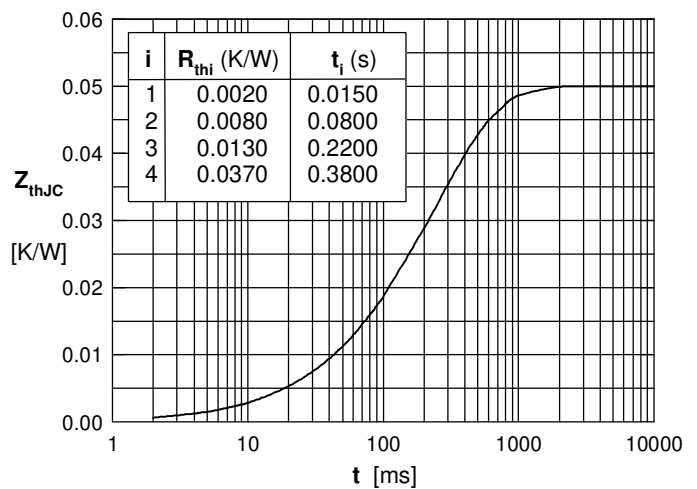


Fig. 8 Transient thermal impedance junction to case