Thyristor Module

V_{RRM}	=	1800 V
I_{TAV}	=	300 A
V_T	=	1.02 V

1~ Triac

Part number

MCMA650MT1800NKD

Backside: isolated

UL E72873

Three Quadrants Operation

Positive Half Cycle

	QII	QI	
I_{GT} -	QIII	QIV	+ I_{GT}

Negative Half Cycle

Note: All Polarities are referenced to T1
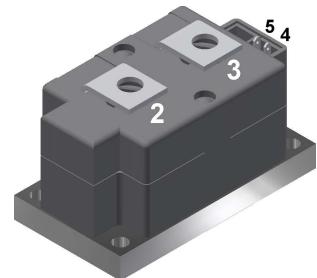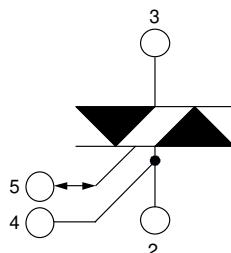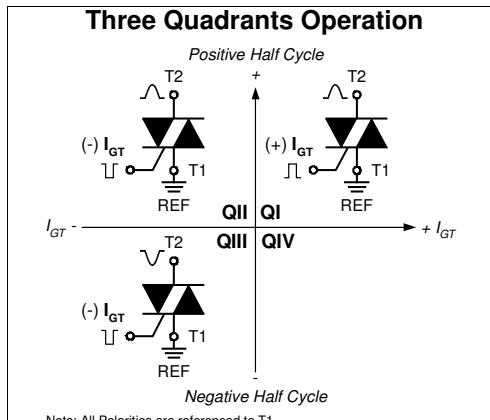
Features / Advantages:
- Triac for line frequency
- Three Quadrants Operation
  - QI - QIII
- Planar passivated chip
- Long-term stability
  of blocking currents and voltages

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

Terms and Conditions of Usage

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend
- to perform joint risk and quality assessments;
- the conclusion of quality agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

IXYS

MCMA650MT1800NKD

Rectifier				**Ratings**		
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*	$T_{VJ} = 25°C$			1900	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*	$T_{VJ} = 25°C$			1800	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D} = 1800$ V $T_{VJ} = 25°C$			1	mA
		$V_{R/D} = 1800$ 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*	$T_{VJ} = 140°C$			0.81	V
r_T	*slope resistance* } *for power loss calculation only*				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	kA²s
		t = 8,3 ms; (60 Hz), sine $V_R = 0$ V			447.4	kA²s
		t = 10 ms; (50 Hz), sine $T_{VJ} = 140°C$			332.9	kA²s
		t = 8,3 ms; (60 Hz), sine $V_R = 0$ V			323.3	kA²s
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

Symbol	Definition	Conditions		min.	typ.	max.	Unit
			Ratings				
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; $I_{ISOL} \le 1$ mA	3600			V
		t = 1 minute		3000			V

Production Index (PI)
Date Code (DC)

IXYS **UL**

Circuit

yywwAA
Part Number
Lot.No: xxxxxx

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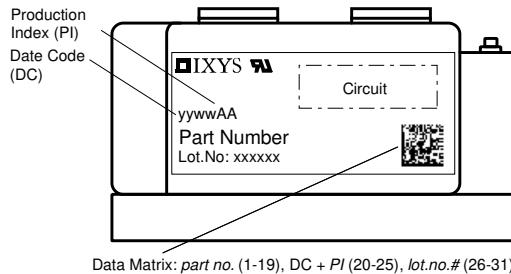
Part description

- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 650 = Current Rating [A]
- MT = 1~ Triac
- 1800 = 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	MCMA650MT1800NKD	MCMA650MT1800NKD	Box	2	518710

Similar Part	Package	Voltage class
MCMA650MT1400NKD	Y1-2-CU	1400

Equivalent Circuits for Simulation

* on die level $T_{VJ} = 140 °C$
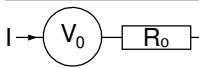
I → V_0 — R_0 —   **Thyristor**

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

Outlines   Y1

2x M8

2.8 x 0.8

15 ±1

52 $^{+0}_{-1,4}$

49

43

45

10

22.5

35

28.5

50

38

4 5 6 7

5

2

3

6.2

80

92
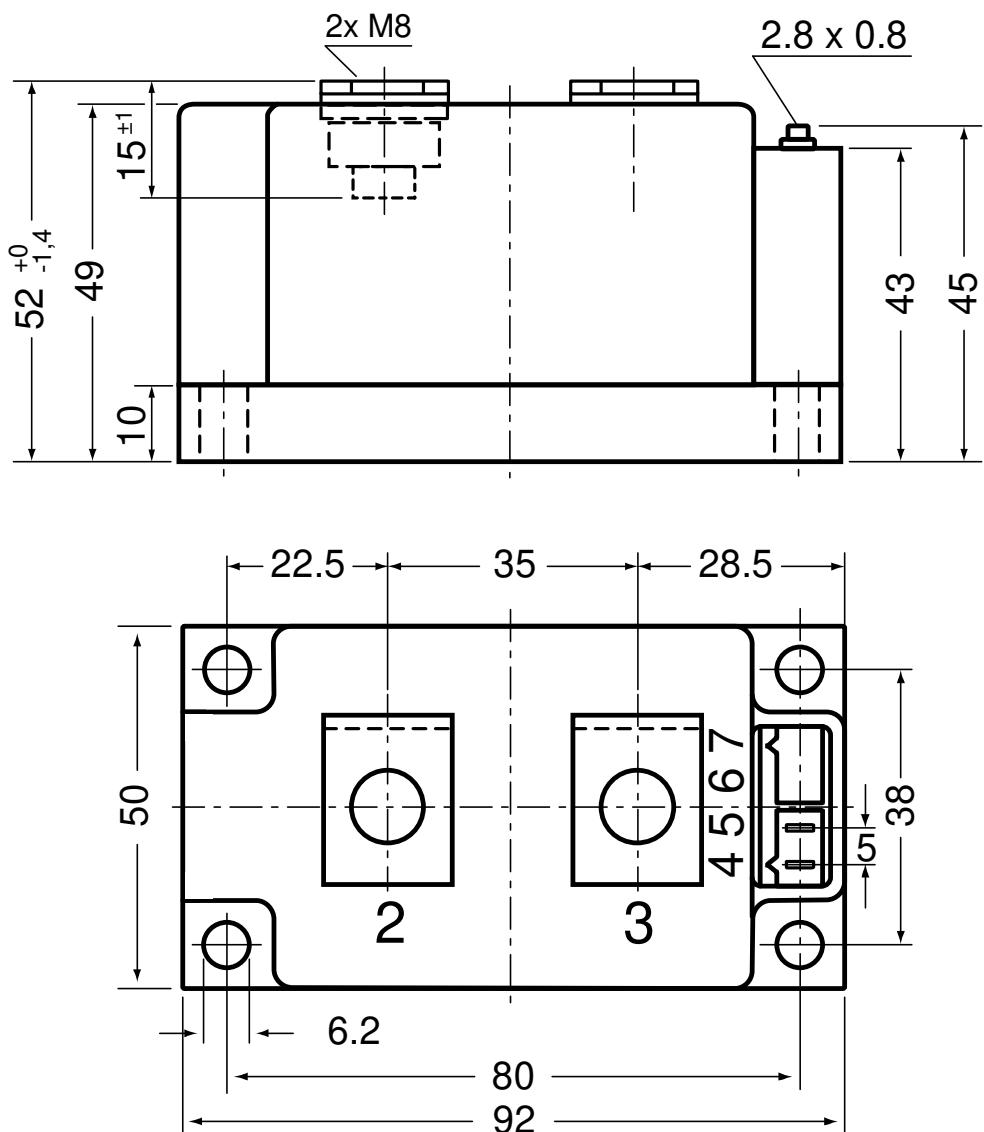
Optional accessories for modules
Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red
Type ZY 180L (L = Left for pin pair 4/5) U L 758, style 3751

3

5

4

2
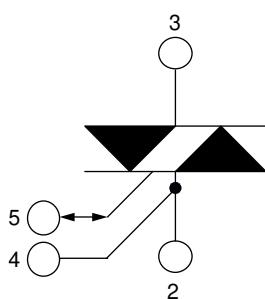
**Thyristor**
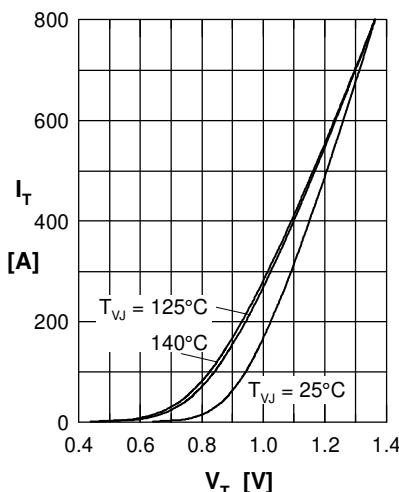
Fig. 1 Forward characteristics
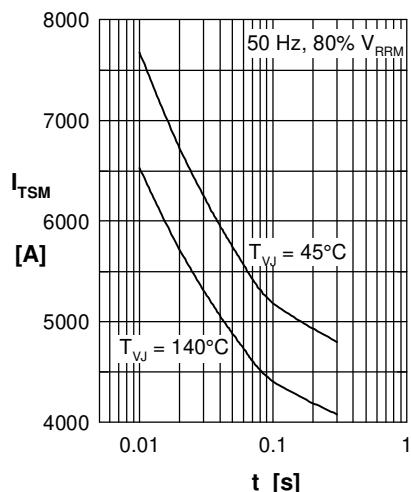
Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration
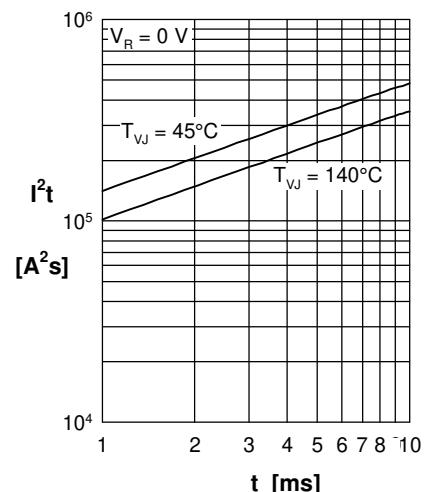

Fig. 3 I^2t versus time (1-10 s)
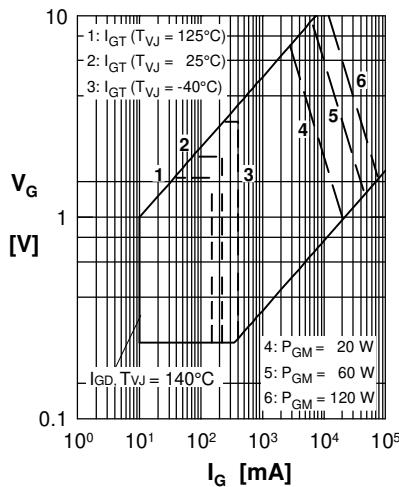
Fig. 4 Gate voltage & gate current
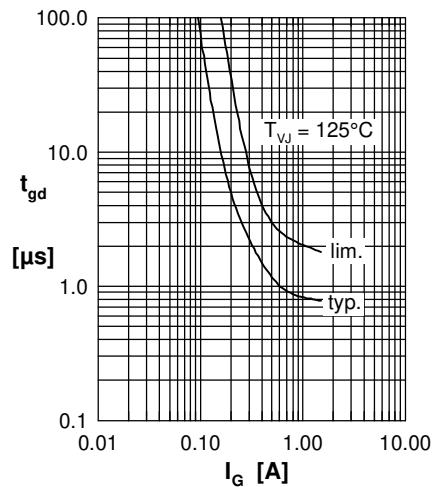

Fig. 5 Gate controlled delay time t_{gd}
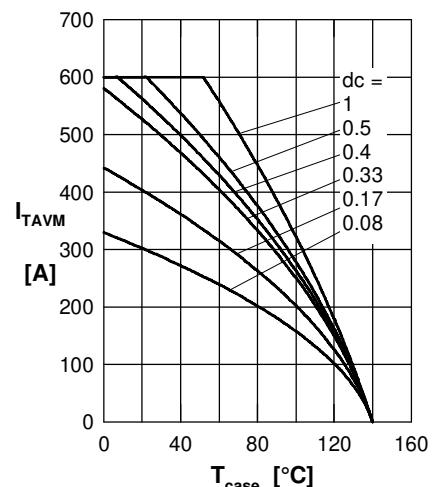

Fig. 6 Max. forward current at
case temperature
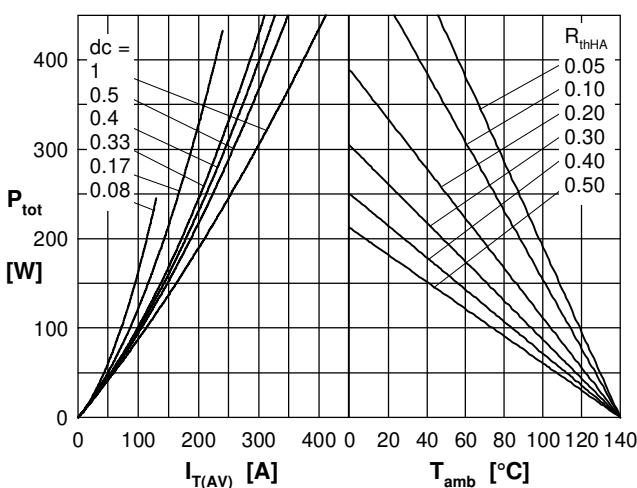
Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

| 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
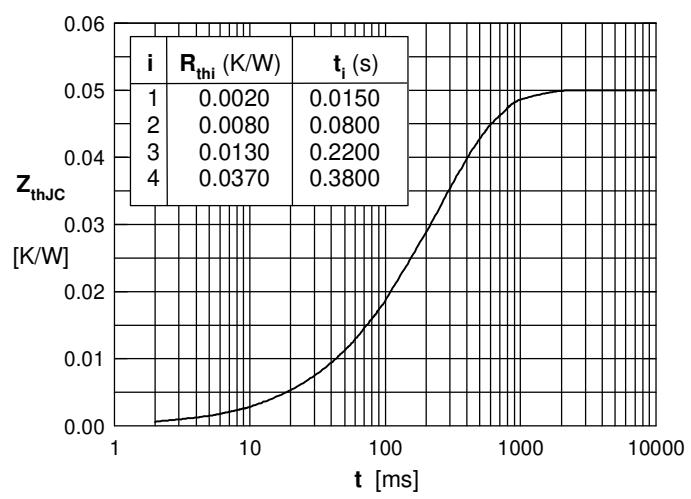
Fig. 8 Transient thermal impedance junction to case

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747and per semiconductor unless otherwise specified   20170116e