Thyristor Module

V_{RRM} = 2 x 1400 V

I_{TAV} = 181 A

V_T = 1.03 V

Phase leg

Part number

MCC162-14io1
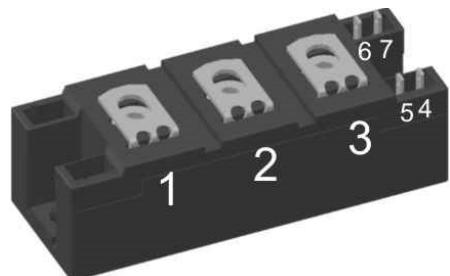
Backside: isolated

E72873
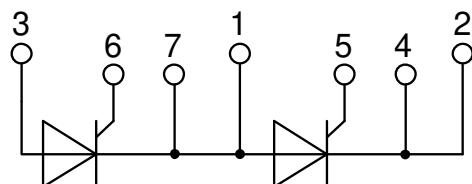
Features / Advantages:
- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al2O3-ceramic

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

Package: Y4
- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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Thyristor

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	$T_{VJ} = 25°C$			300	µA
		$V_{R/D} = 1400$ V	$T_{VJ} = 125°C$			10	mA
V_T	forward voltage drop	$I_T = 150$ A	$T_{VJ} = 25°C$			1.09	V
		$I_T = 300$ A				1.25	V
		$I_T = 150$ A	$T_{VJ} = 125°C$			1.03	V
		$I_T = 300$ A				1.25	V
I_{TAV}	average forward current	$T_C = 85°C$	$T_{VJ} = 125°C$			181	A
$I_{T(RMS)}$	RMS forward current	180° sine				300	A
V_{T0}	threshold voltage	for power loss calculation only	$T_{VJ} = 125°C$			0.88	V
r_T	slope resistance					1.15	mΩ
R_{thJC}	thermal resistance junction to case					0.155	K/W
R_{thCH}	thermal resistance case to heatsink				0.07		K/W
P_{tot}	total power dissipation	$T_C = 25°C$				645	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			6.00	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			6.48	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			5.10	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			5.51	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			180.0	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			174.7	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			130.1	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			126.3	kA²s
C_J	junction capacitance	$V_R = 400$ V f = 1 MHz	$T_{VJ} = 25°C$		273		pF
P_{GM}	max. gate power dissipation	$t_P = 30$ µs	$T_C = 125°C$			120	W
		$t_P = 500$ µs				60	W
P_{GAV}	average gate power dissipation					8	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125°C$; f = 50 Hz repetitive, $I_T = 540$ A $t_P = 200$ µs; $di_G/dt = 0.5$ A/µs;				150	A/µs
		$I_G = 0.5$ A; V = ⅔ V_{DRM} non-repet., $I_T = 180$ A				500	A/µs
$(dv/dt)_{cr}$	critical rate of rise of voltage	V = ⅔ V_{DRM} $R_{GK} = ∞$; method 1 (linear voltage rise)	$T_{VJ} = 125°C$			1000	V/µs
V_{GT}	gate trigger voltage	$V_D = 6$ V	$T_{VJ} = 25°C$			2.5	V
			$T_{VJ} = -40°C$			2.6	V
I_{GT}	gate trigger current	$V_D = 6$ V	$T_{VJ} = 25°C$			150	mA
			$T_{VJ} = -40°C$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = ⅔ V_{DRM}$	$T_{VJ} = 125°C$			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 30$ µs $I_G = 0.5$ A; $di_G/dt = 0.5$ A/µs	$T_{VJ} = 25°C$			300	mA
I_H	holding current	$V_D = 6$ V $R_{GK} = ∞$	$T_{VJ} = 25°C$			200	mA
t_{gd}	gate controlled delay time	$V_D = ½ V_{DRM}$ $I_G = 0.5$ A; $di_G/dt = 0.5$ A/µs	$T_{VJ} = 25°C$			2	µs
t_q	turn-off time	$V_R = 100$ V; $I_T = 300$A; V = ⅔ V_{DRM} $T_{VJ} = 100$ °C di/dt = 10 A/µs dv/dt = 20 V/µs $t_p = 200$ µs			150		µs

IXYS reserves the right to change limits, conditions and dimensions.

Data according to IEC 60747and per semiconductor unless otherwise specified

20191210c

Package	Y4			Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				300	A
T_{VJ}	virtual junction temperature			-40		125	°C
T_{op}	operation temperature			-40		100	°C
T_{stg}	storage temperature			-40		125	°C
Weight					150		g
M_D	mounting torque			2.25		2.75	Nm
M_T	terminal torque			4.5		5.5	Nm
$d_{Spp/App}$	creepage distance on surface | striking distance through air	terminal to terminal	14.0	10.0			mm
$d_{Spb/Apb}$		terminal to backside	16.0	16.0			mm
V_{ISOL}	isolation voltage	t = 1 second	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute		3000			V

Date Code (DC) + Production Index (PI)

yywwAA
Part Number
Lot.No: xxxxxx
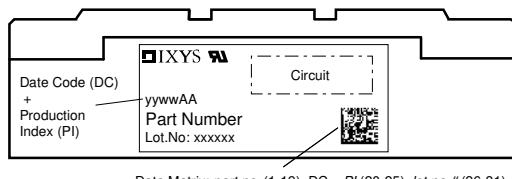
Circuit

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

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC162-14io1	MCC162-14io1	Box	6	429600

Equivalent Circuits for Simulation   * * on die level* $T_{VJ} = 125°C$
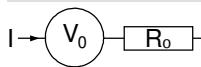
Thyristor

$V_{0\,max}$	threshold voltage	0.88	V
$R_{0\,max}$	slope resistance *	0.8	mΩ

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Outlines   Y4
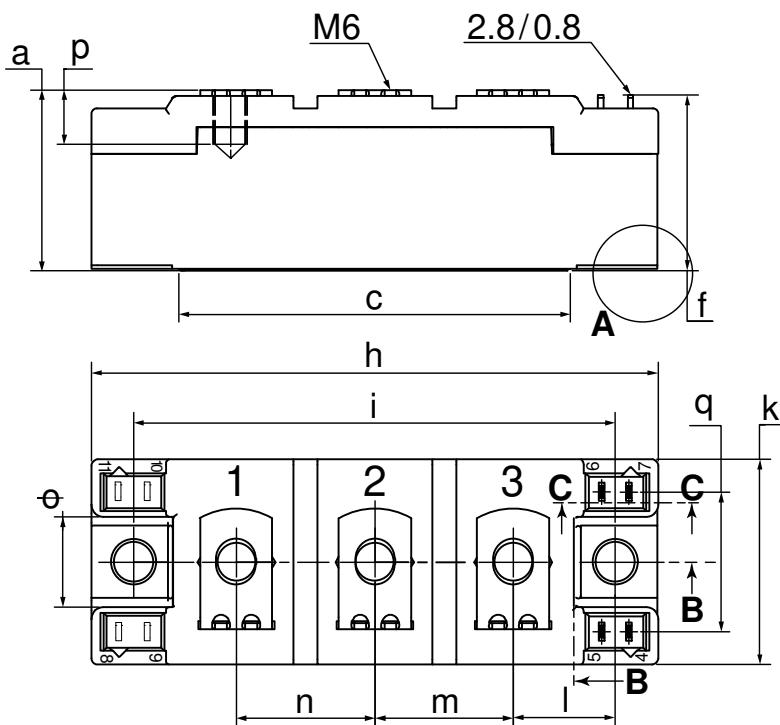
Dim.	MIN [mm]	MAX [mm]	MIN [inch]	MAX [inch]
a	30.0	30.6	1.181	1.205
b	typ. 0.25		typ. 0.010	
c	64.0	65.0	2.520	2.559
d	6.5	7.0	0.256	0.275
e	4.9	5.1	0.193	0.201
f	28.6	29.2	1.126	1.150
g	7.3	7.7	0.287	0.303
h	93.5	94.5	3.681	3.720
i	79.5	80.5	3.130	3.169
j	4.8	5.2	0.189	0.205
k	33.4	34.0	1.315	1.339
l	16.7	17.3	0.657	0.681
m	22.7	23.3	0.894	0.917
n	22.7	23.3	0.894	0.917
o	14.0	15.0	0.551	0.591
p	typ. 10.5		typ. 0.413	
q	22.8	23.3	0.898	0.917
r	1.8	2.4	0.071	0.041

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
Type ZY 180R (R = Right for pin pair 6/7) ⎭

A (3:1)

B-B (1:1)

C-C (1:1)
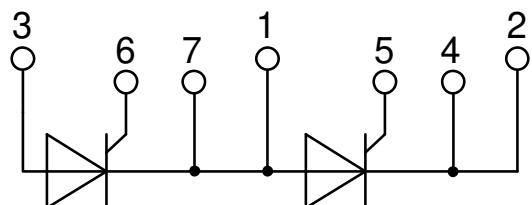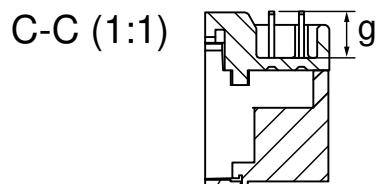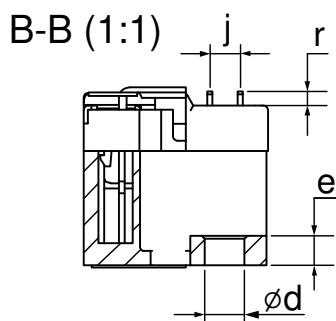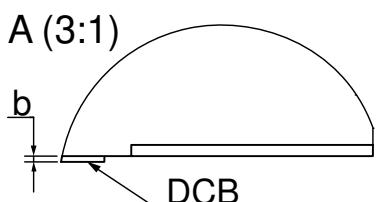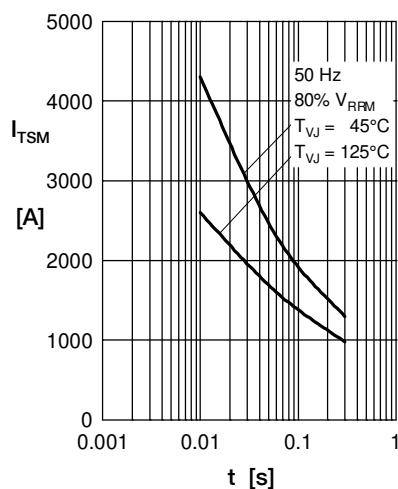
Thyristor

Fig. 1 Surge overload current I_{TSM},
I_{FSM}: Crest value, t: duration
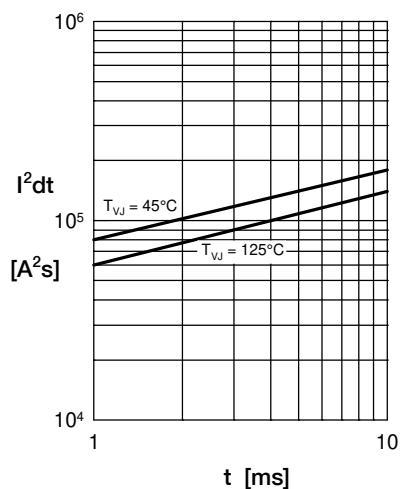
Fig. 2 I^2t versus time (1-10 ms)
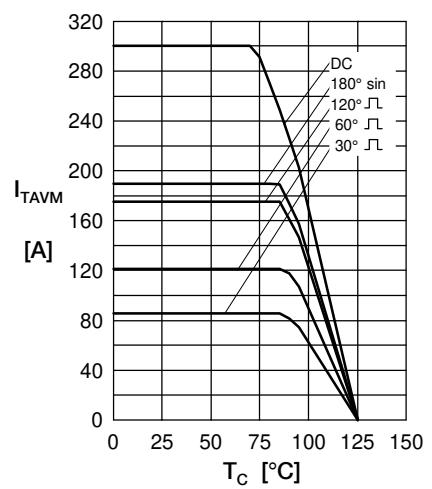

Fig. 3 Max. forward current
at case temperature
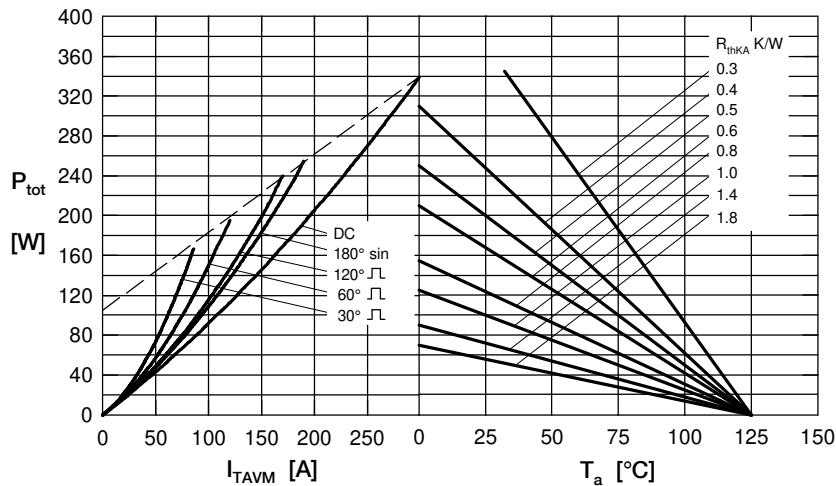
Fig. 4 Power dissipation vs. on-state current & ambient temperature
(per thyristor or diode)
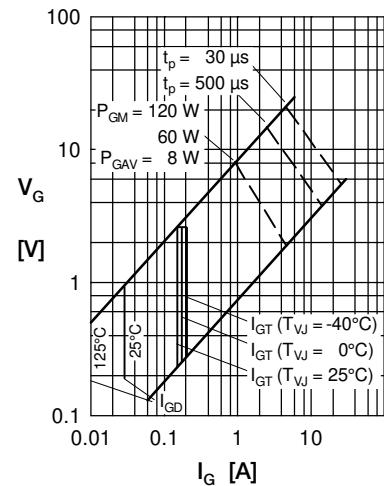
Fig. 5 Gate trigger characteristics
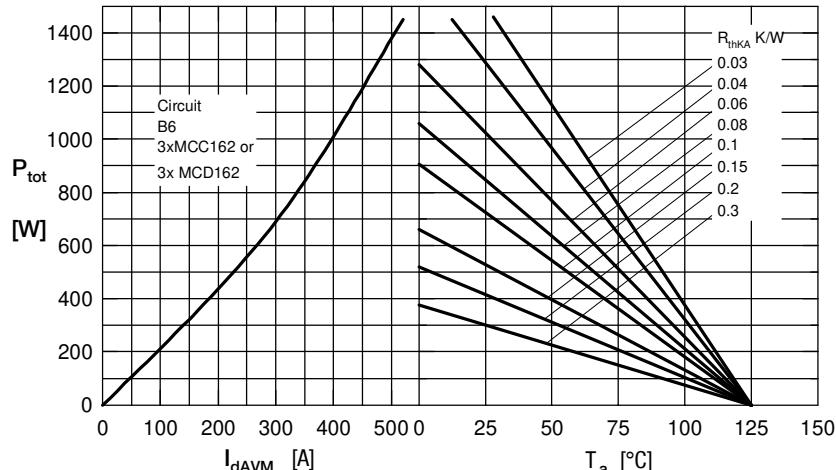
Fig. 6 Three phase rectifier bridge: Power dissipation versus direct
output current and ambient temperature
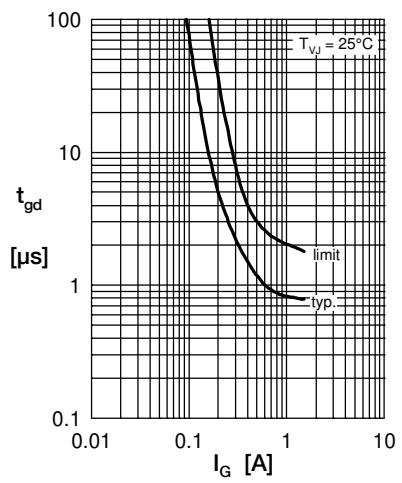
Fig. 7 Gate trigger delay time

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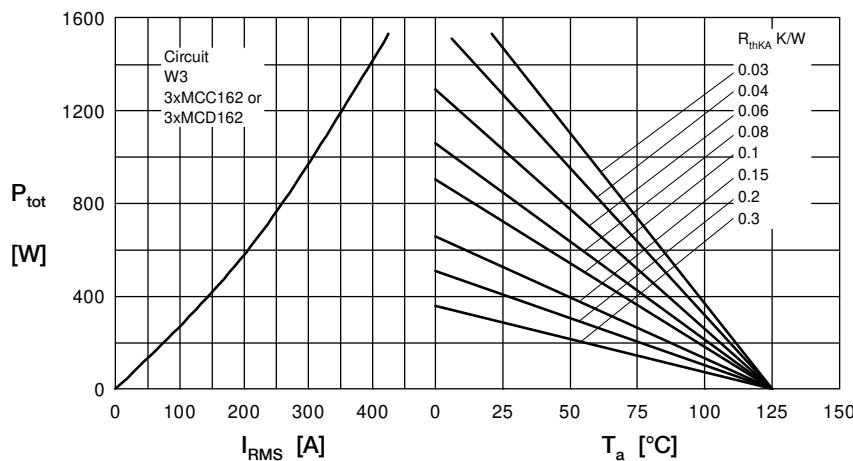
Thyristor

Fig. 8 Three phase AC-controller: Power dissipation versus
RMS output current and ambient temperature
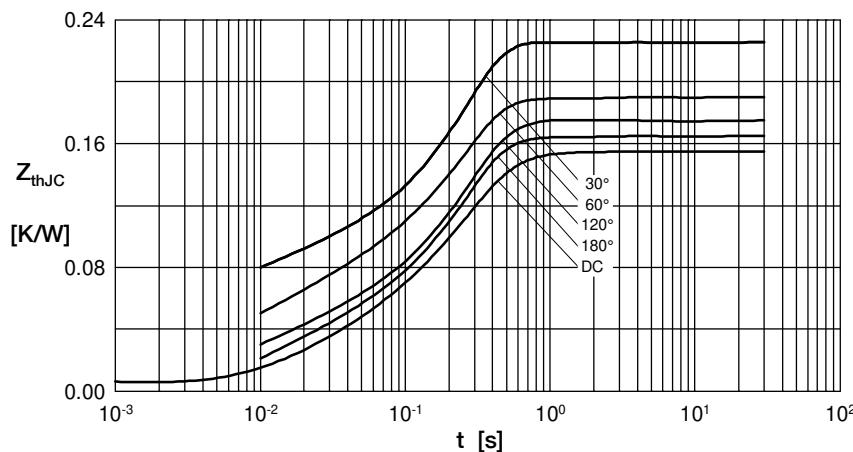
Fig. 9 Transient thermal impedance junction to case (per thyristor/diode)

R_{thJC} for various conduction angles d:

d	R_{thJC} [K/W]
DC	0.155
180°	0.167
120°	0.176
60°	0.197
30°	0.227

Constants for Z_{thJC} calculation:

| i	R_{thi} [K/W]	t_i [s]
1	0.0072	0.001
2	0.0188	0.080
3	0.1290	0.200
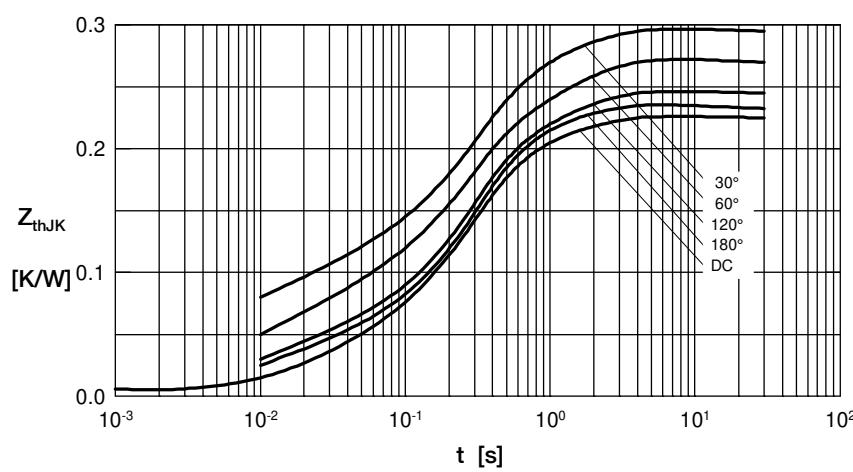
Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)

R_{thJK} for various conduction angles d:

d	R_{thJK} [K/W]
DC	0.225
180°	0.237
120°	0.246
60°	0.267
30°	0.297

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.0072	0.001
2	0.0188	0.080
3	0.1290	0.200
4	0.0700	1.000

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