Thyristor Module

V_{RRM}	$=$	$2 \times 1600\,V$
I_{TAV}	$=$	$320\,A$
V_T	$=$	$1.08\,V$

Phase leg
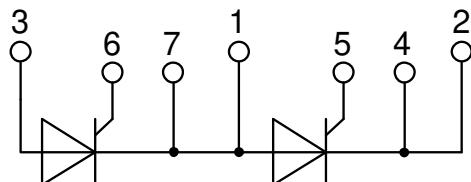
Part number

MCC310-16io1

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: Y2
- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling
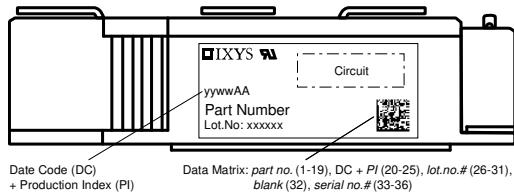
Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747and per semiconductor unless otherwise specified   20191210d

Thyristor

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	T_{VJ} = 25°C				1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	T_{VJ} = 25°C				1600	V
$I_{R/D}$	reverse current, drain current	$V_{R/D}$ = 1600 V	T_{VJ} = 25°C			1	mA
		$V_{R/D}$ = 1600 V	T_{VJ} = 140°C			40	mA
V_T	forward voltage drop	I_T = 300 A	T_{VJ} = 25°C			1.14	V
		I_T = 600 A				1.32	V
		I_T = 300 A	T_{VJ} = 125°C			1.08	V
		I_T = 600 A				1.30	V
I_{TAV}	average forward current	T_C = 85°C	T_{VJ} = 140°C			320	A
$I_{T(RMS)}$	RMS forward current	180° sine				500	A
V_{T0}	threshold voltage	for power loss calculation only	T_{VJ} = 140°C			0.80	V
r_T	slope resistance					0.82	mΩ
R_{thJC}	thermal resistance junction to case					0.11	K/W
R_{thCH}	thermal resistance case to heatsink				0.04		K/W
P_{tot}	total power dissipation	T_C = 25°C				1030	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			9.20	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			9.94	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			7.82	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			8.45	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			423.2	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			410.6	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			305.8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			296.7	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 = 500 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 = 960 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 = 320 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			150	mA
			T_{VJ} = -40°C			200	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 = 0.45 A; di_G/dt = 0.45 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 = 320A; V = ⅔ V_{DRM} T_{VJ} =125 °C			200		µs
		di/dt = 10 A/µs dv/dt = 50 V/µs t_p = 200 µs					

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747and per semiconductor unless otherwise specified   20191210d

Package   Y2

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					255		g
M$_D$	mounting torque			2.5		5	Nm
M$_T$	terminal torque			12		15	Nm
d$_{Spp/App}$	creepage distance on surface | striking distance through air	terminal to terminal		13.0			mm
d$_{Spb/Apb}$		terminal to backside		13.0			mm
V$_{ISOL}$	isolation voltage	t = 1 second	50/60 Hz, RMS; I$_{ISOL}$ ≤ 1 mA	3600			V
		t = 1 minute		3000			V

Date Code (DC) + Production Index (PI)

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

yywwAA
Part Number
Lot.No: xxxxxx
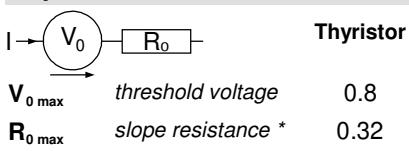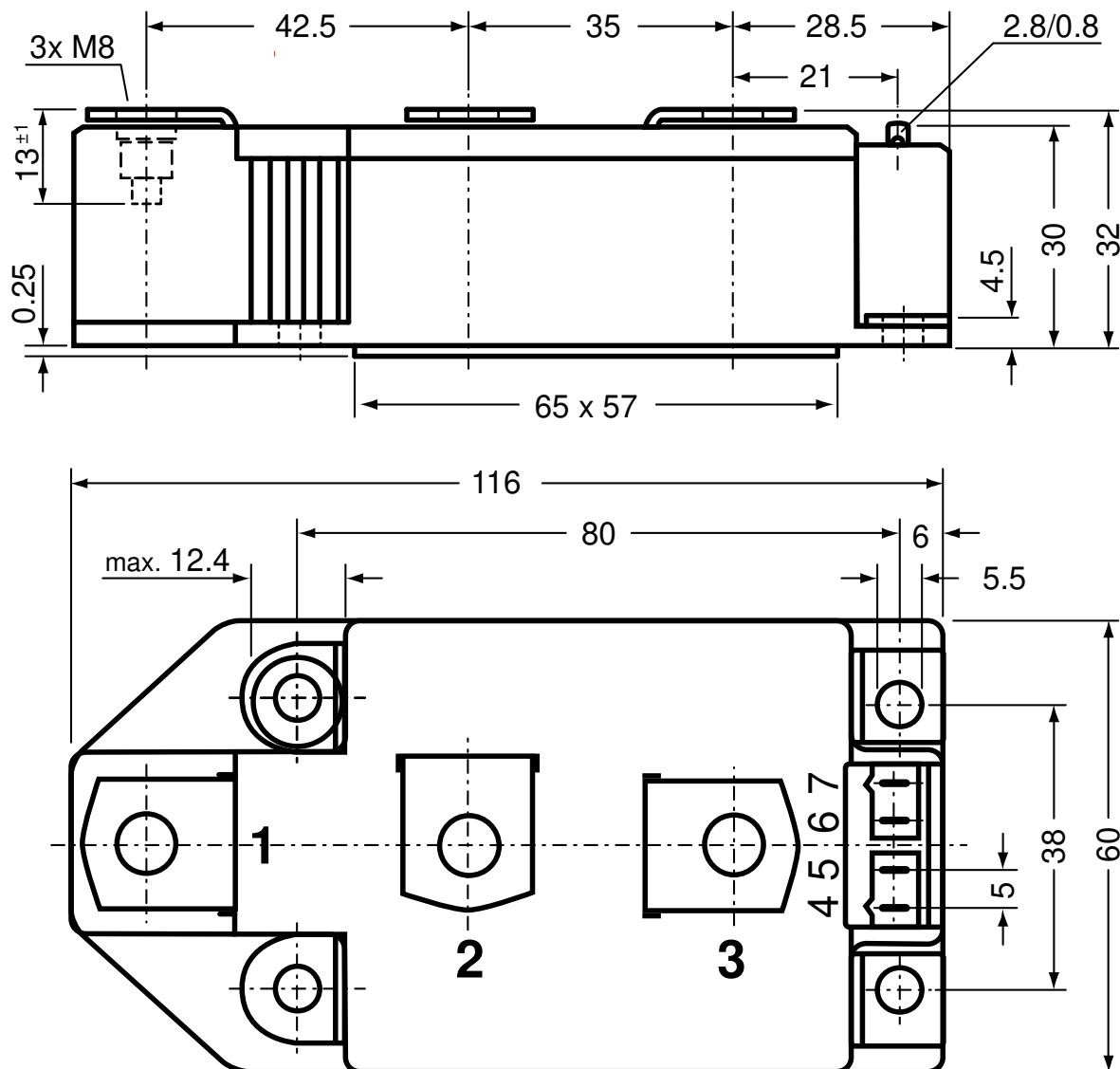
Circuit

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC310-16io1	MCC310-16io1	Box	2	428663

Equivalent Circuits for Simulation   *on die level*   T$_{VJ}$ = 140°C

I → V$_0$ → R$_0$

Thyristor

V$_{0\ max}$	threshold voltage	0.8	V
R$_{0\ max}$	slope resistance *	0.32	mΩ

Outlines   Y2

3x M8

42.5   35   28.5   2.8/0.8
21
13 ±1
0.25
4.5   30   32
65 x 57

116
80   6
max. 12.4   5.5
1
4 5 6 7
38   60
5
2   3
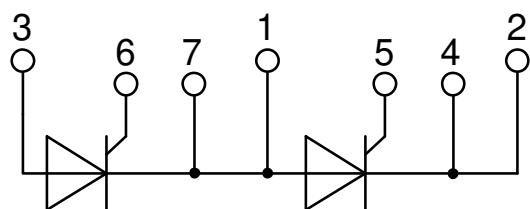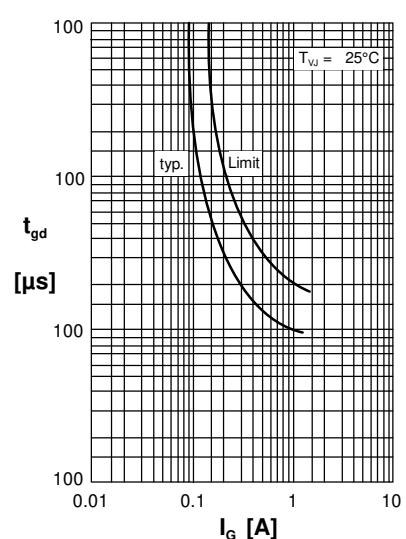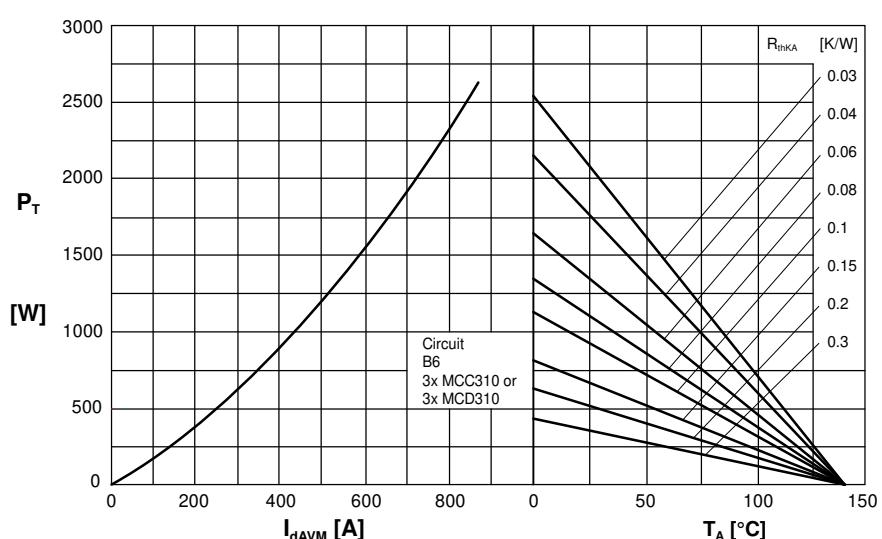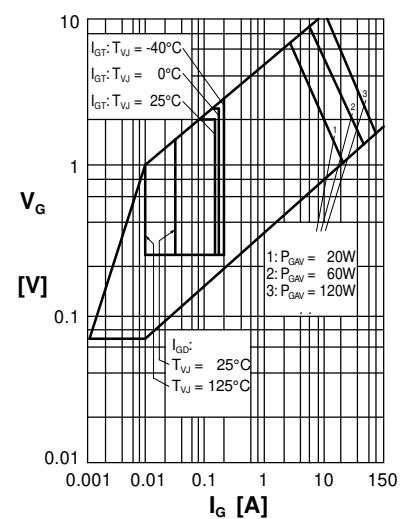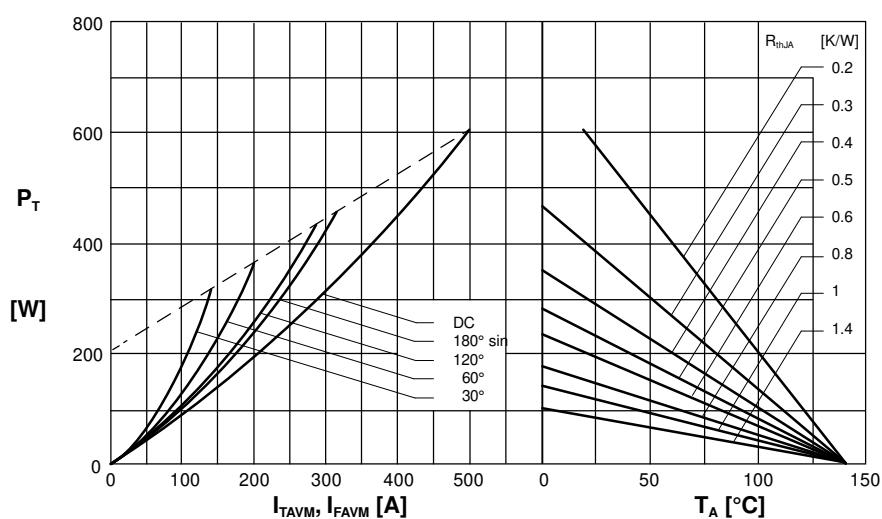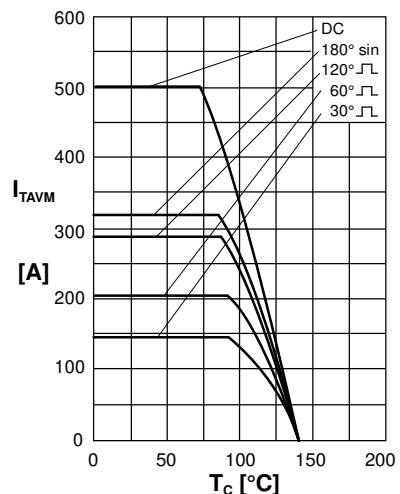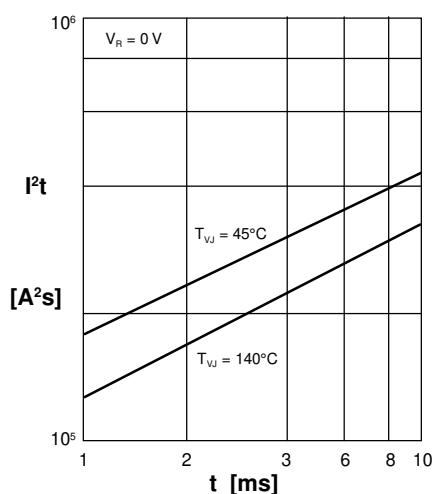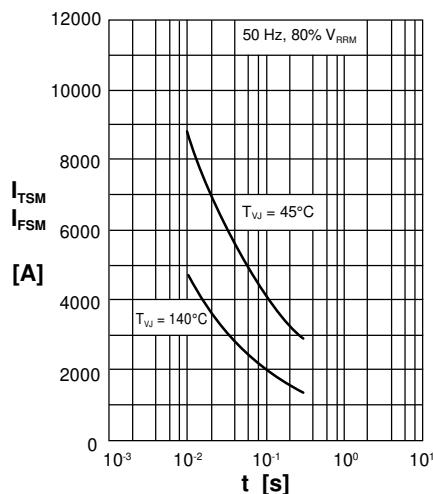
Optional accessories for modules
Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red
Type ZY 180L (L = Left for pin pair 4/5)
Type ZY 180R (R = Right for pin pair 6/7)   } UL 758, style 3751

3   6   7   1   5   4   2

## Thyristor

Fig. 1 Surge overload current
$I_{T(F)SM}$: crest value, t: duration

Fig. 2 I²t versus time (1-10 ms)

Fig. 3 Max. forward current
at case temperature

Fig. 4 Power dissipation versus onstate current and•
ambient temperature (per thyristor/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

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747and per semiconductor unless otherwise specified   20191210d

Thyristor

Fig. 7   Three phase AC-controller: •
Power dissipation versus RMS output current and ambient temperature
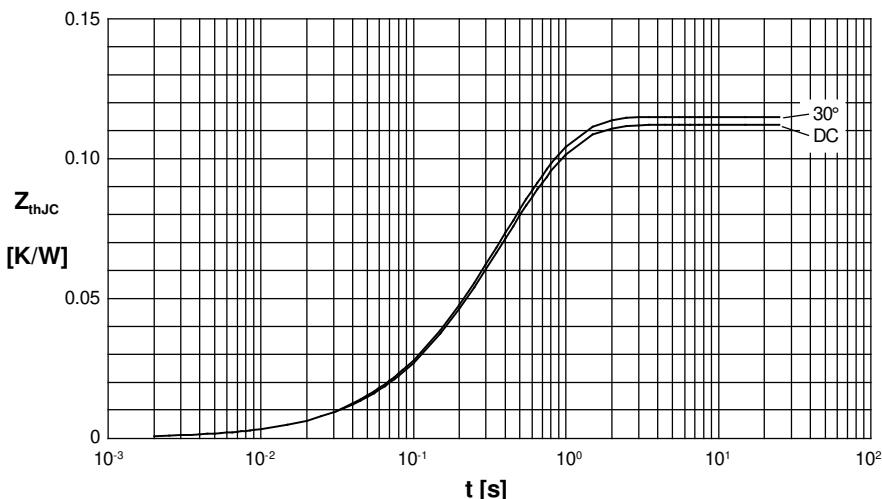
Fig. 8   Transient thermal impedance junction to case (per thyristor)

R_{thJC} for various conduction angles d:

d	R_{thJC} (K/W)
DC	0.112
180°C	0.113
120°C	0.114
60°C	0.115
30°C	0.115

Constants for Z_{thJC} calculation:

| i	R_{thi} [K/W]	t_i [s]
1	0.003	0.099
2	0.0143	0.168
3	0.0947	0.456
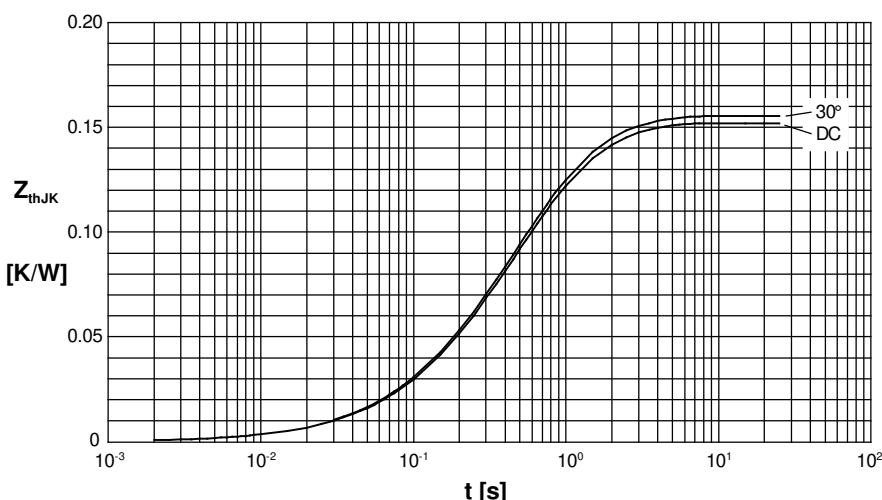
Fig. 9   Transient thermal impedance junction to heatsink (per thyristor)

R_{thJK} for various conduction angles d:

d	R_{thJK} [K/W]
DC	0.152
180°C	0.154
120°C	0.154
60°C	0.155
30°C	0.155

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.003	0.099
2	0.0143	0.168
3	0.0947	0.456
4	0.04	1.36

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747and per semiconductor unless otherwise specified   20191210d