

Thyristor Module

$$V_{RRM} = 2 \times 1600 \text{ V}$$

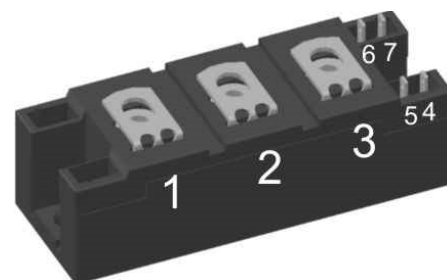
$$I_{TAV} = 200 \text{ A}$$

$$V_T = 1.12 \text{ V}$$

Phase leg

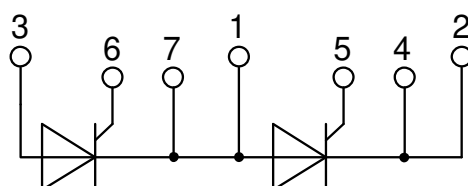
Part number

MCMA200P1600YA



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

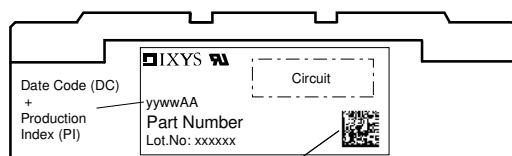
Disclaimer Notice

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.



Thyristor				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1600	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1600\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			300	μA
		$V_{R/D} = 1600\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			10	mA
V_T	forward voltage drop	$I_T = 200\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.17	V
		$I_T = 400\text{ A}$				1.40	V
		$I_T = 200\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.12	V
		$I_T = 400\text{ A}$				1.41	V
I_{TAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 125^{\circ}\text{C}$			200	A
$I_{T(RMS)}$	RMS forward current	180° sine				315	A
V_{T0}	threshold voltage	for power loss calculation only	$T_{VJ} = 125^{\circ}\text{C}$			0.83	V
r_T	slope resistance					1.43	m Ω
R_{thJC}	thermal resistance junction to case					0.17	K/W
R_{thCH}	thermal resistance case to heatsink				0.09		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$			680	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			6.00	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			6.48	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			5.10	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			5.51	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			180.0	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			174.7	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			130.1	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			126.3	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		273		pF
P_{GM}	max. gate power dissipation	$t_P = 30\text{ }\mu\text{s}$	$T_C = 125^{\circ}\text{C}$			120	W
		$t_P = 500\text{ }\mu\text{s}$				60	W
P_{GAV}	average gate power dissipation					8	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 600\text{ A}$				100	A/ μs
		$t_P = 200\text{ }\mu\text{s}; di_G/dt = 0.5\text{ A}/\mu\text{s};$					
$(dv/dt)_{cr}$	critical rate of rise of voltage	$I_G = 0.5\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 200\text{ A}$				1000	A/ μs
		$V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 140^{\circ}\text{C}$				1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			2.5	V
			$T_{VJ} = -40^{\circ}\text{C}$			2.6	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			150	mA
			$T_{VJ} = -40^{\circ}\text{C}$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_P = 30\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			300	mA
		$I_G = 0.5\text{ A}; di_G/dt = 0.5\text{ A}/\mu\text{s}$					
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			200	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
		$I_G = 0.5\text{ A}; di_G/dt = 0.5\text{ A}/\mu\text{s}$					
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 200\text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 100^{\circ}\text{C}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_P = 200\text{ }\mu\text{s}$			150		μs

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} ≤ 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

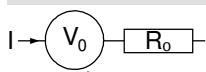
M = Module
 C = Thyristor (SCR)
 M = Thyristor
 A = (up to 1800V)
 200 = Current Rating [A]
 P = Phase leg
 1600 = Reverse Voltage [V]
 YA = Y4-M6

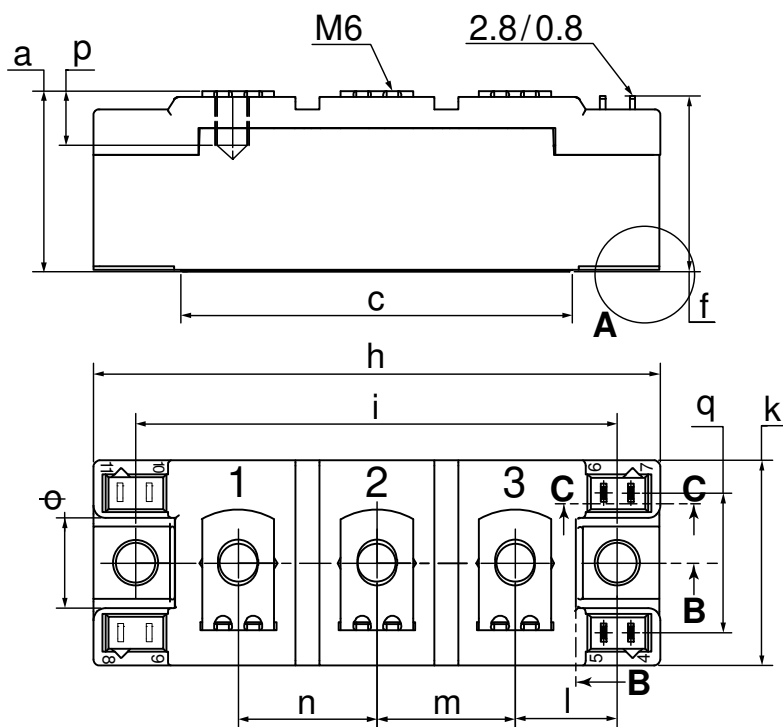
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA200P1600YA	MCMA200P1600YA	Box	6	524795

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 125\text{ °C}$

		Thyristor	
$V_{0\text{ max}}$	threshold voltage	0.83	V
$R_{0\text{ max}}$	slope resistance *	0.8	mΩ

Outlines Y4


Optional accessories for modules

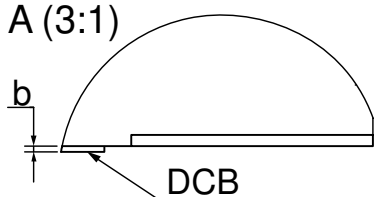
Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red

Type ZY 180L (L = Left for pin pair 4/5)

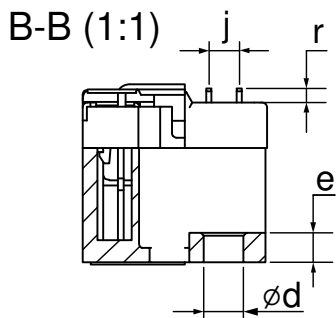
Type ZY 180R (R = Right for pin pair 6/7) } UL 758, style 3751

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

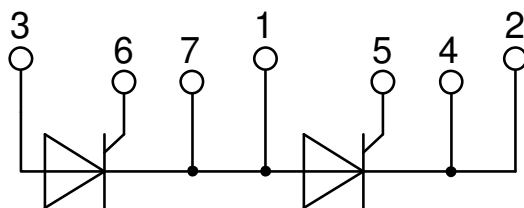
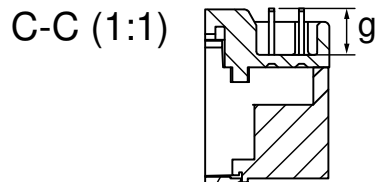
A (3:1)



B-B (1:1)



C-C (1:1)



Thyristor

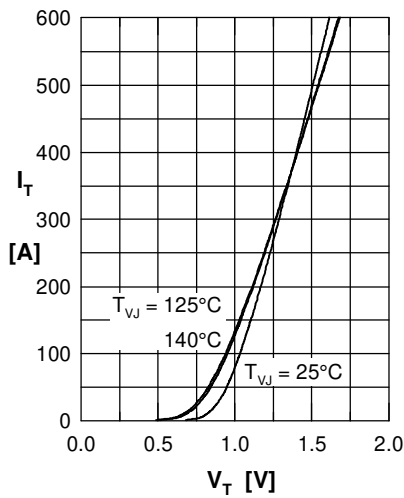


Fig. 1 Forward current vs. voltage drop per thyristor

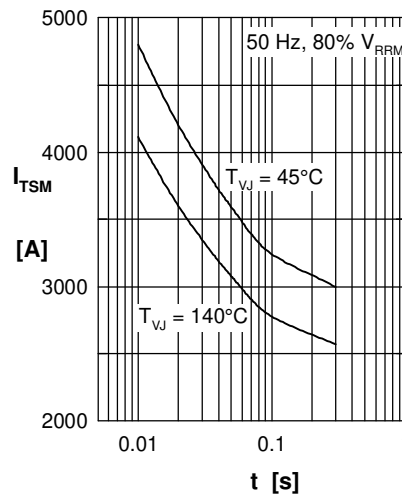


Fig. 2 Surge overload current vs. time per thyristor

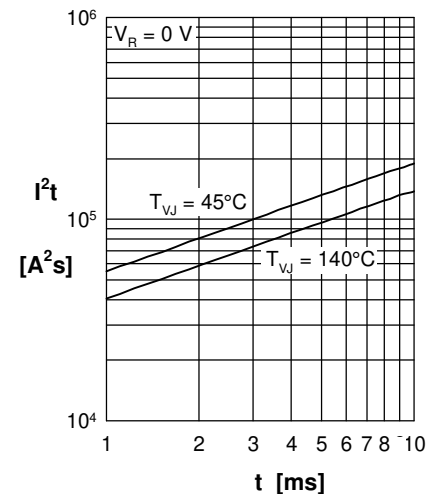


Fig. 3 I^2t vs. time per thyristor

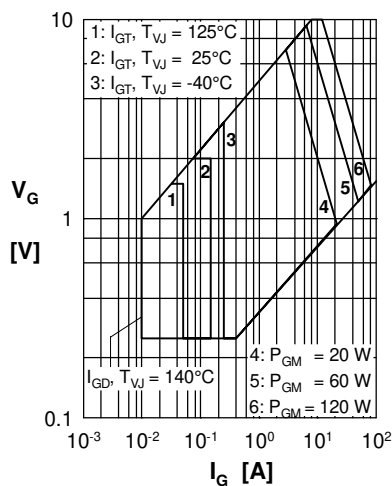


Fig. 4 Gate voltage & gate current

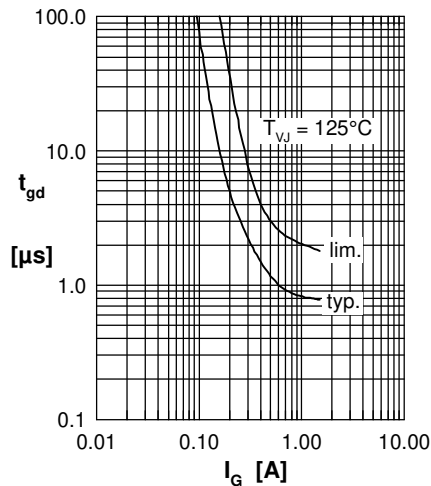


Fig. 5 Gate controlled delay time t_{gd}

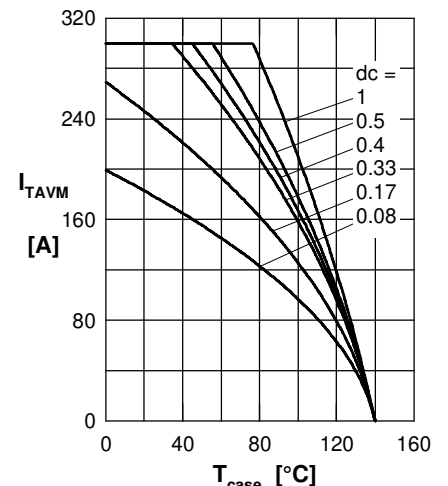


Fig. 6 Max. forward current vs. case temperature per thy.

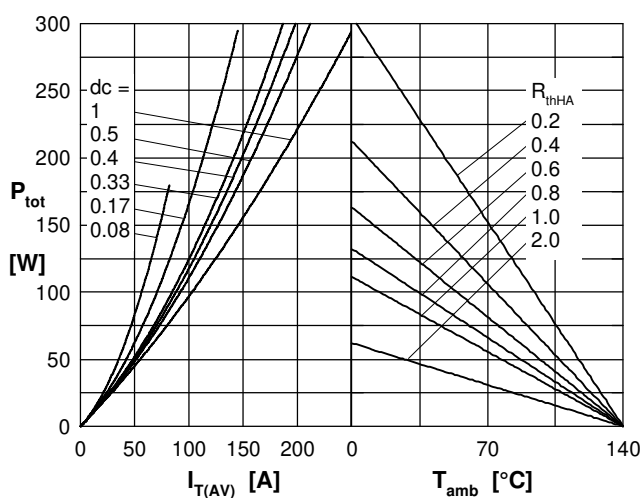


Fig. 7 Power dissipation vs. forward current and ambient temperature per thyristor

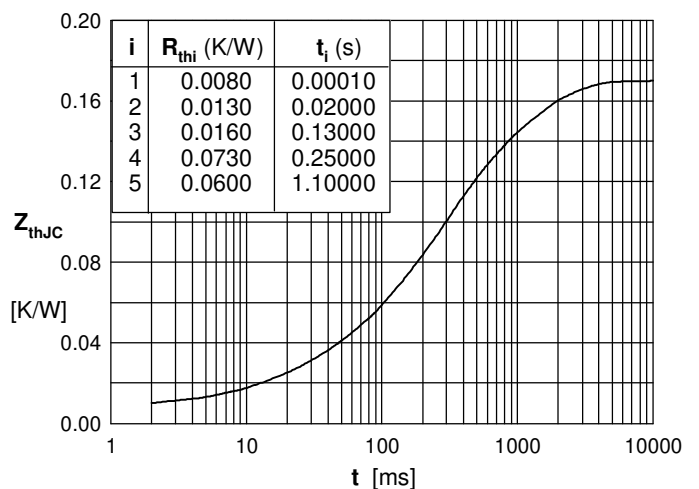


Fig. 8 Transient thermal impedance junction to case vs. time per thyristor