

Thyristor Module

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

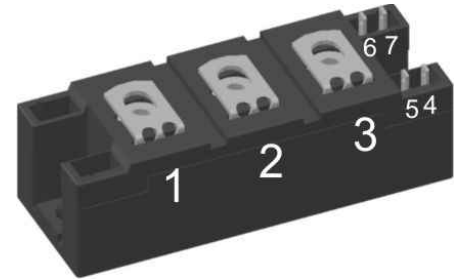
$$I_{TAV} = 260 \text{ A}$$

$$V_T = 1.06 \text{ V}$$

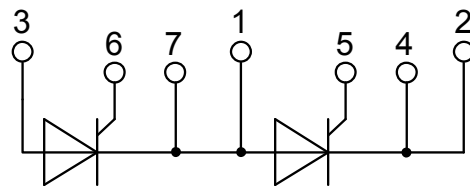
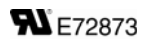
Phase leg

Part number

MCMA260P1600YA



Backside: isolated



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al₂O₃-ceramic

Applications:

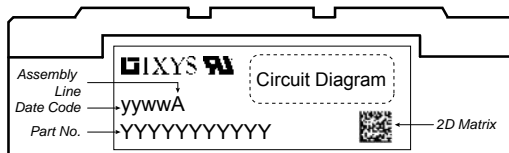
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: Y4

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

Thyristor				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V	
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V	
I_{RD}	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		300	μA	
		$V_{R/D} = 1600 V$	$T_{VJ} = 140^{\circ}C$		20	mA	
V_T	forward voltage drop	$I_T = 200 A$	$T_{VJ} = 25^{\circ}C$		1.12	V	
		$I_T = 400 A$			1.33	V	
		$I_T = 200 A$	$T_{VJ} = 125^{\circ}C$		1.06	V	
		$I_T = 400 A$			1.31	V	
I_{TAV}	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		260	A	
$I_{T(RMS)}$	RMS forward current	180° sine			408	A	
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0.81	V	
r_T	slope resistance				1.23	m Ω	
R_{thJC}	thermal resistance junction to case				0.13	K/W	
R_{thCH}	thermal resistance case to heatsink			0.08		K/W	
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		880	W	
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		8.30	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		8.97	kA	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		7.06	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		7.62	kA	
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		344.5	kA ² s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		334.3	kA ² s	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		248.9	kA ² s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		241.6	kA ² s	
C_J	junction capacitance	$V_R = 400 V$ f = 1 MHz	$T_{VJ} = 25^{\circ}C$		366	pF	
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		120	W	
		$t_p = 500 \mu s$			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 Hz	repetitive, $I_T = 780 A$		100	A/ μs	
		$t_p = 200 \mu s$; $di_G/dt = 0.5 A/\mu s$; $I_G = 0.5 A$; $V_D = \frac{2}{3} V_{DRM}$	non-repet., $I_T = 500 A$		260	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	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		2	V	
			$T_{VJ} = -40^{\circ}C$		3	V	
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		150	mA	
			$T_{VJ} = -40^{\circ}C$		220	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	$t_p = 30 \mu s$	$T_{VJ} = 25^{\circ}C$		200	mA	
		$I_G = 0.5 A$; $di_G/dt = 0.5 A/\mu s$					
I_H	holding current	$V_D = 6 V$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		150	mA	
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	μs	
		$I_G = 0.5 A$; $di_G/dt = 0.5 A/\mu s$					
t_q	turn-off time	$V_R = 100 V$; $I_T = 260 A$; $V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s$; $dv/dt = 50 V/\mu s$; $t_p = 200 \mu s$	$T_{VJ} = 140^{\circ}C$		200	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		140	°C
T_{op}	operation temperature		-40		125	°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		4800	V
		t = 1 minute			4000	V



Part number

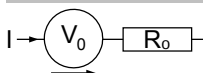
- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 260 = Current Rating [A]
- P = Phase leg
- 1600 = Reverse Voltage [V]
- YA = Y4-M6

Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA260P1600YA	MCMA260P1600YA	Box	6	509785

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 140$ °C



Thyristor

$V_{0\ max}$	threshold voltage	0.81	V
$R_{0\ max}$	slope resistance *	0.59	mΩ

Thyristor

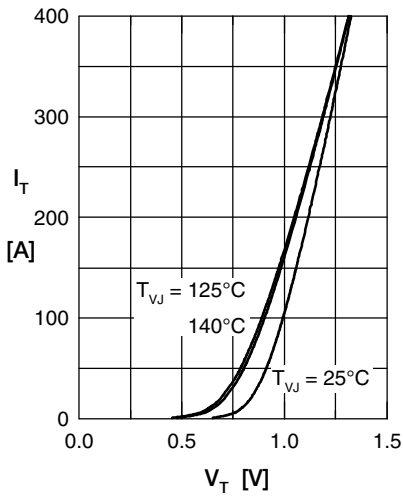


Fig. 1 Forward current vs. voltage drop per thyristor

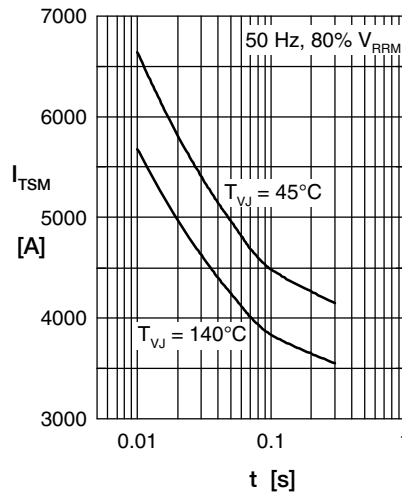


Fig. 2 Surge overload current vs. time per thyristor

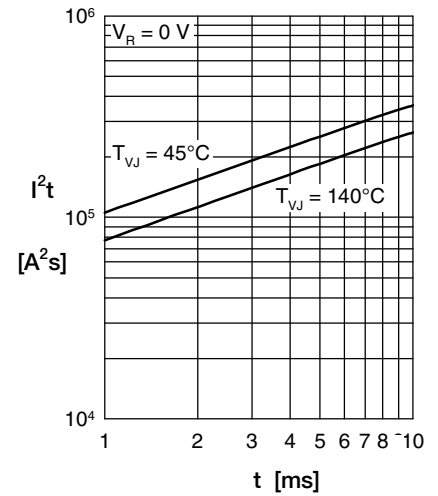


Fig. 3 I^2t vs. time per thyristor

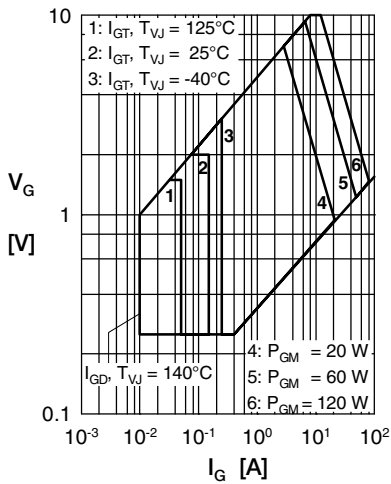


Fig. 4 Gate voltage & gate current

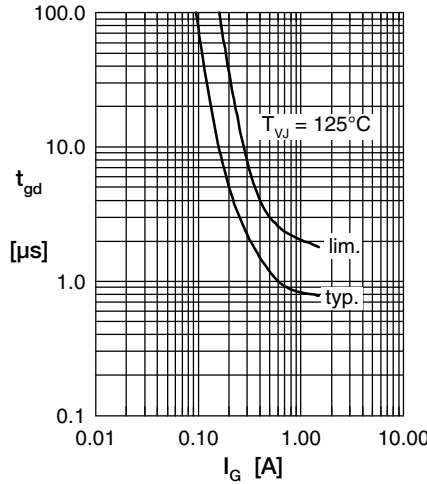


Fig. 5 Gate controlled delay time t_{gd}

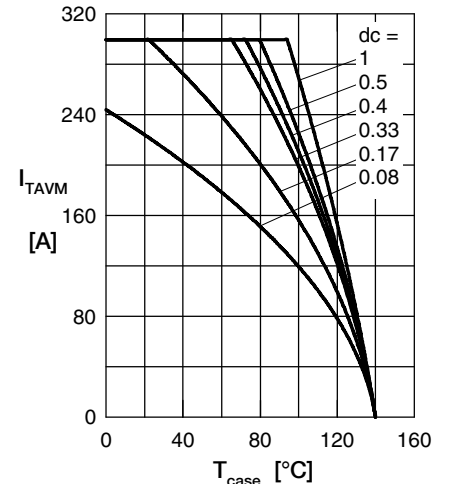


Fig. 6 Max. forward current vs. case temperature per thyristor.

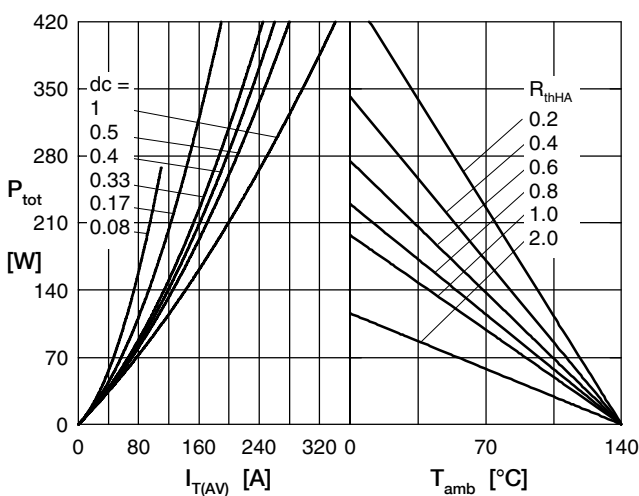


Fig. 7 Power dissipation vs. forward current and ambient temperature per thyristor

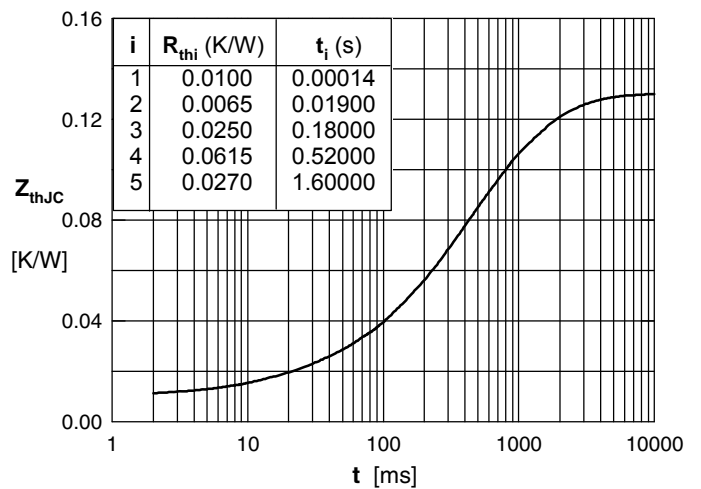


Fig. 8 Transient thermal impedance junction to case vs. time per thyristor