

Thyristor Module

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

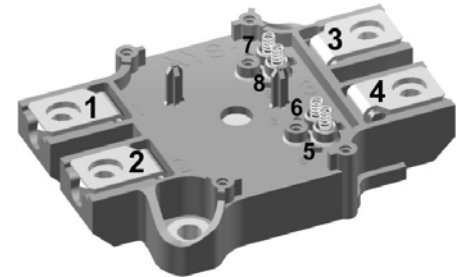
$$I_{TAV} = 200 \text{ A}$$

$$V_T = 1.13 \text{ V}$$

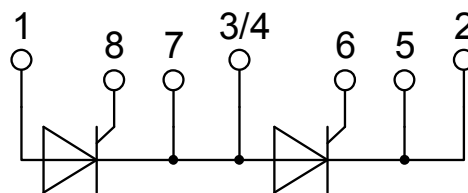
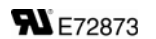
Phase leg

Part number

MCMA200P1600SA



Backside: isolated



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Copper base plate with Direct Copper Bonded Al₂O₃-ceramic
- Spring contacts for solder-free dirver connection

Applications:

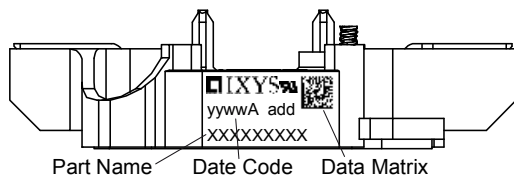
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: SimBus A

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Gate: Spring contacts for solder-free PCB-mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- 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	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		200	μA	
		$V_{R/D} = 1600 V$	$T_{VJ} = 125^{\circ}C$		15	mA	
V_T	forward voltage drop	$I_T = 200 A$	$T_{VJ} = 25^{\circ}C$		1.16	V	
		$I_T = 400 A$			1.40	V	
		$I_T = 200 A$	$T_{VJ} = 125^{\circ}C$		1.13	V	
		$I_T = 400 A$			1.44	V	
I_{TAV}	average forward current	$T_C = 90^{\circ}C$	$T_{VJ} = 140^{\circ}C$		200	A	
$I_{T(RMS)}$	RMS forward current	180° sine			314	A	
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0.81	V	
r_T	slope resistance				1.6	m Ω	
R_{thJC}	thermal resistance junction to case				0.15	K/W	
R_{thCH}	thermal resistance case to heatsink			0.08		K/W	
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		760	W	
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		6.00	kA	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		6.48	kA	
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		5.10	kA	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		5.51	kA	
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		180.0	kA ² s	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		174.7	kA ² s	
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		130.1	kA ² s	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		126.3	kA ² s	
C_J	junction capacitance	$V_R = 400 V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		273	pF	
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		120	W	
		$t_p = 300 \mu s$			60	W	
P_{GAV}	average gate power dissipation				8	W	
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C; f = 50 \text{ Hz}$	repetitive, $I_T = 600 A$		150	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., $I_T = 200 A$		500	A/ μs	
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$	$T_{VJ} = 140^{\circ}C$		1000	V/ μs	
V_{GT}	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		2.5	V	
			$T_{VJ} = -40^{\circ}C$		2.6	V	
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		150	mA	
			$T_{VJ} = -40^{\circ}C$		200	mA	
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		0.2	V	
I_{GD}	gate non-trigger current				10	mA	
I_L	latching current	$t_p = 30 \mu s$	$T_{VJ} = 25^{\circ}C$		300	mA	
		$I_G = 0.5 A; di_G/dt = 0.5 A/\mu s$					
I_H	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	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	$V_R = 100 V; I_T = 200 A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 20 V/\mu s; t_p = 200 \mu s$	$T_{VJ} = 140^{\circ}C$		150	μs	

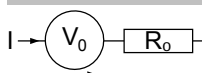
Package SimBus A		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			300	A
T_{VJ}	virtual junction temperature		-40		140	°C
T_{op}	operation temperature		-40		125	°C
T_{stg}	storage temperature		-40		125	°C
Weight				152		g
M_D	mounting torque		3		5	Nm
M_T	terminal torque		2.5		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	14.0	10.0		mm
V_{ISOL}	isolation voltage	t = 1 second		4800		V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4000		V


Part number

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

Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA200P1600SA	MCMA200P1600SA	Blister	9	510387

Similar Part	Package	Voltage class
MCMA200PD1600SA	Simbus A	1600

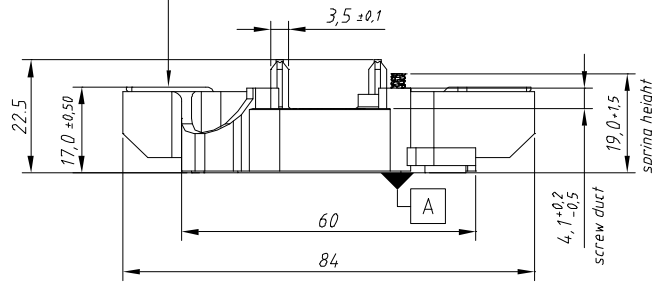
Equivalent Circuits for Simulation
** on die level*
 $T_{VJ} = 140\text{ °C}$

Thyristor

$V_{0\ max}$	threshold voltage	0.81	V
$R_{0\ max}$	slope resistance *	0.8	mΩ

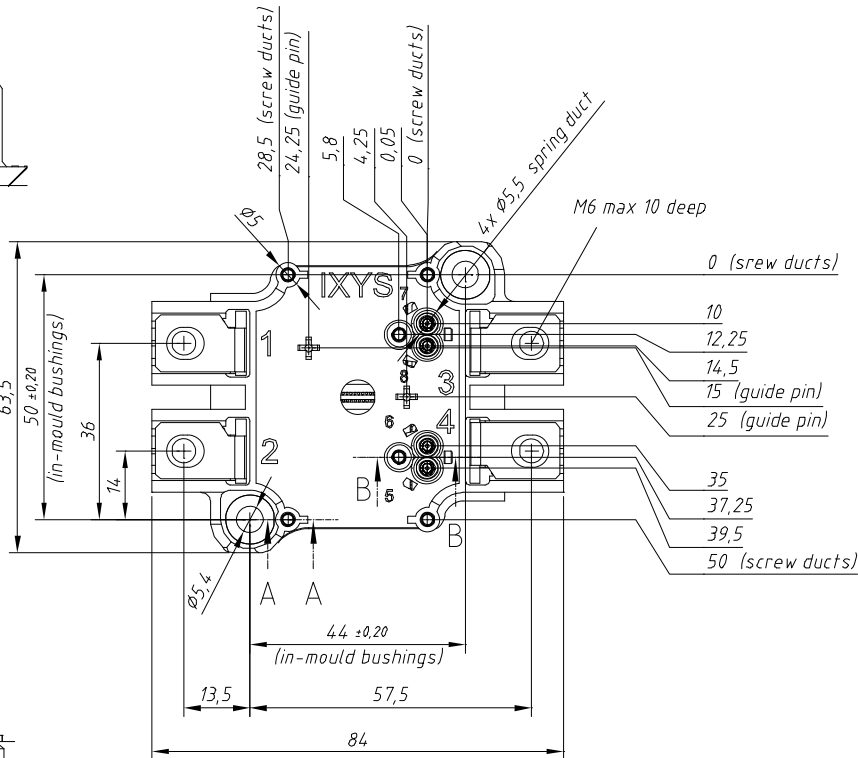
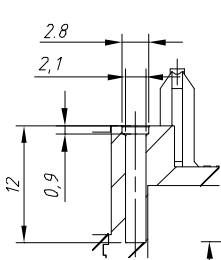
Outlines SimBus A

general tolerance:
ISO 2768-mK

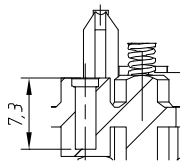
\square	0,3	main terminal
//	0,2	A



A (2:1)
screw duct (4x)

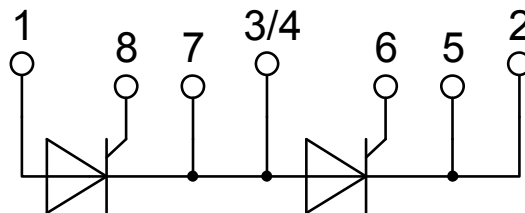


B (2:1)
screw duct (2x)



Rules for the contact PCB:

- spring landing pad = $\phi 3,5 \pm 0,2$, position tolerance $\pm 0,1$
- holes guide pins = $\phi 4 \pm 0,1$, position tolerance $\pm 0,1$
- holes PCB screws = $2,9 \pm 0,1$, position tolerance $\pm 0,1$



Thyristor

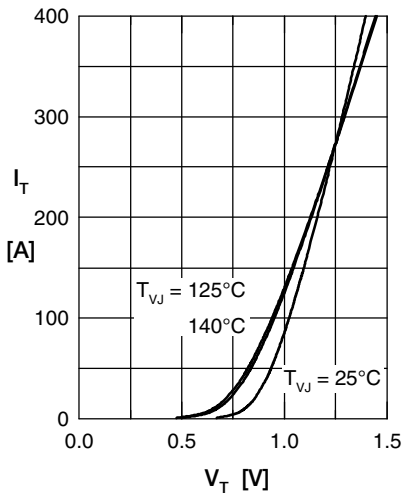


Fig. 1 Forward current vs. voltage drop per thyristor

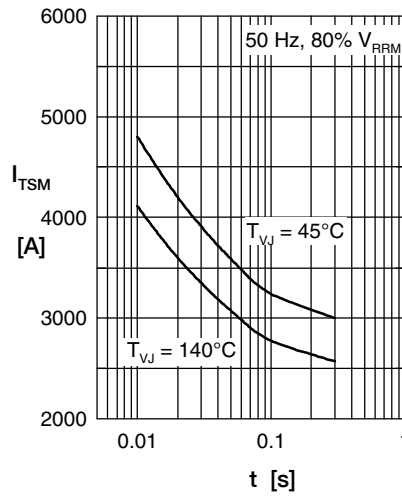


Fig. 2 Surge overload current vs. time per thyristor

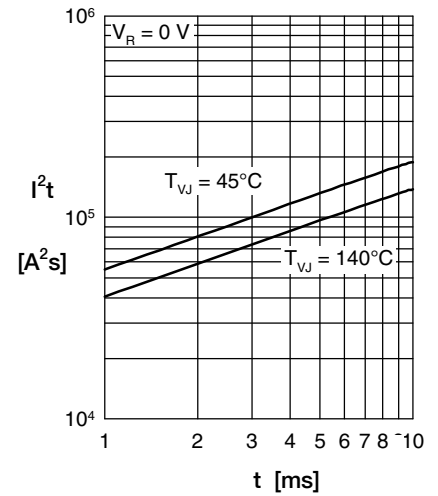


Fig. 3 I^2t vs. time per thyristor

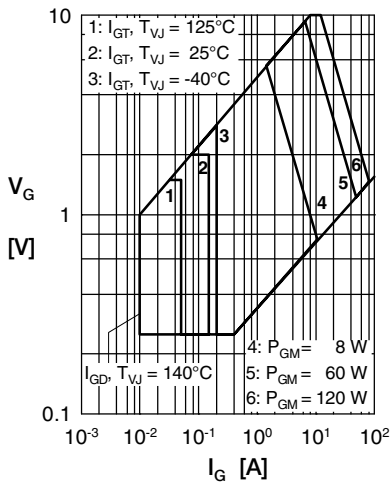


Fig. 4 Gate voltage & gate current

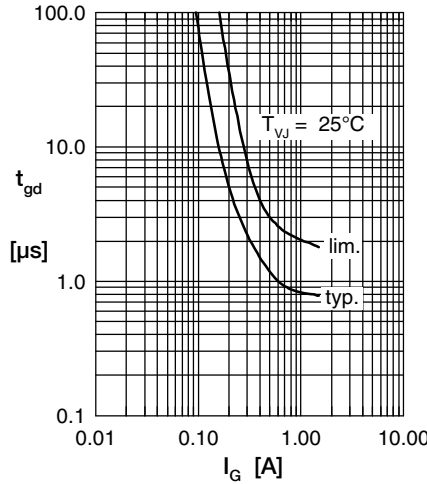


Fig. 5 Gate controlled delay time t_{gd}

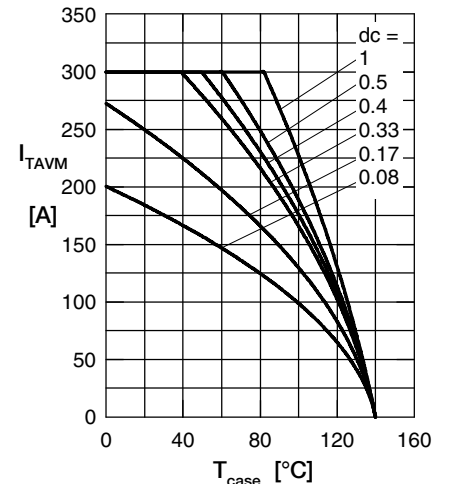


Fig. 6 Max. forward current vs. case temperature per thyristor.

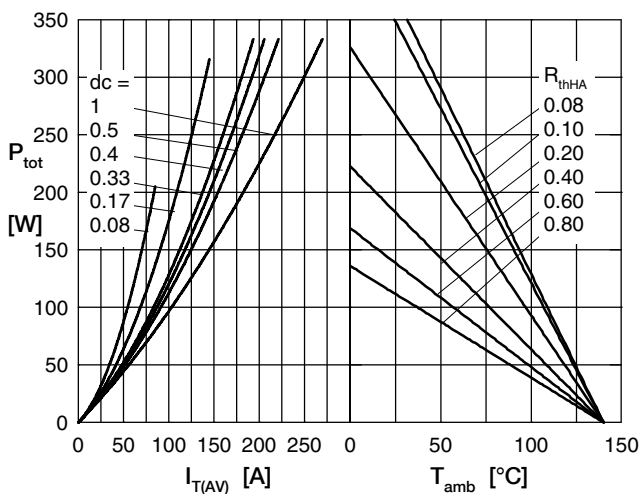


Fig. 7 Power dissipation vs. forward current and ambient temperature per thyristor

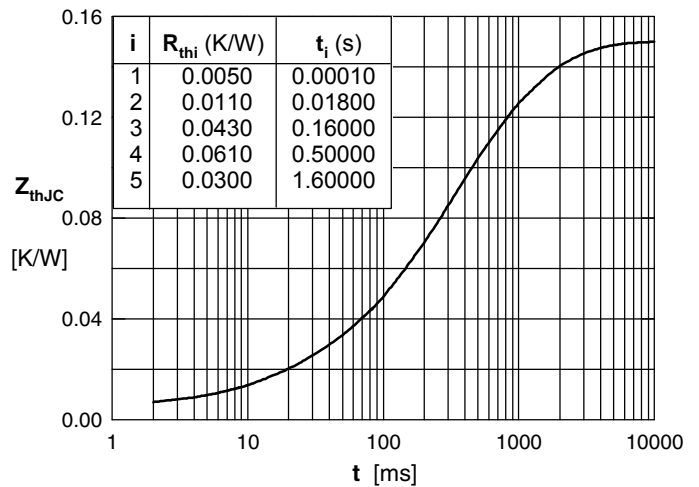


Fig. 8 Transient thermal impedance junction to case vs. time per thyristor