



on request

# Thyristor \ Diode Module

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

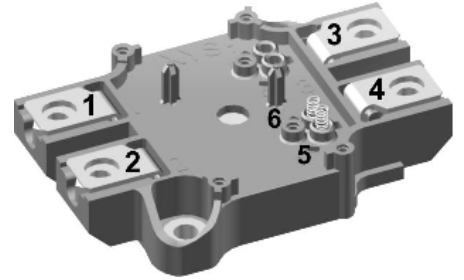
$$I_{TAV} = 200 \text{ A}$$

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

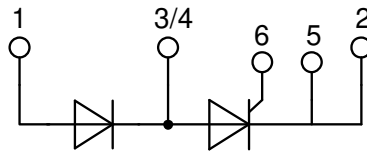
Phase leg

Part number

**MCMA200PD1600SA**



Backside: isolated



### Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Copper base plate with Direct Copper Bonded Al<sub>2</sub>O<sub>3</sub>-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

### Disclaimer Notice

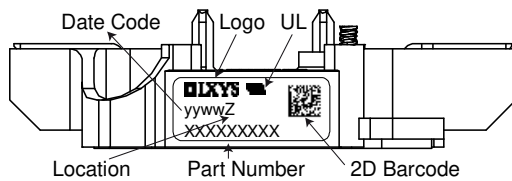
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Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		200	$\mu A$
		$V_{R/D} = 1600 V$	$T_{VJ} = 125^{\circ}C$		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 $\Omega$
$R_{thJC}$	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	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		6.00	kA
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		6.48	kA
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 140^{\circ}C$		5.10	kA
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		5.51	kA
$I^2t$	value for fusing	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		180.0	kA <sup>2</sup> s
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		174.7	kA <sup>2</sup> s
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 140^{\circ}C$		130.1	kA <sup>2</sup> s
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		126.3	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400 V f = 1 MHz$	$T_{VJ} = 25^{\circ}C$	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	$T_{VJ} = 140^{\circ}C; f = 50 Hz$ repetitive, $I_T = 600 A$			150	A/ $\mu s$
		$t_p = 200 \mu s; di_G/dt = 0.5 A/\mu s;$ $I_G = 0.5 A; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 200 A$			500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; method 1 (linear voltage rise)$	$T_{VJ} = 140^{\circ}C$		1000	V/ $\mu s$
$V_{GT}$	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	$V_D = 6 V R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.5 A; di_G/dt = 0.5 A/\mu s$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
$t_q$	turn-off time	$V_R = 100 V; I_T = 200 A; V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s dv/dt = 20 V/\mu s t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$	150		$\mu s$

on request

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
<b>Weight</b>				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	4000			V


**Part description**

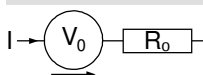
M = Module  
 C = Thyristor (SCR)  
 M = Thyristor  
 A = (up to 1800V)  
 200 = Current Rating [A]  
 PD = Phase leg  
 1600 = Reverse Voltage [V]  
 SA = SimBus A

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA200PD1600SA	MCMA200PD1600SA	Blister	9	510380

Similar Part	Package	Voltage class
MCMA200P1600SA	Simbus A	1600

**Equivalent Circuits for Simulation**

\* on die level

 $T_{VJ} = 140^{\circ}\text{C}$ 

**Thyristor**

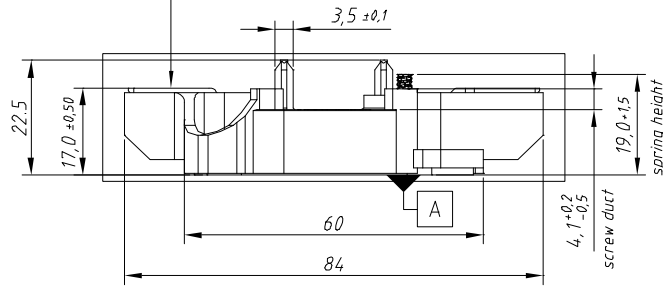
$V_{0 \max}$	threshold voltage	0.81	V
$R_{0 \max}$	slope resistance *	0.8	mΩ



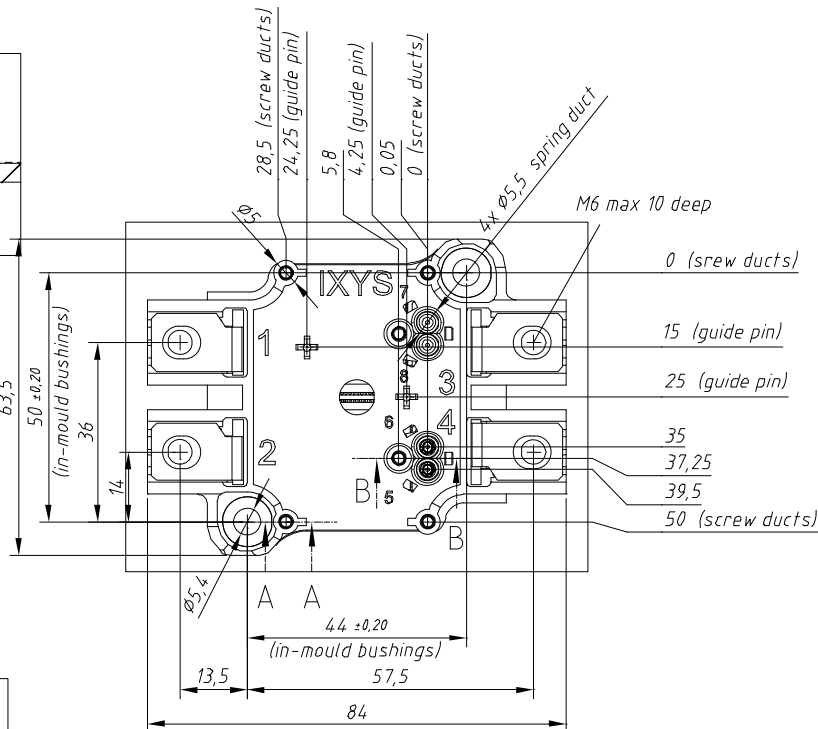
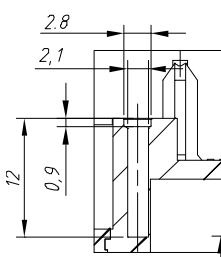
**Outlines SimBus A**

general tolerance:  
ISO 2768-mK

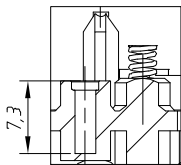
	0,3	main terminal
	0,2	A



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

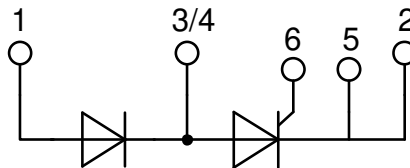


B (2:1)



**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

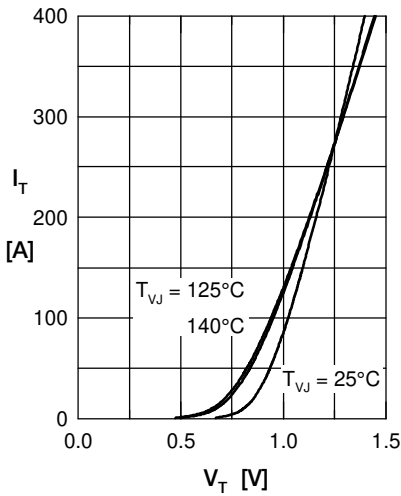


Fig. 1 Forward current vs. voltage drop per thyristor

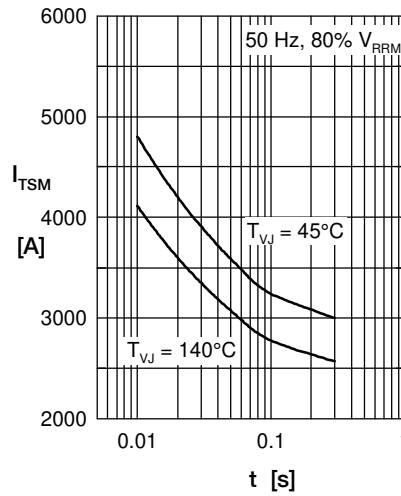


Fig. 2 Surge overload current vs. time per thyristor

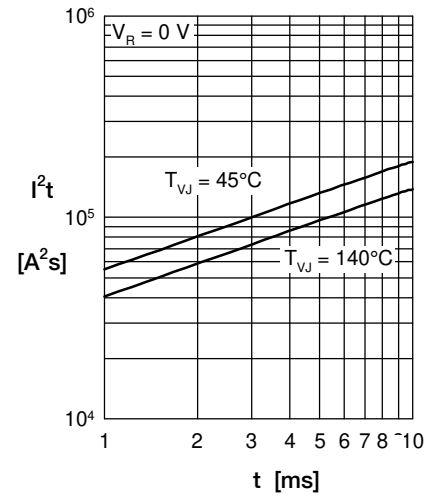


Fig. 3  $I^2t$  vs. time per thyristor

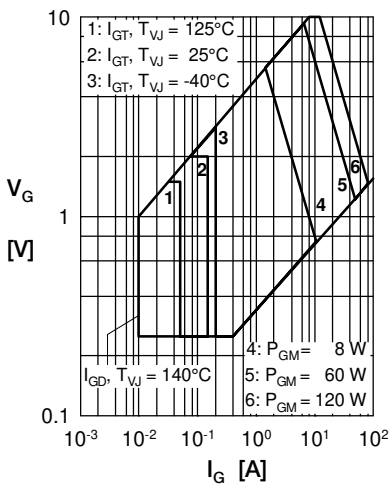


Fig. 4 Gate voltage & gate current

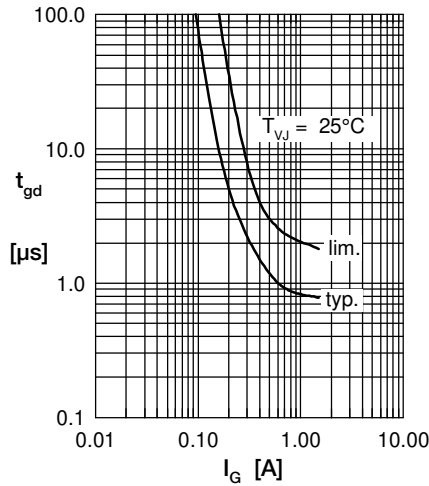


Fig. 5 Gate controlled delay time  $t_{gd}$

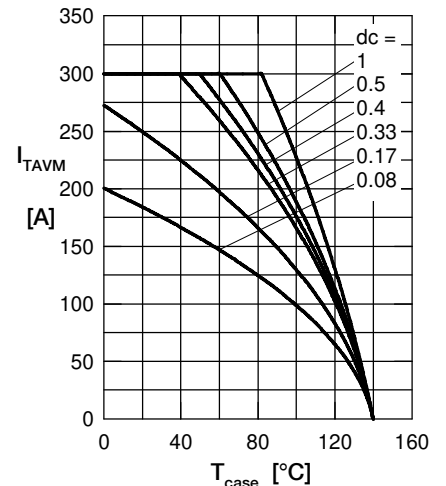


Fig. 6 Max. forward current vs. case temperature per thyristor.

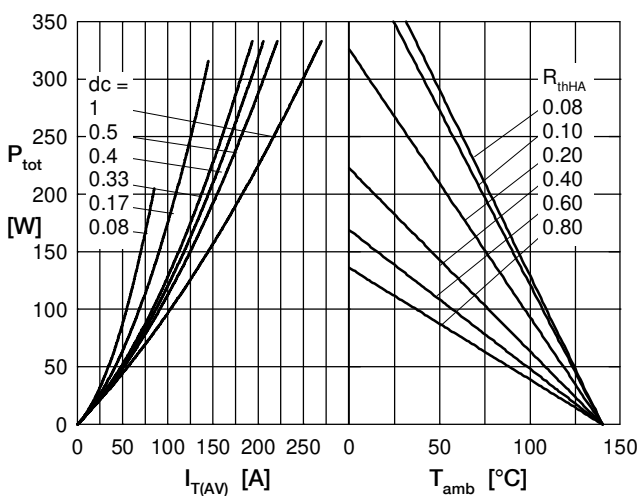


Fig. 7 Power dissipation vs. forward current and ambient temperature per thyristor

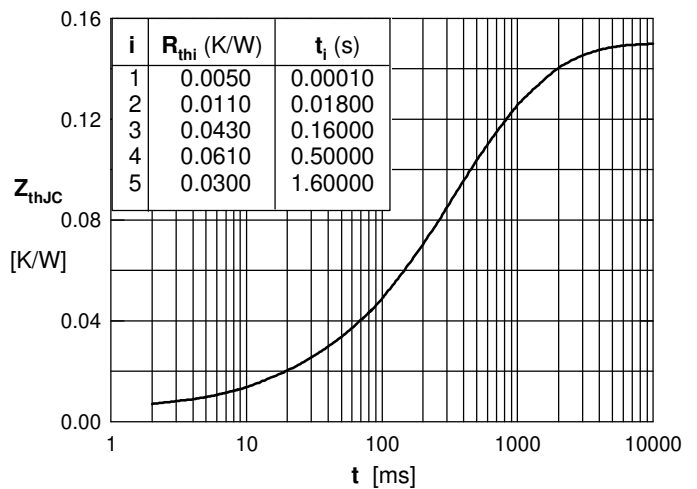


Fig. 8 Transient thermal impedance junction to case vs. time per thyristor