Thyristor \ Diode Module

V_{RRM}	$=$	2×1600 V
I_{TAV}	$=$	60 A
V_T	$=$	1.24 V

Phase leg

Part number

**MCD56-16io8B**
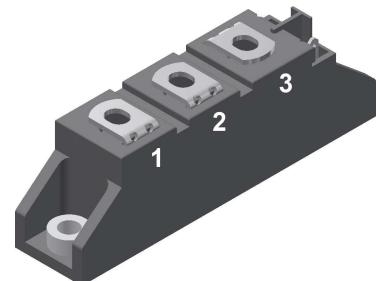
Backside: isolated

E72873
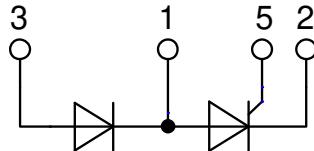
Features / Advantages:
- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al2O3-ceramic

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

Package: TO-240AA
- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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Rectifier

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			200	µA
		$V_{R/D}$ = 1600 V	T_{VJ} = 125°C			5	mA
V_T	forward voltage drop	I_T = 100 A	T_{VJ} = 25°C			1.26	V
		I_T = 200 A				1.57	V
		I_T = 100 A	T_{VJ} = 125°C			1.24	V
		I_T = 200 A				1.62	V
I_{TAV}	average forward current	T_C = 85°C	T_{VJ} = 125°C			60	A
$I_{T(RMS)}$	RMS forward current	180° sine				94	A
V_{T0}	threshold voltage	T_{VJ} = 125°C				0.85	V
r_T	slope resistance	for power loss calculation only				3.7	mΩ
R_{thJC}	thermal resistance junction to case					0.45	K/W
R_{thCH}	thermal resistance case to heatsink				0.2		K/W
P_{tot}	total power dissipation	T_C = 25°C				222	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1.50	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.62	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 125°C			1.28	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.38	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			11.3	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			10.9	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 125°C			8.13	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			7.87	kA²s
C_J	junction capacitance	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		74		pF
P_{GM}	max. gate power dissipation	t_P = 30 µs	T_C = 125°C			10	W
		t_P = 300 µs				5	W
P_{GAV}	average gate power dissipation					0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	T_{VJ} = 125°C; f = 50 Hz repetitive, I_T = 150 A				150	A/µs
		t_P = 200 µs; di_G/dt = 0.45 A/µs;					
		I_G = 0.45 A; V = ⅔ V_{DRM} non-repet., I_T = 60 A				500	A/µs
$(dv/dt)_{cr}$	critical rate of rise of voltage	V = ⅔ V_{DRM}	T_{VJ} = 125°C			1000	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	gate trigger voltage	V_D = 6 V	T_{VJ} = 25°C			1.5	V
			T_{VJ} = -40°C			1.6	V
I_{GT}	gate trigger current	V_D = 6 V	T_{VJ} = 25°C			100	mA
			T_{VJ} = -40°C			200	mA
V_{GD}	gate non-trigger voltage	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	t_p = 10 µs	T_{VJ} = 25°C			450	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			200	mA
t_{gd}	gate controlled delay time	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0.45 A; di_G/dt = 0.45 A/µs					
t_q	turn-off time	V_R = 100 V; I_T = 150A; V = ⅔ V_{DRM} T_{VJ} = 100 °C			150		µs
		di/dt = 10 A/µs dv/dt = 20 V/µs t_p = 200 µs					

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747 and per semiconductor unless otherwise specified   20200701c

Package	TO-240AA		Ratings				
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	RMS current	per terminal				200	A
T_{VJ}	virtual junction temperature			-40		125	°C
T_{op}	operation temperature			-40		100	°C
T_{stg}	storage temperature			-40		125	°C
Weight					81		g
M_D	mounting torque			2.5		4	Nm
M_T	terminal torque			2.5		4	Nm
$d_{Spp/App}$	creepage distance on surface | striking distance through air	terminal to terminal	13.0	9.7			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
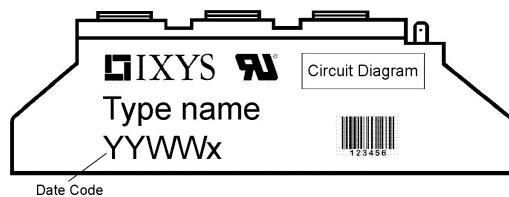
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCD56-16io8B	MCD56-16io8B	Box	36	457736

Similar Part	Package	Voltage class
MCMA65PD1600TB	TO-240AA-1B	1600
MCMA85PD1600TB	TO-240AA-1B	1600

Equivalent Circuits for Simulation   ** on die level* $T_{VJ} = 125°C$


Thyristor

$V_{0\ max}$	threshold voltage	0.85	V
$R_{0\ max}$	slope resistance *	2.5	mΩ

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Outlines   TO-240AA


A 2.8 - 0.8
DIN 46244
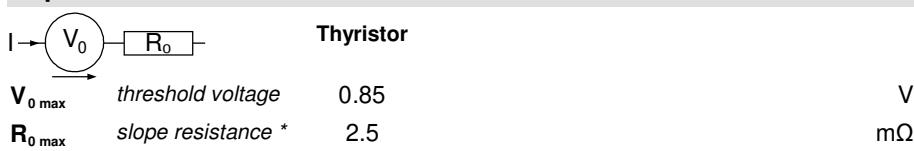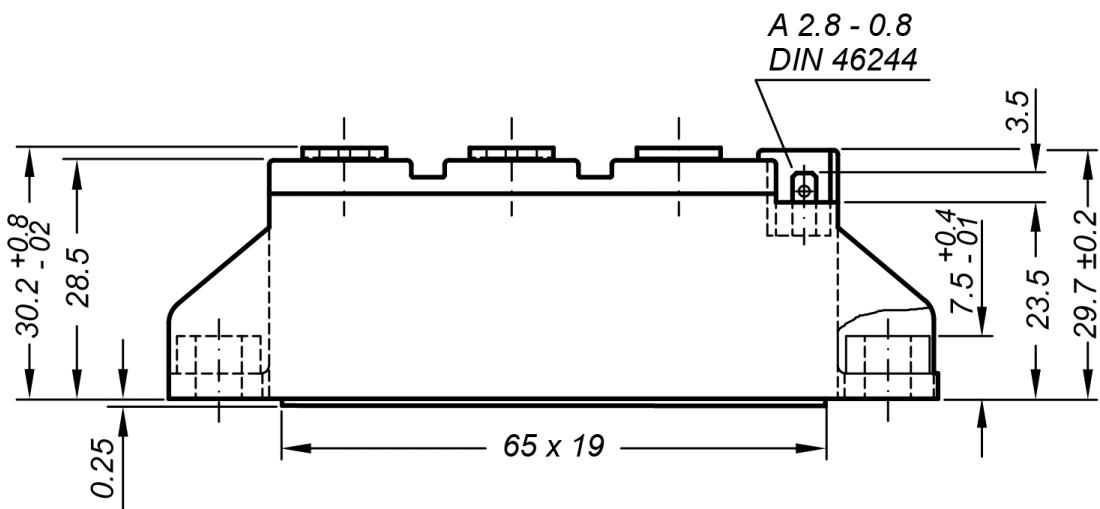
General tolerance: DIN ISO 2768 class „c"
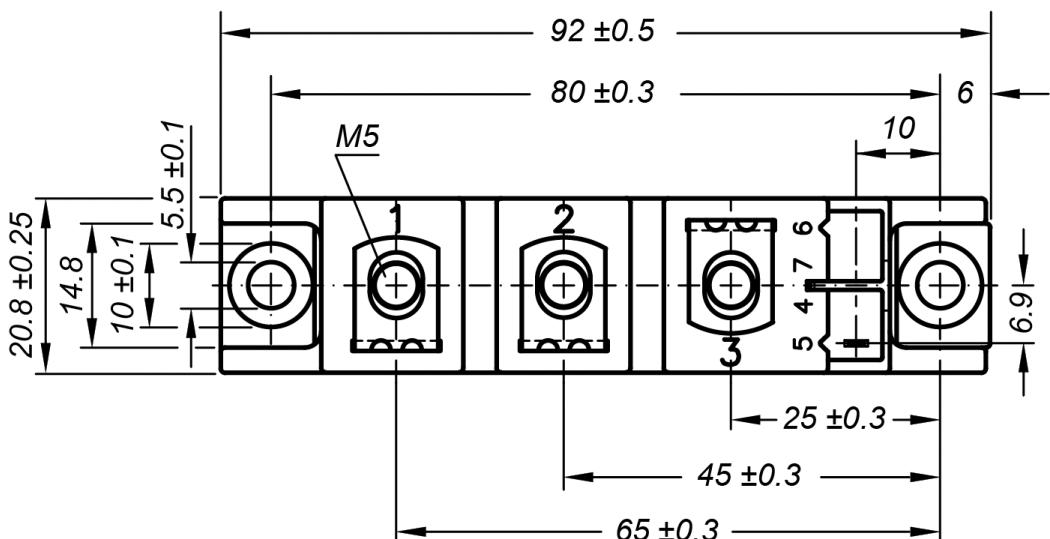
Optional accessories for modules
Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red
Type ZY 200L (L = Left for pin pair 4/5) UL 758, style 3751

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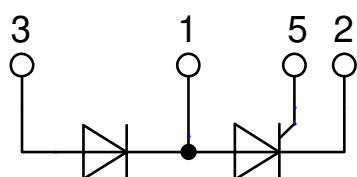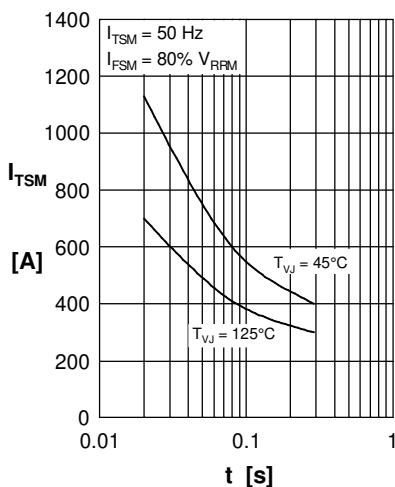
Thyristor

Fig. 1 Surge overload current I_TSM, I_FSM: Crest value, t: duration
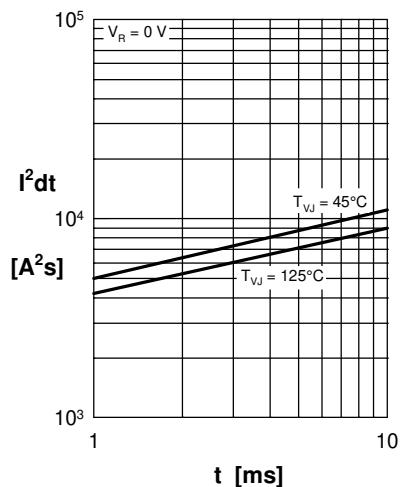
Fig. 2 I²t versus time (1-10 ms)
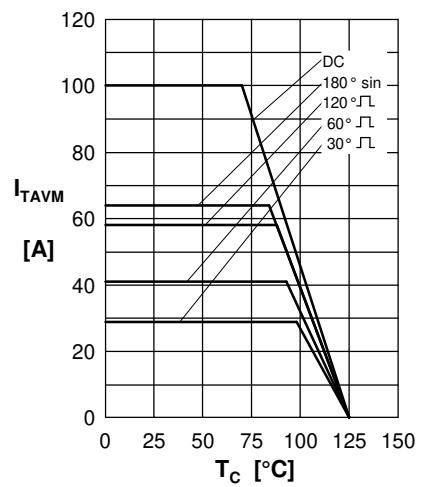
Fig. 3 Max. forward current at case temperature
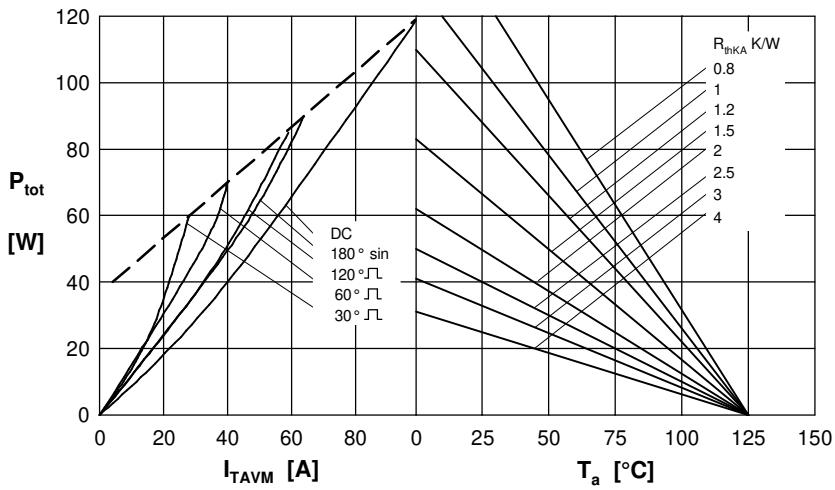
Fig. 4 Power dissipation vs. on-state current & ambient temperature (per thyristor or diode)
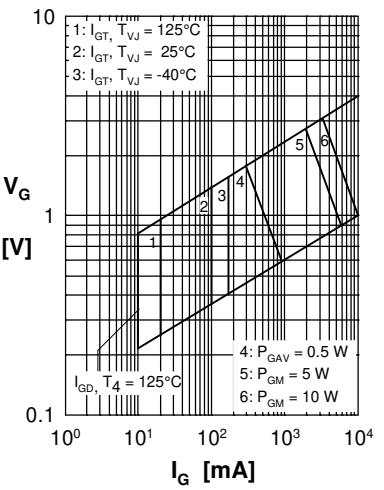

Fig. 5 Gate trigger characteristics
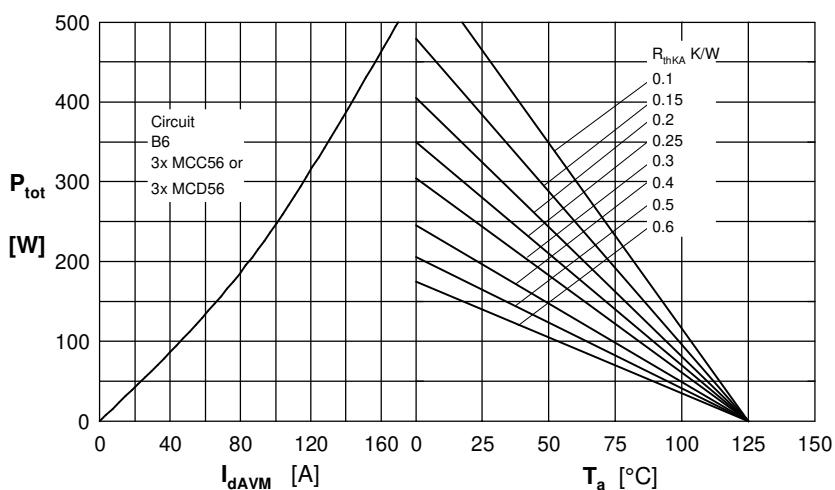
Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature
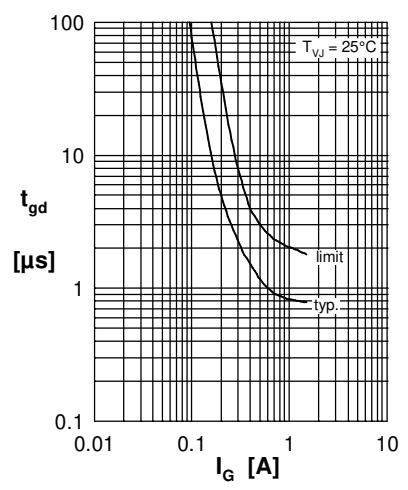

Fig. 7 Gate trigger delay time

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Data according to IEC 60747 and per semiconductor unless otherwise specified

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Rectifier
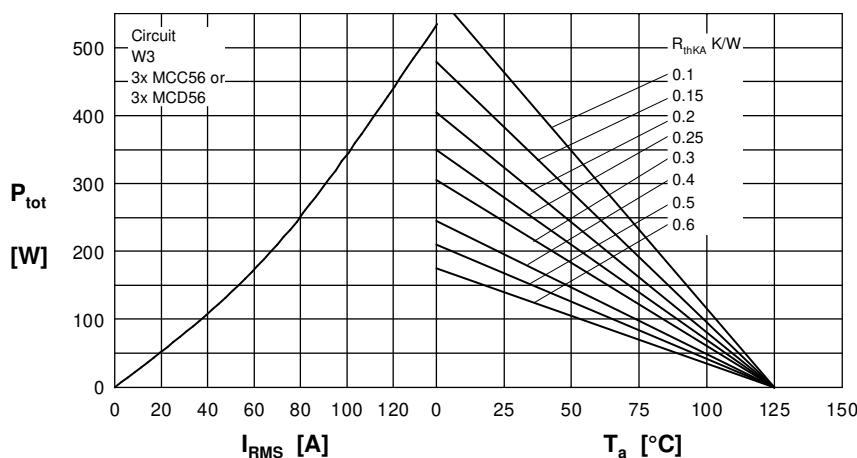
Fig. 8 Three phase AC-controller: Power dissipation versus
RMS output current and ambient temperature
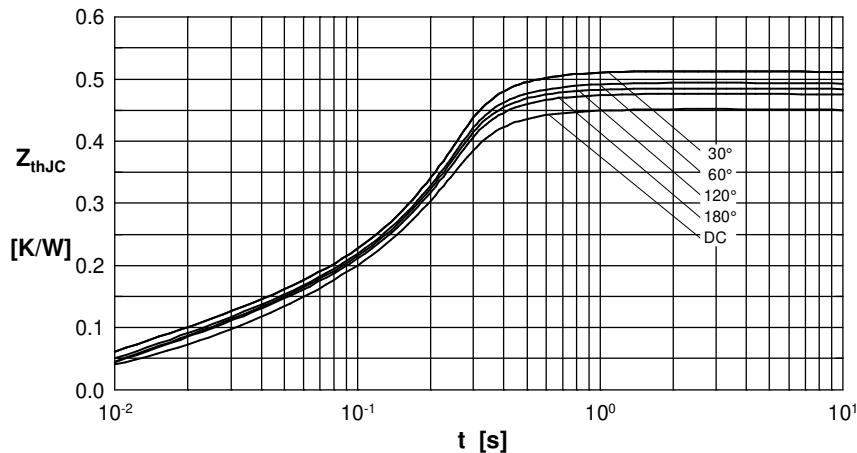
Fig. 9 Transient thermal impedance junction to case (per thyristor/diode)

R_{thJC} for various conduction angles d:

d	R_{thJC} [K/W]
DC	0.450
180°	0.470
120°	0.490
60°	0.505
30°	0.520

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.014	0.0150
2	0.026	0.0095
3	0.410	0.1750
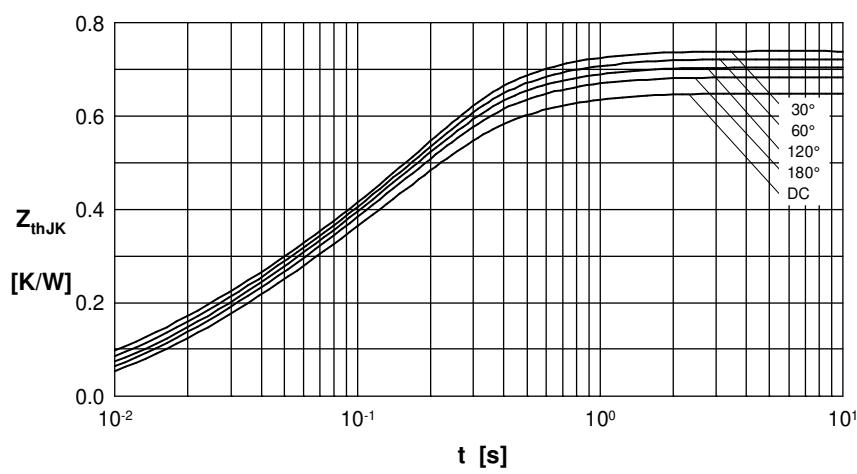
Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)

R_{thJK} for various conduction angles d:

d	R_{thJK} [K/W]
DC	0.650
180°	0.670
120°	0.690
60°	0.705
30°	0.720

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.014	0.0150
2	0.026	0.0095
3	0.410	0.1750
4	0.200	0.6700

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