

Thyristor \ Diode Module

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

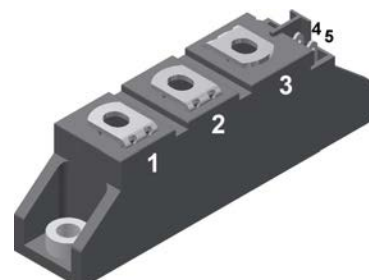
$$I_{TAV} = 60 \text{ A}$$

$$V_T = 1,24 \text{ V}$$

Phase leg

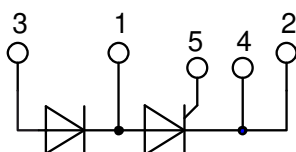
Part number

MCD56-16io1B



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

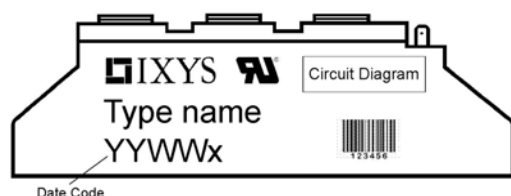
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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1600	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1600\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			200	μA
		$V_{R/D} = 1600\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			5	mA
V_T	forward voltage drop	$I_T = 100\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1,26	V
		$I_T = 200\text{ A}$				1,57	V
		$I_T = 100\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1,24	V
		$I_T = 200\text{ A}$				1,62	V
I_{TAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 125^{\circ}\text{C}$			60	A
$I_{T(RMS)}$	RMS forward current	180° sine				94	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}\text{C}$			0,85	V
r_T	slope resistance					3,7	m Ω
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		$T_C = 25^{\circ}\text{C}$			222	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1,50	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1,62	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			1,28	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1,38	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			11,3	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			10,9	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			8,13	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			7,87	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		74		pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 125^{\circ}\text{C}$			10	W
		$t_p = 300\text{ }\mu\text{s}$				5	W
P_{GAV}	average gate power dissipation					0,5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 150\text{ A}$				150	A/ μs

Package TO-240AA				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	<i>RMS current</i>	per terminal				200	A
T_{VJ}	<i>virtual junction temperature</i>			-40		125	°C
T_{op}	<i>operation temperature</i>			-40		100	°C
T_{stg}	<i>storage temperature</i>			-40		125	°C
Weight					81		g
M_D	<i>mounting torque</i>			2,5		4	Nm
M_T	<i>terminal torque</i>			2,5		4	Nm
$d_{Spp/App}$	<i>creepage distance on surface striking distance through air</i>	<i>terminal to terminal</i>		13,0	9,7		mm
$d_{Spb/Apb}$		<i>terminal to backside</i>		16,0	16,0		mm
V_{ISOL}	<i>isolation voltage</i>	t = 1 second		4800			V
		t = 1 minute 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		4000			V



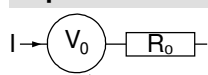
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCD56-16io1B	MCD56-16io1B	Box	36	465984

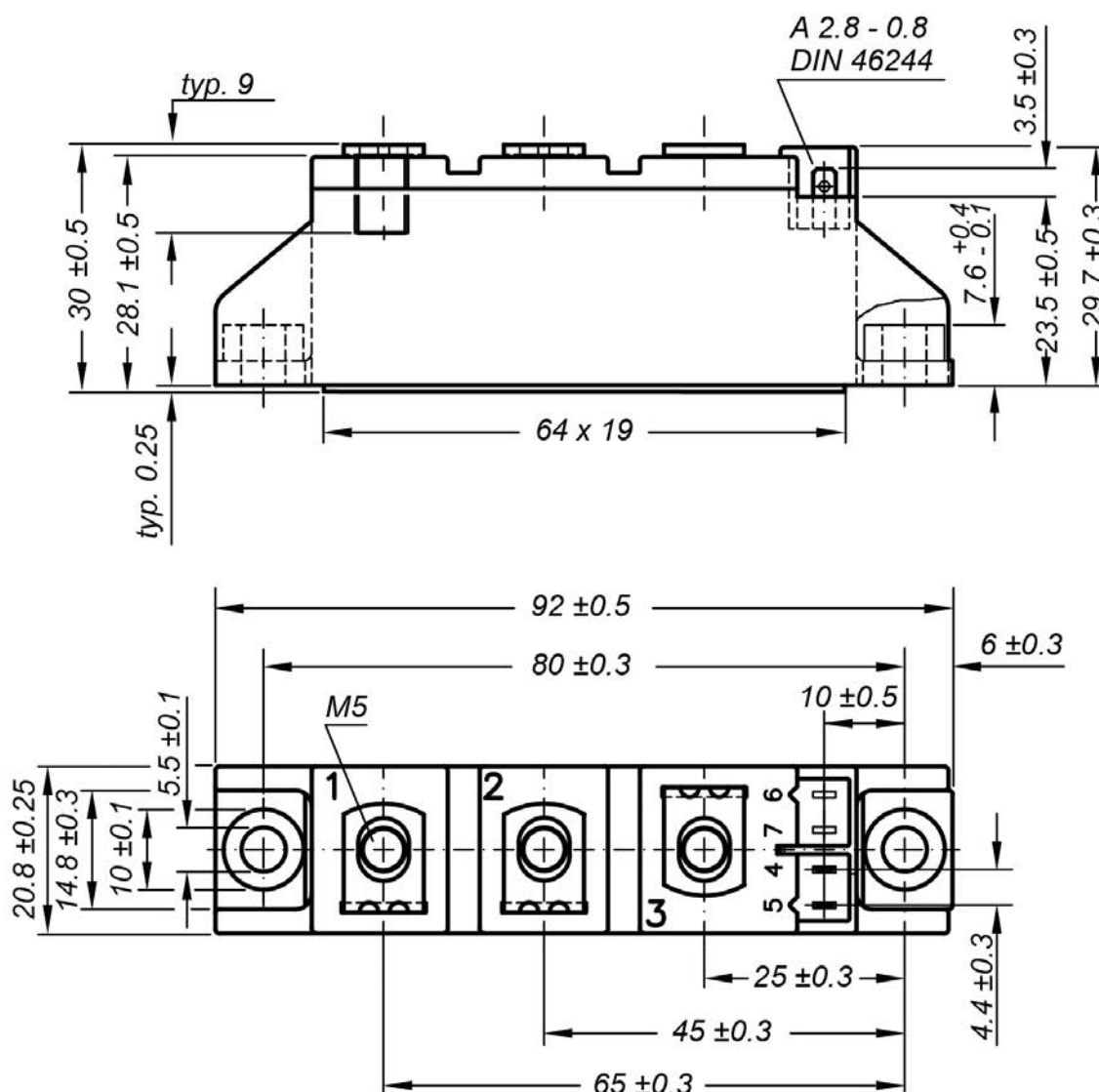
Similar Part	Package	Voltage class
MCMA65PD1600TB	TO-240AA-1B	1600
MCMA85PD1600TB	TO-240AA-1B	1600

Equivalent Circuits for Simulation

* on die level

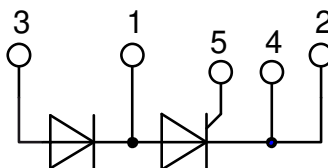
$T_{VJ} = 125^{\circ}\text{C}$

		Thyristor	
$V_{0\ max}$	<i>threshold voltage</i>	0,85	V
$R_{0\ max}$	<i>slope resistance *</i>	2,5	mΩ

Outlines TO-240AA


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



Thyristor

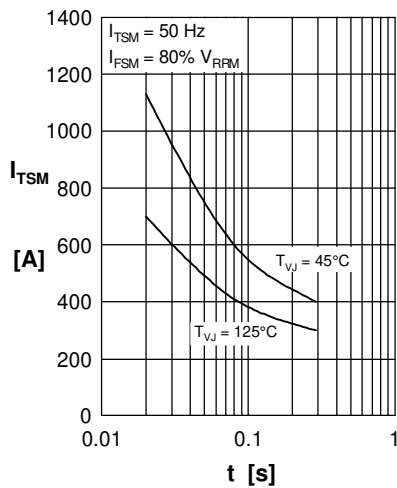


Fig. 1 Surge overload current I_{TSM} ,
 I_{FSM} : Crest value, t : duration

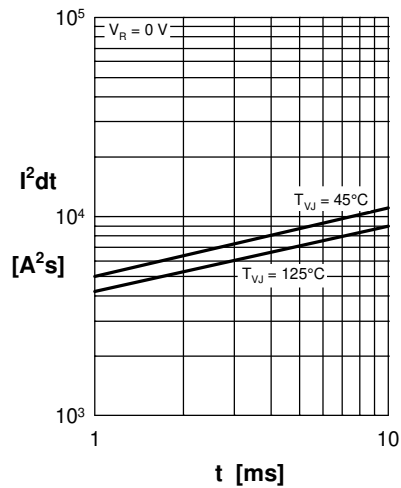


Fig. 2 I^2dt versus time (1-10 ms)

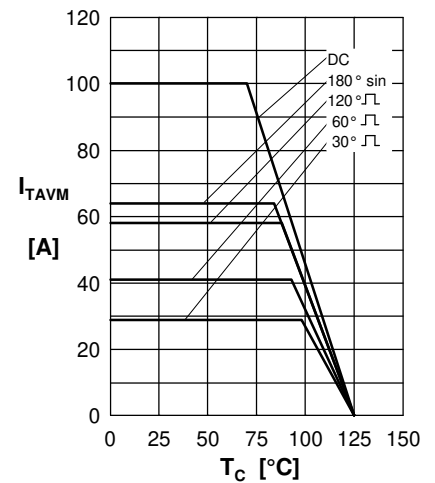


Fig. 3 Max. forward current
 at case temperature

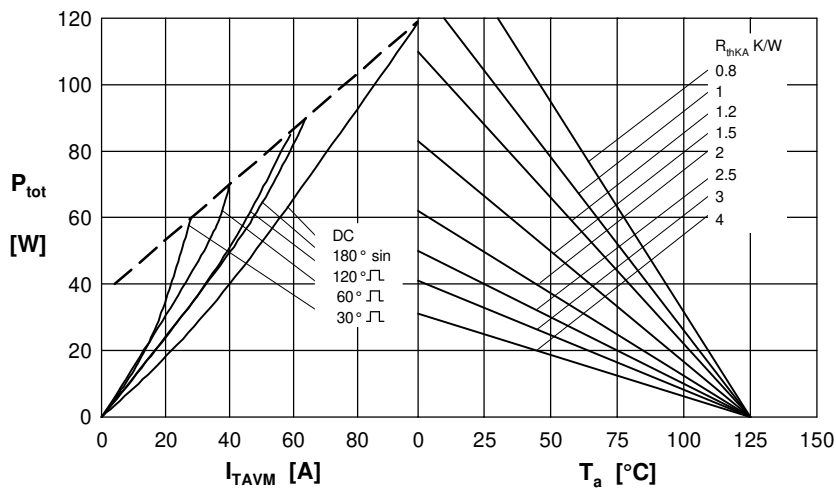


Fig. 4 Power dissipation vs. on-state current & ambient temperature
 (per thyristor or diode)

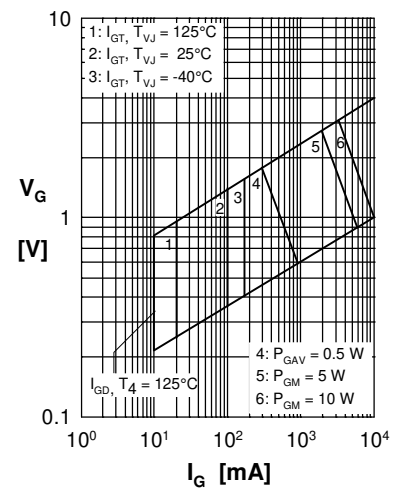


Fig. 5 Gate trigger characteristics

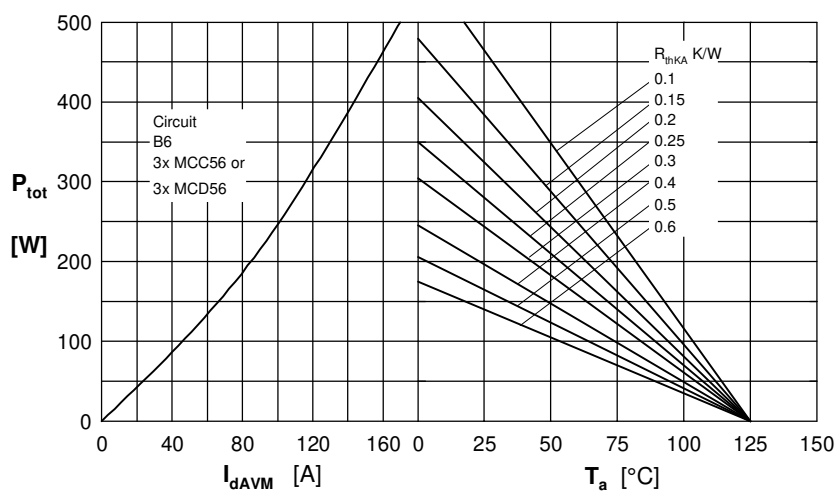


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct
 output current and ambient temperature

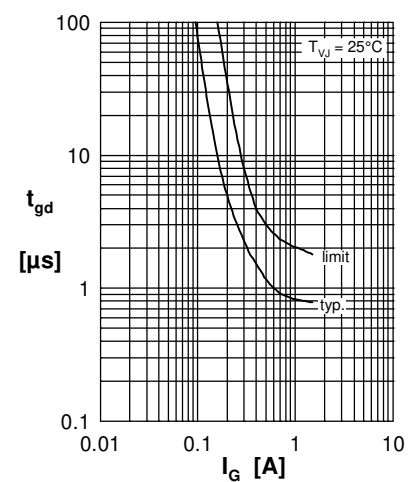


Fig. 7 Gate trigger delay time

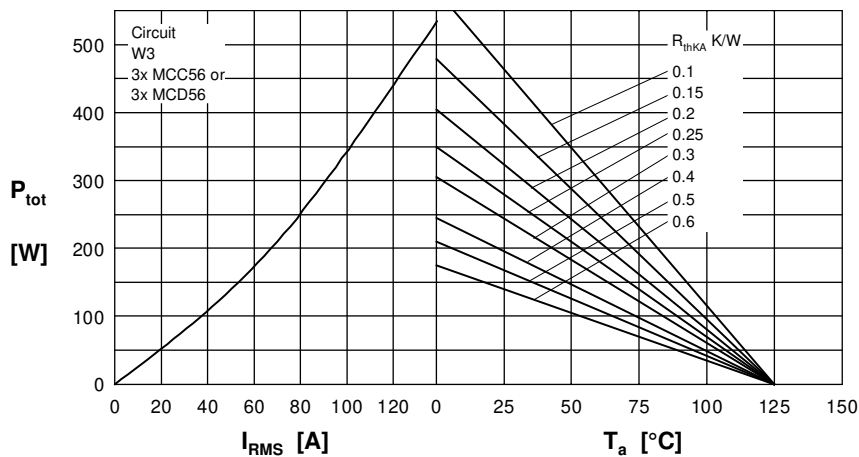
Rectifier


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

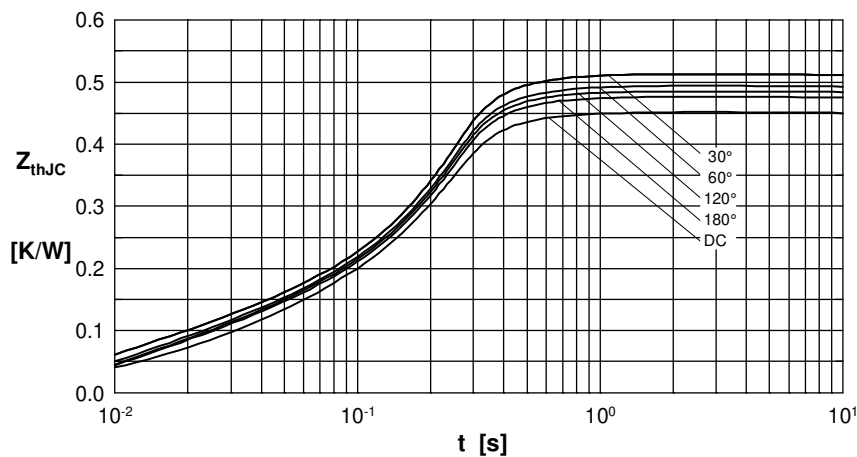


Fig. 9 Transient thermal impedance junction to case (per thyristor/diode)

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

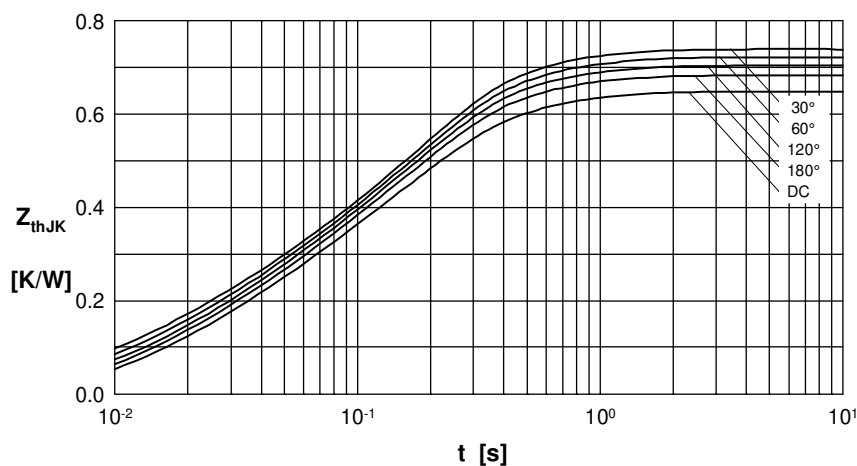


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)

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