



preliminary

# Thyristor \ Diode Module

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

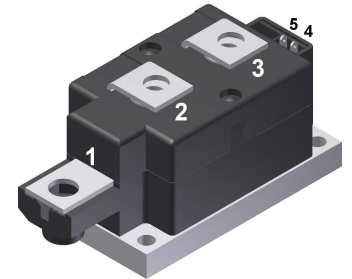
$$I_{TAV} = 260 \text{ A}$$

$$V_T = 1.15 \text{ V}$$

Phase leg

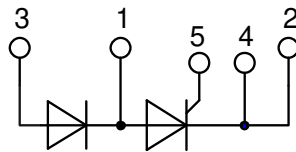
Part number

**MCMA265PD1600KB**



Backside: isolated

E72873



**Features / Advantages:**

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

**Applications:**

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

**Package: Y1**

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper internally DCB isolated
- Advanced power cycling

**Disclaimer Notice**

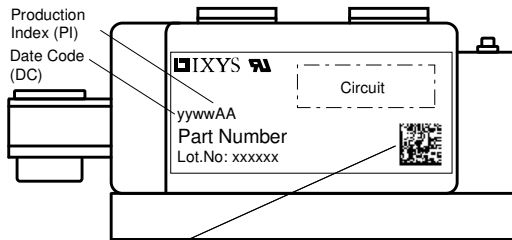
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Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		300	$\mu A$
		$V_{R/D} = 1600 V$	$T_{VJ} = 140^{\circ}C$		30	mA
$V_T$	forward voltage drop	$I_T = 300 A$	$T_{VJ} = 25^{\circ}C$		1.19	V
		$I_T = 600 A$			1.46	V
		$I_T = 300 A$	$T_{VJ} = 125^{\circ}C$		1.15	V
		$I_T = 600 A$			1.44	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	$T_{VJ} = 140^{\circ}C$		0.80	V
$r_T$	slope resistance				0.75	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0.16	K/W
$R_{thCH}$	thermal resistance case to heatsink		0.04			K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		720	W
$I_{TSM}$	max. forward surge current	$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		8.50	kA
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		9.18	kA
		$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		7.23	kA
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		7.81	kA
$I^2t$	value for fusing	$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		361.3	kA <sup>2</sup> s
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		350.6	kA <sup>2</sup> s
		$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		261.0	kA <sup>2</sup> s
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		253.4	kA <sup>2</sup> 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, $I_T = 750 A$			100	A/ $\mu s$
		$t_p = 200 \mu s$ ; $di_G/dt = 1 A/\mu s$ ; $I_G = 1 A$ ; $V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 268 A$			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	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
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$				
$I_H$	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	$\mu s$
		$I_G = 1 A$ ; $di_G/dt = 1 A/\mu s$				
$t_q$	turn-off time	$V_R = 100 V$ ; $I_T = 300 A$ ; $V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s$ $dv/dt = 50 V/\mu s$ $t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$	200		$\mu s$



Package Y1		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			600	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>				680		g
$M_D$	mounting torque		4.5		7	Nm
$M_T$	terminal torque		11		13	Nm
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	16.0			mm
$d_{Spb/Apb}$		terminal to backside	16.0			mm
$V_{ISOL}$	isolation voltage	t = 1 second	4800			V
		t = 1 minute	4000			V



Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

**Part description**

- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 265 = Current Rating [A]
- PD = Phase leg
- 1600 = Reverse Voltage [V]
- KB = Y1-CU

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA265PD1600KB	MCMA265PD1600KB	Box	3	509202

**Equivalent Circuits for Simulation**

\* on die level

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

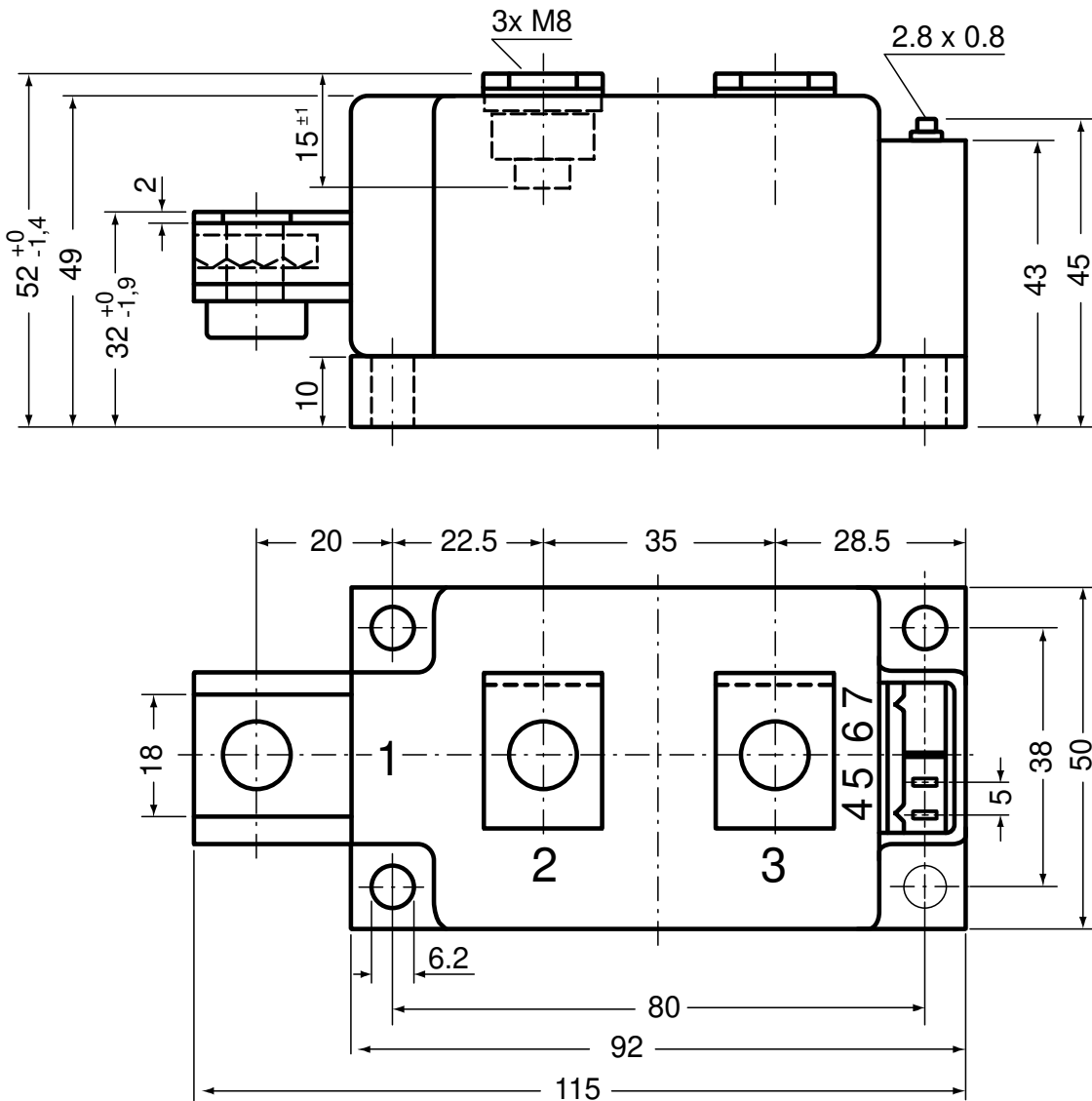


Thyristor

$V_{0\ max}$	threshold voltage	0.8	V
$R_{0\ max}$	slope resistance *	0.51	mΩ



Outlines Y1



Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red  
Type ZY 180L (L = Left for pin pair 4/5) UL 758, style 3751





**Thyristor**

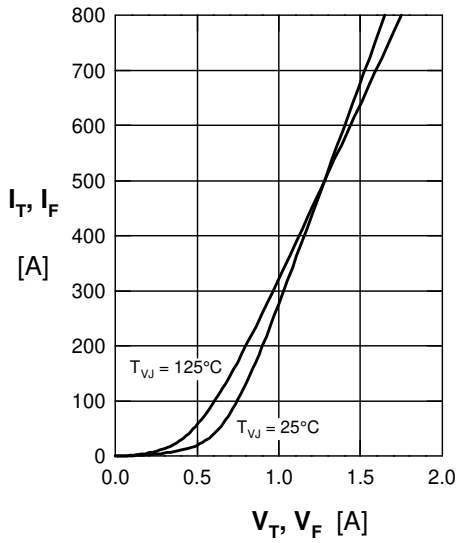


Fig. 1 Forward voltage drop

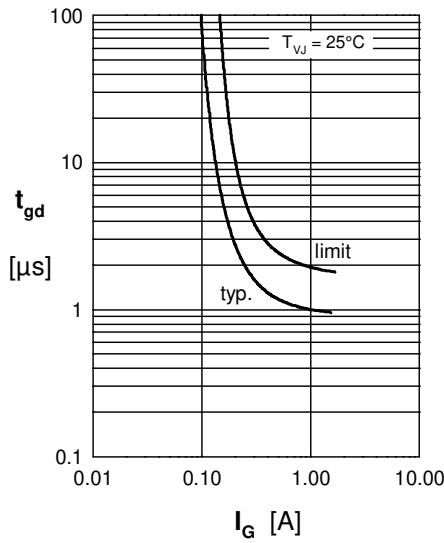


Fig. 2 Gate trigger delay time

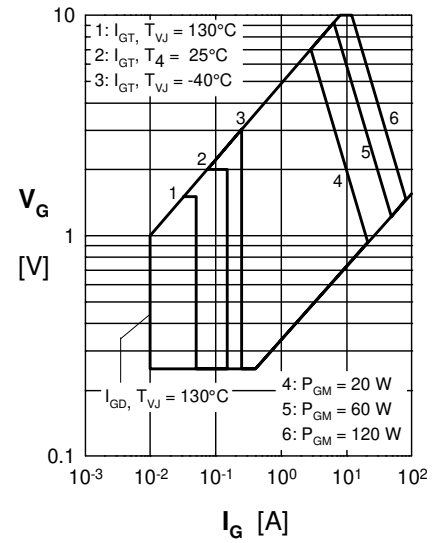


Fig. 3 Gate trigger characteristics

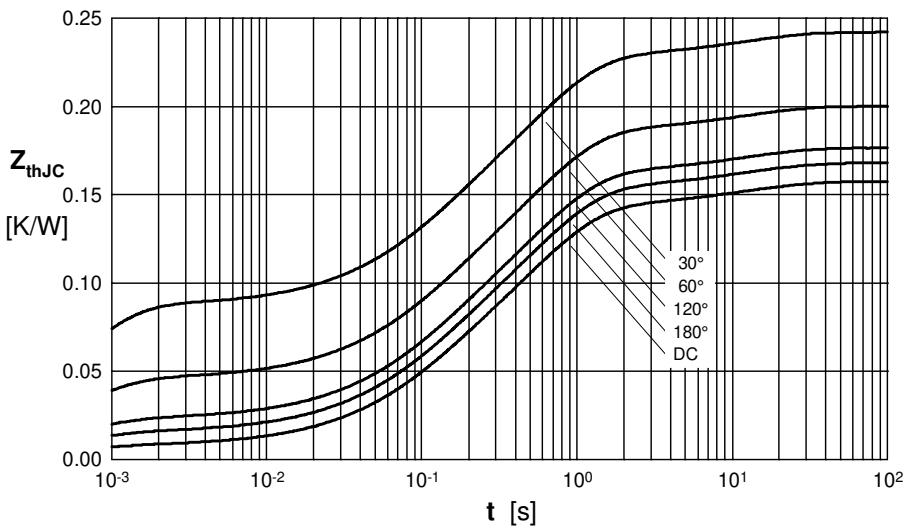


Fig. 4 Transient thermal impedance junction to case (per thyristor/diode)

$R_{thJC}$  for various conduction angles d:

d	$R_{thJC}$ (K/W)
DC	0.157
180°	0.168
120°	0.177
60°	0.200
30°	0.243

Constants for  $Z_{th}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0076	0.0054
2	0.0406	0.098
3	0.0944	0.54
4	0.0147	12