

# Thyristor \ Diode Module

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

$$I_{TAV} = 65 \text{ A}$$

$$V_T = 1.17 \text{ V}$$

Phase leg

Part number

**MCMA65PD1600TB**



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: 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

## Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).



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	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		100	$\mu A$
		$V_{R/D} = 1600 V$	$T_{VJ} = 140^{\circ}C$		10	mA
$V_T$	forward voltage drop	$I_T = 65 A$	$T_{VJ} = 25^{\circ}C$		1.20	V
		$I_T = 130 A$			1.45	V
		$I_T = 65 A$	$T_{VJ} = 125^{\circ}C$		1.17	V
		$I_T = 130 A$			1.48	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		65	A
$I_{T(RMS)}$	RMS forward current	180° sine			105	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0.85	V
$r_T$	slope resistance				4.8	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0.5	K/W
$R_{thCH}$	thermal resistance case to heatsink			0.2		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		230	W
$I_{TSM}$	max. forward surge current	$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		1.15	kA
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		1.24	kA
		$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		980	A
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		1.06	kA
$I^2t$	value for fusing	$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		6.62	kA <sup>2</sup> s
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		6.40	kA <sup>2</sup> s
		$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		4.80	kA <sup>2</sup> s
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		4.63	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400 V$ $f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		54	pF
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		10	W
		$t_p = 300 \mu s$			5	W
$P_{GAV}$	average gate power dissipation				0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C$ ; $f = 50 Hz$ repetitive, $I_T = 195 A$			150	A/ $\mu s$
		$t_p = 200 \mu s$ ; $di_G/dt = 0.45 A/\mu s$ ; $I_G = 0.45 A$ ; $V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 65 A$			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	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1.5	V
			$T_{VJ} = -40^{\circ}C$		1.6	V
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		95	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	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		200	mA
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$				
$I_H$	holding current	$V_D = 6 V$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$				
$t_q$	turn-off time	$V_R = 100 V$ ; $I_T = 65 A$ ; $V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s$ $dv/dt = 20 V/\mu s$ $t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		150	$\mu s$



Package TO-240AA				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$I_{RMS}$	RMS current	per terminal			120	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>					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	



**Part description**

- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 65 = Current Rating [A]
- PD = Phase leg
- 1600 = Reverse Voltage [V]
- TB = TO-240AA-1B

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA65PD1600TB	MCMA65PD1600TB	Box	36	515770

**Equivalent Circuits for Simulation**

\* on die level

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

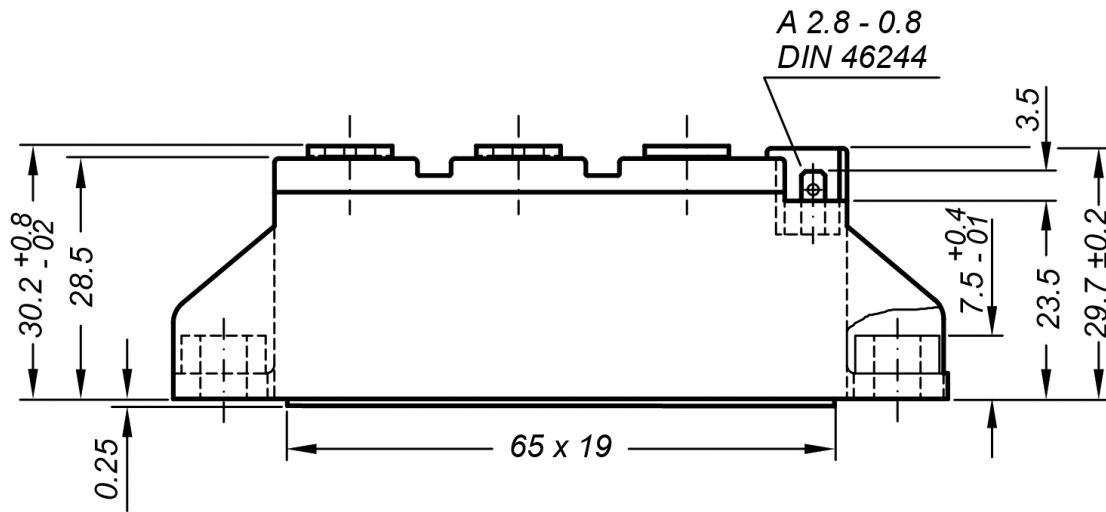


**Thyristor**

$V_{0\ max}$	threshold voltage	0.85	V
$R_{0\ max}$	slope resistance *	3.6	mΩ



Outlines TO-240AA



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



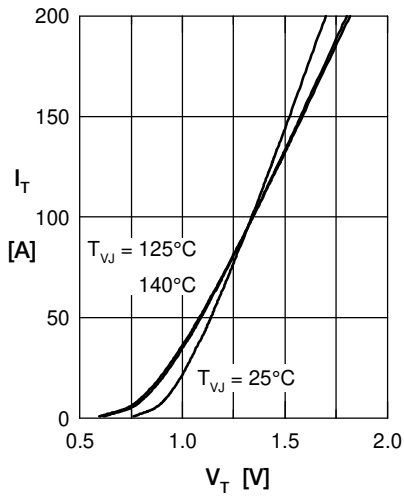
**Thyristor**


Fig. 1 Forward characteristics

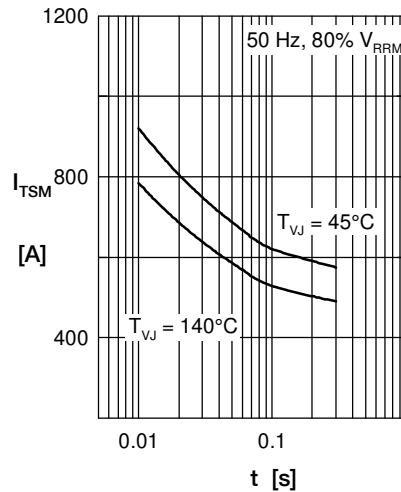
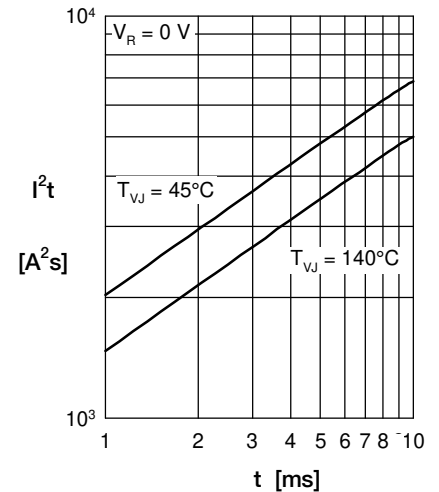

 Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

 Fig. 3  $I^2t$  versus time (1-10 s)


Fig. 4 Gate voltage &amp; gate current

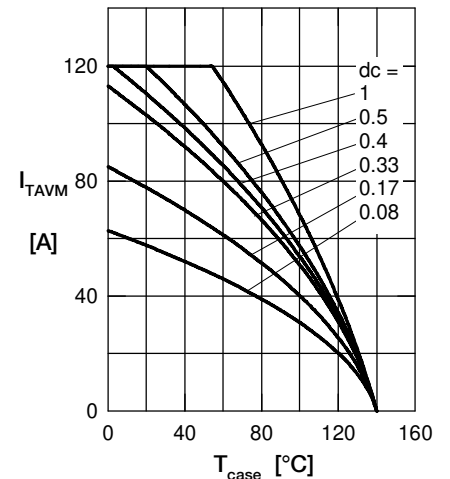

 Fig. 5 Gate controlled delay time  $t_{gd}$ 


Fig. 6 Max. forward current at case temperature


 Fig. 7a Power dissipation versus direct output current  
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case