

# High Voltage Thyristor \ Diode Module

$$V_{RRM} = 2 \times 2200 \text{ V}$$

$$I_{TAV} = 150 \text{ A}$$

$$V_T = 1.18 \text{ V}$$

Phase leg

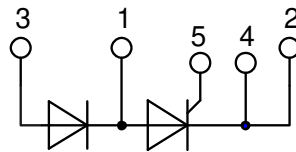
Part number

**MCNA150PD2200YB**



Backside: isolated

 E72873



## Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability

## Applications:

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

## Package: Y4

- 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	$T_{VJ} = 25^{\circ}C$			2300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			2200	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 2200 V$	$T_{VJ} = 25^{\circ}C$		400	$\mu A$
		$V_{R/D} = 2200 V$	$T_{VJ} = 125^{\circ}C$		15	mA
$V_T$	forward voltage drop	$I_T = 150 A$	$T_{VJ} = 25^{\circ}C$		1.24	V
		$I_T = 300 A$			1.48	V
		$I_T = 150 A$	$T_{VJ} = 125^{\circ}C$		1.18	V
		$I_T = 300 A$			1.51	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		150	A
$I_{T(RMS)}$	RMS forward current	180° sine			235	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0.86	V
$r_T$	slope resistance				2.1	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0.21	K/W
$R_{thCH}$	thermal resistance case to heatsink			0.11		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		550	W
$I_{TSM}$	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		4.30	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		4.65	kA
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		3.66	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		3.95	kA
$I^2t$	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		92.5	kA <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		89.8	kA <sup>2</sup> s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		66.8	kA <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		64.7	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 700 V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		113	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	$T_{VJ} = 140^{\circ}C; f = 50 \text{ Hz}$	repetitive, $I_T = 450 A$		150	A/ $\mu s$
		$t_p = 200 \mu s; di_G/dt = 0.5 A/\mu s;$	non-repet., $I_T = 150 A$		500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		1000	V/ $\mu s$
		$R_{GK} = \infty; \text{method 1 (linear voltage rise)}$				
$V_{GT}$	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		2	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	$t_p = 30 \mu s$	$T_{VJ} = 25^{\circ}C$		200	mA
		$I_G = 0.45 A; di_G/dt = 0.45 A/\mu s$				
$I_H$	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0.5 A; di_G/dt = 0.5 A/\mu s$				
$t_q$	turn-off time	$V_R = 100 V; I_T = 150 A; V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}C$		200	$\mu s$
		$di/dt = 10 A/\mu s \quad dv/dt = 20 V/\mu s \quad t_p = 200 \mu s$				



Package Y4				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>					150	g	
$M_D$	mounting torque		2.25		2.75	Nm	
$M_T$	terminal torque		4.5		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	16.0	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)
- N = High Voltage Thyristor
- A = (>= 2000V)
- 150 = Current Rating [A]
- PD = Phase leg
- 2200 = Reverse Voltage [V]
- YB = Y4-M6

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCNA150PD2200YB	MCNA150PD2200YB	Box	6	524568

Similar Part	Package	Voltage class
MCNA180PD2200YB	Y4-M6	2200
MCNA220PD2200YB	Y4-M6	2200

**Equivalent Circuits for Simulation**

\* on die level

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



Thyristor

$V_{0\ max}$	threshold voltage	0.86	V
$R_{0\ max}$	slope resistance *	1.49	mΩ



**Outlines Y4**



Dim.	MIN [mm]	MAX [mm]	MIN [inch]	MAX [inch]
a	30.0	30.6	1.181	1.205
b	typ. 0.25		typ. 0.010	
c	64.0	65.0	2.520	2.559
d	6.5	7.0	0.256	0.275
e	4.9	5.1	0.193	0.201
f	28.6	29.2	1.126	1.150
g	7.3	7.7	0.287	0.303
h	93.5	94.5	3.681	3.720
i	79.5	80.5	3.130	3.169
j	4.8	5.2	0.189	0.205
k	33.4	34.0	1.315	1.339
l	16.7	17.3	0.657	0.681
m	22.7	23.3	0.894	0.917
n	22.7	23.3	0.894	0.917
o	14.0	15.0	0.551	0.591
p	typ. 10.5		typ. 0.413	
r	1.8	2.4	0.071	0.041

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

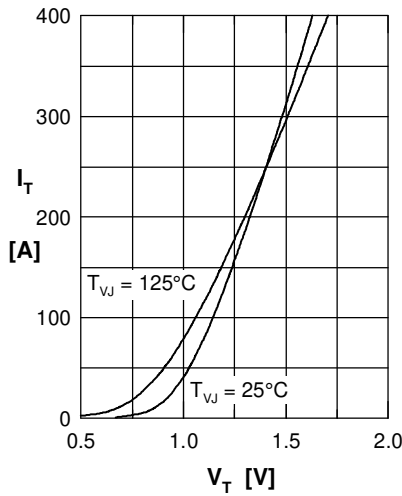


Fig. 1 Forward characteristics

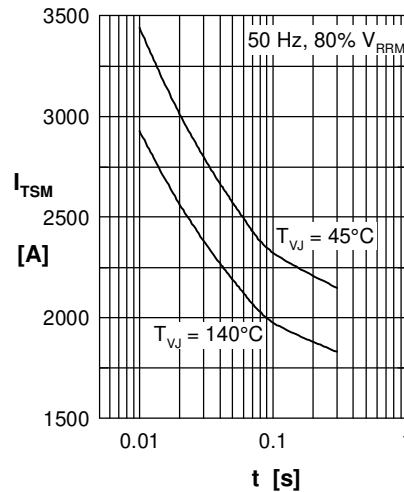


Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

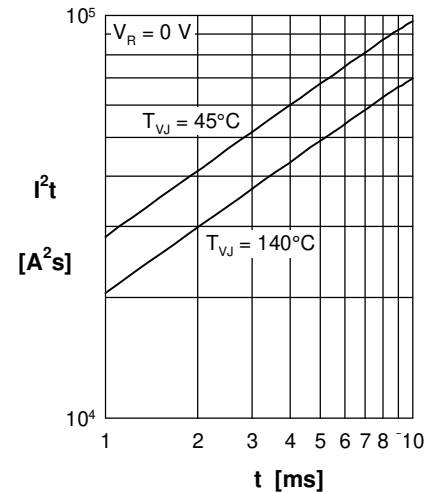


Fig. 3  $I^2t$  versus time (1-10 s)

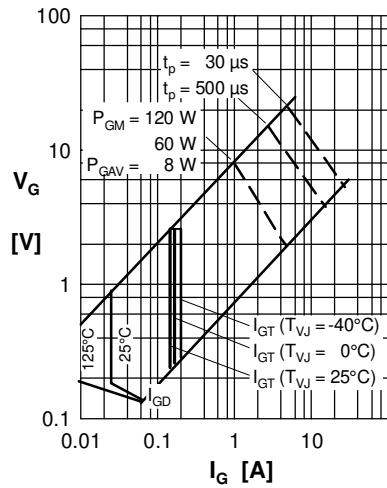


Fig. 4 Gate voltage & gate current

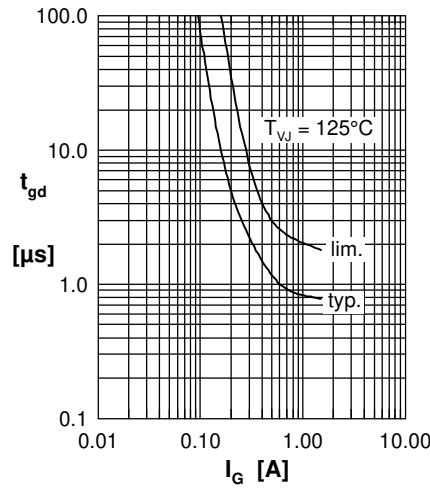


Fig. 5 Gate controlled delay time  $t_{gd}$

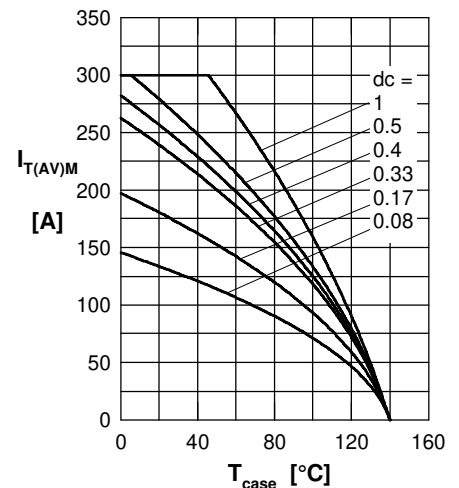


Fig. 6 Max. forward current at case temperature

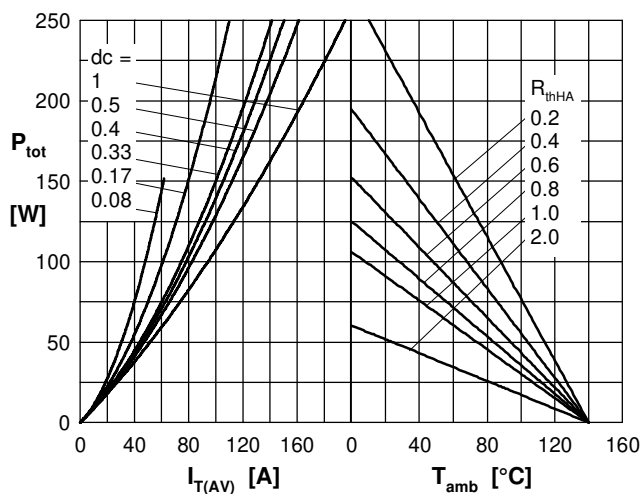


Fig. 7a Power dissipation versus direct output current  
Fig. 7b and ambient temperature

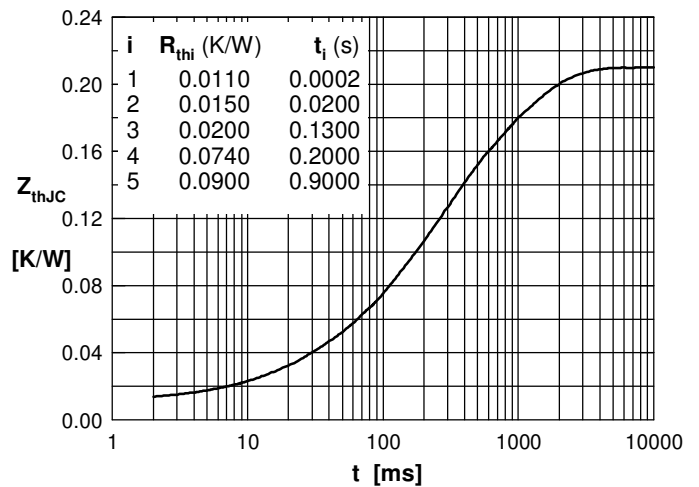


Fig. 8 Transient thermal impedance junction to case