

High Voltage Thyristor \ Diode Module

 $V_{RRM} = 2 \times 2200 \text{ V}$
 $I_{TAV} = 220 \text{ A}$
 $V_T = 1.19 \text{ V}$

Phase leg

Part number

MCNA220PD2200YB



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

Terms .Conditions of usage:

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

- to perform joint risk and quality assessments;

- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

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	μA
		$V_{R/D} = 2200 V$	$T_{VJ} = 125^{\circ}C$		15	mA
V_T	forward voltage drop	$I_T = 220 A$	$T_{VJ} = 25^{\circ}C$		1.24	V
		$I_T = 440 A$			1.51	V
		$I_T = 220 A$	$T_{VJ} = 125^{\circ}C$		1.19	V
		$I_T = 440 A$			1.53	V
I_{TAV}	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		220	A
$I_{T(RMS)}$	RMS forward current	180° sine			345	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0.84	V
r_T	slope resistance				1.5	m Ω
R_{thJC}	thermal resistance junction to case				0.13	K/W
R_{thCH}	thermal resistance case to heatsink		0.070			K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		885	W
I_{TSM}	max. forward surge current	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		7.20	kA
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		7.78	kA
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 140^{\circ}C$		6.12	kA
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		6.61	kA
I^2t	value for fusing	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		259.2	kA ² s
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		251.5	kA ² s
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 140^{\circ}C$		187.3	kA ² s
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		181.8	kA ² s
C_J	junction capacitance	$V_R = 700 V \quad f = 1 MHz$	$T_{VJ} = 25^{\circ}C$	195		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	$T_{VJ} = 140^{\circ}C; f = 50 Hz$	repetitive, $I_T = 660 A$		150	A/ μs
		$t_p = 200 \mu s; di_G/dt = 0.5 A/\mu s;$ $I_G = 0.5 A; V = \frac{2}{3} V_{DRM}$	non-repet., $I_T = 220 A$		500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		1000	V/ μs
		$R_{GK} = \infty; \text{method 1 (linear voltage rise)}$				
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	μs
		$I_G = 0.5 A; di_G/dt = 0.5 A/\mu s$				
t_q	turn-off time	$V_R = 100 V; I_T = 220 A; V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s \quad dv/dt = 20 V/\mu s \quad t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$	200		μs

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	
Weight				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	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4000		V	



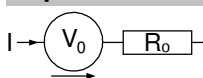
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

Part description

- M = Module
- C = Thyristor (SCR)
- N = High Voltage Thyristor
- A = ($\geq 2000V$)
- 220 = 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	MCNA220PD2200YB	MCNA220PD2200YB	Box	6	520509

Similar Part	Package	Voltage class
MCNA150PD2200YB	Y4-M6	2200
MCNA180PD2200YB	Y4-M6	2200

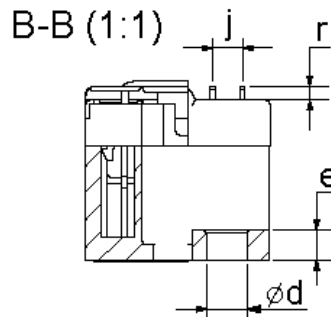
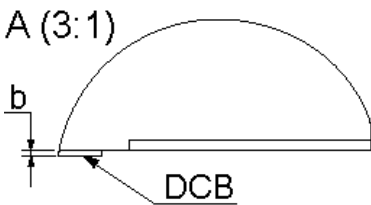
Equivalent Circuits for Simulation
** on die level*
 $T_{VJ} = 140^\circ\text{C}$

Thyristor

$V_{0\ max}$	threshold voltage	0.84	V
$R_{0\ max}$	slope resistance *	0.9	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



Thyristor

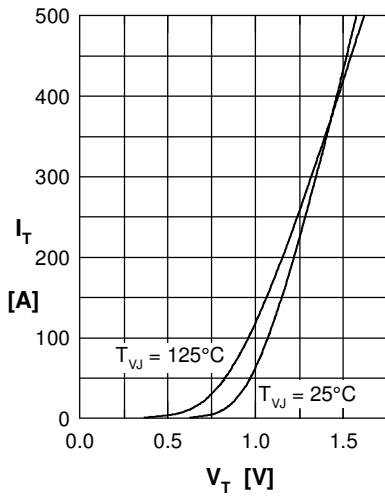


Fig. 1 Forward characteristics

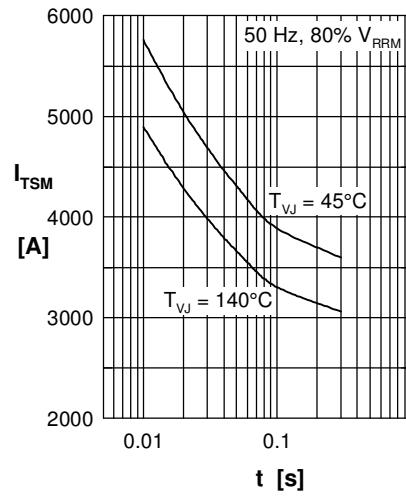


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

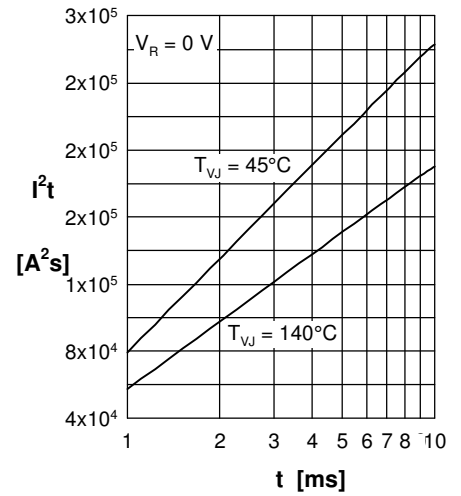


Fig. 3 I^2t versus time (1-10 s)

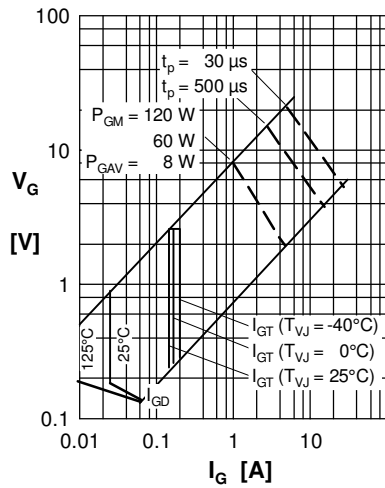


Fig. 4 Gate voltage & gate current

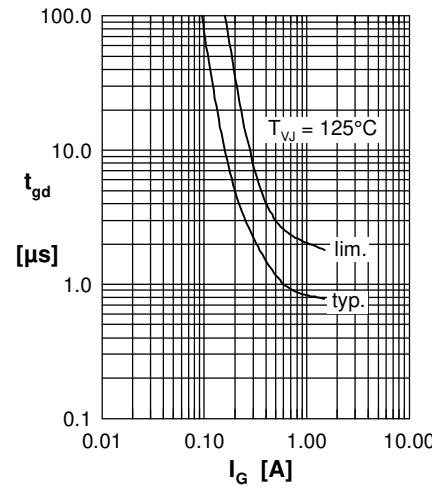


Fig. 5 Gate controlled delay time t_{gd}

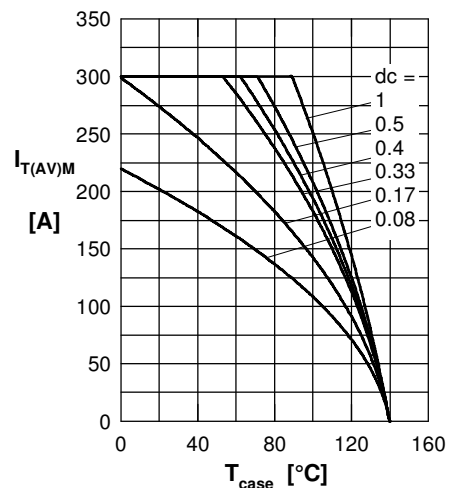


Fig. 6 Max. forward current at case temperature

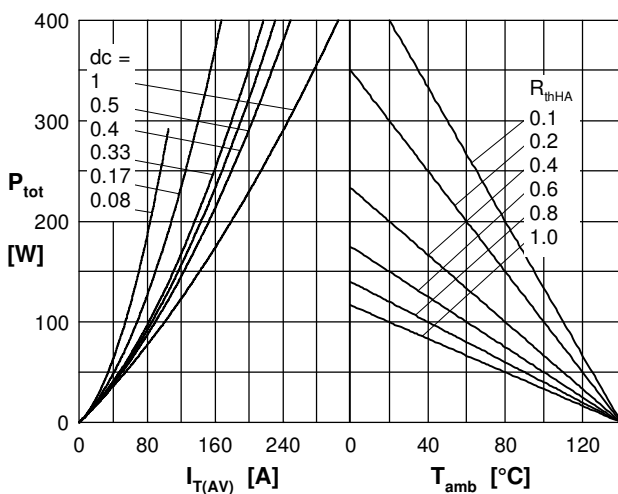


Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature

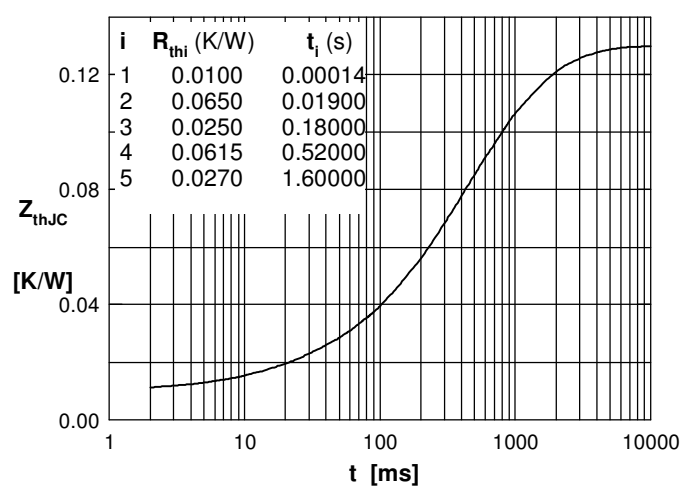


Fig. 8 Transient thermal impedance junction to case