

## Standard Rectifier Module

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

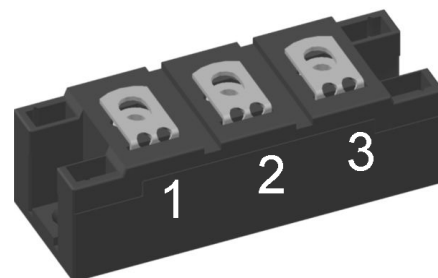
$$I_{FAV} = 210 \text{ A}$$

$$V_F = 1.04 \text{ V}$$

Phase leg

Part number

**MDMA210P1600YD**



Backside: isolated

 E72873



### Features / Advantages:

- Package with DCB ceramic
- Improved temperature and power cycling
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current

### Applications:

- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

### Package: Y4

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

### Disclaimer Notice

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| Rectifier  |                                              |                                                      |                                | Ratings                        |      |       |                   |
|------------|----------------------------------------------|------------------------------------------------------|--------------------------------|--------------------------------|------|-------|-------------------|
| Symbol     | Definition                                   | Conditions                                           |                                | min.                           | typ. | max.  | Unit              |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$                        |                                |                                |      | 1700  | V                 |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$                        |                                |                                |      | 1600  | V                 |
| $I_R$      | reverse current                              | $V_R = 1600\text{ V}$                                | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 1     | mA                |
|            |                                              | $V_R = 1600\text{ V}$                                | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 15    | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 210\text{ A}$                                 | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 1.13  | V                 |
|            |                                              | $I_F = 420\text{ A}$                                 |                                |                                |      | 1.34  | V                 |
|            |                                              | $I_F = 210\text{ A}$                                 | $T_{VJ} = 125^{\circ}\text{C}$ |                                |      | 1.04  | V                 |
|            |                                              | $I_F = 420\text{ A}$                                 |                                |                                |      | 1.30  | V                 |
| $I_{FAV}$  | average forward current                      | $T_C = 100^{\circ}\text{C}$<br>rectangular $d = 0.5$ | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 210   | A                 |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                    |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0.76  | V                 |
| $r_F$      | slope resistance                             |                                                      |                                |                                |      | 1.2   | mΩ                |
| $R_{thJC}$ | thermal resistance junction to case          |                                                      |                                |                                |      | 0.17  | K/W               |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                      |                                |                                | 0.09 |       | K/W               |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                           |                                |                                |      | 735   | W                 |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 6.60  | kA                |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 7.13  | kA                |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 5.61  | kA                |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 6.06  | kA                |
| $I^2t$     | value for fusing                             | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 217.8 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 211.5 | kA <sup>2</sup> s |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 157.4 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 152.8 | kA <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}; f = 1\text{ MHz}$               |                                |                                | 208  |       | pF                |

| Package Y4           |                                                              |                      |                                         | Ratings |      |      |      |
|----------------------|--------------------------------------------------------------|----------------------|-----------------------------------------|---------|------|------|------|
| Symbol               | Definition                                                   | Conditions           |                                         | min.    | typ. | max. | Unit |
| I <sub>RMS</sub>     | RMS current                                                  | per terminal         |                                         |         |      | 300  | A    |
| T <sub>VJ</sub>      | virtual junction temperature                                 |                      |                                         | -40     |      | 150  | °C   |
| T <sub>op</sub>      | operation temperature                                        |                      |                                         | -40     |      | 125  | °C   |
| T <sub>stg</sub>     | storage temperature                                          |                      |                                         | -40     |      | 125  | °C   |
| Weight               |                                                              |                      |                                         |         | 150  |      | g    |
| M <sub>D</sub>       | mounting torque                                              |                      |                                         | 2.25    |      | 2.75 | Nm   |
| M <sub>T</sub>       | terminal torque                                              |                      |                                         | 4.5     |      | 5.5  | Nm   |
| d <sub>Spp/App</sub> | creepage distance on surface   striking distance through air | terminal to terminal | 14.0                                    | 10.0    |      |      | mm   |
| d <sub>Spb/Apb</sub> |                                                              | terminal to backside | 16.0                                    | 16.0    |      |      | mm   |
| V <sub>ISOL</sub>    | isolation voltage                                            | t = 1 second         | 50/60 Hz, RMS; I <sub>ISOL</sub> ≤ 1 mA | 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  
 D = Diode  
 M = Standard Rectifier  
 A = (up to 1800V)  
 210 = Current Rating [A]  
 P = Phase leg  
 1600 = Reverse Voltage [V]  
 YD = Y4-M6

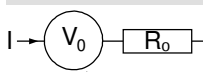
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MDMA210P1600YD  | MDMA210P1600YD     | Box           | 6        | 517762   |

| Similar Part   | Package | Voltage class |
|----------------|---------|---------------|
| MDMA180P1600YD | Y4-M6   | 1600          |
| MDMA280P1600YD | Y4-M6   | 1600          |

### Equivalent Circuits for Simulation

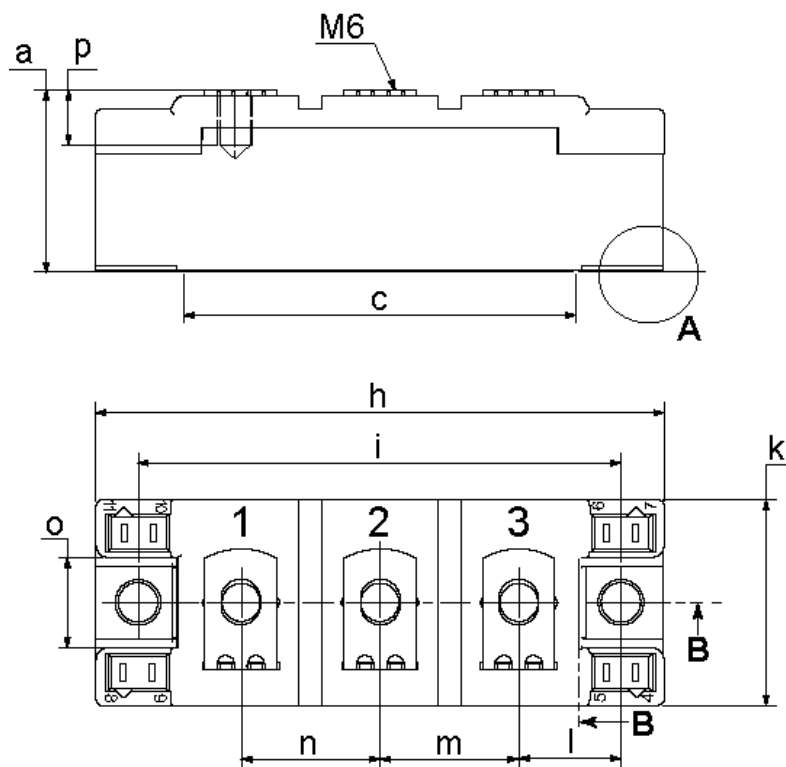
\* on die level

$T_{VJ} = 150^{\circ}\text{C}$

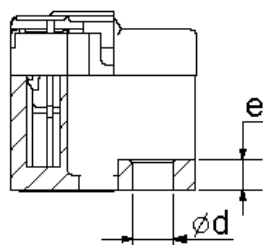


**Rectifier**

|             |                    |      |    |
|-------------|--------------------|------|----|
| $V_{0\max}$ | threshold voltage  | 0.76 | V  |
| $R_{0\max}$ | slope resistance * | 0.57 | mΩ |

**Outlines Y4**


| Dim. | MIN<br>[mm] | MAX<br>[mm] | MIN<br>[inch] | MAX<br>[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         |
| h    | 93.5        | 94.5        | 3.681         | 3.720         |
| i    | 79.5        | 80.5        | 3.130         | 3.169         |
| 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    |               |


**B-B (1:1)**


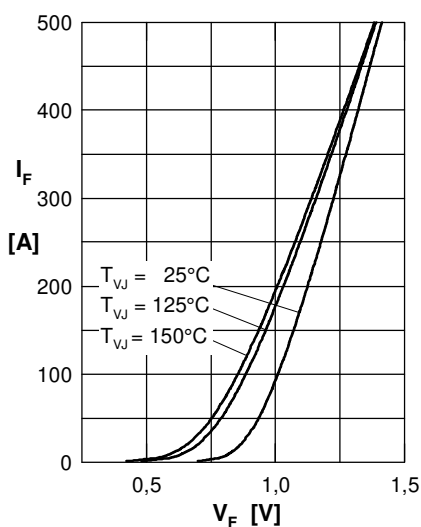
**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

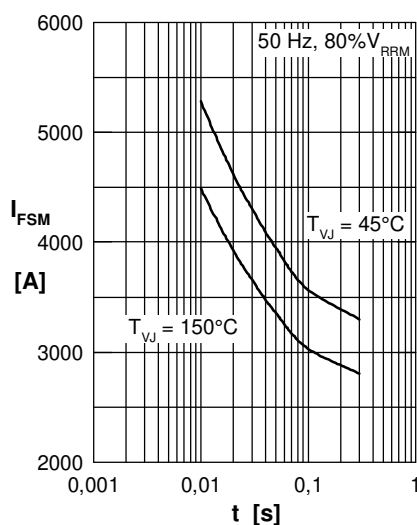


Fig. 2 Surge overload current vs. time per diode

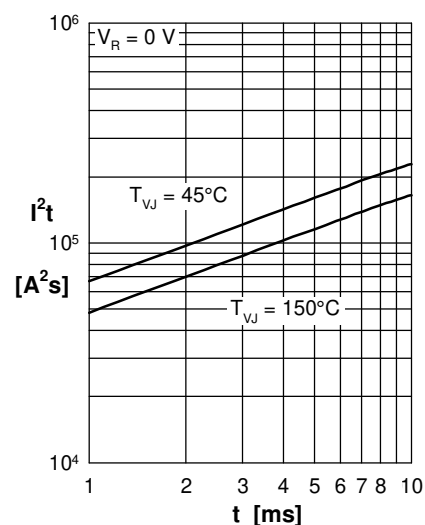
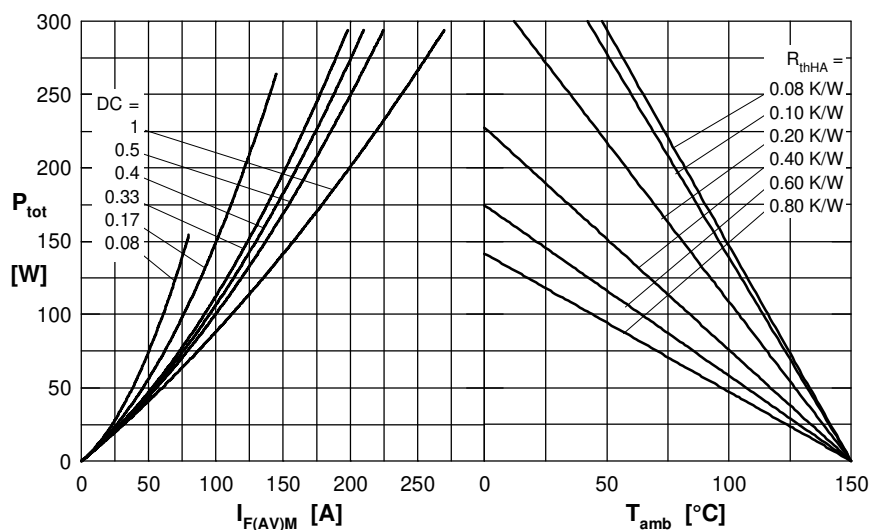

 Fig. 3  $I^2t$  versus time per diode


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

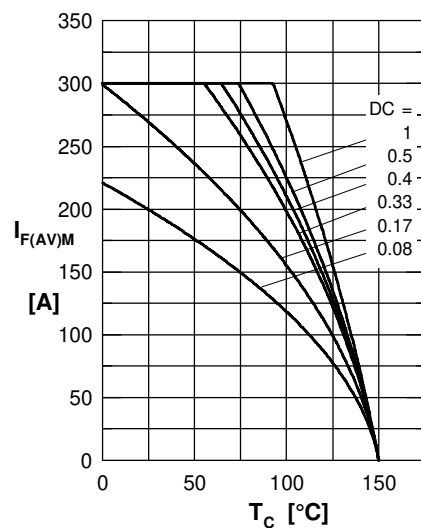


Fig. 5 Max. forward current vs. case temperature per diode

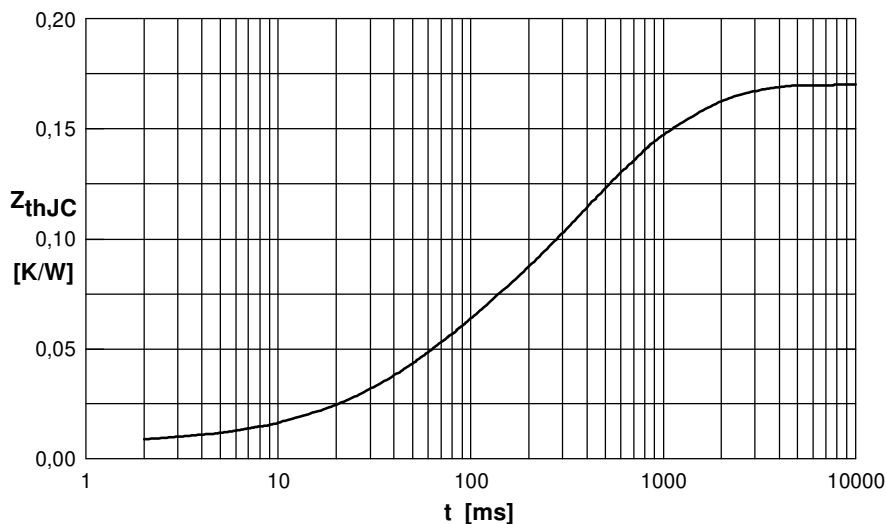


Fig. 6 Transient thermal impedance junction to case vs. time per diode

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.007           | 0.0005    |
| 2 | 0.036           | 0.0500    |
| 3 | 0.072           | 0.3000    |
| 4 | 0.055           | 1.0000    |