

## Standard Rectifier Module

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

$$I_{FAV} = 50 \text{ A}$$

$$V_F = 1.09 \text{ V}$$

Phase leg

Part number

**MDMA50P1600TG**



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: TO-240AA

- 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                              | $V_R = 1600\text{ V}$                                | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 50   | $\mu\text{A}$     |
|            |                                              | $V_R = 1600\text{ V}$                                | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 1.5  | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 50\text{ A}$                                  | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 1.13 | V                 |
|            |                                              | $I_F = 100\text{ A}$                                 |                                |                                |      | 1.34 | V                 |
|            |                                              | $I_F = 50\text{ A}$                                  | $T_{VJ} = 125^{\circ}\text{C}$ |                                |      | 1.09 | V                 |
|            |                                              | $I_F = 100\text{ A}$                                 |                                |                                |      | 1.37 | V                 |
| $I_{FAV}$  | average forward current                      | $T_C = 100^{\circ}\text{C}$<br>rectangular $d = 0.5$ | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 50   | A                 |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                    |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0.80 | V                 |
| $r_F$      | slope resistance                             |                                                      |                                |                                |      | 5.7  | m $\Omega$        |
| $R_{thJC}$ | thermal resistance junction to case          |                                                      |                                |                                |      | 0.65 | K/W               |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                      |                                |                                | 0.2  |      | K/W               |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                           |                                |                                |      | 190  | W                 |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 850  | A                 |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 920  | A                 |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 725  | A                 |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 780  | A                 |
| $I^2t$     | value for fusing                             | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 3.62 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 3.52 | kA <sup>2</sup> s |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$     | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 2.63 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$    | $V_R = 0\text{ V}$             |                                |      | 2.53 | kA <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}; f = 1\text{ MHz}$               |                                |                                | 27   |      | pF                |

| Package TO-240AA |                                                              |                              |                                     | Ratings      |      |      |        |
|------------------|--------------------------------------------------------------|------------------------------|-------------------------------------|--------------|------|------|--------|
| Symbol           | Definition                                                   | Conditions                   |                                     | min.         | typ. | max. | Unit   |
| $I_{RMS}$        | RMS current                                                  | per terminal                 |                                     |              |      | 200  | A      |
| $T_{VJ}$         | virtual junction temperature                                 |                              |                                     | -40          |      | 150  | °C     |
| $T_{op}$         | operation temperature                                        |                              |                                     | -40          |      | 125  | °C     |
| $T_{stg}$        | storage temperature                                          |                              |                                     | -40          |      | 125  | °C     |
| <b>Weight</b>    |                                                              |                              |                                     |              | 76   |      | 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<br>t = 1 minute | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 4800<br>4000 |      |      | V<br>V |



### Part description

M = Module  
 D = Diode  
 M = Standard Rectifier  
 A = (up to 1800V)  
 50 = Current Rating [A]  
 P = Phase leg  
 1600 = Reverse Voltage [V]  
 TG = TO-240AA

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MDMA50P1600TG   | MDMA50P1600TG      | Box           | 36       | 513022   |

### Equivalent Circuits for Simulation

\* on die level

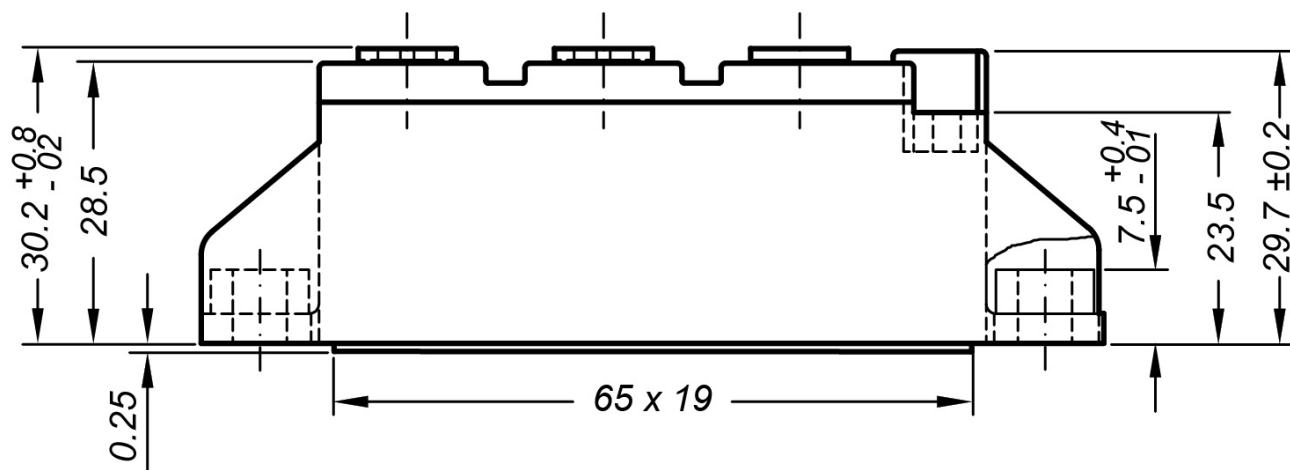
$T_{VJ} = 150^{\circ}\text{C}$



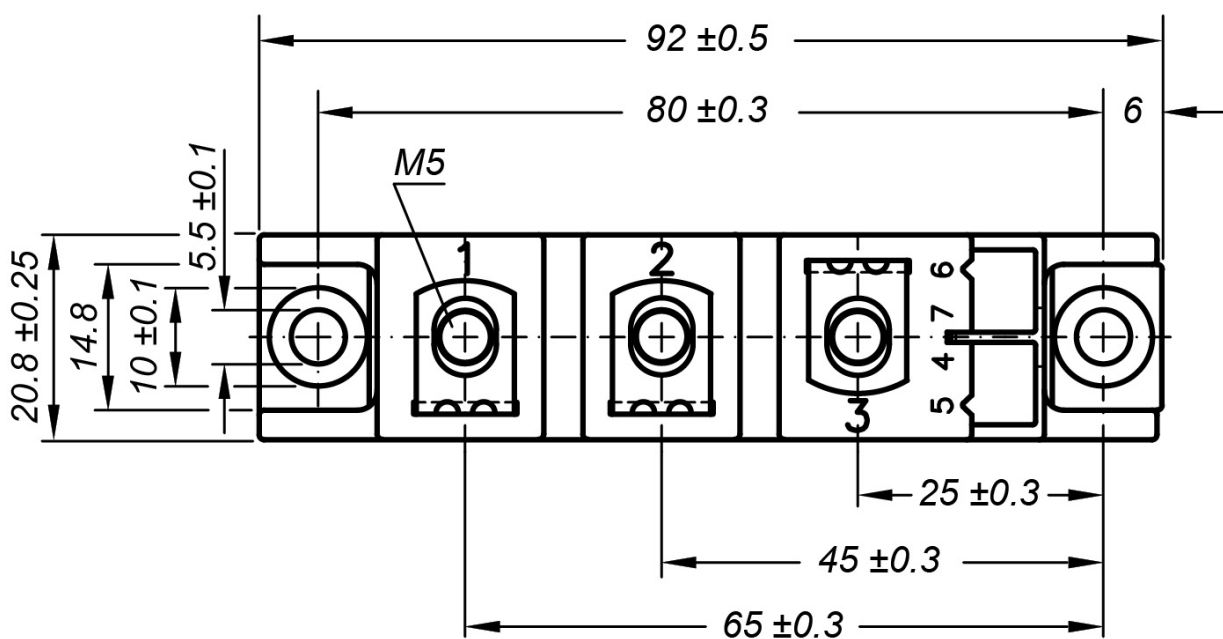
Rectifier

|             |                    |     |    |
|-------------|--------------------|-----|----|
| $V_{0\max}$ | threshold voltage  | 0.8 | V  |
| $R_{0\max}$ | slope resistance * | 4.5 | mΩ |

Outlines TO-240AA



General tolerance: DIN ISO 2768 class „c“



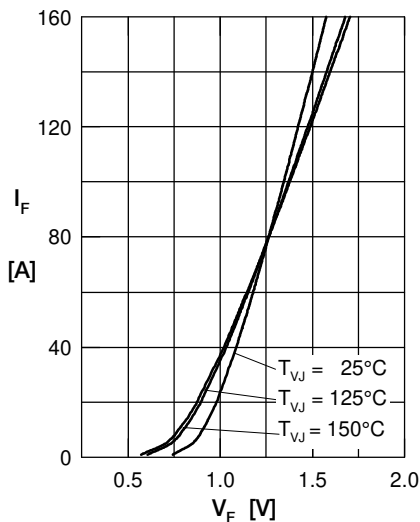
**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

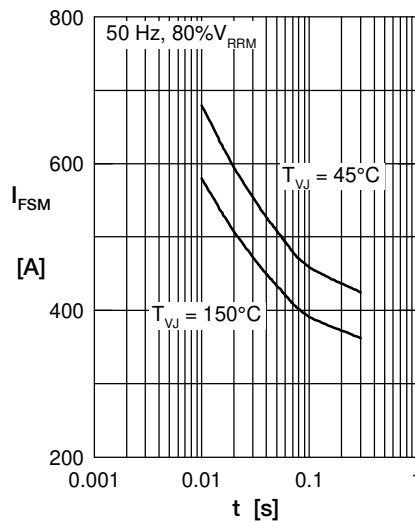


Fig. 2 Surge overload current vs. time per diode

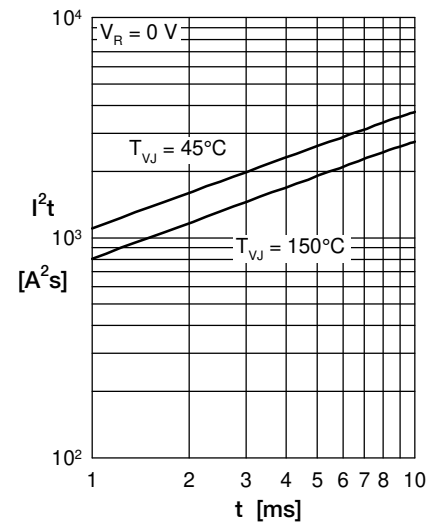
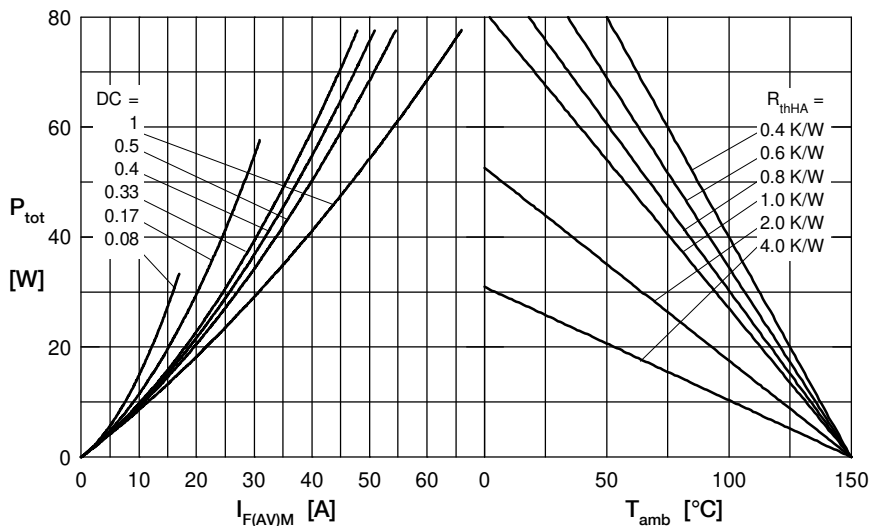

 Fig. 3  $I^2t$  versus time per diode


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

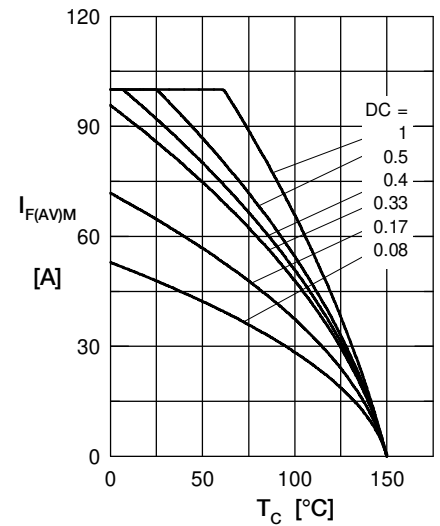


Fig. 5 Max. forward current vs. case temperature per diode

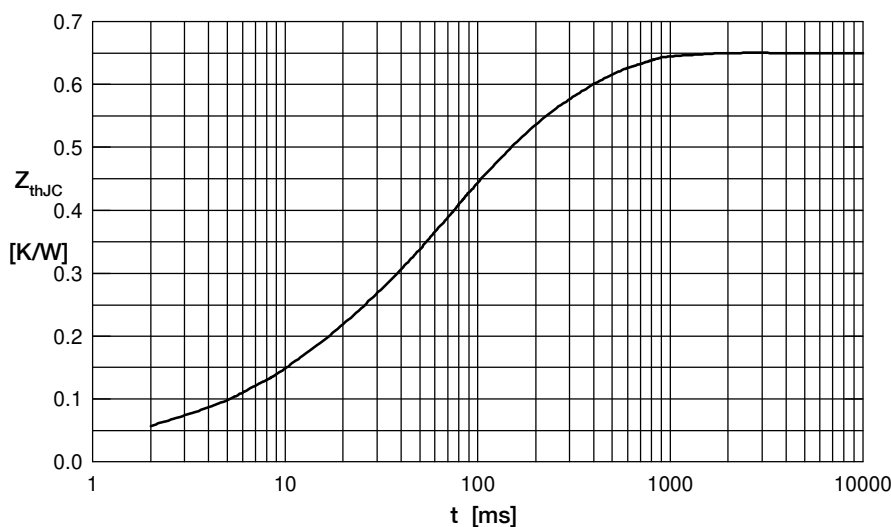


Fig. 6 Transient thermal impedance junction to case vs. time per diode

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.032           | 0.001     |
| 2 | 0.098           | 0.010     |
| 3 | 0.305           | 0.060     |
| 4 | 0.215           | 0.270     |