

# High Voltage Standard Rectifier Module

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

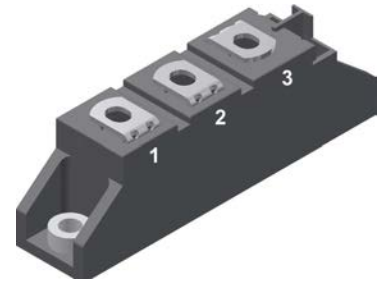
$$I_{FAV} = 50 \text{ A}$$

$$V_F = 1,09 \text{ V}$$

Phase leg

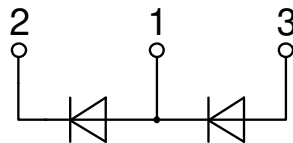
Part number

**MDNA50P2200TG**



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

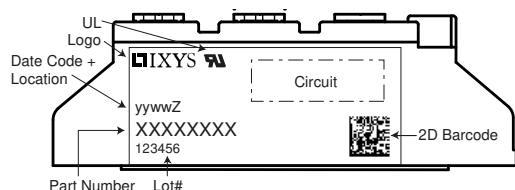
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| Rectifier  |                                                     |                                                      |                                | Ratings                        |      |      |                   |
|------------|-----------------------------------------------------|------------------------------------------------------|--------------------------------|--------------------------------|------|------|-------------------|
| Symbol     | Definition                                          | Conditions                                           |                                | min.                           | typ. | max. | Unit              |
| $V_{RSM}$  | <b>max. non-repetitive reverse blocking voltage</b> | $T_{VJ} = 25^{\circ}\text{C}$                        |                                |                                |      | 2300 | V                 |
| $V_{RRM}$  | <b>max. repetitive reverse blocking voltage</b>     | $T_{VJ} = 25^{\circ}\text{C}$                        |                                |                                |      | 2200 | V                 |
| $I_R$      | <b>reverse current</b>                              | $V_R = 2200\text{ V}$                                | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 50   | $\mu\text{A}$     |
|            |                                                     | $V_R = 2200\text{ V}$                                | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 1,5  | mA                |
| $V_F$      | <b>forward voltage drop</b>                         | $I_F = 50\text{ A}$                                  | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 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                 |
| $I_{FAV}$  | <b>average forward current</b>                      | $T_C = 100^{\circ}\text{C}$<br>rectangular $d = 0.5$ | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 50   | A                 |
| $V_{F0}$   | <b>threshold voltage</b>                            | } <b>for power loss calculation only</b>             |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0,80 | V                 |
| $r_F$      | <b>slope resistance</b>                             |                                                      |                                |                                |      | 5,7  | m $\Omega$        |
| $R_{thJC}$ | <b>thermal resistance junction to case</b>          |                                                      |                                |                                |      | 0,65 | K/W               |
| $R_{thCH}$ | <b>thermal resistance case to heatsink</b>          |                                                      |                                |                                | 0,2  |      | K/W               |
| $P_{tot}$  | <b>total power dissipation</b>                      | $T_C = 25^{\circ}\text{C}$                           |                                |                                |      | 190  | W                 |
| $I_{FSM}$  | <b>max. forward surge current</b>                   | $t = 10\text{ ms; (50 Hz), sine}$                    | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 850  | A                 |
|            |                                                     | $t = 8,3\text{ ms; (60 Hz), sine}$                   | $V_R = 0\text{ V}$             |                                |      | 920  | A                 |
|            |                                                     | $t = 10\text{ ms; (50 Hz), sine}$                    | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 725  | A                 |
|            |                                                     | $t = 8,3\text{ ms; (60 Hz), sine}$                   | $V_R = 0\text{ V}$             |                                |      | 780  | A                 |
| $I^2t$     | <b>value for fusing</b>                             | $t = 10\text{ ms; (50 Hz), sine}$                    | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 3,62 | kA <sup>2</sup> s |
|            |                                                     | $t = 8,3\text{ ms; (60 Hz), sine}$                   | $V_R = 0\text{ V}$             |                                |      | 3,52 | kA <sup>2</sup> s |
|            |                                                     | $t = 10\text{ ms; (50 Hz), sine}$                    | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 2,63 | kA <sup>2</sup> s |
|            |                                                     | $t = 8,3\text{ ms; (60 Hz), sine}$                   | $V_R = 0\text{ V}$             |                                |      | 2,53 | kA <sup>2</sup> s |
| $C_J$      | <b>junction capacitance</b>                         | $V_R = 400\text{ V; } f = 1\text{ MHz}$              |                                |                                | 27   |      | pF                |



| Package TO-240AA |                                                                     |                              |                                     | Ratings      |      |      |        |
|------------------|---------------------------------------------------------------------|------------------------------|-------------------------------------|--------------|------|------|--------|
| Symbol           | Definition                                                          | Conditions                   |                                     | min.         | typ. | max. | Unit   |
| $I_{RMS}$        | <b>RMS current</b>                                                  | per terminal                 |                                     |              |      | 200  | A      |
| $T_{VJ}$         | <b>virtual junction temperature</b>                                 |                              |                                     | -40          |      | 150  | °C     |
| $T_{op}$         | <b>operation temperature</b>                                        |                              |                                     | -40          |      | 125  | °C     |
| $T_{stg}$        | <b>storage temperature</b>                                          |                              |                                     | -40          |      | 125  | °C     |
| <b>Weight</b>    |                                                                     |                              |                                     |              | 76   |      | g      |
| $M_D$            | <b>mounting torque</b>                                              |                              |                                     | 2,5          |      | 4    | Nm     |
| $M_T$            | <b>terminal torque</b>                                              |                              |                                     | 2,5          |      | 4    | Nm     |
| $d_{Spp/App}$    | <b>creepage distance on surface   striking distance through air</b> | <b>terminal to terminal</b>  | 13,0                                | 9,7          |      |      | mm     |
| $d_{Spb/Apb}$    |                                                                     | <b>terminal to backside</b>  | 16,0                                | 16,0         |      |      | mm     |
| $V_{ISOL}$       | <b>isolation voltage</b>                                            | 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  
N = High Voltage Standard Rectifier  
A = ( $\geq 2000V$ )  
50 = Current Rating [A]  
P = Phase leg  
2200 = Reverse Voltage [V]  
TG = TO-240AA

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MDNA50P2200TG   | MDNA50P2200TG      | Box           | 36       | 525439   |

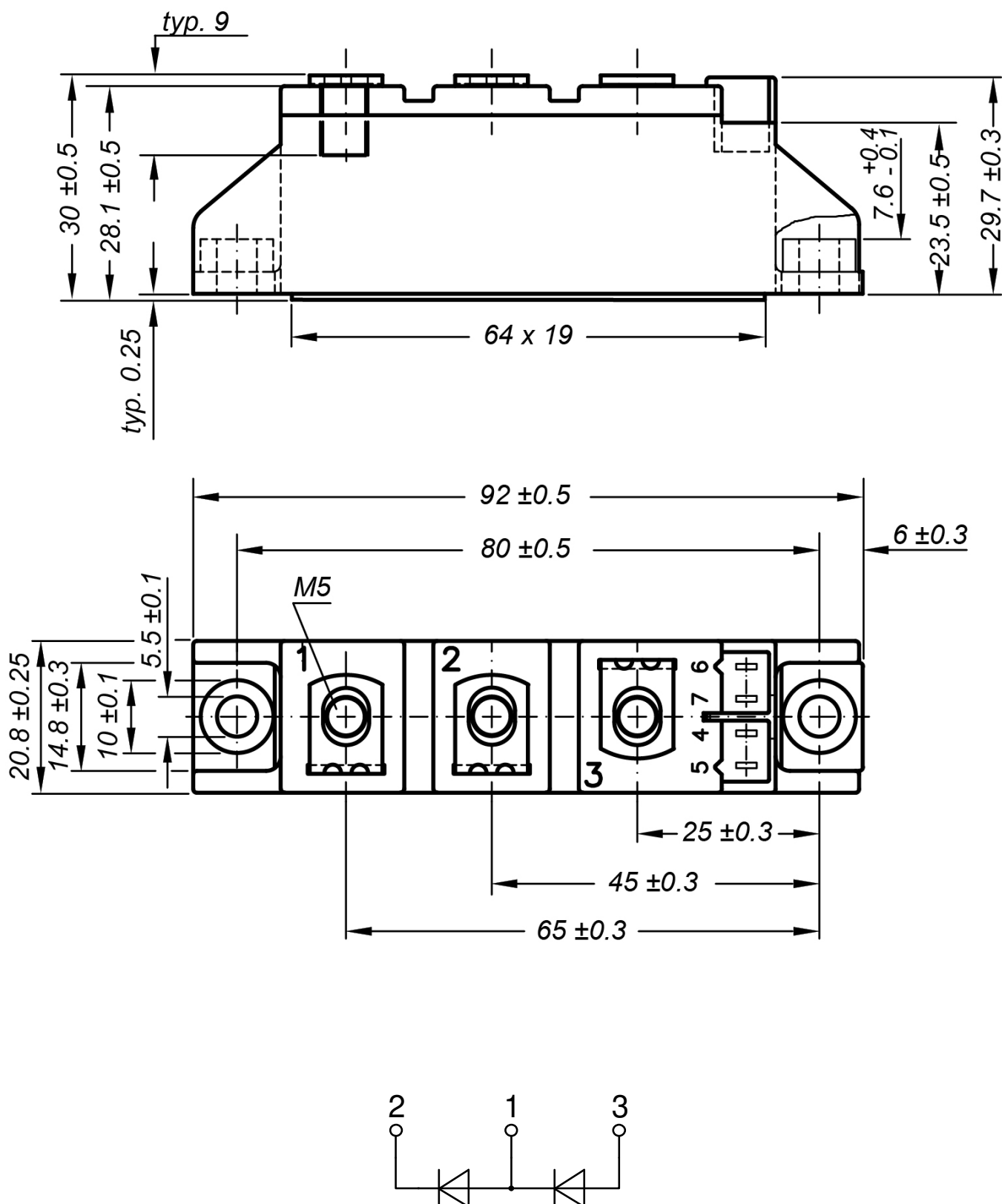
#### Equivalent Circuits for Simulation

\* on die level

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

|              |                           |        |
|--------------|---------------------------|--------|
|              | <b>Rectifier</b>          |        |
| $V_{0\ max}$ | <b>threshold voltage</b>  | 0,8 V  |
| $R_{0\ max}$ | <b>slope resistance *</b> | 4,5 mΩ |

Outlines TO-240AA



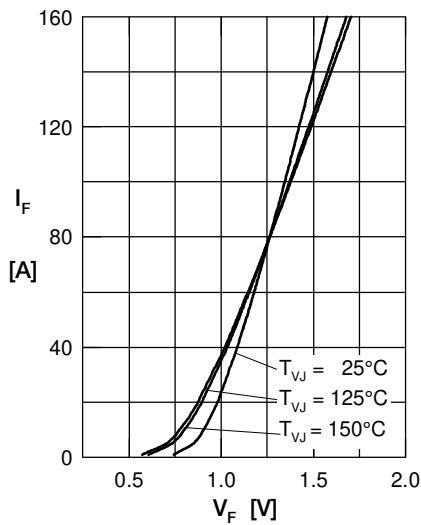
**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

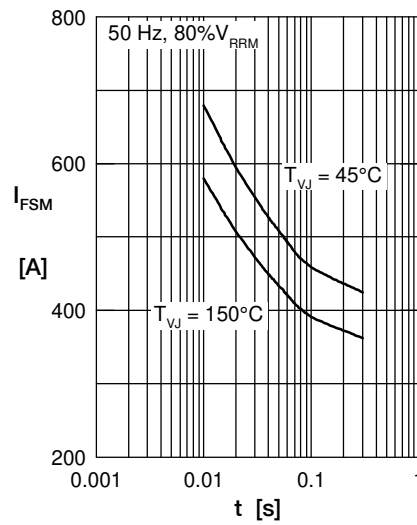


Fig. 2 Surge overload current vs. time per diode

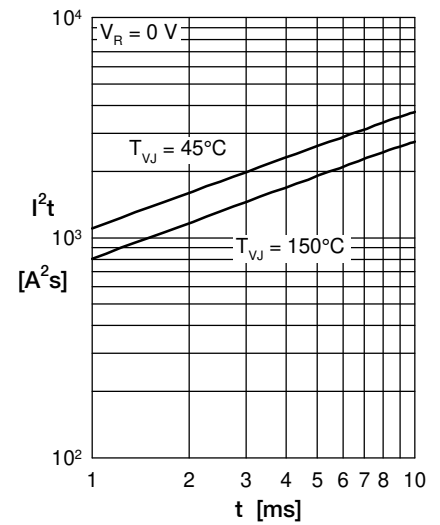
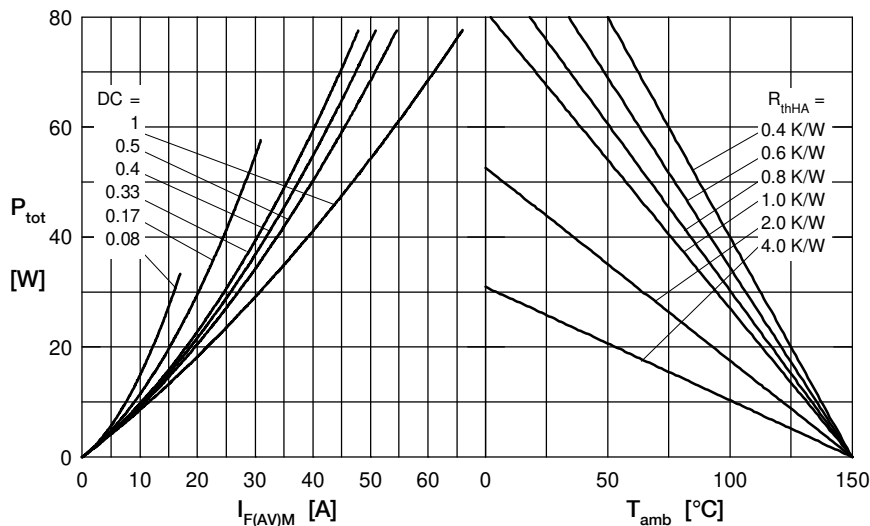

 Fig. 3  $I^2t$  versus time per diode


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

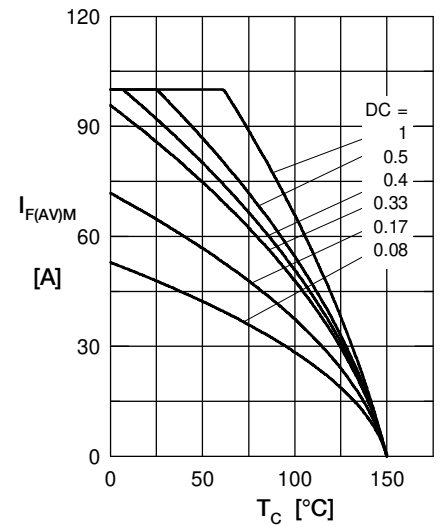


Fig. 5 Max. forward current vs. case temperature per diode

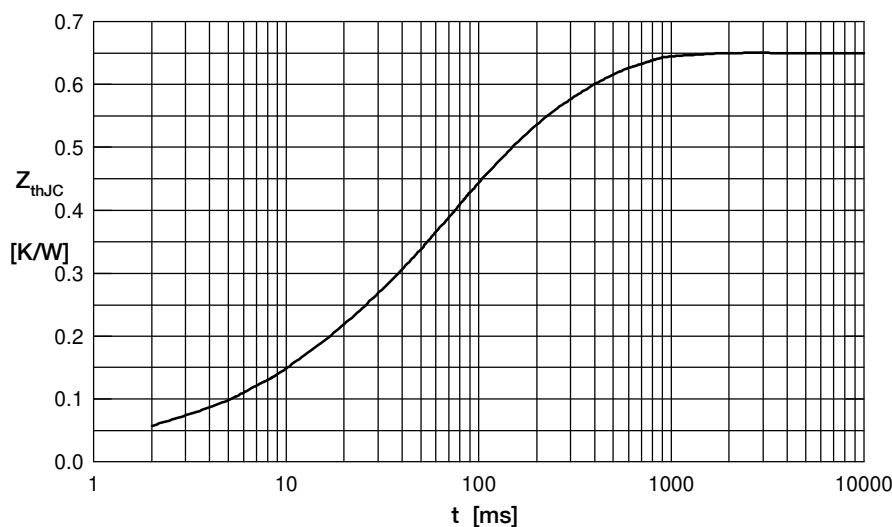


Fig. 6 Transient thermal impedance junction to case vs. time per diode

 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     |