

# High Voltage Standard Rectifier Module

$$\begin{aligned} V_{RRM} &= 2 \times 3400 \text{ V} \\ I_{FAV} &= 240 \text{ A} \\ V_F &= 1.01 \text{ V} \end{aligned}$$

Phase leg

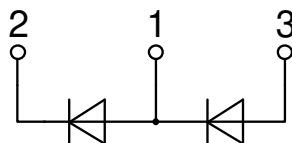
Part number

**MDD175-34N1**



Backside: isolated

 E72873



## Features / Advantages:

- Planar passivated chips
- Very low leakage current
- Very low forward voltage drop
- Improved thermal behaviour

## 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: Y1

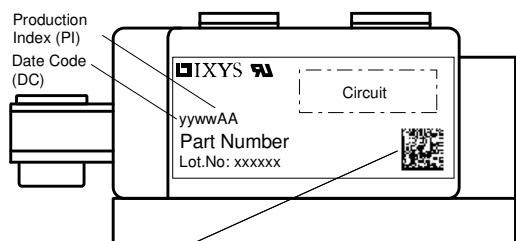
- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling

## Disclaimer Notice

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| Rectifier  |                                              |                                                   |                                | Ratings                        |      |       |                   |
|------------|----------------------------------------------|---------------------------------------------------|--------------------------------|--------------------------------|------|-------|-------------------|
| Symbol     | Definition                                   | Conditions                                        |                                | min.                           | typ. | max.  | Unit              |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$                     |                                |                                |      | 3500  | V                 |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$                     |                                |                                |      | 3400  | V                 |
| $I_R$      | reverse current                              | $V_R = 3400\text{ V}$                             | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 1     | mA                |
|            |                                              | $V_R = 3400\text{ V}$                             | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 5     | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 200\text{ A}$                              | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 1.07  | V                 |
|            |                                              | $I_F = 400\text{ A}$                              |                                |                                |      | 1.26  | V                 |
|            |                                              | $I_F = 200\text{ A}$                              | $T_{VJ} = 125^{\circ}\text{C}$ |                                |      | 1.01  | V                 |
|            |                                              | $I_F = 400\text{ A}$                              |                                |                                |      | 1.26  | V                 |
| $I_{FAV}$  | average forward current                      | $T_C = 100^{\circ}\text{C}$                       | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 240   | A                 |
|            |                                              | 180° sine $d = 0.5$                               |                                |                                |      |       |                   |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                 |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0.74  | V                 |
| $r_F$      | slope resistance                             |                                                   |                                |                                |      | 1.27  | mΩ                |
| $R_{thJC}$ | thermal resistance junction to case          |                                                   |                                |                                |      | 0.14  | K/W               |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                   |                                |                                | 0.04 |       | K/W               |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                        |                                |                                |      | 900   | W                 |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 8.50  | kA                |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$             |                                |      | 9.18  | kA                |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 7.23  | kA                |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$             |                                |      | 7.81  | kA                |
| $I^2t$     | value for fusing                             | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 361.3 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$             |                                |      | 350.6 | kA <sup>2</sup> s |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 261.0 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$             |                                |      | 253.4 | kA <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 1100\text{ V}; f = 1\text{ MHz}$           |                                |                                | 182  |       | pF                |

| Package Y1    |                                                              |                      | Ratings |      |      |      |
|---------------|--------------------------------------------------------------|----------------------|---------|------|------|------|
| Symbol        | Definition                                                   | Conditions           | min.    | typ. | max. | Unit |
| $I_{RMS}$     | RMS current                                                  | per terminal         |         |      | 600  | 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> |                                                              |                      |         | 680  |      | g    |
| $M_D$         | mounting torque                                              |                      | 4.5     |      | 7    | Nm   |
| $M_T$         | terminal torque                                              |                      | 11      |      | 13   | Nm   |
| $d_{Spp/App}$ | creepage distance on surface   striking distance through air | terminal to terminal | 16.0    |      |      | mm   |
| $d_{Spb/Apb}$ |                                                              | terminal to backside | 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)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MDD175-34N1     | MDD175-34N1        | Box           | 3        | 504075   |

### Equivalent Circuits for Simulation

\* on die level

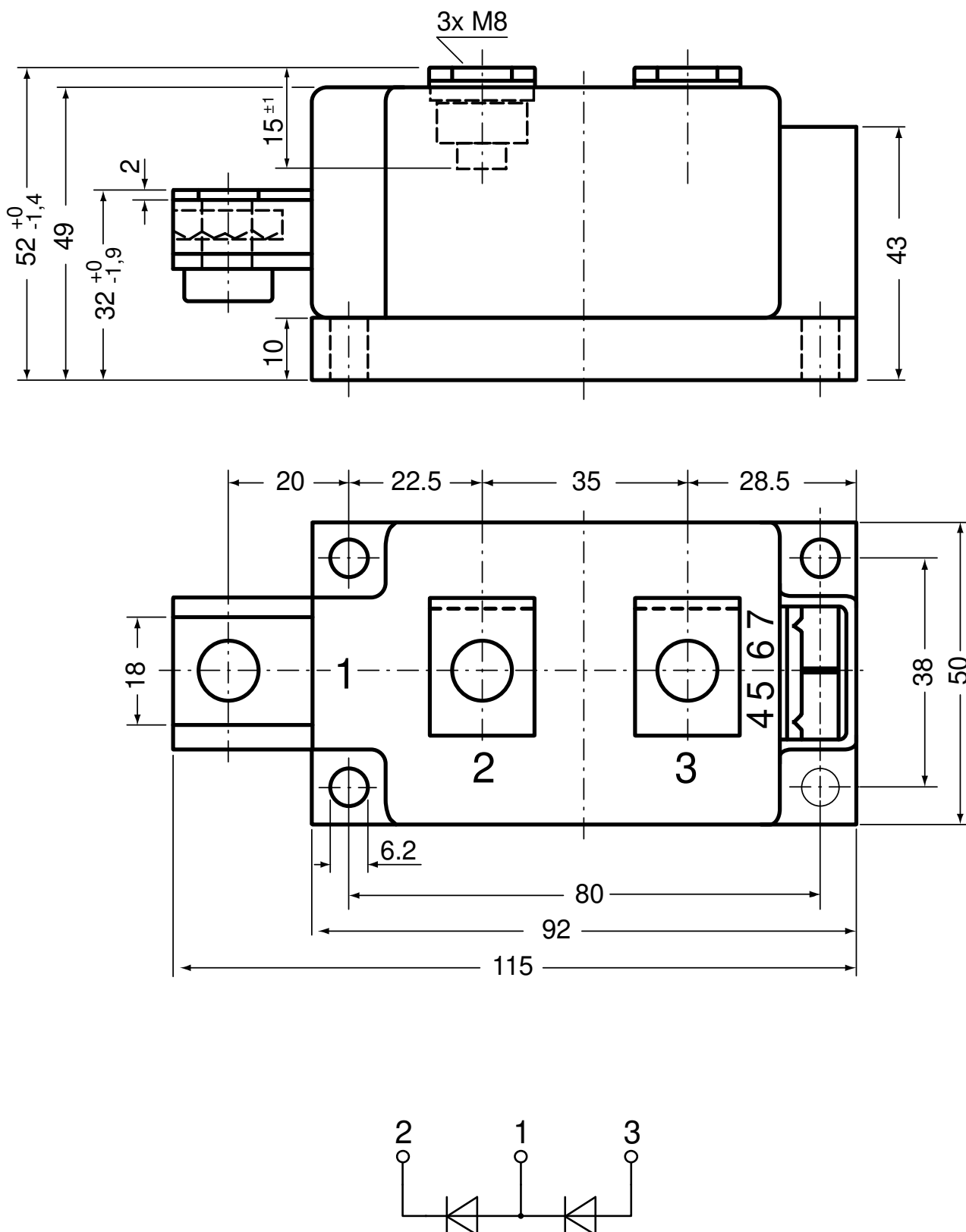
$T_{VJ} = 150^{\circ}\text{C}$



Rectifier

|             |                    |      |    |
|-------------|--------------------|------|----|
| $V_{0\max}$ | threshold voltage  | 0.74 | V  |
| $R_{0\max}$ | slope resistance * | 0.75 | mΩ |

**Outlines Y1**



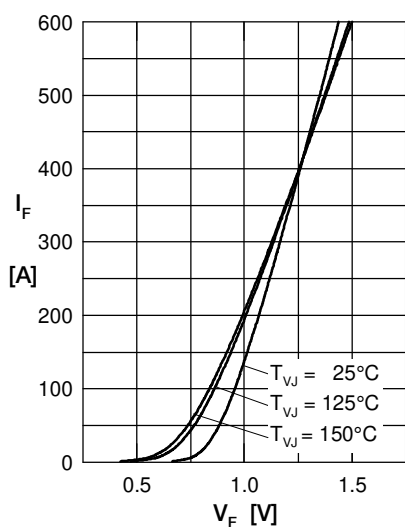
**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

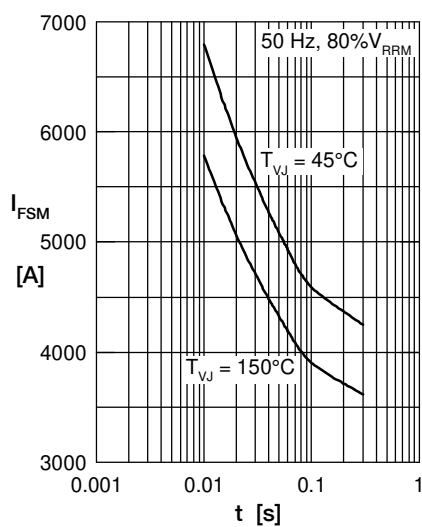


Fig. 2 Surge overload current

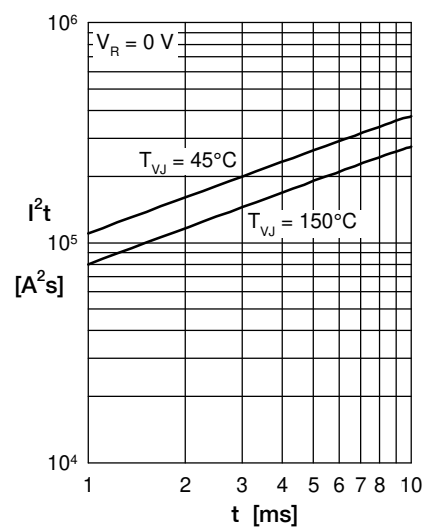
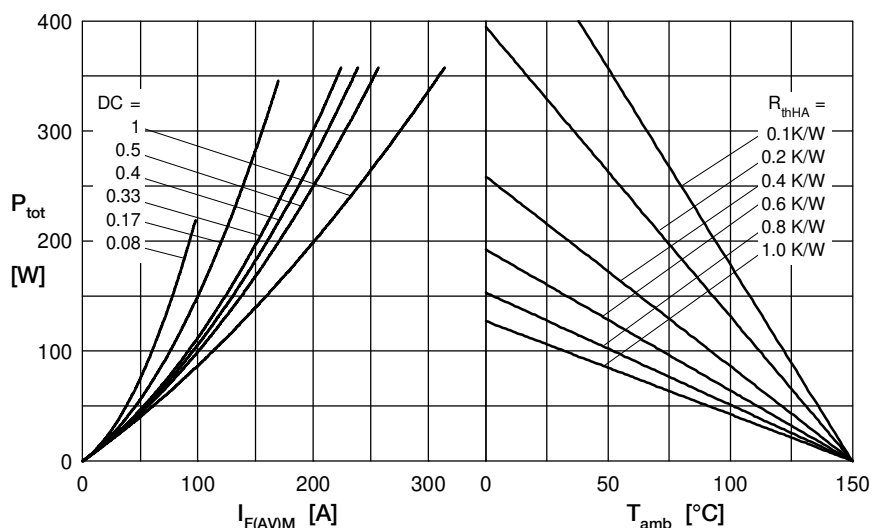

 Fig. 3  $I^2t$  versus time per diode


Fig. 4 Power dissipation vs. direct output current and ambient temperature

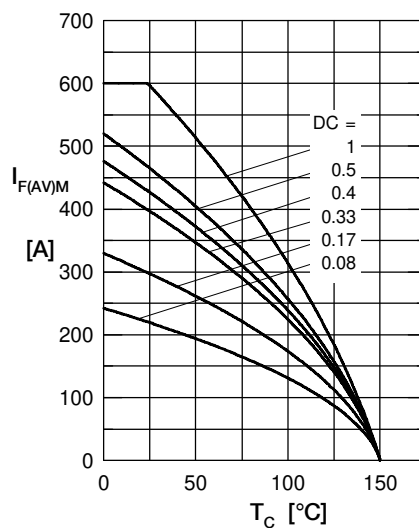


Fig. 5 Max. forward current vs. case temperature

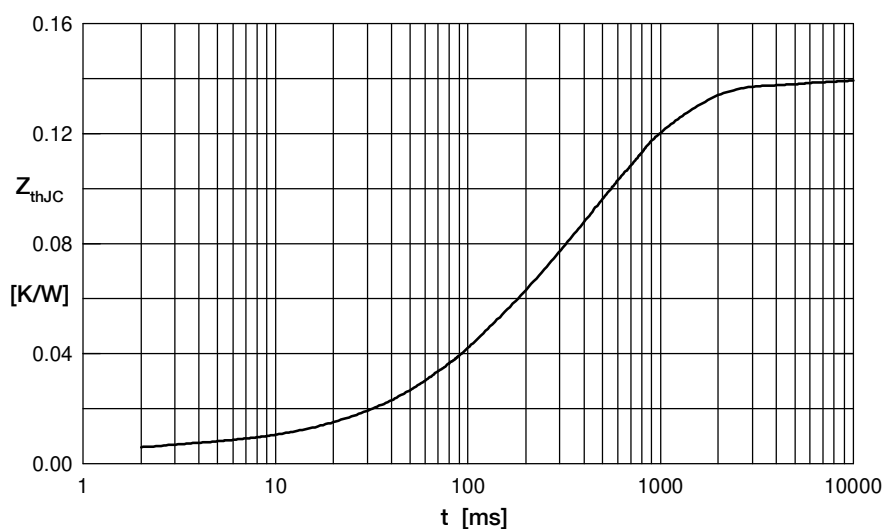


Fig. 6 Transient thermal impedance junction to case

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.155           | 0.0005    |
| 2 | 0.332           | 0.0095    |
| 3 | 0.713           | 0.17      |
| 4 | 0.3             | 0.8       |
| 5 | 0.00001         | 0.00001   |