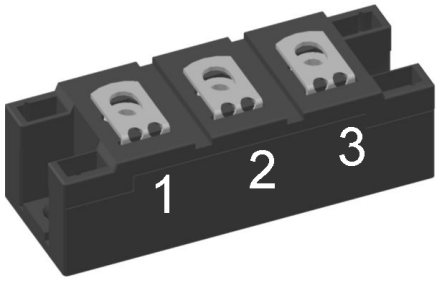
# Standard Rectifier Module

$V_{RRM}$ = 2x 1600 V
$I_{FAV}$ = 224 A
$V_F$ = 1.07 V

Phase leg

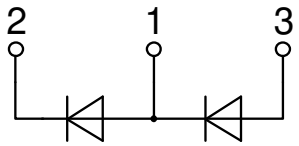
**Part number**

**MDD200-16N1**




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

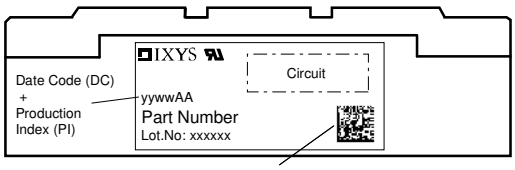
**Package:** Y4

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

## Rectifier

| Symbol | Definition | Conditions | | Ratings min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RSM}$ | *max. non-repetitive reverse blocking voltage* | | $T_{VJ}$ = 25°C | | | 1700 | V |
| $V_{RRM}$ | *max. repetitive reverse blocking voltage* | | $T_{VJ}$ = 25°C | | | 1600 | V |
| $I_R$ | *reverse current* | $V_R$ = 1600 V | $T_{VJ}$ = 25°C | | | 1 | mA |
| | | $V_R$ = 1600 V | $T_{VJ}$ = 150°C | | | 20 | mA |
| $V_F$ | *forward voltage drop* | $I_F$ = 300 A | $T_{VJ}$ = 25°C | | | 1.16 | V |
| | | $I_F$ = 600 A | | | | 1.39 | V |
| | | $I_F$ = 300 A | $T_{VJ}$ = 125°C | | | 1.07 | V |
| | | $I_F$ = 600 A | | | | 1.36 | V |
| $I_{FAV}$ | *average forward current* | $T_C$ = 100°C | $T_{VJ}$ = 150°C | | | 224 | A |
| $I_{F(RMS)}$ | *RMS forward current* | 180° sine d = 0.5 | | | | 350 | A |
| $V_{F0}$ | *threshold voltage* } *for power loss calculation only* | | $T_{VJ}$ = 150°C | | | 0.80 | V |
| $r_F$ | *slope resistance* } | | | | | 0.6 | mΩ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0.13 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.08 | | K/W |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 960 | W |
| $I_{FSM}$ | *max. forward surge current* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 10.5 | kA |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 11.3 | kA |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 8.93 | kA |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 9.64 | kA |
| $I^2t$ | *value for fusing* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 551.3 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 535.0 | kA²s |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 398.3 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 386.6 | kA²s |
| $C_J$ | *junction capacitance* | $V_R$ = 1100 V; f = 1 MHz | $T_{VJ}$ = 25°C | | 230 | | pF |

| Package Y4 | | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Definition** | **Conditions** | | | **min.** | **typ.** | **max.** | **Unit** |
| $I_{RMS}$ | *RMS current* | per terminal | | | | | 300 | A |
| $T_{VJ}$ | *virtual junction temperature* | | | | -40 | | 150 | °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 | 50/60 Hz, RMS; $I_{ISOL}$ ≤ 1 mA | | 3600 | | | V |
| | | t = 1 minute | | | 3000 | | | V |

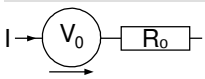



Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | MDD200-16N1 | MDD200-16N1 | Box | 6 | 500212 |

## Equivalent Circuits for Simulation

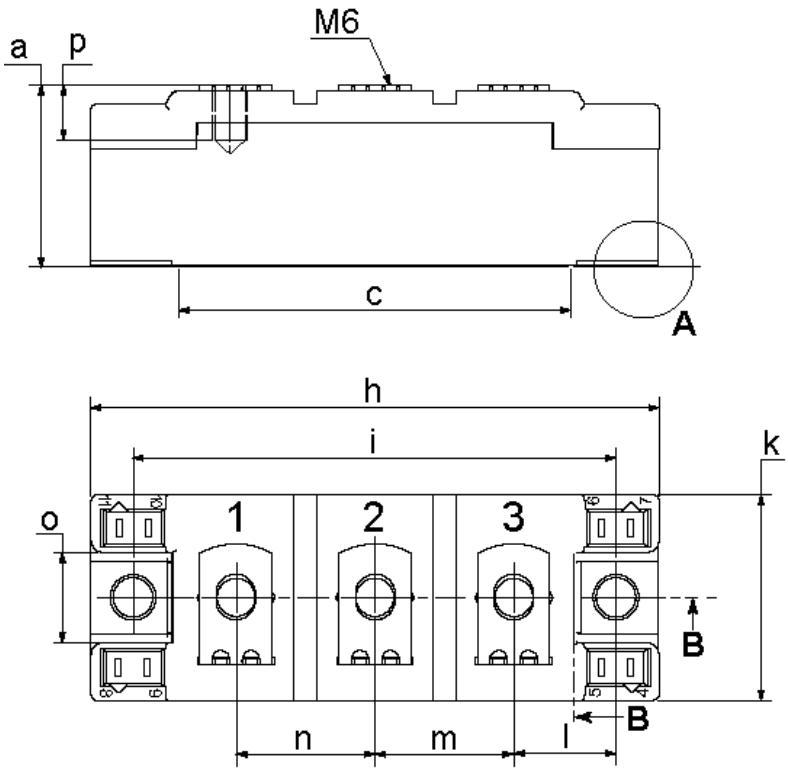
** on die level* $T_{VJ}$ = 150°C



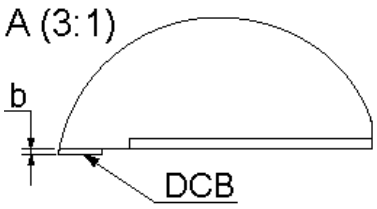

**Rectifier**

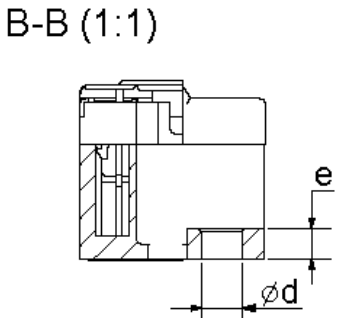
| | | | |
|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 0.8 | V |
| $R_{0\,max}$ | *slope resistance ** | 0.4 | mΩ |

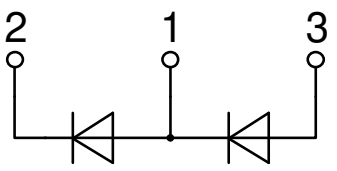
## Outlines Y4




| 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 |
| 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 | |



## Rectifier

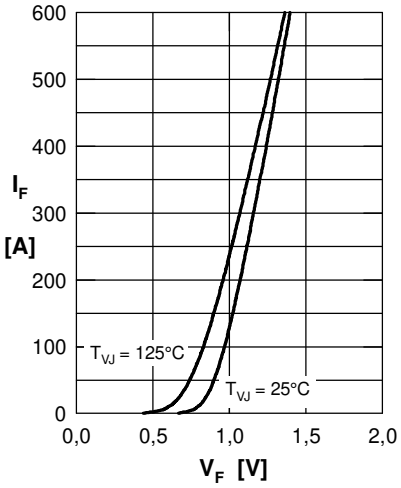



Fig. 1 Forward current versus voltage drop

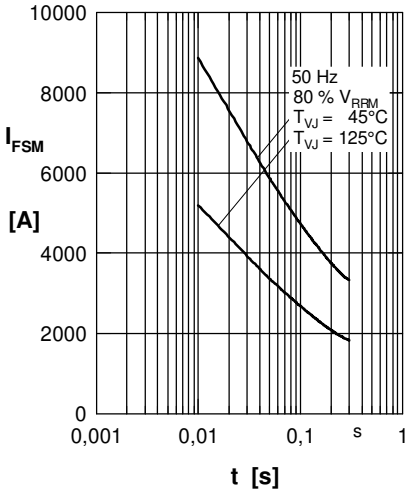



Fig. 2 Surge overload current
$I_{FSM}$: Crest value, t: duration

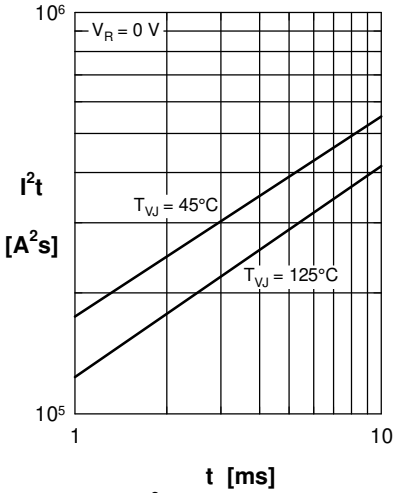



Fig. 3 $I^2t$ versus time (1-10 ms)

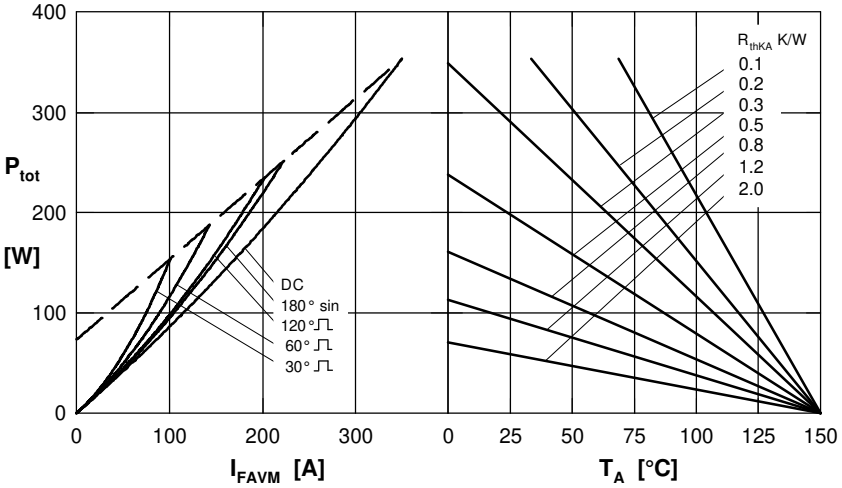



Fig.4 Power dissipation versus forward current and ambient temperature (per diode)

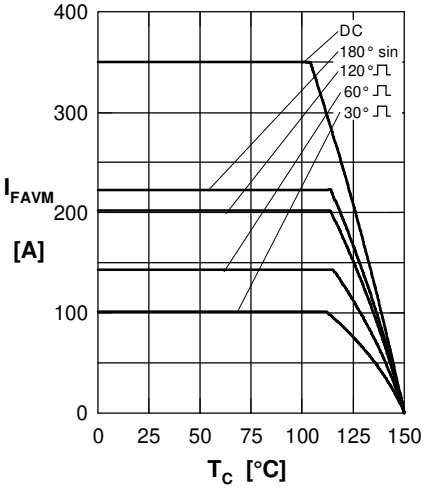



Fig. 5 Maximum forward current at case temperature

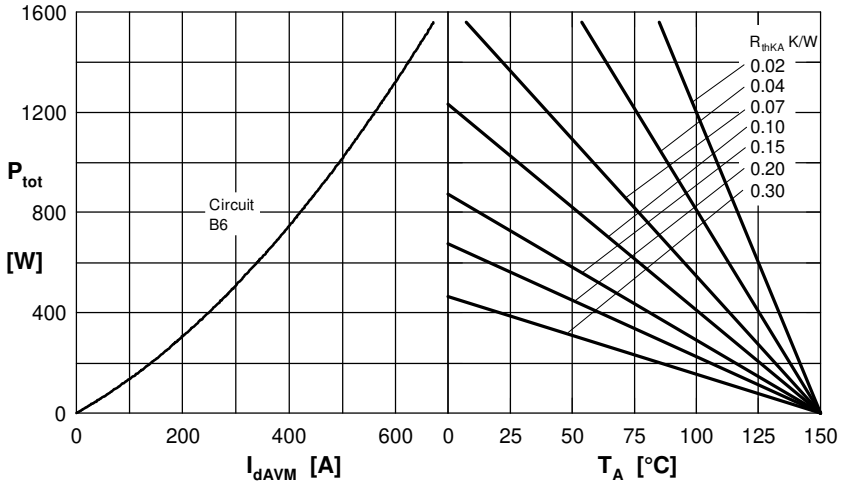



Fig.6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

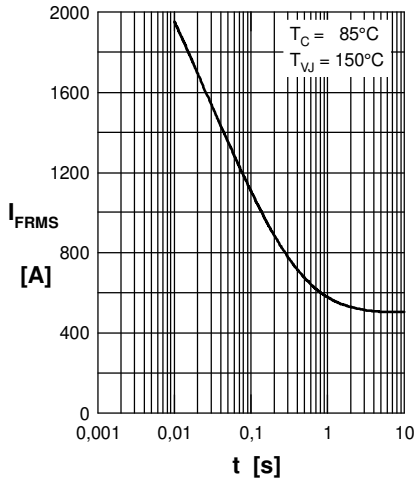



Fig. 7 Rated RMS current versus time (360° conduction)

## Rectifier

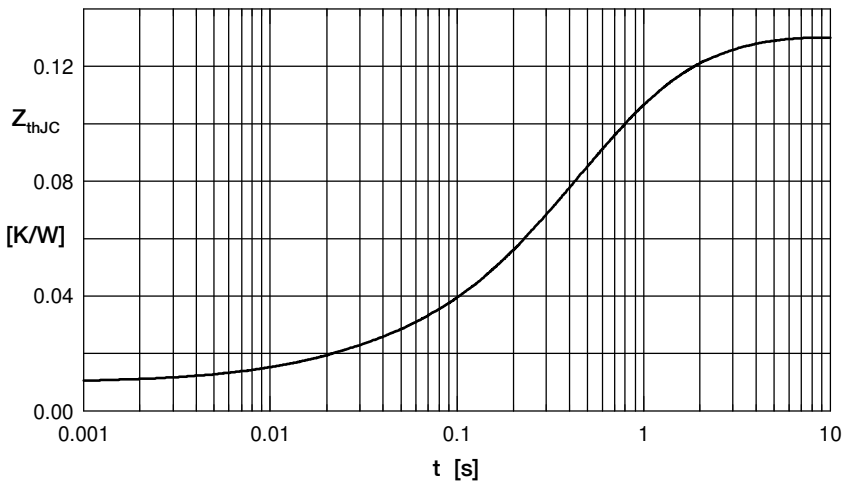



Fig. 8 Transient thermal impedance junction to case

Constants for $Z_{thJC}$ calculation:

| i | $R_{thi}$ [K/W] | $t_i$ [s] |
|---|---|---|
| 1 | 0.0100 | 0.00014 |
| 2 | 0.0065 | 0.019 |
| 3 | 0.0250 | 0.180 |
| 4 | 0.0615 | 0.520 |
| 5 | 0.0270 | 1.600 |