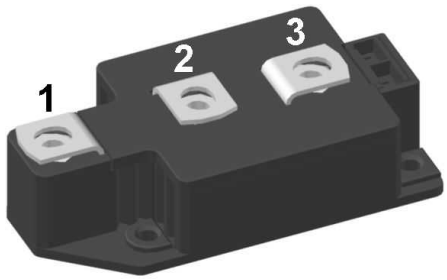
# Standard Rectifier Module

$V_{RRM}$ = 2x 1800 V
$I_{FAV}$ = 300 A
$V_F$ = 1 V

Phase leg

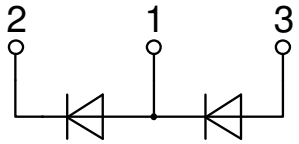
**Part number**

**MDD310-18N1**




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:**

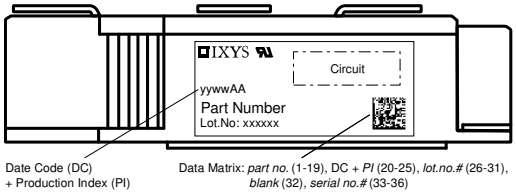
- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

**Package:** Y2

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

| Rectifier | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| **Symbol** | **Definition** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| $V_{RSM}$ | *max. non-repetitive reverse blocking voltage* | | $T_{VJ}$ = 25°C | | | 1900 | V |
| $V_{RRM}$ | *max. repetitive reverse blocking voltage* | | $T_{VJ}$ = 25°C | | | 1800 | V |
| $I_R$ | *reverse current* | $V_R$ = 1800 V | $T_{VJ}$ = 25°C | | | 1 | mA |
| | | $V_R$ = 1800 V | $T_{VJ}$ = 150°C | | | 20 | mA |
| $V_F$ | *forward voltage drop* | $I_F$ = 300 A | $T_{VJ}$ = 25°C | | | 1.13 | V |
| | | $I_F$ = 600 A | | | | 1.33 | V |
| | | $I_F$ = 300 A | $T_{VJ}$ = 125°C | | | 1.00 | V |
| | | $I_F$ = 600 A | | | | 1.29 | V |
| $I_{FAV}$ | *average forward current* | $T_C$ = 100°C | $T_{VJ}$ = 150°C | | | 300 | A |
| $I_{F(RMS)}$ | *RMS forward current* | 180° sine | | | | 480 | A |
| $V_{F0}$ | *threshold voltage* } *for power loss calculation only* | | $T_{VJ}$ = 150°C | | | 0.75 | V |
| $r_F$ | *slope resistance* } | | | | | 0.63 | mΩ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0.13 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.04 | | 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 | | | 11.5 | kA |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 12.4 | kA |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 9.78 | kA |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 10.6 | kA |
| $I^2t$ | *value for fusing* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 661.3 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 641.7 | kA²s |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 477.8 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 463.5 | kA²s |
| $C_J$ | *junction capacitance* | $V_R$ = 400 V; f = 1 MHz | $T_{VJ}$ = 25°C | | 381 | | pF |

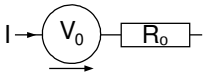
| Package Y2 | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| **Symbol** | **Definition** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| $I_{RMS}$ | *RMS current* | per terminal | | | | 600 | A |
| $T_{VJ}$ | *virtual junction temperature* | | | -40 | | 150 | °C |
| $T_{op}$ | *operation temperature* | | | -40 | | 125 | °C |
| $T_{stg}$ | *storage temperature* | | | -40 | | 125 | °C |
| **Weight** | | | | | 254 | | g |
| $M_D$ | *mounting torque* | | | 2.5 | | 5 | Nm |
| $M_T$ | *terminal torque* | | | 12 | | 15 | Nm |
| $d_{Spp/App}$ | *creepage distance on surface \| striking distance through air* | | *terminal to terminal* | 13.0 | | | mm |
| $d_{Spb/Apb}$ | | | *terminal to backside* | 13.0 | | | mm |
| $V_{ISOL}$ | *isolation voltage* | t = 1 second | 50/60 Hz, RMS; $I_{ISOL}$ ≤ 1 mA | 3600 | | | V |
| | | t = 1 minute | | 3000 | | | V |




| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | MDD310-18N1 | MDD310-18N1 | Box | 2 | 463973 |

## Equivalent Circuits for Simulation

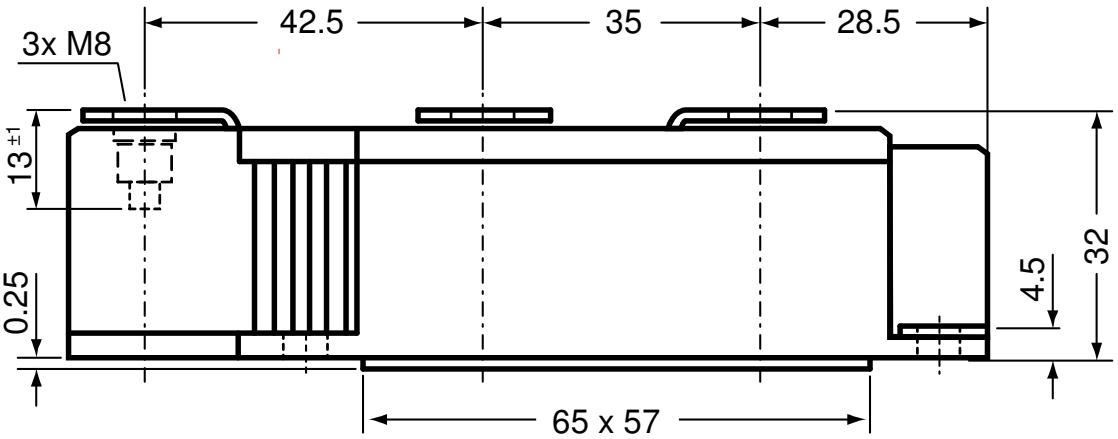
** on die level* $T_{VJ}$ = 150 °C

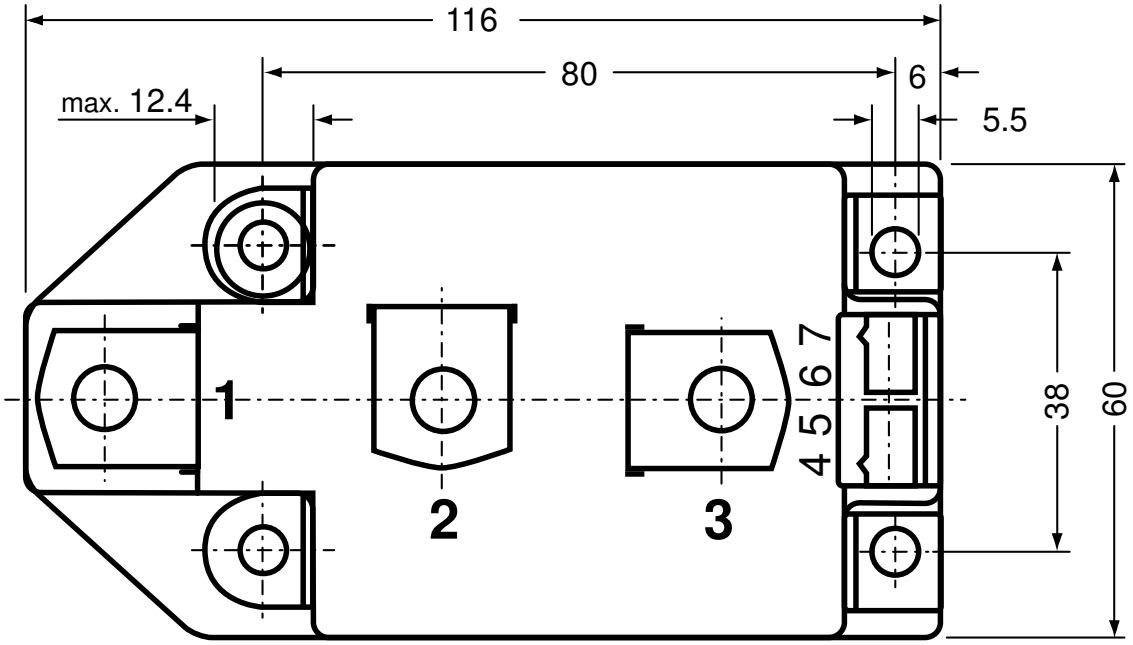


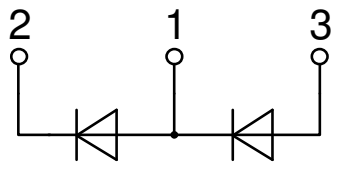

**Rectifier**

| | | | |
|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 0.75 | V |
| $R_{0\,max}$ | *slope resistance ** | 0.34 | mΩ |

## Outlines Y2



## Rectifier

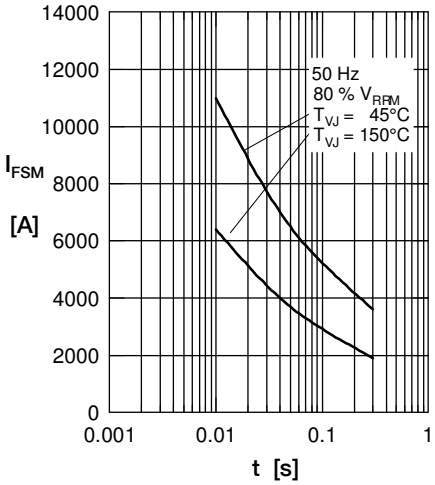



Fig. 1 Surge overload current
$I_{FSM}$: Crest value, t: duration

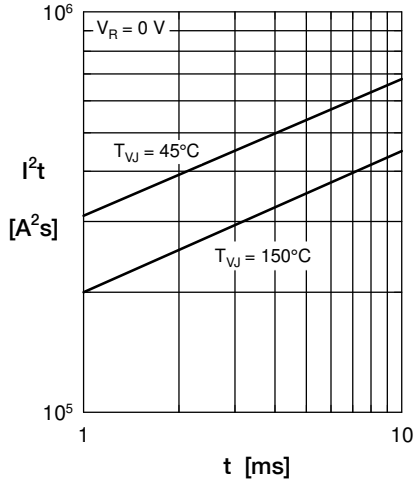



Fig. 2 $I^2t$ versus time (1-10 ms)

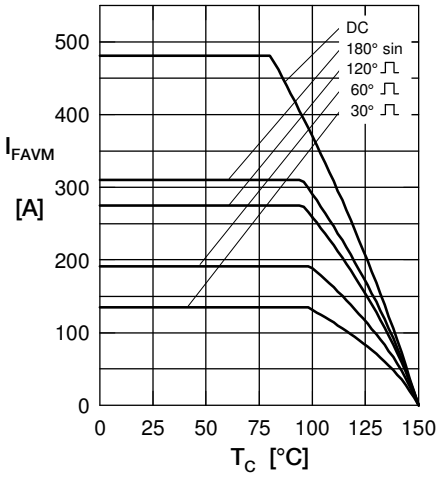



Fig. 3 Maximum forward current at case temperature

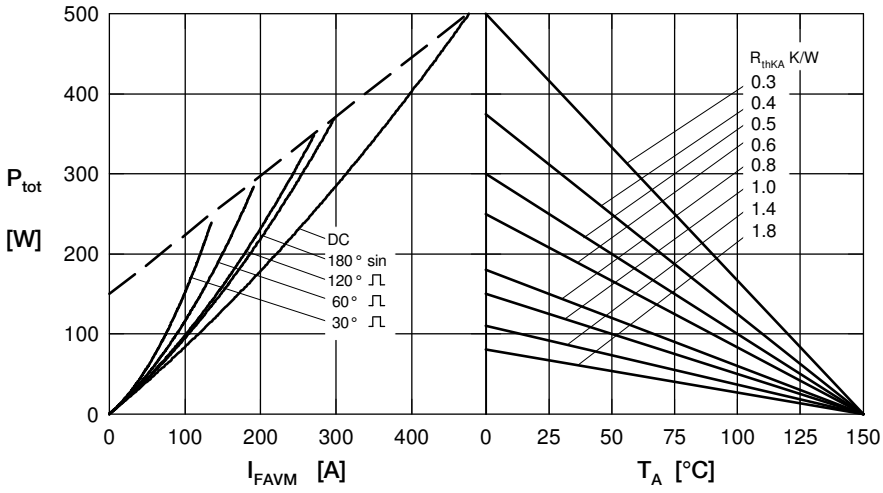



Fig. 4 Power dissipation versus forward current and ambient temperature (per diode)

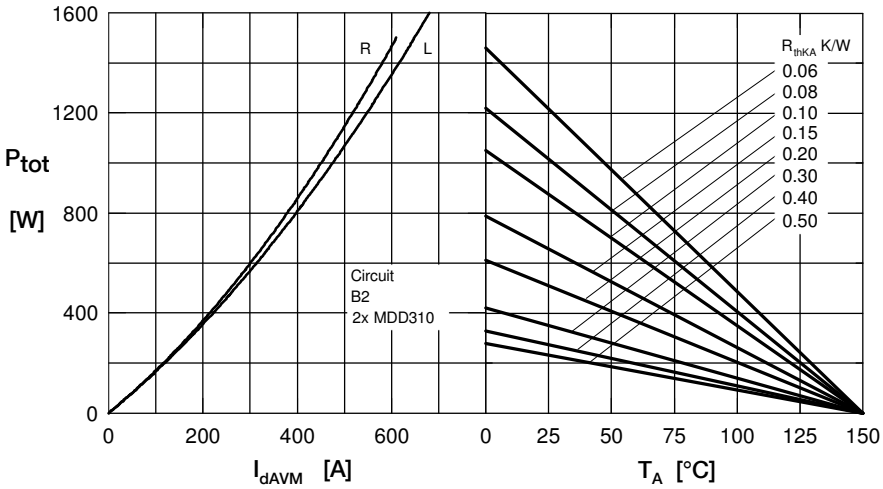



Fig. 5 Single phase rectifier bridge: Power dissipation vs. direct output current and ambient temperature *R = resistive load, L = inductive load*

## Rectifier

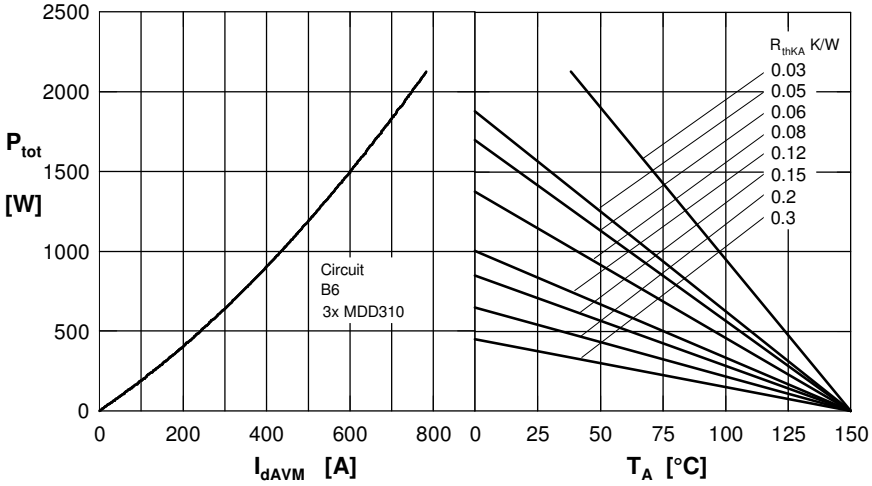
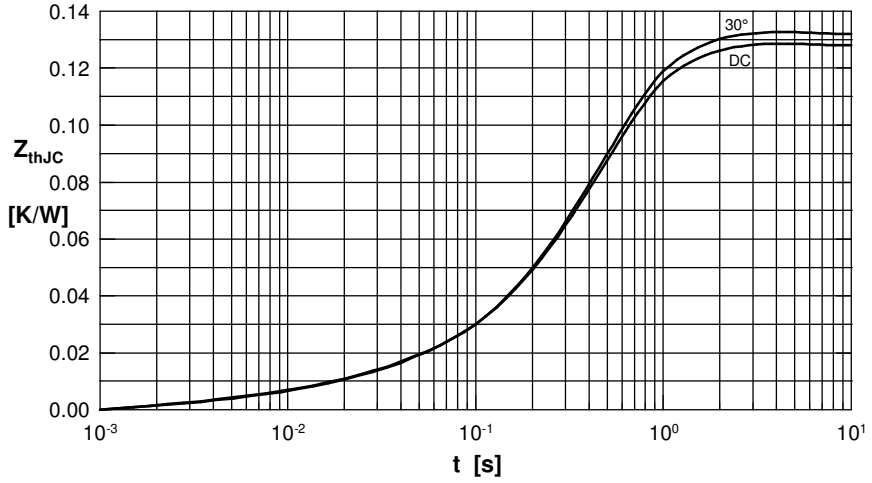



Fig.6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature



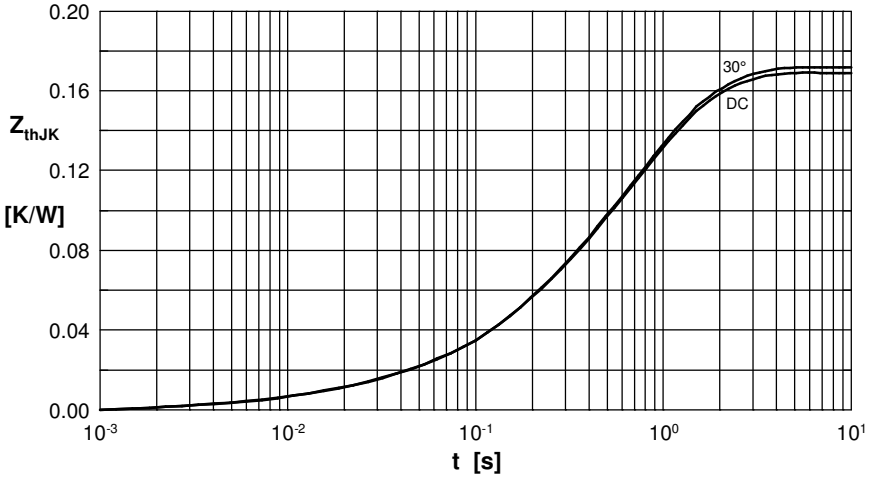

$R_{thJC}$ for various conduction angles d:

| d | $R_{thJC}$ [K/W] |
|---|---|
| DC | 0.129 |
| 180° | 0.131 |
| 120° | 0.132 |
| 60° | 0.132 |
| 30° | 0.133 |

Constants for $Z_{thJC}$ calculation:

| i | $R_{thi}$ [K/W] | $t_i$ [s] |
|---|---|---|
| 1 | 0.0035 | 0.0099 |
| 2 | 0.0165 | 0.1680 |
| 3 | 0.1091 | 0.4560 |

Fig. 7 Transient thermal impedance junction to case (per diode)




$R_{thJK}$ for various conduction angles d:

| d | $R_{thJK}$ [K/W] |
|---|---|
| DC | 0.169 |
| 180° | 0.171 |
| 120° | 0.172 |
| 60° | 0.172 |
| 30° | 0.173 |

Constants for $Z_{thJK}$ calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|---|---|
| 1 | 0.0035 | 0.0099 |
| 2 | 0.0165 | 0.1680 |
| 3 | 0.1091 | 0.4560 |
| 4 | 0.0400 | 1.3600 |

Fig. 8 Transient thermal impedance junction to heatsink (per diode)