

Standard Rectifier Module

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

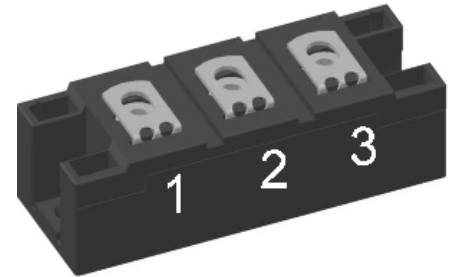
$$I_{FAV} = 190 \text{ A}$$

$$V_F = 0.96 \text{ V}$$


Phase leg

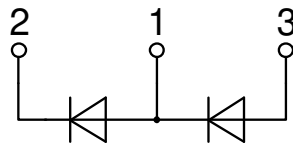
Part number

MDD172-16N1



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
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

Disclaimer Notice

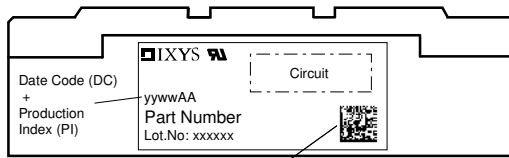
Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.



| Rectifier | | | | Ratings | | | |
|--------------|--|--|------------------------------|---------|-------|-------------------|---|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit | |
| V_{RSM} | max. non-repetitive reverse blocking voltage | | | | 1700 | V | |
| V_{RRM} | max. repetitive reverse blocking voltage | | | | 1600 | V | |
| I_R | reverse current | $V_R = 1600\text{ V}$ | | | 1 | mA | |
| | | $V_R = 1600\text{ V}$ | | | 20 | mA | |
| V_F | forward voltage drop | $I_F = 150\text{ A}$ | | | 1.07 | V | |
| | | $I_F = 300\text{ A}$ | | | 1.22 | V | |
| | | $I_F = 150\text{ A}$ | $T_{VJ} = 125^\circ\text{C}$ | | | 0.96 | V |
| | | $I_F = 300\text{ A}$ | | | | 1.16 | V |
| I_{FAV} | average forward current | $T_C = 100^\circ\text{C}$ | | | 190 | A | |
| $I_{F(RMS)}$ | RMS forward current | 180° sine | | | 300 | A | |
| V_{F0} | threshold voltage | } for power loss calculation only | | | 0.80 | V | |
| r_F | slope resistance | | | | 0.8 | mΩ | |
| R_{thJC} | thermal resistance junction to case | | | | 0.21 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | 0.08 | | K/W | |
| P_{tot} | total power dissipation | | $T_C = 25^\circ\text{C}$ | | 600 | W | |
| I_{FSM} | max. forward surge current | t = 10 ms; (50 Hz), sine | $T_{VJ} = 45^\circ\text{C}$ | | 6.60 | kA | |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0\text{ V}$ | | 7.13 | kA | |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ} = 150^\circ\text{C}$ | | 5.61 | kA | |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0\text{ V}$ | | 6.06 | kA | |
| I^2t | value for fusing | t = 10 ms; (50 Hz), sine | $T_{VJ} = 45^\circ\text{C}$ | | 217.8 | kA ² s | |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0\text{ V}$ | | 211.5 | kA ² s | |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ} = 150^\circ\text{C}$ | | 157.4 | kA ² s | |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0\text{ V}$ | | 152.8 | kA ² s | |
| C_J | junction capacitance | $V_R = 400\text{ V}; f = 1\text{ MHz}$ | $T_{VJ} = 25^\circ\text{C}$ | | 238 | 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 | | | 3600 | V | |
| | | t = 1 minute | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | | 3000 | V | |



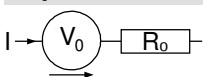
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MDD172-16N1 | MDD172-16N1 | Box | 6 | 429724 |

Equivalent Circuits for Simulation

* on die level

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

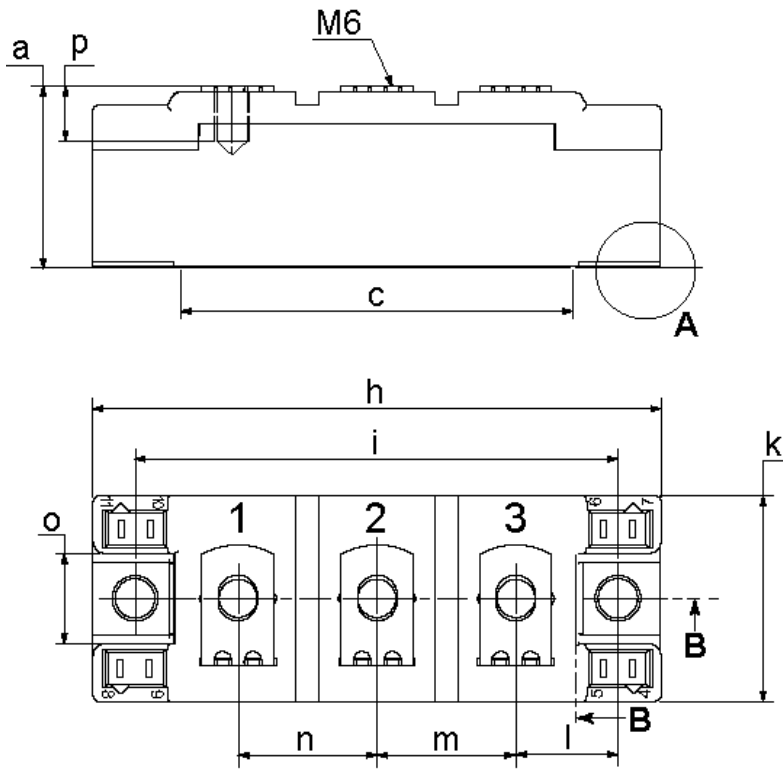


Rectifier

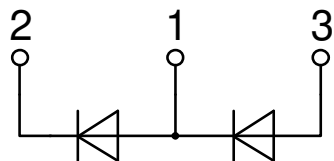
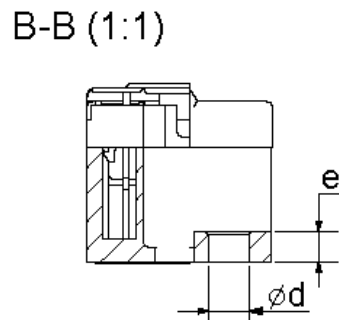
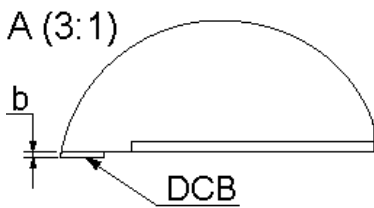
| | | | |
|--------------|--------------------|-----|----|
| $V_{0\ max}$ | threshold voltage | 0.8 | V |
| $R_{0\ max}$ | slope resistance * | 0.4 | mΩ |



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

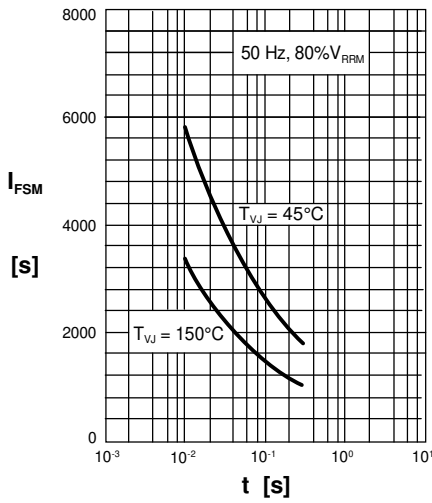


Fig. 1 Surge overload current
 I_{FSM} : Crest value, t : duration

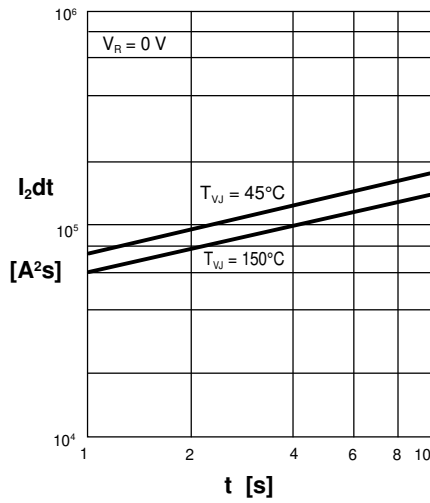


Fig. 2 I^2dt versus time (1-10 ms)

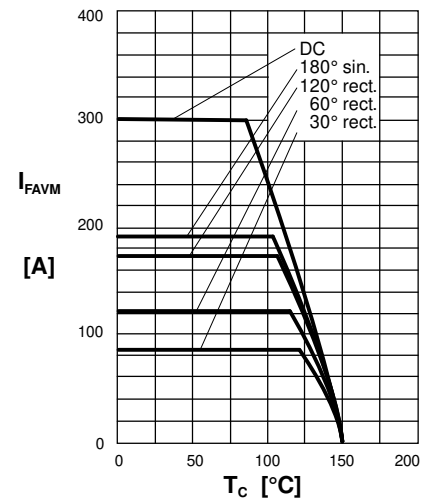


Fig. 2a Maximum forward current at case temperature

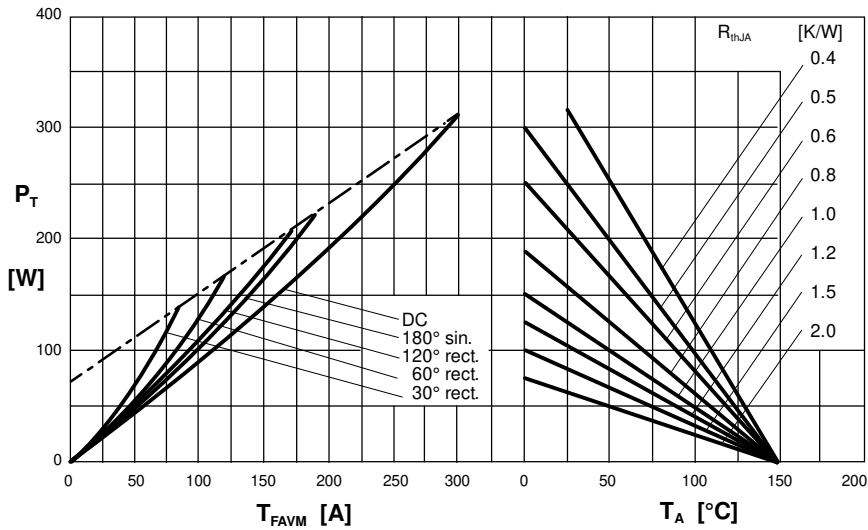


Fig. 3 Power dissipation vs. forward current and ambient temperature (per diode)

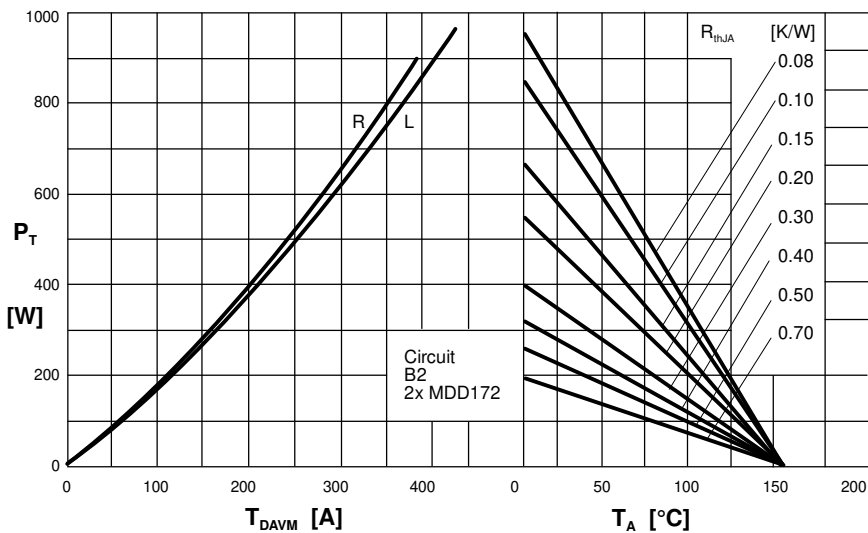


Fig. 4 Single phase rectifier bridge: Power dissipation vs. direct output current and ambient



Rectifier

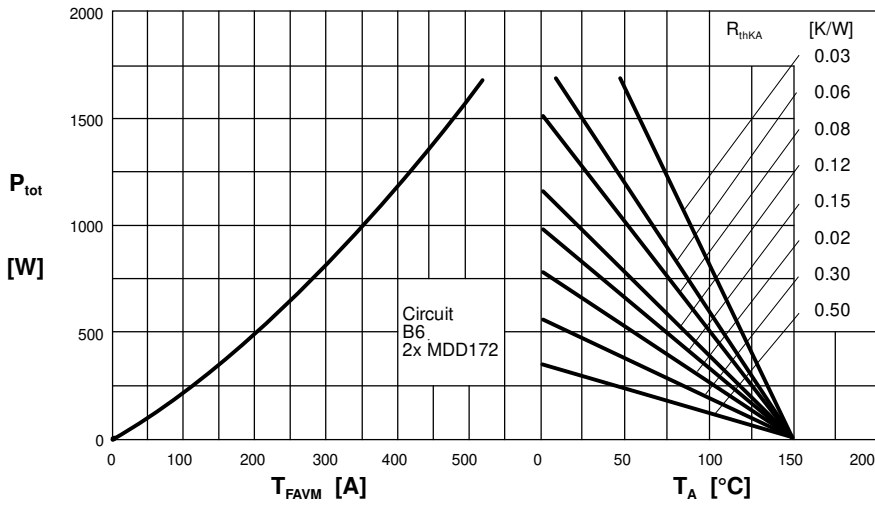


Fig. 5 Three phase rectifier bridge: Power dissipation vs. direct output current and ambient temperature

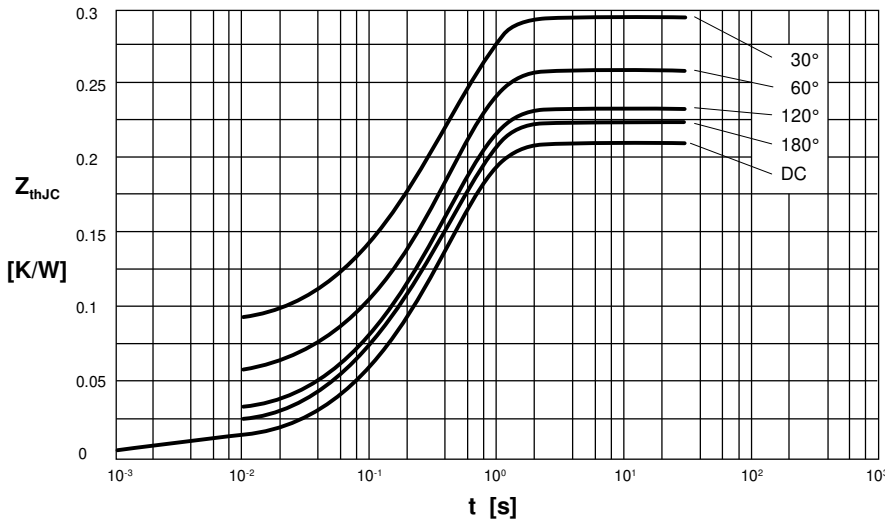


Fig. 6 Transient thermal impedance junction to case (per diode)

R_{thJC} for various conduction angles d :

| d | R_{thJC} [K/W] |
|------|------------------|
| DC | 0.210 |
| 180° | 0.223 |
| 120° | 0.233 |
| 60° | 0.260 |
| 30° | 0.295 |

Constants for Z_{thJC} calculation:

| i | R_{thi} [K/W] | t_i [s] |
|-----|-----------------|-----------|
| 1 | 0.0087 | 0.001 |
| 2 | 0.0163 | 0.065 |
| 3 | 0.1850 | 0.400 |

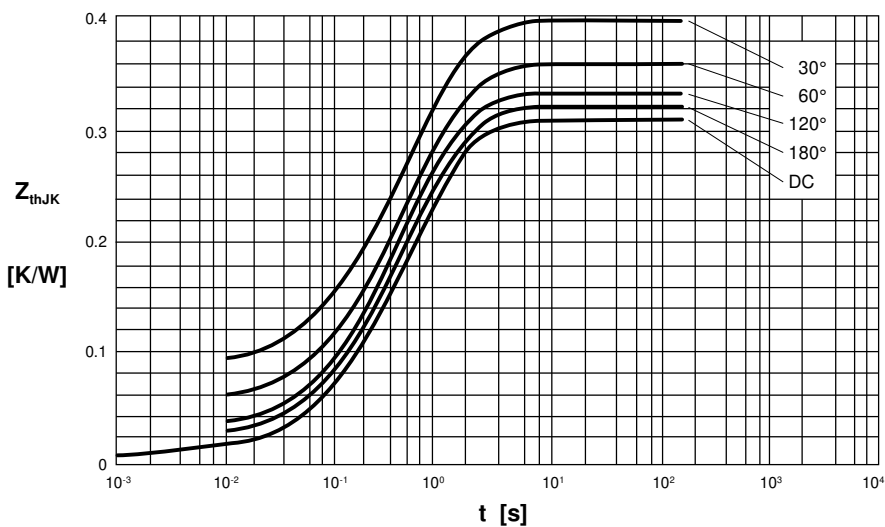


Fig. 7 Transient thermal impedance junction to heatsink (per diode)

R_{thJK} for various conduction angles d :

| d | R_{thJK} [K/W] |
|------|------------------|
| DC | 0.310 |
| 180° | 0.323 |
| 120° | 0.333 |
| 60° | 0.360 |
| 30° | 0.395 |

Constants for Z_{thJK} calculation:

| i | R_{thi} [K/W] | t_i [s] |
|-----|-----------------|-----------|
| 1 | 0.0087 | 0.001 |
| 2 | 0.0163 | 0.065 |
| 3 | 0.1850 | 0.400 |
| 4 | 0.1000 | 1.290 |