

Standard Rectifier Module

$$V_{RRM} = 2 \times 1200 \text{ V}$$

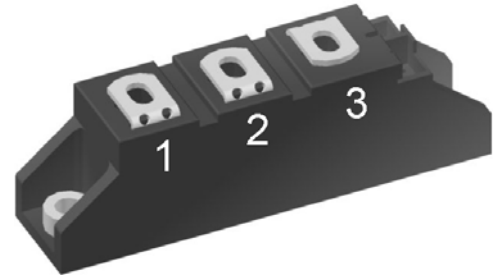
$$I_{FAV} = 120 \text{ A}$$

$$V_F = 1.13 \text{ V}$$


Phase leg

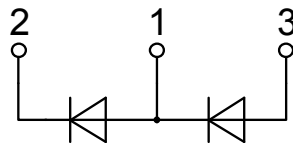
Part number

MDD95-12N1B



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:

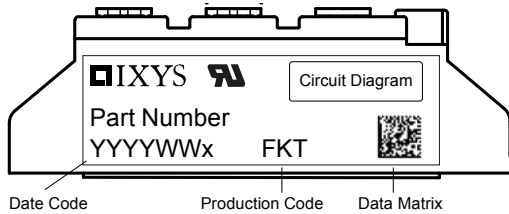
- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

Package: TO-240AA

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- 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 | $T_{VJ} = 25^{\circ}C$ | | | 1300 | V | |
| V_{RRM} | max. repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}C$ | | | 1200 | V | |
| I_R | reverse current | $V_R = 1200 V$ | $T_{VJ} = 25^{\circ}C$ | | 200 | μA | |
| | | $V_R = 1200 V$ | $T_{VJ} = 150^{\circ}C$ | | 15 | mA | |
| V_F | forward voltage drop | $I_F = 150 A$ | $T_{VJ} = 25^{\circ}C$ | | 1.20 | V | |
| | | $I_F = 300 A$ | | | 1.43 | V | |
| | | $I_F = 150 A$ | $T_{VJ} = 125^{\circ}C$ | | 1.13 | V | |
| | | $I_F = 300 A$ | | | 1.46 | V | |
| I_{FAV} | average forward current | $T_C = 100^{\circ}C$ | $T_{VJ} = 150^{\circ}C$ | | 120 | A | |
| $I_{F(RMS)}$ | RMS forward current | 180° sine | | | 180 | A | |
| V_{FO} | threshold voltage | } for power loss calculation only | $T_{VJ} = 150^{\circ}C$ | | 0.75 | V | |
| r_F | slope resistance | | | | 1.95 | m Ω | |
| R_{thJC} | thermal resistance junction to case | | | | 0.26 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | 0.20 | | K/W | |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}C$ | | 481 | W | |
| I_{FSM} | max. forward surge current | $t = 10 \text{ ms; (50 Hz), sine}$ | $T_{VJ} = 45^{\circ}C$ | | 2.80 | kA | |
| | | $t = 8,3 \text{ ms; (60 Hz), sine}$ | $V_R = 0 V$ | | 3.03 | kA | |
| | | $t = 10 \text{ ms; (50 Hz), sine}$ | $T_{VJ} = 150^{\circ}C$ | | 2.38 | kA | |
| | | $t = 8,3 \text{ ms; (60 Hz), sine}$ | $V_R = 0 V$ | | 2.57 | kA | |
| I^2t | value for fusing | $t = 10 \text{ ms; (50 Hz), sine}$ | $T_{VJ} = 45^{\circ}C$ | | 39.2 | kA ² s | |
| | | $t = 8,3 \text{ ms; (60 Hz), sine}$ | $V_R = 0 V$ | | 38.1 | kA ² s | |
| | | $t = 10 \text{ ms; (50 Hz), sine}$ | $T_{VJ} = 150^{\circ}C$ | | 28.3 | kA ² s | |
| | | $t = 8,3 \text{ ms; (60 Hz), sine}$ | $V_R = 0 V$ | | 27.5 | kA ² s | |
| C_J | junction capacitance | $V_R = 400 V; f = 1 \text{ MHz}$ | $T_{VJ} = 25^{\circ}C$ | | 116 | pF | |

| Package TO-240AA | | | | Ratings | | |
|------------------|--|----------------------|------|---------|------|------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal | | | 200 | A |
| T_{stg} | storage temperature | | -40 | | 125 | °C |
| T_{VJ} | virtual junction temperature | | -40 | | 150 | °C |
| Weight | | | | 90 | | g |
| M_D | mounting torque | | 2.5 | | 4 | Nm |
| M_T | terminal torque | | 2.5 | | 4 | Nm |
| $d_{Spp/App}$ | creepage distance on surface striking distance through air | terminal to terminal | 13.0 | 9.7 | | mm |
| $d_{Spb/Appb}$ | | terminal to backside | 16.0 | 16.0 | | mm |
| V_{ISOL} | isolation voltage | t = 1 second | 3600 | | | V |
| | | t = 1 minute | 3000 | | | V |

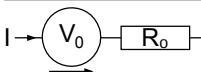


| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-------------|--------------------|---------------|----------|----------|
| Standard | MDD95-12N1B | MDD95-12N1B | Box | 6 | 453145 |

Equivalent Circuits for Simulation

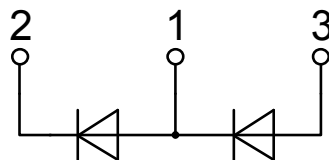
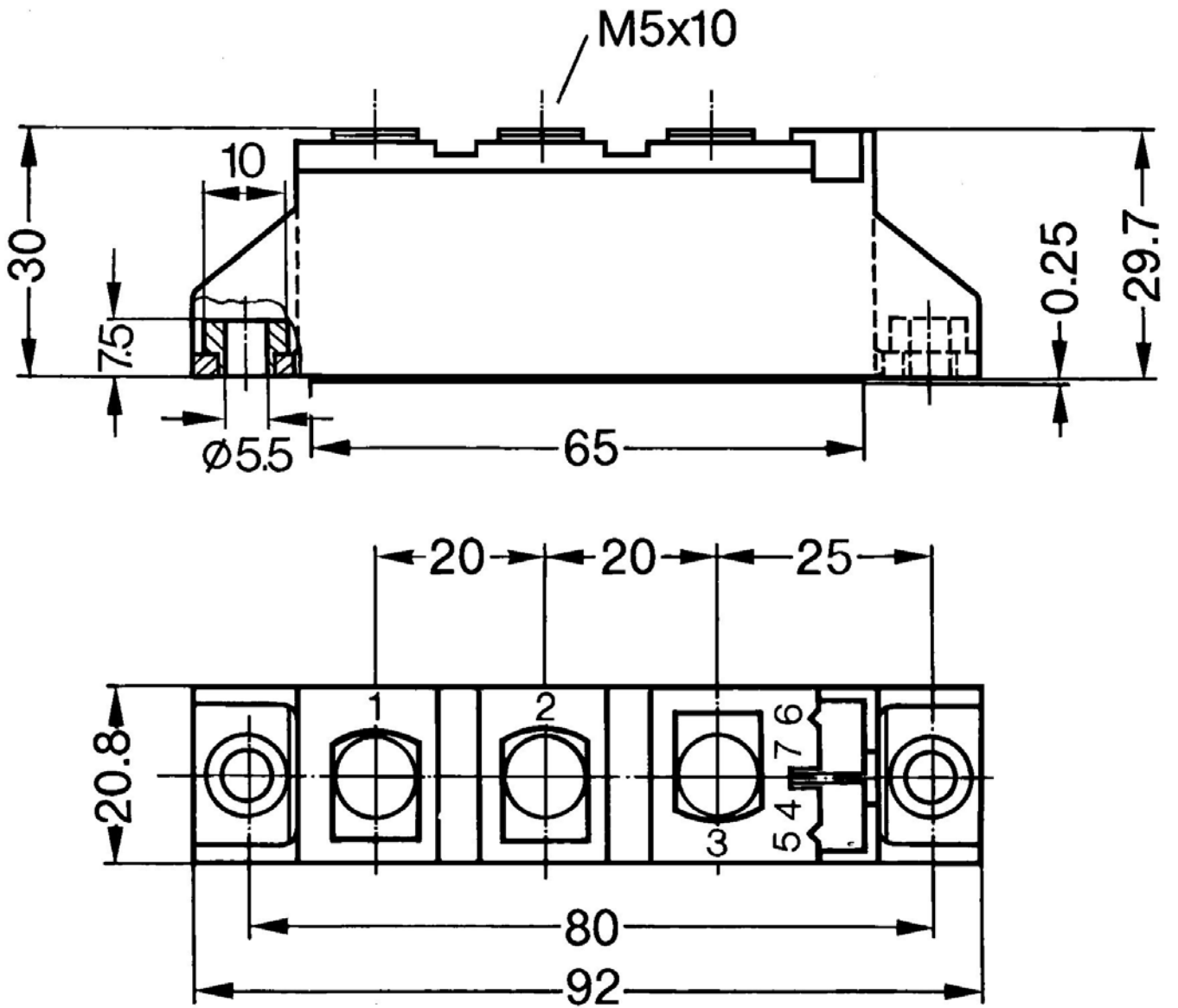
* on die level

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



Rectifier

| | | | |
|--------------------|--------------------|------|----|
| $V_{0\text{ max}}$ | threshold voltage | 0.75 | V |
| $R_{0\text{ max}}$ | slope resistance * | 0.76 | mΩ |



Rectifier

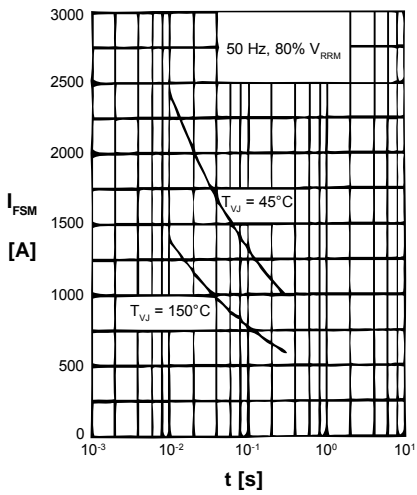


Fig. 1 Surge overload current
 I_{TSM} , I_{FSM} : Crest value, t : duration

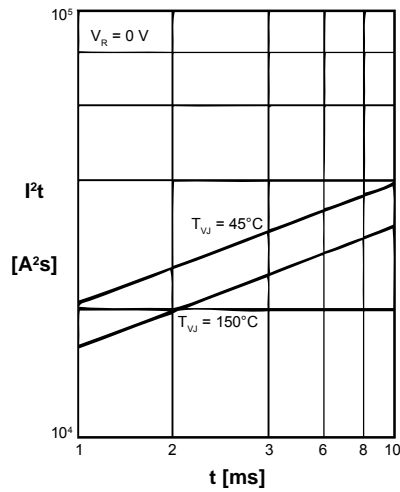


Fig. 2 I^2t versus time (1-10 ms)

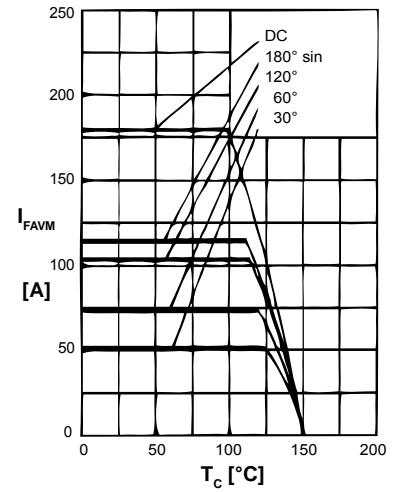


Fig. 3 Maximum forward current at case temperature

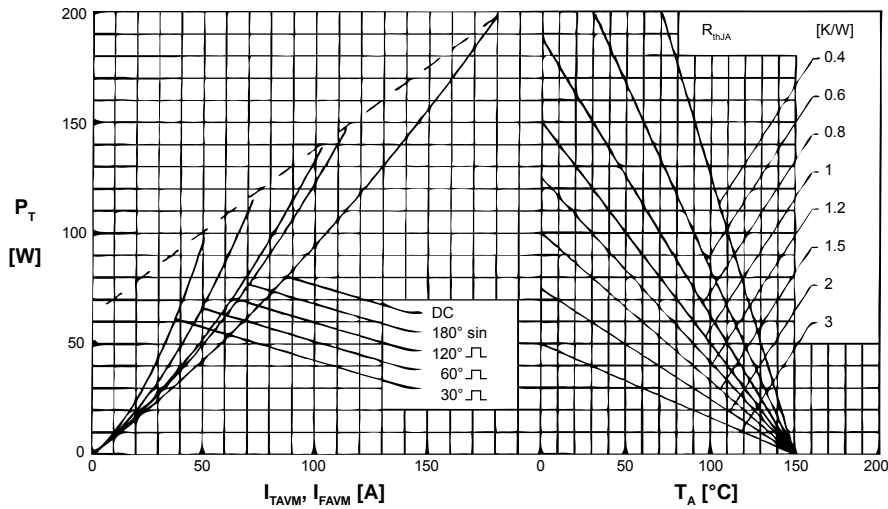


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)

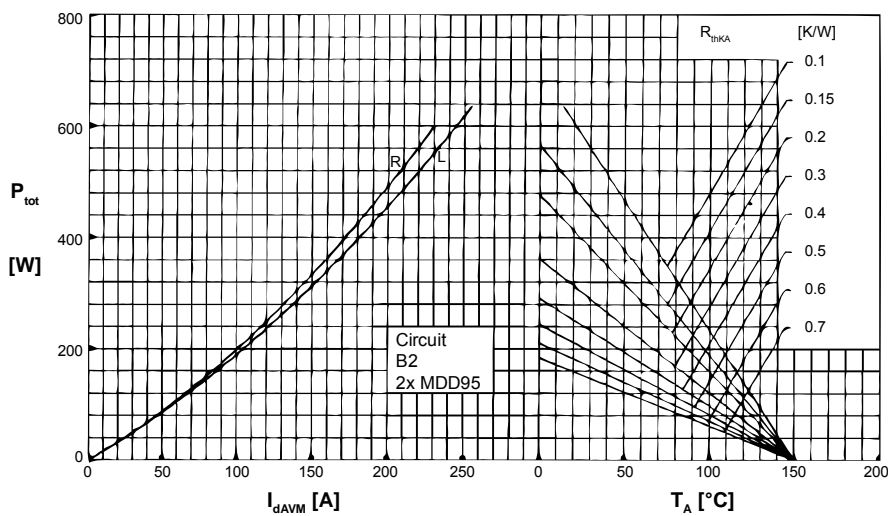


Fig. 6 Single phase rectifier bridge: Power dissipation versus direct output current and ambient temperature; R = resistive load, L = inductive load

Rectifier

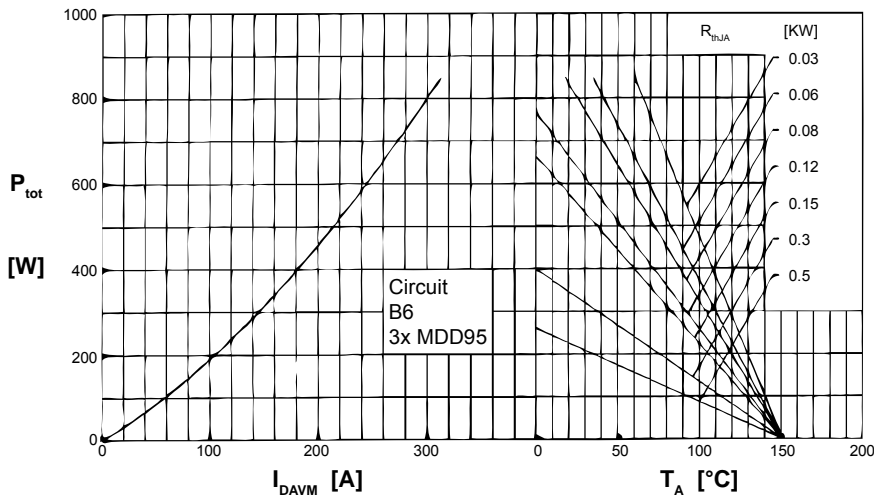


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

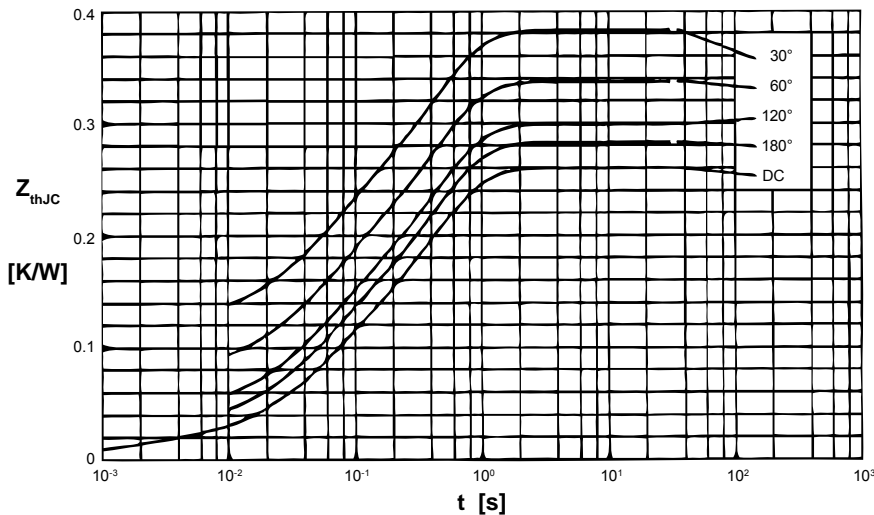


Fig. 7 Transient thermal impedance junction to case (per diode)

R_{thJC} for various conduction angles d:

| d | R_{thJC} [K/W] |
|------|------------------|
| DC | 0.26 |
| 180° | 0.28 |
| 120° | 0.30 |
| 60° | 0.34 |
| 30° | 0.38 |

Constants for Z_{thJC} calculation:

| i | R_{thi} [K/W] | t_i [s] |
|---|-----------------|-----------|
| 1 | 0.013 | 0.0012 |
| 2 | 0.072 | 0.0470 |
| 3 | 0.175 | 0.3940 |

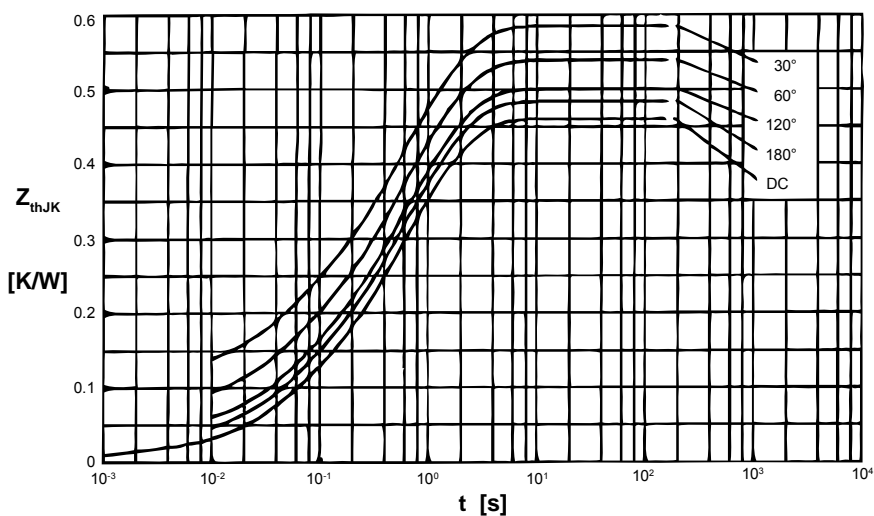


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

R_{thJK} for various conduction angles d:

| d | R_{thJK} [K/W] |
|------|------------------|
| DC | 0.46 |
| 180° | 0.48 |
| 120° | 0.50 |
| 60° | 0.54 |
| 30° | 0.58 |

Constants for Z_{thJK} calculation:

| i | R_{thi} [K/W] | t_i [s] |
|---|-----------------|-----------|
| 1 | 0.013 | 0.0012 |
| 2 | 0.072 | 0.0470 |
| 3 | 0.175 | 0.3940 |
| 4 | 0.200 | 1.3200 |