

# 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: 4800 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- 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 |  |                              |         | 1300 | V                 |   |
| $V_{RRM}$    | max. repetitive reverse blocking voltage     |  |                              |         | 1200 | V                 |   |
| $I_R$        | reverse current                              | $V_R = 1200\text{ V}$                  |                              |         | 200  | $\mu\text{A}$     |   |
|              |  | $V_R = 1200\text{ V}$                  |                              |         | 15   | mA                |   |
| $V_F$        | forward voltage drop                         | $I_F = 150\text{ A}$                   |                              |         | 1.20 | V                 |   |
|              |  | $I_F = 300\text{ A}$                   |                              |         | 1.43 | V                 |   |
|              |  | $I_F = 150\text{ A}$                   | $T_{VJ} = 125^\circ\text{C}$ |         |      | 1.13              | V |
|              |  | $I_F = 300\text{ A}$                   |                              |         |      | 1.46              | V |
| $I_{FAV}$    | average forward current                      | $T_C = 100^\circ\text{C}$              |                              |         | 120  | A                 |   |
| $I_{F(RMS)}$ | RMS forward current                          | 180° sine                              |                              |         | 180  | A                 |   |
| $V_{F0}$     | threshold voltage                            | } for power loss calculation only      |                              |         | 0.75 | V                 |   |
| $r_F$        | slope resistance                             |  |                              |         | 1.95 | m $\Omega$        |   |
| $R_{thJC}$   | thermal resistance junction to case          |  |                              |         | 0.26 | K/W               |   |
| $R_{thCH}$   | thermal resistance case to heatsink          |  |                              | 0.2     |      | K/W               |   |
| $P_{tot}$    | total power dissipation                      |  | $T_C = 25^\circ\text{C}$     |         | 481  | W                 |   |
| $I_{FSM}$    | max. forward surge current                   | t = 10 ms; (50 Hz), sine               | $T_{VJ} = 45^\circ\text{C}$  |         | 2.80 | kA                |   |
|              |  | t = 8,3 ms; (60 Hz), sine              | $V_R = 0\text{ V}$           |         | 3.03 | kA                |   |
|              |  | t = 10 ms; (50 Hz), sine               | $T_{VJ} = 150^\circ\text{C}$ |         | 2.38 | kA                |   |
|              |  | t = 8,3 ms; (60 Hz), sine              | $V_R = 0\text{ V}$           |         | 2.57 | kA                |   |
| $I^2t$       | value for fusing                             | t = 10 ms; (50 Hz), sine               | $T_{VJ} = 45^\circ\text{C}$  |         | 39.2 | kA <sup>2</sup> s |   |
|              |  | t = 8,3 ms; (60 Hz), sine              | $V_R = 0\text{ V}$           |         | 38.1 | kA <sup>2</sup> s |   |
|              |  | t = 10 ms; (50 Hz), sine               | $T_{VJ} = 150^\circ\text{C}$ |         | 28.3 | kA <sup>2</sup> s |   |
|              |  | t = 8,3 ms; (60 Hz), sine              | $V_R = 0\text{ V}$           |         | 27.5 | kA <sup>2</sup> s |   |
| $C_J$        | junction capacitance                         | $V_R = 400\text{ V}; f = 1\text{ MHz}$ | $T_{VJ} = 25^\circ\text{C}$  |         | 116  | pF                |   |



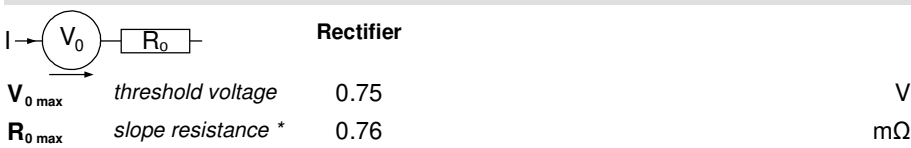
| Package TO-240AA |  |                      |                                     | Ratings |      |      |  |
|------------------|--|----------------------|-------------------------------------|---------|------|------|--|
| Symbol           | Definition   | Conditions           | min.                                | typ.    | max. | Unit |  |
| $I_{RMS}$        | RMS current  | per terminal         |                                     |         | 200  | 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>    |  |                      |                                     |         | 76   | 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   |  |
| $d_{Spb/Apb}$    |  | terminal to backside | 16.0                                | 16.0    |      | mm   |  |
| $V_{ISOL}$       | isolation voltage  | t = 1 second         |                                     |         | 4800 | V    |  |
|                  |  | t = 1 minute         | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA |         | 4000 | V    |  |



| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MDD95-12N1B     | MDD95-12N1B        | Box           | 36       | 453145   |

| Similar Part | Package  | Voltage class |
|--------------|----------|---------------|
| MDD95-08N1B  | TO-240AA | 800           |
| MDD95-14N1B  | TO-240AA | 1400          |
| MDD95-16N1B  | TO-240AA | 1600          |
| MDD95-18N1B  | TO-240AA | 1800          |

**Equivalent Circuits for Simulation** \* on die level  $T_{VJ} = 150^{\circ}\text{C}$





Outlines TO-240AA



General tolerance: DIN ISO 2768 class „c“



**Rectifier**



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

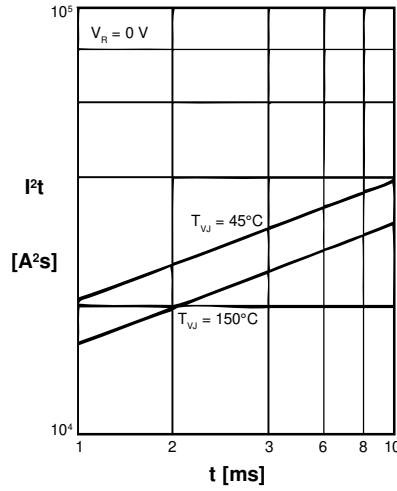


Fig. 2  $I^2t$  versus time (1-10 ms)



Fig. 3 Maximum forward current at case temperature

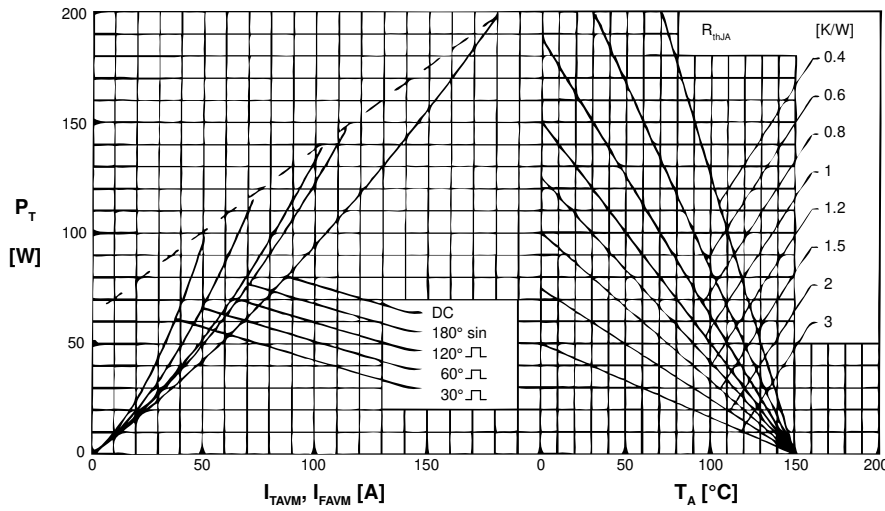


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)



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



**Rectifier**

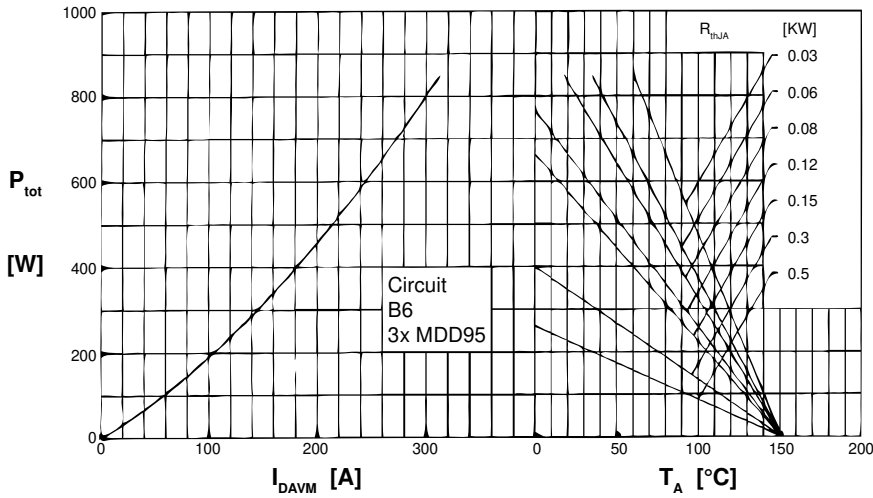


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

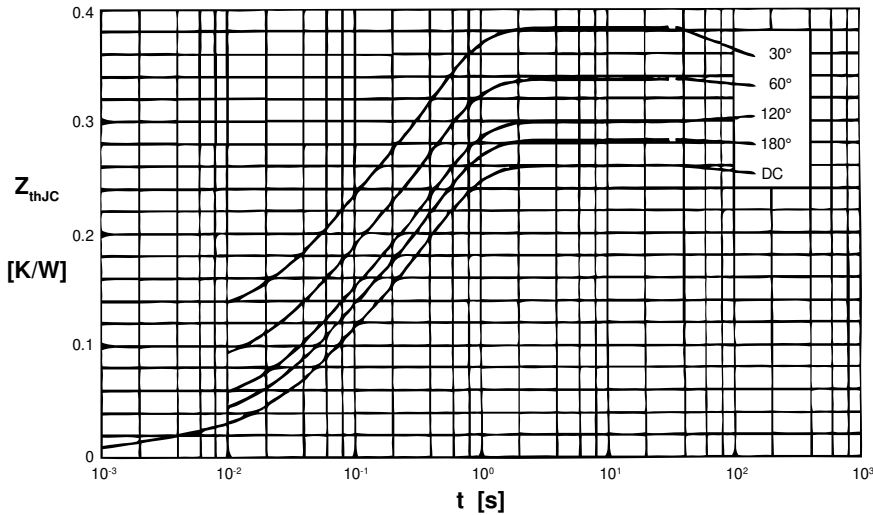


Fig. 7 Transient thermal impedance junction to case (per diode)

$R_{thJC}$  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    |

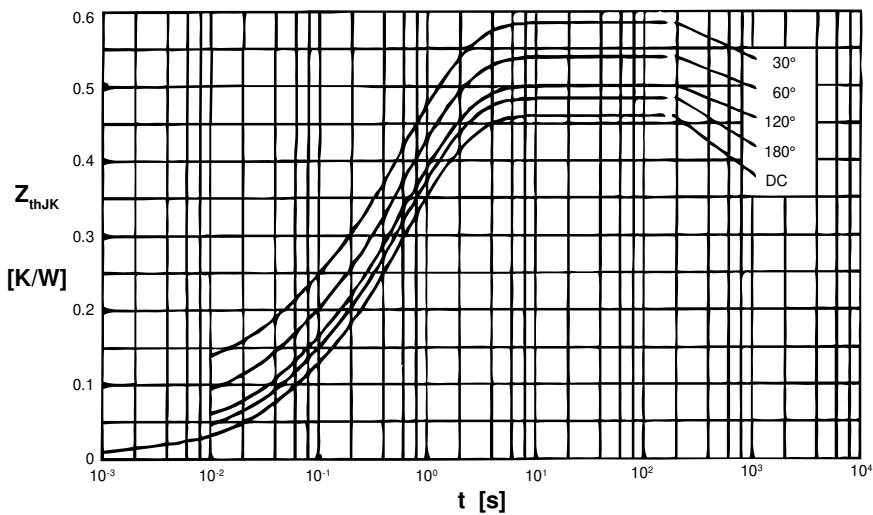


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

$R_{thJK}$  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    |