

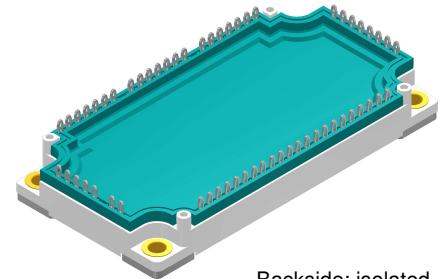
# High Voltage Standard Rectifier Module

| 3~<br>Rectifier            |
|----------------------------|
| $V_{RRM} = 2200 \text{ V}$ |
| $I_{DAV} = 660 \text{ A}$  |
| $I_{FSM} = 5000 \text{ A}$ |

3~ Rectifier Bridge + NTC

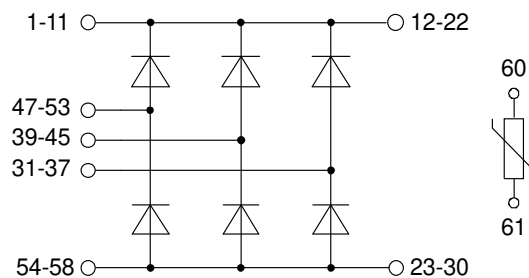
Part number

**MDNA660U2200PTEH**



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 three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

## Package: E3-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

## Terms and Conditions of Usage

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

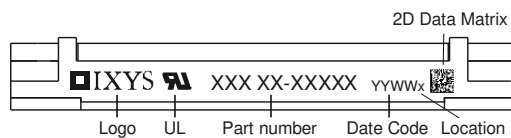
- to perform joint risk and quality assessments;

- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

| Rectifier  |                                              |                                                   |                                                     | Ratings                        |       |       |                   |
|------------|----------------------------------------------|---------------------------------------------------|-----------------------------------------------------|--------------------------------|-------|-------|-------------------|
| Symbol     | Definition                                   | Conditions                                        |                                                     | min.                           | typ.  | max.  | Unit              |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$                     |                                                     |                                |       | 2300  | V                 |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$                     |                                                     |                                |       | 2200  | V                 |
| $I_R$      | reverse current                              | $V_R = 2200\text{ V}$                             | $T_{VJ} = 25^{\circ}\text{C}$                       |                                |       | 400   | $\mu\text{A}$     |
|            |                                              | $V_R = 2200\text{ V}$                             | $T_{VJ} = 150^{\circ}\text{C}$                      |                                |       | 6     | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 220\text{ A}$                              | $T_{VJ} = 25^{\circ}\text{C}$                       |                                |       | 1.28  | V                 |
|            |                                              | $I_F = 660\text{ A}$                              |                                                     |                                |       | 1.95  | V                 |
|            |                                              | $I_F = 220\text{ A}$                              | $T_{VJ} = 125^{\circ}\text{C}$                      |                                |       | 1.19  | V                 |
|            |                                              | $I_F = 660\text{ A}$                              |                                                     |                                |       | 1.95  | V                 |
| $I_{DAV}$  | bridge output current                        | $T_C = 85^{\circ}\text{C}$<br>rectangular         | $T_{VJ} = 150^{\circ}\text{C}$<br>$d = \frac{1}{3}$ |                                |       | 660   | A                 |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                 |                                                     | $T_{VJ} = 150^{\circ}\text{C}$ |       | 0.77  | V                 |
| $r_F$      | slope resistance                             |                                                   |                                                     |                                |       | 1.8   | m $\Omega$        |
| $R_{thJC}$ | thermal resistance junction to case          |                                                   |                                                     |                                |       | 0.15  | K/W               |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                   |                                                     |                                | 0.075 |       | K/W               |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                        |                                                     |                                |       | 830   | W                 |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 45^{\circ}\text{C}$                       |                                |       | 5.00  | kA                |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$                                  |                                |       | 5.40  | kA                |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 150^{\circ}\text{C}$                      |                                |       | 4.25  | kA                |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$                                  |                                |       | 4.59  | kA                |
| $I^2t$     | value for fusing                             | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 45^{\circ}\text{C}$                       |                                |       | 125.0 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$                                  |                                |       | 121.3 | kA <sup>2</sup> s |
|            |                                              | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$  | $T_{VJ} = 150^{\circ}\text{C}$                      |                                |       | 90.3  | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$                                  |                                |       | 87.6  | kA <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 700\text{ V}; f = 1\text{ MHz}$            |                                                     |                                | 158   |       | pF                |

| Package E3-Pack                         |                                                              |                      |  | Ratings |      |      |      |
|-----------------------------------------|--------------------------------------------------------------|----------------------|--|---------|------|------|------|
| Symbol                                  | Definition                                                   | Conditions           |  | min.    | typ. | max. | Unit |
| I <sub>RMS</sub>                        | RMS current                                                  | per terminal         |  |         |      | 30   | A    |
| T <sub>VJ</sub>                         | virtual junction temperature                                 |                      |  | -40     |      | 150  | °C   |
| T <sub>op</sub>                         | operation temperature                                        |                      |  | -40     |      | 125  | °C   |
| T <sub>stg</sub>                        | storage temperature                                          |                      |  | -40     |      | 125  | °C   |
| Weight                                  |                                                              |                      |  |         | 270  |      | g    |
| M <sub>D</sub>                          | mounting torque                                              |                      |  | 3       |      | 6    | Nm   |
| d <sub>Spp/App</sub>                    | creepage distance on surface / striking distance through air | terminal to terminal |  | 6.0     |      |      | mm   |
| d <sub>Spb/Apb</sub>                    |                                                              | terminal to backside |  | 12.0    |      |      | mm   |
| V <sub>ISOL</sub>                       | isolation voltage                                            | t = 1 second         |  | 3600    |      |      | V    |
|                                         |                                                              | t = 1 minute         |  | 3000    |      |      | V    |
| 50/60 Hz, RMS; I <sub>ISOL</sub> ≤ 1 mA |                                                              |                      |  |         |      |      |      |



## Part description

M = Module  
 D = Diode  
 N = High Voltage Standard Rectifier  
 A = ( $\geq 2000V$ )  
 660 = Current Rating [A]  
 U = 3~ Rectifier Bridge  
 2200 = Reverse Voltage [V]  
 PT = PressFit-Pin, Thermistor  
 EH = E3-Pack  
 - = Hyphen  
 PC = Phase Change Material

| Ordering    | Ordering Number     | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|---------------------|--------------------|---------------|----------|----------|
| Standard    | MDNA660U2200PTEH    | MDNA660U2200PTEH   | Blister       | 24       | 516663   |
| Alternative | MDNA660U2200PTEH-PC | MDNA660U2200PTEH   | Blister       | 24       | 514482   |

## Temperature Sensor NTC

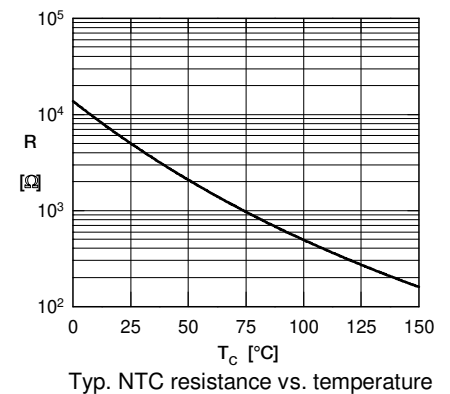
| Symbol      | Definition              | Conditions          | min. | typ. | max. | Unit       |
|-------------|-------------------------|---------------------|------|------|------|------------|
| $R_{25}$    | resistance              | $T_{VJ} = 25^\circ$ | 4.85 | 5    | 5.15 | k $\Omega$ |
| $B_{25/50}$ | temperature coefficient |                     |      | 3375 |      | K          |

## Equivalent Circuits for Simulation

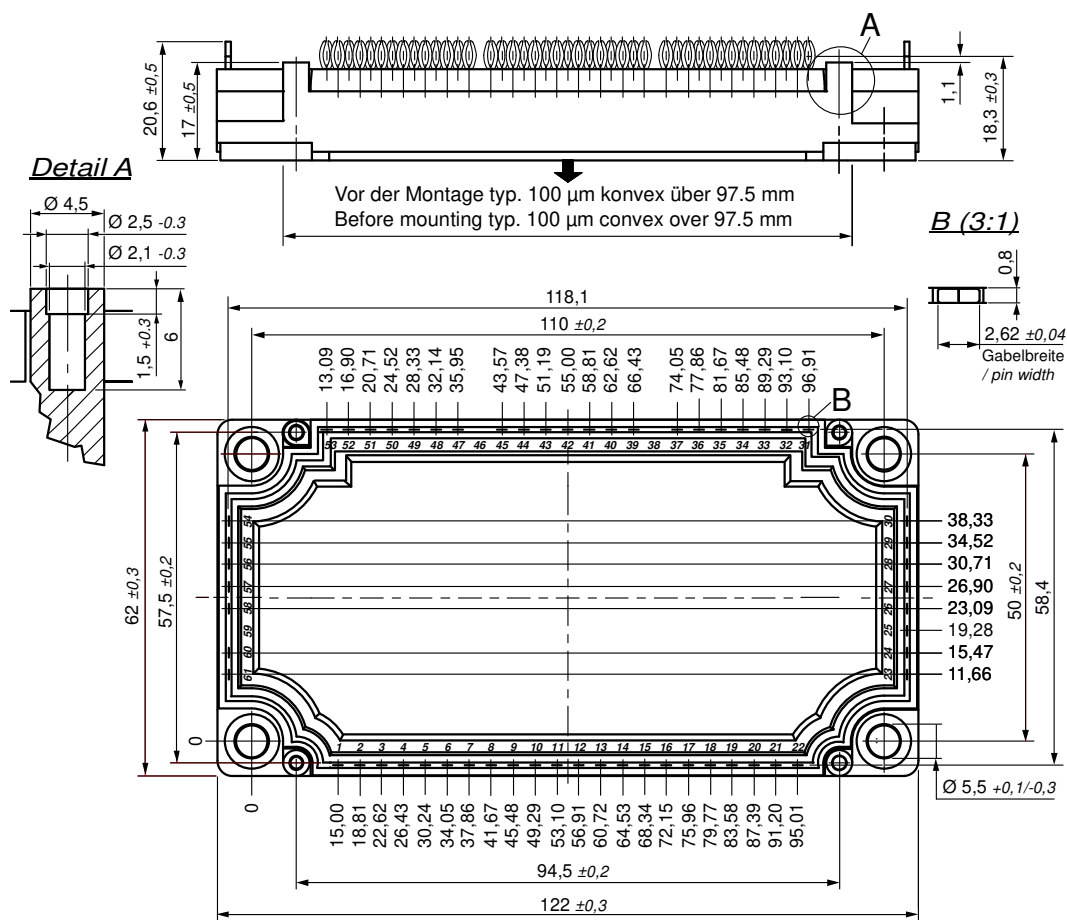
\* on die level

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

|              |                    |           |            |
|--------------|--------------------|-----------|------------|
|              |                    | Rectifier |            |
| $V_{0\ max}$ | threshold voltage  | 0.77      | V          |
| $R_{0\ max}$ | slope resistance * | 0.57      | m $\Omega$ |



## Outlines E3-Pack

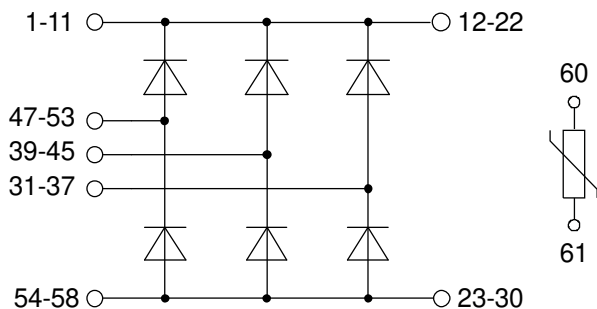


### Bemerkung / Note:

- Nichttolerierete Maße nach / Measure without tolerances according DIN ISO 2768-T1-m
- PCB-Lochmuster / PCB hole pattern: **see pin position**
- Toleranz Pin-Position und PCB-Lochmuster / Tolerance of pin position and PCB hole pattern:  $\pm 0.1$
- Bohrlochdurchmesser / Diameter of drill: **Ø 2.35 mm**
- Endlochdurchmesser / Diameter of plated holes: **Ø 2.14 - 2.29 mm** (Cu thickness in via typ. 50 µm)
- Beschichtung / Plating: **chem. Sn max. 15 µm**
- Einpresskraft / Insert Force: per terminal with a typ. insert speed of 7 mm/s: **typ. 90 N**
- Weitere Angaben / Further information: [www.ixys.com](http://www.ixys.com) **Application note IXAN0077**
- Montageanleitung / Mounting instruction: [www.ixys.com](http://www.ixys.com) **Application note IXAN0024**

### Detail A: PCB-Montage / Mounting on PCB<sup>1</sup>

- Empfohlene, selbstschneidende Schraube / Recommended, self-tapping screw: **EJOT PT®** (Größe / size: **K25**)<sup>1</sup>
- Max. Schraubenlänge / Max. screw length: **PCB-Dicke / thickness + 6 mm** (max. Lochtiefe / hole depth)<sup>1</sup>
- Empfohlenes Drehmoment / Recommended mounting torque: **1.5 Nm**



## Rectifier

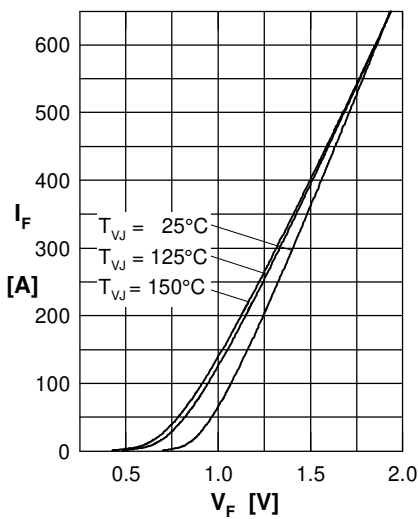


Fig. 1 Forward current versus voltage drop per diode

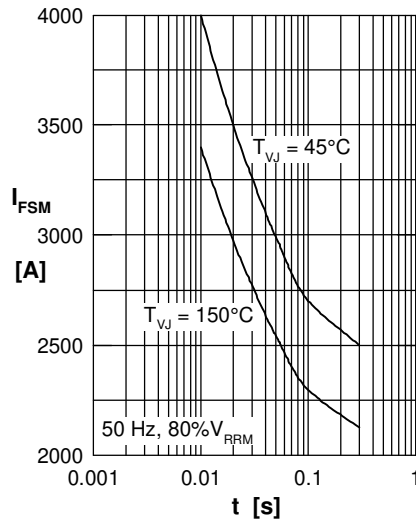


Fig. 2 Surge overload current vs. time per diode

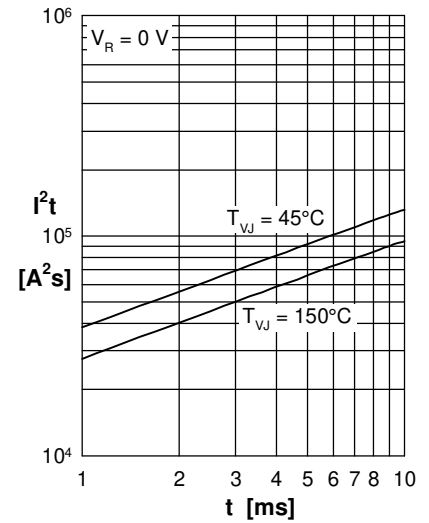


Fig. 3  $I^2t$  versus time per diode

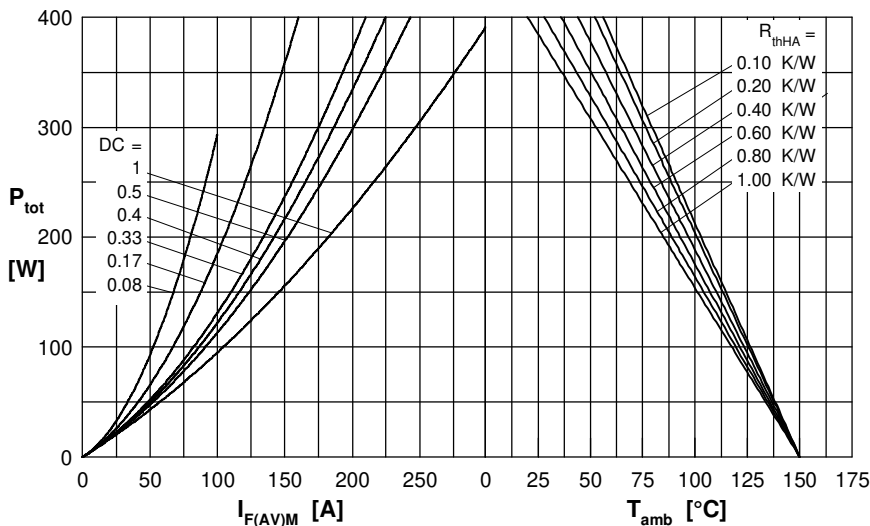


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

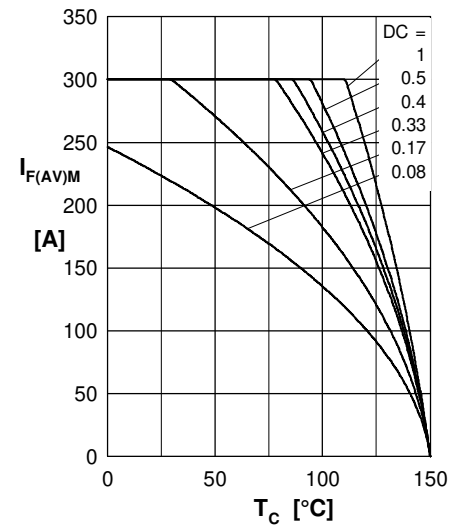


Fig. 5 Max. forward current vs. case temperature per diode

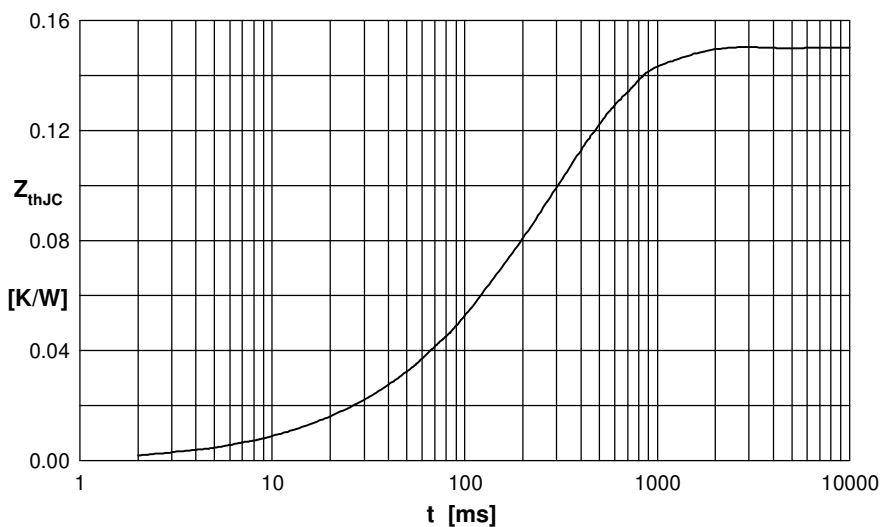


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.006           | 0.015     |
| 2 | 0.017           | 0.080     |
| 3 | 0.039           | 0.220     |
| 4 | 0.088           | 0.380     |