

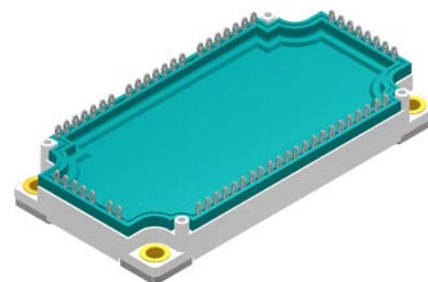
# Standard Rectifier Module

| 3~<br>Rectifier           |
|---------------------------|
| $V_{RRM} = 1600\text{ V}$ |
| $I_{DAV} = 450\text{ A}$  |
| $I_{FSM} = 2400\text{ A}$ |

3~ Rectifier Bridge + NTC

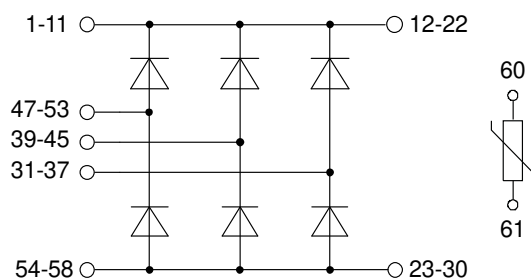
Part number

**MDMA450U1600PTEH**



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

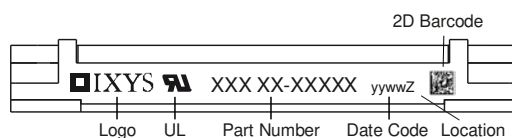
- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

## Disclaimer Notice

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| Rectifier  |                                              |                                           |                                                     | Ratings                        |      |      |                   |
|------------|----------------------------------------------|-------------------------------------------|-----------------------------------------------------|--------------------------------|------|------|-------------------|
| Symbol     | Definition                                   | Conditions                                |                                                     | min.                           | typ. | max. | Unit              |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$             |                                                     |                                |      | 1700 | V                 |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$             |                                                     |                                |      | 1600 | V                 |
| $I_R$      | reverse current                              | $V_R = 1600\text{ V}$                     | $T_{VJ} = 25^{\circ}\text{C}$                       |                                |      | 100  | $\mu\text{A}$     |
|            |                                              | $V_R = 1600\text{ V}$                     | $T_{VJ} = 150^{\circ}\text{C}$                      |                                |      | 3    | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 150\text{ A}$                      | $T_{VJ} = 25^{\circ}\text{C}$                       |                                |      | 1,24 | V                 |
|            |                                              | $I_F = 450\text{ A}$                      |                                                     |                                |      | 1,76 | V                 |
|            |                                              | $I_F = 150\text{ A}$                      | $T_{VJ} = 125^{\circ}\text{C}$                      |                                |      | 1,20 | V                 |
|            |                                              | $I_F = 450\text{ A}$                      |                                                     |                                |      | 1,91 | V                 |
| $I_{DAV}$  | bridge output current                        | $T_C = 85^{\circ}\text{C}$<br>rectangular | $T_{VJ} = 150^{\circ}\text{C}$<br>$d = \frac{1}{3}$ |                                |      | 450  | A                 |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only         |                                                     | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0,82 | V                 |
| $r_F$      | slope resistance                             |                                           |                                                     |                                |      | 2,5  | m $\Omega$        |
| $R_{thJC}$ | thermal resistance junction to case          |                                           |                                                     |                                |      | 0,2  | K/W               |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                           |                                                     |                                | 0,1  |      | K/W               |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                |                                                     |                                |      | 625  | W                 |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms; (50 Hz), sine}$         | $T_{VJ} = 45^{\circ}\text{C}$                       |                                |      | 2,40 | kA                |
|            |                                              | $t = 8,3\text{ ms; (60 Hz), sine}$        | $V_R = 0\text{ V}$                                  |                                |      | 2,59 | kA                |
|            |                                              | $t = 10\text{ ms; (50 Hz), sine}$         | $T_{VJ} = 150^{\circ}\text{C}$                      |                                |      | 2,04 | kA                |
|            |                                              | $t = 8,3\text{ ms; (60 Hz), sine}$        | $V_R = 0\text{ V}$                                  |                                |      | 2,21 | kA                |
| $I^2t$     | value for fusing                             | $t = 10\text{ ms; (50 Hz), sine}$         | $T_{VJ} = 45^{\circ}\text{C}$                       |                                |      | 28,8 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms; (60 Hz), sine}$        | $V_R = 0\text{ V}$                                  |                                |      | 27,9 | kA <sup>2</sup> s |
|            |                                              | $t = 10\text{ ms; (50 Hz), sine}$         | $T_{VJ} = 150^{\circ}\text{C}$                      |                                |      | 20,8 | kA <sup>2</sup> s |
|            |                                              | $t = 8,3\text{ ms; (60 Hz), sine}$        | $V_R = 0\text{ V}$                                  |                                |      | 20,2 | kA <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V; } f = 1\text{ MHz}$   |                                                     | $T_{VJ} = 25^{\circ}\text{C}$  | 91   |      | pF                |

| Package E3-Pack |                                                              |                      |                                     | Ratings |      |      |      |
|-----------------|--------------------------------------------------------------|----------------------|-------------------------------------|---------|------|------|------|
| Symbol          | Definition                                                   | Conditions           |                                     | min.    | typ. | max. | Unit |
| $I_{RMS}$       | RMS current                                                  | per terminal         |                                     |         |      | 30   | 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>   |                                                              |                      |                                     |         | 270  |      | g    |
| $M_D$           | mounting torque                                              |                      |                                     | 3       |      | 6    | Nm   |
| $d_{Spp/App}$   | creepage distance on surface / striking distance through air | terminal to terminal |                                     | 6,0     |      |      | mm   |
| $d_{Spb/Apb}$   |                                                              | terminal to backside |                                     | 12,0    |      |      | mm   |
| $V_{ISOL}$      | isolation voltage                                            | t = 1 second         | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 4300    |      |      | V    |
|                 |                                                              | t = 1 minute         |                                     | 3600    |      |      | V    |



### Part description

M = Module  
 D = Diode  
 M = Standard Rectifier  
 A = (up to 1800V)  
 450 = Current Rating [A]  
 U = 3~ Rectifier Bridge  
 1600 = 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    | MDMA450U1600PTEH    | MDMA450U1600PTEH   | Blister       | 24       |          |
| Alternative | MDMA450U1600PTEH-PC | MDMA450U1600PTEH   | Blister       | 24       | 518562   |

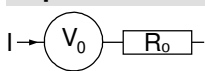
### Temperature Sensor NTC

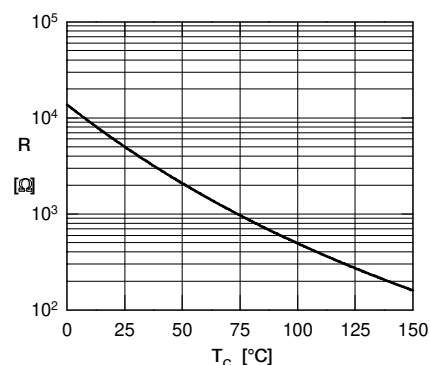
| Symbol      | Definition              | Conditions          | min. | typ. | max. | Unit |
|-------------|-------------------------|---------------------|------|------|------|------|
| $R_{25}$    | resistance              | $T_{VJ} = 25^\circ$ | 4,85 | 5    | 5,15 | kΩ   |
| $B_{25/50}$ | temperature coefficient |                     |      | 3375 |      | K    |

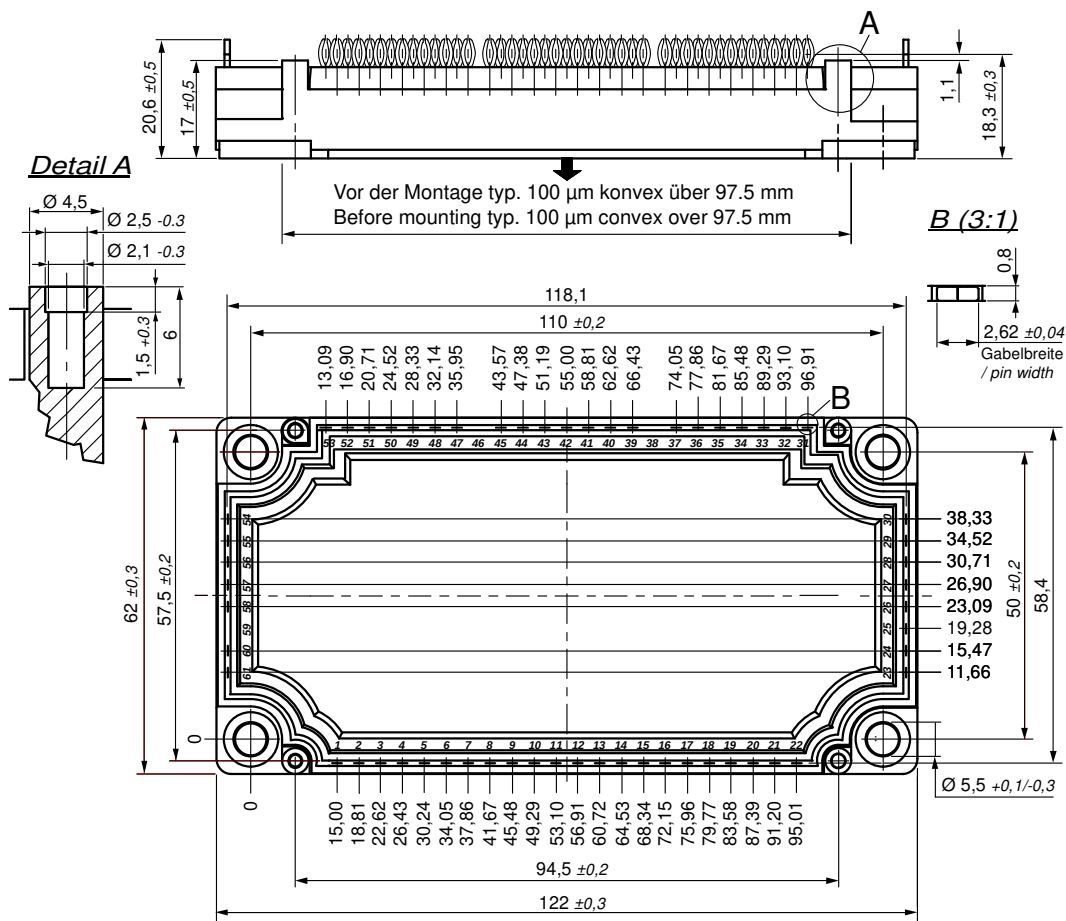
### Equivalent Circuits for Simulation

\* on die level

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

|                                                                                     |                    |      |                  |
|-------------------------------------------------------------------------------------|--------------------|------|------------------|
|  |                    |      | <b>Rectifier</b> |
| $V_{0\max}$                                                                         | threshold voltage  | 0,82 | V                |
| $R_{0\max}$                                                                         | slope resistance * | 1,2  | mΩ               |

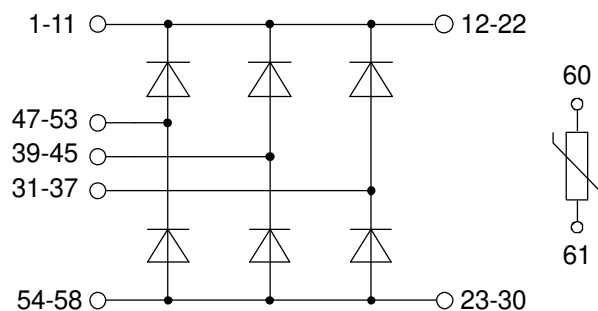


**Outlines E3-Pack**

**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

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



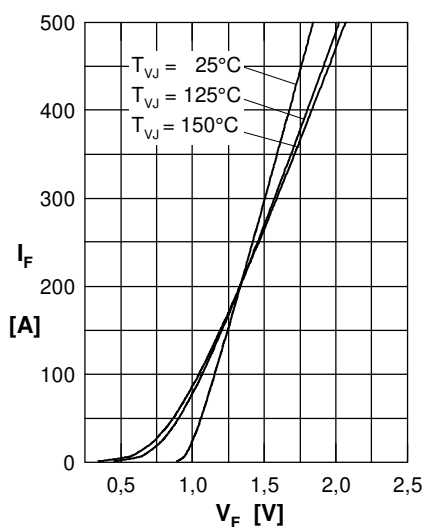
**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

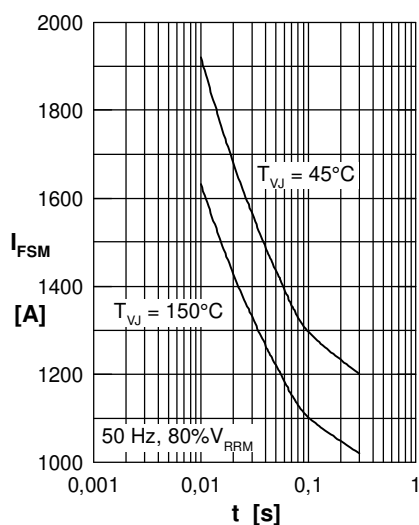


Fig. 2 Surge overload current vs. time per diode

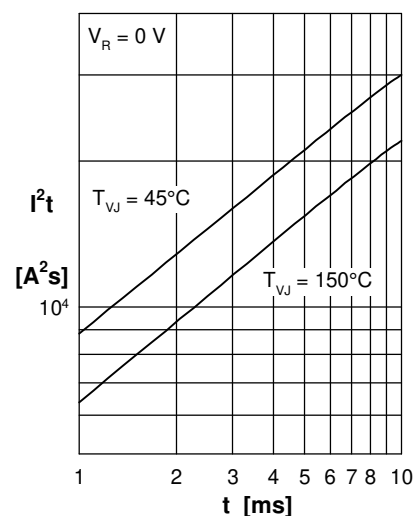
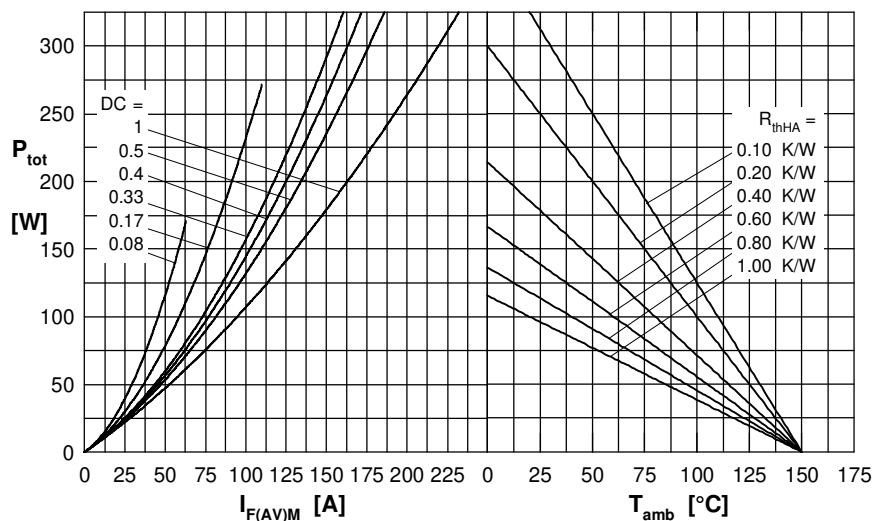

 Fig. 3  $I^2t$  versus time per diode


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

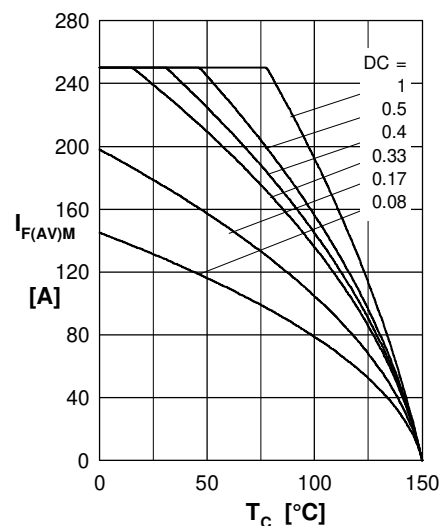


Fig. 5 Max. forward current vs. case temperature per diode

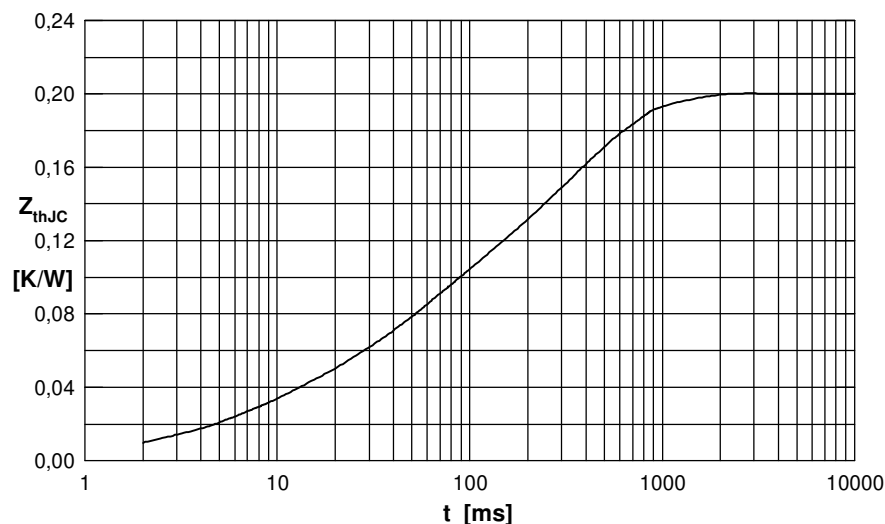


Fig. 6 Transient thermal impedance junction to case vs. time per diode

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.020           | 0.006     |
| 2 | 0.003           | 0.007     |
| 3 | 0.057           | 0.042     |
| 4 | 0.120           | 0.350     |