

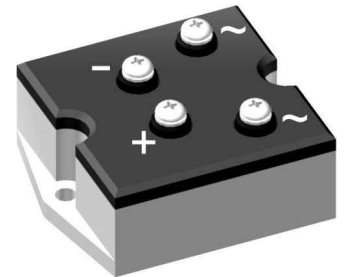
# Standard Rectifier Module

| 1~<br>Rectifier |          |
|-----------------|----------|
| $V_{RRM}$       | = 1600 V |
| $I_{DAV}$       | = 45 A   |
| $I_{FSM}$       | = 750 A  |

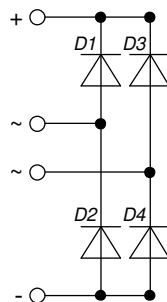
## 1~ Rectifier Bridge

Part number

**VBO50-16NO7**



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

### Package: PWS-B

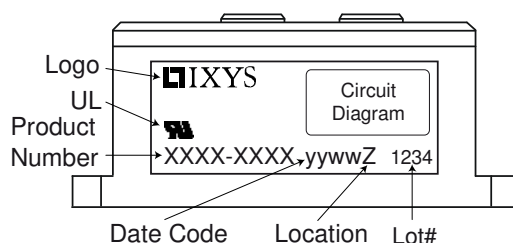
- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Easy to mount with two screws
- Base plate: Aluminium internally DCB isolated
- Advanced power cycling

### Disclaimer Notice

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| Rectifier  |                                              |                                           |                                           | Ratings                        |      |      |                   |
|------------|----------------------------------------------|-------------------------------------------|-------------------------------------------|--------------------------------|------|------|-------------------|
| Symbol     | Definition                                   | Conditions                                |                                           | min.                           | typ. | max. | Unit              |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$             |                                           |                                |      | 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  | $\mu\text{A}$     |
|            |                                              | $V_R = 1600\text{ V}$                     | $T_{VJ} = 150^{\circ}\text{C}$            |                                |      | 1.5  | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 20\text{ A}$                       | $T_{VJ} = 25^{\circ}\text{C}$             |                                |      | 1.03 | V                 |
|            |                                              | $I_F = 40\text{ A}$                       |                                           |                                |      | 1.14 | V                 |
|            |                                              | $I_F = 20\text{ A}$                       | $T_{VJ} = 125^{\circ}\text{C}$            |                                |      | 0.92 | V                 |
|            |                                              | $I_F = 40\text{ A}$                       |                                           |                                |      | 1.06 | V                 |
| $I_{DAV}$  | bridge output current                        | $T_C = 85^{\circ}\text{C}$<br>rectangular | $T_{VJ} = 150^{\circ}\text{C}$<br>d = 0.5 |                                |      | 45   | A                 |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only         |                                           | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0.76 | V                 |
| $r_F$      | slope resistance                             |                                           |                                           |                                |      | 6.9  | m $\Omega$        |
| $R_{thJC}$ | thermal resistance junction to case          |                                           |                                           |                                |      | 2.7  | K/W               |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                           |                                           |                                | 0.4  |      | K/W               |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                |                                           |                                |      | 46   | W                 |
| $I_{FSM}$  | max. forward surge current                   | t = 10 ms; (50 Hz), sine                  | $T_{VJ} = 45^{\circ}\text{C}$             |                                |      | 750  | A                 |
|            |                                              | t = 8,3 ms; (60 Hz), sine                 | $V_R = 0\text{ V}$                        |                                |      | 810  | A                 |
|            |                                              | t = 10 ms; (50 Hz), sine                  | $T_{VJ} = 150^{\circ}\text{C}$            |                                |      | 640  | A                 |
|            |                                              | t = 8,3 ms; (60 Hz), sine                 | $V_R = 0\text{ V}$                        |                                |      | 690  | A                 |
| $I^2t$     | value for fusing                             | t = 10 ms; (50 Hz), sine                  | $T_{VJ} = 45^{\circ}\text{C}$             |                                |      | 2.82 | kA <sup>2</sup> s |
|            |                                              | t = 8,3 ms; (60 Hz), sine                 | $V_R = 0\text{ V}$                        |                                |      | 2.73 | kA <sup>2</sup> s |
|            |                                              | t = 10 ms; (50 Hz), sine                  | $T_{VJ} = 150^{\circ}\text{C}$            |                                |      | 2.05 | kA <sup>2</sup> s |
|            |                                              | t = 8,3 ms; (60 Hz), sine                 | $V_R = 0\text{ V}$                        |                                |      | 1.98 | kA <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}; f = 1\text{ MHz}$    |                                           |                                | 10   |      | pF                |

| Package PWS-B |                                                              |                      |                                     | Ratings |      |      |      |
|---------------|--------------------------------------------------------------|----------------------|-------------------------------------|---------|------|------|------|
| Symbol        | Definition                                                   | Conditions           |                                     | min.    | typ. | max. | Unit |
| $I_{RMS}$     | RMS current                                                  | per terminal         |                                     |         |      | 100  | 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> |                                                              |                      |                                     |         | 193  |      | g    |
| $M_D$         | mounting torque                                              |                      |                                     | 4.25    |      | 5.75 | Nm   |
| $M_T$         | terminal torque                                              |                      |                                     | 2.5     |      | 3.5  | Nm   |
| $d_{Spp/Apb}$ | creepage distance on surface   striking distance through air | terminal to terminal |                                     | 11.0    |      |      | mm   |
| $d_{Spp/Apb}$ |                                                              | terminal to backside |                                     | 7.5     |      |      | mm   |
| $V_{ISOL}$    | isolation voltage                                            | t = 1 second         | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 3000    |      |      | V    |
|               |                                                              | t = 1 minute         |                                     | 2500    |      |      | V    |

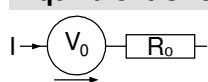


| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | VBO50-16NO7     | VBO50-16NO7        | Box           | 10       | 472271   |

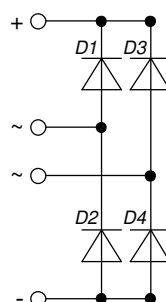
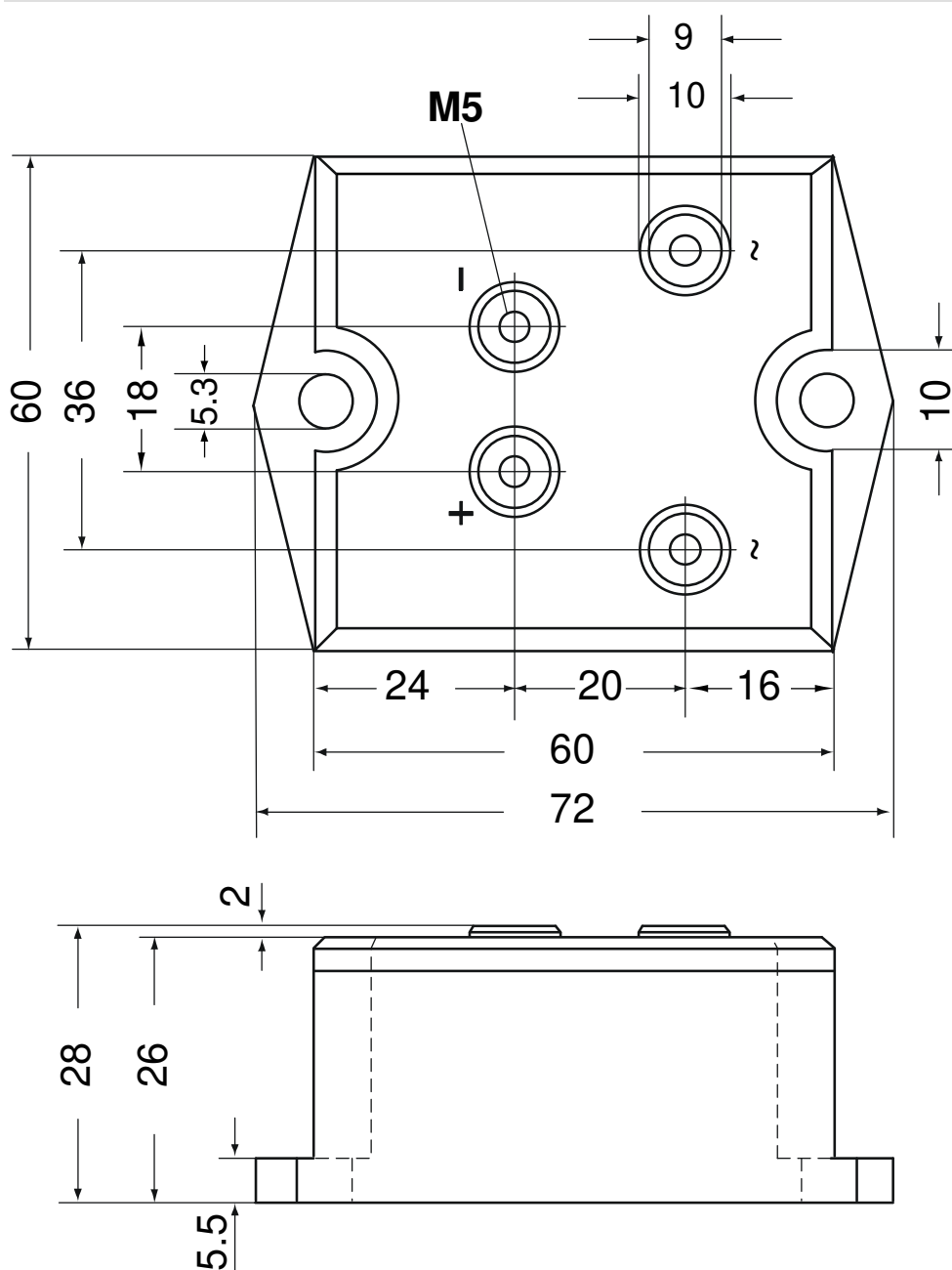
### Equivalent Circuits for Simulation

\* on die level

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

|                                                                                     |                    |                  |    |
|-------------------------------------------------------------------------------------|--------------------|------------------|----|
|  |                    | <b>Rectifier</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 0.76             | V  |
| $R_{0\max}$                                                                         | slope resistance * | 5.7              | mΩ |

**Outlines PWS-B**



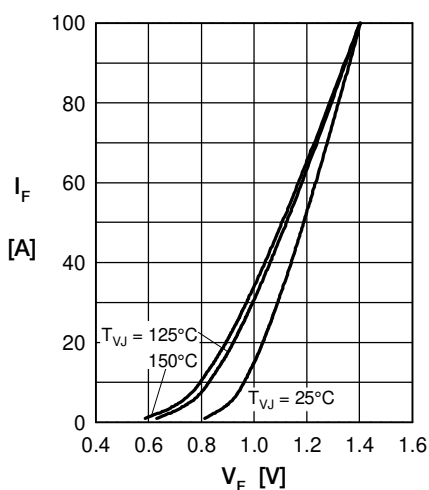
**Rectifier**


Fig. 1 Forward current vs. voltage drop per diode

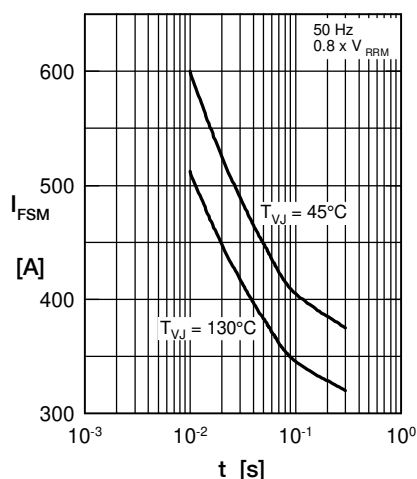


Fig. 2 Surge overload current vs. time per diode

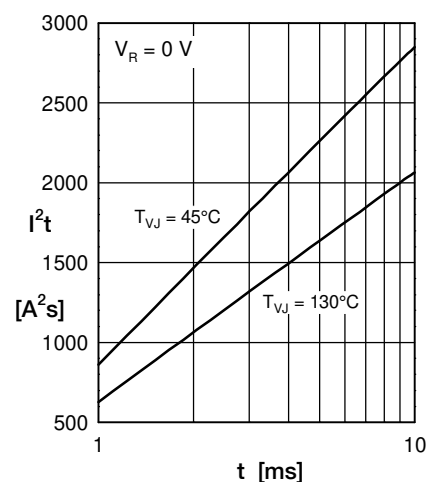


Fig. 3  $I^2t$  vs. time per diode

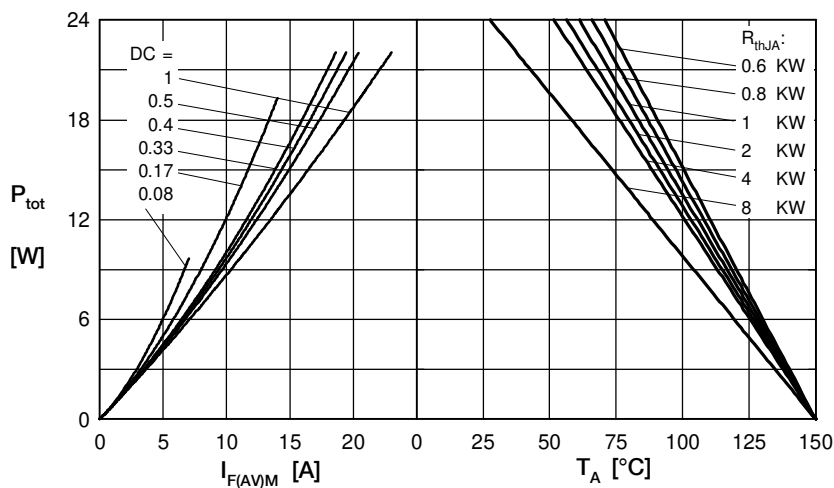


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

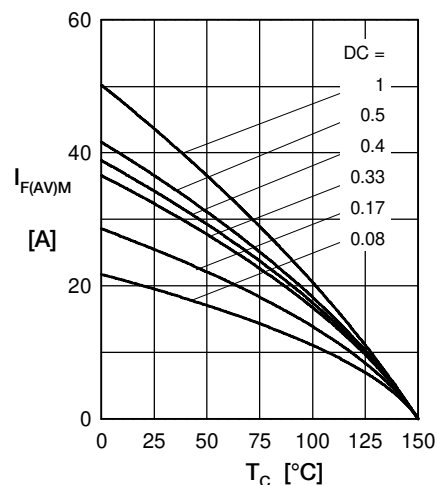


Fig. 5 Max. forward current vs. case temperature per diode

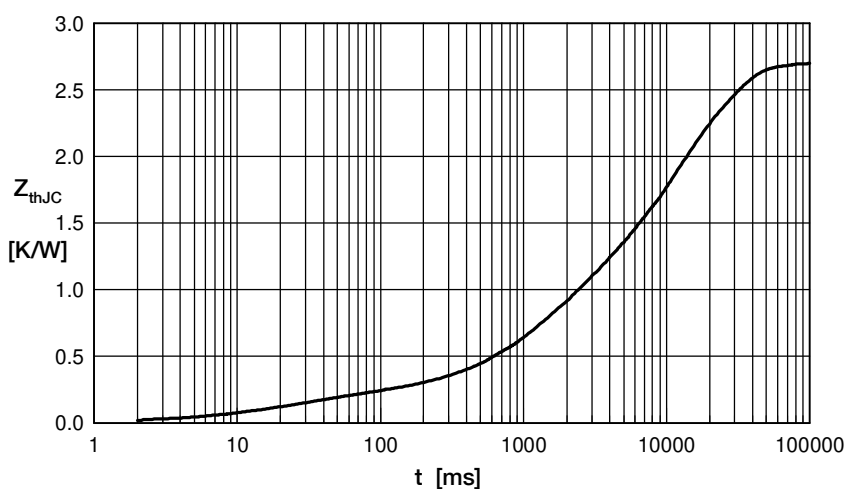


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for  $Z_{thJC}$  calculation:

| i | $R_{th}$ (K/W) | $t_i$ (s) |
|---|----------------|-----------|
| 1 | 0.040          | 0.010     |
| 2 | 0.150          | 0.030     |
| 3 | 0.610          | 1.350     |
| 4 | 1.900          | 14.00     |