

# Standard Rectifier Module

| 1~<br>Rectifier |          |
|-----------------|----------|
| $V_{RRM}$       | = 1200 V |
| $I_{DAV}$       | = 55 A   |
| $I_{FSM}$       | = 300 A  |

## 1~ Rectifier Bridge

Part number

**VBO54-12NO7**



 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: ECO-PAC1

- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 9 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 | $T_{VJ} = 25^{\circ}\text{C}$              |                                           |                                |      | 1300 | V                |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$              |                                           |                                |      | 1200 | V                |
| $I_R$      | reverse current                              | $V_R = 1200\text{ V}$                      | $T_{VJ} = 25^{\circ}\text{C}$             |                                |      | 40   | $\mu\text{A}$    |
|            |                                              | $V_R = 1200\text{ V}$                      | $T_{VJ} = 150^{\circ}\text{C}$            |                                |      | 1.5  | mA               |
| $V_F$      | forward voltage drop                         | $I_F = 20\text{ A}$                        | $T_{VJ} = 25^{\circ}\text{C}$             |                                |      | 1.15 | V                |
|            |                                              | $I_F = 40\text{ A}$                        |                                           |                                |      | 1.34 | V                |
|            |                                              | $I_F = 20\text{ A}$                        | $T_{VJ} = 125^{\circ}\text{C}$            |                                |      | 1.12 | V                |
|            |                                              | $I_F = 40\text{ A}$                        |                                           |                                |      | 1.32 | V                |
| $I_{DAV}$  | bridge output current                        | $T_C = 105^{\circ}\text{C}$<br>rectangular | $T_{VJ} = 150^{\circ}\text{C}$<br>d = 0.5 |                                |      | 55   | A                |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only          |                                           | $T_{VJ} = 150^{\circ}\text{C}$ |      | 0.82 | V                |
| $r_F$      | slope resistance                             |                                            |                                           |                                |      | 12.2 | m $\Omega$       |
| $R_{thJC}$ | thermal resistance junction to case          |                                            |                                           |                                |      | 1.1  | K/W              |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                            |                                           |                                | 0.4  |      | K/W              |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                 |                                           |                                |      | 110  | W                |
| $I_{FSM}$  | max. forward surge current                   | t = 10 ms; (50 Hz), sine                   | $T_{VJ} = 45^{\circ}\text{C}$             |                                |      | 300  | A                |
|            |                                              | t = 8,3 ms; (60 Hz), sine                  | $V_R = 0\text{ V}$                        |                                |      | 325  | A                |
|            |                                              | t = 10 ms; (50 Hz), sine                   | $T_{VJ} = 150^{\circ}\text{C}$            |                                |      | 255  | A                |
|            |                                              | t = 8,3 ms; (60 Hz), sine                  | $V_R = 0\text{ V}$                        |                                |      | 275  | A                |
| $I^2t$     | value for fusing                             | t = 10 ms; (50 Hz), sine                   | $T_{VJ} = 45^{\circ}\text{C}$             |                                |      | 450  | A <sup>2</sup> s |
|            |                                              | t = 8,3 ms; (60 Hz), sine                  | $V_R = 0\text{ V}$                        |                                |      | 440  | A <sup>2</sup> s |
|            |                                              | t = 10 ms; (50 Hz), sine                   | $T_{VJ} = 150^{\circ}\text{C}$            |                                |      | 325  | A <sup>2</sup> s |
|            |                                              | t = 8,3 ms; (60 Hz), sine                  | $V_R = 0\text{ V}$                        |                                |      | 315  | A <sup>2</sup> s |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}; f = 1\text{ MHz}$     |                                           |                                | 10   |      | pF               |

| Package ECO-PAC1 |                                                              |                      | 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>    |                                                              |                      |         | 19   |      | g    |
| $M_D$            | mounting torque                                              |                      | 1.4     |      | 2    | Nm   |
| $d_{Spp/App}$    | creepage distance on surface / striking distance through air | terminal to terminal | 6.0     |      |      | mm   |
| $d_{Spb/Apb}$    |                                                              | terminal to backside | 10.0    |      |      | mm   |
| $V_{ISOL}$       | isolation voltage                                            | t = 1 second         | 3000    |      |      | V    |
|                  |                                                              | t = 1 minute         | 2500    |      |      | V    |



| Ordering    | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|-----------------|--------------------|---------------|----------|----------|
| Standard    | VBO54-12NO7     | VBO54-12NO7        | Box           | 25       | 479543   |
| Alternative | VBO54-12NO7     | VBO54-12NO7        | Tube          | 13       | 521501   |

### 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 * | 11               | mΩ |

**Outlines ECO-PAC1**



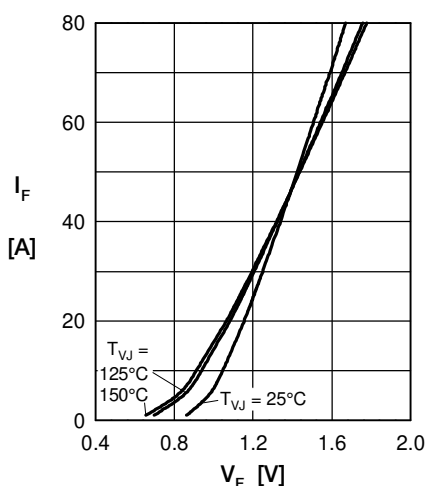
**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

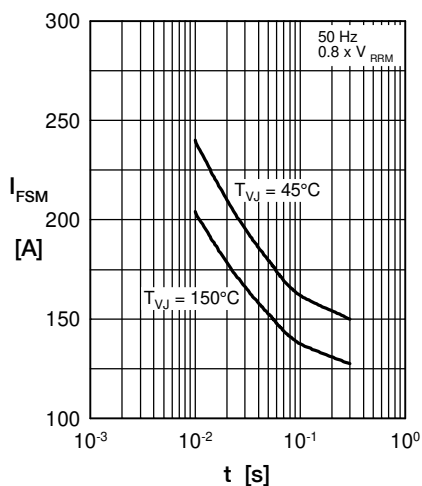


Fig. 2 Surge overload current

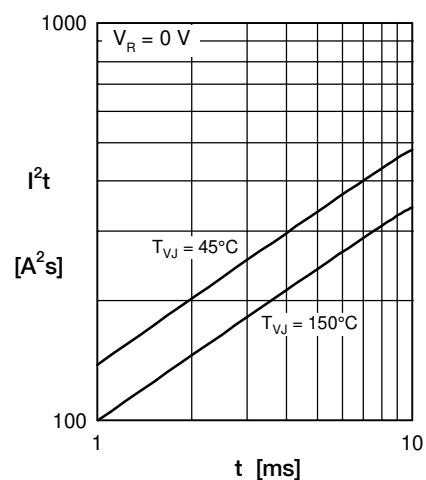

 Fig. 3  $I^2t$  versus time per diode


Fig. 4 Power dissipation vs. direct output current &amp; ambient temperature

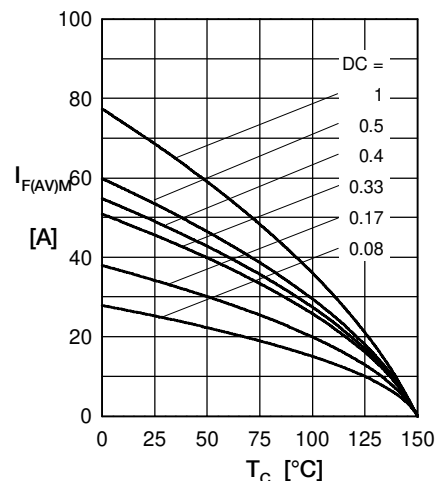


Fig. 5 Max. forward current vs. case temperature

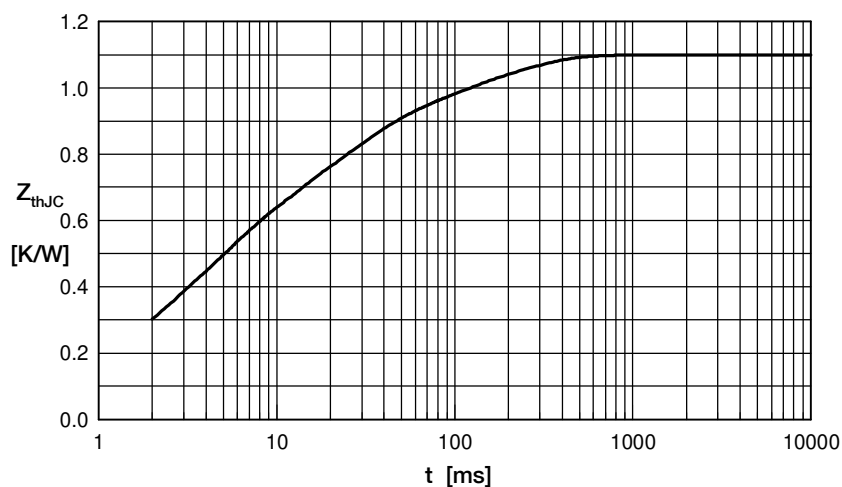


Fig. 6 Transient thermal impedance junction to case

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{th}$ (K/W) | $t_i$ (s) |
|---|----------------|-----------|
| 1 | 0.05070        | 0.004     |
| 2 | 0.163          | 0.0025    |
| 3 | 0.2805         | 0.0035    |
| 4 | 0.363          | 0.02      |
| 5 | 0.2228         | 0.15      |