

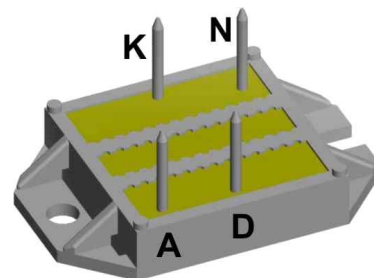
# HiPerFRED Module

$$\begin{aligned} V_{RRM} &= 1200 \text{ V} \\ I_{DAV} &= 59 \text{ A} \\ t_{rr} &= 60 \text{ ns} \end{aligned}$$

High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 1~ Rectifier Bridge

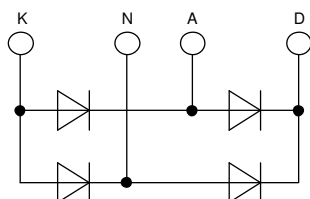
Part number

**VBE55-12NO7**



Backside: isolated

 E72873



## Features / Advantages:

- Planar passivated chips
- Very low leakage current
- Very short recovery time
- Improved thermal behaviour
- Very low  $I_{rm}$ -values
- Very soft recovery behaviour
- Avalanche voltage rated for reliable operation
- Soft reverse recovery for low EMI/RFI
- Low  $I_{rm}$  reduces:
  - Power dissipation within the diode
  - Turn-on loss in the commutating switch

## Applications:

- Antiparallel diode for high frequency switching devices
- Antisaturation diode
- Snubber diode
- Free wheeling diode
- Rectifiers in switch mode power supplies (SMPS)
- Uninterruptible power supplies (UPS)

## Package: ECO-PAC1

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Base plate: Copper internally DCB isolated
- Advanced power cycling

## Disclaimer Notice

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| Fast Diode        |                                              |                                                                                    |                         | Ratings                  |      |      |      |  |
|-------------------|----------------------------------------------|------------------------------------------------------------------------------------|-------------------------|--------------------------|------|------|------|--|
| Symbol            | Definition                                   | Conditions                                                                         |                         | min.                     | typ. | max. | Unit |  |
| V <sub>RSM</sub>  | max. non-repetitive reverse blocking voltage | T <sub>VJ</sub> = 25°C                                                             |                         |                          |      | 1200 | V    |  |
| V <sub>RRM</sub>  | max. repetitive reverse blocking voltage     | T <sub>VJ</sub> = 25°C                                                             |                         |                          |      | 1200 | V    |  |
| I <sub>R</sub>    | reverse current, drain current               | V <sub>R</sub> = 1200 V                                                            | T <sub>VJ</sub> = 25°C  |                          |      | 250  | μA   |  |
|                   |                                              | V <sub>R</sub> = 1200 V                                                            | T <sub>VJ</sub> = 150°C |                          |      | 1    | mA   |  |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 30 A                                                              | T <sub>VJ</sub> = 25°C  |                          |      | 2.71 | V    |  |
|                   |                                              | I <sub>F</sub> = 60 A                                                              |                         |                          |      | 3.21 | V    |  |
|                   |                                              | I <sub>F</sub> = 30 A                                                              | T <sub>VJ</sub> = 150°C |                          |      | 1.75 | V    |  |
|                   |                                              | I <sub>F</sub> = 60 A                                                              |                         |                          |      | 2.23 | V    |  |
| I <sub>DAV</sub>  | bridge output current                        | T <sub>C</sub> = 85°C<br>rectangular      d = 0.5                                  | T <sub>VJ</sub> = 150°C |                          |      | 59   | A    |  |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                  |                         | T <sub>VJ</sub> = 150°C  |      | 1.31 | V    |  |
| r <sub>F</sub>    | slope resistance                             |                                                                                    |                         |                          |      | 15   | mΩ   |  |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                    |                         |                          |      | 0.9  | K/W  |  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                                                    |                         |                          | 0.30 |      | K/W  |  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                                                              |                         |                          |      | 140  | W    |  |
| I <sub>FSM</sub>  | max. forward surge current                   | t = 10 ms; (50 Hz), sine; V <sub>R</sub> = 0 V                                     |                         | T <sub>VJ</sub> = 45°C   |      | 200  | A    |  |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 600 V   f = 1 MHz                                                 |                         | T <sub>VJ</sub> = 25°C   | 12   |      | pF   |  |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 30 A; V <sub>R</sub> = 600 V<br>-di <sub>F</sub> /dt = 200 A/μs |                         | T <sub>VJ</sub> = 25 °C  | 8.5  |      | A    |  |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100 °C | 13   |      | A    |  |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                    |                         | T <sub>VJ</sub> = 25 °C  | 60   |      | ns   |  |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100 °C | 170  |      | ns   |  |

| 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         | 3600    |      |      | V    |
|                  |                                                              | t = 1 minute         | 3000    |      |      | V    |



| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | VBE55-12NO7     | VBE55-12NO7        | Box           | 25       | 482803   |

### Equivalent Circuits for Simulation

\* on die level

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



**Fast Diode**

$V_{0\max}$  threshold voltage

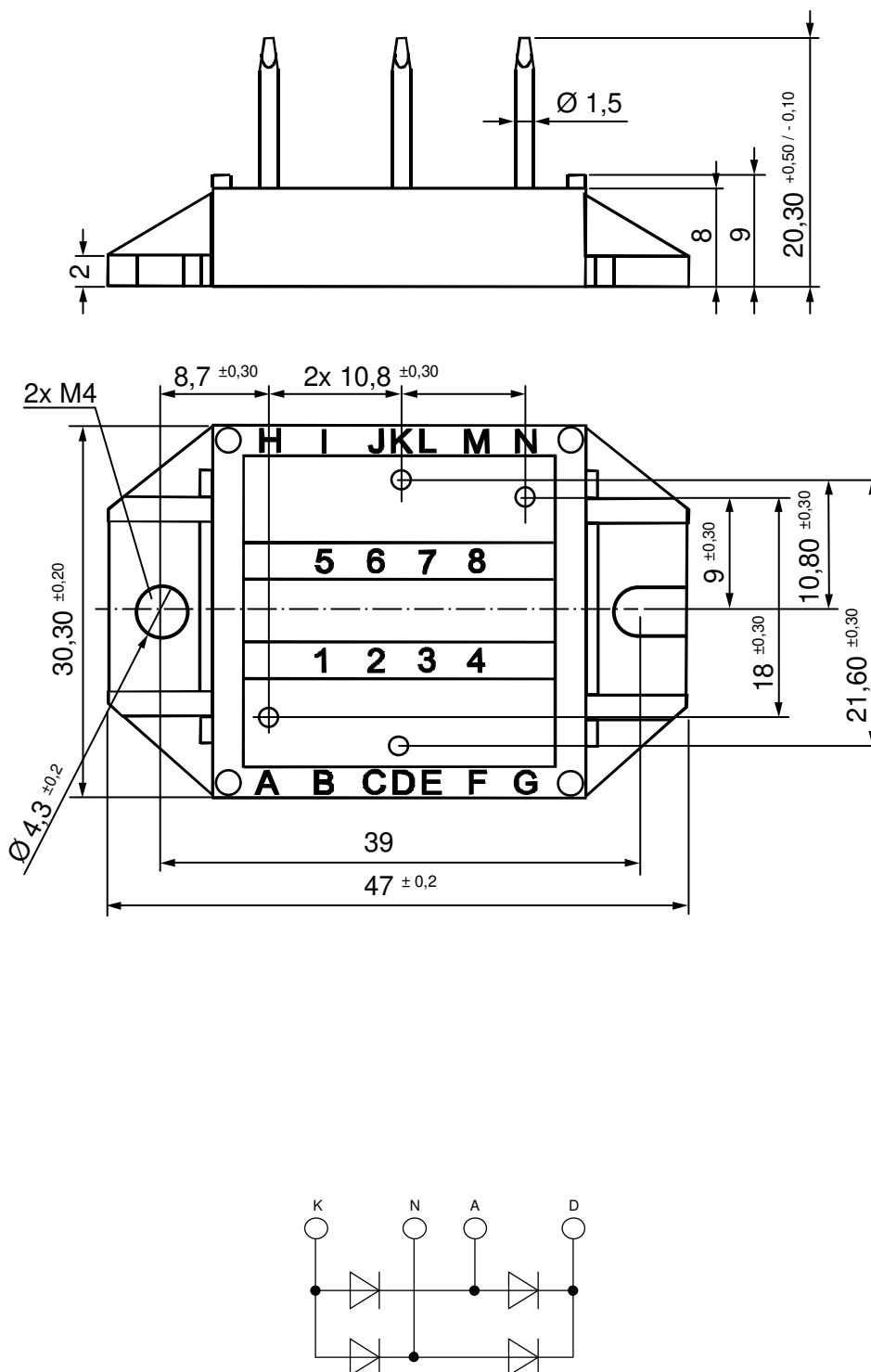
1.31

V

$R_{0\max}$  slope resistance \*

13

mΩ



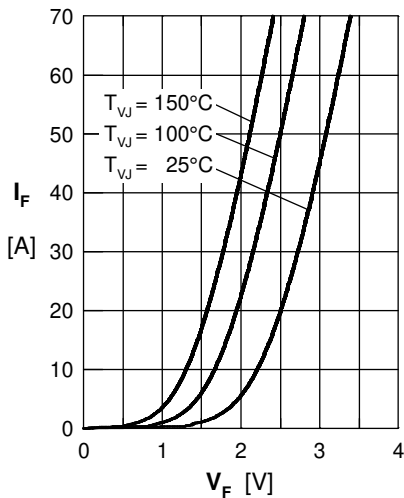
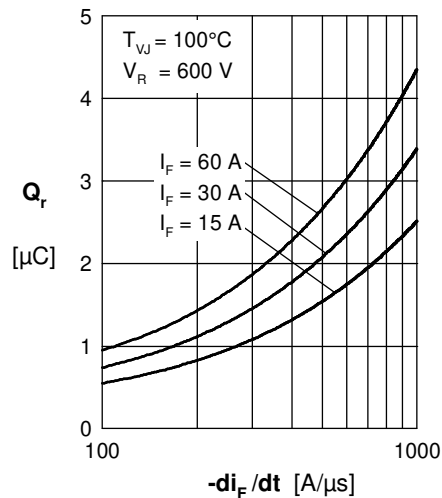
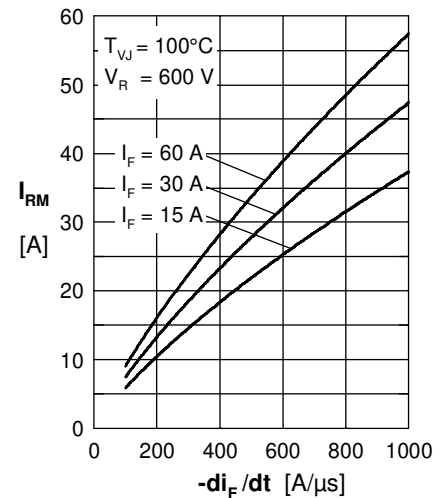
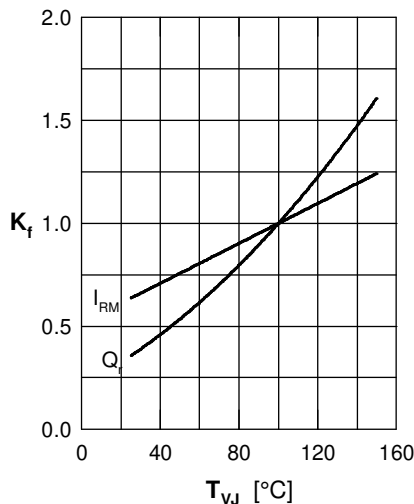
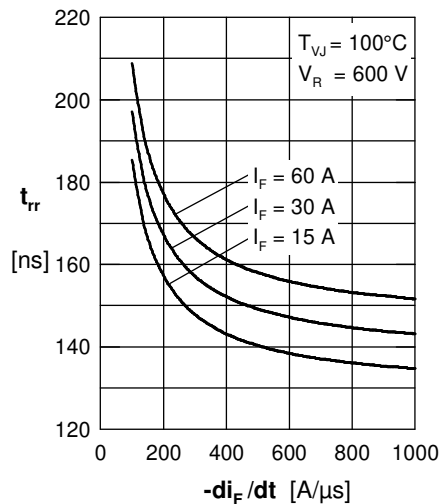
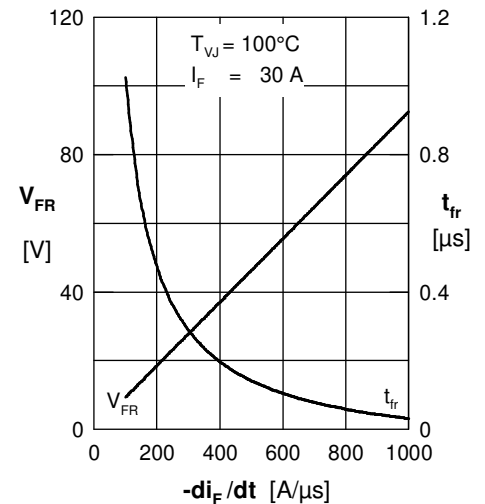
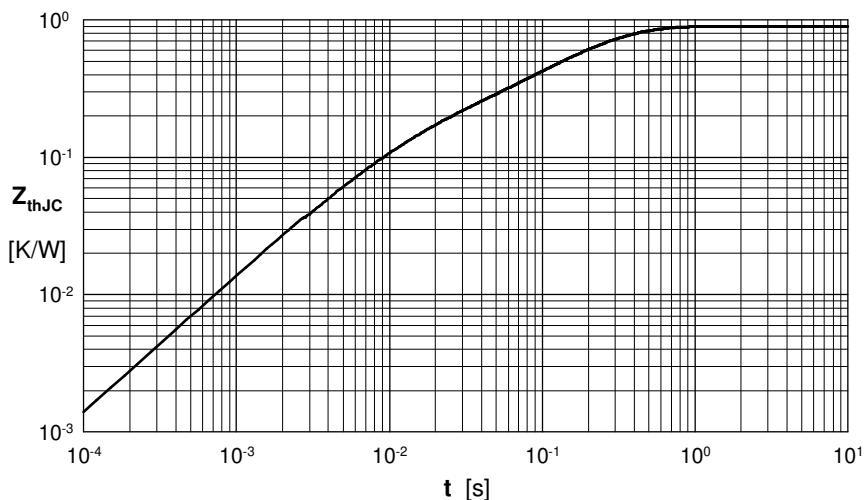
**Fast Diode**

 Fig. 1 Forward current  $I_F$  vs.  $V_F$ 

 Fig. 2 Reverse recovery charge  $Q_r$  versus  $-di_F/dt$ 

 Fig. 3 Peak reverse current  $I_{RM}$  versus  $-di_F/dt$ 

 Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$ 

 Fig. 5 Recovery time  $t_{rr}$  versus  $-di_F/dt$ 

 Fig. 6 Peak forward voltage  $V_{FR}$  and  $t_{fr}$  vs.  $-di_F/dt$ 


Fig. 7 Transient thermal resistance junction to case

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.3012          | 0.0052    |
| 2 | 0.1160          | 0.0003    |
| 3 | 0.0241          | 0.0004    |
| 4 | 0.4586          | 0.0092    |