

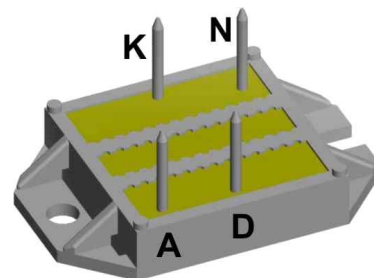
# HiPerFRED Module

|           |   |       |
|-----------|---|-------|
| $V_{RRM}$ | = | 600 V |
| $I_{DAV}$ | = | 27 A  |
| $t_{rr}$  | = | 35 ns |

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

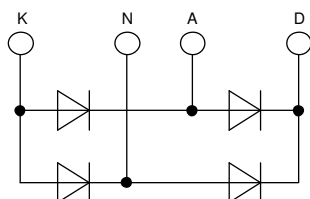
Part number

**VBE17-06NO7**



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          |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$                                                    |                                |                                |      | 600  | V             |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$                                                    |                                |                                |      | 600  | V             |
| $I_R$      | reverse current, drain current               | $V_R = 600\text{ V}$                                                             | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 60   | $\mu\text{A}$ |
|            |                                              | $V_R = 600\text{ V}$                                                             | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 0.25 | mA            |
| $V_F$      | forward voltage drop                         | $I_F = 10\text{ A}$                                                              | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 2.09 | V             |
|            |                                              | $I_F = 20\text{ A}$                                                              |                                |                                |      | 2.30 | V             |
|            |                                              | $I_F = 10\text{ A}$                                                              | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 1.41 | V             |
|            |                                              | $I_F = 20\text{ A}$                                                              |                                |                                |      | 1.66 | V             |
| $I_{DAV}$  | bridge output current                        | $T_C = 85^{\circ}\text{C}$<br>rectangular $d = 0.5$                              | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 27   | A             |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                                                |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 1.18 | V             |
| $r_F$      | slope resistance                             |                                                                                  |                                |                                |      | 22   | m $\Omega$    |
| $R_{thJC}$ | thermal resistance junction to case          |                                                                                  |                                |                                |      | 2.5  | K/W           |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                                                  |                                |                                | 0.30 |      | K/W           |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                                                       |                                |                                |      | 50   | W             |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}; V_R = 0\text{ V}$               | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 50   | A             |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}$ $f = 1\text{ MHz}$                                          | $T_{VJ} = 25^{\circ}\text{C}$  |                                | 6    |      | pF            |
| $I_{RM}$   | max. reverse recovery current                | $I_F = 10\text{ A}; V_R = 300\text{ V}$<br>$-di_F/dt = 200\text{ A}/\mu\text{s}$ |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 3.5  |      | A             |
|            |                                              |                                                                                  |                                | $T_{VJ} = 100^{\circ}\text{C}$ | 6    |      | A             |
| $t_{rr}$   | reverse recovery time                        |                                                                                  |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 35   |      | ns            |
|            |                                              |                                                                                  |                                | $T_{VJ} = 100^{\circ}\text{C}$ | 90   |      | 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 | VBE17-06NO7     | VBE17-06NO7        | Box           | 25       | 482765   |

### Equivalent Circuits for Simulation

\* on die level

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



**Fast Diode**

$V_{0\max}$  threshold voltage

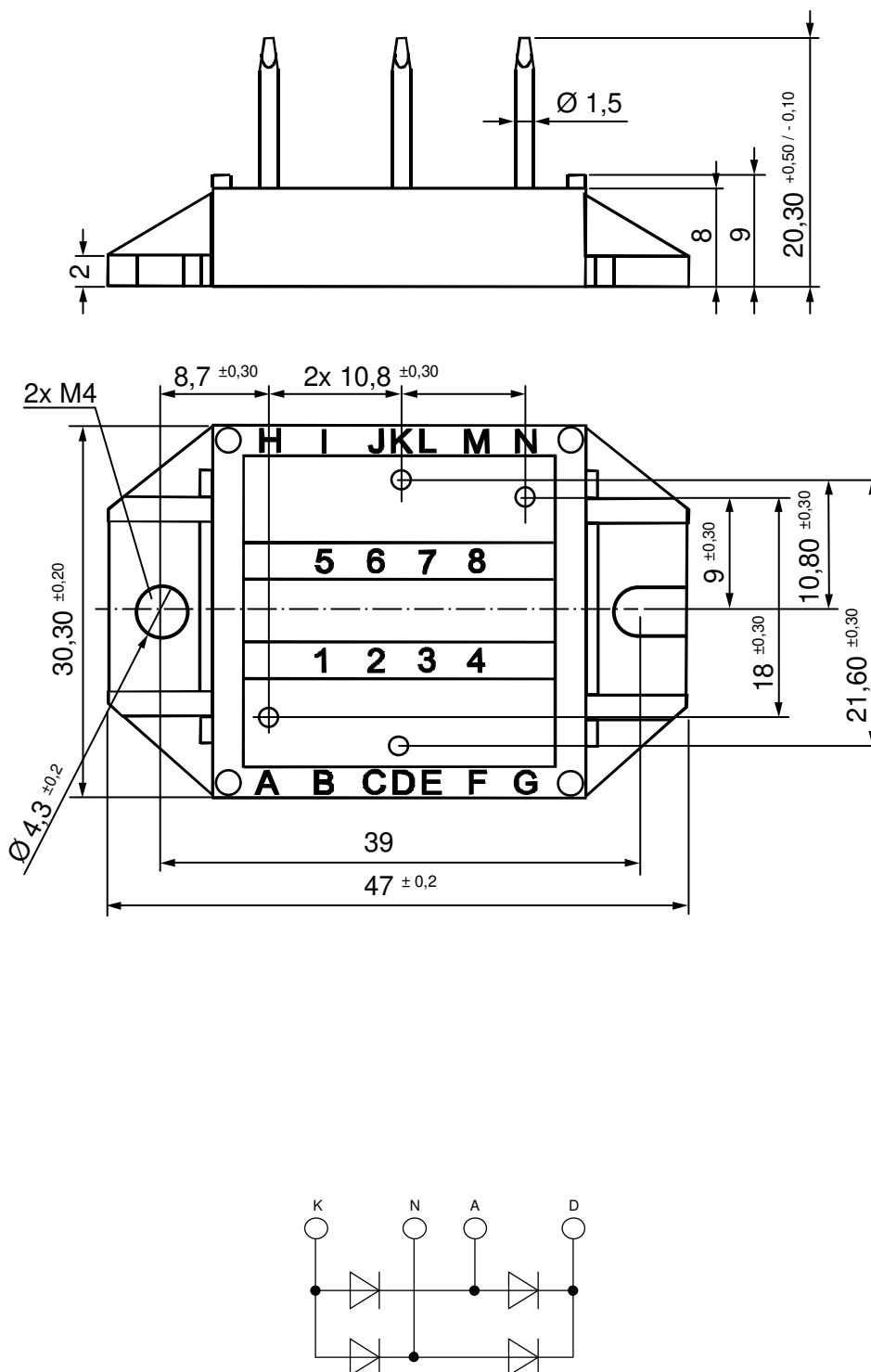
1.18

V

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

20

mΩ



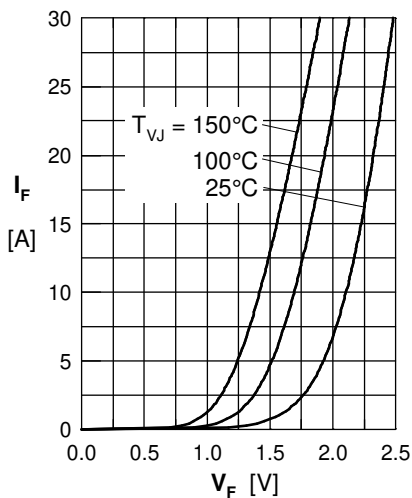
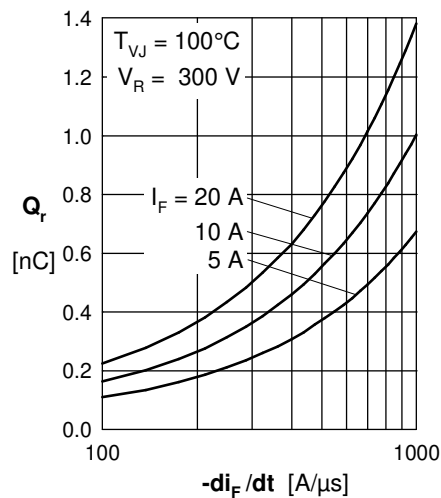
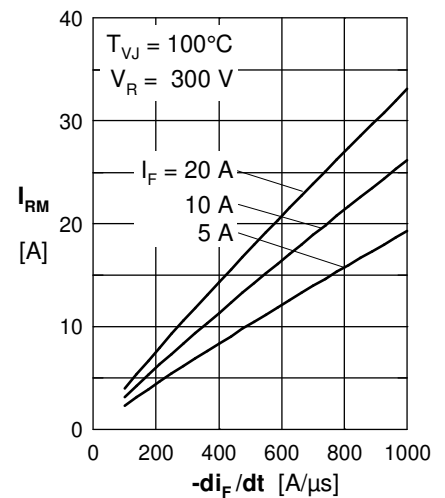
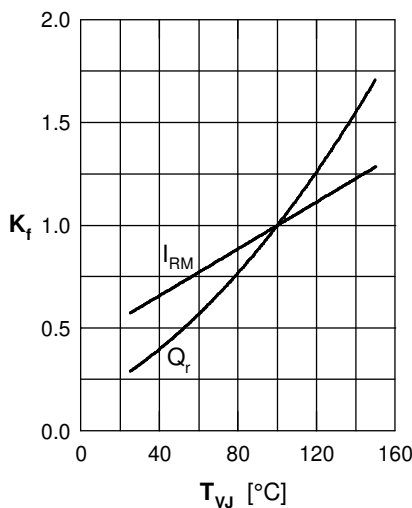
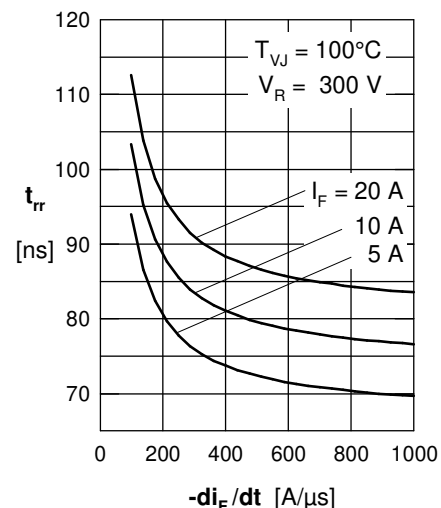
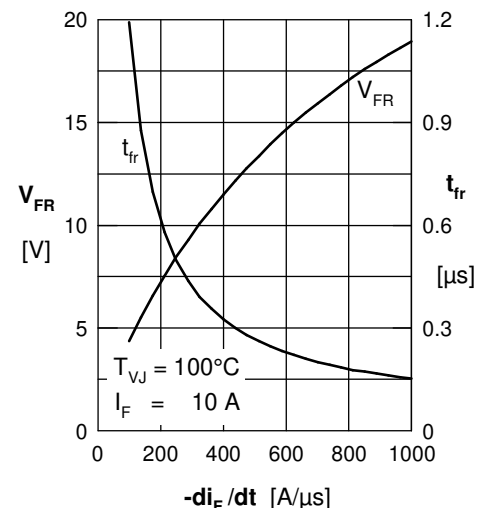
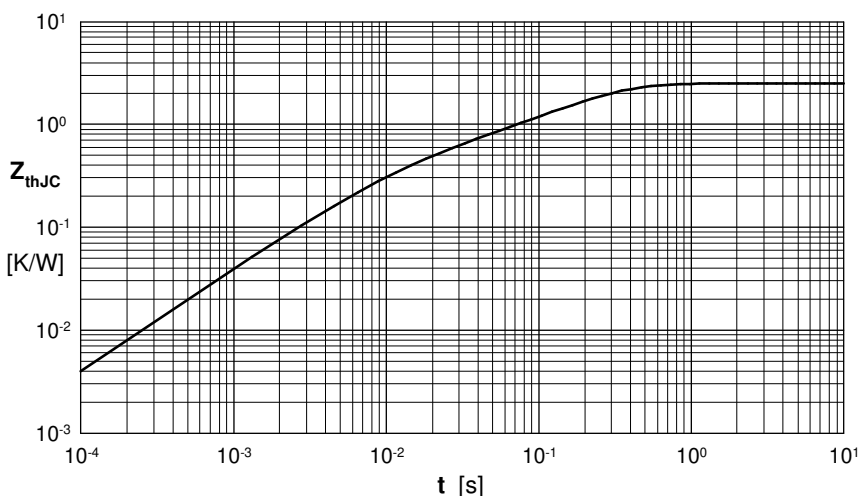
**Fast Diode**

 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  $t_{fr}$  versus  $-di_F/dt$ 


Fig. 7 Transient thermal resistance junction to case

 Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.8776          | 0.0052    |
| 2 | 0.3378          | 0.0003    |
| 3 | 0.0678          | 0.0004    |
| 4 | 1.2168          | 0.0092    |