

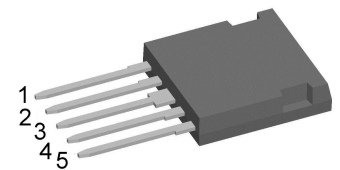
# HiPerFRED

|           |   |       |
|-----------|---|-------|
| $V_{RRM}$ | = | 600 V |
| $I_{DAV}$ | = | 22 A  |
| $t_{rr}$  | = | 30 ns |

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

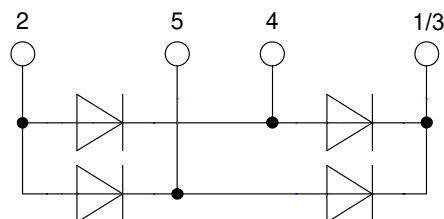
Part number

**FBE22-06N1**



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:

- Rectifiers in switch mode power supplies (SMPS)

## Package: i4-Pac

- Isolation Voltage: 3000 V~
- Industry convenient outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Backside: DCB ceramic
- Reduced weight
- Advanced power cycling

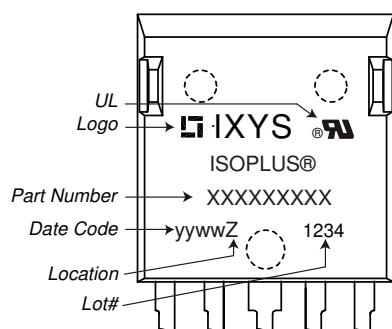
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| Fast Diode        |                                              |                                                                                    |                         | Ratings                  |      |      |      |
|-------------------|----------------------------------------------|------------------------------------------------------------------------------------|-------------------------|--------------------------|------|------|------|
| Symbol            | Definition                                   | Conditions                                                                         |                         | min.                     | typ. | max. | Unit |
| V <sub>RSM</sub>  | max. non-repetitive reverse blocking voltage | T <sub>VJ</sub> = 25°C                                                             |                         |                          |      | 600  | V    |
| V <sub>RRM</sub>  | max. repetitive reverse blocking voltage     | T <sub>VJ</sub> = 25°C                                                             |                         |                          |      | 600  | V    |
| I <sub>R</sub>    | reverse current, drain current               | V <sub>R</sub> = 600 V                                                             | T <sub>VJ</sub> = 25°C  |                          |      | 60   | μA   |
|                   |                                              | V <sub>R</sub> = 600 V                                                             | T <sub>VJ</sub> = 150°C |                          |      | 0.25 | mA   |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 11 A                                                              | T <sub>VJ</sub> = 25°C  |                          |      | 2.13 | V    |
|                   |                                              | I <sub>F</sub> = 22 A                                                              |                         |                          |      | 2.35 | V    |
|                   |                                              | I <sub>F</sub> = 11 A                                                              | T <sub>VJ</sub> = 150°C |                          |      | 1.44 | V    |
|                   |                                              | I <sub>F</sub> = 22 A                                                              |                         |                          |      | 1.71 | V    |
| I <sub>DAV</sub>  | bridge output current                        | T <sub>C</sub> = 115°C<br>rectangular      d = 0.5                                 | T <sub>VJ</sub> = 175°C |                          |      | 22   | A    |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                  |                         | T <sub>VJ</sub> = 175°C  |      | 1.04 | V    |
| r <sub>F</sub>    | slope resistance                             |                                                                                    |                         |                          |      | 24   | mΩ   |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                    |                         |                          |      | 3    | K/W  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                                                    |                         |                          | 0.2  |      | K/W  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                                                              |                         |                          |      | 50   | 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   |      | 50   | A    |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 400 V   f = 1 MHz                                                 |                         | T <sub>VJ</sub> = 25°C   | 6    |      | pF   |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 10 A; V <sub>R</sub> = 300 V<br>-di <sub>F</sub> /dt = 200 A/μs |                         | T <sub>VJ</sub> = 25 °C  | 3.5  |      | A    |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100 °C | 6    |      | A    |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                    |                         | T <sub>VJ</sub> = 25 °C  | 30   |      | ns   |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100 °C | 90   |      | ns   |

| Package i4-Pac |                                                              |                      | Ratings |      |      |      |
|----------------|--------------------------------------------------------------|----------------------|---------|------|------|------|
| Symbol         | Definition                                                   | Conditions           | min.    | typ. | max. | Unit |
| $I_{RMS}$      | RMS current                                                  | per terminal         |         |      | 35   | A    |
| $T_{VJ}$       | virtual junction temperature                                 |                      | -55     |      | 175  | °C   |
| $T_{op}$       | operation temperature                                        |                      | -55     |      | 150  | °C   |
| $T_{stg}$      | storage temperature                                          |                      | -55     |      | 150  | °C   |
| <b>Weight</b>  |                                                              |                      |         | 6    |      | g    |
| $F_c$          | mounting force with clip                                     |                      | 20      |      | 120  | N    |
| $d_{Spp/App}$  | creepage distance on surface / striking distance through air | terminal to terminal | 1.7     |      |      | mm   |
| $d_{Spb/Apb}$  |                                                              | terminal to backside | 5.1     |      |      | mm   |
| $V_{ISOL}$     | isolation voltage                                            | t = 1 second         | 3000    |      |      | V    |
|                |                                                              | t = 1 minute         | 2500    |      |      | V    |

## Product Marking

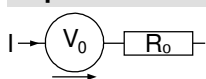


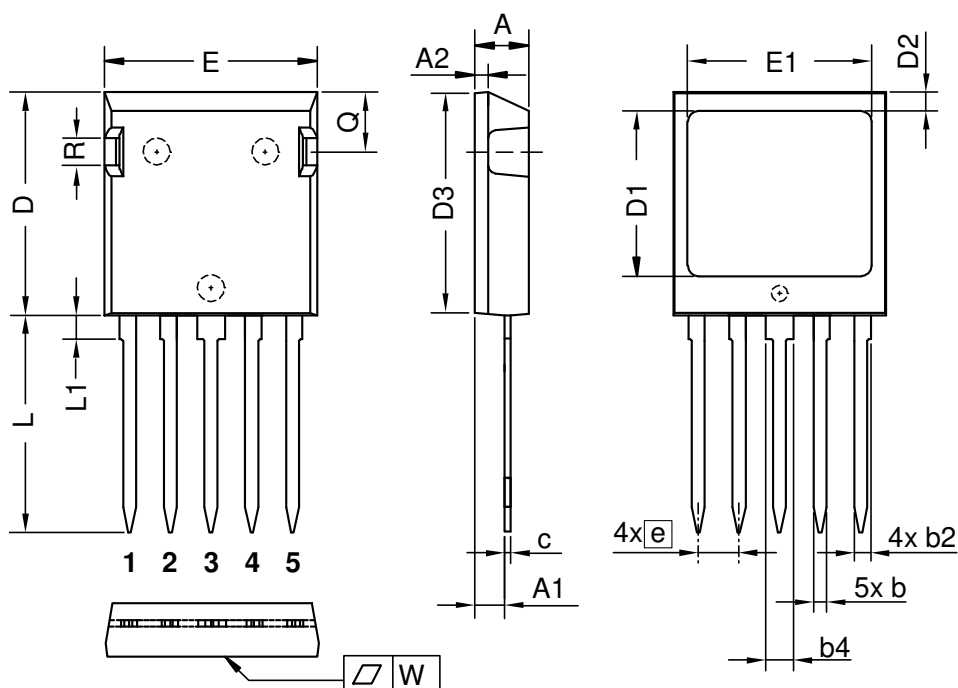
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | FBE22-06N1      | FBE22-06N1         | Tube          | 25       | 484954   |

## Equivalent Circuits for Simulation

\* on die level

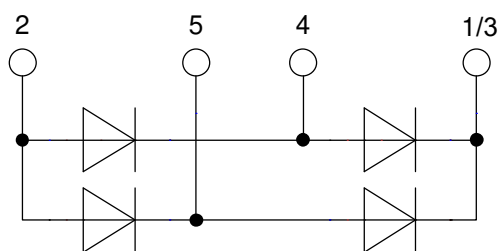
$T_{VJ} = 175^{\circ}\text{C}$

|                                                                                     |                    |      |                   |    |
|-------------------------------------------------------------------------------------|--------------------|------|-------------------|----|
|  |                    |      | <b>Fast Diode</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 1.04 |                   | V  |
| $R_{0\max}$                                                                         | slope resistance * | 21   |                   | mΩ |

**Outlines i4-Pac**


| Dim. | Millimeter |       | Inches    |       |
|------|------------|-------|-----------|-------|
|      | min        | max   | min       | max   |
| A    | 4.83       | 5.21  | 0.190     | 0.205 |
| A1   | 2.59       | 3.00  | 0.102     | 0.118 |
| A2   | 1.17       | 2.16  | 0.046     | 0.085 |
| b    | 1.14       | 1.40  | 0.045     | 0.055 |
| b2   | 1.47       | 1.73  | 0.058     | 0.068 |
| b4   | 2.54       | 2.79  | 0.100     | 0.110 |
| c    | 0.51       | 0.74  | 0.020     | 0.029 |
| D    | 20.80      | 21.34 | 0.819     | 0.840 |
| D1   | 14.99      | 15.75 | 0.590     | 0.620 |
| D2   | 1.65       | 2.03  | 0.065     | 0.080 |
| D3   | 20.30      | 20.70 | 0.799     | 0.815 |
| E    | 19.56      | 20.29 | 0.770     | 0.799 |
| E1   | 16.76      | 17.53 | 0.660     | 0.690 |
| e    | 3.81 BSC   |       | 0.150 BSC |       |
| L    | 19.81      | 21.34 | 0.780     | 0.840 |
| L1   | 2.11       | 2.59  | 0.083     | 0.102 |
| Q    | 5.33       | 6.20  | 0.210     | 0.244 |
| R    | 2.54       | 4.57  | 0.100     | 0.180 |
| W    | -          | 0.10  | -         | 0.004 |

Die konvexe Form des Substrates ist typ. < 0.05 mm über der Kunststoffoberfläche der Bauteilunterseite  
 The convexbow of substrate is typ. < 0.05 mm over plastic surface level of device bottom side



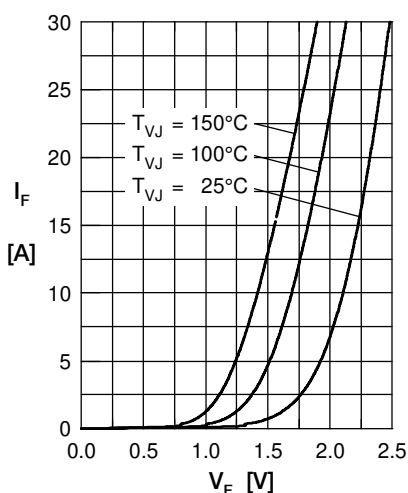
**Fast Diode**


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

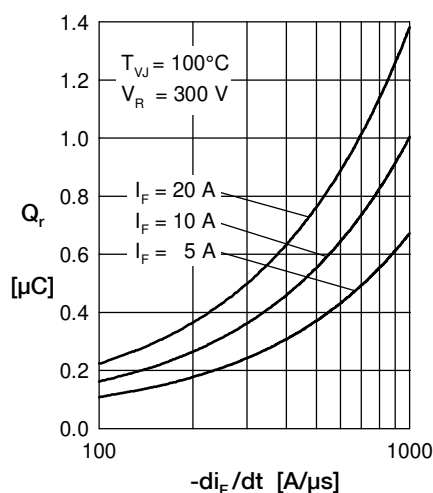


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

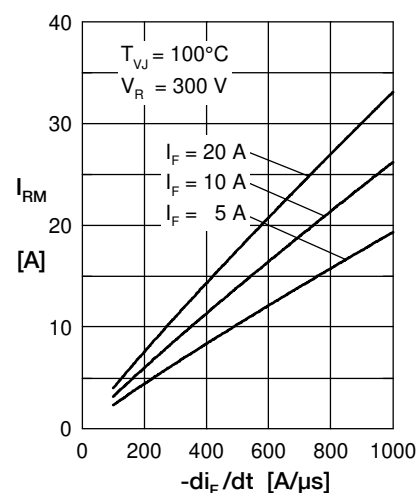


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

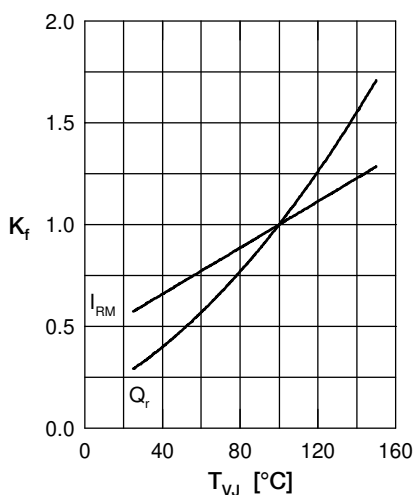


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

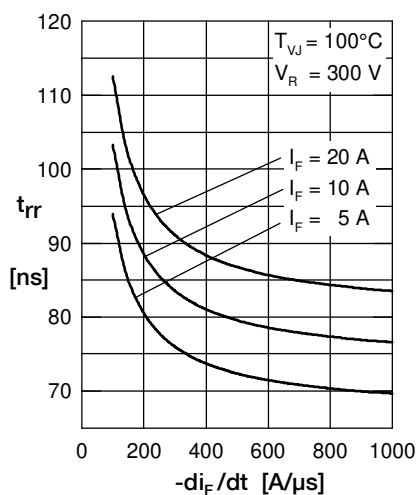


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

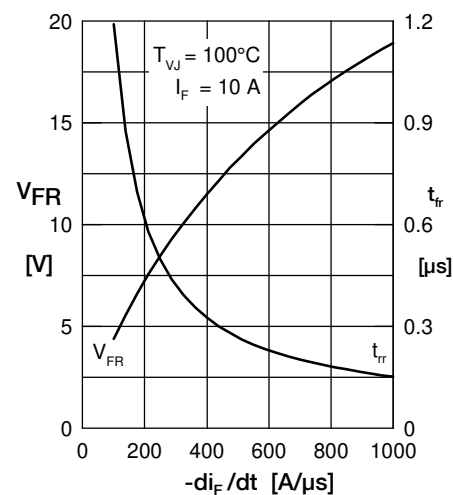


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{rr}$  versus  $di_F/dt$

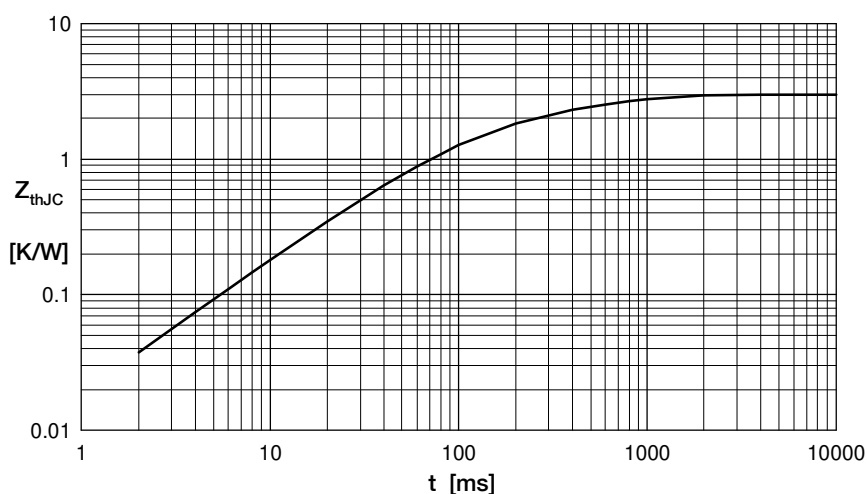


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ [K/W] | $t_i$ [s] |
|---|-----------------|-----------|
| 1 | 1.3590          | 0.1015    |
| 2 | 0.4651          | 0.1026    |
| 3 | 0.8473          | 0.4919    |
| 4 | 0.8473          | 0.6200    |