

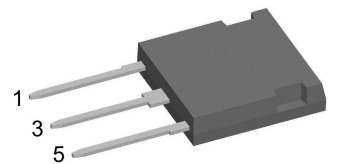
# HiPerFRED

$$\begin{aligned} V_{RRM} &= 2 \times 1200 \text{ V} \\ I_{FAV} &= 60 \text{ A} \\ t_{rr} &= 40 \text{ ns} \end{aligned}$$

High Performance Fast Recovery Diode  
Low Loss and Soft Recovery  
Phase leg

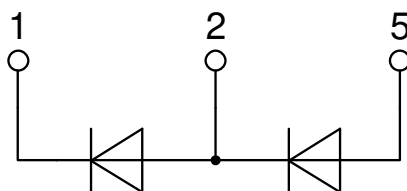
Part number

**DSEE55-24N1F**



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: 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

## Terms and Conditions of Usage

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

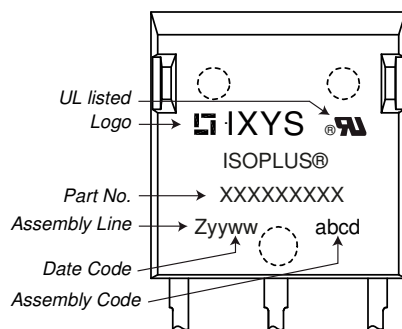
Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

- to perform joint risk and quality assessments;
- the conclusion of quality agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

| Fast Diode |                                              |                                                                                  |                                             | Ratings                        |      |      |      |
|------------|----------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------|--------------------------------|------|------|------|
| Symbol     | Definition                                   | Conditions                                                                       |                                             | min.                           | typ. | max. | Unit |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$                                                    |                                             |                                |      | 1200 | V    |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$                                                    |                                             |                                |      | 1200 | V    |
| $I_R$      | reverse current, drain current               | $V_R = 1200\text{ V}$                                                            | $T_{VJ} = 25^{\circ}\text{C}$               |                                |      | 1    | mA   |
|            |                                              | $V_R = 1200\text{ V}$                                                            | $T_{VJ} = 150^{\circ}\text{C}$              |                                |      | 4    | mA   |
| $V_F$      | forward voltage drop                         | $I_F = 60\text{ A}$                                                              | $T_{VJ} = 25^{\circ}\text{C}$               |                                |      | 2.45 | V    |
|            |                                              | $I_F = 120\text{ A}$                                                             |                                             |                                |      | 2.90 | V    |
|            |                                              | $I_F = 60\text{ A}$                                                              | $T_{VJ} = 150^{\circ}\text{C}$              |                                |      | 1.56 | V    |
|            |                                              | $I_F = 120\text{ A}$                                                             |                                             |                                |      | 2.00 | V    |
| $I_{FAV}$  | average forward current                      | $T_C = 110^{\circ}\text{C}$<br>rectangular                                       | $T_{VJ} = 175^{\circ}\text{C}$<br>$d = 0.5$ |                                |      | 60   | A    |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                                                |                                             | $T_{VJ} = 175^{\circ}\text{C}$ |      | 0.97 | V    |
| $r_F$      | slope resistance                             |                                                                                  |                                             |                                |      | 6.8  | mΩ   |
| $R_{thJC}$ | thermal resistance junction to case          |                                                                                  |                                             |                                |      | 0.6  | K/W  |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                                                  |                                             |                                | 0.20 |      | K/W  |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                                                       |                                             |                                |      | 250  | W    |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}; V_R = 0\text{ V}$               | $T_{VJ} = 45^{\circ}\text{C}$               |                                |      | 800  | A    |
| $C_J$      | junction capacitance                         | $V_R = 600\text{ V}$ $f = 1\text{ MHz}$                                          | $T_{VJ} = 25^{\circ}\text{C}$               |                                | 48   |      | pF   |
| $I_{RM}$   | max. reverse recovery current                | $I_F = 60\text{ A}; V_R = 600\text{ V}$<br>$-di_F/dt = 200\text{ A}/\mu\text{s}$ |                                             | $T_{VJ} = 25^{\circ}\text{C}$  |      | 13   | A    |
|            |                                              |                                                                                  |                                             | $T_{VJ} = 100^{\circ}\text{C}$ |      | 20   | A    |
| $t_{rr}$   | reverse recovery time                        |                                                                                  |                                             | $T_{VJ} = 25^{\circ}\text{C}$  |      | 85   | ns   |
|            |                                              |                                                                                  |                                             | $T_{VJ} = 100^{\circ}\text{C}$ |      | 250  | ns   |

| Package i4-Pac       |                                                              |                      |                                         | Ratings |      |      |      |
|----------------------|--------------------------------------------------------------|----------------------|-----------------------------------------|---------|------|------|------|
| Symbol               | Definition                                                   | Conditions           |                                         | min.    | typ. | max. | Unit |
| I <sub>RMS</sub>     | RMS current                                                  | per terminal         |                                         |         |      | 70   | A    |
| T <sub>VJ</sub>      | virtual junction temperature                                 |                      |                                         | -55     |      | 175  | °C   |
| T <sub>op</sub>      | operation temperature                                        |                      |                                         | -55     |      | 150  | °C   |
| T <sub>stg</sub>     | storage temperature                                          |                      |                                         | -55     |      | 150  | °C   |
| Weight               |                                                              |                      |                                         |         | 9    |      | g    |
| F <sub>C</sub>       | mounting force with clip                                     |                      |                                         | 20      |      | 120  | N    |
| d <sub>Spp/App</sub> | creepage distance on surface / striking distance through air | terminal to terminal |                                         | 5.5     |      |      | mm   |
| d <sub>Spb/Apb</sub> |                                                              | terminal to backside |                                         | 5.1     |      |      | mm   |
| V <sub>ISOL</sub>    | isolation voltage                                            | t = 1 second         | 50/60 Hz, RMS; I <sub>ISOL</sub> ≤ 1 mA | 3000    |      |      | V    |
|                      |                                                              | t = 1 minute         |                                         | 2500    |      |      | V    |

## Product Marking

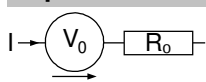


| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSEE55-24N1F    | DSEE55-24N1F       | Tube          | 25       | 488739   |

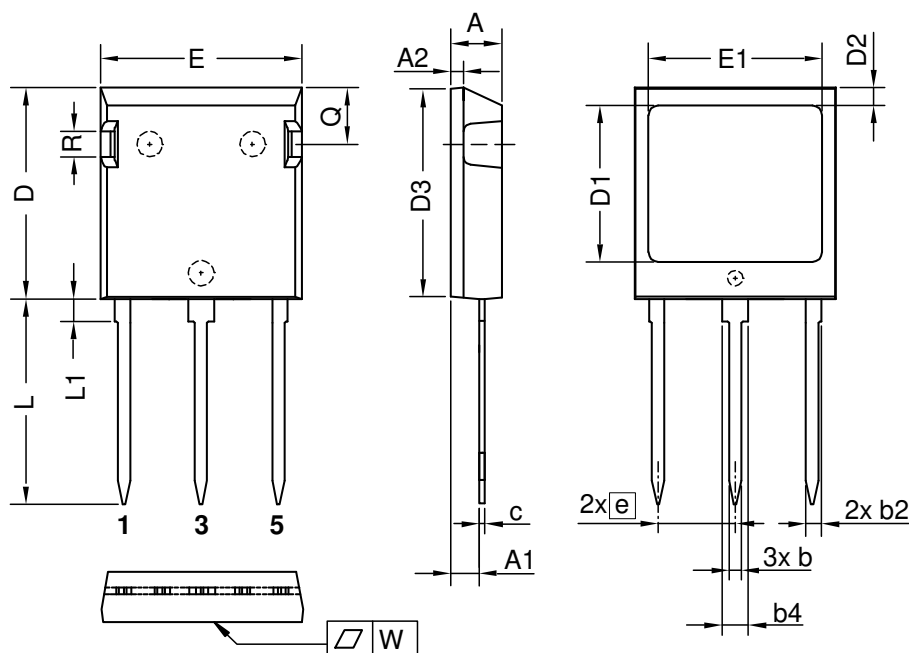
## Equivalent Circuits for Simulation

\* on die level

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

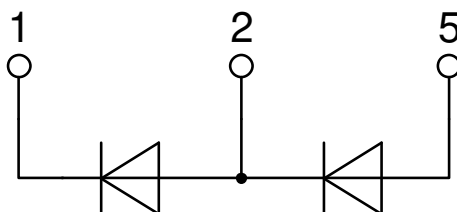
|                                                                                     |                    |                   |    |
|-------------------------------------------------------------------------------------|--------------------|-------------------|----|
|  |                    | <b>Fast Diode</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 0.97              | V  |
| $R_{0\max}$                                                                         | slope resistance * | 4.4               | 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    | 7.62       | BSC   | 0.300  | 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

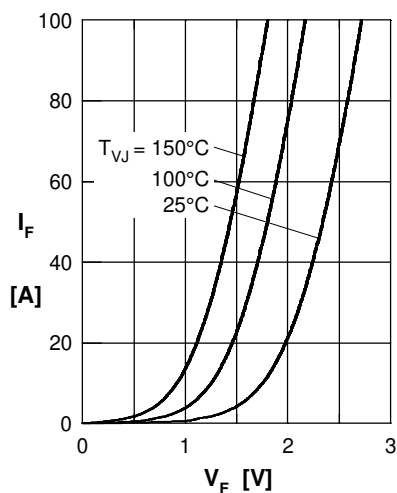


Fig. 1 Forward current  $I_F$  vs.  $V_F$

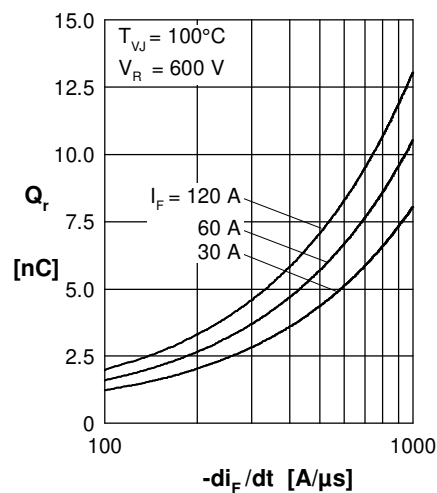


Fig. 2 Typ. reverse recovery charge  $Q_r$  versus  $-di_F/dt$

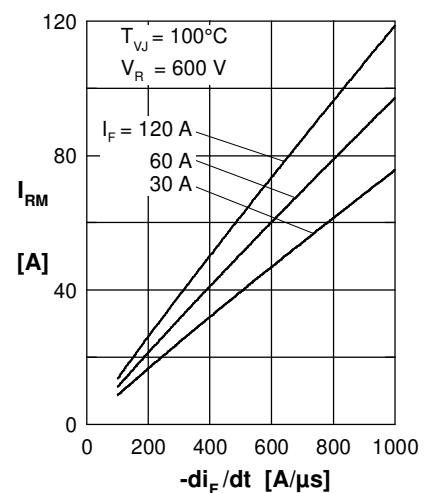


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

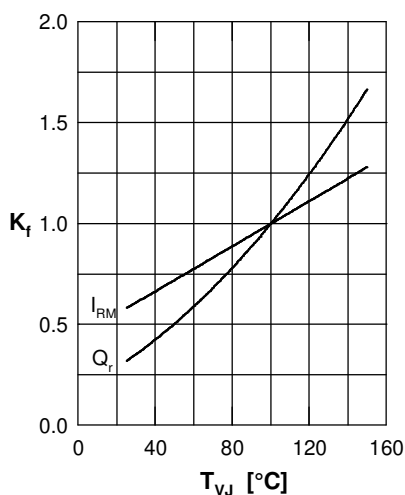


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

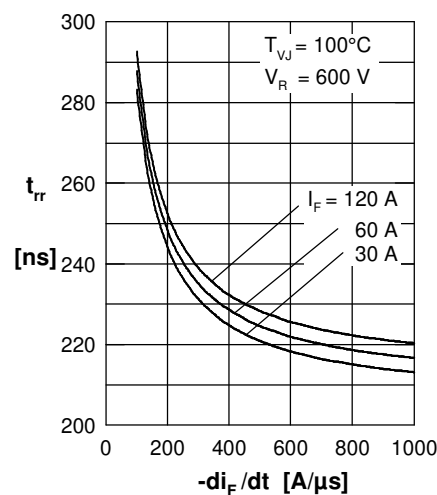


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

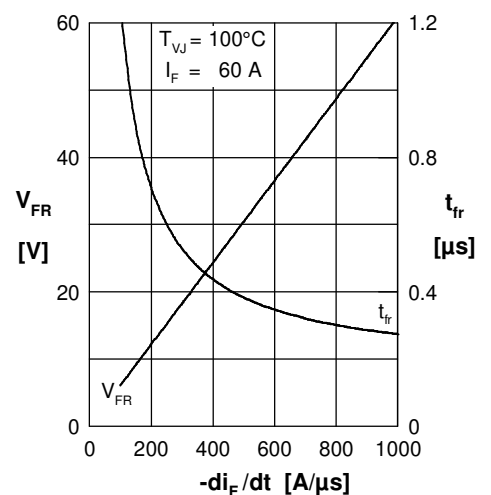


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and typ. forward recovery time  $t_{fr}$  versus  $di_F/dt$

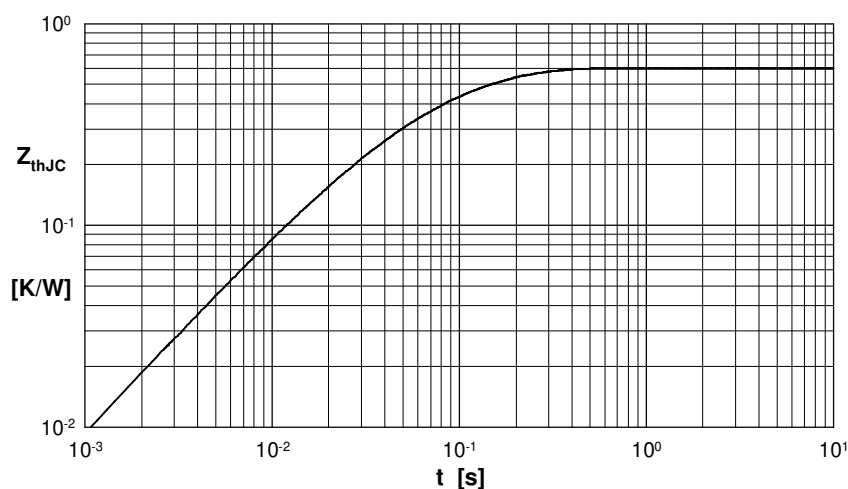


Fig. 7 Transient thermal resistance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.212           | 0.0055    |
| 2 | 0.248           | 0.0092    |
| 3 | 0.063           | 0.0007    |
| 4 | 0.077           | 0.0391    |