

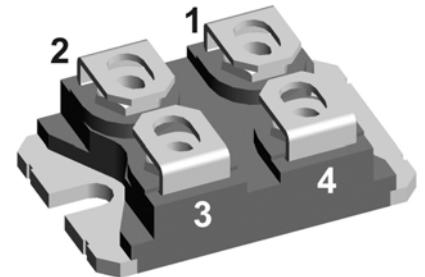
# HiPerFRED

$$\begin{aligned} V_{RRM} &= 300\text{ V} \\ I_{FAV} &= 2 \times 90\text{ A} \\ t_{rr} &= 30\text{ ns} \end{aligned}$$

High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Parallel legs

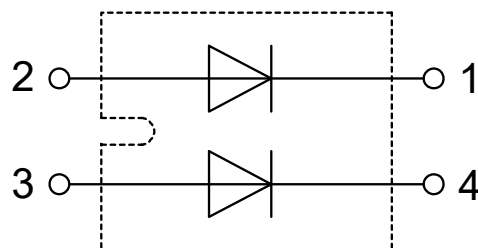
Part number

**DSEP2x91-03A**



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: SOT-227B (minibloc)

- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Base plate: Copper internally DCB isolated
- Advanced power cycling

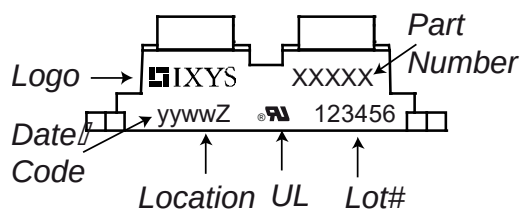
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| Fast Diode        |                                              |                                                   |                         | Ratings                 |      |      |      |
|-------------------|----------------------------------------------|---------------------------------------------------|-------------------------|-------------------------|------|------|------|
| Symbol            | Definition                                   | Conditions                                        |                         | min.                    | typ. | max. | Unit |
| V <sub>RSM</sub>  | max. non-repetitive reverse blocking voltage | T <sub>VJ</sub> = 25°C                            |                         |                         |      | 300  | V    |
| V <sub>RRM</sub>  | max. repetitive reverse blocking voltage     | T <sub>VJ</sub> = 25°C                            |                         |                         |      | 300  | V    |
| I <sub>R</sub>    | reverse current, drain current               | V <sub>R</sub> = 300 V                            | T <sub>VJ</sub> = 25°C  |                         |      | 1    | mA   |
|                   |                                              | V <sub>R</sub> = 300 V                            | T <sub>VJ</sub> = 150°C |                         |      | 4    | mA   |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 90 A                             | T <sub>VJ</sub> = 25°C  |                         |      | 1,54 | V    |
|                   |                                              | I <sub>F</sub> = 180 A                            |                         |                         |      | 1,86 | V    |
|                   |                                              | I <sub>F</sub> = 90 A                             | T <sub>VJ</sub> = 150°C |                         |      | 1,10 | V    |
|                   |                                              | I <sub>F</sub> = 180 A                            |                         |                         |      | 1,44 | V    |
| I <sub>FAV</sub>  | average forward current                      | T <sub>C</sub> = 75°C<br>rectangular      d = 0.5 | T <sub>VJ</sub> = 150°C |                         |      | 90   | A    |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                 |                         | T <sub>VJ</sub> = 150°C |      | 0,77 | V    |
| r <sub>F</sub>    | slope resistance                             |                                                   |                         |                         |      | 3,7  | mΩ   |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                   |                         |                         |      | 0,6  | K/W  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                   |                         |                         | 0,1  |      | K/W  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                             |                         |                         |      | 200  | 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  |      | 1,00 | kA   |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 150 V   f = 1 MHz                |                         | T <sub>VJ</sub> = 25°C  |      | 273  | pF   |
| I <sub>RM</sub>   | max. reverse recovery current                | I <sub>F</sub> = 90 A; V <sub>R</sub> = 150 V     |                         | T <sub>VJ</sub> = 25°C  |      | 12   | A    |
|                   |                                              |                                                   |                         | T <sub>VJ</sub> = 100°C |      | 15   | A    |
| t <sub>rr</sub>   | reverse recovery time                        | -di <sub>F</sub> /dt = 600 A/μs                   |                         | T <sub>VJ</sub> = 25°C  |      | 40   | ns   |
|                   |                                              |                                                   |                         | T <sub>VJ</sub> = 100°C |      | 60   | ns   |

| Package SOT-227B (minibloc) |                                                              |                      |                                         | Ratings |      |      |      |   |
|-----------------------------|--------------------------------------------------------------|----------------------|-----------------------------------------|---------|------|------|------|---|
| Symbol                      | Definition                                                   | Conditions           |                                         | min.    | typ. | max. | Unit |   |
| I <sub>RMS</sub>            | RMS current                                                  | per terminal         |                                         |         |      | 100  | A    |   |
| T <sub>VJ</sub>             | virtual junction temperature                                 |                      |                                         | -40     |      | 150  | °C   |   |
| T <sub>op</sub>             | operation temperature                                        |                      |                                         | -40     |      | 125  | °C   |   |
| T <sub>stg</sub>            | storage temperature                                          |                      |                                         | -40     |      | 150  | °C   |   |
| Weight                      |                                                              |                      |                                         |         | 30   |      | g    |   |
| M <sub>D</sub>              | mounting torque                                              |                      |                                         | 1,1     |      | 1,5  | Nm   |   |
| M <sub>T</sub>              | terminal torque                                              |                      |                                         | 1,1     |      | 1,5  | Nm   |   |
| d <sub>Spp/App</sub>        | creepage distance on surface   striking distance through air | terminal to terminal | 10,5                                    | 3,2     |      |      | mm   |   |
| d <sub>Spb/Apb</sub>        |                                                              | terminal to backside | 8,6                                     | 6,8     |      |      | 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

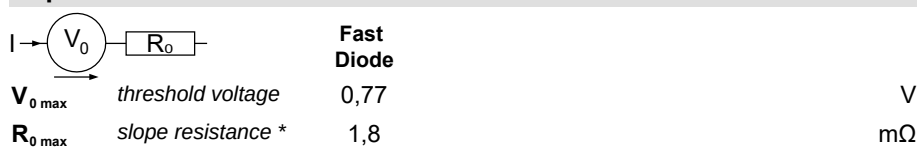


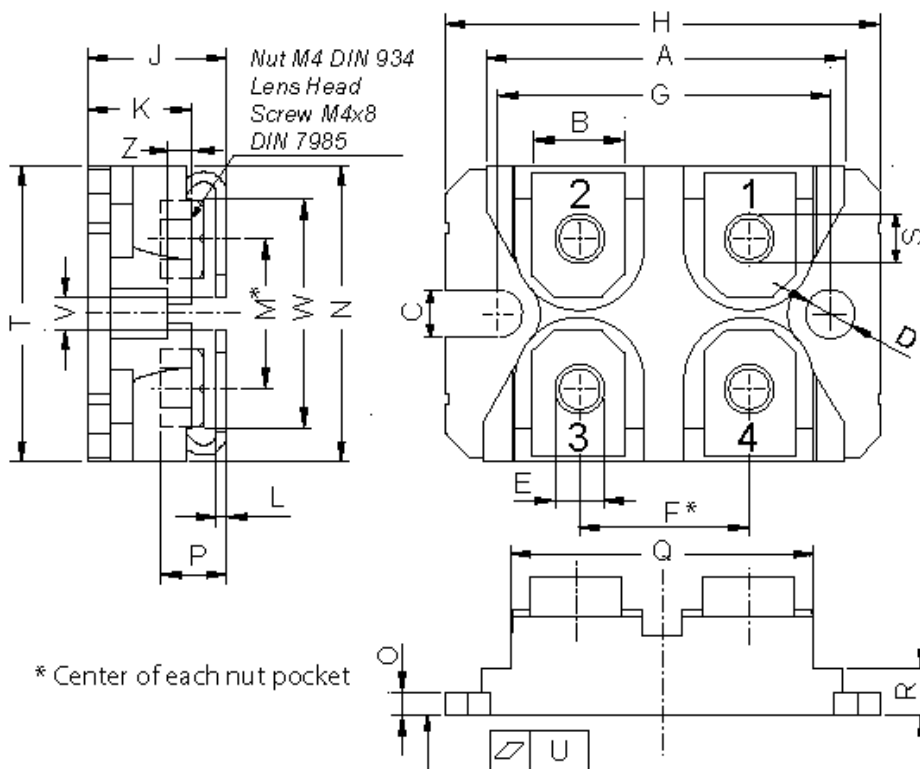
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSEP2x91-03A    | DSEP2x91-03A       | Tube          | 10       | 476269   |

### Equivalent Circuits for Simulation

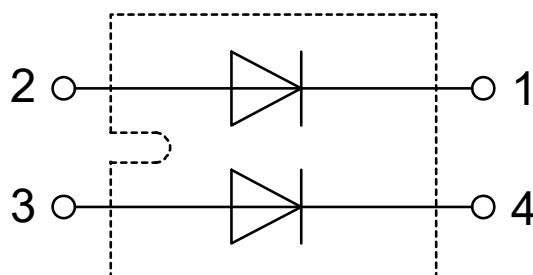
\* on die level

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



**Outlines SOT-227B (minibloc)**


| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | min        | max   | min    | max   |
| A    | 31.50      | 31.88 | 1.240  | 1.255 |
| B    | 7.80       | 8.20  | 0.307  | 0.323 |
| C    | 4.09       | 4.29  | 0.161  | 0.169 |
| D    | 4.09       | 4.29  | 0.161  | 0.169 |
| E    | 4.09       | 4.29  | 0.161  | 0.169 |
| F    | 14.91      | 15.11 | 0.587  | 0.595 |
| G    | 30.12      | 30.30 | 1.186  | 1.193 |
| H    | 37.80      | 38.23 | 1.488  | 1.505 |
| J    | 11.68      | 12.22 | 0.460  | 0.481 |
| K    | 8.92       | 9.60  | 0.351  | 0.378 |
| L    | 0.74       | 0.84  | 0.029  | 0.033 |
| M    | 12.50      | 13.10 | 0.492  | 0.516 |
| N    | 25.15      | 25.42 | 0.990  | 1.001 |
| O    | 1.95       | 2.13  | 0.077  | 0.084 |
| P    | 4.95       | 6.20  | 0.195  | 0.244 |
| Q    | 26.54      | 26.90 | 1.045  | 1.059 |
| R    | 3.94       | 4.42  | 0.155  | 0.167 |
| S    | 4.55       | 4.85  | 0.179  | 0.191 |
| T    | 24.59      | 25.25 | 0.968  | 0.994 |
| U    | -0.05      | 0.10  | -0.002 | 0.004 |
| V    | 3.20       | 5.50  | 0.126  | 0.217 |
| W    | 19.81      | 21.08 | 0.780  | 0.830 |
| Z    | 2.50       | 2.70  | 0.098  | 0.106 |



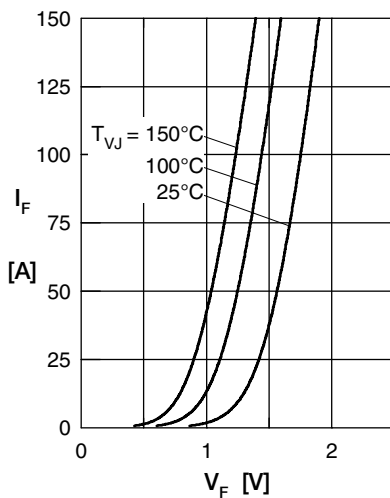
**Fast Diode**


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

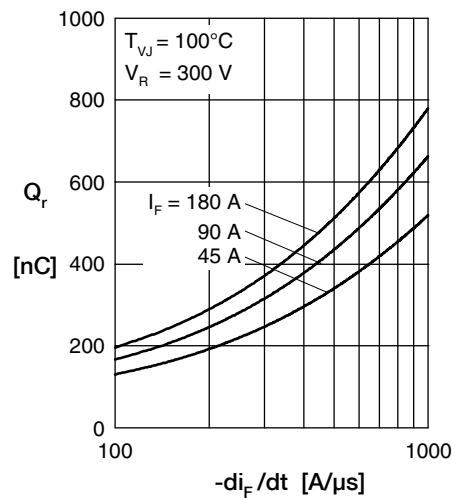


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

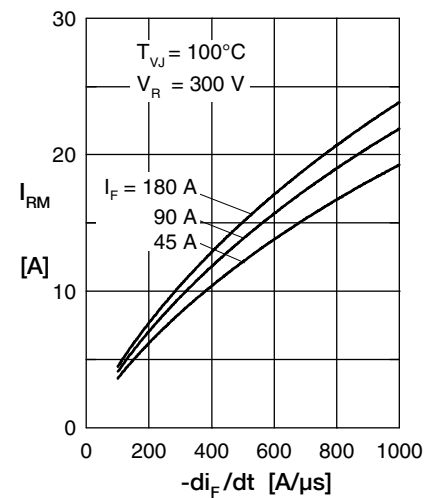


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

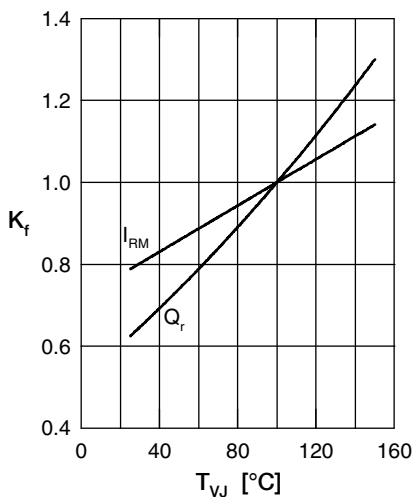


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

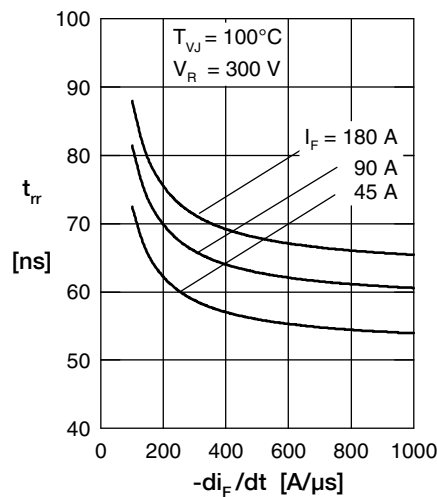


Fig. 5 Recovery time  $t_{rr}$  versus  $-di_F/dt$

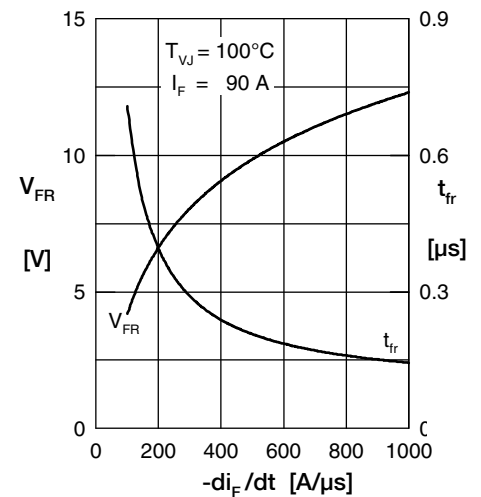


Fig. 6 Peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

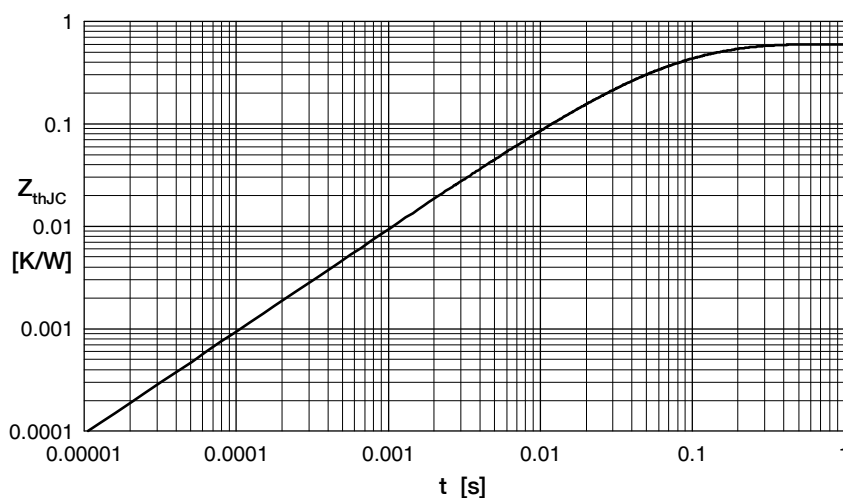


Fig. 7 Transient thermal resistance junction to case

Constants for  $Z_{thJC}$  calculation:

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