

# HiPerFRED

$$\begin{aligned} V_{RRM} &= 600V \\ I_{FAV} &= 2 \times 60A \\ t_{rr} &= 35ns \end{aligned}$$

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

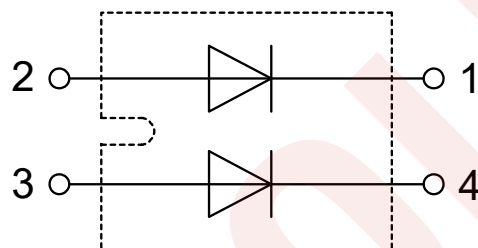
Part number

**DSEP2x61-06A**



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

## Disclaimer Notice

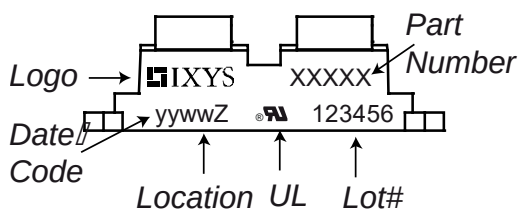
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| Fast Diode |                                              |                                                                              |                                | Ratings                        |      |      |               |  |
|------------|----------------------------------------------|------------------------------------------------------------------------------|--------------------------------|--------------------------------|------|------|---------------|--|
| 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               | $V_R = 600\text{ V}$                                                         | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 650  | $\mu\text{A}$ |  |
|            |                                              | $V_R = 600\text{ V}$                                                         | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 2,5  | mA            |  |
| $V_F$      | forward voltage drop                         | $I_F = 60\text{ A}$                                                          | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 2,01 | V             |  |
|            |                                              | $I_F = 120\text{ A}$                                                         |                                |                                |      | 2,27 | V             |  |
|            |                                              | $I_F = 60\text{ A}$                                                          | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 1,35 | V             |  |
|            |                                              | $I_F = 120\text{ A}$                                                         |                                |                                |      | 1,63 | V             |  |
| $I_{FAV}$  | average forward current                      | $T_C = 70^{\circ}\text{C}$                                                   | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 60   | A             |  |
|            |                                              | rectangular                                                                  | d = 0.5                        |                                |      |      |               |  |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                                            |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 1,09 | V             |  |
| $r_F$      | slope resistance                             |                                                                              |                                |                                |      | 4,3  | m $\Omega$    |  |
| $R_{thJC}$ | thermal resistance junction to case          |                                                                              |                                |                                |      | 0,85 | K/W           |  |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                                              |                                |                                | 0,1  |      | K/W           |  |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                                                   |                                |                                |      | 140  | W             |  |
| $I_{FSM}$  | max. forward surge current                   | t = 10 ms; (50 Hz), sine; $V_R = 0\text{ V}$                                 |                                | $T_{VJ} = 45^{\circ}\text{C}$  |      | 600  | A             |  |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}$ f = 1 MHz                                               |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 67   |      | pF            |  |
| $I_{RM}$   | max. reverse recovery current                | } $I_F = 60\text{ A}; V_R = 300\text{ V}$<br>-di <sub>F</sub> /dt = 200 A/μs |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 8    |      | A             |  |
|            |                                              |                                                                              |                                | $T_{VJ} = 100^{\circ}\text{C}$ | 13   |      | A             |  |
| $t_{rr}$   | reverse recovery time                        |                                                                              |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 35   |      | ns            |  |
|            |                                              |                                                                              |                                | $T_{VJ} = 100^{\circ}\text{C}$ | 110  |      | ns            |  |

| Package SOT-227B (minibloc) |                                                              |                      |                                     | 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     |      | 150  | °C   |
| <b>Weight</b>               |                                                              |                      |                                     |         | 30   |      | g    |
| $M_D$                       | mounting torque                                              |                      |                                     | 1,1     |      | 1,5  | Nm   |
| $M_T$                       | terminal torque                                              |                      |                                     | 1,1     |      | 1,5  | Nm   |
| $d_{Spp/App}$               | creepage distance on surface   striking distance through air | terminal to terminal | 10,5                                | 3,2     |      |      | mm   |
| $d_{Spb/Apb}$               |                                                              | terminal to backside | 8,6                                 | 6,8     |      |      | mm   |
| $V_{ISOL}$                  | isolation voltage                                            | t = 1 second         |                                     | 3000    |      |      | V    |
|                             |                                                              | t = 1 minute         | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 2500    |      |      | V    |

### Product Marking

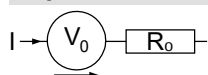


| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSEP2x61-06A    | DSEP2x61-06A       | Tube          | 10       | 474754   |

### Equivalent Circuits for Simulation

\* on die level

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



**Fast Diode**

$V_{0\max}$  threshold voltage

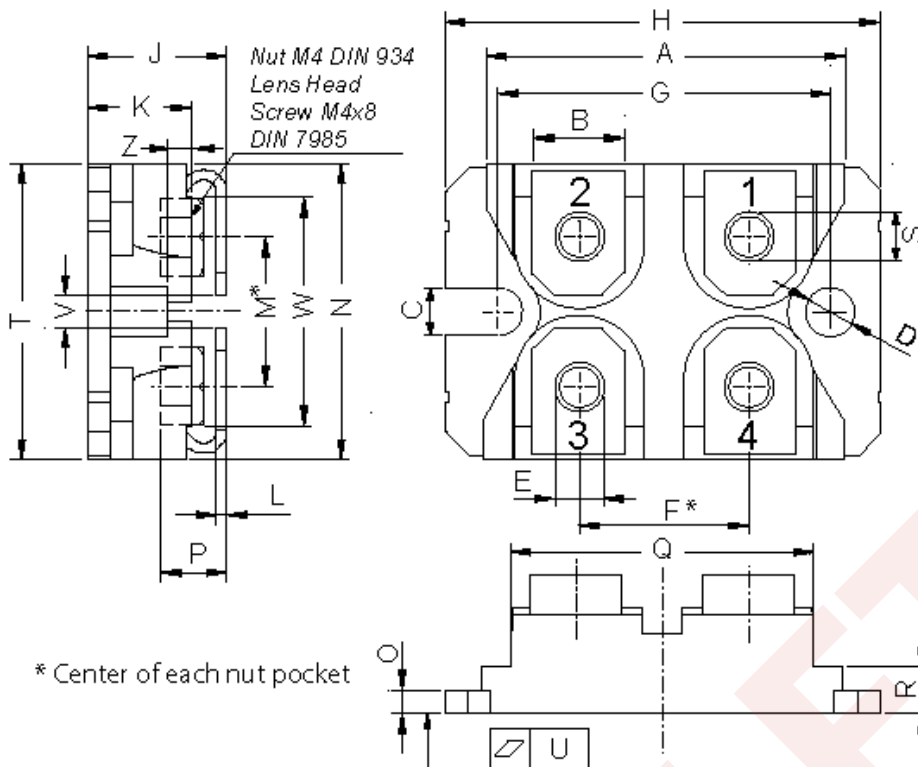
1,09

V

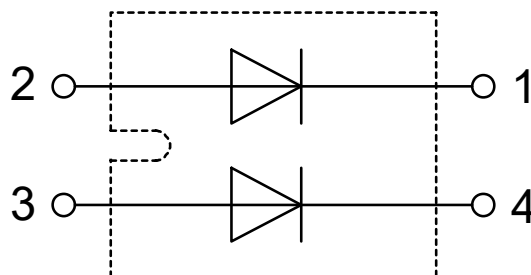
$R_{0\max}$  slope resistance \*

2,4

mΩ

**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 |



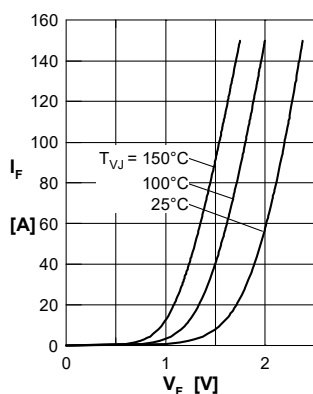
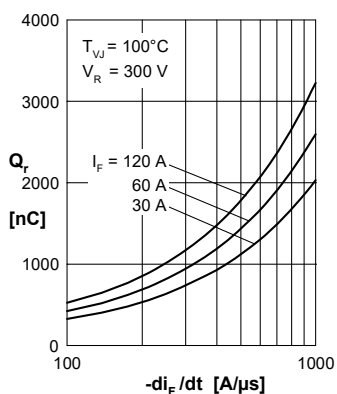
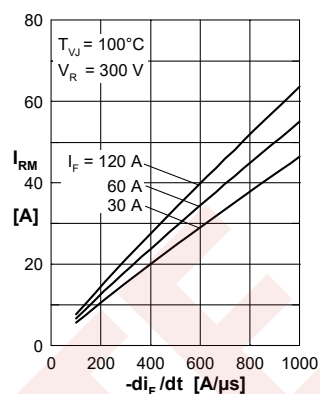
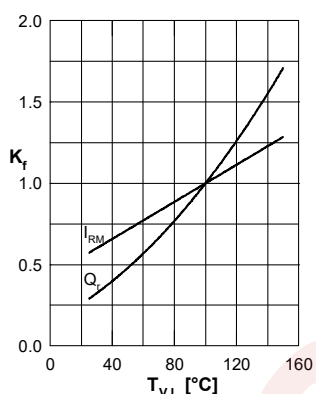
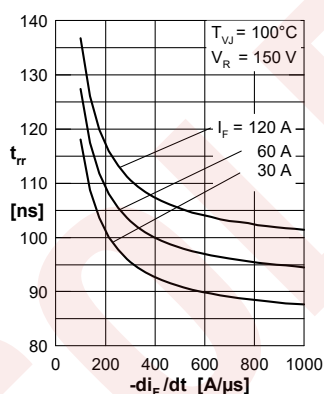
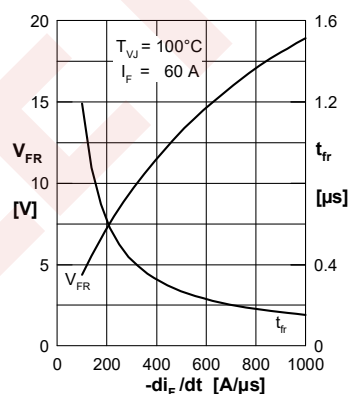
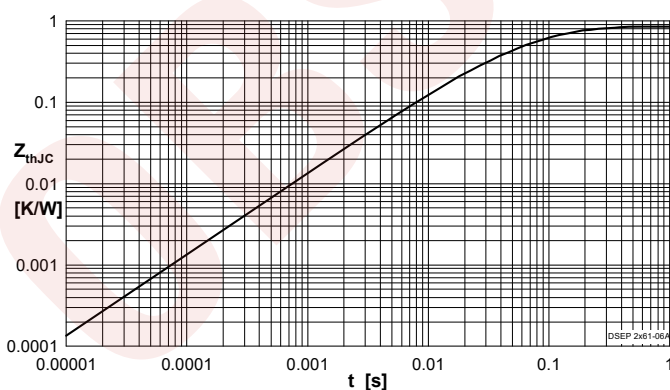
**Fast Diode**

 Fig. 1 Forward current  $I_F$  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 | 0.3073          | 0.0055    |
| 2 | 0.3533          | 0.0092    |
| 3 | 0.0887          | 0.0007    |
| 4 | 0.1008          | 0.0399    |