



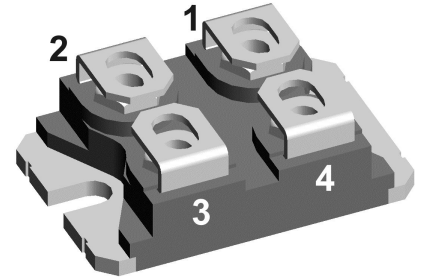
# FRED

$V_{RRM} = 400\text{ V}$   
 $I_{FAV} = 2 \times 60\text{ A}$   
 $t_{rr} = 35\text{ ns}$

Fast Recovery Epitaxial Diode  
 Low Loss and Soft Recovery  
 Anti-parallel legs

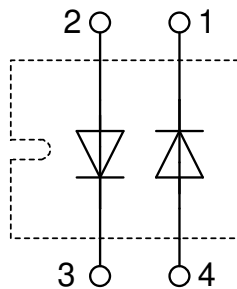
Part number

**DSEI2x60-04C**



Backside: isolated

E72873



### Features / Advantages:

- Planar passivated chips
- 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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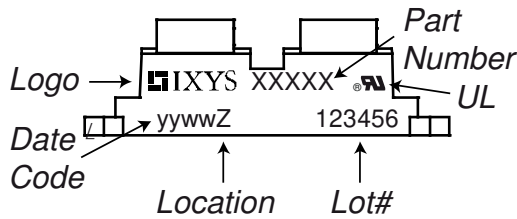


| Fast Diode |  |  |                              | Ratings                      |      |      |               |
|------------|--|--|------------------------------|------------------------------|------|------|---------------|
| Symbol     | Definition                                   | Conditions   |                              | min.                         | typ. | max. | Unit          |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage |  |                              |                              |      | 400  | V             |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     |  |                              |                              |      | 400  | V             |
| $I_R$      | reverse current, drain current               | $V_R = 400\text{ V}$   | $T_{VJ} = 25^\circ\text{C}$  |                              |      | 200  | $\mu\text{A}$ |
|            |  | $V_R = 320\text{ V}$   | $T_{VJ} = 125^\circ\text{C}$ |                              |      | 14   | mA            |
| $V_F$      | forward voltage drop                         | $I_F = 60\text{ A}$  | $T_{VJ} = 25^\circ\text{C}$  |                              |      | 1.72 | V             |
|            |  | $I_F = 120\text{ A}$   |                              |                              |      | 1.96 | V             |
|            |  | $I_F = 60\text{ A}$  | $T_{VJ} = 150^\circ\text{C}$ |                              |      | 1.47 | V             |
|            |  | $I_F = 120\text{ A}$   |                              |                              |      | 1.80 | V             |
| $I_{FAV}$  | average forward current                      | $T_C = 75^\circ\text{C}$<br>rectangular $d = 0.5$                  | $T_{VJ} = 150^\circ\text{C}$ |                              |      | 60   | A             |
| $V_{FO}$   | threshold voltage                            | } for power loss calculation only                                  |                              |                              |      | 1.16 | V             |
| $r_F$      | slope resistance                             |  |                              |                              |      | 5.1  | m $\Omega$    |
| $R_{thJC}$ | thermal resistance junction to case          |  |                              |                              |      | 0.7  | K/W           |
| $R_{thCH}$ | thermal resistance case to heatsink          |  |                              |                              | 0.10 |      | K/W           |
| $P_{tot}$  | total power dissipation                      |  |                              | $T_C = 25^\circ\text{C}$     |      | 180  | W             |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}; V_R = 0\text{ V}$ |                              | $T_{VJ} = 45^\circ\text{C}$  |      | 550  | A             |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}$ $f = 1\text{ MHz}$                            |                              | $T_{VJ} = 25^\circ\text{C}$  |      | 60   | pF            |
| $I_{RM}$   | max. reverse recovery current                | } $I_F = 60\text{ A}; V_R = 350\text{ V}$                          |                              | $T_{VJ} = 25^\circ\text{C}$  |      | 10   | A             |
|            |  |  |                              | $T_{VJ} = 100^\circ\text{C}$ |      | 16   | A             |
| $t_{rr}$   | reverse recovery time                        | } $-di_F/dt = 400\text{ A}/\mu\text{s}$                            |                              | $T_{VJ} = 25^\circ\text{C}$  |      | 100  | ns            |
|            |  |  |                              | $T_{VJ} = 100^\circ\text{C}$ |      | 180  | ns            |



| Package SOT-227B (minibloc) |  |                      |                                     | Ratings |      |      |  |
|-----------------------------|--|----------------------|-------------------------------------|---------|------|------|--|
| Symbol                      | Definition   | Conditions           | min.                                | typ.    | max. | Unit |  |
| $I_{RMS}$                   | RMS current  | per terminal         |                                     |         | 150  | 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 | DSEI2x60-04C    | DSEI2x60-04C       | Tube          | 10       | 512461   |

| Similar Part | Package             | Voltage class |
|--------------|---------------------|---------------|
| DSEI2x61-04C | SOT-227B (minibloc) | 400           |

**Equivalent Circuits for Simulation**

\* on die level

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



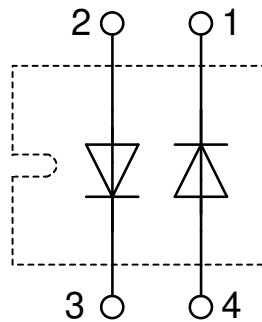
| Symbol       | Definition         | Value | Unit |
|--------------|--------------------|-------|------|
| $V_{0\ max}$ | threshold voltage  | 1.16  | V    |
| $R_{0\ max}$ | slope resistance * | 3.3   | mΩ   |



**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 |



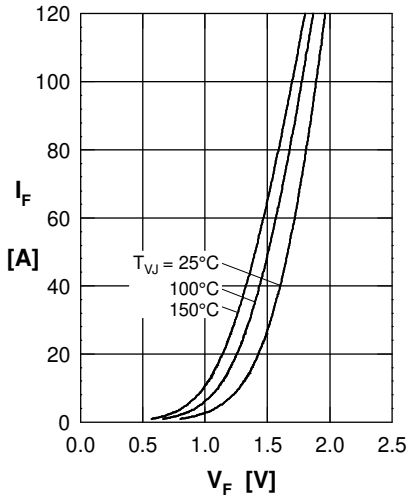
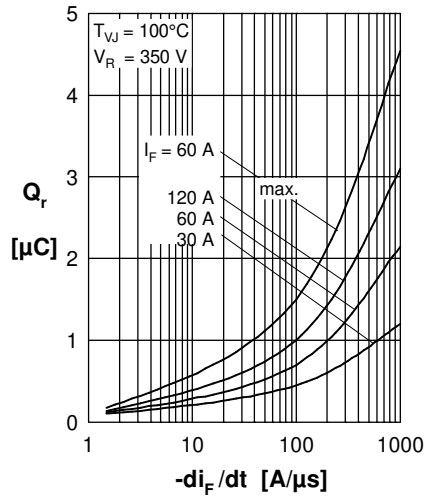
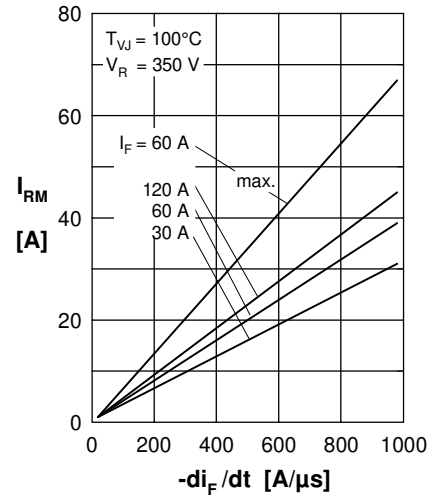
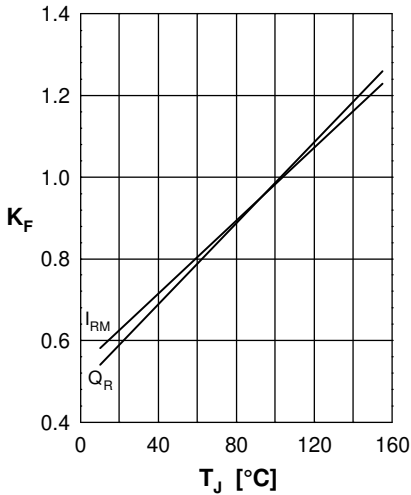
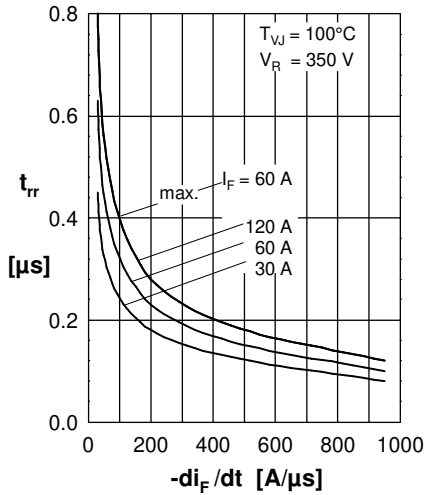
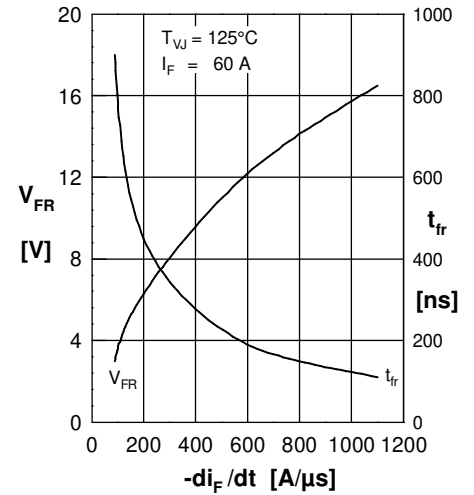
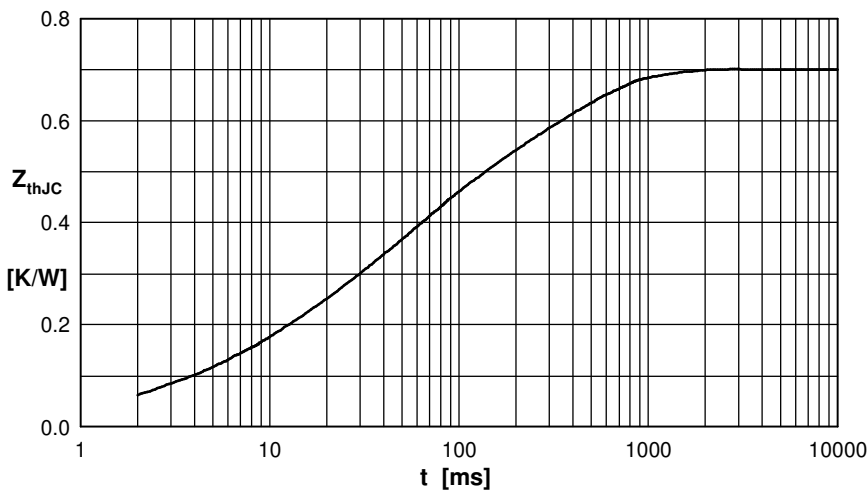
**Fast Diode**

 Fig. 1 Forward current  $I_F$  versus max. forward voltage drop  $V_F$ 

 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  $T_J$ 

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

 Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{tr}$  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 | 0.120           | 0.010     |
| 2 | 0.045           | 0.002     |
| 3 | 0.105           | 0.050     |
| 4 | 0.160           | 0.050     |
| 5 | 0.270           | 0.350     |