

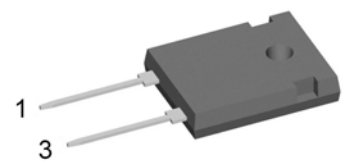
# HiPerFRED

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

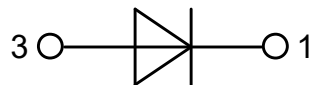
High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Single Diode

Part number

**DSEP60-06A**



Backside: cathode



## 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: TO-247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

## Disclaimer Notice

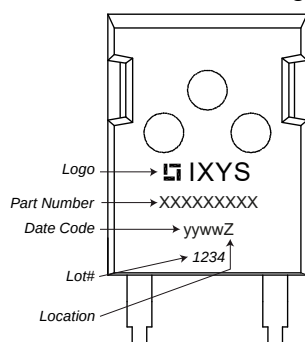
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| Fast Diode        |                                              |                                                                                    |                         | Ratings                 |      |      |      |
|-------------------|----------------------------------------------|------------------------------------------------------------------------------------|-------------------------|-------------------------|------|------|------|
| 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  |                         |      | 650  | μA   |
|                   |                                              | V <sub>R</sub> = 600 V                                                             | T <sub>VJ</sub> = 150°C |                         |      | 2,5  | mA   |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 60 A                                                              | T <sub>VJ</sub> = 25°C  |                         |      | 2,04 | V    |
|                   |                                              | I <sub>F</sub> = 120 A                                                             |                         |                         |      | 2,33 | V    |
|                   |                                              | I <sub>F</sub> = 60 A                                                              | T <sub>VJ</sub> = 150°C |                         |      | 1,39 | V    |
|                   |                                              | I <sub>F</sub> = 120 A                                                             |                         |                         |      | 1,70 | V    |
| I <sub>FAV</sub>  | average forward current                      | T <sub>C</sub> = 130°C<br>rectangular      d = 0.5                                 | T <sub>VJ</sub> = 175°C |                         |      | 60   | A    |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                  |                         | T <sub>VJ</sub> = 175°C |      | 0,95 | V    |
| r <sub>F</sub>    | slope resistance                             |                                                                                    |                         |                         |      | 5    | mΩ   |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                    |                         |                         |      | 0,45 | K/W  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                                                    |                         |                         | 0,25 |      | K/W  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                                                              |                         |                         |      | 330  | 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  |      | 600  | A    |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 400V   f = 1 MHz                                                  |                         | T <sub>VJ</sub> = 25°C  | 67   |      | pF   |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 60 A; V <sub>R</sub> = 300 V<br>-di <sub>F</sub> /dt = 200 A/μs |                         | T <sub>VJ</sub> = 25°C  | 8    |      | A    |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                    |                         | T <sub>VJ</sub> = 100°C | 13   |      | A    |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 25°C  | 35   |      | ns   |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100°C | 110  |      | ns   |

| Package TO-247 |                              |              | Ratings |      |      |      |
|----------------|------------------------------|--------------|---------|------|------|------|
| Symbol         | Definition                   | Conditions   | min.    | typ. | max. | Unit |
| $I_{RMS}$      | RMS current                  | per terminal |         |      | 70   | A    |
| $T_{VJ}$       | virtual junction temperature |              | -55     |      | 175  | °C   |
| $T_{op}$       | operation temperature        |              | -55     |      | 150  | °C   |
| $T_{stg}$      | storage temperature          |              | -55     |      | 150  | °C   |
| Weight         |                              |              |         | 6    |      | g    |
| $M_D$          | mounting torque              |              | 0,8     |      | 1,2  | Nm   |
| $F_C$          | mounting force with clip     |              | 20      |      | 120  | N    |

### Product Marking



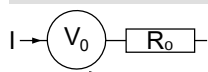
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSEP60-06A      | DSEP60-06A         | Tube          | 30       | 474827   |

| Similar Part | Package              | Voltage class |
|--------------|----------------------|---------------|
| DSEP60-06AT  | TO-268AA (D3Pak) (2) | 600           |
| DHG60I600HA  | TO-247AD (2)         | 600           |
| DPH30IS600HI | ISOPLUS247 (2)       | 600           |

### Equivalent Circuits for Simulation

\* on die level

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



**Fast Diode**

$V_{0 \max}$  threshold voltage

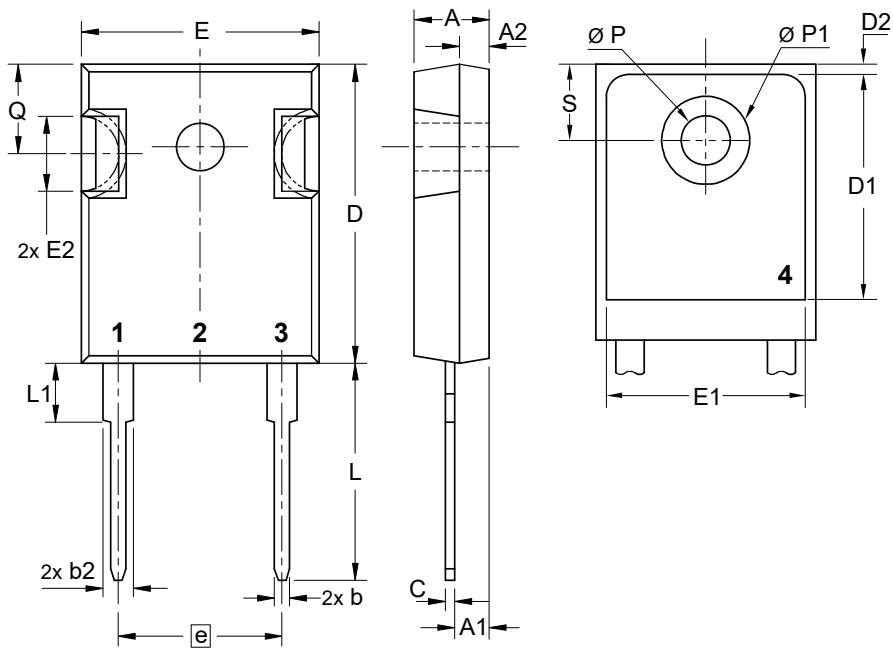
0,95

V

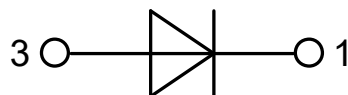
$R_{0 \max}$  slope resistance \*

2,4

mΩ

**Outlines TO-247**


| Sym. | Inches |       | Millimeter |       |
|------|--------|-------|------------|-------|
|      | min.   | max.  | min.       | max.  |
| A    | 0.185  | 0.209 | 4.70       | 5.30  |
| A1   | 0.087  | 0.102 | 2.21       | 2.59  |
| A2   | 0.059  | 0.098 | 1.50       | 2.49  |
| D    | 0.819  | 0.845 | 20.79      | 21.45 |
| E    | 0.610  | 0.640 | 15.48      | 16.24 |
| E2   | 0.170  | 0.216 | 4.31       | 5.48  |
| e    | 0.430  | BSC   | 10.92      | BSC   |
| L    | 0.780  | 0.800 | 19.80      | 20.30 |
| L1   | -      | 0.177 | -          | 4.49  |
| Ø P  | 0.140  | 0.144 | 3.55       | 3.65  |
| Q    | 0.212  | 0.244 | 5.38       | 6.19  |
| S    | 0.242  | BSC   | 6.14       | BSC   |
| b    | 0.039  | 0.055 | 0.99       | 1.40  |
| b2   | 0.065  | 0.094 | 1.65       | 2.39  |
| b4   | 0.102  | 0.135 | 2.59       | 3.43  |
| c    | 0.015  | 0.035 | 0.38       | 0.89  |
| D1   | 0.515  | -     | 13.07      | -     |
| D2   | 0.020  | 0.053 | 0.51       | 1.35  |
| E1   | 0.530  | -     | 13.45      | -     |
| Ø P1 | -      | 0.29  | -          | 7.39  |



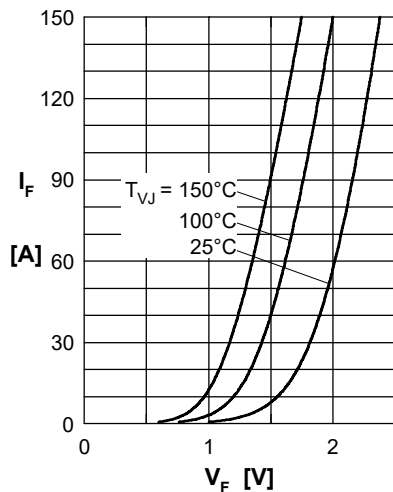
**Fast Diode**


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

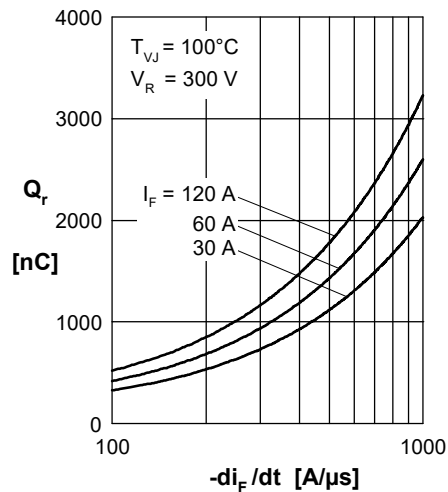


Fig. 2 Typ. reverse recov. charge  
 $Q_r$  versus  $-di_F/dt$

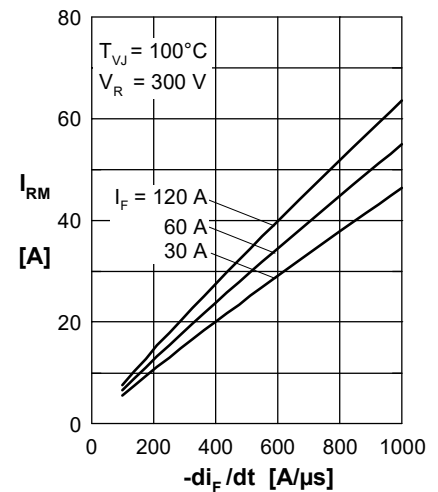


Fig. 3 Typ. peak reverse current  
 $I_{RM}$  versus  $-di_F/dt$

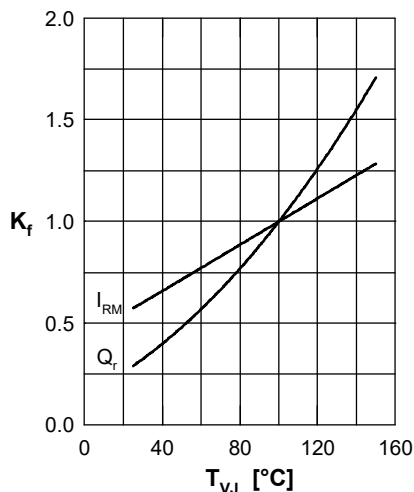


Fig. 4 Typ. dynamic parameters  
 $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

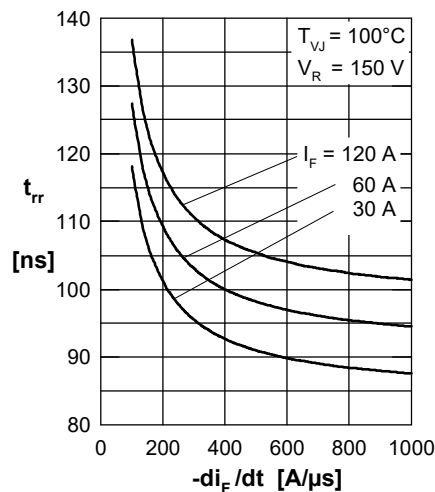


Fig. 5 Typ. recovery time  
 $t_{rr}$  versus  $-di_F/dt$

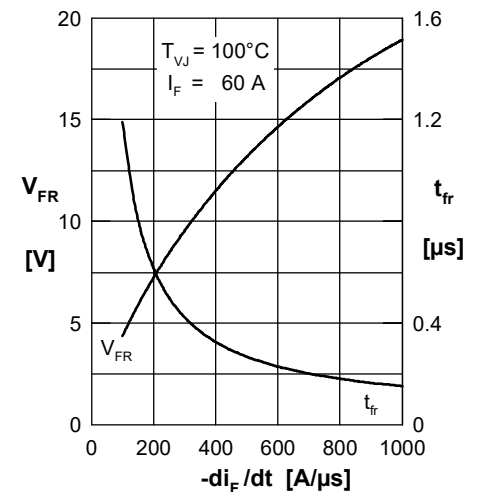


Fig. 6 Typ. peak forward voltage  
 $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

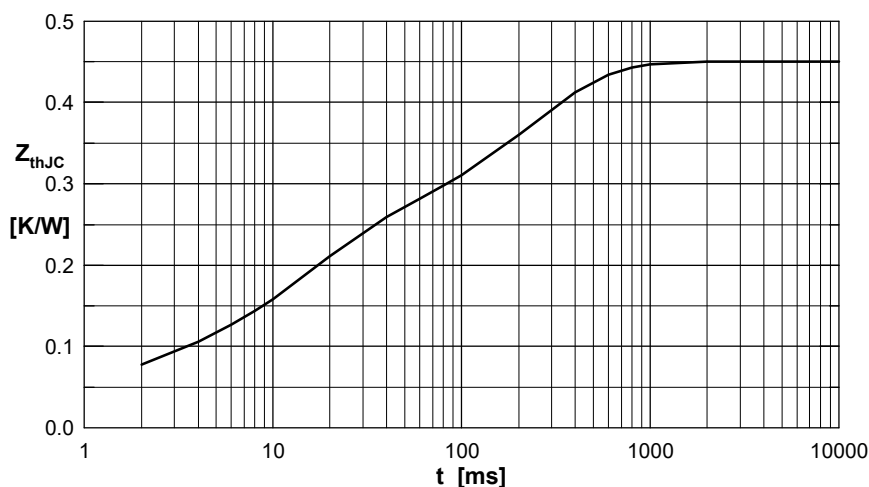


Fig. 7 Transient thermal resistance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.0050          | 0.0001    |
| 2 | 0.0550          | 0.0010    |
| 3 | 0.1750          | 0.0140    |
| 4 | 0.2150          | 0.2300    |

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