

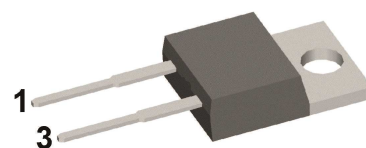
# HiPerFRED

$$\begin{aligned} V_{RRM} &= 1200 \text{ V} \\ I_{FAV} &= 12 \text{ A} \\ t_{rr} &= 40 \text{ ns} \end{aligned}$$

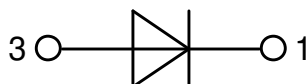
High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Single Diode

Part number

**DSEP12-12A**



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-220

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

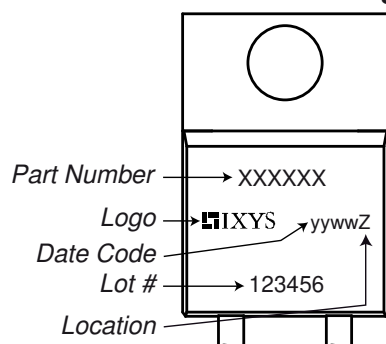
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| Fast Diode        |                                              |                                                                                    |                         | Ratings                  |      |      |      |  |
|-------------------|----------------------------------------------|------------------------------------------------------------------------------------|-------------------------|--------------------------|------|------|------|--|
| Symbol            | Definition                                   | Conditions                                                                         |                         | min.                     | typ. | max. | Unit |  |
| V <sub>RSM</sub>  | max. non-repetitive reverse blocking voltage | T <sub>VJ</sub> = 25°C                                                             |                         |                          |      | 1200 | V    |  |
| V <sub>RRM</sub>  | max. repetitive reverse blocking voltage     | T <sub>VJ</sub> = 25°C                                                             |                         |                          |      | 1200 | V    |  |
| I <sub>R</sub>    | reverse current, drain current               | V <sub>R</sub> = 1200 V                                                            | T <sub>VJ</sub> = 25°C  |                          |      | 100  | μA   |  |
|                   |                                              | V <sub>R</sub> = 1200 V                                                            | T <sub>VJ</sub> = 150°C |                          |      | 0.5  | mA   |  |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 15 A                                                              | T <sub>VJ</sub> = 25°C  |                          |      | 2.62 | V    |  |
|                   |                                              | I <sub>F</sub> = 30 A                                                              |                         |                          |      | 3.19 | V    |  |
|                   |                                              | I <sub>F</sub> = 15 A                                                              | T <sub>VJ</sub> = 150°C |                          |      | 1.87 | V    |  |
|                   |                                              | I <sub>F</sub> = 30 A                                                              |                         |                          |      | 2.56 | V    |  |
| I <sub>FAV</sub>  | average forward current                      | T <sub>C</sub> = 135°C<br>rectangular      d = 0.5                                 | T <sub>VJ</sub> = 175°C |                          |      | 12   | A    |  |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                  |                         | T <sub>VJ</sub> = 175°C  |      | 1.03 | V    |  |
| r <sub>F</sub>    | slope resistance                             |                                                                                    |                         |                          |      | 46   | mΩ   |  |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                    |                         |                          |      | 1.6  | K/W  |  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                                                    |                         |                          | 0.50 |      | K/W  |  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                                                              |                         |                          |      | 95   | 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   |      | 90   | A    |  |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 600 V   f = 1 MHz                                                 |                         | T <sub>VJ</sub> = 25°C   | 5    |      | pF   |  |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 15 A; V <sub>R</sub> = 600 V<br>-di <sub>F</sub> /dt = 200 A/μs |                         | T <sub>VJ</sub> = 25 °C  | 6    |      | A    |  |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100 °C | 9    |      | A    |  |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                    |                         | T <sub>VJ</sub> = 25 °C  | 40   |      | ns   |  |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 100 °C | 140  |      | ns   |  |

| Package TO-220 |                              |              | Ratings |      |      |      |
|----------------|------------------------------|--------------|---------|------|------|------|
| Symbol         | Definition                   | Conditions   | min.    | typ. | max. | Unit |
| $I_{RMS}$      | RMS current                  | per terminal |         |      | 35   | A    |
| $T_{VJ}$       | virtual junction temperature |              | -55     |      | 175  | °C   |
| $T_{op}$       | operation temperature        |              | -55     |      | 150  | °C   |
| $T_{stg}$      | storage temperature          |              | -55     |      | 150  | °C   |
| Weight         |                              |              |         | 2    |      | g    |
| $M_D$          | mounting torque              |              | 0.4     |      | 0.6  | Nm   |
| $F_C$          | mounting force with clip     |              | 20      |      | 60   | N    |

### Product Marking



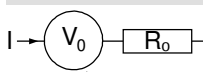
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSEP12-12A      | DSEP12-12A         | Tube          | 50       | 470465   |

| Similar Part | Package        | Voltage class |
|--------------|----------------|---------------|
| DSEP12-12B   | TO-220AC (2)   | 1200          |
| DSEP15-12CR  | ISOPLUS247 (2) | 1200          |

### Equivalent Circuits for Simulation

\* on die level

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



**Fast Diode**

$V_{0\max}$  threshold voltage

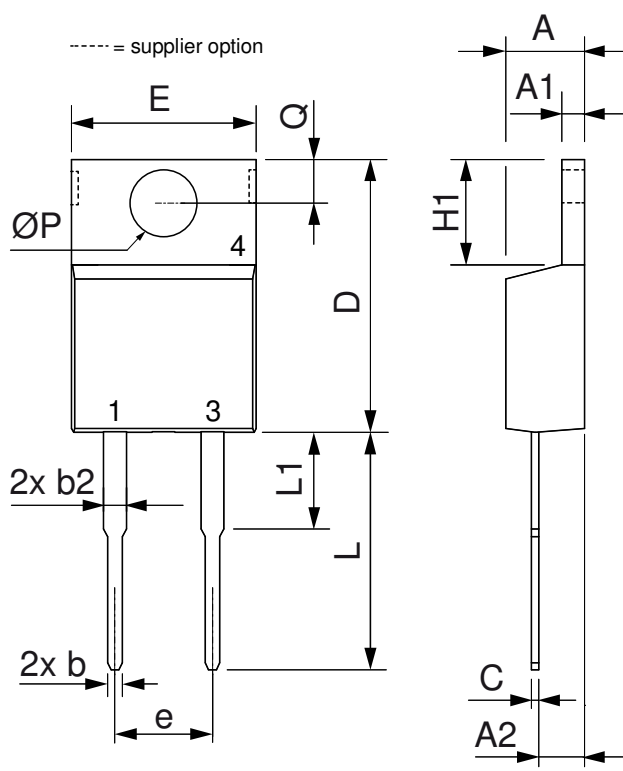
1.03

V

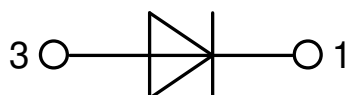
$R_{0\max}$  slope resistance \*

43

mΩ

**Outlines TO-220**


| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 4.32       | 4.82  | 0.170  | 0.190 |
| A1   | 1.14       | 1.39  | 0.045  | 0.055 |
| A2   | 2.29       | 2.79  | 0.090  | 0.110 |
| b    | 0.64       | 1.01  | 0.025  | 0.040 |
| b2   | 1.15       | 1.65  | 0.045  | 0.065 |
| C    | 0.35       | 0.56  | 0.014  | 0.022 |
| D    | 14.73      | 16.00 | 0.580  | 0.630 |
| E    | 9.91       | 10.66 | 0.390  | 0.420 |
| e    | 5.08       | BSC   | 0.200  | BSC   |
| H1   | 5.85       | 6.85  | 0.230  | 0.270 |
| L    | 12.70      | 13.97 | 0.500  | 0.550 |
| L1   | 2.79       | 5.84  | 0.110  | 0.230 |
| ØP   | 3.54       | 4.08  | 0.139  | 0.161 |
| Q    | 2.54       | 3.18  | 0.100  | 0.125 |



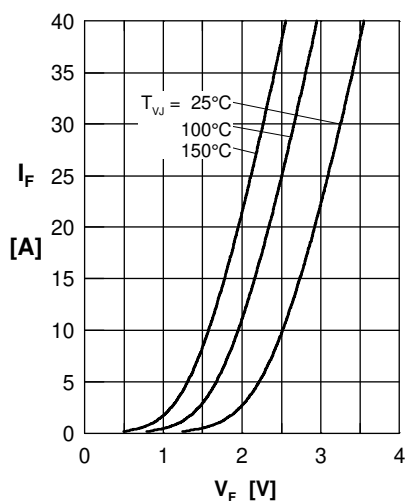
**Fast Diode**


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

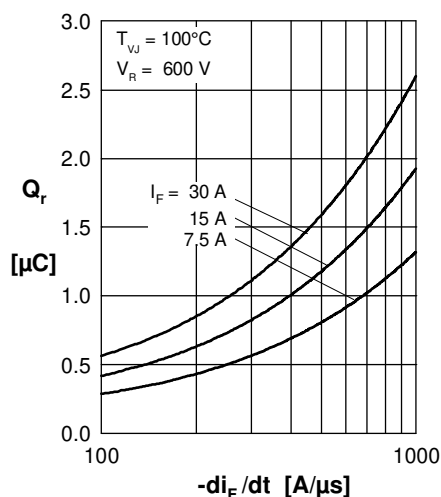


Fig. 2 Typ. reverse recov. charge  
 $Q_r$  versus  $-di_F/dt$

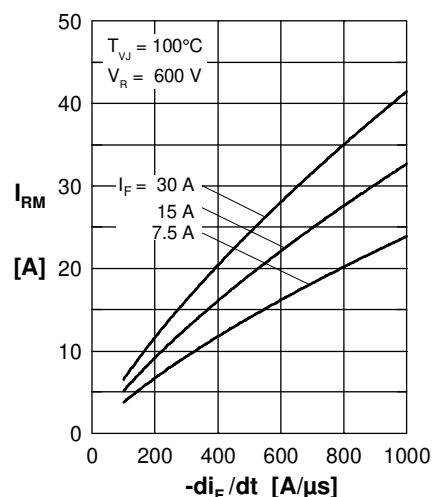


Fig. 3 Typ. peak reverse current  
 $I_{RM}$  versus  $-di_F/dt$

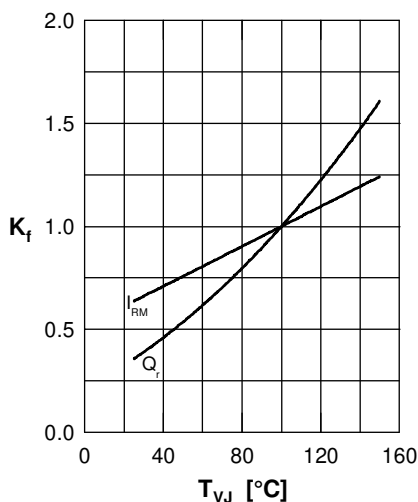


Fig. 4 Dynamic parameters  
 $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

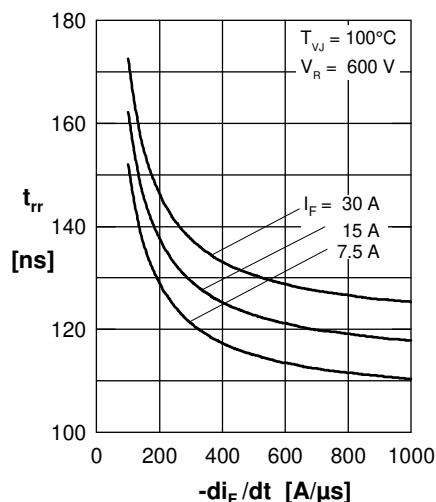


Fig. 5 Typ. recovery time  
 $t_{rr}$  versus  $-di_F/dt$

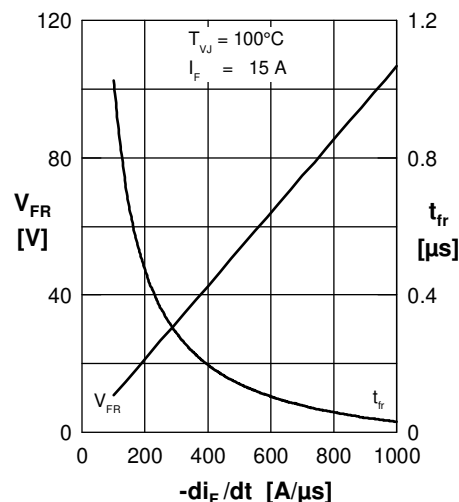


Fig. 6 Typ. peak forward voltage  
 $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

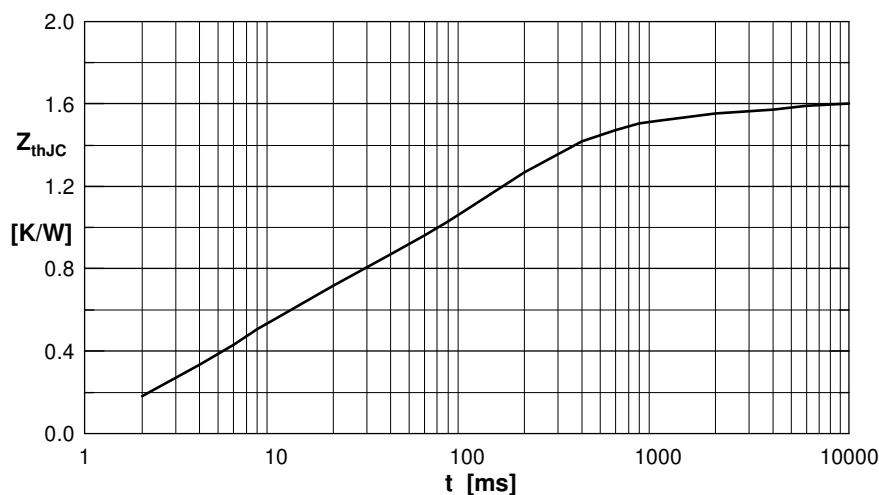


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.160           | 0.0010    |
| 2 | 0.100           | 0.0150    |
| 3 | 0.500           | 0.0040    |
| 4 | 0.840           | 0.1200    |