

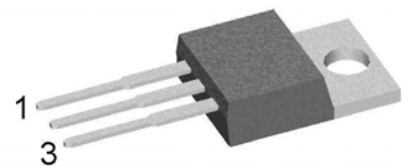
**HiPerFRED**

$$\begin{aligned}
 V_{RRM} &= 600\text{ V} \\
 I_{FAV} &= 2 \times 10\text{ A} \\
 t_{rr} &= 30\text{ ns}
 \end{aligned}$$

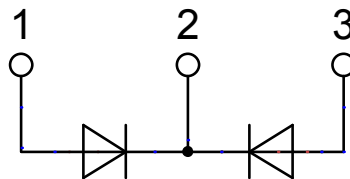
High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Common Cathode

Part number

**DSEC16-06A**



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-220**

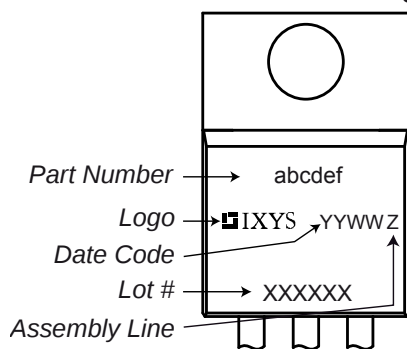
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

| 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               | $V_R = 600\text{ V}$                                                                     | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 60   | $\mu\text{A}$ |  |
|            |                                              | $V_R = 600\text{ V}$                                                                     | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 0.25 | mA            |  |
| $V_F$      | forward voltage drop                         | $I_F = 10\text{ A}$                                                                      | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 2.10 | V             |  |
|            |                                              | $I_F = 20\text{ A}$                                                                      |                                |                                |      | 2.32 | V             |  |
|            |                                              | $I_F = 10\text{ A}$                                                                      | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 1.42 | V             |  |
|            |                                              | $I_F = 20\text{ A}$                                                                      |                                |                                |      | 1.68 | V             |  |
| $I_{FAV}$  | average forward current                      | $T_C = 135^{\circ}\text{C}$                                                              | $T_{VJ} = 175^{\circ}\text{C}$ |                                |      | 10   | A             |  |
|            |                                              | rectangular      d = 0.5                                                                 |                                |                                |      |      |               |  |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                                                        |                                |                                |      | 1.03 | V             |  |
| $r_F$      | slope resistance                             |                                                                                          |                                |                                |      | 25.1 | m $\Omega$    |  |
| $R_{thJC}$ | thermal resistance junction to case          |                                                                                          |                                |                                |      | 2.5  | K/W           |  |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                                                          |                                |                                | 0.50 |      | K/W           |  |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                                                               |                                |                                |      | 60   | W             |  |
| $I_{FSM}$  | max. forward surge current                   | t = 10 ms; (50 Hz), sine; $V_R = 0\text{ V}$                                             |                                | $T_{VJ} = 45^{\circ}\text{C}$  |      | 50   | A             |  |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}$ f = 1 MHz                                                           |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 6    |      | pF            |  |
| $I_{RM}$   | max. reverse recovery current                | } $I_F = 10\text{ A}; V_R = 100\text{ V}$<br>-di <sub>F</sub> /dt = 200 A/ $\mu\text{s}$ |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 4    |      | A             |  |
|            |                                              |                                                                                          |                                | $T_{VJ} = 100^{\circ}\text{C}$ | 6    |      | A             |  |
| $t_{rr}$   | reverse recovery time                        |                                                                                          |                                | $T_{VJ} = 25^{\circ}\text{C}$  | 30   |      | ns            |  |
|            |                                              |                                                                                          |                                | $T_{VJ} = 100^{\circ}\text{C}$ | 90   |      | ns            |  |

| Package TO-220 |                              |                            | Ratings |      |      |      |
|----------------|------------------------------|----------------------------|---------|------|------|------|
| Symbol         | Definition                   | Conditions                 | min.    | typ. | max. | Unit |
| $I_{RMS}$      | RMS current                  | per terminal <sup>1)</sup> |         |      | 35   | A    |
| $T_{stg}$      | storage temperature          |                            | -55     |      | 150  | °C   |
| $T_{VJ}$       | virtual junction temperature |                            | -55     |      | 175  | °C   |
| Weight         |                              |                            |         | 2    |      | g    |
| $M_D$          | mounting torque              |                            | 0.4     |      | 0.6  | Nm   |
| $F_C$          | mounting force with clip     |                            | 20      |      | 60   | N    |

<sup>1)</sup>  $I_{RMS}$  is typically limited by the pin-to-chip resistance (1); or by the current capability of the chip (2). In case of (1) and a common cathode/anode configuration with a non-isolated backside, the current capability can be increased by connecting the backside.

### Product Marking



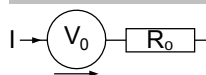
| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-------------|--------------------|---------------|----------|----------|
| Standard | DSEC16-06A  | DSEC16-06A         | Tube          | 50       | 475130   |

| Similar Part | Package          | Voltage class |
|--------------|------------------|---------------|
| DSEC16-06AC  | ISOPLUS220AB (3) | 600           |

### Equivalent Circuits for Simulation

\* on die level

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



Fast Diode

$V_{0\max}$  threshold voltage

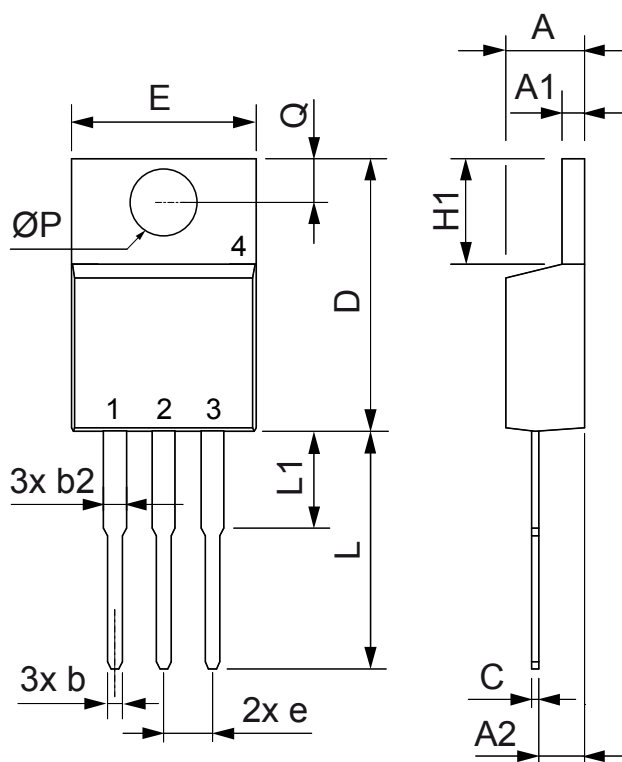
1.03

V

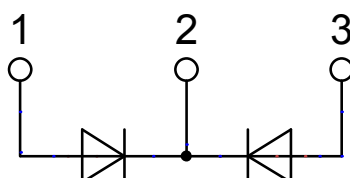
$R_{0\max}$  slope resistance \*

22

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    | 2.54       | BSC   | 0.100  | 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

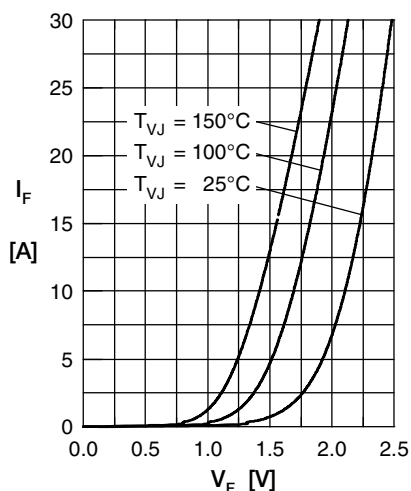


Fig. 1 Forward current  $I_F$  versus  $V_F$

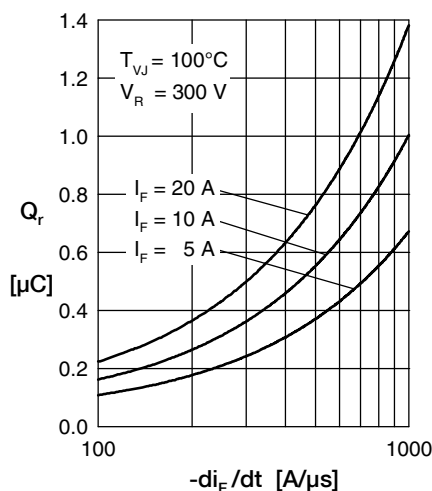


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

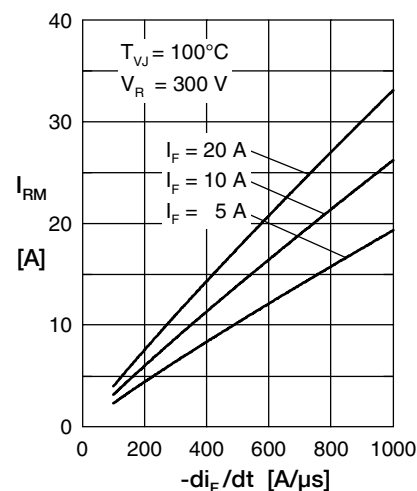


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

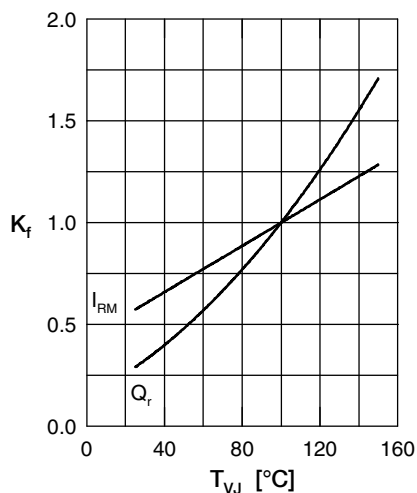


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

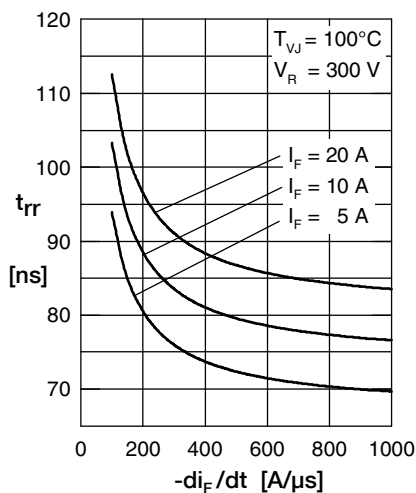


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

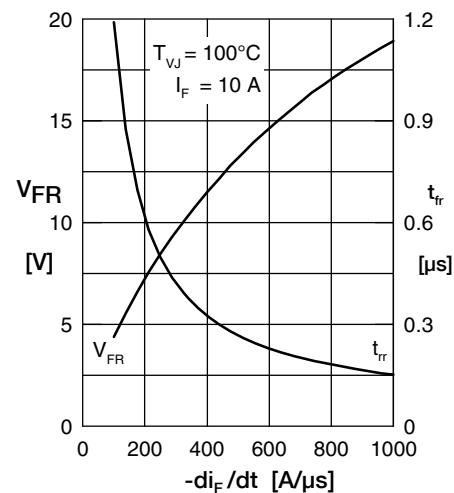


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{rr}$  versus  $di_F/dt$

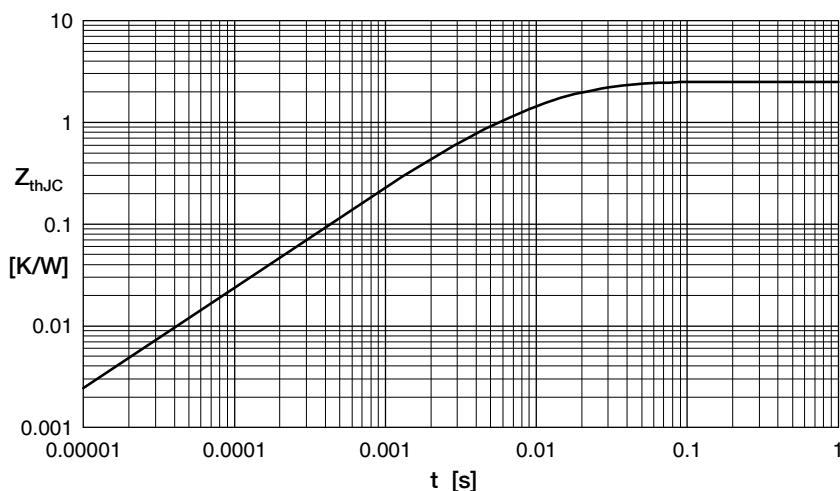


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ [K/W] | $t_i$ [s] |
|---|-----------------|-----------|
| 1 | 1.449           | 0.0052    |
| 2 | 0.5578          | 0.0003    |
| 3 | 0.4931          | 0.0169    |