

# HiPerFRED

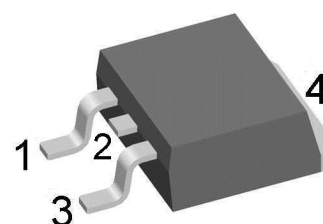
|           |   |       |
|-----------|---|-------|
| $V_{RRM}$ | = | 600 V |
| $I_{FAV}$ | = | 15 A  |
| $t_{rr}$  | = | 25 ns |

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

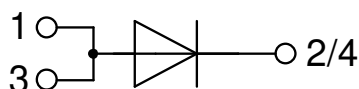
Part number

**DSEP15-06BS**

Marking on Product: DSEP15-06BS



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-263 (D2Pak)

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

## Disclaimer Notice

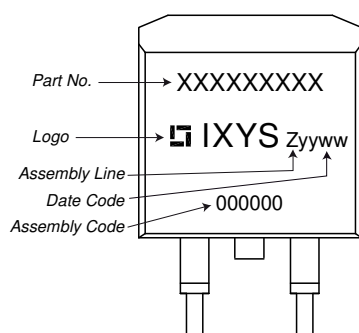
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| Fast Diode        |                                              |                                                                                     |                         | Ratings                  |      |      |      |  |
|-------------------|----------------------------------------------|-------------------------------------------------------------------------------------|-------------------------|--------------------------|------|------|------|--|
| 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  |                          |      | 100  | μA   |  |
|                   |                                              | V <sub>R</sub> = 600 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  |                          |      | 2.54 | V    |  |
|                   |                                              | I <sub>F</sub> = 30 A                                                               |                         |                          |      | 2.99 | V    |  |
|                   |                                              | I <sub>F</sub> = 15 A                                                               | T <sub>VJ</sub> = 150°C |                          |      | 1.59 | V    |  |
|                   |                                              | I <sub>F</sub> = 30 A                                                               |                         |                          |      | 2.04 | 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 |                          |      | 15   | A    |  |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                   |                         | T <sub>VJ</sub> = 175°C  |      | 0.98 | V    |  |
| r <sub>F</sub>    | slope resistance                             |                                                                                     |                         |                          |      | 28   | mΩ   |  |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                     |                         |                          |      | 1.6  | 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                                                               |                         |                          |      | 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   |      | 110  | A    |  |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 400 V   f = 1 MHz                                                  |                         | T <sub>VJ</sub> = 25°C   | 12   |      | pF   |  |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 15 A; V <sub>R</sub> = 300 V<br>-di <sub>F</sub> / dt = 200 A/μs |                         | T <sub>VJ</sub> = 25 °C  | 2    |      | A    |  |
|                   |                                              |                                                                                     |                         | T <sub>VJ</sub> = 100 °C | 3    |      | A    |  |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                     |                         | T <sub>VJ</sub> = 25 °C  | 25   |      | ns   |  |
|                   |                                              |                                                                                     |                         | T <sub>VJ</sub> = 100 °C | 80   |      | ns   |  |

| Package TO-263 (D2Pak) |                              |                            | Ratings |      |      |      |
|------------------------|------------------------------|----------------------------|---------|------|------|------|
| Symbol                 | Definition                   | Conditions                 | min.    | typ. | max. | Unit |
| $I_{RMS}$              | RMS current                  | per terminal <sup>1)</sup> |         |      | 35   | A    |
| $T_{VJ}$               | virtual junction temperature |                            | -55     |      | 175  | °C   |
| $T_{op}$               | operation temperature        |                            | -55     |      | 150  | °C   |
| $T_{stg}$              | storage temperature          |                            | -55     |      | 150  | °C   |
| <b>Weight</b>          |                              |                            |         | 2    |      | g    |
| $F_c$                  | 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 product with multiple pins for one chip-potential, the current capability can be increased by connecting the pins as one contact.

### Product Marking



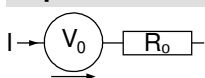
| Ordering    | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|-----------------|--------------------|---------------|----------|----------|
| Standard    | DSEP15-06BS-TRL | DSEP15-06BS        | Tape & Reel   | 800      | 513028   |
| Alternative | DSEP15-06BS-TUB | DSEP15-06BS        | Tube          | 50       | 525184   |

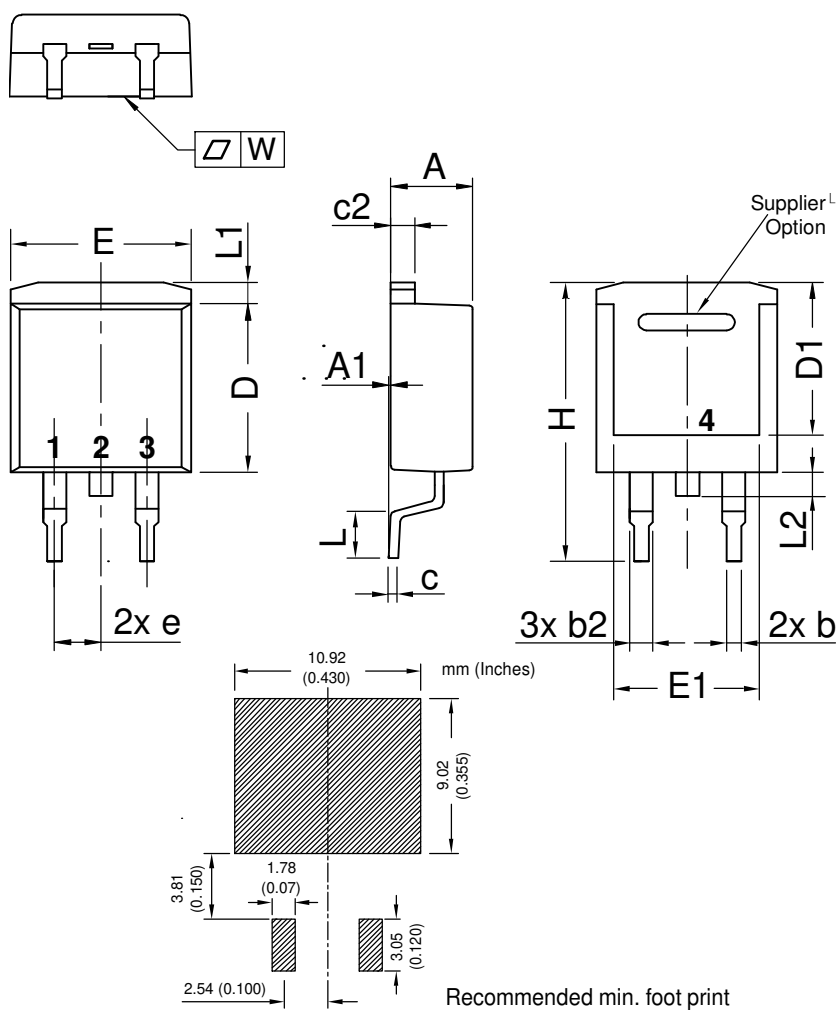
| Similar Part | Package              | Voltage class |
|--------------|----------------------|---------------|
| DSEP15-06AS  | TO-263AB (D2Pak) (2) | 600           |
| DSEP15-06A   | TO-220AC             | 600           |
| DSEP15-06B   | TO-220AC             | 600           |

### Equivalent Circuits for Simulation

\* on die level

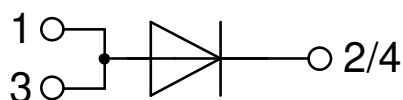
$T_{VJ} = 175\text{ °C}$

|                                                                                     |                    |        |
|-------------------------------------------------------------------------------------|--------------------|--------|
|  | <b>Fast Diode</b>  |        |
| $V_{0\text{ max}}$                                                                  | threshold voltage  | 0.98 V |
| $R_{0\text{ max}}$                                                                  | slope resistance * | 25 mΩ  |

**Outlines TO-263 (D2Pak)**


| Dim. | Millimeter |       | Inches      |       |
|------|------------|-------|-------------|-------|
|      | min        | max   | min         | max   |
| A    | 4.06       | 4.83  | 0.160       | 0.190 |
| A1   | typ. 0.10  |       | typ. 0.004  |       |
| A2   | 2.41       |       | 0.095       |       |
| b    | 0.51       | 0.99  | 0.020       | 0.039 |
| b2   | 1.14       | 1.40  | 0.045       | 0.055 |
| c    | 0.40       | 0.74  | 0.016       | 0.029 |
| c2   | 1.14       | 1.40  | 0.045       | 0.055 |
| D    | 8.38       | 9.40  | 0.330       | 0.370 |
| D1   | 8.00       | 8.89  | 0.315       | 0.350 |
| D2   | 2.5        |       | 0.098       |       |
| E    | 9.65       | 10.41 | 0.380       | 0.410 |
| E1   | 6.22       | 8.50  | 0.245       | 0.335 |
| e    | 2.54 BSC   |       | 0.100 BSC   |       |
| e1   | 4.28       |       | 0.169       |       |
| H    | 14.61      | 15.88 | 0.575       | 0.625 |
| L    | 1.78       | 2.79  | 0.070       | 0.110 |
| L1   | 1.02       | 1.68  | 0.040       | 0.066 |
| W    | typ. 0.02  | 0.040 | typ. 0.0008 | 0.002 |

*All dimensions conform with and/or within JEDEC standard.*



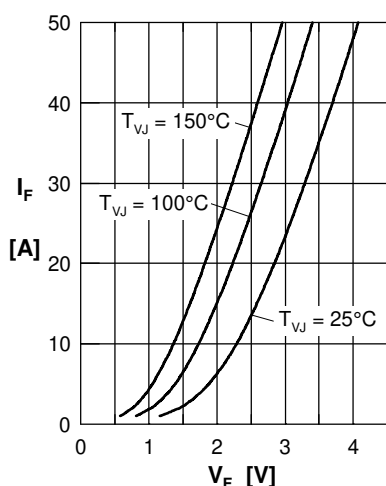
**Fast Diode**


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

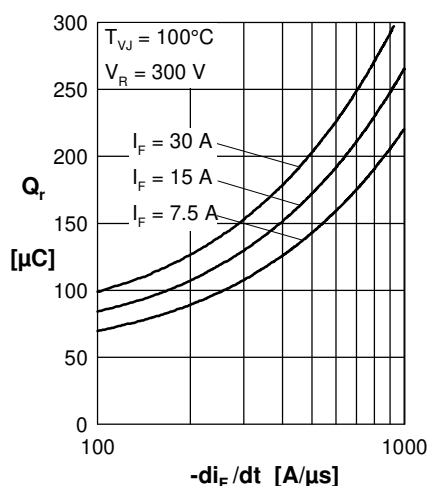


Fig. 2 Typ. reverse recov. charge  
 $Q_r$  versus  $-di_F/dt$

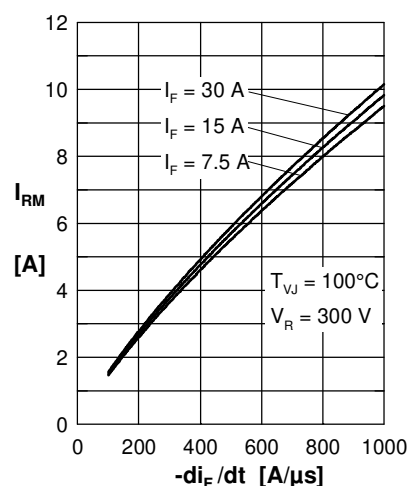


Fig. 3 Typ. peak reverse current  
 $I_{RM}$  versus  $-di_F/dt$

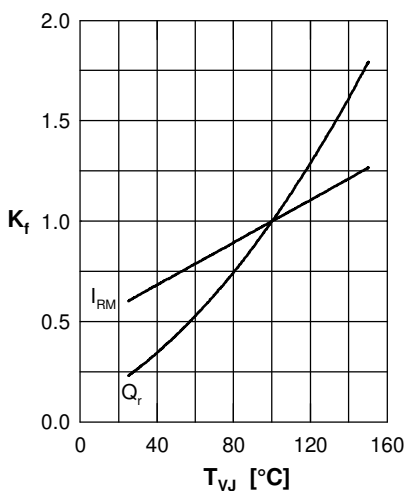


Fig. 4 Dynamic parameters  
 $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

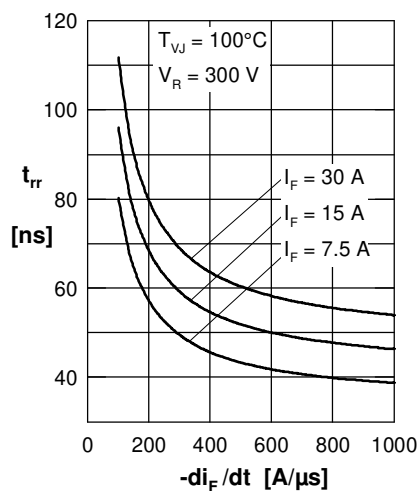


Fig. 5 Typ. recovery time  
 $t_{rr}$  versus  $-di_F/dt$

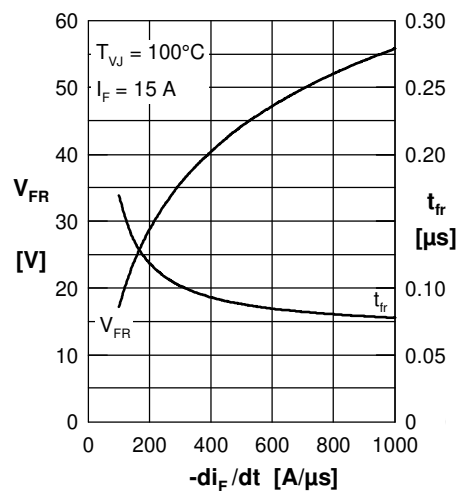


Fig. 6 Typ. peak forward voltage  
 $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

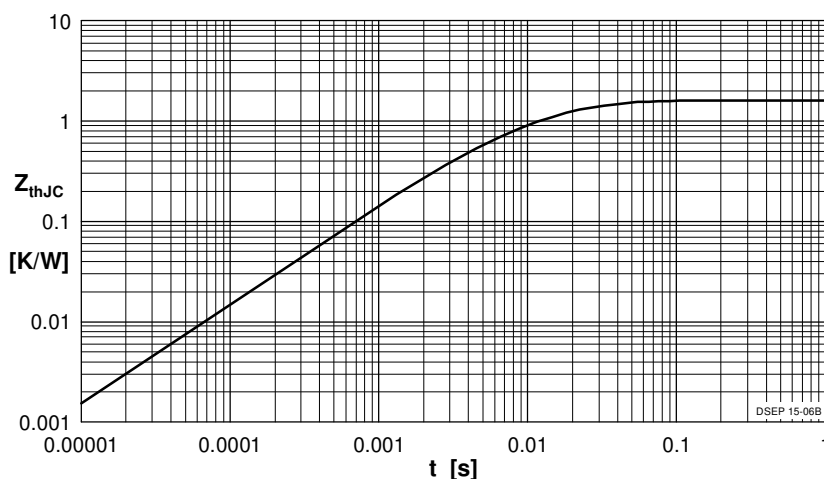


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.908           | 0.0052    |
| 2 | 0.350           | 0.0003    |
| 3 | 0.342           | 0.017     |

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