

# FRED

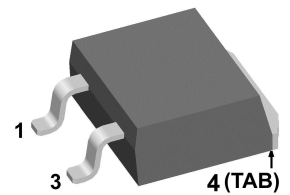
$V_{RRM} = 1200\text{ V}$   
 $I_{FAV} = 12\text{ A}$   
 $t_{rr} = 50\text{ ns}$

## Fast Recovery Epitaxial Diode Single Diode

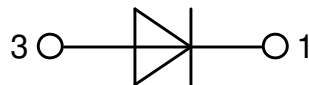
### Part number

**DSEI12-12AZ**

Marking on Product: DSEI12-12AZ



Backside: cathode



### 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: TO-263 (D2Pak-HV)

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

### Disclaimer Notice

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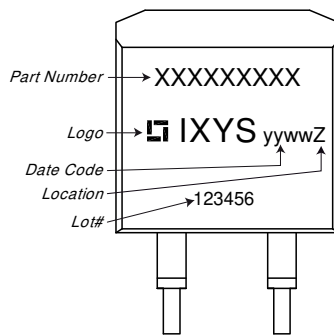


| Fast Diode |  |   |                         | Ratings |      |            |  |
|------------|--|---|-------------------------|---------|------|------------|--|
| Symbol     | Definition                                   | Conditions                                    | min.                    | typ.    | max. | Unit       |  |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}C$                        |                         |         | 1200 | V          |  |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}C$                        |                         |         | 1200 | V          |  |
| $I_R$      | reverse current, drain current               | $V_R = 1200 V$                                | $T_{VJ} = 25^{\circ}C$  |         | 250  | $\mu A$    |  |
|            |  | $V_R = 960 V$                                 | $T_{VJ} = 125^{\circ}C$ |         | 4    | mA         |  |
| $V_F$      | forward voltage drop                         | $I_F = 12 A$                                  | $T_{VJ} = 25^{\circ}C$  |         | 2,58 | V          |  |
|            |  | $I_F = 24 A$                                  |                         |         | 2,94 | V          |  |
|            |  | $I_F = 12 A$                                  | $T_{VJ} = 150^{\circ}C$ |         | 2,23 | V          |  |
|            |  | $I_F = 24 A$                                  |                         |         | 2,72 | V          |  |
| $I_{FAV}$  | average forward current                      | $T_C = 100^{\circ}C$<br>rectangular $d = 0.5$ | $T_{VJ} = 150^{\circ}C$ |         | 12   | A          |  |
| $V_{FO}$   | threshold voltage                            | } for power loss calculation only             | $T_{VJ} = 150^{\circ}C$ |         | 1,77 | V          |  |
| $r_F$      | slope resistance                             |   |                         |         | 38   | m $\Omega$ |  |
| $R_{thJC}$ | thermal resistance junction to case          |   |                         |         | 1,6  | K/W        |  |
| $R_{thCH}$ | thermal resistance case to heatsink          |   |                         | 0,25    |      | K/W        |  |
| $P_{tot}$  | total power dissipation                      |   | $T_C = 25^{\circ}C$     |         | 78   | W          |  |
| $I_{FSM}$  | max. forward surge current                   | $t = 10 ms; (50 Hz), sine; V_R = 0 V$         | $T_{VJ} = 45^{\circ}C$  |         | 75   | A          |  |
| $C_J$      | junction capacitance                         | $V_R = 600 V \quad f = 1 MHz$                 | $T_{VJ} = 25^{\circ}C$  |         | 6    | pF         |  |
| $I_{RM}$   | max. reverse recovery current                | } $I_F = 11 A; V_R = 540 V$                   | $T_{VJ} = 25^{\circ}C$  |         | 4    | A          |  |
|            |  |   | $T_{VJ} = 100^{\circ}C$ |         | 6    | A          |  |
| $t_{rr}$   | reverse recovery time                        | } $-di_F/dt = 100 A/\mu s$                    | $T_{VJ} = 25^{\circ}C$  |         | 150  | ns         |  |
|            |  |   | $T_{VJ} = 100^{\circ}C$ |         | 300  | ns         |  |



| Package TO-263 (D2Pak-HV) |  | Ratings              |      |      |      |      |
|---------------------------|--|----------------------|------|------|------|------|
| Symbol                    | Definition   | Conditions           | min. | typ. | max. | Unit |
| $I_{RMS}$                 | RMS current  | per terminal         |      |      | 25   | 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>             |  |                      |      | 1,5  |      | g    |
| $F_C$                     | mounting force with clip                                     |                      | 20   |      | 60   | N    |
| $d_{Spp/App}$             | creepage distance on surface / striking distance through air | terminal to terminal | 4,2  |      |      | mm   |
| $d_{Spb/Apb}$             |  | terminal to backside | 4,7  |      |      | mm   |

**Product Marking**



| Ordering    | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|-----------------|--------------------|---------------|----------|----------|
| Standard    | DSEI12-12AZ-TRL | DSEI12-12AZ        | Tape & Reel   | 800      | 515338   |
| Alternative | DSEI12-12AZ-TUB | DSEI12-12AZ        | Tube          | 50       | 525375   |

**Equivalent Circuits for Simulation**

\* on die level

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



**Fast Diode**

|              |                    |      |    |
|--------------|--------------------|------|----|
| $V_{0\ max}$ | threshold voltage  | 1,77 | V  |
| $R_{0\ max}$ | slope resistance * | 35   | mΩ |



**Outlines TO-263 (D2Pak-HV)**



| 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   | 2.3        |       | 0.091       |       |
| 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**

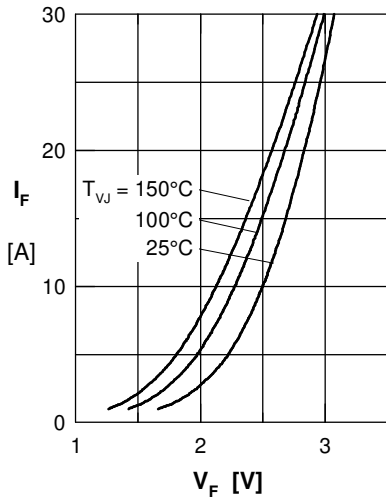


Fig. 1 Forward current  $I_F$  versus max. forward voltage drop  $V_F$

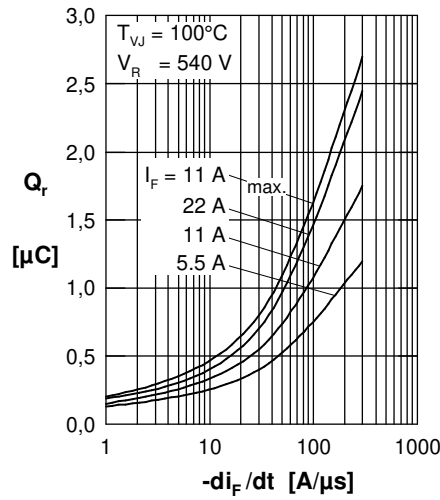


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

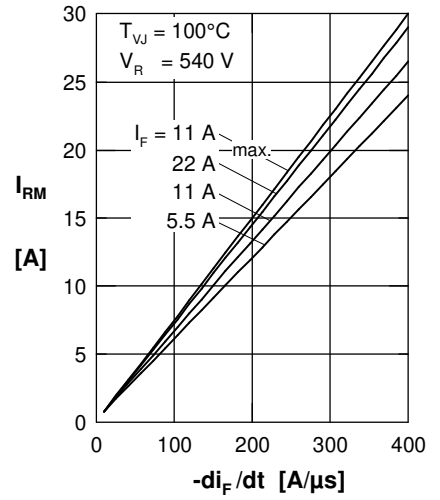


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

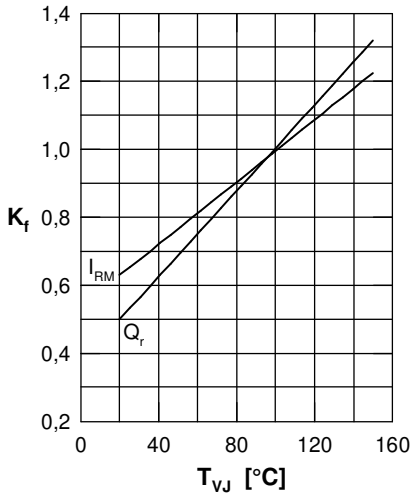


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

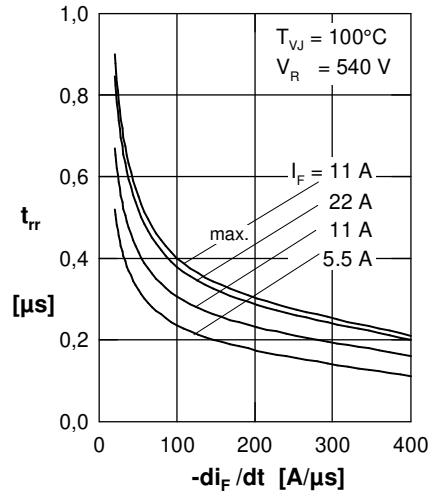


Fig. 5 Typ. recovery time  $t_{tr}$  versus  $-di_F/dt$

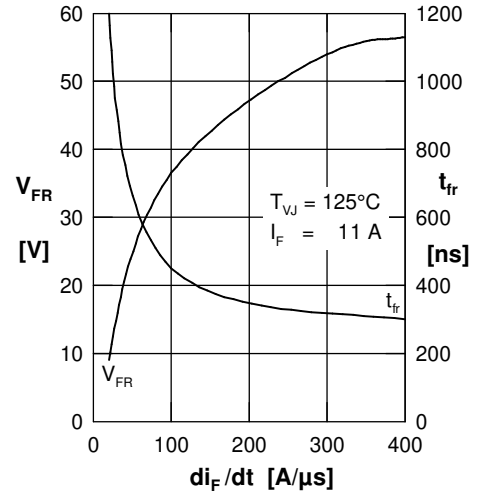


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

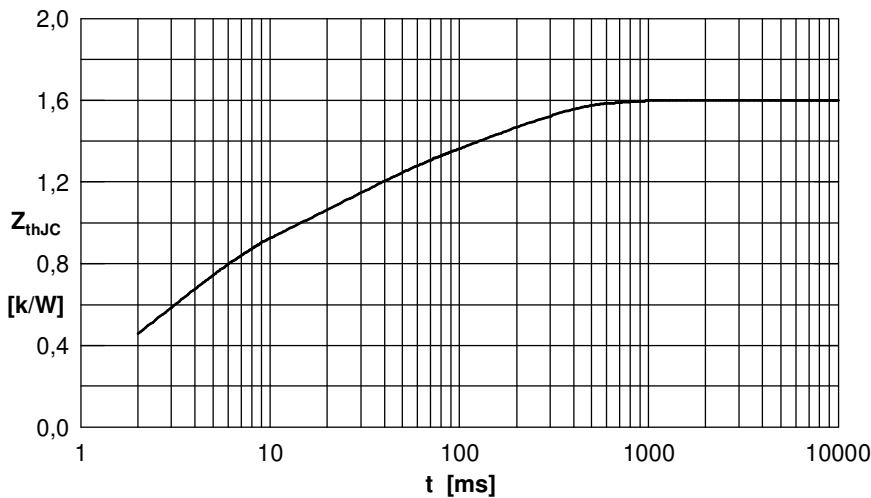


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.200           | 0.0018    |
| 2 | 0.220           | 0.0100    |
| 3 | 0.080           | 0.5000    |
| 4 | 0.300           | 0.0900    |
| 5 | 0.680           | 0.0300    |