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# FRED

$$V_{RRM} = 1000 \text{ V}$$

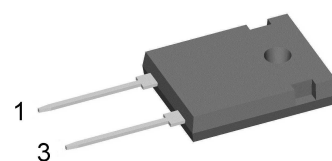
$$I_{FAV} = 60 \text{ A}$$

$$t_{rr} = 45 \text{ ns}$$

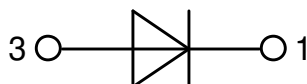
## Fast Recovery Epitaxial Diode Single Diode

Part number

**DSEI60-10A**



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-247

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

### Disclaimer Notice

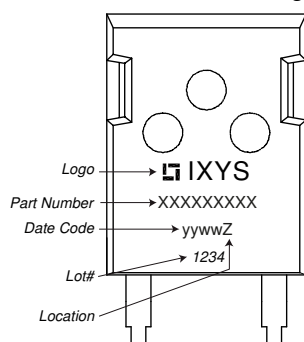
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| Fast Diode |                                              |                                                                                  |                                | Ratings                        |      |      |      |
|------------|----------------------------------------------|----------------------------------------------------------------------------------|--------------------------------|--------------------------------|------|------|------|
| Symbol     | Definition                                   | Conditions                                                                       |                                | min.                           | typ. | max. | Unit |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$                                                    |                                |                                |      | 1000 | V    |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$                                                    |                                |                                |      | 1000 | V    |
| $I_R$      | reverse current, drain current               | $V_R = 1000\text{ V}$                                                            | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 3    | mA   |
|            |                                              | $V_R = 800\text{ V}$                                                             | $T_{VJ} = 125^{\circ}\text{C}$ |                                |      | 14   | mA   |
| $V_F$      | forward voltage drop                         | $I_F = 60\text{ A}$                                                              | $T_{VJ} = 25^{\circ}\text{C}$  |                                |      | 2.30 | V    |
|            |                                              | $I_F = 120\text{ A}$                                                             |                                |                                |      | 2.65 | V    |
|            |                                              | $I_F = 60\text{ A}$                                                              | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 1.92 | V    |
|            |                                              | $I_F = 120\text{ A}$                                                             |                                |                                |      | 2.43 | V    |
| $I_{FAV}$  | average forward current                      | $T_C = 80^{\circ}\text{C}$<br>rectangular $d = 0.5$                              | $T_{VJ} = 150^{\circ}\text{C}$ |                                |      | 60   | A    |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only                                                |                                | $T_{VJ} = 150^{\circ}\text{C}$ |      | 1.44 | V    |
| $r_F$      | slope resistance                             |                                                                                  |                                |                                |      | 8    | mΩ   |
| $R_{thJC}$ | thermal resistance junction to case          |                                                                                  |                                |                                |      | 0.5  | K/W  |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                                                                  |                                |                                | 0.25 |      | K/W  |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}\text{C}$                                                       |                                |                                |      | 250  | W    |
| $I_{FSM}$  | max. forward surge current                   | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}; V_R = 0\text{ V}$               | $T_{VJ} = 45^{\circ}\text{C}$  |                                |      | 500  | A    |
| $C_J$      | junction capacitance                         | $V_R = 600\text{ V}$ $f = 1\text{ MHz}$                                          | $T_{VJ} = 25^{\circ}\text{C}$  |                                | 36   |      | pF   |
| $I_{RM}$   | max. reverse recovery current                | $I_F = 60\text{ A}; V_R = 540\text{ V}$<br>$-di_F/dt = 300\text{ A}/\mu\text{s}$ |                                | $T_{VJ} = 25^{\circ}\text{C}$  |      | 15   | A    |
|            |                                              |                                                                                  |                                | $T_{VJ} = 100^{\circ}\text{C}$ |      | 23   | A    |
| $t_{rr}$   | reverse recovery time                        |                                                                                  |                                | $T_{VJ} = 25^{\circ}\text{C}$  |      | 100  | ns   |
|            |                                              |                                                                                  |                                | $T_{VJ} = 100^{\circ}\text{C}$ |      | 200  | 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 |              | -40     |      | 150  | °C   |
| $T_{op}$       | operation temperature        |              | -40     |      | 125  | °C   |
| $T_{stg}$      | storage temperature          |              | -40     |      | 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



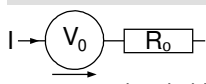
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSEI60-10A      | DSEI60-10A         | Tube          | 30       | 434515   |

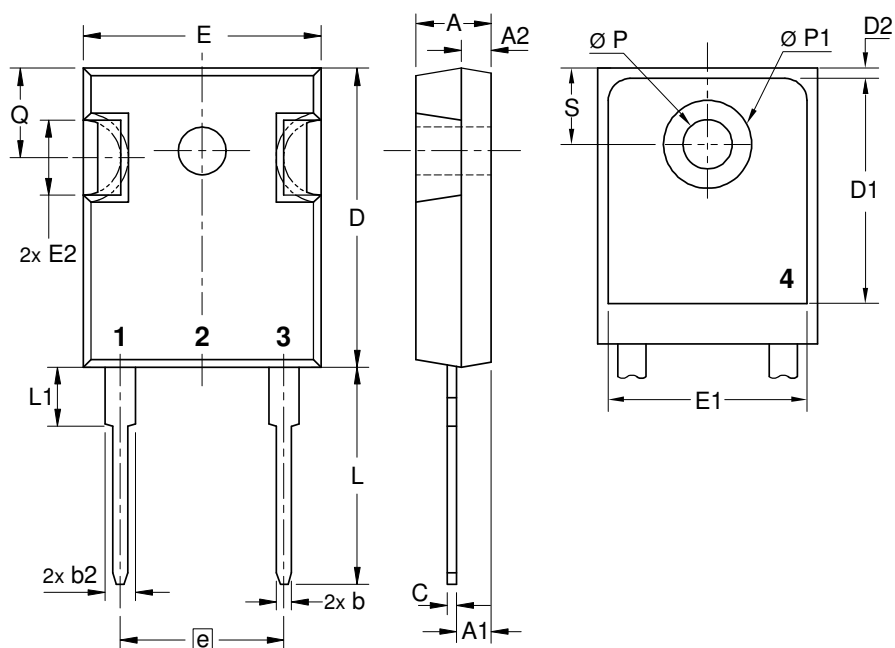
| Similar Part | Package      | Voltage class |
|--------------|--------------|---------------|
| DSEI60-12A   | TO-247AD (2) | 1200          |

### Equivalent Circuits for Simulation

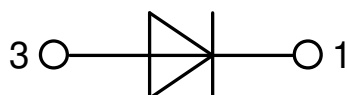
\* on die level

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

|                                                                                     |                    |                   |    |
|-------------------------------------------------------------------------------------|--------------------|-------------------|----|
|  |                    | <b>Fast Diode</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 1.44              | V  |
| $R_{0\max}$                                                                         | slope resistance * | 5.5               | 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  |



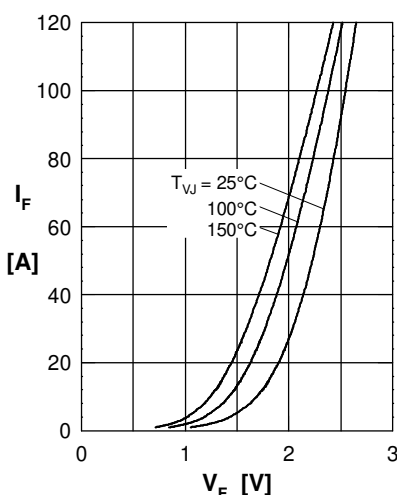
**Fast Diode**


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

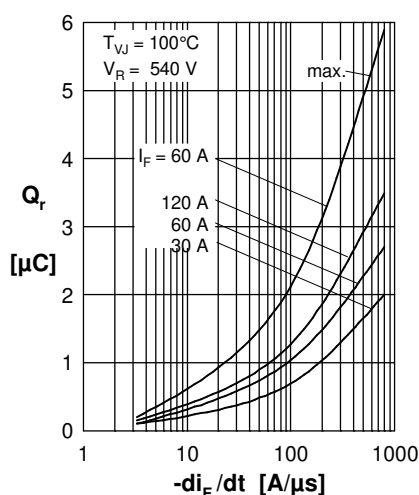


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

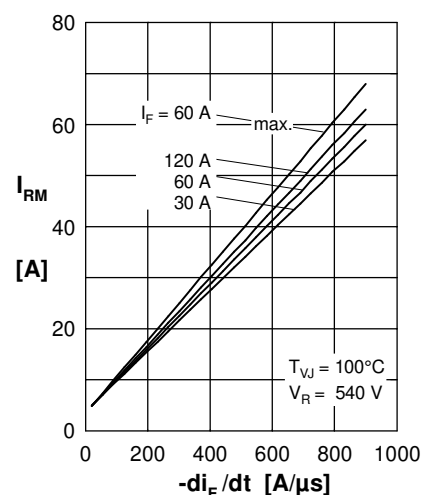


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

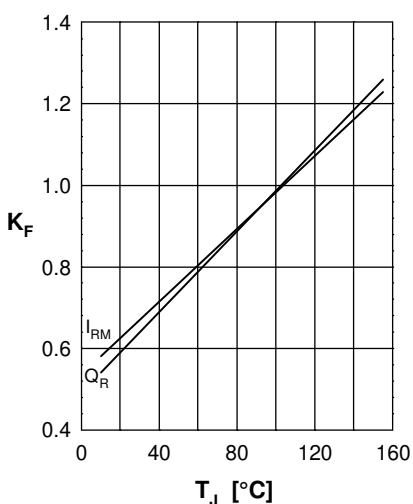


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

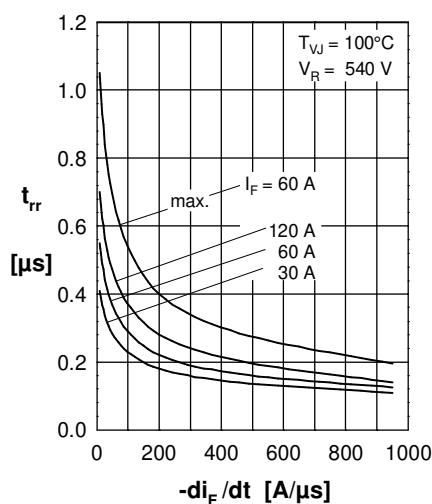


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

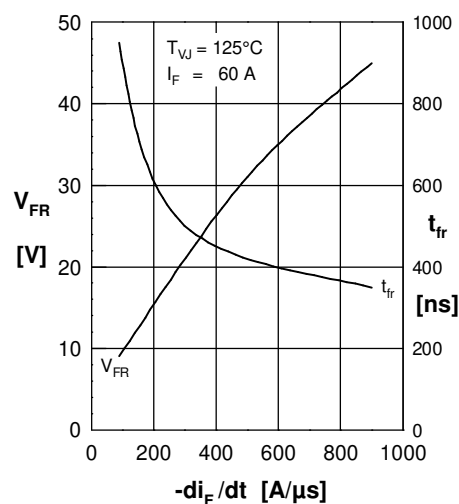


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

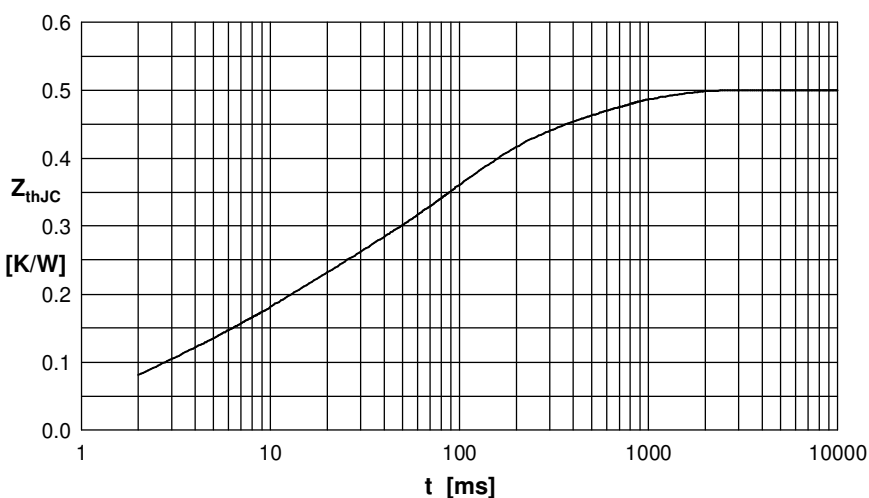


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.080           | 0.0018    |
| 2 | 0.120           | 0.0100    |
| 3 | 0.100           | 0.5000    |
| 4 | 0.200           | 0.0800    |