

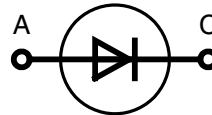
# Fast Recovery Epitaxial Diode (FRED)

$$I_{FAVM} = 109 \text{ A}$$

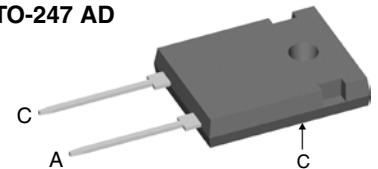
$$V_{RRM} = 1200 \text{ V}$$

$$t_{rr} = 40 \text{ ns}$$

| $V_{RSM}$ | $V_{RRM}$ | Type         |
|-----------|-----------|--------------|
| V         | V         |              |
| 1200      | 1200      | DSEI 120-12A |



TO-247 AD



A = Anode, C = Cathode

| Symbol       | Conditions                                                             | Maximum Ratings |                  |
|--------------|------------------------------------------------------------------------|-----------------|------------------|
| $I_{FRMS}$   | $T_{VJ} = T_{VJM}$                                                     | 100             | A                |
| $I_{FAVM}$ ① | $T_C = 60^\circ\text{C}$ ; rectangular, $d = 0.5$                      | 109             | A                |
| $I_{FAV}$ ②  | $T_C = 95^\circ\text{C}$ ; rectangular, $d = 0.5$                      | 75              | A                |
| $I_{FRM}$    | $t_p < 10 \mu\text{s}$ ; rep. rating, pulse width limited by $T_{VJM}$ | 1200            | A                |
| $I_{FSM}$    | $T_{VJ} = 45^\circ\text{C}$ ; $t = 10 \text{ ms}$ (50 Hz), sine        | 600             | A                |
|              | $t = 8.3 \text{ ms}$ (60 Hz), sine                                     | 660             | A                |
|              | $T_{VJ} = 150^\circ\text{C}$ ; $t = 10 \text{ ms}$ (50 Hz), sine       | 540             | A                |
|              | $t = 8.3 \text{ ms}$ (60 Hz), sine                                     | 600             | A                |
| $I^2t$       | $T_{VJ} = 45^\circ\text{C}$ ; $t = 10 \text{ ms}$ (50 Hz), sine        | 1800            | A <sup>2</sup> s |
|              | $t = 8.3 \text{ ms}$ (60 Hz), sine                                     | 1800            | A <sup>2</sup> s |
|              | $T_{VJ} = 150^\circ\text{C}$ ; $t = 10 \text{ ms}$ (50 Hz), sine       | 1450            | A <sup>2</sup> s |
|              | $t = 8.3 \text{ ms}$ (60 Hz), sine                                     | 1500            | A <sup>2</sup> s |
| $T_{VJ}$     |                                                                        | -40...+150      | °C               |
| $T_{VJM}$    |                                                                        | 150             | °C               |
| $T_{stg}$    |                                                                        | -40...+150      | °C               |
| $P_{tot}$    | $T_C = 25^\circ\text{C}$                                               | 357             | W                |
| $M_d$        | mounting torque                                                        | 0.8...1.2       | Nm               |
| Weight       | typical                                                                | 6               | g                |

## Features

- International standard package JEDEC TO-247 AD
- Planar passivated chips
- Very short recovery time
- Extremely low switching losses
- Low  $I_{RM}$ -values
- Soft recovery behaviour
- Epoxy meets UL 94V-0

## Applications

- Antiparallel diode for high frequency switching devices
- Anti saturation diode
- Snubber diode
- Free wheeling diode in converters and motor control circuits
- Rectifiers in switch mode power supplies (SMPS)
- Inductive heating and melting
- Uninterruptible power supplies (UPS)
- Ultrasonic cleaners and welders

## Advantages

- High reliability circuit operation
- Low voltage peaks for reduced protection circuits
- Low noise switching
- Low losses
- Operating at lower temperature or space saving by reduced cooling

| Symbol     | Conditions                                                                                                                                        | Characteristic Values |      |     |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----|
|            |                                                                                                                                                   | typ.                  | max. |     |
| $I_R$      | $V_R = V_{RRM}$ $T_{VJ} = 25^\circ\text{C}$                                                                                                       |                       | 3    | mA  |
|            | $V_R = 0.8 \cdot V_{RRM}$ $T_{VJ} = 25^\circ\text{C}$                                                                                             |                       | 1.5  | mA  |
|            | $V_R = 0.8 \cdot V_{RRM}$ $T_{VJ} = 125^\circ\text{C}$                                                                                            |                       | 20   | mA  |
| $V_F$      | $I_F = 70 \text{ A}$ $T_{VJ} = 150^\circ\text{C}$                                                                                                 |                       | 1.55 | V   |
|            | $T_{VJ} = 25^\circ\text{C}$                                                                                                                       |                       | 1.8  | V   |
| $V_{T0}$   | for power-loss calculations only                                                                                                                  |                       | 1.2  | V   |
| $r_T$      | $T_{VJ} = T_{VJM}$                                                                                                                                |                       | 4.6  | mΩ  |
| $R_{thJC}$ | (version A)                                                                                                                                       | 0.25                  | 0.35 | K/W |
| $R_{thCH}$ |                                                                                                                                                   |                       |      | K/W |
| $R_{thJA}$ |                                                                                                                                                   |                       | 35   | K/W |
| $t_{rr}$   | $I_F = 1 \text{ A}$ ; $-di/dt = 200 \text{ A}/\mu\text{s}$ ; $V_R = 30 \text{ V}$ ; $T_{VJ} = 25^\circ\text{C}$                                   | 40                    | 60   | ns  |
| $I_{RM}$   | $V_R = 350 \text{ V}$ ; $I_F = 75 \text{ A}$ ; $-di_F/dt = 200 \text{ A}/\mu\text{s}$<br>$L \leq 0.05 \mu\text{H}$ ; $T_{VJ} = 100^\circ\text{C}$ | 25                    | 30   | A   |

① Chip capability, ② limited to 70 A by leads Data according to IEC 60747

IXYS reserves the right to change limits, test conditions and dimensions.

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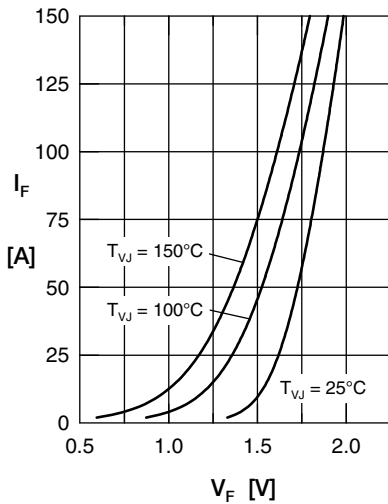


Fig. 1 Forward current  $I_F$  vs.  $V_F$

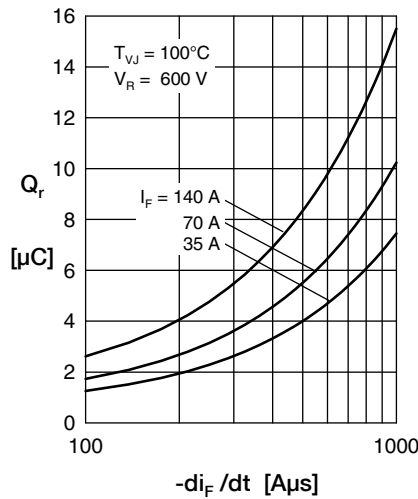


Fig. 2 Reverse recovery charge  $Q_r$  versus  $-di_F/dt$

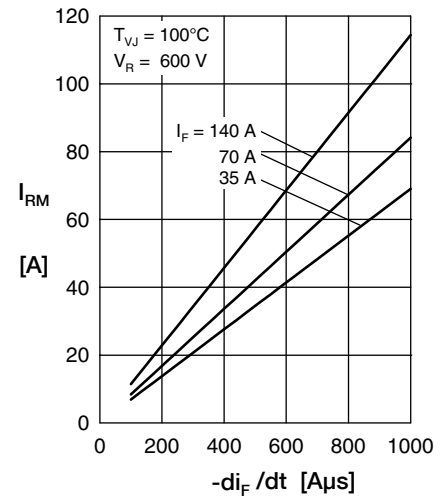


Fig. 3 Peak reverse current  $I_{RM}$  versus  $-di_F/dt$

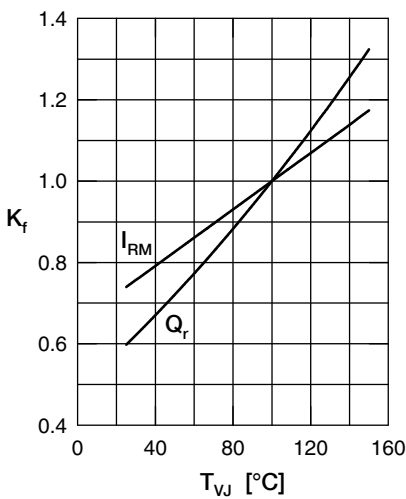


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

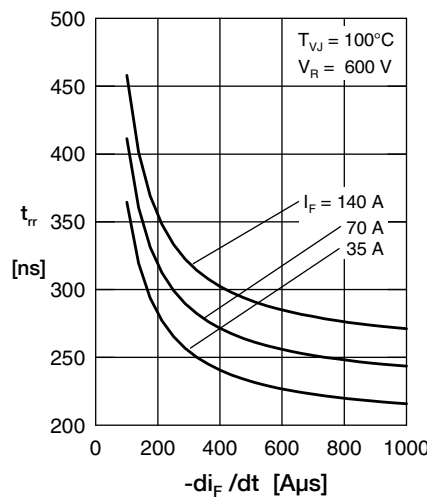


Fig. 5 Recovery time  $t_{rr}$  versus  $-di_F/dt$

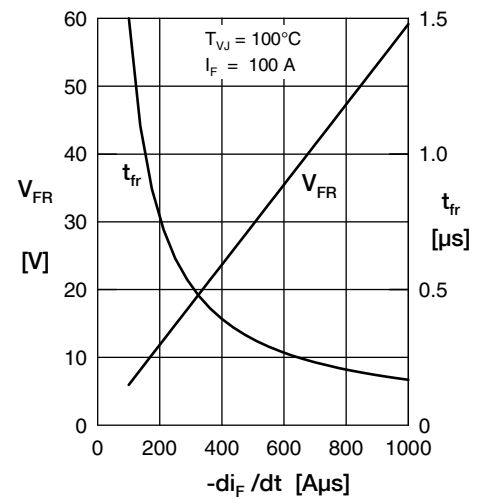


Fig. 6 Peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $-di_F/dt$

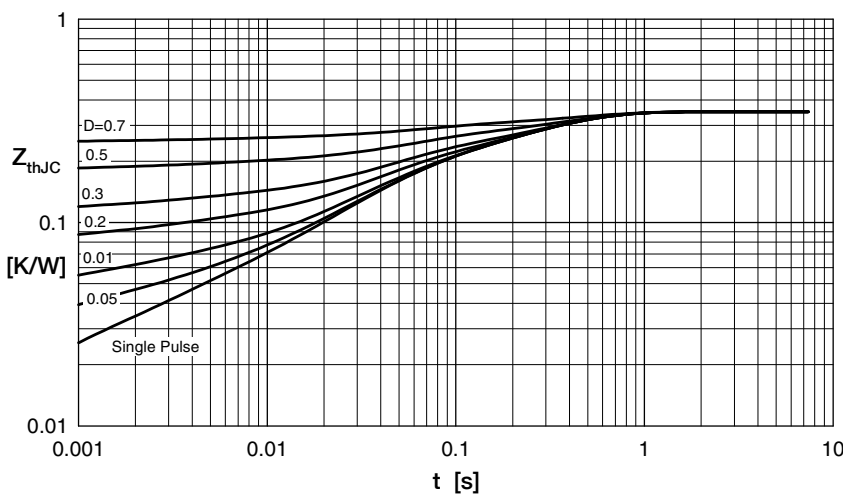
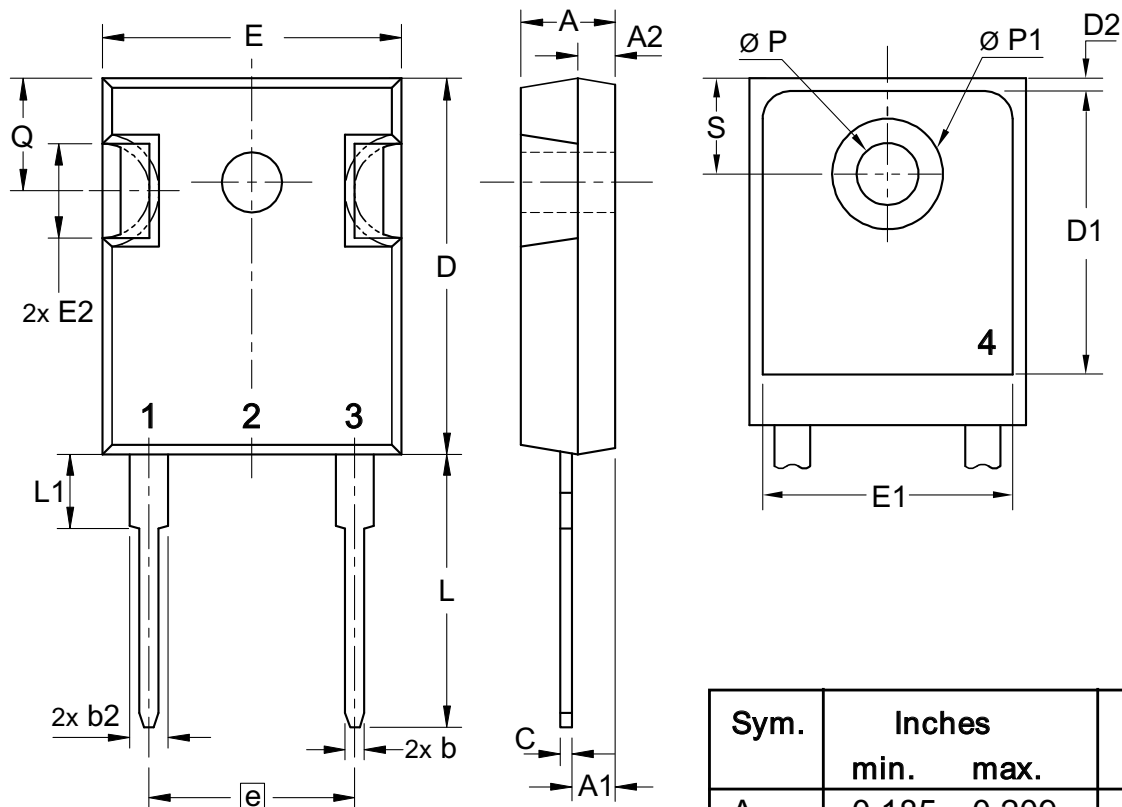


Fig. 7 Transient thermal resistance junction to case at various duty cycles

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.017           | 0.00038   |
| 2 | 0.0184          | 0.0026    |
| 3 | 0.1296          | 0.0387    |
| 4 | 0.185           | 0.274     |

## Dimensions TO-247 AD



| 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  |