| | | |
|---|---|---|
| $V_{RRM}$ | = | 5500 V |
| $I_{FAVM}$ | = | 380 A |
| $I_{FSM}$ | = | 10 kA |
| $V_{F0}$ | = | 2.7 V |
| $r_F$ | = | 2.8 mΩ |
| $V_{DClink}$ | = | 3300 V |

# Fast Recovery Diode

# 5SDF 04F6004

Doc. No. 5SYA1150-02 Sep. 01

- **Patented free-floating technology**
- **Industry standard housing**
- **Cosmic radiation withstand rating**
- **Low on-state and switching losses**
- **Optimized to use in snubberless operation**

## Blocking

| | | | | |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive peak reverse voltage | 5500 V | Half sine wave, $t_P$ = 10 ms, f = 50 Hz | |
| $I_{RRM}$ | Repetitive peak reverse current | ≤ 20 mA | $V_R = V_{RRM}$, $T_j$ = 115°C | |
| $V_{DClink}$ | Permanent DC voltage for 100 FIT failure rate | 3300 V | 100% Duty | Ambient cosmic radiation at sea level in open air. |
| $V_{DClink}$ | Permanent DC voltage for 100 FIT failure rate | 3900 V | 5% Duty | |

## Mechanical data

| | | | | |
|---|---|---|---|---|
| $F_m$ | Mounting force | min. | 18 kN | |
| | | max. | 22 kN | |
| a | Acceleration:<br>Device unclamped<br>Device clamped | | <br>50 m/s$^2$<br>200 m/s$^2$ | |
| m | Weight | | 0.46 kg | |
| $D_S$ | Surface creepage distance | | ≥ 33 mm | |
| $D_a$ | Air strike distance | | ≥ 20 mm | |

## On-state (see Fig. 1, 2)

| | | | | |
|---|---|---|---|---|
| $I_{FAVM}$ | Max. average on-state current | 380 A | Half sine wave, $T_c$ = 70°C | |
| $I_{FRMS}$ | Max. RMS on-state current | 600 A | | |
| $I_{FSM}$ | Max. peak non-repetitive surge current | 10 kA | tp = 10 ms | Before surge: $T_c = T_j$ = 115°C |
| | | 22 kA | tp = 1 ms | |
| $\int I^2dt$ | Max. surge current integral | $0.5 \cdot 10^6$ $A^2s$ | tp = 10 ms | After surge: $V_R \approx 0$ V |
| | | $0.24 \cdot 10^6$ $A^2s$ | tp = 1 ms | |
| $V_F$ | Forward voltage drop | ≤ 5.2 V | $I_F$ = 900 A | $T_j$ = 115°C |
| $V_{F0}$ | Threshold voltage | 2.7 V | Approximation for | |
| $r_F$ | Slope resistance | 2.8 mΩ | $I_F$ = 200…2000 A | |

## Turn-on (see Fig. 3, 4)

| | | | |
|---|---|---|---|
| $V_{fr}$ | Peak forward recovery voltage | ≤ 370 V | di/dt = 1000 A/µs, $T_j$ = 115°C |

## Turn-off

| | | | |
|---|---|---|---|
| $di/dt_{crit}$ | Max. decay rate of on-state current | ≤ 340 A/µs | $I_F$ = 900 A, $T_j$ = 115 °C<br>$V_{Dclink}$ = 3300 V |
| $I_{rr}$ | Reverse recovery current | ≤ 600 A | |
| $Q_{rr}$ | Reverse recovery charge | ≤ µC | |
| $E_{rr}$ | Turn-off energy | ≤ 3.5 J | |

## Thermal

| | | | | |
|---|---|---|---|---|
| $T_j$ | Operating junction temperature range | -40...115°C | | |
| $T_{stg}$ | Storage temperature range | -40...125°C | | |
| $R_{thJC}$ | Thermal resistance junction to case | ≤ 44 K/kW | Anode side cooled | $F_m$ = 18… 22 kN |
| | | ≤ 44 K/kW | Cathode side cooled | |
| | | ≤ 22 K/kW | Double side cooled | |
| $R_{thCH}$ | Thermal resistance case to heatsink | ≤ 10 K/kW | Single side cooled | |
| | | ≤ 5 K/kW | Double side cooled | |

Analytical function for transient thermal impedance.

$$Z_{thJC}(t) = \sum_{i=1}^{n} R_i(1 - e^{-t/\tau_i})$$

| i | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $R_i$(K/kW) | 9.74 | 3.12 | 1.18 | 0.52 |
| $\tau_i$(s) | 0.387 | 0.0457 | 0.006 | 0.0018 |
| $F_m$ = 18… 22 kN Double side cooled | | | | |

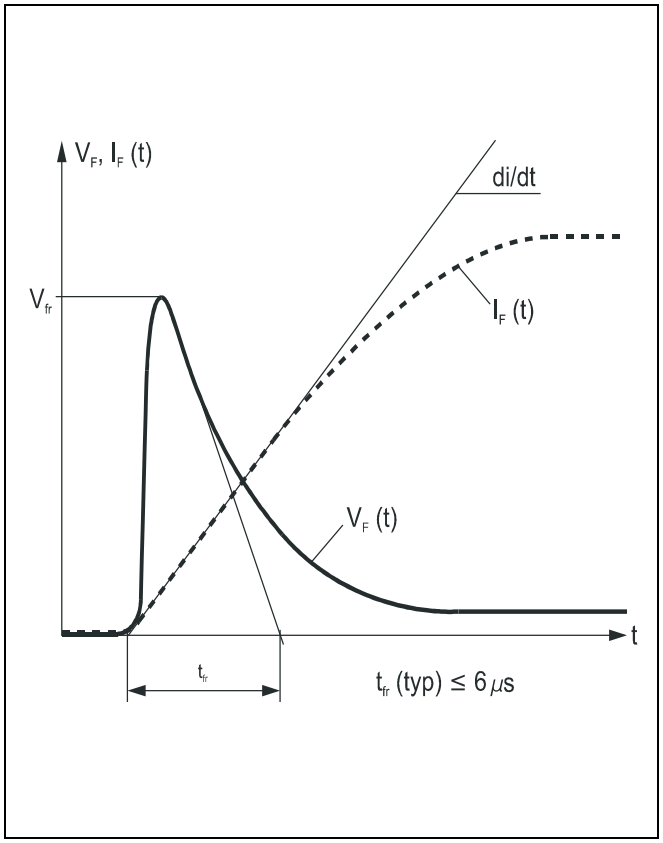


**Fig. 1 Typical forward voltage waveform when the diode is turned on with high di/dt.**

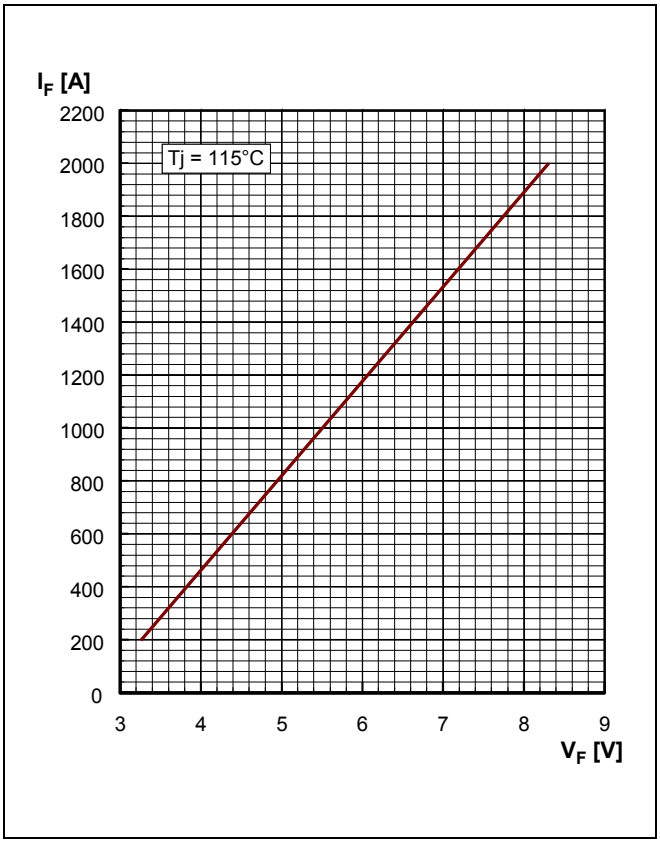


**Fig. 2 Forward current vs. forward voltage.**

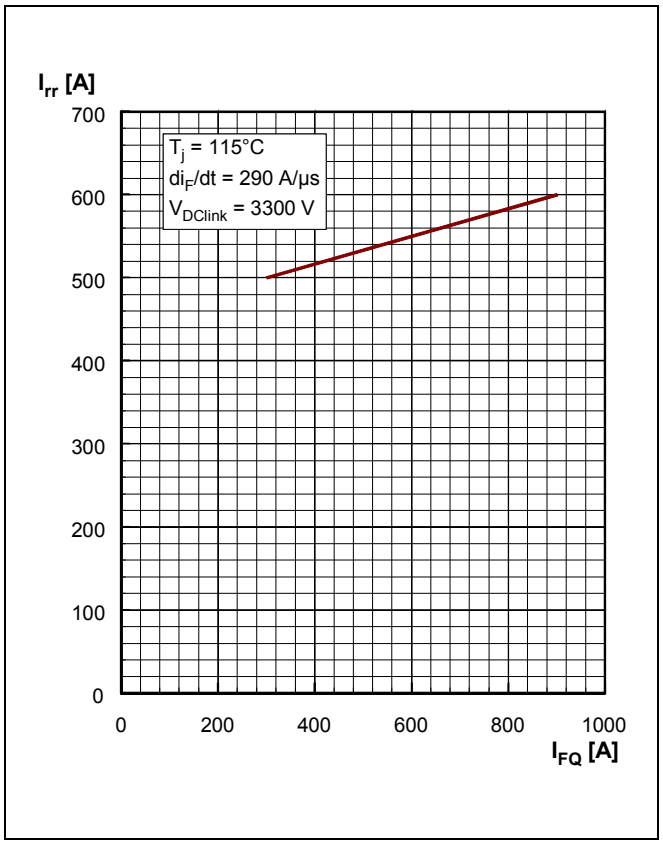


**Fig. 3 Diode reverse recovery current vs. turn-off current.**

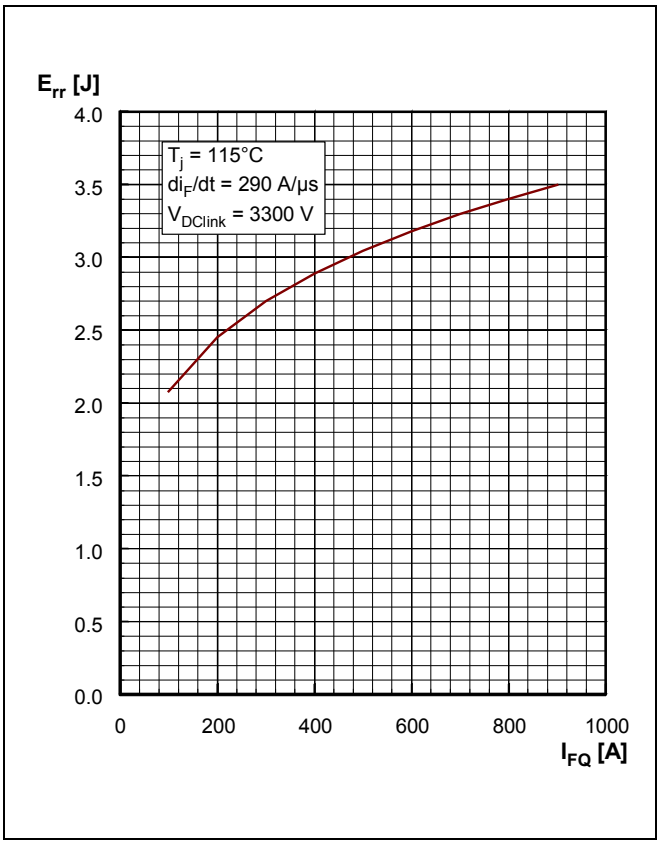


**Fig. 4 Diode turn-off energy per pulse vs. turn-off current.**

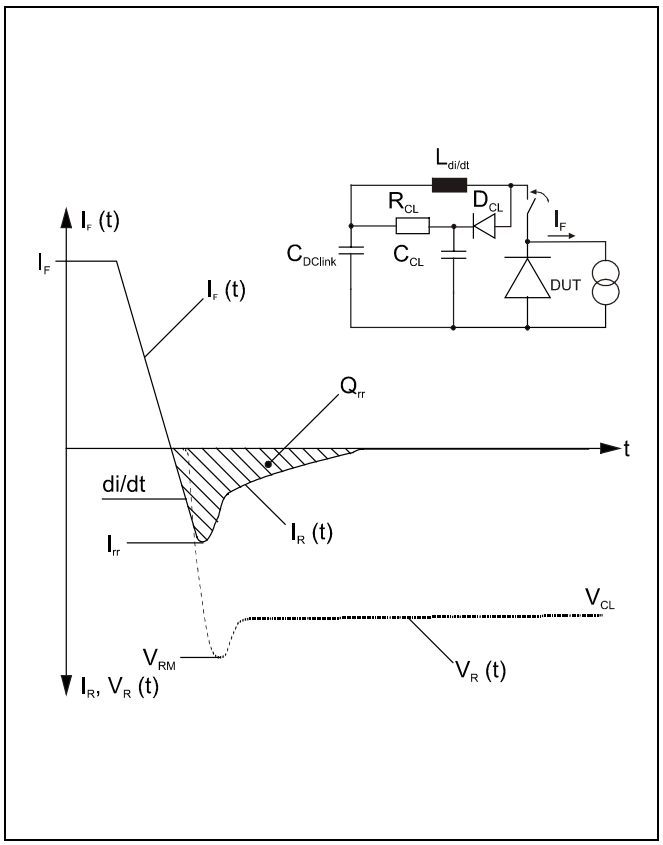


**Fig. 5 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.**

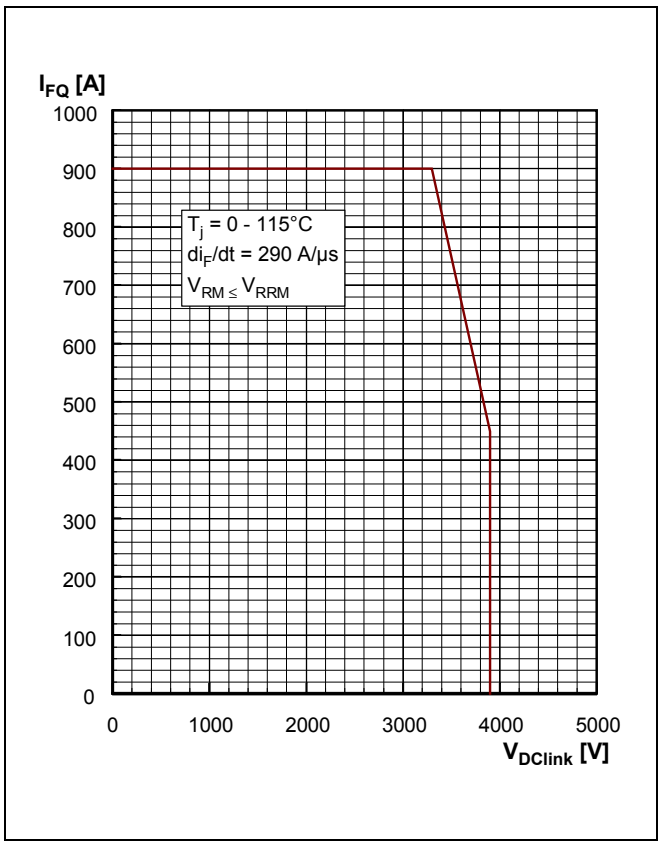


**Fig. 6 Max. repetitive diode forward current.**

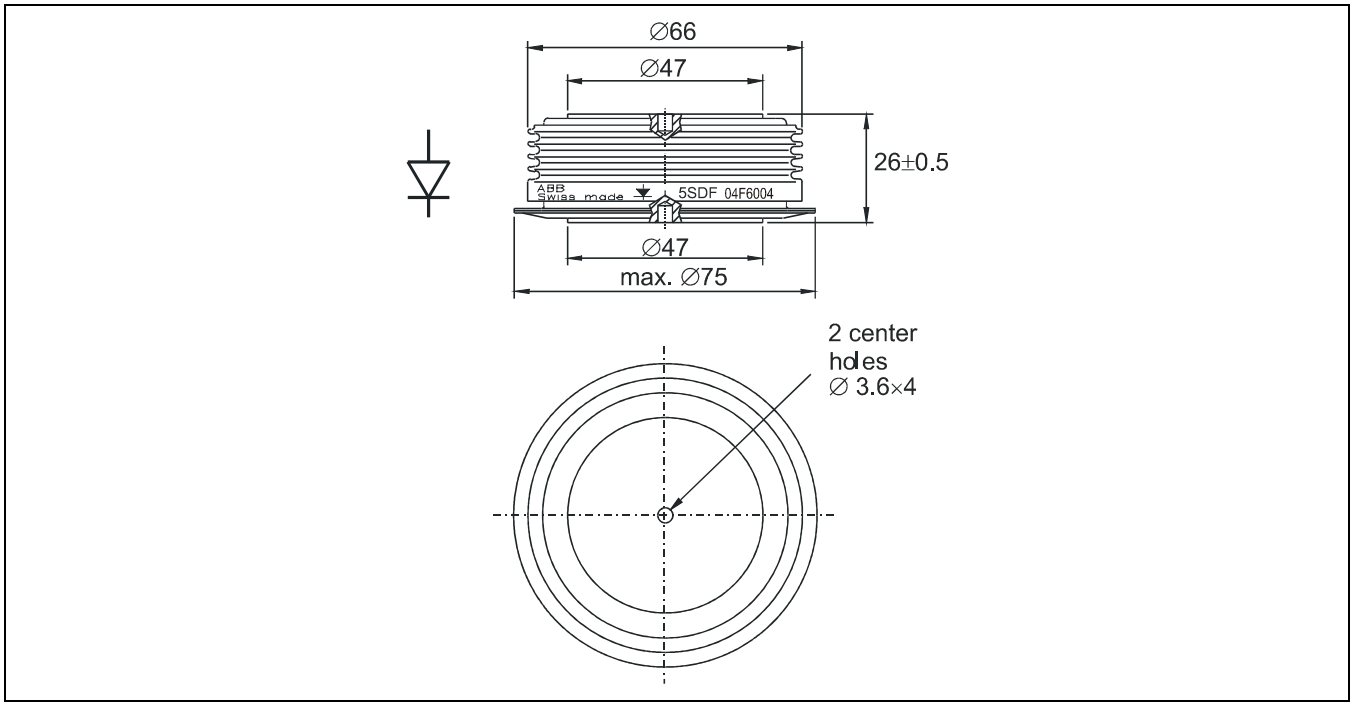


**Fig. 7 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.**



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