

Fast Recovery Diode

5SDF 04F6004

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

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 | $V_R = V_{RRM}$, $T_j = 115^\circ\text{C}$ | |
| 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: Device unclamped Device clamped | | 50 m/s ² |
| | | | 200 m/s ² |
| m | Weight | | 0.46 kg |
| D_s | Surface creepage distance | \geq | 33 mm |
| D_a | Air strike distance | \geq | 20 mm |

ABB Semiconductors AG reserves the right to change specifications without notice.

On-state (see Fig. 1, 2)

| | | | |
|------------|-------------------------------|-------|--|
| I_{FAVM} | Max. average on-state current | 380 A | Half sine wave, $T_c = 70^\circ\text{C}$ |
| I_{FRMS} | Max. RMS on-state current | 600 A | |

| | | | | |
|-------------------|--|---------------------------------------|-------------------------------|--|
| I _{FSM} | Max. peak non-repetitive surge current | 10 kA | t _p = 10 ms | Before surge: T _c = T _j = 115°C |
| | | 22 kA | t _p = 1 ms | |
| I ² dt | Max. surge current integral | 0.5·10 ⁶ A ² s | t _p = 10 ms | After surge: V _R ≈ 0 V |
| | | 0.24·10 ⁶ A ² s | t _p = 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 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 |
| τ _i (s) | 0.387 | 0.0457 | 0.006 | 0.0018 |
| F _m = 18... 22 kN Double side cool | | | | |

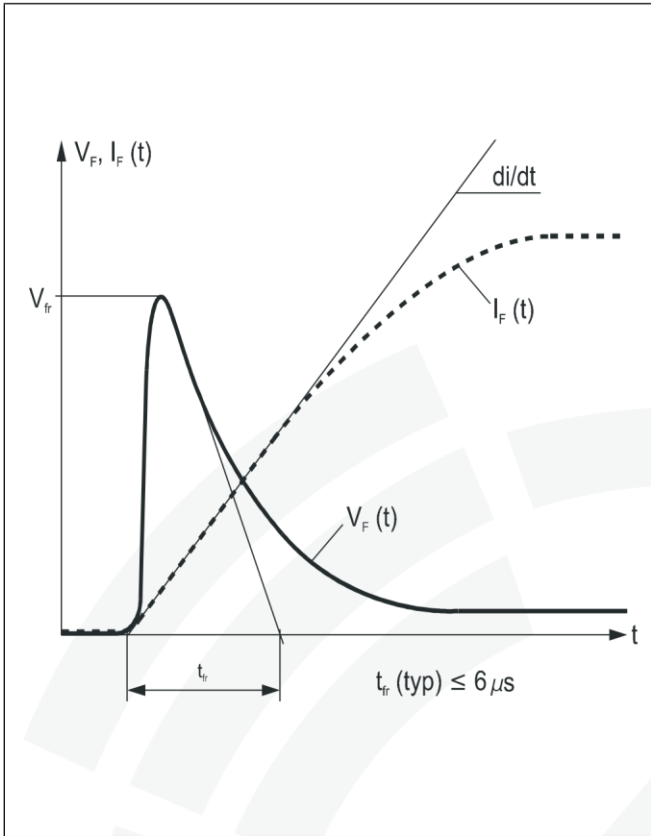


Fig. 1 Typical forward voltage waveform when the diode is turned on with high di/dt .

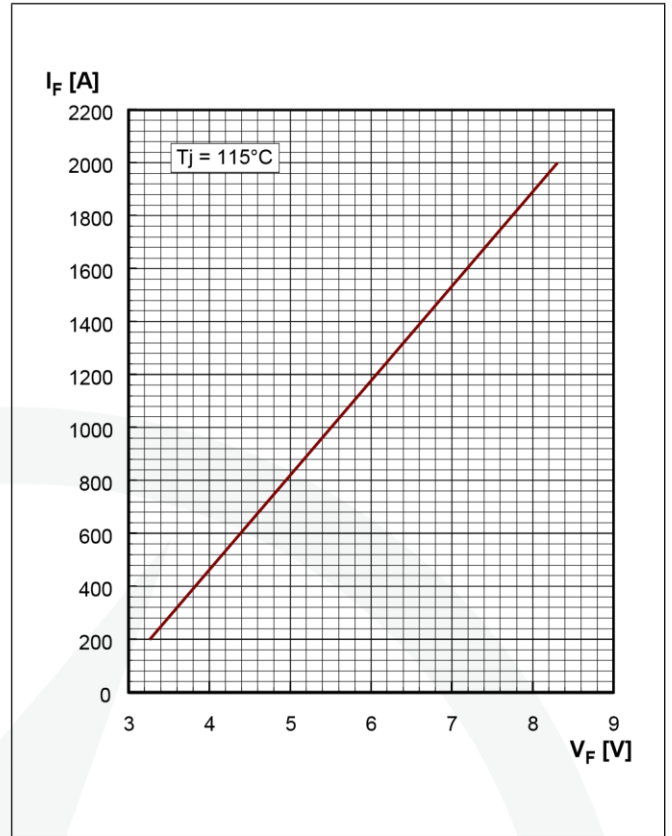


Fig. 2 Forward current vs. forward voltage.

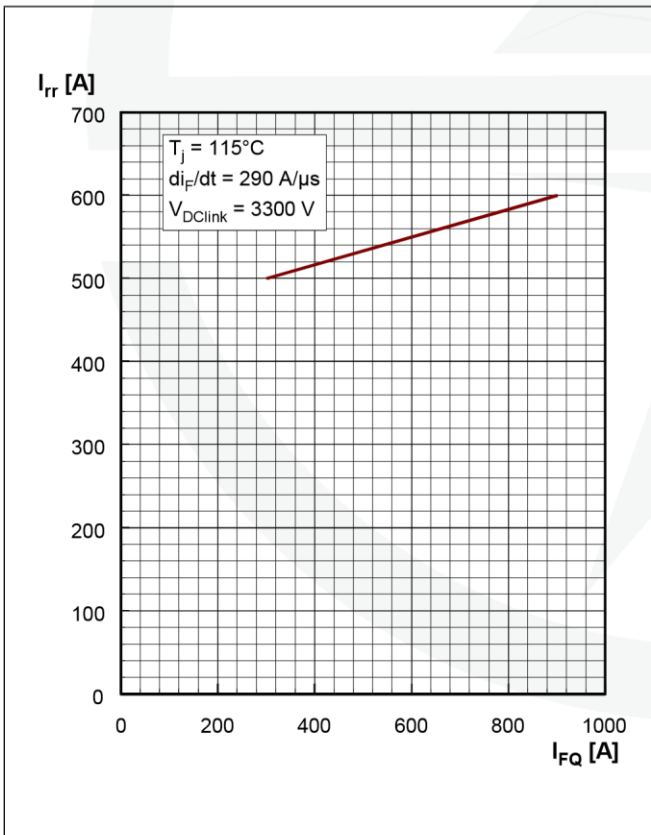


Fig. 3 Diode reverse recovery current vs. turn-off current.

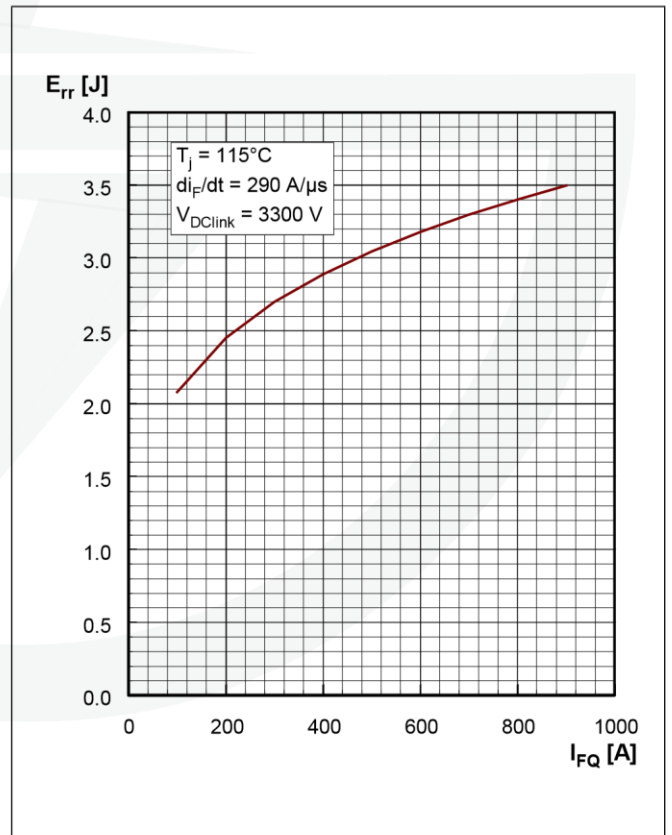


Fig. 4 Diode turn-off energy per pulse vs. turn-off current.

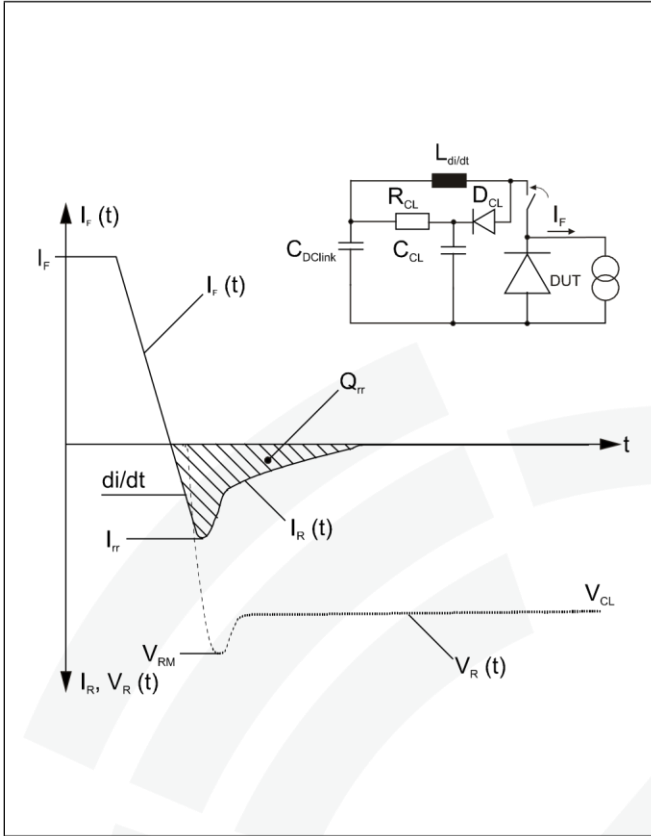


Fig. 5 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.

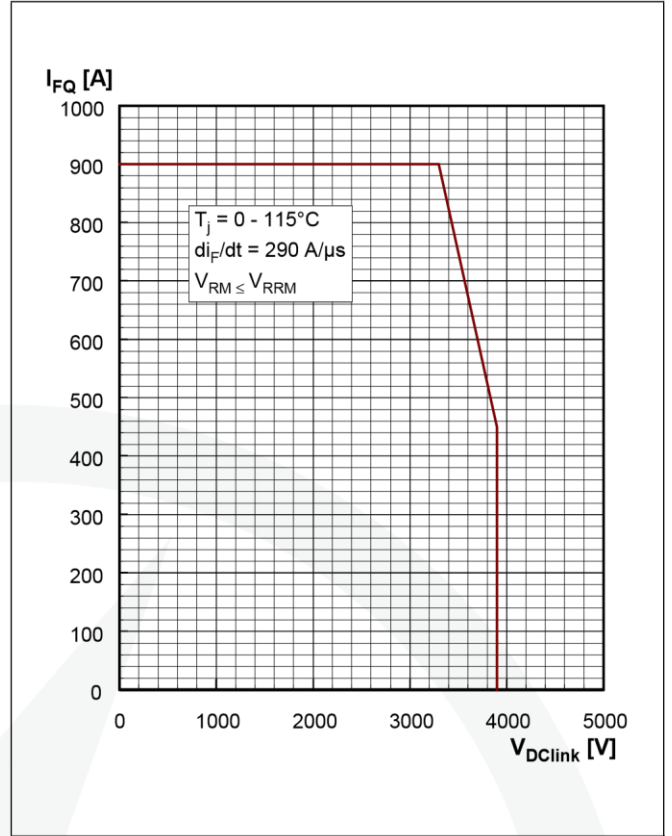


Fig. 6 Max. repetitive diode forward current.

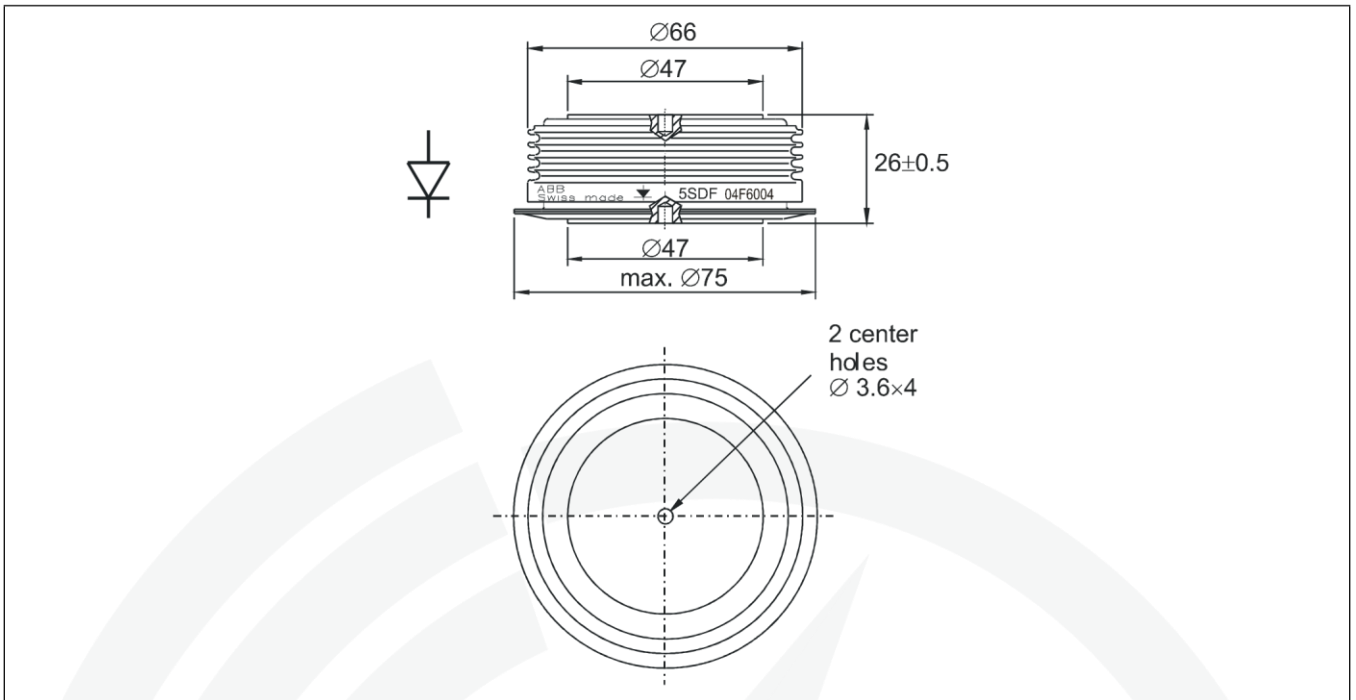


Fig. 7 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.