

| | | |
|--------------|---|-----------------|
| V_{RRM} | = | 4500 V |
| I_{FAVM} | = | 1650 A |
| I_{FSM} | = | 26 kA |
| V_{F0} | = | 1.9 V |
| r_F | = | 0.79 m Ω |
| V_{DClink} | = | 2800 V |

Fast Recovery Diode

5SDF 16L4503

PRELIMINARY

Doc. No. 5SYA1164-00 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 | 4500 V | Half sine wave, $t_p = 10$ ms, $f = 50$ Hz | |
| I_{RRM} | Repetitive peak reverse current | ≤ 150 mA | $V_R = V_{RRM}$, $T_J = 125^\circ\text{C}$ | |
| V_{DClink} | Permanent DC voltage for 100 FIT failure rate | 2800 V | 100% Duty | Ambient cosmic radiation at sea level in open air. |
| V_{DClink} | Permanent DC voltage for 100 FIT failure rate | 3200 V | 5% Duty | |

Mechanical data (see Fig. 6)

| | | | | |
|-------|---|--------|----------------------|--|
| F_m | Mounting force | min. | 36 kN | |
| | | max. | 70 kN | |
| a | Acceleration: Device unclamped Device clamped | | 50 m/s ² | |
| | | | 200 m/s ² | |
| m | Weight | | 1.45 kg | |
| D_s | Surface creepage distance | \geq | 33 mm | |
| D_a | Air strike distance | \geq | 14 mm | |

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On-state (see Fig. 3)

| | | | | |
|---------------|--|-------------------------------------|--|--|
| I_{FAVM} | Max. average on-state current | 1650 A | Half sine wave, $T_c = 70^\circ\text{C}$ | |
| I_{FRMS} | Max. RMS on-state current | 2590 A | | |
| I_{FSM} | Max. peak non-repetitive surge current | 26 kA | $t_p = 10\text{ ms}$ | Before surge: $T_c = T_j = 125^\circ\text{C}$ |
| | | 47 kA | $t_p = 1\text{ ms}$ | |
| $\int I^2 dt$ | Max. surge current integral | $3.4 \cdot 10^6\text{ A}^2\text{s}$ | $t_p = 10\text{ ms}$ | After surge: $V_R \approx 0\text{ V}$ |
| | | $1.1 \cdot 10^6\text{ A}^2\text{s}$ | $t_p = 1\text{ ms}$ | |
| V_F | Forward voltage drop | $\leq 4.51\text{ V}$ | $I_F = 3300\text{ A}$ | $T_j = 125^\circ\text{C}$ |
| V_{F0} | Threshold voltage | 1.9 V | Approximation for | |
| r_F | Slope resistance | 0.79 m Ω | $I_F = 500 \dots 4000\text{ A}$ | |

Turn-on (see Fig. 2)

| | | | |
|----------|-------------------------------|--------------------|--|
| V_{fr} | Peak forward recovery voltage | $\leq 80\text{ V}$ | $di/dt = 600\text{ A}/\mu\text{s}$, $T_j = 125^\circ\text{C}$ |
|----------|-------------------------------|--------------------|--|

Turn-off (see Fig. 5, 7)

| | | | |
|----------------|-------------------------------------|---------------------------------|--|
| di/dt_{crit} | Max. decay rate of on-state current | $\leq 600\text{ A}/\mu\text{s}$ | $I_F = 4000\text{ A}$, $T_j = 125^\circ\text{C}$ $V_{Dclink} = 2800\text{ V}$ |
| I_{rr} | Reverse recovery current | $\leq 1200\text{ A}$ | $I_F = 3300\text{ A}$, $V_{DC-Link} = 2800\text{ V}$ |
| Q_{rr} | Reverse recovery charge | $\leq 3900\text{ }\mu\text{C}$ | $di/dt = 600\text{ A}/\mu\text{s}$, $L_{CL} = 300\text{ nH}$ |
| E_{rr} | Turn-off energy | $\leq 9.0\text{ J}$ | $C_{CL} = 8\text{ }\mu\text{F}$, $R_{CL} = 0.6\text{ }\Omega$, $T_j = 125^\circ\text{C}$ |

Thermal (see Fig. 1)

| | | | | |
|------------|--------------------------------------|----------------------------|---------------------|-------------------------------|
| T_j | Operating junction temperature range | 0...125 $^\circ\text{C}$ | | |
| T_{stg} | Storage temperature range | -40...125 $^\circ\text{C}$ | | |
| R_{thJC} | Thermal resistance junction to case | $\leq 13\text{ K/kW}$ | Anode side cooled | $F_m = 36 \dots 70\text{ kN}$ |
| | | $\leq 13\text{ K/kW}$ | Cathode side cooled | |
| | | $\leq 6.5\text{ K/kW}$ | Double side cooled | |
| R_{thCH} | Thermal resistance case to heatsink | $\leq 5\text{ K/kW}$ | Single side cooled | |
| | | $\leq 3\text{ K/kW}$ | 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 |
| $R_i(\text{K/kW})$ | 4.05 | 1.28 | 0.62 | 0.56 |
| $\tau_i(\text{s})$ | 0.56685 | 0.10686 | 0.01239 | 0.00300 |
| $F_m = 36 \dots 70\text{ kN}$ Double side cooled | | | | |

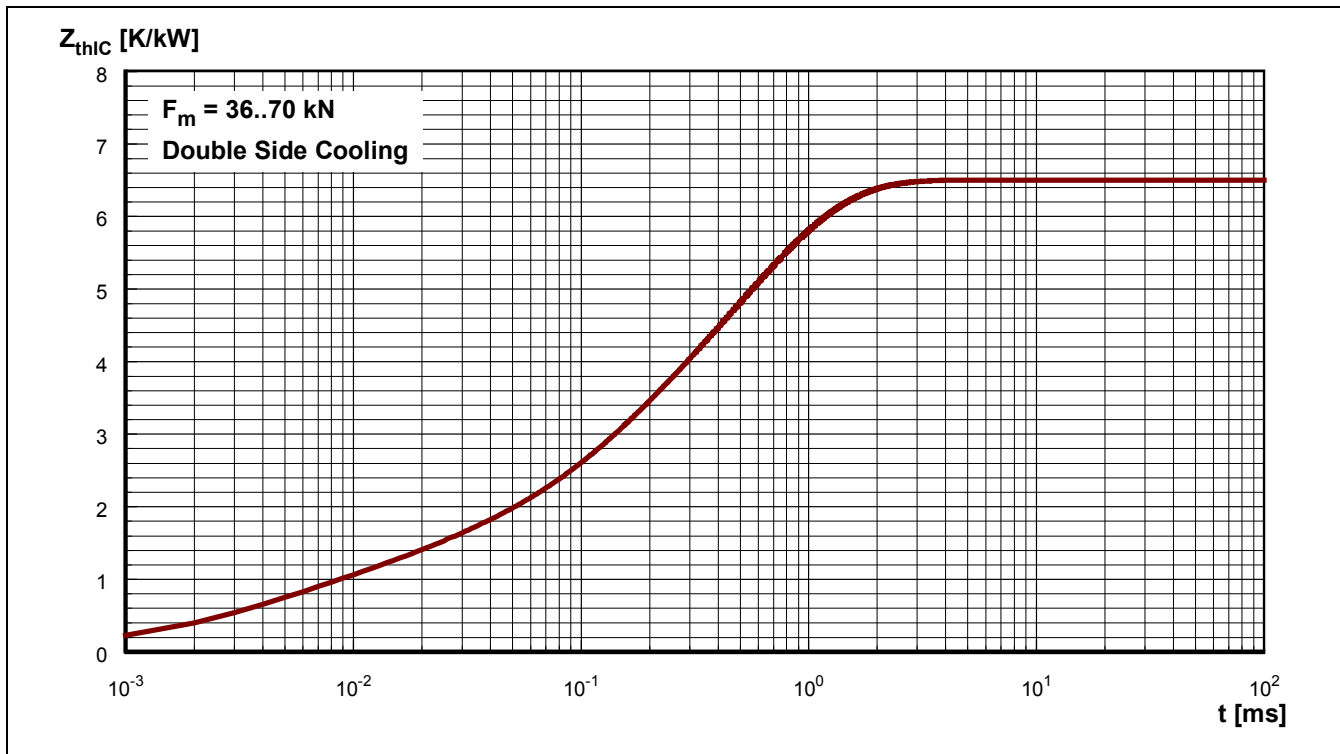


Fig. 1 Transient thermal impedance (junction to case) vs. time in analytical and graphical form (max. values).

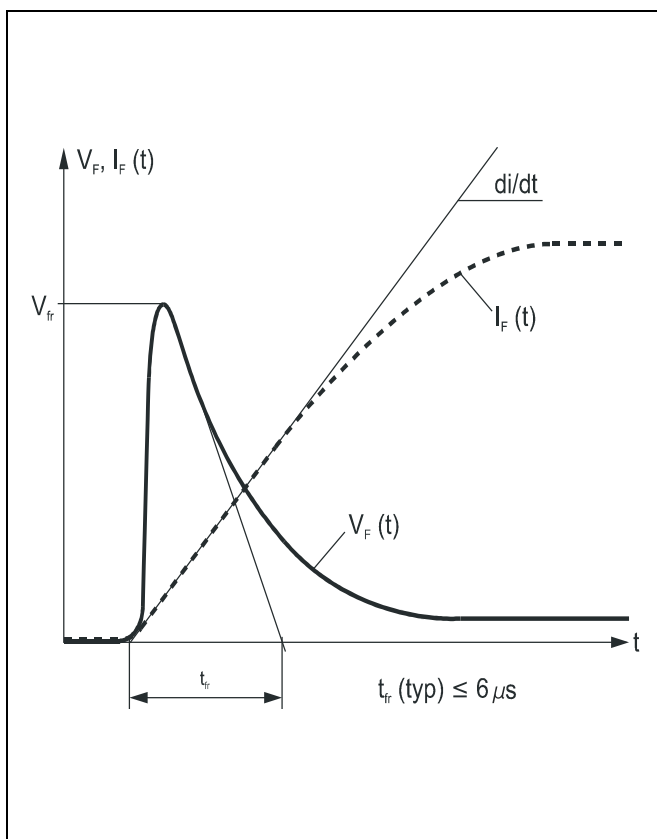


Fig. 2 Typical forward voltage waveform when the diode is turned on with high di/dt .

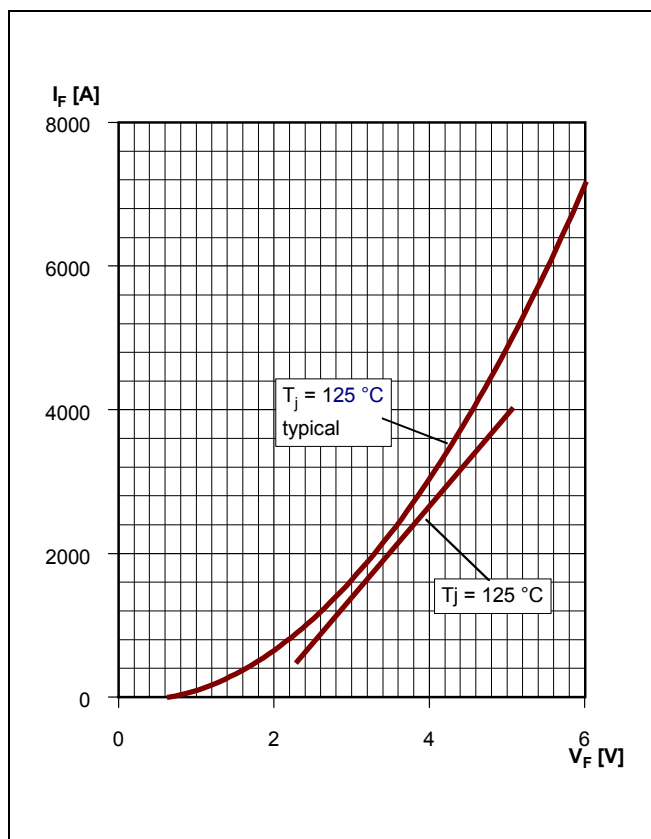


Fig. 3 Forward current vs. forward voltage.

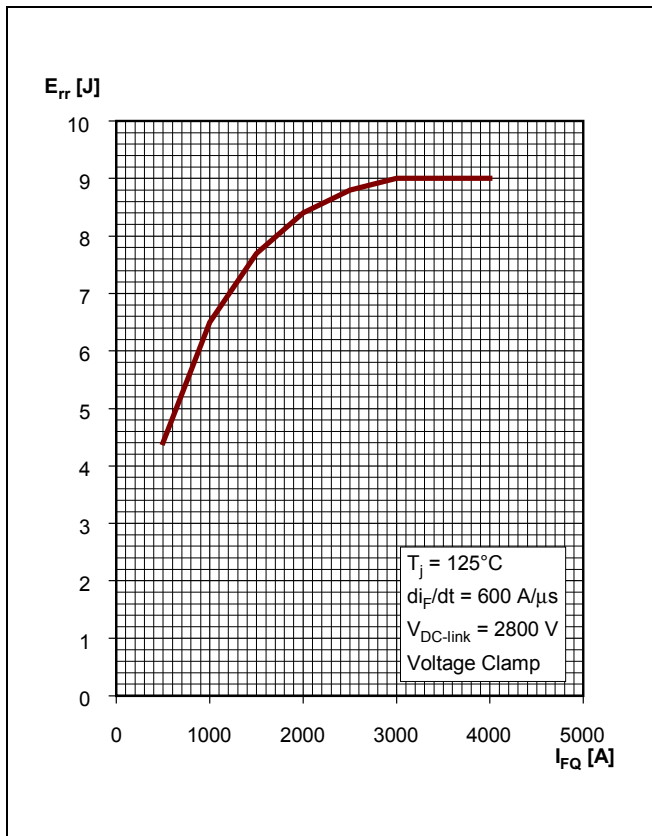


Fig. 4 Diode turn-off energy per pulse vs. turn-off current.

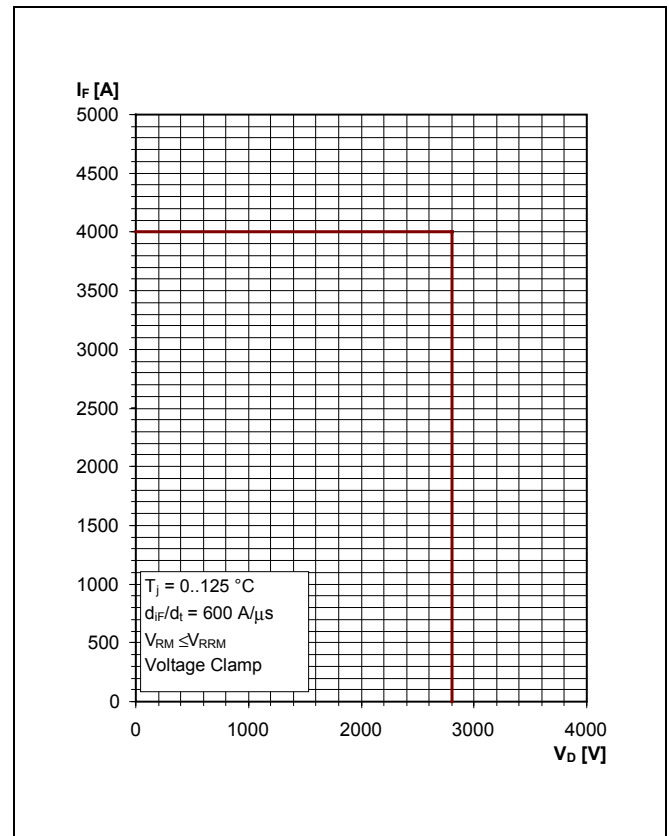


Fig. 5 Max. repetitive turn off current.

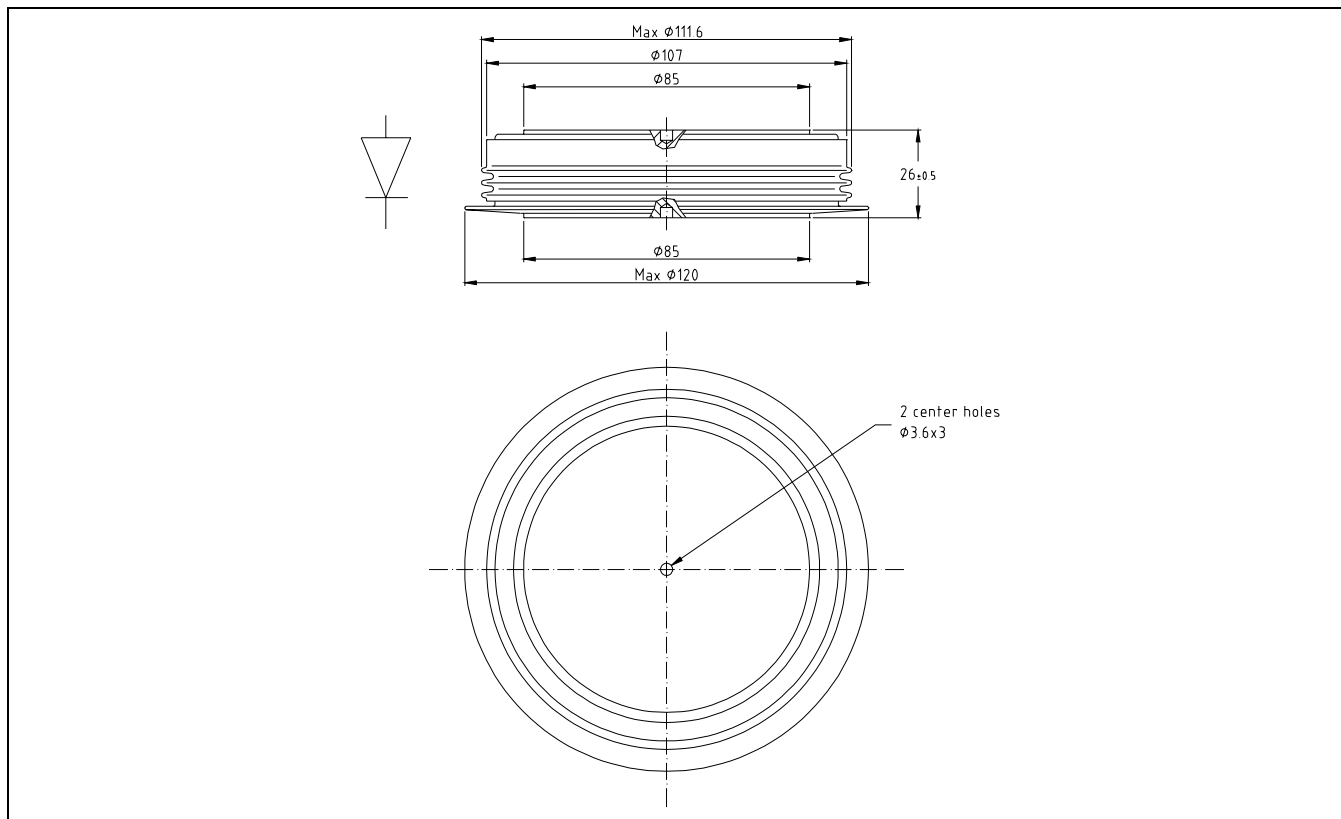


Fig. 6 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

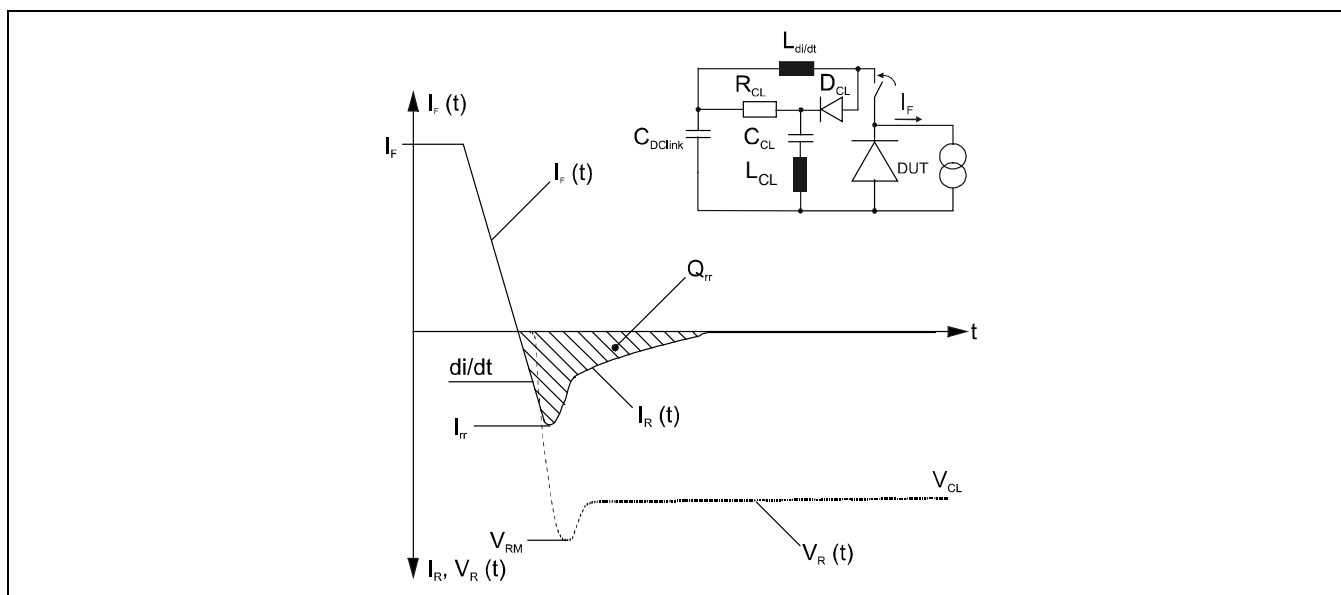


Fig. 7 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.

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