

|              |   |                |
|--------------|---|----------------|
| $V_{RRM}$    | = | 6000 V         |
| $I_{FAVM}$   | = | 250 A          |
| $I_{FSM}$    | = | 3.6 kA         |
| $V_{F0}$     | = | 2.5 V          |
| $r_F$        | = | 2.5 m $\Omega$ |
| $V_{DClink}$ | = | 3000 V         |

## Fast Recovery Diode

# 5SDF 02D6002

## PRELIMINARY

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- Patented free-floating silicon technology
- Low switching losses
- Optimized for use as snubber diode in high-voltage GTO converters
- Standard press-pack ceramic housing, hermetically cold-welded
- Cosmic radiation withstand rating

### Blocking

|              |   |              |   |  |
|--------------|---|--------------|---|--|
| $V_{RRM}$    | Repetitive peak reverse voltage               | 6000 V       | Half sine wave, $t_p = 10$ ms, $f = 50$ Hz  |  |
| $I_{RRM}$    | Repetitive peak reverse current               | $\leq 50$ mA | $V_R = V_{RRM}$ , $T_j = 125^\circ\text{C}$ |  |
| $V_{DClink}$ | Permanent DC voltage for 100 FIT failure rate | 3000 V       | 100% Duty                                   | Ambient cosmic radiation at sea level in open air. |
|              |   | 3800 V       | 5% Duty                                     |  |

### Mechanical data (see Fig. 6)

|       |                           |        |                      |
|-------|---------------------------|--------|----------------------|
| $F_m$ | Mounting force            | min.   | 10 kN                |
|       |                           | max.   | 12 kN                |
| a     | Acceleration:             |        |                      |
|       | Device unclamped          |        | 50 m/s <sup>2</sup>  |
|       | Device clamped            |        | 200 m/s <sup>2</sup> |
| m     | Weight                    |        | 0.25 kg              |
| $D_s$ | Surface creepage distance | $\geq$ | 30 mm                |
| $D_a$ | Air strike distance       | $\geq$ | 20 mm                |

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

|               |  |                                    |  |  |
|---------------|--|------------------------------------|--|--|
| $I_{FAVM}$    | Max. average on-state current          | 250 A                              | Half sine wave, $T_c = 85^\circ\text{C}$ |  |
| $I_{FRMS}$    | Max. RMS on-state current              | 400 A                              |  |  |
| $I_{FSM}$     | Max. peak non-repetitive surge current | 3.6 kA                             | $t_p = 10\text{ ms}$                     | Before surge:<br>$T_c = T_j = 125^\circ\text{C}$ |
|               |  | 11.4 kA                            | $t_p = 1\text{ ms}$                      |  |
| $\int I^2 dt$ | Max. surge current integral            | $65 \cdot 10^3\text{ A}^2\text{s}$ | $t_p = 10\text{ ms}$                     | After surge:<br>$V_R \approx 0\text{ V}$         |
|               |  | $65 \cdot 10^3\text{ A}^2\text{s}$ | $t_p = 1\text{ ms}$                      |  |
| $V_F$         | Forward voltage drop                   | $\leq 5\text{ V}$                  | $I_F = 1000\text{ A}$                    | $T_j = 125^\circ\text{C}$                        |
| $V_{F0}$      | Threshold voltage                      | 2.5 V                              | Approximation for                        |  |
| $r_F$         | Slope resistance                       | 2.5 m $\Omega$                     | $I_F = 200 \dots 4000\text{ A}$          |  |

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

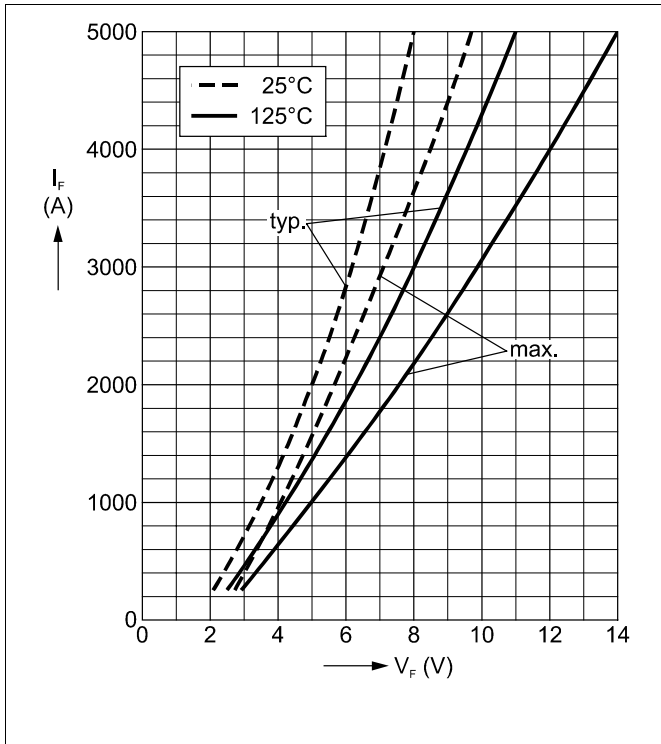
|          |                               |                     |   |
|----------|-------------------------------|---------------------|---|
| $V_{fr}$ | Peak forward recovery voltage | $\leq 370\text{ V}$ | $di/dt = 1000\text{ A}/\mu\text{s}$ , $T_j = 125^\circ\text{C}$ |
|----------|-------------------------------|---------------------|---|

**Turn-off** (see Fig. 5)

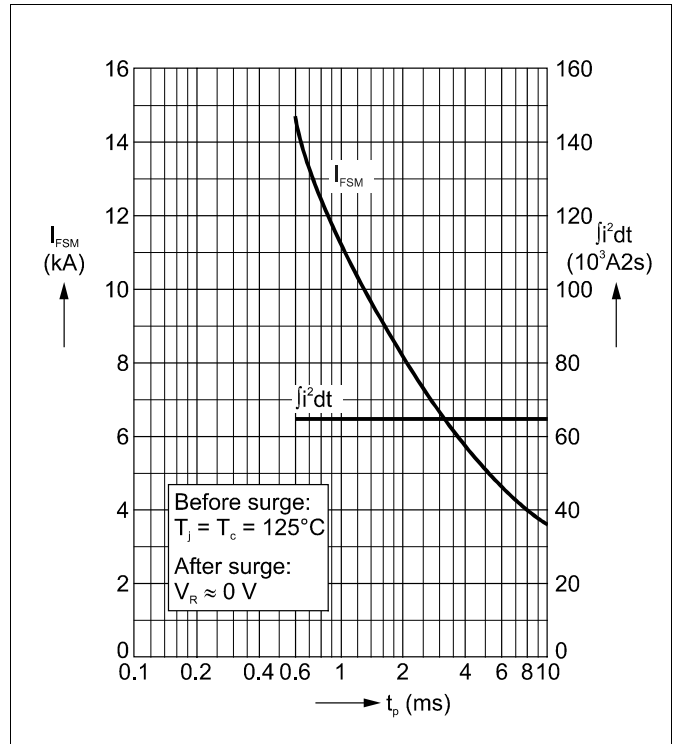
|          |                          |                          |  |
|----------|--------------------------|--------------------------|--|
| $I_{rr}$ | Reverse recovery current | $\leq 260\text{ A}$      | $di/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 125^\circ\text{C}$ ,<br>$I_F = 1000\text{ A}$ , $V_{RM} = V$ ,<br>$R_S = 22\ \Omega$ , $C_S = 0.22\ \mu\text{F}$ |
| $Q_{rr}$ | Reverse recovery charge  | $\leq 2000\ \mu\text{C}$ |  |
| $E_{rr}$ | Turn-off energy          | $\leq \text{-- J}$       |  |

**Thermal** (see Fig. 7)

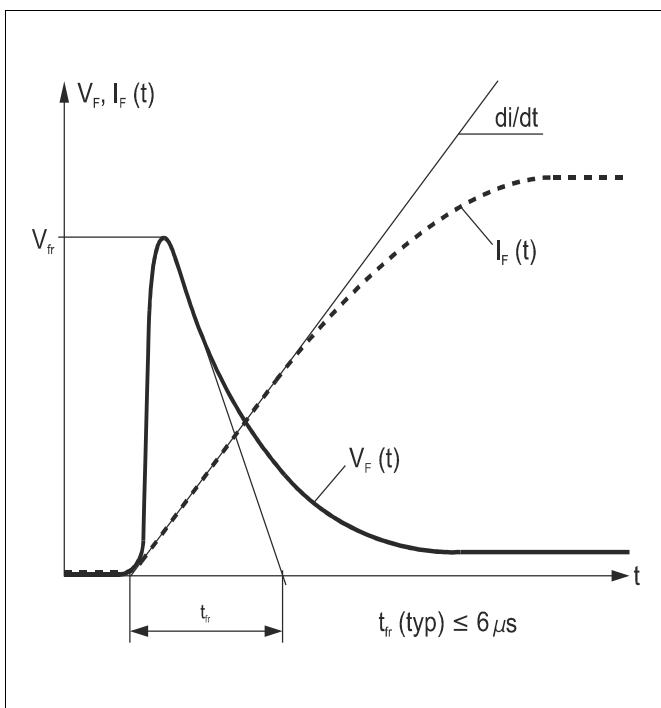
|            |                                      |                            |                     |                               |
|------------|--------------------------------------|----------------------------|---------------------|-------------------------------|
| $T_j$      | Operating junction temperature range | -40...125 $^\circ\text{C}$ |                     |                               |
| $T_{stg}$  | Storage temperature range            | -40...125 $^\circ\text{C}$ |                     |                               |
| $R_{thJC}$ | Thermal resistance junction to case  | $\leq 80\text{ K/kW}$      | Anode side cooled   | $F_M = 10 \dots 12\text{ kN}$ |
|            |                                      | $\leq 80\text{ K/kW}$      | Cathode side cooled |                               |
|            |                                      | $\leq 40\text{ K/kW}$      | Double side cooled  |                               |
| $R_{thCH}$ | Thermal resistance case to heatsink  | $\leq 16\text{ K/kW}$      | Single side cooled  |                               |
|            |                                      | $\leq 8\text{ K/kW}$       | Double side cooled  |                               |



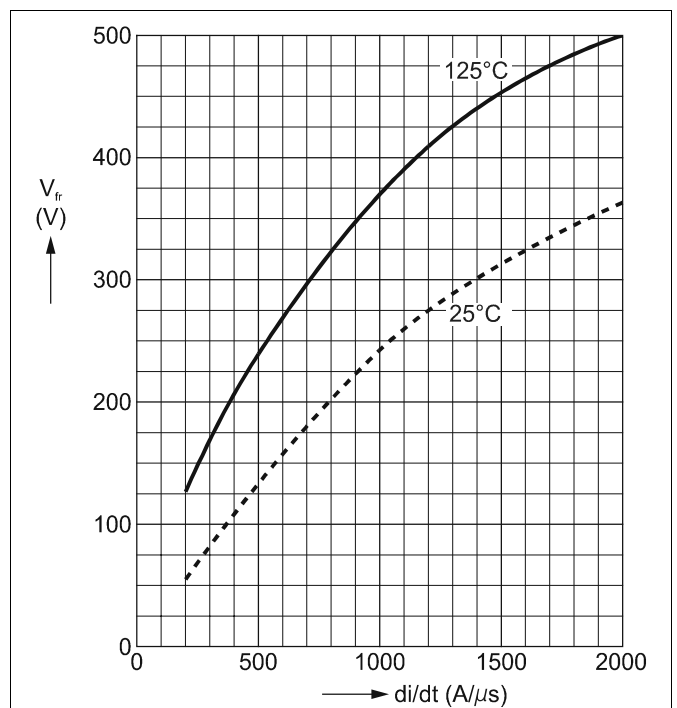
**Fig. 1** Forward current vs. forward voltage (typ. and max. values).



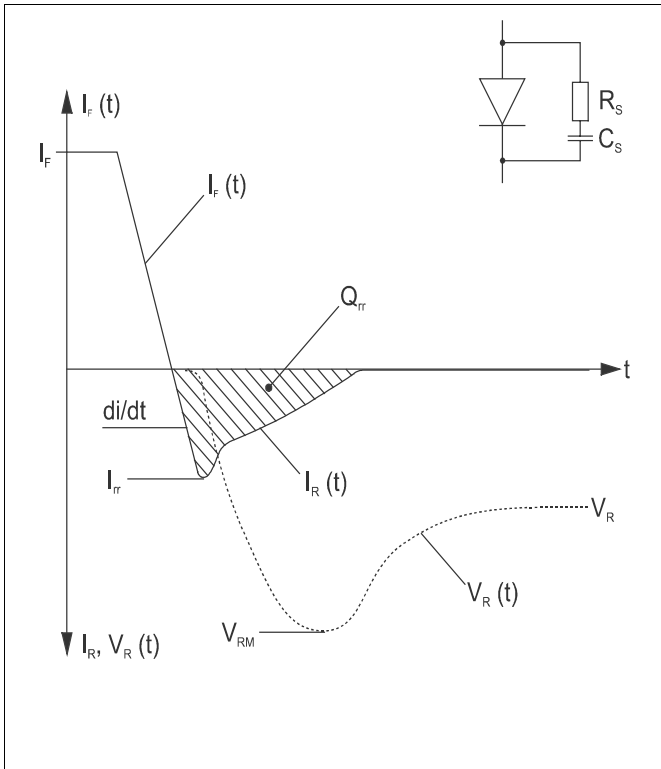
**Fig. 2** Surge current and fusing integral vs. pulse width (max. values) for non repetitive, half-sinusoidal surge current pulses.



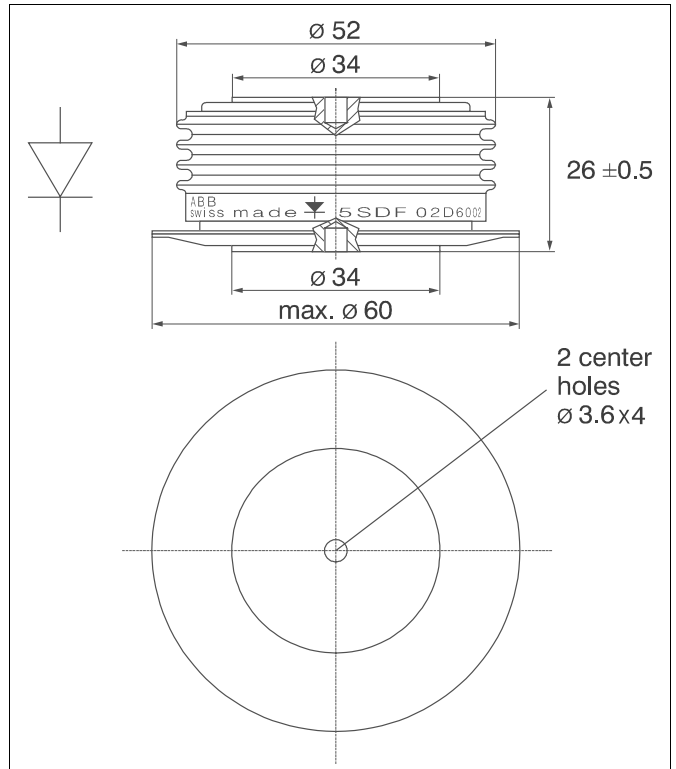
**Fig. 3** Typical forward voltage waveform when the diode is turned on with a high  $di/dt$ .



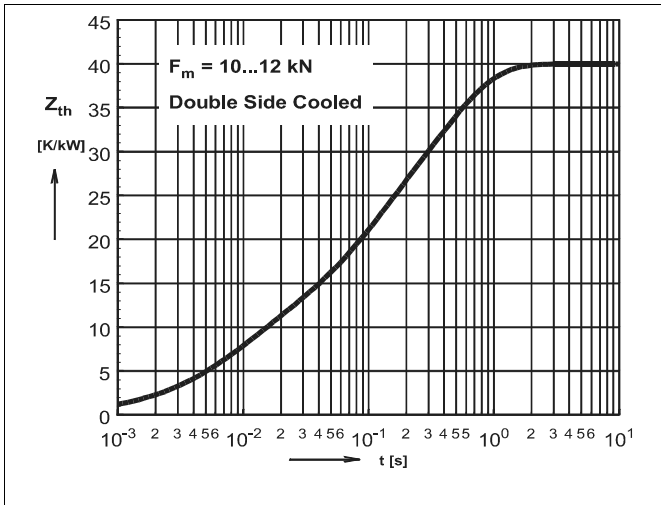
**Fig. 4** Forward recovery voltage vs. turn-on  $di/dt$  (max. values).



**Fig. 5** Typical current and voltage waveforms at turn-off with conventional RC snubber circuit



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



**Fig. 7** Transient thermal impedance (junction to case) vs. time in analytical and graphical form (max. values).

$$Z_{thJC}(t) = \sum_{i=1}^4 R_i (1 - e^{-t/\tau_i})$$

| i                     | 1     | 2     | 3     | 4      |
|-----------------------|-------|-------|-------|--------|
| R <sub>i</sub> (K/kW) | 20.95 | 10.57 | 7.15  | 1.33   |
| τ <sub>i</sub> (s)    | 0.396 | 0.072 | 0.009 | 0.0044 |

F<sub>m</sub> = 10... 12 kN  
Double side cooled

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



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