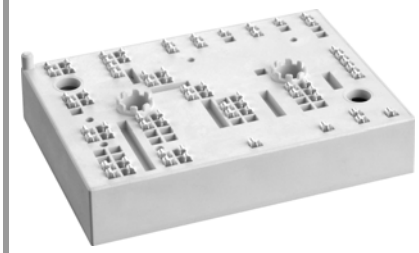
# SKiiP 38AC12T4V1



**MiniSKiiP® 3**

**SKiiP 38AC12T4V1**

### Features

- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

### Typical Applications*

- Inverter up to 41 kVA
- Typical motor power 22 kW

### Remarks

- Max. case temperature limited to $T_C$=125°C
- Product reliability results valid for $T_j$≤150°C (recommended $T_{j,op}$=-40...+150°C)
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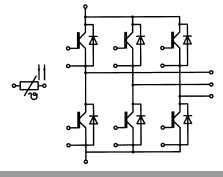
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information.



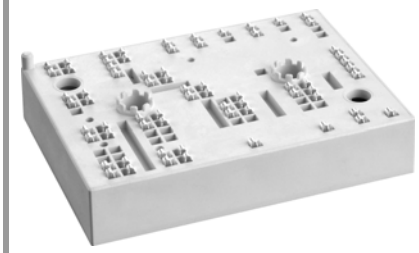
**AC**

**Absolute Maximum Ratings**

| Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|
| **Inverter - IGBT** | | | | |
| $V_{CES}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_C$ | $\lambda_{paste}$=0.8 W/(mK) | $T_s$ = 25 °C | 115 | A |
| | $T_j$ = 175 °C | $T_s$ = 70 °C | 93 | A |
| $I_C$ | $\lambda_{paste}$=2.5 W/(mK) | $T_s$ = 25 °C | 140 | A |
| | $T_j$ = 175 °C | $T_s$ = 70 °C | 114 | A |
| $I_{Cnom}$ | | | 100 | A |
| $I_{CRM}$ | $I_{CRM}$ = 3 x $I_{Cnom}$ | | 300 | A |
| $V_{GES}$ | | | -20 ... 20 | V |
| $t_{psc}$ | $V_{CC}$ = 800 V<br>$V_{GE}$ ≤ 15 V<br>$V_{CES}$ ≤ 1200 V | $T_j$ = 150 °C | 10 | µs |
| $T_j$ | | | -40 ... 175 | °C |
| **Inverse - Diode** | | | | |
| $I_F$ | $\lambda_{paste}$=0.8 W/(mK) | $T_s$ = 25 °C | 100 | A |
| | $T_j$ = 175 °C | $T_s$ = 70 °C | 79 | A |
| $I_F$ | $\lambda_{paste}$=2.5 W/(mK) | $T_s$ = 25 °C | 116 | A |
| | $T_j$ = 175 °C | $T_s$ = 70 °C | 93 | A |
| $I_{Fnom}$ | | | 100 | A |
| $I_{FRM}$ | $I_{FRM}$ = 3 x $I_{Fnom}$ | | 300 | A |
| $I_{FSM}$ | 10 ms, sin 180°, $T_j$ = 150 °C | | 550 | A |
| $T_j$ | | | -40 ... 175 | °C |
| **Module** | | | | |
| $I_{t(RMS)}$ | $T_{terminal}$ = 80 °C, 20 A per spring | | 160 | A |
| $T_{stg}$ | | | -40 ... 125 | °C |
| $V_{isol}$ | AC sinus 50 Hz, t = 1 min | | 2500 | V |

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Inverter - IGBT** | | | | | | |
| $V_{CE(sat)}$ | $I_C$ = 100 A<br>$V_{GE}$ = 15 V<br>chiplevel | $T_j$ = 25 °C | | 1.80 | 2.05 | V |
| | | $T_j$ = 150 °C | | 2.20 | 2.40 | V |
| $V_{CE0}$ | chiplevel | $T_j$ = 25 °C | | 0.80 | 0.90 | V |
| | | $T_j$ = 150 °C | | 0.70 | 0.80 | V |
| $r_{CE}$ | $V_{GE}$ = 15 V<br>chiplevel | $T_j$ = 25 °C | | 10 | 12 | mΩ |
| | | $T_j$ = 150 °C | | 15 | 16 | mΩ |
| $V_{GE(th)}$ | $V_{GE}$ = $V_{CE}$, $I_C$ = 4 mA | | 5 | 5.8 | 6.5 | V |
| $I_{CES}$ | $V_{GE}$ = 0 V, $V_{CE}$ = 1200 V, $T_j$ = 25 °C | | | 0.1 | 0.3 | mA |
| $C_{ies}$ | $V_{CE}$ = 25 V<br>$V_{GE}$ = 0 V | f = 1 MHz | | 6.15 | | nF |
| $C_{oes}$ | | f = 1 MHz | | 0.41 | | nF |
| $C_{res}$ | | f = 1 MHz | | 0.35 | | nF |
| $Q_G$ | - 8 V...+ 15 V | | | 565 | | nC |
| $R_{Gint}$ | $T_j$ = 25 °C | | | 7.5 | | Ω |
| $t_{d(on)}$ | $V_{CC}$ = 600 V<br>$I_C$ = 100 A<br>$R_{G\ on}$ = 1 Ω<br>$R_{G\ off}$ = 1 Ω<br>di/dt$_{on}$ = 2080 A/µs<br>di/dt$_{off}$ = 1240 A/µs | $T_j$ = 150 °C | | 160 | | ns |
| $t_r$ | | $T_j$ = 150 °C | | 45 | | ns |
| $E_{on}$ | | $T_j$ = 150 °C | | 13.7 | | mJ |
| $t_{d(off)}$ | | $T_j$ = 150 °C | | 395 | | ns |
| $t_f$ | | $T_j$ = 150 °C | | 73 | | ns |
| $E_{off}$ | $V_{GE}$ = +15/-15 V | $T_j$ = 150 °C | | 9.7 | | mJ |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=0.8 W/(mK) | | | 0.48 | | K/W |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=2.5 W/(mK) | | | 0.34 | | K/W |



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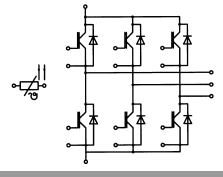


AC

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Inverse - Diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ = 100 A<br>$V_{GE}$ = 0 V<br>chiplevel | $T_j$ = 25 °C | | 2.20 | 2.52 | V |
| | | $T_j$ = 150 °C | | 2.15 | 2.47 | V |
| $V_{F0}$ | chiplevel | $T_j$ = 25 °C | | 1.30 | 1.50 | V |
| | | $T_j$ = 150 °C | | 0.90 | 1.10 | V |
| $r_F$ | chiplevel | $T_j$ = 25 °C | | 9.0 | 10 | mΩ |
| | | $T_j$ = 150 °C | | 13 | 14 | mΩ |
| $I_{RRM}$ | $I_F$ = 100 A<br>$di/dt_{off}$ = 2680 A/µs<br>+15/-15<br>$V_{CC}$ = 600 V | $T_j$ = 150 °C | | 112 | | A |
| $Q_{rr}$ | | $T_j$ = 150 °C | | 16 | | µC |
| $E_{rr}$ | | $T_j$ = 150 °C | | 6.5 | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=0.8 W/(mK) | | | 0.66 | | K/W |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=2.5 W/(mK) | | | 0.52 | | K/W |
| **Module** | | | | | | |
| $L_{CE}$ | | | | | | nH |
| $M_s$ | to heat sink | | 2 | | 2.5 | Nm |
| w | | | | 82 | | g |
| **Temperature Sensor** | | | | | | |
| $R_{100}$ | $T_r$=100°C ($R_{25}$=1000Ω) | | | 1670 ± 3% | | Ω |
| R(T) | R(T)=1000Ω[1+A(T-25°C)+B(T-25°C)$^2$], A = 7.635*10$^{-3}$ °C$^{-1}$, B = 1.731*10$^{-5}$ °C$^{-2}$ | | | | | |

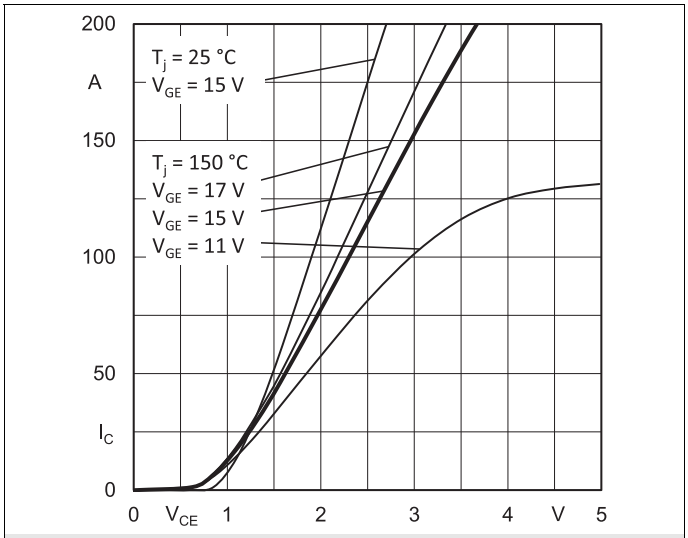



Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

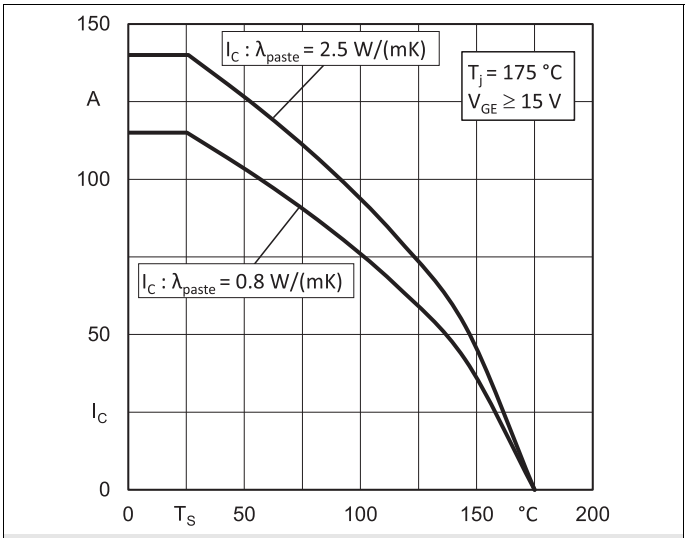



Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

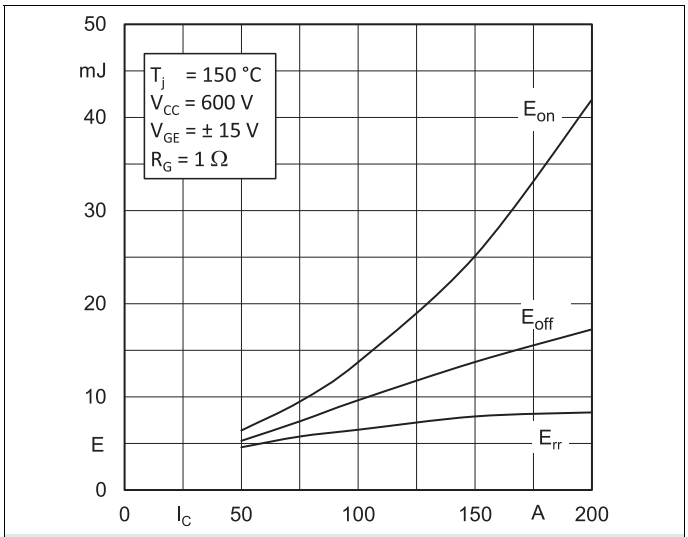



Fig. 3: Typ. turn-on /-off energy = f ($I_C$)

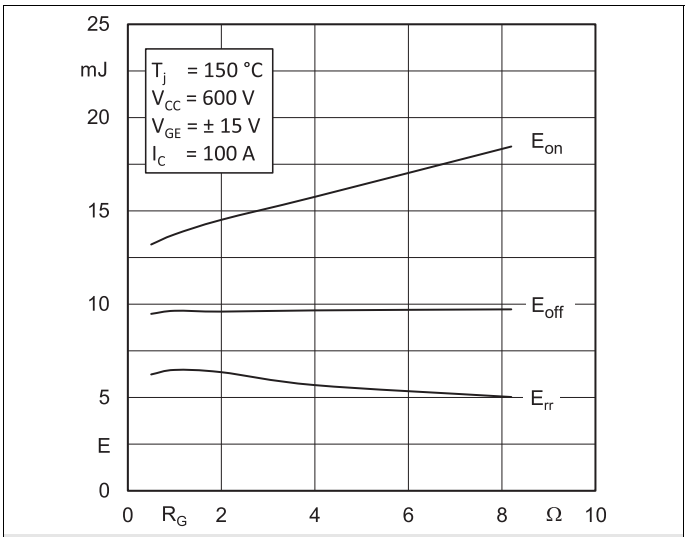



Fig. 4: Typ. turn-on /-off energy = f ($R_G$)

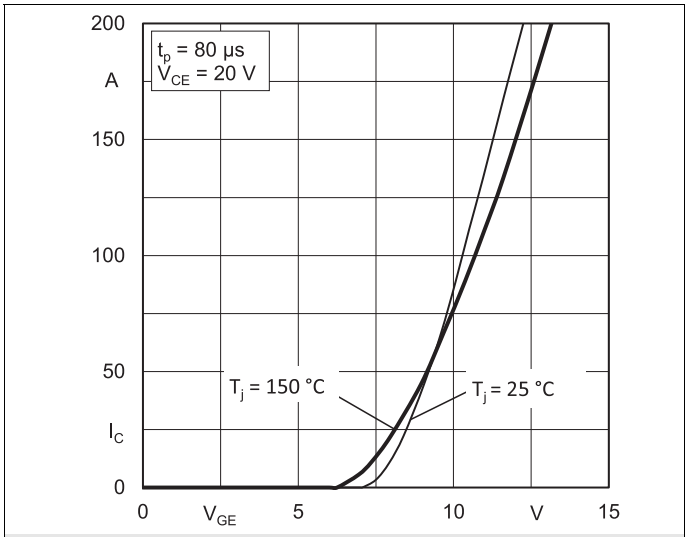



Fig. 5: Typ. transfer characteristic

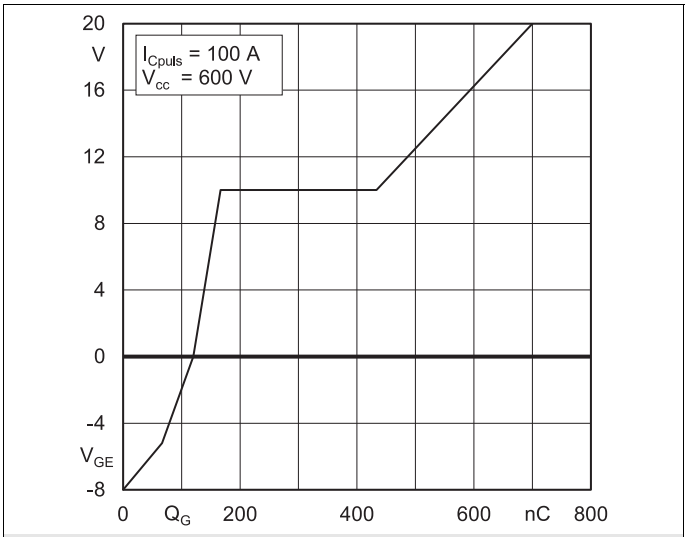



Fig. 6: Typ. gate charge characteristic

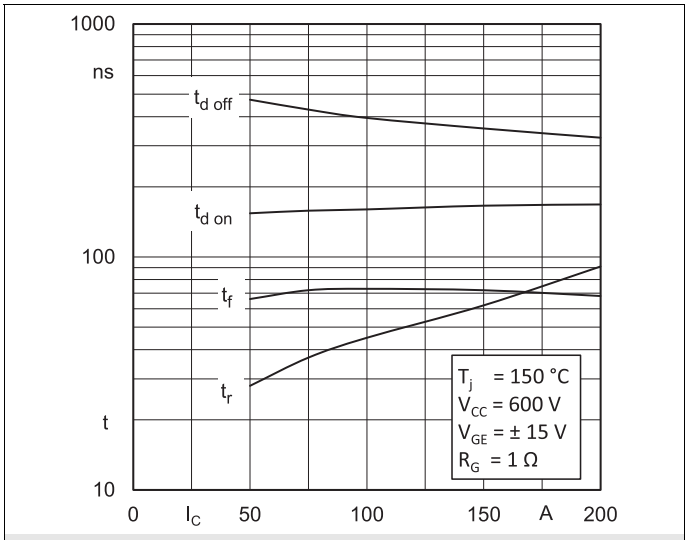



Fig. 7: Typ. switching times vs. $I_C$

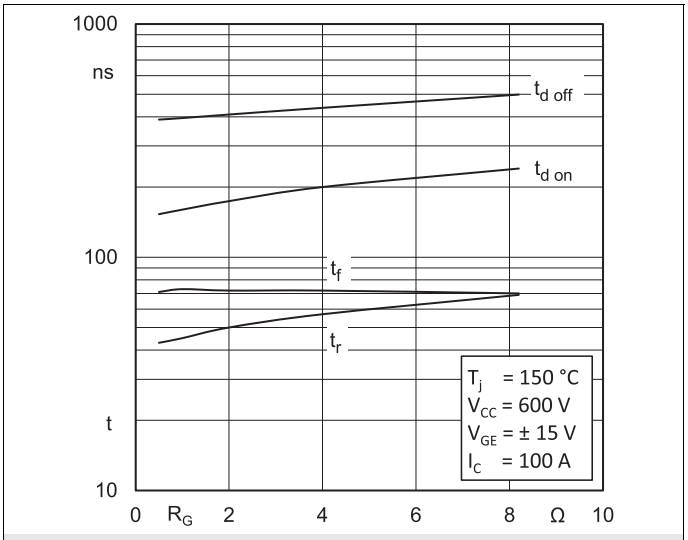



Fig. 8: Typ. switching times vs. gate resistor $R_G$

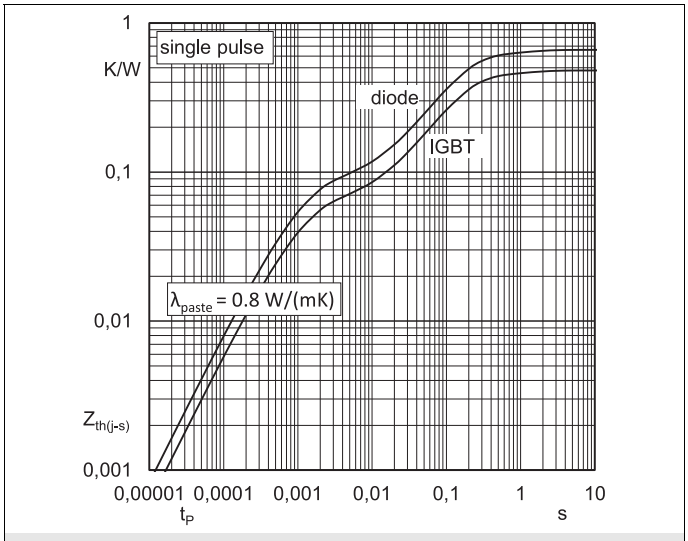



Fig. 9: Transient thermal impedance of IGBT and Diode

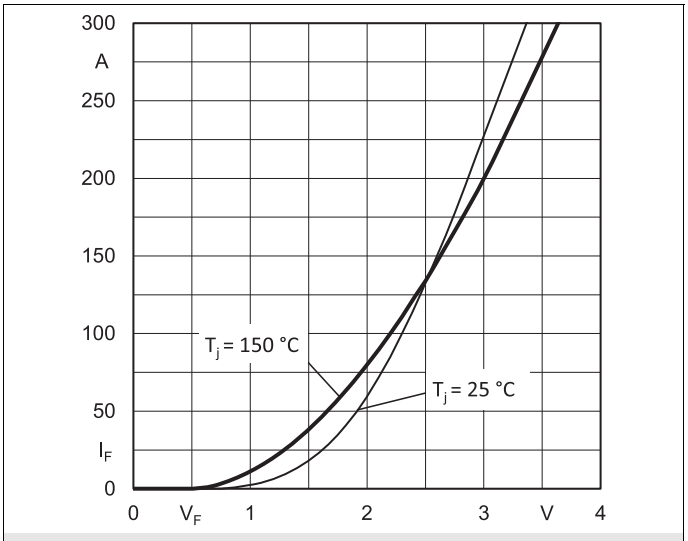



Fig. 10: CAL diode forward characteristic

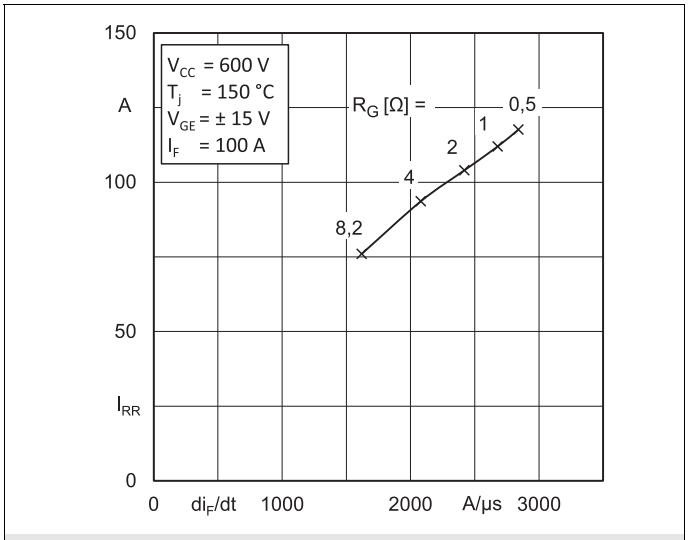



Fig. 11: Typ. CAL diode peak reverse recovery current

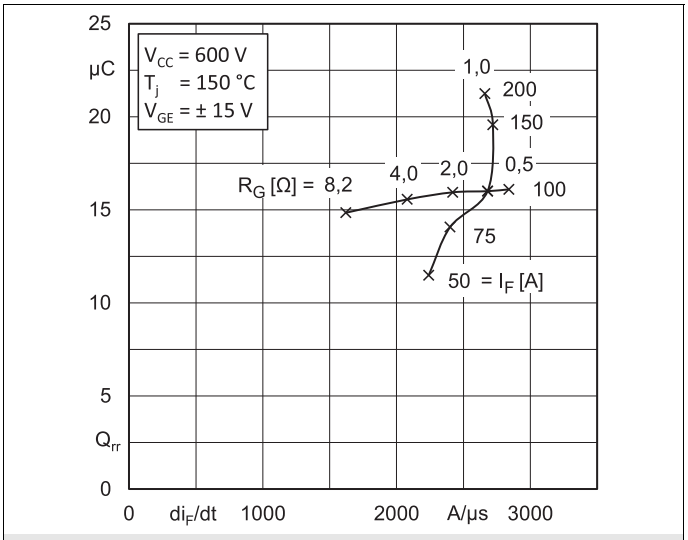
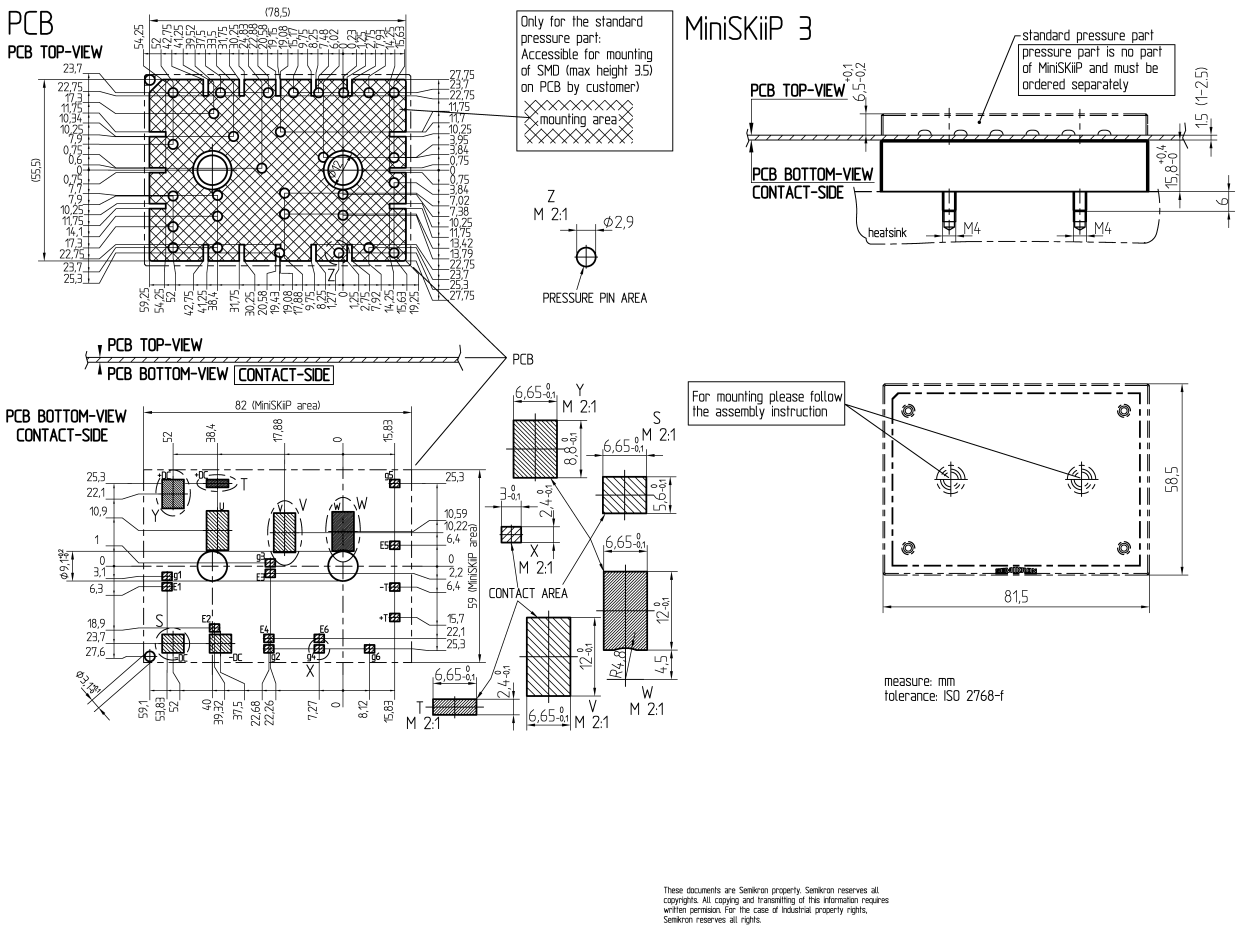


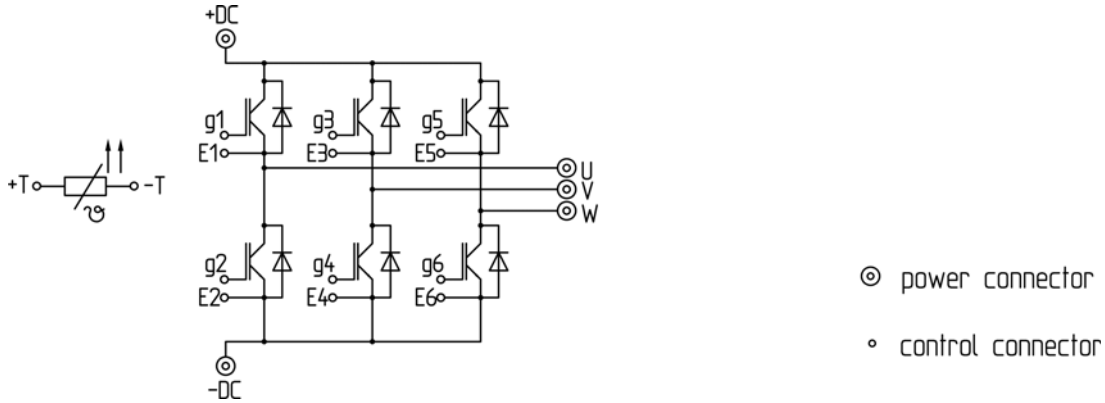

Fig. 12: Typ. CAL diode recovery charge






**pinout, dimensions**




**pinout**

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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