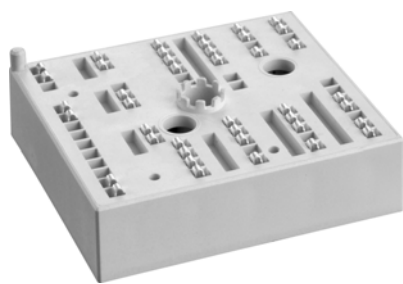


# SKiiP 23AC12T4V1



MiniSKiiP® 2

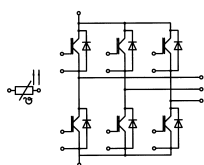
## SKiiP 23AC12T4V1

### Features

- Trench 4 IGBT's
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

### Remarks

- $V_{CEsat}$ ,  $V_F$  = chip level value
- Case temp. limited to  $T_C = 125^\circ\text{C}$  max. (for baseplateless modules  $T_C = T_S$ )
- product rel. results valid for  $T_j \leq 150$  (recomm. Top =  $-40 \dots +150^\circ\text{C}$ )



AC

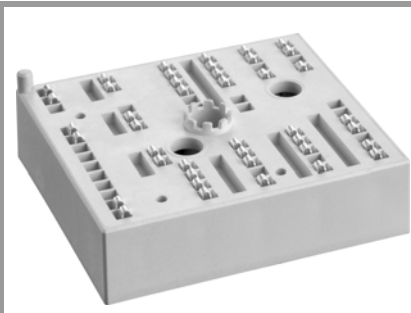
### Absolute Maximum Ratings

| Symbol                 | Conditions                                                                           | Values                    | Unit             |
|------------------------|--------------------------------------------------------------------------------------|---------------------------|------------------|
| <b>Inverter - IGBT</b> |                                                                                      |                           |                  |
| $V_{CES}$              | $T_j = 25^\circ\text{C}$                                                             | 1200                      | V                |
| $I_C$                  | $T_j = 175^\circ\text{C}$                                                            | $T_s = 25^\circ\text{C}$  | 41               |
|                        |                                                                                      | $T_s = 70^\circ\text{C}$  | 34               |
| $I_{Cnom}$             |                                                                                      | 25                        | A                |
| $I_{CRM}$              | $I_{CRM} = 3 \times I_{Cnom}$                                                        | 75                        | A                |
| $V_{GES}$              |                                                                                      | -20 ... 20                | V                |
| $t_{psc}$              | $V_{CC} = 800\text{ V}$<br>$V_{GE} \leq 15\text{ V}$<br>$V_{CES} \leq 1200\text{ V}$ | $T_j = 150^\circ\text{C}$ | 10               |
| $T_j$                  |                                                                                      | -40 ... 175               | $^\circ\text{C}$ |
| <b>Inverse - Diode</b> |                                                                                      |                           |                  |
| $I_F$                  | $T_j = 175^\circ\text{C}$                                                            | $T_s = 25^\circ\text{C}$  | 32               |
|                        |                                                                                      | $T_s = 70^\circ\text{C}$  | 26               |
| $I_{Fnom}$             |                                                                                      | 25                        | A                |
| $I_{FRM}$              | $I_{FRM} = 3 \times I_{Fnom}$                                                        | 75                        | A                |
| $I_{FSM}$              | 10 ms, sin $180^\circ$ , $T_j = 150^\circ\text{C}$                                   | 100                       | A                |
| $T_j$                  |                                                                                      | -40 ... 175               | $^\circ\text{C}$ |
| <b>Module</b>          |                                                                                      |                           |                  |
| $I_{t(RMS)}$           | $T_{terminal} = 80^\circ\text{C}$ , 20A per spring                                   | 100                       | A                |
| $T_{stg}$              |                                                                                      | -40 ... 125               | $^\circ\text{C}$ |
| $V_{isol}$             | AC sinus 50Hz, t = 1 min                                                             | 2500                      | V                |

### Characteristics

| Symbol                 | Conditions                                                          | min. | typ. | max.                      | Unit                      |
|------------------------|---------------------------------------------------------------------|------|------|---------------------------|---------------------------|
| <b>Inverter - IGBT</b> |                                                                     |      |      |                           |                           |
| $V_{CE(sat)}$          | $I_C = 25\text{ A}$<br>$V_{GE} = 15\text{ V}$<br>chipelevel         |      |      | $T_j = 25^\circ\text{C}$  | 1.85                      |
|                        |                                                                     |      |      | $T_j = 150^\circ\text{C}$ | 2.10                      |
| $V_{CE0}$              |                                                                     |      |      | $T_j = 25^\circ\text{C}$  | 0.8                       |
|                        |                                                                     |      |      | $T_j = 150^\circ\text{C}$ | 0.9                       |
| $r_{CE}$               | $V_{GE} = 15\text{ V}$                                              |      |      | $T_j = 25^\circ\text{C}$  | 42                        |
|                        |                                                                     |      |      | $T_j = 150^\circ\text{C}$ | 48                        |
| $V_{GE(th)}$           | $V_{GE} = V_{CE}$ , $I_C = 1\text{ mA}$                             | 5    | 5.8  | 6.5                       | $T_j = 25^\circ\text{C}$  |
|                        |                                                                     |      |      |                           | $T_j = 150^\circ\text{C}$ |
| $I_{CES}$              | $V_{GE} = 0\text{ V}$<br>$V_{CE} = 1200\text{ V}$                   |      |      | $T_j = 25^\circ\text{C}$  | 0.1                       |
|                        |                                                                     |      |      |                           | 0.3                       |
| $C_{ies}$              | $V_{CE} = 25\text{ V}$                                              |      | 1.43 |                           | nF                        |
| $C_{oes}$              | $V_{GE} = 0\text{ V}$                                               |      | 0.12 |                           | nF                        |
| $C_{res}$              |                                                                     |      | 0.09 |                           | nF                        |
| $Q_G$                  | - 8 V...+ 15 V                                                      |      | 142  |                           | nC                        |
| $R_{Gint}$             | $T_j = 25^\circ\text{C}$                                            |      | 0.00 |                           | $\Omega$                  |
| $t_{d(on)}$            | $V_{CC} = 600\text{ V}$                                             |      | 44   |                           | ns                        |
| $t_r$                  | $I_C = 25\text{ A}$                                                 |      |      | $T_j = 150^\circ\text{C}$ | 46                        |
|                        |                                                                     |      |      | $T_j = 150^\circ\text{C}$ | 46                        |
| $E_{on}$               | $R_{G on} = 39\ \Omega$                                             |      | 3.7  |                           | mJ                        |
| $t_{d(off)}$           | $R_{G off} = 39\ \Omega$<br>$di/dt_{on} = 465\text{ A}/\mu\text{s}$ |      |      | $T_j = 150^\circ\text{C}$ | 330                       |
|                        |                                                                     |      |      | $T_j = 150^\circ\text{C}$ | 330                       |
| $t_f$                  | $di/dt_{off} = 350\text{ A}/\mu\text{s}$                            |      | 62   |                           | ns                        |
| $E_{off}$              | $V_{GE} = +15/-15\text{ V}$                                         |      | 2.4  |                           | mJ                        |
| $R_{th(j-s)}$          | per IGBT                                                            |      | 1    |                           | K/W                       |

# SKiiP 23AC12T4V1



MiniSKiiP® 2

## SKiiP 23AC12T4V1

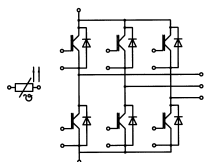
### Features

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- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

### Remarks

- $V_{CEsat}$ ,  $V_F$  = chip level value
- Case temp. limited to  $T_C = 125^\circ\text{C}$  max. (for baseplateless modules  $T_C = T_S$ )
- product rel. results valid for  $T_j \leq 150$  (recomm. Top =  $-40 \dots +150^\circ\text{C}$ )

| Characteristics                  |                                                                                                                                               |                         |      |           |      |      |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|-----------|------|------|
| Symbol                           | Conditions                                                                                                                                    |                         | min. | typ.      | max. | Unit |
| Inverse - Diode                  |                                                                                                                                               |                         |      |           |      |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 25 A                                                                                                                         | T <sub>j</sub> = 25 °C  |      | 2.4       | 2.7  | V    |
|                                  | V <sub>GE</sub> = 0 V<br>chiplevel                                                                                                            | T <sub>j</sub> = 150 °C |      | 2.5       | 2.8  | V    |
| V <sub>F0</sub>                  |                                                                                                                                               | T <sub>j</sub> = 25 °C  |      | 1.3       | 1.5  | V    |
|                                  |                                                                                                                                               | T <sub>j</sub> = 150 °C |      | 0.9       | 1.1  | V    |
| r <sub>F</sub>                   |                                                                                                                                               | T <sub>j</sub> = 25 °C  |      | 44        | 50   | mΩ   |
|                                  |                                                                                                                                               | T <sub>j</sub> = 150 °C |      | 62        | 68   | mΩ   |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 25 A                                                                                                                         | T <sub>j</sub> = 150 °C |      | 19        |      | A    |
| Q <sub>rr</sub>                  | di/dt <sub>off</sub> = 640 A/μs                                                                                                               | T <sub>j</sub> = 150 °C |      | 4         |      | μC   |
| E <sub>rr</sub>                  | V <sub>GE</sub> = -15 V                                                                                                                       | T <sub>j</sub> = 150 °C |      | 1.64      |      | mJ   |
|                                  | V <sub>CC</sub> = 600 V                                                                                                                       |                         |      |           |      |      |
| R <sub>th(j-s)</sub>             | per Diode                                                                                                                                     |                         |      | 1.52      |      | K/W  |
| Module                           |                                                                                                                                               |                         |      |           |      |      |
| M <sub>s</sub>                   | to heat sink                                                                                                                                  |                         | 2    |           | 2.5  | Nm   |
| w                                |                                                                                                                                               |                         |      | 65        |      | g    |
| Temperatur Sensor                |                                                                                                                                               |                         |      |           |      |      |
| R <sub>100</sub>                 | T <sub>C</sub> =100°C (R <sub>25</sub> =1000Ω)                                                                                                |                         |      | 1670 ± 3% |      | Ω    |
| R(T)                             | R(T)=1000Ω[1+A(T-25°C)+B(T-25°C) <sup>2</sup> ], A = 7.635*10 <sup>-3</sup> °C <sup>-1</sup> ,<br>B = 1.731*10 <sup>-5</sup> °C <sup>-2</sup> |                         |      |           |      |      |



AC

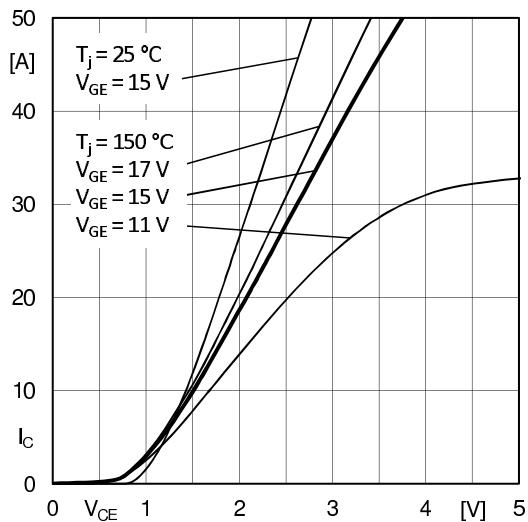


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'} + E_{E'}$

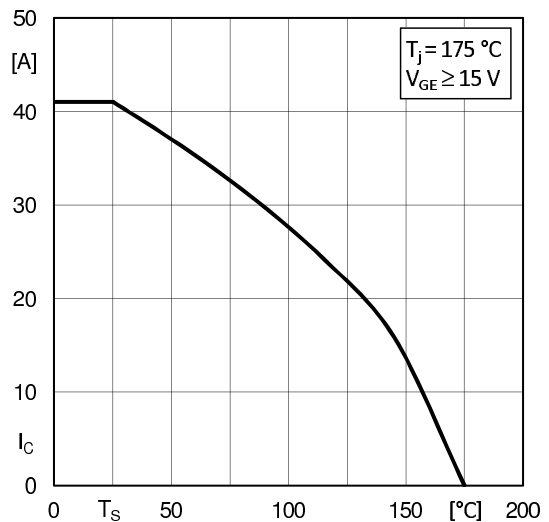


Fig. 2: Rated current vs. temperature  $I_C = f(T_S)$

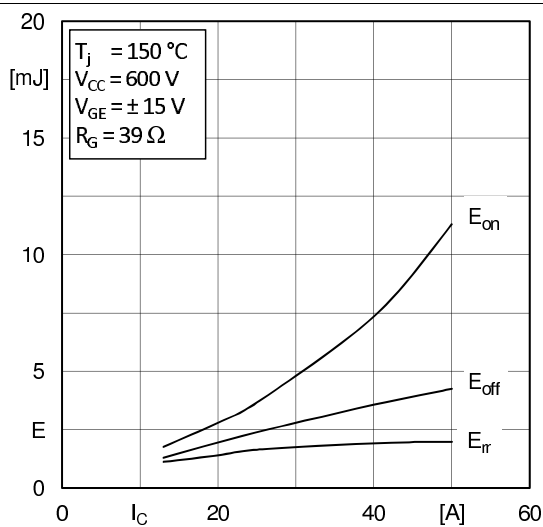


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

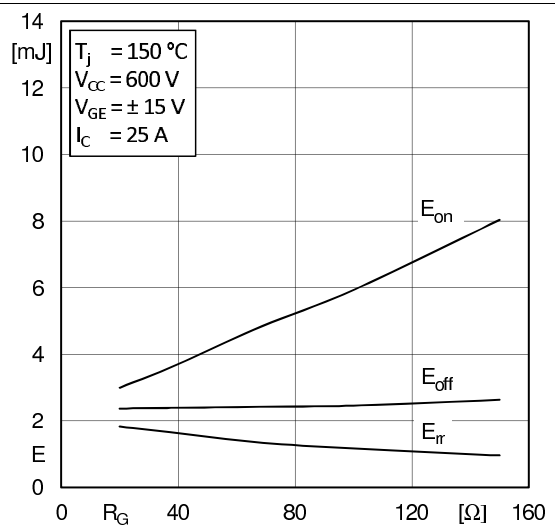


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

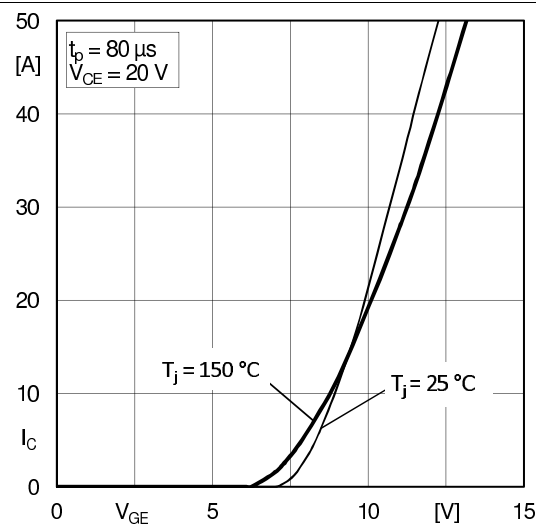


Fig. 5: Typ. transfer characteristic

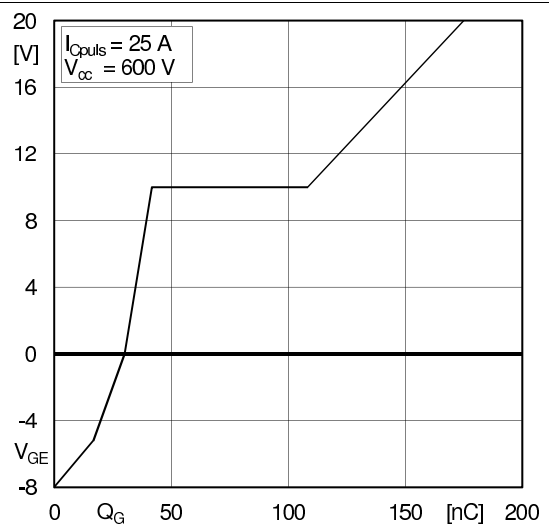


Fig. 6: Typ. gate charge characteristic

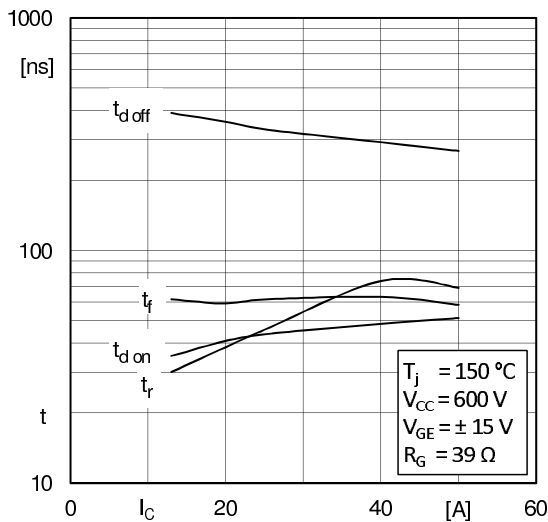


Fig. 7: Typ. switching times vs.  $I_C$

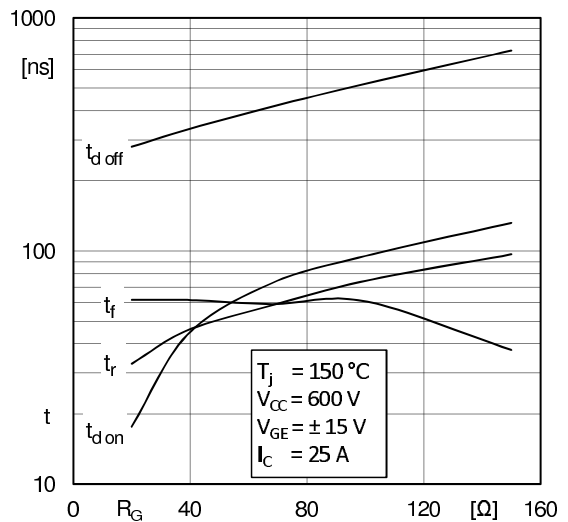


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

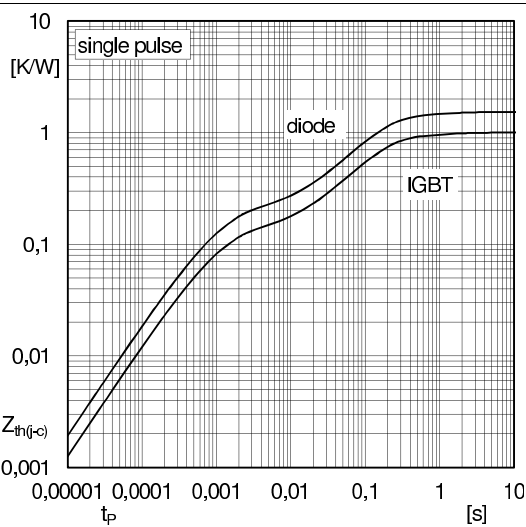


Fig. 9: Transient thermal impedance of IGBT and Diode

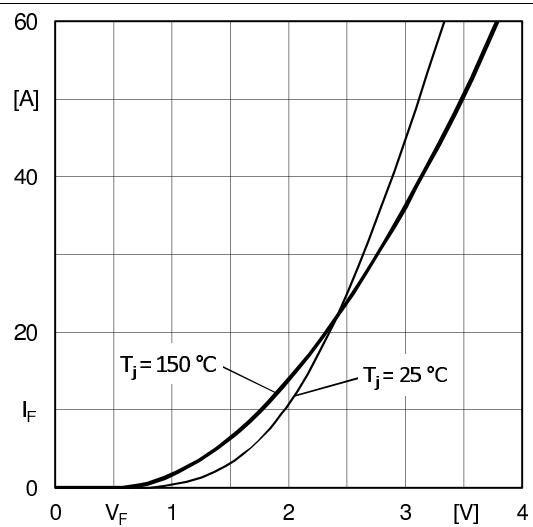


Fig. 10: CAL diode forward characteristic

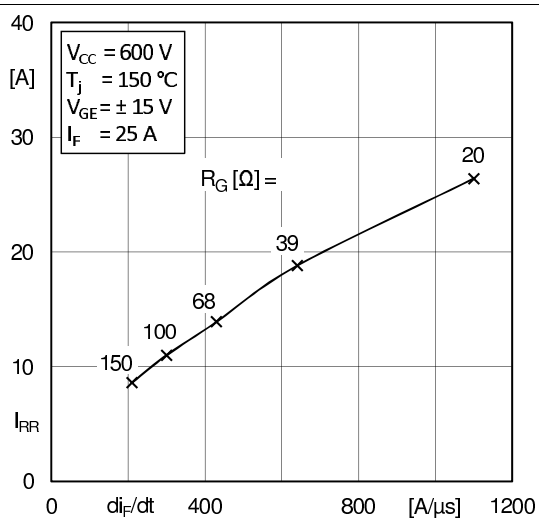


Fig. 11: Typ. CAL diode peak reverse recovery current

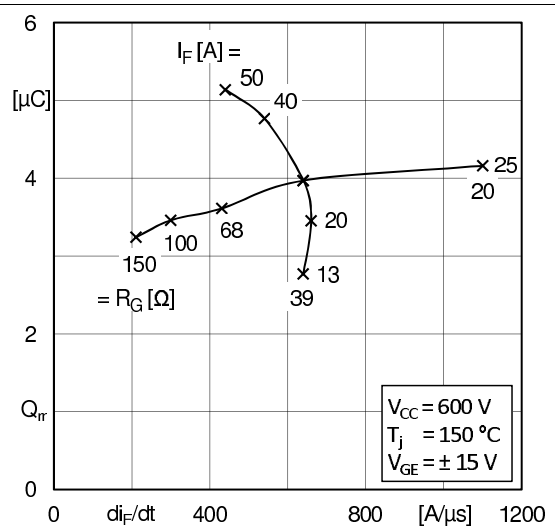
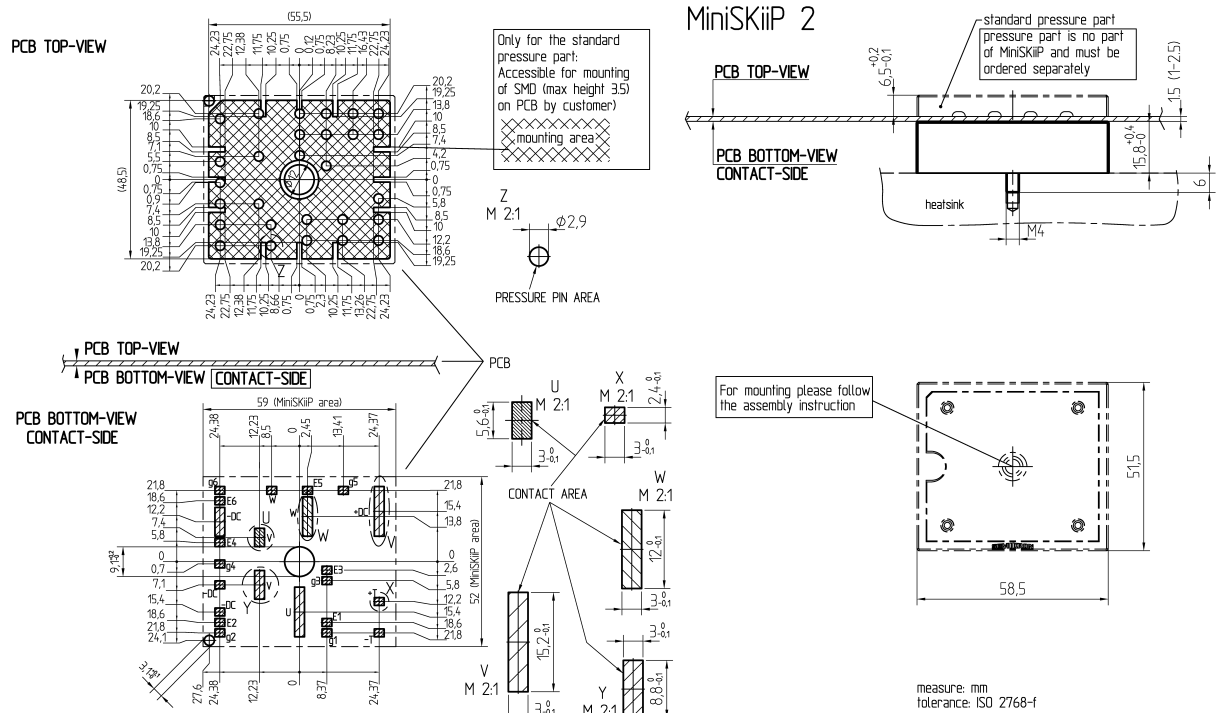
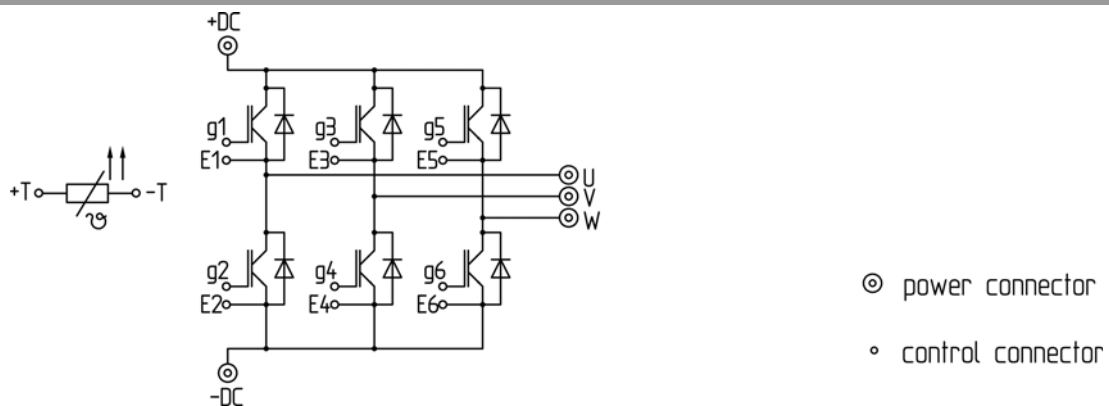


Fig. 12: Typ. CAL diode recovery charge



## pinout, dimensions



## pinout

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

\* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.