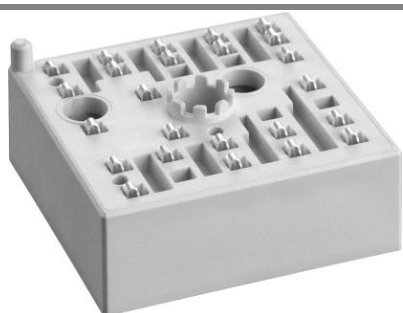




MiniSKiiP® 1

3-phase bridge rectifier +  
brake chopper + 3-phase  
bridge inverter  
**SKiiP 11NAB066V1**

## Features

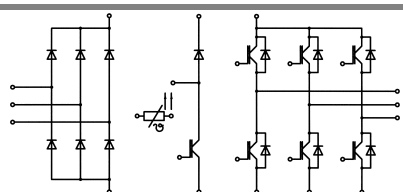
- Trench IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

## Typical Applications

- Inverter up to 3,5 kVA
- Typical motor power 1,5 kW

## Remarks

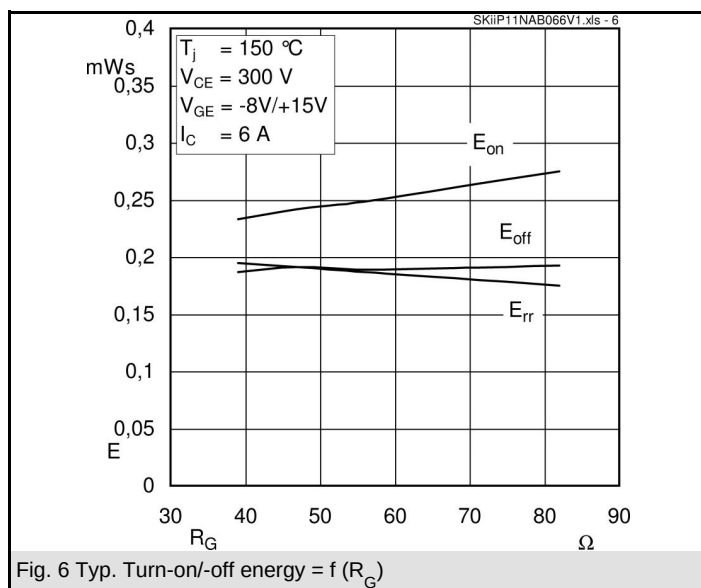
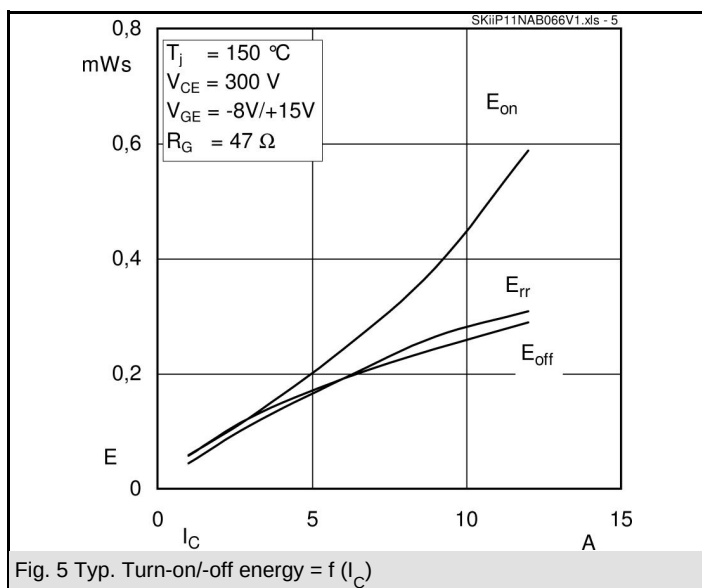
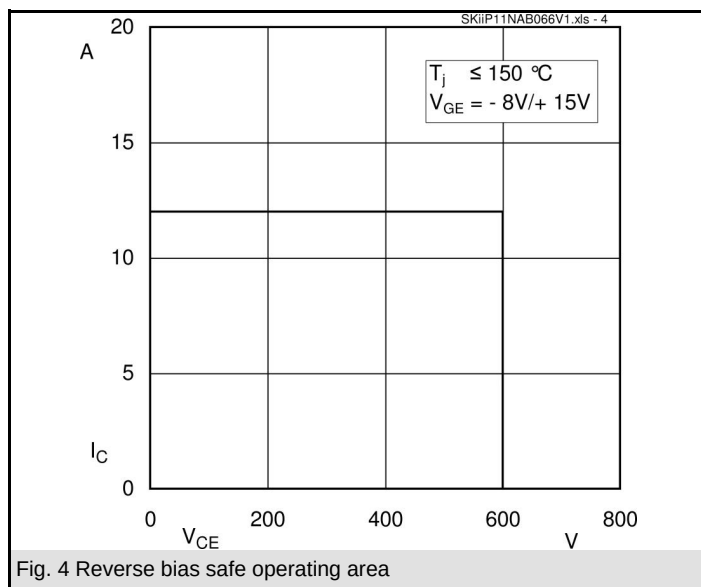
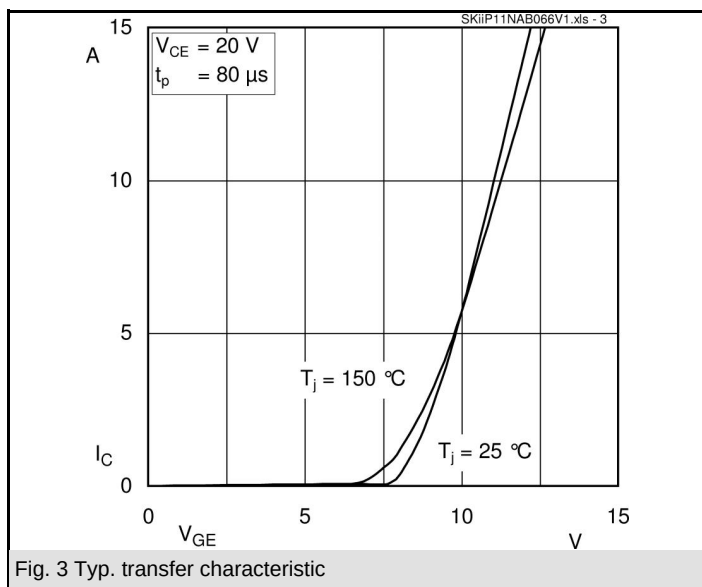
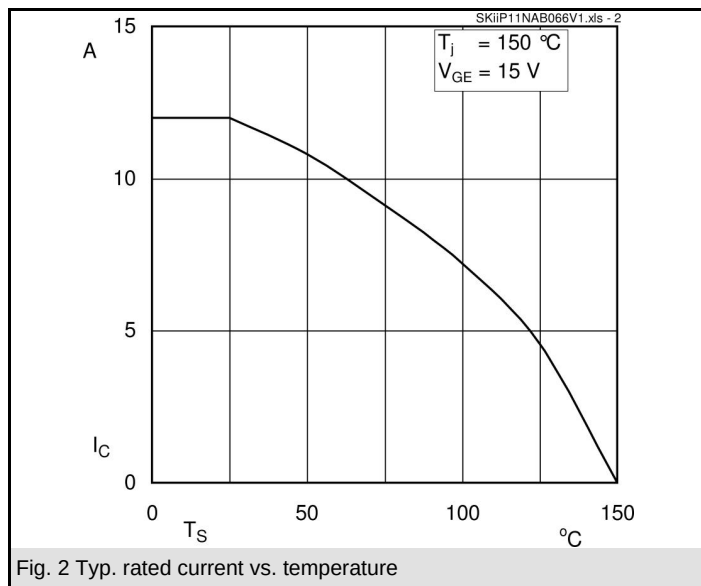
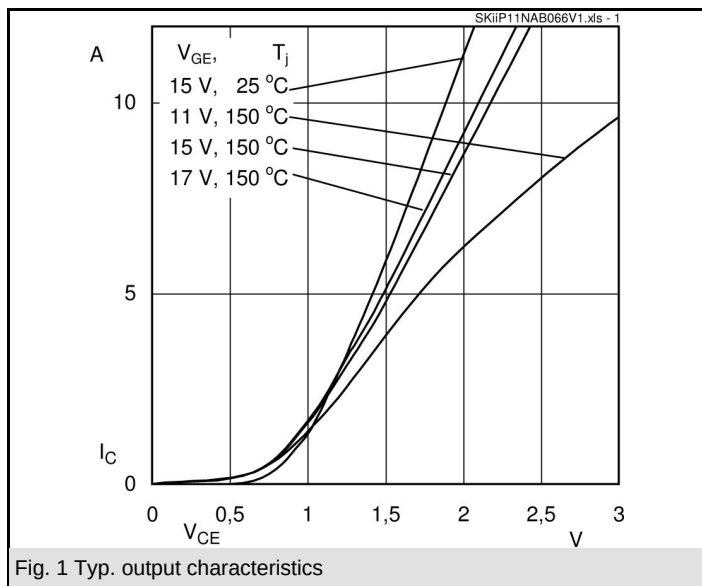
- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.
- Product reliability results are valid for  $T_j = 150^\circ\text{C}$
- SC data:  $t_p \leq 6 \mu\text{s}$ ;  $V_{GE} \leq 15 \text{ V}$ ;  $T_j = 150^\circ\text{C}$ ;  $V_{CC} = 360 \text{ V}$
- $V_{CEsat}$ ,  $V_F = \text{chip level value}$



NAB

| Absolute Maximum Ratings         |                                                                     | $T_s = 25^\circ\text{C}$ , unless otherwise specified |                  |
|----------------------------------|---------------------------------------------------------------------|-------------------------------------------------------|------------------|
| Symbol                           | Conditions                                                          | Values                                                | Units            |
| <b>IGBT - Inverter, Chopper</b>  |                                                                     |                                                       |                  |
| $V_{CES}$                        |                                                                     | 600                                                   | V                |
| $I_C$                            | $T_s = 25 (70)^\circ\text{C}$ , $T_j = 150^\circ\text{C}$           | 12 (11)                                               | A                |
| $I_C$                            | $T_s = 25 (70)^\circ\text{C}$ , $T_j = 175^\circ\text{C}$           | 12 (12)                                               | A                |
| $I_{CRM}$                        | $t_p = 1 \text{ ms}$                                                | 12                                                    | A                |
| $V_{GES}$                        |                                                                     | $\pm 20$                                              | V                |
| <b>Diode - Inverter, Chopper</b> |                                                                     |                                                       |                  |
| $I_F$                            | $T_s = 25 (70)^\circ\text{C}$ , $T_j = 150^\circ\text{C}$           | 12 (12)                                               | A                |
| $I_F$                            | $T_s = 25 (70)^\circ\text{C}$ , $T_j = 175^\circ\text{C}$           | 12 (12)                                               | A                |
| $I_{FRM}$                        | $t_p = 1 \text{ ms}$                                                | 12                                                    | A                |
| <b>Diode - Rectifier</b>         |                                                                     |                                                       |                  |
| $V_{RRM}$                        |                                                                     | 800                                                   | V                |
| $I_F$                            | $T_s = 70^\circ\text{C}$                                            | 35                                                    | A                |
| $I_{FSM}$                        | $t_p = 10 \text{ ms}$ , $\sin 180^\circ$ , $T_j = 25^\circ\text{C}$ | 220                                                   | A                |
| $i^2t$                           | $t_p = 10 \text{ ms}$ , $\sin 180^\circ$ , $T_j = 25^\circ\text{C}$ | 240                                                   | A <sup>2</sup> s |
| $I_{tRMS}$                       | per power terminal (20 A / spring)                                  | 20                                                    | A                |
| $T_j$                            | IGBT, Diode                                                         | -40...+175                                            | $^\circ\text{C}$ |
| $T_{stg}$                        |                                                                     | -40...+125                                            | $^\circ\text{C}$ |
| $V_{isol}$                       | AC, 1 min.                                                          | 2500                                                  | V                |

| Characteristics                  |                                                                        | $T_s = 25^\circ\text{C}$ , unless otherwise specified |             |             |               |
|----------------------------------|------------------------------------------------------------------------|-------------------------------------------------------|-------------|-------------|---------------|
| Symbol                           | Conditions                                                             | min.                                                  | typ.        | max.        | Units         |
| <b>IGBT - Inverter, Chopper</b>  |                                                                        |                                                       |             |             |               |
| $V_{CE(sat)}$                    | $I_{Cnom} = 6 \text{ A}$ , $T_j = 25 (150)^\circ\text{C}$              | 1,1                                                   | 1,45 (1,65) | 1,85 (2,05) | V             |
| $V_{GE(th)}$                     | $V_{GE} = V_{CE}$ , $I_C = 1 \text{ mA}$                               |                                                       | 5,8         |             | V             |
| $V_{CE(TO)}$                     | $T_j = 25 (150)^\circ\text{C}$                                         |                                                       | 0,9 (0,7)   | 1,1 (1)     | V             |
| $r_{CE}$                         | $T_j = 25 (150)^\circ\text{C}$                                         |                                                       | 100 (167)   | 134 (184)   | m $\Omega$    |
| $C_{ies}$                        | $V_{CE} = 25 \text{ V}$ , $V_{GE} = 0 \text{ V}$ , $f = 1 \text{ MHz}$ |                                                       | 0,45        |             | nF            |
| $C_{oes}$                        | $V_{CE} = 25 \text{ V}$ , $V_{GE} = 0 \text{ V}$ , $f = 1 \text{ MHz}$ |                                                       | 0,1         |             | nF            |
| $C_{res}$                        | $V_{CE} = 25 \text{ V}$ , $V_{GE} = 0 \text{ V}$ , $f = 1 \text{ MHz}$ |                                                       | 0,05        |             | nF            |
| $R_{CC+EE'}$                     | spring contact-chip $T_s = 25 (150)^\circ\text{C}$                     |                                                       |             |             | m $\Omega$    |
| $R_{th(j-s)}$                    | per IGBT                                                               |                                                       | 2,4         |             | K/W           |
| $t_{d(on)}$                      | under following conditions                                             |                                                       | 20          |             | ns            |
| $t_r$                            | $V_{CC} = 300 \text{ V}$ , $V_{GE} = -8\text{V}/+15\text{V}$           |                                                       | 25          |             | ns            |
| $t_{d(off)}$                     | $I_{Cnom} = 6 \text{ A}$ , $T_j = 150^\circ\text{C}$                   |                                                       | 175         |             | ns            |
| $t_f$                            | $R_{Gon} = R_{Goff} = 47 \Omega$                                       |                                                       | 60          |             | ns            |
| $E_{on} (E_{off})$               | inductive load                                                         |                                                       | 0,3 (0,2)   |             | mJ            |
| <b>Diode - Inverter, Chopper</b> |                                                                        |                                                       |             |             |               |
| $V_F = V_{EC}$                   | $I_F = 6 \text{ A}$ , $T_j = 25 (150)^\circ\text{C}$                   |                                                       | 1,3 (1,3)   | 1,6 (1,6)   | V             |
| $V_{(TO)}$                       | $T_j = 25 (150)^\circ\text{C}$                                         |                                                       | 0,9 (0,8)   | 1 (0,9)     | V             |
| $r_T$                            | $T_j = 25 (150)^\circ\text{C}$                                         |                                                       | 67 (83)     | 100 (117)   | m $\Omega$    |
| $R_{th(j-s)}$                    | per diode                                                              |                                                       | 3           |             | K/W           |
| $I_{RRM}$                        | under following conditions                                             |                                                       | 11,2        |             | A             |
| $Q_{rr}$                         | $I_{Fnom} = 6 \text{ A}$ , $V_R = 600 \text{ V}$                       |                                                       | 0,9         |             | $\mu\text{C}$ |
| $E_{rr}$                         | $V_{GE} = 0 \text{ V}$ , $T_j = 150^\circ\text{C}$                     |                                                       | 0,2         |             | mJ            |
|                                  | $di_F/dt = 520 \text{ A}/\mu\text{s}$                                  |                                                       |             |             |               |
| <b>Diode - Rectifier</b>         |                                                                        |                                                       |             |             |               |
| $V_F$                            | $I_{Fnom} = 15 \text{ A}$ , $T_j = 25^\circ\text{C}$                   |                                                       | 1,1         |             | V             |
| $V_{(TO)}$                       | $T_j = 150^\circ\text{C}$                                              |                                                       | 0,8         |             | V             |
| $r_T$                            | $T_j = 150^\circ\text{C}$                                              |                                                       | 20          |             | m $\Omega$    |
| $R_{th(j-s)}$                    | per diode                                                              |                                                       | 1,5         |             | K/W           |
| <b>Temperature Sensor</b>        |                                                                        |                                                       |             |             |               |
| $R_{ts}$                         | 3 %, $T_r = 25 (100)^\circ\text{C}$                                    |                                                       | 1000(1670)  |             | $\Omega$      |
| <b>Mechanical Data</b>           |                                                                        |                                                       |             |             |               |
| w                                |                                                                        |                                                       | 35          |             | g             |
| $M_s$                            | Mounting torque                                                        | 2                                                     |             | 2,5         | Nm            |



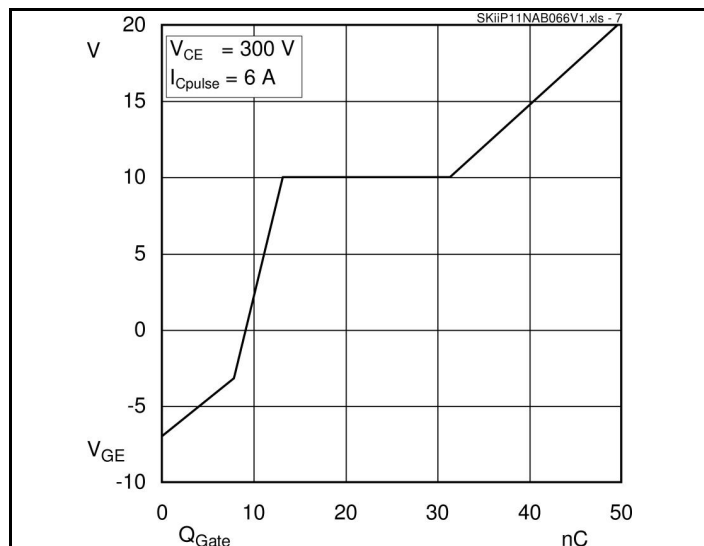


Fig. 7 Typ. gate charge characteristic

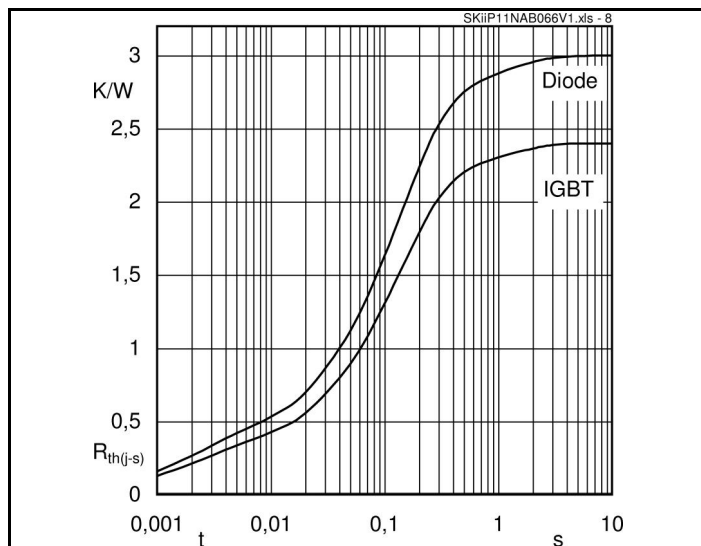


Fig. 8 Typ. thermal impedance

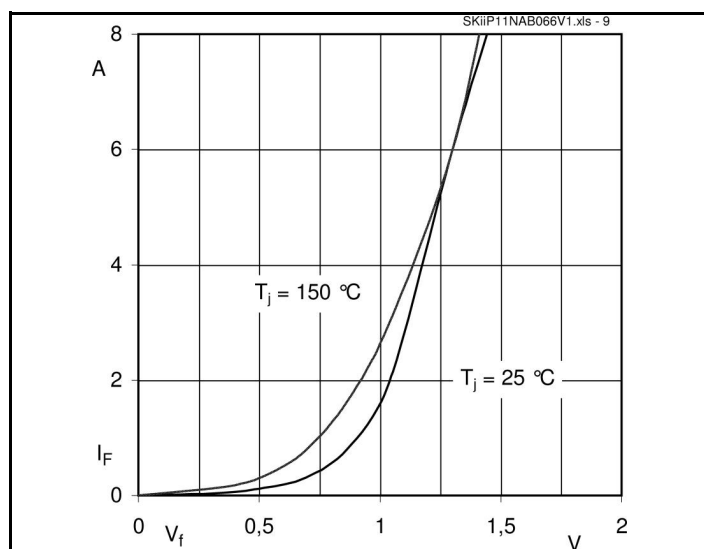


Fig. 9 Typ. freewheeling diode forward characteristic

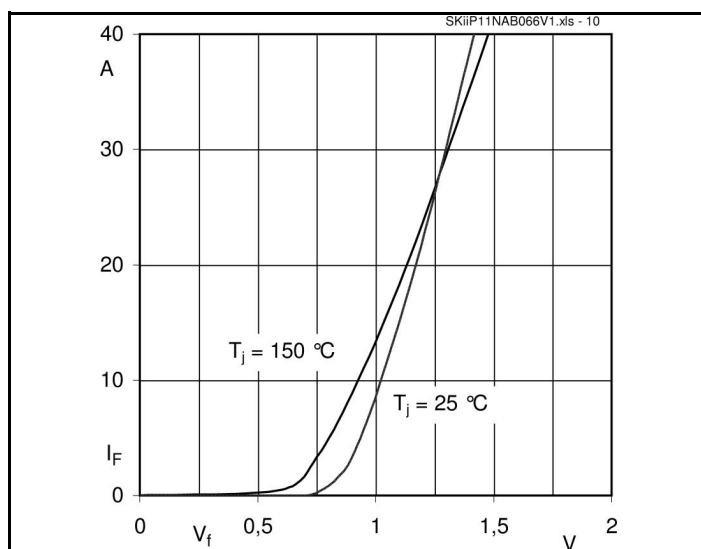
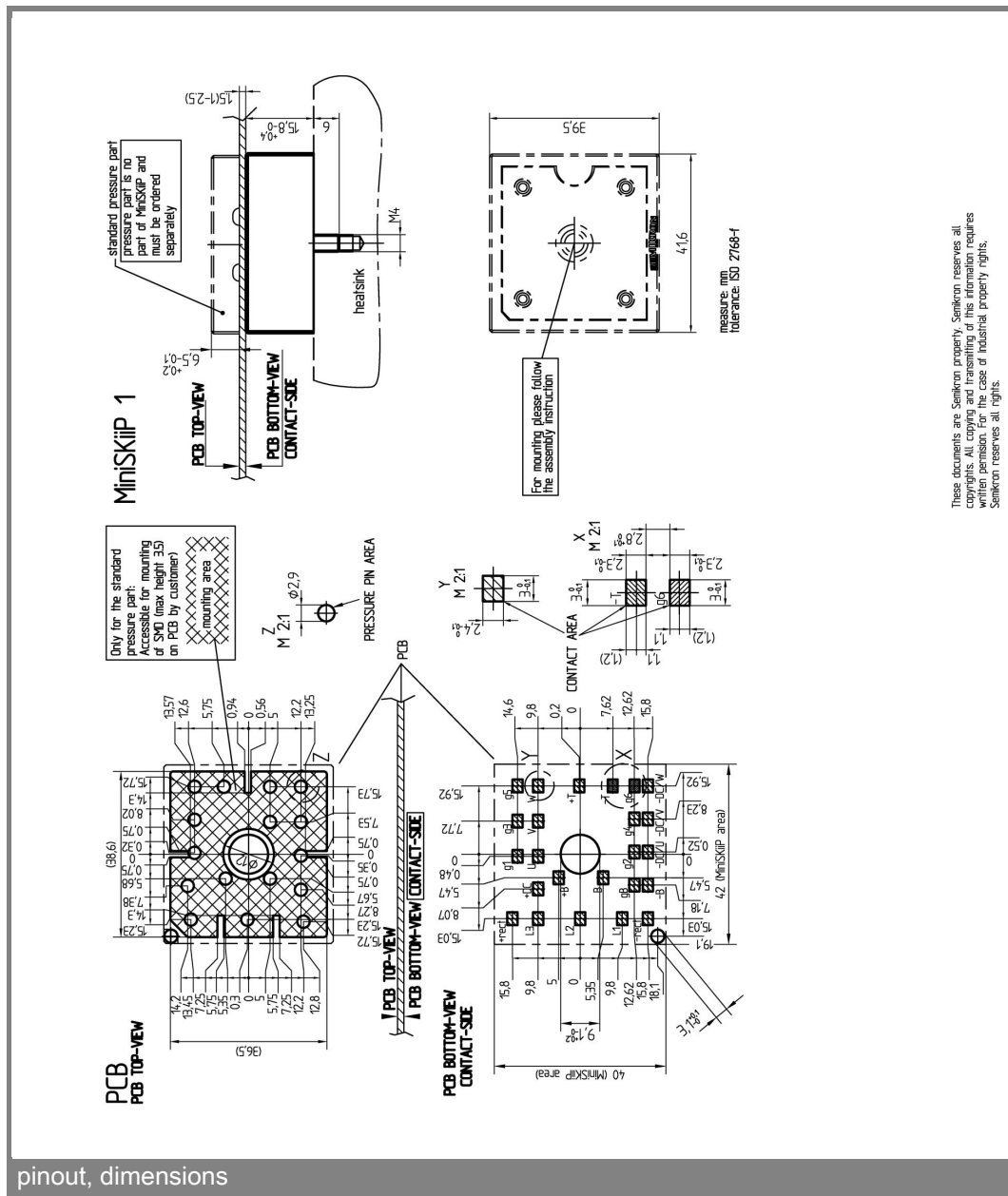
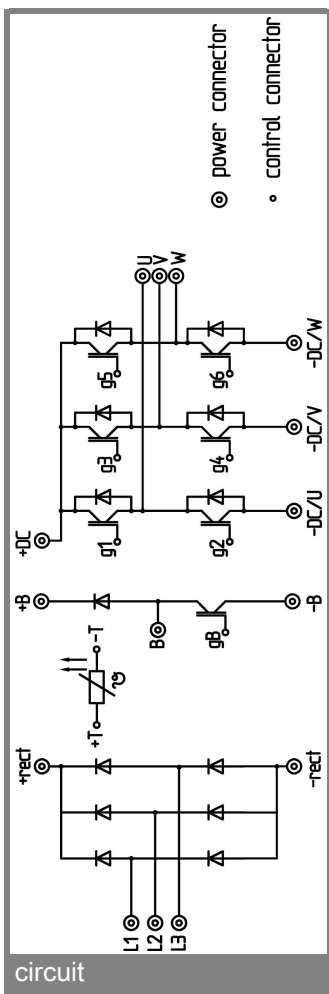


Fig. 10 Typ. input bridge forward characteristic



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

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