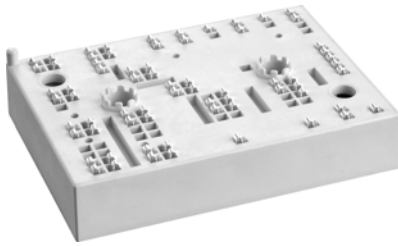


# SKiiP 34NAB12T7V1



MiniSKiiP® 3

## 3-phase Converter-Inverter-Brake (CIB)

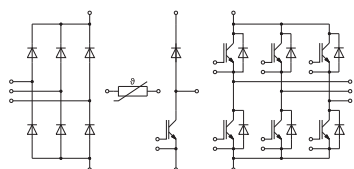
### SKiiP 34NAB12T7V1

#### Features\*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

#### Remarks

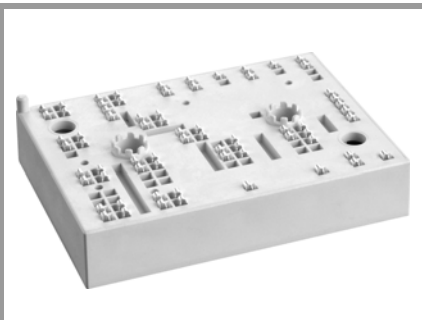
- Max. case temperature limited to  $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$ ;  $T_{j,op} > 150^\circ\text{C}$  during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet Please refer to both documents for further information
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"
- Inverter IGBT: T1 – T6
- Chopper IGBT: T14
- Inverse Diode: D1 – D6
- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12



NAB

| Absolute Maximum Ratings |                                                                                |                         |             |      |
|--------------------------|--------------------------------------------------------------------------------|-------------------------|-------------|------|
| Symbol                   | Conditions                                                                     |                         | Values      | Unit |
| Inverter - IGBT          |                                                                                |                         |             |      |
| V <sub>CES</sub>         | T <sub>j</sub> = 25 °C                                                         |                         | 1200        | V    |
| I <sub>C</sub>           | λ <sub>paste</sub> =0.8 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 45          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 37          | A    |
| I <sub>C</sub>           | λ <sub>paste</sub> =2.5 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 50          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 41          | A    |
| I <sub>Cnom</sub>        |                                                                                |                         | 35          | A    |
| I <sub>CRM</sub>         |                                                                                |                         | 70          | A    |
| V <sub>GES</sub>         |                                                                                |                         | -20 ... 20  | V    |
| t <sub>psc</sub>         | V <sub>CC</sub> = 800 V<br>V <sub>GE</sub> ≤ 15 V<br>V <sub>CES</sub> ≤ 1200 V | T <sub>j</sub> = 175 °C | 7           | μs   |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Chopper - IGBT           |                                                                                |                         |             |      |
| V <sub>CES</sub>         | T <sub>j</sub> = 25 °C                                                         |                         | 1200        | V    |
| I <sub>C</sub>           | λ <sub>paste</sub> =0.8 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 45          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 37          | A    |
| I <sub>C</sub>           | λ <sub>paste</sub> =2.5 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 50          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 41          | A    |
| I <sub>Cnom</sub>        |                                                                                |                         | 35          | A    |
| I <sub>CRM</sub>         |                                                                                |                         | 70          | A    |
| V <sub>GES</sub>         |                                                                                |                         | -20 ... 20  | V    |
| t <sub>psc</sub>         | V <sub>CC</sub> = 800 V<br>V <sub>GE</sub> ≤ 15 V<br>V <sub>CES</sub> ≤ 1200 V | T <sub>j</sub> = 175 °C | 7           | μs   |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Inverse - Diode          |                                                                                |                         |             |      |
| V <sub>RRM</sub>         | T <sub>j</sub> = 25 °C                                                         |                         | 1200        | V    |
| I <sub>F</sub>           | λ <sub>paste</sub> =0.8 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 35          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 28          | A    |
| I <sub>F</sub>           | λ <sub>paste</sub> =2.5 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 39          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 32          | A    |
| I <sub>FRM</sub>         |                                                                                |                         | 70          | A    |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 150 °C                      |                         | 170         | A    |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Freewheeling - Diode     |                                                                                |                         |             |      |
| V <sub>RRM</sub>         | T <sub>j</sub> = 25 °C                                                         |                         | 1200        | V    |
| I <sub>F</sub>           | λ <sub>paste</sub> =0.8 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 35          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 28          | A    |
| I <sub>F</sub>           | λ <sub>paste</sub> =2.5 W/(mK)                                                 | T <sub>s</sub> = 70 °C  | 39          | A    |
|                          | T <sub>j</sub> = 175 °C                                                        | T <sub>s</sub> = 100 °C | 32          | A    |
| I <sub>FRM</sub>         |                                                                                |                         | 70          | A    |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 150 °C                      |                         | 170         | A    |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |

# SKiiP 34NAB12T7V1



MiniSKiiP® 3

## 3-phase Converter-Inverter-Brake (CIB)

### SKiiP 34NAB12T7V1

#### Features\*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

#### Remarks

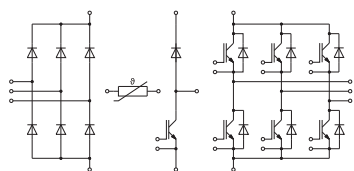
- Max. case temperature limited to  $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$ ;  $T_{j,op} > 150^\circ\text{C}$  during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet Please refer to both documents for further information
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"
- Inverter IGBT: T1 – T6
- Chopper IGBT: T14
- Inverse Diode: D1 – D6
- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12

#### Absolute Maximum Ratings

| Symbol              | Conditions                                     |                         | Values      | Unit             |
|---------------------|------------------------------------------------|-------------------------|-------------|------------------|
| Rectifier - Diode   |                                                |                         |             |                  |
| V <sub>RRM</sub>    | T <sub>j</sub> = 25 °C                         |                         | 1600        | V                |
| I <sub>F</sub>      | λ <sub>paste</sub> =0.8 W/(mK)                 | T <sub>s</sub> = 70 °C  | 53          | A                |
|                     | T <sub>j</sub> = 175 °C                        | T <sub>s</sub> = 100 °C | 42          | A                |
| I <sub>F</sub>      | λ <sub>paste</sub> =2.5 W/(mK)                 | T <sub>s</sub> = 70 °C  | 59          | A                |
|                     | T <sub>j</sub> = 175 °C                        | T <sub>s</sub> = 100 °C | 47          | A                |
| I <sub>FSM</sub>    | t <sub>p</sub> = 10 ms                         | T <sub>j</sub> = 25 °C  | 370         | A                |
|                     | sin 180°                                       | T <sub>j</sub> = 150 °C | 270         | A                |
| i <sup>2</sup> t    | t <sub>p</sub> = 10 ms                         | T <sub>j</sub> = 25 °C  | 685         | A <sup>2</sup> s |
|                     | sin 180°                                       | T <sub>j</sub> = 150 °C | 365         | A <sup>2</sup> s |
| T <sub>j</sub>      |                                                |                         | -40 ... 175 | °C               |
| Module              |                                                |                         |             |                  |
| I <sub>t(RMS)</sub> | T <sub>terminal</sub> = 80 °C, 20 A per spring |                         | 80          | A                |
| T <sub>stg</sub>    | module without TIM                             |                         | -40 ... 125 | °C               |
| V <sub>isol</sub>   | AC sinus 50 Hz, 1 min                          |                         | 2500        | V                |

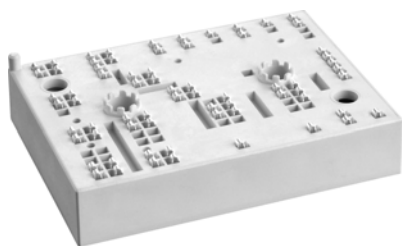
#### Characteristics

| Symbol                 | Conditions                                                                                                                                                     | min.                      | typ. | max. | Unit             |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|------|------------------|
| <b>Inverter - IGBT</b> |                                                                                                                                                                |                           |      |      |                  |
| $V_{CE(sat)}$          | $I_C = 35 \text{ A}$<br>$V_{GE} = 15 \text{ V}$<br>chiplevel                                                                                                   | $T_j = 25^\circ\text{C}$  | 1.60 | 1.75 | V                |
|                        |                                                                                                                                                                | $T_j = 150^\circ\text{C}$ | 1.78 | 1.93 | V                |
|                        |                                                                                                                                                                | $T_j = 175^\circ\text{C}$ | 1.82 | 1.97 | V                |
| $V_{CE0}$              | chiplevel                                                                                                                                                      | $T_j = 25^\circ\text{C}$  | 1.00 | 1.05 | V                |
|                        |                                                                                                                                                                | $T_j = 150^\circ\text{C}$ | 0.80 | 0.85 | V                |
|                        |                                                                                                                                                                | $T_j = 175^\circ\text{C}$ | 0.75 | 0.80 | V                |
| $r_{CE}$               | $V_{GE} = 15 \text{ V}$<br>chiplevel                                                                                                                           | $T_j = 25^\circ\text{C}$  | 17   | 20   | $\text{m}\Omega$ |
|                        |                                                                                                                                                                | $T_j = 150^\circ\text{C}$ | 28   | 31   | $\text{m}\Omega$ |
|                        |                                                                                                                                                                | $T_j = 175^\circ\text{C}$ | 31   | 33   | $\text{m}\Omega$ |
| $V_{GE(th)}$           | $V_{GE} = V_{CE}$ , $I_C = 0.75 \text{ mA}$                                                                                                                    | 5.15                      | 5.8  | 6.45 | V                |
| $I_{CES}$              | $V_{GE} = 0 \text{ V}$ , $V_{CE} = 1200 \text{ V}$ , $T_j = 25^\circ\text{C}$                                                                                  |                           |      | 1    | mA               |
| $C_{ies}$              | $V_{CE} = 25 \text{ V}$<br>$V_{GE} = 0 \text{ V}$                                                                                                              | $f = 1 \text{ MHz}$       | 6.60 |      | nF               |
| $C_{oes}$              |                                                                                                                                                                | $f = 1 \text{ MHz}$       | 0.09 |      | nF               |
| $C_{res}$              |                                                                                                                                                                | $f = 1 \text{ MHz}$       | 0.02 |      | nF               |
| $Q_G$                  | $V_{GE} = -8 \text{ V} \dots +15 \text{ V}$                                                                                                                    |                           | 490  |      | nC               |
| $R_{Gint}$             | $T_j = 25^\circ\text{C}$                                                                                                                                       |                           | 0    |      | $\Omega$         |
| $t_{d(on)}$            | $V_{CC} = 600 \text{ V}$<br>$I_C = 35 \text{ A}$<br>$R_{G on} = 9.1 \Omega$<br>$R_{G off} = 9.1 \Omega$                                                        | $T_j = 25^\circ\text{C}$  | 37   |      | ns               |
|                        |                                                                                                                                                                | $T_j = 150^\circ\text{C}$ | 39   |      | ns               |
|                        |                                                                                                                                                                | $T_j = 175^\circ\text{C}$ | 40   |      | ns               |
| $t_r$                  | $V_{GE} = +15/-15 \text{ V}$                                                                                                                                   | $T_j = 25^\circ\text{C}$  | 37   |      | ns               |
|                        |                                                                                                                                                                | $T_j = 150^\circ\text{C}$ | 43   |      | ns               |
|                        |                                                                                                                                                                | $T_j = 175^\circ\text{C}$ | 46   |      | ns               |
| $E_{on}$               | @ $T_j = 150^\circ\text{C}$ :<br>$di/dt_{on} = 860 \text{ A}/\mu\text{s}$<br>$di/dt_{off} = 380 \text{ A}/\mu\text{s}$<br>$dv/dt = 3610 \text{ V}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  | 2.8  |      | mJ               |
|                        |                                                                                                                                                                | $T_j = 150^\circ\text{C}$ | 4    |      | mJ               |
|                        |                                                                                                                                                                | $T_j = 175^\circ\text{C}$ | 4.2  |      | mJ               |



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MiniSKiiP® 3

## 3-phase Converter-Inverter-Brake (CIB)

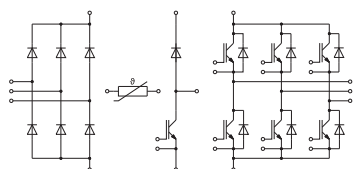
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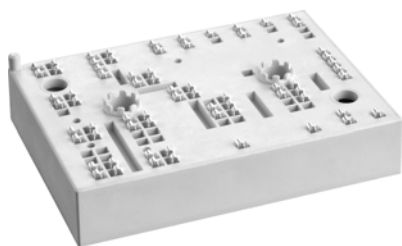
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- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12



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| Characteristics      |                                                                                                                                                                                                                                                                        |                         |      |      |      |      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|------|------|------|
| Symbol               | Conditions                                                                                                                                                                                                                                                             |                         | min. | typ. | max. | Unit |
| Inverter - IGBT      |                                                                                                                                                                                                                                                                        |                         |      |      |      |      |
| t <sub>d(off)</sub>  | V <sub>CC</sub> = 600 V                                                                                                                                                                                                                                                | T <sub>j</sub> = 25 °C  |      | 231  |      | ns   |
|                      | I <sub>C</sub> = 35 A                                                                                                                                                                                                                                                  | T <sub>j</sub> = 150 °C |      | 321  |      | ns   |
|                      | R <sub>G on</sub> = 9.1 Ω                                                                                                                                                                                                                                              | T <sub>j</sub> = 175 °C |      | 346  |      | ns   |
| t <sub>f</sub>       | R <sub>G off</sub> = 9.1 Ω                                                                                                                                                                                                                                             | T <sub>j</sub> = 25 °C  |      | 48   |      | ns   |
|                      | V <sub>GE</sub> = +15/-15 V                                                                                                                                                                                                                                            | T <sub>j</sub> = 150 °C |      | 74   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 90   |      | ns   |
| E <sub>off</sub>     | @ T <sub>j</sub> = 150 °C:                                                                                                                                                                                                                                             | T <sub>j</sub> = 25 °C  |      | 2.3  |      | mJ   |
|                      | di/dt <sub>on</sub> = 860 A/μs                                                                                                                                                                                                                                         | T <sub>j</sub> = 150 °C |      | 3.9  |      | mJ   |
|                      | di/dt <sub>off</sub> = 380 A/μs                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 4.2  |      | mJ   |
|                      | dv/dt = 3610 V/μs                                                                                                                                                                                                                                                      |                         |      |      |      |      |
| R <sub>th(j-s)</sub> | per IGBT, λ <sub>paste</sub> =0.8 W/(mK)                                                                                                                                                                                                                               |                         |      | 1.02 |      | K/W  |
| R <sub>th(j-s)</sub> | per IGBT, λ <sub>paste</sub> =2.5 W/(mK)                                                                                                                                                                                                                               |                         |      | 0.85 |      | K/W  |
| Chopper - IGBT       |                                                                                                                                                                                                                                                                        |                         |      |      |      |      |
| V <sub>CE(sat)</sub> | I <sub>C</sub> = 35 A                                                                                                                                                                                                                                                  | T <sub>j</sub> = 25 °C  |      | 1.60 | 1.75 | V    |
|                      | V <sub>GE</sub> = 15 V                                                                                                                                                                                                                                                 | T <sub>j</sub> = 150 °C |      | 1.78 | 1.93 | V    |
|                      | chiplevel                                                                                                                                                                                                                                                              | T <sub>j</sub> = 175 °C |      | 1.82 | 1.97 | V    |
| V <sub>CE0</sub>     |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 25 °C  |      | 1.00 | 1.05 | V    |
|                      | chiplevel                                                                                                                                                                                                                                                              | T <sub>j</sub> = 150 °C |      | 0.80 | 0.85 | V    |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 0.75 | 0.80 | V    |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V<br>chiplevel                                                                                                                                                                                                                                    | T <sub>j</sub> = 25 °C  |      | 17   | 20   | mΩ   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 150 °C |      | 28   | 31   | mΩ   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 31   | 33   | mΩ   |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 0.75 mA                                                                                                                                                                                                           |                         | 5.15 | 5.8  | 6.45 | V    |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1200 V, T <sub>j</sub> = 25 °C                                                                                                                                                                                                |                         |      |      | 1    | mA   |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25 V<br>V <sub>GE</sub> = 0 V                                                                                                                                                                                                                        | f = 1 MHz               |      | 6.60 |      | nF   |
| C <sub>oes</sub>     |                                                                                                                                                                                                                                                                        | f = 1 MHz               |      | 0.09 |      | nF   |
| C <sub>res</sub>     |                                                                                                                                                                                                                                                                        | f = 1 MHz               |      | 0.02 |      | nF   |
| Q <sub>G</sub>       | V <sub>GE</sub> = - 8V ... + 15 V                                                                                                                                                                                                                                      |                         |      | 490  |      | nC   |
| R <sub>Gint</sub>    | T <sub>j</sub> = 25 °C                                                                                                                                                                                                                                                 |                         |      | 0    |      | Ω    |
| t <sub>d(on)</sub>   | V <sub>CC</sub> = 600 V<br>I <sub>C</sub> = 35 A<br>R <sub>G on</sub> = 9.1 Ω<br>R <sub>G off</sub> = 9.1 Ω<br>V <sub>GE</sub> = +15/-15 V<br><br>@ T <sub>j</sub> = 150 °C:<br>di/dt <sub>on</sub> = 860 A/μs<br>di/dt <sub>off</sub> = 380 A/μs<br>dv/dt = 3610 V/μs | T <sub>j</sub> = 25 °C  |      | 37   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 150 °C |      | 39   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 40   |      | ns   |
| t <sub>r</sub>       |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 25 °C  |      | 37   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 150 °C |      | 43   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 46   |      | ns   |
| E <sub>on</sub>      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 25 °C  |      | 2.8  |      | mJ   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 150 °C |      | 4    |      | mJ   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 4.2  |      | mJ   |
| t <sub>d(off)</sub>  |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 25 °C  |      | 231  |      | ns   |
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| t <sub>f</sub>       |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 25 °C  |      | 48   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 150 °C |      | 74   |      | ns   |
|                      |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 175 °C |      | 90   |      | ns   |
| E <sub>off</sub>     |                                                                                                                                                                                                                                                                        | T <sub>j</sub> = 25 °C  |      | 2.3  |      | mJ   |
|                      | T <sub>j</sub> = 150 °C                                                                                                                                                                                                                                                |                         | 3.9  |      | mJ   |      |
|                      | T <sub>j</sub> = 175 °C                                                                                                                                                                                                                                                |                         | 4.2  |      | mJ   |      |
| R <sub>th(j-s)</sub> | per IGBT, λ <sub>paste</sub> =0.8 W/(mK)                                                                                                                                                                                                                               |                         |      | 1.02 |      | K/W  |
| R <sub>th(j-s)</sub> | per IGBT, λ <sub>paste</sub> =2.5 W/(mK)                                                                                                                                                                                                                               |                         |      | 0.85 |      | K/W  |

# SKiiP 34NAB12T7V1



MiniSKiiP® 3

## 3-phase Converter-Inverter-Brake (CIB)

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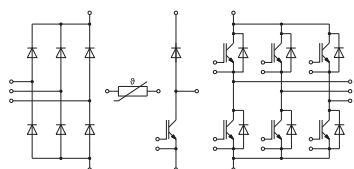
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- UL recognized: File no. E63532

#### Remarks

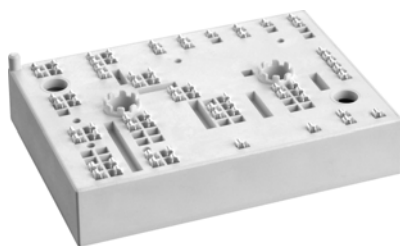
- Max. case temperature limited to  $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$ ;  $T_{j,op} > 150^\circ\text{C}$  during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet Please refer to both documents for further information
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"
- Inverter IGBT: T1 – T6
- Chopper IGBT: T14
- Inverse Diode: D1 – D6
- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12

| Characteristics                  |                                           |                         |      |      |      |      |
|----------------------------------|-------------------------------------------|-------------------------|------|------|------|------|
| Symbol                           | Conditions                                |                         | min. | typ. | max. | Unit |
| Inverse - Diode                  |                                           |                         |      |      |      |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 35 A                     | T <sub>j</sub> = 25 °C  |      | 2.30 | 2.62 | V    |
|                                  | V <sub>GE</sub> = 0 V                     | T <sub>j</sub> = 150 °C |      | 2.29 | 2.62 | V    |
|                                  | chiplevel                                 | T <sub>j</sub> = 175 °C |      | 2.14 | 2.46 | V    |
| V <sub>F0</sub>                  |                                           | T <sub>j</sub> = 25 °C  |      | 1.30 | 1.50 | V    |
|                                  | chiplevel                                 | T <sub>j</sub> = 150 °C |      | 0.90 | 1.10 | V    |
|                                  |                                           | T <sub>j</sub> = 175 °C |      | 0.82 | 0.98 | V    |
| r <sub>F</sub>                   |                                           | T <sub>j</sub> = 25 °C  |      | 29   | 32   | mΩ   |
|                                  | chiplevel                                 | T <sub>j</sub> = 150 °C |      | 40   | 43   | mΩ   |
|                                  |                                           | T <sub>j</sub> = 175 °C |      | 38   | 42   | mΩ   |
| I <sub>RRM</sub>                 |                                           | T <sub>j</sub> = 25 °C  |      | 22   |      | A    |
|                                  |                                           | T <sub>j</sub> = 150 °C |      | 28   |      | A    |
|                                  | V <sub>CC</sub> = 600 V                   | T <sub>j</sub> = 175 °C |      | 33   |      | A    |
| Q <sub>rr</sub>                  | I <sub>F</sub> = 35 A                     | T <sub>j</sub> = 25 °C  |      | 2    |      | μC   |
|                                  | V <sub>GE</sub> = -15 V                   | T <sub>j</sub> = 150 °C |      | 5.2  |      | μC   |
|                                  | @ T <sub>j</sub> = 150 °C:                | T <sub>j</sub> = 175 °C |      | 5.7  |      | μC   |
| E <sub>rr</sub>                  | di/dt <sub>off</sub> = 870 A/μs           | T <sub>j</sub> = 25 °C  |      | 0.65 |      | mJ   |
|                                  |                                           | T <sub>j</sub> = 150 °C |      | 2.1  |      | mJ   |
|                                  |                                           | T <sub>j</sub> = 175 °C |      | 2.7  |      | mJ   |
| R <sub>th(j-s)</sub>             | per Diode, λ <sub>paste</sub> =0.8 W/(mK) |                         |      | 1.22 |      | K/W  |
| R <sub>th(j-s)</sub>             | per Diode, λ <sub>paste</sub> =2.5 W/(mK) |                         |      | 1.03 |      | K/W  |
| Freewheeling - Diode             |                                           |                         |      |      |      |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 35 A                     | T <sub>j</sub> = 25 °C  |      | 2.30 | 2.62 | V    |
|                                  | V <sub>GE</sub> = 0 V                     | T <sub>j</sub> = 150 °C |      | 2.29 | 2.62 | V    |
|                                  | chiplevel                                 | T <sub>j</sub> = 175 °C |      | 2.14 | 2.46 | V    |
| V <sub>F0</sub>                  |                                           | T <sub>j</sub> = 25 °C  |      | 1.30 | 1.50 | V    |
|                                  | chiplevel                                 | T <sub>j</sub> = 150 °C |      | 0.90 | 1.10 | V    |
|                                  |                                           | T <sub>j</sub> = 175 °C |      | 0.82 | 0.98 | V    |
| r <sub>F</sub>                   |                                           | T <sub>j</sub> = 25 °C  |      | 29   | 32   | mΩ   |
|                                  | chiplevel                                 | T <sub>j</sub> = 150 °C |      | 40   | 43   | mΩ   |
|                                  |                                           | T <sub>j</sub> = 175 °C |      | 38   | 42   | mΩ   |
| I <sub>RRM</sub>                 |                                           | T <sub>j</sub> = 25 °C  |      | 22   |      | A    |
|                                  |                                           | T <sub>j</sub> = 150 °C |      | 28   |      | A    |
|                                  | V <sub>CC</sub> = 600 V                   | T <sub>j</sub> = 175 °C |      | 33   |      | A    |
| Q <sub>rr</sub>                  | I <sub>F</sub> = 35 A                     | T <sub>j</sub> = 25 °C  |      | 2    |      | μC   |
|                                  | V <sub>GE</sub> = -15 V                   | T <sub>j</sub> = 150 °C |      | 5.2  |      | μC   |
|                                  | @ T <sub>j</sub> = 150 °C:                | T <sub>j</sub> = 175 °C |      | 5.7  |      | μC   |
| E <sub>rr</sub>                  | di/dt <sub>off</sub> = 870 A/μs           | T <sub>j</sub> = 25 °C  |      | 0.65 |      | mJ   |
|                                  |                                           | T <sub>j</sub> = 150 °C |      | 2.1  |      | mJ   |
|                                  |                                           | T <sub>j</sub> = 175 °C |      | 2.7  |      | mJ   |
| R <sub>th(j-s)</sub>             | per Diode, λ <sub>paste</sub> =0.8 W/(mK) |                         |      | 1.22 |      | K/W  |
| R <sub>th(j-s)</sub>             | per Diode, λ <sub>paste</sub> =2.5 W/(mK) |                         |      | 1.03 |      | K/W  |



NAB

# SKiiP 34NAB12T7V1



MiniSKiiP® 3

## 3-phase Converter-Inverter-Brake (CIB)

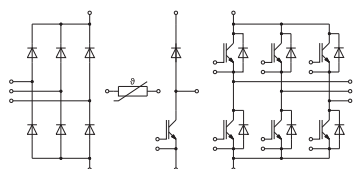
### SKiiP 34NAB12T7V1

#### Features\*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

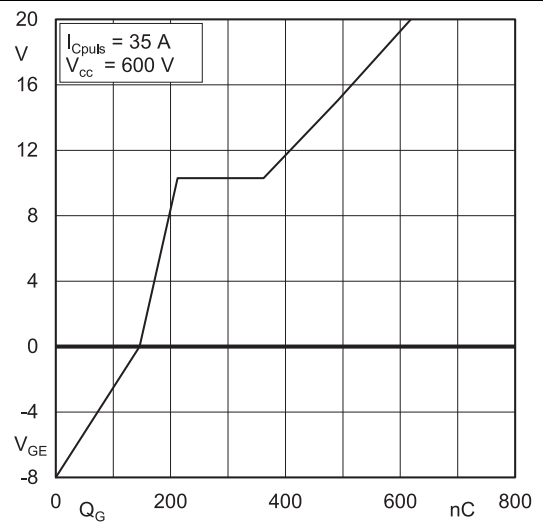
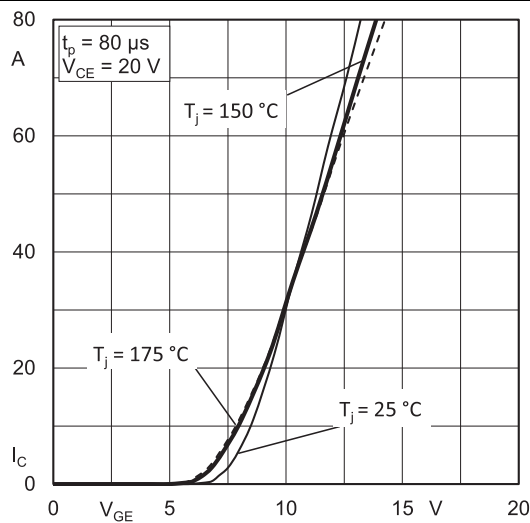
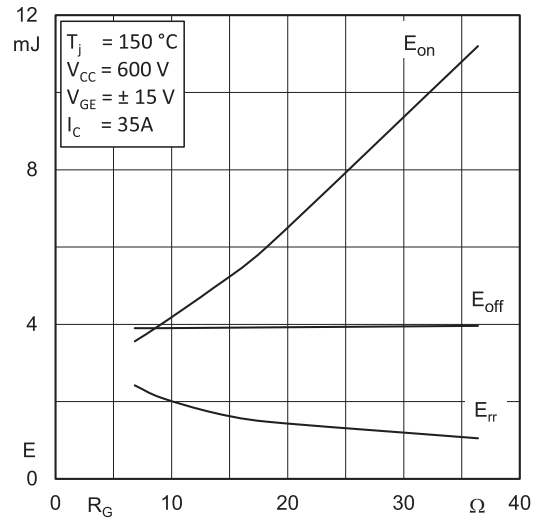
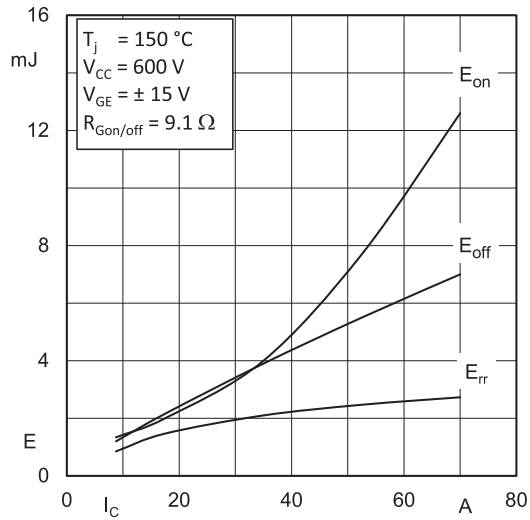
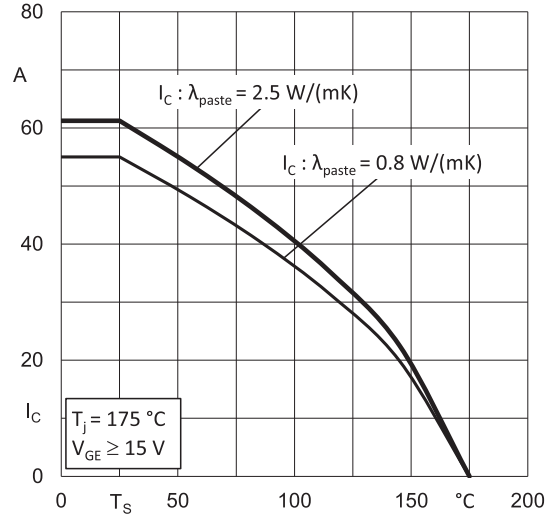
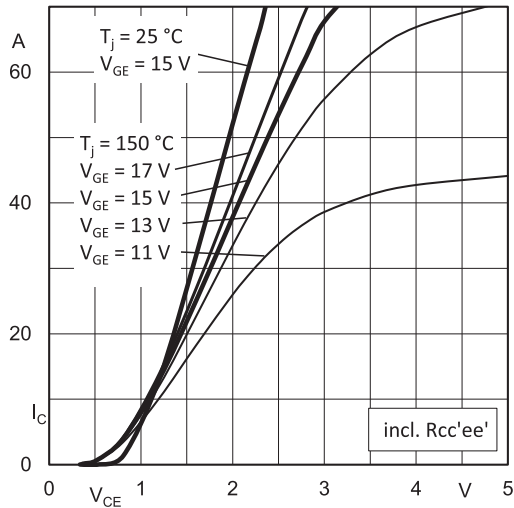
#### Remarks

- Max. case temperature limited to  $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$ ;  $T_{j,op} > 150^\circ\text{C}$  during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet Please refer to both documents for further information
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"
- Inverter IGBT: T1 – T6
- Chopper IGBT: T14
- Inverse Diode: D1 – D6
- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12



NAB

| Characteristics      |                                                                                                                                                                |                         |      |           |      |      |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|-----------|------|------|
| Symbol               | Conditions                                                                                                                                                     |                         | min. | typ.      | max. | Unit |
| Rectifier - Diode    |                                                                                                                                                                |                         |      |           |      |      |
| V <sub>F</sub>       | I <sub>F</sub> = 13 A<br>chiplevel                                                                                                                             | T <sub>j</sub> = 25 °C  |      | 0.97      | 1.20 | V    |
|                      |                                                                                                                                                                | T <sub>j</sub> = 150 °C |      | 0.84      | 1.07 | V    |
|                      |                                                                                                                                                                | T <sub>j</sub> = 175 °C |      | 0.82      | 1.05 | V    |
| V <sub>F0</sub>      | chiplevel                                                                                                                                                      | T <sub>j</sub> = 25 °C  |      | 0.89      | 1.09 | V    |
|                      |                                                                                                                                                                | T <sub>j</sub> = 150 °C |      | 0.73      | 0.92 | V    |
|                      |                                                                                                                                                                | T <sub>j</sub> = 175 °C |      | 0.69      | 0.88 | V    |
| r <sub>F</sub>       | chiplevel                                                                                                                                                      | T <sub>j</sub> = 25 °C  |      | 6.2       | 8.5  | mΩ   |
|                      |                                                                                                                                                                | T <sub>j</sub> = 150 °C |      | 8.8       | 12   | mΩ   |
|                      |                                                                                                                                                                | T <sub>j</sub> = 175 °C |      | 10.0      | 13   | mΩ   |
| I <sub>R</sub>       | T <sub>j</sub> = 150 °C, V <sub>RRM</sub>                                                                                                                      |                         |      |           | 1.7  | mA   |
| R <sub>th(j-s)</sub> | per Diode, λ <sub>paste</sub> =0.8 W/(mK)                                                                                                                      |                         |      | 1.26      |      | K/W  |
| R <sub>th(j-s)</sub> | per Diode, λ <sub>paste</sub> =2.5 W/(mK)                                                                                                                      |                         |      | 1.08      |      | K/W  |
| Module               |                                                                                                                                                                |                         |      |           |      |      |
| M <sub>s</sub>       | to heat sink                                                                                                                                                   |                         | 2    |           | 2.5  | Nm   |
| w                    |                                                                                                                                                                |                         |      | 82        |      | g    |
| L <sub>CE</sub>      |                                                                                                                                                                |                         |      | -         |      | nH   |
| Temperature Sensor   |                                                                                                                                                                |                         |      |           |      |      |
| R <sub>100</sub>     | T <sub>r</sub> =100°C (R <sub>25</sub> =1000Ω)                                                                                                                 |                         |      | 1670 ± 3% |      | Ω    |
| R <sub>(T)</sub>     | R <sub>(T)</sub> =1000Ω[1+A(T-25°C)+B(T-25°C) <sup>2</sup> ]<br>, A = 7.635*10 <sup>-3</sup> °C <sup>-1</sup> ,<br>B = 1.731*10 <sup>-5</sup> °C <sup>-2</sup> |                         |      |           |      |      |



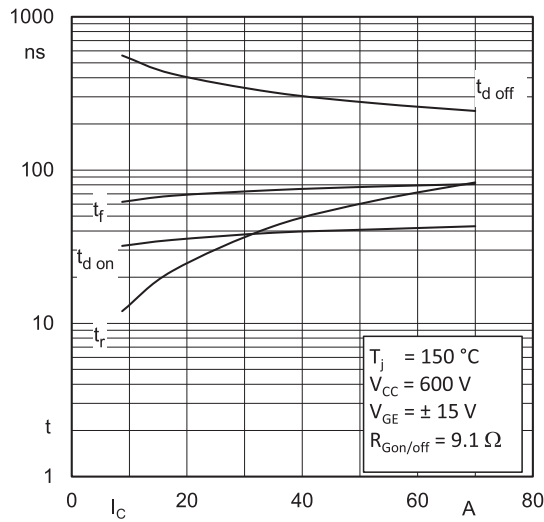


Fig. 7: Typ. switching times vs.  $I_C$

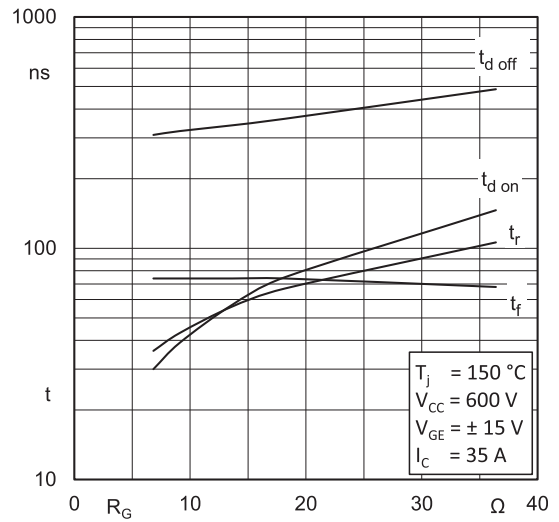


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

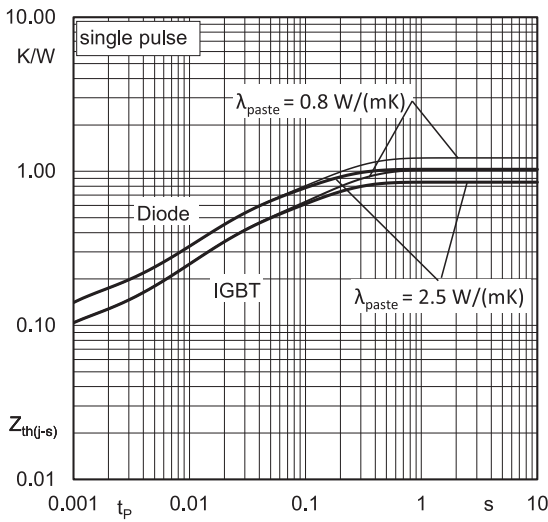


Fig. 9: Typ. transient thermal impedance

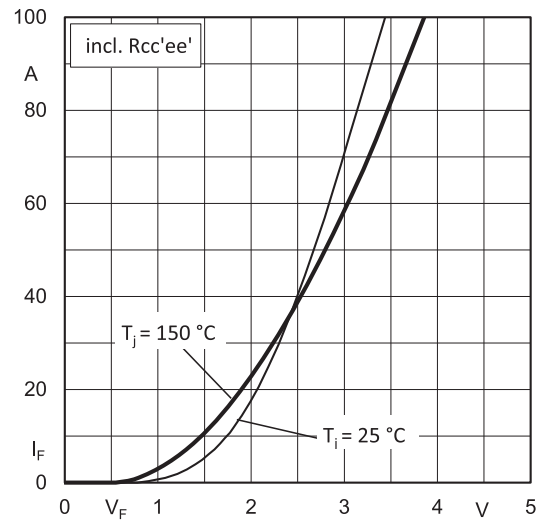


Fig. 10: Typ. CAL diode forward characteristic

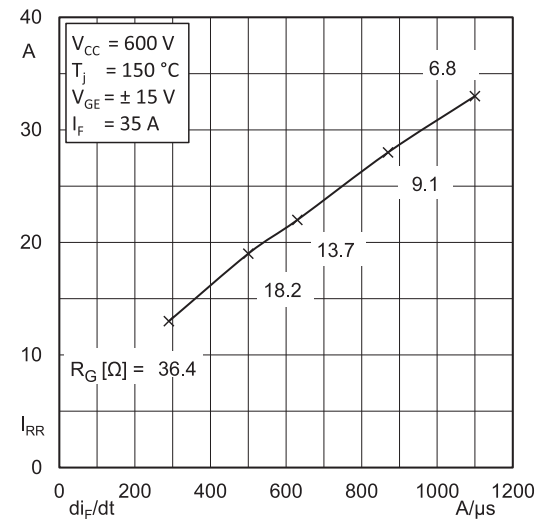


Fig. 11: Typ. CAL diode peak reverse recovery current

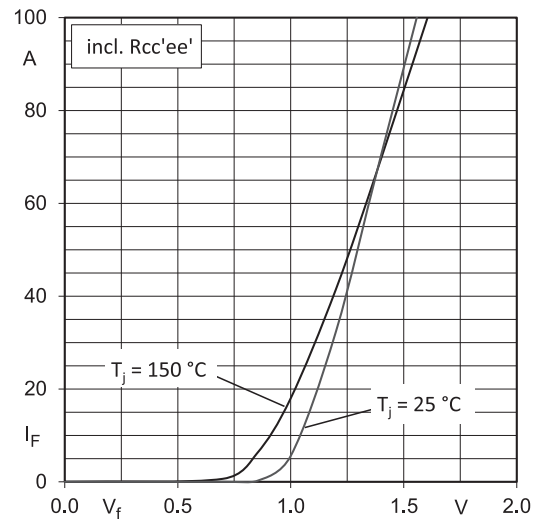
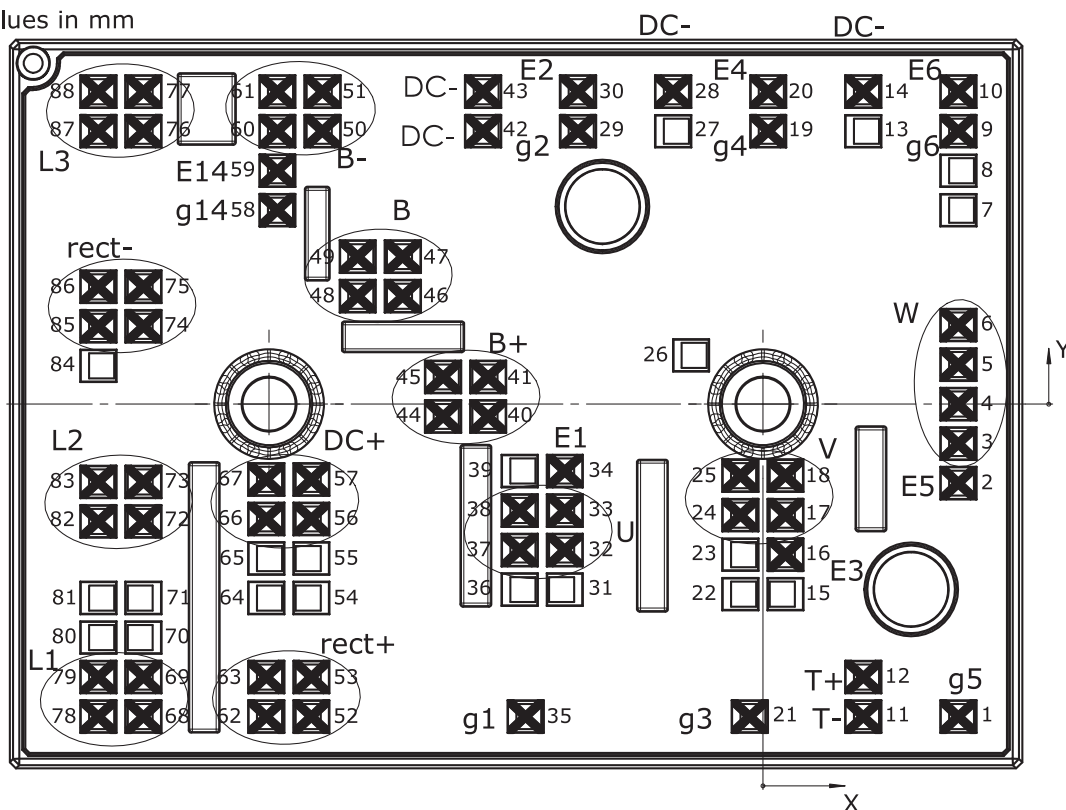


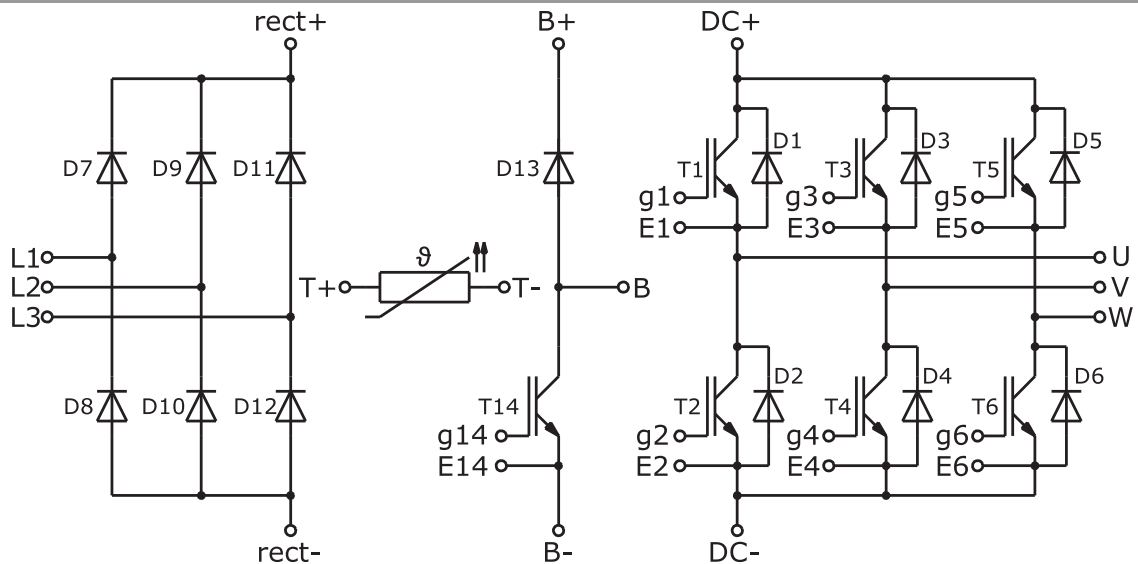
Fig. 12: Typ. input bridge forward characteristic

| Pin out |        |        |          |     |        |        |          |     |        |        |          |
|---------|--------|--------|----------|-----|--------|--------|----------|-----|--------|--------|----------|
| Pin     | X      | Y      | Function | Pin | X      | Y      | Function | Pin | X      | Y      | Function |
| 1       | 15,83  | -25,30 | g5       | 31  | -16,05 | -15,02 |          | 61  | -39,33 | 25,30  | B-       |
| 2       | 15,83  | -6,40  | E5       | 32  | -16,05 | -11,82 | U        | 62  | -40,23 | -25,30 | rect+    |
| 3       | 15,83  | -3,20  | W        | 33  | -16,05 | -8,62  | U        | 63  | -40,23 | -22,10 | rect+    |
| 4       | 15,83  | 0      | W        | 34  | -16,05 | -5,42  | E1       | 64  | -40,23 | -15,70 |          |
| 5       | 15,83  | 3,20   | W        | 35  | -19,70 | -25,30 | g1       | 65  | -40,23 | -12,50 |          |
| 6       | 15,83  | 6,40   | W        | 36  | -19,70 | -15,02 |          | 66  | -40,23 | -9,30  | DC+      |
| 7       | 15,83  | 15,70  |          | 37  | -19,70 | -11,82 | U        | 67  | -40,23 | -6,10  | DC+      |
| 8       | 15,83  | 18,90  |          | 38  | -19,70 | -8,62  | U        | 68  | -50,18 | -25,30 | L1       |
| 9       | 15,83  | 22,10  | g6       | 39  | -19,70 | -5,42  |          | 69  | -50,18 | -22,10 | L1       |
| 10      | 15,83  | 25,30  | E6       | 40  | -22,26 | -1,00  | B+       | 70  | -50,18 | -18,90 |          |
| 11      | 8,13   | -25,30 | T-       | 41  | -22,26 | 2,20   | B+       | 71  | -50,18 | -15,70 |          |
| 12      | 8,13   | -22,10 | T+       | 42  | -22,68 | 22,10  | DC-      | 72  | -50,18 | -9,50  | L2       |
| 13      | 8,13   | 22,10  |          | 43  | -22,68 | 25,30  | DC-      | 73  | -50,18 | -6,30  | L2       |
| 14      | 8,13   | 25,30  | DC-      | 44  | -25,91 | -1,00  | B+       | 74  | -50,18 | 6,30   | rect-    |
| 15      | 1,83   | -15,39 |          | 45  | -25,91 | 2,20   | B+       | 75  | -50,18 | 9,50   | rect-    |
| 16      | 1,83   | -12,19 | E3       | 46  | -29,18 | 8,74   | B        | 76  | -50,18 | 22,10  | L3       |
| 17      | 1,83   | -8,99  | V        | 47  | -29,18 | 11,94  | B        | 77  | -50,18 | 25,30  | L3       |
| 18      | 1,83   | -5,79  | V        | 48  | -32,83 | 8,74   | B        | 78  | -53,83 | -25,30 | L1       |
| 19      | 0,43   | 22,10  | g4       | 49  | -32,83 | 11,94  | B        | 79  | -53,83 | -22,10 | L1       |
| 20      | 0,43   | 25,30  | E4       | 50  | -35,68 | 22,10  | B-       | 80  | -53,83 | -18,90 |          |
| 21      | -1,08  | -25,30 | g3       | 51  | -35,68 | 25,30  | B-       | 81  | -53,83 | -15,70 |          |
| 22      | -1,83  | -15,39 |          | 52  | -36,58 | -25,30 | rect+    | 82  | -53,83 | -9,50  | L2       |
| 23      | -1,83  | -12,19 |          | 53  | -36,58 | -22,10 | rect+    | 83  | -53,83 | -6,30  | L2       |
| 24      | -1,83  | -8,99  | V        | 54  | -36,58 | -15,70 |          | 84  | -53,83 | 3,10   |          |
| 25      | -1,83  | -5,79  | V        | 55  | -36,58 | -12,50 |          | 85  | -53,83 | 6,30   | rect-    |
| 26      | -5,83  | 3,95   |          | 56  | -36,58 | -9,30  | DC+      | 86  | -53,83 | 9,50   | rect-    |
| 27      | -7,28  | 22,10  |          | 57  | -36,58 | -6,10  | DC+      | 87  | -53,83 | 22,10  | L3       |
| 28      | -7,28  | 25,30  | DC-      | 58  | -39,33 | 15,70  | g14      | 88  | -53,83 | 25,30  | L3       |
| 29      | -14,98 | 22,10  | g2       | 59  | -39,33 | 18,90  | E14      |     |        |        |          |
| 30      | -14,98 | 25,30  | E2       | 60  | -39,33 | 22,10  | B-       |     |        |        |          |

all values in mm



Pinout



Pinout

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

## \*IMPORTANT INFORMATION AND WARNINGS

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.