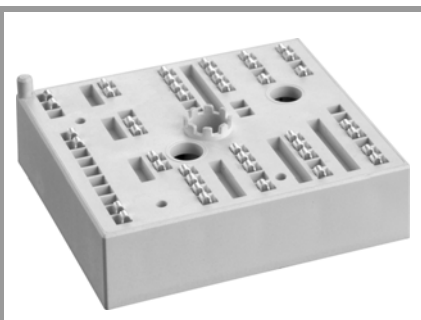


SKiiP 23NAB12T4V2



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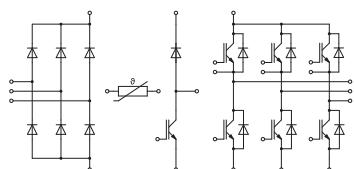
Features

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

Remarks

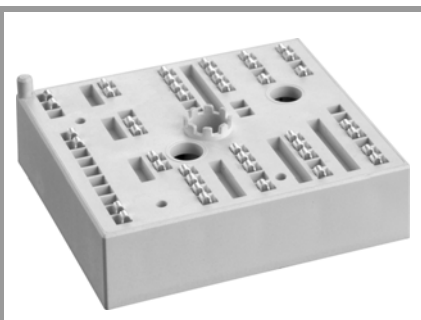
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"

| Absolute Maximum Ratings | | | | |
|-----------------------------|---|---------------------------|-------------|------------------|
| Symbol | Conditions | | Values | Unit |
| Inverter - IGBT | | | | |
| V_{CES} | $T_j = 25^\circ\text{C}$ | | 1200 | V |
| I_C | $\lambda_{paste}=0.8\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 37 | A |
| | | $T_j = 175^\circ\text{C}$ | 30 | A |
| I_C | $\lambda_{paste}=2.5\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 41 | A |
| | | $T_j = 175^\circ\text{C}$ | 34 | A |
| I_{Cnom} | | | 25 | A |
| I_{CRM} | $I_{CRM} = 3 \times I_{Cnom}$ | | 75 | A |
| V_{GES} | | | -20 ... 20 | V |
| t_{psc} | $V_{CC} = 800\text{ V}$ | $T_j = 150^\circ\text{C}$ | 10 | μs |
| | $V_{GE} \leq 15\text{ V}$ | | | |
| | $V_{CES} \leq 1200\text{ V}$ | | | |
| T_j | | | -40 ... 175 | $^\circ\text{C}$ |
| Chopper - IGBT | | | | |
| V_{CES} | $T_j = 25^\circ\text{C}$ | | 1200 | V |
| I_C | $\lambda_{paste}=0.8\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 37 | A |
| | | $T_j = 175^\circ\text{C}$ | 30 | A |
| I_C | $\lambda_{paste}=2.5\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 41 | A |
| | | $T_j = 175^\circ\text{C}$ | 34 | A |
| I_{Cnom} | | | 25 | A |
| I_{CRM} | $I_{CRM} = 3 \times I_{Cnom}$ | | 75 | A |
| V_{GES} | | | -20 ... 20 | V |
| t_{psc} | $V_{CC} = 800\text{ V}$ | $T_j = 150^\circ\text{C}$ | 10 | μs |
| | $V_{GE} \leq 15\text{ V}$ | | | |
| | $V_{CES} \leq 1200\text{ V}$ | | | |
| T_j | | | -40 ... 175 | $^\circ\text{C}$ |
| Inverse - Diode | | | | |
| V_{RRM} | $T_j = 25^\circ\text{C}$ | | 1200 | V |
| I_F | $\lambda_{paste}=0.8\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 32 | A |
| | | $T_j = 175^\circ\text{C}$ | 26 | A |
| I_F | $\lambda_{paste}=2.5\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 35 | A |
| | | $T_j = 175^\circ\text{C}$ | 28 | A |
| I_{Fnom} | | | 25 | A |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | | 50 | A |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$ | | 100 | A |
| T_j | | | -40 ... 175 | $^\circ\text{C}$ |
| Freewheeling - Diode | | | | |
| V_{RRM} | $T_j = 25^\circ\text{C}$ | | 1200 | V |
| I_F | $\lambda_{paste}=0.8\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 32 | A |
| | | $T_j = 175^\circ\text{C}$ | 26 | A |
| I_F | $\lambda_{paste}=2.5\text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 35 | A |
| | | $T_j = 175^\circ\text{C}$ | 28 | A |
| I_{Fnom} | | | 25 | A |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | | 50 | A |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$ | | 100 | A |
| T_j | | | -40 ... 175 | $^\circ\text{C}$ |



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Features

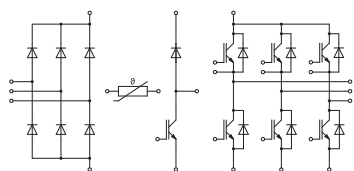
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"

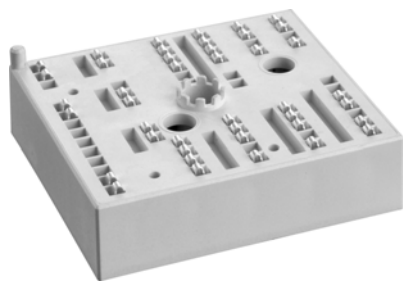
| Absolute Maximum Ratings | | | | |
|--------------------------|---|---------------------------|------|------------------|
| Symbol | Conditions | Values | Unit | |
| Rectifier - Diode | | | | |
| V_{RRM} | $T_j = 25^\circ\text{C}$ | 1600 | V | |
| I_F | $\lambda_{paste}=0.8 \text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 52 | A |
| | $T_j = 150^\circ\text{C}$ | $T_s = 70^\circ\text{C}$ | 39 | A |
| I_F | $\lambda_{paste}=2.5 \text{ W/(mK)}$ | $T_s = 25^\circ\text{C}$ | 57 | A |
| | $T_j = 150^\circ\text{C}$ | $T_s = 70^\circ\text{C}$ | 43 | A |
| I_{Fnom} | | 13 | A | |
| I_{FSM} | 10 ms | $T_j = 25^\circ\text{C}$ | 370 | A |
| | sin 180° | $T_j = 150^\circ\text{C}$ | 270 | A |
| I^2t | 10 ms | $T_j = 25^\circ\text{C}$ | 685 | A ² s |
| | sin 180° | $T_j = 150^\circ\text{C}$ | 365 | A ² s |
| T_j | | -40 ... 150 | °C | |
| Module | | | | |
| $I_{t(RMS)}$ | $T_{terminal} = 80^\circ\text{C}$, 20 A per spring | 40 | A | |
| T_{stg} | | -40 ... 125 | °C | |
| V_{isol} | AC sinus 50 Hz, 1 min | 2500 | V | |

| Characteristics | | | | | |
|------------------------|---|---------------------------|------|------|------|
| Symbol | Conditions | min. | typ. | max. | Unit |
| Inverter - IGBT | | | | | |
| $V_{CE(sat)}$ | $I_C = 25 \text{ A}$ | $T_j = 25^\circ\text{C}$ | 1.85 | 2.10 | V |
| | $V_{GE} = 15 \text{ V}$ chipelevel | $T_j = 150^\circ\text{C}$ | 2.25 | 2.45 | V |
| V_{CE0} | chipelevel | $T_j = 25^\circ\text{C}$ | 0.80 | 0.90 | V |
| | | $T_j = 150^\circ\text{C}$ | 0.70 | 0.80 | V |
| r_{CE} | $V_{GE} = 15 \text{ V}$ chipelevel | $T_j = 25^\circ\text{C}$ | 42 | 48 | mΩ |
| | | $T_j = 150^\circ\text{C}$ | 62 | 66 | mΩ |
| $V_{GE(th)}$ | $V_{GE} = V_{CE} \text{ V}$, $I_C = 1 \text{ mA}$ | 5 | 5.8 | 6.5 | V |
| I_{CES} | $V_{GE} = 0 \text{ V}$, $V_{CE} = 1200 \text{ V}$, $T_j = 25^\circ\text{C}$ | | 0.1 | 0.3 | mA |
| C_{ies} | $V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$ | $f = 1 \text{ MHz}$ | 1.43 | | nF |
| C_{oes} | | $f = 1 \text{ MHz}$ | 0.12 | | nF |
| C_{res} | | $f = 1 \text{ MHz}$ | 0.09 | | nF |
| Q_G | $V_{GE} = -8 \text{ V} \dots +15 \text{ V}$ | | 142 | | nC |
| R_{Gint} | $T_j = 25^\circ\text{C}$ | | 0 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 600 \text{ V}$ | $T_j = 150^\circ\text{C}$ | 63 | | ns |
| t_r | $I_C = 25 \text{ A}$ | $T_j = 150^\circ\text{C}$ | 65 | | ns |
| E_{on} | $R_{G on} = 24 \Omega$ $R_{G off} = 24 \Omega$ | $T_j = 150^\circ\text{C}$ | 3.1 | | mJ |
| $t_{d(off)}$ | | $T_j = 150^\circ\text{C}$ | 330 | | ns |
| t_f | | $T_j = 150^\circ\text{C}$ | 84 | | ns |
| E_{off} | $V_{GE} = +15/-15 \text{ V}$ | $T_j = 150^\circ\text{C}$ | 2.56 | | mJ |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$ | | 1.2 | | K/W |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$ | | 1 | | K/W |



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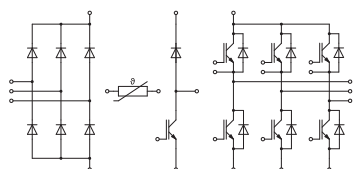
Features

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

Remarks

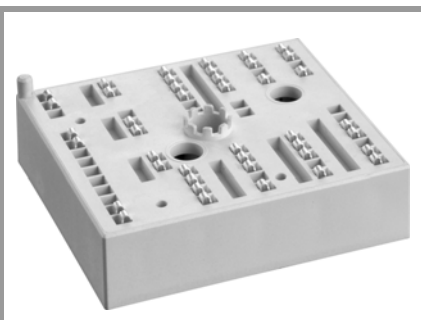
- Max. case temperature limited to $T_C=125^{\circ}\text{C}$
- Product reliability results valid for $T_j \leq 150^{\circ}\text{C}$ (recommended $T_{j,op} = -40 \dots +150^{\circ}\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"

| Characteristics | | | | | | |
|-----------------------------|---|-----------------------------|------|------|------|---------------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Chopper - IGBT | | | | | | |
| $V_{CE(sat)}$ | $I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel | $T_j = 25^{\circ}\text{C}$ | | 1.85 | 2.10 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | 2.25 | 2.45 | V |
| V_{CE0} | chipllevel | $T_j = 25^{\circ}\text{C}$ | | 0.80 | 0.90 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | 0.70 | 0.80 | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ chipllevel | $T_j = 25^{\circ}\text{C}$ | | 42 | 48 | m Ω |
| | | $T_j = 150^{\circ}\text{C}$ | | 62 | 66 | m Ω |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$ | | 5 | 5.8 | 6.5 | V |
| I_{CES} | $V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25^{\circ}\text{C}$ | | | 0.1 | 0.3 | mA |
| Q_G | $V_{GE} = -8\text{ V} \dots +15\text{ V}$ | | | 142 | | nC |
| R_{Gint} | $T_j = 25^{\circ}\text{C}$ | | | 0 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 600\text{ V}$ $I_C = 25\text{ A}$ | $T_j = 150^{\circ}\text{C}$ | | 28 | | ns |
| t_r | $R_{G\ on} = 24\ \Omega$ | $T_j = 150^{\circ}\text{C}$ | | 40 | | ns |
| E_{on} | $R_{G\ off} = 24\ \Omega$ | $T_j = 150^{\circ}\text{C}$ | | 2.65 | | mJ |
| $t_{d(off)}$ | | $T_j = 150^{\circ}\text{C}$ | | 295 | | ns |
| t_f | | $T_j = 150^{\circ}\text{C}$ | | 68 | | ns |
| E_{off} | $V_{GE} = +15/-15\text{ V}$ | | | 2.3 | | mJ |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$ | | | 1.2 | | K/W |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$ | | | 1 | | K/W |
| Inverse - Diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel | $T_j = 25^{\circ}\text{C}$ | | 2.41 | 2.74 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | 2.45 | 2.79 | V |
| V_{F0} | chipllevel | $T_j = 25^{\circ}\text{C}$ | | 1.30 | 1.50 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | 0.90 | 1.10 | V |
| r_F | chipllevel | $T_j = 25^{\circ}\text{C}$ | | 44 | 50 | m Ω |
| | | $T_j = 150^{\circ}\text{C}$ | | 62 | 68 | m Ω |
| I_{RRM} | $I_F = 25\text{ A}$ | $T_j = 150^{\circ}\text{C}$ | | 18 | | A |
| Q_{rr} | $di/dt_{off} = 500\text{ A}/\mu\text{s}$ | $T_j = 150^{\circ}\text{C}$ | | 3.7 | | μC |
| E_{rr} | $V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$ | $T_j = 150^{\circ}\text{C}$ | | 1.4 | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$ | | | 1.52 | | K/W |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$ | | | 1.3 | | K/W |
| Freewheeling - Diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel | $T_j = 25^{\circ}\text{C}$ | | 2.41 | 2.74 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | 2.45 | 2.79 | V |
| V_{F0} | chipllevel | $T_j = 25^{\circ}\text{C}$ | | 1.30 | 1.50 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | 0.90 | 1.10 | V |
| r_F | chipllevel | $T_j = 25^{\circ}\text{C}$ | | 44 | 50 | m Ω |
| | | $T_j = 150^{\circ}\text{C}$ | | 62 | 68 | m Ω |
| I_{RRM} | $I_F = 25\text{ A}$ | $T_j = 150^{\circ}\text{C}$ | | 24 | | A |
| Q_{rr} | $di/dt_{off} = 850\text{ A}/\mu\text{s}$ | $T_j = 150^{\circ}\text{C}$ | | 3.7 | | μC |
| E_{rr} | $V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$ | $T_j = 150^{\circ}\text{C}$ | | 1.6 | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$ | | | 1.52 | | K/W |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$ | | | 1.3 | | K/W |



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SKiiP 23NAB12T4V2



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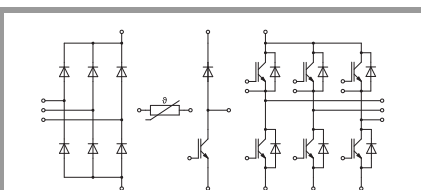
Features

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

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"

| Characteristics | | | | | | |
|---------------------------|---|---------------------------|------|------------------|------|------------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Rectifier - Diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 13 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel | $T_j = 25^\circ\text{C}$ | | 1.00 | 1.21 | V |
| | | $T_j = 125^\circ\text{C}$ | | 0.90 | 1.10 | V |
| V_{F0} | chipelevel | $T_j = 25^\circ\text{C}$ | | 0.88 | 0.98 | V |
| | | $T_j = 125^\circ\text{C}$ | | 0.73 | 0.83 | V |
| r_F | chipelevel | $T_j = 25^\circ\text{C}$ | | 9.2 | 18 | m Ω |
| | | $T_j = 125^\circ\text{C}$ | | 13 | 21 | m Ω |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}=0.8 \text{ W/(mK)}$ | | | 1.25 | | K/W |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}=2.5 \text{ W/(mK)}$ | | | 1.1 | | K/W |
| Module | | | | | | |
| M_s | to heat sink | | 2 | | 2.5 | Nm |
| w | | | | 55 | | g |
| L_{CE} | | | | - | | nH |
| Temperature Sensor | | | | | | |
| R_{100} | $T_r = 100^\circ\text{C}$, tolerance = 3 % | | | 1670 \pm 3% | | Ω |
| $R(T)$ | $R(T)=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$], $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$ | | | | | |



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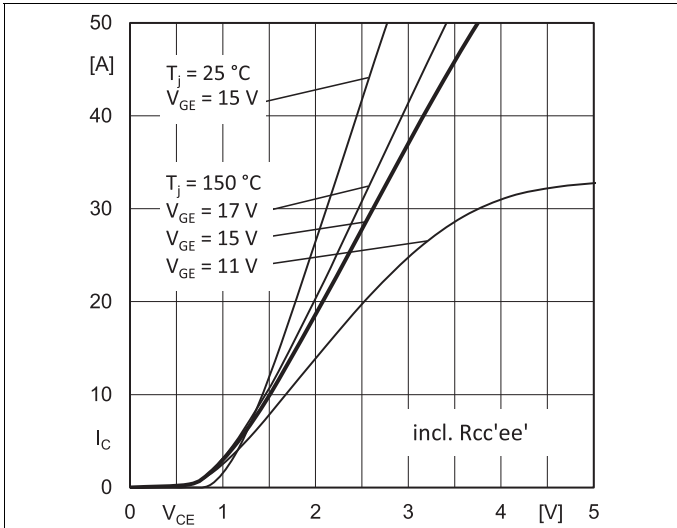


Fig. 1: Typ. output characteristic

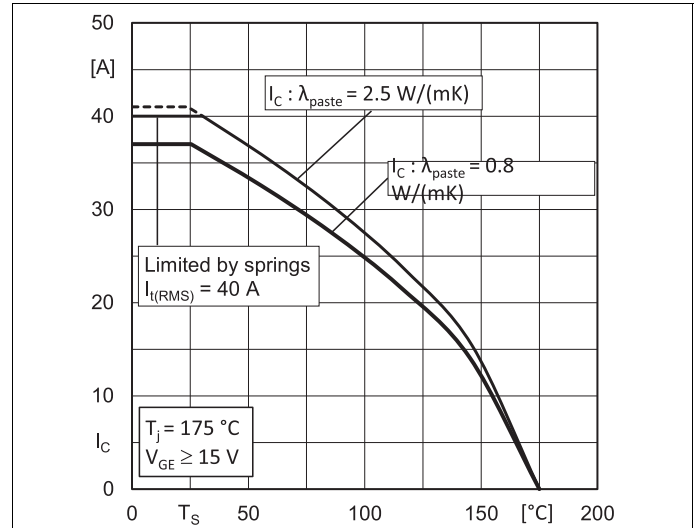


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

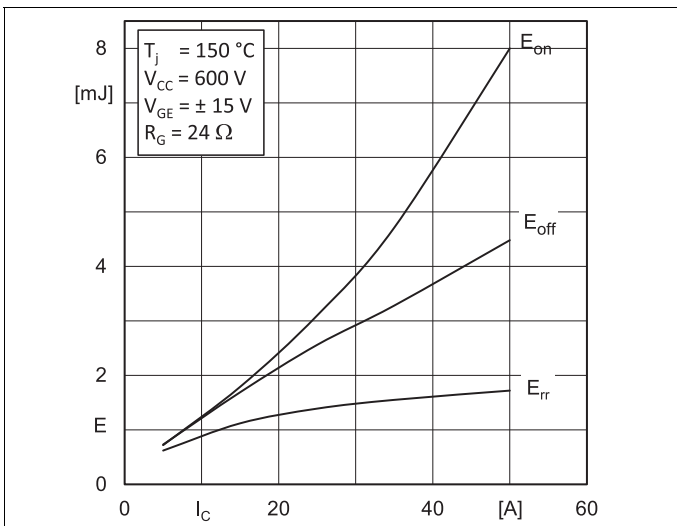


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

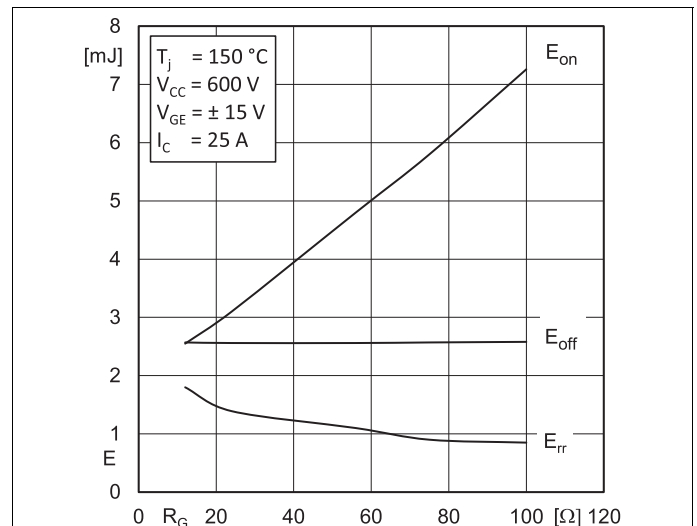


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

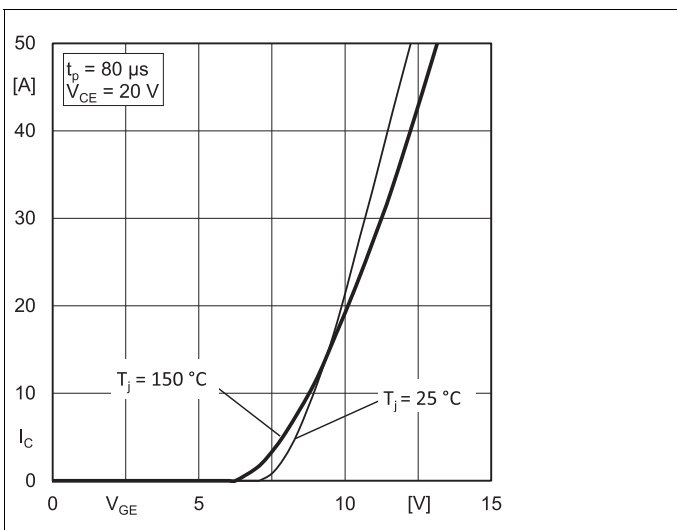


Fig. 5: Typ. transfer characteristic

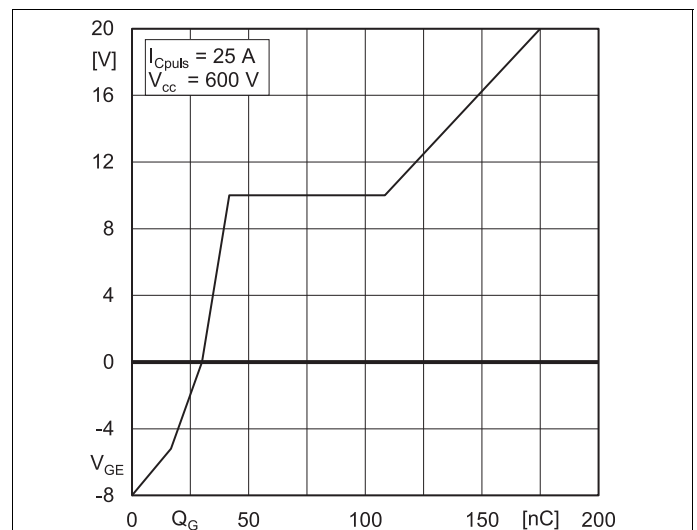


Fig. 6: Typ. gate charge characteristic

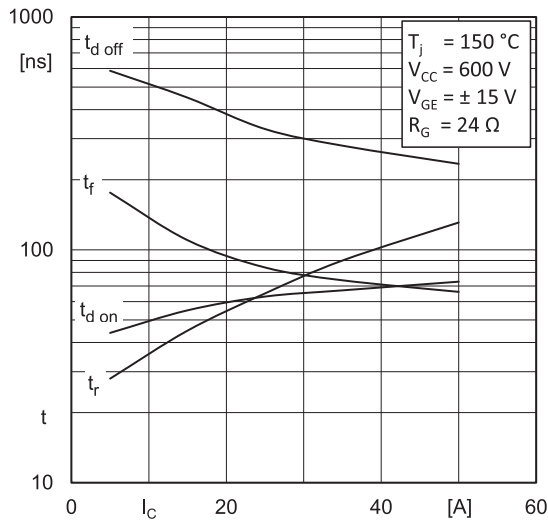


Fig. 7: Typ. switching times vs. I_C

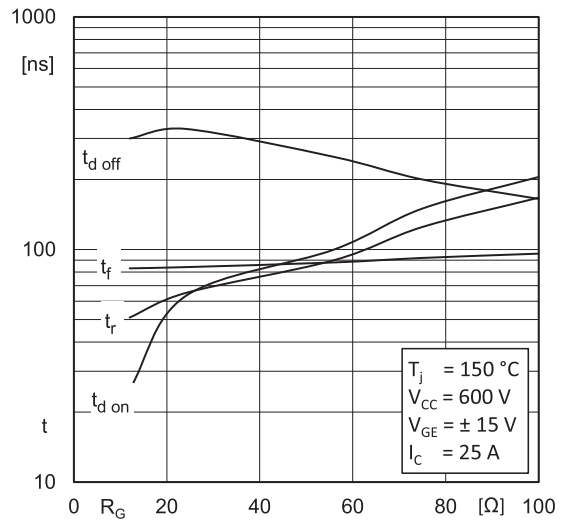


Fig. 8: Typ. switching times vs. gate resistor R_G

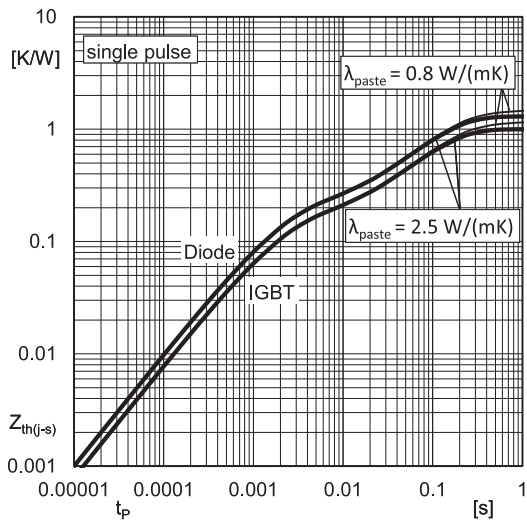


Fig. 9: Transient thermal impedance of IGBT and Diode

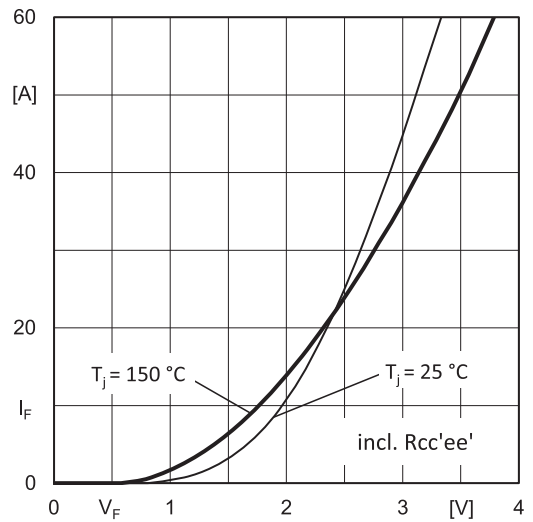


Fig. 10: CAL diode forward characteristic

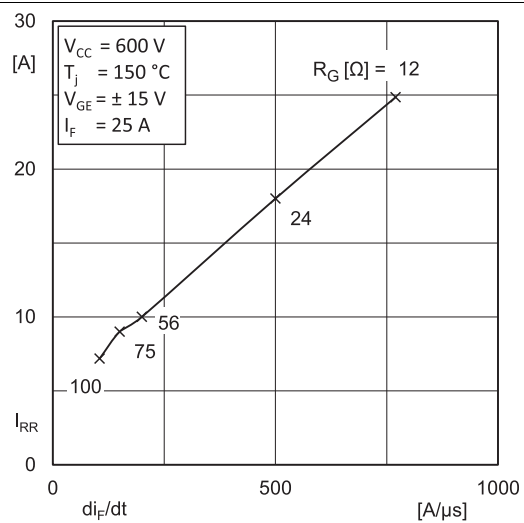


Fig. 11: Typ. CAL diode peak reverse recovery current

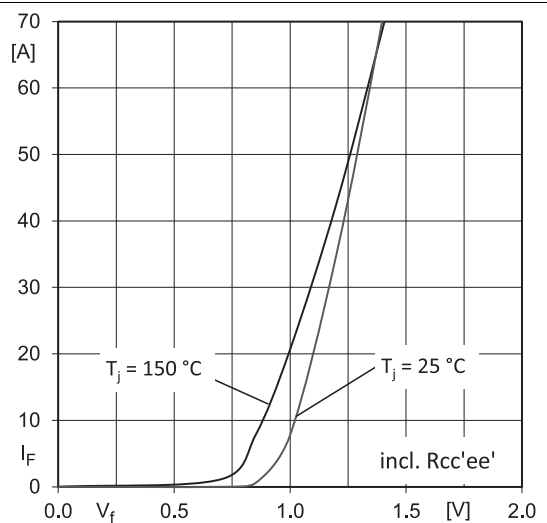
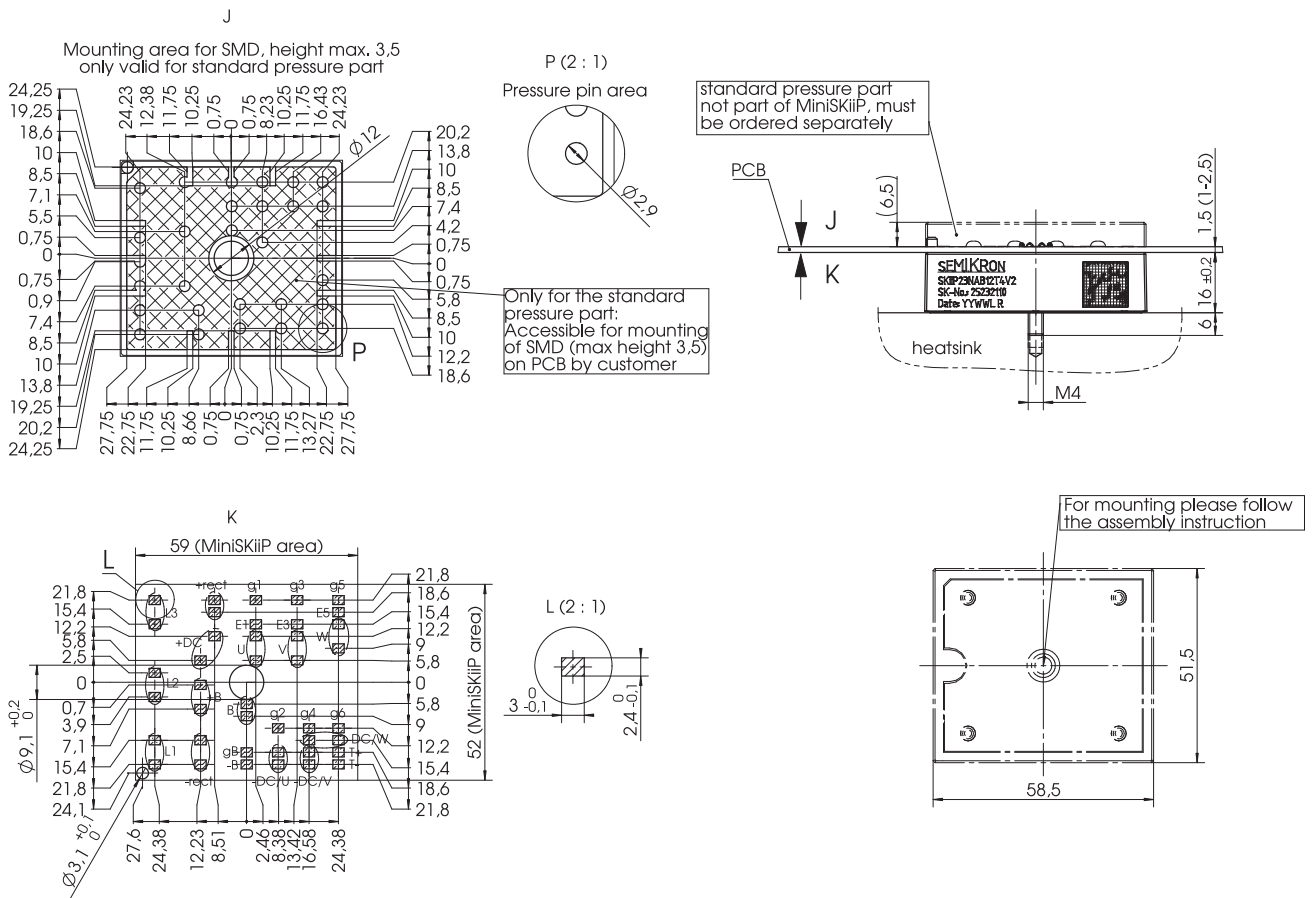
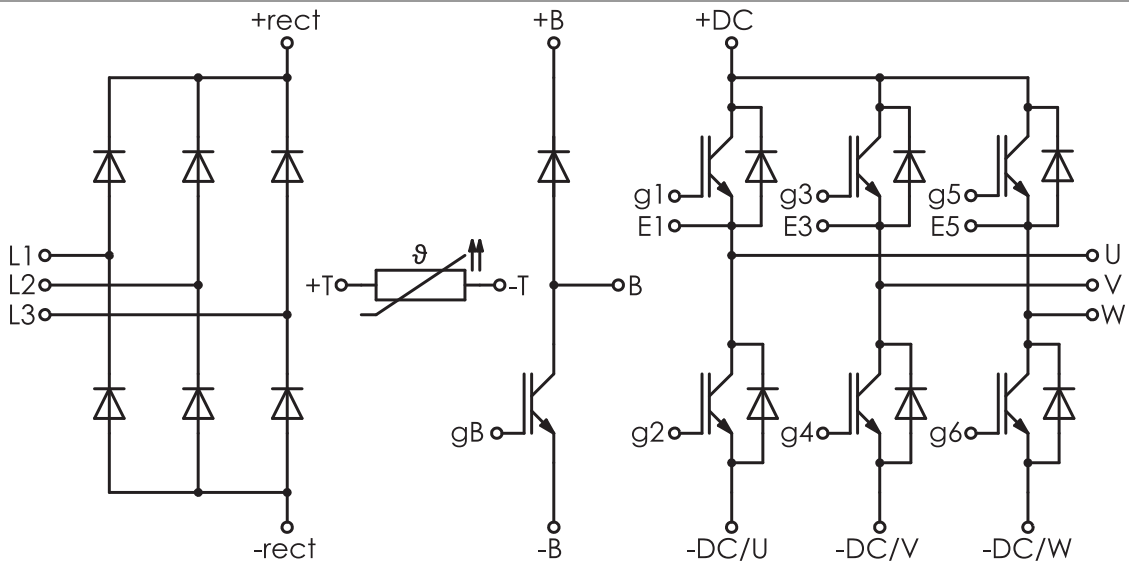


Fig. 12: Typ. input bridge forward characteristic

SKiiP 23NAB12T4V2



pinout, dimensions



pinout

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

***IMPORTANT INFORMATION AND WARNINGS**

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