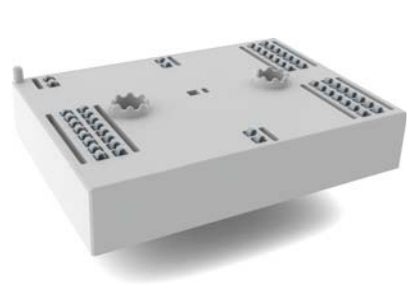


MiniSKiiP® 3 Dual

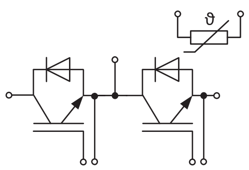
**SKiiP39GB12E4V1**

### Features

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

### Remarks

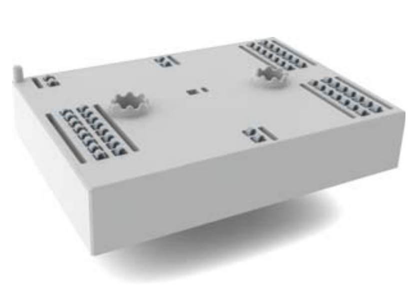
- Case temp. limited to $T_C$= 125°C max. (for baseplateless modules $T_C$ = $T_S$)
- product rel. results valid for Tj≤150 (recomm. Top = -40 ... +150°C)




GB

| Absolute Maximum Ratings | | | | |
|---|---|---|---|---|
| **Symbol** | **Conditions** | | **Values** | **Unit** |
| **Inverter - IGBT** | | | | |
| $V_{CES}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_C$ | $\lambda_{paste}$=0.8 W/(mK) $T_j$ = 175 °C | $T_s$ = 25 °C | 388 | A |
| | | $T_s$ = 70 °C | 312 | A |
| $I_C$ | $\lambda_{paste}$=2.5 W/(mK) $T_j$ = 175 °C | $T_s$ = 25 °C | 580 | A |
| | | $T_s$ = 70 °C | 473 | A |
| $I_{Cnom}$ | | | 400 | A |
| $I_{CRM}$ | $I_{CRM}$ = 3 x $I_{Cnom}$ | | 1200 | A |
| $V_{GES}$ | | | -20 ... 20 | V |
| $t_{psc}$ | $V_{CC}$ = 800 V $V_{GE}$ ≤ 15 V $V_{CES}$ ≤ 1200 V | $T_j$ = 150 °C | 10 | µs |
| $T_j$ | | | -40 ... 175 | °C |
| **Inverse - Diode** | | | | |
| $I_F$ | $\lambda_{paste}$=0.8 W/(mK) $T_j$ = 175 °C | $T_s$ = 25 °C | 363 | A |
| | | $T_s$ = 70 °C | 287 | A |
| $I_F$ | $\lambda_{paste}$=2.5 W/(mK) $T_j$ = 175 °C | $T_s$ = 25 °C | 422 | A |
| | | $T_s$ = 70 °C | 335 | A |
| $I_{Fnom}$ | | | 400 | A |
| $I_{FRM}$ | $I_{FRM}$ = 3 x $I_{Fnom}$ | | 1200 | A |
| $I_{FSM}$ | 10 ms, sin 180°, $T_j$ = 150 °C | | 1980 | A |
| $T_j$ | | | -40 ... 175 | °C |
| **Module** | | | | |
| $I_{t(RMS)}$ | $T_{terminal}$ = 80 °C, 20 A per spring | | 280 | A |
| $T_{stg}$ | | | -40 ... 125 | °C |
| $V_{isol}$ | AC sinus 50 Hz, t = 1 min | | 2500 | V |

| Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| **Inverter - IGBT** | | | | | | |
| $V_{CE(sat)}$ | $I_C$ = 400 A $V_{GE}$ = 15 V chiplevel | $T_j$ = 25 °C | | 1.80 | 2.05 | V |
| | | $T_j$ = 150 °C | | 2.20 | 2.40 | V |
| $V_{CE0}$ | chiplevel | $T_j$ = 25 °C | | 0.80 | 0.90 | V |
| | | $T_j$ = 150 °C | | 0.70 | 0.80 | V |
| $r_{CE}$ | $V_{GE}$ = 15 V chiplevel | $T_j$ = 25 °C | | 2.5 | 2.9 | mΩ |
| | | $T_j$ = 150 °C | | 3.8 | 4.0 | mΩ |
| $V_{GE(th)}$ | $V_{GE}$ = $V_{CE}$, $I_C$ = 15.2 mA | | 5 | 5.8 | 6.5 | V |
| $I_{CES}$ | $V_{GE}$ = 0 V $V_{CE}$ = 1200 V | $T_j$ = 25 °C | | 0.1 | 0.3 | mA |
| | | | | - | | mA |
| $C_{ies}$ | $V_{CE}$ = 25 V $V_{GE}$ = 0 V | f = 1 MHz | | 24.60 | | nF |
| $C_{oes}$ | | f = 1 MHz | | 1.62 | | nF |
| $C_{res}$ | | f = 1 MHz | | 1.38 | | nF |
| $Q_G$ | - 8 V...+ 15 V | | | 2260 | | nC |
| $R_{Gint}$ | $T_j$ = 25 °C | | | 1.9 | | Ω |
| $t_{d(on)}$ | $V_{CC}$ = 600 V $I_C$ = 400 A $R_{G\,on}$ = 1.5 Ω $R_{G\,off}$ = 1.5 Ω $di/dt_{on}$ = 6940 A/µs $di/dt_{off}$ = 2930 A/µs | $T_j$ = 150 °C | | 183 | | ns |
| $t_r$ | | $T_j$ = 150 °C | | 62 | | ns |
| $E_{on}$ | | $T_j$ = 150 °C | | 20.8 | | mJ |
| $t_{d(off)}$ | | $T_j$ = 150 °C | | 520 | | ns |
| $t_f$ | | $T_j$ = 150 °C | | 118 | | ns |
| $E_{off}$ | $V_{GE}$ = +15/-15 V $L_s$ = 25 nH | $T_j$ = 150 °C | | 49.7 | | mJ |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=0.8 W/(mK) | | | 0.16 | | K/W |



MiniSKiiP® 3 Dual

**SKiiP39GB12E4V1**

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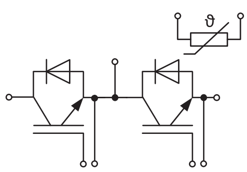
### Remarks

- Case temp. limited to $T_C$= 125°C max. (for baseplateless modules $T_C$ = $T_S$)
- product rel. results valid for Tj≤150 (recomm. Top = -40 ... +150°C)

| Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| **Inverter - IGBT** | | | | | | |
| $R_{th(j-s)}$ | per IGBT, $\lambda_{paste}$=2.5 W/(mK) | | | 0.08 | | K/W |
| **Inverse - Diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ = 400 A<br>$V_{GE}$ = 0 V<br>chiplevel | $T_j$ = 25 °C | | 2.20 | 2.52 | V |
| | | $T_j$ = 150 °C | | 2.15 | 2.47 | V |
| $V_{F0}$ | chiplevel | $T_j$ = 25 °C | | 1.30 | 1.50 | V |
| | | $T_j$ = 150 °C | | 0.90 | 1.10 | V |
| $r_F$ | chiplevel | $T_j$ = 25 °C | | 2.3 | 2.6 | mΩ |
| | | $T_j$ = 150 °C | | 3.1 | 3.4 | mΩ |
| $I_{RRM}$ | $I_F$ = 400 A<br>di/dt$_{off}$ = 6840 A/µs<br>$V_{GE}$ = -15 V<br>$V_{CC}$ = 600 V | $T_j$ = 150 °C | | 425 | | A |
| $Q_{rr}$ | | $T_j$ = 150 °C | | 63.2 | | µC |
| $E_{rr}$ | | $T_j$ = 150 °C | | 30.2 | | mJ |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=0.8 W/(mK) | | | 0.19 | | K/W |
| $R_{th(j-s)}$ | per Diode, $\lambda_{paste}$=2.5 W/(mK) | | | 0.15 | | K/W |
| **Module** | | | | | | |
| $L_{CE}$ | | | | 15 | | nH |
| $M_s$ | to heat sink | | 2 | | 2.5 | Nm |
| w | | | | 76 | | g |
| **Temperature Sensor** | | | | | | |
| $R_{100}$ | $T_c$=100°C ($R_{25}$=5 kΩ) | | | 493 ± 5% | | Ω |
| $B_{25/85}$ | $R_{(T)}=R_{25}*\exp[B_{25/85}*(1/T-1/298)]$, [T]=K | | | 3420 | | K |



GB

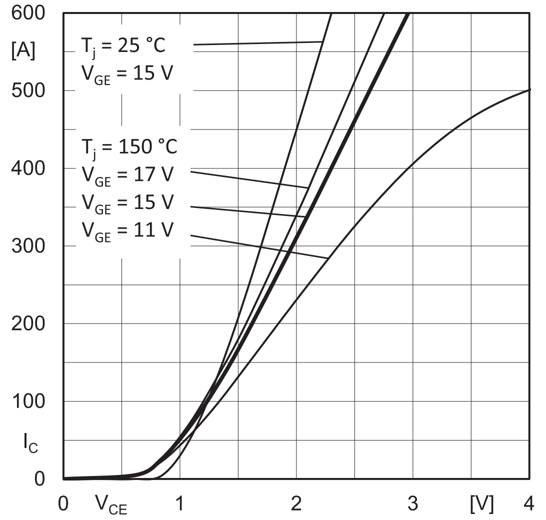



Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

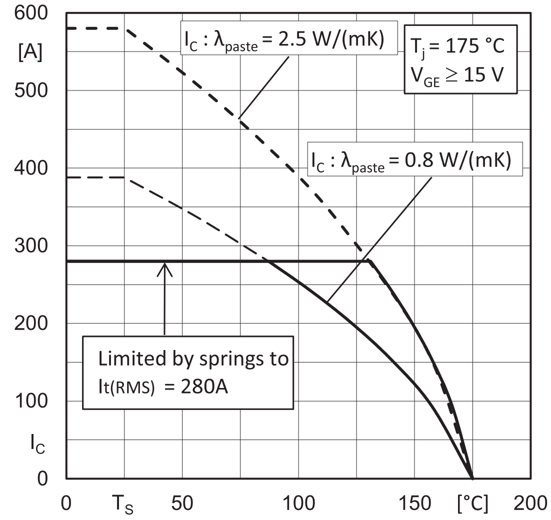



Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

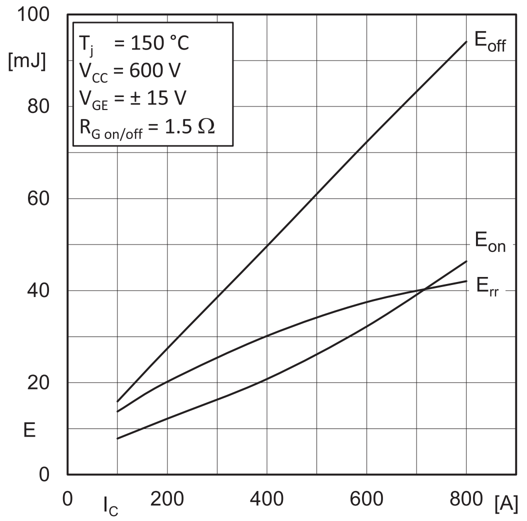



Fig. 3: Typ. turn-on /-off energy = f ($I_C$)

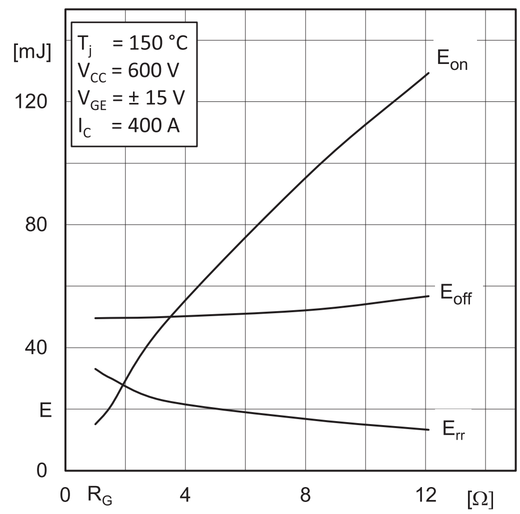



Fig. 4: Typ. turn-on /-off energy = f ($R_G$)

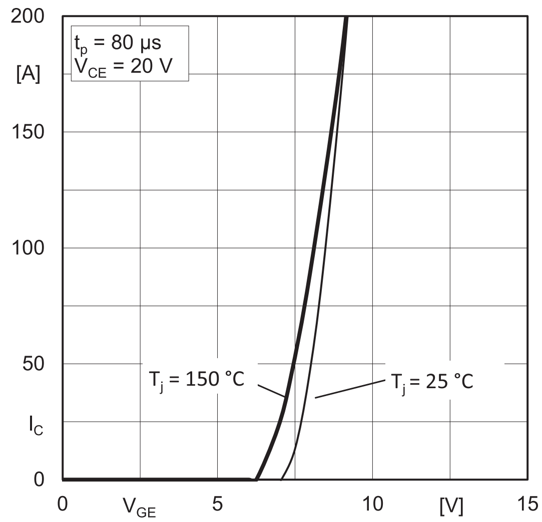



Fig. 5: Typ. transfer characteristic

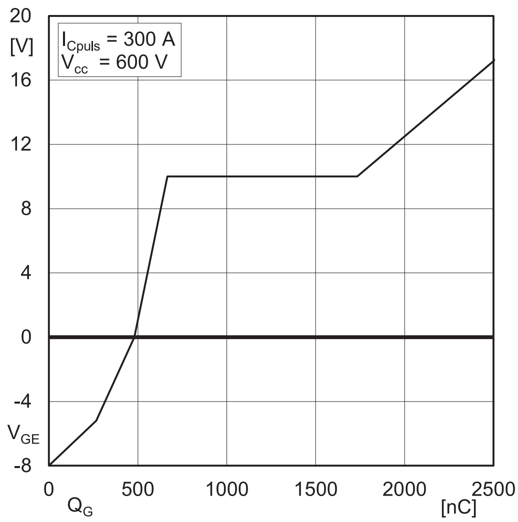



Fig. 6: Typ. gate charge characteristic

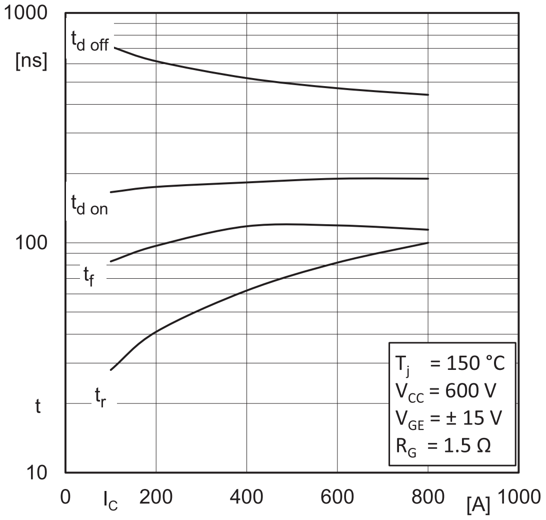



Fig. 7: Typ. switching times vs. $I_C$

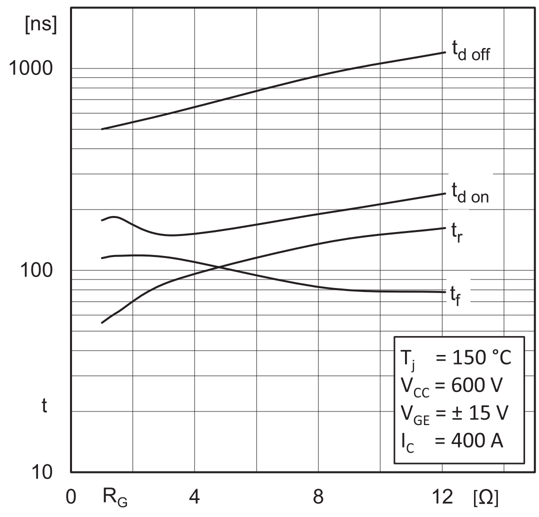



Fig. 8: Typ. switching times vs. gate resistor $R_G$

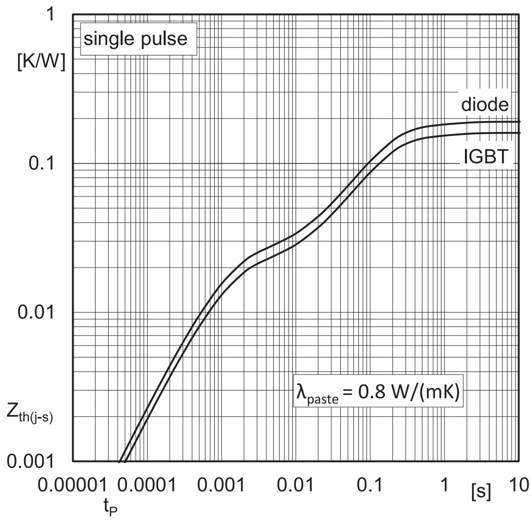



Fig. 9: Transient thermal impedance of IGBT and Diode

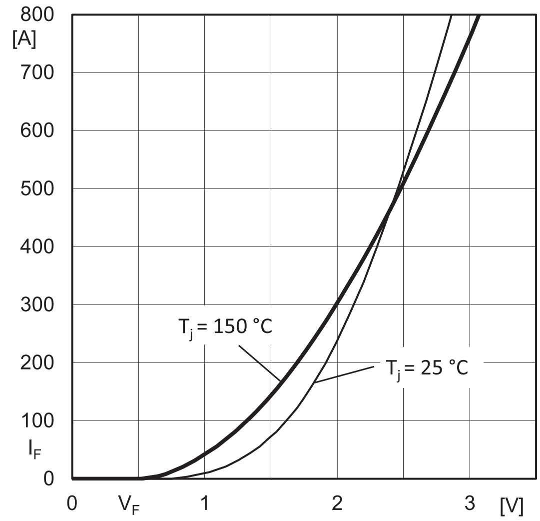



Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

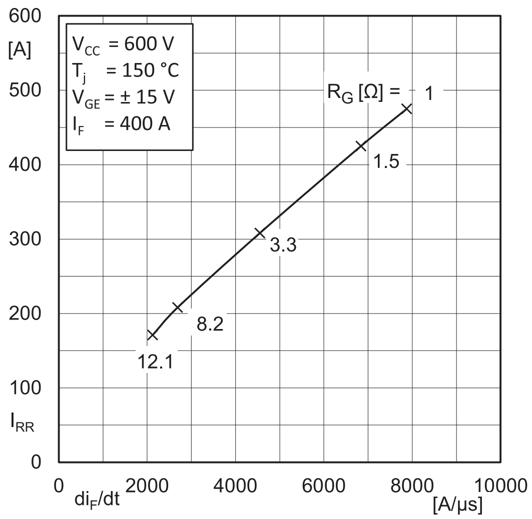



Fig. 11: Typ. CAL diode peak reverse recovery current

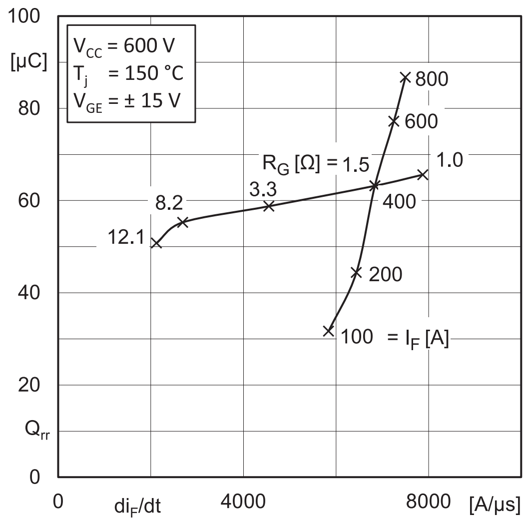
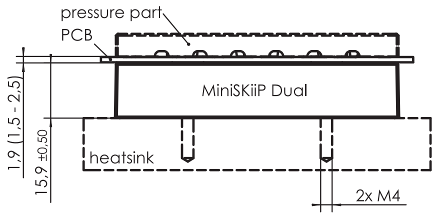



Fig. 12: Typ. CAL diode recovery charge

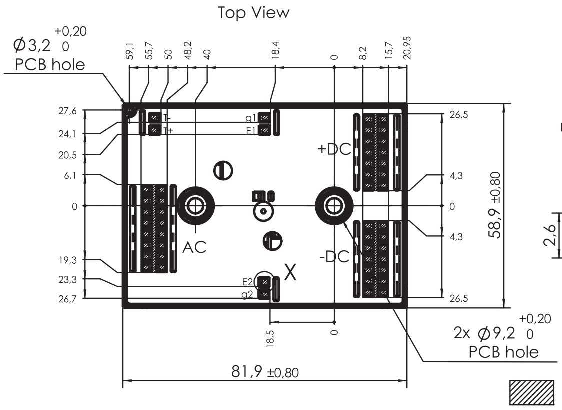
 

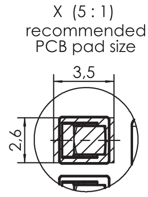



For mounting please follow the assembly instruction

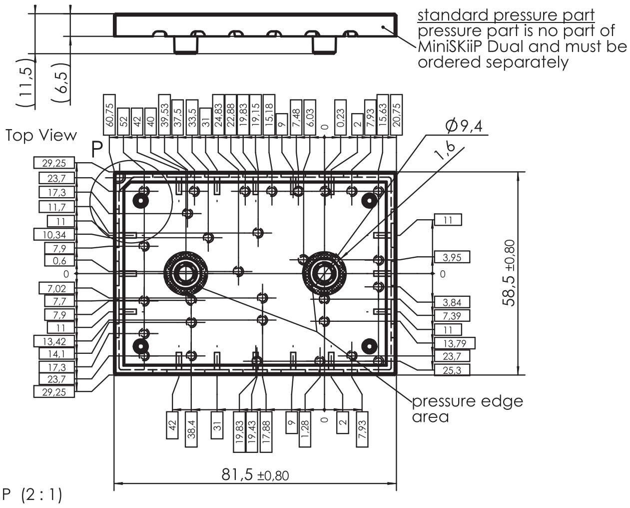
requirement for PCB Design: The MiniSKiiP area shall be coverd with a maximum of circuit paths. This ensures a uniform area pressure

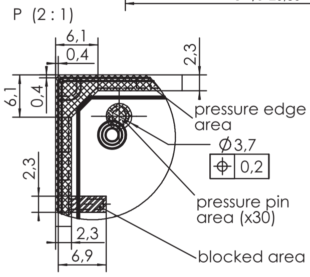
measure: mm
tolerance: +/- 0,2




recommended PCB pad size



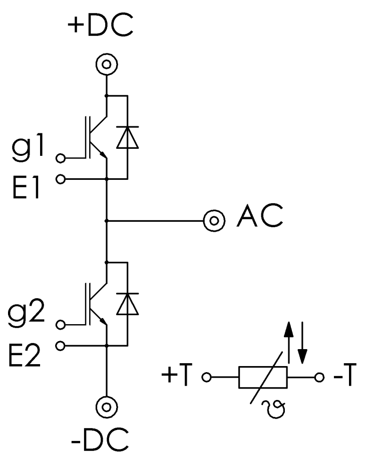




Accessible for mounting of SMD (max. height 3.5) on PCB by customer. Except pressure areas and blocked areas!

requirement for PCB design: The pressure pin areas and more than 80% of the pressure edge areas must be on the same level and coverd with circuit path. This ensures a uniform area pressure.

measure: mm
tolerance: +/- 0,2

**pinout, dimensions**




◎ power connector

∘ control connector

**pinout**

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

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