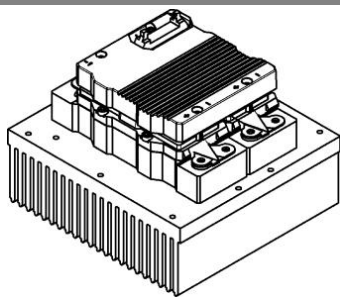


# SKiiP 1013GB122-2DL



SKiiP® 3

## 2-pack-integrated intelligent Power System

### Power section

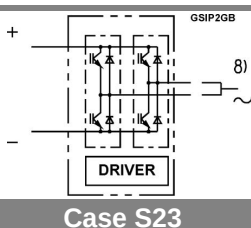
SKiiP 1013GB122-2DL

Preliminary Data

### Features

- SKiiP technology inside
- SPT (Soft Punch Trough) IGBTs
- CAL diode technology
- Integrated current sensor
- Integrated temperature sensor
- Integrated heat sink
- IEC 60721-3-3 (humidity) class 3K3/IE32 (SKiiP® 3 System)
- IEC 60068-1 (climate) 40/125/56
- UL recognized File no. E63532

- 1) with assembly of suitable MKP capacitor per terminal (SEMIKRON type is recommended)
- 8) AC connection busbars must be connected by the user; copper busbars available on request



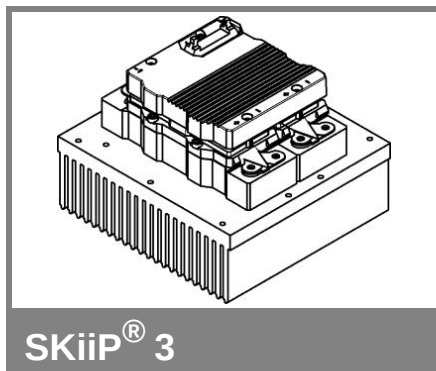
Case S23

| Absolute Maximum Ratings |                                                         | $T_s = 25^\circ\text{C}$ unless otherwise specified |                   |
|--------------------------|---------------------------------------------------------|-----------------------------------------------------|-------------------|
| Symbol                   | Conditions                                              | Values                                              | Units             |
| <b>IGBT</b>              |                                                         |                                                     |                   |
| $V_{CES}$                | Operating DC link voltage                               | 1200                                                | V                 |
| $V_{CC}^{1)}$            |                                                         | 900                                                 | V                 |
| $V_{GES}$                |                                                         | $\pm 20$                                            | V                 |
| $I_C$                    | $T_s = 25 (70)^\circ\text{C}$                           | 1000 (750)                                          | A                 |
| <b>Inverse diode</b>     |                                                         |                                                     |                   |
| $I_F = -I_C$             | $T_s = 25 (70)^\circ\text{C}$                           | 880 (670)                                           | A                 |
| $I_{FSM}$                | $T_j = 150^\circ\text{C}$ , $t_p = 10\text{ ms}$ ; sin. | 6900                                                | A                 |
| $I^2t$ (Diode)           | Diode, $T_j = 150^\circ\text{C}$ , 10 ms                | 238                                                 | kA <sup>2</sup> s |
| $T_j, (T_{stg})$         | rms, AC, 1 min, main terminals to heat sink             | - 40 ... + 150 (125)                                | $^\circ\text{C}$  |
| $V_{isol}$               |                                                         | 3000                                                | V                 |
| $I_{AC\text{-terminal}}$ |                                                         | 400                                                 | A                 |
|                          | $T_{terminal} < 115^\circ\text{C}$                      |                                                     |                   |

| Characteristics                                                                                                                                                     |                                                                              | $T_s = 25^\circ\text{C}$ unless otherwise specified |            |                |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------|------------|----------------|------------|
| Symbol                                                                                                                                                              | Conditions                                                                   | min.                                                | typ.       | max.           | Units      |
| <b>IGBT</b>                                                                                                                                                         |                                                                              |                                                     |            |                |            |
| $V_{CEsat}$                                                                                                                                                         | $I_C = 600\text{ A}$ , $T_j = 25 (125)^\circ\text{C}$ ; measured at terminal |                                                     | 2,3 (2,5)  | 2,6            | V          |
| $V_{CEO}$                                                                                                                                                           | $T_j = 25 (125)^\circ\text{C}$ ; at terminal                                 |                                                     | 1,1 (1)    | 1,3 (1,2)      | V          |
| $r_{CE}$                                                                                                                                                            | $T_j = 25 (125)^\circ\text{C}$ ; at terminal                                 |                                                     | 1,9 (2,5)  | 2,3 (2,8)      | m $\Omega$ |
| $I_{CES}$                                                                                                                                                           | $V_{GE} = 0\text{ V}$ , $V_{CE} = V_{CES}$ , $T_j = 25 (125)^\circ\text{C}$  |                                                     | 2,4 (72)   |                | mA         |
| $E_{on} + E_{off}$                                                                                                                                                  | $I_C = 600\text{ A}$ , $V_{CC} = 600\text{ V}$                               |                                                     | 180        |                | mJ         |
|                                                                                                                                                                     | $T_j = 125^\circ\text{C}$ , $V_{CC} = 900\text{ V}$                          |                                                     | 318        |                | mJ         |
| $R_{CC+EE'}$                                                                                                                                                        | terminal chip, $T_j = 25^\circ\text{C}$                                      |                                                     | 0,25       |                | m $\Omega$ |
| $L_{CE}$                                                                                                                                                            | top, bottom                                                                  |                                                     | 6          |                | nH         |
| $C_{CHC}$                                                                                                                                                           | per phase, AC-side                                                           |                                                     | 3,4        |                | nF         |
| <b>Inverse diode</b>                                                                                                                                                |                                                                              |                                                     |            |                |            |
| $V_F = V_{EC}$                                                                                                                                                      | $I_F = 600\text{ A}$ , $T_j = 25 (125)^\circ\text{C}$ ; measured at terminal |                                                     | 1,95 (1,7) | 2,1            | V          |
| $V_{TO}$                                                                                                                                                            | $T_j = 25 (125)^\circ\text{C}$                                               |                                                     | 1,1 (0,8)  | 1,2 (0,9)      | V          |
| $r_T$                                                                                                                                                               | $T_j = 25 (125)^\circ\text{C}$                                               |                                                     | 1,4 (1,5)  | 1,5 (1,8)      | m $\Omega$ |
| $E_{rr}$                                                                                                                                                            | $I_C = 600\text{ A}$ , $V_{CC} = 600\text{ V}$                               |                                                     | 48         |                | mJ         |
|                                                                                                                                                                     | $T_j = 125^\circ\text{C}$ , $V_{CC} = 900\text{ V}$                          |                                                     | 61         |                | mJ         |
| <b>Mechanical data</b>                                                                                                                                              |                                                                              |                                                     |            |                |            |
| $M_{dc}$                                                                                                                                                            | DC terminals, SI Units                                                       | 6                                                   |            | 8              | Nm         |
| $M_{ac}$                                                                                                                                                            | AC terminals, SI Units                                                       | 13                                                  |            | 15             | Nm         |
| $w$                                                                                                                                                                 | SKiiP® 3 System w/o heat sink                                                |                                                     | 1,7        |                | kg         |
| $w$                                                                                                                                                                 | heat sink                                                                    |                                                     | 5,4        |                | kg         |
| <b>Thermal characteristics (PX16 heat sink with fan SKF16B-230-1); "s" reference to heat sink; "r" reference to built-in temperature sensor (acc. IEC 60747-15)</b> |                                                                              |                                                     |            |                |            |
| $R_{th(j-s)I}$                                                                                                                                                      | per IGBT                                                                     |                                                     |            | 0,03           | K/W        |
| $R_{th(j-s)D}$                                                                                                                                                      | per diode                                                                    |                                                     |            | 0,058          | K/W        |
| $Z_{th}$                                                                                                                                                            | $R_i$ (mK/W) (max. values)                                                   |                                                     |            | $\tau_{th}(s)$ |            |
|                                                                                                                                                                     | 1 2 3 4                                                                      | 1                                                   | 2          | 3              | 4          |
| $Z_{th(j-r)I}$                                                                                                                                                      | 9,8 16,4 3,8 0                                                               | 0,37                                                | 0,06       | 0,01           | 1          |
| $Z_{th(j-r)D}$                                                                                                                                                      | 10 24 24 36                                                                  | 50                                                  | 5          | 0,25           | 0,04       |
| $Z_{th(r-a)}$                                                                                                                                                       | 4,3 20,3 7,1 2,3                                                             | 160                                                 | 53         | 9              | 0,4        |

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# SKiiP 1013GB122-2DL



## 2-pack-integrated intelligent Power System

### 2-pack integrated gate driver SKiiP 1013GB122-2DL

Preliminary Data

#### Gate driver features

- CMOS compatible inputs
- Wide range power supply
- Integrated circuitry to sense phase current, heat sink temperature and DC-bus voltage (option)
- Short circuit protection
- Over current protection
- Over voltage protection (option)
- Power supply protected against under voltage
- Interlock of top/bottom switch
- Isolation by transformers
- Fibre optic interface (option for GB-types only)
- IEC 60068-1 (climate) 40/85/56
- UL recognized file no. 242581

| Absolute Maximum Ratings |                                                                          | $T_a = 25^\circ\text{C}$ unless otherwise specified |                   |
|--------------------------|--------------------------------------------------------------------------|-----------------------------------------------------|-------------------|
| Symbol                   | Conditions                                                               | Values                                              | Units             |
| $V_{S2}$                 | unstabilized 24 V power supply                                           | 30                                                  | V                 |
| $V_i$                    | input signal voltage (high)                                              | $15 + 0,3$                                          | V                 |
| $dv/dt$                  | secondary to primary side                                                | 75                                                  | kV/ $\mu\text{s}$ |
| $V_{isolIO}$             | input / output (AC, rms, 2s)                                             | 3000                                                | V                 |
| $V_{isolPD}$             | partial discharge extinction voltage, rms, $Q_{PD} \leq 10 \text{ pC}$ ; | 1170                                                | V                 |
| $V_{isol12}$             | output 1 / output 2 (AC, rms, 2s)                                        | 1500                                                | V                 |
| $f_{sw}$                 | switching frequency                                                      | 15                                                  | kHz               |
| $f_{out}$                | output frequency for $I = I_C$ ; sin.                                    | 1                                                   | kHz               |
| $T_{op} (T_{stg})$       | operating / storage temperature                                          | - 40 ... + 85                                       | $^\circ\text{C}$  |

| Characteristics |                                                                                   | $(T_a = 25^\circ\text{C})$                                            |                 |      |                  |
|-----------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------|------|------------------|
| Symbol          | Conditions                                                                        | min.                                                                  | typ.            | max. | Units            |
| $V_{S2}$        | supply voltage non stabilized                                                     | 13                                                                    | 24              | 30   | V                |
| $I_{S2}$        | $V_{S2} = 24 \text{ V}$                                                           | $278 + 20 \cdot f / \text{kHz} + 0,00022 \cdot (I_{AC} / \text{A})^2$ |                 |      | mA               |
| $V_{iT+}$       | input threshold voltage (High)                                                    |                                                                       |                 | 12,3 | V                |
| $V_{iT-}$       | input threshold voltage (Low)                                                     | 4,6                                                                   |                 |      | V                |
| $R_{IN}$        | input resistance                                                                  |                                                                       | 10              |      | k $\Omega$       |
| $C_{IN}$        | input capacitance                                                                 |                                                                       | 1               |      | nF               |
| $t_{d(on)IO}$   | input-output turn-on propagation time                                             |                                                                       | 1,3             |      | $\mu\text{s}$    |
| $t_{d(off)IO}$  | input-output turn-off propagation time                                            |                                                                       | 1,3             |      | $\mu\text{s}$    |
| $t_{pERRRESET}$ | error memory reset time                                                           |                                                                       | 9               |      | $\mu\text{s}$    |
| $t_{TD}$        | top / bottom switch interlock time                                                |                                                                       | 3,3             |      | $\mu\text{s}$    |
| $I_{analogOUT}$ | max. 5mA; 8 V corresponds to 15 V supply voltage for external components          |                                                                       | 1000            |      | A                |
| $I_{s1out}$     | max. load current                                                                 |                                                                       |                 | 50   | mA               |
| $I_{TRIPSC}$    | over current trip level<br>( $I_{analog OUT} = 10 \text{ V}$ )                    |                                                                       | 1250            |      | A                |
| $T_{tp}$        | over temperature protection                                                       | 110                                                                   |                 | 120  | $^\circ\text{C}$ |
| $U_{DCTRIP}$    | $U_{DC}$ -protection ( $U_{analog OUT} = 9 \text{ V}$ );<br>(option for GB types) |                                                                       | not implemented |      | V                |

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