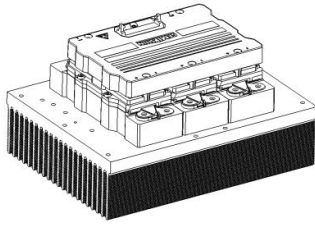


# SKiiP 513GD172-3DUL V3



SKiiP® 3

## 6-pack-integrated intelligent Power System

### Power section

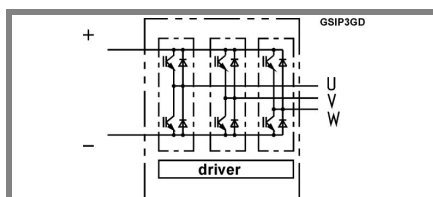
#### SKiiP 513GD172-3DUL V3

Preliminary Data

### Power section features

- SKiiP technology inside
- Trench 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)



Case S33

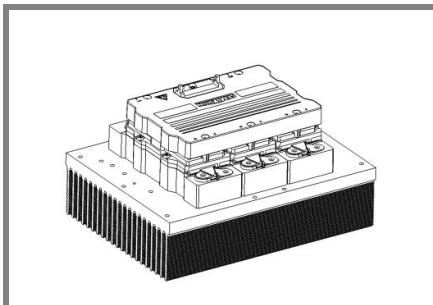
| Absolute Maximum Ratings |  | $T_s = 25^\circ\text{C}$ unless otherwise specified |                   |
|--------------------------|--|---|-------------------|
| Symbol                   | Conditions   | Values  | Units             |
| <b>IGBT</b>              |  |   |                   |
| $V_{CES}$                | Operating DC link voltage                              | 1700  | V                 |
| $V_{CC}^{1)}$            |  | 1200  | V                 |
| $V_{GES}$                |  | $\pm 20$  | V                 |
| $I_C$                    | $T_s = 25 (70)^\circ\text{C}$                          | 500 (375)   | A                 |
| <b>Inverse diode</b>     |  |   |                   |
| $I_F = -I_C$             | $T_s = 25 (70)^\circ\text{C}$                          | 400 (300)   | A                 |
| $I_{FSM}$                | $T_j = 150^\circ\text{C}$ , $t_p = 10\text{ ms}$ ; sin | 3500  | A                 |
| $I^2t$ (Diode)           | Diode, $T_j = 150^\circ\text{C}$ , 10 ms               | 61  | kA <sup>2</sup> s |
| $T_j$ , ( $T_{stg}$ )    |  | - 40 ... + 150 (125)                                | $^\circ\text{C}$  |
| $V_{isol}$               | rms, AC, 1 min, main terminals to heat sink            | 4000  | V                 |
| $I_{AC-terminal}$        | per AC terminal, rms, $T_s = 70^\circ\text{C}$ ,       | 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>   |   |   |           |           |            |      |      |      |
| $V_{CEsat}$   | $I_C = 300\text{ A}$ , $T_j = 25 (125)^\circ\text{C}$ ;<br>measured at terminal |   | 1,9 (2,2) | 2,4       | V          |      |      |      |
| $V_{CEO}$   | $T_j = 25 (125)^\circ\text{C}$ ; at terminal                                    |   | 1 (0,9)   | 1,2 (1,1) | V          |      |      |      |
| $r_{CE}$  | $T_j = 25 (125)^\circ\text{C}$ ; at terminal                                    |   | 3 (4,1)   | 3,9 (5)   | m $\Omega$ |      |      |      |
| $I_{CES}$   | $V_{GE} = 0\text{ V}$ , $V_{CE} = V_{CES}$ ;<br>$T_j = 25 (125)^\circ\text{C}$  |   | 1,2 (72)  |           | mA         |      |      |      |
| $E_{on} + E_{off}$  | $I_C = 300\text{ A}$ , $V_{CC} = 900\text{ V}$                                  |   | 195       |           | mJ         |      |      |      |
|   | $T_j = 125^\circ\text{C}$ , $V_{CC} = 1200\text{ V}$                            |   | 288       |           | mJ         |      |      |      |
| $R_{CC+EE}$   | terminal chip, $T_j = 25^\circ\text{C}$   |   | 0,5       |           | m $\Omega$ |      |      |      |
| $L_{CE}$  | top, bottom   |   | 12        |           | nH         |      |      |      |
| $C_{CHC}$   | per phase, AC-side  |   | 1,7       |           | nF         |      |      |      |
| <b>Inverse diode</b>  |   |   |           |           |            |      |      |      |
| $V_F = V_{EC}$  | $I_F = 300\text{ A}$ , $T_j = 25 (125)^\circ\text{C}$ ;<br>measured at terminal |   | 1,9 (1,7) | 2,4       | V          |      |      |      |
| $V_{TO}$  | $T_j = 25 (125)^\circ\text{C}$  |   | 1,1 (0,8) | 1,4 (1,1) | V          |      |      |      |
| $r_T$   | $T_j = 25 (125)^\circ\text{C}$  |   | 2,6 (2,9) | 3,4 (3,7) | m $\Omega$ |      |      |      |
| $E_{rr}$  | $I_C = 300\text{ A}$ , $V_{CC} = 900\text{ V}$                                  |   | 36        |           | mJ         |      |      |      |
|   | $T_j = 125^\circ\text{C}$ , $V_{CC} = 1200\text{ V}$                            |   | 43        |           | 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   |   | 2,4       |           | kg         |      |      |      |
| w   | heat sink   |   | 7,5       |           | kg         |      |      |      |
| <b>Thermal characteristics (P2016 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  |   |           | 0,059     | K/W        |      |      |      |
| $R_{th(j-s)D}$  | per diode   |   |           | 0,115     | K/W        |      |      |      |
| $Z_{th}$  | $R_i$ (mK/W) (max. values)  | tau <sub>i</sub> (s)                                |           |           |            |      |      |      |
|   |   | 1   | 2         | 3         | 4          |      |      |      |
| $Z_{th(j-r)I}$  | 10,2  | 28,8  | 21        | 0         | 363        | 0,18 | 0,04 | 1    |
| $Z_{th(j-r)D}$  | 36  | 36  | 54        | 60        | 30         | 5    | 0,25 | 0,04 |
| $Z_{th(r-a)}$   | 2,1   | 20  | 5,5       | 1,4       | 210        | 85   | 11   | 0,4  |

\* The specifications of our components may not be considered as an assurance of specific characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of

our personal.

# SKiiP 513GD172-3DUL V3



SKiiP® 3

## 6-pack-integrated intelligent Power System

**6-pack  
integrated gate driver  
SKiiP 513GD172-3DUL V3**

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 transformer
- IEC 60068-1 (climate) 40/85/56

| 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/ $\mu\text{s}$ |
| $V_{\text{isolIO}}$              | input / output (AC, rms, 2s)  | 4000  | V                 |
| $V_{\text{isolPD}}$              | partial discharge extinction voltage, rms, $Q_{\text{PD}} \leq 10 \text{ pC}$ ; | 1500  | V                 |
| $V_{\text{isol12}}$              | output 1 / output 2 (AC, rms, 2s)   | 1500  | V                 |
| $f_{\text{sw}}$                  | switching frequency   | 14  | kHz               |
| $f_{\text{out}}$                 | output frequency for $I_{\text{peak}(1)} = I_C$                                 | 14  | kHz               |
| $T_{\text{op}} (T_{\text{stg}})$ | 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                |
| $I_{S2}$               | $V_{S2} = 13\text{V} - 30\text{V}$  | $417 + 42 \cdot f / \text{kHz} + 0,00014 \cdot (I_{\text{AC}} / \text{A})^2$ |      |      | mA               |
| $V_{\text{IT}+}$       | input threshold voltage (High)  | 12,3   |      |      | V                |
| $V_{\text{IT}-}$       | input threshold voltage (Low)   | 4,6  |      |      | V                |
| $R_{\text{IN}}$        | input resistance  | 10   |      |      | $\text{k}\Omega$ |
| $C_{\text{IN}}$        | input capacitance   | 1  |      |      | nF               |
| $t_{\text{d(on)IO}}$   | input-output turn-on propagation time   | 1,4  |      |      | $\mu\text{s}$    |
| $t_{\text{d(off)IO}}$  | input-output turn-off propagation time  | 1,4  |      |      | $\mu\text{s}$    |
| $t_{\text{pERRRESET}}$ | error memory reset time   | 12,2   |      |      | $\mu\text{s}$    |
| $t_{\text{TD}}$        | top / bottom switch interlock time  | 3  |      |      | $\mu\text{s}$    |
| $I_{\text{analogOUT}}$ | max. 5mA; 8 V corresponds to 15 V supply voltage for external components      | 500  |      |      | A                |
| $I_{\text{s1out}}$     | max. load current   | 50   |      |      | mA               |
| $I_{\text{TRIPSC}}$    | over current trip level ( $I_{\text{analog OUT}} = 10 \text{ V}$ )            | 625  |      |      | A                |
| $T_{\text{tp}}$        | over temperature protection   | 110  | 120  |      | $^\circ\text{C}$ |
| $U_{\text{DCTRIP}}$    | $U_{\text{DC}}$ -protection ( $U_{\text{analog OUT}} = 9 \text{ V}$ );<br>( ) | 1200   |      |      | V                |

For electrical and thermal design support please use SEMISEL.

Access to SEMISEL is via SEMIKRON website <http://www.semikron.com>.

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