

SEMITOP® 3

### 3-phase bridge rectifier + brake chopper +3-phase bridge inverter

#### SK 20 DGD L 065 ET

Preliminary Data

#### Features

- Compact design
- One screw mounting
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DCB)
- Ultrafast NPT technology IGBT
- CAL Technology FWD
- Integrated NTC temperature sensor

#### Typical Applications

- Inverter

DGD L - ET

| Absolute Maximum Ratings         |                                                                                                                                                                        | $T_s = 25^\circ\text{C}$ , unless otherwise specified |                      |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------|
| Symbol                           | Conditions                                                                                                                                                             | Values                                                | Units                |
| <b>IGBT - Inverter, Chopper</b>  |                                                                                                                                                                        |                                                       |                      |
| $V_{CES}$                        | $T_s = 25\ (80)^\circ\text{C}$<br>$I_{CRM} = 2 \times I_{Cnom}$ , $t_p = 1\ \text{ms}$                                                                                 | 600                                                   | V                    |
| $I_C$                            |                                                                                                                                                                        | 24 (17)                                               | A                    |
| $I_{CRM}$                        |                                                                                                                                                                        | 40                                                    | A                    |
| $V_{GES}$                        |                                                                                                                                                                        | $\pm 20$                                              | V                    |
| $T_j$                            |                                                                                                                                                                        | -40 ... +150                                          | $^\circ\text{C}$     |
| <b>Diode - Inverter, Chopper</b> |                                                                                                                                                                        |                                                       |                      |
| $I_F$                            | $T_s = 25\ (80)^\circ\text{C}$                                                                                                                                         | 25 (18)                                               | A                    |
| $I_{FRM}$                        | $I_{FRM} = 2 \times I_{Fnom}$ , $t_p = 1\ \text{ms}$                                                                                                                   | 50                                                    | A                    |
| $T_j$                            |                                                                                                                                                                        | -40 ... +150                                          | $^\circ\text{C}$     |
| <b>Rectifier</b>                 |                                                                                                                                                                        |                                                       |                      |
| $V_{RRM}$                        | $T_s = 80^\circ\text{C}$<br>$t_p = 10\ \text{ms}$ , $\sin 180^\circ$ , $T_j = 25^\circ\text{C}$<br>$t_p = 10\ \text{ms}$ , $\sin 180^\circ$ , $T_j = 25^\circ\text{C}$ | 800                                                   | V                    |
| $I_F$                            |                                                                                                                                                                        | 30                                                    | A                    |
| $I_{FSM} / I_{TSM}$              |                                                                                                                                                                        | 220                                                   | A                    |
| $I_t^2$                          |                                                                                                                                                                        | 240                                                   | $\text{A}^2\text{s}$ |
| $T_j$                            |                                                                                                                                                                        | -40 ... +150                                          | $^\circ\text{C}$     |
| $T_{sol}$                        | Terminals, 10s                                                                                                                                                         | 260                                                   | $^\circ\text{C}$     |
| $T_{stg}$                        |                                                                                                                                                                        | -40 ... +125                                          | $^\circ\text{C}$     |
| $V_{isol}$                       | AC, 1 min. / 1s                                                                                                                                                        | 2500 / 3000                                           | V                    |

| Characteristics                  |                                                                                   | $T_s = 25^\circ\text{C}$ , unless otherwise specified |           |      |               |
|----------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------|-----------|------|---------------|
| Symbol                           | Conditions                                                                        | min.                                                  | typ.      | max. | Units         |
| <b>IGBT - Inverter, Chopper</b>  |                                                                                   |                                                       |           |      |               |
| $V_{CEsat}$                      | $I_C = 20\ \text{A}$ , $T_j = 25\ (125)^\circ\text{C}$                            |                                                       | 2 (2,2)   | 2,5  | V             |
| $V_{GE(th)}$                     | $V_{GE} = V_{CE}$ , $I_C = 0,5\ \text{mA}$                                        | 3                                                     | 4         | 5    | V             |
| $V_{CE(TO)}$                     | $T_j = ^\circ\text{C}\ ( )^\circ\text{C}$                                         |                                                       | 1,2 (1,1) | 1,3  | V             |
| $r_T$                            | $T_j = ^\circ\text{C}\ ( )^\circ\text{C}$                                         |                                                       | 40 (55)   | 60   | m $\Omega$    |
| $C_{ies}$                        | $V_{CE} = V_{GE} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                             |                                                       | 1,2       |      | nF            |
| $C_{oes}$                        | $V_{CE} = V_{GE} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                             |                                                       | -         |      | nF            |
| $C_{res}$                        | $V_{CE} = V_{GE} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                             |                                                       | -         |      | nF            |
| $R_{th(j-s)}$                    | per IGBT                                                                          |                                                       |           | 1,7  | K/W           |
| $t_{d(on)}$                      | under following conditions                                                        |                                                       | 21        |      | ns            |
| $t_r$                            | $V_{CC} = 300\ \text{V}$ , $V_{GE} = \pm 15\ \text{V}$                            |                                                       | 28        |      | ns            |
| $t_{d(off)}$                     | $I_C = 20\ \text{A}$ , $T_j = 125^\circ\text{C}$                                  |                                                       | 170       |      | ns            |
| $t_f$                            | $R_{Gon} = R_{Goff} = 30\ \Omega$                                                 |                                                       | 20        |      | ns            |
| $E_{on}$                         | inductive load                                                                    |                                                       | 0,69      |      | mJ            |
| $E_{off}$                        |                                                                                   |                                                       | 0,39      |      | mJ            |
| <b>Diode - Inverter, Chopper</b> |                                                                                   |                                                       |           |      |               |
| $V_F = V_{EC}$                   | $I_F = 20\ \text{A}$ , $T_j = 25\ (125)^\circ\text{C}$                            |                                                       | 1,6 (1,6) |      | V             |
| $V_{(TO)}$                       | $T_j = ^\circ\text{C}\ (125)^\circ\text{C}$                                       |                                                       | 1 (0,9)   |      | V             |
| $r_T$                            | $T_j = ^\circ\text{C}\ (125)^\circ\text{C}$                                       |                                                       | 30 (33)   |      | m $\Omega$    |
| $R_{th(j-s)}$                    | per diode                                                                         |                                                       |           | 1,7  | K/W           |
| $I_{RRM}$                        | under following conditions                                                        |                                                       | -         |      | A             |
| $Q_{rr}$                         | $I_F = A$ , $V_R = V$                                                             |                                                       | -         |      | $\mu\text{C}$ |
| $E_{rr}$                         | $V_{GE} = 0\ \text{V}$ , $T_j = 125^\circ\text{C}$<br>$di_F/dt = - A/\mu\text{s}$ |                                                       | -         |      | mJ            |
| <b>Diode rectifier</b>           |                                                                                   |                                                       |           |      |               |
| $V_F$                            | $I_F = 15\ \text{A}$ , $T_j = 25^\circ\text{C}$                                   |                                                       | 1,1       |      | V             |
| $V_{(TO)}$                       | $T_j = 150^\circ\text{C}$                                                         |                                                       | 0,8       |      | V             |
| $r_T$                            | $T_j = 150^\circ\text{C}$                                                         |                                                       | 20        |      | m $\Omega$    |
| $R_{th(j-s)}$                    | per diode                                                                         |                                                       |           | 2    | K/W           |
| <b>Temperatur sensor</b>         |                                                                                   |                                                       |           |      |               |
| $R_{ts}$                         | 5 %, $T_r = 25\ (100)^\circ\text{C}$                                              |                                                       | 5000(493) |      | $\Omega$      |
| <b>Mechanical data</b>           |                                                                                   |                                                       |           |      |               |
| w                                |                                                                                   |                                                       | 30        |      | g             |
| $M_s$                            | Mounting torque                                                                   |                                                       |           | 2,5  | Nm            |

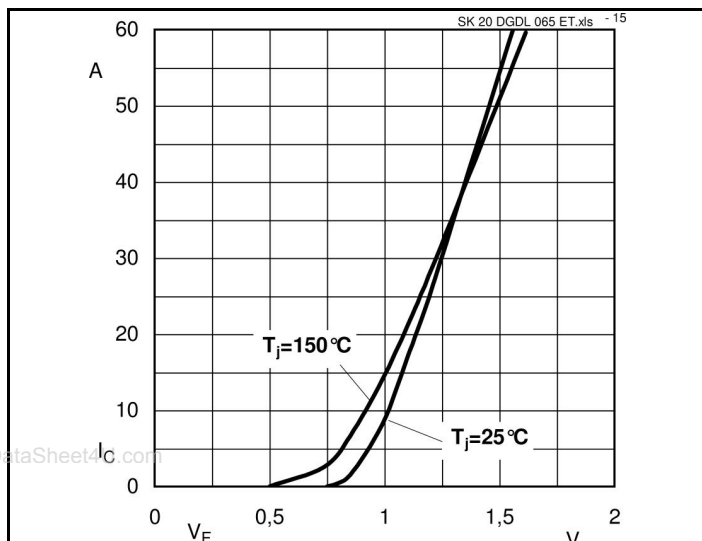


Fig. 15 Input Bridge Diode forward characteristic

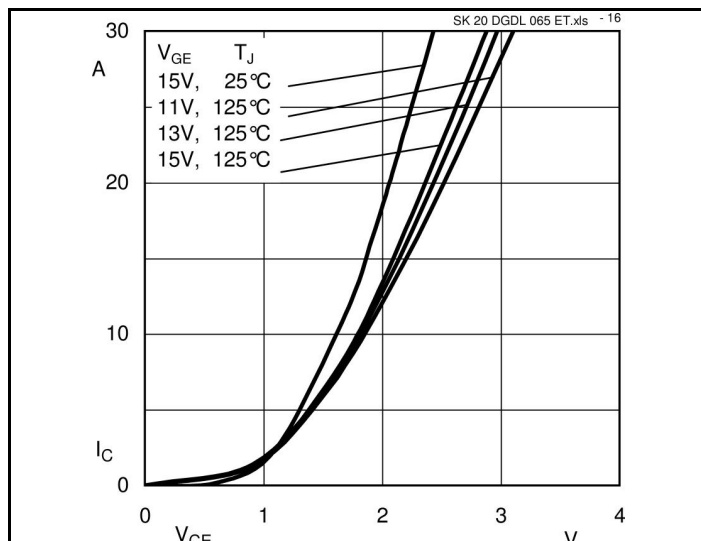


Fig. 16 Typical Output Characteristic

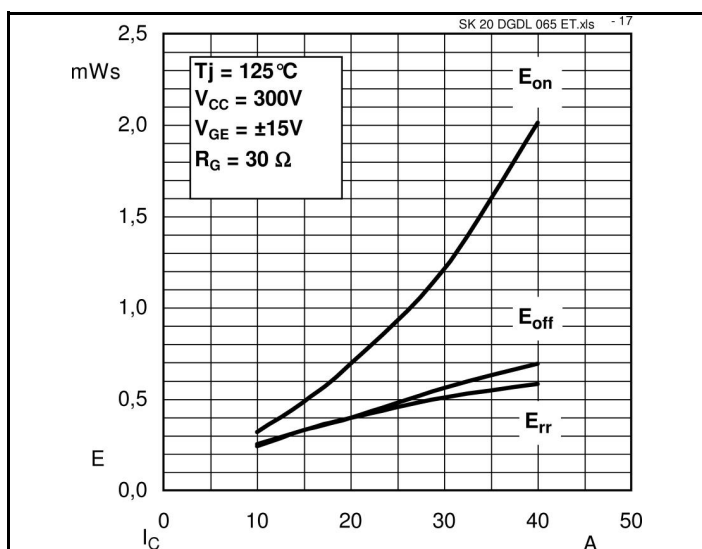


Fig. 17 Turn-on/off energy =  $f(I_C)$

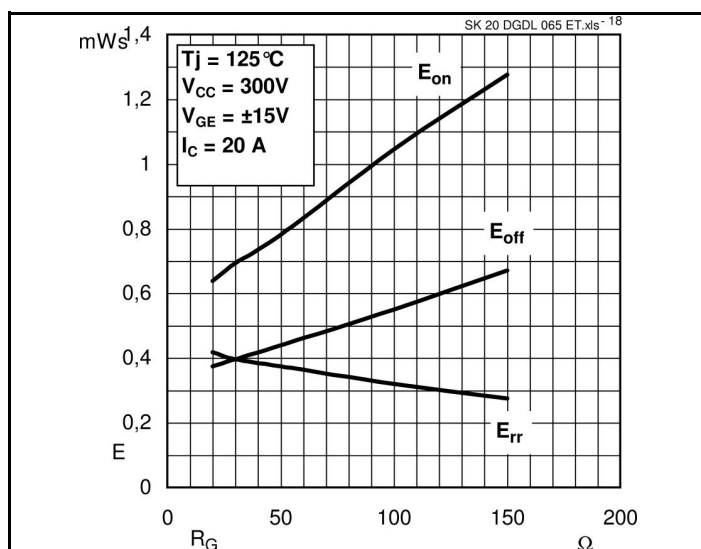


Fig. 18 Turn-on/off energy =  $f(R_G)$

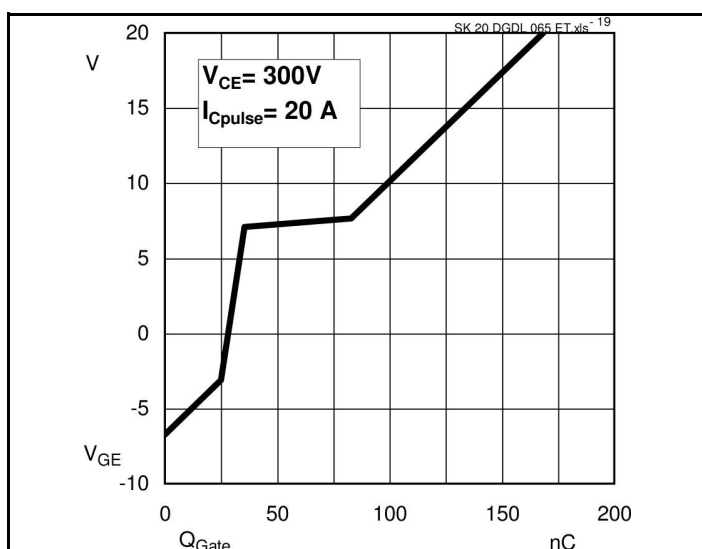
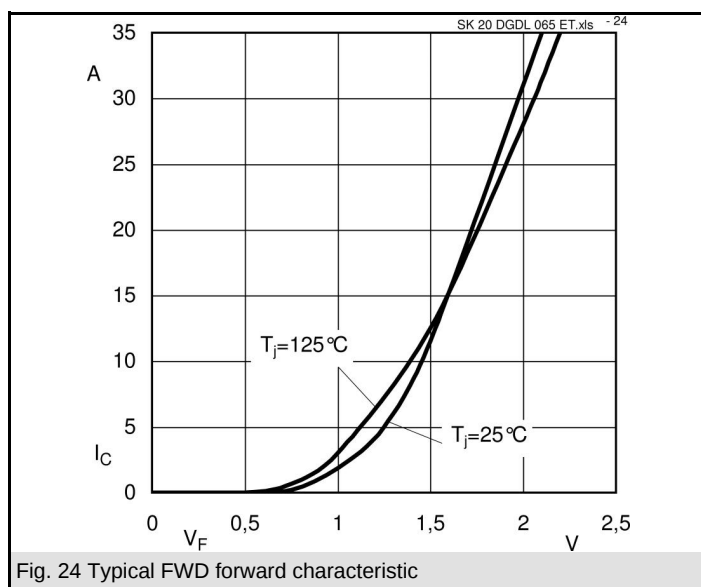
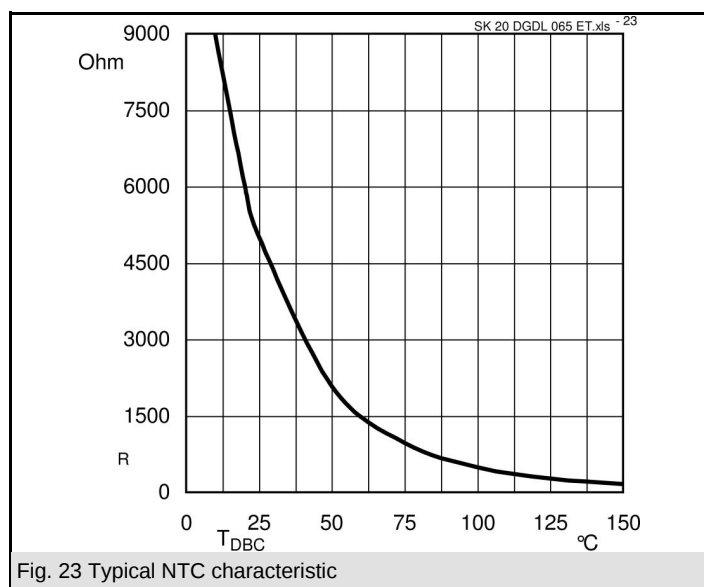
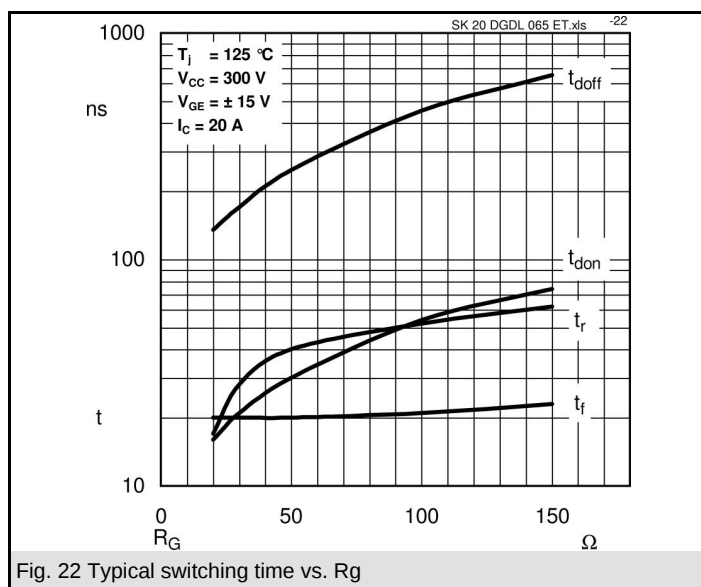
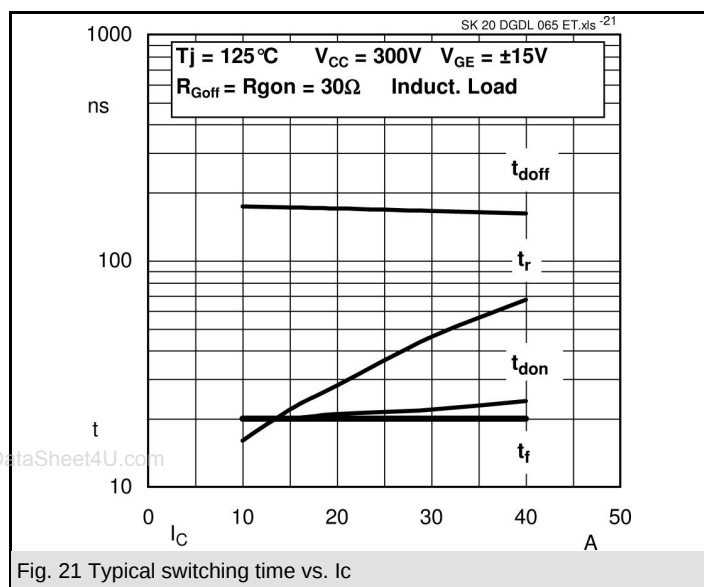
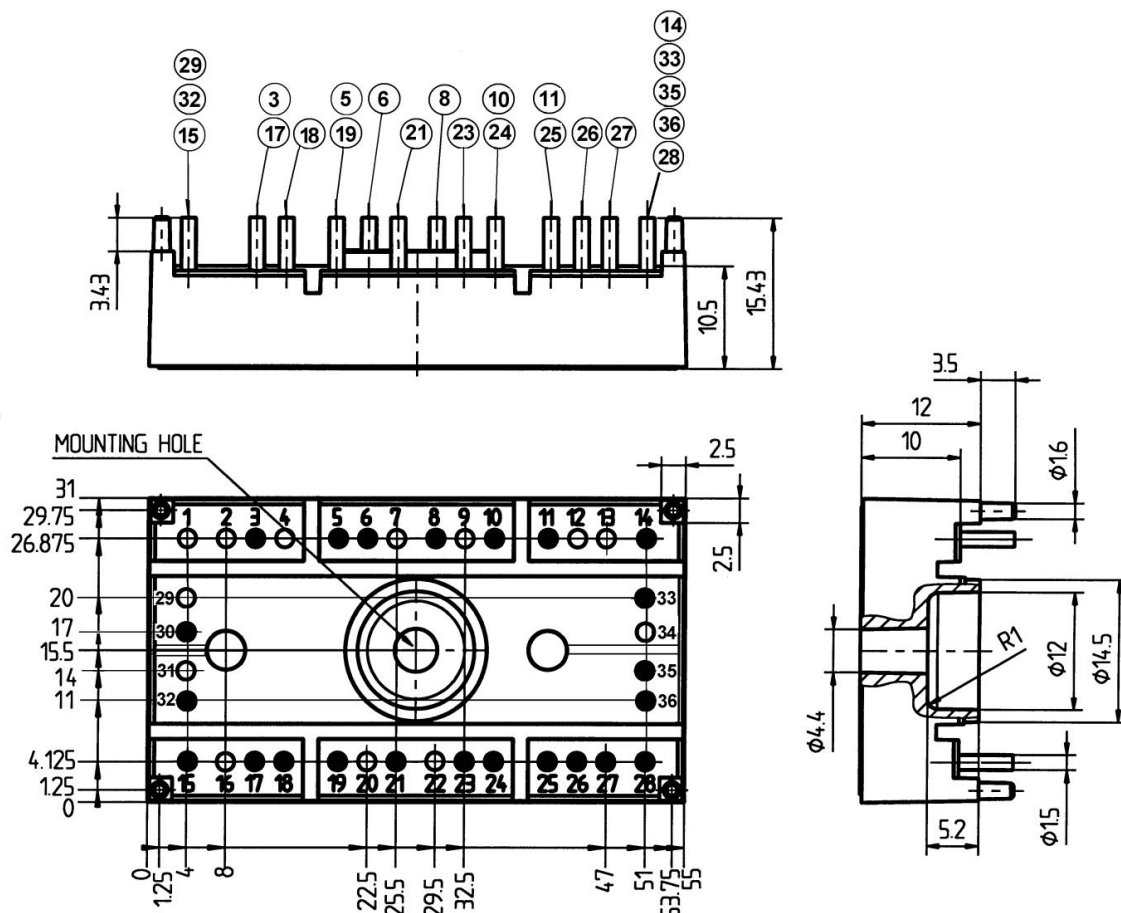
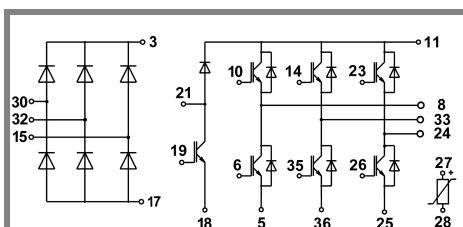


Fig. 19 Typical gate charge characteristic





Case T 49 (Suggested hole diameter, in the PCB, for solder pins and plastic mounting pins: 2mm)



Case T 49

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

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