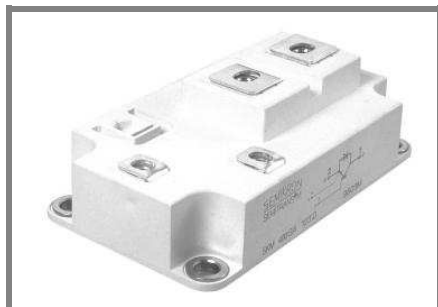


# SKM 600GA176D



**SEMITRANS® 4**

## Trench IGBT Modules

**SKM 600GA176D**

### Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$

### Typical Applications\*

- AC inverter drives mains 575 - 790 V AC
- Public transport (auxiliary systems)

### Remarks

- $I_{DC} \leq 500$  A limited for  $T_{Terminal} = 100^\circ\text{C}$

| Absolute Maximum Ratings |                                                                                                        | T <sub>case</sub> = 25°C, unless otherwise specified |       |   |
|--------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------|---|
| Symbol                   | Conditions                                                                                             | Values                                               | Units |   |
| IGBT                     |                                                                                                        |                                                      |       |   |
| V <sub>CES</sub>         | T <sub>j</sub> = 25 °C                                                                                 | 1700                                                 | V     |   |
| I <sub>C</sub>           | T <sub>j</sub> = 150 °C                                                                                | T <sub>c</sub> = 25 °C                               | 660   | A |
|                          |                                                                                                        | T <sub>c</sub> = 80 °C                               | 470   | A |
| I <sub>CRM</sub>         | I <sub>CRM</sub> =2xI <sub>Cnom</sub>                                                                  | 800                                                  | A     |   |
| V <sub>GES</sub>         |                                                                                                        | ± 20                                                 | V     |   |
| t <sub>psc</sub>         | V <sub>CC</sub> = 1200 V; V <sub>GE</sub> ≤ 20 V; T <sub>j</sub> = 125 °C<br>V <sub>CES</sub> < 1700 V | 10                                                   | µs    |   |
| Inverse Diode            |                                                                                                        |                                                      |       |   |
| I <sub>F</sub>           | T <sub>j</sub> = 150 °C                                                                                | T <sub>c</sub> = 25 °C                               | 600   | A |
|                          |                                                                                                        | T <sub>c</sub> = 80 °C                               | 410   | A |
| I <sub>FRM</sub>         | I <sub>FRM</sub> =2xI <sub>Fnom</sub>                                                                  | 800                                                  | A     |   |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms; sin.                                                                           | T <sub>j</sub> = 150 °C                              | 3800  | A |
| Module                   |                                                                                                        |                                                      |       |   |
| I <sub>t(RMS)</sub>      |                                                                                                        | 500                                                  | A     |   |
| T <sub>vj</sub>          |                                                                                                        | - 40 ... +150                                        | °C    |   |
| T <sub>stg</sub>         |                                                                                                        | - 40 ... +125                                        | °C    |   |
| V <sub>isol</sub>        | AC, 1 min.                                                                                             | 4000                                                 | V     |   |

| Characteristics      |                                                                                                                                              | T <sub>case</sub> = 25°C, unless otherwise specified                                                  |      |       |       |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------|-------|-------|
| Symbol               | Conditions                                                                                                                                   | min.                                                                                                  | typ. | max.  | Units |
| IGBT                 |                                                                                                                                              |                                                                                                       |      |       |       |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 16 mA                                                                                   | 5,2                                                                                                   | 5,8  | 6,4   | V     |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = V <sub>CES</sub> T <sub>j</sub> = 25 °C                                                             |                                                                                                       |      | 4     | mA    |
| V <sub>CE0</sub>     | T <sub>j</sub> = 25 °C<br>T <sub>j</sub> = 125 °C                                                                                            |                                                                                                       | 1    | 1,2   | V     |
|                      |                                                                                                                                              |                                                                                                       | 0,9  | 1,1   | V     |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V<br>T <sub>j</sub> = 25°C<br>T <sub>j</sub> = 125°C                                                                    |                                                                                                       | 2,5  | 3,1   | mΩ    |
|                      |                                                                                                                                              |                                                                                                       | 3,9  | 4,5   | mΩ    |
| V <sub>CE(sat)</sub> | I <sub>Cnom</sub> = 400 A, V <sub>GE</sub> = 15 V<br>T <sub>j</sub> = 25°C <sub>chiplev.</sub><br>T <sub>j</sub> = 125°C <sub>chiplev.</sub> |                                                                                                       | 2    | 2,45  | V     |
|                      |                                                                                                                                              |                                                                                                       | 2,45 | 2,9   | V     |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25, V <sub>GE</sub> = 0 V<br>f = 1 MHz                                                                                     |                                                                                                       | 28,4 |       | nF    |
| C <sub>oes</sub>     |                                                                                                                                              |                                                                                                       | 1,46 |       | nF    |
| C <sub>res</sub>     |                                                                                                                                              |                                                                                                       | 1,17 |       | nF    |
| t <sub>d(on)</sub>   | R <sub>Gon</sub> = 3 Ω                                                                                                                       | V <sub>CC</sub> = 1200V<br>I <sub>C</sub> = 400A<br>T <sub>j</sub> = 125 °C<br>V <sub>GE</sub> = ±15V | 290  |       | ns    |
| t <sub>r</sub>       |                                                                                                                                              |                                                                                                       | 70   |       | ns    |
| E <sub>on</sub>      | 255                                                                                                                                          |                                                                                                       |      | mJ    |       |
| t <sub>d(off)</sub>  | 890                                                                                                                                          |                                                                                                       |      | ns    |       |
| t <sub>f</sub>       | 160                                                                                                                                          |                                                                                                       |      | ns    |       |
| E <sub>off</sub>     |                                                                                                                                              | 155                                                                                                   |      | mJ    |       |
| R <sub>th(j-c)</sub> | per IGBT                                                                                                                                     |                                                                                                       |      | 0,044 | K/W   |



GA



**SEMITRANS® 4**

## Trench IGBT Modules

### SKM 600GA176D

#### Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$

#### Typical Applications\*

- AC inverter drives mains 575 - 790 V AC
- Public transport (auxiliary systems)

#### Remarks

- $I_{DC} \leq 500$  A limited for  $T_{Terminal} = 100^\circ\text{C}$

| Characteristics      |                                      |           |      |       |       |
|----------------------|--------------------------------------|-----------|------|-------|-------|
| Symbol               | Conditions                           | min.      | typ. | max.  | Units |
| <b>Inverse Diode</b> |                                      |           |      |       |       |
| $V_F = V_{EC}$       | $I_{Fnom} = 400$ A; $V_{GE} = 0$ V   |           |      |       |       |
|                      | $T_j = 25^\circ\text{C}_{chiplev.}$  |           | 1,6  | 1,9   | V     |
|                      | $T_j = 125^\circ\text{C}_{chiplev.}$ |           | 1,6  | 1,9   | V     |
| $V_{F0}$             | $T_j = 25^\circ\text{C}$             |           | 1,1  | 1,3   | V     |
| $r_F$                | $T_j = 25^\circ\text{C}$             |           | 1,3  | 1,5   | mΩ    |
| $I_{RRM}$            | $I_F = 400$ A                        |           | 510  |       | A     |
| $Q_{rr}$             | $di/dt = 5700$ A/μs                  |           | 155  |       | μC    |
| $E_{rr}$             | $V_{GE} = -15$ V; $V_{CC} = 1200$ V  |           | 102  |       | mJ    |
| $R_{th(j-c)D}$       | per diode                            |           |      | 0,09  | K/W   |
| <b>Module</b>        |                                      |           |      |       |       |
| $L_{CE}$             |                                      |           | 15   | 20    | nH    |
| $R_{CC'+EE'}$        | res., terminal-chip                  |           | 0,18 |       | mΩ    |
|                      | $T_{case} = 25^\circ\text{C}$        |           | 0,22 |       | mΩ    |
|                      | $T_{case} = 125^\circ\text{C}$       |           |      |       |       |
| $R_{th(c-s)}$        | per module                           |           |      | 0,038 | K/W   |
| $M_s$                | to heat sink M6                      | 3         |      | 5     | Nm    |
| $M_t$                | to terminals M6 (M4)                 | 2,5 (1,1) |      | 5 (2) | Nm    |
| w                    |                                      |           |      | 330   | g     |

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

\* The specifications of our components may not be considered as an assurance of component 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.



**GA**

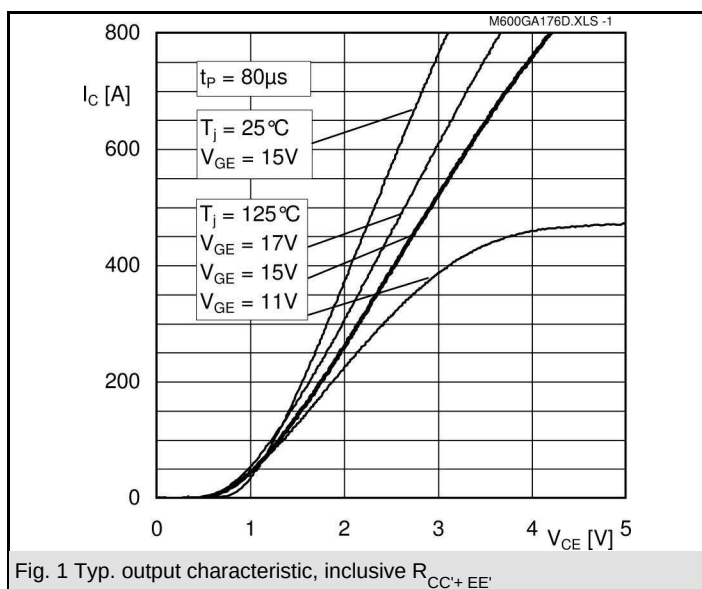


Fig. 1 Typ. output characteristic, inclusive  $R_{CC'+EE'}$

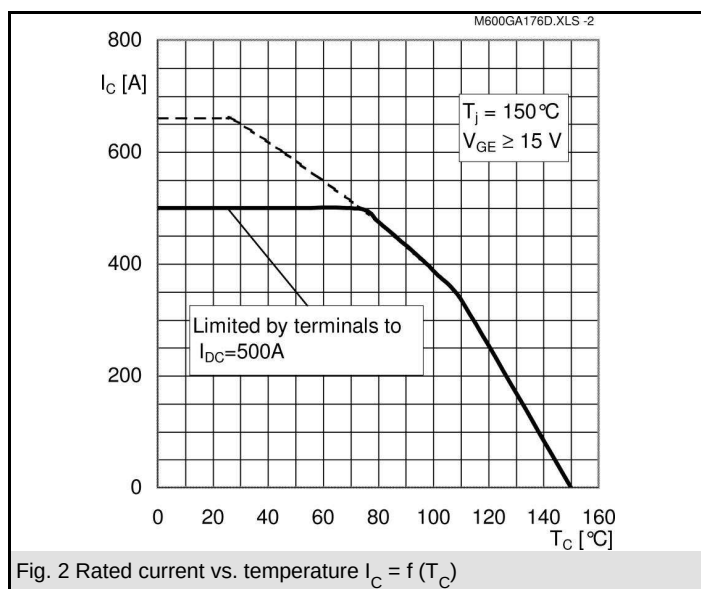


Fig. 2 Rated current vs. temperature  $I_C = f(T_C)$

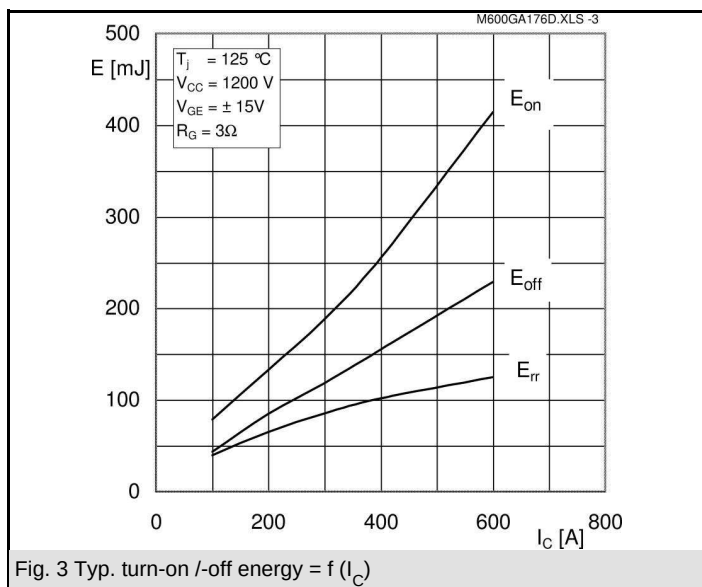


Fig. 3 Typ. turn-on /-off energy =  $f(I_C)$

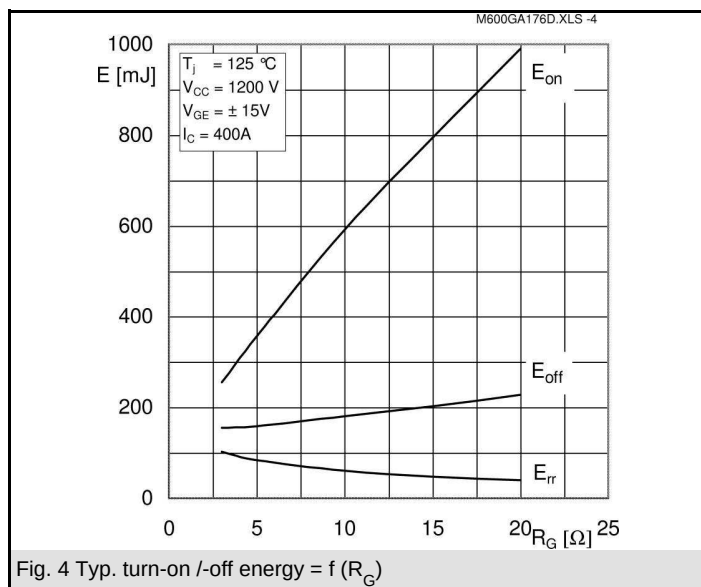


Fig. 4 Typ. turn-on /-off energy =  $f(R_G)$

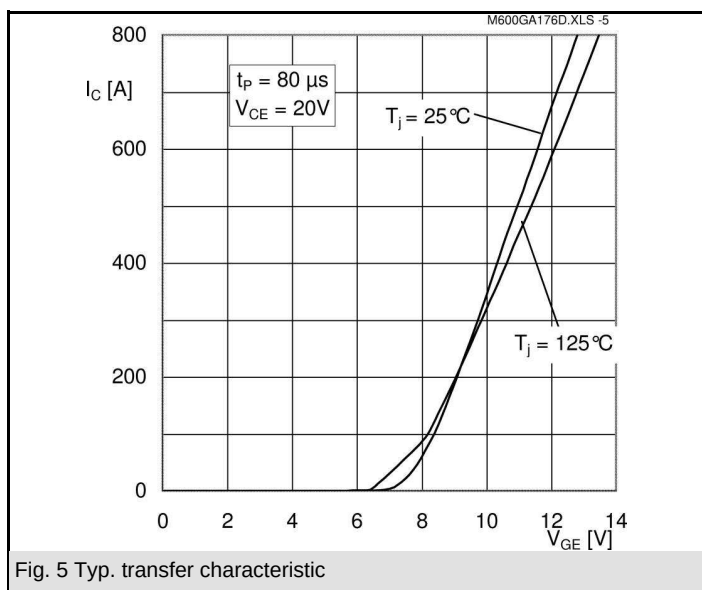


Fig. 5 Typ. transfer characteristic

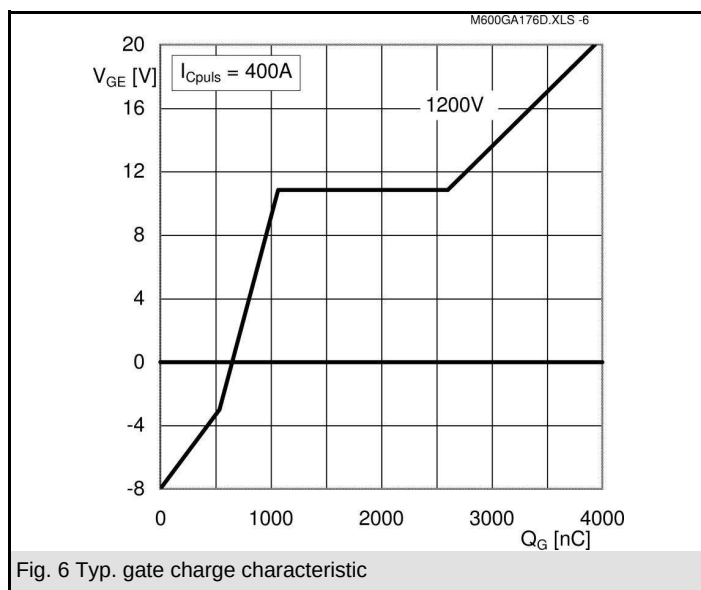
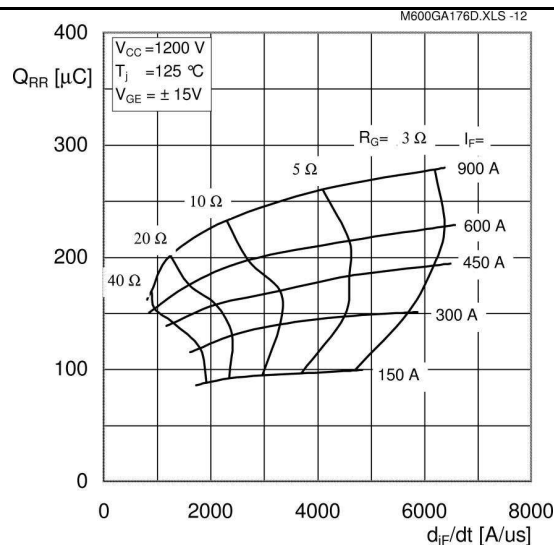
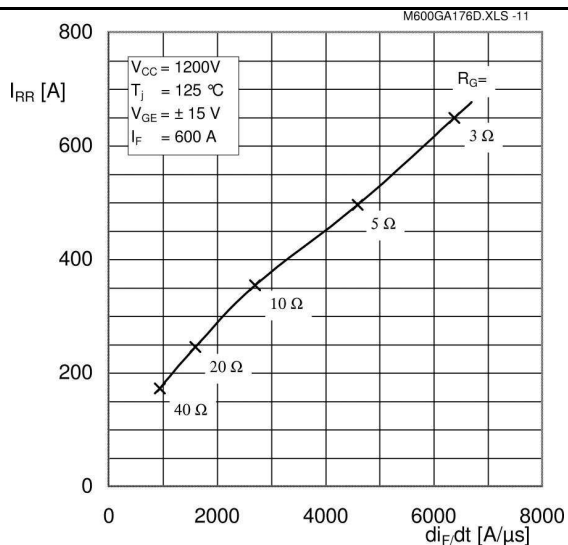
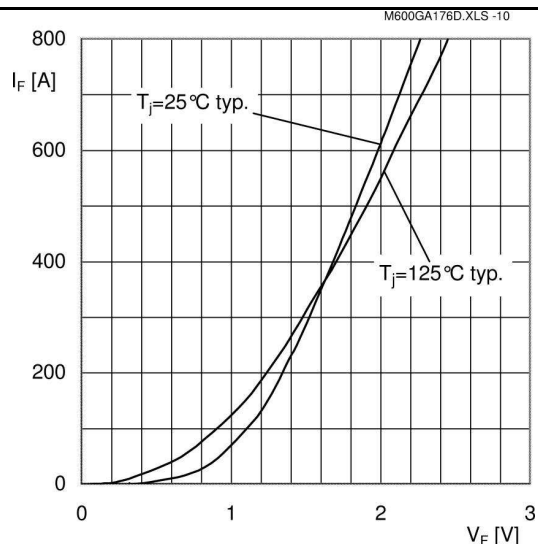
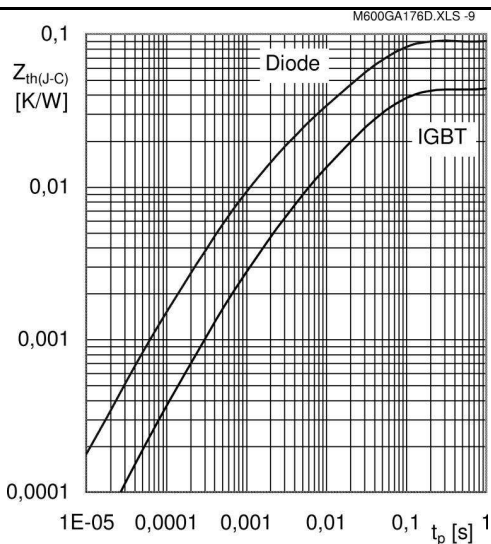
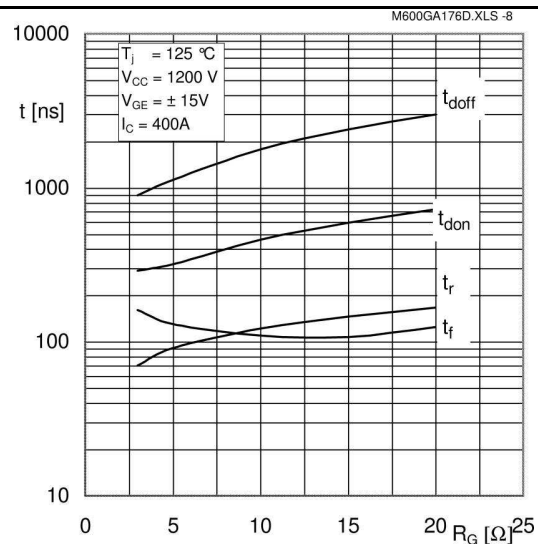
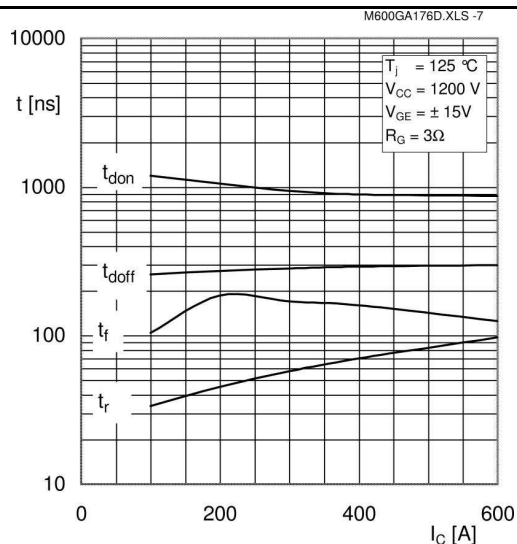


Fig. 6 Typ. gate charge characteristic

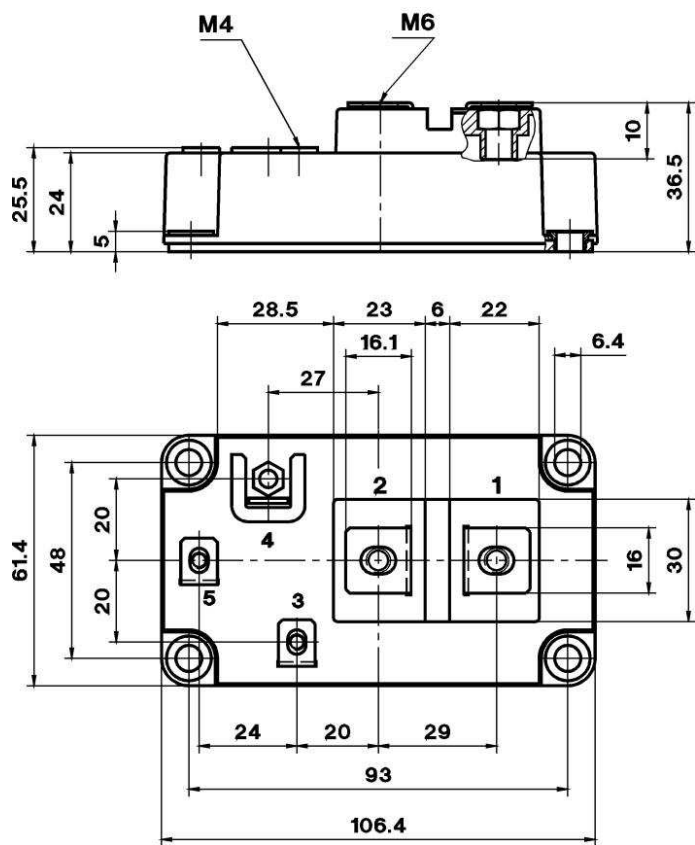


SKM 600GA176D

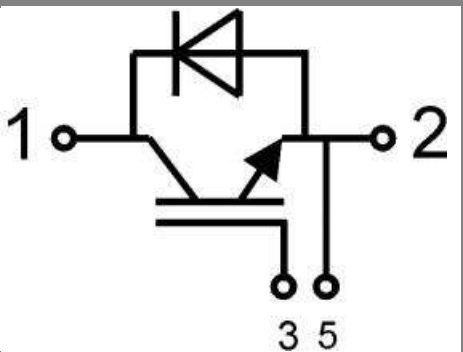
UL Recognized

CASED59

File no. 63 532



Case D 59



GA

Case D59