

# SKM 800GA176D



**SEMITRANS® 4**

## Trench IGBT Modules

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### Features

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

### Typical Applications\*

- AC inverter drives mains 575 - 750 V AC
- Public transport (auxiliary syst.)
- Wind power

### Remarks

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

| Absolute Maximum Ratings |                                                                                                        |                         | T <sub>c</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  | 830                                                | A     |
|                          |                                                                                                        | T <sub>c</sub> = 80 °C  | 590                                                | A     |
| I <sub>CRM</sub>         | I <sub>CRM</sub> =2xI <sub>Cnom</sub>                                                                  |                         | 1200                                               | 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  | 630                                                | A     |
|                          |                                                                                                        | T <sub>c</sub> = 80 °C  | 440                                                | A     |
| I <sub>FRM</sub>         | I <sub>FRM</sub> =2xI <sub>Fnom</sub>                                                                  |                         | 1200                                               | A     |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms; sin.                                                                           | T <sub>j</sub> = 150 °C | 3600                                               | 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>c</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> = 24 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>     |                                                                                  |                                                    |                                                    | 1    | 1,2  | V     |
|                      |                                                                                  |                                                    |                                                    | 0,9  | 1,1  | V     |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V                                                           | T <sub>j</sub> = 25 °C                             |                                                    | 1,7  | 2,1  | mΩ    |
|                      |                                                                                  | T <sub>j</sub> = 125 °C                            |                                                    | 2,5  |      | mΩ    |
| V <sub>CE(sat)</sub> | I <sub>Cnom</sub> = 600 A, V <sub>GE</sub> = 15 V                                | T <sub>j</sub> = 25 °C <sub>chiplev.</sub>         |                                                    | 2    | 2,45 | V     |
|                      |                                                                                  | T <sub>j</sub> = 125 °C <sub>chiplev.</sub>        |                                                    | 2,45 | 2,9  | V     |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25, V <sub>GE</sub> = 0 V                                      | f = 1 MHz                                          |                                                    | 39,6 |      | nF    |
| C <sub>oes</sub>     |                                                                                  |                                                    |                                                    | 2,2  |      | nF    |
| C <sub>res</sub>     |                                                                                  |                                                    |                                                    | 2,5  |      | nF    |
| Q <sub>G</sub>       | V <sub>GE</sub> = -8V...+15V                                                     |                                                    |                                                    | 4800 |      | nC    |
| t <sub>d(on)</sub>   | R <sub>Gon</sub> = 3 Ω                                                           | V <sub>CC</sub> = 1200V<br>I <sub>C</sub> = 600A   |                                                    | 230  |      | ns    |
| t <sub>r</sub>       |                                                                                  |                                                    |                                                    | 90   |      | ns    |
| E <sub>on</sub>      |                                                                                  |                                                    |                                                    | 335  |      | mJ    |
| t <sub>d(off)</sub>  | R <sub>Goff</sub> = 3 Ω                                                          | T <sub>j</sub> = 125 °C<br>V <sub>GE</sub> = ± 15V |                                                    | 1030 |      | ns    |
| t <sub>f</sub>       |                                                                                  |                                                    |                                                    | 160  |      | ns    |
| E <sub>off</sub>     |                                                                                  |                                                    |                                                    | 245  |      | mJ    |
| R <sub>th(j-c)</sub> | per IGBT                                                                         |                                                    |                                                    |      | 0,04 | K/W   |



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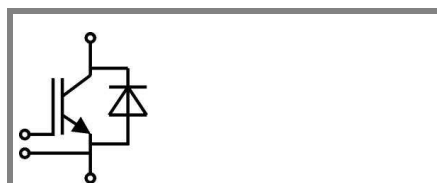
### Remarks

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| Characteristics      |                                     |           |      |       |       |
|----------------------|-------------------------------------|-----------|------|-------|-------|
| Symbol               | Conditions                          | min.      | typ. | max.  | Units |
| <b>Inverse Diode</b> |                                     |           |      |       |       |
| $V_F = V_{EC}$       | $I_{Fnom} = 600$ A; $V_{GE} = 0$ V  |           |      |       |       |
|                      | $T_j = 25$ °C <sub>chiplev.</sub>   |           | 1,6  | 1,9   | V     |
|                      | $T_j = 125$ °C <sub>chiplev.</sub>  |           | 1,6  |       | V     |
| $V_{F0}$             | $T_j = 25$ °C                       |           | 1,1  | 1,3   | V     |
| $r_F$                | $T_j = 25$ °C                       |           | 0,83 | 1     | mΩ    |
| $I_{RRM}$            | $I_F = 600$ A                       |           | 650  |       | A     |
| $Q_{rr}$             | $di/dt = 6400$ A/μs                 |           | 230  |       | μC    |
| $E_{rr}$             | $V_{GE} = -15$ V; $V_{CC} = 1200$ V |           | 155  |       | mJ    |
| $R_{th(j-c)D}$       | per diode                           |           |      | 0,07  | K/W   |
| <b>Module</b>        |                                     |           |      |       |       |
| $L_{CE}$             |                                     |           | 15   | 20    | nH    |
| $R_{CC'+EE'}$        | res., terminal-chip                 |           | 0,18 |       | mΩ    |
|                      | $T_{case} = 25$ °C                  |           |      |       |       |
|                      | $T_{case} = 125$ °C                 |           | 0,22 |       | mΩ    |
| $R_{th(c-s)}$        | 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     |

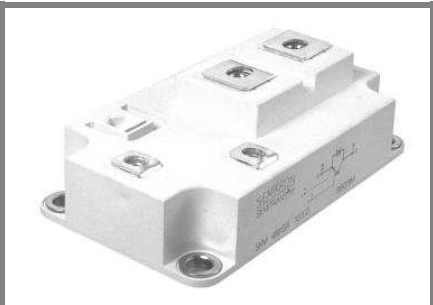
This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.

\* 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.



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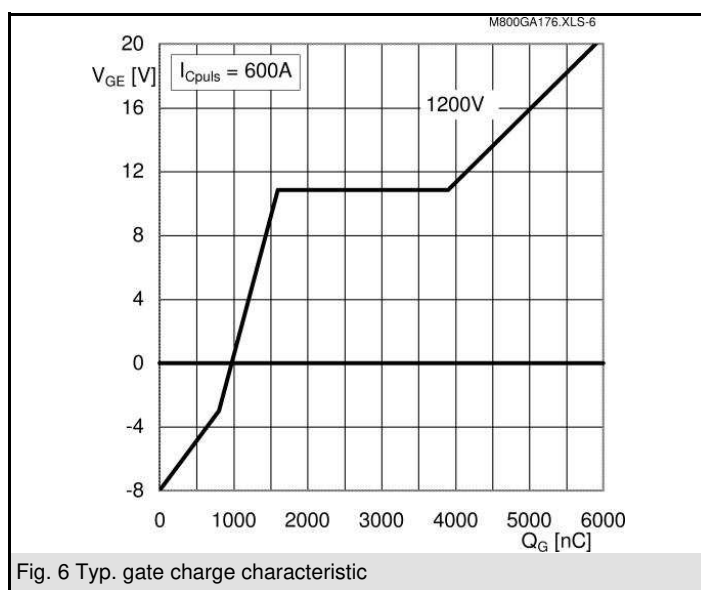
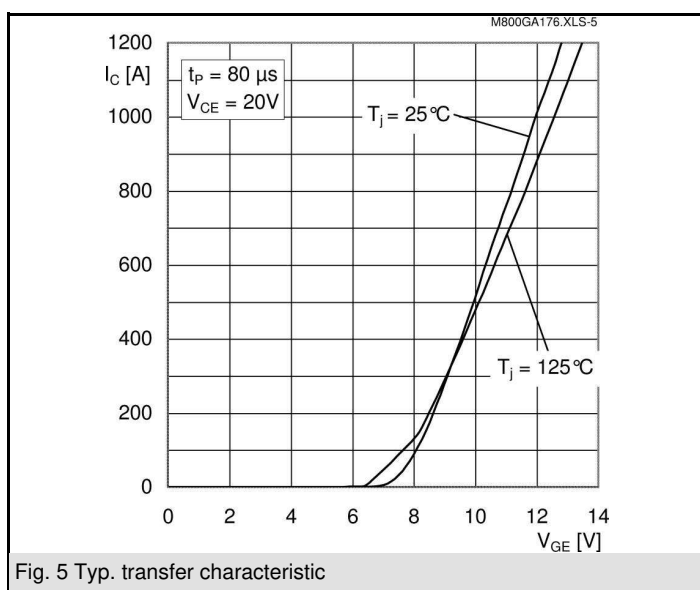
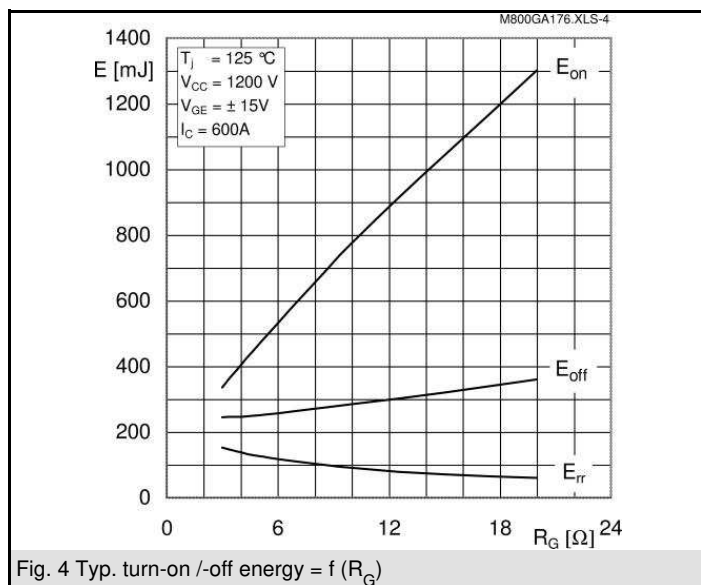
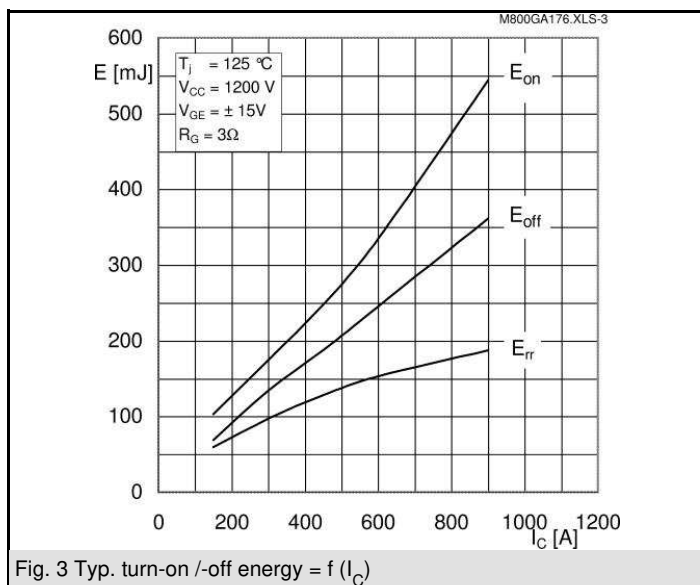
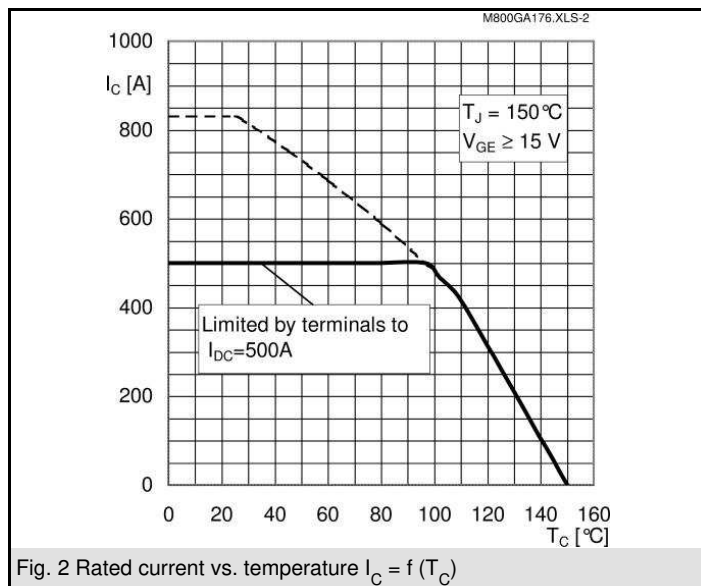
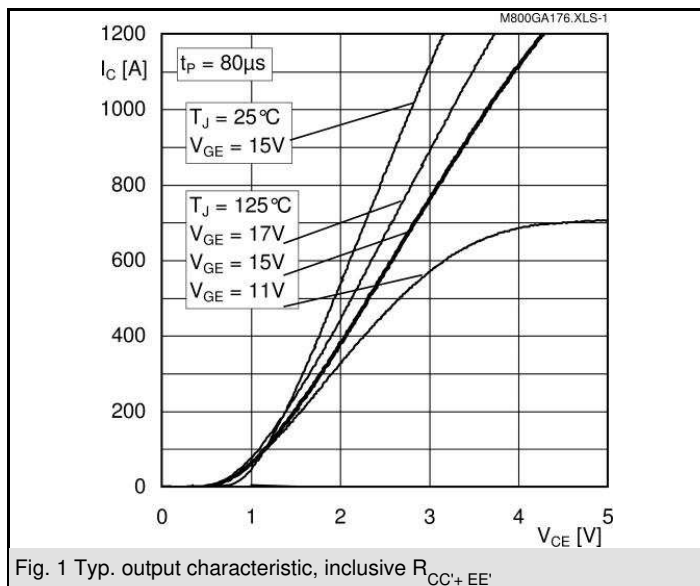
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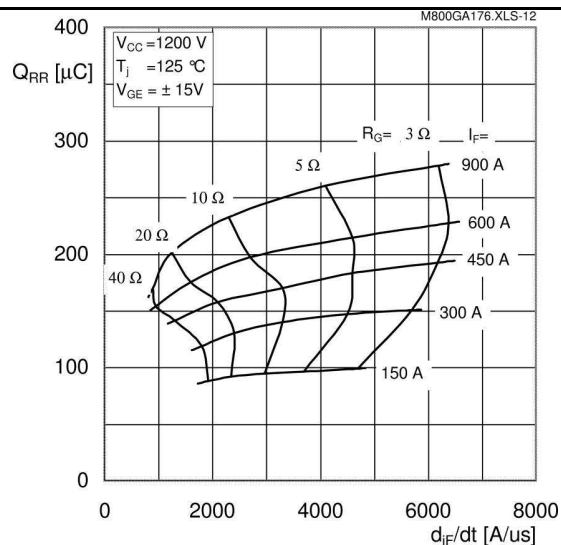
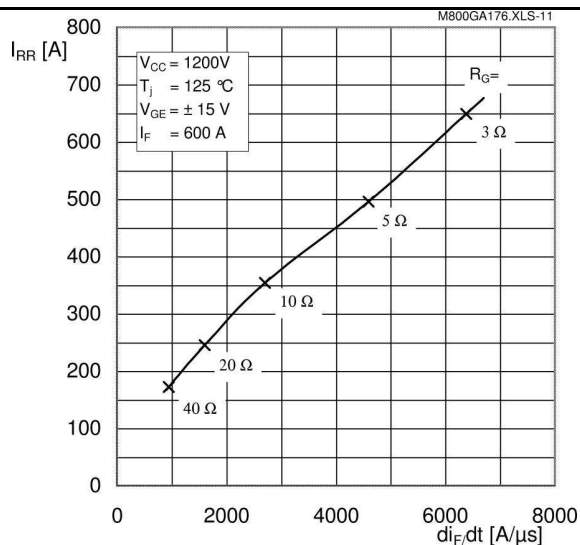
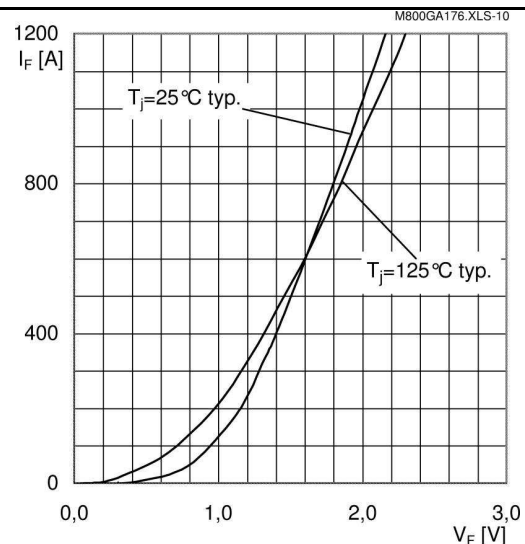
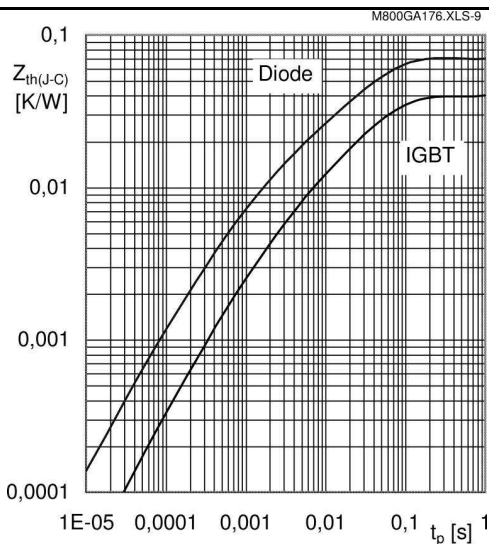
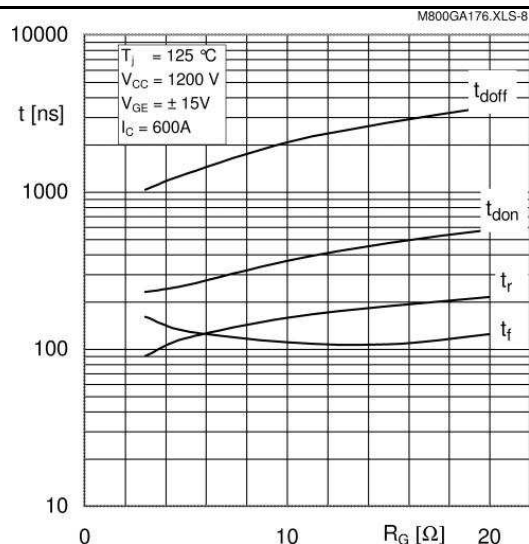
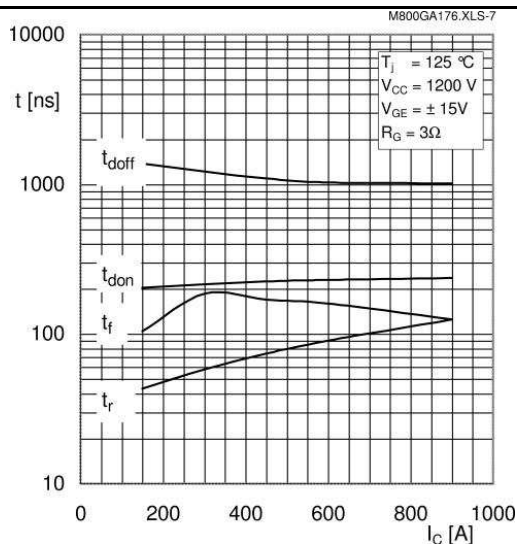
### Remarks

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| $Z_{th}$       |            |        |       |
|----------------|------------|--------|-------|
| Symbol         | Conditions | Values | Units |
| $Z_{th(j-c)I}$ |            |        |       |
| $R_i$          | $i = 1$    | 28     | mk/W  |
| $R_i$          | $i = 2$    | 9,5    | mk/W  |
| $R_i$          | $i = 3$    | 2,17   | mk/W  |
| $R_i$          | $i = 4$    | 0,33   | mk/W  |
| $\tau_{ui}$    | $i = 1$    | 0,0447 | s     |
| $\tau_{ui}$    | $i = 2$    | 0,02   | s     |
| $\tau_{ui}$    | $i = 3$    | 0,0015 | s     |
| $\tau_{ui}$    | $i = 4$    | 0,0025 | s     |
| $Z_{th(j-c)D}$ |            |        |       |
| $R_i$          | $i = 1$    | 46     | mk/W  |
| $R_i$          | $i = 2$    | 17     | mk/W  |
| $R_i$          | $i = 3$    | 5,9    | mk/W  |
| $R_i$          | $i = 4$    | 1,1    | mk/W  |
| $\tau_{ui}$    | $i = 1$    | 0,05   | s     |
| $\tau_{ui}$    | $i = 2$    | 0,0075 | s     |
| $\tau_{ui}$    | $i = 3$    | 0,002  | s     |
| $\tau_{ui}$    | $i = 4$    | 0,0002 | s     |





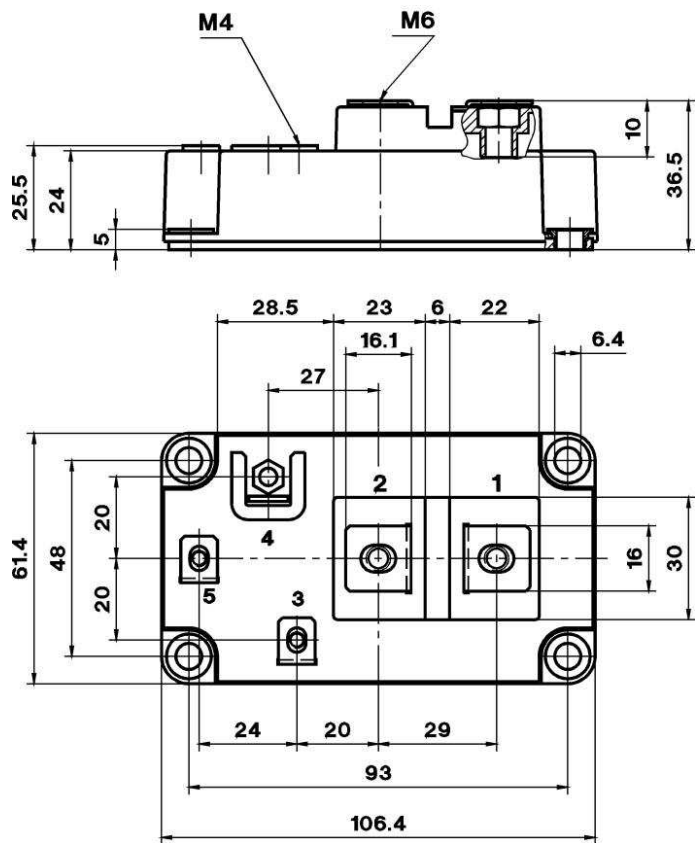


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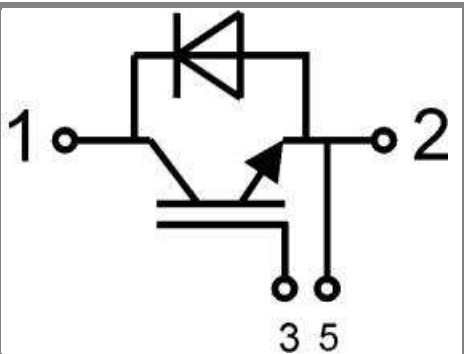
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