

# SKM200GB12T4SiC2



**SEMITRANS® 3**

## Fast IGBT4 Modules

### SKM200GB12T4SiC2

#### Features\*

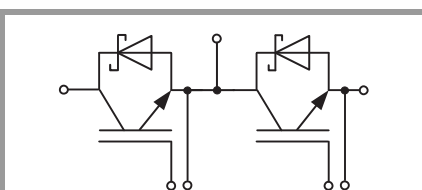
- IGBT4 = 4. Generation Fast Trench IGBT (Infineon)
- With Silicon Carbide Schottky diodes (ROHM)
- Insulated copper baseplate using DBC Technology (Direct Bonded Copper)
- UL recognized, file no. E63532
- Increased power cycling capability
- With integrated gate resistor
- For higher switching frequencies

#### Typical Applications

- AC inverter drives
- UPS
- Electronic welders
- DC/DC converters

#### Remarks

- Case temperature limited to  $T_c = 125^\circ\text{C}$  max.
- Recommended  $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for  $T_j = 150^\circ\text{C}$



GB

| Absolute Maximum Ratings |                                                                                |                         |             |      |
|--------------------------|--------------------------------------------------------------------------------|-------------------------|-------------|------|
| Symbol                   | Conditions                                                                     |                         | Values      | Unit |
| IGBT                     |                                                                                |                         |             |      |
| V <sub>CES</sub>         | T <sub>j</sub> = 25 °C                                                         |                         | 1200        | V    |
| I <sub>C</sub>           | T <sub>j</sub> = 175 °C                                                        | T <sub>c</sub> = 25 °C  | 313         | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 241         | A    |
| I <sub>Cnom</sub>        |                                                                                |                         | 200         | A    |
| I <sub>CRM</sub>         |                                                                                |                         | 600         | A    |
| V <sub>GES</sub>         |                                                                                |                         | -20 ... 20  | V    |
| t <sub>psc</sub>         | V <sub>CC</sub> = 800 V<br>V <sub>GE</sub> ≤ 15 V<br>V <sub>CES</sub> ≤ 1200 V | T <sub>j</sub> = 150 °C | 10          | μs   |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Inverse diode            |                                                                                |                         |             |      |
| V <sub>RRM</sub>         | T <sub>j</sub> = 25 °C                                                         |                         | 1200        | V    |
| I <sub>F</sub>           | T <sub>j</sub> = 175 °C                                                        | T <sub>c</sub> = 25 °C  | 246         | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 187         | A    |
| I <sub>FRM</sub>         |                                                                                |                         | 336         | A    |
| I <sub>FSM</sub>         | t <sub>p</sub> = 8.3 ms, sin 180°, T <sub>j</sub> = 25 °C                      |                         | 531         | A    |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Module                   |                                                                                |                         |             |      |
| I <sub>t(RMS)</sub>      |                                                                                |                         | 500         | A    |
| T <sub>stg</sub>         |                                                                                |                         | -40 ... 125 | °C   |
| V <sub>isol</sub>        | AC sinus 50 Hz, t = 1 min                                                      |                         | 4000        | V    |

| Characteristics      |                                                            |                         |                         |      |      |      |
|----------------------|------------------------------------------------------------|-------------------------|-------------------------|------|------|------|
| Symbol               | Conditions                                                 |                         | min.                    | typ. | max. | Unit |
| IGBT                 |                                                            |                         |                         |      |      |      |
| V <sub>CE(sat)</sub> | I <sub>C</sub> = 200 A                                     | T <sub>j</sub> = 25 °C  |                         | 1.80 | 2.05 | V    |
|                      | V <sub>GE</sub> = 15 V<br>chipelevel                       | T <sub>j</sub> = 150 °C |                         | 2.20 | 2.40 | V    |
| V <sub>CE0</sub>     | chipelevel                                                 | T <sub>j</sub> = 25 °C  |                         | 0.80 | 0.90 | V    |
|                      |                                                            | T <sub>j</sub> = 150 °C |                         | 0.70 | 0.80 | V    |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V<br>chipelevel                       | T <sub>j</sub> = 25 °C  |                         | 5.0  | 5.8  | mΩ   |
|                      |                                                            | T <sub>j</sub> = 150 °C |                         | 7.5  | 8.0  | mΩ   |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> =V <sub>CE</sub> , I <sub>C</sub> = 7.6 mA |                         | 5                       | 5.8  | 6.5  | V    |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V                                      | T <sub>j</sub> = 25 °C  |                         |      | 3.2  | mA   |
|                      | V <sub>CE</sub> = 1200 V                                   | T <sub>j</sub> = 150 °C |                         | -    |      | mA   |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25 V<br>V <sub>GE</sub> = 0 V            | f = 1 MHz               |                         | 12.3 |      | nF   |
| C <sub>oes</sub>     |                                                            | f = 1 MHz               |                         | 0.81 |      | nF   |
| C <sub>res</sub>     |                                                            | f = 1 MHz               |                         | 0.69 |      | nF   |
| Q <sub>G</sub>       | V <sub>GE</sub> = - 8 V...+ 15 V                           |                         |                         | 1130 |      | nC   |
| R <sub>Gint</sub>    | T <sub>j</sub> = 25 °C                                     |                         |                         | 3.8  |      | Ω    |
| t <sub>d(on)</sub>   | V <sub>CC</sub> = 600 V                                    | T <sub>j</sub> = 150 °C |                         | 170  |      | ns   |
| t <sub>r</sub>       | I <sub>C</sub> = 200 A                                     |                         | T <sub>j</sub> = 150 °C |      | 33   |      |
| E <sub>on</sub>      | V <sub>GE</sub> = +15/-15 V                                | T <sub>j</sub> = 150 °C |                         | 4    |      | mJ   |
| t <sub>d(off)</sub>  | R <sub>G on</sub> = 1 Ω                                    | T <sub>j</sub> = 150 °C |                         | 435  |      | ns   |
|                      | R <sub>G off</sub> = 1 Ω                                   | T <sub>j</sub> = 150 °C |                         | 96   |      | ns   |
| t <sub>f</sub>       | di/dt <sub>on</sub> = 6300 A/μs                            | T <sub>j</sub> = 150 °C |                         |      |      |      |
| E <sub>off</sub>     | di/dt <sub>off</sub> = 1700 A/μs                           | T <sub>j</sub> = 150 °C |                         |      |      |      |
|                      | dv/dt = 3280 V/μs                                          |                         |                         |      |      |      |
|                      | L <sub>s</sub> = 25 nH                                     |                         |                         | 23   |      | mJ   |
| R <sub>th(j-c)</sub> | per IGBT                                                   |                         |                         |      | 0.14 | K/W  |



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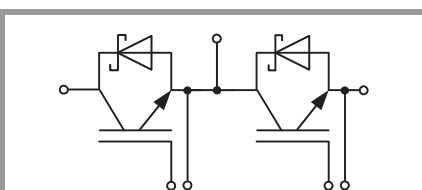
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| Characteristics                  |                                                                                         |                         |      |      |       |      |
|----------------------------------|-----------------------------------------------------------------------------------------|-------------------------|------|------|-------|------|
| Symbol                           | Conditions                                                                              |                         | min. | typ. | max.  | Unit |
| Inverse diode                    |                                                                                         |                         |      |      |       |      |
| V <sub>F</sub> = V <sub>SD</sub> | I <sub>F</sub> = 160 A                                                                  | T <sub>j</sub> = 25 °C  |      | 1.40 | 1.60  | V    |
|                                  | V <sub>GE</sub> = 0 V                                                                   | T <sub>j</sub> = 150 °C |      | 1.81 | 2.10  | V    |
|                                  | chiplevel                                                                               |                         |      |      |       |      |
| V <sub>F0</sub>                  | chiplevel                                                                               | T <sub>j</sub> = 25 °C  |      | 0.95 | 1.05  | V    |
|                                  |                                                                                         | T <sub>j</sub> = 150 °C |      | 0.83 | 0.90  | V    |
| r <sub>F</sub>                   | chiplevel                                                                               | T <sub>j</sub> = 25 °C  |      | 2.8  | 3.4   | mΩ   |
|                                  |                                                                                         | T <sub>j</sub> = 150 °C |      | 6.1  | 7.6   | mΩ   |
| C <sub>j</sub>                   | f = 1 MHz, V <sub>R</sub> = 800 V, T <sub>j</sub> = 25 °C, parallel to C <sub>oss</sub> |                         |      | 0.68 |       | nF   |
| Q <sub>c</sub>                   | V <sub>R</sub> = 800 V, di/dt <sub>off</sub> = 500 A/μs                                 |                         |      | 0.53 |       | μC   |
| R <sub>th(j-c)</sub>             | per diode                                                                               |                         |      |      | 0.21  | K/W  |
| Module                           |                                                                                         |                         |      |      |       |      |
| L <sub>CE</sub>                  |                                                                                         |                         |      | 15   |       | nH   |
| R <sub>CC'+EE'</sub>             | measured per                                                                            | T <sub>C</sub> = 25 °C  |      | 0.55 |       | mΩ   |
|                                  | switch                                                                                  | T <sub>C</sub> = 125 °C |      | 0.85 |       | mΩ   |
| R <sub>th(c-s)1</sub>            | calculated without thermal coupling (λ <sub>grease</sub> =0.81 W/(m*K))                 |                         |      | 0.02 | 0.038 | K/W  |
| M <sub>s</sub>                   | to heat sink M6                                                                         |                         | 3    |      | 5     | Nm   |
| M <sub>t</sub>                   |                                                                                         | to terminals M6         | 2.5  |      | 5     | Nm   |
|                                  |                                                                                         |                         |      |      |       | Nm   |
| w                                |                                                                                         |                         |      |      | 325   | g    |



**GB**

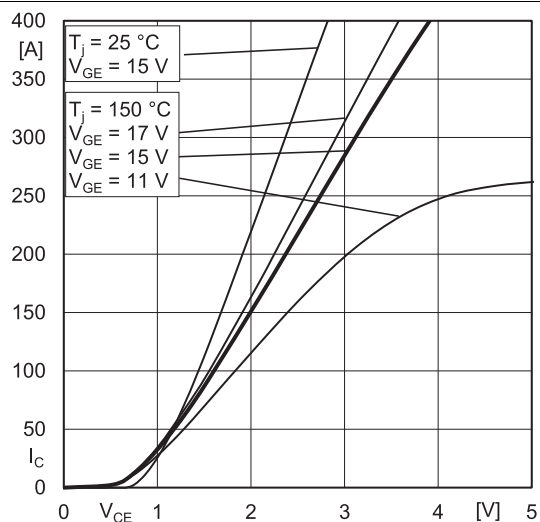


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'} + E_{E'}$

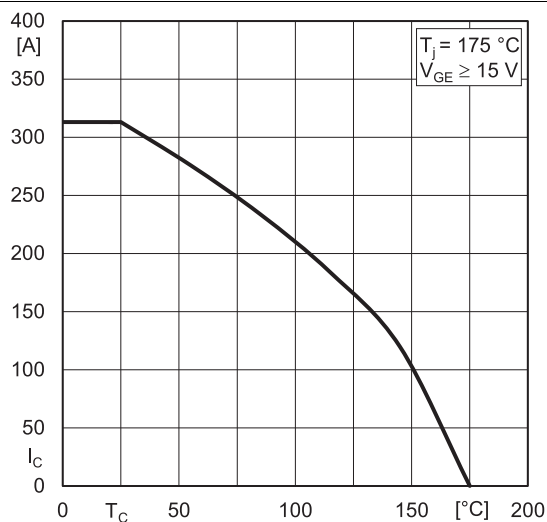


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

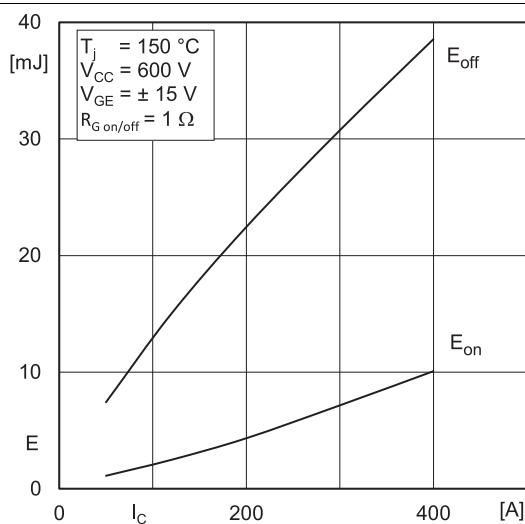


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

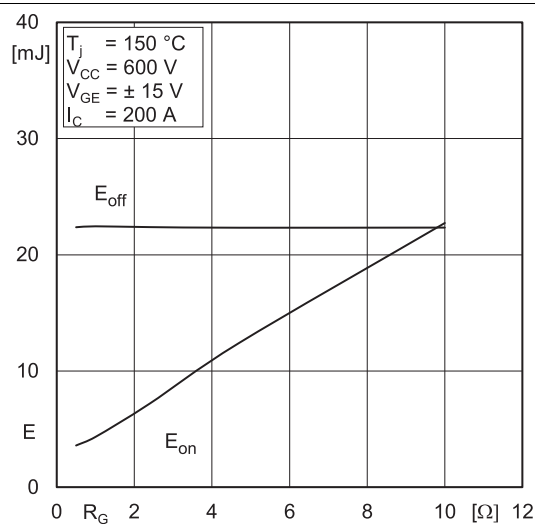


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

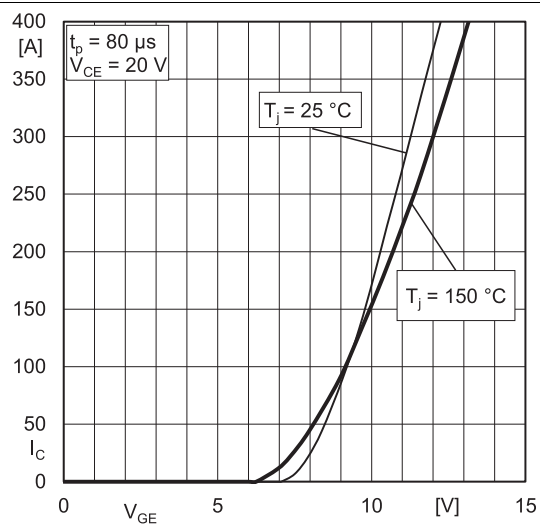


Fig. 5: Typ. transfer characteristic

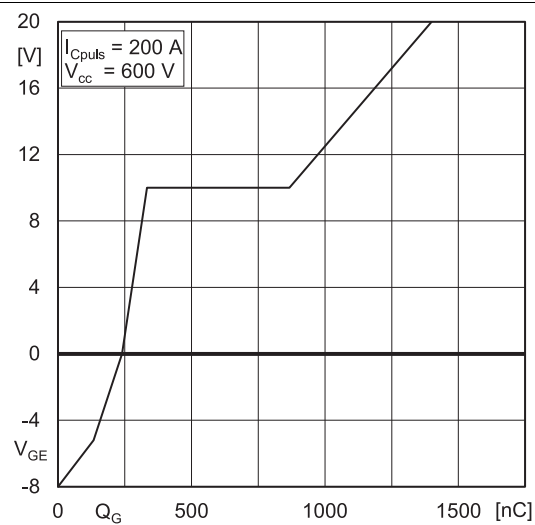
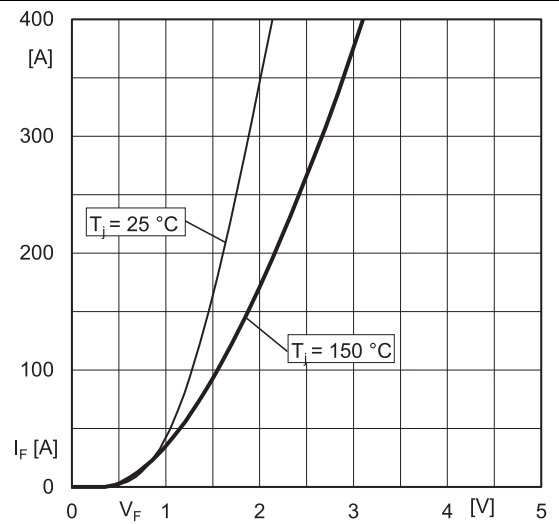
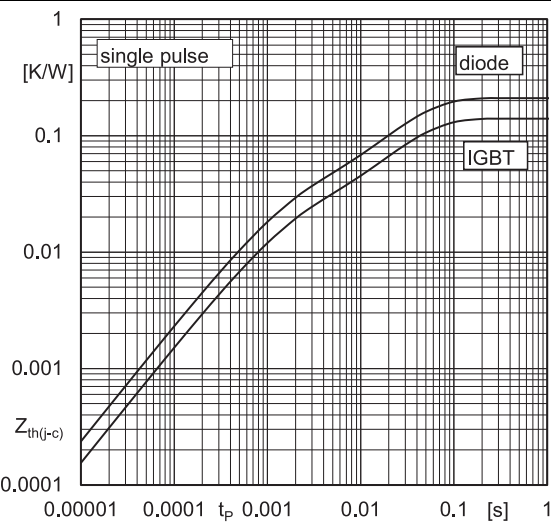
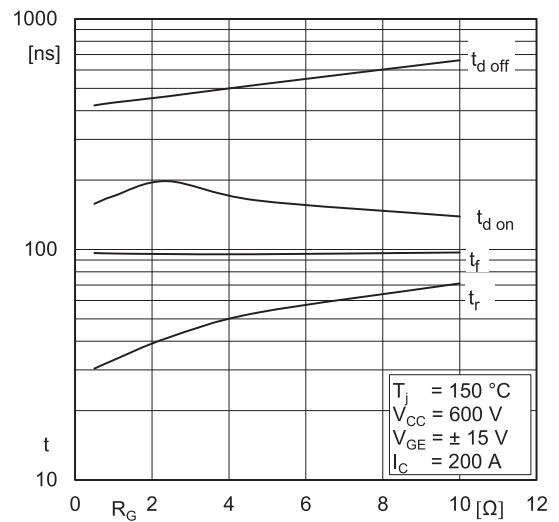
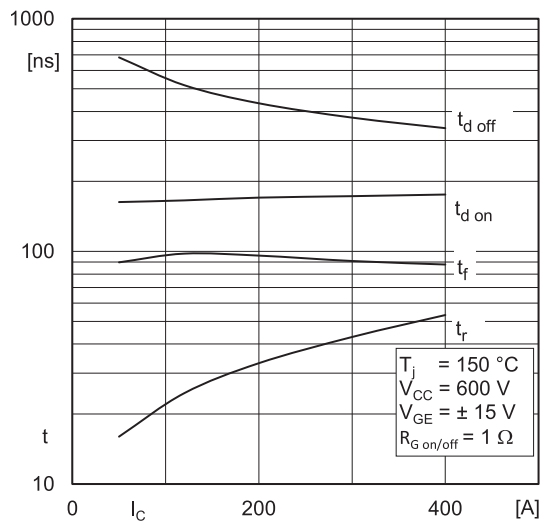
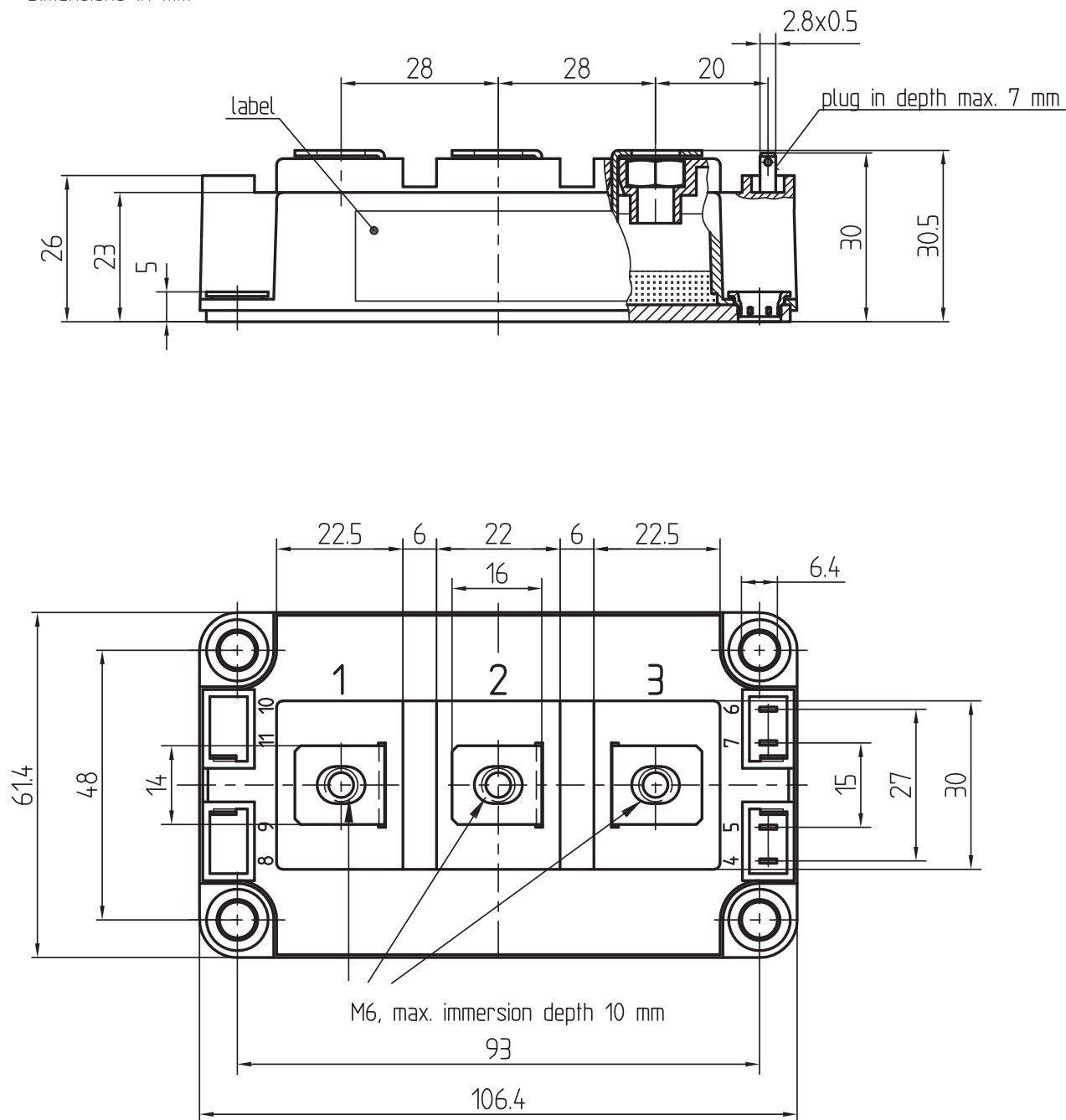


Fig. 6: Typ. gate charge characteristic



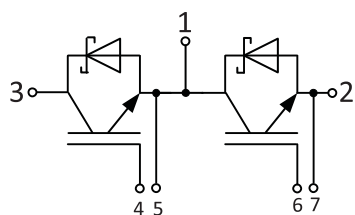
# SKM200GB12T4SiC2

Dimensions in mm



General tolerance +/- 0.5 mm

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This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

## **\*IMPORTANT INFORMATION AND WARNINGS**

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