

# SKM260MB170SCH17



## SiC MOSFET Module

### SKM260MB170SCH17

#### Features\*

- Full Silicon Carbide (SiC) power module
- High reliability 2<sup>nd</sup> Generation SiC MOSFETs
- Optimized for fast switching and lowest power losses
- External SiC Schottky Barrier Diode embedded
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Improved thermal performances with Aluminum Nitride (AlN) substrate
- UL recognized, file no. E63532

#### Typical Applications

- High frequency power supplies
- AC inverters
- Traction APU
- EV Chargers
- Industrial Test Systems

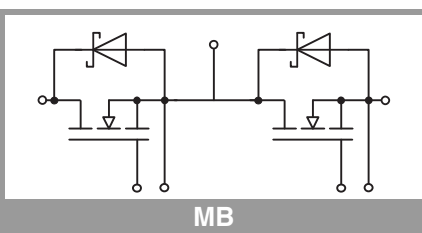
#### Remarks

- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.
- Recommended  $T_{jop} = -40 \dots +150^\circ\text{C}$
- Gate-Source SURGE VOLTAGE ( $t_{surge} < 300\text{ns}$ ),  $V_{GS\_surge} = -10\text{V} \dots +26\text{V}$

| Absolute Maximum Ratings |   |                          |                  |
|--------------------------|---|--------------------------|------------------|
| Symbol                   | Conditions                                      | Values                   | Unit             |
| <b>MOSFET</b>            |   |                          |                  |
| $V_{DSS}$                | $T_j = 25^\circ\text{C}$                        | 1700                     | V                |
| $I_D$                    | $T_j = 175^\circ\text{C}$                       | $T_c = 25^\circ\text{C}$ | 378              |
|                          |   | $T_c = 80^\circ\text{C}$ | 301              |
| $I_{DM}$                 | $PW \leq 10\mu\text{s}$ , Duty cycle $\leq 1\%$ | 980                      | A                |
| $I_{DM,repitive}$        |   | 790                      | A                |
| $V_{GS}$                 |   | -6 ... 22                | V                |
| $T_j$                    |   | -40 ... 175              | $^\circ\text{C}$ |

| Absolute Maximum Ratings |   |                          |                  |
|--------------------------|---|--------------------------|------------------|
| Symbol                   | Conditions  | Values                   | Unit             |
| <b>Inverse diode</b>     |   |                          |                  |
| $V_{RRM}$                | $T_j = 25^\circ\text{C}$  | 1700                     | V                |
| $I_F$                    | $T_j = 175^\circ\text{C}$   | $T_c = 25^\circ\text{C}$ | 552              |
|                          |   | $T_c = 80^\circ\text{C}$ | 428              |
| $I_{Fnom}$               |   | 300                      | A                |
| $I_{FRM}$                |   | 900                      | A                |
| $I_{FSM}$                | $t_p = 10\text{ ms}$ , sin $180^\circ$ , $T_j = 150^\circ\text{C}$ , including body diode | 2030                     | A                |
| $T_j$                    |   | -40 ... 175              | $^\circ\text{C}$ |

| Absolute Maximum Ratings |                                    |             |                  |
|--------------------------|------------------------------------|-------------|------------------|
| Symbol                   | Conditions                         | Values      | Unit             |
| <b>Module</b>            |                                    |             |                  |
| $I_{t(RMS)}$             |                                    | 500         | A                |
| $T_{stg}$                | module without TIM                 | -40 ... 125 | $^\circ\text{C}$ |
| $V_{isol}$               | AC sinus 50 Hz, $t = 1\text{ min}$ | 4000        | V                |



# SKM260MB170SCH17



SEMITRANS® 3

## SiC MOSFET Module

### SKM260MB170SCH17

#### Features\*

- Full Silicon Carbide (SiC) power module
- High reliability 2<sup>nd</sup> Generation SiC MOSFETs
- Optimized for fast switching and lowest power losses
- External SiC Schottky Barrier Diode embedded
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Improved thermal performances with Aluminum Nitride (AlN) substrate
- UL recognized, file no. E63532

#### Typical Applications

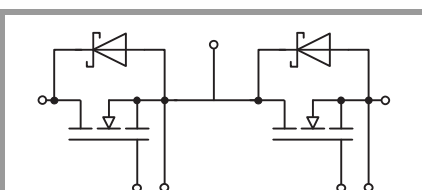
- High frequency power supplies
- AC inverters
- Traction APU
- EV Chargers
- Industrial Test Systems

#### Remarks

- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.
- Recommended  $T_{jop} = -40 \dots +150^\circ\text{C}$
- Gate-Source SURGE VOLTAGE ( $t_{surge} < 300\text{ns}$ ),  $V_{GS\_surge} = -10\text{V} \dots +26\text{V}$

| Characteristics |  |      |       |       |      |
|-----------------|--|------|-------|-------|------|
| Symbol          | Conditions   | min. | typ.  | max.  | Unit |
| <b>MOSFET</b>   |  |      |       |       |      |
| $V_{(BR)DSS}$   | $V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$ , $T_j = 25^\circ\text{C}$               | 1700 |       |       | V    |
| $V_{GS(th)}$    | $V_{DS} = V_{GS}$ , $I_D = 57.75\text{ mA}$  | 1.6  | 2.8   | 4     | V    |
| $I_{DSS}$       | $V_{GS} = 0\text{ V}$ , $V_{DS} = 1700\text{ V}$ , $T_j = 25^\circ\text{C}$          |      |       | 1.8   | mA   |
| $I_{GSS}$       | $V_{GS} = 22\text{ V}$ , $V_{DS} = 0\text{ V}$                                       |      |       | 700   | nA   |
| $R_{DS(on)}$    | $V_{GS} = 18\text{ V}$   |      |       |       |      |
|                 | $I_D = 161\text{ A}$   |      |       |       |      |
|                 | chiplevel  |      | 8.1   | 10    | mΩ   |
|                 |  |      | 14    |       | mΩ   |
| $C_{iss}$       | $V_{GS} = 0\text{ V}$  |      | 27    |       | nF   |
| $C_{oss}$       | $V_{DS} = 800\text{ V}$  |      | 0.88  |       | nF   |
| $C_{rss}$       | $f = 1\text{ MHz}$   |      | 0.105 |       | nF   |
| $R_{Gint}$      | $T_j = 25^\circ\text{C}$   |      | 2.1   |       | Ω    |
| $Q_G$           | $V_{DD} = 1000\text{V}$ , $V_{GS} = -5 \dots 20\text{V}$ , $I_D = 300\text{ A}$      |      | 1470  |       | nC   |
| $t_{d(on)}$     | $V_{DD} = 900\text{ V}$  |      | 64    |       | ns   |
| $t_r$           | $I_D = 300\text{ A}$   |      | 60    |       | ns   |
| $t_{d(off)}$    | $V_{GS} = -5 / +20\text{ V}$   |      | 162   |       | ns   |
| $t_f$           | $R_{Gon} = 0.7\text{ Ω}$   |      | 32    |       | ns   |
| $E_{on}$        | $R_{Goff} = 0.7\text{ Ω}$  |      | 7.59  |       | mJ   |
| $E_{off}$       | $di/dt_{on} = 12\text{ kA}/\mu\text{s}$<br>$di/dt_{off} = 9.5\text{ kA}/\mu\text{s}$ |      | 6.21  |       | mJ   |
|                 | $dv/dt_{off} = 22\text{ kV}/\mu\text{s}$   |      |       |       |      |
| $R_{th(j-c)}$   | per MOSFET   |      |       | 0.065 | K/W  |
| $R_{th(c-s)}$   | per MOSFET ( $\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$ )               |      | 0.03  |       | K/W  |

| Characteristics      |   |      |       |       |      |
|----------------------|---|------|-------|-------|------|
| Symbol               | Conditions  | min. | typ.  | max.  | Unit |
| <b>Inverse diode</b> |   |      |       |       |      |
| $V_F = V_{SD}$       | $I_F = 300\text{ A}$  |      | 1.65  | 1.95  | V    |
|                      | chiplevel   |      | 2.51  | 2.86  | V    |
| $V_{F0}$             |   |      | 1.00  | 1.10  | V    |
|                      | chiplevel   |      | 0.86  | 0.96  | V    |
| $r_F$                |   |      | 2.2   | 2.8   | mΩ   |
|                      | chiplevel   |      | 5.5   | 6.3   | mΩ   |
| $C_j$                | parallel to $C_{oss}$ , $f = 1\text{ MHz}$ , $V_R = 1700\text{ V}$ , $T_j = 25^\circ\text{C}$ |      | 1.026 |       | nF   |
| $Q_c$                | $V_R = 800\text{ V}$ , $di/dt_{off} = 500\text{ A}/\mu\text{s}$ , $T_j = 25^\circ\text{C}$    |      | 0.95  |       | μC   |
| $R_{th(j-c)}$        | per diode   |      |       | 0.056 | K/W  |
| $R_{th(c-s)}$        | per diode ( $\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$ )                         |      | 0.027 |       | K/W  |



MB

# SKM260MB170SCH17



**SEMITRANS® 3**

## SiC MOSFET Module

### SKM260MB170SCH17

#### Features\*

- Full Silicon Carbide (SiC) power module
- High reliability 2<sup>nd</sup> Generation SiC MOSFETs
- Optimized for fast switching and lowest power losses
- External SiC Schottky Barrier Diode embedded
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Improved thermal performances with Aluminum Nitride (AlN) substrate
- UL recognized, file no. E63532

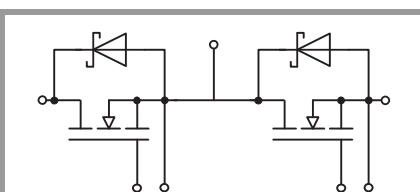
#### Typical Applications

- High frequency power supplies
- AC inverters
- Traction APU
- EV Chargers
- Industrial Test Systems

#### Remarks

- Case temperature limited to  $T_C = 125^\circ\text{C}$  max.
- Recommended  $T_{jop} = -40 \dots +150^\circ\text{C}$
- Gate-Source SURGE VOLTAGE ( $t_{surge} < 300\text{ns}$ ),  $V_{GS\_surge} = -10\text{V} \dots +26\text{V}$

| Characteristics       |  |                         |      |       |      |      |
|-----------------------|--|-------------------------|------|-------|------|------|
| Symbol                | Conditions   |                         | min. | typ.  | max. | Unit |
| Module                |  |                         |      |       |      |      |
| L <sub>DS</sub>       |  |                         |      | 15    |      | nH   |
| R <sub>DD'+SS'</sub>  | measured per switch  | T <sub>C</sub> = 25 °C  |      | 0.55  |      | mΩ   |
|                       |  | 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))                          |                         |      | 0.008 |      | K/W  |
| R <sub>th(c-s)2</sub> | including thermal coupling, T <sub>s</sub> underneath module (λ <sub>grease</sub> =0.81 W/(m*K)) |                         |      | 0.013 |      | 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    |



**MB**

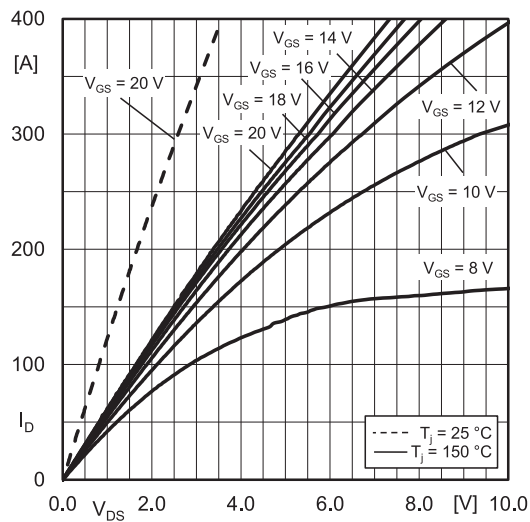


Fig. 1: Typ. MOSFET forward output characteristic, incl.  $R_{DD'}+SS'$

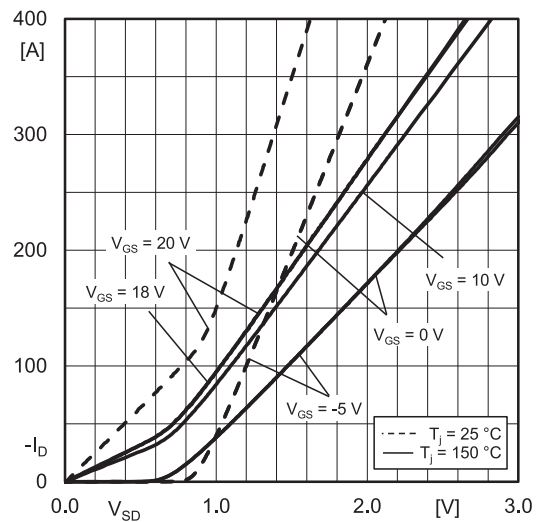


Fig. 2: Typ. reverse output characteristic, incl.  $R_{DD'}+SS'$

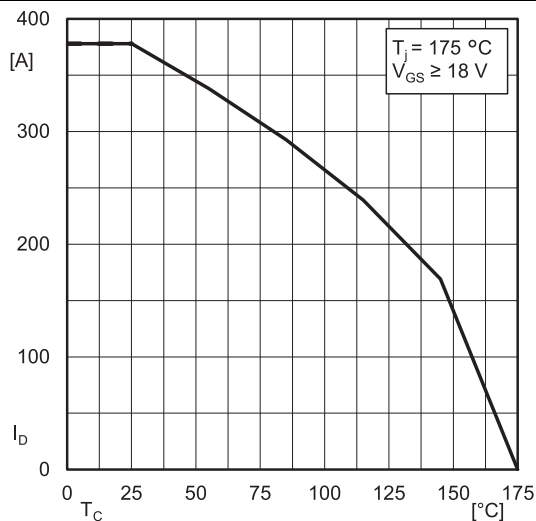


Fig. 3: Rated current vs. temperature  $I_D = f(T_C)$

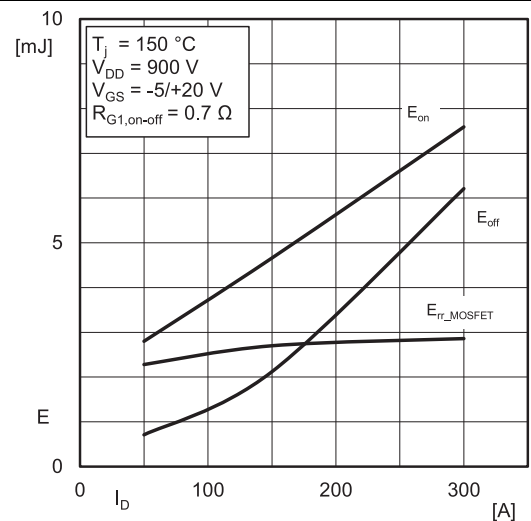


Fig. 4: Typ. switching energy  $E = f(I_D)$  at  $R_{G1}$

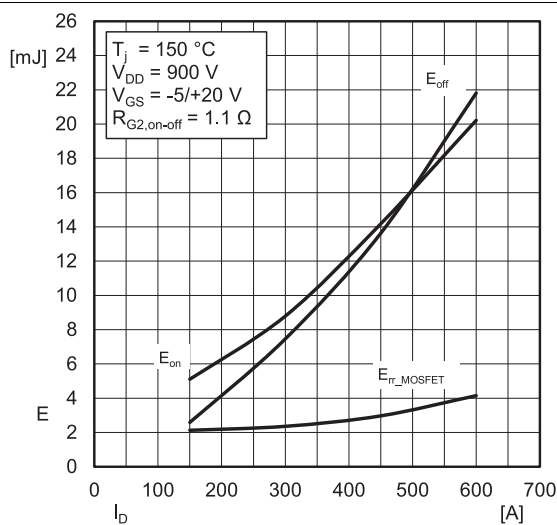


Fig. 5: Typ. switching energy  $E = f(I_D)$  at  $R_{G2}$

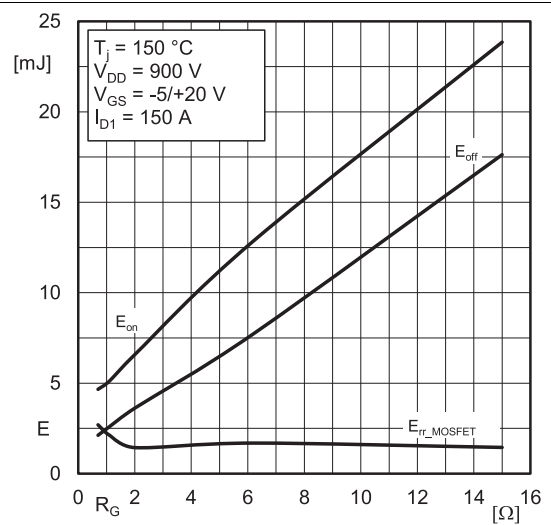


Fig. 6: Typ. switching energy  $E = f(R_G)$  at  $I_{D1}$

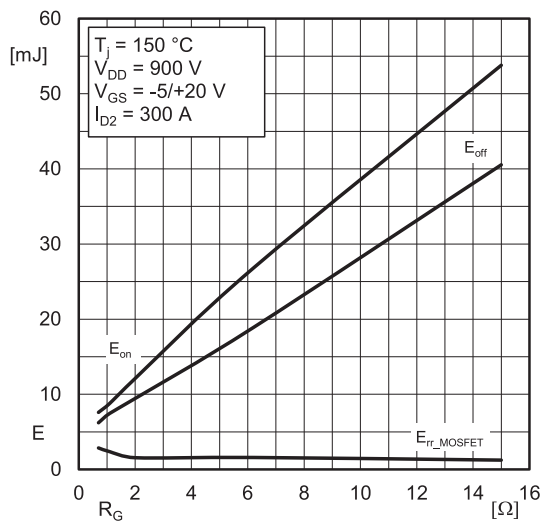


Fig. 7: Typ. switching energy  $E = f(R_G)$  at  $I_{D2}$

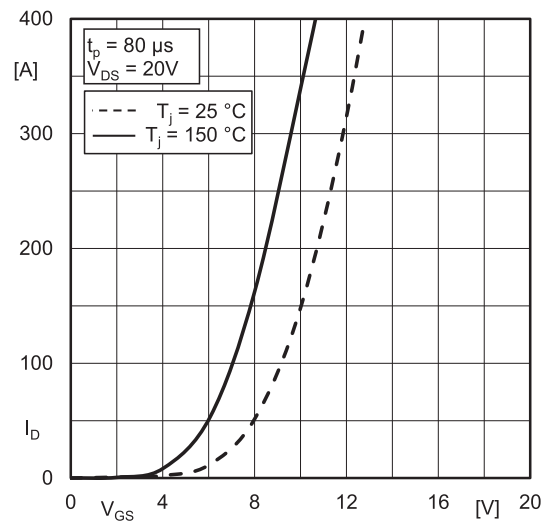


Fig. 8: Typ. MOSFET transfer characteristic

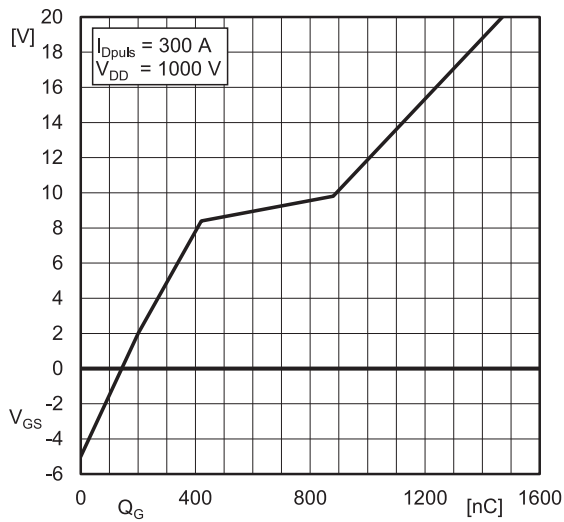


Fig. 9: Typ. gate charge characteristic

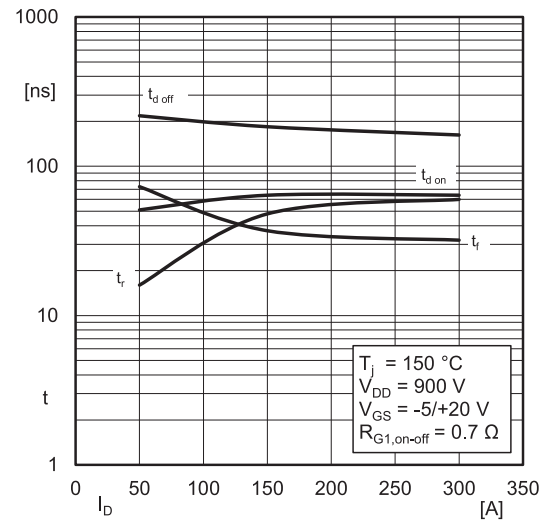


Fig. 10: Typ. switching times  $t = f(I_D)$  at  $R_{G1}$

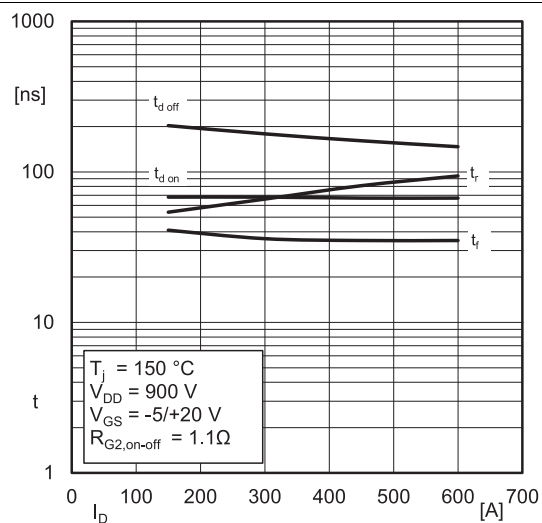


Fig. 11: Typ. switching times  $t = f(I_D)$  at  $R_{G2}$

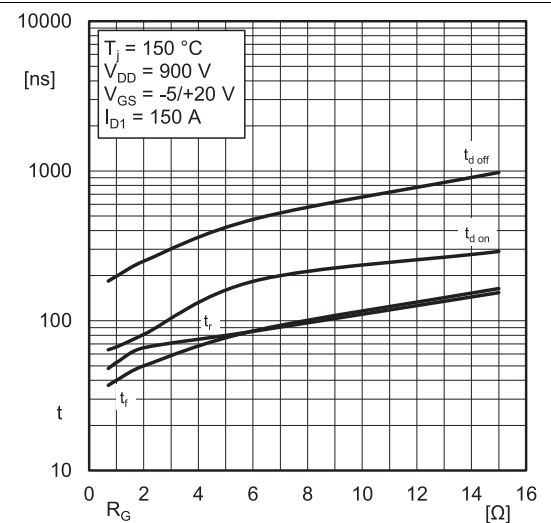


Fig. 12: Typ. switching times  $t = f(R_G)$  at  $I_{D1}$

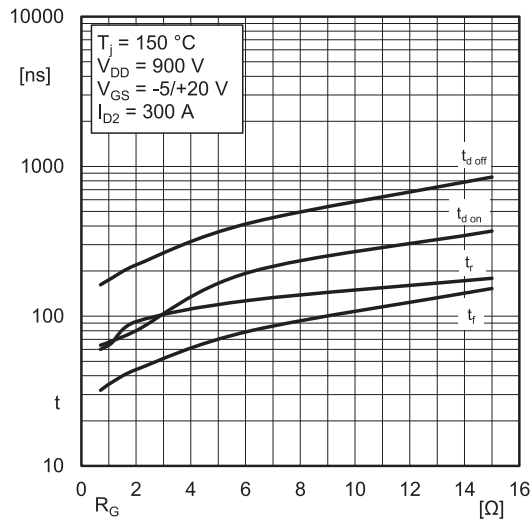


Fig. 13: Typ. switching times  $t = f(R_G)$  at  $I_{D2}$

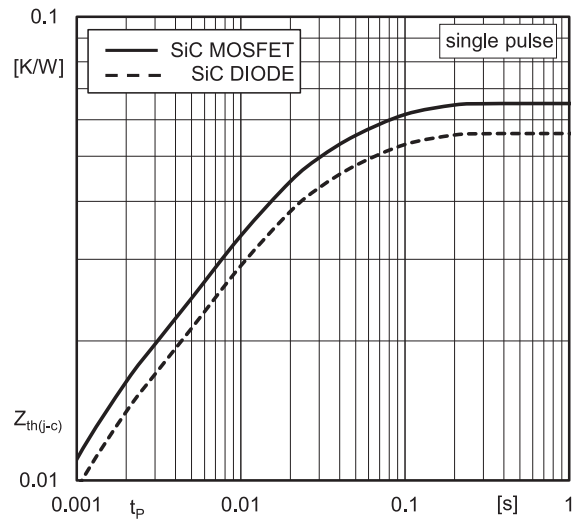
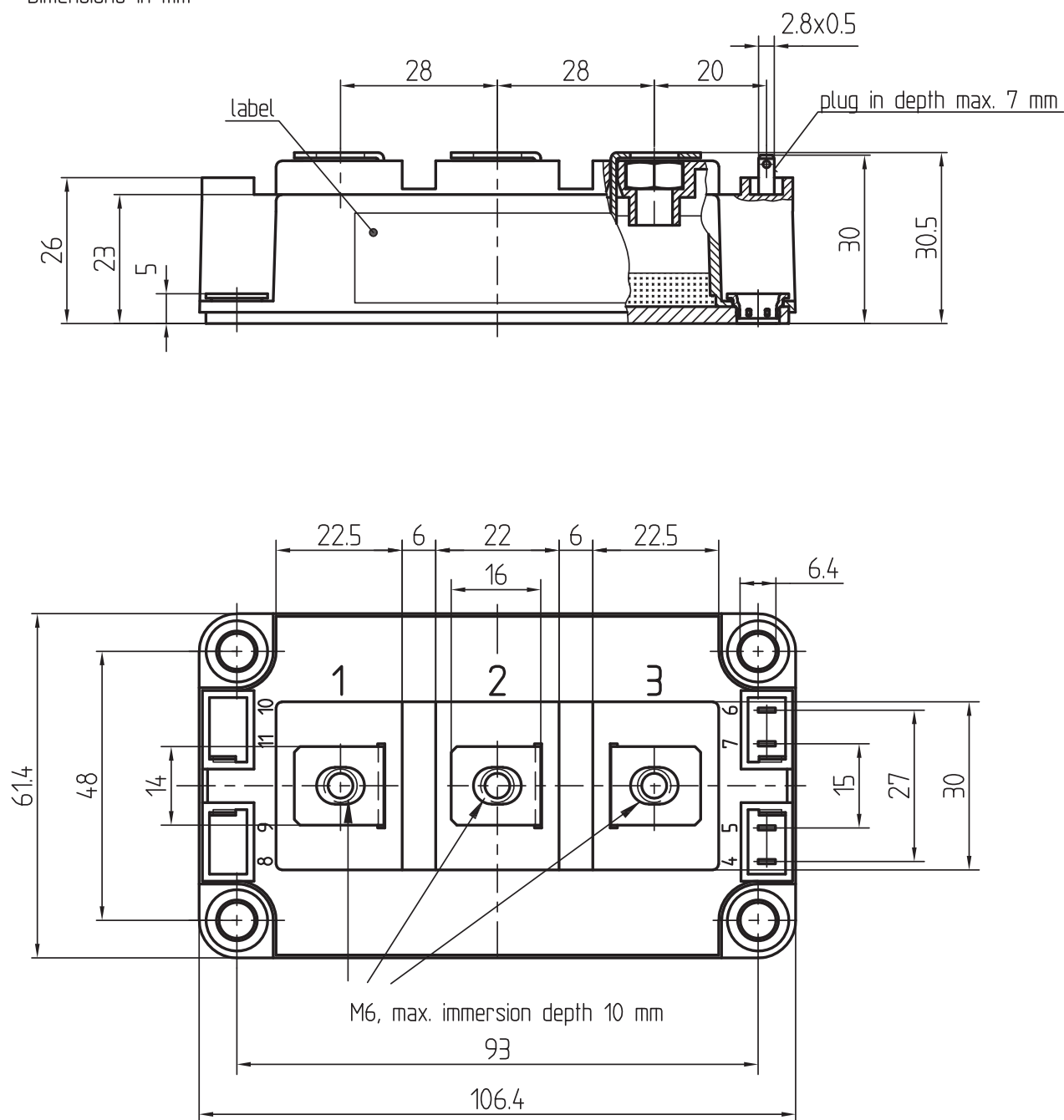


Fig. 14: Transient thermal impedance

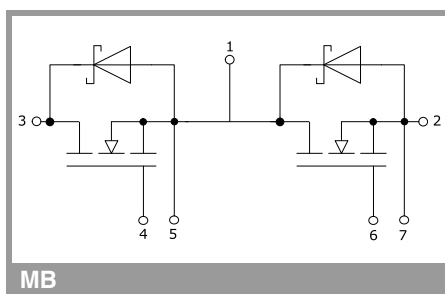
# SKM260MB170SCH17

Dimensions in mm



General tolerance  $\pm 0.5$  mm

SEMITRANS 3



MB

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

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

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.