



**SEMITRANS<sup>®</sup> 2**

## Trench IGBT Modules

**SKM 195GB066D**

Preliminary Data

### Features

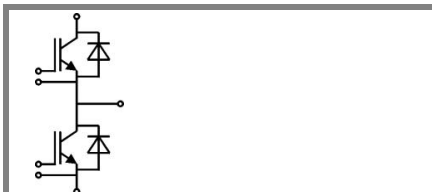
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$

### Typical Applications

- AC inverter drives
- UPS
- Electronic welders

### Remarks

- Case temperature limited to  $T_c = 125^\circ\text{C}$  max., product rel. results valid for  $T_j \leq 150^\circ\text{C}$
- SC data: Use of soft  $R_G$  necessary!
- Take care of over-voltage caused by stray induct.



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| Absolute Maximum Ratings |  | $T_{case} = 25^\circ\text{C}$ , unless otherwise specified |                  |   |
|--------------------------|--|--|------------------|---|
| Symbol                   | Conditions   | Values   | Units            |   |
| <b>IGBT</b>              |  |  |                  |   |
| $V_{CES}$                | $T_j = 25^\circ\text{C}$   | 600  | V                |   |
| $I_C$                    | $T_j = 175^\circ\text{C}$  | $T_c = 25^\circ\text{C}$                                   | 265              | A |
|                          |  | $T_c = 80^\circ\text{C}$                                   | 200              | A |
| $I_{CRM}$                | $I_{CRM} = 2 \times I_{Cnom}$ , $t_p = 1 \text{ ms}$   | 400  | A                |   |
| $V_{GES}$                |  | $\pm 20$   | V                |   |
| $t_{psc}$                | $V_{CC} = 360 \text{ V}$ ; $V_{GE} \leq 15 \text{ V}$ ; $T_j = 150^\circ\text{C}$<br>$V_{CES} < 600 \text{ V}$ | 6  | $\mu\text{s}$    |   |
| <b>Inverse Diode</b>     |  |  |                  |   |
| $I_F$                    | $T_j = 175^\circ\text{C}$  | $T_c = 25^\circ\text{C}$                                   | 200              | A |
|                          |  | $T_c = 80^\circ\text{C}$                                   | 130              | A |
| $I_{FRM}$                | $I_{FRM} = 2 \times I_{Fnom}$ , $t_p = 1 \text{ ms}$   | 400  | A                |   |
| $I_{FSM}$                | $t_p = 10 \text{ ms}$ ; sin. $T_j = 175^\circ\text{C}$   | 1400   | A                |   |
| <b>Module</b>            |  |  |                  |   |
| $I_{t(RMS)}$             |  | 200  | A                |   |
| $T_{vj}$                 |  | - 40 ... + 175   | $^\circ\text{C}$ |   |
| $T_{stg}$                | $T_{OPERATION} \leq T_{stg}$   | - 40 ... + 125   | $^\circ\text{C}$ |   |
| $V_{isol}$               | AC, 1 min.   | 4000   | V                |   |

| Characteristics |  | $T_{case} = 25^\circ\text{C}$ , unless otherwise specified     |      |      |            |
|-----------------|--|--|------|------|------------|
| Symbol          | Conditions   | min.   | typ. | max. | Units      |
| <b>IGBT</b>     |  |  |      |      |            |
| $V_{GE(th)}$    | $V_{GE} = V_{CE}$ , $I_C = 3,2 \text{ mA}$           | 5  | 5,8  | 6,5  | V          |
| $I_{CES}$       | $V_{GE} = 0 \text{ V}$ , $V_{CE} = V_{CES}$          |  | 0,13 | 0,38 | mA         |
| $V_{CE0}$       |  | $T_j = 25^\circ\text{C}$                                       | 0,9  | 1    | V          |
|                 |  | $T_j = 150^\circ\text{C}$                                      | 0,85 | 0,9  | V          |
| $r_{CE}$        | $V_{GE} = 15 \text{ V}$                              | $T_j = 25^\circ\text{C}$                                       | 2,8  | 4,5  | m $\Omega$ |
|                 |  | $T_j = 150^\circ\text{C}$                                      | 4,3  | 6    | m $\Omega$ |
| $V_{CE(sat)}$   | $I_{Cnom} = 200 \text{ A}$ , $V_{GE} = 15 \text{ V}$ | $T_j = 25^\circ\text{C}_{chiplev.}$                            | 1,45 | 1,9  | V          |
|                 |  | $T_j = 150^\circ\text{C}_{chiplev.}$                           | 1,7  | 2,1  | V          |
| $C_{ies}$       | $V_{CE} = 25$ , $V_{GE} = 0 \text{ V}$               | $f = 1 \text{ MHz}$  | 12,3 |      | nF         |
| $C_{oes}$       |  |  | 0,77 |      | nF         |
| $C_{res}$       |  |  | 0,37 |      | nF         |
| $Q_G$           | $V_{GE} = -8\text{V} \dots +15\text{V}$              |  | 1500 |      | nC         |
| $R_{Gint}$      | $T_j = ^\circ\text{C}$                               |  | 2    |      | $\Omega$   |
| $t_{d(on)}$     | $R_{Gon} = 3 \Omega$                                 | $V_{CC} = 300\text{V}$<br>$I_{Cnom} = 200\text{A}$             | 160  |      | ns         |
| $t_r$           |  |  | 68   |      | ns         |
| $E_{on}$        | $R_{Goff} = 3 \Omega$                                | $T_j = 150^\circ\text{C}$<br>$V_{GE} = -8\text{V}/+15\text{V}$ | 14   |      | mJ         |
| $t_{d(off)}$    |  |  | 520  |      | ns         |
| $t_f$           |  |  | 49   |      | ns         |
| $E_{off}$       |  |  | 8    |      | mJ         |
| $R_{th(j-c)}$   | per IGBT   |  |      | 0,22 | K/W        |



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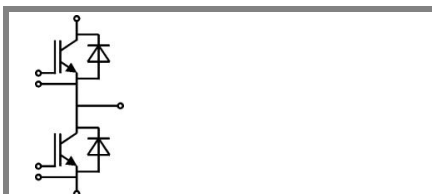
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### Characteristics

| Symbol               | Conditions                                       | min.                           | typ. | max. | Units |
|----------------------|--|--------------------------------|------|------|-------|
| <b>Inverse Diode</b> |  |                                |      |      |       |
| $V_F = V_{EC}$       | $I_{Fnom} = 200 \text{ A}; V_{GE} = 0 \text{ V}$ |                                | 1,4  | 1,6  | V     |
| $V_{F0}$             |  |                                | 0,95 | 1    | V     |
| $r_F$                |  |                                | 2,3  | 3    | mΩ    |
| $I_{RRM}$            | $I_{Fnom} = 200 \text{ A}$                       |                                | 100  |      | A     |
| $Q_{rr}$             | $di/dt = 2000 \text{ A}/\mu\text{s}$             |                                | 30   |      | μC    |
| $E_{off}$            | $V_{GE} = -8 \text{ V}; V_{CC} = 300 \text{ V}$  |                                | 5,6  |      | mJ    |
| $R_{th(j-c)D}$       | per diode  |                                |      | 0,4  | K/W   |
| <b>Module</b>        |  |                                |      |      |       |
| $L_{CE}$             |  |                                |      | 30   | nH    |
| $R_{CC+EE}$          | res., terminal-chip                              | $T_{case} = 25^\circ\text{C}$  | 0,75 |      | mΩ    |
|                      |  | $T_{case} = 125^\circ\text{C}$ | 1    |      | mΩ    |
| $R_{th(c-s)}$        | per module                                       |                                |      | 0,05 | K/W   |
| $M_s$                | to heat sink M6                                  |                                | 3    | 5    | Nm    |
| $M_t$                | to terminals M5                                  |                                | 2,5  | 5    | Nm    |
| w                    |  |                                |      | 150  | g     |

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

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.

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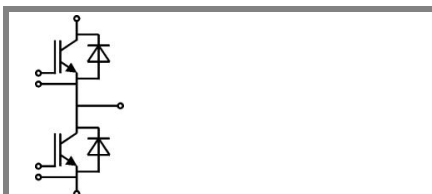
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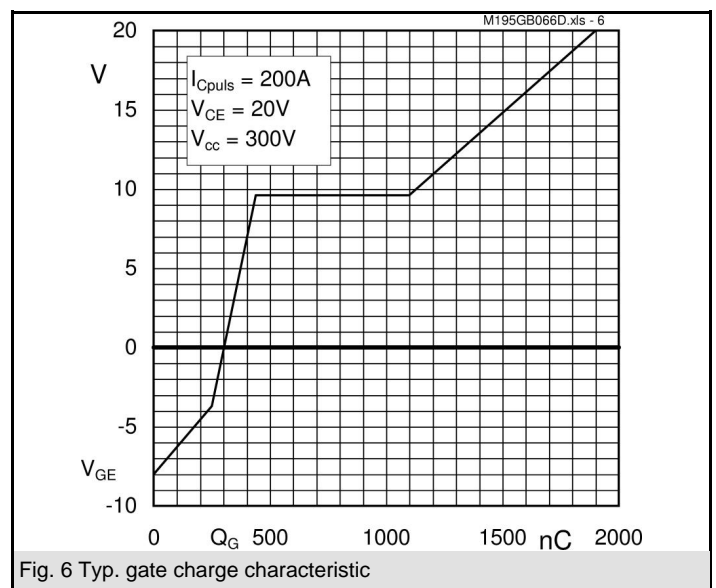
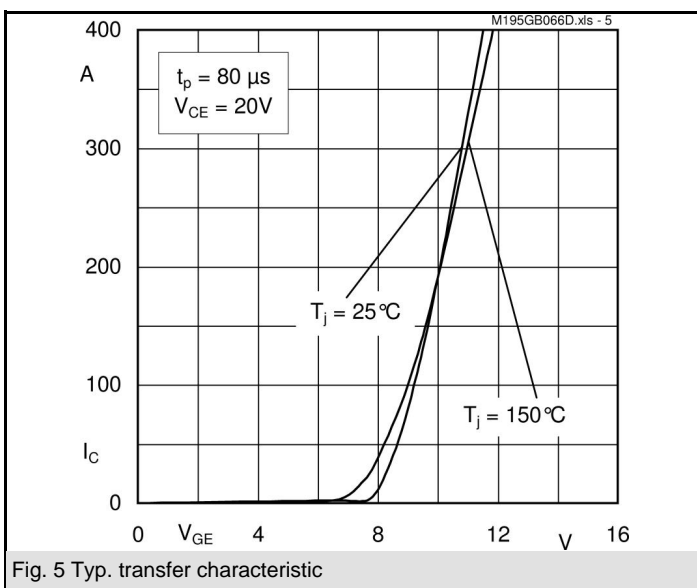
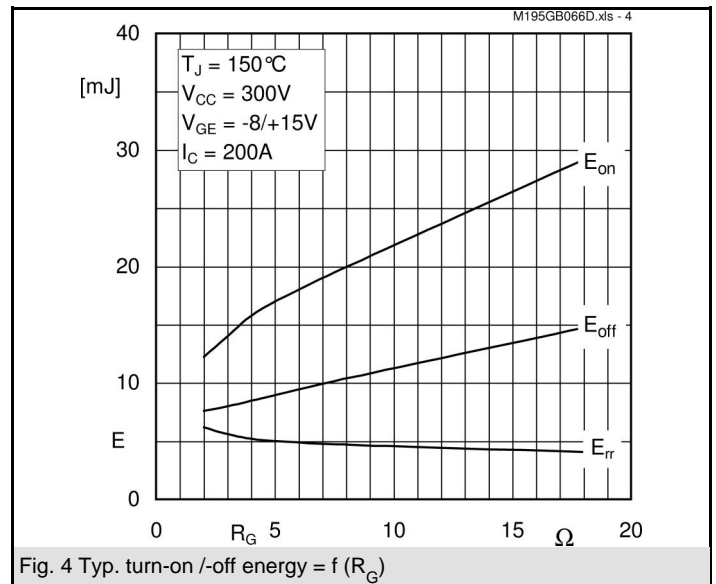
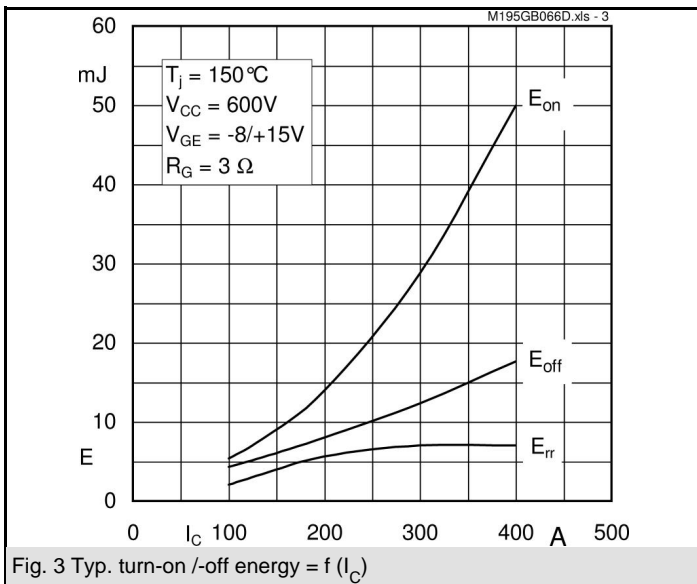
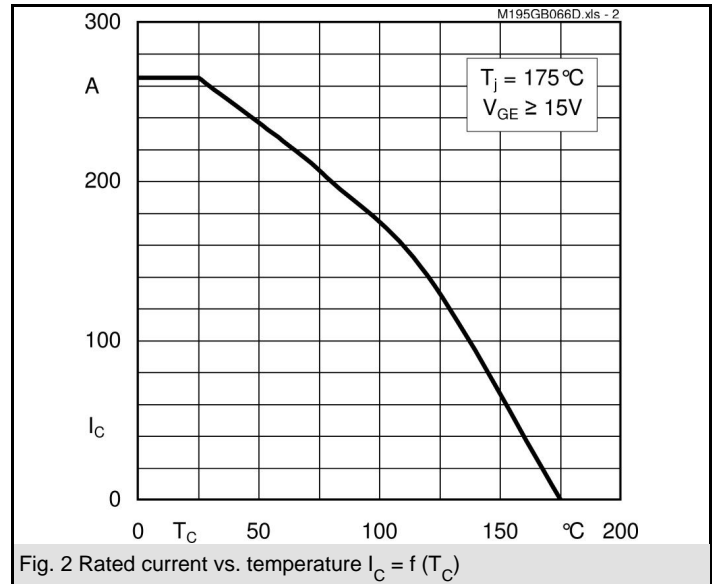
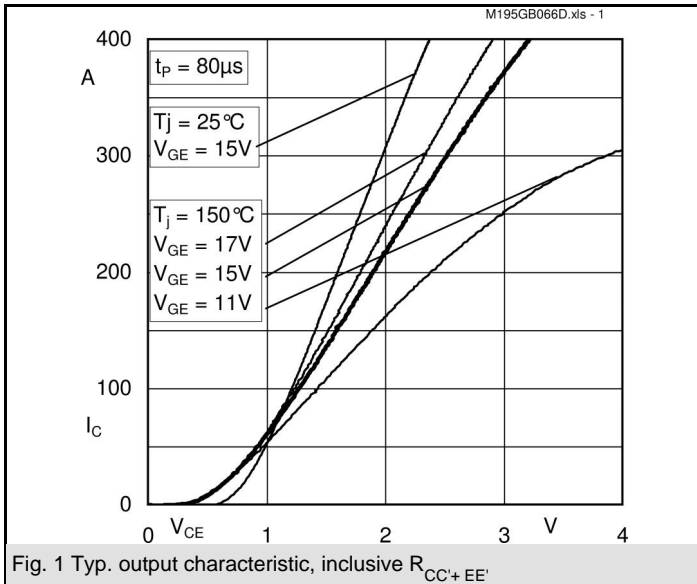
### Remarks

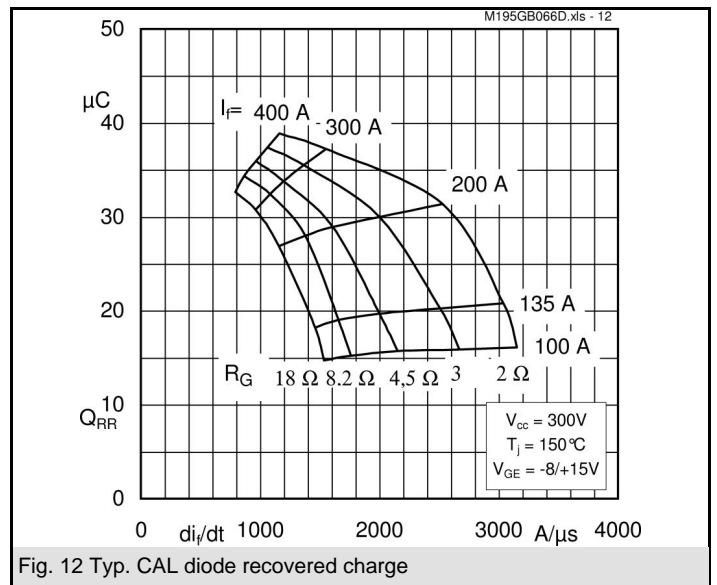
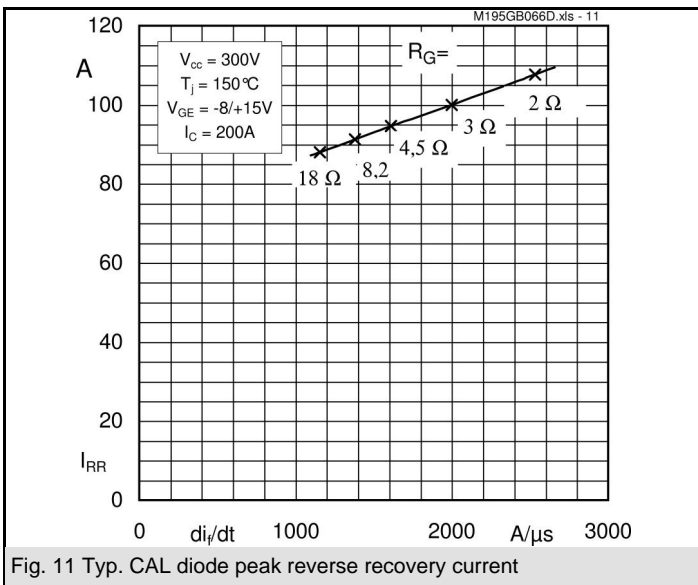
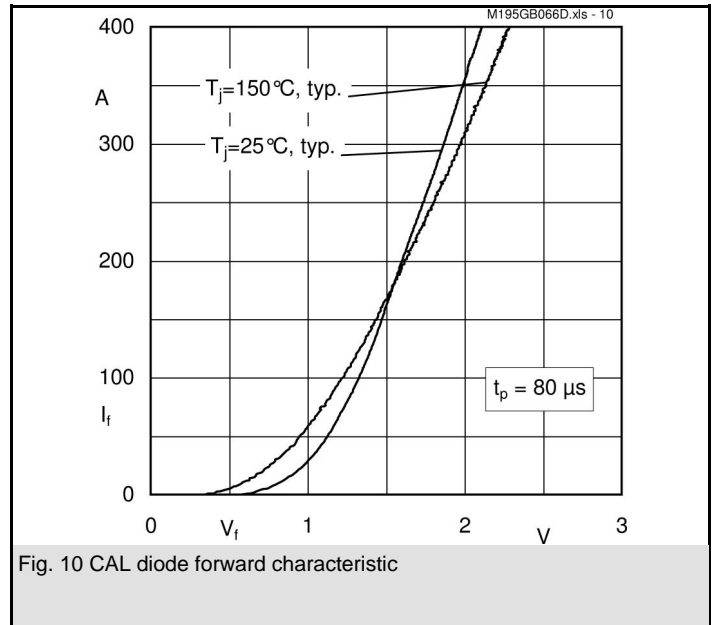
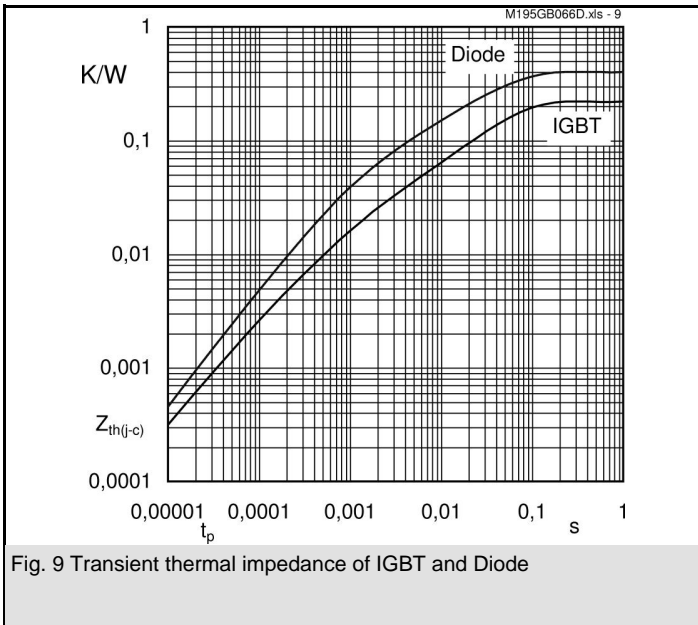
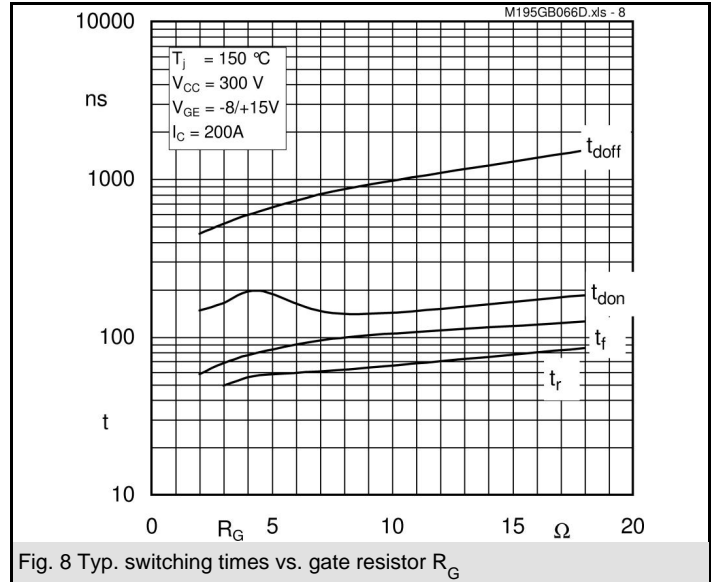
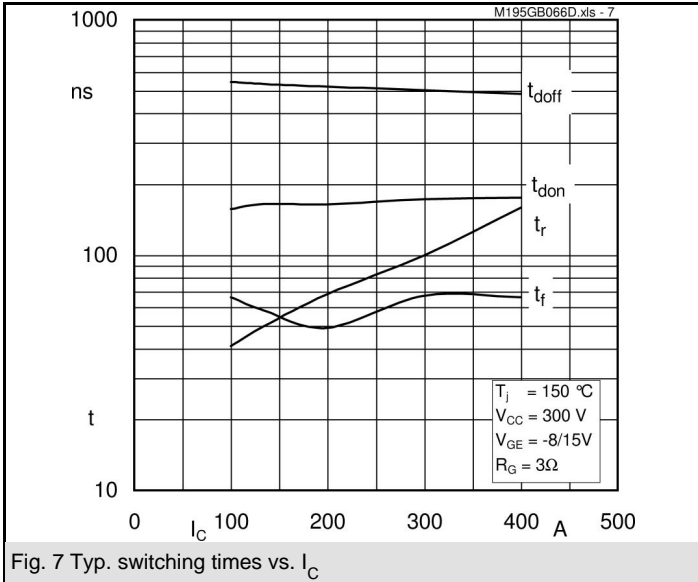
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| $Z_{th}$<br>Symbol               | Conditions | Values | Units |
|----------------------------------|------------|--------|-------|
| <b><math>Z_{th(j-c)I}</math></b> |            |        |       |
| $R_{\theta i}$                   | $i = 1$    | 160    | mk/W  |
| $R_{\theta i}$                   | $i = 2$    | 41     | mk/W  |
| $R_{\theta i}$                   | $i = 3$    | 16     | mk/W  |
| $R_{\theta i}$                   | $i = 4$    | 3      | mk/W  |
| $\tau_{\theta i}$                | $i = 1$    | 0,0276 | s     |
| $\tau_{\theta i}$                | $i = 2$    | 0,0406 | s     |
| $\tau_{\theta i}$                | $i = 3$    | 0,001  | s     |
| $\tau_{\theta i}$                | $i = 4$    | 0,0011 | s     |
| <b><math>Z_{th(j-c)D}</math></b> |            |        |       |
| $R_{\theta i}$                   | $i = 1$    | 250    | mk/W  |
| $R_{\theta i}$                   | $i = 2$    | 110    | mk/W  |
| $R_{\theta i}$                   | $i = 3$    | 35     | mk/W  |
| $R_{\theta i}$                   | $i = 4$    | 5      | mk/W  |
| $\tau_{\theta i}$                | $i = 1$    | 0,054  | s     |
| $\tau_{\theta i}$                | $i = 2$    | 0,012  | s     |
| $\tau_{\theta i}$                | $i = 3$    | 0,0015 | s     |
| $\tau_{\theta i}$                | $i = 4$    | 0,0007 | s     |



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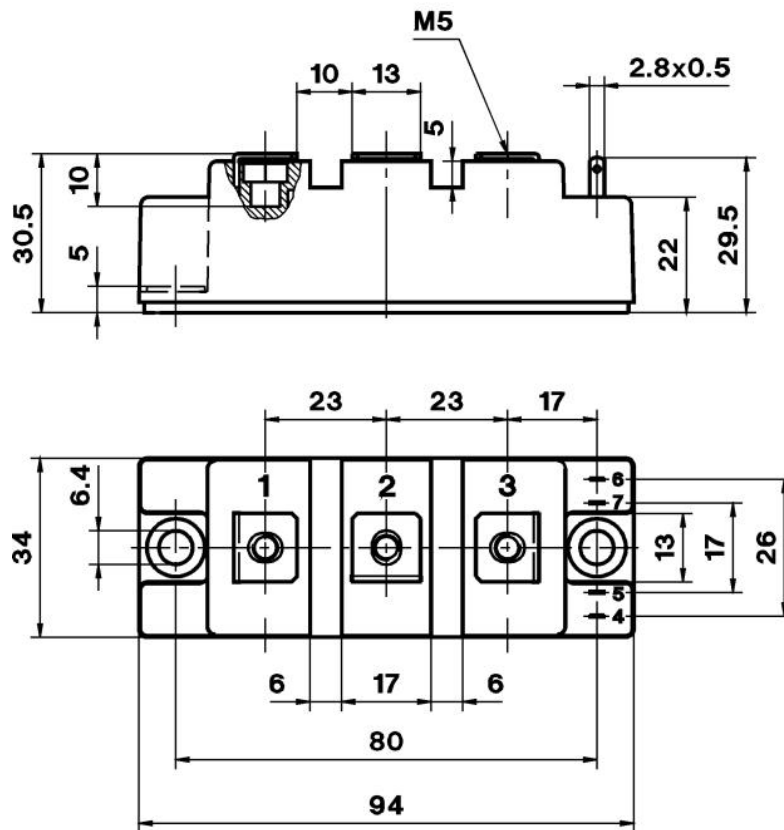


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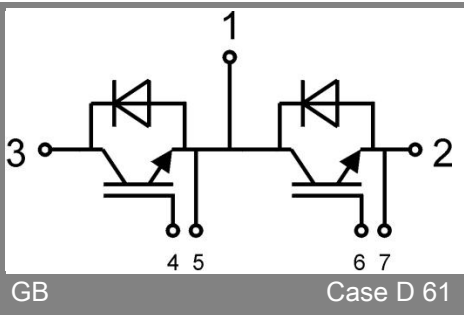
UL Recognized  
File no. E 63 532

Dimensions in mm

CASED61



Case D 61



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Case D 61