

# SKM 75GB176D



**SEMITRANS® 2**

## Trench IGBT Modules

**SKM 75GB176D**

### Features

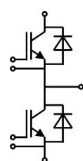
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$

### Typical Applications\*

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

| 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                               | 80            | A     |
|                          |                                                                                                        | T <sub>c</sub> = 80 °C                               | 55            | A     |
| I <sub>CRM</sub>         | I <sub>CRM</sub> =2xI <sub>Cnom</sub>                                                                  |                                                      | 100           | 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                               | 80            | A     |
|                          |                                                                                                        | T <sub>c</sub> = 80 °C                               | 55            | A     |
| I <sub>FRM</sub>         | I <sub>FRM</sub> =2xI <sub>Fnom</sub>                                                                  |                                                      | 100           | A     |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms; sin.                                                                           | T <sub>j</sub> = 150 °C                              | 550           | A     |
| Module                   |                                                                                                        |                                                      |               |       |
| I <sub>t(RMS)</sub>      |                                                                                                        |                                                      | 200           | 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 |                                                                | $T_{case} = 25^\circ\text{C}$ , unless otherwise specified |                                      |      |                  |
|-----------------|----------------------------------------------------------------|------------------------------------------------------------|--------------------------------------|------|------------------|
| Symbol          | Conditions                                                     | min.                                                       | typ.                                 | max. | Units            |
| <b>IGBT</b>     |                                                                |                                                            |                                      |      |                  |
| $V_{GE(th)}$    | $V_{GE} = V_{CE}, I_C = 2\text{ mA}$                           | 5,2                                                        | 5,8                                  | 6,4  | V                |
| $I_{CES}$       | $V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$                        |                                                            |                                      | 3    | mA               |
| $V_{CE0}$       |                                                                |                                                            | $T_j = 25^\circ\text{C}$             | 1    | V                |
|                 |                                                                |                                                            | $T_j = 125^\circ\text{C}$            | 0,9  | V                |
| $r_{CE}$        | $V_{GE} = 15\text{ V}$                                         |                                                            | $T_j = 25^\circ\text{C}$             | 20   | $\text{m}\Omega$ |
|                 |                                                                |                                                            | $T_j = 125^\circ\text{C}$            | 31   | $\text{m}\Omega$ |
| $V_{CE(sat)}$   | $I_{Cnom} = 50\text{ A}, V_{GE} = 15\text{ V}$                 |                                                            | $T_j = 25^\circ\text{C}_{chiplev.}$  | 2    | V                |
|                 |                                                                |                                                            | $T_j = 125^\circ\text{C}_{chiplev.}$ | 2,45 | V                |
| $C_{ies}$       | $V_{CE} = 25, V_{GE} = 0\text{ V}$                             | $f = 1\text{ MHz}$                                         |                                      | 4,3  | nF               |
| $C_{oes}$       |                                                                |                                                            |                                      | 0,18 | nF               |
| $C_{res}$       |                                                                |                                                            |                                      | 0,15 | nF               |
| $Q_G$           | $V_{GE} = -8\text{V}...+15\text{V}$                            |                                                            |                                      | 410  | nC               |
| $R_{Gint}$      | $T_j = 25^\circ\text{C}$                                       |                                                            |                                      | 9,5  | $\Omega$         |
| $t_{d(on)}$     | $R_{Gon} = 6,2\ \Omega$<br>$di/dt = 1680\text{ A}/\mu\text{s}$ | $V_{CC} = 1200\text{V}$<br>$I_C = 50\text{A}$              |                                      | 210  | ns               |
| $t_r$           |                                                                |                                                            |                                      | 30   | ns               |
| $E_{on}$        |                                                                |                                                            |                                      | 25   | mJ               |
| $t_{d(off)}$    | $R_{Goff} = 6,2\ \Omega$<br>$di/dt = 320\text{ A}/\mu\text{s}$ | $T_j = 125^\circ\text{C}$<br>$V_{GE} = \pm 15\text{V}$     |                                      | 590  | ns               |
| $t_f$           |                                                                |                                                            |                                      | 135  | ns               |
| $E_{off}$       |                                                                |                                                            |                                      | 18   | mJ               |
| $R_{th(j-c)}$   | per IGBT                                                       |                                                            |                                      | 0,38 | K/W              |



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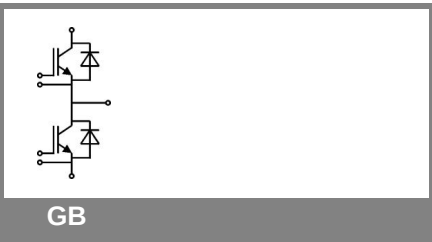
Typical Applications\*

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

| Characteristics                  |                                                   |                                             |      |      |      |       |
|----------------------------------|---------------------------------------------------|---------------------------------------------|------|------|------|-------|
| Symbol                           | Conditions                                        |                                             | min. | typ. | max. | Units |
| Inverse Diode                    |                                                   |                                             |      |      |      |       |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>Fnom</sub> = 50 A; V <sub>GE</sub> = 0 V   | T <sub>j</sub> = 25 °C <sub>chiplev.</sub>  | 1,7  | 1,9  | V    |       |
|                                  |                                                   | T <sub>j</sub> = 125 °C <sub>chiplev.</sub> | 1,8  | 2    | V    |       |
| V <sub>F0</sub>                  |                                                   | T <sub>j</sub> = 25 °C                      | 1,1  | 1,3  | V    |       |
|                                  |                                                   | T <sub>j</sub> = 125 °C                     | 0,9  | 1,1  | V    |       |
| r <sub>F</sub>                   |                                                   | T <sub>j</sub> = 25 °C                      | 12   | 12   | mΩ   |       |
|                                  |                                                   | T <sub>j</sub> = 125 °C                     | 18   | 18   | mΩ   |       |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 50 A                             | T <sub>j</sub> = 125 °C                     | 52   |      | A    |       |
| Q <sub>rr</sub>                  | di/dt = 1320 A/μs                                 |                                             | 20   |      | μC   |       |
| E <sub>rr</sub>                  | V <sub>GE</sub> = -15 V; V <sub>CC</sub> = 1200 V |                                             | 14,5 |      | mJ   |       |
| R <sub>th(j-c)D</sub>            | per diode                                         |                                             |      | 0,55 | K/W  |       |
| Module                           |                                                   |                                             |      |      |      |       |
| L <sub>CE</sub>                  |                                                   |                                             |      | 30   | nH   |       |
| R <sub>CC'+EE'</sub>             | res., terminal-chip                               | T <sub>case</sub> = 25 °C                   | 0,75 |      | mΩ   |       |
|                                  |                                                   | T <sub>case</sub> = 125 °C                  | 1    |      | mΩ   |       |
| R <sub>th(c-s)</sub>             | per module                                        |                                             |      | 0,05 | K/W  |       |
| M <sub>s</sub>                   | to heat sink M6                                   |                                             | 3    | 5    | Nm   |       |
| M <sub>t</sub>                   | to terminals M5                                   |                                             | 2,5  | 5    | Nm   |       |
| w                                |                                                   |                                             |      | 160  | 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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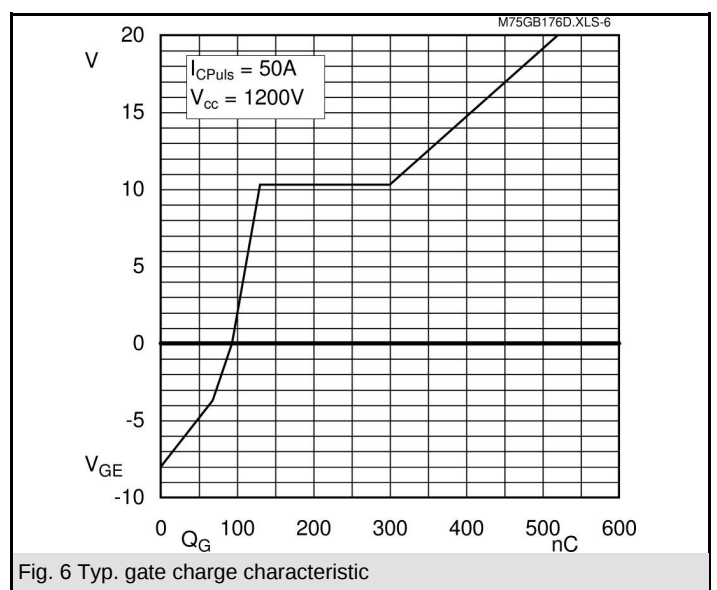
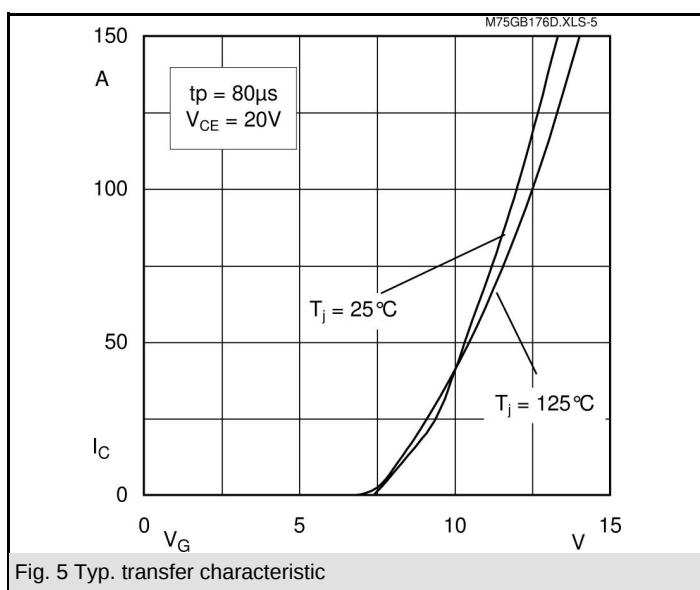
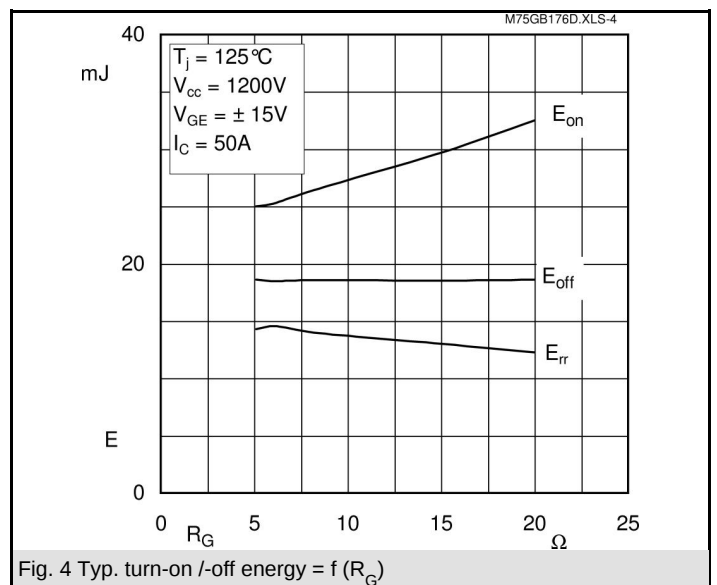
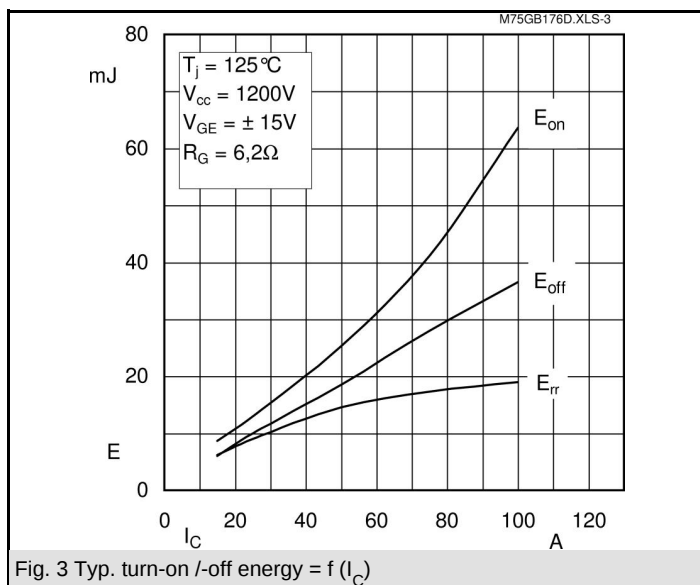
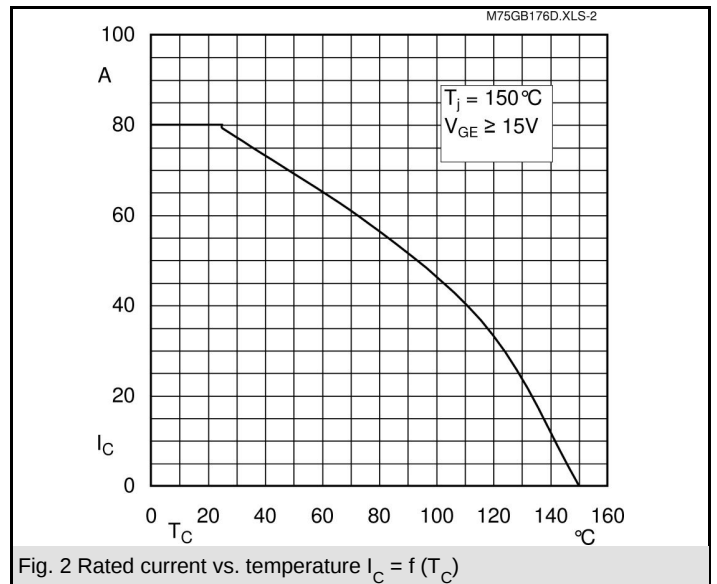
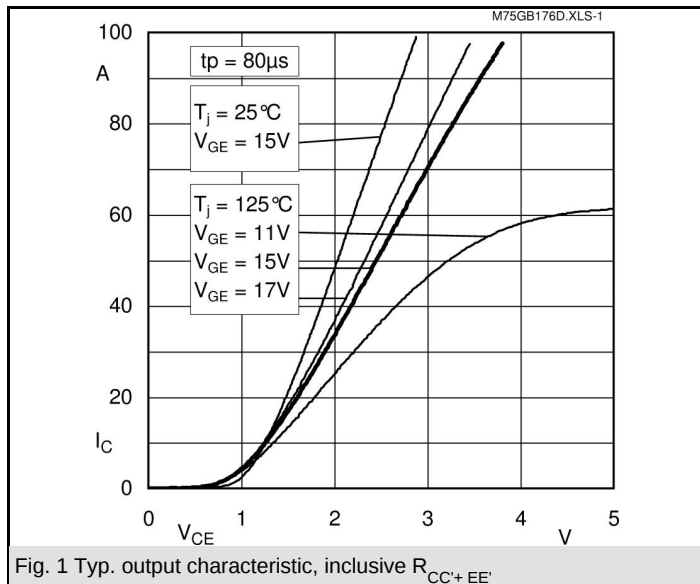
### Typical Applications\*

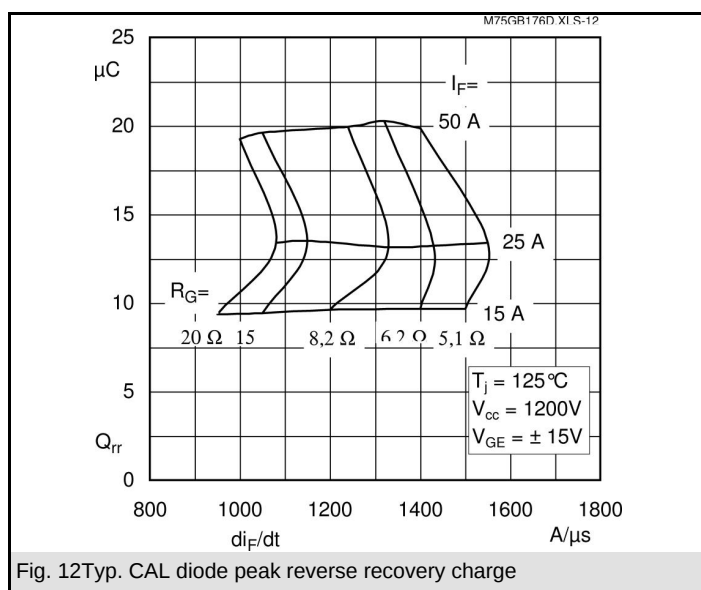
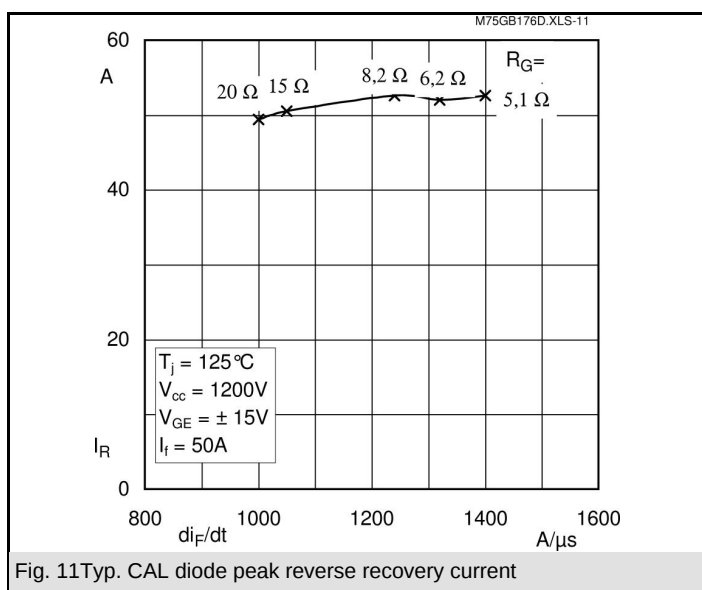
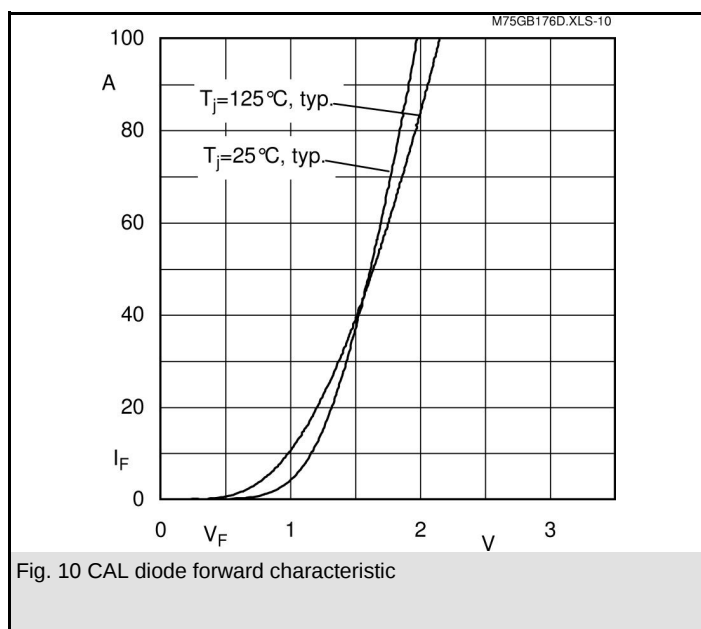
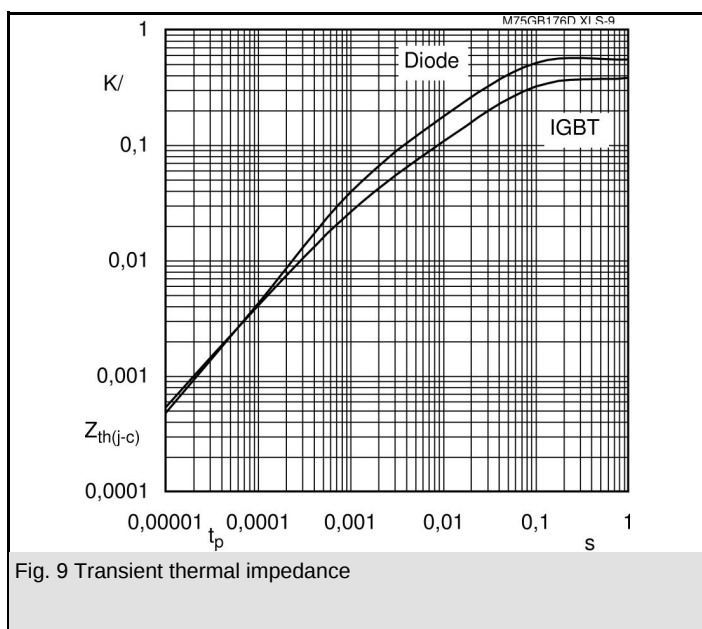
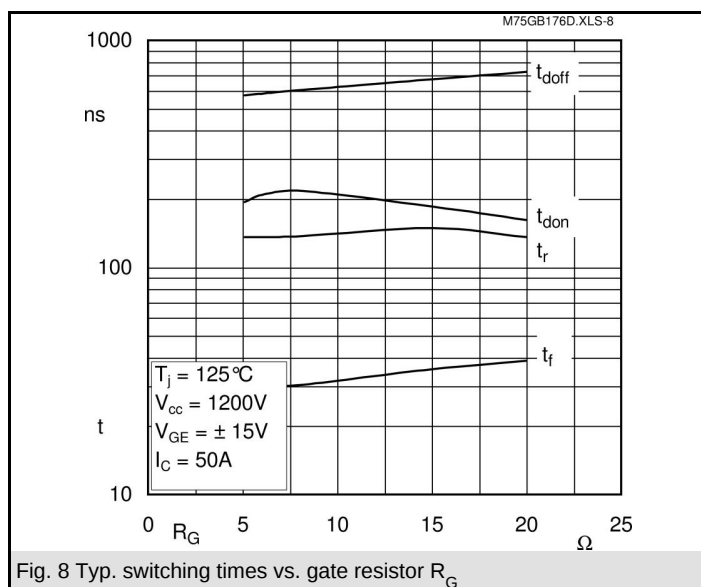
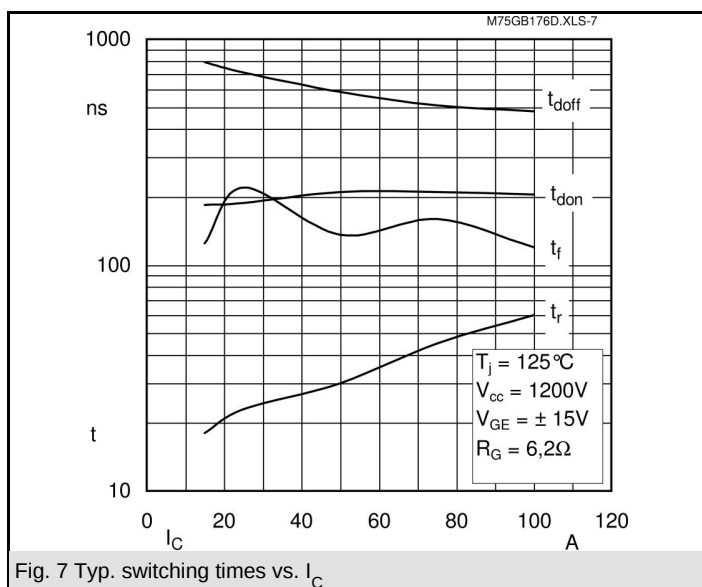
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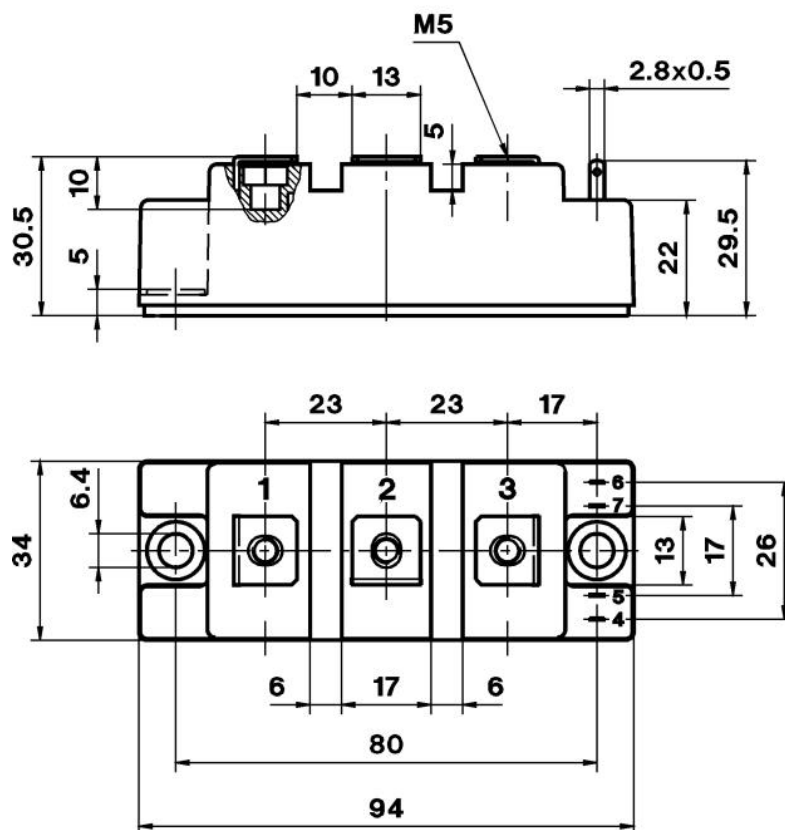
| $Z_{th}$       |            |        |       |
|----------------|------------|--------|-------|
| Symbol         | Conditions | Values | Units |
| $Z_{th(j-c)I}$ |            |        |       |
| $R_i$          | $i = 1$    | 270    | mk/W  |
| $R_i$          | $i = 2$    | 85     | mk/W  |
| $R_i$          | $i = 3$    | 21     | mk/W  |
| $R_i$          | $i = 4$    | 4      | mk/W  |
| $\tau_{u_i}$   | $i = 1$    | 0,0393 | s     |
| $\tau_{u_i}$   | $i = 2$    | 0,0786 | s     |
| $\tau_{u_i}$   | $i = 3$    | 0,0014 | s     |
| $\tau_{u_i}$   | $i = 4$    | 0,0002 | s     |
| $Z_{th(j-c)D}$ |            |        |       |
| $R_i$          | $i = 1$    | 360    | mk/W  |
| $R_i$          | $i = 2$    | 150    | mk/W  |
| $R_i$          | $i = 3$    | 36     | mk/W  |
| $R_i$          | $i = 4$    | 4      | mk/W  |
| $\tau_{u_i}$   | $i = 1$    | 0,0262 | s     |
| $\tau_{u_i}$   | $i = 2$    | 0,0417 | s     |
| $\tau_{u_i}$   | $i = 3$    | 0,0012 | s     |
| $\tau_{u_i}$   | $i = 4$    | 0,001  | s     |



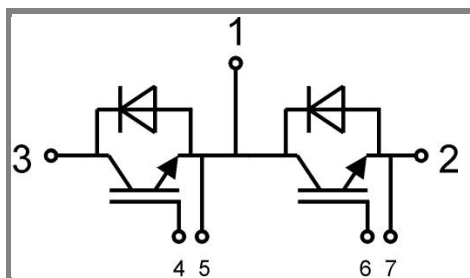
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Case D 61



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