



## SEMITRANS® 6

### IGBT modules

#### SKM25GD125D

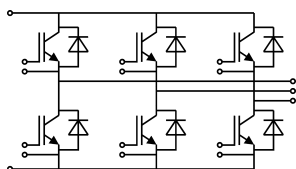
##### Target Data

##### Features

- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_{Cnom}$
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)
- UL recognized, file no. E63532

##### Typical Applications\*

- Three phase inverters for AC motor speed control
- Pulse frequencies also above 15 kHz
- DC servo and robot drives



GD

| 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> = 150 °C                                                        | T <sub>c</sub> = 25 °C  | 39          | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 27          | A    |
| I <sub>Cnom</sub>        |                                                                                |                         | 25          | A    |
| I <sub>CRM</sub>         | I <sub>CRM</sub> = 2xI <sub>Cnom</sub>                                         |                         | 50          | A    |
| V <sub>GES</sub>         |                                                                                |                         | -20 ... 20  | V    |
| t <sub>psc</sub>         | V <sub>CC</sub> = 600 V<br>V <sub>GE</sub> ≤ 15 V<br>V <sub>CES</sub> ≤ 1200 V | T <sub>j</sub> = 125 °C | 10          | μs   |
| T <sub>j</sub>           |                                                                                |                         | -55 ... 150 | °C   |
| Inverse diode            |                                                                                |                         |             |      |
| I <sub>F</sub>           | T <sub>j</sub> = 150 °C                                                        | T <sub>c</sub> = 25 °C  | 47          | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 32          | A    |
| I <sub>Fnom</sub>        |                                                                                |                         | 40          | A    |
| I <sub>FRM</sub>         | I <sub>FRM</sub> = 2xI <sub>Fnom</sub>                                         |                         | 80          | A    |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 25 °C                       |                         | 410         | A    |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 150 | °C   |
| Module                   |                                                                                |                         |             |      |
| I <sub>t(RMS)</sub>      | T <sub>terminal</sub> = 80 °C                                                  |                         | 100         | 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> = 25 A                                    | T <sub>j</sub> = 25 °C  |      | 3.20  | 3.70  | V    |
|                      | V <sub>GE</sub> = 15 V<br>chiplevel                      | T <sub>j</sub> = 125 °C |      | 3.60  | 4.20  | V    |
| V <sub>CE0</sub>     | chiplevel                                                | T <sub>j</sub> = 25 °C  |      | 1.5   | 1.75  | V    |
|                      |                                                          | T <sub>j</sub> = 125 °C |      | 1.7   | 1.95  | V    |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V<br>chiplevel                      | T <sub>j</sub> = 25 °C  |      | 68.00 | 78.00 | mΩ   |
|                      |                                                          | T <sub>j</sub> = 125 °C |      | 76.00 | 90.00 | mΩ   |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> =V <sub>CE</sub> , I <sub>C</sub> = 1 mA |                         | 4.5  | 5.5   | 6.5   | V    |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V                                    | T <sub>j</sub> = 25 °C  |      | 0.1   | 0.3   | mA   |
|                      | V <sub>CE</sub> = 1200 V                                 |                         |      |       |       | mA   |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25 V<br>V <sub>GE</sub> = 0 V          | f = 1 MHz               |      | 1.65  |       | nF   |
| C <sub>oes</sub>     |                                                          | f = 1 MHz               |      | 0.25  |       | nF   |
| C <sub>res</sub>     |                                                          | f = 1 MHz               |      | 0.11  |       | nF   |
| Q <sub>G</sub>       | V <sub>GE</sub> = - 8 V...+ 20 V                         |                         |      | 221   |       | nC   |
| R <sub>Gint</sub>    | T <sub>j</sub> = 25 °C                                   |                         |      | 0.00  |       | Ω    |
| t <sub>d(on)</sub>   | V <sub>CC</sub> = 600 V                                  | T <sub>j</sub> = 125 °C |      | 25    |       | ns   |
| t <sub>r</sub>       | I <sub>C</sub> = 25 A                                    | T <sub>j</sub> = 125 °C |      | 19    |       | ns   |
| E <sub>on</sub>      | V <sub>GE</sub> = ±15 V                                  | T <sub>j</sub> = 125 °C |      | 3.9   |       | mJ   |
| t <sub>d(off)</sub>  | R <sub>G on</sub> = 16 Ω                                 | T <sub>j</sub> = 125 °C |      | 184   |       | ns   |
| t <sub>f</sub>       | R <sub>G off</sub> = 16 Ω                                | T <sub>j</sub> = 125 °C |      | 8     |       | ns   |
| E <sub>off</sub>     |                                                          | T <sub>j</sub> = 125 °C |      | 1.6   |       | mJ   |
| R <sub>th(j-c)</sub> | per IGBT                                                 |                         |      |       | 0.56  | K/W  |



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### SKM25GD125D

#### Target Data

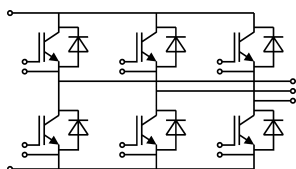
#### Features

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| Characteristics                  |                                                    |                         |      |      |      |      |
|----------------------------------|----------------------------------------------------|-------------------------|------|------|------|------|
| Symbol                           | Conditions                                         |                         | min. | typ. | max. | Unit |
| Inverse diode                    |                                                    |                         |      |      |      |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 40 A                              | T <sub>J</sub> = 25 °C  |      | 2.13 | 2.65 | V    |
|                                  | V <sub>GE</sub> = 0 V<br>chiplevel                 | T <sub>J</sub> = 125 °C |      | 1.94 | 2.46 | V    |
| V <sub>F0</sub>                  | chiplevel                                          | T <sub>J</sub> = 25 °C  |      | 1.1  | 1.45 | V    |
|                                  |                                                    | T <sub>J</sub> = 125 °C |      | 0.85 | 1.2  | V    |
| r <sub>F</sub>                   | chiplevel                                          | T <sub>J</sub> = 25 °C  |      | 25.7 | 30.0 | mΩ   |
|                                  |                                                    | T <sub>J</sub> = 125 °C |      | 27.1 | 31.4 | mΩ   |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 25 A                              | T <sub>J</sub> = 125 °C |      | 50   |      | A    |
| Q <sub>rr</sub>                  | di/dt <sub>off</sub> = 2500 A/μs                   | T <sub>J</sub> = 125 °C |      | 4    |      | μC   |
| E <sub>rr</sub>                  | V <sub>GE</sub> = ±15 V<br>V <sub>CC</sub> = 600 V | T <sub>J</sub> = 125 °C |      | 1.1  |      | mJ   |
| R <sub>th(j-c)</sub>             | per diode                                          |                         |      |      | 1    | K/W  |
| Module                           |                                                    |                         |      |      |      |      |
| L <sub>CE</sub>                  |                                                    |                         |      |      | 60   | nH   |
| R <sub>CC'+EE'</sub>             | terminal-chip                                      | T <sub>C</sub> = 25 °C  |      |      |      | mΩ   |
|                                  |                                                    | T <sub>C</sub> = 125 °C |      |      |      | mΩ   |
| R <sub>th(c-s)</sub>             | per module                                         |                         |      |      | 0.05 | K/W  |
| M <sub>s</sub>                   | to heat sink M6                                    |                         | 4    |      | 5    | Nm   |
| M <sub>t</sub>                   |                                                    |                         |      |      |      | Nm   |
|                                  |                                                    |                         |      |      |      | Nm   |
| w                                |                                                    |                         |      |      | 175  | g    |



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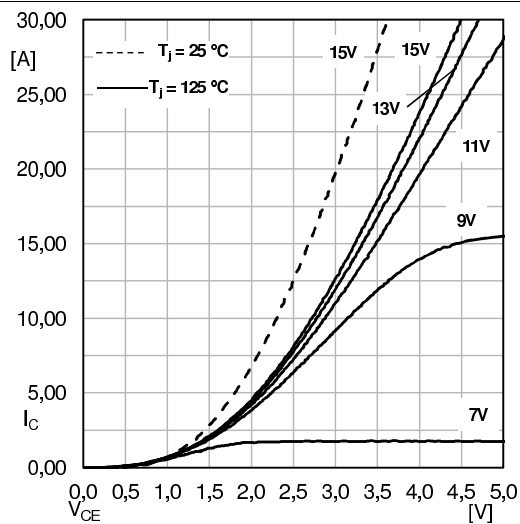


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'} + E_{E'}$

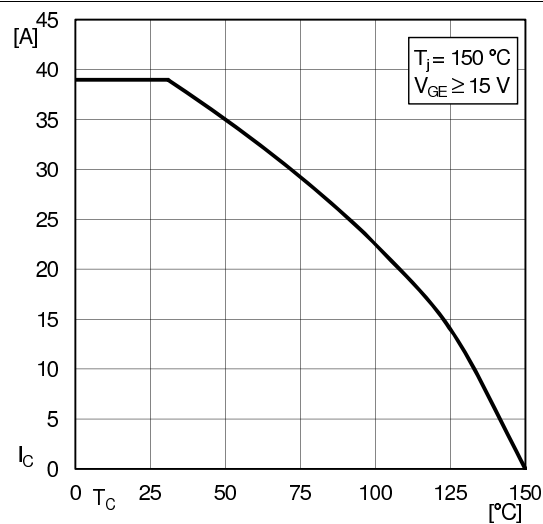


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

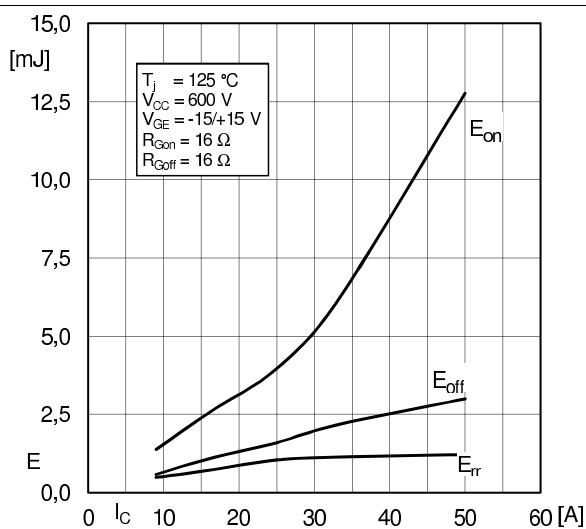


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

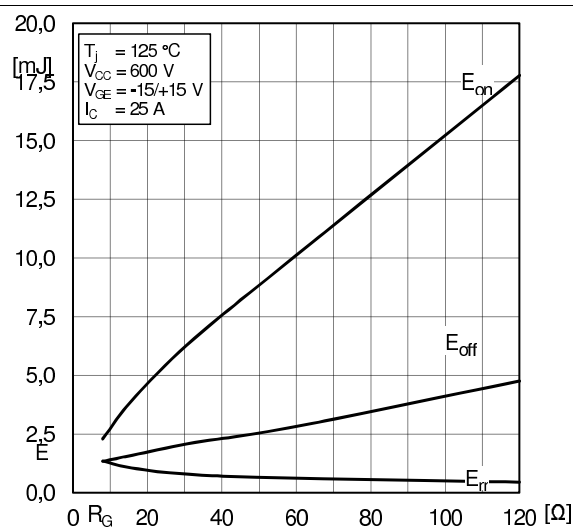


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

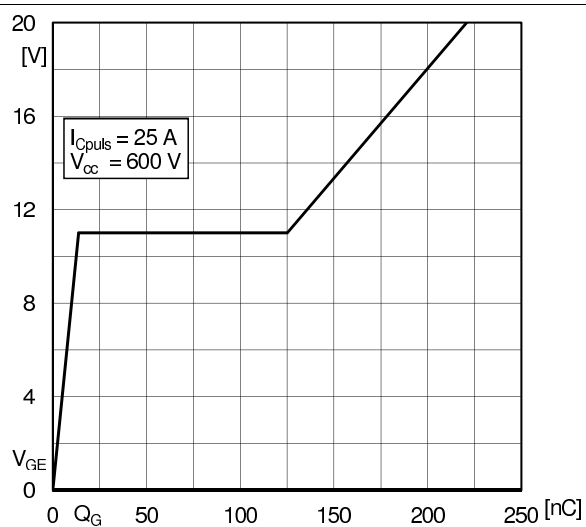


Fig. 6: Typ. gate charge characteristic

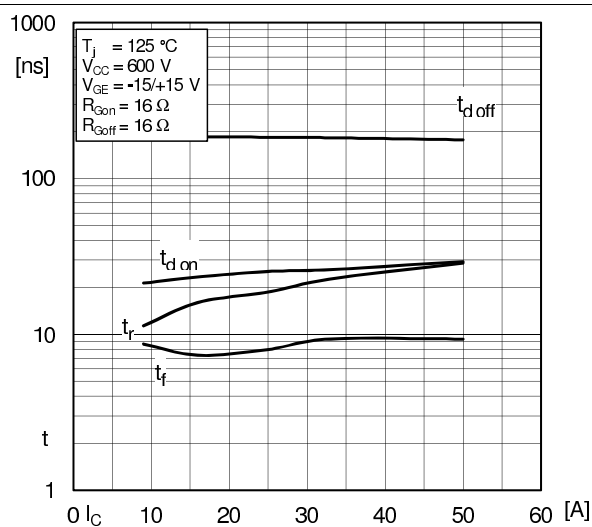


Fig. 7: Typ. switching times vs.  $I_C$

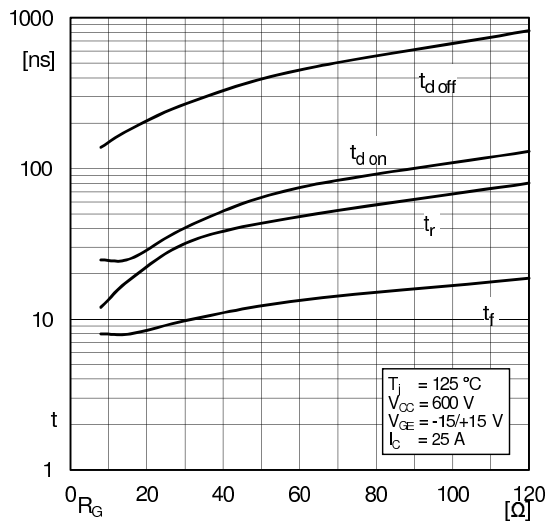


Fig. 8: Typ. switching times vs. gate resistor R<sub>G</sub>

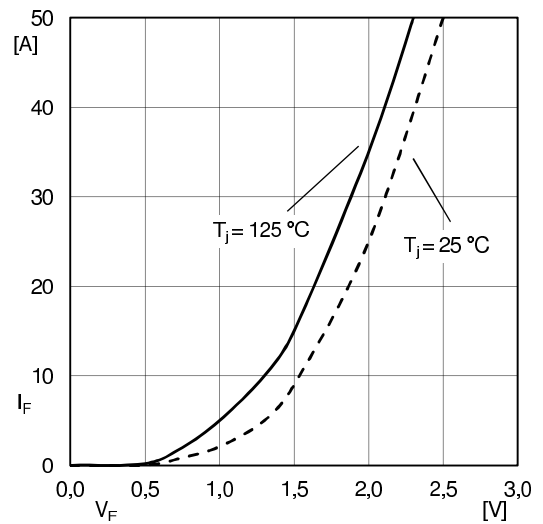
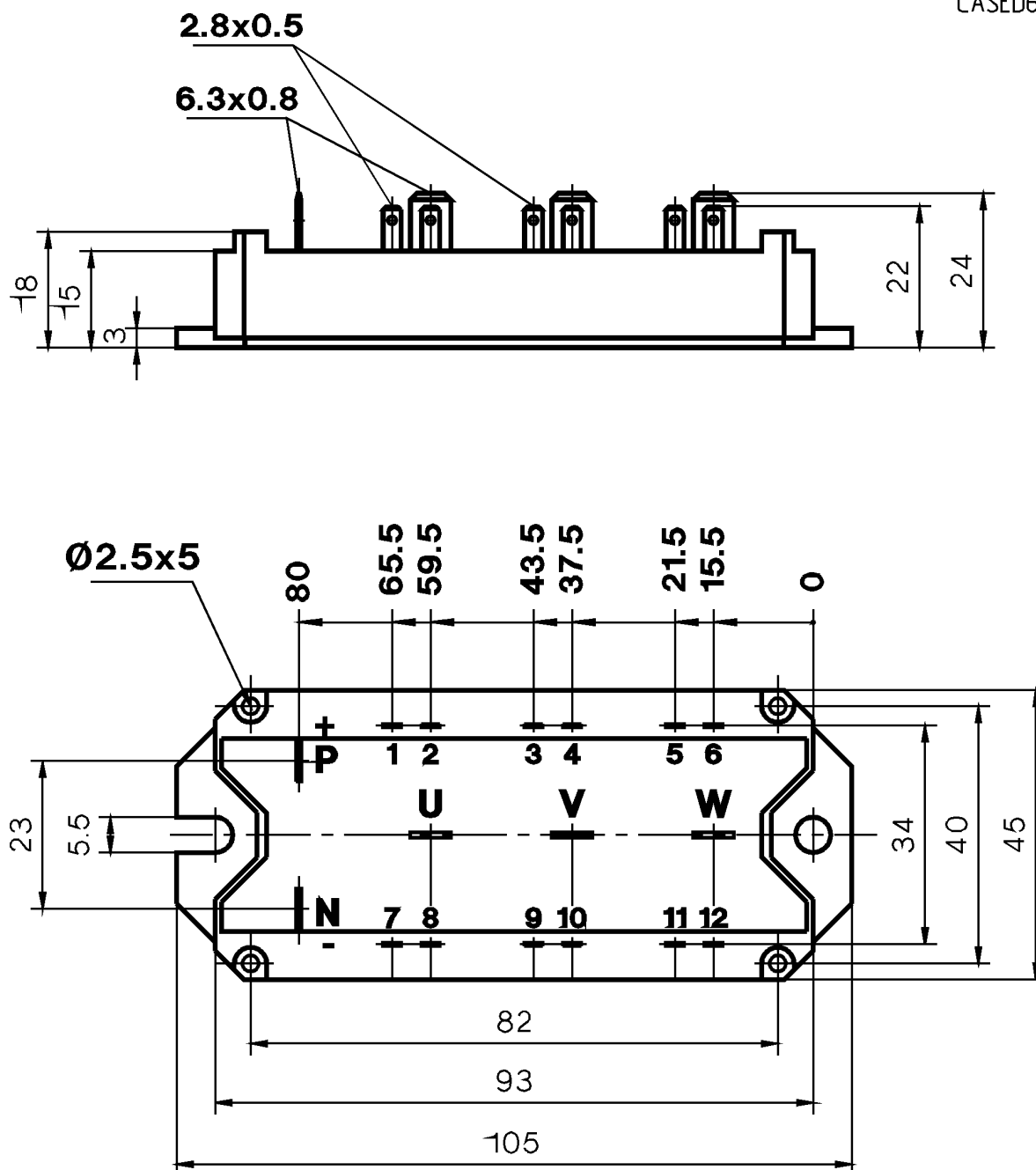
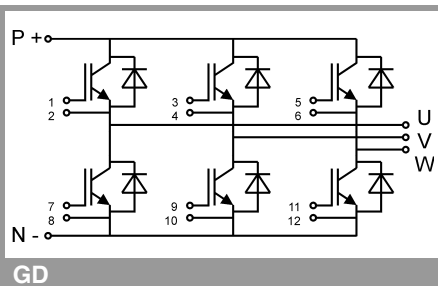


Fig. 10: Typ. CAL diode forward charact., incl. R<sub>CC'+EE'</sub>



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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 staff.