

# SEMiX252GB126HDs



SEMiX® 2s

## Trench IGBT Modules

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#### Features

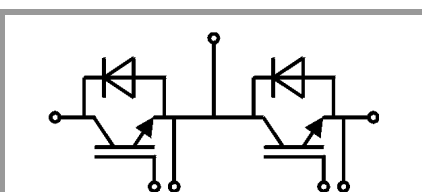
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

#### Typical Applications\*

- AC inverter drives
- UPS
- Electronic Welding

#### Remarks

- Case temperatur limited to  $T_C=125^\circ\text{C}$  max.
- Not for new design



GB

#### Absolute Maximum Ratings

| Symbol               | Conditions                                                                           | Values                    | Unit             |
|----------------------|--------------------------------------------------------------------------------------|---------------------------|------------------|
| <b>IGBT</b>          |                                                                                      |                           |                  |
| $V_{CES}$            | $T_j = 25^\circ\text{C}$                                                             | 1200                      | V                |
| $I_C$                | $T_j = 150^\circ\text{C}$                                                            | $T_c = 25^\circ\text{C}$  | 242              |
|                      |                                                                                      | $T_c = 80^\circ\text{C}$  | 170              |
| $I_{Cnom}$           |                                                                                      | 150                       | A                |
| $I_{CRM}$            | $I_{CRM} = 2 \times I_{Cnom}$                                                        | 300                       | A                |
| $V_{GES}$            |                                                                                      | -20 ... 20                | V                |
| $t_{psc}$            | $V_{CC} = 600\text{ V}$<br>$V_{GE} \leq 20\text{ V}$<br>$V_{CES} \leq 1200\text{ V}$ | $T_j = 125^\circ\text{C}$ | 10               |
| $T_j$                |                                                                                      | -40 ... 150               | $^\circ\text{C}$ |
| <b>Inverse diode</b> |                                                                                      |                           |                  |
| $I_F$                | $T_j = 150^\circ\text{C}$                                                            | $T_c = 25^\circ\text{C}$  | 228              |
|                      |                                                                                      | $T_c = 80^\circ\text{C}$  | 158              |
| $I_{Fnom}$           |                                                                                      | 150                       | A                |
| $I_{FRM}$            | $I_{FRM} = 2 \times I_{Fnom}$                                                        | 300                       | A                |
| $I_{FSM}$            | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$                         | 1000                      | A                |
| $T_j$                |                                                                                      | -40 ... 150               | $^\circ\text{C}$ |
| <b>Module</b>        |                                                                                      |                           |                  |
| $I_{t(RMS)}$         | $T_{terminal} = 80^\circ\text{C}$                                                    | 600                       | A                |
| $T_{stg}$            |                                                                                      | -40 ... 125               | $^\circ\text{C}$ |
| $V_{isol}$           | AC sinus 50Hz, $t = 1\text{ min}$                                                    | 4000                      | V                |

#### Characteristics

| Symbol        | Conditions                                                   | min.                      | typ.                      | max. | Unit     |
|---------------|--------------------------------------------------------------|---------------------------|---------------------------|------|----------|
| <b>IGBT</b>   |                                                              |                           |                           |      |          |
| $V_{CE(sat)}$ | $I_C = 150\text{ A}$<br>$V_{GE} = 15\text{ V}$<br>chipelevel |                           | $T_j = 25^\circ\text{C}$  | 1.7  | 2.10     |
|               |                                                              |                           | $T_j = 125^\circ\text{C}$ | 2.0  | 2.45     |
| $V_{CE0}$     | chipelevel                                                   |                           | $T_j = 25^\circ\text{C}$  | 1    | 1.2      |
|               |                                                              |                           | $T_j = 125^\circ\text{C}$ | 0.9  | 1.1      |
| $r_{CE}$      | $V_{GE} = 15\text{ V}$<br>chipelevel                         |                           | $T_j = 25^\circ\text{C}$  | 4.7  | 6.0      |
|               |                                                              |                           | $T_j = 125^\circ\text{C}$ | 7.3  | 9.0      |
| $V_{GE(th)}$  | $V_{GE}=V_{CE}, I_C = 6\text{ mA}$                           | 5                         | 5.8                       | 6.5  | V        |
| $I_{CES}$     | $V_{GE} = 0\text{ V}$<br>$V_{CE} = 1200\text{ V}$            |                           | $T_j = 25^\circ\text{C}$  |      | 2.0      |
|               |                                                              |                           | $T_j = 125^\circ\text{C}$ |      |          |
| $C_{ies}$     | $V_{CE} = 25\text{ V}$<br>$V_{GE} = 0\text{ V}$              |                           | $f = 1\text{ MHz}$        | 10.7 | nF       |
| $C_{oes}$     |                                                              |                           | $f = 1\text{ MHz}$        | 0.56 | nF       |
| $C_{res}$     |                                                              |                           | $f = 1\text{ MHz}$        | 0.48 | nF       |
| $Q_G$         | $V_{GE} = -8\text{ V...} + 15\text{ V}$                      |                           | 1200                      |      | nC       |
| $R_{Gint}$    | $T_j = 25^\circ\text{C}$                                     |                           | 5.00                      |      | $\Omega$ |
| $t_{d(on)}$   | $V_{CC} = 600\text{ V}$                                      | $T_j = 125^\circ\text{C}$ |                           | 300  | ns       |
| $t_r$         | $I_C = 150\text{ A}$                                         |                           |                           |      |          |
| $E_{on}$      | $V_{GE} = \pm 15\text{ V}$                                   | $T_j = 125^\circ\text{C}$ |                           | 20   | mJ       |
| $t_{d(off)}$  | $R_{G on} = 3\ \Omega$                                       |                           |                           |      |          |
| $t_f$         | $R_{G off} = 3\ \Omega$                                      | $T_j = 125^\circ\text{C}$ |                           | 110  | ns       |
| $E_{off}$     |                                                              |                           |                           |      |          |
| $R_{th(j-c)}$ | per IGBT                                                     |                           |                           | 0.15 | K/W      |

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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> = 150 A                                                           | T <sub>j</sub> = 25 °C  |      | 1.6         | 1.80 | V    |
|                                  | V <sub>GE</sub> = 0 V<br>chiplevel                                               | T <sub>j</sub> = 125 °C |      | 1.6         | 1.8  | V    |
| V <sub>F0</sub>                  | chiplevel                                                                        | T <sub>j</sub> = 25 °C  | 0.9  | 1           | 1.1  | V    |
|                                  |                                                                                  | T <sub>j</sub> = 125 °C | 0.7  | 0.8         | 0.9  | V    |
| r <sub>F</sub>                   | chiplevel                                                                        | T <sub>j</sub> = 25 °C  | 3.3  | 4.0         | 4.7  | mΩ   |
|                                  |                                                                                  | T <sub>j</sub> = 125 °C | 4.7  | 5.3         | 6.0  | mΩ   |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 150 A                                                           | T <sub>j</sub> = 125 °C |      | 260         |      | A    |
| Q <sub>rr</sub>                  | di/dt <sub>off</sub> = 4600 A/μs                                                 | T <sub>j</sub> = 125 °C |      | 43          |      | μC   |
| E <sub>rr</sub>                  | V <sub>GE</sub> = -15 V                                                          | T <sub>j</sub> = 125 °C |      | 18          |      | mJ   |
|                                  | V <sub>CC</sub> = 600 V                                                          |                         |      |             |      |      |
| R <sub>th(j-c)</sub>             | per diode                                                                        |                         |      |             | 0.24 | K/W  |
| Module                           |                                                                                  |                         |      |             |      |      |
| L <sub>CE</sub>                  |                                                                                  |                         |      | 18          |      | nH   |
| R <sub>CC'+EE'</sub>             | res., terminal-chip                                                              | T <sub>C</sub> = 25 °C  |      | 0.7         |      | mΩ   |
|                                  |                                                                                  | T <sub>C</sub> = 125 °C |      | 1           |      | mΩ   |
| R <sub>th(c-s)</sub>             | per module                                                                       |                         |      | 0.045       |      | K/W  |
| M <sub>s</sub>                   | to heat sink (M5)                                                                |                         | 3    |             | 5    | Nm   |
| M <sub>t</sub>                   |                                                                                  | to terminals (M6)       | 2.5  |             | 5    | Nm   |
|                                  |                                                                                  |                         |      |             |      | Nm   |
| w                                |                                                                                  |                         |      |             | 250  | g    |
| Temperature Sensor               |                                                                                  |                         |      |             |      |      |
| R <sub>100</sub>                 | T <sub>C</sub> =100°C (R <sub>25</sub> =5 kΩ)                                    |                         |      | 493 ± 5%    |      | Ω    |
| B <sub>100/125</sub>             | R(T)=R <sub>100</sub> exp[B <sub>100/125</sub> (1/T-1/T <sub>100</sub> )]; T[K]; |                         |      | 3550<br>±2% |      | K    |



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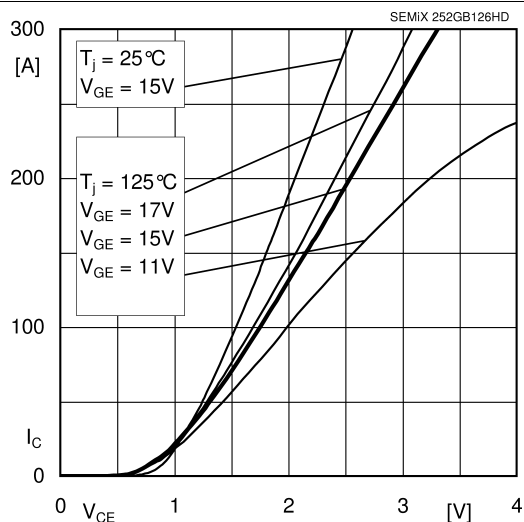


Fig. 1: Typ. output characteristic, inclusive  $R_{CC} + EE'$

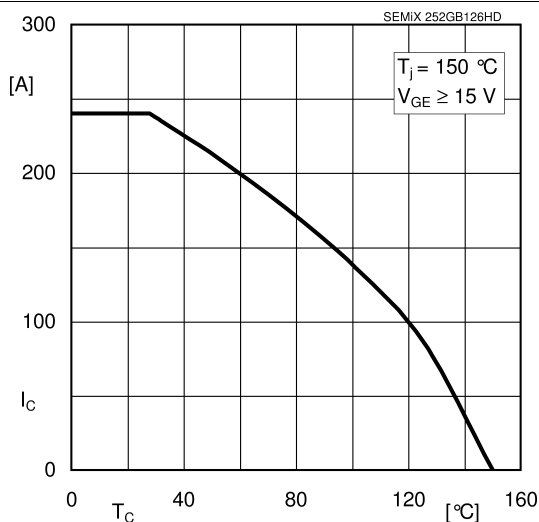


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

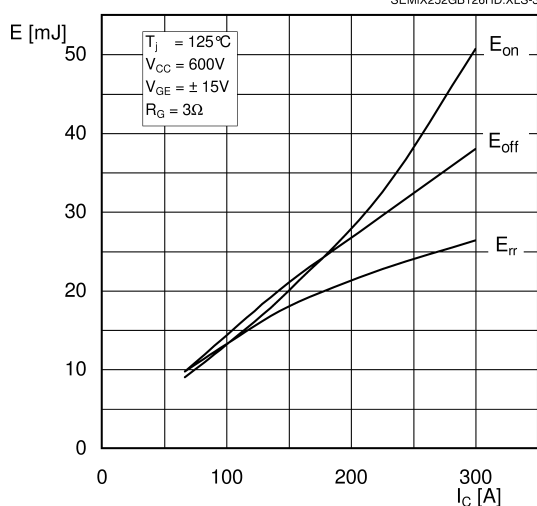


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

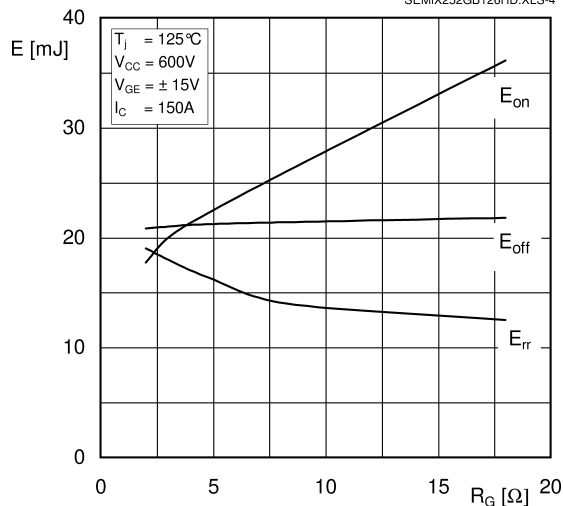


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

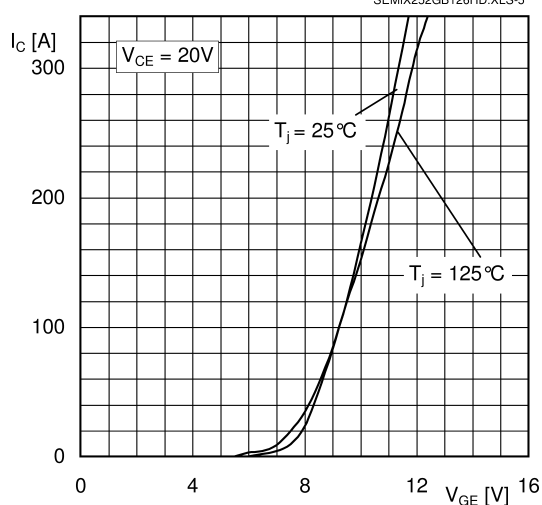


Fig. 5: Typ. transfer characteristic

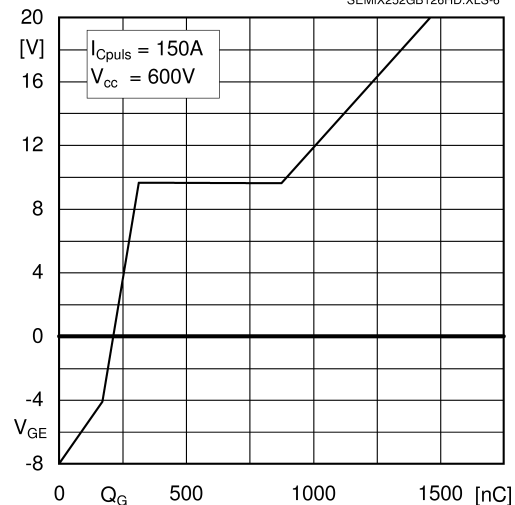


Fig. 6: Typ. gate charge characteristic

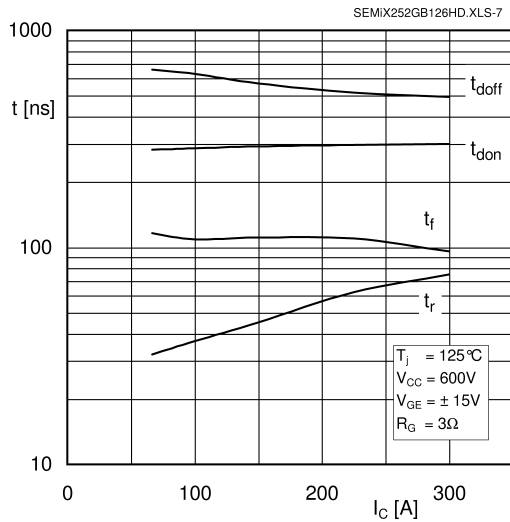


Fig. 7: Typ. switching times vs.  $I_C$

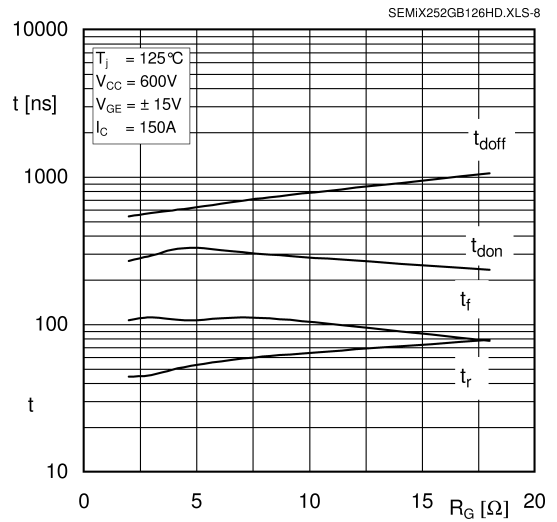


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

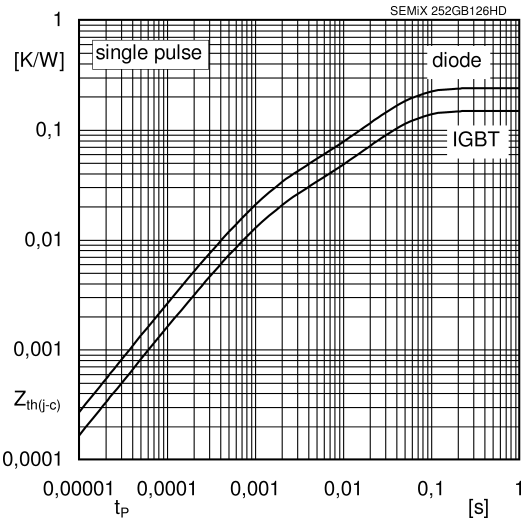


Fig. 9: Typ. transient thermal impedance

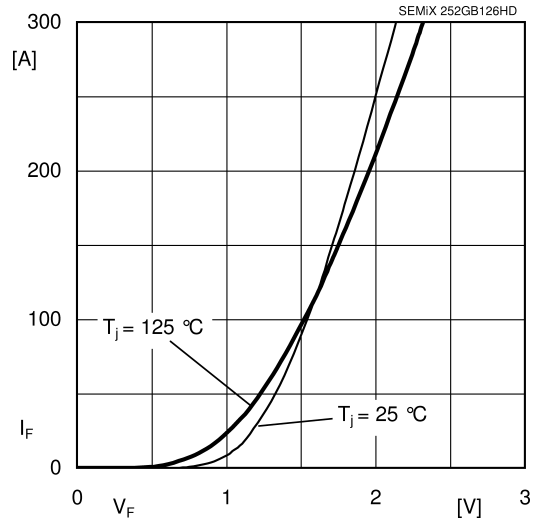


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC'} + EE'$

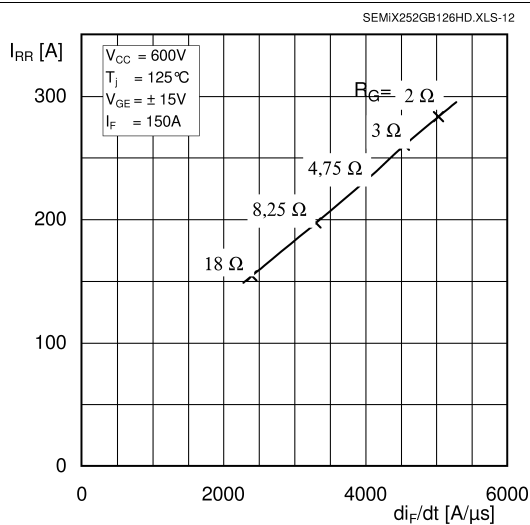


Fig. 11: Typ. CAL diode peak reverse recovery current

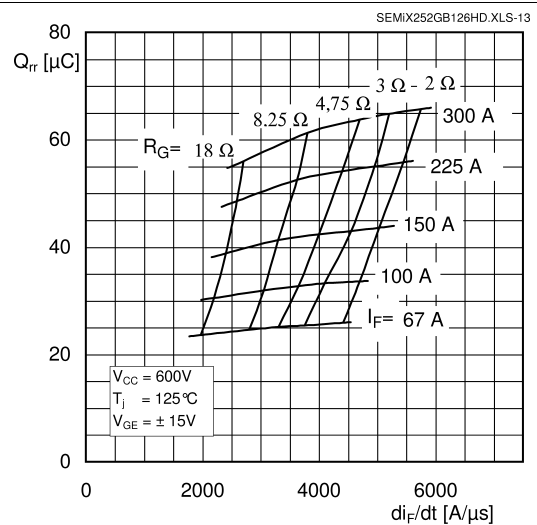
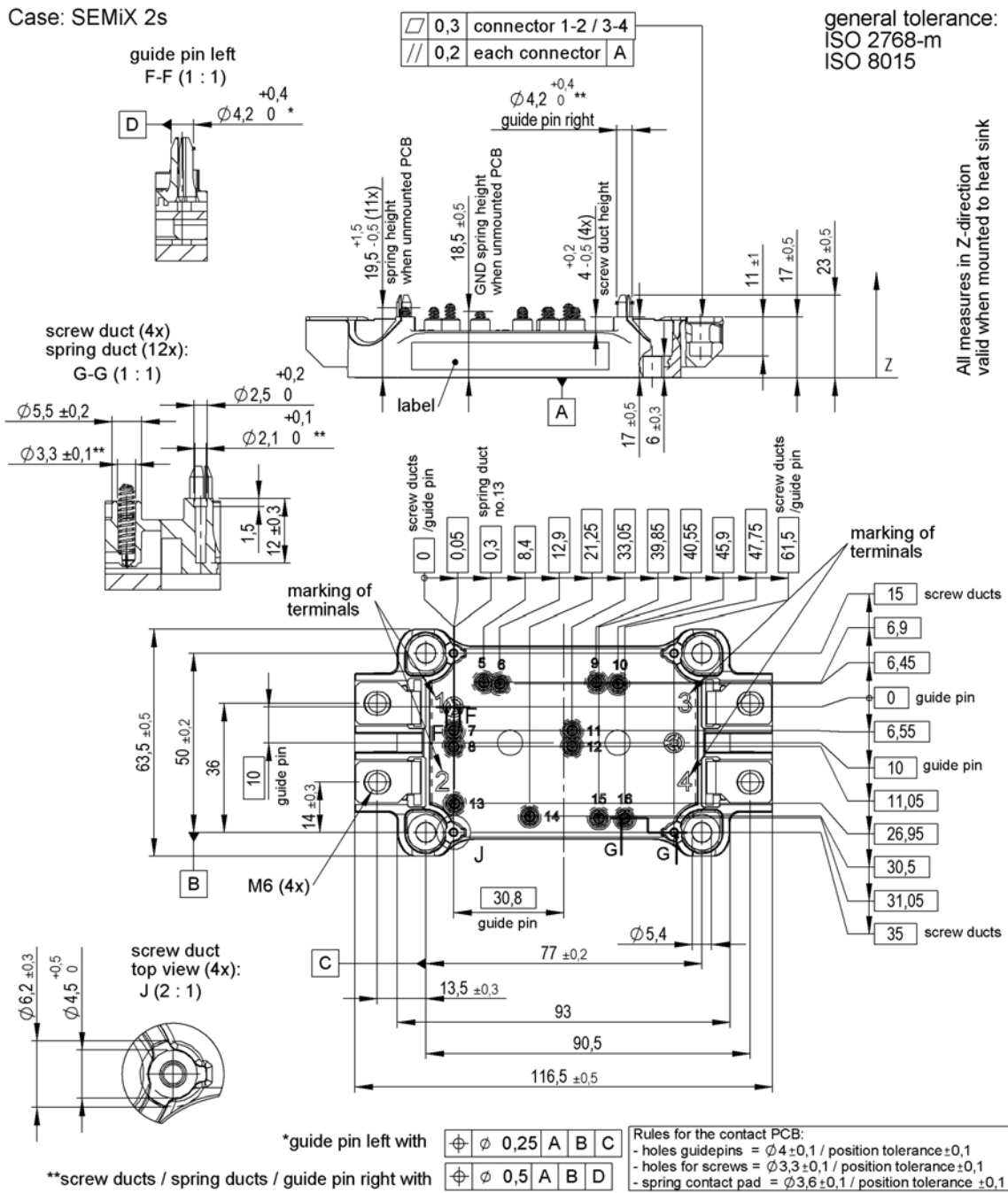
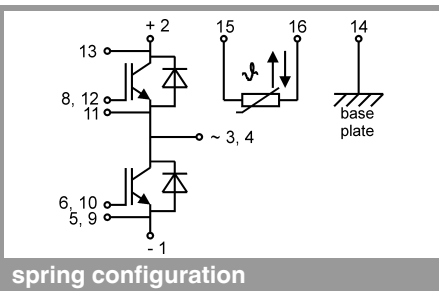


Fig. 12: Typ. CAL diode recovery charge

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## SEMIX 2s



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.