

# SEMiX452GB126HDs



SEMiX® 2s

## Trench IGBT Modules

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#### Features

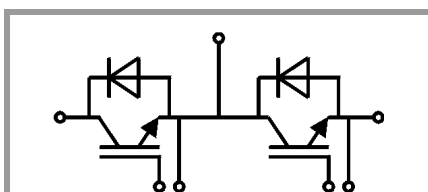
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

#### 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 |
| 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  | 455         | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 319         | A    |
| I <sub>Cnom</sub>        |                                                                                |                         | 300         | A    |
| I <sub>CRM</sub>         | I <sub>CRM</sub> = 2xI <sub>Cnom</sub>                                         |                         | 600         | A    |
| V <sub>GES</sub>         |                                                                                |                         | -20 ... 20  | V    |
| t <sub>psc</sub>         | V <sub>CC</sub> = 600 V<br>V <sub>GE</sub> ≤ 20 V<br>V <sub>CES</sub> ≤ 1200 V | T <sub>j</sub> = 125 °C | 10          | μs   |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 150 | °C   |
| Inverse diode            |                                                                                |                         |             |      |
| I <sub>F</sub>           | T <sub>j</sub> = 150 °C                                                        | T <sub>c</sub> = 25 °C  | 394         | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 272         | A    |
| I <sub>Fnom</sub>        |                                                                                |                         | 300         | A    |
| I <sub>FRM</sub>         | I <sub>FRM</sub> = 2xI <sub>Fnom</sub>                                         |                         | 600         | A    |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 25 °C                       |                         | 1900        | A    |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 150 | °C   |
| Module                   |                                                                                |                         |             |      |
| I <sub>t(RMS)</sub>      | T <sub>terminal</sub> = 80 °C                                                  |                         | 600         | A    |
| T <sub>stg</sub>         |                                                                                |                         | -40 ... 125 | °C   |
| V <sub>isol</sub>        | AC sinus 50Hz, t = 1 min                                                       |                         | 4000        | V    |

| Characteristics      |                                                           |                         |      |      |       |      |
|----------------------|-----------------------------------------------------------|-------------------------|------|------|-------|------|
| Symbol               | Conditions                                                |                         | min. | typ. | max.  | Unit |
| IGBT                 |                                                           |                         |      |      |       |      |
| V <sub>CE(sat)</sub> | I <sub>C</sub> = 300 A                                    | T <sub>j</sub> = 25 °C  |      | 1.7  | 2.1   | V    |
|                      | V <sub>GE</sub> = 15 V<br>chipelevel                      | T <sub>j</sub> = 125 °C |      | 2.0  | 2.45  | V    |
| V <sub>CE0</sub>     |                                                           | T <sub>j</sub> = 25 °C  |      | 1    | 1.2   | V    |
|                      |                                                           | T <sub>j</sub> = 125 °C |      | 0.9  | 1.1   | V    |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V                                    | T <sub>j</sub> = 25 °C  |      | 2.3  | 3.0   | mΩ   |
|                      |                                                           | T <sub>j</sub> = 125 °C |      | 3.7  | 4.5   | mΩ   |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> =V <sub>CE</sub> , I <sub>C</sub> = 12 mA |                         | 5    | 5.8  | 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                                  | T <sub>j</sub> = 125 °C |      |      |       | mA   |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25 V<br>V <sub>GE</sub> = 0 V           | f = 1 MHz               |      | 21.5 |       | nF   |
| C <sub>oes</sub>     |                                                           | f = 1 MHz               |      | 1.13 |       | nF   |
| C <sub>res</sub>     |                                                           | f = 1 MHz               |      | 0.98 |       | nF   |
| Q <sub>G</sub>       | V <sub>GE</sub> = - 8 V...+ 15 V                          |                         |      | 2400 |       | nC   |
| R <sub>Gint</sub>    | T <sub>j</sub> = 25 °C                                    |                         |      | 2.50 |       | Ω    |
| t <sub>d(on)</sub>   | V <sub>CC</sub> = 600 V                                   | T <sub>j</sub> = 125 °C |      | 280  |       | ns   |
| t <sub>r</sub>       | I <sub>C</sub> = 300 A                                    | T <sub>j</sub> = 125 °C |      | 65   |       | ns   |
| E <sub>on</sub>      | V <sub>GE</sub> = ±15 V                                   | T <sub>j</sub> = 125 °C |      | 35   |       | mJ   |
| t <sub>d(off)</sub>  | R <sub>G on</sub> = 2 Ω                                   | T <sub>j</sub> = 125 °C |      | 630  |       | ns   |
| t <sub>f</sub>       | R <sub>G off</sub> = 2 Ω                                  | T <sub>j</sub> = 125 °C |      | 130  |       | ns   |
| E <sub>off</sub>     |                                                           | T <sub>j</sub> = 125 °C |      | 45   |       | mJ   |
| R <sub>th(j-c)</sub> | per IGBT                                                  |                         |      |      | 0.083 | K/W  |

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- High short circuit capability
- UL recognised file no. E63532

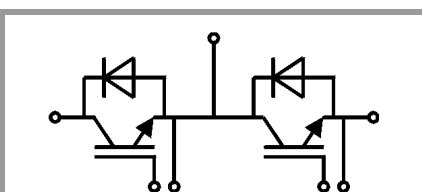
#### Typical Applications\*

- AC inverter drives
- UPS
- Electronic Welding

#### Remarks

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

| Characteristics                  |                                                                                               |                         |             |      |      |      |
|----------------------------------|-----------------------------------------------------------------------------------------------|-------------------------|-------------|------|------|------|
| Symbol                           | Conditions                                                                                    |                         | min.        | typ. | max. | Unit |
| Inverse diode                    |                                                                                               |                         |             |      |      |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 300 A                                                                        | T <sub>j</sub> = 25 °C  |             | 1.6  | 1.80 | V    |
|                                  | V <sub>GE</sub> = 0 V<br>chip                                                                 | T <sub>j</sub> = 125 °C |             | 1.6  | 1.8  | V    |
| V <sub>F0</sub>                  |                                                                                               | 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>                   |                                                                                               | T <sub>j</sub> = 25 °C  | 1.7         | 2.0  | 2.3  | mΩ   |
|                                  |                                                                                               | T <sub>j</sub> = 125 °C | 2.3         | 2.7  | 3.0  | mΩ   |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 300 A                                                                        | T <sub>j</sub> = 125 °C | 375         |      |      | A    |
| Q <sub>rr</sub>                  | di/dt <sub>off</sub> = 6200 A/μs                                                              | T <sub>j</sub> = 125 °C | 75          |      |      | μC   |
| E <sub>rr</sub>                  | V <sub>GE</sub> = -15 V                                                                       | T <sub>j</sub> = 125 °C | 33          |      |      | mJ   |
|                                  | V <sub>CC</sub> = 600 V                                                                       |                         |             |      |      |      |
| R <sub>th(j-c)</sub>             | per diode                                                                                     |                         | 0.15        |      |      | 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    |
| Temperatur 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 <sub>(T)</sub> =R <sub>100</sub> exp[B <sub>100/125</sub> (1/T-1/T <sub>100</sub> )]; T[K]; |                         | 3550<br>±2% |      |      | K    |



GB

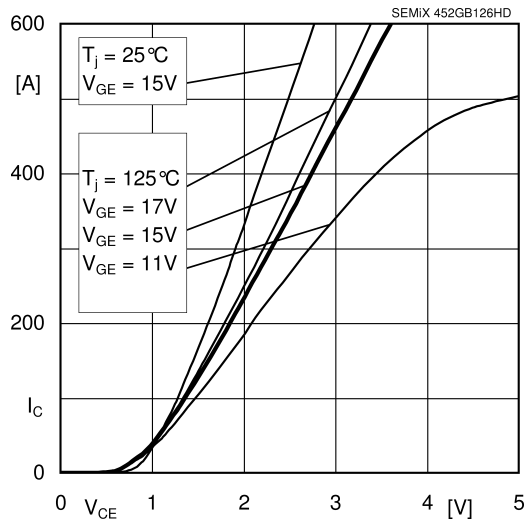


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'} + E_{E'}$

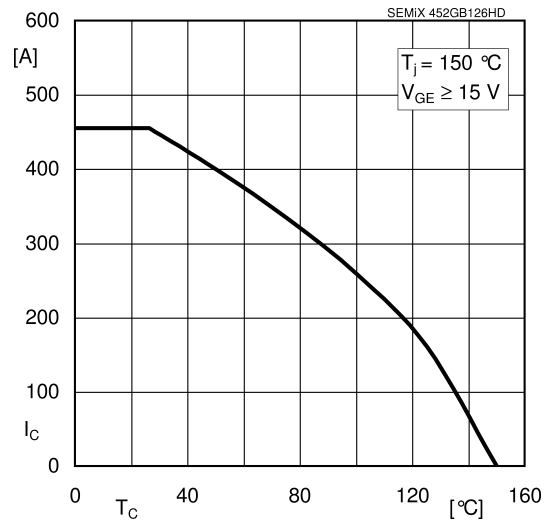


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

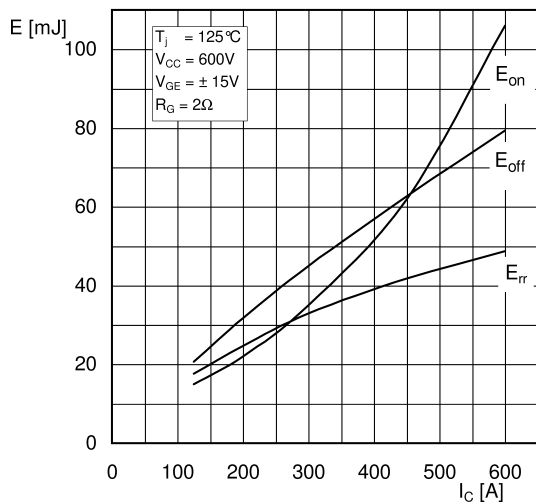


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

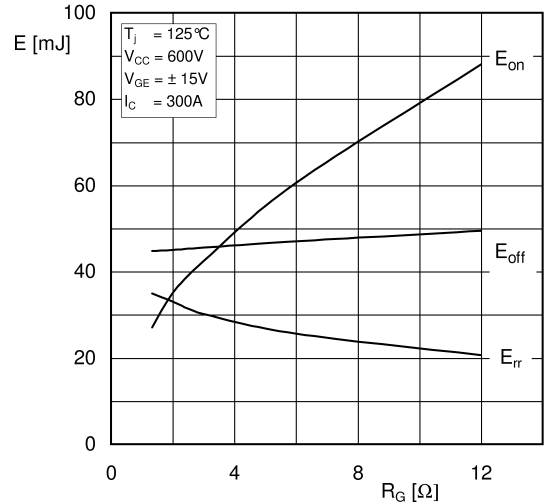


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

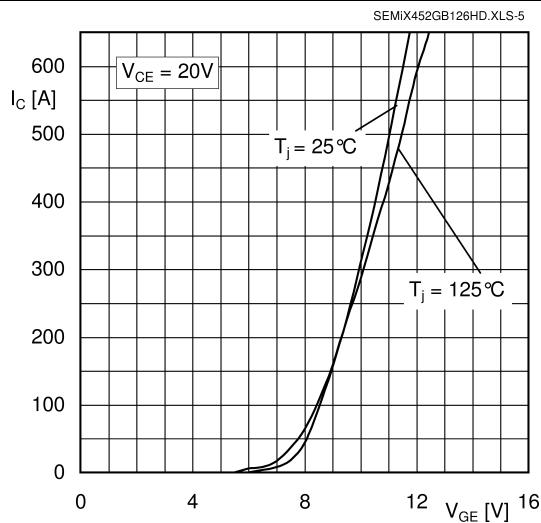


Fig. 5: Typ. transfer characteristic

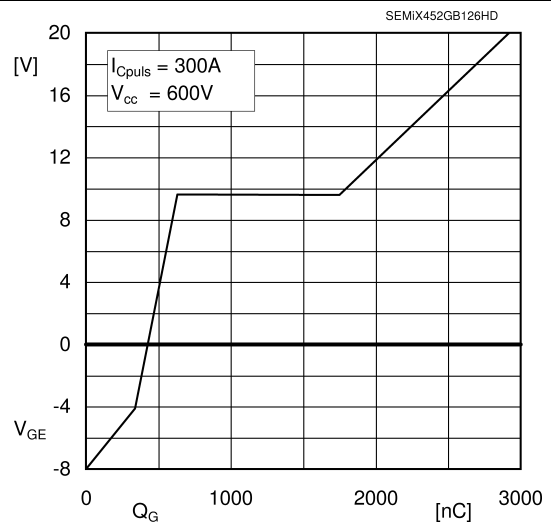
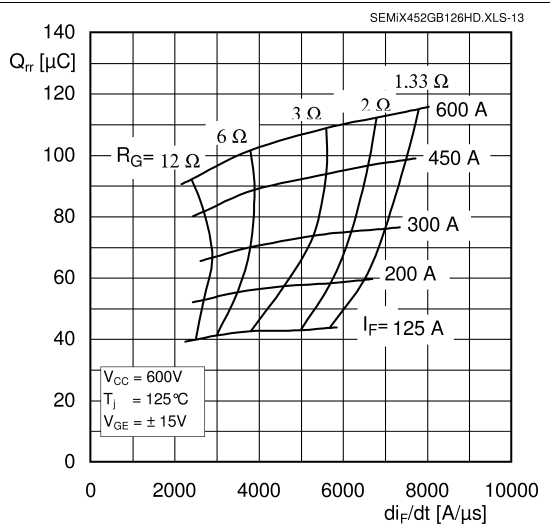
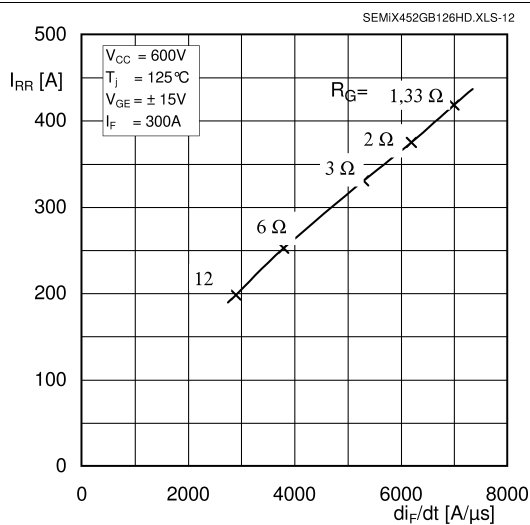
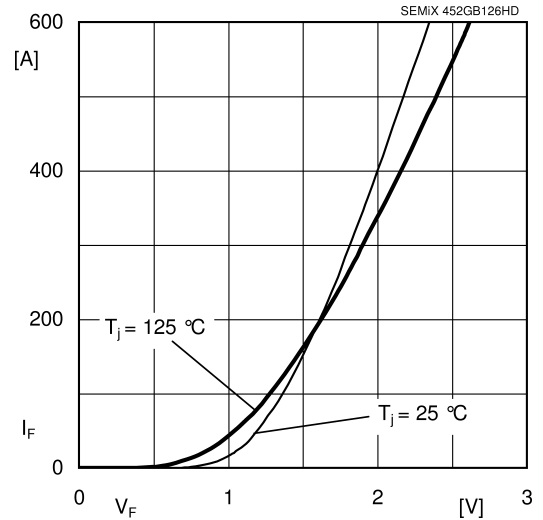
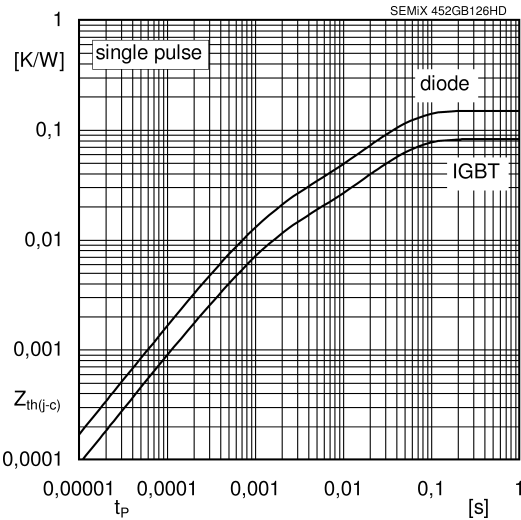
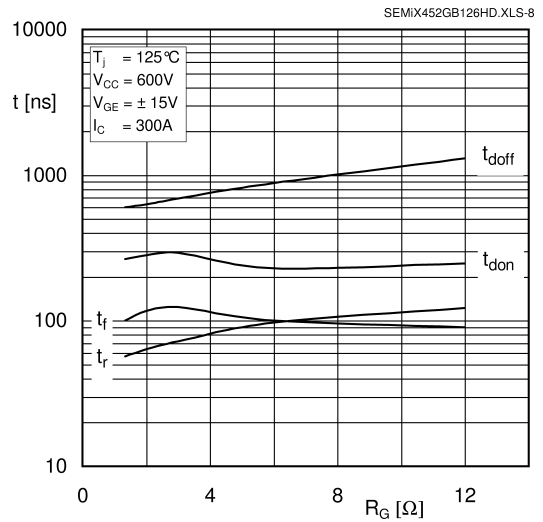
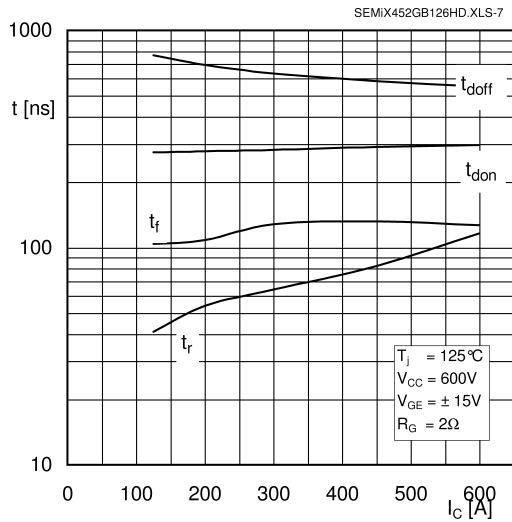


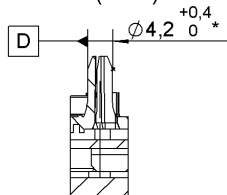
Fig. 6: Typ. gate charge characteristic



# SEMiX452GB126HDs

Case: SEMiX 2s

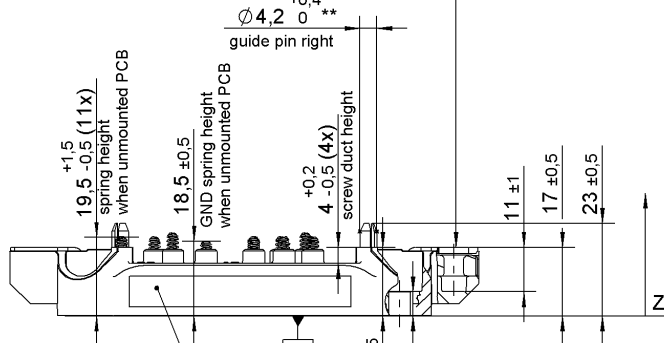
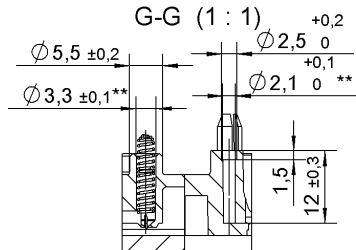
guide pin left  
F-F (1 : 1)



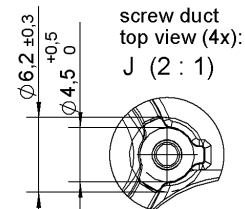
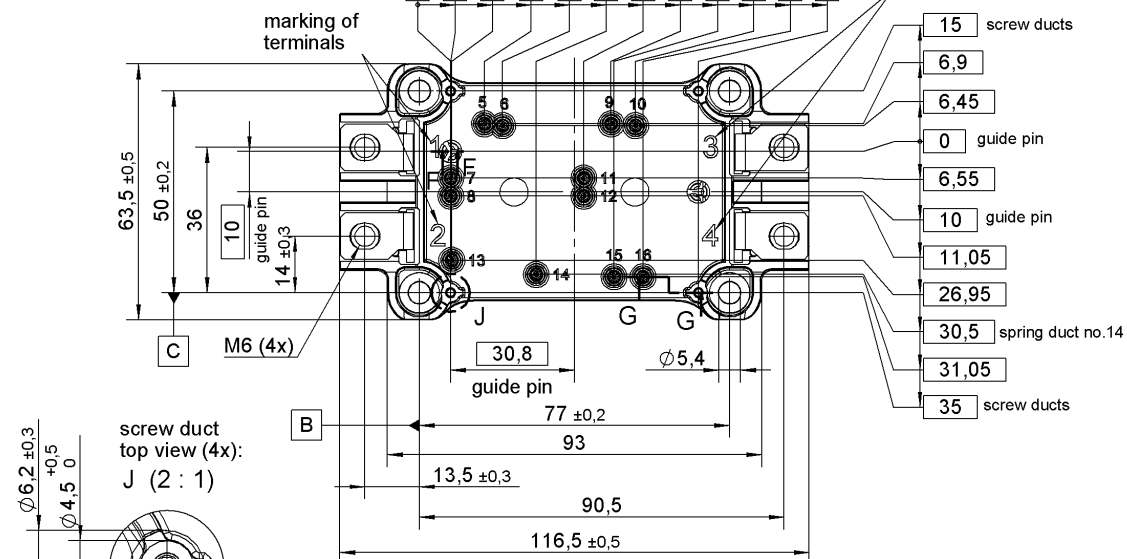
|             |     |                     |
|-------------|-----|---------------------|
| $\square$   | 0,3 | connector 1-2 / 3-4 |
| $\parallel$ | 0,2 | each connector A    |

general tolerance:  
ISO 2768-m  
ISO 8015

screw duct (4x)  
spring duct (12x):  
G-G (1 : 1)



All measures in Z-direction  
valid when mounted to heat sink



\*guide pin left with

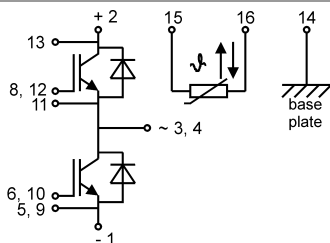
|        |             |   |   |   |
|--------|-------------|---|---|---|
| $\phi$ | $\phi$ 0,25 | A | B | C |
| $\phi$ | $\phi$ 0,5  | A | D | C |

Rules for the contact PCB:

- holes guidepins =  $\phi 4 \pm 0,1$  / position tolerance  $\pm 0,1$
- holes for screws =  $\phi 3,3 \pm 0,1$  / position tolerance  $\pm 0,1$
- spring contact pad =  $\phi 3,6 \pm 0,1$  / position tolerance  $\pm 0,1$

\*\*screw ducts / spring ducts / guide pin right with

SEMiX 2s



spring configuration

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.