

# SEMiX352GAL128Ds



SEMiX<sup>®</sup>2s

## SPT IGBT Modules

SEMiX352GAL128Ds

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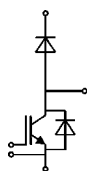
Preliminary Data

### Features

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

### Typical Applications

- AC inverter drives
- UPS
- Electronic welders up to 20 kHz



GAL

### Absolute Maximum Ratings

| Symbol                    | Conditions                                                                                                    | Values                                       | Unit          |
|---------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------|
| <b>IGBT</b>               |                                                                                                               |                                              |               |
| $V_{CES}$                 |                                                                                                               | 1200                                         | V             |
| $I_C$                     | $T_j = 150\text{ °C}$                                                                                         | $T_c = 25\text{ °C}$<br>$T_c = 80\text{ °C}$ | A<br>A        |
| $I_{Cnom}$                |                                                                                                               | 200                                          | A             |
| $I_{CRM}$                 | $I_{CRM} = 2 \times I_{Cnom}$                                                                                 | 400                                          | A             |
| $V_{GES}$                 |                                                                                                               | -20 ... 20                                   | V             |
| $t_{psc}$                 | $V_{CC} = 600\text{ V}$<br>$V_{GE} \leq 20\text{ V}$<br>$T_j = 125\text{ °C}$<br>$V_{CES} \leq 1200\text{ V}$ | 10                                           | $\mu\text{s}$ |
| $T_j$                     |                                                                                                               | -40 ... 150                                  | °C            |
| <b>Inverse diode</b>      |                                                                                                               |                                              |               |
| $I_F$                     | $T_j = 150\text{ °C}$                                                                                         | $T_c = 25\text{ °C}$<br>$T_c = 80\text{ °C}$ | A<br>A        |
| $I_{Fnom}$                |                                                                                                               | 200                                          | A             |
| $I_{FRM}$                 | $I_{FRM} = 2 \times I_{Fnom}$                                                                                 | 400                                          | A             |
| $I_{FSM}$                 | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25\text{ °C}$                                                      | 2000                                         | A             |
| $T_j$                     |                                                                                                               | -40 ... 150                                  | °C            |
| <b>Freewheeling diode</b> |                                                                                                               |                                              |               |
| $I_F$                     | $T_j = 150\text{ °C}$                                                                                         | $T_c = 25\text{ °C}$<br>$T_c = 80\text{ °C}$ | A<br>A        |
| $I_{Fnom}$                |                                                                                                               | 200                                          | A             |
| $I_{FRM}$                 | $I_{FRM} = 2 \times I_{Fnom}$                                                                                 | 400                                          | A             |
| $I_{FSM}$                 | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25\text{ °C}$                                                      | 2000                                         | A             |
| $T_j$                     |                                                                                                               | -40 ... 150                                  | °C            |
| <b>Module</b>             |                                                                                                               |                                              |               |
| $I_{t(RMS)}$              |                                                                                                               | 600                                          | A             |
| $T_{stg}$                 |                                                                                                               | -40 ... 125                                  | °C            |
| $V_{isol}$                | AC sinus 50Hz, $t = 1\text{ min}$                                                                             | 4000                                         | V             |

### Characteristics

| Symbol        | Conditions                                                  | min.                                          | typ.        | max.         | Unit                     |
|---------------|-------------------------------------------------------------|-----------------------------------------------|-------------|--------------|--------------------------|
| <b>IGBT</b>   |                                                             |                                               |             |              |                          |
| $V_{CE(sat)}$ | $I_C = 200\text{ A}$<br>$V_{GE} = 15\text{ V}$<br>chiplevel | $T_j = 25\text{ °C}$<br>$T_j = 125\text{ °C}$ | 1.9<br>2.10 | 2.35<br>2.55 | V<br>V                   |
| $V_{CE0}$     |                                                             | $T_j = 25\text{ °C}$<br>$T_j = 125\text{ °C}$ | 1<br>0.9    | 1.15<br>1.05 | V<br>V                   |
| $r_{CE}$      | $V_{GE} = 15\text{ V}$                                      | $T_j = 25\text{ °C}$<br>$T_j = 125\text{ °C}$ | 4.5<br>6.0  | 6.0<br>7.5   | m $\Omega$<br>m $\Omega$ |
| $V_{GE(th)}$  | $V_{GE} = V_{CE}, I_C = 8\text{ mA}$                        | 4.5                                           | 5           | 6.5          | V                        |
| $I_{CES}$     | $V_{GE} = 0\text{ V}$<br>$V_{CE} = 1200\text{ V}$           | $T_j = 25\text{ °C}$<br>$T_j = 125\text{ °C}$ | 0.1         | 0.3          | mA<br>mA                 |
| $C_{ies}$     | $V_{CE} = 25\text{ V}$<br>$V_{GE} = 0\text{ V}$             | $f = 1\text{ MHz}$                            | 18.9        |              | nF                       |
| $C_{oes}$     |                                                             | $f = 1\text{ MHz}$                            | 1.24        |              | nF                       |
| $C_{res}$     |                                                             | $f = 1\text{ MHz}$                            | 0.78        |              | nF                       |
| $Q_G$         | $V_{GE} = -8\text{ V...} + 15\text{ V}$                     |                                               | 1920        |              | nC                       |
| $R_{Gint}$    | $T_j = 25\text{ °C}$                                        |                                               | 2.00        |              | $\Omega$                 |

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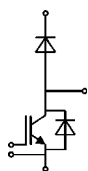
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### Features

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| Characteristics                  |                                                                                                  |                         |      |              |       |      |
|----------------------------------|--------------------------------------------------------------------------------------------------|-------------------------|------|--------------|-------|------|
| Symbol                           | Conditions                                                                                       |                         | min. | typ.         | max.  | Unit |
| t <sub>d(on)</sub>               | V <sub>CC</sub> = 600 V                                                                          |                         |      | 230          |       | ns   |
| t <sub>r</sub>                   | I <sub>C</sub> = 200 A                                                                           |                         |      | 55           |       | ns   |
| E <sub>on</sub>                  | T <sub>j</sub> = 125 °C                                                                          |                         |      | 20           |       | mJ   |
| t <sub>d(off)</sub>              | R <sub>G on</sub> = 3 Ω                                                                          |                         |      | 585          |       | ns   |
| t <sub>f</sub>                   | R <sub>G off</sub> = 3 Ω                                                                         |                         |      | 90           |       | ns   |
| E <sub>off</sub>                 |                                                                                                  |                         |      | 21           |       | mJ   |
| R <sub>th(j-c)</sub>             | per IGBT                                                                                         |                         |      |              | 0.083 | K/W  |
| R <sub>th(j-s)</sub>             | per IGBT                                                                                         |                         |      |              |       | K/W  |
| Inverse diode                    |                                                                                                  |                         |      |              |       |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 200 A                                                                           | T <sub>j</sub> = 25 °C  |      | 2.0          | 2.5   | V    |
|                                  | V <sub>GE</sub> = 0 V                                                                            | T <sub>j</sub> = 125 °C |      | 1.8          | 2.3   | V    |
|                                  | chiplevel                                                                                        |                         |      |              |       |      |
| V <sub>F0</sub>                  |                                                                                                  | T <sub>j</sub> = 25 °C  | 0.75 | 1.1          | 1.45  | V    |
|                                  |                                                                                                  | T <sub>j</sub> = 125 °C | 0.5  | 0.85         | 1.2   | V    |
| r <sub>F</sub>                   |                                                                                                  | T <sub>j</sub> = 25 °C  | 3.8  | 4.5          | 5.3   | mΩ   |
|                                  |                                                                                                  | T <sub>j</sub> = 125 °C | 4.0  | 4.8          | 5.5   | mΩ   |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 200 A                                                                           | T <sub>j</sub> = 125 °C |      | 240          |       | A    |
| Q <sub>rr</sub>                  | di/dt <sub>off</sub> = 5350 A/μs                                                                 | T <sub>j</sub> = 125 °C |      | 31           |       | μC   |
| E <sub>rr</sub>                  | V <sub>GE</sub> = -15 V                                                                          | T <sub>j</sub> = 125 °C |      | 11           |       | mJ   |
|                                  | V <sub>CC</sub> = 600 V                                                                          |                         |      |              |       |      |
| R <sub>th(j-c)</sub>             | per diode                                                                                        |                         |      |              | 0.15  | K/W  |
| R <sub>th(j-s)</sub>             | per diode                                                                                        |                         |      |              |       | K/W  |
| Freewheeling diode               |                                                                                                  |                         |      |              |       |      |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>F</sub> = 200 A                                                                           | T <sub>j</sub> = 25 °C  |      | 2.0          | 2.5   | V    |
|                                  | V <sub>GE</sub> = 0 V                                                                            | T <sub>j</sub> = 125 °C |      | 1.8          | 2.3   | V    |
|                                  | chiplevel                                                                                        |                         |      |              |       |      |
| V <sub>F0</sub>                  |                                                                                                  | T <sub>j</sub> = 25 °C  | 0.75 | 1.1          | 1.45  | V    |
|                                  |                                                                                                  | T <sub>j</sub> = 125 °C | 0.5  | 0.85         | 1.2   | V    |
| r <sub>F</sub>                   |                                                                                                  | T <sub>j</sub> = 25 °C  | 3.8  | 4.5          | 5.3   | mΩ   |
|                                  |                                                                                                  | T <sub>j</sub> = 125 °C | 4.0  | 4.8          | 5.5   | mΩ   |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 200 A                                                                           | T <sub>j</sub> = 125 °C |      | 240          |       | A    |
| Q <sub>rr</sub>                  | di/dt <sub>off</sub> = 5320 A/μs                                                                 | T <sub>j</sub> = 125 °C |      | 31           |       | μC   |
| E <sub>rr</sub>                  | V <sub>GE</sub> = -15 V                                                                          | T <sub>j</sub> = 125 °C |      | 11           |       | mJ   |
|                                  | V <sub>CC</sub> = 600 V                                                                          |                         |      |              |       |      |
| R <sub>th(j-c)</sub>             | per diode                                                                                        |                         |      |              | 0.15  | K/W  |
| R <sub>th(j-s)</sub>             | per diode                                                                                        |                         |      |              |       | 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)                                                    |                         |      | 0,493<br>±5% |       | kΩ   |
| 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> )];<br>T[K]; |                         |      | 3550<br>±2%  |       | K    |

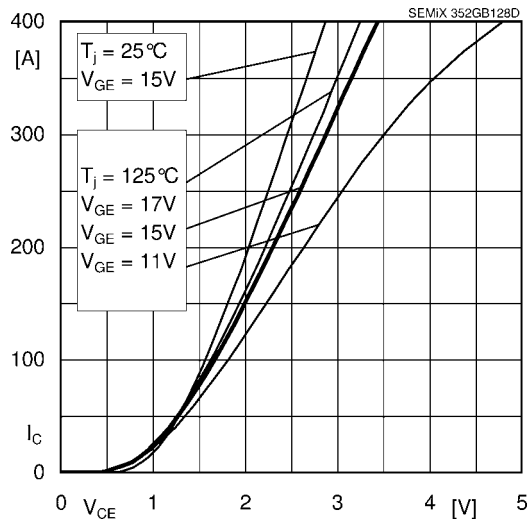


Fig. 1 Typ. output characteristic, inclusive  $R_{CC}'+EE'$

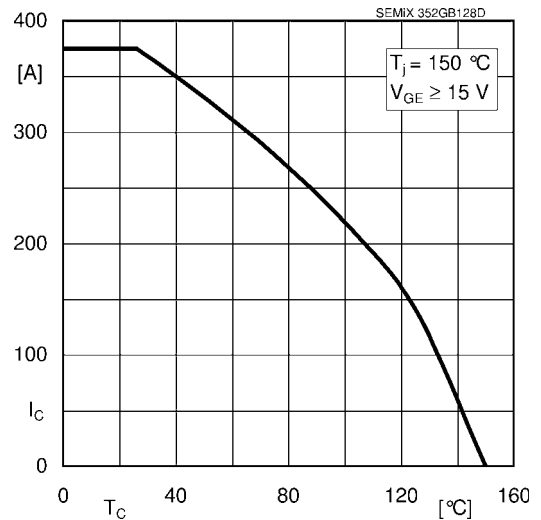


Fig. 2 Rated current vs. temperature  $I_C = f(T_C)$

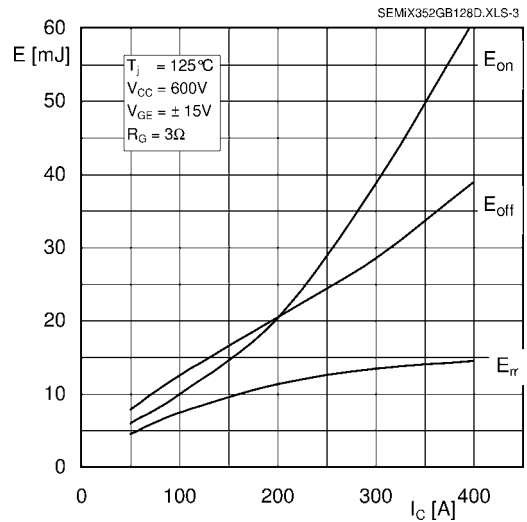


Fig. 3 Typ. turn-on /-off energy =  $f(I_C)$

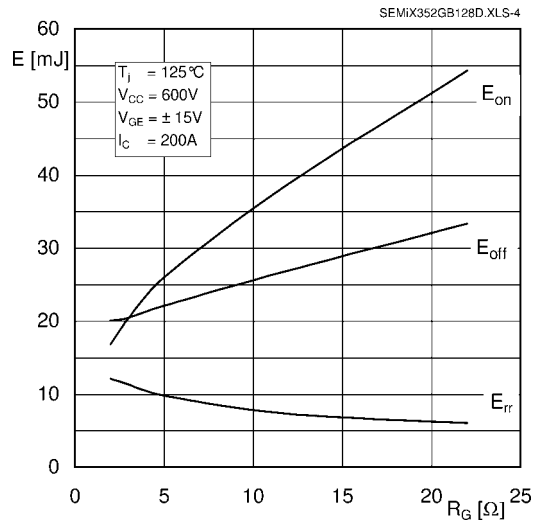


Fig. 4 Typ. turn-on /-off energy =  $f(R_G)$

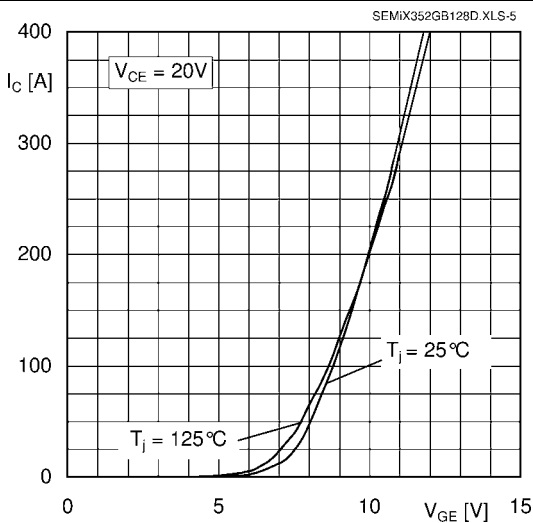


Fig. 5 Typ. transfer characteristic

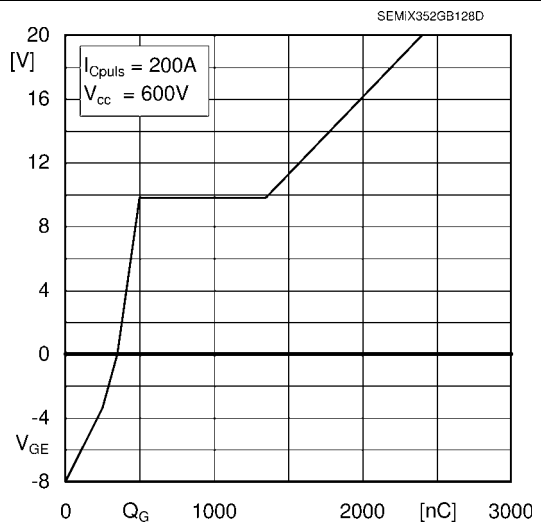


Fig. 6 Typ. gate charge characteristic

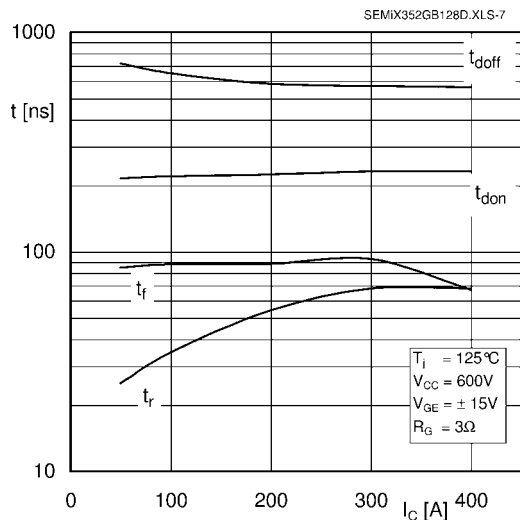


Fig. 7 Typ. switching times vs.  $I_C$

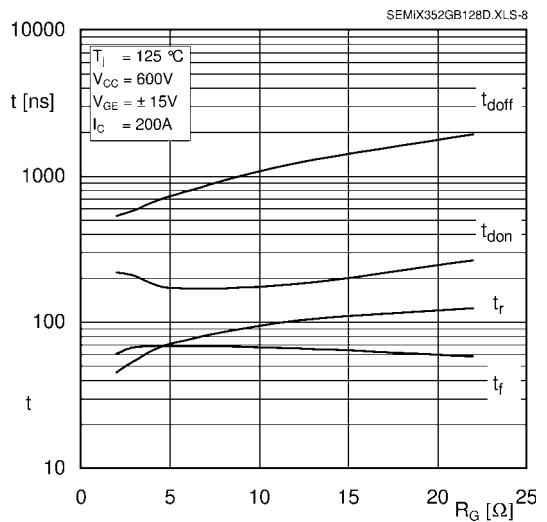


Fig. 8 Typ. switching times vs. gate resistor  $R_G$

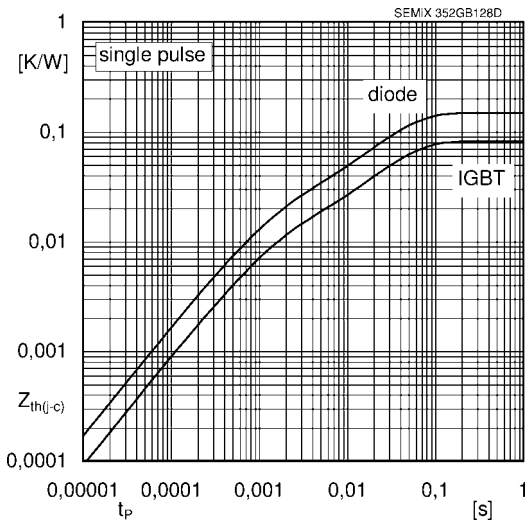


Fig. 9 Typ. transient thermal impedance

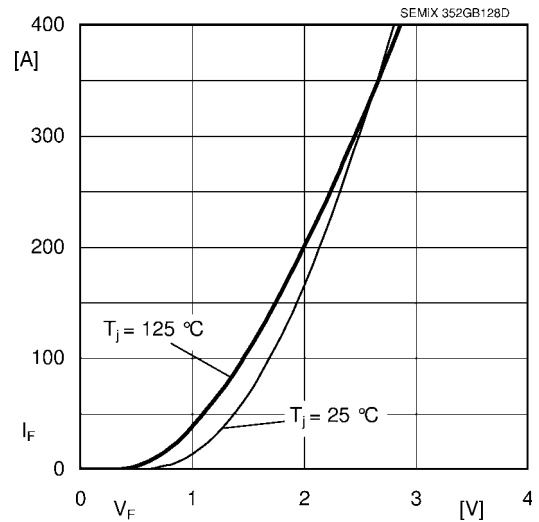


Fig. 10 Typ. CAL diode forward charact., incl.  $R_{CC'+EE'}$

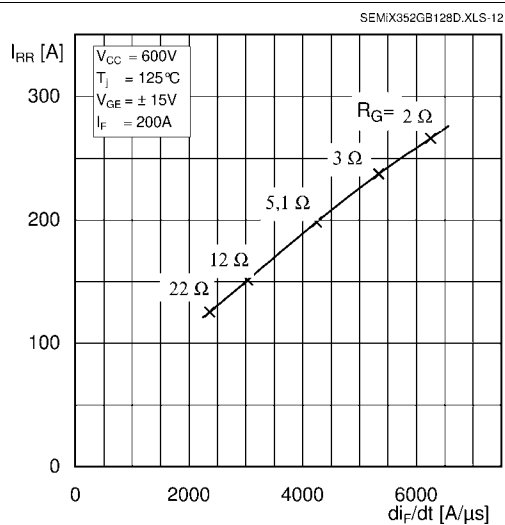


Fig. 11 Typ. CAL diode peak reverse recovery current

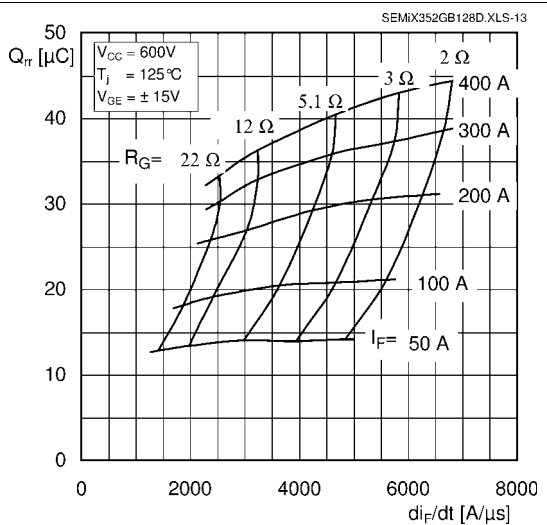
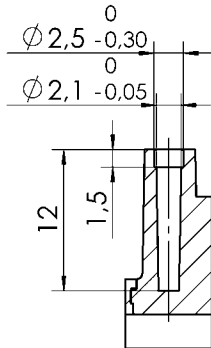


Fig. 12 Typ. CAL diode recovery charge

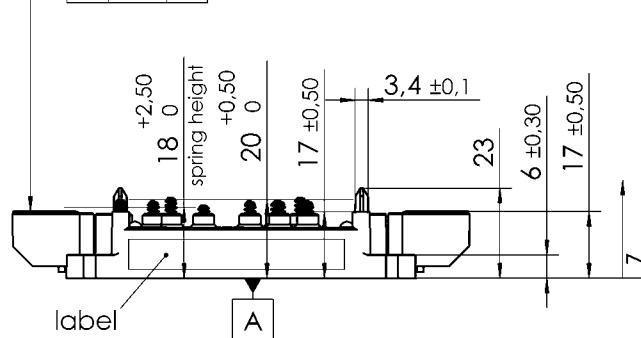
# SEMiX352GAL128Ds

case: SEMiX 2s

screw duct (4x):  
A-A (2 : 1)

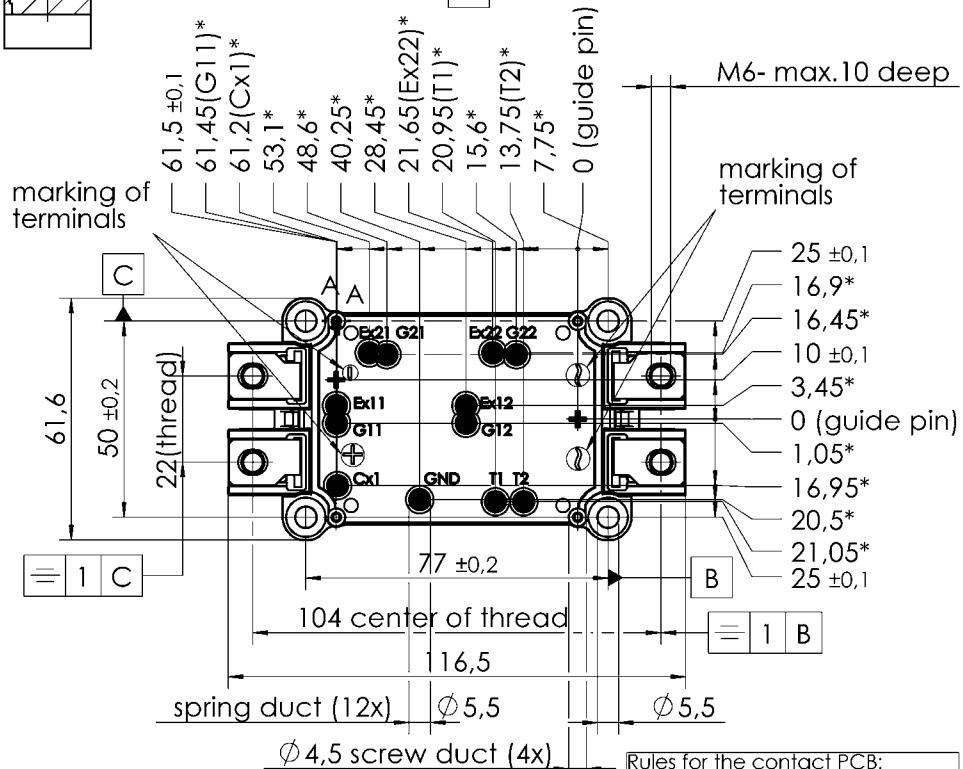


|           |     |                            |
|-----------|-----|----------------------------|
| $\square$ | 0,3 | main terminal + , - / ~, ~ |
| //        | 0,2 | A                          |



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

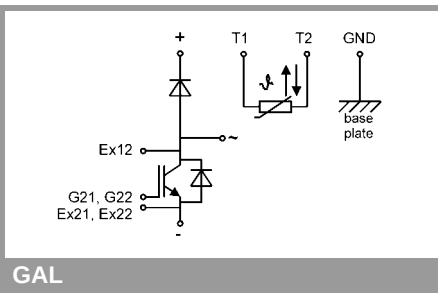
www.DataSheet4U.com



\* all measures with  $\pm 0,2$  B C

Rules for the contact PCB:  
- holes guidepins =  $\phi 4 \pm 0,1$   
- spring landing pad =  $\phi 3,5 \pm 0,2$

SEMiX 2s



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.