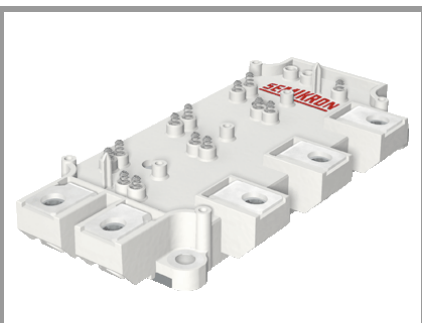


SEMiX151GD12E4s



SEMiX® 13

Trench IGBT Modules

SEMiX151GD12E4s

Features

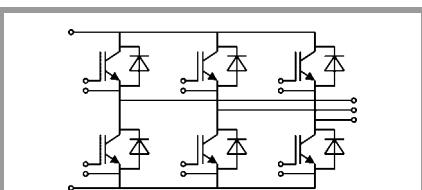
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Electronic Welding

Remarks

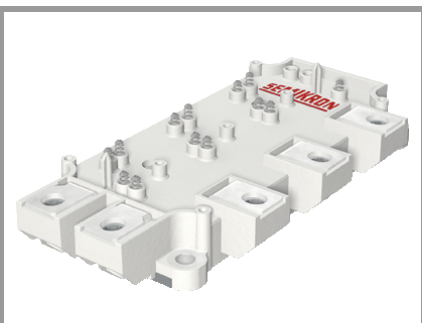
- Case temperature limited to $T_C=125^\circ\text{C}$ max.
- Product reliability results are valid for $T_j=150^\circ\text{C}$



GD

| Absolute Maximum Ratings | | | | |
|--------------------------|--|---------------------------|------------------|---------------|
| Symbol | Conditions | Values | Unit | |
| IGBT | | | | |
| V_{CES} | | 1200 | V | |
| I_C | $T_j = 175^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 232 | A |
| | | $T_c = 80^\circ\text{C}$ | 179 | A |
| I_{Cnom} | | 150 | A | |
| I_{CRM} | $I_{CRM} = 3 \times I_{Cnom}$ | 450 | A | |
| V_{GES} | | -20 ... 20 | V | |
| t_{psc} | $V_{CC} = 800\text{ V}$ | $T_j = 150^\circ\text{C}$ | 10 | μs |
| | $V_{GE} \leq 20\text{ V}$ | | | |
| | $V_{CES} \leq 1200\text{ V}$ | | | |
| T_j | | -40 ... 175 | $^\circ\text{C}$ | |
| Inverse diode | | | | |
| I_F | $T_j = 175^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 189 | A |
| | | $T_c = 80^\circ\text{C}$ | 141 | A |
| I_{Fnom} | | 150 | A | |
| I_{FRM} | $I_{FRM} = 3 \times I_{Fnom}$ | 450 | A | |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$ | 900 | A | |
| T_j | | -40 ... 175 | $^\circ\text{C}$ | |
| Module | | | | |
| $I_{t(RMS)}$ | | 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 |
| IGBT | | | | | |
| $V_{CE(sat)}$ | $I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel | $T_j = 25^\circ\text{C}$ | 1.8 | 2.05 | V |
| | | $T_j = 150^\circ\text{C}$ | 2.2 | 2.4 | V |
| V_{CE0} | | $T_j = 25^\circ\text{C}$ | 0.8 | 0.9 | V |
| | | $T_j = 150^\circ\text{C}$ | 0.7 | 0.8 | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ | $T_j = 25^\circ\text{C}$ | 6.7 | 7.7 | $\text{m}\Omega$ |
| | | $T_j = 150^\circ\text{C}$ | 10.0 | 10.7 | $\text{m}\Omega$ |
| $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C = 6\text{ mA}$ | 5 | 5.8 | 6.5 | V |
| I_{CES} | $V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$ | $T_j = 25^\circ\text{C}$ | 0.1 | 0.3 | mA |
| | | $T_j = 150^\circ\text{C}$ | | | mA |
| C_{ies} | $V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$ | $f = 1\text{ MHz}$ | 9.3 | | nF |
| C_{oes} | | $f = 1\text{ MHz}$ | 0.58 | | nF |
| C_{res} | | $f = 1\text{ MHz}$ | 0.51 | | nF |
| Q_G | $V_{GE} = -8\text{ V...} + 15\text{ V}$ | | 850 | | nC |
| R_{Gint} | $T_j = 25^\circ\text{C}$ | | 5.00 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 600\text{ V}$ | $T_j = 150^\circ\text{C}$ | 209 | | ns |
| t_r | $I_C = 150\text{ A}$ | $T_j = 150^\circ\text{C}$ | 39 | | ns |
| | | $T_j = 150^\circ\text{C}$ | 14.1 | | mJ |
| E_{on} | $R_{Gon} = 1\ \Omega$ | $T_j = 150^\circ\text{C}$ | | | mJ |
| $t_{d(off)}$ | $R_{Goff} = 1\ \Omega$ | $T_j = 150^\circ\text{C}$ | 483 | | ns |
| t_f | $di/dt_{on} = 3900\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | 82 | | ns |
| E_{off} | $di/dt_{off} = 2000\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | 19.2 | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | 0.19 | K/W |



SEMiX[®] 13

Trench IGBT Modules

SEMiX151GD12E4s

Features

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

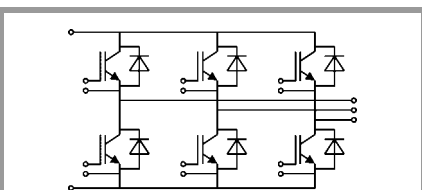
Typical Applications

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- Case temperature limited to $T_C=125^\circ\text{C}$ max.
- Product reliability results are valid for $T_j=150^\circ\text{C}$

| Characteristics | | | | | | |
|--------------------------|--|---------------------------|------|---------------------|------|---------------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Inverse diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chip | $T_j = 25^\circ\text{C}$ | | 2.1 | 2.46 | V |
| | | $T_j = 150^\circ\text{C}$ | | 2.1 | 2.4 | V |
| V_{F0} | | $T_j = 25^\circ\text{C}$ | 1.1 | 1.3 | 1.5 | V |
| | | $T_j = 150^\circ\text{C}$ | 0.7 | 0.9 | 1.1 | V |
| r_F | | $T_j = 25^\circ\text{C}$ | 4.3 | 5.6 | 6.4 | m Ω |
| | | $T_j = 150^\circ\text{C}$ | 6.7 | 7.8 | 8.5 | m Ω |
| I_{RRM} | $I_F = 150\text{ A}$ | $T_j = 150^\circ\text{C}$ | | 185 | | A |
| Q_{rr} | $di/dt_{off} = 3400\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | | 23 | | μC |
| E_{rr} | $V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$ | $T_j = 150^\circ\text{C}$ | | 8.9 | | mJ |
| $R_{th(j-c)}$ | per diode | | | | 0.31 | K/W |
| Module | | | | | | |
| L_{CE} | | | | 20 | | nH |
| $R_{CC'+EE'}$ | res., terminal-chip | $T_C = 25^\circ\text{C}$ | | 0.7 | | m Ω |
| | | $T_C = 125^\circ\text{C}$ | | 1 | | m Ω |
| $R_{th(c-s)}$ | per module | | | 0.04 | | K/W |
| M_s | to heat sink (M5) | | 3 | | 5 | Nm |
| M_t | | to terminals (M6) | 2.5 | | 5 | Nm |
| | | | | | | Nm |
| w | | | | | 350 | g |
| Temperatur Sensor | | | | | | |
| R_{100} | $T_C=100^\circ\text{C}$ ($R_{25}=5\text{ k}\Omega$) | | | $493 \pm 5\%$ | | Ω |
| $B_{100/125}$ | $R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; $T[\text{K}]$; | | | 3550 $\pm 2\%$ | | K |



GD

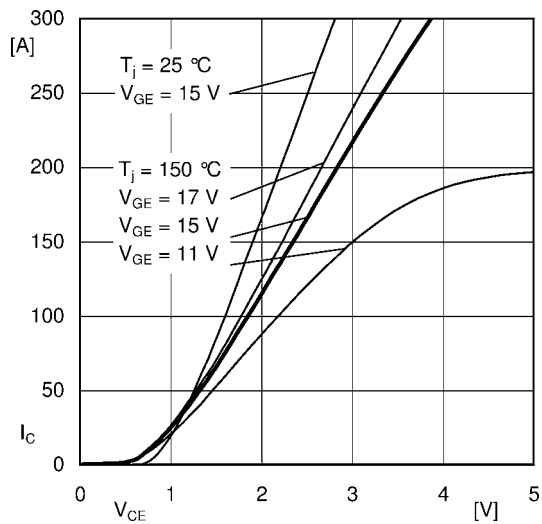


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

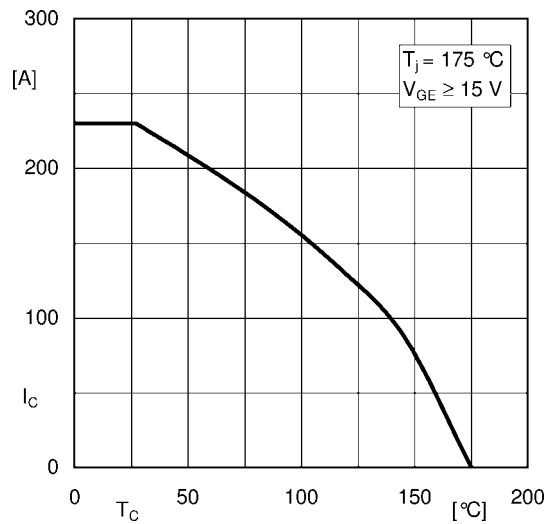


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

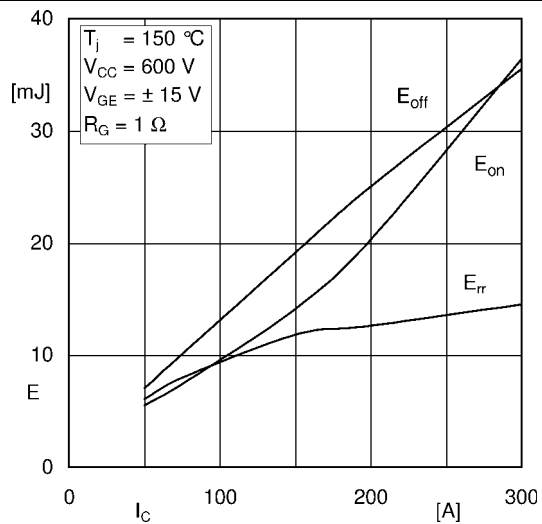


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

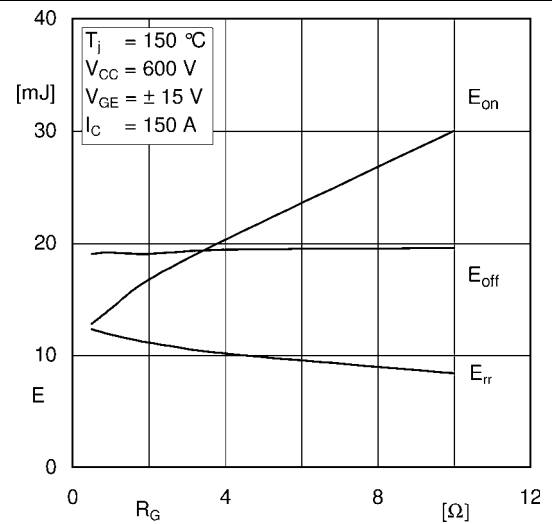


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

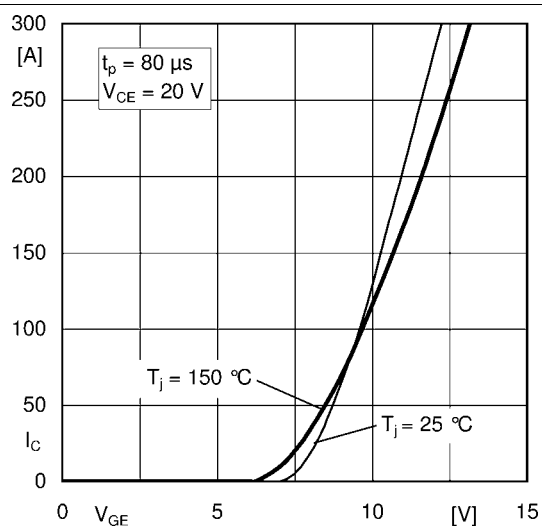


Fig. 5: Typ. transfer characteristic

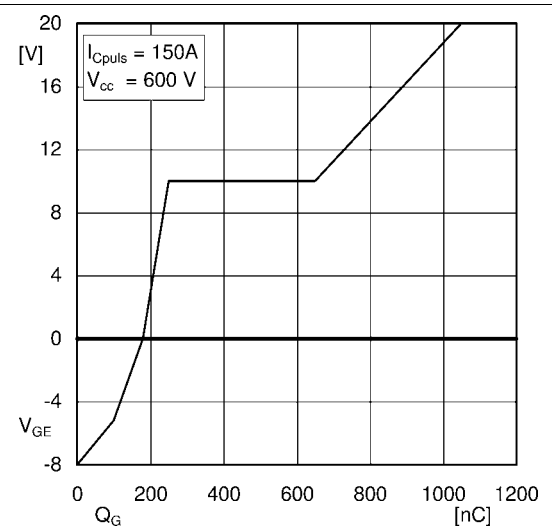


Fig. 6: Typ. gate charge characteristic

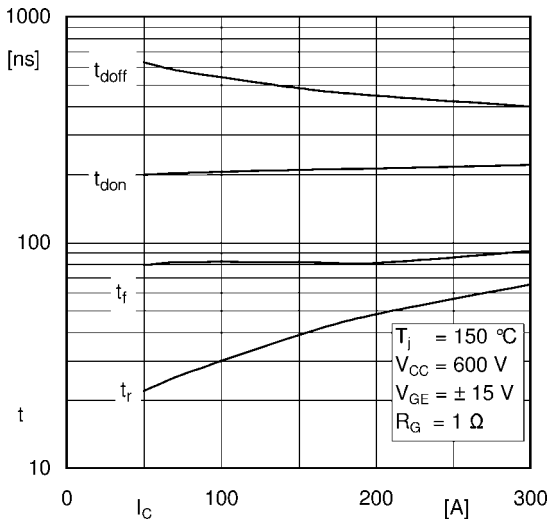


Fig. 7: Typ. switching times vs. I_C

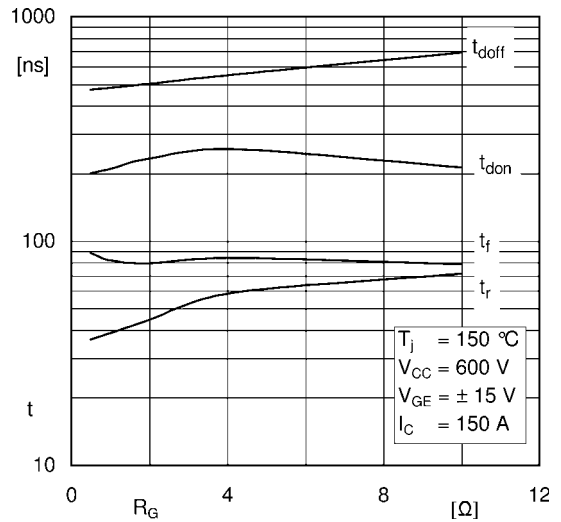


Fig. 8: Typ. switching times vs. gate resistor R_G

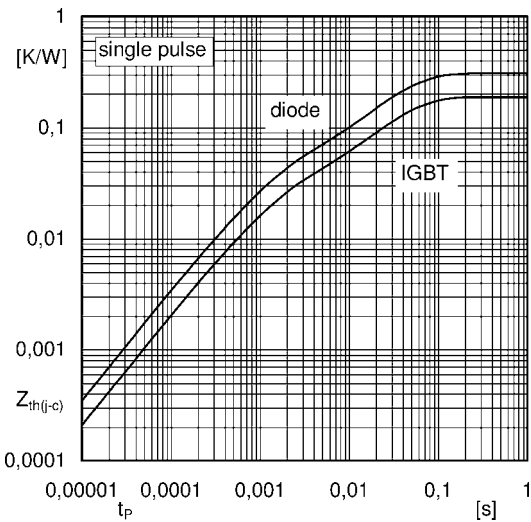


Fig. 9: Typ. transient thermal impedance

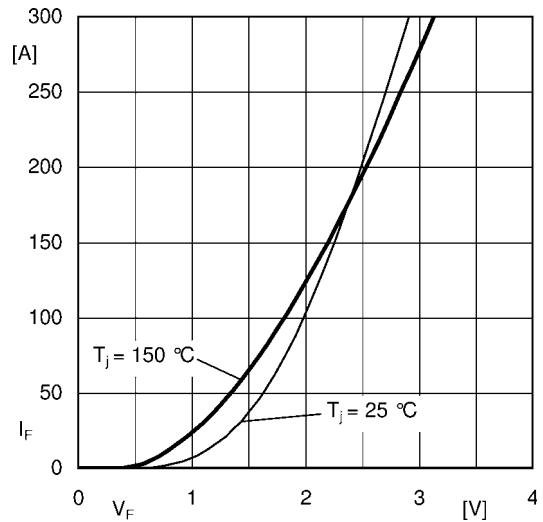


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

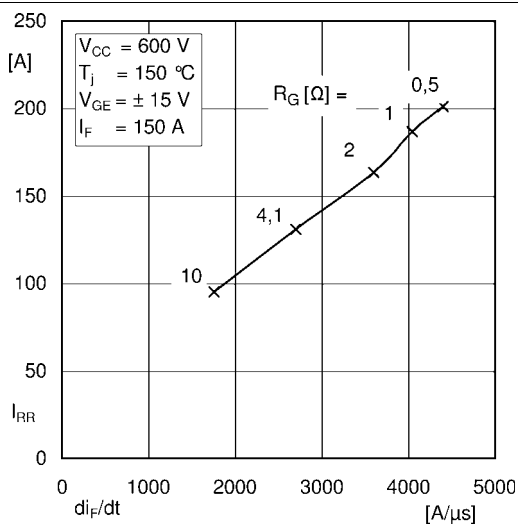


Fig. 11: Typ. CAL diode peak reverse recovery current

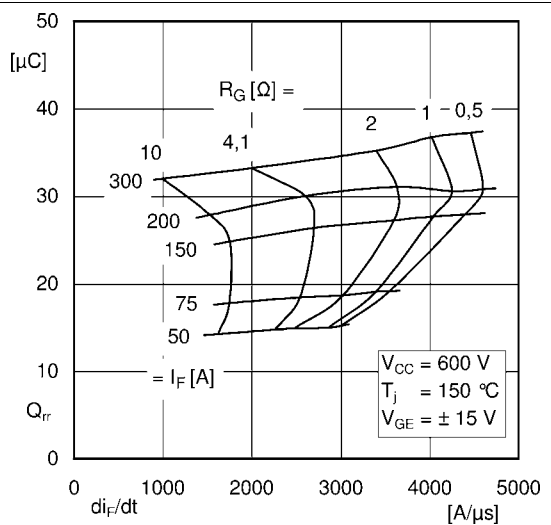
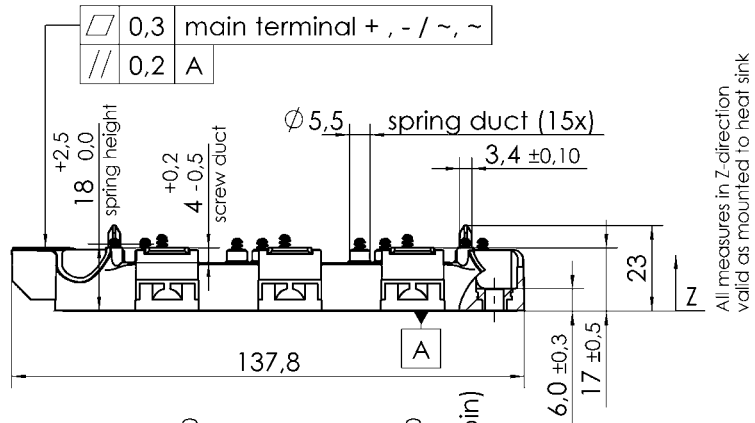
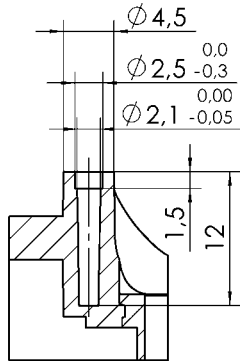


Fig. 12: Typ. CAL diode recovery charge

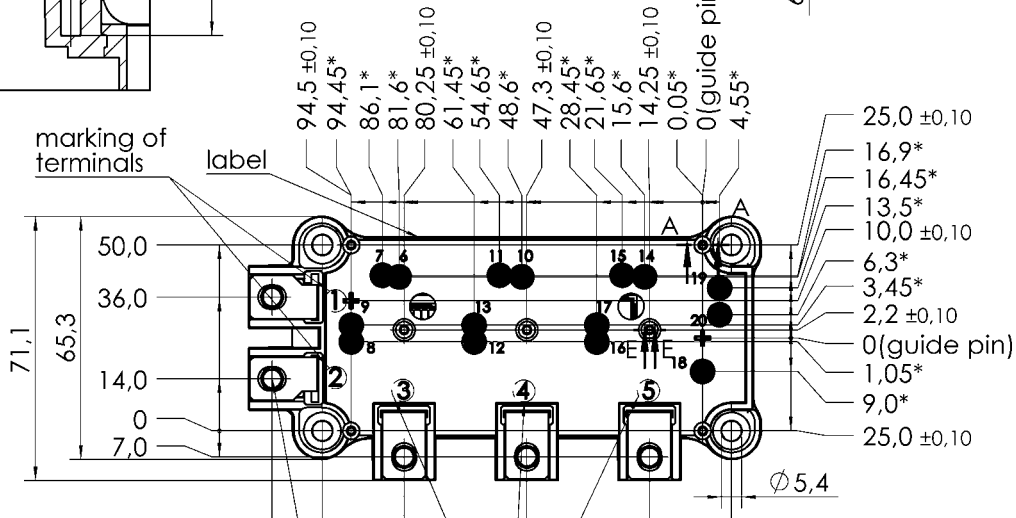
SEMiX151GD12E4s

case: SEMiX 13

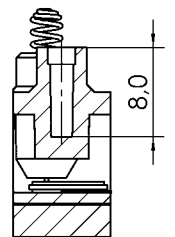
screw duct (4x):
A-A (2:1)



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



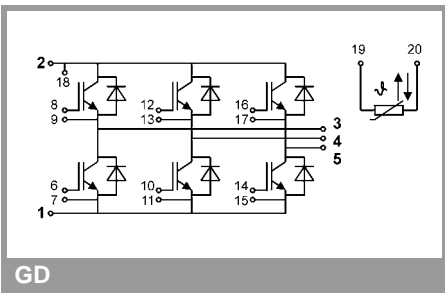
screw duct (3x centre):
E-E (2:1)



* all measures with $\pm 0,2$

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

SEMIX 13



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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

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