

SEMiX453GB17E4p



SEMiX® 3p

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Features

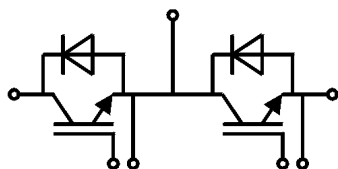
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- Press-fit pins as auxiliary contacts
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Renewable energy systems

Remarks

- Product reliability results are valid for $T_j=150^\circ\text{C}$
- V_{isol} between temperature sensor and power section is only 2500V
- For storage and case temperature with TIM see document "TP(*) SEMiX 3p"



GB

| Absolute Maximum Ratings | | | | |
|--------------------------|---|---------------------------|------------------|---------------|
| Symbol | Conditions | Values | Unit | |
| IGBT | | | | |
| V_{CES} | $T_j = 25^\circ\text{C}$ | 1700 | V | |
| I_C | $T_j = 175^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 731 | A |
| | | $T_c = 80^\circ\text{C}$ | 555 | A |
| I_{Cnom} | | 450 | A | |
| I_{CRM} | $I_{CRM} = 3 \times I_{Cnom}$ | 1350 | A | |
| V_{GES} | | -20 ... 20 | V | |
| t_{psc} | $V_{CC} = 1000\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1700\text{ V}$ | $T_j = 150^\circ\text{C}$ | 10 | μs |
| | | | | |
| T_j | | -40 ... 175 | $^\circ\text{C}$ | |
| Inverse diode | | | | |
| V_{RRM} | $T_j = 25^\circ\text{C}$ | 1700 | V | |
| I_F | $T_j = 175^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 557 | A |
| | | $T_c = 80^\circ\text{C}$ | 412 | A |
| I_{Fnom} | | 450 | A | |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | 900 | A | |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$ | 2565 | A | |
| T_j | | -40 ... 175 | $^\circ\text{C}$ | |
| Module | | | | |
| $I_{t(RMS)}$ | | 600 | A | |
| T_{stg} | module without TIM | -40 ... 125 | $^\circ\text{C}$ | |
| V_{isol} | AC sinus 50Hz, $t = 1\text{ min}$ | 4000 | V | |

| Characteristics | | | | | |
|-----------------|---|---------------------------|-------|------|------------------|
| Symbol | Conditions | min. | typ. | max. | Unit |
| IGBT | | | | | |
| $V_{CE(sat)}$ | $I_C = 450\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel | $T_j = 25^\circ\text{C}$ | 1.90 | 2.20 | V |
| | | $T_j = 150^\circ\text{C}$ | 2.26 | 2.45 | V |
| V_{CE0} | chipllevel | $T_j = 25^\circ\text{C}$ | 1.10 | 1.20 | V |
| | | $T_j = 150^\circ\text{C}$ | 1.00 | 1.10 | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ chipllevel | $T_j = 25^\circ\text{C}$ | 1.78 | 2.2 | $\text{m}\Omega$ |
| | | $T_j = 150^\circ\text{C}$ | 2.8 | 3.0 | $\text{m}\Omega$ |
| $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C = 18\text{ mA}$ | 5.2 | 5.8 | 6.4 | V |
| I_{CES} | $V_{GE} = 0\text{ V}, V_{CE} = 1700\text{ V}, T_j = 25^\circ\text{C}$ | | | 5 | mA |
| C_{ies} | $V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$ | $f = 1\text{ MHz}$ | 36.0 | | nF |
| C_{oes} | | $f = 1\text{ MHz}$ | 1.50 | | nF |
| C_{res} | | $f = 1\text{ MHz}$ | 1.14 | | nF |
| Q_G | $V_{GE} = -8\text{ V} \dots +15\text{ V}$ | | 3600 | | nC |
| R_{Gint} | $T_j = 25^\circ\text{C}$ | | 1.7 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 900\text{ V}$ $I_C = 450\text{ A}$ | $T_j = 150^\circ\text{C}$ | 290 | | ns |
| t_r | $V_{GE} = +15/-15\text{ V}$ | $T_j = 150^\circ\text{C}$ | 90 | | ns |
| E_{on} | $R_{Gon} = 2.7\ \Omega$ | $T_j = 150^\circ\text{C}$ | 131 | | mJ |
| $t_{d(off)}$ | $R_{Goff} = 2.7\ \Omega$ | $T_j = 150^\circ\text{C}$ | 790 | | ns |
| t_f | $di/dt_{on} = 4600\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | 175 | | ns |
| | $di/dt_{off} = 2300\text{ A}/\mu\text{s}$ | | | | |
| E_{off} | $du/dt = 3200\text{ V}/\mu\text{s}$ $L_s = 21\text{ nH}$ | $T_j = 150^\circ\text{C}$ | 146 | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | 0.06 | K/W |
| $R_{th(c-s)}$ | per IGBT ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$) | | 0.029 | | K/W |
| $R_{th(c-s)}$ | per IGBT, pre-applied phase change material | | 0.02 | | K/W |



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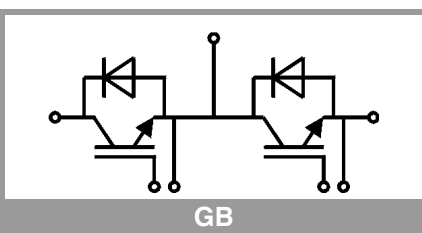
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|---------------------------|---|---------------------------|------|----------------|------|---------------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Inverse diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 450\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel | $T_j = 25^\circ\text{C}$ | | 1.98 | 2.37 | V |
| | | $T_j = 150^\circ\text{C}$ | | 2.11 | 2.52 | V |
| V_{F0} | chipelevel | $T_j = 25^\circ\text{C}$ | | 1.32 | 1.56 | V |
| | | $T_j = 150^\circ\text{C}$ | | 1.08 | 1.22 | V |
| r_F | chipelevel | $T_j = 25^\circ\text{C}$ | | 1.46 | 1.80 | m Ω |
| | | $T_j = 150^\circ\text{C}$ | | 2.3 | 2.9 | m Ω |
| I_{RRM} | $I_F = 450\text{ A}$ | $T_j = 150^\circ\text{C}$ | | 380 | | A |
| Q_{rr} | $di/dt_{off} = 4850\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | | 120 | | μC |
| E_{rr} | $V_{GE} = -15\text{ V}$ $V_{CC} = 900\text{ V}$ | $T_j = 150^\circ\text{C}$ | | 72 | | mJ |
| $R_{th(j-c)}$ | per diode | | | | 0.1 | K/W |
| $R_{th(c-s)}$ | per diode ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$) | | | 0.048 | | K/W |
| $R_{th(c-s)}$ | per diode, pre-applied phase change material | | | 0.038 | | K/W |
| Module | | | | | | |
| L_{CE} | | | | 20 | | nH |
| R_{CC+EE} | measured per switch | $T_C = 25^\circ\text{C}$ | | 1.2 | | m Ω |
| | | $T_C = 125^\circ\text{C}$ | | 1.65 | | m Ω |
| $R_{th(c-s)1}$ | calculated without thermal coupling | | | 0.009 | | K/W |
| $R_{th(c-s)2}$ | including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$) | | | 0.014 | | K/W |
| $R_{th(c-s)2}$ | including thermal coupling, T_s underneath module, pre-applied phase change material | | | 0.011 | | K/W |
| M_s | to heat sink (M5) | | 3 | | 6 | Nm |
| M_t | | to terminals (M6) | 3 | | 6 | Nm |
| | | | | | | Nm |
| w | | | | | 350 | g |
| Temperature 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 |



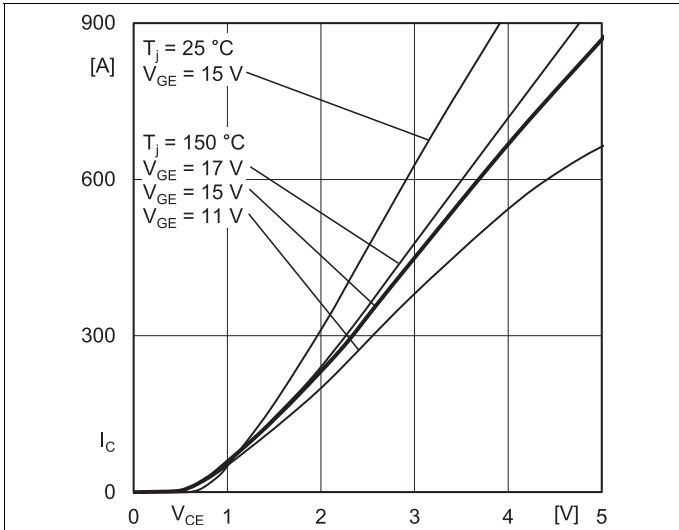


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

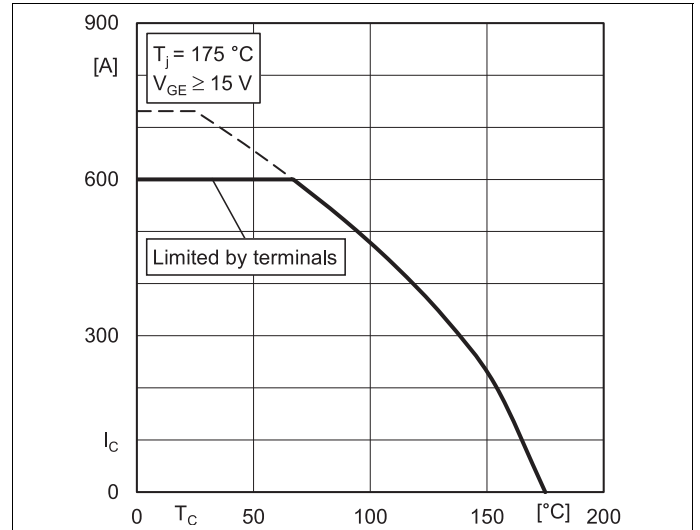


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

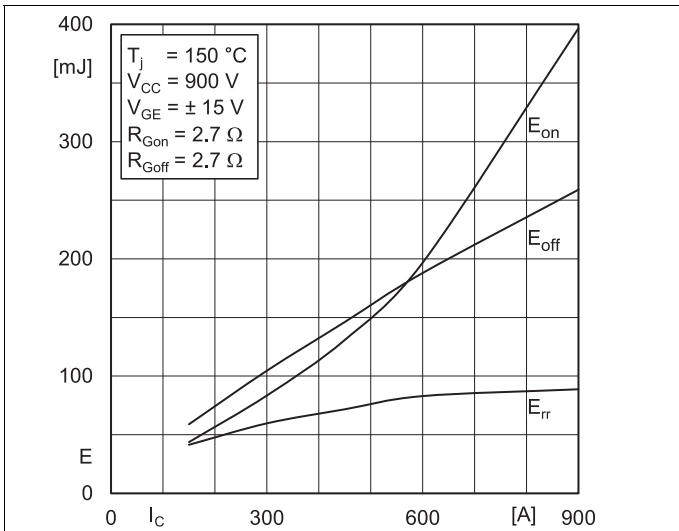


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

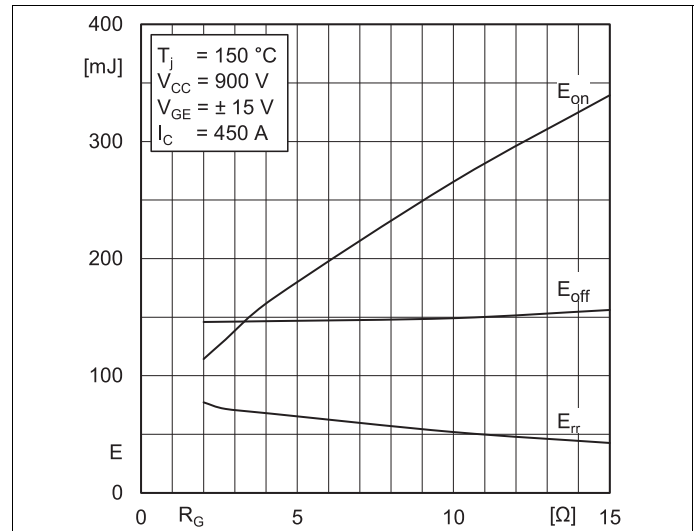


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

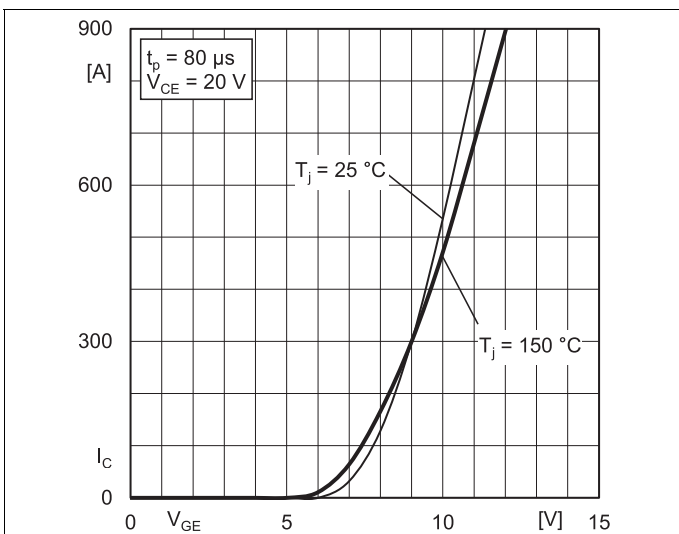


Fig. 5: Typ. transfer characteristic

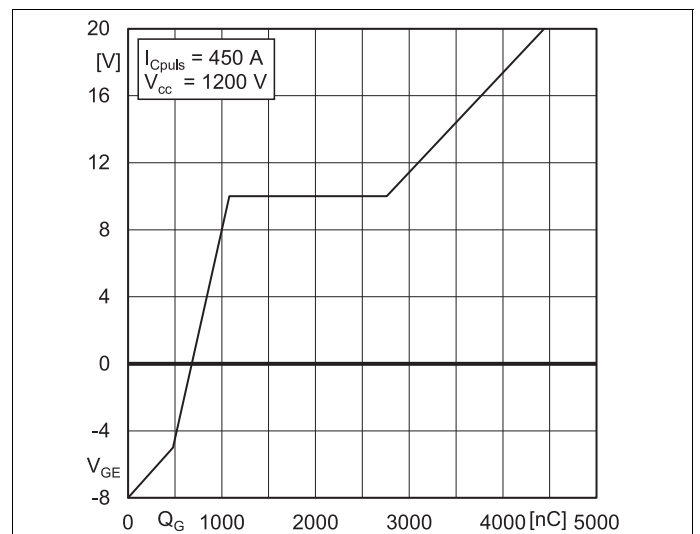


Fig. 6: Typ. gate charge characteristic

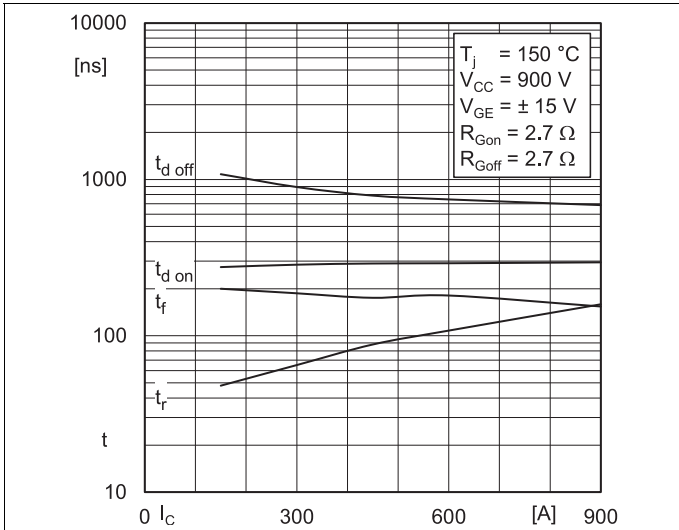


Fig. 7: Typ. switching times vs. I_C

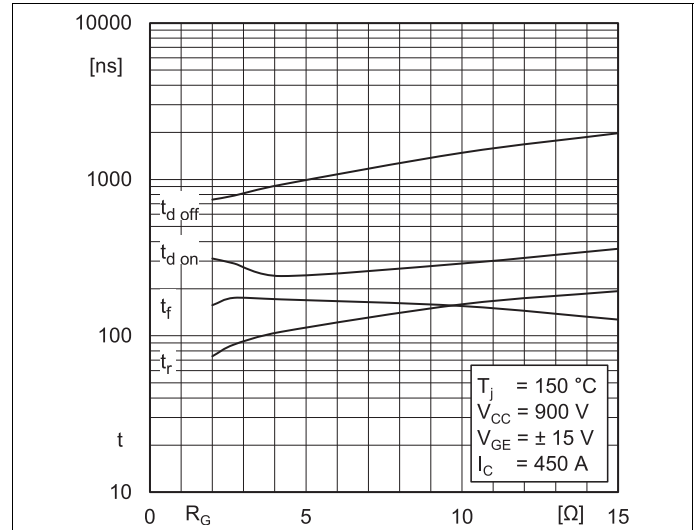


Fig. 8: Typ. switching times vs. gate resistor R_G

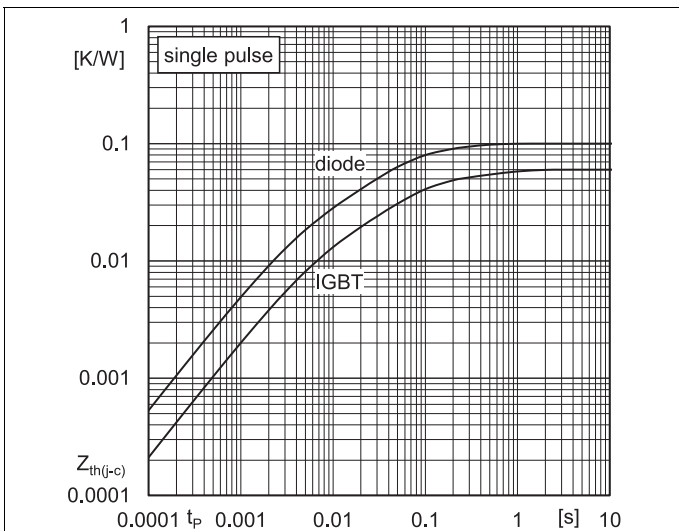


Fig. 9: Transient thermal impedance

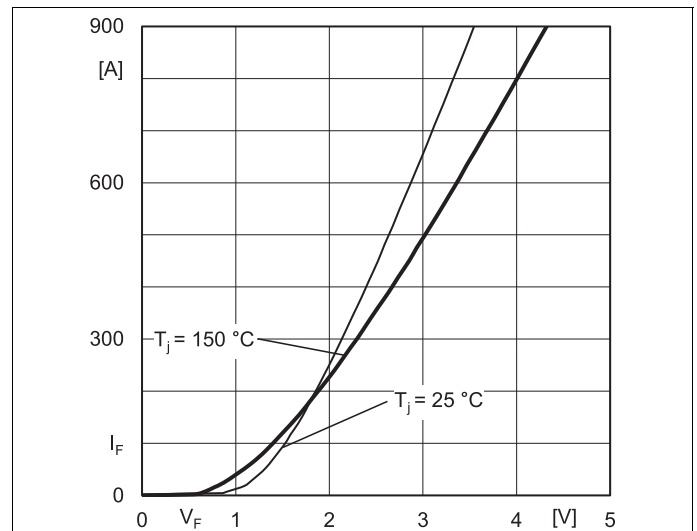


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

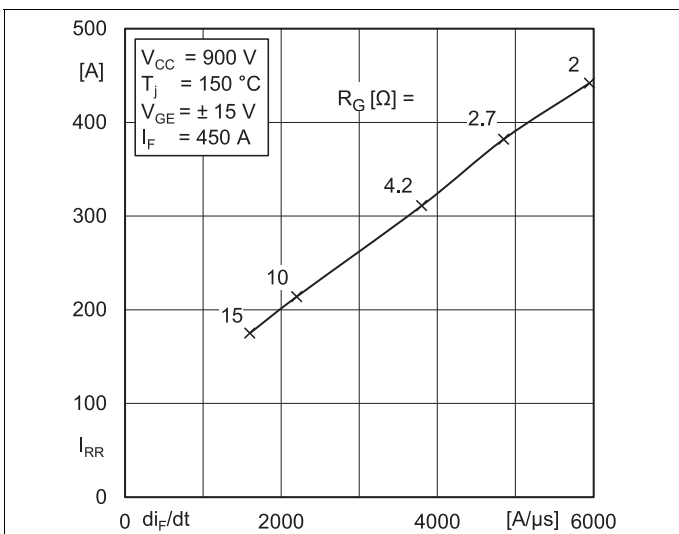


Fig. 11: Typ. CAL diode peak reverse recovery current

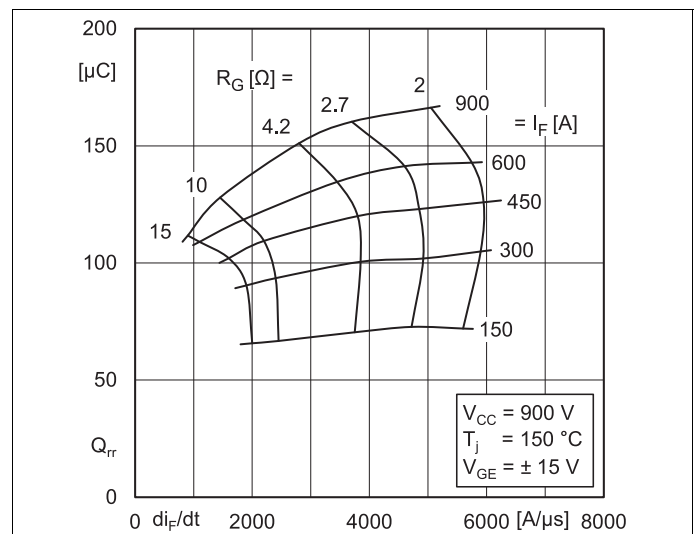


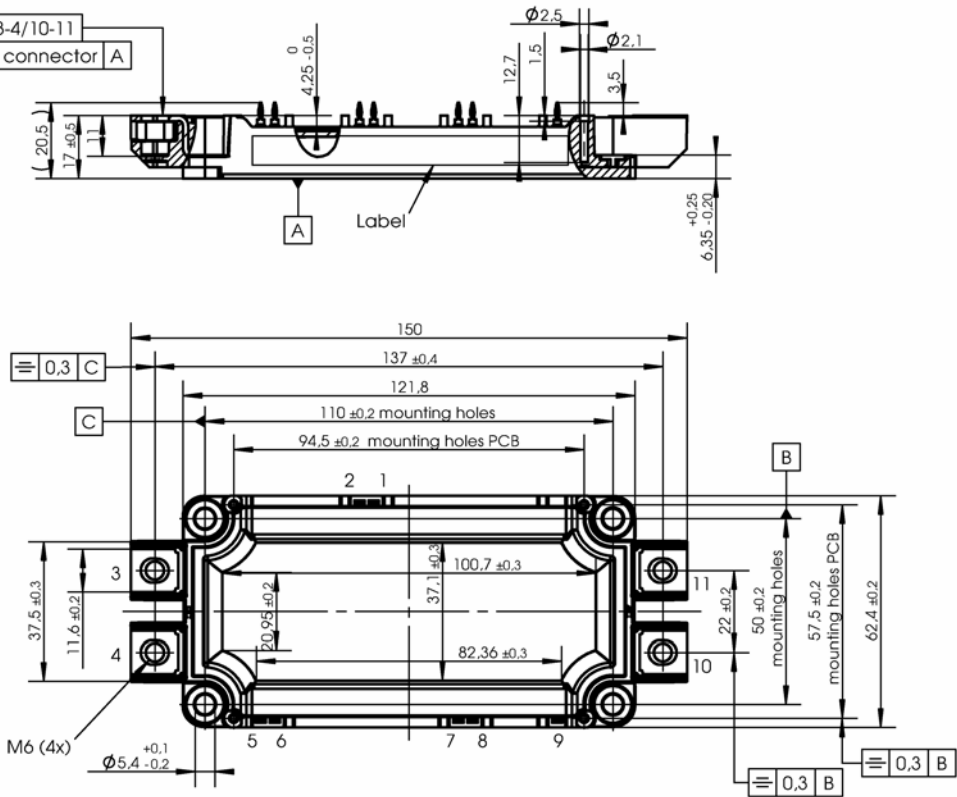


Fig. 12: Typ. CAL diode recovery charge

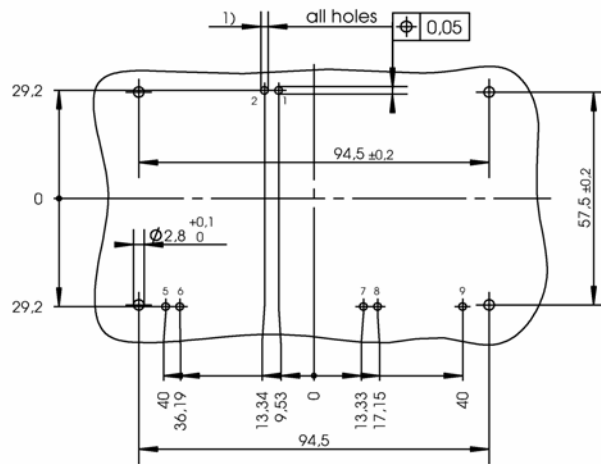
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Package outline

-  0.3 connector 3-4/10-11
-  0.2 each single connector A



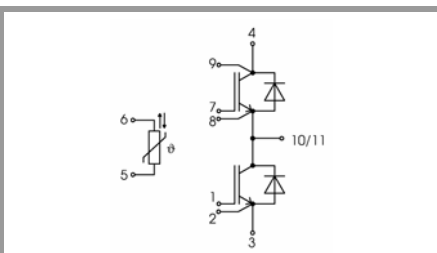
PCB drillhole pattern



Dimensions valid in mounted status

1) PCB hole specification see Mounting Instructions SEMiX press-fit

SEMiX 3p



pinout

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

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