SEMITRANS® 2

Superfast NPT-IGBT Modules

**SKM50GB063D**

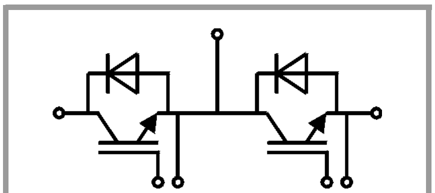
Target Data

### Features

- NPT = non punch-through IGBT technology
- High short circuit capability, self limiting to 6 x IC
- Pos. temp.-coeff. of VCEsat
- Isolated copper baseplate

### Typical Applications*

- Switched mode power supplies
- UPS
- Three phase inverters for servo / AC motor speed control




**Absolute Maximum Ratings**

| Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|
| **IGBT** | | | | |
| $V_{CES}$ | $T_j$ = 25 °C | | 600 | V |
| $I_C$ | $T_j$ = 150 °C | $T_c$ = 25 °C | 70 | A |
| | | $T_c$ = 75 °C | 51 | A |
| $I_{Cnom}$ | | | 50 | A |
| $I_{CRM}$ | $I_{CRM} = 2xI_{Cnom}$ | | 100 | A |
| $V_{GES}$ | | | -20 ... 20 | V |
| $t_{psc}$ | $V_{CC}$ = 300 V<br>$V_{GE} \leq$ 20 V<br>$V_{CES} \leq$ 600 V | $T_j$ = 125 °C | 10 | µs |
| $T_j$ | | | -55 ... 150 | °C |
| **Inverse diode** | | | | |
| $I_F$ | | $T_c$ = 25 °C | 75 | A |
| | | $T_c$ = 80 °C | 45 | A |
| $I_{Fnom}$ | | | 50 | A |
| $I_{FRM}$ | $I_{FRM} = 2xI_{Fnom}$ | | 100 | A |
| $I_{FSM}$ | $t_p$ = 10 ms, sin 180°, $T_j$ = 25 °C | | | A |
| $T_j$ | | | -40 ... 150 | °C |
| **Module** | | | | |
| $I_{t(RMS)}$ | $T_{terminal}$ < 80 °C | | 200 | A |
| $T_{stg}$ | | | -40 ... 125 | °C |
| $V_{isol}$ | AC sinus 50Hz, t = 1 min | | 2500 | V |

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **IGBT** | | | | | | |
| $V_{CE(sat)}$ | $I_C$ = 50 A<br>$V_{GE}$ = 15 V<br>chiplevel | $T_j$ = 25 °C | | 2.1 | 2.5 | V |
| | | $T_j$ = 125 °C | | 2.4 | 2.8 | V |
| $V_{CE0}$ | | $T_j$ = 25 °C | | 1.05 | 1.3 | V |
| | | $T_j$ = 125 °C | | 1 | 1.2 | V |
| $r_{CE}$ | $V_{GE}$ = 15 V | $T_j$ = 25 °C | | 21.0 | 24.0 | mΩ |
| | | $T_j$ = 125 °C | | 28.0 | 32.0 | mΩ |
| $V_{GE(th)}$ | $V_{GE}=V_{CE}$, $I_C$ = 1 mA | | 4.5 | 5.5 | 6.5 | V |
| $I_{CES}$ | $V_{GE}$ = 0 V<br>$V_{CE}$ = 600 V | $T_j$ = 25 °C | | 0.1 | 0.3 | mA |
| | | | | | | mA |
| $C_{ies}$ | $V_{CE}$ = 25 V<br>$V_{GE}$ = 0 V | f = 1 MHz | | 2.2 | | nF |
| $C_{oes}$ | | f = 1 MHz | | | | nF |
| $C_{res}$ | | f = 1 MHz | | 0.2 | | nF |
| $Q_G$ | $V_{GE}$ = - 8 V...+ 20 V | | | | | nC |
| $R_{Gint}$ | $T_j$ = 25 °C | | | | | Ω |
| $t_{d(on)}$ | $V_{CC}$ = 300 V<br>$I_C$ = 50 A<br>$V_{GE}$ = ±15 V<br>$R_{G\,on}$ = 22 Ω<br>$R_{G\,off}$ = 22 Ω | $T_j$ = 125 °C | | 50 | | ns |
| $t_r$ | | $T_j$ = 125 °C | | 40 | | ns |
| $E_{on}$ | | $T_j$ = 125 °C | | 2.5 | | mJ |
| $t_{d(off)}$ | | $T_j$ = 125 °C | | 300 | | ns |
| $t_f$ | | $T_j$ = 125 °C | | 30 | | ns |
| $E_{off}$ | | $T_j$ = 125 °C | | 1.8 | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | | 0.5 | K/W |

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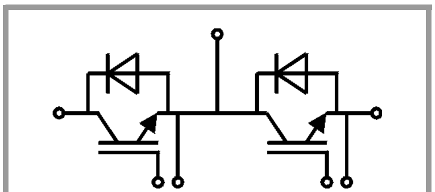

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| Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| **Inverse diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ = 50 A<br>$V_{GE}$ = 0 V<br>chip | $T_j$ = 25 °C | | 1.35 | 1.60 | V |
| | | $T_j$ = 125 °C | | 1.35 | 1.60 | V |
| $V_{F0}$ | | $T_j$ = 25 °C | | 1.05 | 1.2 | V |
| | | $T_j$ = 125 °C | | 0.9 | 1 | V |
| $r_F$ | | $T_j$ = 25 °C | | 6.0 | 8.0 | mΩ |
| | | $T_j$ = 125 °C | | 9.0 | 12.0 | mΩ |
| $I_{RRM}$ | $I_F$ = 50 A<br>$di/dt_{off}$ = 50 A/µs<br>$V_{GE}$ = ±15 V<br>$V_{CC}$ = 300 V | $T_j$ = 125 °C | | 31 | | A |
| $Q_{rr}$ | | $T_j$ = 125 °C | | 3.2 | | µC |
| $E_{rr}$ | | $T_j$ = 125 °C | | 0.48 | | mJ |
| $R_{th(j-c)}$ | per diode | | | | 1 | K/W |
| **Module** | | | | | | |
| $L_{CE}$ | | | | | 30 | nH |
| $R_{CC'+EE'}$ | terminal-chip | $T_C$ = 25 °C | | 0.65 | | mΩ |
| | | $T_C$ = 125 °C | | 1 | | mΩ |
| $R_{th(c-s)}$ | per module | | | 0.04 | 0.05 | K/W |
| $M_s$ | to heat sink M6 | | 3 | | 5 | Nm |
| $M_t$ | | to terminals M5 | 2.5 | | 5 | Nm |
| | | | | | | Nm |
| w | | | | | 160 | g |

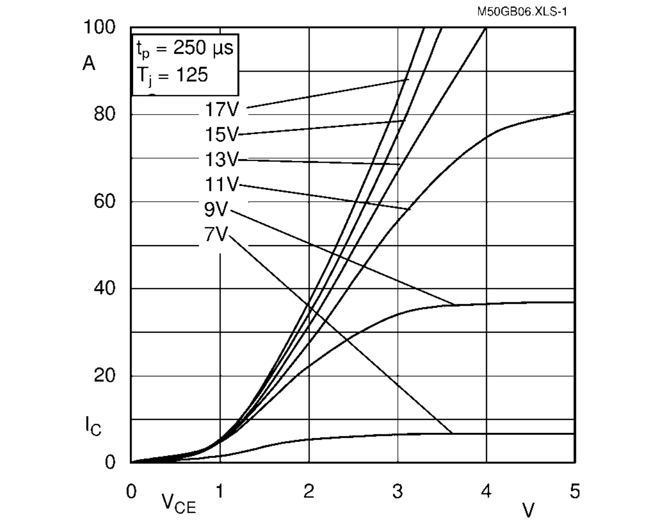



Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

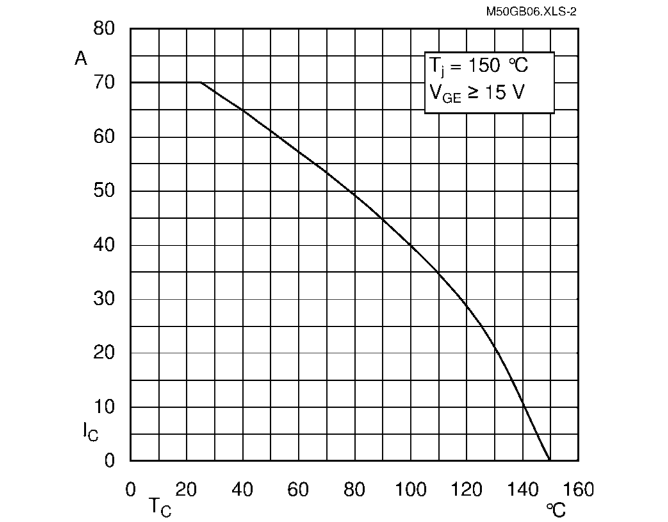



Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

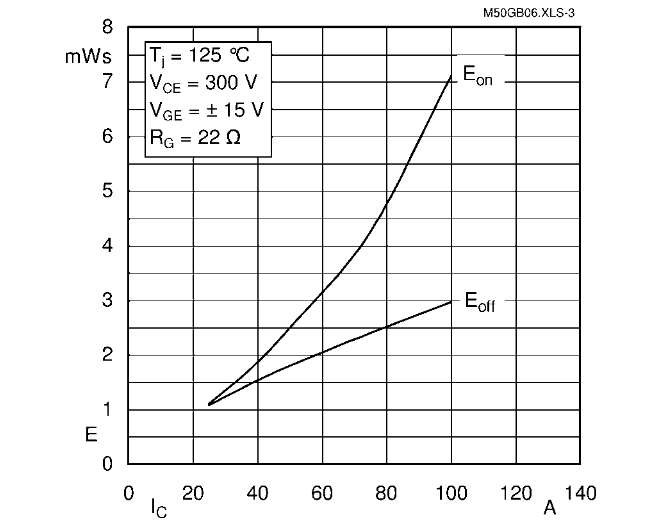



Fig. 3: Typ. turn-on /-off energy = f ($I_C$)

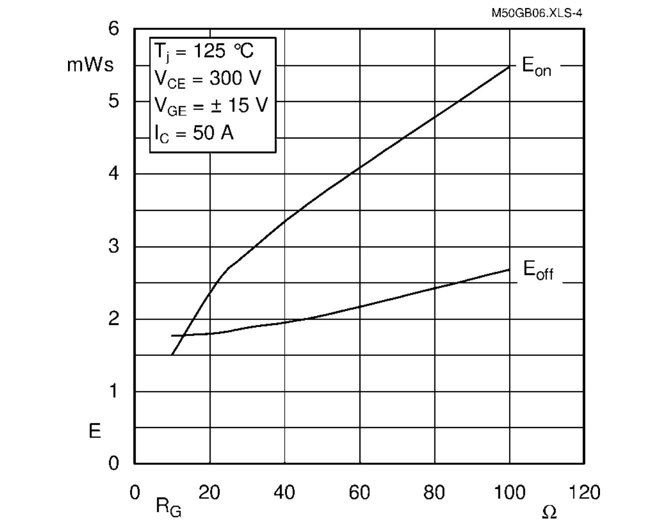



Fig. 4: Typ. turn-on /-off energy = f ($R_G$)

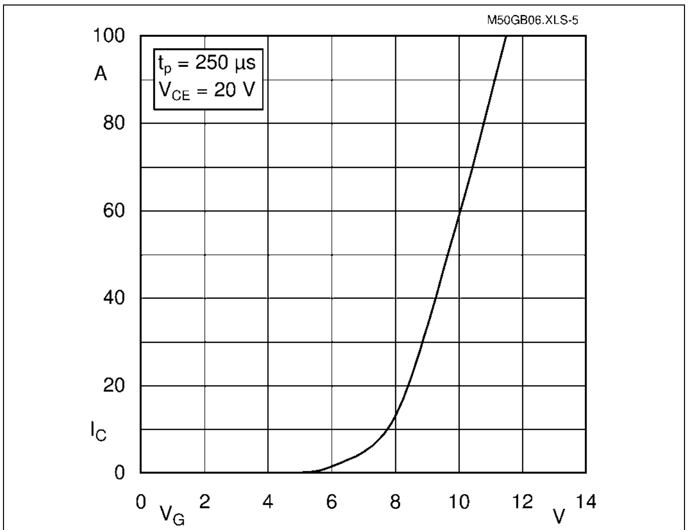



Fig. 5: Typ. transfer characteristic

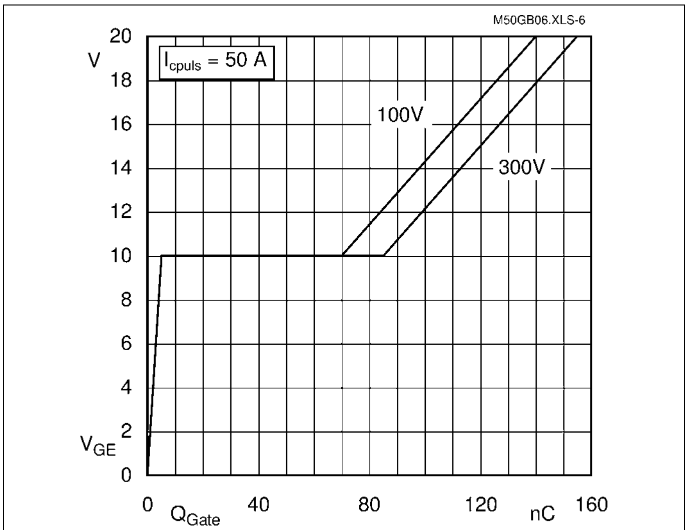



Fig. 6: Typ. gate charge characteristic

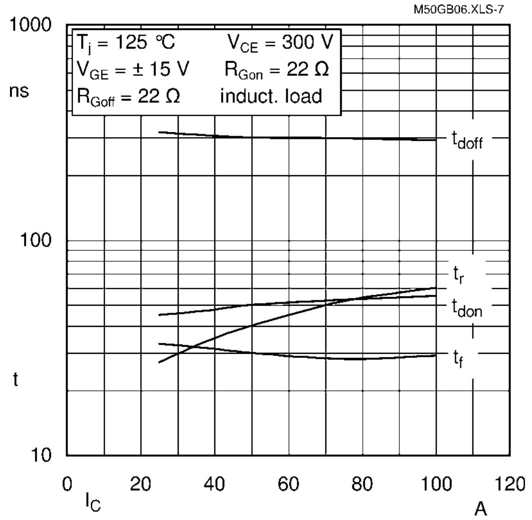



Fig. 7: Typ. switching times vs. $I_C$

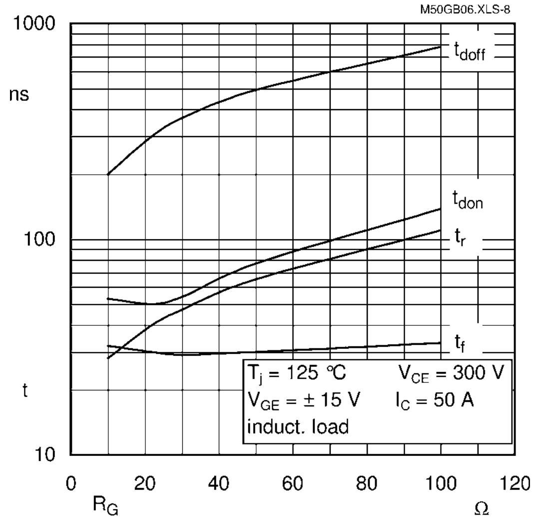



Fig. 8: Typ. switching times vs. gate resistor $R_G$

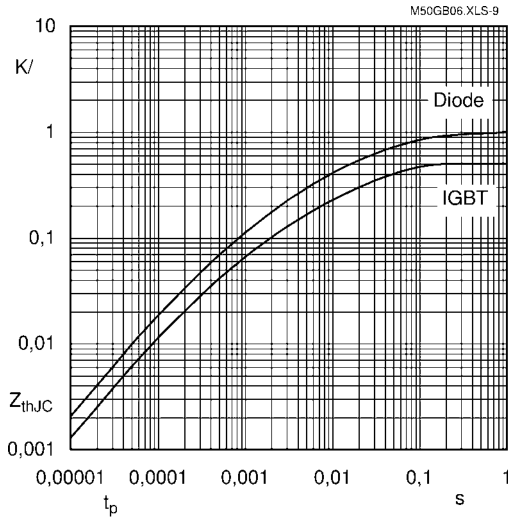



Fig. 9: Transient thermal impedance

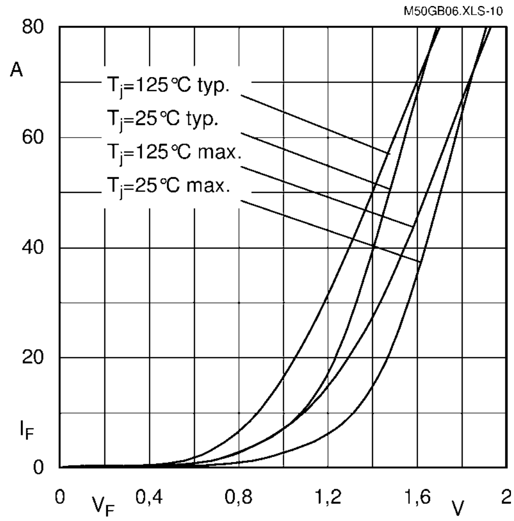



Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

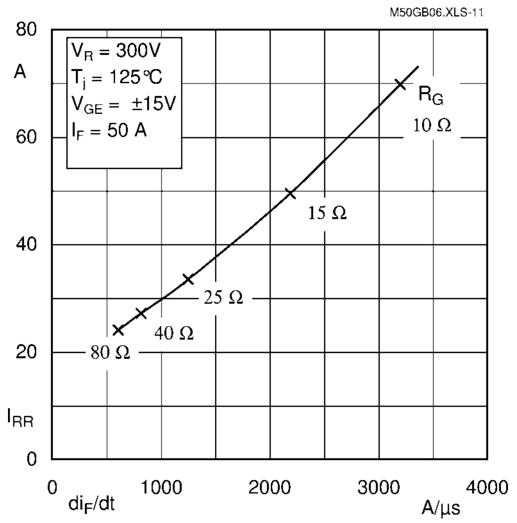



Fig. 11: CAL diode peak reverse recovery current

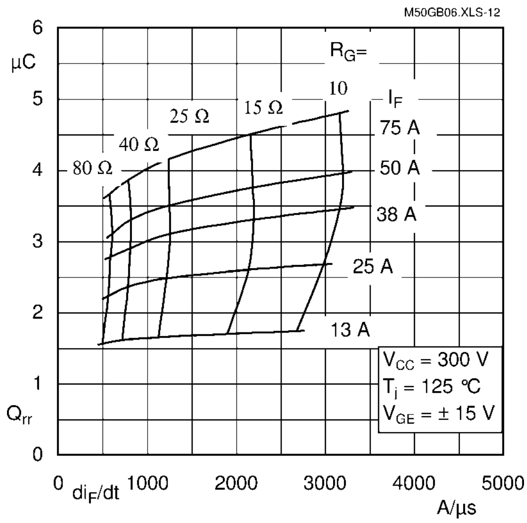
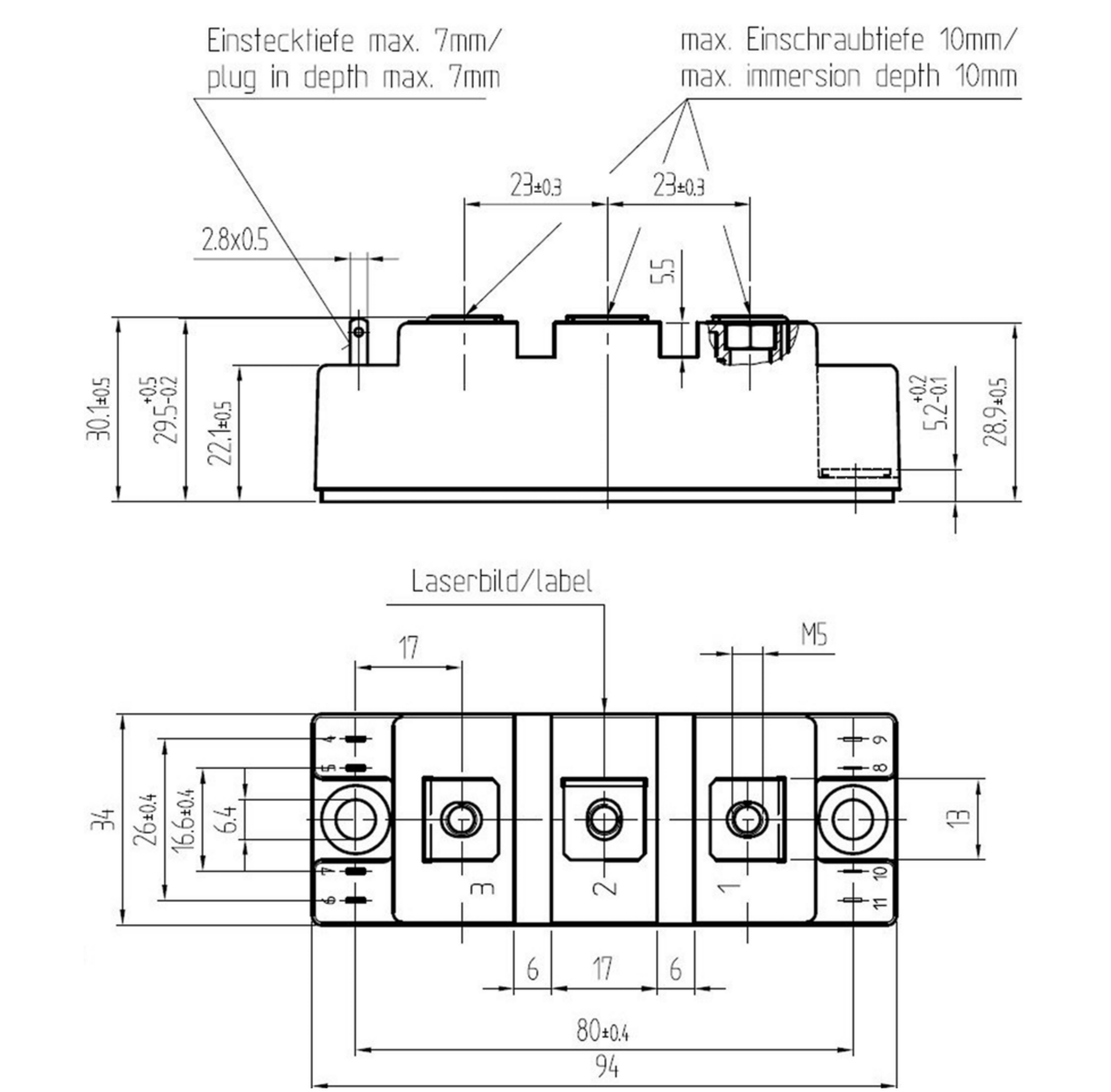



Fig. 12: Typ. CAL diode peak reverse recovery charge

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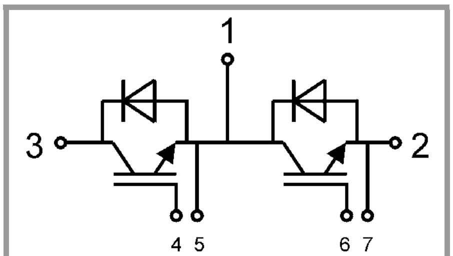


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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

* 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 personal.