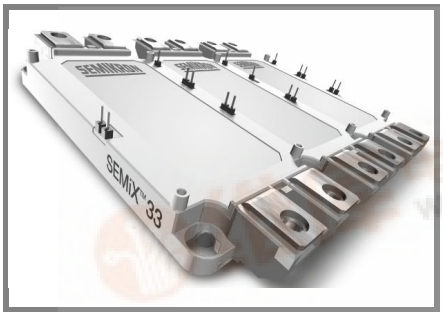
# SEMiX 253GD176HDc



SEMiX® 33c

## Trench IGBT Modules

**SEMiX 253GD176HDc**

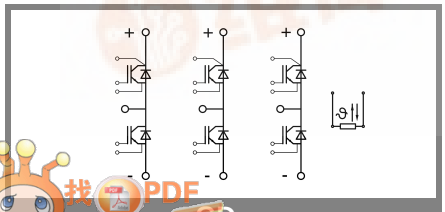
Preliminary Data

### Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability

### Typical Applications

- AC inverter drives
- UPS
- Electronic welders



SD

| Absolute Maximum Ratings | | $T_{case}$ = 25°C, unless otherwise specified | |
|---|---|---|---|
| **Symbol** | **Conditions** | **Values** | **Units** |
| **IGBT** | | | |
| $V_{CES}$ | | 1700 | V |
| $I_C$ | $T_c$ = 25 (80) °C | 250 (180) | A |
| $I_{CRM}$ | $t_p$ = 1 ms | 300 | A |
| $V_{GES}$ | | ± 20 | V |
| $T_{vj}$, ($T_{stg}$) | $T_{OPERATION} \leq T_{stg}$ | - 40 ... + 150 (125) | °C |
| $V_{isol}$ | AC, 1 min. | 4000 | V |
| **Inverse diode** | | | |
| $I_F$ | $T_c$ = 25 (80) °C | 240 (170) | A |
| $I_{FRM}$ | $t_p$ = 1 ms | 300 | A |
| $I_{FSM}$ | $t_p$ = 10 ms; sin.; $T_j$ = 25 °C | 1500 | A |

| Characteristics | | $T_{case}$ = 25°C, unless otherwise specified | | | |
|---|---|---|---|---|---|
| **Symbol** | **Conditions** | **min.** | **typ.** | **max.** | **Units** |
| **IGBT** | | | | | |
| $V_{GE(th)}$ | $V_{GE}$ = $V_{CE}$, $I_C$ = 6 mA | 5,2 | 5,8 | 6,4 | V |
| $I_{CES}$ | $V_{GE}$ = 0, $V_{CE}$ = $V_{CES}$, $T_j$ = 25 (125) °C | | | 1 | mA |
| $V_{CE(TO)}$ | $T_j$ = 25 (125) °C | | 1 (0,9) | 1,2 (1,1) | V |
| $r_{CE}$ | $V_{GE}$ = 15 V, $T_j$ = 25 (125) °C | | 6,7 (10,3) | 8,3 (12) | mΩ |
| $V_{CE(sat)}$ | $I_{Cnom}$ = 150 A, $V_{GE}$ = 15 V, $T_j$ = 25 (125) °C, chip level | | 2 (2,45) | 2,45 (2,9) | V |
| $C_{ies}$ | under following conditions | | 12 | | nF |
| $C_{oes}$ | $V_{GE}$ = 0, $V_{CE}$ = 25 V, f = 1 MHz | | 0,5 | | nF |
| $C_{res}$ | | | 0,4 | | nF |
| $L_{CE}$ | | | 20 | | nH |
| $R_{CC'+EE'}$ | terminal-chip, $T_c$= 25 (125) °C | | 0,7 (1) | | mΩ |
| $t_{d(on)}$/$t_r$ | $V_{CC}$ = 1200 V, $I_{Cnom}$ = 150 A | | | | ns |
| $t_{d(off)}$/$t_f$ | $V_{GE}$ = ± 15 V | | | | ns |
| $E_{on}$ ($E_{off}$) | $R_{Gon}$ = $R_{Goff}$ = Ω, $T_j$ = 125 °C | | 100 (50) | | mJ |
| **Inverse diode** | | | | | |
| $V_F$ = $V_{EC}$ | $I_{Fnom}$ = 150 A; $V_{GE}$ = 0 V; $T_j$ = 25 (125) °C, chip level | | 1,7 (1,7) | 1,9 (1,9) | V |
| $V_{(TO)}$ | $T_j$ = 25 (125) °C | | 1,1 (0,9) | 1,3 (1,1) | V |
| $r_T$ | $T_j$ = 25 (125) °C | | 4 (5,3) | 4 (5,3) | mΩ |
| $I_{RRM}$ | $I_{Fnom}$ = 150 A; $T_j$ = 25 (125) °C | | | | A |
| $Q_{rr}$ | di/dt = A/µs | | | | µC |
| $E_{rr}$ | $V_{GE}$ = 0 V | | | | mJ |
| **Thermal characteristics** | | | | | |
| $R_{th(j-c)}$ | per IGBT | | | 0,12 | K/W |
| $R_{th(j-c)D}$ | per Inverse Diode | | | 0,17 | K/W |
| $R_{th(j-c)FD}$ | per FWD | | | | K/W |
| $R_{th(c-s)}$ | per module | | 0,014 | | K/W |
| **Temperature sensor** | | | | | |
| $R_{25}$ | $T_c$ = 25 °C | | 5 ±5% | | kΩ |
| $B_{25/85}$ | $R_2$=$R_1$exp[B(1/$T_2$-1/$T_1$)] ; T[K];B | | 3420 | | K |
| **Mechanical data** | | | | | |
| $M_s$/$M_t$ | to heatsink (M5) / for terminals (M6) | 3/2,5 | | 5 /5 | Nm |
| w | | | 882 | | g |

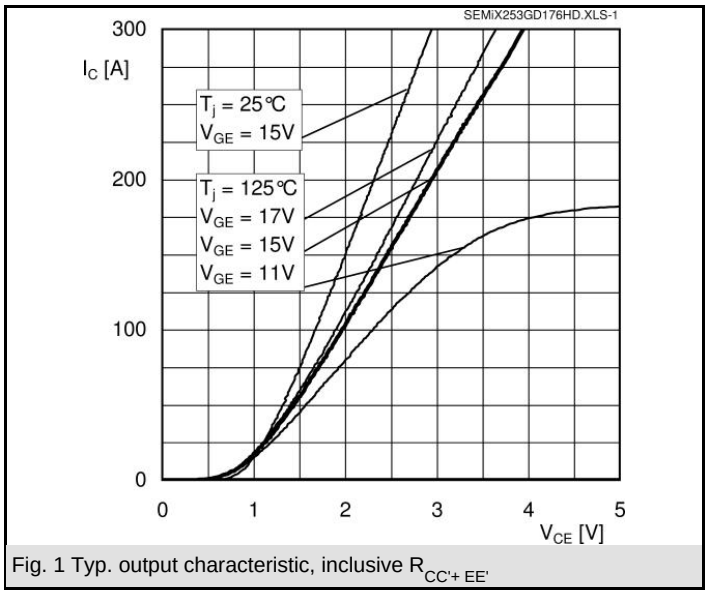



Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

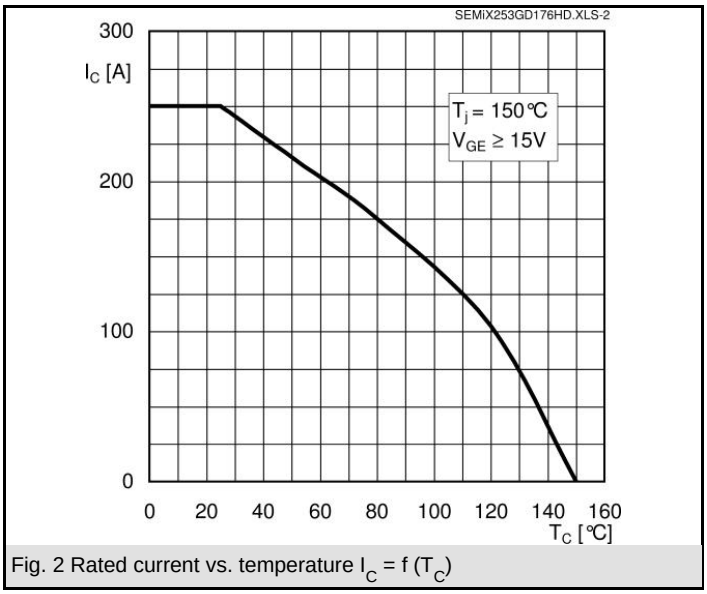



Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

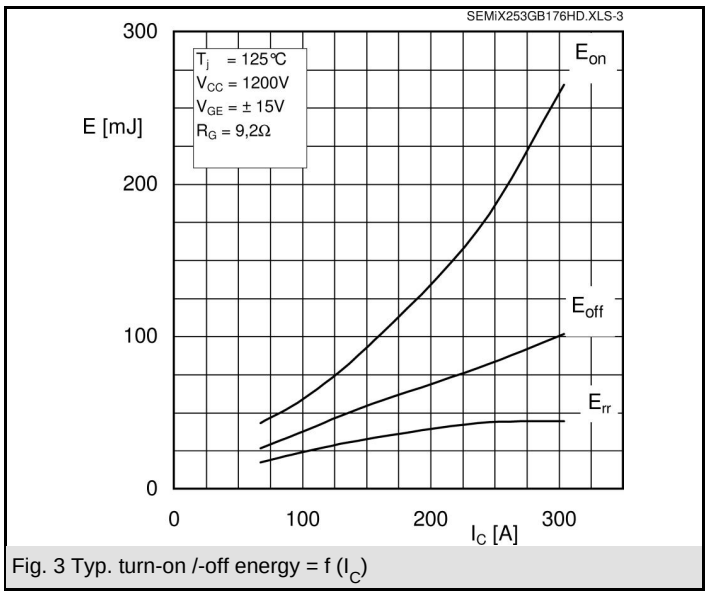



Fig. 3 Typ. turn-on /-off energy = f ($I_C$)

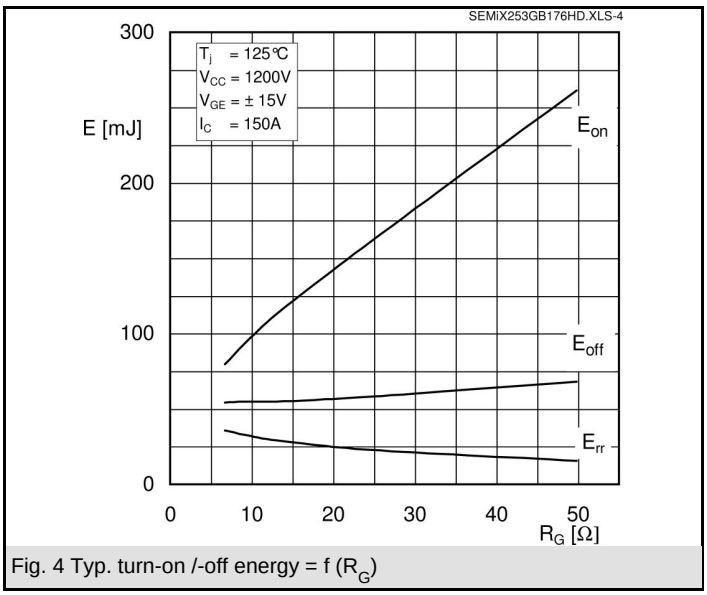



Fig. 4 Typ. turn-on /-off energy = f ($R_G$)

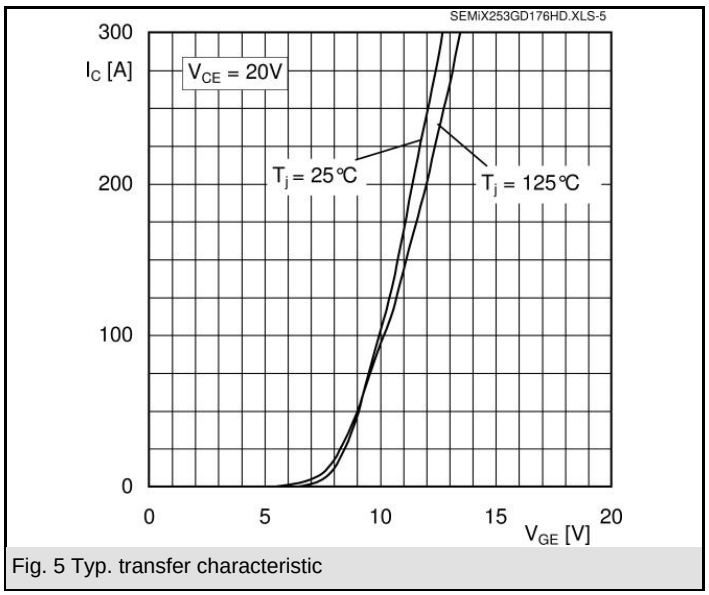



Fig. 5 Typ. transfer characteristic

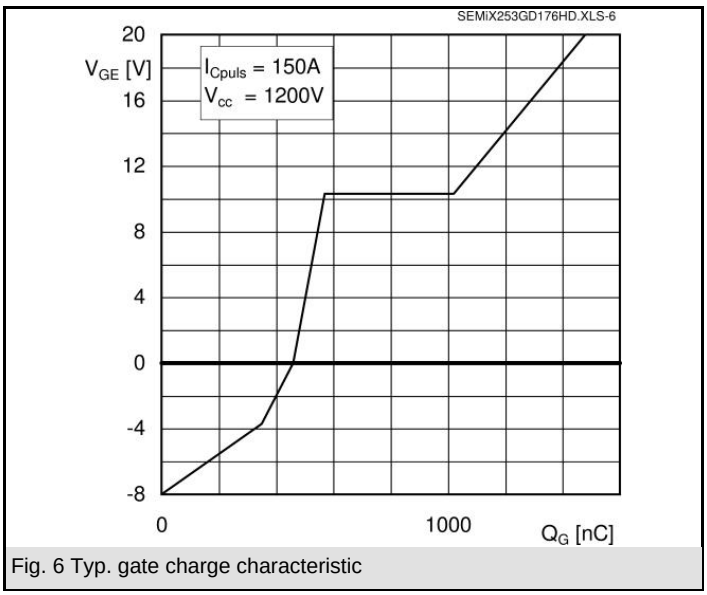



Fig. 6 Typ. gate charge characteristic

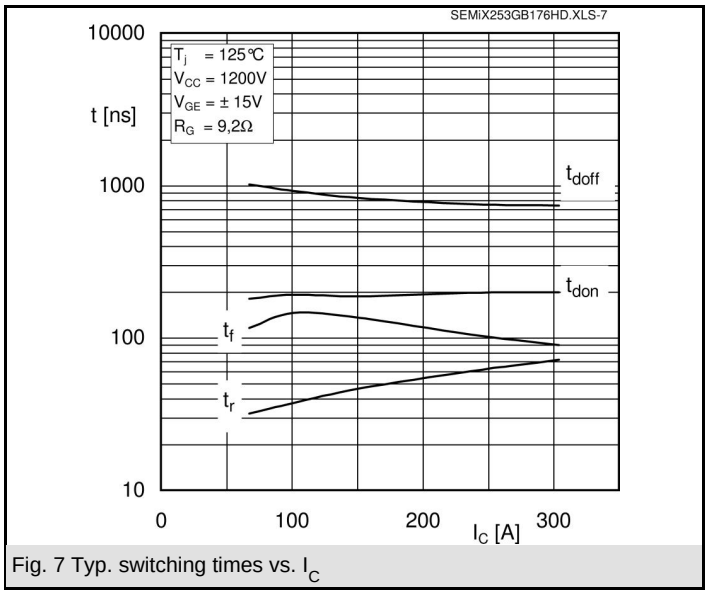



Fig. 7 Typ. switching times vs. $I_C$

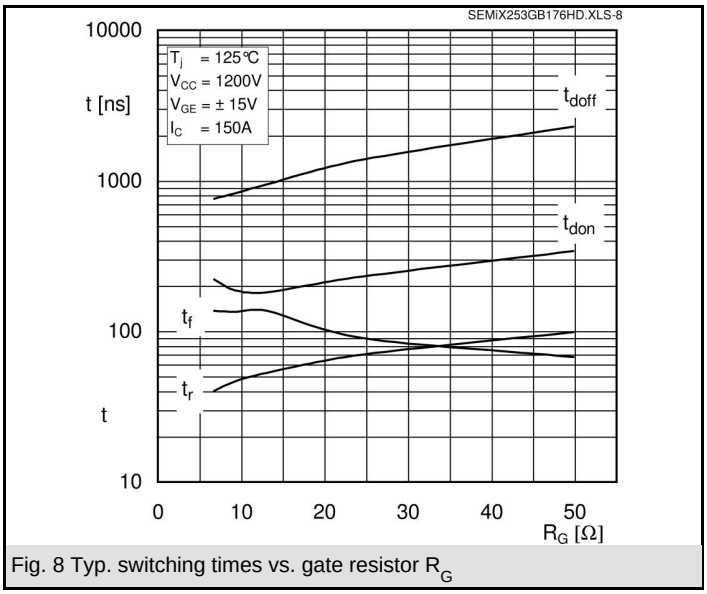



Fig. 8 Typ. switching times vs. gate resistor $R_G$

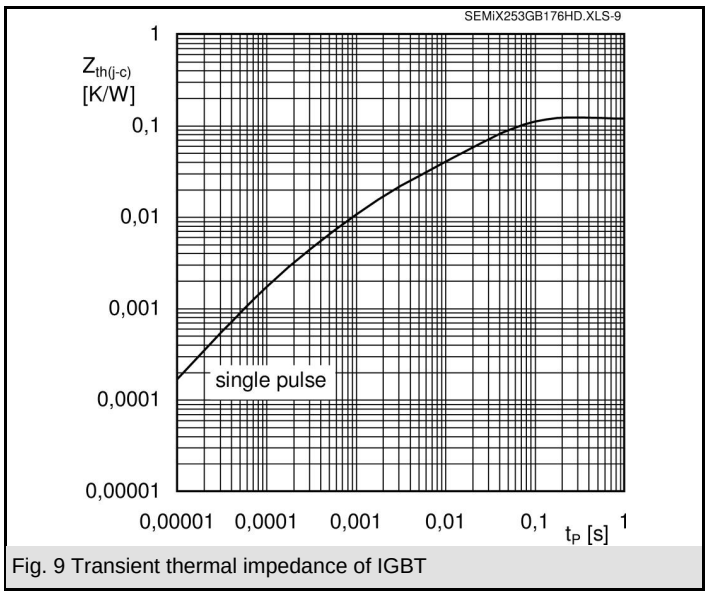



Fig. 9 Transient thermal impedance of IGBT

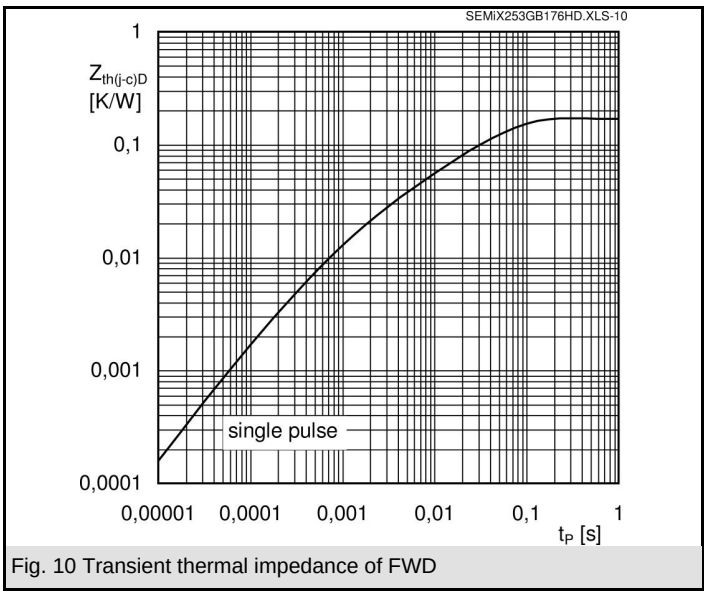



Fig. 10 Transient thermal impedance of FWD

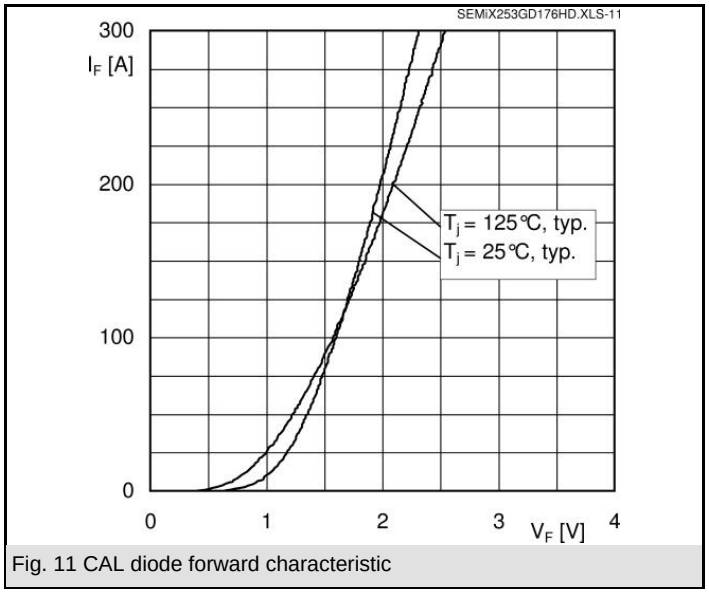



Fig. 11 CAL diode forward characteristic

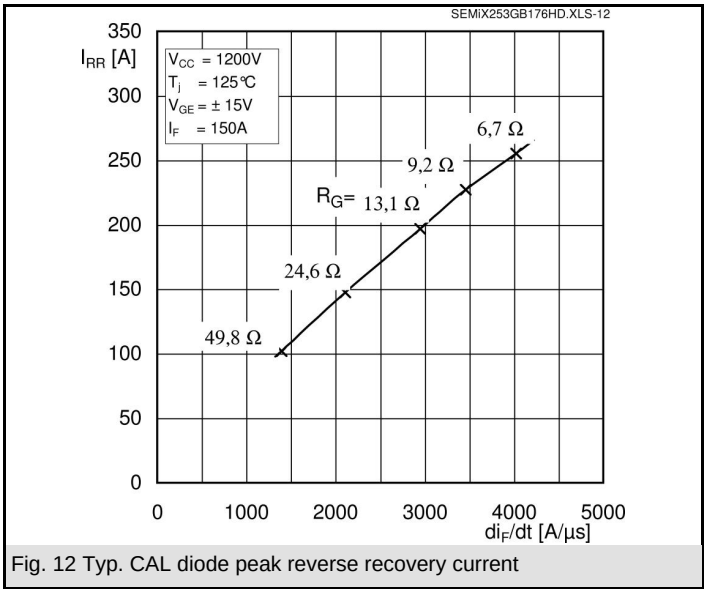



Fig. 12 Typ. CAL diode peak reverse recovery current

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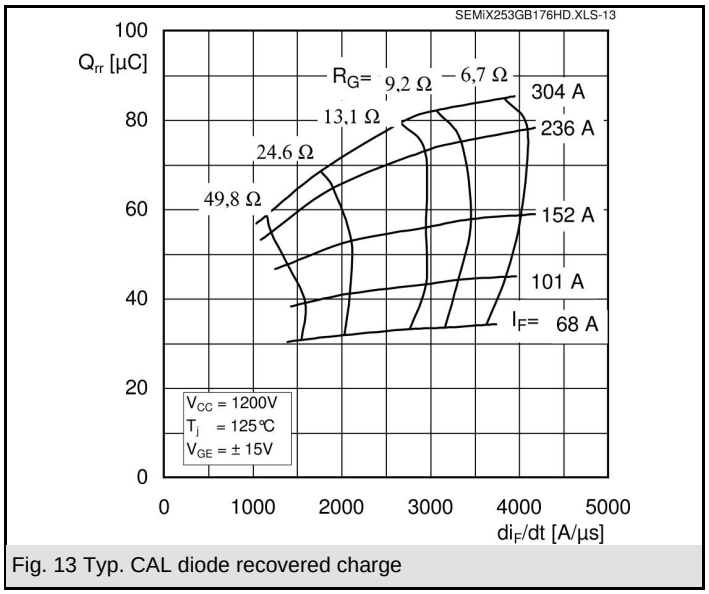
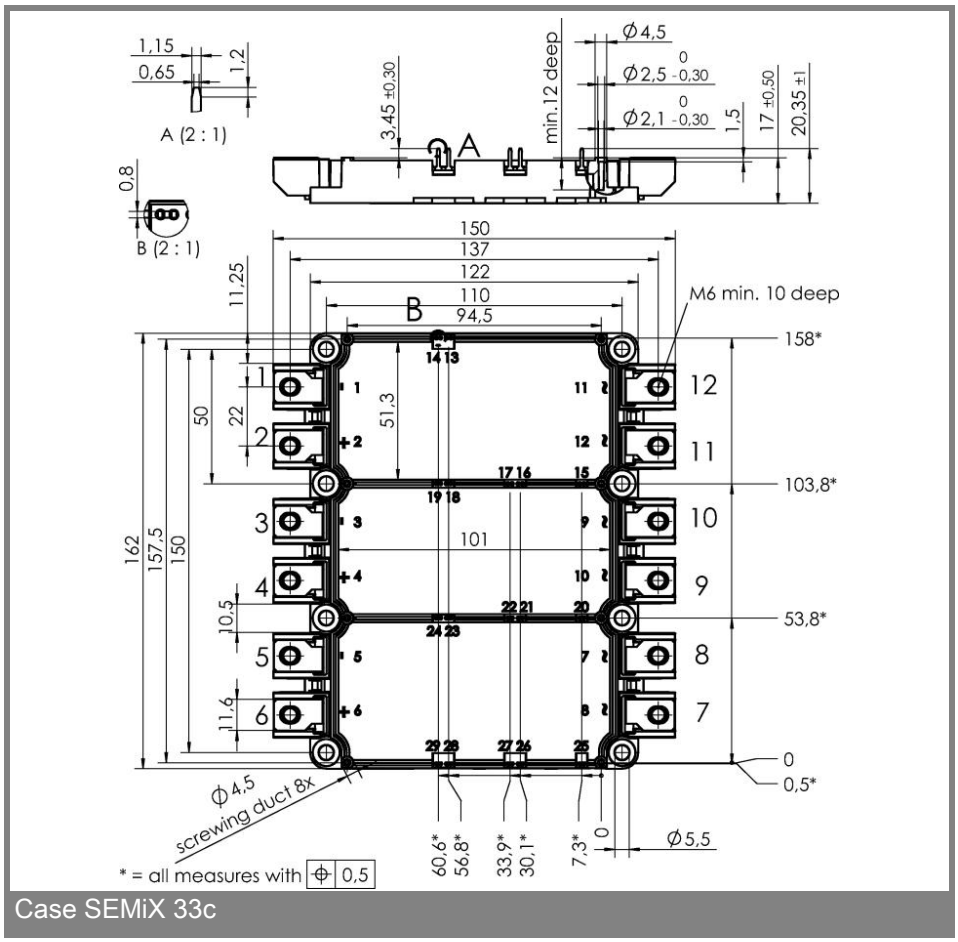



Fig. 13 Typ. CAL diode recovered charge

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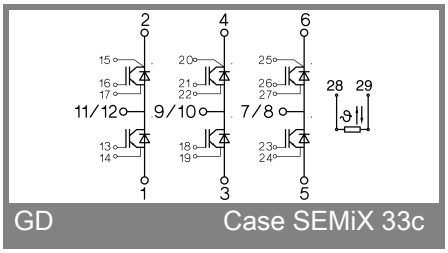


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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.

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