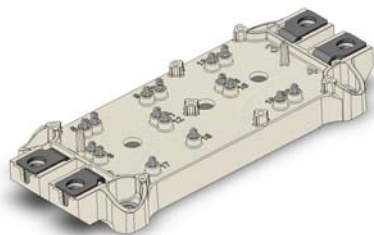


SEMiX653GB176HDs



SEMiX® 3s

Trench IGBT Modules

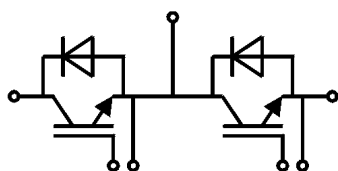
SEMiX653GB176HDs

Features

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

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

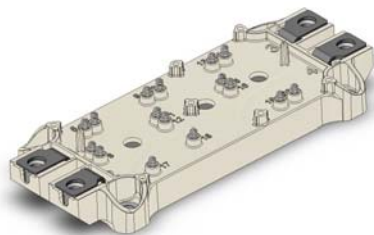


GB

| Absolute Maximum Ratings | | | | |
|--------------------------|--|-----------------------|--------------------|---------------|
| Symbol | Conditions | Values | Unit | |
| IGBT | | | | |
| V_{CES} | | 1700 | V | |
| I_C | $T_j = 150\text{ °C}$ | $T_c = 25\text{ °C}$ | 619 | A |
| | | $T_c = 80\text{ °C}$ | 438 | A |
| I_{Cnom} | | 450 | A | |
| I_{CRM} | $I_{CRM} = 2 \times I_{Cnom}$ | 900 | A | |
| V_{GES} | | -20 ... 20 | V | |
| t_{psc} | $V_{CC} = 1000\text{ V}$ | $T_j = 125\text{ °C}$ | 10 | μs |
| | $V_{GE} \leq 20\text{ V}$ | | | |
| | $V_{CES} \leq 1700\text{ V}$ | | | |
| T_j | | -55 ... 150 | $^{\circ}\text{C}$ | |
| Inverse diode | | | | |
| I_F | $T_j = 150\text{ °C}$ | $T_c = 25\text{ °C}$ | 545 | A |
| | | $T_c = 80\text{ °C}$ | 365 | A |
| I_{Fnom} | | 450 | A | |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | 900 | A | |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25\text{ °C}$ | 2900 | A | |
| T_j | | -40 ... 150 | $^{\circ}\text{C}$ | |
| 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 | | | | | |
| $V_{CE(sat)}$ | $I_C = 450\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel | $T_j = 25\text{ °C}$ | 2 | 2.45 | V |
| | | $T_j = 125\text{ °C}$ | 2.45 | 2.9 | V |
| V_{CE0} | | $T_j = 25\text{ °C}$ | 1 | 1.2 | V |
| | | $T_j = 125\text{ °C}$ | 0.9 | 1.1 | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ | $T_j = 25\text{ °C}$ | 2.2 | 2.8 | $\text{m}\Omega$ |
| | | $T_j = 125\text{ °C}$ | 3.4 | 4.0 | $\text{m}\Omega$ |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}, I_C = 18\text{ mA}$ | 5.2 | 5.8 | 6.4 | V |
| I_{CES} | $V_{GE} = 0\text{ V}$ $V_{CE} = 1700\text{ V}$ | $T_j = 25\text{ °C}$ | 0.1 | 0.3 | mA |
| | | $T_j = 125\text{ °C}$ | | | mA |
| C_{ies} | $V_{CE} = 25\text{ V}$ | | 39.6 | | nF |
| C_{oes} | $V_{GE} = 0\text{ V}$ | | 1.65 | | nF |
| C_{res} | | | 1.31 | | nF |
| Q_G | $V_{GE} = -8\text{ V...} + 15\text{ V}$ | | 4200 | | nC |
| R_{Gint} | $T_j = 25\text{ °C}$ | | 1.67 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 1200\text{ V}$ | $T_j = 125\text{ °C}$ | 290 | | ns |
| t_r | $I_C = 450\text{ A}$ | $T_j = 125\text{ °C}$ | 90 | | ns |
| | | $T_j = 125\text{ °C}$ | 300 | | mJ |
| E_{on} | $R_{G\ on} = 3.6\ \Omega$ | $T_j = 125\text{ °C}$ | 975 | | ns |
| $t_{d(off)}$ | $R_{G\ off} = 3.6\ \Omega$ | $T_j = 125\text{ °C}$ | 190 | | ns |
| t_f | | $T_j = 125\text{ °C}$ | 180 | | mJ |
| E_{off} | | $T_j = 125\text{ °C}$ | | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | 0.054 | K/W |

SEMiX653GB176HDs



SEMiX® 3s

Trench IGBT Modules

SEMiX653GB176HDs

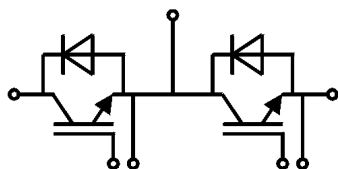
Features

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

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

| Characteristics | | | | | | |
|--------------------------|---|-----------------------|------|----------------|------|------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Inverse diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 450\text{ A}$ $V_{GE} = 0\text{ V}$ chip | $T_j = 25\text{ °C}$ | | 1.7 | 1.90 | V |
| | | $T_j = 125\text{ °C}$ | | 1.7 | 1.9 | V |
| V_{F0} | | $T_j = 25\text{ °C}$ | 0.9 | 1.1 | 1.3 | V |
| | | $T_j = 125\text{ °C}$ | 0.7 | 0.9 | 1.1 | V |
| r_F | | $T_j = 25\text{ °C}$ | 1.3 | 1.3 | 1.3 | mΩ |
| | | $T_j = 125\text{ °C}$ | 1.8 | 1.8 | 1.8 | mΩ |
| I_{RRM} | $I_F = 450\text{ A}$ | $T_j = 125\text{ °C}$ | | 380 | | A |
| Q_{rr} | $di/dt_{off} = 4200\text{ A}/\mu\text{s}$ | $T_j = 125\text{ °C}$ | | 130 | | μC |
| E_{rr} | $V_{GE} = -15\text{ V}$ $V_{CC} = 1200\text{ V}$ | $T_j = 125\text{ °C}$ | | 73 | | mJ |
| $R_{th(j-c)}$ | per diode | | | | 0.11 | K/W |
| Module | | | | | | |
| L_{CE} | | | | 20 | | nH |
| $R_{CC'+EE'}$ | res., terminal-chip | $T_C = 25\text{ °C}$ | | 0.7 | | mΩ |
| | | $T_C = 125\text{ °C}$ | | 1 | | mΩ |
| $R_{th(c-s)}$ | 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 | | | | | 300 | g |
| Temperatur Sensor | | | | | | |
| R_{100} | $T_c = 100\text{ °C}$ ($R_{25} = 5\text{ k}\Omega$) | | | $493 \pm 5\%$ | | Ω |
| $B_{100/125}$ | $R_{(T)} = R_{100} \exp[B_{100/125}(1/T - 1/T_{100})]$; $T[\text{K}]$; | | | $3550 \pm 2\%$ | | K |



GB

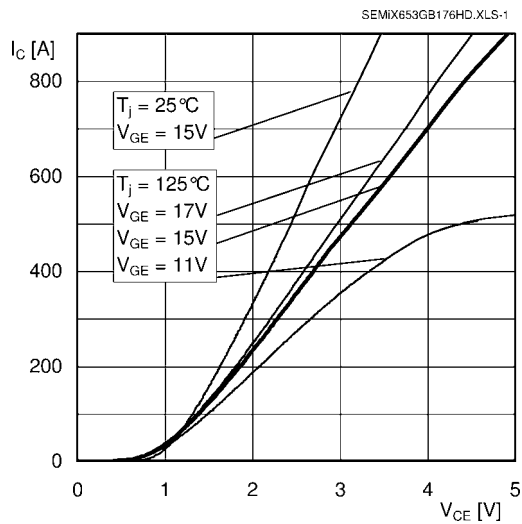


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

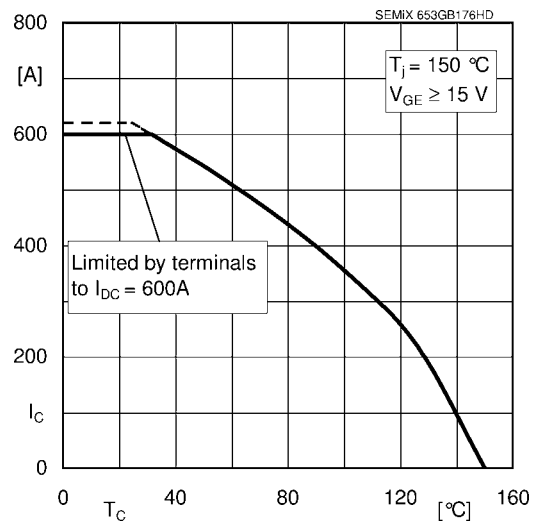


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

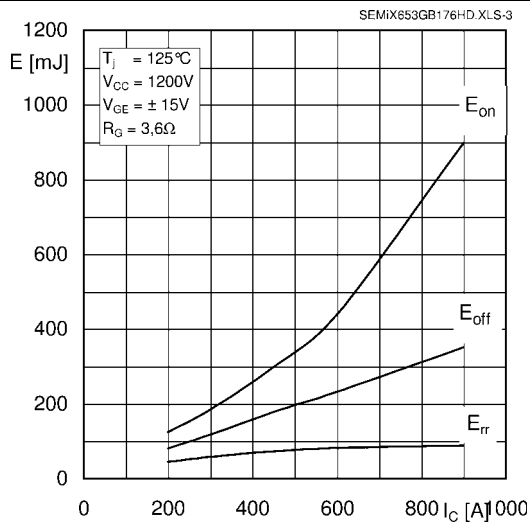


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

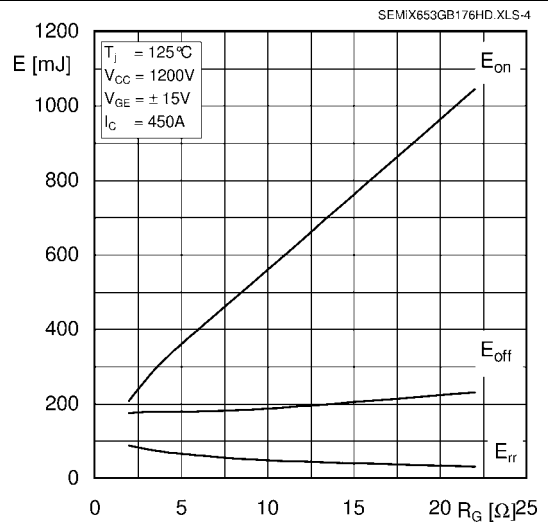


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

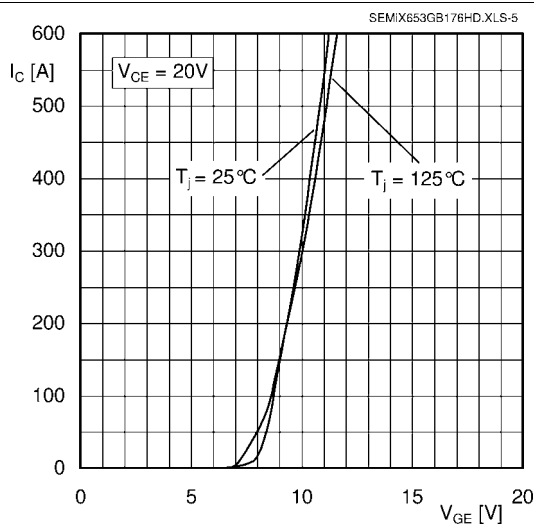


Fig. 5: Typ. transfer characteristic

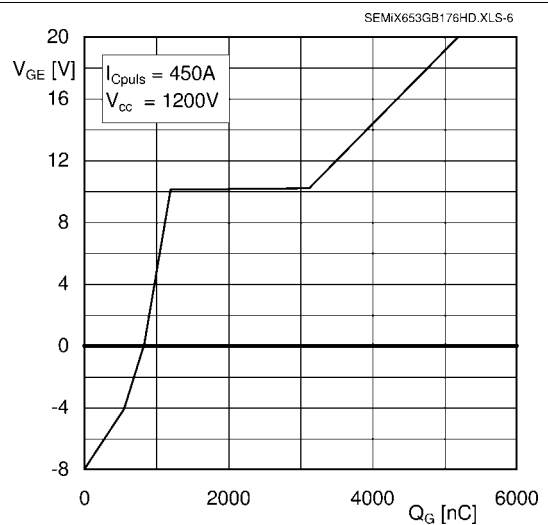


Fig. 6: Typ. gate charge characteristic

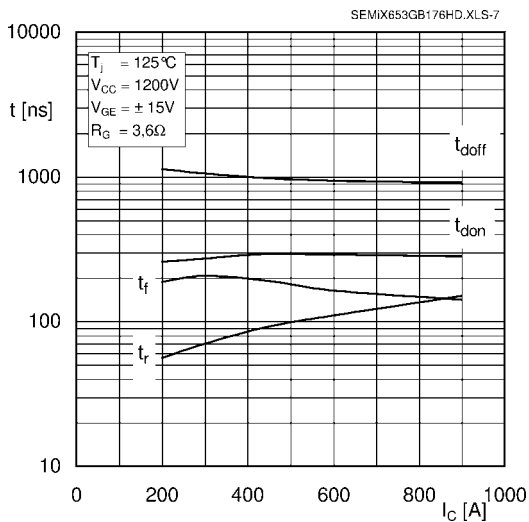


Fig. 7: Typ. switching times vs. I_C

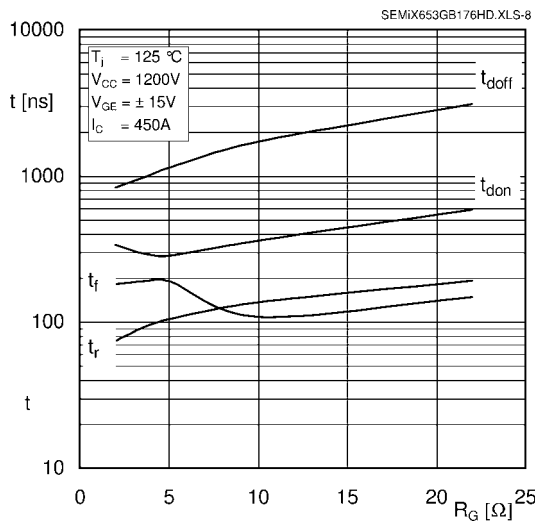


Fig. 8: Typ. switching times vs. gate resistor R_G

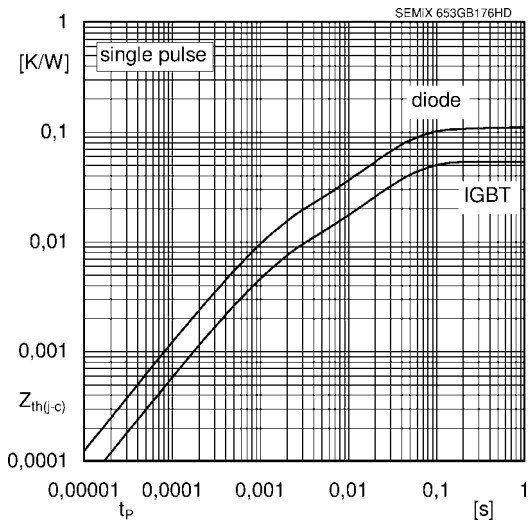


Fig. 9: Typ. transient thermal impedance

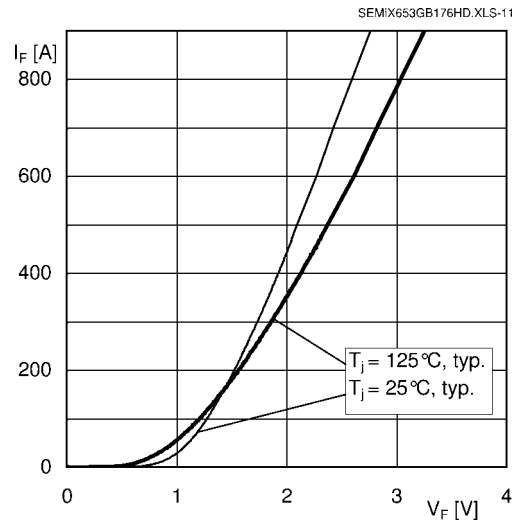


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

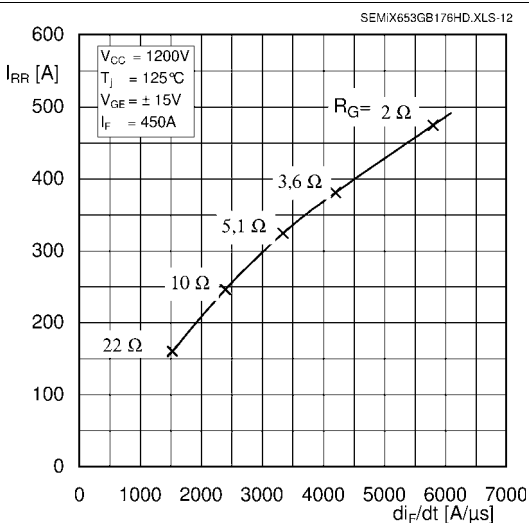


Fig. 11: Typ. CAL diode peak reverse recovery current

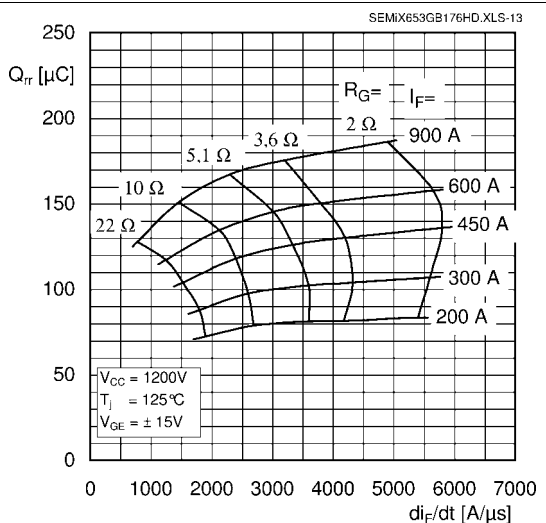


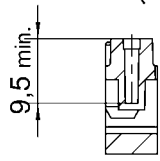
Fig. 12: Typ. CAL diode recovery charge

SEMiX653GB176HDs

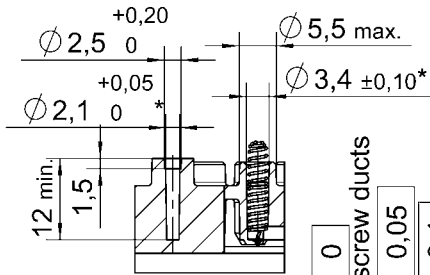
Case: SEMiX 3s

general tolerance ISO 2768-mK

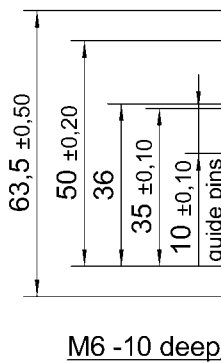
screw duct
(1x centre) :
H-H (1 : 1)



screw duct (6x)
spring duct (16x) :
A-A (1 : 1)

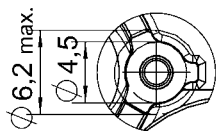


marking of terminals

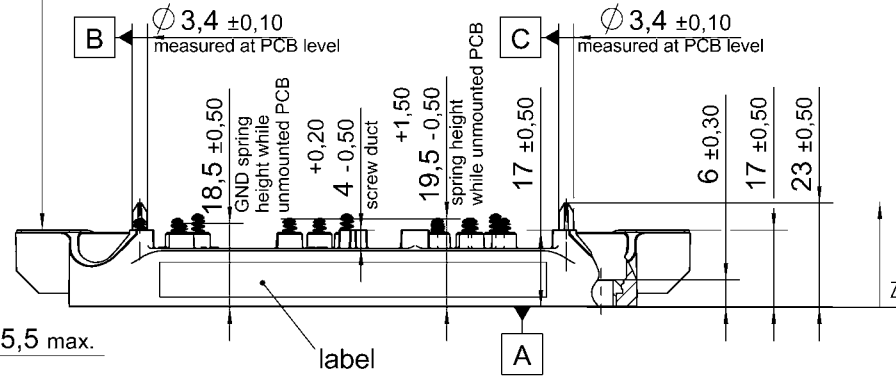


M6 -10 deep

screw duct
top view (7x) :
J (2 : 1)



| | | |
|--|-----|---------------------|
| | 0,3 | connector 1-2 / 3-4 |
| | 0,2 | each connector A |

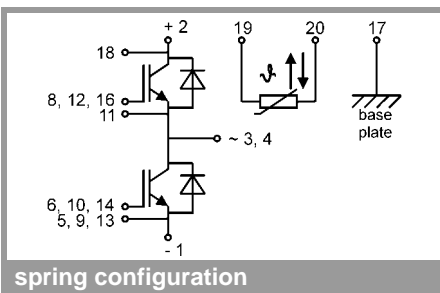


All measures in Z-direction
valid as mounted to heat sink

*screw ducts / spring ducts with $\phi \pm 0,2$ A B C

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

SEMiX 3s



spring configuration

SEMiX653GB176HDs

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