

SEMiX703GB126HDs



SEMiX[®] 3s

Trench IGBT Modules

SEMiX703GB126HDs

Features

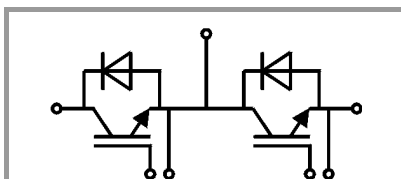
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- Case temperatur limited to $T_C=125^\circ\text{C}$ max.
- Not for new design



GB

| Absolute Maximum Ratings | | | | |
|--------------------------|--|---------------------------|-------------|------------------|
| Symbol | Conditions | | Values | Unit |
| IGBT | | | | |
| V_{CES} | | | 1200 | V |
| I_C | $T_j = 150^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 642 | A |
| | | $T_c = 80^\circ\text{C}$ | 449 | A |
| I_{Cnom} | | | 450 | A |
| I_{CRM} | $I_{CRM} = 2 \times I_{Cnom}$ | | 900 | A |
| V_{GES} | | | -20 ... 20 | V |
| t_{psc} | $V_{CC} = 600\text{ V}$ $V_{GE} \leq 20\text{ V}$ $V_{CES} \leq 1200\text{ V}$ | $T_j = 125^\circ\text{C}$ | 10 | μs |
| | | | | |
| T_j | | | -40 ... 150 | $^\circ\text{C}$ |
| Inverse diode | | | | |
| I_F | $T_j = 150^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 561 | A |
| | | $T_c = 80^\circ\text{C}$ | 384 | A |
| I_{Fnom} | | | 450 | A |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | | 900 | A |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$ | | 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 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 | $T_j = 25^\circ\text{C}$ | 1.7 | 2.1 | | V |
| | | $T_j = 125^\circ\text{C}$ | 2 | 2.45 | | V |
| V_{CE0} | | | 1 | 1.2 | | V |
| | | | 0.9 | 1.1 | | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ | $T_j = 25^\circ\text{C}$ | 1.6 | 2.0 | | $\text{m}\Omega$ |
| | | $T_j = 125^\circ\text{C}$ | 2.4 | 3.0 | | $\text{m}\Omega$ |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}, I_C = 18\text{ mA}$ | | 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 |
| | | $T_j = 125^\circ\text{C}$ | | | | mA |
| C_{ies} | | | | 32.3 | | nF |
| C_{oes} | $V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$ | | | 1.69 | | nF |
| C_{res} | | | | 1.46 | | nF |
| Q_G | $V_{GE} = -8\text{ V...} + 15\text{ V}$ | | | 3600 | | nC |
| R_{Gint} | $T_j = 25^\circ\text{C}$ | | | 1.67 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 600\text{ V}$ $I_C = 450\text{ A}$ | $T_j = 125^\circ\text{C}$ | | 310 | | ns |
| t_r | | $T_j = 125^\circ\text{C}$ | | 60 | | ns |
| E_{on} | $R_{G on} = 1.6\ \Omega$ | | | 32 | | mJ |
| $t_{d(off)}$ | $R_{G off} = 1.6\ \Omega$ | | | 680 | | ns |
| t_f | | | | 135 | | ns |
| E_{off} | | | | 68 | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | | 0.061 | K/W |

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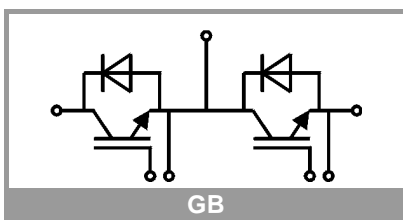
Typical Applications*

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Remarks

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| Characteristics | | | | | | |
|--------------------------|--|---------------------------|------|---------------------|------|---------------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Inverse diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 450\text{ A}$ | $T_j = 25^\circ\text{C}$ | | 1.6 | 1.80 | V |
| | $V_{GE} = 0\text{ V}$ | $T_j = 125^\circ\text{C}$ | | 1.6 | 1.8 | V |
| | chip | | | | | |
| V_{F0} | | $T_j = 25^\circ\text{C}$ | 0.9 | 1 | 1.1 | V |
| | | $T_j = 125^\circ\text{C}$ | 0.7 | 0.8 | 0.9 | V |
| r_F | | $T_j = 25^\circ\text{C}$ | 1.1 | 1.3 | 1.6 | m Ω |
| | | $T_j = 125^\circ\text{C}$ | 1.6 | 1.8 | 2.0 | m Ω |
| I_{RRM} | $I_F = 450\text{ A}$ | $T_j = 125^\circ\text{C}$ | | 580 | | A |
| Q_{rr} | $di/dt_{off} = 8500\text{ A}/\mu\text{s}$ | $T_j = 125^\circ\text{C}$ | | 130 | | μC |
| E_{rr} | $V_{GE} = -15\text{ V}$ | $T_j = 125^\circ\text{C}$ | | 60 | | mJ |
| | $V_{CC} = 600\text{ V}$ | | | | | |
| $R_{th(j-c)}$ | per diode | | | | 0.11 | 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 |
| | | | | | | |
| w | | | | | 300 | 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 |



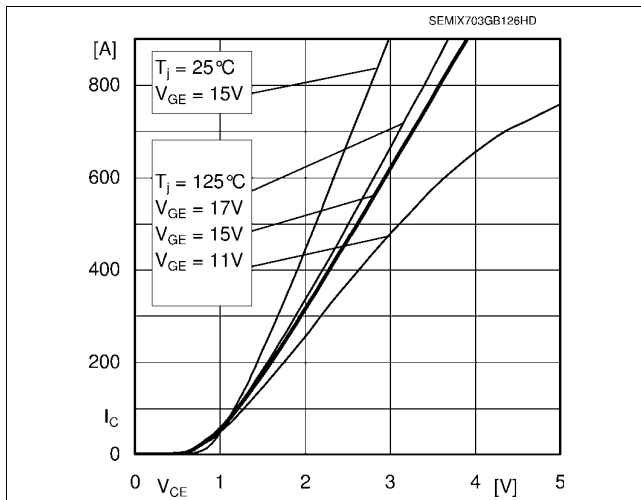


Fig. 1: Typ. output characteristic, inclusive $R_{CC+EE'}$

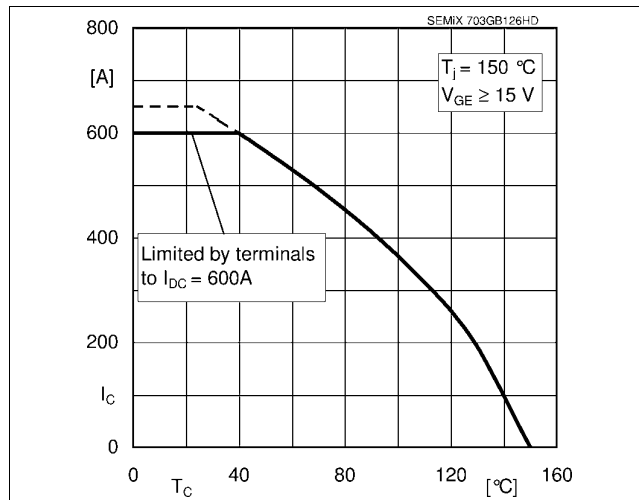


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

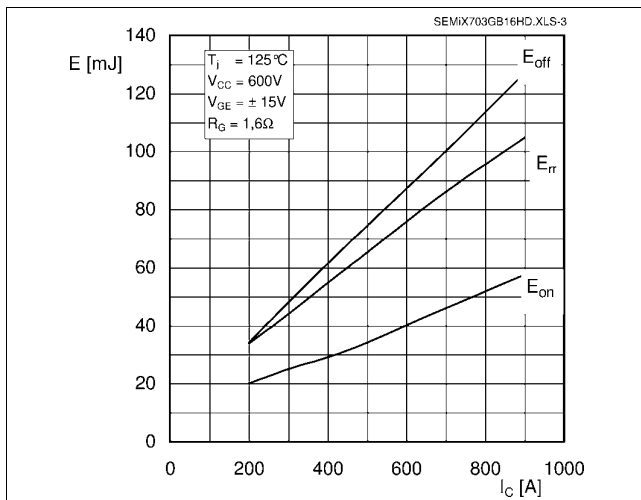


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

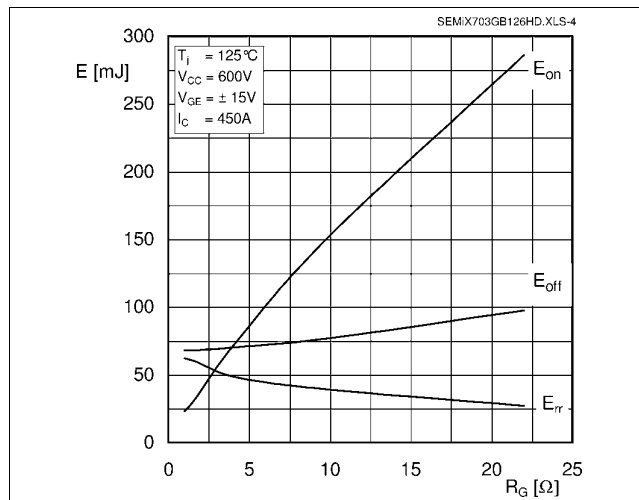


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

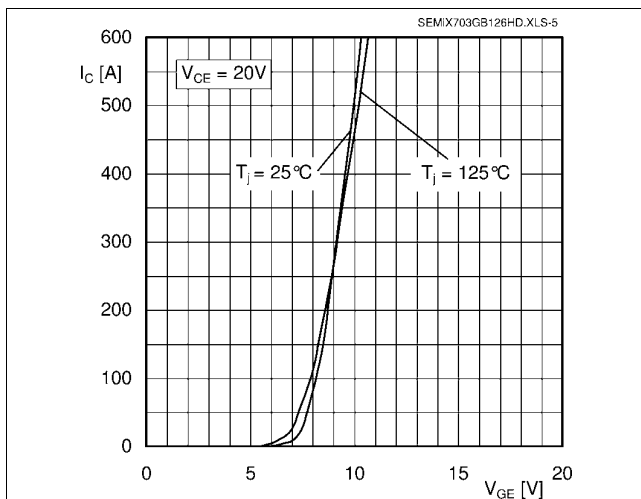


Fig. 5: Typ. transfer characteristic

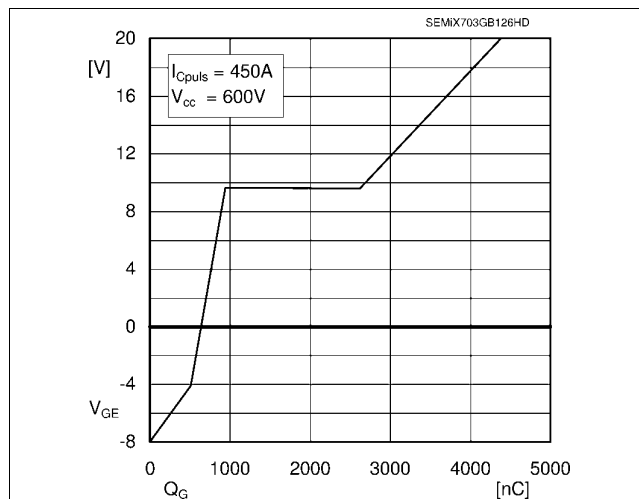


Fig. 6: Typ. gate charge characteristic

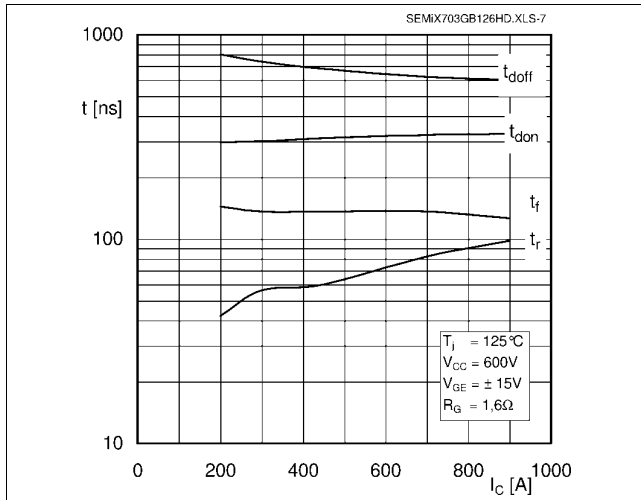


Fig. 7: Typ. switching times vs. I_C

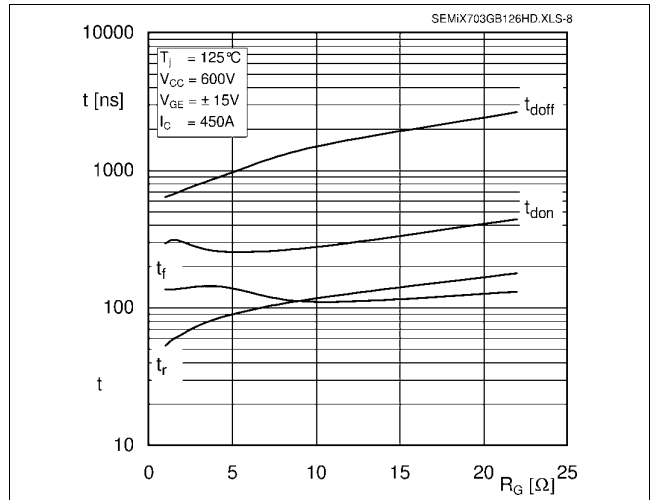


Fig. 8: Typ. switching times vs. gate resistor R_G

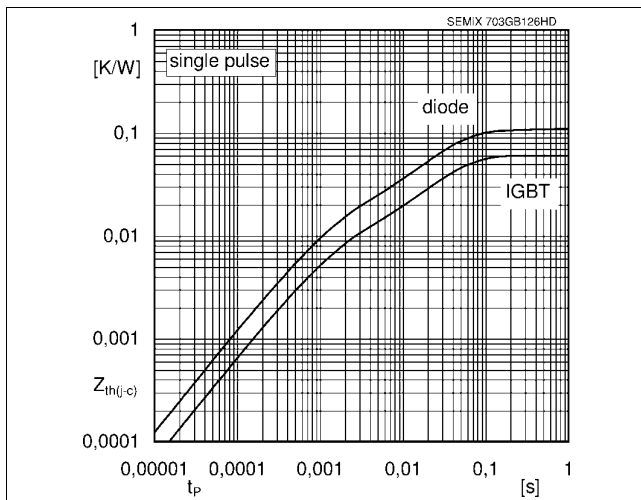


Fig. 9: Typ. transient thermal impedance

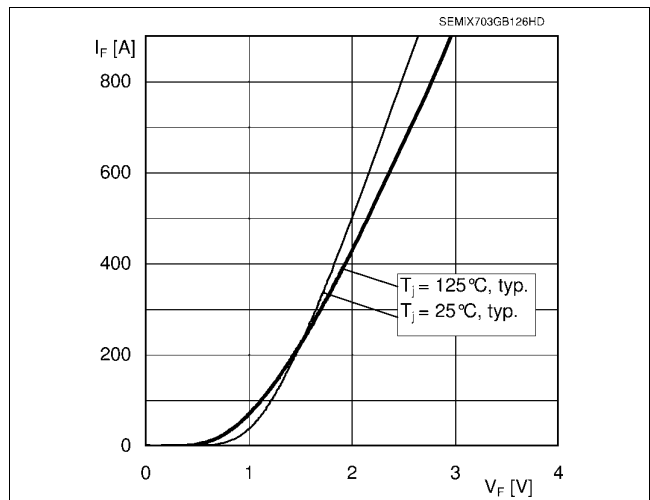


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

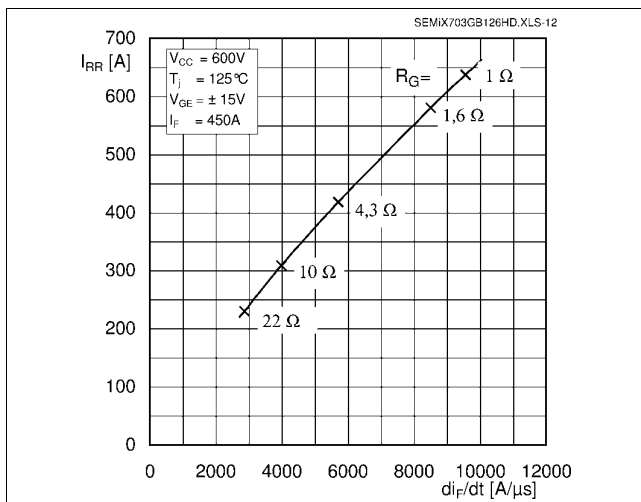


Fig. 11: Typ. CAL diode peak reverse recovery current

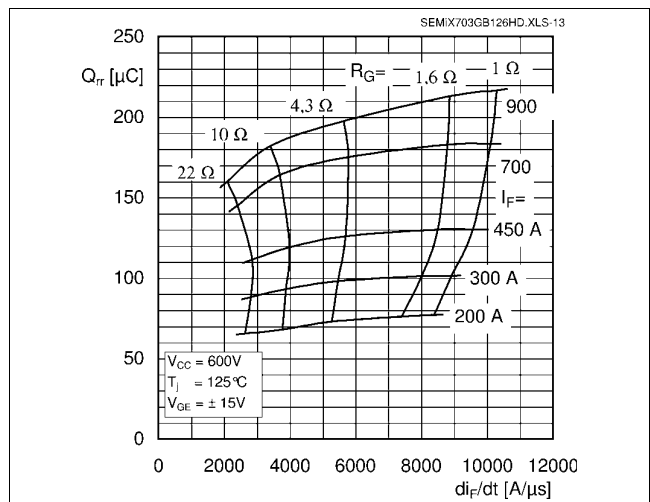


Fig. 12: Typ. CAL diode recovery charge

