

SKM75GB12T4



SEMITRANS®2

Fast IGBT4 Modules

SKM75GB12T4

Features

- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{Cnom}
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)

Typical Applications

- AC inverter drives
- UPS
- Electronic welders at fsw up to 20 kHz

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm.
 $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$



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| Absolute Maximum Ratings | | | | |
|--------------------------|--|---------------------------|------------------|---------------|
| Symbol | Conditions | Values | Unit | |
| IGBT | | | | |
| V_{CES} | | 1200 | V | |
| I_C | $T_j = 175^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 115 | A |
| | | $T_c = 80^\circ\text{C}$ | 88 | A |
| I_{Cnom} | | 75 | A | |
| I_{CRM} | $I_{CRM} = 3 \times I_{Cnom}$ | 225 | A | |
| V_{GES} | | -20 ... 20 | V | |
| t_{psc} | $V_{CC} = 800\text{ V}$ | $T_j = 150^\circ\text{C}$ | 10 | μs |
| | $V_{GE} \leq 15\text{ V}$ | | | |
| | $V_{CES} \leq 1200\text{ V}$ | | | |
| T_j | | -40 ... 175 | $^\circ\text{C}$ | |
| Inverse diode | | | | |
| I_F | $T_j = 175^\circ\text{C}$ | $T_c = 25^\circ\text{C}$ | 97 | A |
| | | $T_c = 80^\circ\text{C}$ | 73 | A |
| I_{Fnom} | | 75 | A | |
| I_{FRM} | $I_{FRM} = 3 \times I_{Fnom}$ | 225 | A | |
| I_{FSM} | $t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$ | 430 | A | |
| T_j | | -40 ... 175 | $^\circ\text{C}$ | |
| Module | | | | |
| $I_{t(RMS)}$ | | 200 | 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 | | | | | |
| $V_{CE(sat)}$ | $I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel | $T_j = 25^\circ\text{C}$ | 1.85 | 2.1 | V |
| | | $T_j = 150^\circ\text{C}$ | 2.25 | 2.45 | V |
| V_{CE0} | | $T_j = 25^\circ\text{C}$ | 0.8 | 0.9 | V |
| | | $T_j = 150^\circ\text{C}$ | 0.7 | 0.8 | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ | $T_j = 25^\circ\text{C}$ | 14.0 | 16.0 | $\text{m}\Omega$ |
| | | $T_j = 150^\circ\text{C}$ | 20.7 | 22.0 | $\text{m}\Omega$ |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}, I_C = 3\text{ mA}$ | 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 |
| | | $T_j = 150^\circ\text{C}$ | | | mA |
| C_{ies} | $V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$ | $f = 1\text{ MHz}$ | 4.4 | | nF |
| C_{oes} | | $f = 1\text{ MHz}$ | 0.29 | | nF |
| C_{res} | | $f = 1\text{ MHz}$ | 0.235 | | nF |
| Q_G | $V_{GE} = -8\text{ V} \dots +15\text{ V}$ | | 425 | | nC |
| R_{Gint} | $T_j = 25^\circ\text{C}$ | | 10.0 | | Ω |
| $t_{d(on)}$ | $V_{CC} = 600\text{ V}$ | $T_j = 150^\circ\text{C}$ | 150 | | ns |
| t_r | $I_C = 75\text{ A}$ $V_{GE} = \pm 15\text{ V}$ | $T_j = 150^\circ\text{C}$ | 39 | | ns |
| | | $T_j = 150^\circ\text{C}$ | 11 | | mJ |
| E_{on} | $R_{Gon} = 1\ \Omega$ | $T_j = 150^\circ\text{C}$ | | | mJ |
| $t_{d(off)}$ | $R_{Goff} = 1\ \Omega$ | $T_j = 150^\circ\text{C}$ | 370 | | ns |
| t_f | $di/dt_{on} = 1600\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | 66 | | ns |
| E_{off} | $di/dt_{off} = 950\text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | 6.9 | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | 0.38 | K/W |



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| Characteristics | | | | | | |
|----------------------|---|---------------------------|------|------|------|---------------|
| Symbol | Conditions | | min. | typ. | max. | Unit |
| Inverse diode | | | | | | |
| $V_F = V_{EC}$ | $I_F = 75 \text{ A}$ $V_{GE} = 0 \text{ V}$ chip | $T_j = 25^\circ\text{C}$ | | 2.17 | 2.49 | V |
| | | $T_j = 150^\circ\text{C}$ | | 2.11 | 2.42 | V |
| V_{F0} | | $T_j = 25^\circ\text{C}$ | | 1.3 | 1.5 | V |
| | | $T_j = 150^\circ\text{C}$ | | 0.9 | 1.1 | V |
| r_F | | $T_j = 25^\circ\text{C}$ | | 11.6 | 13.2 | m Ω |
| | | $T_j = 150^\circ\text{C}$ | | 16.1 | 17.6 | m Ω |
| I_{RRM} | $I_F = 75 \text{ A}$ | $T_j = 150^\circ\text{C}$ | | 37 | | A |
| Q_{rr} | $di/dt_{off} = 990 \text{ A}/\mu\text{s}$ | $T_j = 150^\circ\text{C}$ | | 12.6 | | μC |
| E_{rr} | $V_{GE} = \pm 15 \text{ V}$ $V_{CC} = 600 \text{ V}$ | $T_j = 150^\circ\text{C}$ | | 4.7 | | mJ |
| $R_{th(j-c)}$ | per diode | | | | 0.58 | K/W |
| Module | | | | | | |
| L_{CE} | | | | | 30 | nH |
| $R_{CC'+EE'}$ | terminal-chip | $T_c = 25^\circ\text{C}$ | | 0.65 | | m Ω |
| | | $T_c = 125^\circ\text{C}$ | | 1 | | m Ω |
| $R_{th(c-s)}$ | 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 |



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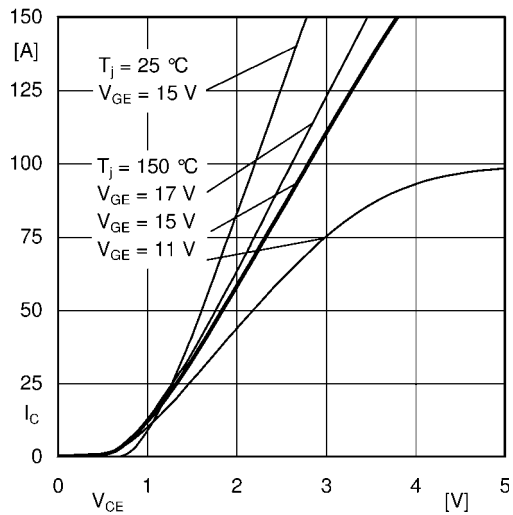


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

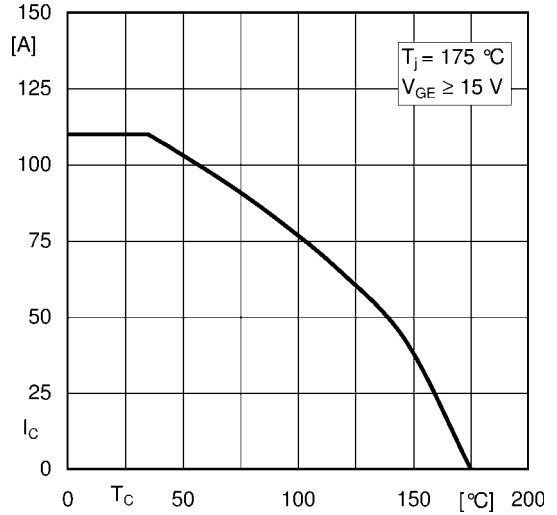


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

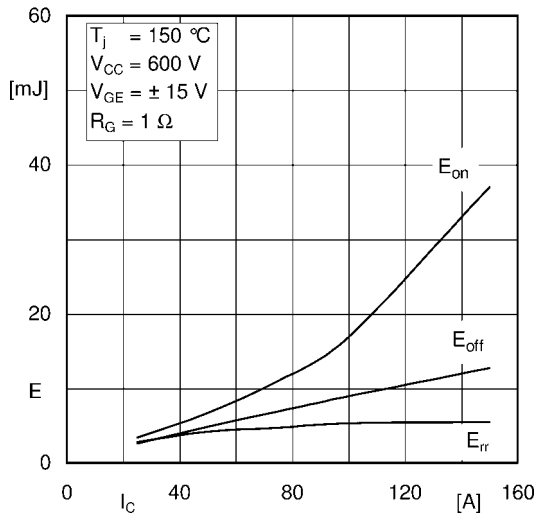


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

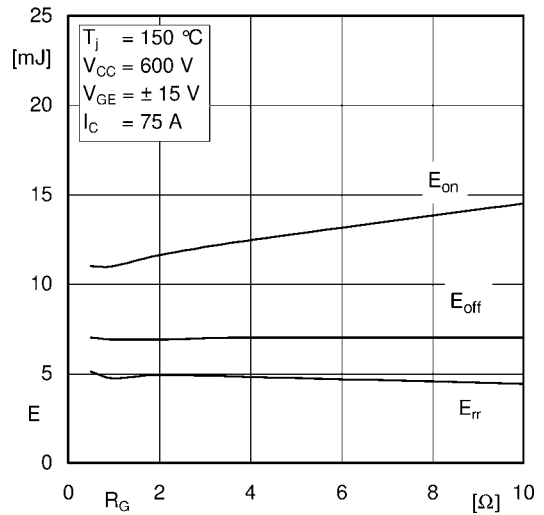


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

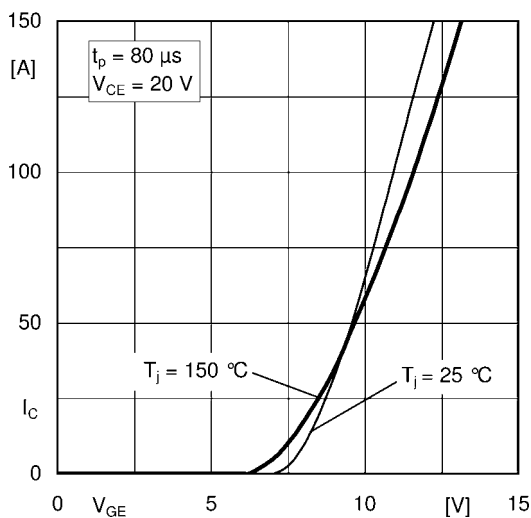


Fig. 5: Typ. transfer characteristic

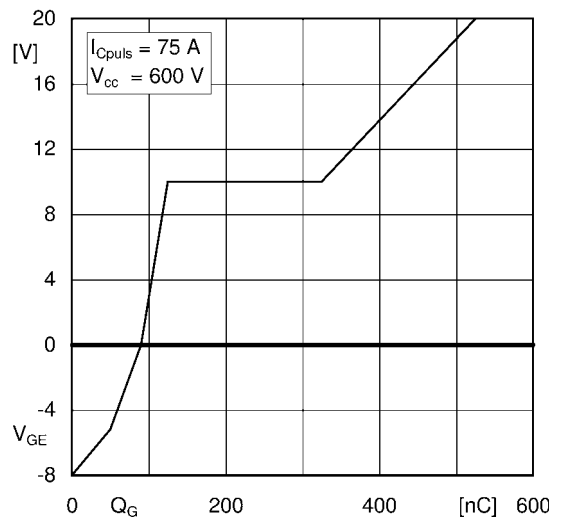


Fig. 6: Typ. gate charge characteristic

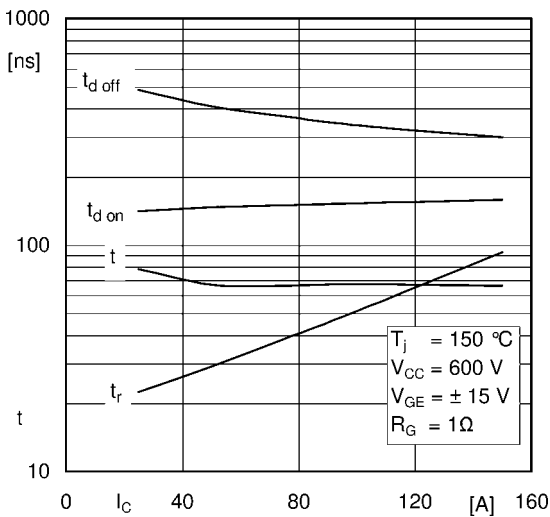


Fig. 7: Typ. switching times vs. I_C

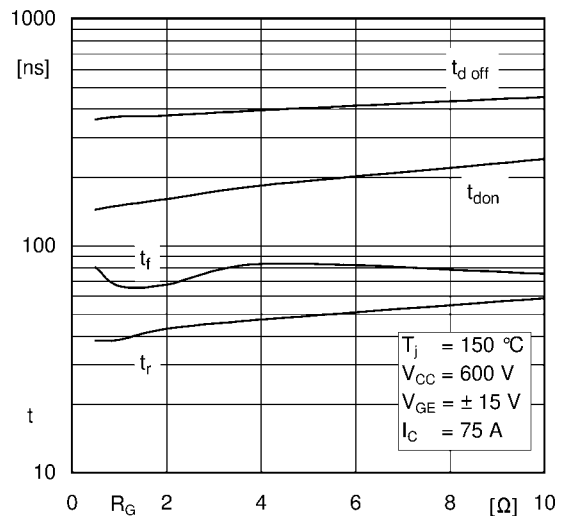


Fig. 8: Typ. switching times vs. gate resistor R_G

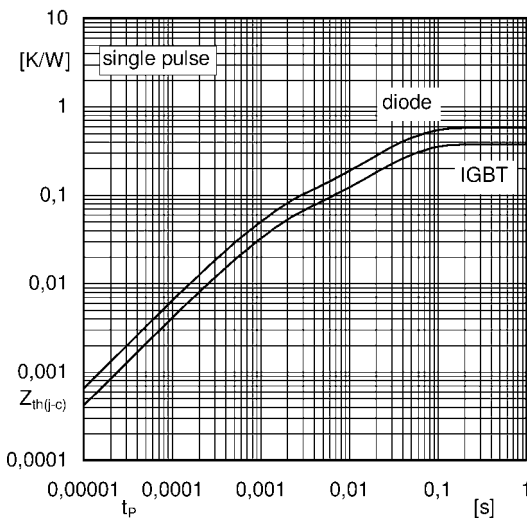


Fig. 9: Transient thermal impedance

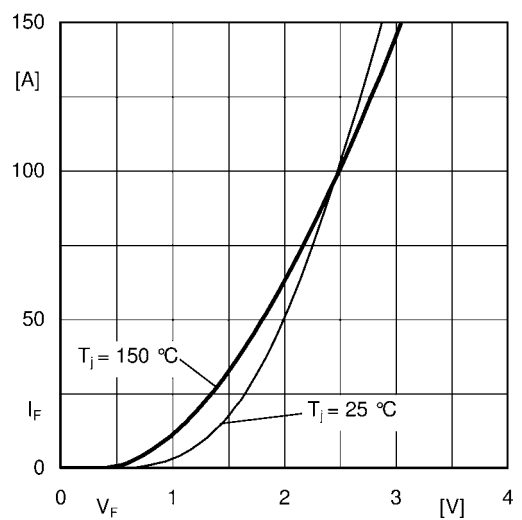


Fig. 10: CAL diode forward characteristic

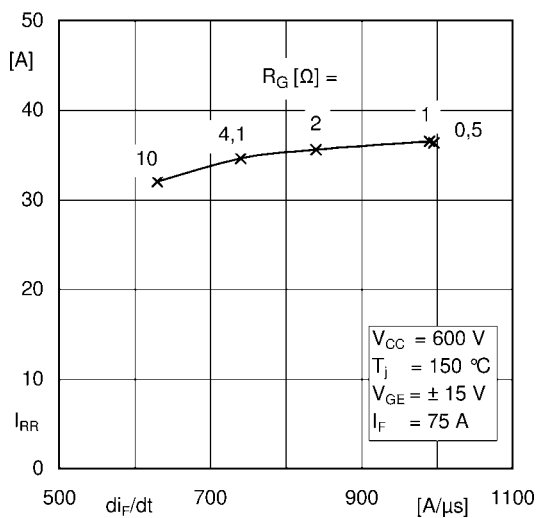


Fig. 11: CAL diode peak reverse recovery current

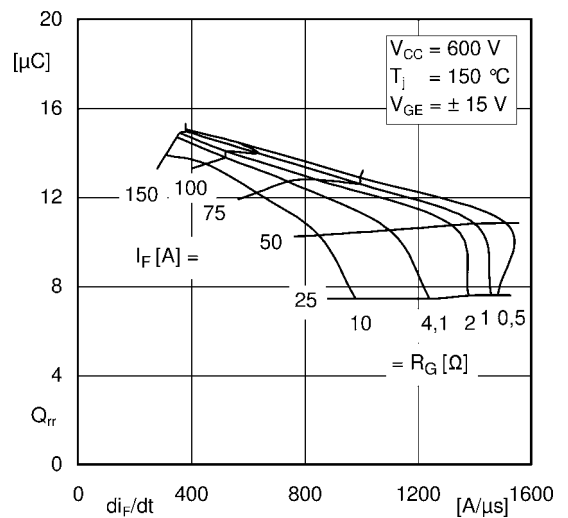
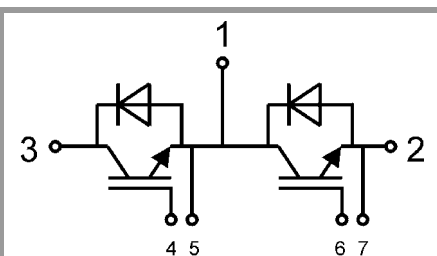


Fig. 12: Typ. CAL diode peak reverse recovery charge

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Semitrans 2



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

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