



SEMITOP® 3

IGBT Module

SK50MLI066

Target Data

Features

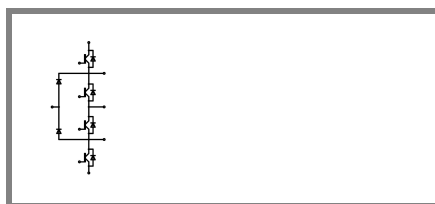
- Compact design
- One screw mounting
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DCB)
- Trench IGBT technology
- CAL technology FWD

Typical Applications*

- 3 Level Inverter
- UPS

Remarks

- Visol = 3000V AC, 1s, 50Hz
- Dynamic measure: DUT= IGBT (Gate pin 1) and Neutral Clamp Diode (Kathode pin 16) as free-wheeling diode



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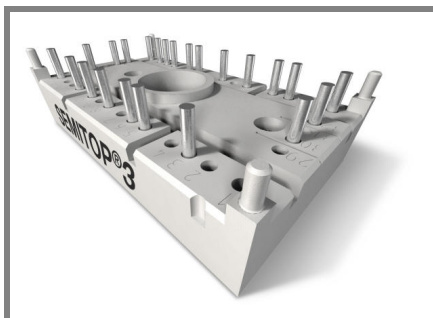
| Absolute Maximum Ratings | | $T_s = 25\text{ °C}$, unless otherwise specified | | |
|--------------------------|---|---|---------------|---|
| Symbol | Conditions | Values | Units | |
| IGBT | | | | |
| V_{CES} | $T_j = 25\text{ °C}$ | 600 | V | |
| I_C | $T_j = 175\text{ °C}$ | $T_s = 25\text{ °C}$ | 60 | A |
| | | $T_s = 70\text{ °C}$ | 50 | A |
| I_{CRM} | $I_{CRM} = 2 \times I_{Cnom}$ | 100 | A | |
| V_{GES} | | ± 20 | V | |
| t_{psc} | $V_{CC} = 360\text{ V}; V_{GE} \leq 20\text{ V}; T_j = 150\text{ °C}$ $V_{CES} < 600\text{ V}$ | 6 | μs | |

| Inverse Diode | | | | |
|----------------------|--|----------------------|----|---|
| I_F | $T_j = 175\text{ °C}$ | $T_s = 25\text{ °C}$ | 56 | A |
| | | $T_s = 70\text{ °C}$ | 44 | A |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | 100 | A | |
| I_{FSM} | $t_p = 10\text{ ms}; \text{half sine wave } T_j = 150\text{ °C}$ | 320 | A | |

| Freewheeling Diode | | | | |
|---------------------------|--|----------------------|----|---|
| I_F | $T_j = 175\text{ °C}$ | $T_s = 25\text{ °C}$ | 56 | A |
| | | $T_s = 70\text{ °C}$ | 44 | A |
| I_{FRM} | $I_{FRM} = 2 \times I_{Fnom}$ | 60 | A | |
| I_{FSM} | $t_p = 10\text{ ms}; \text{half sine wave } T_j = 150\text{ °C}$ | 320 | A | |

| Module | | | |
|---------------|------------|--------------|--------------------|
| $I_{t(RMS)}$ | | | A |
| T_{vj} | | -40 ... +175 | $^{\circ}\text{C}$ |
| T_{stg} | | -40 ... +125 | $^{\circ}\text{C}$ |
| V_{isol} | AC, 1 min. | 2500 | V |

| Characteristics | | $T_s = 25\text{ °C}$, unless otherwise specified | | | |
|-----------------|---|---|-------|--------|------------------|
| Symbol | Conditions | min. | typ. | max. | Units |
| IGBT | | | | | |
| $V_{GE(th)}$ | $V_{GE} = V_{CE}, I_C = 0,8\text{ mA}$ | 5 | 5,8 | 6,5 | V |
| I_{CES} | $V_{GE} = 0\text{ V}, V_{CE} = V_{CES} T_j = 25\text{ °C}$ | | | 0,0026 | mA |
| I_{GES} | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V } T_j = 25\text{ °C}$ | | | 600 | nA |
| V_{CE0} | | $T_j = 25\text{ °C}$ | 0,9 | 1,1 | V |
| | | $T_j = 150\text{ °C}$ | 0,8 | 1 | V |
| r_{CE} | $V_{GE} = 15\text{ V}$ | $T_j = 25\text{ °C}$ | 11 | | $\text{m}\Omega$ |
| | | $T_j = 150\text{ °C}$ | 17 | | $\text{m}\Omega$ |
| $V_{CE(sat)}$ | $I_{Cnom} = 50\text{ A}, V_{GE} = 15\text{ V}$ | $T_j = 25\text{ °C}_{chiplev.}$ | 1,45 | | V |
| | | $T_j = 150\text{ °C}_{chiplev.}$ | 1,65 | | V |
| C_{ies} | $V_{CE} = 25, V_{GE} = 0\text{ V} \quad f = 1\text{ MHz}$ | | 3,1 | | nF |
| C_{oes} | | | 0,2 | | nF |
| C_{res} | | | 0,093 | | nF |
| $t_{d(on)}$ | $R_{Gon} = 16\ \Omega$ | $V_{CC} = 300\text{ V}$ $I_C = 50\text{ A}$ | 30 | | ns |
| t_r | | | | 31 | ns |
| E_{on} | | | | 1,46 | mJ |
| $t_{d(off)}$ | $R_{Goff} = 16\ \Omega$ | $T_j = 150\text{ °C}$ $V_{GE} = -7/+15\text{ V}$ | 351 | | ns |
| t_f | | | | 45 | ns |
| E_{off} | | | | 2,02 | mJ |
| $R_{th(j-s)}$ | per IGBT | | 1,11 | | K/W |



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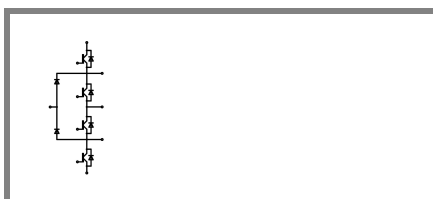
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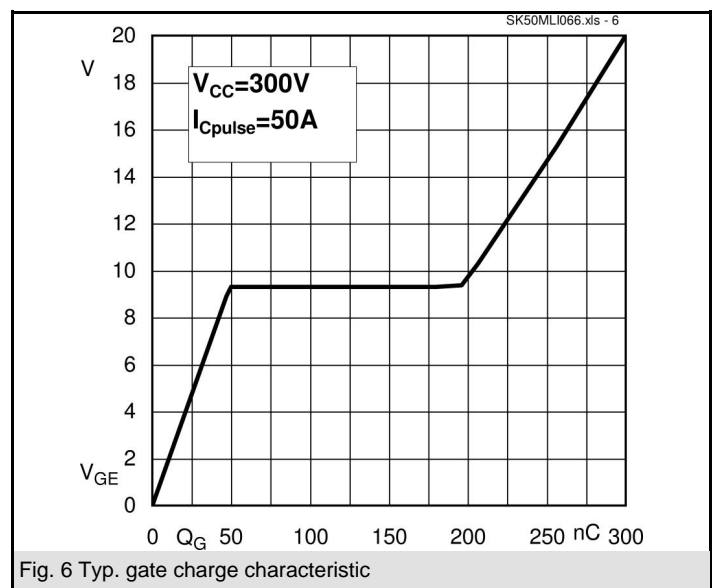
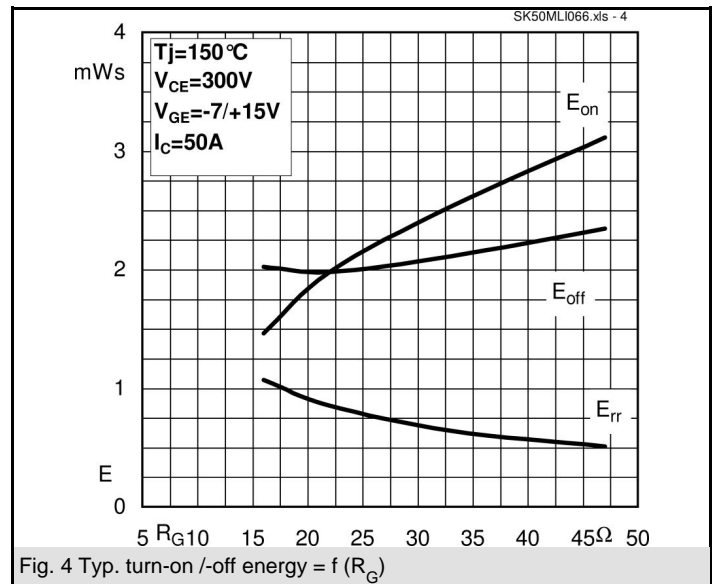
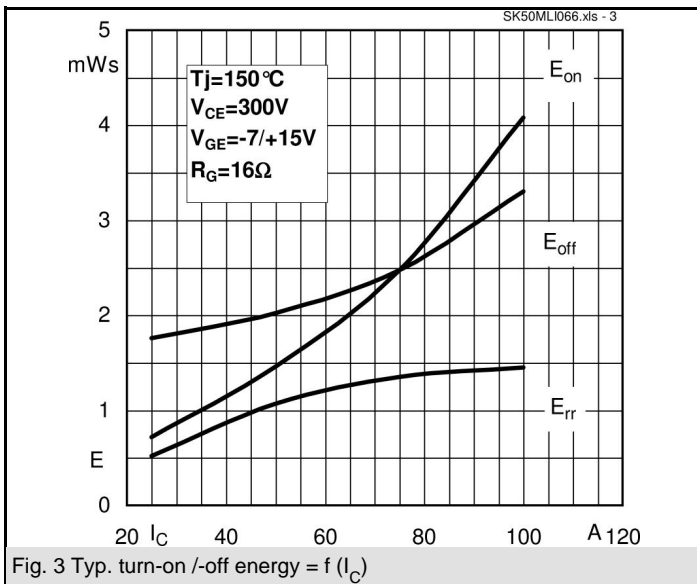
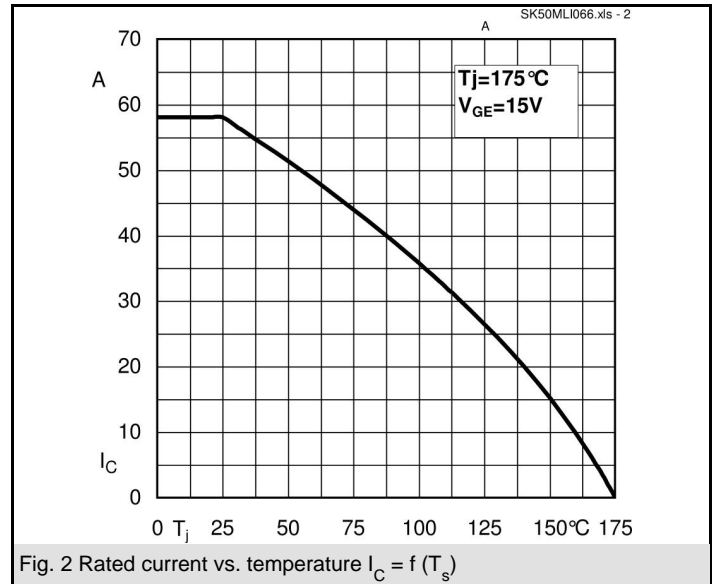
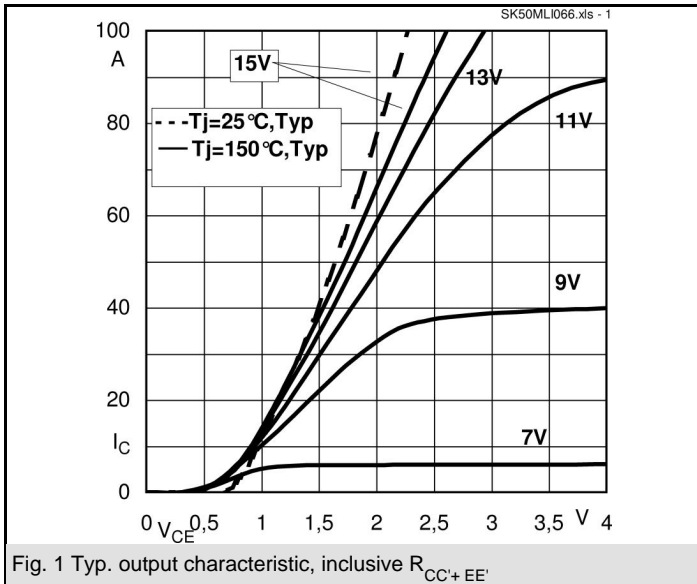
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Characteristics

| Symbol | Conditions | min. | typ. | max. | Units |
|---|---|------|--|------|-------|
| Inverse Diode (Antiparallel Diode) | | | | | |
| $V_F = V_{EC}$ | $I_{Fnom} = 50 \text{ A}; V_{GE} = 0 \text{ V}$ | | $T_j = 25 \text{ }^\circ\text{C}_{\text{chiplev.}}$ | 1,5 | V |
| | | | $T_j = 150 \text{ }^\circ\text{C}_{\text{chiplev.}}$ | 1,5 | V |
| V_{F0} | | | $T_j = 25 \text{ }^\circ\text{C}$ | 1 | V |
| | | | $T_j = 150 \text{ }^\circ\text{C}$ | 0,9 | V |
| r_F | | | $T_j = 25 \text{ }^\circ\text{C}$ | 10 | mΩ |
| | | | $T_j = 150 \text{ }^\circ\text{C}$ | 12 | mΩ |
| I_{RRM} | $I_F = 50 \text{ A}$ | | $T_j = 150 \text{ }^\circ\text{C}$ | | A |
| Q_{rr} | | | | | μC |
| E_{rr} | $V_R = 300 \text{ V}$ | | | 1,07 | mJ |
| $R_{th(j-s)D}$ | per diode | | | 1,7 | K/W |
| Freewheeling Diode (Neutral Clamp diode) | | | | | |
| $V_F = V_{EC}$ | $I_{Fnom} = 50 \text{ A}; V_{GE} = 0 \text{ V}$ | | $T_j = 25 \text{ }^\circ\text{C}_{\text{chiplev.}}$ | 1,5 | V |
| | | | $T_j = 150 \text{ }^\circ\text{C}_{\text{chiplev.}}$ | 1,5 | V |
| V_{F0} | | | $T_j = 25 \text{ }^\circ\text{C}$ | 1 | V |
| | | | $T_j = 150 \text{ }^\circ\text{C}$ | 0,9 | V |
| r_F | | | $T_j = 25 \text{ }^\circ\text{C}$ | 10 | V |
| | | | $T_j = 150 \text{ }^\circ\text{C}$ | 12 | V |
| I_{RRM} | $I_F = 50 \text{ A}$ | | $T_j = 150 \text{ }^\circ\text{C}$ | 40 | A |
| Q_{rr} | $di/dt = -2670 \text{ A}/\mu\text{s}$ | | | 2,2 | μC |
| E_{rr} | $V_R = 300 \text{ V}$ | | | 1,07 | mJ |
| $R_{th(j-s)FD}$ | per diode | | | 1,7 | K/W |
| M_s | to heat sink | 2,25 | | 2,5 | Nm |
| w | | | | 30 | g |

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.



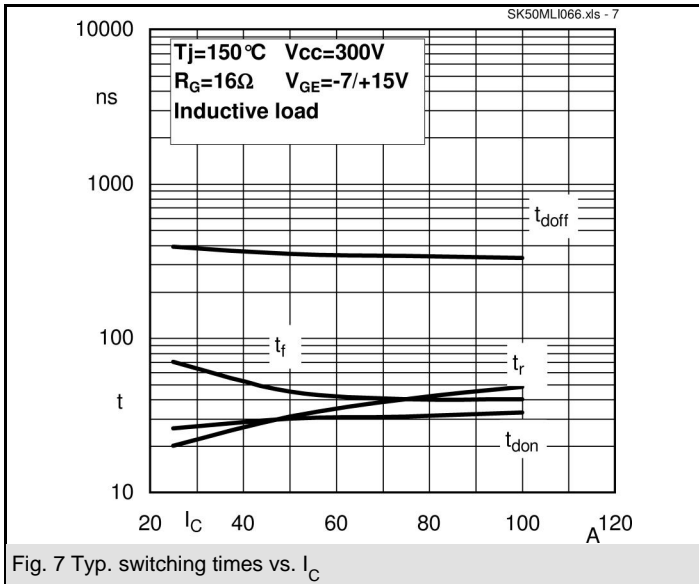


Fig. 7 Typ. switching times vs. I_C

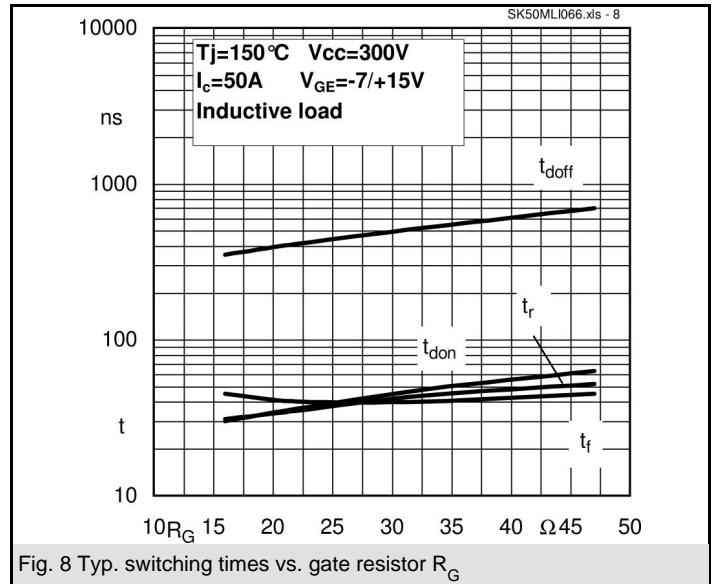


Fig. 8 Typ. switching times vs. gate resistor R_G

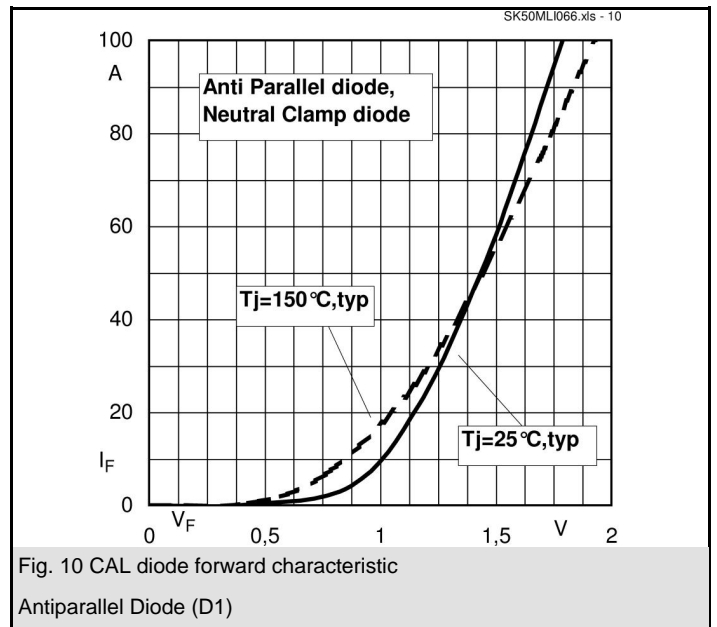
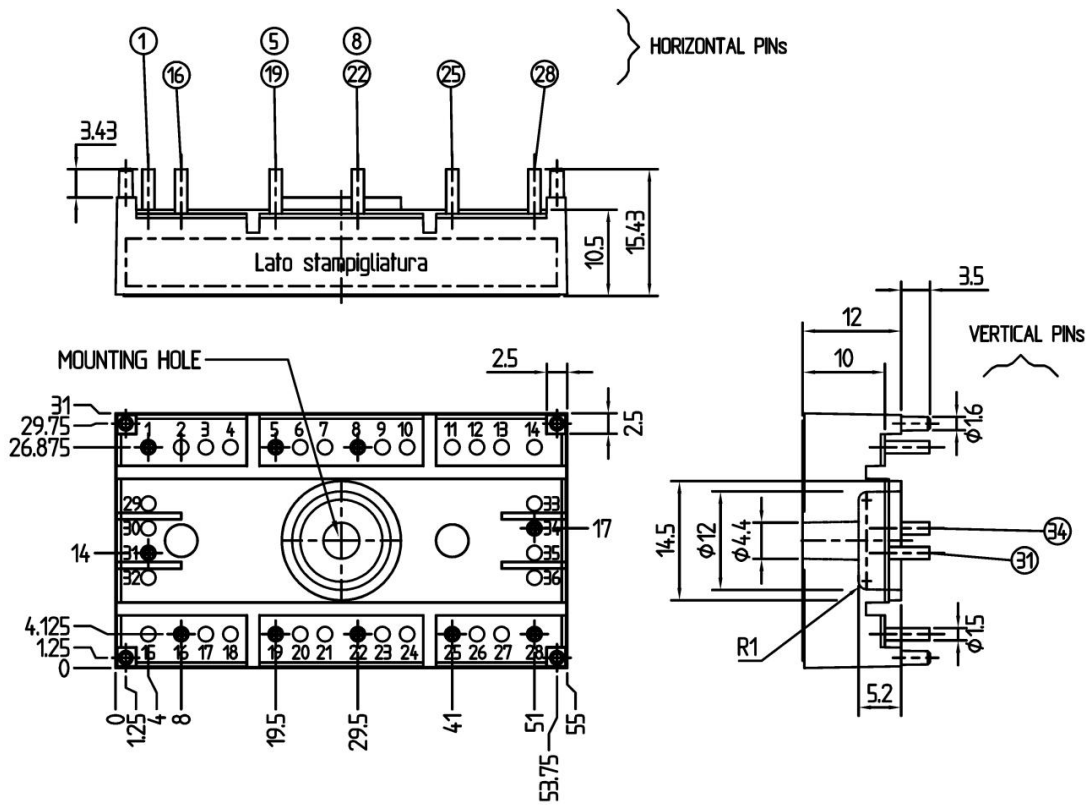
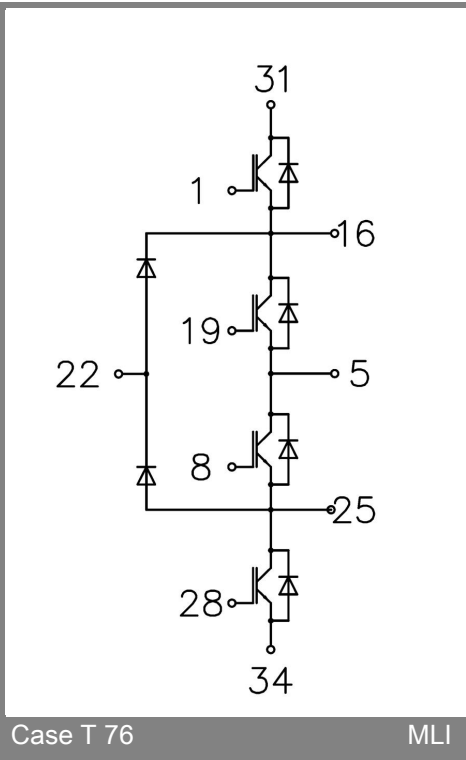


Fig. 10 CAL diode forward characteristic

Antiparallel Diode (D1)



Case T 76 (Suggested hole diameter, in the PCB, for solder pins and plastic mounting pins: 2mm)



Case T 76

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