

**SEMITOP® 3**

## IGBT Module

**SK50MLI065**

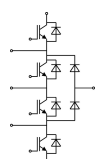
Target Data

### Features

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

### Typical Applications\*

- Multi level inverter



**MLI**

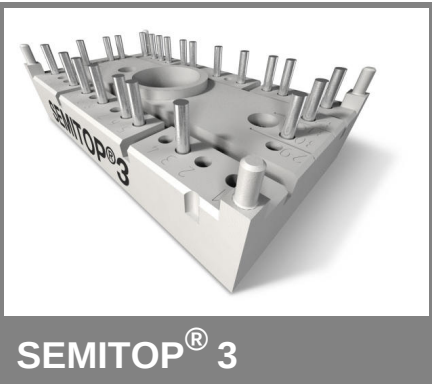
| Absolute Maximum Ratings <span style="float: right;"><math>T_s = 25\text{ °C}</math>, unless otherwise specified</span> |                                                                                                         |                      |               |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------|---------------|
| Symbol                                                                                                                  | Conditions                                                                                              | Values               | Units         |
| <b>IGBT</b>                                                                                                             |                                                                                                         |                      |               |
| $V_{CES}$                                                                                                               | $T_j = 25\text{ °C}$                                                                                    | 600                  | V             |
| $I_C$                                                                                                                   | $T_j = 125\text{ °C}$                                                                                   | $T_s = 25\text{ °C}$ | 54 A          |
|                                                                                                                         |                                                                                                         | $T_s = 80\text{ °C}$ | 40 A          |
| $I_{CRM}$                                                                                                               | $I_{CRM} = 2 \times I_{Cnom}$                                                                           | 120                  | A             |
| $V_{GES}$                                                                                                               |                                                                                                         | $\pm 20$             | V             |
| $t_{psc}$                                                                                                               | $V_{CC} = 300\text{ V}$ ; $V_{GE} \leq 20\text{ V}$ ; $T_j = 125\text{ °C}$<br>$V_{CES} < 600\text{ V}$ | 10                   | $\mu\text{s}$ |

|                      |                                                             |                      |      |
|----------------------|-------------------------------------------------------------|----------------------|------|
| <b>Inverse Diode</b> |                                                             |                      |      |
| $I_F$                | $T_j = 150\text{ °C}$                                       | $T_s = 25\text{ °C}$ | 36 A |
|                      |                                                             | $T_s = 80\text{ °C}$ | 24 A |
| $I_{FRM}$            | $I_{FRM} = 2 \times I_{Fnom}$                               |                      | A    |
| $I_{FSM}$            | $t_p = 10\text{ ms}$ ; half sine wave $T_j = 150\text{ °C}$ | 200                  | A    |

|                           |                                                             |                           |      |
|---------------------------|-------------------------------------------------------------|---------------------------|------|
| <b>Freewheeling Diode</b> |                                                             |                           |      |
| $I_F$                     | $T_j = 150\text{ °C}$                                       | $T_{case} = 25\text{ °C}$ | 64 A |
|                           |                                                             | $T_{case} = 80\text{ °C}$ | 42 A |
| $I_{FRM}$                 |                                                             |                           | A    |
| $I_{FSM}$                 | $t_p = 10\text{ ms}$ ; half sine wave $T_j = 150\text{ °C}$ | 440                       | A    |

|               |            |              |                    |
|---------------|------------|--------------|--------------------|
| <b>Module</b> |            |              |                    |
| $I_{t(RMS)}$  |            |              | A                  |
| $T_{vj}$      |            | -40 ... +150 | $^{\circ}\text{C}$ |
| $T_{stg}$     |            | -40 ... +125 | $^{\circ}\text{C}$ |
| $V_{isol}$    | AC, 1 min. | 2500         | V                  |

| Characteristics <span style="float: right;"><math>T_s = 25\text{ °C}</math>, unless otherwise specified</span> |                                                                     |      |      |                                                |               |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------|------|------------------------------------------------|---------------|
| Symbol                                                                                                         | Conditions                                                          | min. | typ. | max.                                           | Units         |
| <b>IGBT</b>                                                                                                    |                                                                     |      |      |                                                |               |
| $V_{GE(th)}$                                                                                                   | $V_{GE} = V_{CE}$ , $I_C = 1,4\text{ mA}$                           | 3    | 4    | 5                                              | V             |
| $I_{CES}$                                                                                                      | $V_{GE} = 0\text{ V}$ , $V_{CE} = V_{CES}$ $T_j = 25\text{ °C}$     |      |      | 0,0044                                         | mA            |
| $I_{GES}$                                                                                                      | $V_{CE} = 0\text{ V}$ , $V_{GE} = 20\text{ V}$ $T_j = 25\text{ °C}$ |      |      | 240                                            | nA            |
| $V_{CE0}$                                                                                                      |                                                                     |      |      | $T_j = 25\text{ °C}$                           | 1,4 V         |
|                                                                                                                |                                                                     |      |      | $T_j = 125\text{ °C}$                          | 1,7 V         |
| $r_{CE}$                                                                                                       | $V_{GE} = 15\text{ V}$                                              |      |      | $T_j = 25\text{ °C}$                           | m $\Omega$    |
|                                                                                                                |                                                                     |      |      | $T_j = 125\text{ °C}$                          | 22 m $\Omega$ |
| $V_{CE(sat)}$                                                                                                  | $I_{Cnom} = 60\text{ A}$ , $V_{GE} = 15\text{ V}$                   |      |      | $T_j = 25\text{ °C}_{chiplev.}$                | 1,8 V         |
|                                                                                                                |                                                                     |      |      | $T_j = 125\text{ °C}_{chiplev.}$               | 2,1 V         |
| $C_{ies}$                                                                                                      | $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ $f = 1\text{ MHz}$   |      |      |                                                | 3,2 nF        |
| $C_{oes}$                                                                                                      |                                                                     |      |      |                                                | 0,3 nF        |
| $C_{res}$                                                                                                      |                                                                     |      |      |                                                | 0,18 nF       |
| $t_{d(on)}$                                                                                                    | $R_{Gon} = 15\text{ }\Omega$                                        |      |      |                                                | 60 ns         |
| $t_r$                                                                                                          |                                                                     |      |      |                                                | 30 ns         |
| $E_{on}$                                                                                                       | $R_{Goff} = 15\text{ }\Omega$                                       |      |      | $V_{CC} = 300\text{ V}$<br>$I_C = 40\text{ A}$ | 1,07 mJ       |
| $t_{d(off)}$                                                                                                   |                                                                     |      |      | $T_j = 125\text{ °C}$                          | 223 ns        |
| $t_f$                                                                                                          |                                                                     |      |      | $V_{GE} = \pm 15\text{ V}$                     | 20 ns         |
| $E_{off}$                                                                                                      |                                                                     |      |      |                                                | 0,76 mJ       |
| $R_{th(j-s)}$                                                                                                  | per IGBT                                                            |      |      | 0,85                                           | K/W           |



IGBT Module

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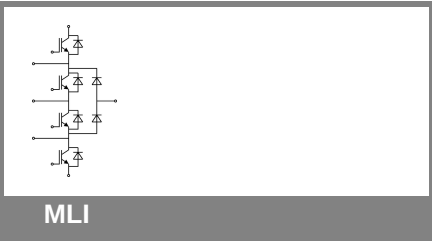
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Typical Applications\*

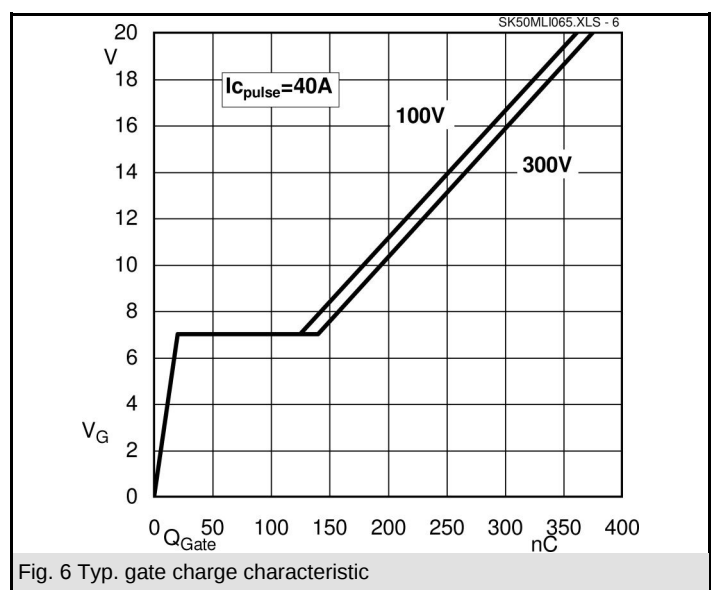
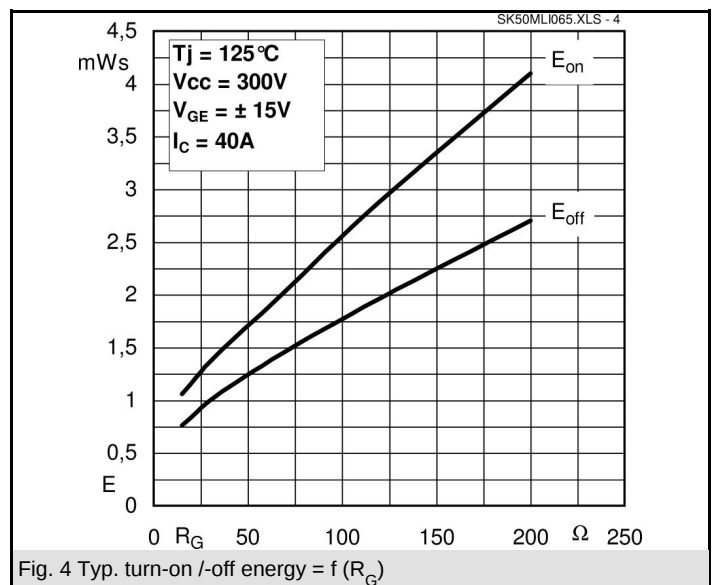
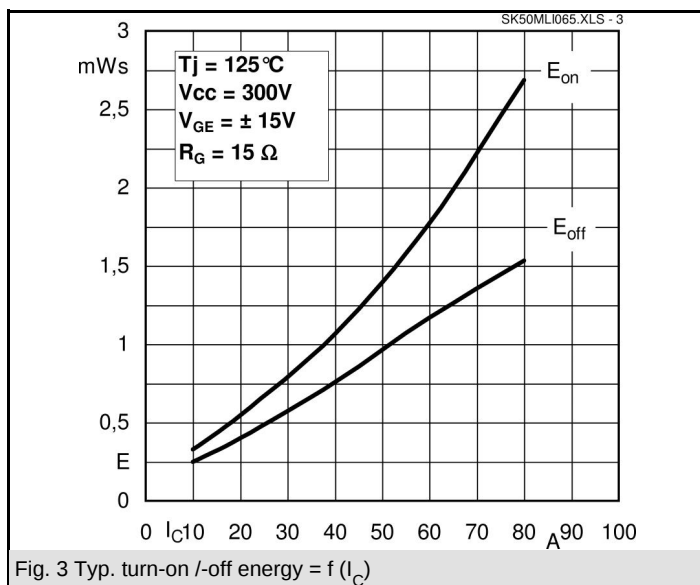
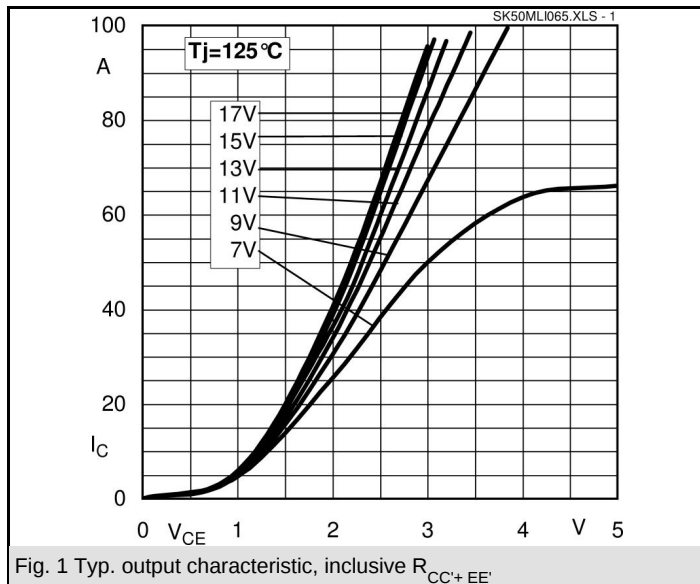
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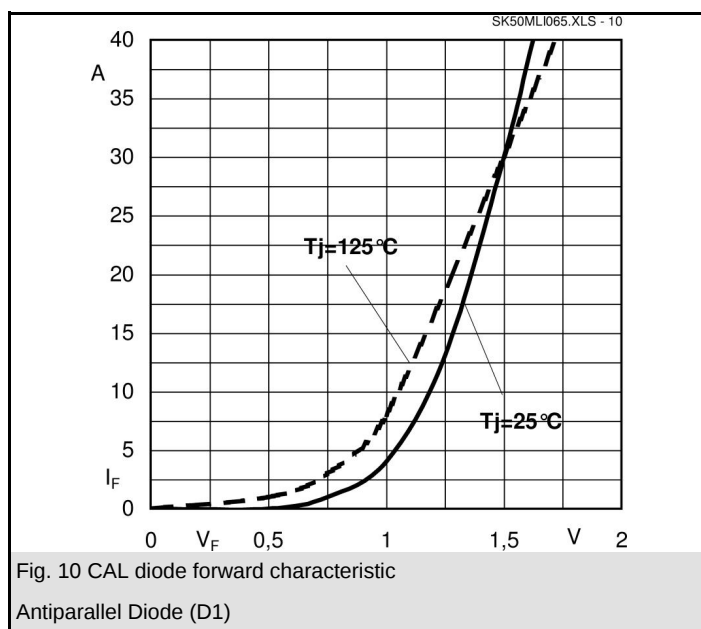
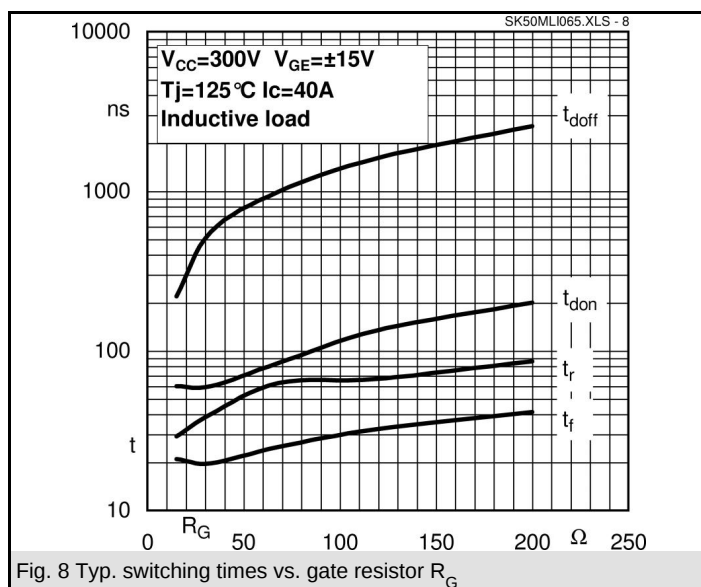
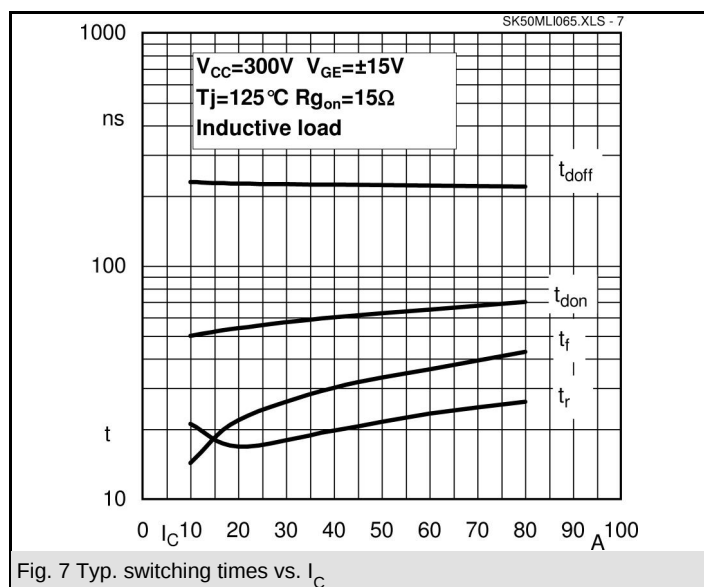


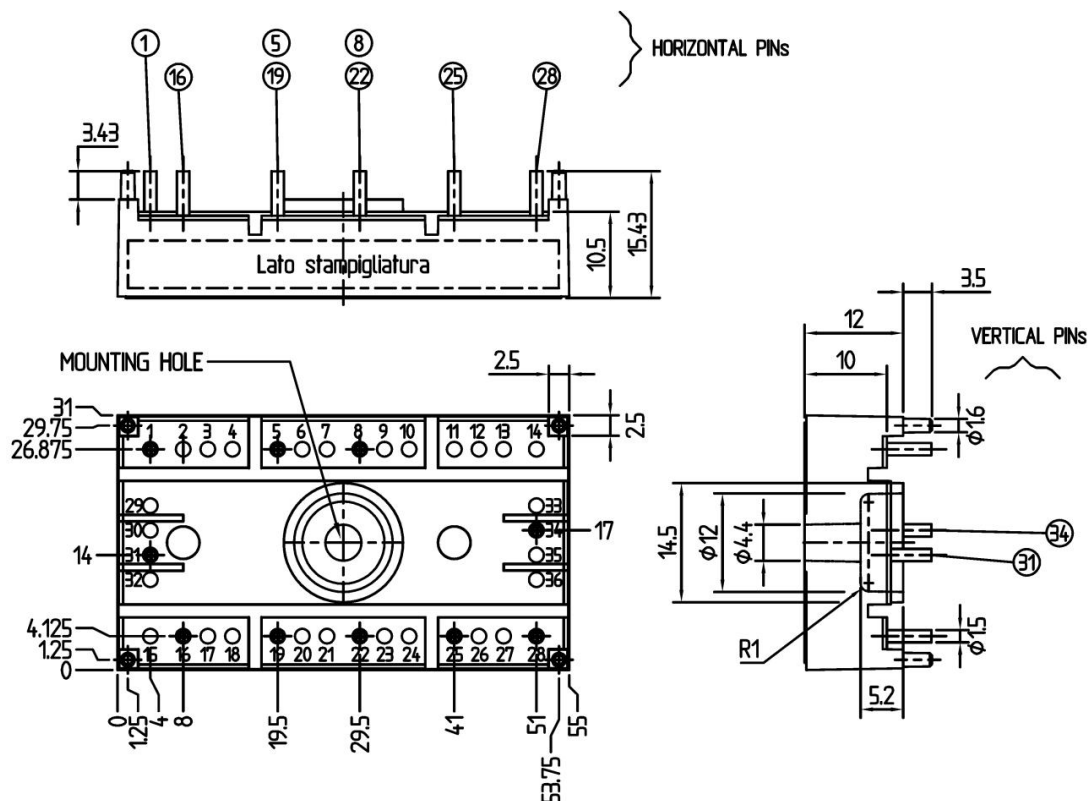
| Characteristics                  |                                                 |                                             |      |      |      |       |
|----------------------------------|-------------------------------------------------|---------------------------------------------|------|------|------|-------|
| Symbol                           | Conditions                                      |                                             | min. | typ. | max. | Units |
| Antiparallel Diode (D1)          |                                                 |                                             |      |      |      |       |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>Fnom</sub> = 25 A; V <sub>GE</sub> = 0 V | T <sub>j</sub> = 25 °C <sub>chiplev.</sub>  |      | 1,45 |      | V     |
|                                  |                                                 | T <sub>j</sub> = 125 °C <sub>chiplev.</sub> |      | 1,4  |      | V     |
| V <sub>F0</sub>                  |                                                 | T <sub>j</sub> = 25 °C                      |      |      |      | V     |
|                                  |                                                 | T <sub>j</sub> = 125 °C                     |      | 0,85 |      | V     |
| r <sub>F</sub>                   |                                                 | T <sub>j</sub> = 25 °C                      |      |      |      | mΩ    |
|                                  |                                                 | T <sub>j</sub> = 125 °C                     |      | 22   |      | mΩ    |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 50 A                           | T <sub>j</sub> = 125 °C                     |      |      |      | A     |
| Q <sub>rr</sub>                  | di/dt = -2400 A/μs                              |                                             |      |      |      | μC    |
| E <sub>rr</sub>                  | V <sub>R</sub> = 300V                           |                                             |      |      |      | mJ    |
| R <sub>th(j-s)D</sub>            | per diode                                       |                                             |      |      | 1,7  | K/W   |
| Freewheeling Diode (D2)          |                                                 |                                             |      |      |      |       |
| V <sub>F</sub> = V <sub>EC</sub> | I <sub>Fnom</sub> = 50 A; V <sub>GE</sub> = 0 V | T <sub>j</sub> = 25 °C <sub>chiplev.</sub>  |      | 1,45 |      | V     |
|                                  |                                                 | T <sub>j</sub> = 125 °C <sub>chiplev.</sub> |      | 1,4  |      | V     |
| V <sub>F0</sub>                  |                                                 | T <sub>j</sub> = 125 °C                     |      | 0,85 |      | V     |
| r <sub>F</sub>                   |                                                 | T <sub>j</sub> = 125 °C                     |      | 11   |      | V     |
| I <sub>RRM</sub>                 | I <sub>F</sub> = 50 A                           | T <sub>j</sub> = 125 °C                     |      |      |      | A     |
| Q <sub>rr</sub>                  | di/dt = -2400 A/μs                              |                                             |      |      |      | μC    |
| E <sub>rr</sub>                  | V <sub>R</sub> =300V                            |                                             |      |      |      | mJ    |
| R <sub>th(j-s)FD</sub>           | per diode                                       |                                             |      |      | 1,1  | K/W   |
| M <sub>s</sub>                   | 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.

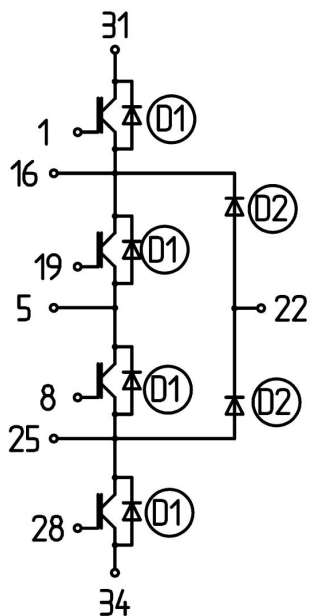
\* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our personal.







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



Case T 76

MLI