

**SEMITOP® 3**

## IGBT Module

**SK20MLI066**

Target Data

### Features

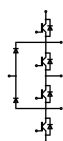
- Compact design
- One screw mounting
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DCB)
- Trench IGBT technology
- CAL technology FWD

### Typical Applications

- 3 Level Inverter
- UPS

### Remarks

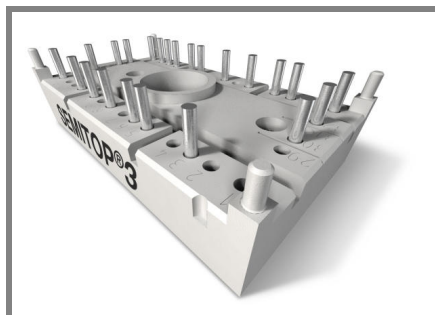
- Visol = 3000V AC, 1s, 50Hz
- Dynamic measure: DUT= IGBT (Gate pin 1) and Neutral Clamp Diode (Kathode pin 16) as free-wheeling diode



MLI

| Absolute Maximum Ratings  |                                                                                                         |                      |  | $T_s = 25\text{ °C}$ , unless otherwise specified |                    |
|---------------------------|---------------------------------------------------------------------------------------------------------|----------------------|--|---------------------------------------------------|--------------------|
| Symbol                    | Conditions                                                                                              |                      |  | Values                                            | Units              |
| <b>IGBT</b>               |                                                                                                         |                      |  |                                                   |                    |
| $V_{CES}$                 | $T_j = 25\text{ °C}$                                                                                    |                      |  | 600                                               | V                  |
| $I_C$                     | $T_j = 175\text{ °C}$                                                                                   | $T_s = 25\text{ °C}$ |  | 30                                                | A                  |
|                           |                                                                                                         | $T_s = 70\text{ °C}$ |  | 24                                                | A                  |
| $I_{CRM}$                 | $I_{CRM} = 2 \times I_{Cnom}$                                                                           |                      |  | 40                                                | A                  |
| $V_{GES}$                 |                                                                                                         |                      |  | $\pm 20$                                          | V                  |
| $t_{psc}$                 | $V_{CC} = 360\text{ V}$ ; $V_{GE} \leq 20\text{ V}$ ; $T_j = 150\text{ °C}$<br>$V_{CES} < 600\text{ V}$ |                      |  | 6                                                 | $\mu\text{s}$      |
| <b>Inverse Diode</b>      |                                                                                                         |                      |  |                                                   |                    |
| $I_F$                     | $T_j = 175\text{ °C}$                                                                                   | $T_s = 25\text{ °C}$ |  | 30                                                | A                  |
|                           |                                                                                                         | $T_s = 70\text{ °C}$ |  | 24                                                | A                  |
| $I_{FRM}$                 | $I_{FRM} = 2 \times I_{Fnom}$                                                                           |                      |  | 40                                                | A                  |
| $I_{FSM}$                 | $t_p = 10\text{ ms}$ ; half sine wave $T_j = 150\text{ °C}$                                             |                      |  | 95                                                | A                  |
| <b>Freewheeling Diode</b> |                                                                                                         |                      |  |                                                   |                    |
| $I_F$                     | $T_j = 175\text{ °C}$                                                                                   | $T_s = 25\text{ °C}$ |  | 31                                                | A                  |
|                           |                                                                                                         | $T_s = 70\text{ °C}$ |  | 24                                                | A                  |
| $I_{FRM}$                 | $I_{FRM} = 2 \times I_{Fnom}$                                                                           |                      |  | 40                                                | A                  |
| $I_{FSM}$                 | $t_p = 10\text{ ms}$ ; half sine wave $T_j = 150\text{ °C}$                                             |                      |  | 95                                                | A                  |
| <b>Module</b>             |                                                                                                         |                      |  |                                                   |                    |
| $I_{t(RMS)}$              |                                                                                                         |                      |  |                                                   | A                  |
| $T_{vj}$                  |                                                                                                         |                      |  | -40 ... +175                                      | $^{\circ}\text{C}$ |
| $T_{stg}$                 |                                                                                                         |                      |  | -40 ... +125                                      | $^{\circ}\text{C}$ |
| $V_{isol}$                | AC, 1 min.                                                                                              |                      |  | 2500                                              | V                  |

| Characteristics      |                                                                                               |                                                       | T <sub>s</sub> = 25 °C, unless otherwise specified |      |      |       |
|----------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------|------|------|-------|
| Symbol               | Conditions                                                                                    |                                                       | min.                                               | typ. | max. | Units |
| IGBT                 |                                                                                               |                                                       |                                                    |      |      |       |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 0,29 mA                                  |                                                       | 5                                                  | 5,8  | 6,5  | V     |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = V <sub>CES</sub> T <sub>j</sub> = 25 °C              |                                                       | 0,0011                                             |      |      | mA    |
| I <sub>GES</sub>     | V <sub>CE</sub> = 0 V, V <sub>GE</sub> = 20 V    T <sub>j</sub> = 25 °C                       |                                                       | 300                                                |      |      | nA    |
| V <sub>CE0</sub>     | T <sub>j</sub> = 25 °C                                                                        |                                                       | 0,9                                                |      | 1,1  | V     |
|                      | T <sub>j</sub> = 150 °C                                                                       |                                                       | 0,8                                                |      | 1    | V     |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V    T <sub>j</sub> = 25°C                                               |                                                       | 27,5                                               |      | 37,5 | mΩ    |
|                      | T <sub>j</sub> = 150°C                                                                        |                                                       | 40                                                 |      | 52,5 | mΩ    |
| V <sub>CE(sat)</sub> | I <sub>Cnom</sub> = 20 A, V <sub>GE</sub> = 15 V    T <sub>j</sub> = 25°C <sub>chiplev.</sub> |                                                       | 1,45                                               |      | 1,85 | V     |
|                      | T <sub>j</sub> = 150°C <sub>chiplev.</sub>                                                    |                                                       | 1,65                                               |      | 2,05 | V     |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25, V <sub>GE</sub> = 0 V    f = 1 MHz                                      |                                                       | 1,1                                                |      |      | nF    |
| C <sub>oes</sub>     |                                                                                               |                                                       | 0,071                                              |      |      | nF    |
| C <sub>res</sub>     |                                                                                               |                                                       | 0,032                                              |      |      | nF    |
| t <sub>d(on)</sub>   | R <sub>Gon</sub> = 33 Ω                                                                       | V <sub>CC</sub> = 300V<br>I <sub>C</sub> = 20A        | 21                                                 |      |      | ns    |
| t <sub>r</sub>       |                                                                                               |                                                       | 19                                                 |      |      | ns    |
| E <sub>on</sub>      | R <sub>Goff</sub> = 33 Ω                                                                      | T <sub>j</sub> = 150 °C<br>V <sub>GE</sub> = -7/+15 V | 0,4                                                |      |      | mJ    |
| t <sub>d(off)</sub>  |                                                                                               |                                                       | 230                                                |      |      | ns    |
| t <sub>f</sub>       |                                                                                               |                                                       | 50                                                 |      |      | ns    |
| E <sub>off</sub>     |                                                                                               |                                                       | 1,07                                               |      |      | mJ    |
| R <sub>th(j-s)</sub> | per IGBT                                                                                      |                                                       | 1,95                                               |      |      | K/W   |



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### Typical Applications

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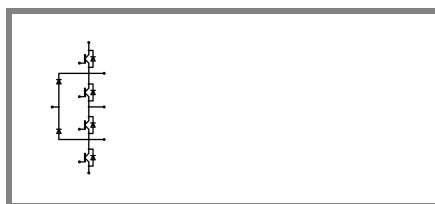
### Remarks

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

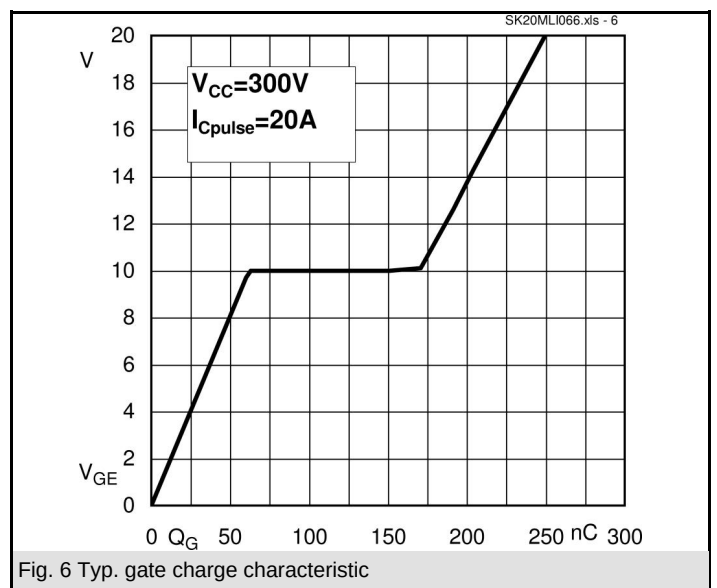
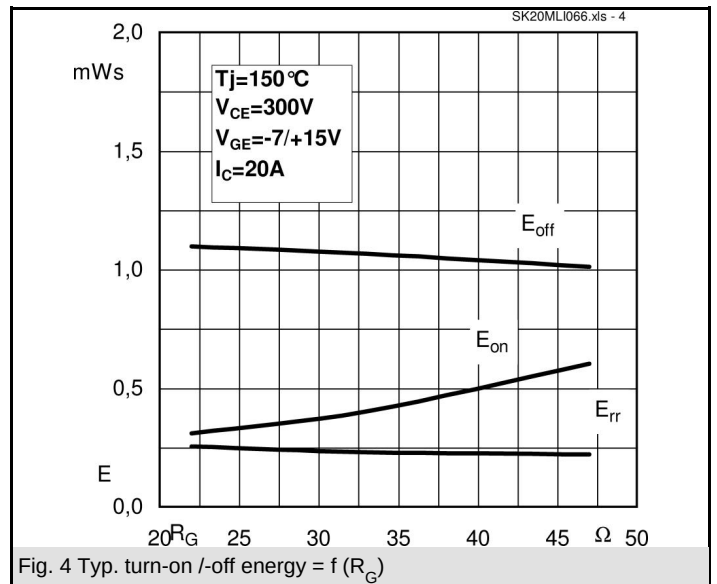
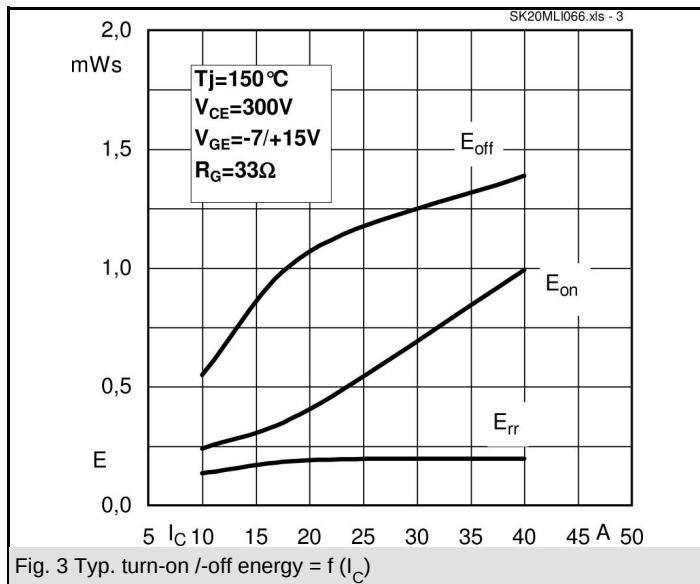
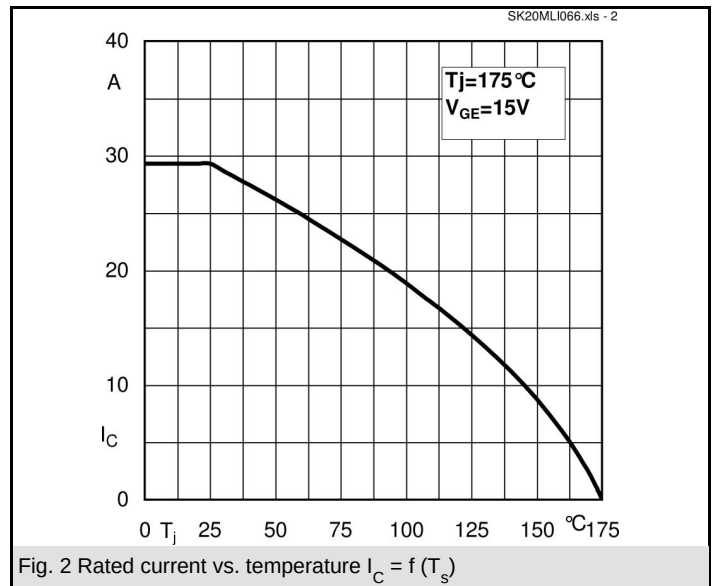
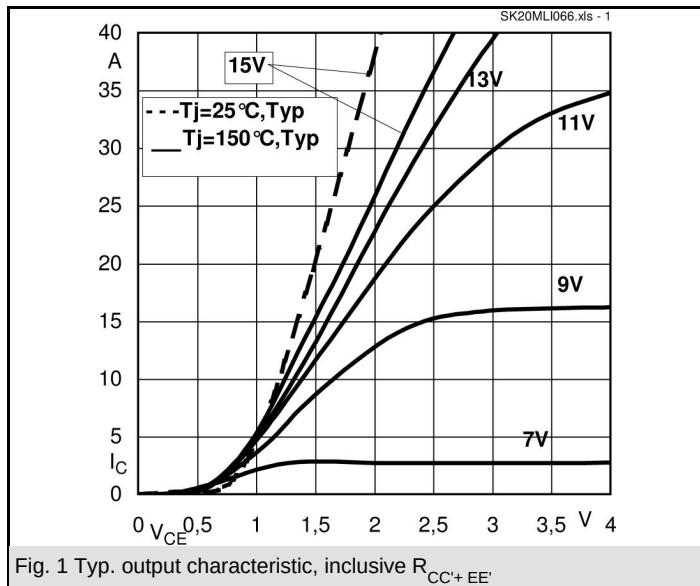
| Characteristics                           |                                                 |                                             |      |      |      |       |
|-------------------------------------------|-------------------------------------------------|---------------------------------------------|------|------|------|-------|
| Symbol                                    | Conditions                                      |                                             | min. | typ. | max. | Units |
| Inverse Diode (Antiparallel Diode)        |                                                 |                                             |      |      |      |       |
| V <sub>F</sub> = V <sub>EC</sub>          | I <sub>Fnom</sub> = 20 A; V <sub>GE</sub> = 0 V | T <sub>j</sub> = 25 °C <sub>chiplev.</sub>  |      | 1,6  | 1,9  | V     |
|                                           |                                                 | T <sub>j</sub> = 150 °C <sub>chiplev.</sub> |      | 1,65 | 1,95 | V     |
| V <sub>F0</sub>                           |                                                 | T <sub>j</sub> = 25 °C                      |      | 1    | 1,1  | V     |
|                                           |                                                 | T <sub>j</sub> = 150 °C                     |      | 0,9  | 1    | V     |
| r <sub>F</sub>                            |                                                 | T <sub>j</sub> = 25 °C                      |      | 30   | 40   | mΩ    |
|                                           |                                                 | T <sub>j</sub> = 150 °C                     |      | 37,5 | 47,5 | mΩ    |
| I <sub>RRM</sub>                          | I <sub>F</sub> = 20 A                           | T <sub>j</sub> = 150 °C                     |      |      |      | A     |
| Q <sub>rr</sub>                           | di/dt = -2000 A/μs                              |                                             |      |      |      | μC    |
| E <sub>rr</sub>                           | V <sub>R</sub> = 300V                           |                                             |      | 0,2  |      | mJ    |
| R <sub>th(j-s)D</sub>                     | per diode                                       |                                             |      | 2,46 |      | K/W   |
| Freewheeling Diode (Neutral Clampo diode) |                                                 |                                             |      |      |      |       |
| V <sub>F</sub> = V <sub>EC</sub>          | I <sub>Fnom</sub> = 20 A; V <sub>GE</sub> = 0 V | T <sub>j</sub> = 25 °C <sub>chiplev.</sub>  |      | 1,5  |      | V     |
|                                           |                                                 | T <sub>j</sub> = 150 °C <sub>chiplev.</sub> |      | 1,5  |      | V     |
| V <sub>F0</sub>                           |                                                 | T <sub>j</sub> = 25 °C                      |      | 1    |      | V     |
|                                           |                                                 | T <sub>j</sub> = 150 °C                     |      | 0,9  |      | V     |
| r <sub>F</sub>                            |                                                 | T <sub>j</sub> = 25 °C                      |      | 20   |      | V     |
|                                           |                                                 | T <sub>j</sub> = 150 °C                     |      | 25   |      | V     |
| I <sub>RRM</sub>                          | I <sub>F</sub> = 20 A                           | T <sub>j</sub> = 150 °C                     |      | 20   |      | A     |
| Q <sub>rr</sub>                           | di/dt = -2000 A/μs                              |                                             |      | 1    |      | μC    |
| E <sub>rr</sub>                           | V <sub>R</sub> =300V                            |                                             |      | 0,2  |      | mJ    |
| R <sub>th(j-s)FD</sub>                    | per diode                                       |                                             |      | 2,46 |      | K/W   |
| M <sub>s</sub>                            | to heat sink                                    |                                             | 2,25 |      | 2,5  | Nm    |
| w                                         |                                                 |                                             |      | 30   |      | g     |

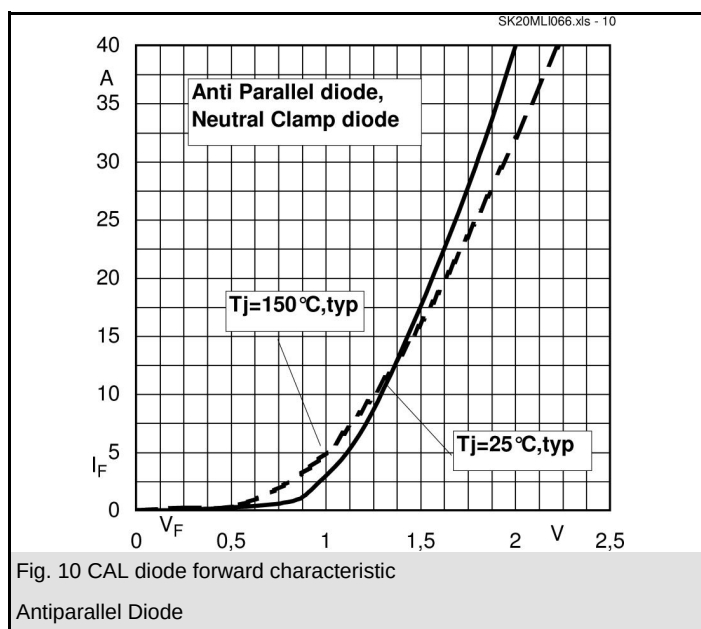
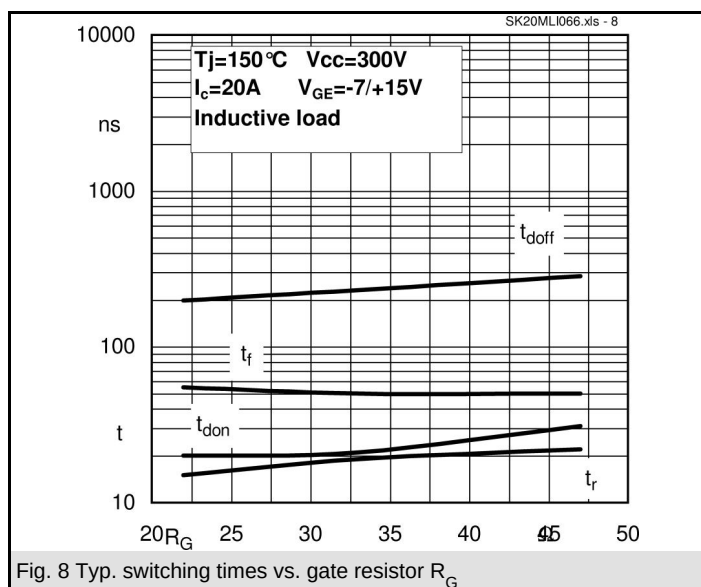
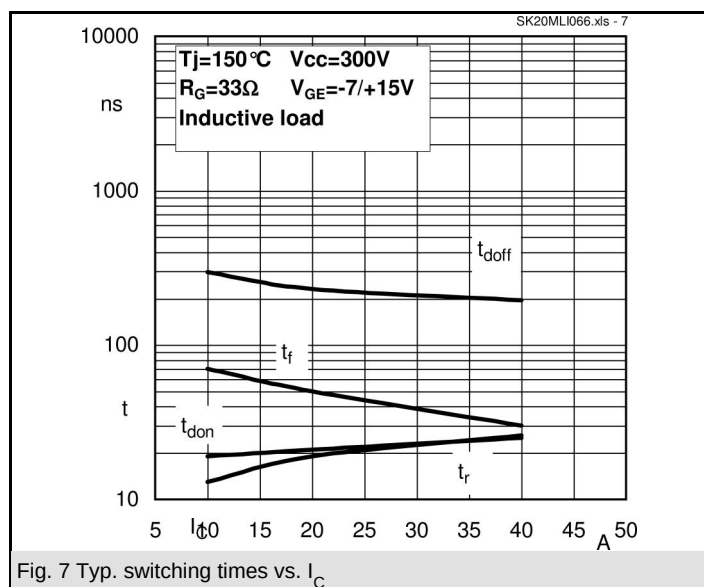
This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.

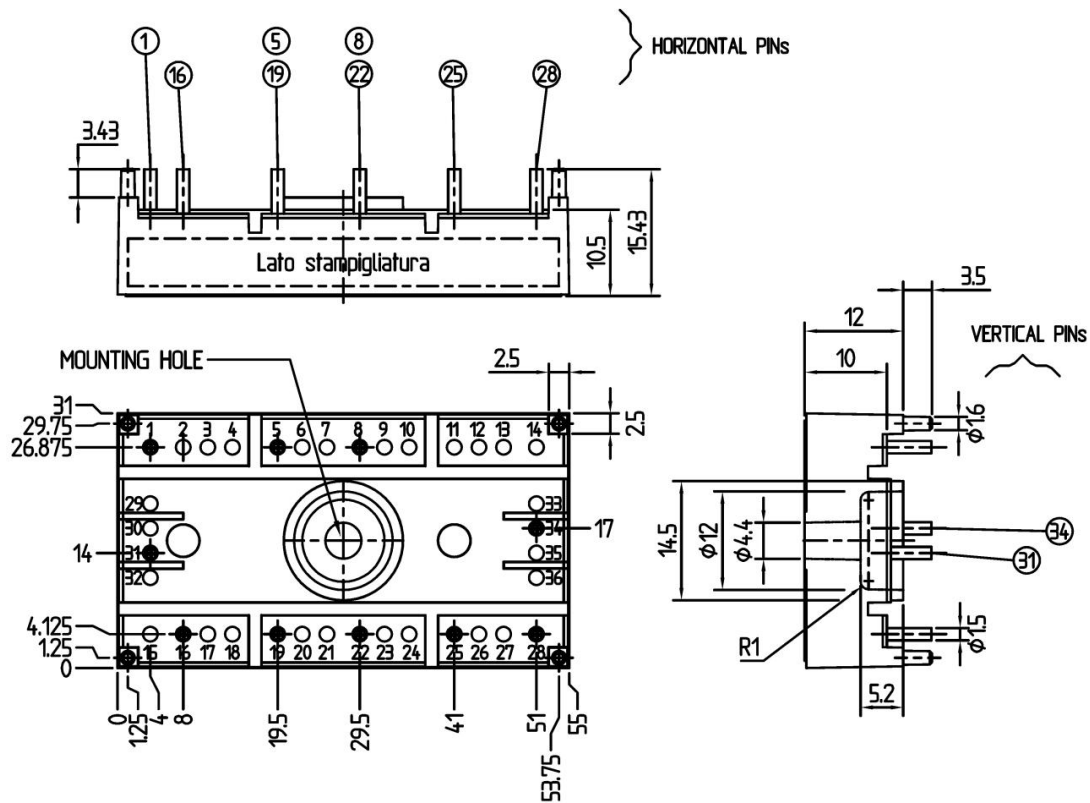
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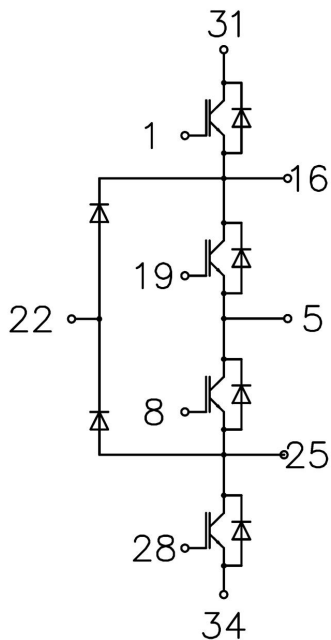
**MLI**







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



Case T 76

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