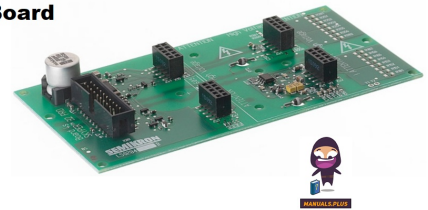


**SEMIKRON**  
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**32R Technical  
Explanation Board**



# SEMIKRON 32R Technical Explanation Board Instruction Manual

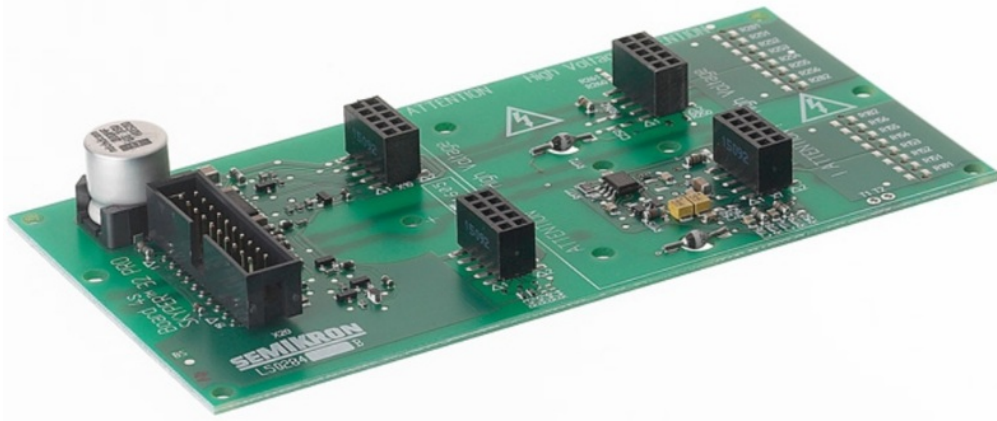
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**SEMIKRON 32R Technical Explanation Board**



## Specifications

1. **Model:** SKYPER IGBT Driver Adapter Board
2. **Revision:** 32 R
3. **Issue Date:** 2016-03-16
4. **Prepared by:** H.Flohrer
5. **Approved by:** J.Krapp

- **Application and Handling Instructions**

For detailed application and handling instructions, refer to the SEMIKRON Application Manual Power Modules available at <http://www.semikron.com>.

- **General Description**

The SKYPER IGBT Driver Adapter Board is designed to provide efficient switching signal inputs and drive power supply for IGBT modules.

- **PIN Array**

Product information of suitable female connectors and distributor contact information is available at <http://www.harting.com> (part.nr.09 18 514 6813).

- **Setting Dynamic Short Circuit Protection**

To set the dynamic short circuit protection, refer to Table 3 for RCE & CCE Designation.

- **Collector Series Resistance**

Refer to Table 4 for RVCE Designation for collector series resistance values based on IGBT operation voltage.

- **Further Application Support**

For the latest information and design support, visit <http://www.semikron.com>.

### Please note:

All values in this technical explanation are typical values. Typical values are the average values expected in large quantities and are provided for information purposes only. These values can and do vary in different applications. All operating parameters should be validated by the user's technical experts for each application.

## Application and Handling Instructions

- Please provide static discharge protection during handling. As long as the hybrid driver is not completely assembled, the input terminals have to be short-circuited. Persons working with devices have to wear a grounded bracelet. Any synthetic floor coverings must not be statically chargeable. Even during transportation the input terminals have to be short-circuited using, for example, conductive rubber. Worktables have to be

grounded. The same safety requirements apply to MOSFET- and IGBT modules.

- Any parasitic inductances within the DC-link have to be minimized. Over-voltages may be absorbed by C- or RCD-snubber networks between main terminals for PLUS and MINUS of the power module.
- When first operating a newly developed circuit, SEMIKRON recommends applying low collector voltage and load current in the beginning and increasing these values gradually, observing the turn-off behavior of the free-wheeling diode and the turn-off voltage spikes generated across the IGBT. An oscillographic control will be necessary. Additionally, the case temperature of the module has to be monitored. When the circuit works correctly under rated operating conditions, short-circuit testing may be done, starting again with low collector voltage.
- It is important to feed any errors back to the control circuit and to switch off the device immediately in failure events. Repeated turn-on of the IGBT into a short circuit with a high frequency may destroy the device.
- The inputs of the hybrid driver are sensitive to over-voltage. Currents higher than  $V_S + 0,3V$  or below  $-0,3V$  may destroy these inputs. Therefore, control signal over-voltages exceeding the above values have to be avoided.
- The connecting leads between the hybrid driver and the power module should be as short as possible (max. 20cm), and the driver leads should be twisted.

### Further application support

The latest information is available at <http://www.semikron.com> . For design support please read the SEMIKRON Application Manual Power Modules available at <http://www.semikron.com> .

## General Information

The Board 3s SKYPER® 32PRO R is an adapter board for the IGBT module SEMiX® 3s (spring contact version). The board can be customized allowing adaptation and optimization to the used SEMiX® Module. The switching characteristic of the IGBT can be influenced through user settings, eg changing turn-on and turn-off speed by variation of  $R_{Gon}$  and  $R_{Goff}$ . Furthermore, it is possible to adjust the monitoring level and blanking time for the DSCP (see Technical Explanations SKYPER® 32PRO R).

### Please note:

This technical explanation is based on the Technical Explanations for SKYPER® 32PRO R. Please read the Technical Explanations for SKYPER® 32 PRO R before using the Adaptor Board.

**Figure 1: Board 2s SKYPER® 32 R**



## Quality

| Table 1: Quality |                              |   |                |
|------------------|------------------------------|---|----------------|
| End of the exam  | test category                | exam details  | level          |
| AOI              | Automated Optical Inspection | Control of accurate placement of components/solder joints   | SEMIKRON       |
| ICT              | In-Circuit Test              | Test of the populated PCB, checking the correct fabrication | SEMIKRON       |
| Test type        | test category                | conditional test  | level          |
| EP               | Electrical Parameters        | Jamb = -40°C / +85°C  | SEMIKRON       |
| SP               | STEP Test, Interrupted PS    | 20x 10µs to 2s  | EN61000-4-29   |
| Yes              | Isolation Test               | Maximum voltage test 4kV, 60s                               | EN 61800-5-1   |
| TC               | Thermal cycling              | 200 cycles, Tstgmax – Tstgmin                               | IEC60068-2-14  |
| PD               | Partial discharge test       | >1.1 kV; suitable for 900V DC Link                          | VDE 0110-20    |
| TH               | Warm humidity                | 85°C, 85% RH, 96h   | IEC 60068-2-67 |
| VB               | Vibration                    | Sine 20/2000Hz Random 10/2000Hz, 5g, 26 per x, y, z         | IEC 60068-2-6  |
| SH               | Shock                        | Half-sinus pulse, 30g, 6000 shocks, 6ms, ±x, ±y, ±z         | IEC 60068-2-29 |

## Dimensions

Technical drawing of a rectangular plate with dimensions and features. The drawing includes a top view and a side view.

**Top View Dimensions:**

- Overall width: 78
- Overall height: 67,5
- Distance from left edge to first vertical feature: 12,5
- Distance between first and second vertical features: 2,54
- Distance from second vertical feature to center of first hole: 45,0
- Distance from center of first hole to center of second hole: 70
- Distance from center of second hole to right edge: 71,2
- Distance from top edge to first horizontal feature: 23,14
- Distance between first and second horizontal features: 20,8
- Distance from second horizontal feature to center of first hole: 20
- Distance from center of first hole to center of second hole: 55,0
- Distance from center of second hole to right edge: 5,18

**Top View Features:**

- Two rectangular features labeled "X20" and "X10".
- Two circular features labeled "Ø 3,2" and "Ø 3,5".
- Two circular features labeled "Ø 3".
- Two circular features labeled "Ø 1,3".
- Two circular features labeled "Ø 3,2" and "Ø 3,5".
- Two circular features labeled "Ø 3".

**Side View Dimensions:**

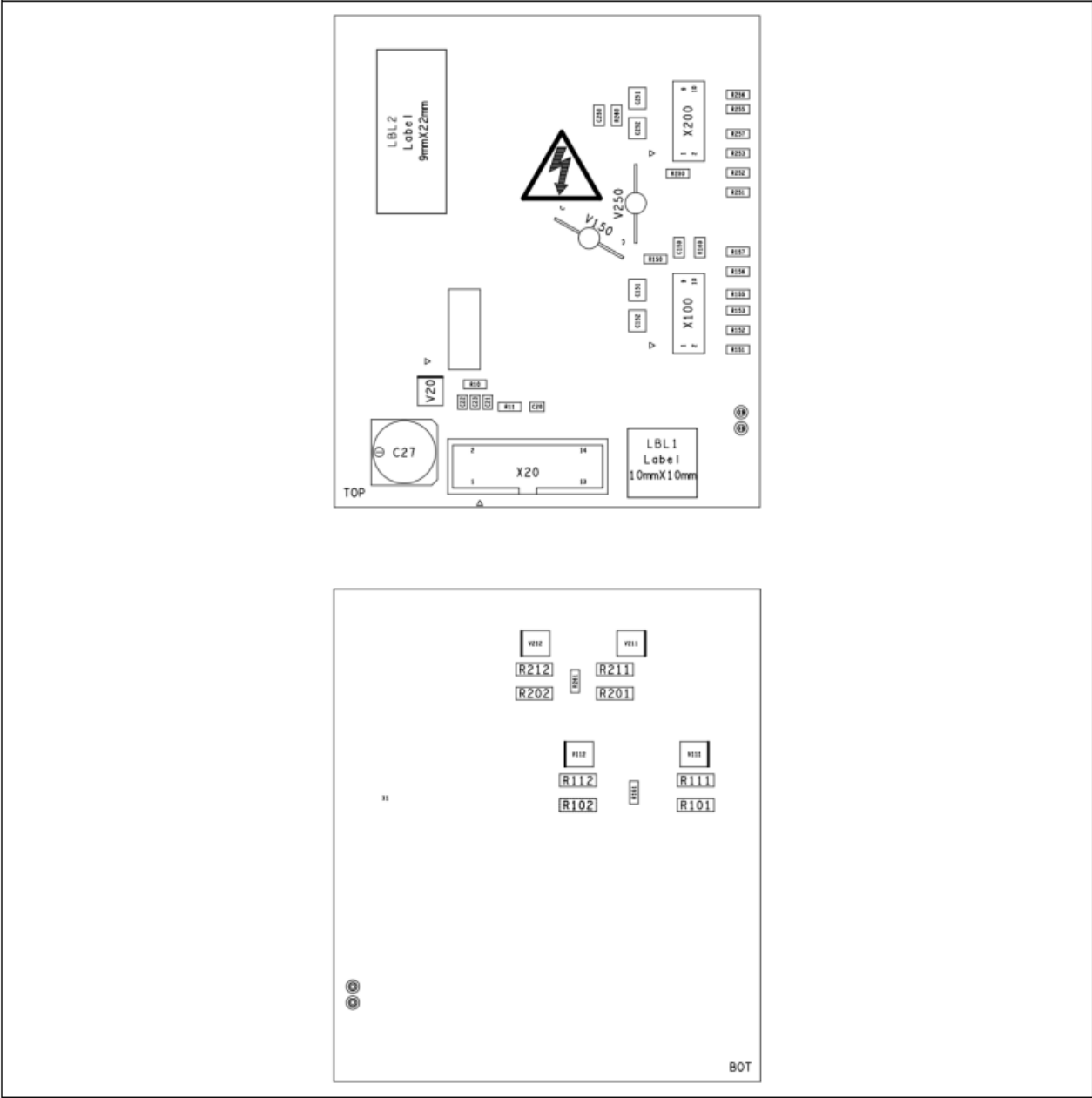
- Overall height: 10,1
- Distance from bottom edge to first horizontal feature: 13,2
- Distance from first horizontal feature to second horizontal feature: 10,1
- Distance from second horizontal feature to third horizontal feature: 10,1
- Distance from third horizontal feature to top edge: 10,1

**Side View Features:**

- Three rectangular features labeled "X20" and "X10".
- Two circular features labeled "Ø 3,2" and "Ø 3,5".
- Two circular features labeled "Ø 3".

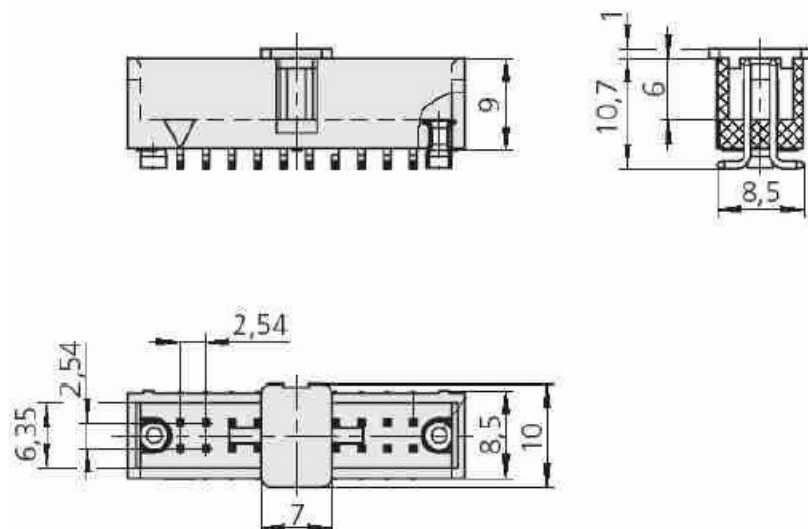
### Figure 3: Adapter Board

**Figure 3: Adaptor Board**



## PIN Array

**Figure 4: Connector X20 (Assmann AWHW 20G SMD)**



Product information of suitable female connectors and distributor contact information is available at eg <http://www.harting.com> (part number 09 18 520 6 813).

**Table 2: PIN Range**

| <b>PIN</b> | <b>Waves</b> | <b>Work</b>   | <b>Measurements</b>  |
|------------|--------------|---|--|
| X20:01     | IF_PWR_15P   | Drive power supply  | Stabilized +15V ±4%  |
| X20:02     | IF_PWR_GND   | GND for power supply  |  |
| X20:03     | IF_PWR_15P   | Drive power supply  | Stabilized +15V ±4%  |
| X20:04     | IF_PWR_GND   | GND for power supply  |  |
| X20:05     | IF_PWR_15P   | Drive power supply  | Stabilized +15V ±4%  |
| X20:06     | IF_PWR_GND   | GND for power supply  |  |
| X20:07     | reserved     |   |  |
| X20:08     | IF_PWR_GND   | GND for power supply  |  |
| X20:09     | IF_CMN_nHALT | Driver core status signal (bidirectional signal with dominant recessive behavior) | Digital 15V logic; LOW (dominant) = driver disabled; HIGH (recessive) = ready to operate |
| X20:10     | reserved     |   |  |
| X20:11     | reserved     |   |  |
| X20:12     | IF_CMN_GND   | GND for signal IF_CMN_nHALT   |  |
| X20:13     | reserved     |   |  |
| X20:14     | reserved     |   |  |
| X20:15     | IF_HB_TOP    | Switching signal input (TOP switch)   | Digital 15 V logic; 10 kOhm impedance; LOW = TOP switch off; HIGH = TOP switch on        |
| X20:16     | IF_HB_BOT    | Switching signal input (BOTTOM switch)  | Digital 15 V logic; 10 kOhm impedance; LOW = BOT switch off; HIGH = BOT switch on        |
| X20:17     | reserved     |   |  |
| X20:18     | IF_HB_GND    | GND for signals IF_HB_TOP & IF_HB_BOT   |  |
| X20:19     | reserved     |   |  |
| X20:20     | reserved     |   |  |

**Please note:**

The feature PRIM\_ERROR\_IN of the driver core is not available at the interface X20.

## Setting Dynamic Short Circuit Protection

| Table 3: R <sub>CE</sub> & C <sub>CE</sub> |              |                                      |     |
|--|--------------|--------------------------------------|-----|
| Designation                                | Pattern Name | Setting                              |     |
| R160                                       | 1206         | RCE<br>Factory setting: not equipped | TOP |
| C150                                       | 1206         | CCE<br>Factory setting: not equipped | TOP |
| R260                                       | 1206         | RCE<br>Factory setting: not equipped | BOT |
| C250                                       | 1206         | CCE<br>Factory setting: not equipped | BOT |

### Collector Series Resistance

| Table 4: R <sub>VCE</sub> |              |   |     |
|---------------------------|--------------|---|-----|
| Designation               | Pattern Name | Setting                                 |     |
| R150                      | MiniMELF     | RVCE *<br>Factory setting: not equipped | TOP |
| R250                      | MiniMELF     | RVCE *<br>Factory setting: not equipped | BOT |

- 1200V IGBT operation: 0Ω
- 1700V IGBT operation: 1kΩ / 0,4W

### Adaptation Gate Resistors



| <b>Table 5: R<sub>Gon</sub> &amp; R<sub>Goff</sub></b> |                     |  |     |
|--|---------------------|--|-----|
| <b>Designation</b>                                     | <b>Pattern Name</b> | <b>Setting</b>                         |     |
| R151, R152, R153<br>(parallel connected)               | MiniMELF            | RGon<br>Factory setting: not equipped  | TOP |
| R155, R156, R157<br>(parallel connected)               | MiniMELF            | RGoff<br>Factory setting: not equipped | TOP |
| R251, R252, R253<br>(parallel connected)               | MiniMELF            | RGon<br>Factory setting: not equipped  | BOT |
| R255, R256, R257<br>(parallel connected)               | MiniMELF            | RGoff<br>Factory setting: not equipped | BOT |

### **Adaptation Decoupling Gate Resistors**

For details to the decoupling gate resistors and recommended values, see Modules Explanations and Data Sheets SEMiX®.

| <b>Table 6: R<sub>G1</sub>, R<sub>G2</sub></b> |                     |                                      |     |
|--|---------------------|--------------------------------------|-----|
| <b>Designation</b>                             | <b>Pattern Name</b> | <b>Setting</b>                       |     |
| R101   | MELF                | RG1<br>Factory setting: not equipped | TOP |
| R102   | MELF                | RG2<br>Factory setting: not equipped | TOP |
| R201   | MELF                | RG1<br>Factory setting: not equipped | BOT |
| R202   | MELF                | RG2<br>Factory setting: not equipped | BOT |

### **Boost Capacitors**

| Table 7: Cboost15P & Cboost8N |              |   |     |
|-------------------------------|--------------|---|-----|
| Designation                   | Pattern Name | Setting                                   |     |
| C151                          | 1210         | Cboost8N<br>Factory setting: 4,7µF/16V *  | TOP |
| C152                          | 1210         | Cboost15P<br>Factory setting: 2,2µF/25V * | TOP |
| C251                          | 1210         | Cboost8N<br>Factory setting: 4,7µF/16V *  | BOT |
| C252                          | 1210         | Cboost15P<br>Factory setting: 2,2µF/25V * | BOT |

\* output charge pulse: 5µC

### Temperature Signal

The temperature sensor inside the SEMiX® module is directly connected to contacting points T1 and T2. For details to the temperature sensor, see Modules Explanations SEMiX®.

**Safety Warnings:** The contacting points T1 and T2 are not electrical isolated. Due to high voltage that may be present at the contacting points T1 and T2, some care must be taken in order to avoid accident. There is no cover or potential isolation that protect the high voltage sections / wires from accidental human contact.

### Mounting Notes

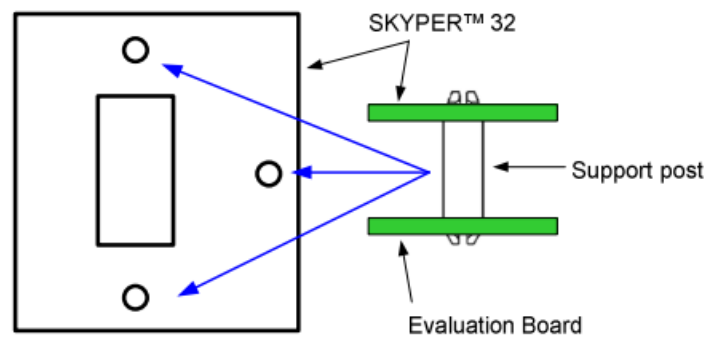
The electrical connections between adaptor board and SEMiX® are realised via spring contacts integrated in SEMiX® power modules and via landing pads on the bottom side of the adaptor board.

### Figure 5: Adaptor Board & Driver Core Mounting

1. Soldering of components (e.g. RGon, RGoff, etc.) on adapter board.
2. Adaptor Board has to be fixed to the SEMiX® module (see “Mounting Instruction and Application Notes for SEMiX® IGBT modules” on SEMiX® product overview page at <http://www.semikron.com>).
3. Insert driver core into the box connector on adaptor board.



- The connection between driver core and adaptor board should be mechanical reinforced by using support posts. The posts have to be spaced between driver core and adaptor board.
- Product information of suitable support posts and distributor contact information is available at e.g. <http://www.richco-inc.com> (e.g. part number DLMSPM-8-01, LCBST-8-01).



## Schematics

Figure 6: Schematic I Adaptor Board

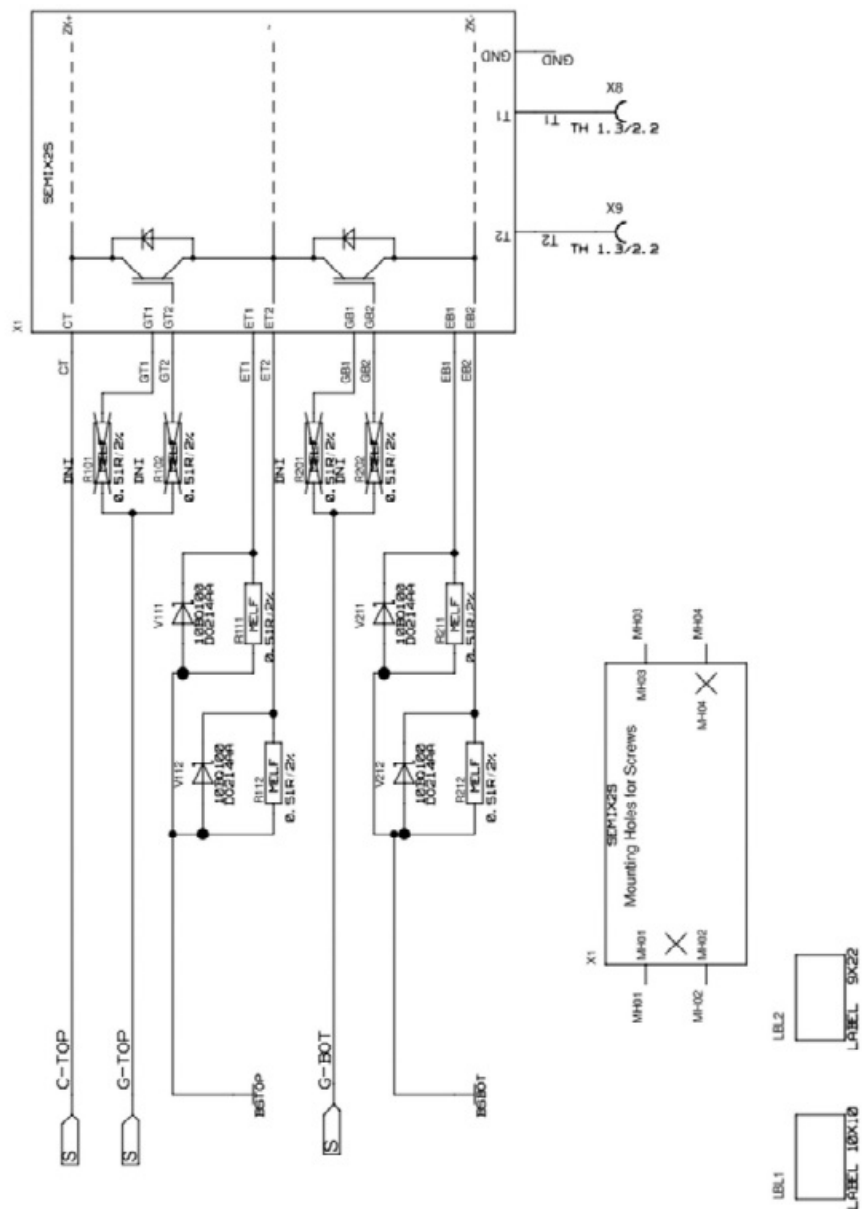
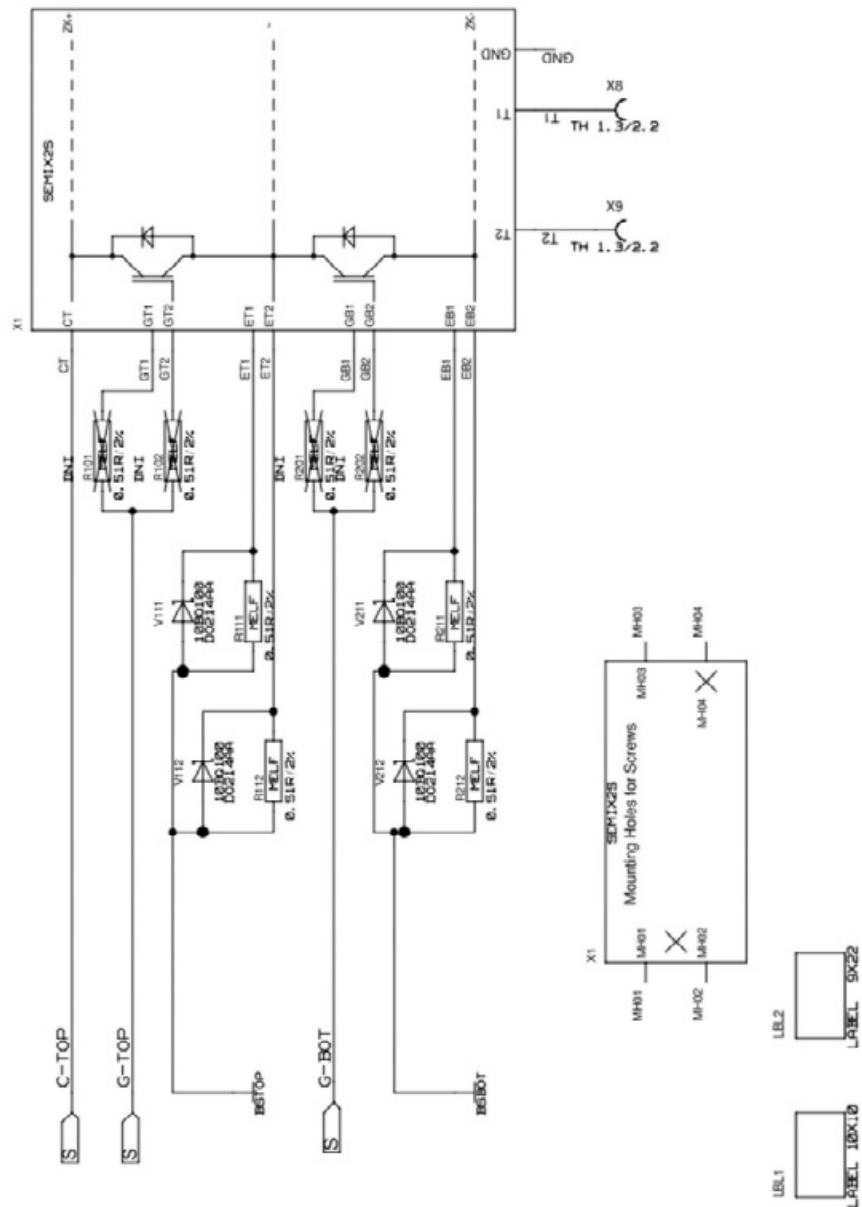


Figure 6: Schematic I Adaptor Board



Parts List

| Count | Ref. Designator        | Value       | Pattern Name   | Description                            |
|-------|------------------------|-------------|----------------|--|
| 2     | C151, C251             | 4.7uF       | 1210 (SMD)     | Capacitor X7R                          |
| 2     | C152, C252             | 2.2uF       | 1210 (SMD)     | Capacitor X7R                          |
| 4     | C20, C21, C22, C23     | 1nF         | 0805 (SMD)     | Capacitor X7R                          |
| 1     | C27                    | 220uF/35V   | SMD            | Longlife-Elko                          |
| 1     | R10                    | 0.000Ohm    | MiniMelf (SMD) | 1%                                     |
| 3     | R11, R161, R261        | 10.0KOhm    | MiniMelf (SMD) | 2%                                     |
| 4     | R111, R112, R201, R212 | 0.51Ohm     | Melf (SMD)     |  |
| 2     | V150, V250             | BY203/20S   | DO215AA (SMD)  | High Voltage Diode                     |
| 1     | V20                    | SMBJ15A     | DO214AA (SMD)  | Suppressor Diode                       |
| 4     | V111, V112, V211, V212 | 10BQ100N    | SMD            | Diode Schottky                         |
| 3     | X10, X100, X200        | RM2.54 10p. | SMD            | Box Connector                          |
| 1     | X20                    | 14p.        |                | Box Connector: SUYIN 254100FA010G200ZU |

- **TP:** Test Review
- **Box Connector:** SUYIN 254100FA010G200ZU

## References

- [www.SEMIKRON.com](http://www.SEMIKRON.com)
- A. Wintrich, U. Nicolai, W. Tursky, T. Reimann, "Application Manual Power Semiconductors", ISLE Verlag 2011, ISBN 978-3-938843-666

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## FAQ

**Q: Are the values provided in the technical explanation specific to my application?**

**A:** No, the values provided are typical values and may vary in different applications. It is recommended to validate all operating parameters with technical experts for each specific application.

## Documents / Resources

|  |   |
|--|---|
|  | <p><b><a href="#">SEMIKRON 32R Technical Explanation Board</a> [pdf] Instruction Manual</b><br/>32R Technical Explanation Board, 32R, Technical Explanation Board, Explanation Board, Board</p> |
|--|---|

## References

-  [We are the Ultimate Partner in Power Electronics | Semikron Danfoss](#)
- [User Manual](#)

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