# Board 2s SKYPER 32PRO R

SKYPER®

## Adaptor board

### Board 2s SKYPER 32PRO R

Preliminary Data

### Features

- Two output channels
- Gold finish

### Typical Applications*

- Adaptor board for SKYPER 32 IGBT drivers in bridge circuits for industrial applications
- DC bus up to 1200V

### Footnotes

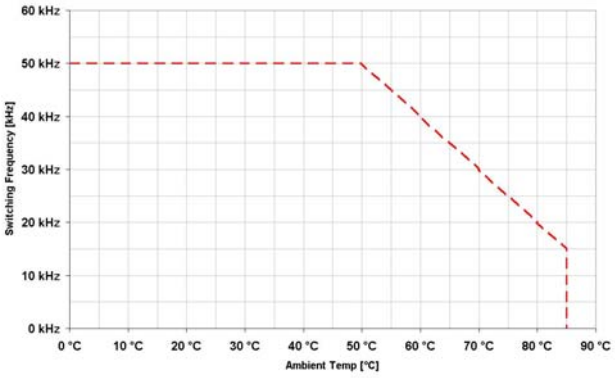
All characteristics listed in the data sheet are guilty for the use with SKYPER 32
Please consider the derating of the ambient temperature
Please refer to the datasheet of SKYPER 32 for further information

**Absolute Maximum Ratings**

| Symbol | Conditions | Values | Unit |
|---|---|---|---|
| Vs | Supply voltage primary | 16 | V |
| $Iout_{PEAK}$ | Output peak current | 15 | A |
| $Iout_{AVmax}$ | Output average current | 50 | mA |
| $f_{max}$ | max. switching frequency | 50 | kHz |
| $V_{CE}$ | Collector emitter voltage sense across the IGBT | 1700 | V |
| $V_{isol\ IO}$ | Isolation test voltage input - output (AC, rms, 2s) | 4000 | V |
| $V_{isolPD}$ | Partial discharge extinction voltage, rms, $Q_{PD} \leq 10pC$ | 1500 | V |
| $V_{isol12}$ | Isolation test voltage output 1 - output 2 (AC, rms, 2s) | 1500 | V |
| $R_{Gon\ min}$ | | 1.5 | Ω |
| $R_{Goff\ min}$ | Minimum rating for external $R_{Goff}$ | 1.5 | Ω |
| $T_{op}$ | Operating temperature | -25 ... 85 | °C |
| $T_{stg}$ | Storage temperature | -25 ... 85 | °C |

**Characteristics**

| Symbol | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|
| Vs | Supply voltage primary side | 14.4 | 15 | 15.6 | V |
| $V_j$ | input signal voltage on / off | | 15 / 0 | | V |
| $V_{IT+}$ | Input treshold voltage HIGH | | | 12.3 | V |
| $V_{IT-}$ | Input threshold voltage (LOW) | 4.6 | | | V |
| $V_{G(on)}$ | Turn on gate voltage output | | 15 | | V |
| $V_{G(off)}$ | Turn off gate voltage output | | -7 | | V |
| $t_{d(on)IO}$ | Input-output turn-on propagation time | | 1.2 | | µs |
| $t_{d(off)IO}$ | Input-output turn-off propagation time | | 1.2 | | µs |




Derating

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.

Adaptor board

# Adaptor Board 2s SKYPER® 32PRO R

Technical Explanations

Revision 02

*This Technical Explanation is valid for the following parts:*

| *part number* | *type* | *date code (YYWW)* |
|---|---|---|
| *L5062501* | *Board 2s SKYPER® 32PRO R* | *≥ 1131* |

*Related documents:*

| *title* |
|---|
| *Technical Explanations SKYPER® 32PRO R* |

*Prepared by: Johannes Krapp*

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**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 user's technical experts for each application.

### Application and Handling Instructions

- Please provide for 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 minimised. 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 to apply low collector voltage and load current in the beginning and to increase these values gradually, observing the turn-off behaviour 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 operation 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. Voltages 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 hybrid driver and the power module should be as short as possible (max. 20cm), the driver leads should be twisted.

### Further application support

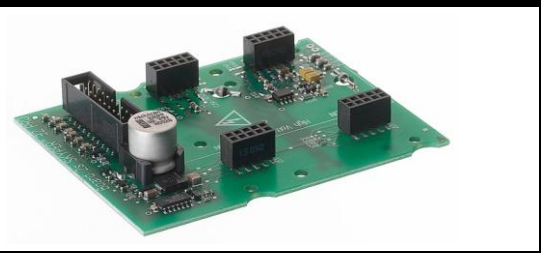
Latest information is available at http://www.semikron.com. For design support please read the SEMIKRON Application Manual Power Modules available at http://www.semikron.com.

### General Description

The Board 2s SKYPER® 32PRO R is an adaptor board for the IGBT module SEMiX® 2s (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, e.g. 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).

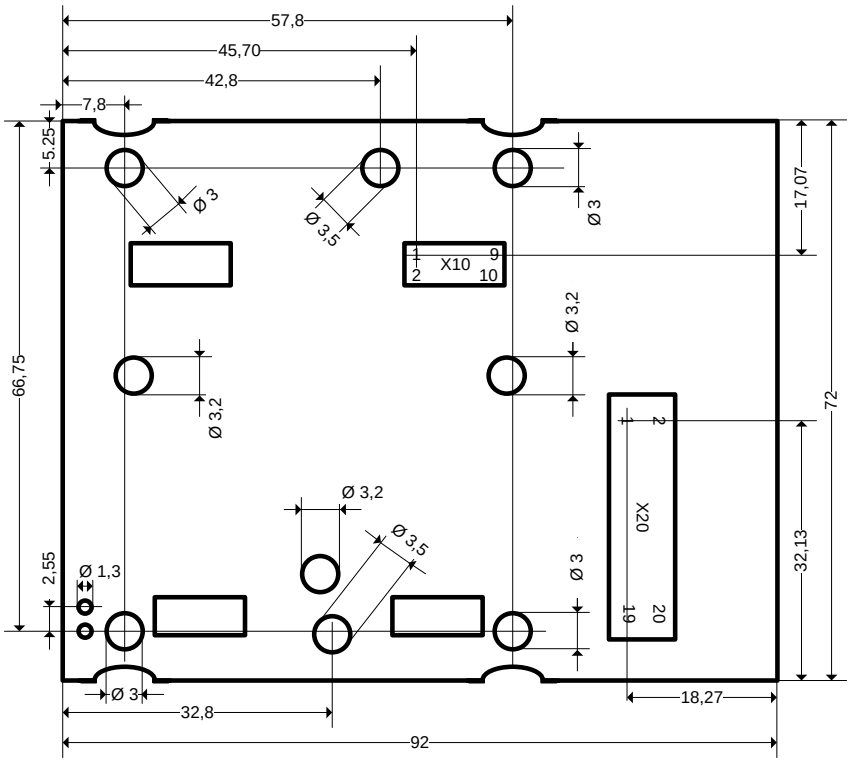
**Please note:**
This technical explanation is based on the Technical Explanations for SKYPER® 32PRO R. Please read the Technical Explanations SKYPER® 32 PRO R before using the Adaptor Board.

**Board 2s SKYPER® 32PRO R**



## Dimensions

**Dimensions in mm**



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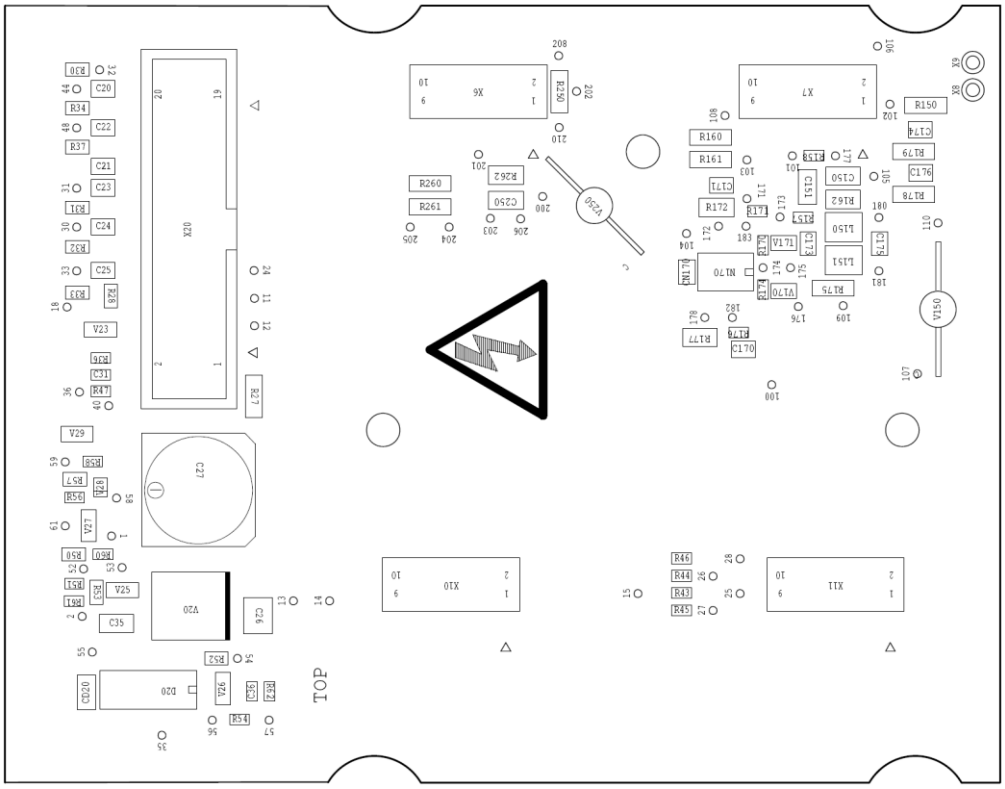
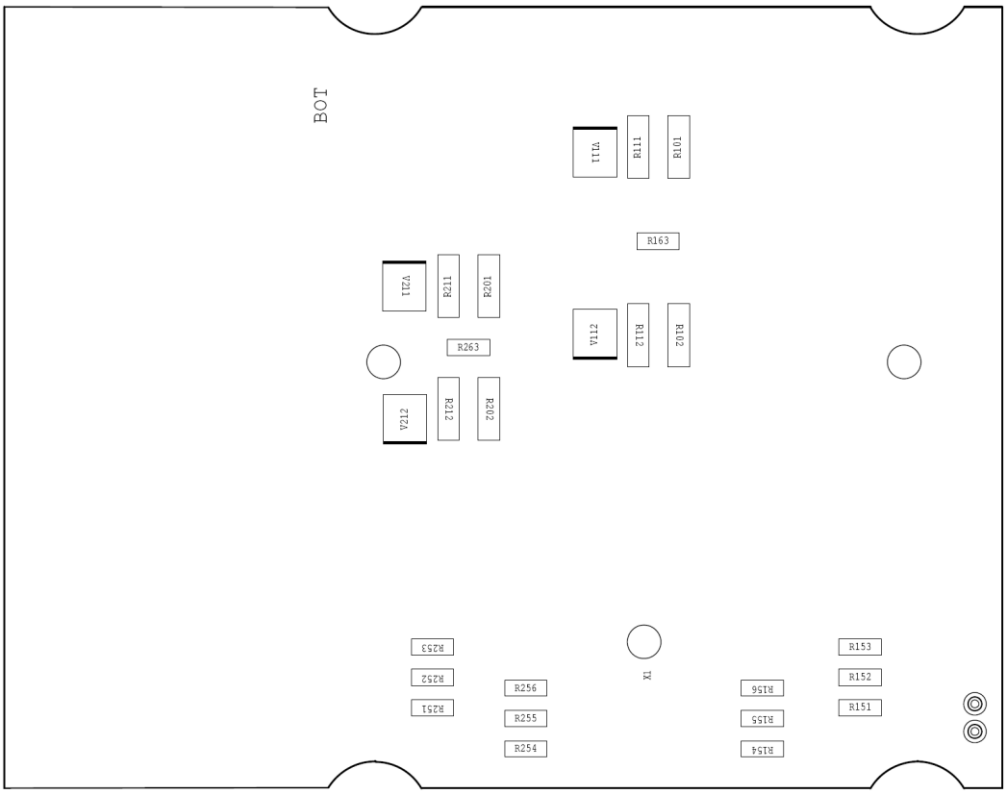
**Component Placement Layout**

**Adaptor Board**

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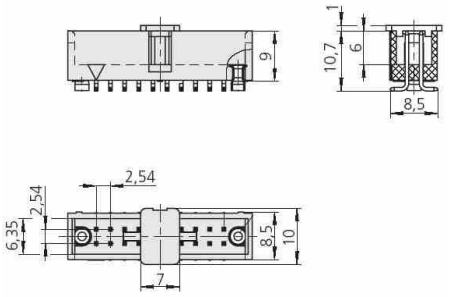
**PIN Array**

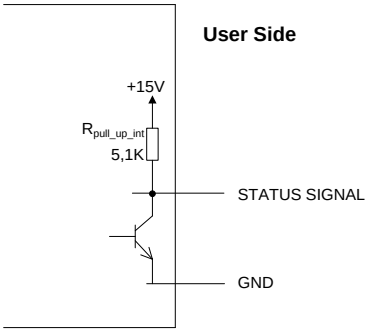
| Connector X20 (ODU FLAKAFIX 511.068.803.020) | |
|---|---|
|  | Product information of suitable female connectors and distributor contact information is available at e.g. http://www.harting.com (part number 09 18 520 6 813). |

| PIN | Signal | Function | Specification |
|---|---|---|---|
| X20:01 | IF_PWR_15P | Drive power supply | Stabilised +15V ±4% |
| X20:02 | IF_PWR_GND | GND for power supply | |
| X20:03 | IF_PWR_15P | Drive power supply | Stabilised +15V ±4% |
| X20:04 | IF_PWR_GND | GND for power supply | |
| X20:05 | IF_PWR_15P | Drive power supply | Stabilised +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 behaviour) | Digital 15V logic;<br>LOW (dominant) = driver disabled;<br>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;<br>LOW = TOP switch off;<br>HIGH = TOP switch on |
| X20:16 | IF_HB_BOT | Switching signal input (BOTTOM switch) | Digital 15 V logic; 10 kOhm impedance;<br>LOW = BOT switch off;<br>HIGH = BOT switch on |
| X20:17 | reserved | | |
| X20:18 | IF_HB_GND | GND for signals IF_HB_TOP & F_HB_BOT | |
| X20:19 | reserved | | |
| X20:20 | reserved | | |

### Signal IF_CMN_nHALT

The Halt Logic Signals PRIM_HALT_IN and PRIM_HALT_OUT of the driver core are coupled to one bidirectional signal (IF_CMN_nHALT) with dominant recessive behaviour. IF_CMN_nHALT shows the driver core status. When IF_CMN_nHALT is HIGH (recessive), the driver core is ready to operate. When IF_CMN_nHALT is LOW (dominant), the driver core is disabled / not ready to operate because of e. g. detected failure or driver core system start.
A controller can hold with the IF_CMN_nHALT signal the driver core in a safe state (e.g. during a start up of a system or gathered failure signal of other hardware) or generate a coeval release of paralleled driver. Furthermore, paralleled drivers can send and receive IF_CMN_nHALT signals among each other by using a single-wire bus.

**Connection IF_CMN_nHALT**




### Setting Dead Time

**DT adjustment**

| Designation | Pattern Name | Setting |
|---|---|---|
| R43 (connected to GND) | 0603 | PRIM_CFG_TDT2_IN Factory setting: 0Ω |
| R44 (connected to GND) | 0603 | PRIM_CFG_SELECT_IN Factory setting: not equipped |
| R45 (connected to GND) | 0603 | PRIM_CFG_TDT3_IN Factory setting: 0Ω |
| R46 (connected to GND) | 0603 | PRIM_CFG_TDT1_IN Factory setting: not equipped |

Factory setting: 3,3µs

### Setting Dynamic Short Circuit Protection

**$R_{CE}$ & $C_{CE}$**

| Designation | Pattern Name | Setting | |
|---|---|---|---|
| R162 | 1206 | $R_{CE}$ Factory setting: not equipped | TOP |
| C150 | 1206 | $C_{CE}$ Factory setting: not equipped | TOP |
| R262 | 1206 | $R_{CE}$ Factory setting: not equipped | BOT |
| C250 | 1206 | $C_{CE}$ Factory setting: not equipped | BOT |

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### Collector Series Resistance

**$R_{VCE}$**

| Designation | Pattern Name | Setting | |
|---|---|---|---|
| R150 | MiniMELF | $R_{VCE}$ * Factory setting: not equipped | TOP |
| R250 | MiniMELF | $R_{VCE}$ * Factory setting: not equipped | BOT |

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

### Adaptation Gate Resistors

**$R_{Gon}$ & $R_{Goff}$**

| Designation | Pattern Name | Setting | |
|---|---|---|---|
| R151, R152, R153 (parallel connected) | MiniMELF | $R_{Gon}$ Factory setting: not equipped | TOP |
| R154, R155, R156 (parallel connected) | MiniMELF | $R_{Goff}$ Factory setting: not equipped | TOP |
| R251, R252, R253 (parallel connected) | MiniMELF | $R_{Gon}$ Factory setting: not equipped | BOT |
| R254, R255, R256 (parallel connected) | MiniMELF | $R_{Goff}$ 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®.

**$R_{G1}$, $R_{G2}$**

| Designation | Pattern Name | Setting | |
|---|---|---|---|
| R101 | MELF | $R_{G1}$ Factory setting: not equipped | TOP |
| R102 | MELF | $R_{G2}$ Factory setting: not equipped | TOP |
| R201 | MELF | $R_{G1}$ Factory setting: not equipped | BOT |
| R202 | MELF | $R_{G2}$ Factory setting: not equipped | BOT |

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### Setting Soft Turn-Off

**$R_{Goff_SC}$**

| Designation | Pattern Name | Setting | |
|---|---|---|---|
| R160, R161 (parallel connected) | MiniMELF | $R_{Goff_SC}$ Factory setting: not equipped | TOP |
| R260, R261 (parallel connected) | MiniMELF | $R_{Goff_SC}$ Factory setting: not equipped | BOT |

### 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.

**Please note:**

If the contacting points T1 and T2 are used for adaptor of the temperature sensor, the Over Temperature Protection Ciruit must be disabled by taking out the resistors R175, R178 and R179.

### Over Temperature Protection Circuit (OTP)

The external error input SEC_TOP_ERR_IN on the secondary side (high potential) of the driver core is used for an over temperature protection circuit to place the gate driver into halt mode.

**Dimensioning OTP**

1. Define an over temperature trip level according to the application.
2. Calculate the nominal ohmic resistance value of the temperature sensor at the defined trip level (see "Modules – Explanations - SEMiX®" on SEMiX® product overview page at http://www.semikron.com).
3. The trip level on the adapter board is set with R172 by using the calculated resistance value.

- **Factory setting R172: not equipped**
- **If no resistor is used, a failure signal is generated.**

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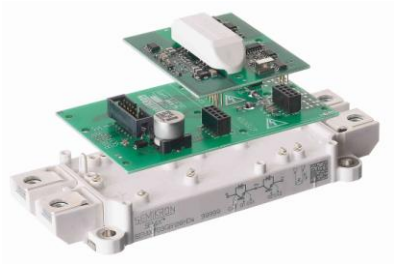
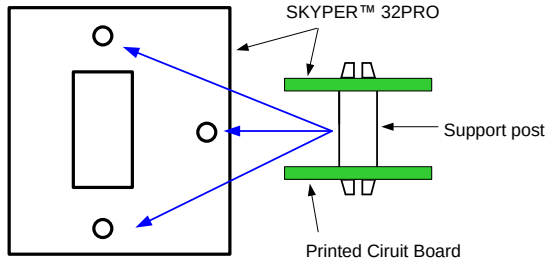
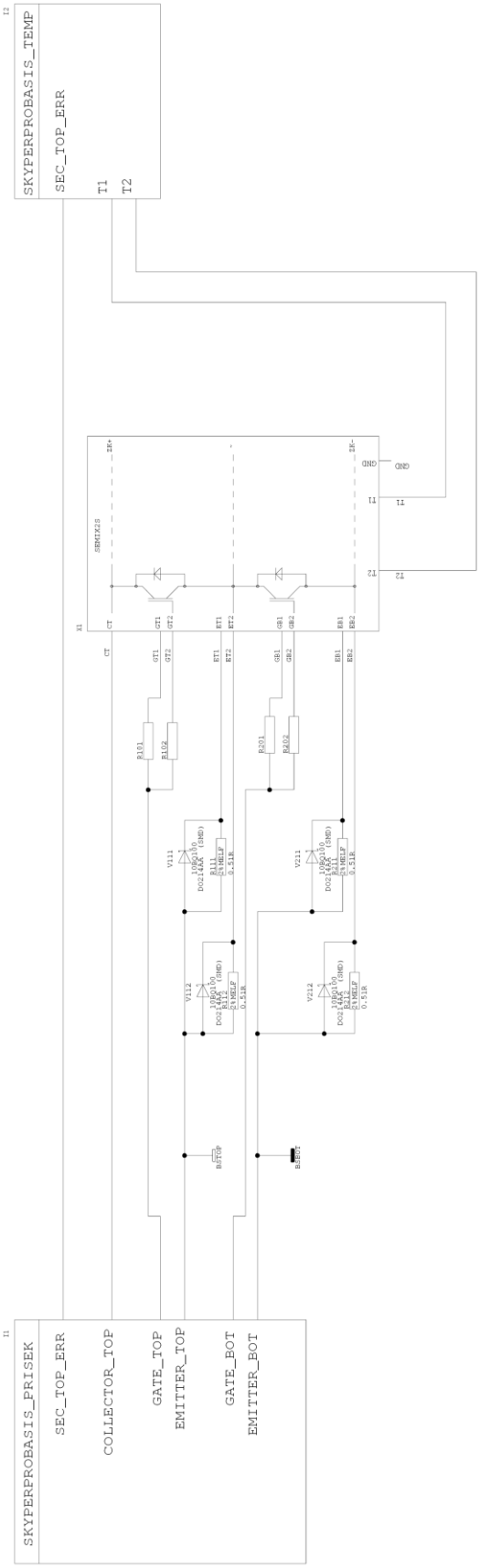
**Mounting Notes**

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.

| Adaptor Board & Driver Core Mounting | |
|---|---|
|  | 4. Soldering of components (e.g. $R_{Gon}$, $R_{Goff}$, etc.) on adapter board.<br>5. 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).<br>6. 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.<br>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**

**Schematic I Adaptor Board**

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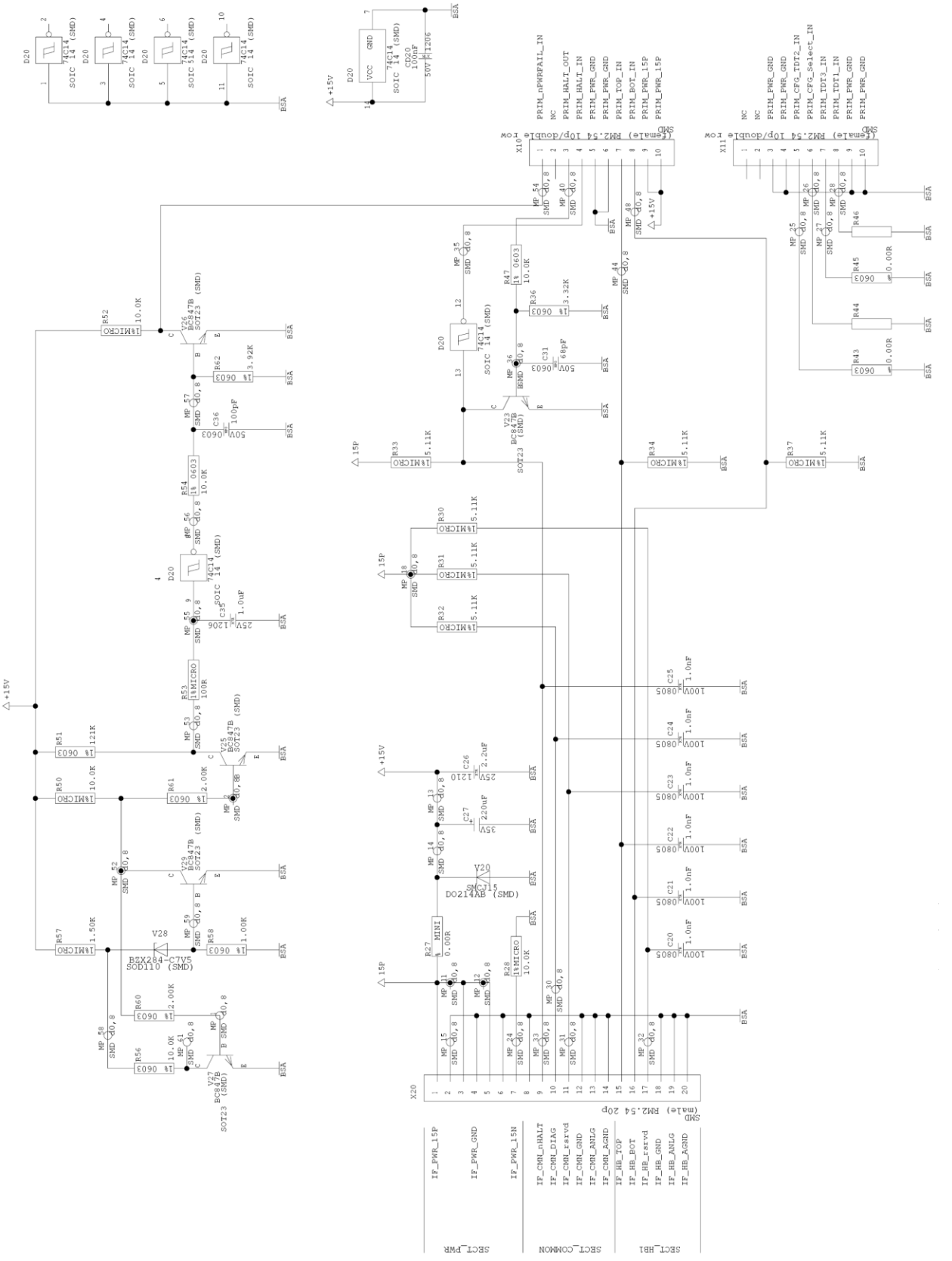
## Schematic II Adaptor Board

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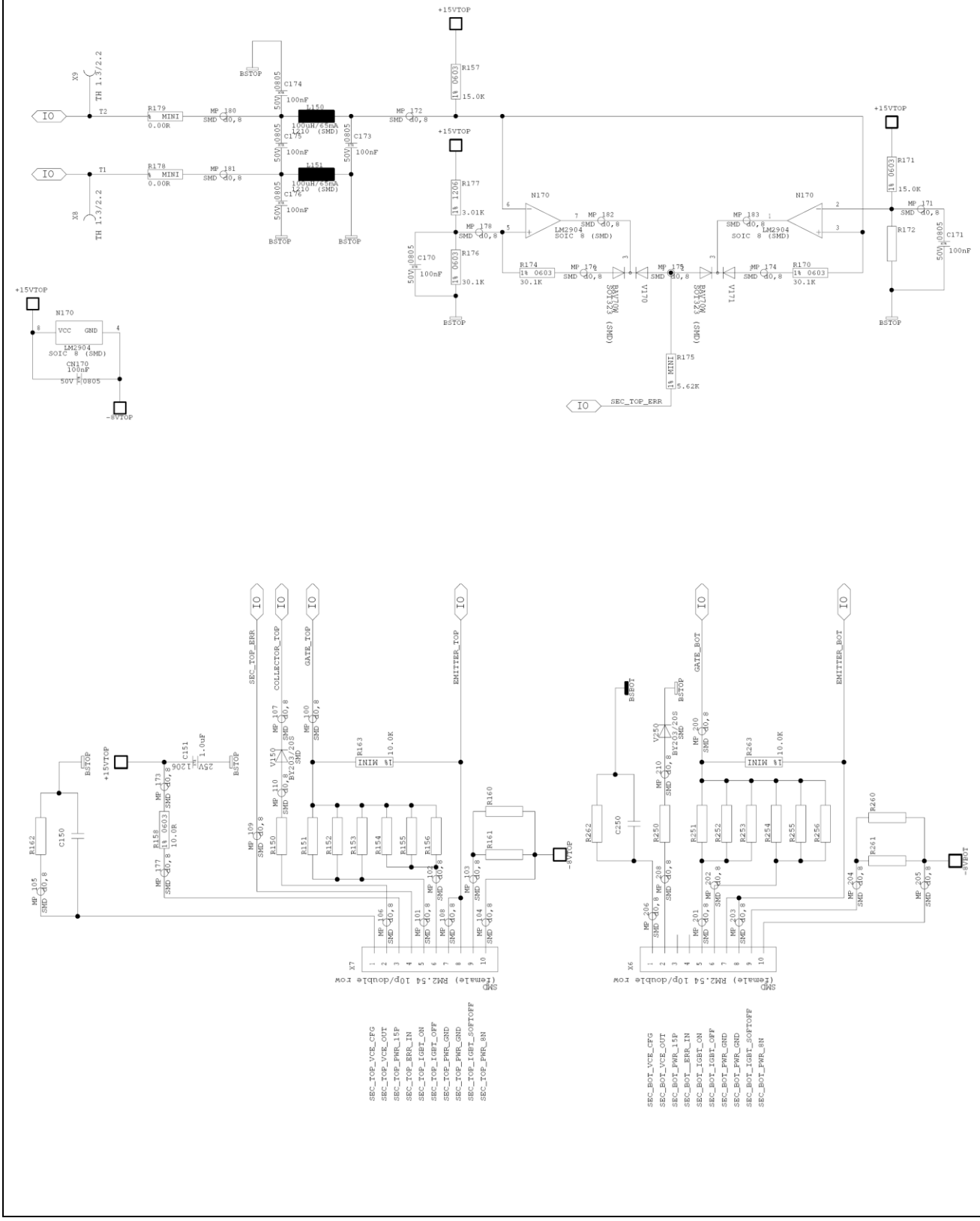
## Schematic III Adaptor Board

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## Parts List

**Parts List Adaptor Board**

| Count | Ref. Designator | Value | Pattern Name | Description |
|---|---|---|---|---|
| 7 | C170, C171, C173, C174, C175, C176, CN170 | 100nF | 0805 (SMD) | Capacitor X7R |
| 6 | C20, C21, C22, C23, C24, C25 | 1nF | 0805 (SMD) | Capacitor X7R |
| 1 | C26 | 2,2µF | 1210 (SMD) | Capacitor X7R |
| 1 | C27 | 220uF/35V | SMD | Longlife-Elko |
| 1 | C31 | 68pF | 0603 (SMD) | Capacitor NP0 |
| 2 | C35, C151 | 1uF | 1206 (SMD) | Capacitor X7R |
| 1 | C36 | 100pF | 0603 (SMD) | Capacitor NP0 |
| 1 | CD20 | 100nF | 1206 (SMD) | Capacitor X7R |
| 1 | D20 | 74C14 | SOIC 14 (SMD) | Logic-IC 74C... |
| 2 | L150, L151 | 100uH | 1210 (SMD) | Inductor |
| 1 | N170 | LM2904 | SOIC 8 (SMD) | Operational Amplifier |
| 4 | R111, R112, R201, R211, R212 | 0,51Ohm | Melf (SMD) | 2% |
| 2 | R157, R171 | 15,0KOhm | 0603 (SMD) | 1% |
| 1 | R158 | 10,0Ohm | 0603 (SMD) | 1% |
| 2 | R163, R263 | 10,0KOhm | MiniMelf (SMD) | 1% |
| 3 | R170, R174, R176 | 30,1KOhm | 0603 (SMD) | 1% |
| 1 | R175 | 5,62KOhm | MiniMelf (SMD) | 1% |
| 1 | R177 | 3,01KOhm | 1206 (SMD) | 1% |
| 3 | R27, R178, R179 | 0,00Ohm | MiniMelf (SMD) | |
| 3 | R28, R50, R52 | 10,0KOhm | MicroMelf (SMD) | 1% |
| 6 | R30, R31, R32, R33, R34, R37 | 5,11KOhm | MicroMelf (SMD) | 1% |
| 1 | R36 | 3,32KOhm | 0603 (SMD) | 1% |
| 2 | R43, R45 | 0,00Ohm | 0603 (SMD) | |
| 3 | R47, R54, R56 | 10,0KOhm | 0603 (SMD) | 1% |
| 1 | R51 | 121KOhm | 0603 (SMD) | 1% |
| 1 | R53 | 100Ohm | MicroMelf (SMD) | 1% |
| 1 | R57 | 1,50KOhm | MicroMelf (SMD) | 1% |
| 1 | R58 | 1,00KOhm | 0603 (SMD) | 1% |
| 2 | R60, R61 | 2,00KOhm | 0603 (SMD) | 1% |
| 1 | R62 | 3,92KOhm | 0603 (SMD) | 1% |
| 4 | V111, V112, V211, V212 | 10BQ100 | SMB (SMD) | Diode Schottky |
| 2 | V150, V250 | BY203/20S | SMD | High Voltage Diode |
| 2 | V170, V171 | BAV70W | SOT323 (SMD) | Double Diode |
| 1 | V20 | SMCJ15 | DO214AB (SMD) | Suppressor Diode |
| 5 | V23, V25, V26, V27, V29 | BC847B | SOT23 (SMD) | NPN-Transistor |
| 1 | V28 | BZX284-C7V5 | SOD110 (SMD) | Zener-Diode |
| 1 | X20 | 20p. | SMD | Connector |
| 4 | X6, X7, X10, X11 | RM2,54 10p. | SMD | Box Connector |

TP: Test Point
Box Connector: SUYIN 254100FA010G200ZU

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