Technical Explanation Board 4s SKYPER® 32 R

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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.

1. 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 VS +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.

2. 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.

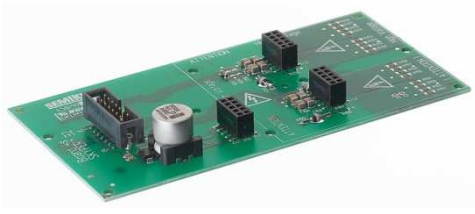
3. General Description

The Board 4s SKYPER® 32 R is an adaptor board for the IGBT module SEMiX® 4s (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® 32 R).

Please note:

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

Figure 1: Board 4s SKYPER® 32 R

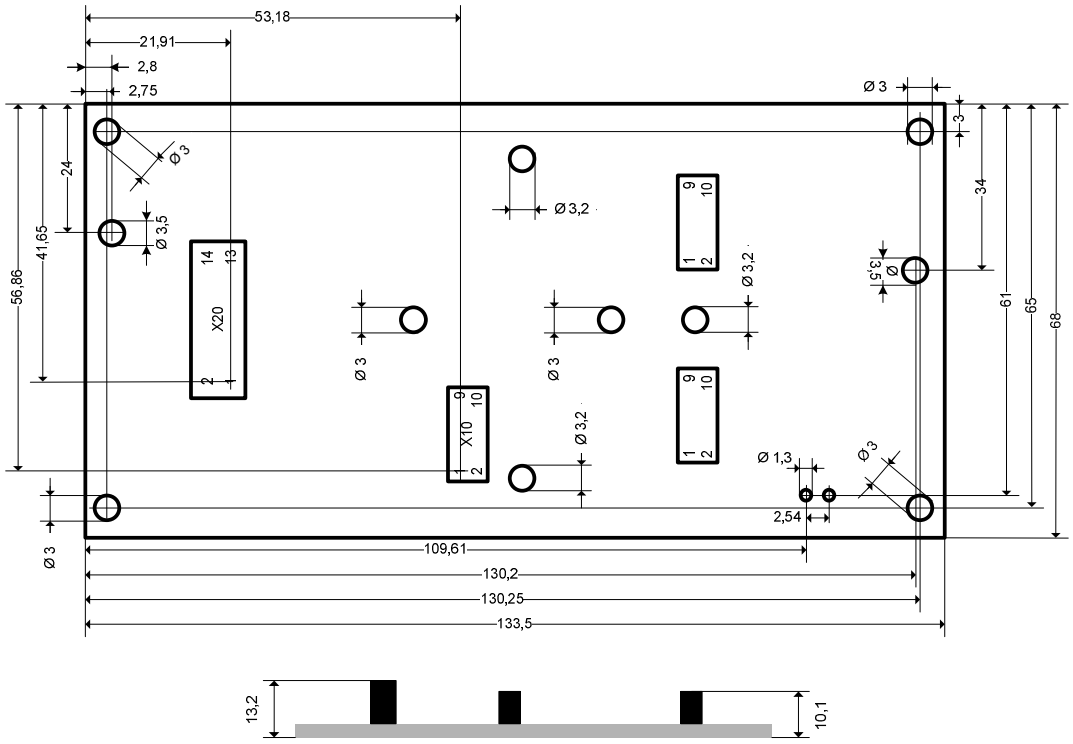


4. Quality

Table 1: Quality			
End test	**test category**	**test describtion**	**standard**
AOI	Automated Optical Inspection	Control of accurate placement of components/ of solder joints	SEMIKRON
ICT	In-Circuit Test	Test of the populated PCB, checking the correctly fabrication	SEMIKRON
Type test	**test category**	**test conditions**	**standard**
EP	Electrical Parameters	Jamb = -40°C / +85°C	SEMIKRON
SP	STEP Test, Interrupted PS	20x 10µs to 2s	EN61000-4-29
Iso	Isolation Test	High voltage test 4kV, 60s	EN 61800-5-1
TC	Thermal Cycling	200 cycles, Tstgmax – Tstgmin	IEC60068-2-14
PD	Partial discharge test	>1,2 kV; suitable for 1000V DC Link	VDE 0110-20
TH	Temperature Humidity	85°C, 85% RH, 96h	IEC 60068-2-67
VB	Vibration	Sinus 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

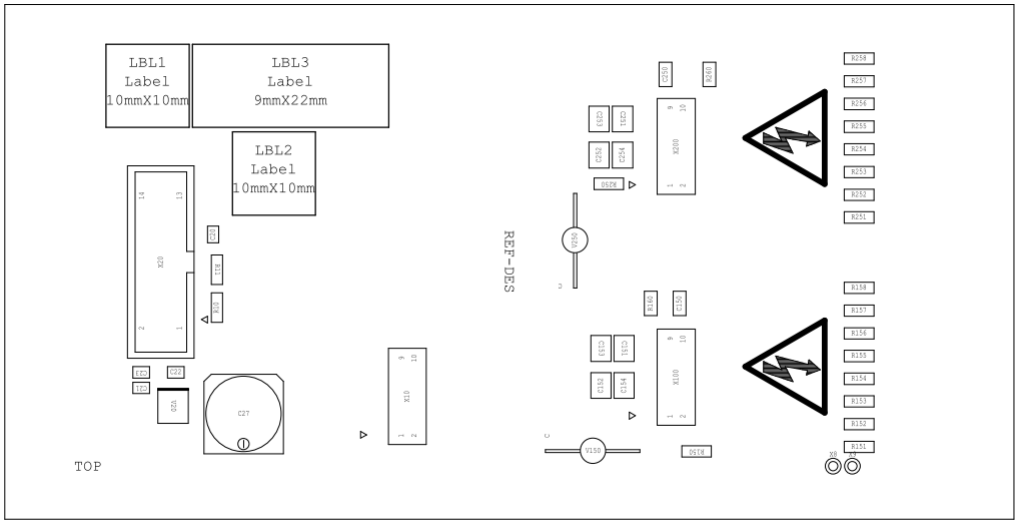
5. Dimensions

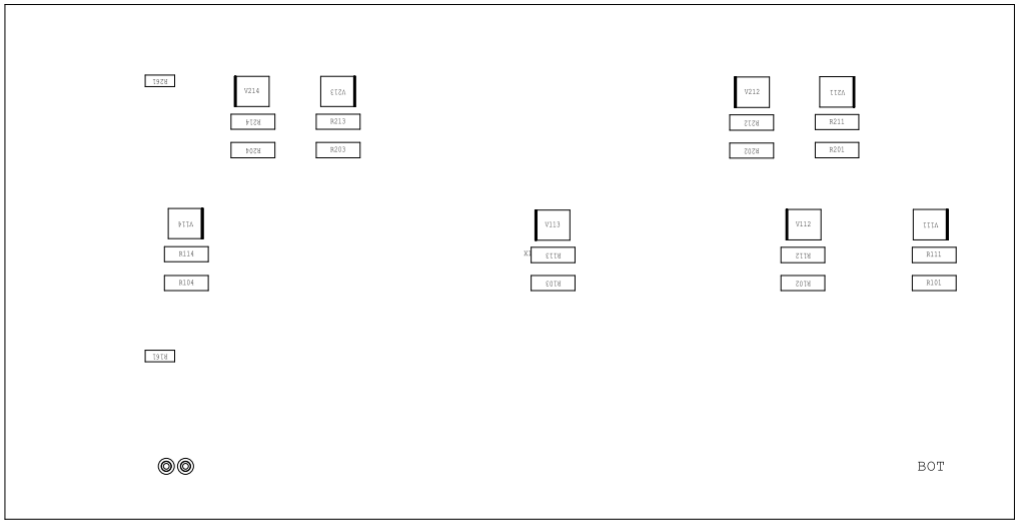
Figure 2: Dimensions in mm



6. Component Placement Layout

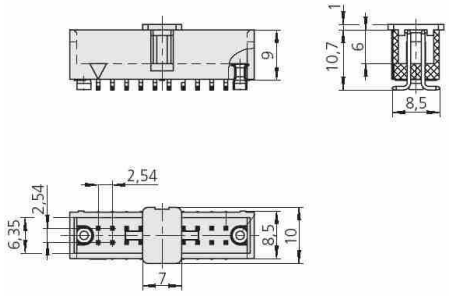
Figure 3: Adaptor Board





7. PIN Array

Figure 4: Connector X20 (Assmann AWHW 14G SMD)



Product information of suitable female connectors and distributor contact information is available at e.g. http://www.harting.com (part number 09 18 514 6 813).

Table 2: PIN Array

PIN	Signal	Function	Specification
X20:01	reserved		
X20:02	IF_HB_BOT	Switching signal input (BOTTOM switch)	Digital 15 V; 10 kOhm impedance; LOW = BOT switch off; HIGH = BOT switch on
X20:03	IF_nERROR_OUT	ERROR output	LOW = NO ERROR; open collector output; max. 30V / 15mA (external pull up resistor necessary)
X20:04	IF_HB_TOP	Switching signal input (TOP switch)	Digital 15 V; 10 kOhm impedance; LOW = TOP switch off; HIGH = TOP switch on
X20:05	reserved		
X20:06	reserved		
X20:07	reserved		
X20:08	IF_PWR_15P	Drive power supply	Stabilised +15V ±4%
X20:09	IF_PWR_15P	Drive power supply	Stabilised +15V ±4%
X20:10	IF_PWR_GND	GND for power supply and GND for digital signals	
X20:11	IF_PWR_GND	GND for power supply and GND for digital signals	
X20:12	reserved		
X20:13	reserved		
X20:14	reserved		

Please note:

The feature PRIM_ERROR_IN of the driver core is not availble at the interface X20.

8. Setting Dynamic Short Circuit Protection

Table 3: R_{CE} & C_{CE}			
Designation	**Pattern Name**	**Setting**	
R160	1206	R_{CE} Factory setting: not equipped	TOP
C150	1206	C_{CE} Factory setting: not equipped	TOP
R260	1206	R_{CE} Factory setting: not equipped	BOT
C250	1206	C_{CE} Factory setting: not equipped	BOT

9. Collector Series Resistance

Table 4: 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

10. Adaptation Gate Resistors

Table 5: R_{Gon} & R_{Goff}			
Designation	**Pattern Name**	**Setting**	
R151, R152, R153, R154 (parallel connected)	MiniMELF	R_{Gon} Factory setting: not equipped	TOP
R155, R156, R157, R158 (parallel connected)	MiniMELF	R_{Goff} Factory setting: not equipped	TOP
R251, R252, R253, R254 (parallel connected)	MiniMELF	R_{Gon} Factory setting: not equipped	BOT
R255, R256, R257, R258 (parallel connected)	MiniMELF	R_{Goff} Factory setting: not equipped	BOT

11. Adaptation Decoupling Gate Resistors

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

Table 6: R_{G1}, R_{G2}, R_{G3} R_{G4}			
Designation	**Pattern Name**	**Setting**	
R101	MELF	R_{G1} Factory setting: not equipped	TOP
R102	MELF	R_{G2} Factory setting: not equipped	TOP
R103	MELF	R_{G3} Factory setting: not equipped	TOP
R104	MELF	R_{G4} Factory setting: not equipped	TOP
R201	MELF	R_{G1} Factory setting: not equipped	BOT
R202	MELF	R_{G2} Factory setting: not equipped	BOT
R203	MELF	R_{G3} Factory setting: not equipped	BOT
R204	MELF	R_{G4} Factory setting: not equipped	BOT

12. Boost Capacitors

Table 7: $C_{boost15P}$ & $C_{boost8N}$			
Designation	**Pattern Name**	**Setting**	
C151	1210	$C_{boost8N}$ Factory setting: 4,7µF/16V *	TOP
C152	1210	$C_{boost15P}$ Factory setting: 2,2µF/25V *	TOP
C251	1210	$C_{boost8N}$ Factory setting: 4,7µF/16V *	BOT
C252	1210	$C_{boost15P}$ Factory setting: 2,2µF/25V *	BOT

* output charge pulse: 5µC

13. Temperature Signal

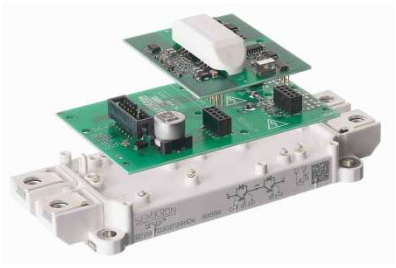
The temperature sensor inside the SEMiX® module is directly connected to contacting points T1 and T2. For details to the temperature sensor, see Modules Explanations SEMiX®.

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.

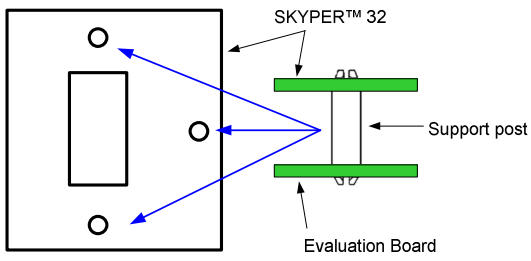
14. Mounting Notes

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. R_{Gon}, R_{Goff}, 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).

15. Schematics

Figure 6: Schematic I Adaptor Board

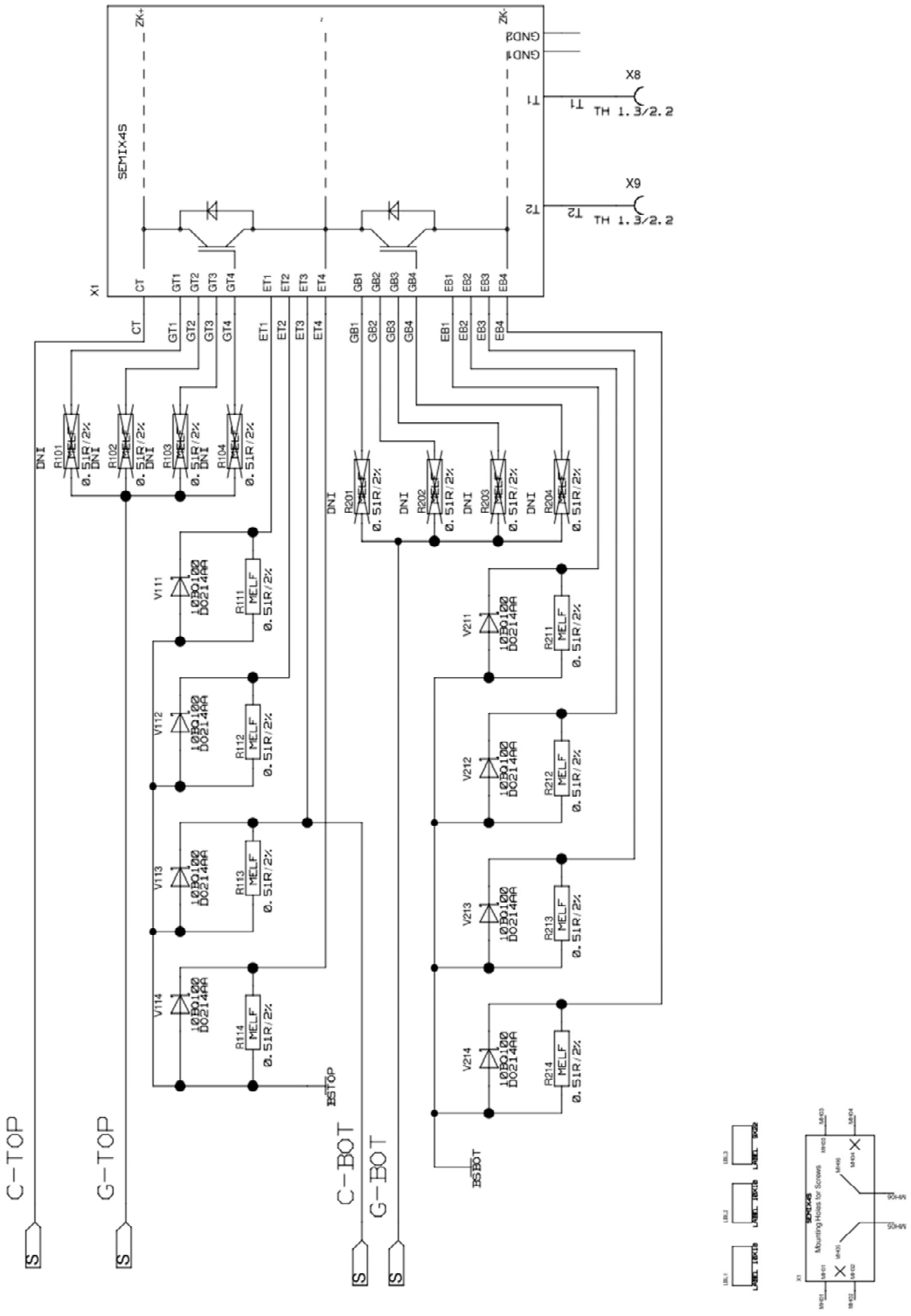
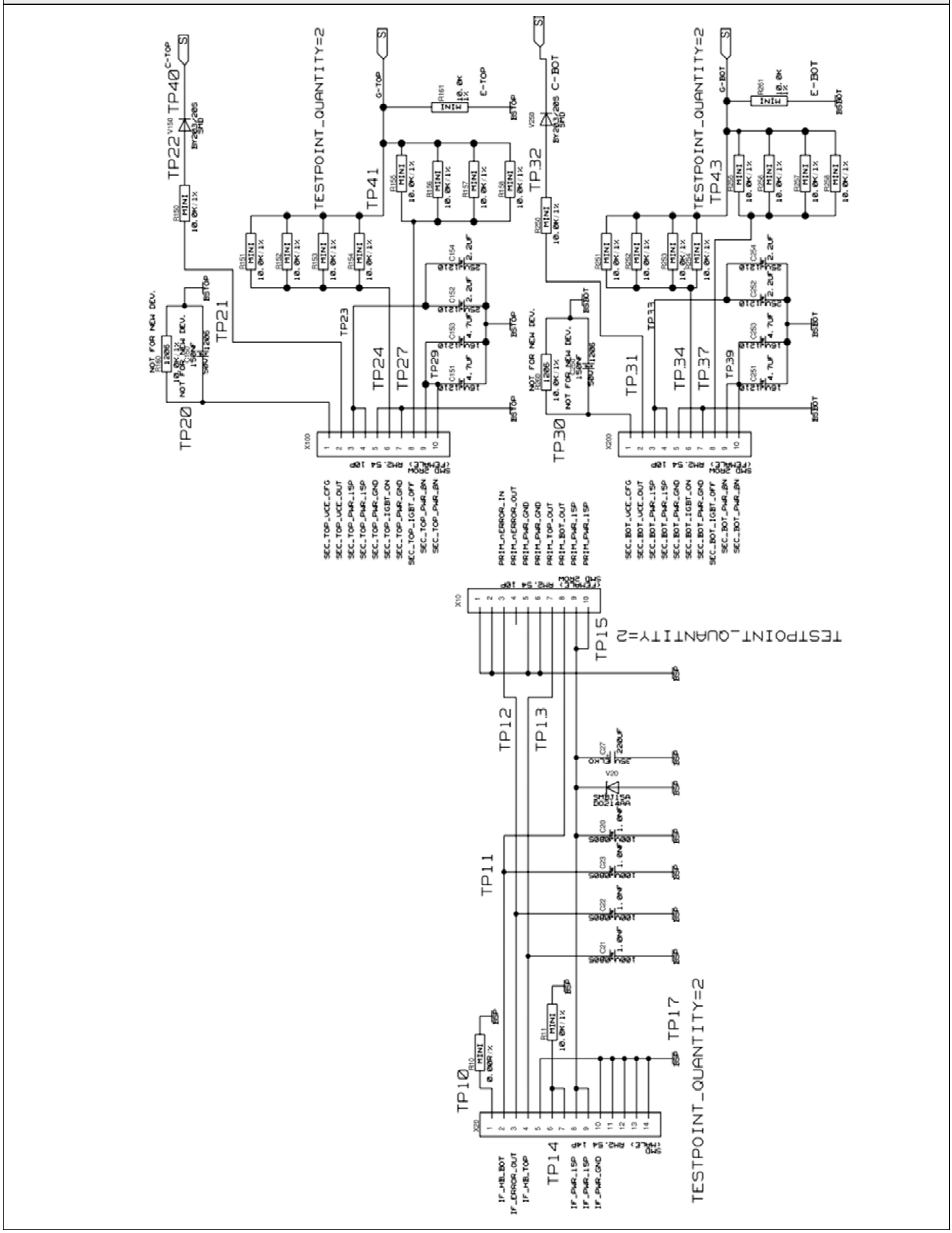


Figure 7: Schematic II Adaptor Board



16. Parts List

Figure 8: Parts List Adaptor Board

Count	Ref. Designator	Value	Pattern Name	Description
4	C151, C153, C251, C253	4,7µF	1210 (SMD)	Capacitor X7R
4	C152, C154, C252, C254	2,2µF	1210 (SMD)	Capacitor X7R
4	C20, C21, C22, C23	1nF	0805 (SMD)	Capacitor X7R
1	C27	220uF/35V	SMD	Longlife-Elko
1	R10	0,00Ohm	MiniMelf (SMD)	
3	R11, R161, R261	10,0KOhm	MiniMelf (SMD)	1%
8	R111, R112, R113, R114, R211, R212, R213, R214	0,51Ohm	Melf (SMD)	2%
8	V111, V112, V113, V114, V211, V212, V213, V214	10BQ100N	DO214AA (SMD)	Diode Schottky
2	V150, V250	BY203/20S		High Voltage Diode
1	V20	SMBJ15A	DO215AA (SMD)	Suppressor Diode
3	X10, X100, X200	RM2,54 10p.	SMD	Box Connector
1	X20	14p.	SMD	Connector

TP: Test Point

Box Connector: SUYIN 254100FA010G200ZU

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References

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

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