Board 2//3S SKYPER 42 R

SKYPER®

IGBT Driver Core

Board 2//3S SKYPER 42 R

Features

- Two output channels
- Failure management

Typical Applications*

- Adaptor board for SKYPER IGBT drivers in bridge circuits for industrial applications
- DC bus up to 1000V

Footnote

Isolation test voltage with external high voltage diode
The isolation test is not performed as a series test at SEMIKRON
The driver power can be expanded to 50µC with external boost capacitors

Isolation coordination in compliance with EN50178 PD2
Operating temperature is real ambient temperature around the driver core
Degree of protection: IP00

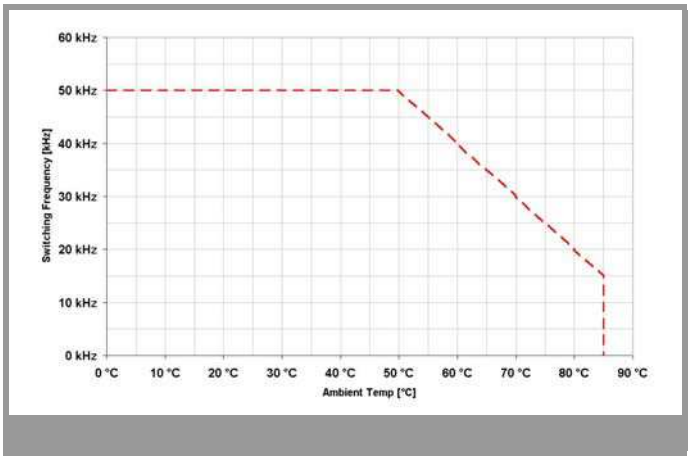
Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
V_s	Supply voltage primary	16	V
$Iout_{PEAK}$	Output peak current	30	A
$Iout_{AVmax}$	Output average current	150	mA
f_{max}	Max. switching frequency	100	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, $Q_{PD} \leq 10pC$	1200	V
V_{isol12}	Isolation test voltage output 1 - output 2 (AC, rms, 2s)	1500	V
$R_{Gon\ min}$	Minimum rating for external R_{Gon}	0.8	Ω
$R_{Goff\ min}$	Minimum rating for external R_{Goff}	0.8	Ω
T_{op}	Operating temperature	-40 ... 85	°C
T_{stg}	Storage temperature	-40 ... 85	°C

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
V_s	Supply voltage primary side	14.4	15	15.6	V
V_i	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 output voltage		15		V
$V_{G(off)}$	Turn off output voltage		-8		V
$t_{d(on)IO}$	Input-output turn-on propagation time		1.1		µs
$t_{d(off)IO}$	Input-output turn-off propagation time		1.1		µs

Adaptor board



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 staff.

Adaptor Board 2 parallel 3S SKYPER® 42 R

Technical Explanations

Revision 04

This Technical Explanation is valid for the following parts:

part number	*type*	*date code (YYWW)*
L5059201	***Board 2 // 3S SKYPER® 42 R***	*≥ 1515*

Related documents:

title
Technical Explanations SKYPER® 42 R

Prepared by: Johannes Krapp

Content

Board 2// 3S SKYPER® 42 R - Technical Explanations

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.

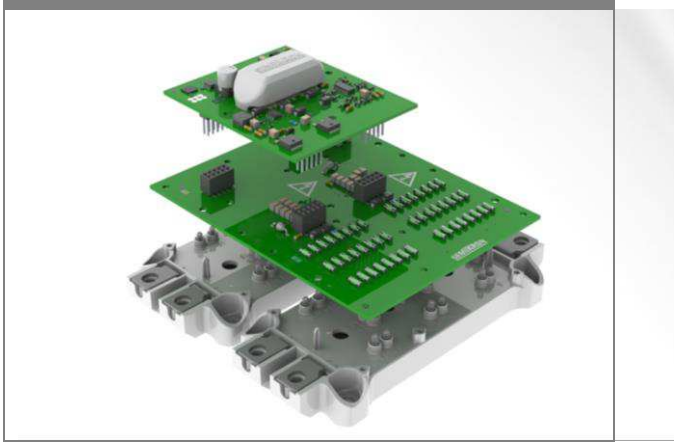
General Description

The Board 2 parallel 3S SKYPER® 42 R is an adaptor board for the IGBT module SEMiX® (spring pin version) with size 3. The board is paralleling two SEMiX modules and realising a symmetrical gate control. The board can be customized allowing adaptation and optimization to the used IGBT 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® 42).

Please note:
This technical explanation is based on the Technical Explanations for SKYPER® 42PRO. Please read the Technical Explanations SKYPER® 42PRO before using the Adaptor Board.

- Symmetric and decoupled gate control
- Easy plug and play solution with SKYPER 42 R
- Expandable up to 50 µC gate charge
- Dynamic Short Circuit Protection (DSCP) including high voltage diode
- Optimized paralleling of SEMiX 3S modules

Board 2 // 3S SKYPER® 42 R – not yet generated



Board 2// 3S SKYPER® 42 R - Technical Explanations

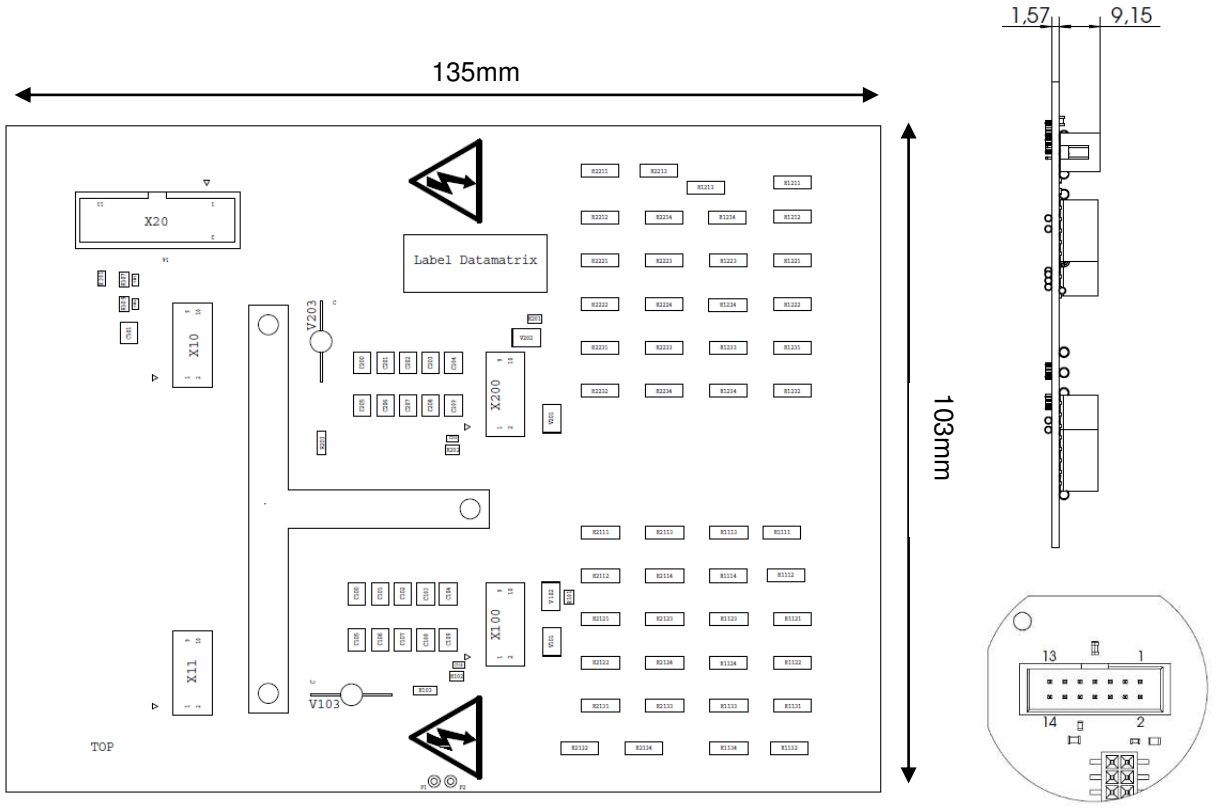
Quality

The following table show the type and end tests of the adapter board.

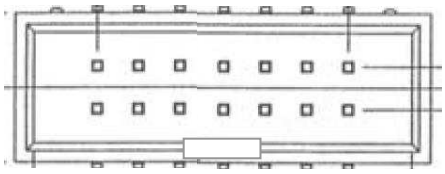
End test	test category	test describtion	standard
AOI	Automated Optical Inspection	Control of accurate placement of components/ of solder joints	SEMIKRON
ICT	In-Circuit Test	Test of the populated PCB, checking the correctly fabrication	SEMIKRON
Type test	**test category**	**test conditions**	**standard**
EP	Electrical Parameters	ϑamb = -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

Dimensions

Adaptor Board



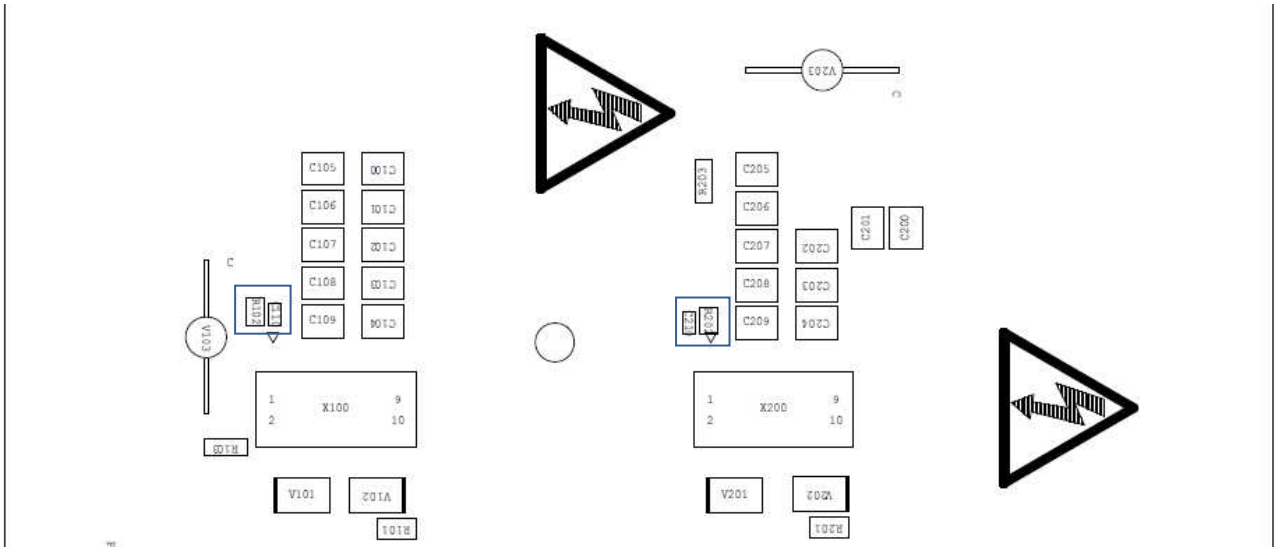
PIN Array

Connector X3 (male), RM2,54, 14p	
	Product information of suitable female connectors and distributor contact information is available at e.g. http://www.harting.com.

PIN	Signal	Function	Specification
X3:01	IF_PWR_GND	GND for power supply and GND for digital signals	
X3:02	IF_HB_BOT	Switching signal input (BOTTOM switch)	Digital 15 V; 10 kOhm impedance; LOW = BOT switch off; HIGH = BOT switch on
X3:03	IF_nERROR_OUT	ERROR output	LOW = NO ERROR; open collector output; max. 30V / 15mA (external pull up resistor necessary)
X3:04	IF_HB_TOP	Switching signal input (TOP switch)	Digital 15 V; 10 kOhm impedance; LOW = TOP switch off; HIGH = TOP switch on
X3:05	IF_PWR_GND	GND for power supply and GND for digital signals	
X3:06	reserved		
X3:07	reserved		
X3:08	IF_PWR_15P	Drive power supply	Stabilised +15V ±4%
X3:09	IF_PWR_15P	Drive power supply	Stabilised +15V ±4%
X3:10-14	IF_PWR_GND	GND for power supply and GND for digital signals	

Setting Dynamic Short Circuit Protection

R_{CE} & C_{CE}

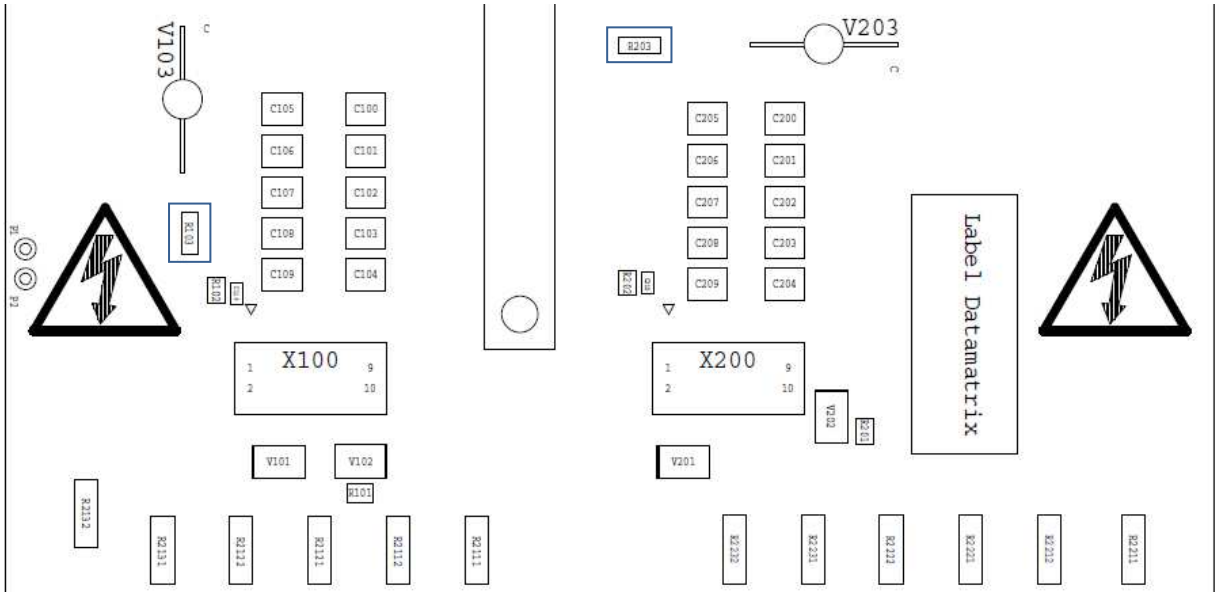


Designation	Shape	Setting	
R102	0805	R_{CE} Factory setting: not equipped	TOP
C110	0603	C_{CE} Factory setting: not equipped	TOP
R202	0805	R_{CE} Factory setting: not equipped	BOT
C210	0603	C_{CE} Factory setting: not equipped	BOT

Please refer to the data sheet of SKYPER 42 R for V_{CE} formula.

Collector Series Resistance

R_{VCE}



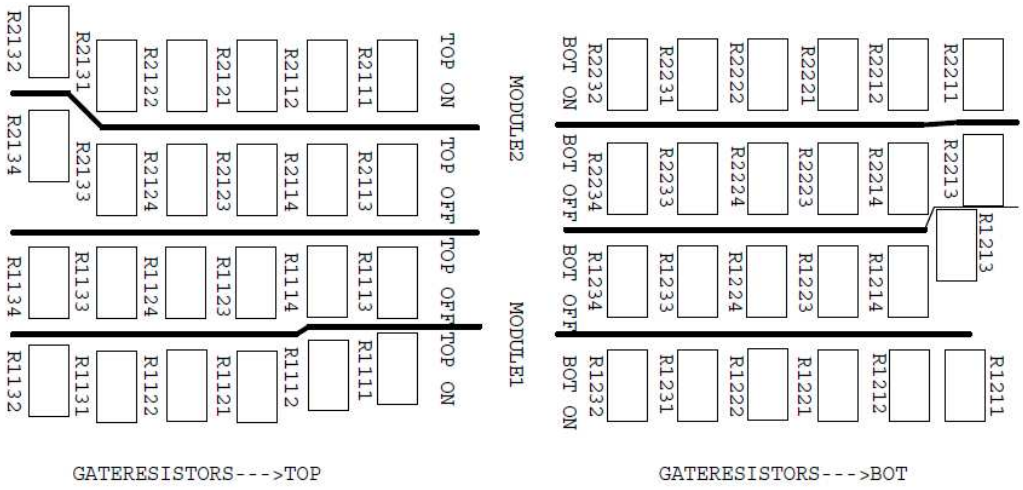
Designation	Setting	
R103	R_{VCE} * Factory setting: not equipped	TOP
R203	R_{VCE} * Factory setting: not equipped	BOT

Please consider that the RVCE resistor has to be equipped before operation.

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

Adaptation Gate Resistors

R_{Gon} & R_{Goff}



Boost Capacitors

$C_{boost15P}$ & $C_{boost8N}$

Designation	Pattern Name	Setting	
C105, C106, C107,C108, C109	1210	$C_{boos+15V}$ Factory setting: C104, C106 = 10µF/25V* C107,C108, C109 = not equipped	TOP
C100, C101, C102,C103, C104	1210	$C_{boost-8V}$ Factory setting: C100, C101=10µF/25V * C102,C103, C104 = not equipped	TOP
C205, C206, C207,C208, C209	1210	$C_{boos+15V}$ Factory setting: C205, C206 = 10µF/25V* C207,C208, C209 = not equipped	BOT
C200, C201, C202,C203, C204	1210	$C_{boos-8V}$ Factory setting: C200, C201=10µF/25V * C202,C203, C204 = not equipped	BOT

* Output charge pulse
Formula: 4µF=1µC ->20µF capacitors on the adapter board =5µC gate charge (SKYPER 42 R: 10µF)

Temperature Signal

The temperature sensor inside the SEMiX® module is directly connected to contacting points P1 and P2. For details to the temperature sensor, see Modules Explanations SEMiX®.

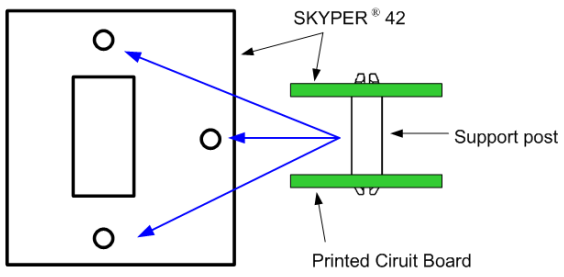
Safety Warnings:

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

Driver Core Mounting

1. Soldering of components (e.g. R_{Gon}, R_{Goff}, etc.) on adaptor board.
2. Insert driver core into the box connector on adaptor board.
3. The connecting leads between board and power module should be as short as possible (max. 20cm), the leads should be twisted.



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.

Parts List

Parts List Adaptor Board

Reference	Describtion	Valure	Shape	Count
R101, R201	Resistor Chip	10,0KOhm	1206 (SMD)	2
R130, R131, R132, R133, R134, R135, R170, R171, R172, R173, R174, R175, R230, R231, R232, R233, R234, R235, R270, R271, R272, R273, R274, R275	Resistor Melf	1,00Ohm	MiniMelf (SMD)	24
R307, R309	Resistor Chip	10,0KOhm	0805 (SMD)	2
V103, V203	Diode High Voltage	BY203/20S	SMD	2
D130, D132, D134, D170, D172, D174, D230, D232, D234, D270, D272, D274	Diode Schottky	10BQ100	DO214AA (SMD)	12
C302, C303	Capacitor NP0	1,0nF	0603 (SMD)	2
R301	Resistor Melf	10,0KOhm	MicroMelf (SMD)	1
X10, X11, X100, X200	Connector	(female) RM2.54 10p	SMD 2ROW	4
X3	Connector	(male) RM2.54 14p	SMD	1
C100, C101, C105, C106, C200, C201, C205, C206, C301	Capacitor X7R	10uF	1210 (SMD)	9
V101, V102, V201, V202	Diode Suppressor	SMAJ15CA	DO214AC (SMD)	4