Project Documentation

C64 A/V-Adaptor

Project number: 132

Revision: 0

Date: 08.08.2019

C64 A/V-Adaptor Rev. 0

Module Description

Introduction

The A/V-Adaptor allows to connect standard S-Video and Audio or Composite-Video cables to the A/V-Jack of the Commodore C64.

A 330Ω resistor to attenuate the Chroma signal for S-Video is installed, but it can be deactivated by setting a jumper (JP2). This attenuation is required, since the chroma signal has a level, which is too high for standard S-Video.

Further, the audio input can be connected to GND, in case it is not in use to reduce the noise introduction.

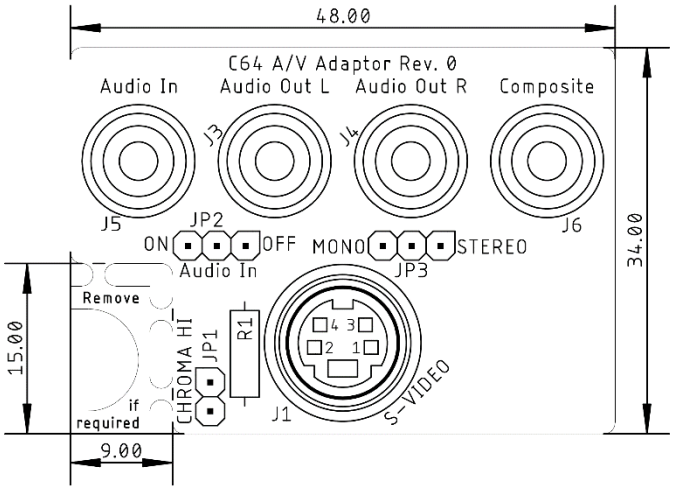


Figure 1: Component side of the A/V-Adaptor

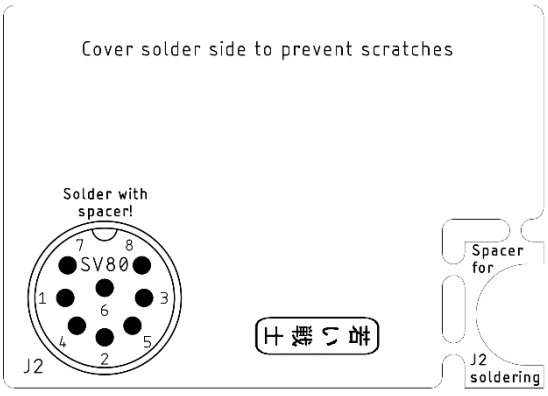


Figure 2: Solder side of the A/V-Adaptor

The two audio output jacks can be connected by a jumper. Alternatively, the stereo sound output (A/V-Jack, pin 7, in case a 2nd SID is installed inside the C64) can be connected to the right channel of the audio output. The first SID output is connected to the left channel of the audio output.

Since the DIN jack for the C64 (J2) has to be installed with a distance, a soldering aid (spacer) is provided with the PCB. It should be clipped off and put between the PCB and J2 while soldering to keep the right distance and angle. After assembly, it can be discarded.

Connectors

A/V-Plug – J2

The A/V-Plug for the C64 is the inner part of a Lumberg 033099 SV 80 DIN-Plug (8 pins, horse shoe = 262°). It provides a round plastic shell of the DIN-connector and long enough pins, so the adaptor can sit firmly in the A/V jack. The inner part of a cheaper (standard) connector cannot be used, since it does not sit firm enough.

Pin	Signal
1	Luminance
2	GND
3	Audio Out (mono/left)
4	Composite Video
5	Audio In
6	Chrominance
7	Audio Out (right – if provided)
8	-

S-Video Jack – J1

A vertical PCB mount Mini-DIN jack (4 circuits)

Pin	Signal
1	GND (Luminance)
2	GND (Chrominance)
3	Luminance
4	Chrominance

RCA-Jacks – J3, J4, J5 & J6

Connector	Signal
J3	Audio Out (mono/left)
J4	Audio Out (mono/right)
J5	Audio In
J6	Composite Video

Jumpers

Chrominance attenuation – JP1

The chrominance signal has a too high level for the standard S-Video chroma signal. The jumper bridges the 330Ω resistor (R1) to switch off this attenuation.

Status	Configuration
open	Attenuation active
set	Attenuation inactive/off

Audio Input Off – JP2

To reduce the noise introduction to the Audio Input, this can be grounded.

Status	Configuration
ON	SID Audio In connected to J5
OFF	SID Audio In connected to GND

Mono/Stereo – JP3

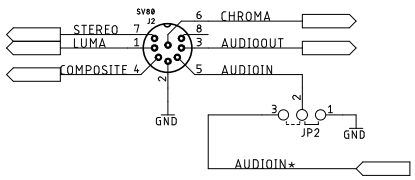
The standard audio output of the SID is one channel (mono). In cases a 2nd SID is installed, the 2nd audio output is (usually) connected to Pin 7 of the Audio/Video jack of the C64. JP3 connected the right channel of the audio output (J4) to either J2, Pin 3 or Pin 7.

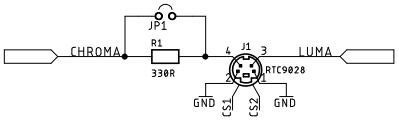
Status	Configuration
MONO	J4 connected to J2, Pin 3
STEREO	J4 connected to J2, Pin 7

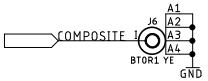
Assembly

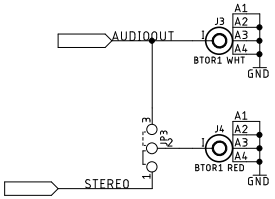
Install the A/V plug on the solder side (bottom) by putting the spacer, which is provided as a part of the PCB, between the PCB and the plug. Make sure, it is parallel to the board. Solder it from the component side.
Install and solder all other components from the component side. Watch the angle of the components, solder them from the solder side. Clip excess pin length.

Cover the solder side (except J2) with duct tape to prevent scratching the case of the C64.



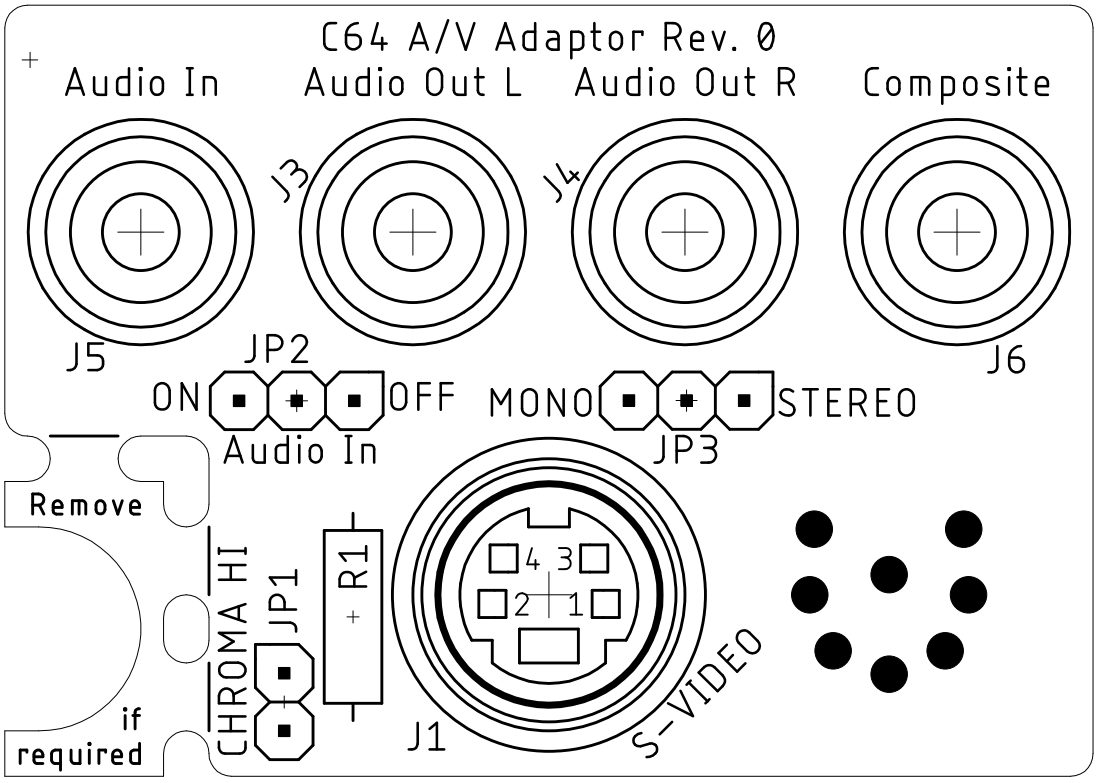




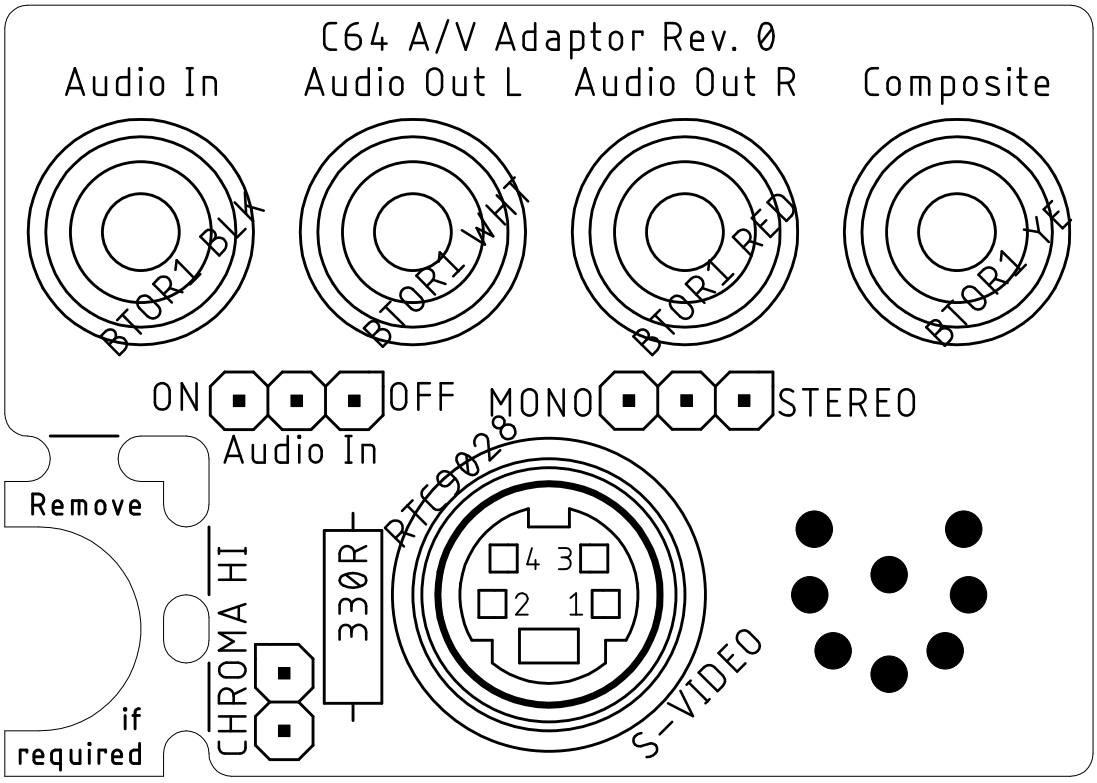


Title: C64 A/V-Adaptor		Doc.-No.: 132-1-01-00	
		Draft.: Sven Petersen	
Date: 08.08.2019 19:28		Rev.: 0	Page 1/1
File: C64_AV-Adaptor			
			A3

Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
placement component side		



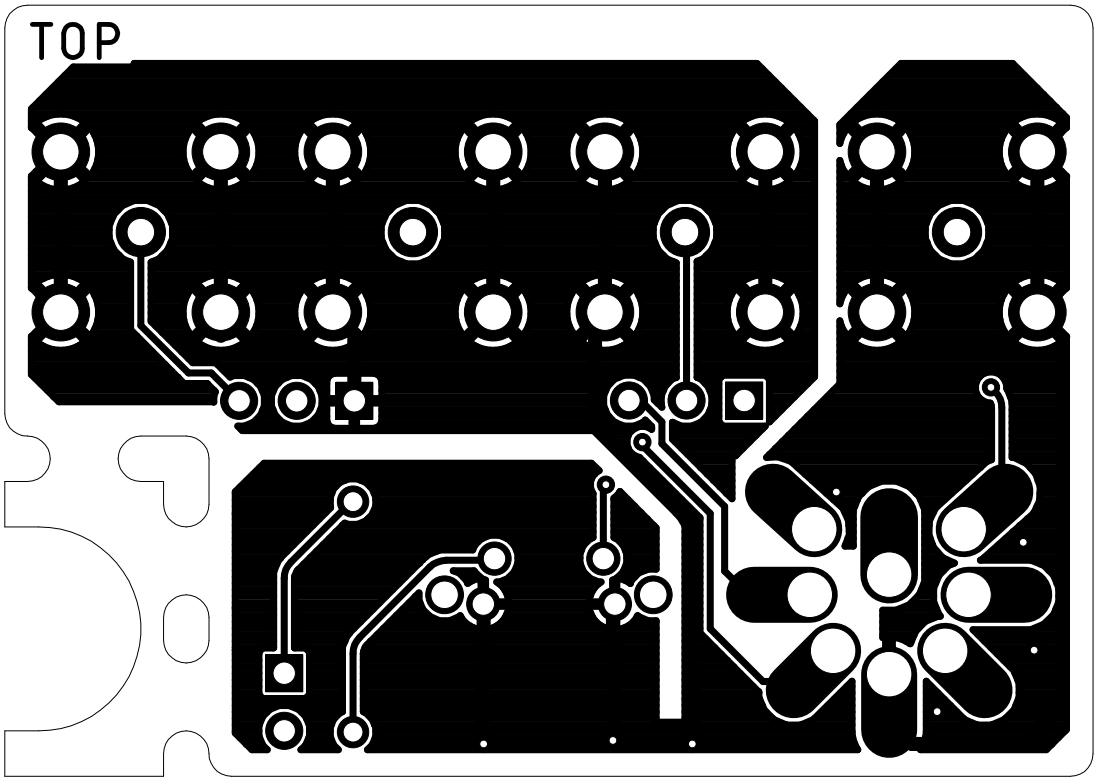
Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
placement component side		



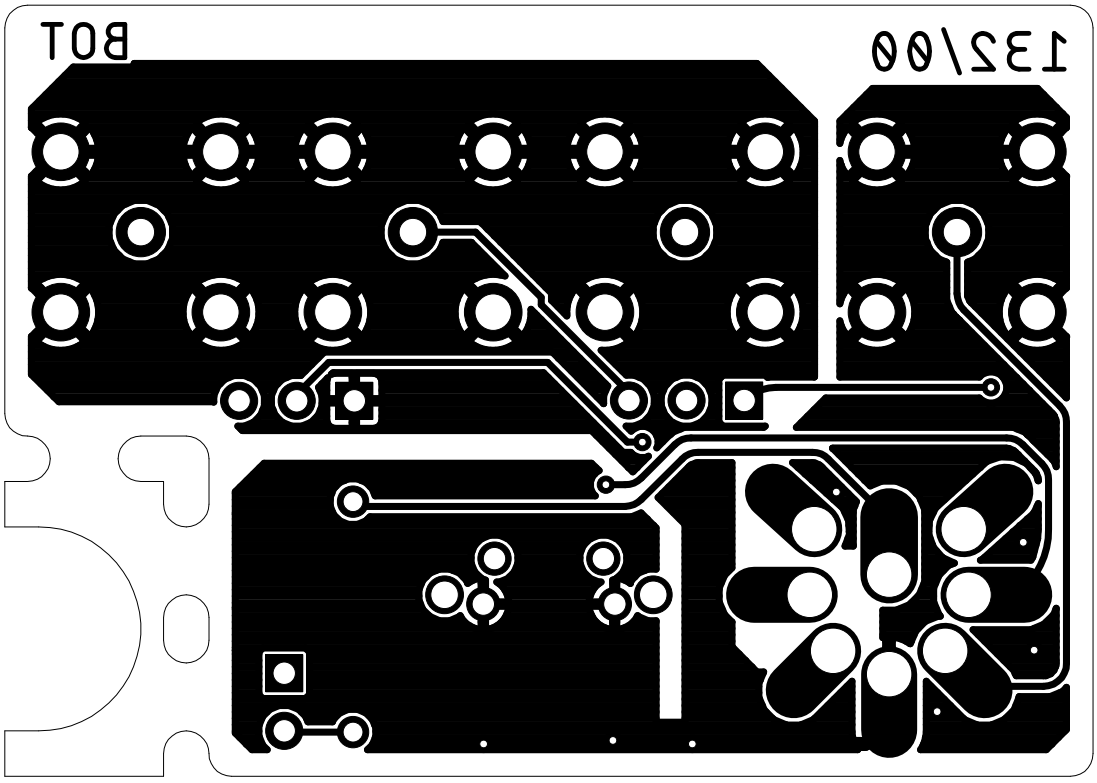
Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
placement solder side		

Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
placement solder side		

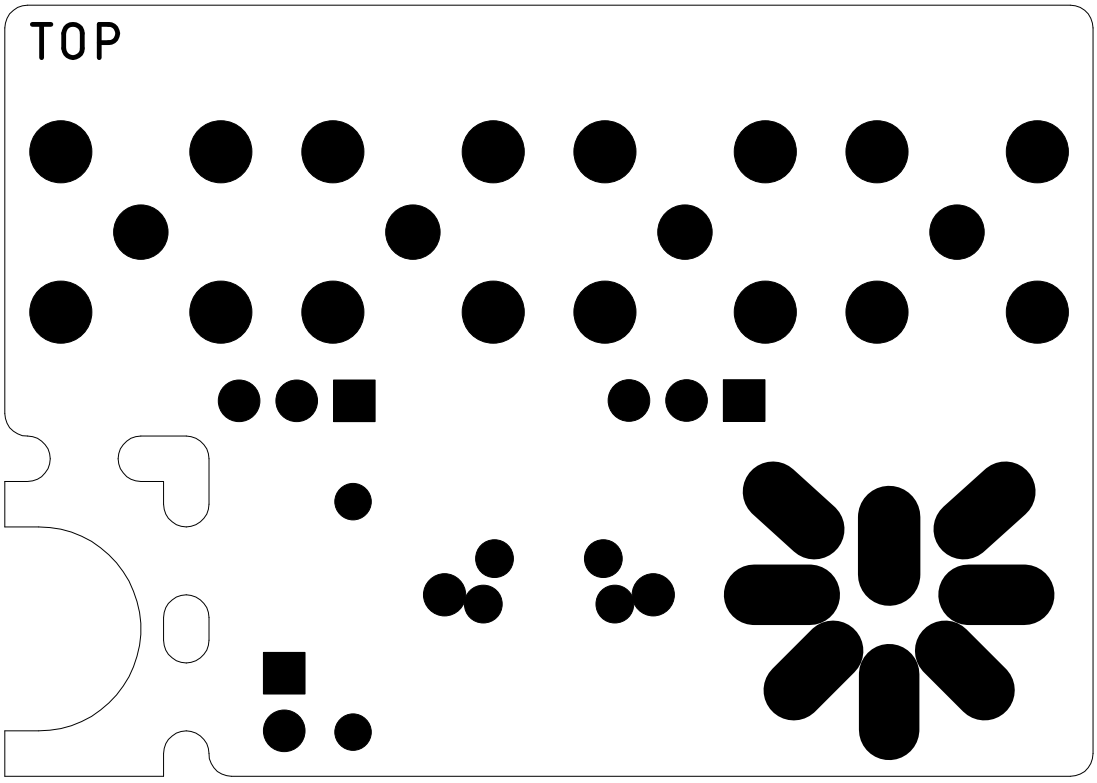
Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
top	[redacted]	



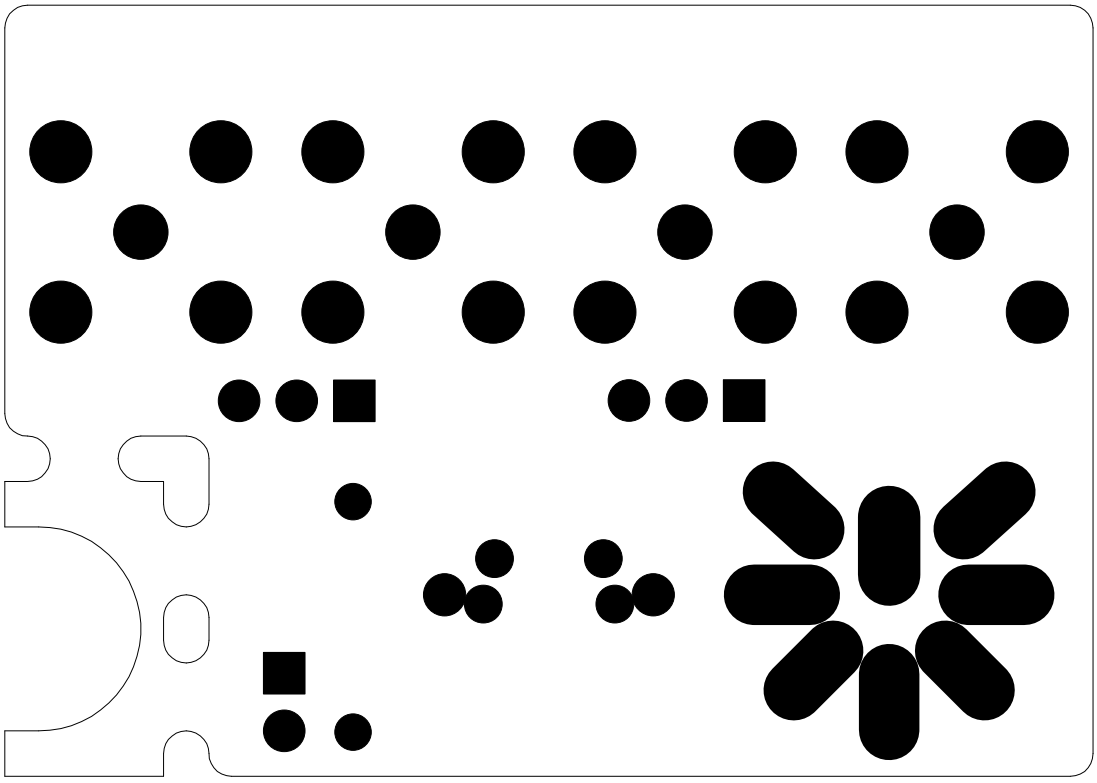
Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
bottom	[redacted]	



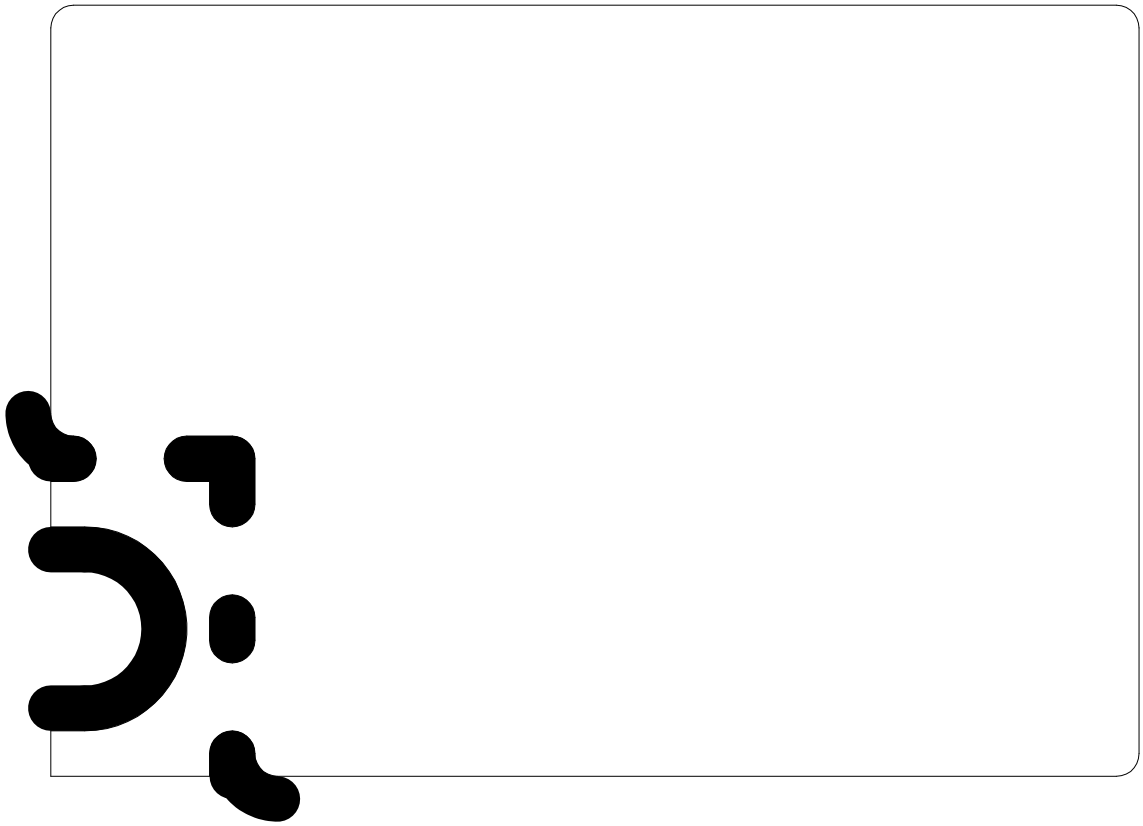
Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
stopmask component side		



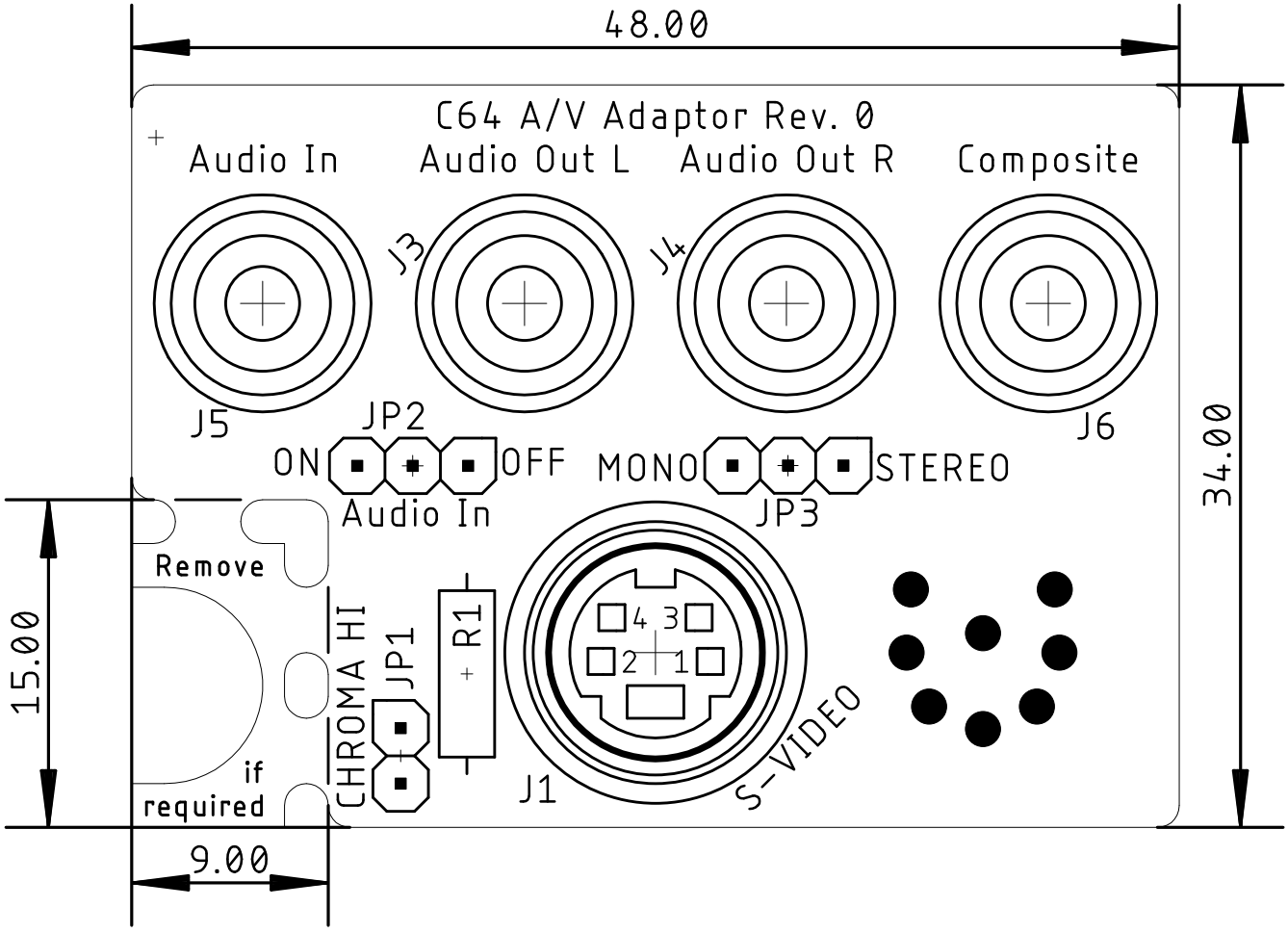
Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
stopmask solder side		



Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
millings		



Sven Petersen 2019	Doc.-No.: 132-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_AV-Adaptor		
07.10.2019 11:40		Rev.: 0
placement component side measures		



C64 A/V-Adaptor Rev. 0

Testing

Introduction

The test was conducted with a prototype of the A/V-Adaptor Rev. 0. For the electrical/functional tests a C64G was used.

Tests

Assembly

The prototype was assembled, all footprints worked out. The DIN plug was assembled using the spacer, which was cut off the PCB. This worked well, too.

Mechanical fitting

The A/V-Adaptor was installed on a classic bread bin and a C64C. Both case versions work well with the prototype. It is required to install the DIN plug with a distance to the bottom side of the PCB to get deep enough into the video jack of the C64 to obtain a stabile seating.

Functional testing

The A/V-adaptor was connected to the C64 and a software was loaded. The jumpers were set to

Jumper	Setting
JP1 (Chroma Hi)	Open (=330R resistor not bridged)
JP2 (Audio in)	Off (audio in → GND)
JP3 (mono/stereo)	Mono (both audio channels connected to J2, Pin 3)

Test	Result	Testing
S-Video cable connected	The displayed image was clear and not distorted	Ok
Audio cable	Both speakers had a clear audio output (mono)	Ok
Composite video	The displayed image was clear and not distorted	Ok
Audio input (JP2 → on)	The audio signal connected was passed through the filter.	Ok
Stereo mode	TBD	TBD
Chroma high (s-video), 330R resistor bridged	The quality of the displayed imaged changed. The colors got stronger and slightly distorted. This was expected.	Ok

The stereo mode was **not** tested.

Test Result

The A/V-Adaptor is fully functional.

C64 A/V-Adaptor Rev. 0
Bill of Material Rev. 0.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	132-2-01-00	2 Layer	PCB Rev. 0	2 layer, Cu 35µ, HASL, 48.0mm x 34.0mm, 1.6mm FR4
2	2	1x 3p pin header, pitch 2.54mm	1X03	JP2, JP3	standard pin header, e.g. Reichelt RND 205-00624
3	1	1x 2p pin header, pitch 2.54mm	1X02	JP1	standard pin header, e.g. Reichelt RND 205-00623
4	3	Jumper 2.54mm pitch	jumper	(JP1), (JP2), (JP3)	Standard jumper (0,1"), e.g. Reichelt MPE 149-2-002-F1
5	1	330R	R-10	R1	resistor, 0.25W or more, 5% or better
6	1	BTOR1 (black)	BTOR1	J5	Lumberg, RCA jack, vertical, black. E.G. Reichelt LUM BTOR1 SW, Farnell: 1217030, Newark: 96K7172, TME.eu: BTOR1B
7	1	BTOR1 RED	BTOR1	J4	Lumberg, RCA jack, vertical, red. E.G. Reichelt LUM BTOR1 RT, Farnell: 1368644, Newark: 53M6863, TME.eu: BTOR1R
8	1	BTOR1 WHITE	BTOR1	J3	Lumberg, RCA jack, vertical, white. E.G. Reichelt LUM BTOR1 WS, Farnell: 1368645, Newark: 53M6864, TME.eu: BTOR1W
9	1	BTOR1 YELLOW	BTOR1	J6	Lumberg, RCA jack, vertical, yellow. E.G. Reichelt LUM BTOR1 GE, Farnell: 1368642, Newark: 53M6865, TME.eu: BTOR1Y
10	1	RTC9028	MINIDIN4_V	J1	Mini-DIN, 4p, vertical, e.g. AliExpress:
					RTConnector: RTC9028
					ebay.de
11	1	SV80	SV80_INNER	J2	Inner part of Lumberg 033099 SV 80, e.G. Reichelt: LUM SV 80, Newark: 23AH4043, Farnell: 1321482, TME.eu: SV80