

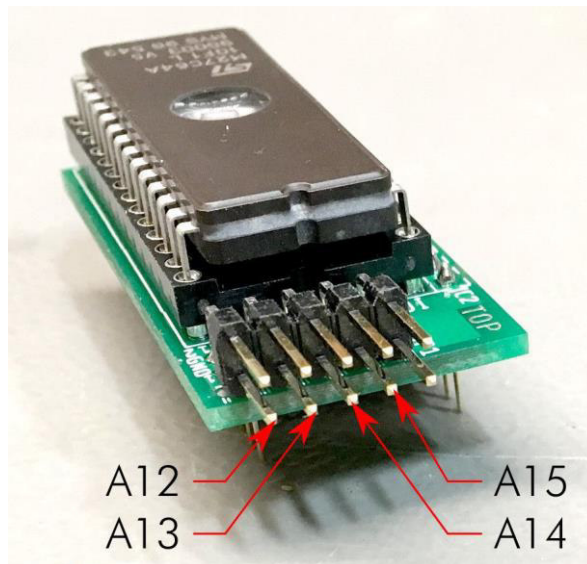
Project Documentation

C64 CHARSET-Adaptor/Switch

Project number: 126

Revision: 0

Date: 15.05.2019



C64 CHARSET-Adaptor/Switch Rev. 0

Module Description

Introduction

The board serves for adapting the CHARACTER ROM U5 (type 2332) to a 27C512 (or 27C256, 27C128, 27C64) EPROM. The pin out of both ICs are slightly different and need adaptation. Furthermore, it allows to access (up to 16) different character sets, which can be selected via the pin-header on the module.

The CHARSET-Adaptor/Switch is suitable to work together with the Keyboard Controlled Kernal Switch (Project Number 128).

This pin-header is connected in a way, that the selection can either be accomplished with standard 2.54mm jumper bridges, DIP-switches, hex-encoding switches or a microcontroller like an Arduino etc.

Signal	Pin	Pin	Signal
A12	1	2	GND
A13	3	4	GND
A14	5	6	GND
A15	7	8	GND
+5V	9	10	+5V

Table 1: Jumper (JP1) for Bank Selection

The +5V pins are to provide supply voltage to a microcontroller.

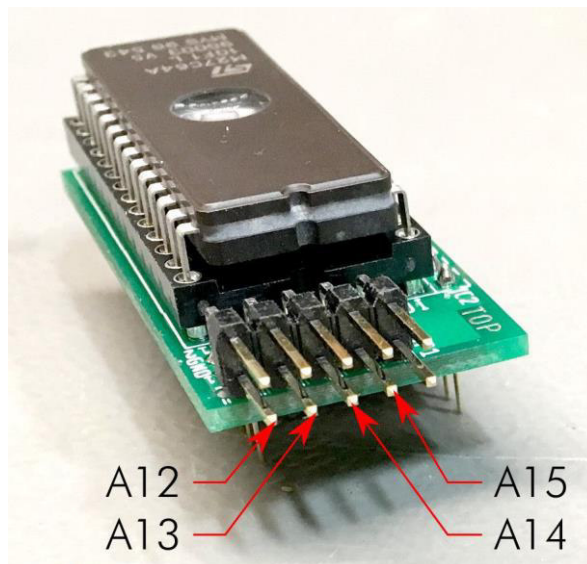


Figure 1: Address pins of JP1

Bank Selection

The desired CHARACTER SET is selected at JP1. For the pinout refer to Table 1. The jumper is installed (vertically) in a way, that it connects the address line with the GND potential.

A15	A14	A13	A12	4k Block	Addr. Offset
set	set	set	set	#0	0x0000
set	set	set	open	#1	0x1000
set	set	open	set	#2	0x2000
set	set	open	open	#3	0x3000
set	open	set	set	#4	0x4000
set	open	set	open	#5	0x5000
set	open	open	set	#6	0x6000
set	open	open	open	#7	0x7000
open	set	set	set	#8	0x8000
open	set	set	open	#9	0x9000
open	set	open	set	#10	0xA000
open	set	open	open	#11	0xB000
open	open	set	set	#12	0xC000
open	open	set	open	#13	0xD000
open	open	open	set	#14	0xE000
open	open	open	open	#15	0xF000

Table 2: Selection of EPROM memory blocks

A set jumper corresponds to a LOW level (binary 0), an open jumper to a HIGH level. Do not confuse the C64 memory address and the EPROM memory address. They have the address Bit A0 to A11 in common, but the rest is different. Each of the 4k blocks appears between address \$D000 and \$DFFF of the C64.

Dimensions

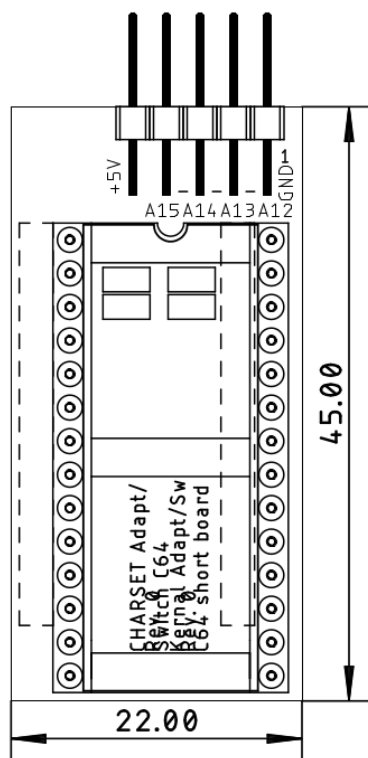


Figure 2: Dimensions of the Character ROM Adaptor/Switch

Compatibility of EPROMs

Although a 27C512 type EPROM is recommended, other types of EPROMs can be installed:

EPROM	Size	Capacity
27C64	8k	2x Character Sets
27C128	16k	4x Character Sets
27C256	32k	8x Character Sets
27C512	64k	16x Character Sets

Table 3: Capacity of EPROM types

Those EPROMs are pin compatible, the jumpers, that have no function, due to the size, have to stay open.

EPROM	Size	A15	A14	A13	A12
27C512	64kx8	☑	☑	☑	☑
27C256	32kx8	open	☑	☑	☑
27C128	16kx8	open	open	☑	☑
27C64	8kx8	open	open	open	☑

Table 4: Settings per EPROM type

☑: The jumper can be open or closed, depending on the desired selection.

In case V_{pp} is located at a dedicated pin (pin 1), A15 has no effect anymore. A HIGH level is recommended, the corresponding jumper is open. The /PGM Pin should be set HIGH, this is accomplished by an open jumper for A14.

27C64											
27C128											
27C256											
27C512											
SOCKET											
V _{pp}	V _{pp}	V _{pp}	A15	1	A15	VCC	28	VCC	VCC	VCC	VCC
A12	A12	A12	A12	2	A12	A14	27	A14	A14	/PGM	/PGM
A7	A7	A7	A7	3	A7	A13	26	A13	A13	A13	n.c.
A6	A6	A6	A6	4	A6	A8	25	A8	A8	A8	A8
A5	A5	A5	A5	5	A5	A9	24	A9	A9	A9	A9
A4	A4	A4	A4	6	A4	A11	23	A11	A11	A11	A11
A3	A3	A3	A3	7	A3	/OE	22	/G/V _{pp}	/G	/G	/G
A2	A2	A2	A2	8	A2	A10	21	A10	A10	A10	A10
A1	A1	A1	A1	9	A1	GND	20	/E	/E	/E	/E
A0	A0	A0	A0	10	A0	D7	19	D7	D7	D7	D7
D0	D0	D0	D0	11	D0	D6	18	D6	D6	D6	D6
D1	D1	D1	D1	12	D1	D5	17	D5	D5	D5	D5
D2	D2	D2	D2	13	D2	D4	16	D4	D4	D4	D4
GND	GND	GND	GND	14	GND	D3	15	D3	D3	D3	D3

Table 5: EPROM pin compatibility

Programming instructions

Character sets can be found here:

<http://www.zimmers.net/anonftp/pub/cbm/firmware/computers/c64/index.html> or elsewhere. For instructions on setting up a complete multiple character ROM image, please refer to

https://github.com/svenpetersen1965/C64-Kernal-Adapter-Switch-Long-Board/blob/master/Rev.%200/pdf/C64_KernalSw_8k_v0.pdf

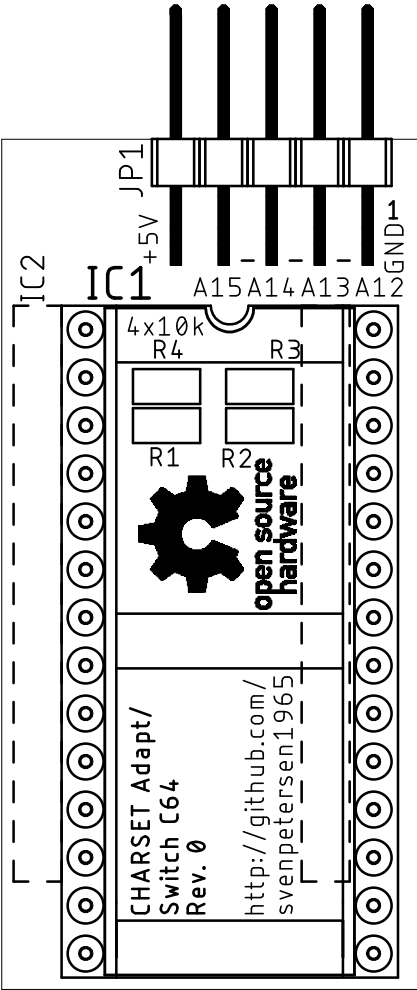
The description is about how to create a multiple Kernal ROM image, a multiple Character ROM image works pretty similar, except the size is only 4kB.

Revision History

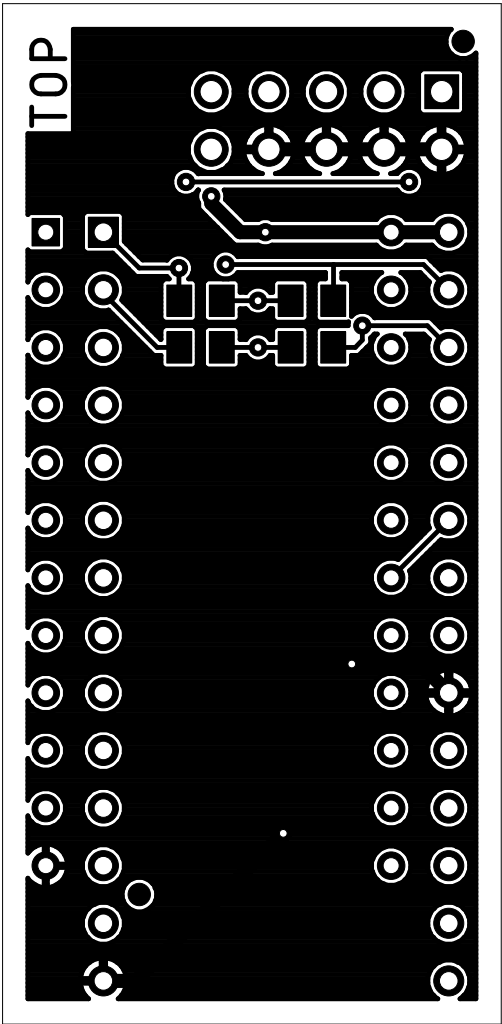
Rev. 0

Prototype, fully functional

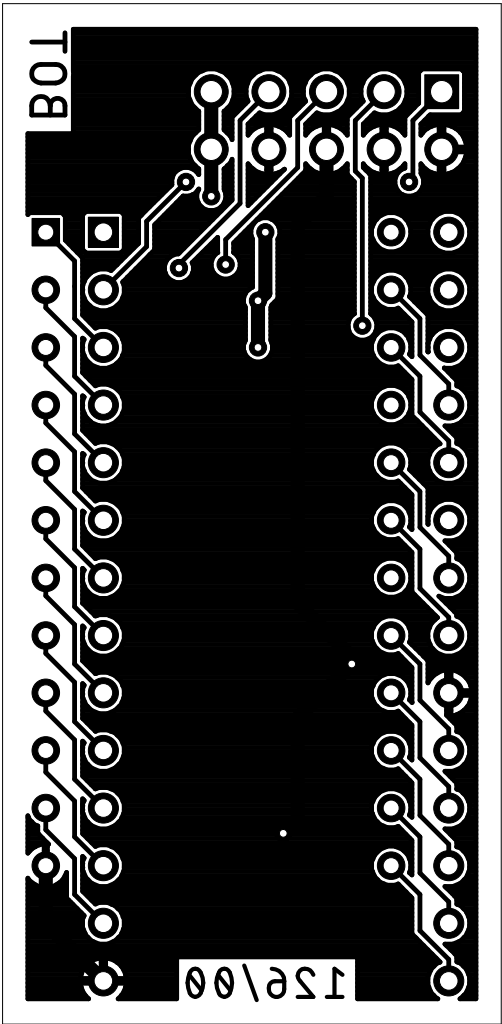
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C64_CHARSW_4k		
07.08.2020 21:49		Rev.: 0
placement component side		



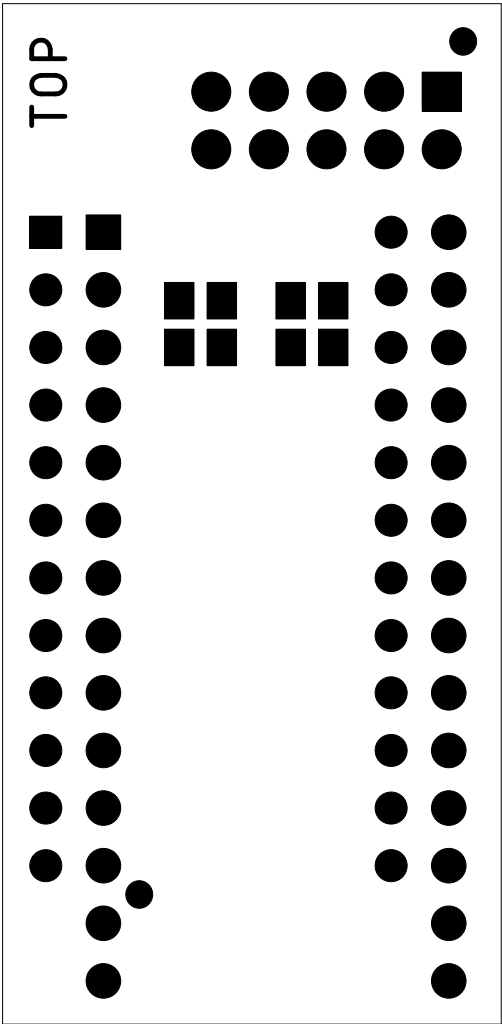
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13.05.2019 11:48		Rev.: 0
top		



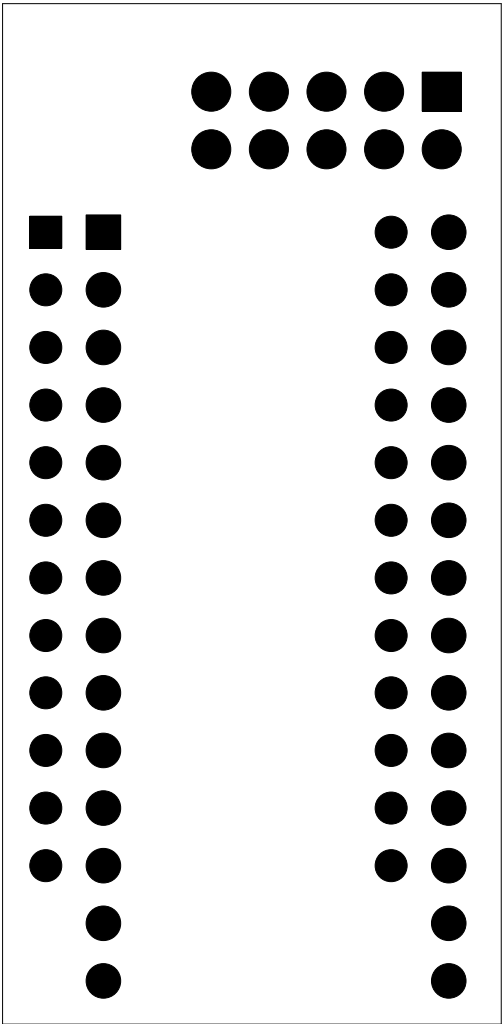
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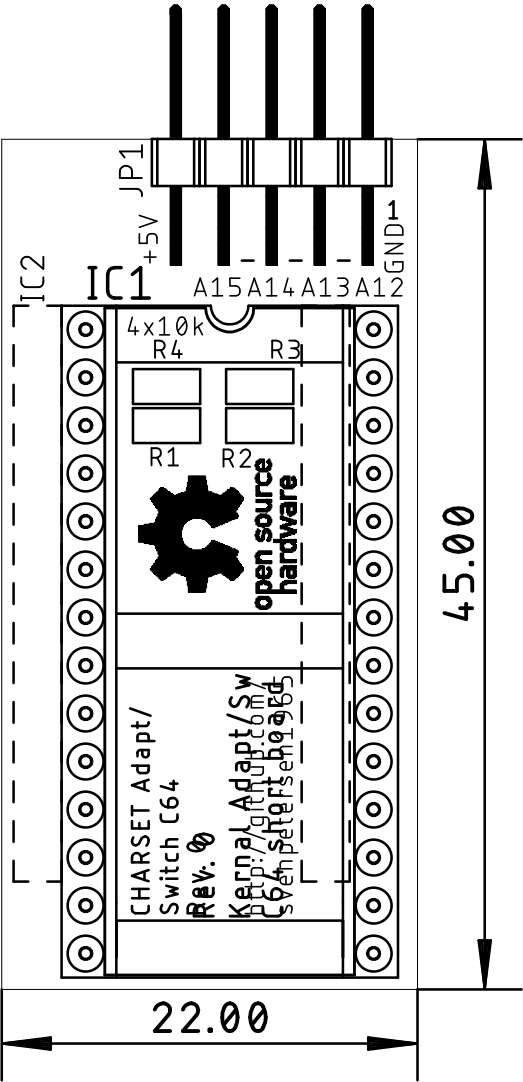
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C64_CHARSETSw_4k		
13.05.2019 11:48		Rev.: 0
stopmask component side		



Sven Petersen 2019	Doc.-No.: 126-2-01-00	
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13.05.2019 11:48		Rev.: 0
stopmask solder side		



Sven Petersen 2019	Doc.-No.: 126-2-01-00	
	Cu: 35µm	Cu-Layers: 2
C64_CHARSETSw_4k		
07.08.2020 21:49		Rev.: 0
placement component side		measures



C64 CHARSET-Adaptor/Switch Rev. 0

Functional Description

IC2 is not an actual IC, these are the precision round pin contacts on the solder side of the module, that fit into the Character ROM socket on the C64 mainboard. The signals A0...A11 are connected to the address bus, D0...D7 are connected to the data bus. The chip select signal \overline{CS} is connected to the C64 signal \overline{CS} , which selects the character rom at the addresses 0xD000 - 0xDFFF.

IC1 is the EPROM, which is here represented by a 27C512 (other types are possible, see the document 126-6-01-*/Module Description).

The chip select signal is connected to pin 22, the enable signal \overline{E} is permanently LOW.

R1 – R4 are pull-up resistors. The desired character set can be either jumpered at JP1 or selected by a micro controller, which is connected to the same pin header.

C64 CHARSET-Adaptor/Switch Rev. 0

Testing

The module was tested on a C64 Mainboard ASSY250425. The test was conducted with various character sets, which were obtained from the internet. The character sets were selected by jumpering JP1.

The EPROM, which was used for the test was ST M27C512-10F1 (100ns).

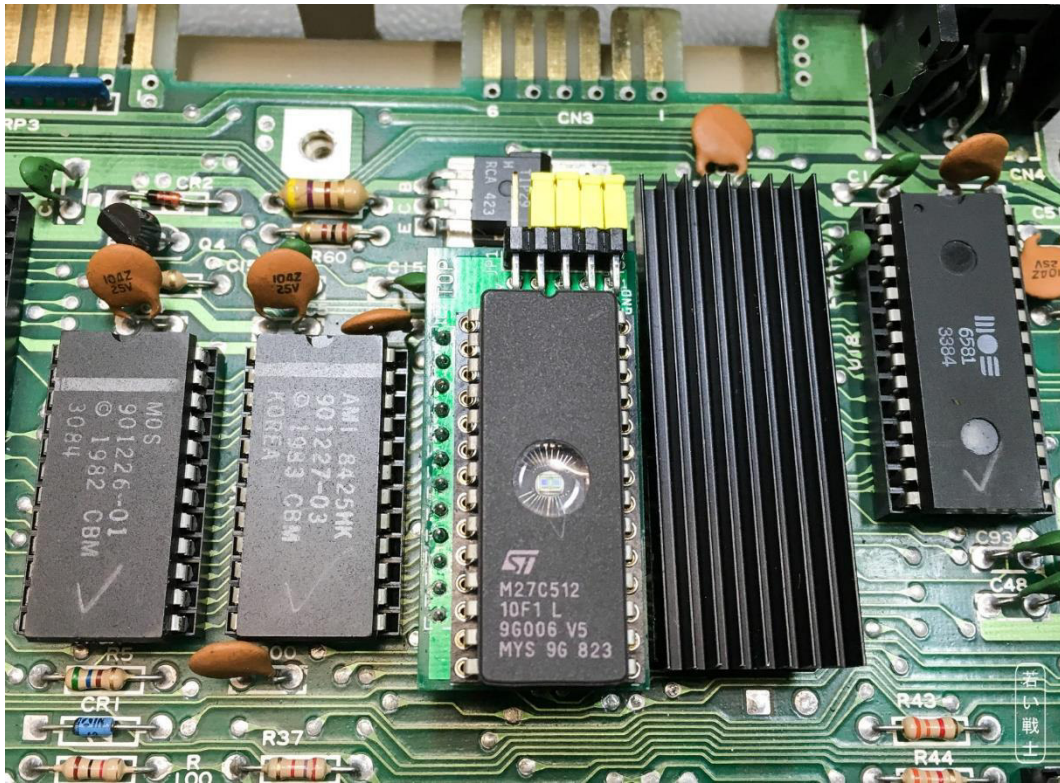


Figure 1: The module installed on an ASSY 250425 mainboard

It was required to slightly bend a capacitor away from the socket. Other than that, no collisions with other components have occurred. The module was sitting firmly in the socket.

After switching on the C64, the selected character sets worked properly. The selection was changed by modifying the jumpering of the pin header JP1.

Conclusion: **The C64 CHARSET-Adaptor/Switch is fully functional.**

C64 CHARSET-Adaptor/Switch Rev. 0

Bill of Material Rev. 0.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	126-2-01-00	2 Layer	PCB Rev. 0	2 layer, Cu 35μ, HASL, 45mm x 22mm, 1.6mm FR4
2	1	2x05pin/90°	2X05_90_SERIES JP1 088		90° pin header, 2.54mm pitch. E.g. Reichelt MPE 088-2-010
3	4	Jumper	2.54mm	(JP1)	Jumpers for address selection (in case it is intended to jumper the kenal selection)
4	4	10k	0805	R1, R2, R3, R3	SMD resistor
5	1	two Pinstrip, precision round pins, cut to 12 pins length	DIL24_SOCKET	IC2	Precision Round pins mandatory! E.g. Reichelt BKL 10120540 or
10PCS Single Row 40Pin 2.54mm Round Male Pin Header machined					
6	1	M27C512	DIL28-6	IC1	EPROM 200ns or faster recommended, alternative sizes: 27C64, 27C128, 27C256 possible
7	1	DIP28 socket	DIL28-6	(IC1)	Precision round pin is recommended