StripboardProto Documentation

Release 0.0.0

ponty

August 11, 2013

CONTENTS

StripboardProto

Date August 11, 2013

PDF StripboardProto.pdf

CHAPTER

ONE

ABOUT

StripboardProto

Stripboard based modular hardware prototyping system.

Links:

- home: https://github.com/ponty/StripboardProto
- documentation: http://ponty.github.com/StripboardProto

Features:

- designed for hobby projects
- stripboard based
- no drilling
- no etching
- modular
- the bus consists of 8 bit ports
- passive backplane holds the modules
- Design tool: EAGLE Light Edition

Example:

```
backplane

II
II
II=C=================      microcontroller module
II
II
II=C=================      sound module
II
II
II=C=================      USB module
II
```

Bus:

```
-------------------------------------------------               -----------
| Port 1                                        |               | Port 2
-------------------------------------------------------------------------
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | POWER | GND | EMPTY | EMPTY | 0 | 1 ...
-------------------------------------------------------------------------
```

other modular designs:

- http://www.instructables.com/id/AVR-mini-board-with-additional-boards/

- Arduino shield

CHAPTER

TWO

STRIPBOARD DESIGN

Stripboard design representation in eagle:

- holes: copper should be cut or drilled here
- SMD: through-hole component, legs are drawn on top layer
- top layer: wires
- lines on documentation layer: wires
- bottom layer: original parallel strips of copper, only those are drawn, which are used for connection
- via: soldering points

Some electronic components have no 3D view in the documentation.

CHAPTER

THREE

ATMEGA8

Status: OK

Arduino compatible board for Atmega8/48/88/168 and maybe others also.

features:

- reset button
- 10 pin ISP connector

3.1 Pins

board pin	AVR pin	Arduino pin	comment
0	PB0	D8	
1	PB1	D9	
2	PB2	D10	
3	PB3	D11	MOSI
4	PB4	D12	MISO
5	PB5	D13	SCK
6	NC		
7	NC		
8	POWER		
9	GND		
•			
•			
10	PC0	A0	
11	PC1	A1	
12	PC2	A2	
13	PC3	A3	
14	PC4	A4	
15	PC5	A5	
16	NC		
17	NC		
18	POWER		
19	GND		
•			

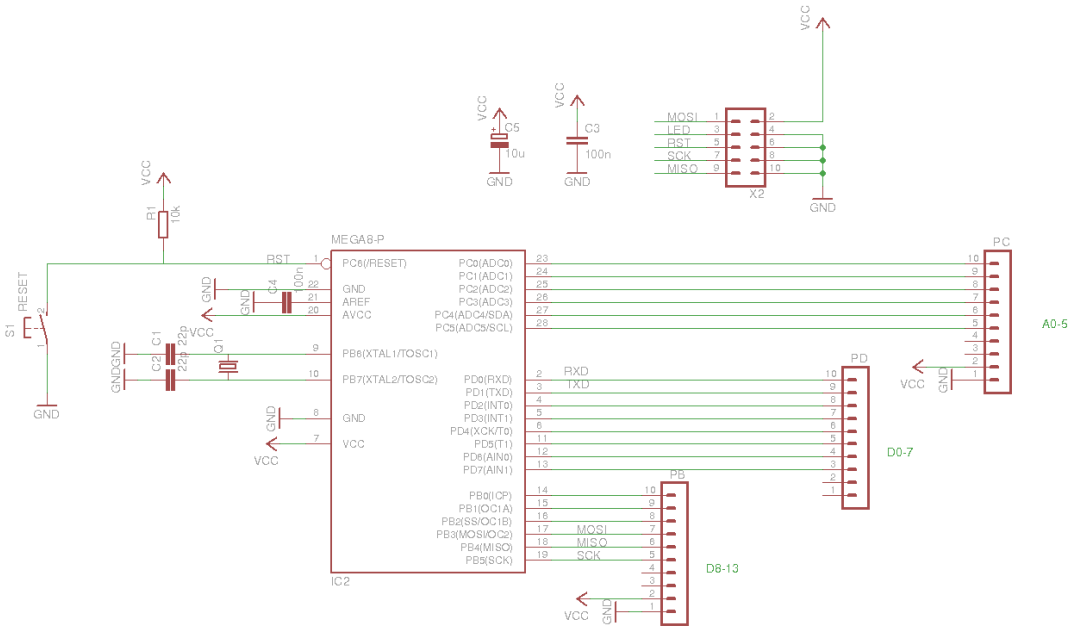
Continued on next page

Table 3.1 – continued from previous page

board pin	AVR pin	Arduino pin	comment
•			
20	PD0	D0	RxD
21	PD1	D1	TxD
22	PD2	D2	
23	PD3	D3	
24	PD4	D4	
25	PD5	D5	
26	PD6	D6	
27	PD7	D7	
28	POWER		
29	GND		

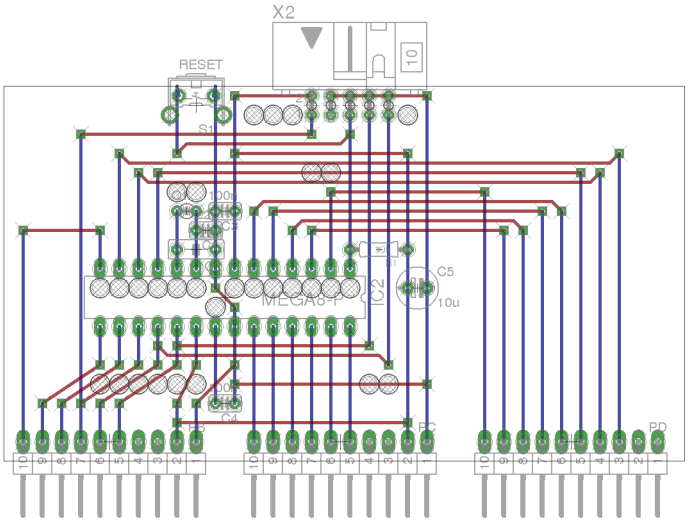
AVR ISP Header Pinouts

3.2 Schematic



3.3 Board

top view:



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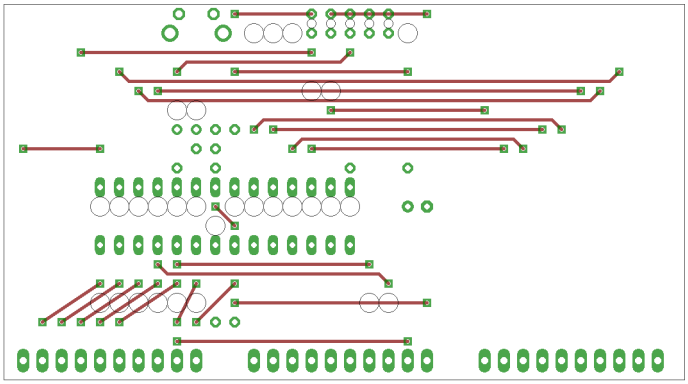
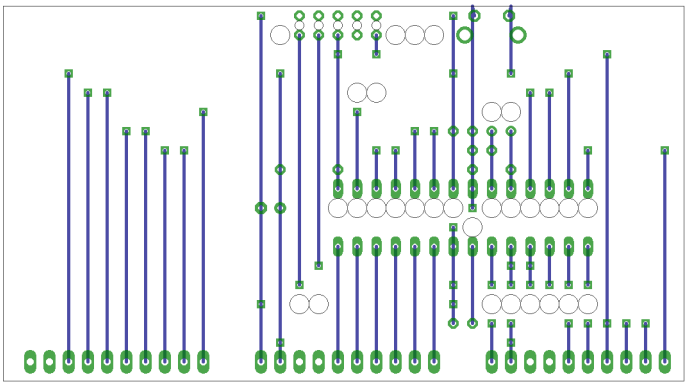


bottom view mirrored:



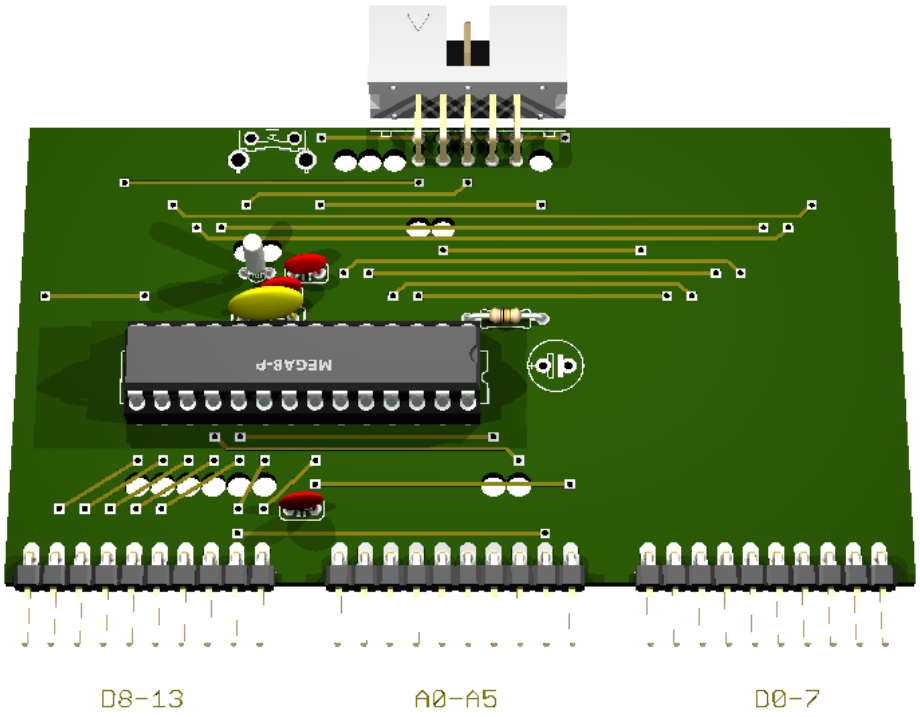
3.4 Partlist

Table 3.2:

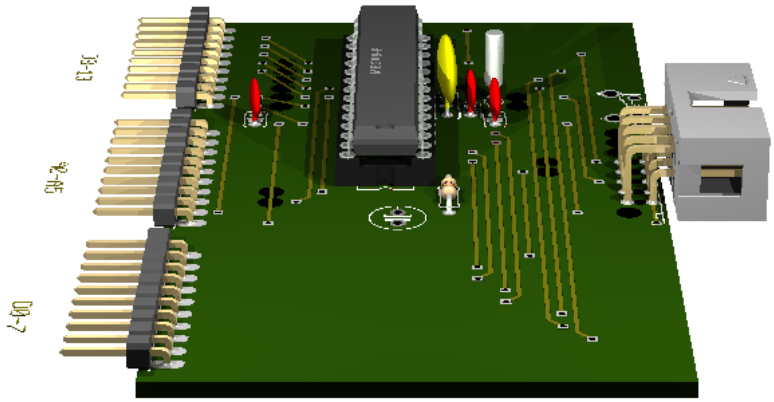
part	value	position
C1	22p	(1.05 1.2)
C2	22p	(1 1.1)
C3	100n	(1.15 1.3)
C4	100n	(1.15 0.3)
C5	10u	(2.15 0.9)
IC2	MEGA8-P	(1.15 0.85)
PB		(0.55 0.1)
PC		(1.75 0.1)
PD		(2.95 0.1)
Q1		(0.95 1.3)
R1	10k	(1.95 1.1)
S1	RESET	(1 1.85)
X2		(1.8 1.85)

3.5 3D view

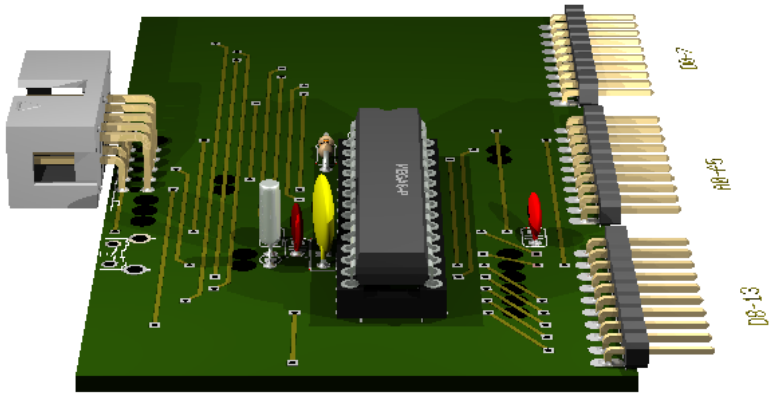
3.5.1 Front



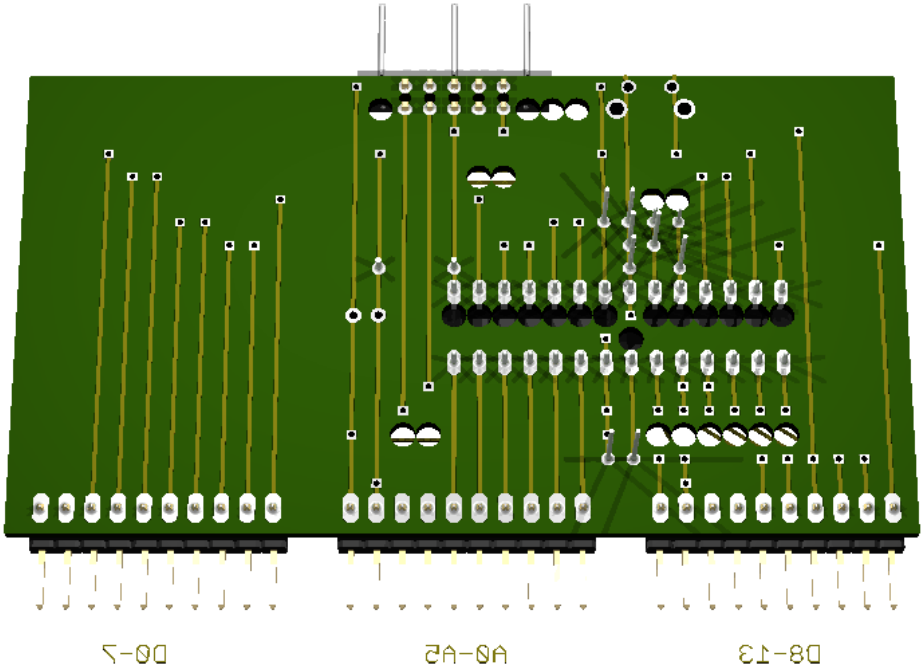
3.5.2 Right side



3.5.3 Left side



3.5.4 Bottom



CHAPTER

FOUR

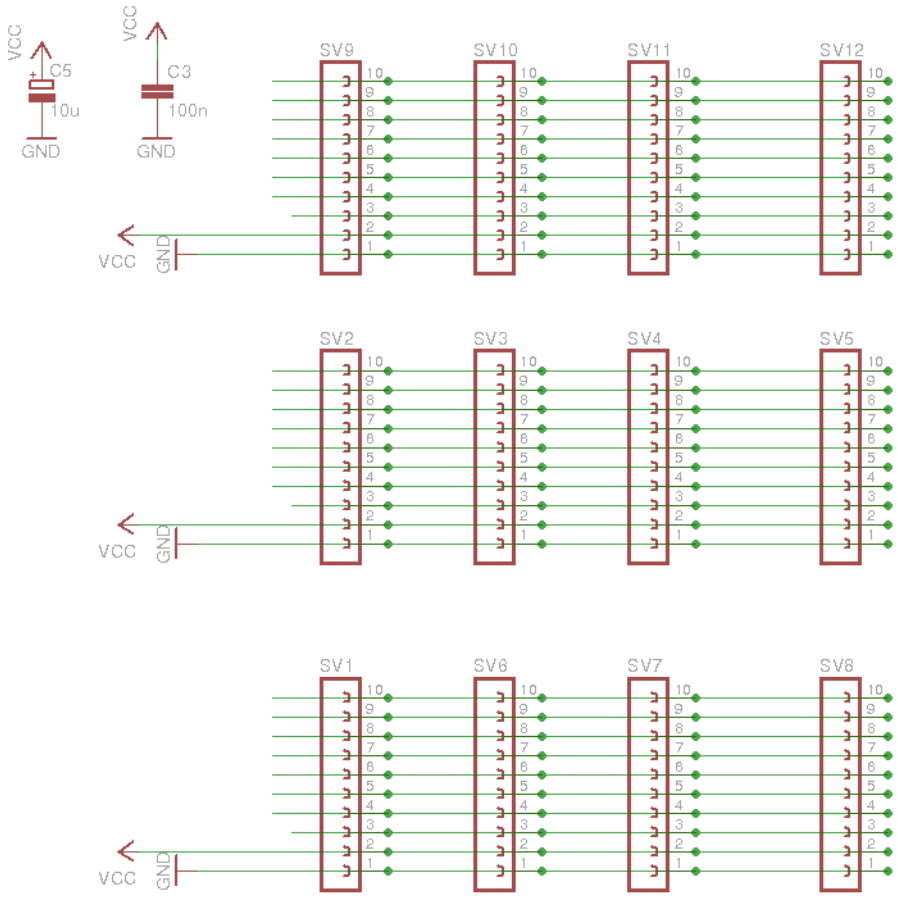
BACKPLANE

Status: OK

features:

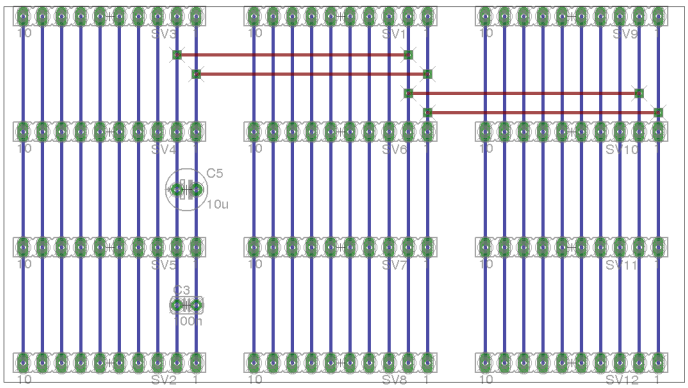
- 3 ports

4.1 Schematic

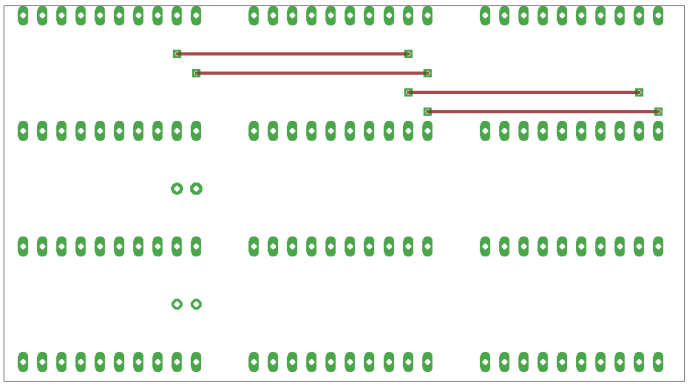


4.2 Board

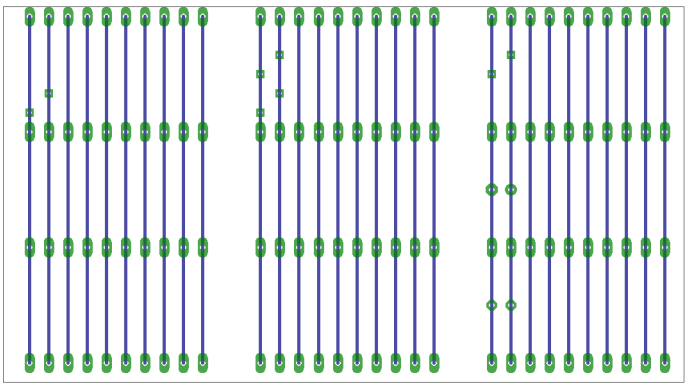
top view:



wires only:



bottom view mirrored:



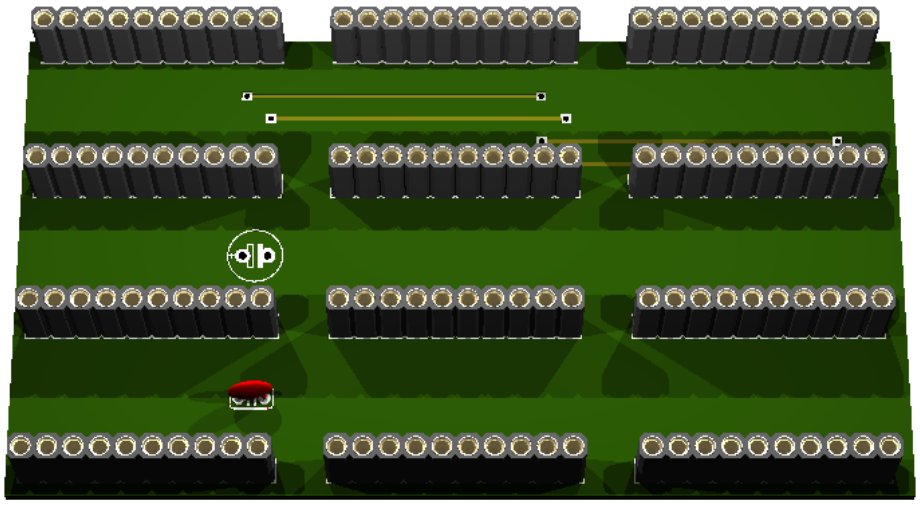
4.3 Partlist

Table 4.1:

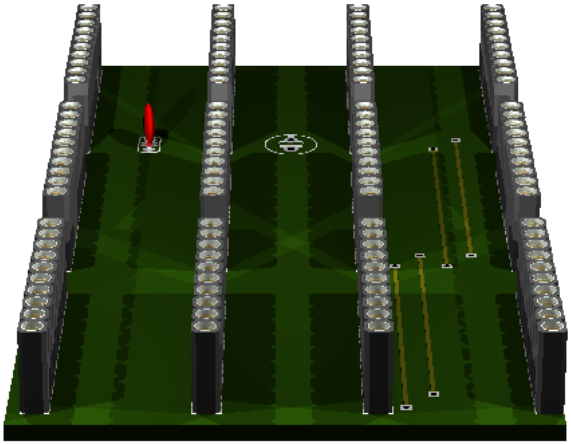
part	value	position
C3	100n	(0.95 0.4)
C5	10u	(0.95 1)
SV1		(1.75 1.9)
SV2		(0.55 0.1)
SV3		(0.55 1.9)
SV4		(0.55 1.3)
SV5		(0.55 0.7)
SV6		(1.75 1.3)
SV7		(1.75 0.7)
SV8		(1.75 0.1)
SV9		(2.95 1.9)
SV10		(2.95 1.3)
SV11		(2.95 0.7)
SV12		(2.95 0.1)

4.4 3D view

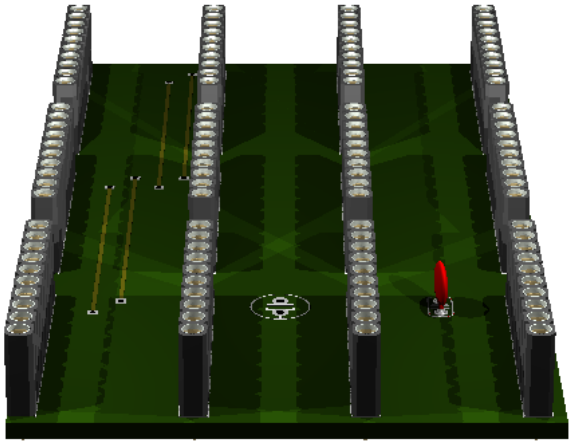
4.4.1 Front



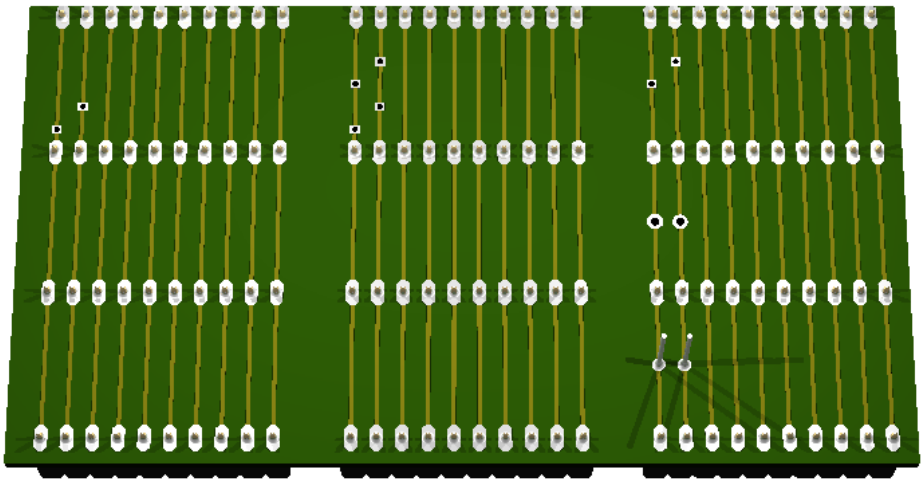
4.4.2 Right side



4.4.3 Left side



4.4.4 Bottom



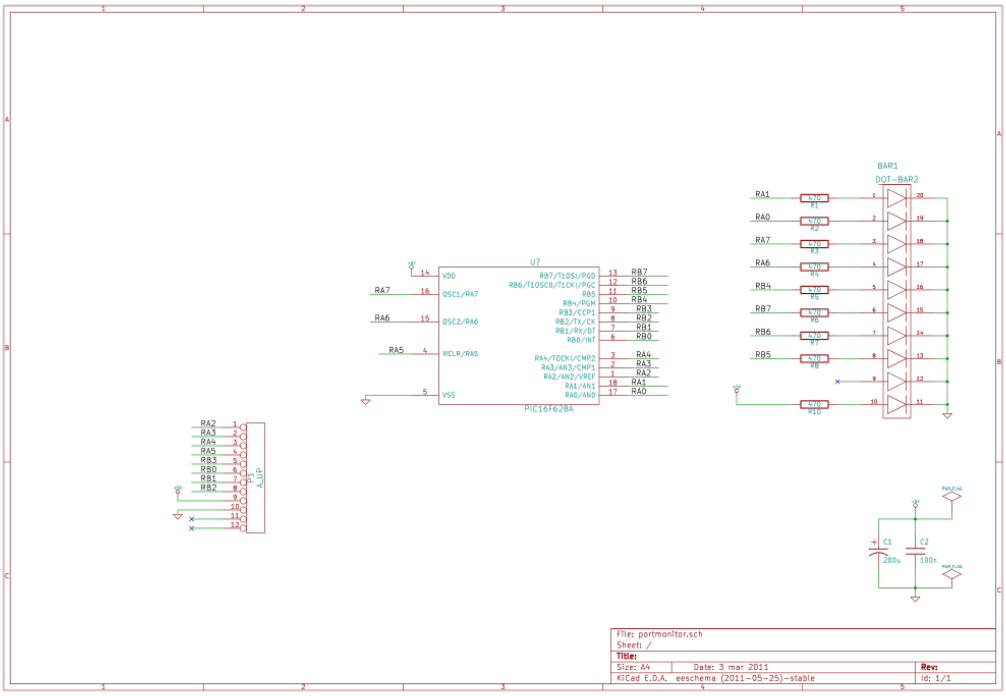
CHAPTER

FIVE

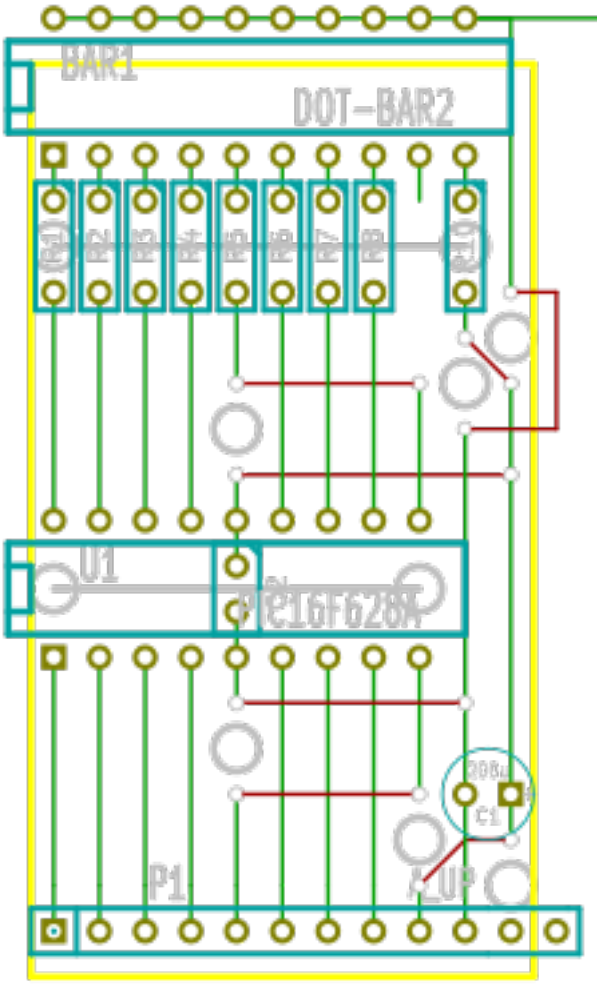
BUSMONITOR

Status: OK

5.1 Schematic



5.2 Board



CHAPTER

SIX

BUZZER

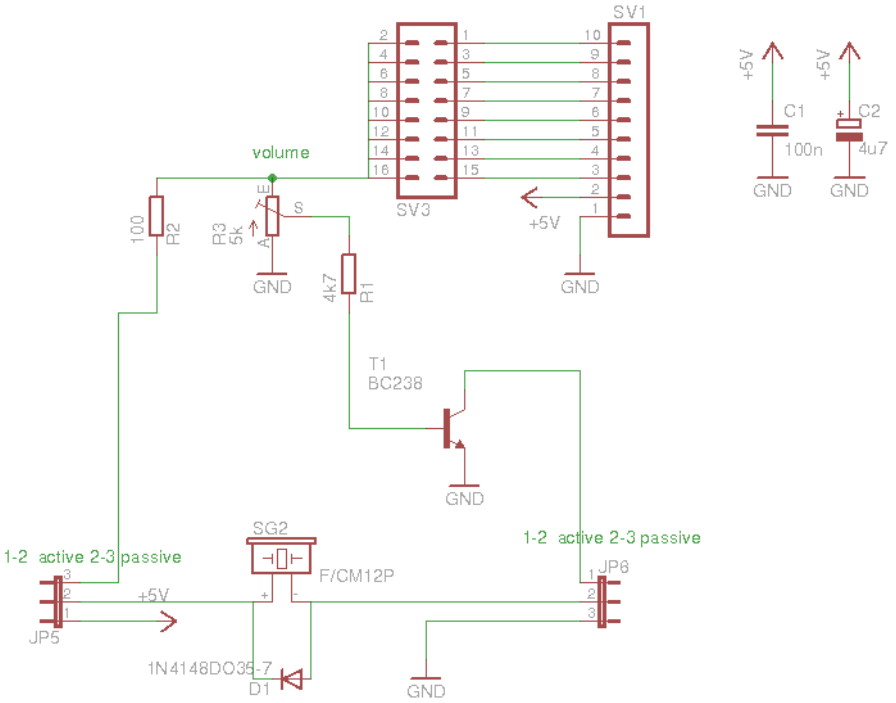
Status: OK

Sound module.

features:

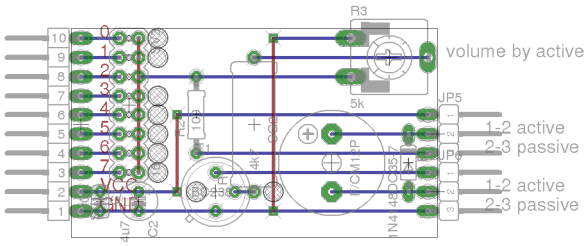
- passive or active
- volume trimmer

6.1 Schematic

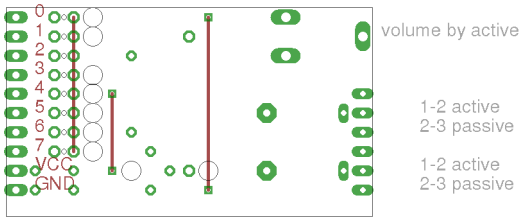


6.2 Board

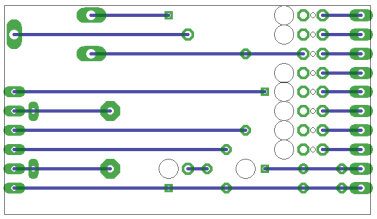
top view:



wires only:



bottom view mirrored:



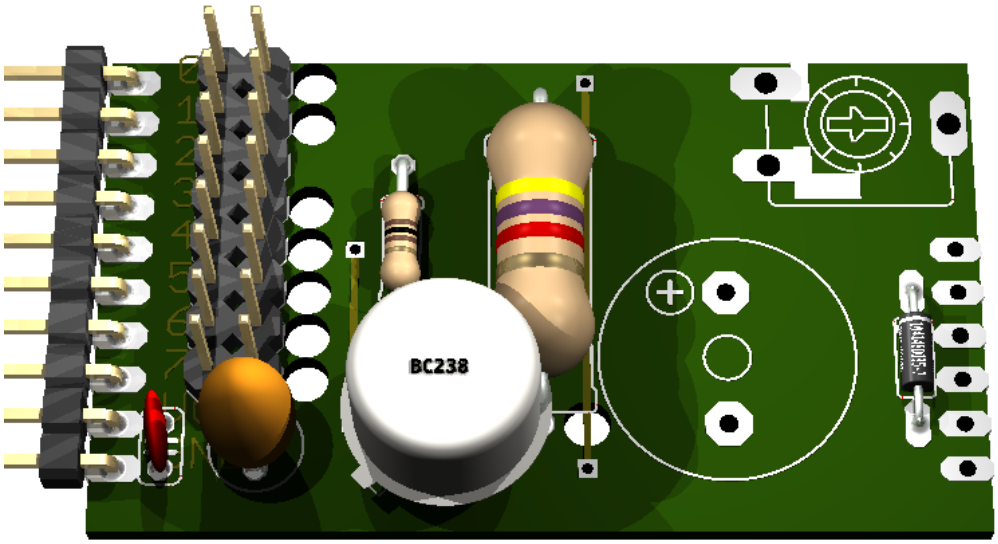
6.3 Partlist

Table 6.1:

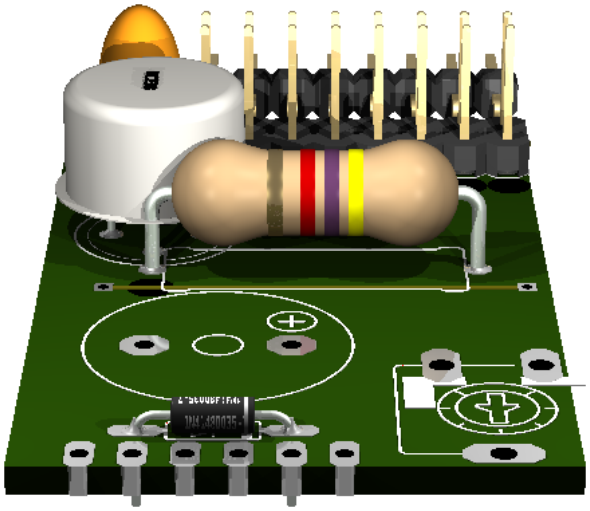
part	value	position
C1	100n	(0.6 0.25)
C2	4u7	(0.8 0.25)
D1	1N4148DO35-7	(2.2 0.45)
JP5		(2.35 0.6)
JP6		(2.35 0.3)
R1	4k7	(1.4 0.65)
R2	100	(1.1 0.7)
R3	5k	(2.1 1)
SG2	F/CM12P	(1.8 0.45)
SV1		(0.5 0.65)
SV3		(0.75 0.75)
T1	BC238	(1.2 0.3)

6.4 3D view

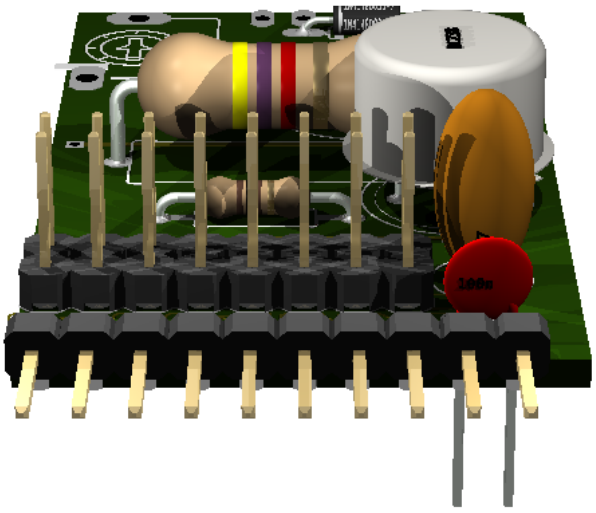
6.4.1 Front



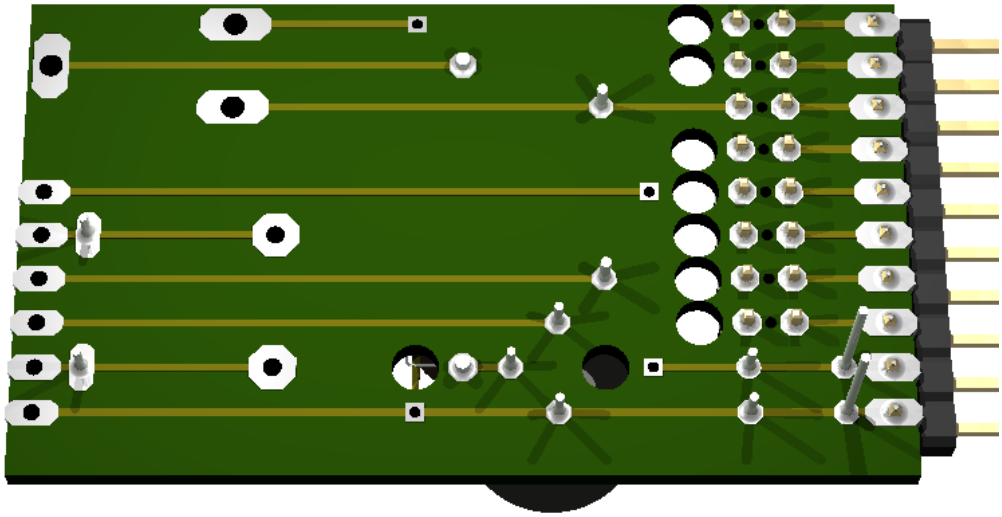
6.4.2 Right side



6.4.3 Left side



6.4.4 Bottom



CHAPTER

SEVEN

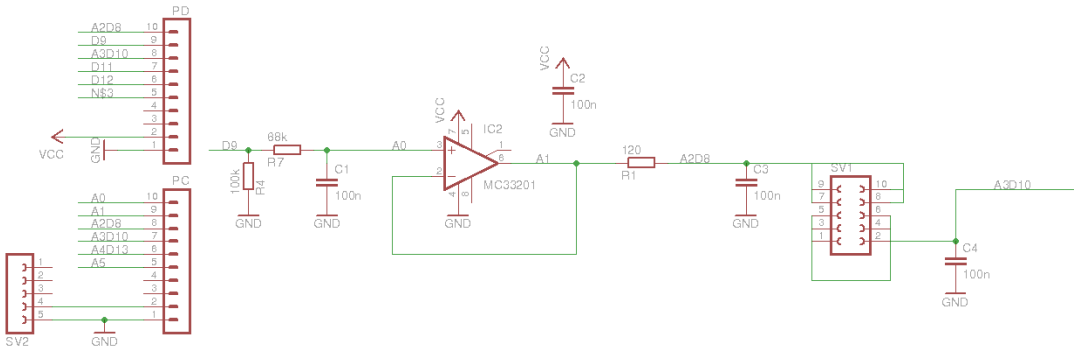
CURVE TRACER

Status: OK

connections:

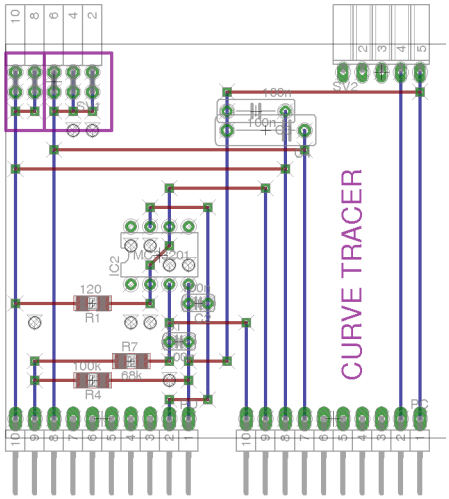
pwm	D9
rail	D10
amp_out	A1
x_in	A2
x_out	A3

7.1 Schematic

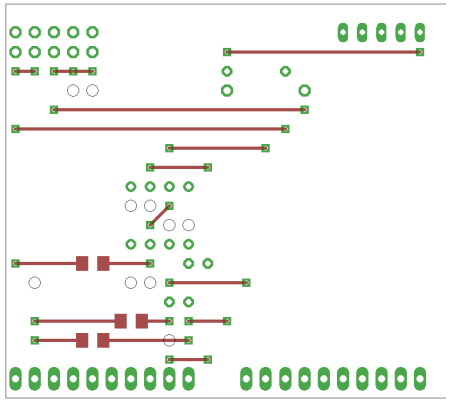


7.2 Board

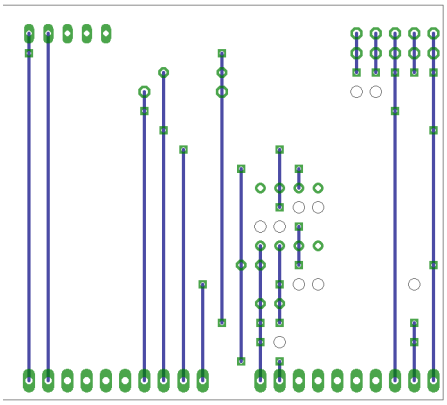
top view:



wires only:



bottom view mirrored:



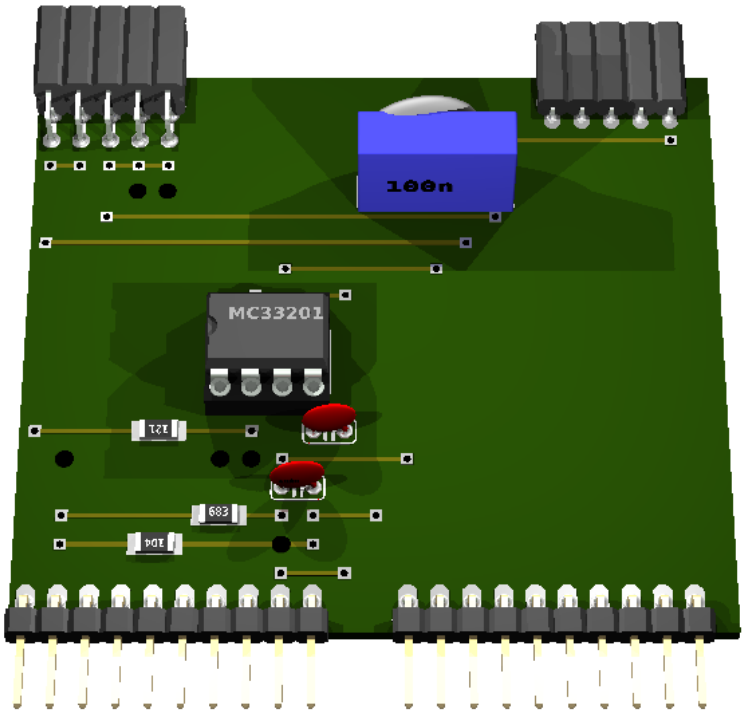
7.3 Partlist

Table 7.1:

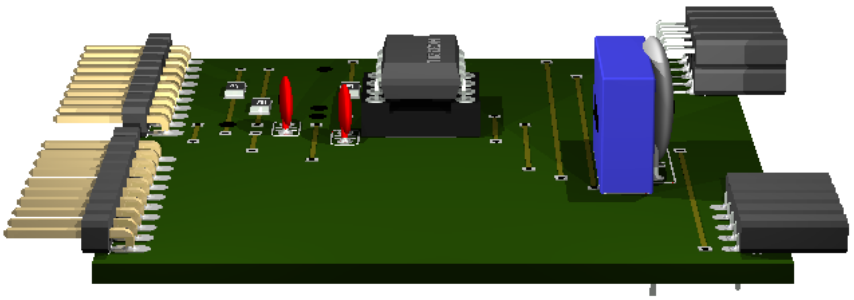
part	value	position
C1	100n	(2.15 0.5)
C2	100n	(2.25 0.7)
C3	100n	(2.55 1.7)
C4	100n	(2.6 1.6)
IC2	MC33201	(2.05 0.95)
PC		(2.95 0.1)
PD		(1.75 0.1)
R1	120	(1.7 0.7)
R4	100k	(1.7 0.3)
R7	68k	(1.9 0.4)
SV1		(1.5 1.85)
SV2		(3.2 1.9)

7.4 3D view

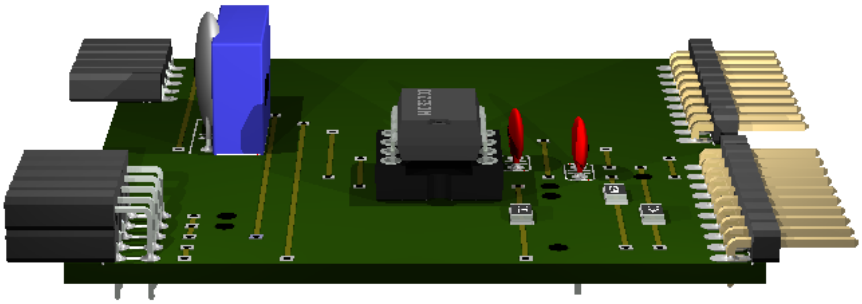
7.4.1 Front



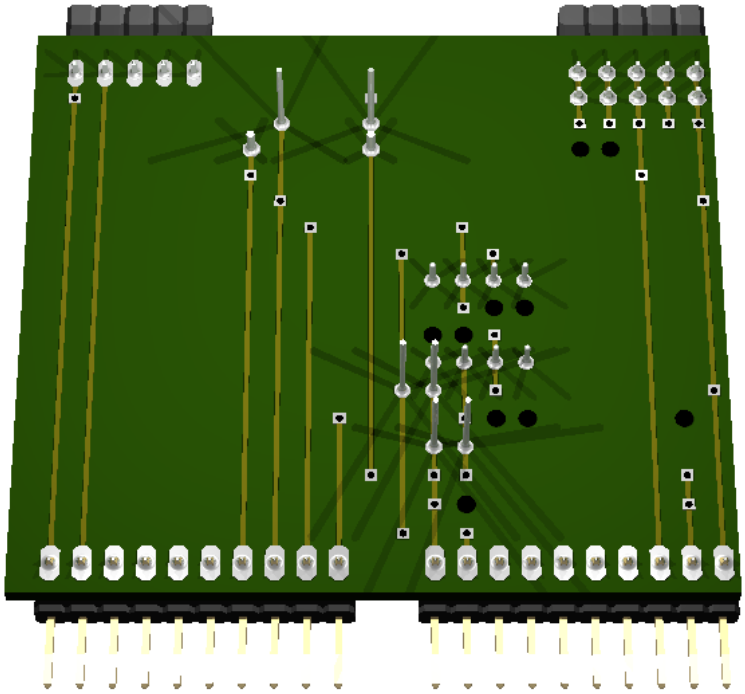
7.4.2 Right side



7.4.3 Left side



7.4.4 Bottom



CHAPTER

EIGHT

ESR METER

Status: ?

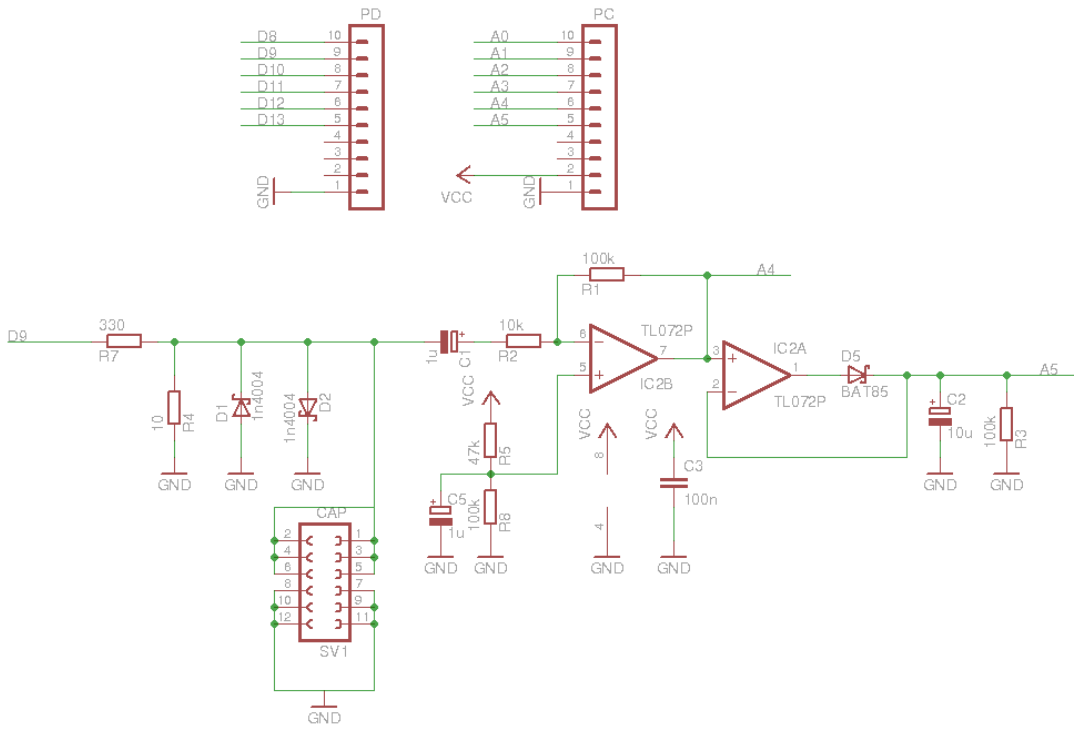
To measure:

- ESR

Similar projects:

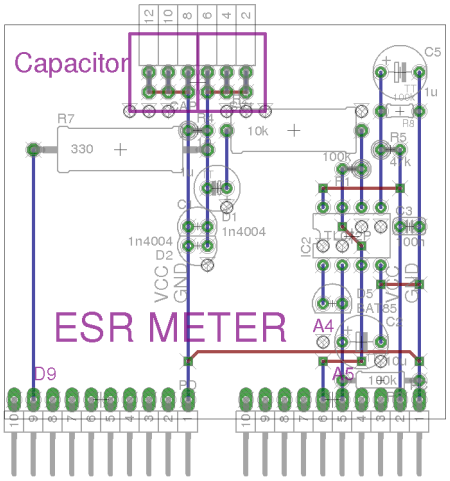
- http://www.qsl.net/ve3lny/esrmeter.html
- http://ludens.cl/Electron/esr/esr.html
- http://members.multimania.co.uk/leeedavison/misc/esr/index.html
- http://kakopa.com/ESR_meter/index.html
- http://members.shaw.ca/swstuff/esrmeter.html

8.1 Schematic

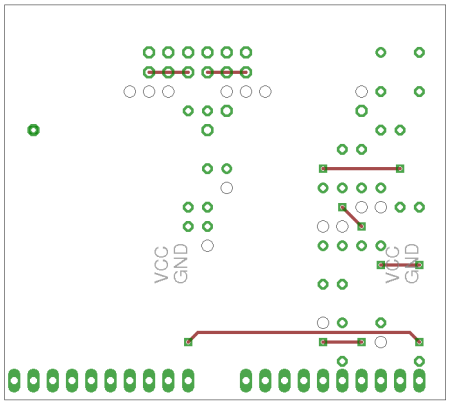


8.2 Board

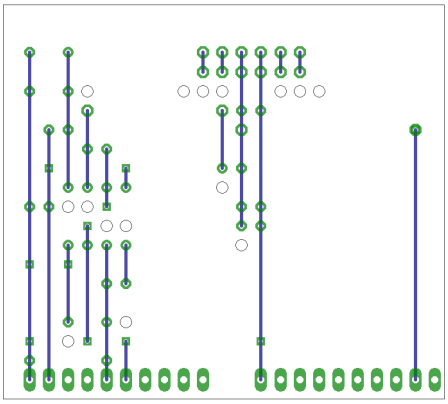
top view:



wires only:



bottom view mirrored:



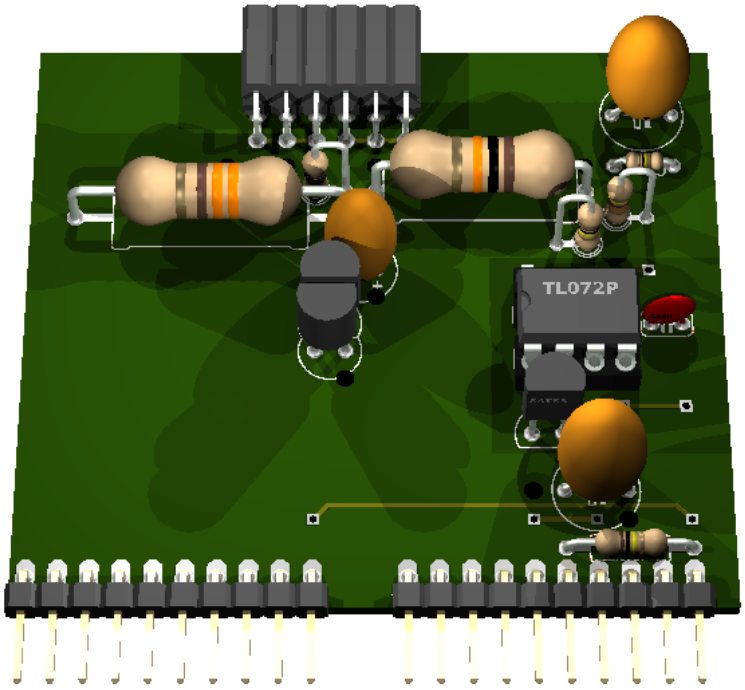
8.3 Partlist

Table 8.1:

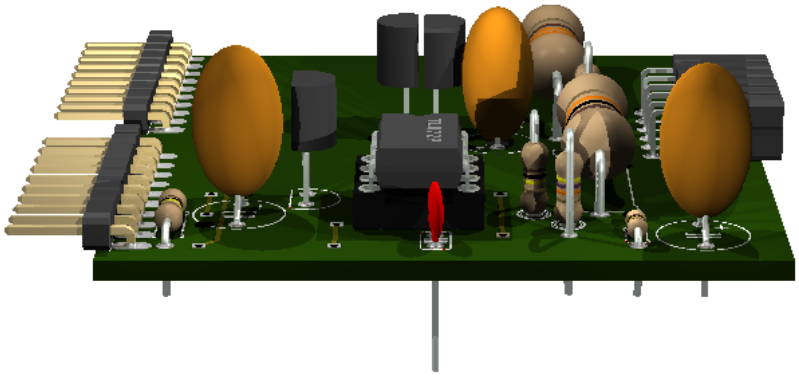
part	value	position
C1	1u	(2.35 1.2)
C2	10u	(3.1 0.4)
C3	100n	(3.35 1)
C5	1u	(3.3 1.8)
D1	1n4004	(2.25 1)
D2	1n4004	(2.25 0.9)
D5	BAT85	(2.95 0.6)
IC2	TL072P	(3.05 0.95)
PC		(2.95 0.1)
PD		(1.75 0.1)
R1	100k	(3.05 1.3)
R2	10k	(2.75 1.5)
R3	100k	(3.2 0.2)
R4	10	(2.25 1.5)
R5	47k	(3.25 1.4)
R7	330	(1.85 1.4)
R8	100k	(3.3 1.6)
SV1	CAP	(2.25 1.75)

8.4 3D view

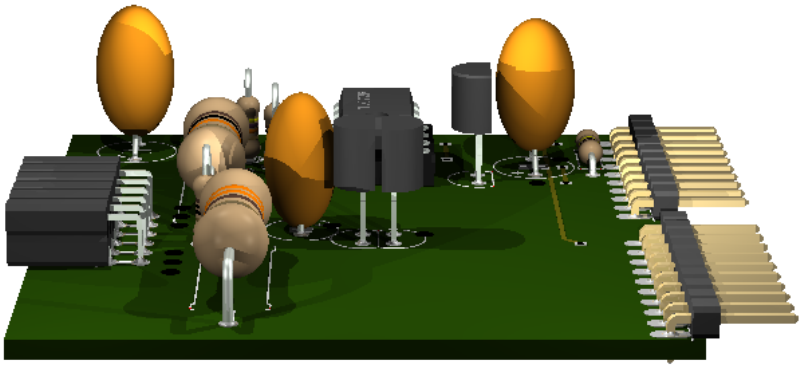
8.4.1 Front



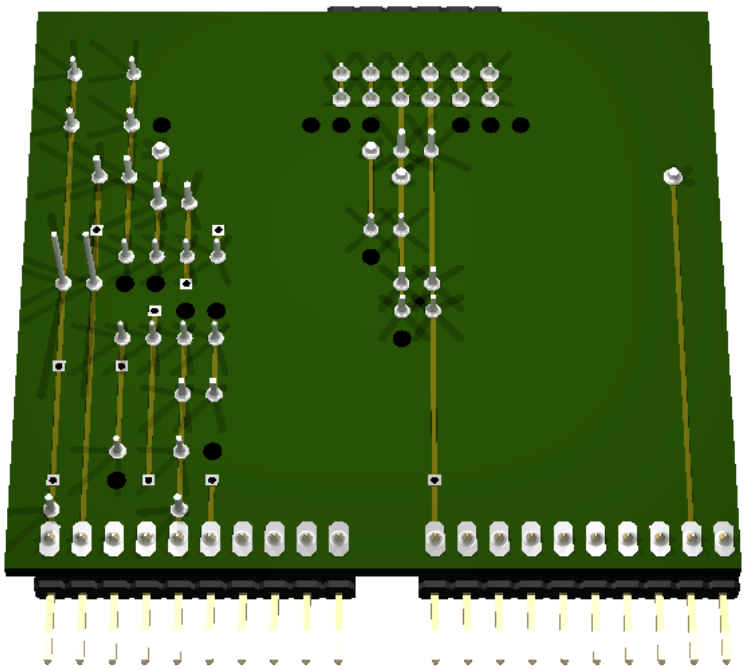
8.4.2 Right side



8.4.3 Left side



8.4.4 Bottom



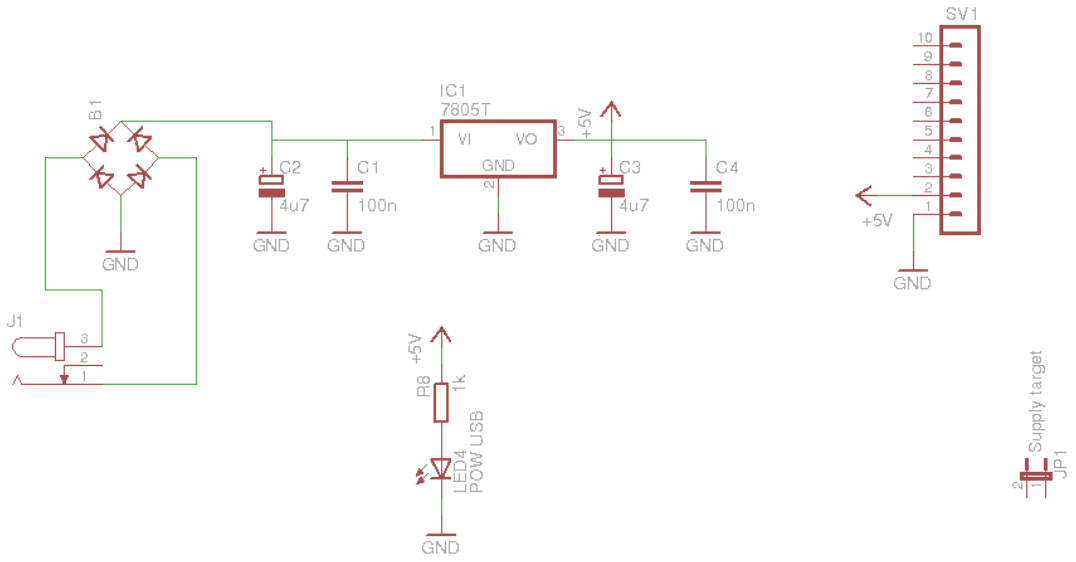
CHAPTER

NINE

EXTERNAL POWER

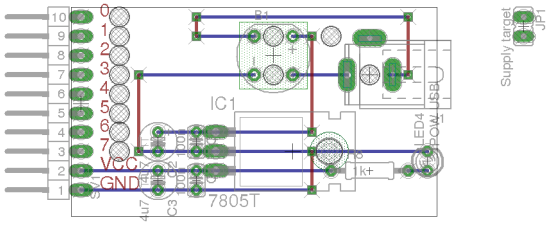
Status: under construction

9.1 Schematic

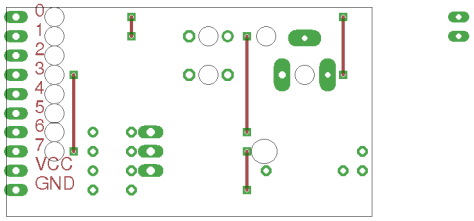


9.2 Board

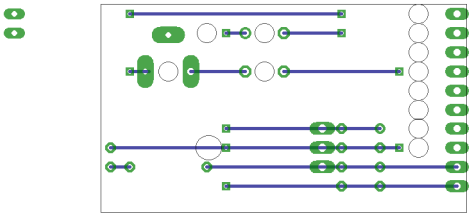
top view:



wires only:



bottom view mirrored:



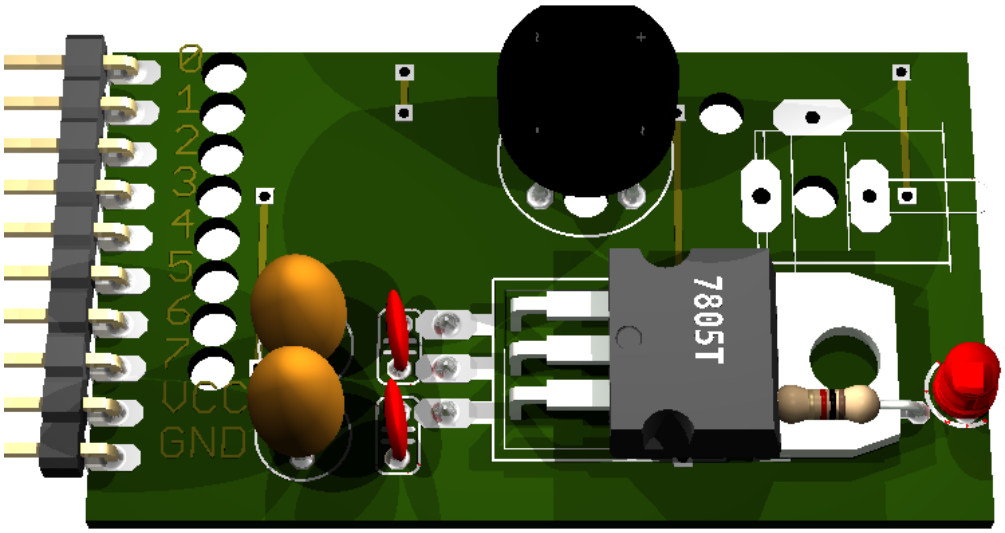
9.3 Partlist

Table 9.1:

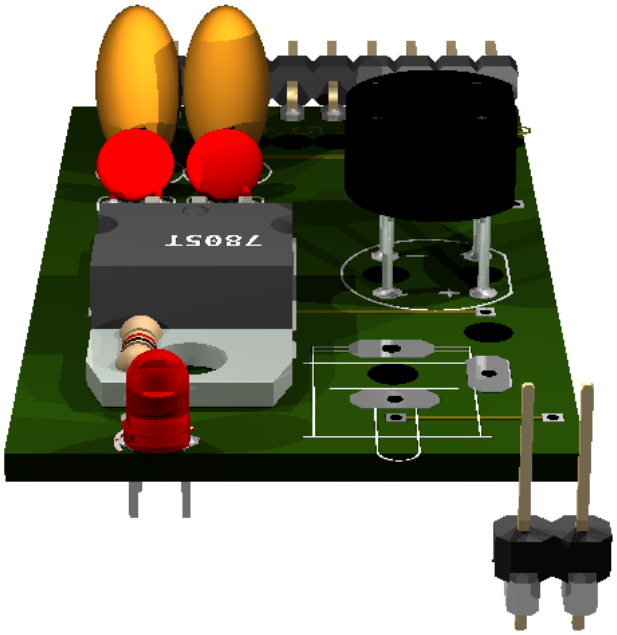
part	value	position
B1		(1.5 0.9)
C1	100n	(1.1 0.45)
C2	4u7	(0.9 0.45)
C3	4u7	(0.9 0.25)
C4	100n	(1.1 0.25)
IC1	7805T	(1.6 0.4)
J1		(2 0.8)
JP1	Supply target	(2.8 1.05)
LED4	POW USB	(2.3 0.35)
R8	1k	(2 0.3)
SV1		(0.5 0.65)

9.4 3D view

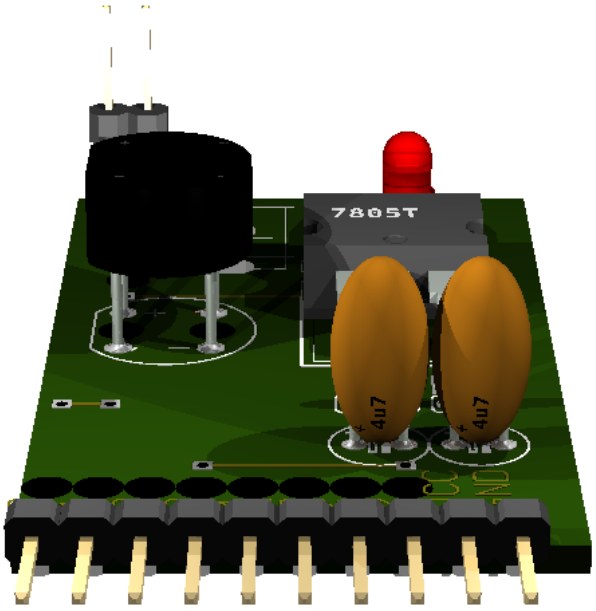
9.4.1 Front



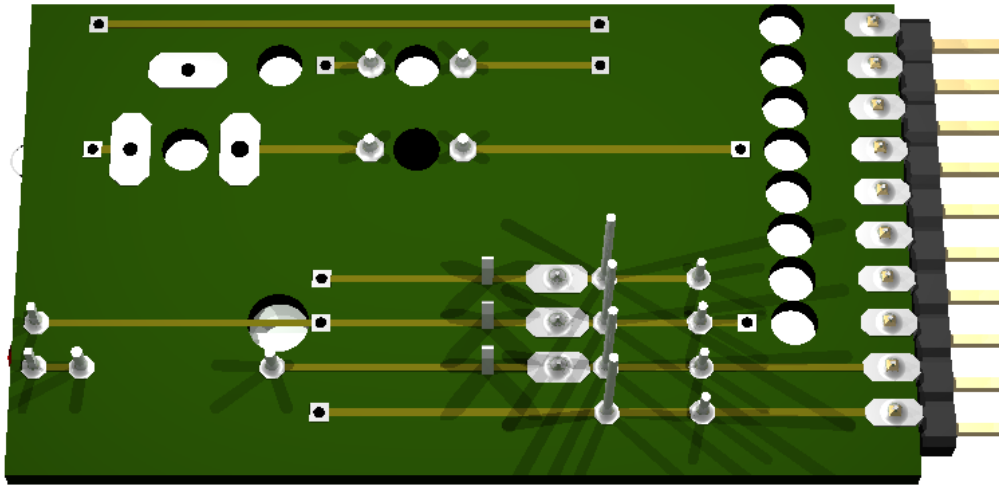
9.4.2 Right side



9.4.3 Left side



9.4.4 Bottom



CHAPTER

TEN

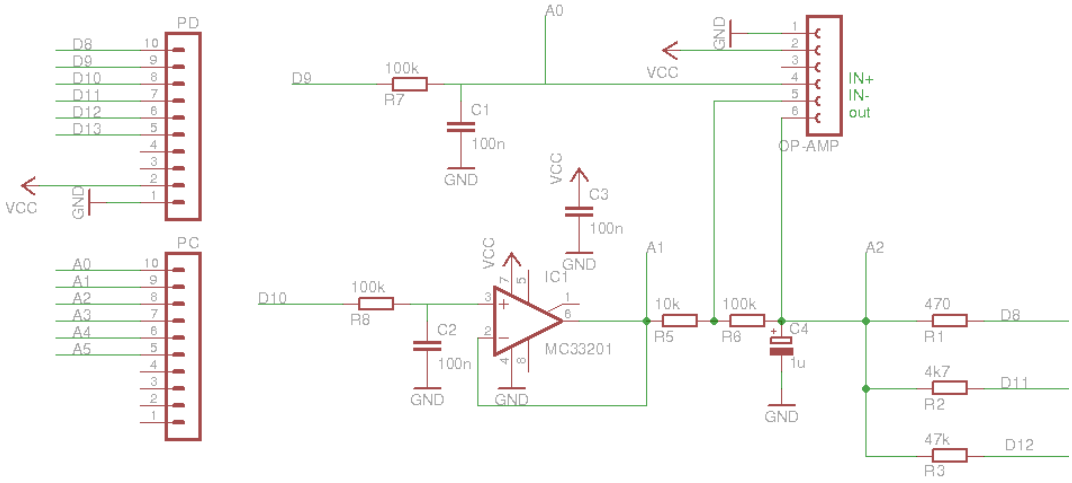
OP-AMP INPUT/OUPUT VOLTAGE RANGE TEST

Status: OK

To measure:

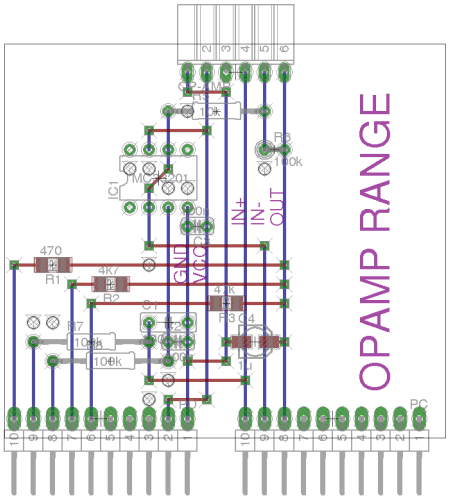
- op-amp output voltage swing
- op-amp common mode input voltage range

10.1 Schematic

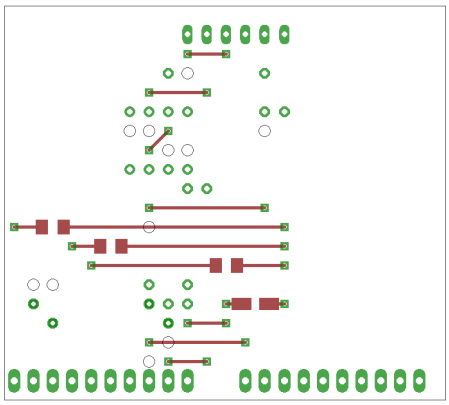


10.2 Board

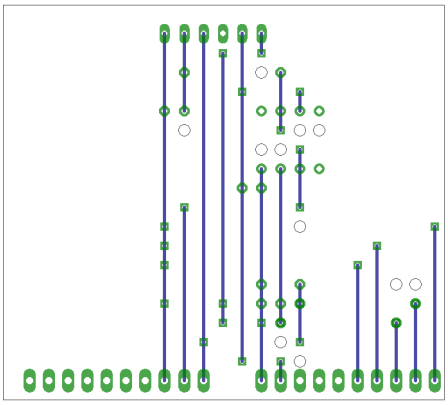
top view:



wires only:



bottom view mirrored:



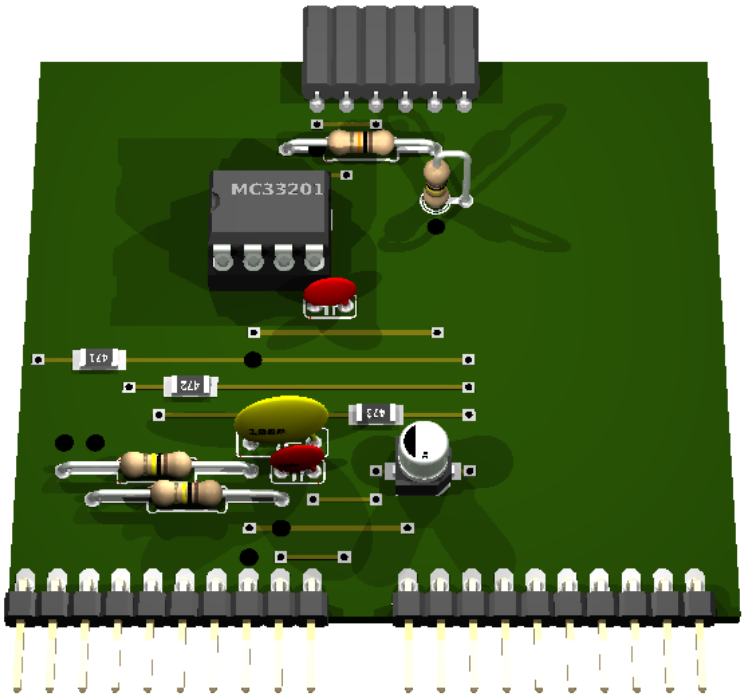
10.3 Partlist

Table 10.1:

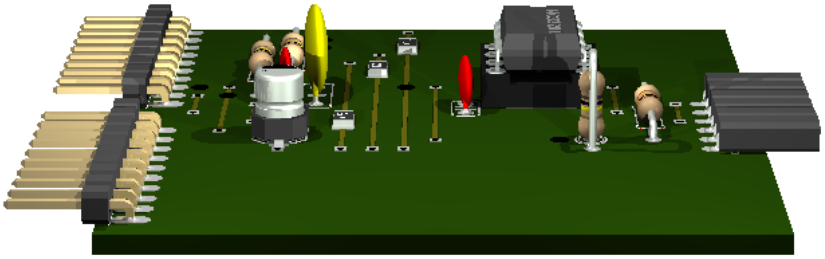
part	value	position
C1	100n	(2.1 0.6)
C2	100n	(2.15 0.5)
C3	100n	(2.25 1.1)
C4	1u	(2.55 0.5)
IC1	MC33201	(2.05 1.35)
OP-AMP		(2.45 1.9)
PC		(2.95 0.1)
PD		(1.75 0.1)
R1	470	(1.5 0.9)
R2	4k7	(1.8 0.8)
R3	47k	(2.4 0.7)
R5	10k	(2.35 1.7)
R6	100k	(2.65 1.5)
R7	100k	(1.7 0.5)
R8	100k	(1.8 0.4)

10.4 3D view

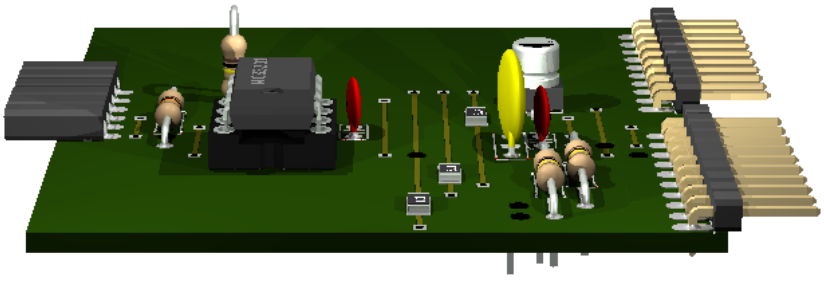
10.4.1 Front



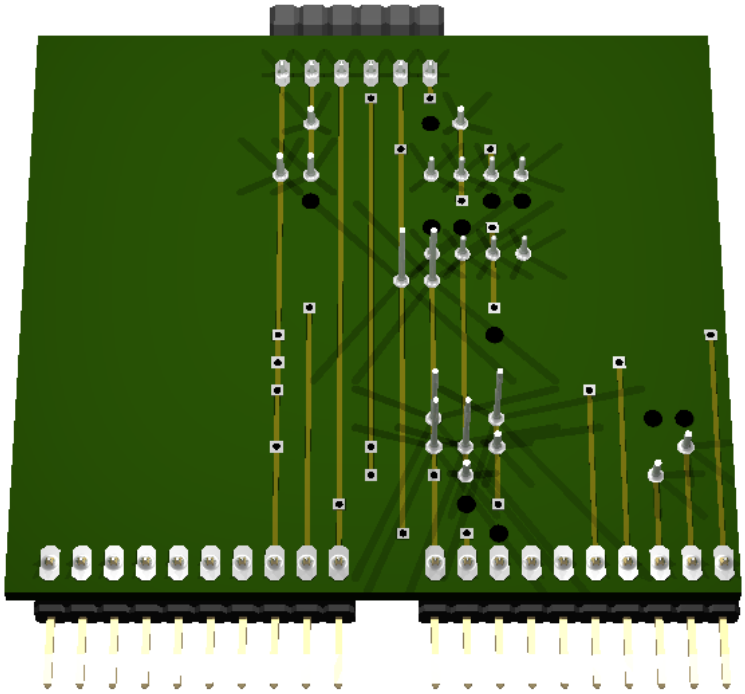
10.4.2 Right side



10.4.3 Left side



10.4.4 Bottom



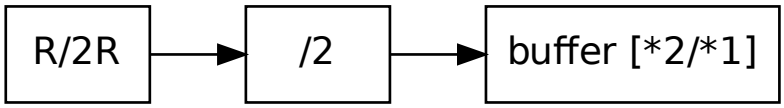
CHAPTER

ELEVEN

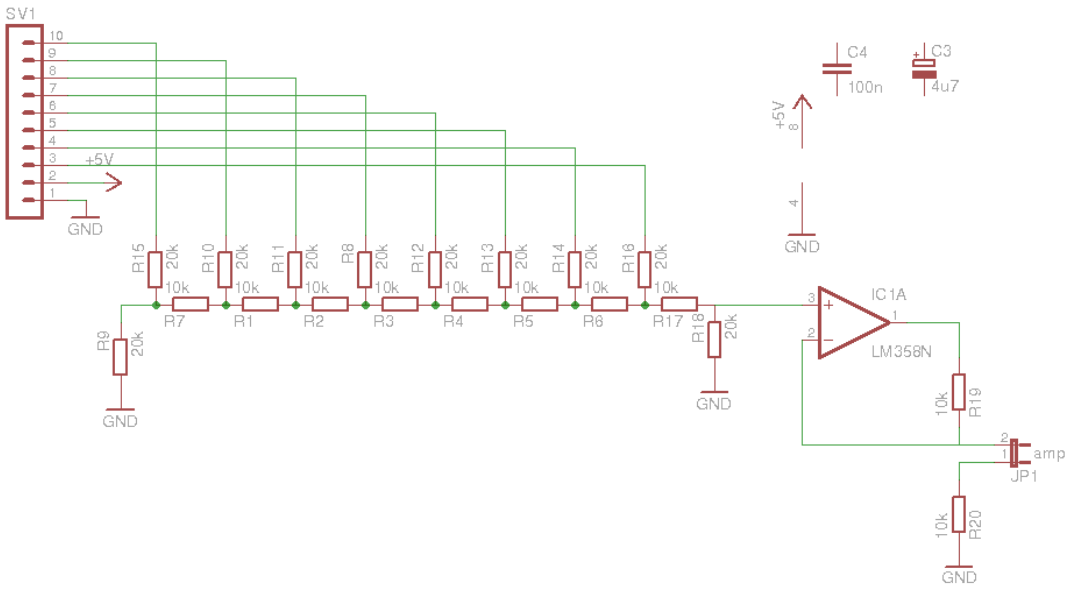
R2R_LADDER_DAC

Status: under construction

http://www.ikalogic.com/dac08.php

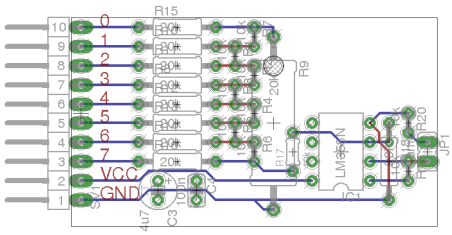


11.1 Schematic

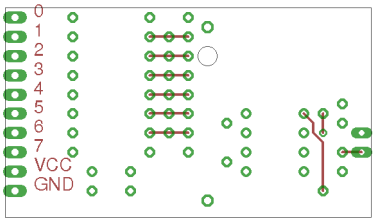


11.2 Board

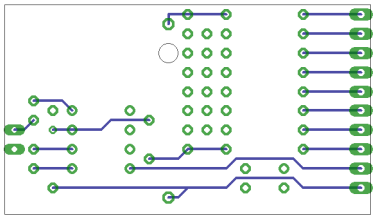
top view:



wires only:



bottom view mirrored:



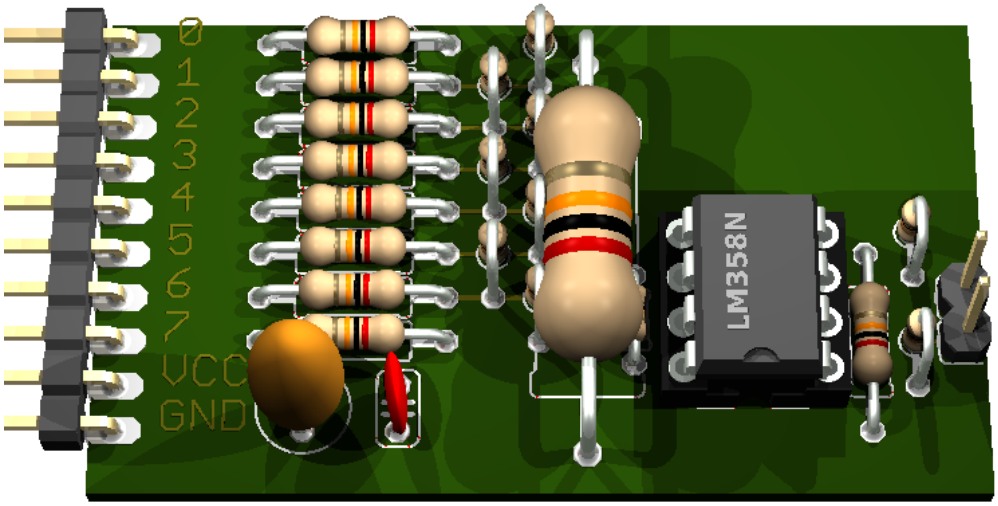
11.3 Partlist

Table 11.1:

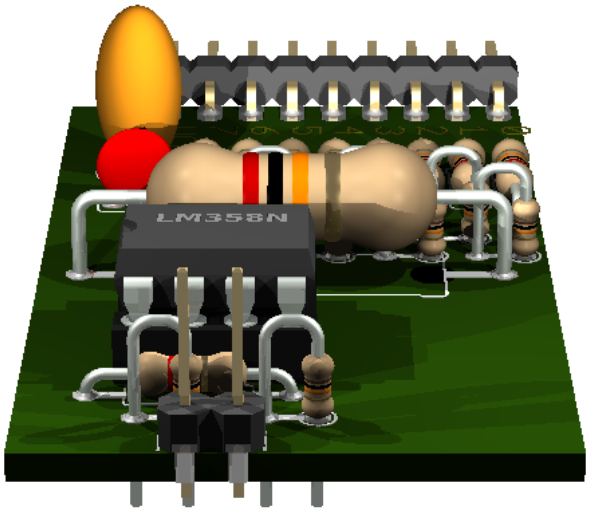
part	value	position
C3	4u7	(0.9 0.25)
C4	100n	(1.1 0.25)
IC1	LM358N	(1.85 0.45)
JP1	amp	(2.3 0.45)
R1	10k	(1.3 0.95)
R2	10k	(1.4 0.85)
R3	10k	(1.3 0.75)
R4	10k	(1.4 0.65)
R5	10k	(1.3 0.55)
R6	10k	(1.4 0.45)
R7	10k	(1.4 1.05)
R8	20k	(1 0.8)
R9	20k	(1.5 0.6)
R10	20k	(1 1)
R11	20k	(1 0.9)
R12	20k	(1 0.7)
R13	20k	(1 0.6)
R14	20k	(1 0.5)
R15	20k	(1 1.1)
R16	20k	(1 0.4)
R17	10k	(1.6 0.45)
R18	20k	(2.1 0.4)
R19	10k	(2.2 0.35)
R20	10k	(2.2 0.6)
SV1		(0.5 0.65)

11.4 3D view

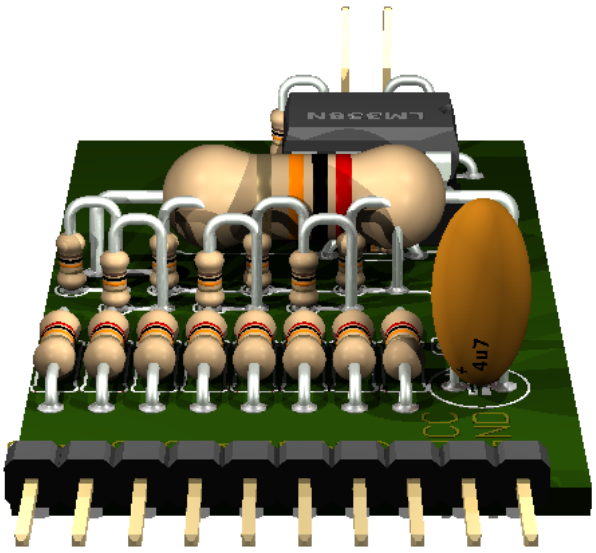
11.4.1 Front



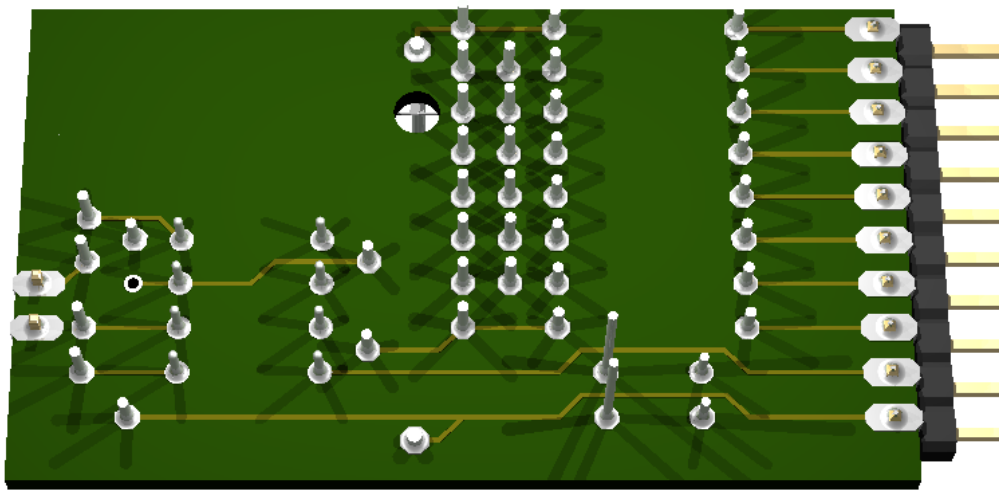
11.4.2 Right side



11.4.3 Left side



11.4.4 Bottom



CHAPTER

TWELVE

RS232 ADAPTER

Status: OK

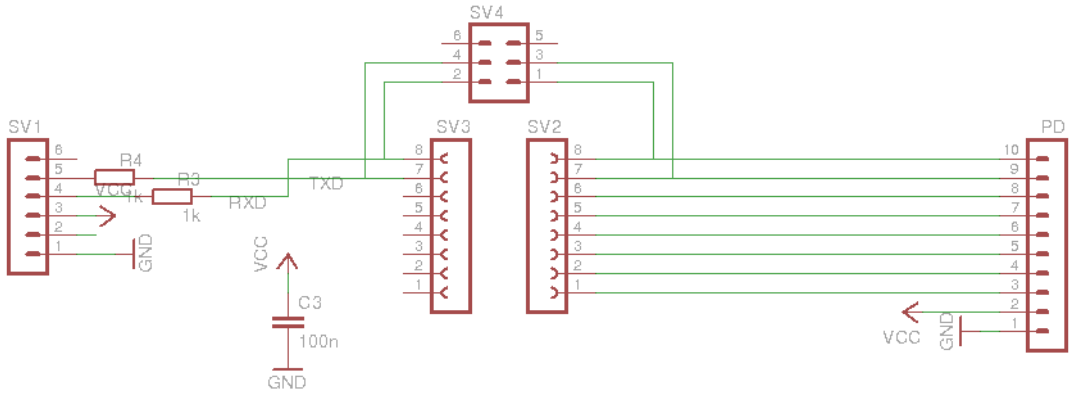
features:

- Jumper pins can be used for default Arduino ports.
- FTDI pinout for RS232 connector

12.1 pins

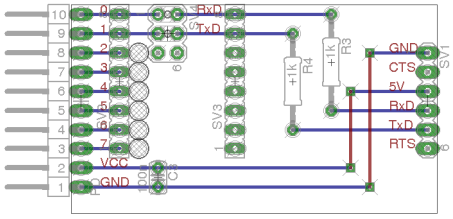
FTDI pin	signal
1	gnd
2	cts
3	5v
4	rxd
5	txd
6	rts

12.2 Schematic

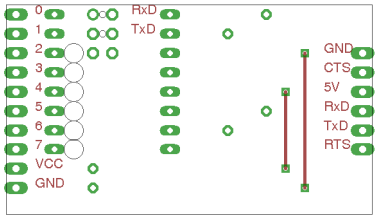


12.3 Board

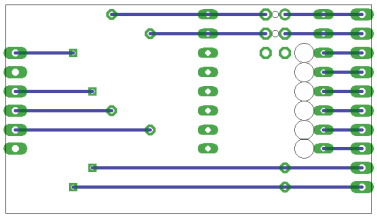
top view:



wires only:



bottom view mirrored:



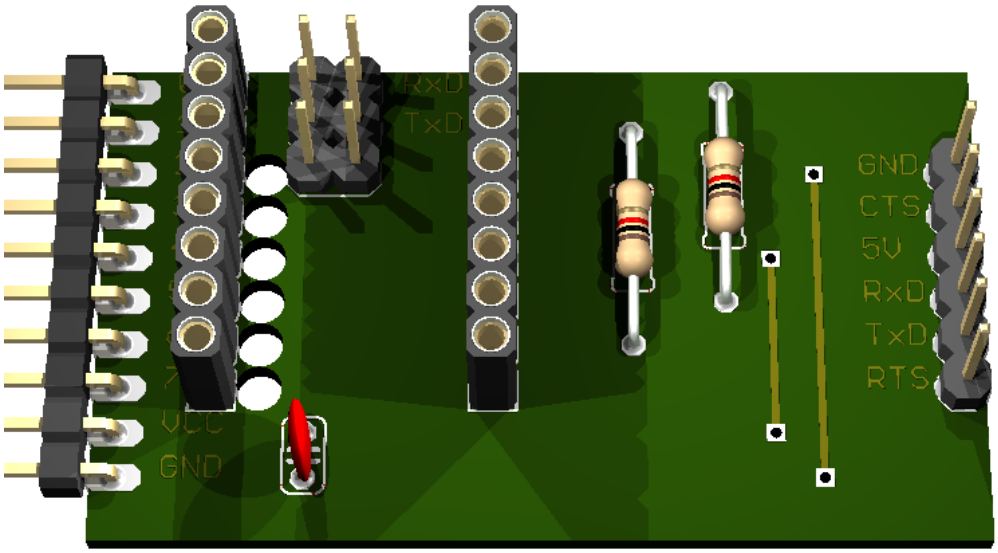
12.4 Partlist

Table 12.1:

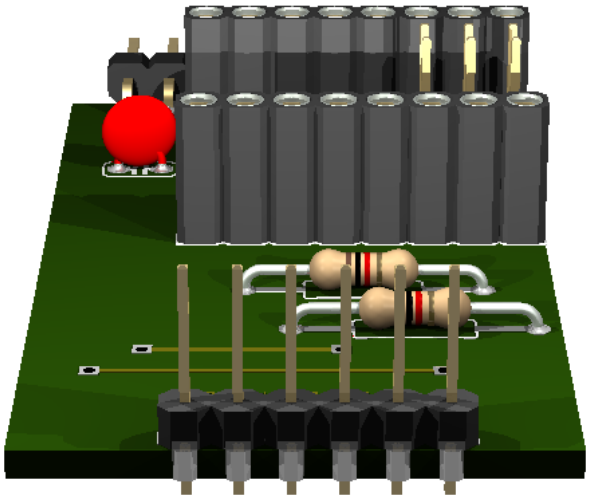
part	value	position
C3	100n	(1.1 0.35)
PD		(0.7 0.75)
R3	1k	(2 0.95)
R4	1k	(1.8 0.85)
SV1		(2.5 0.75)
SV2		(0.9 0.85)
SV3		(1.5 0.85)
SV4		(1.15 1.1)

12.5 3D view

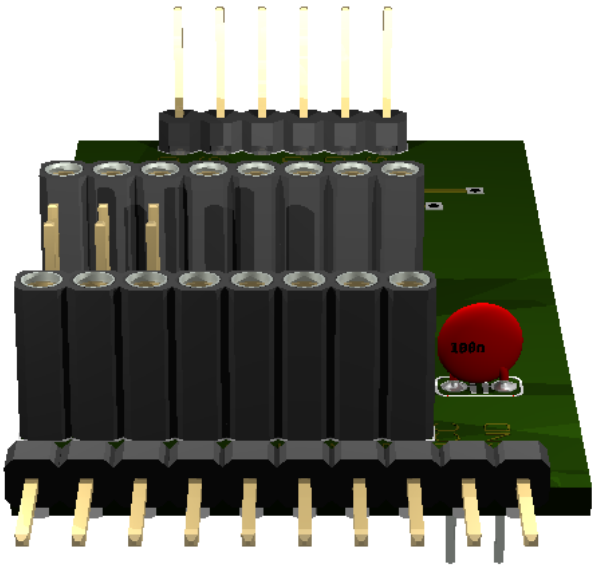
12.5.1 Front



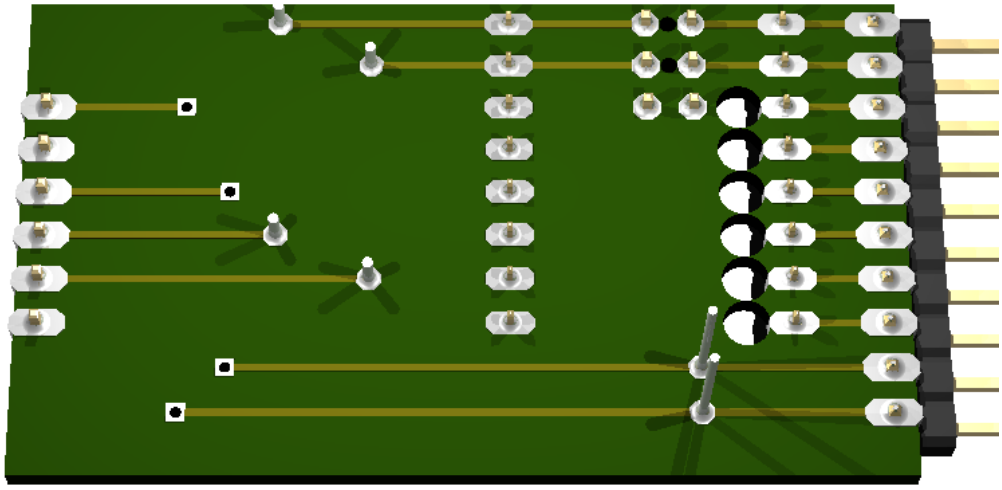
12.5.2 Right side



12.5.3 Left side



12.5.4 Bottom



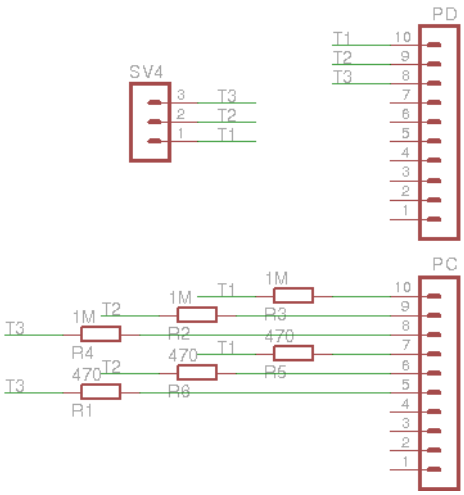
CHAPTER

THIRTEEN

ELECTRONIC COMPONENT TESTER

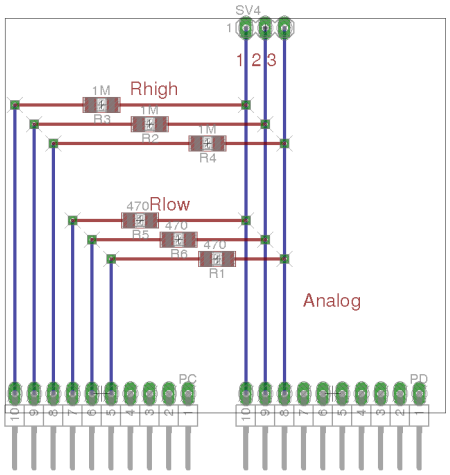
Status: OK

13.1 Schematic

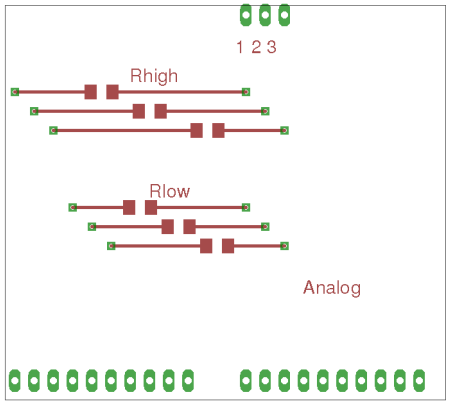


13.2 Board

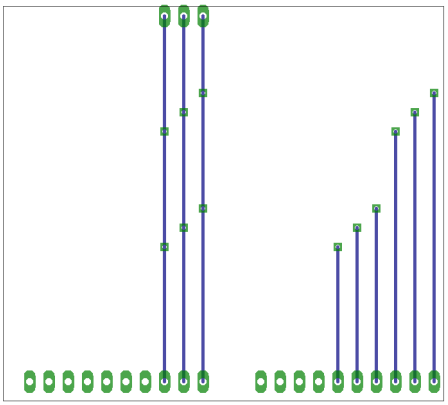
top view:



wires only:



bottom view mirrored:



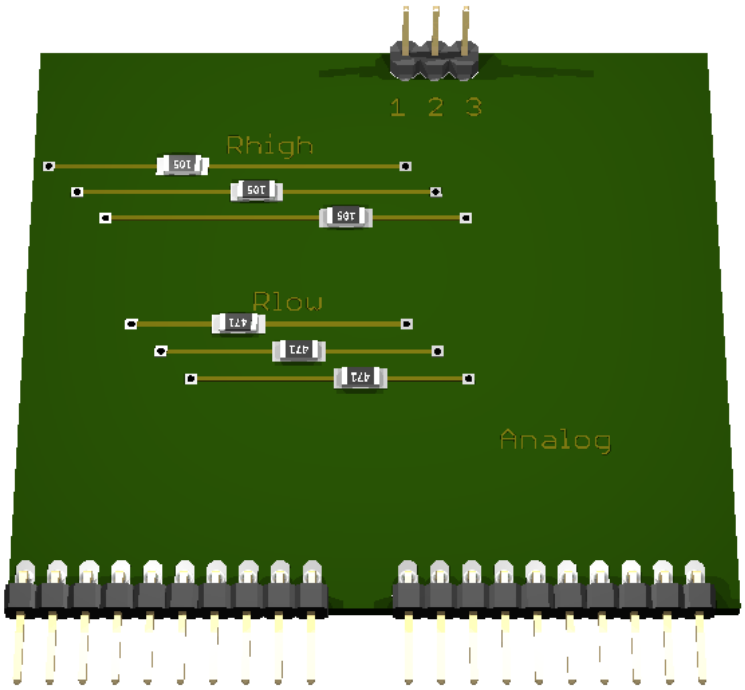
13.3 Partlist

Table 13.1:

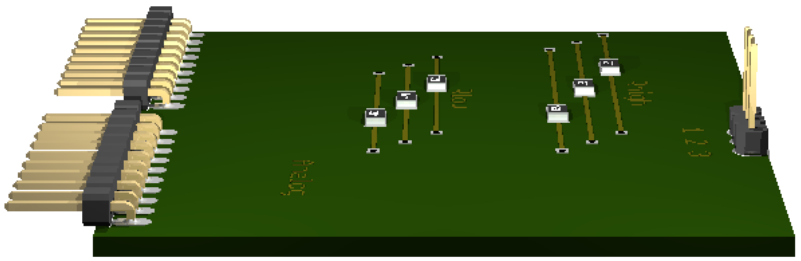
part	value	position
PC		(1.75 0.1)
PD		(2.95 0.1)
R1	470	(2.35 0.8)
R2	1M	(2 1.5)
R3	1M	(1.75 1.6)
R4	1M	(2.3 1.4)
R5	470	(1.95 1)
R6	470	(2.15 0.9)
SV4		(2.6 2)

13.4 3D view

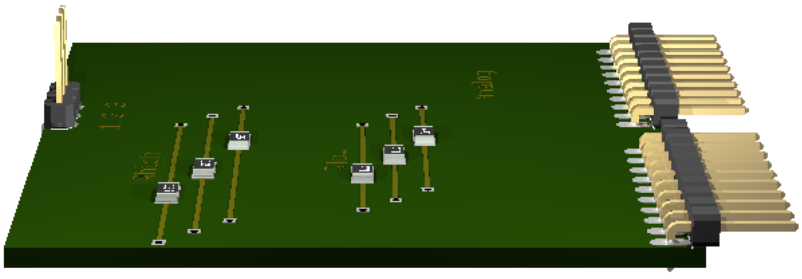
13.4.1 Front



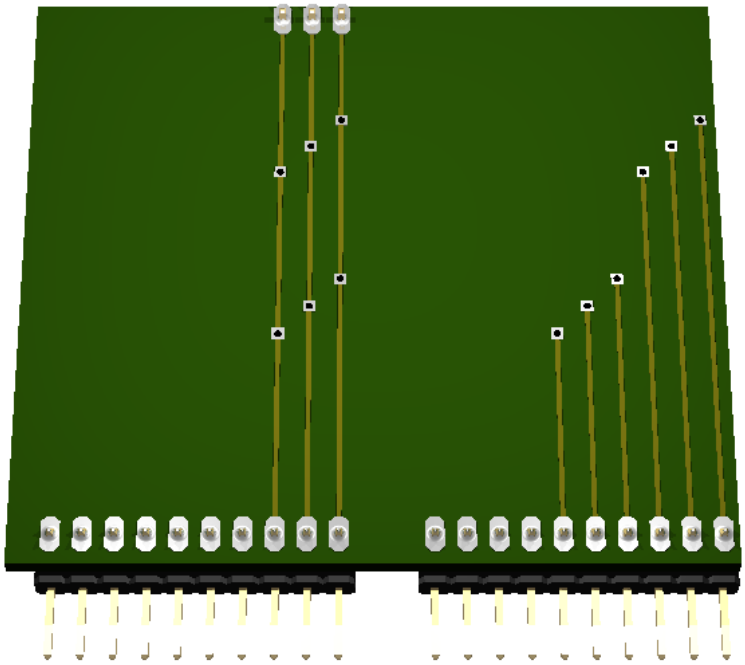
13.4.2 Right side



13.4.3 Left side



13.4.4 Bottom



CHAPTER

FOURTEEN

ARDUINO TVOUT ADAPTER

Status: OK

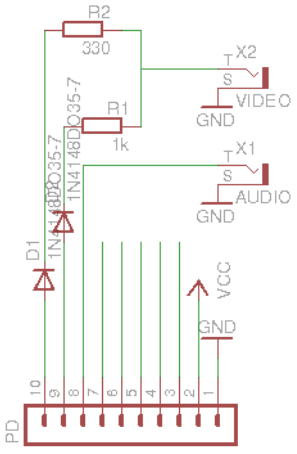
Arduino tvout library interface

features:

14.1 pins

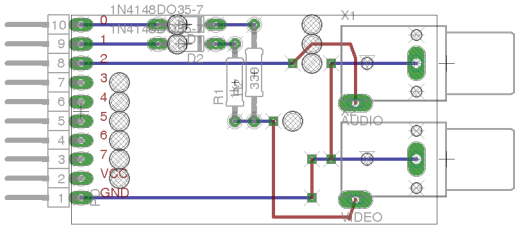
AVR pin	Arduino pin	signal	R
PortB 0	8	video	330
PortB 1	9	sync	1k
PortB 2	10	audio	

14.2 Schematic

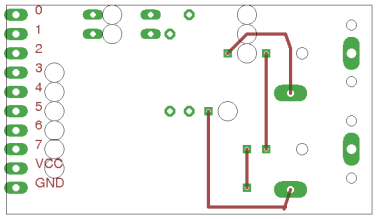


14.3 Board

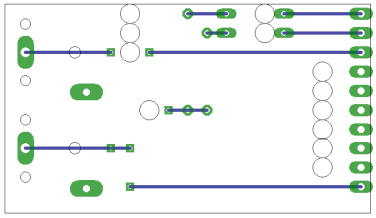
top view:



wires only:



bottom view mirrored:



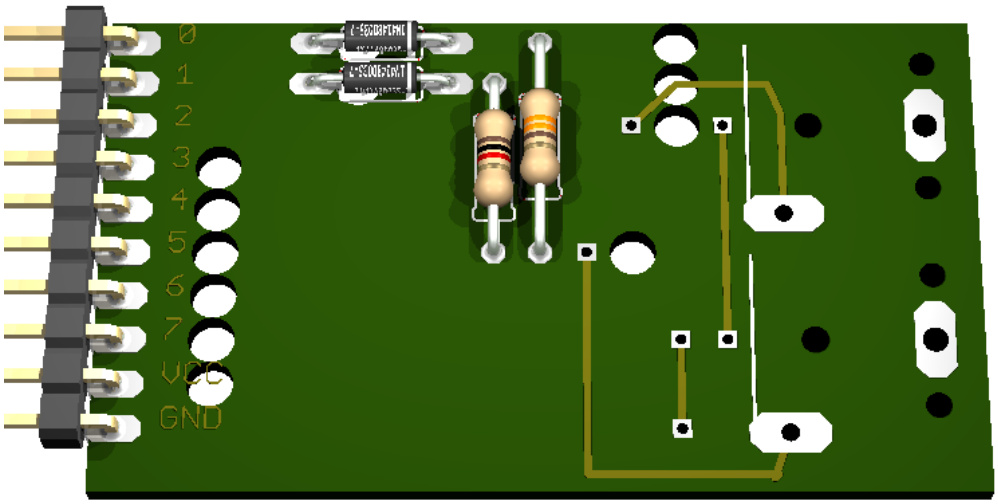
14.4 Partlist

Table 14.1:

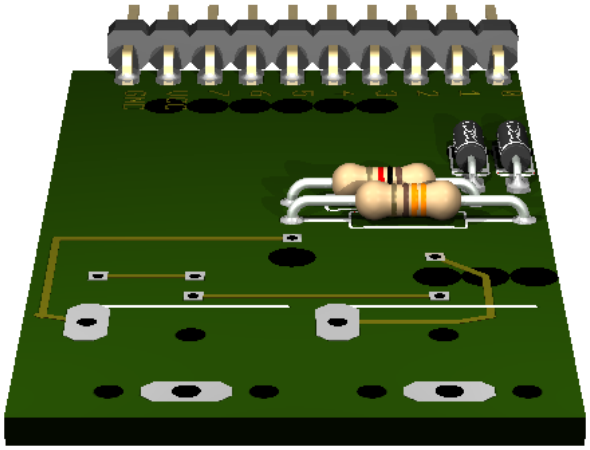
part	value	position
D1	1N4148DO35-7	(1.25 1.2)
D2	1N4148DO35-7	(1.25 1.1)
PD		(0.7 0.75)
R1	1k	(1.5 0.9)
R2	330	(1.6 0.95)
X1	AUDIO	(2.6 1)
X2	VIDEO	(2.6 0.5)

14.5 3D view

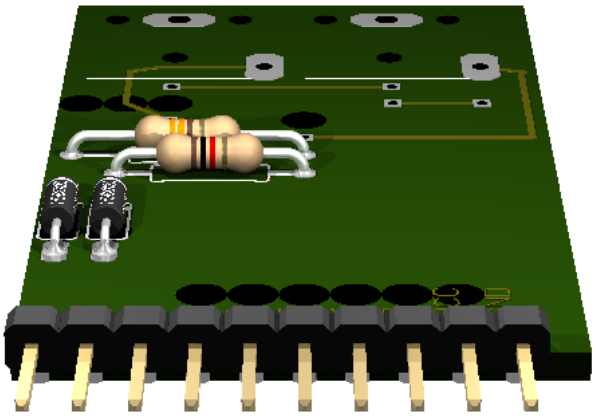
14.5.1 Front



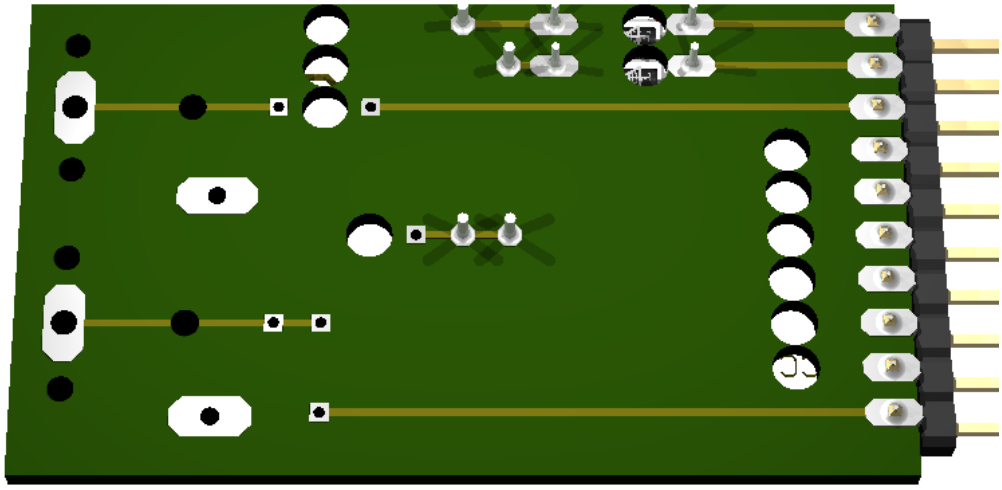
14.5.2 Right side



14.5.3 Left side



14.5.4 Bottom



CHAPTER

FIFTEEN

VOLTAGE TRANSFER

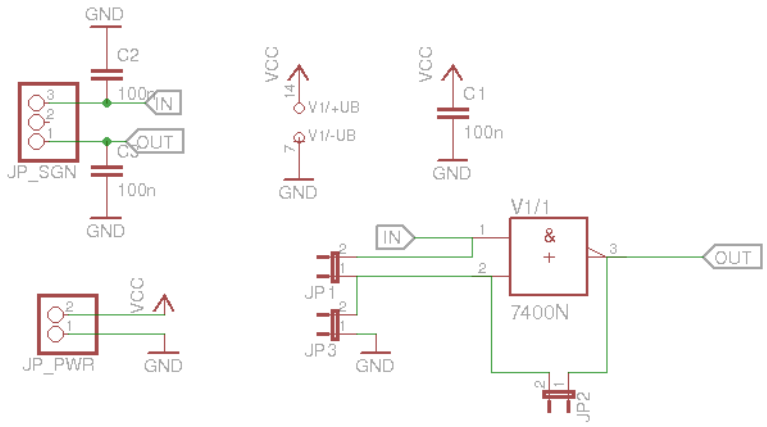
Status: OK

Addon board for curve tracer board.

connections:

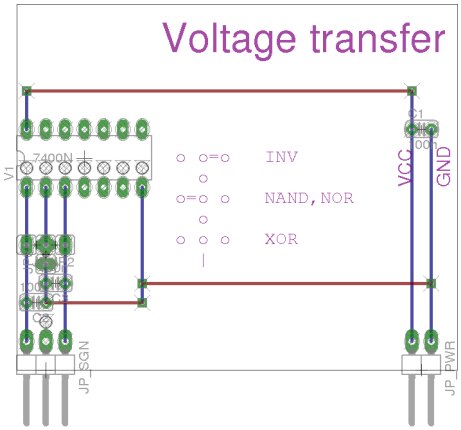
pwm	D9
amp_out	A1
x_in	A2
x_out	A3

15.1 Schematic

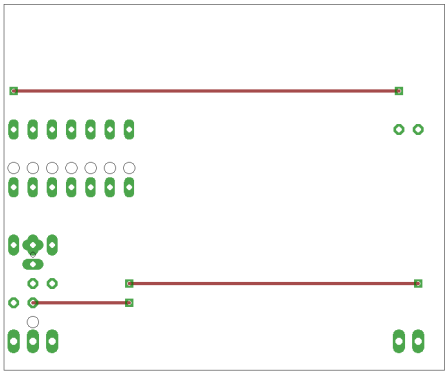


15.2 Board

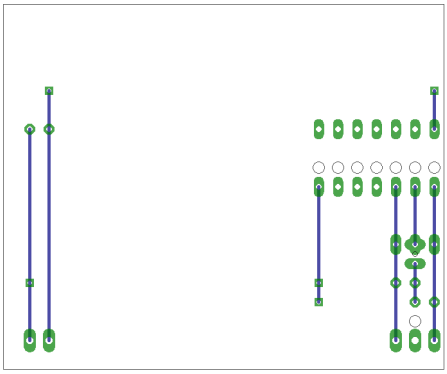
top view:



wires only:



bottom view mirrored:



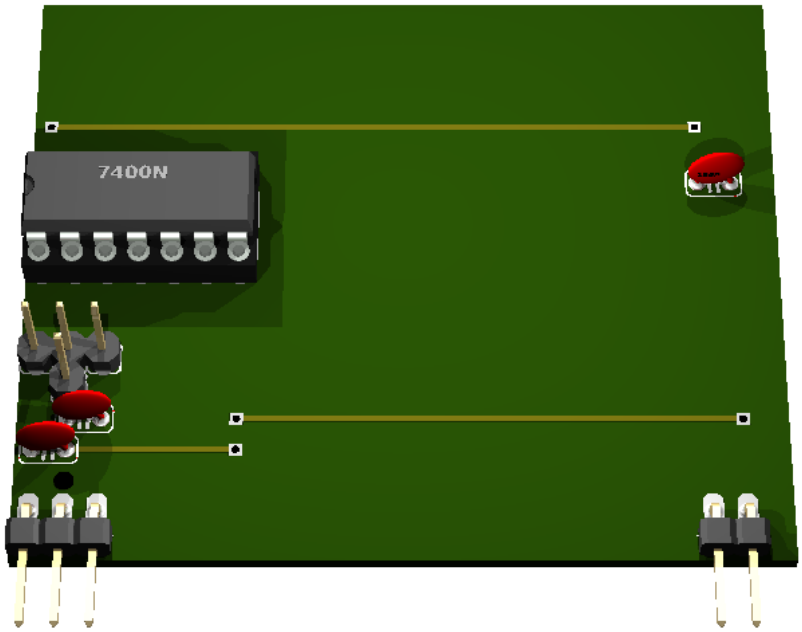
15.3 Partlist

Table 15.1:

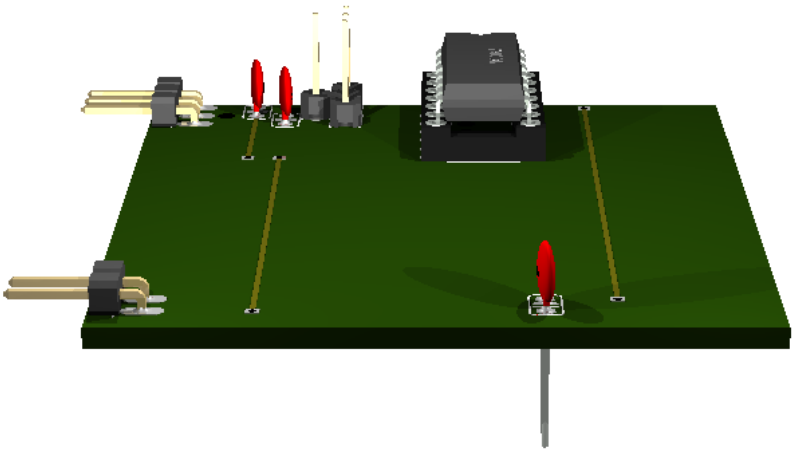
part	value	position
C1	100n	(2.25 1.4)
C2	100n	(0.25 0.5)
C3	100n	(0.35 0.6)
JP1		(0.25 0.8)
JP2		(0.35 0.8)
JP3		(0.3 0.75)
JP_PWR		(2.25 0.15)
JP_SGN		(0.3 0.15)
V1	7400N	(0.5 1.25)

15.4 3D view

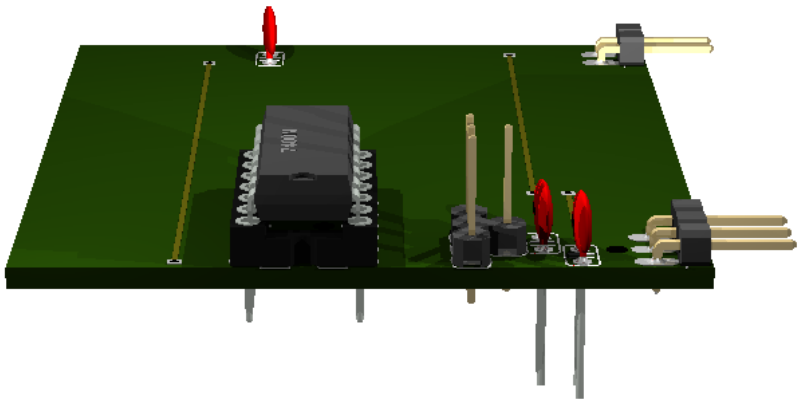
15.4.1 Front



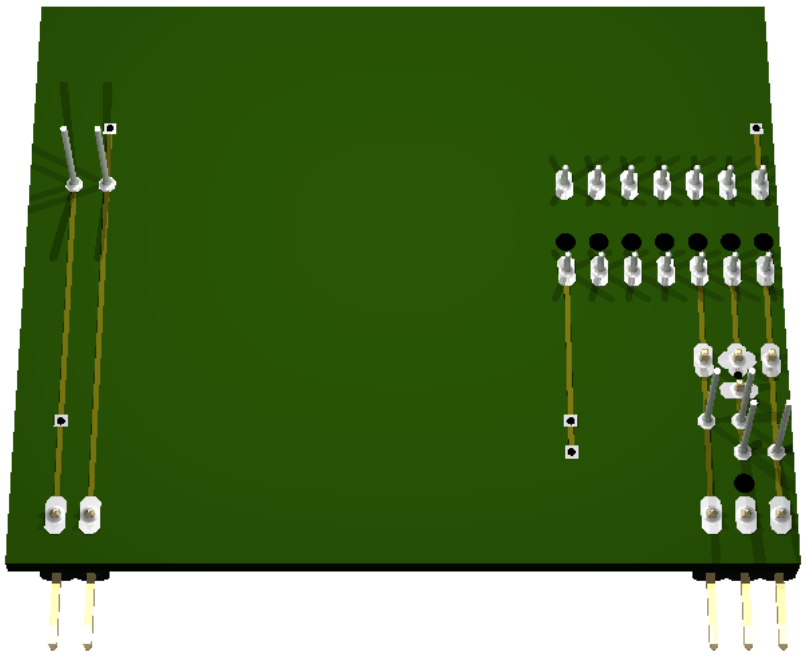
15.4.2 Right side



15.4.3 Left side



15.4.4 Bottom



CHAPTER

SIXTEEN

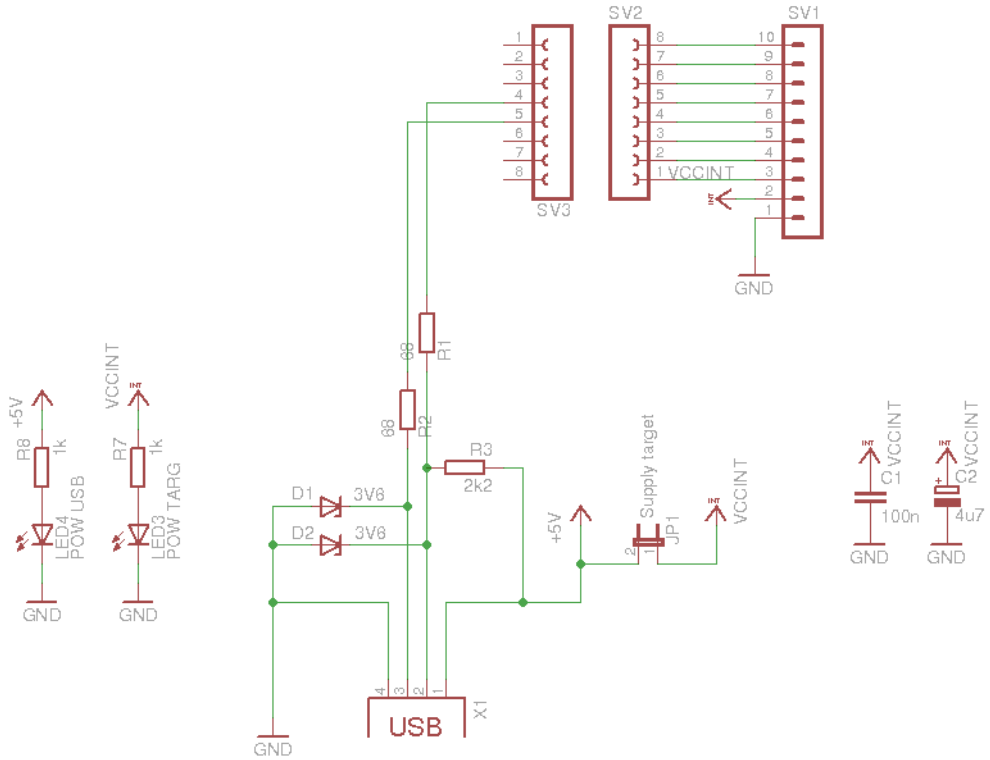
V-USB ADAPTER

Status: OK

TODO:

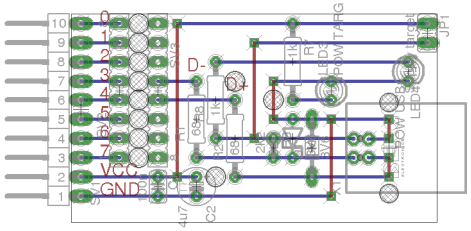
- connect pullup with IO port

16.1 Schematic

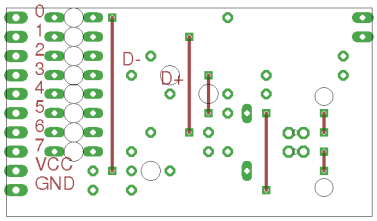


16.2 Board

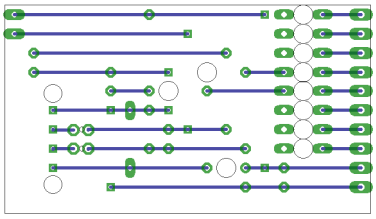
top view:



wires only:



bottom view mirrored:



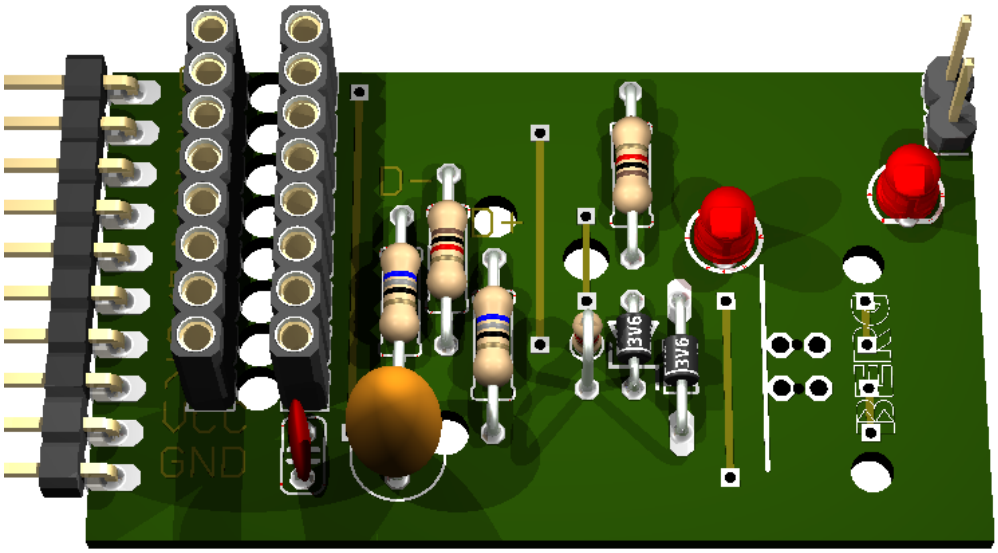
16.3 Partlist

Table 16.1:

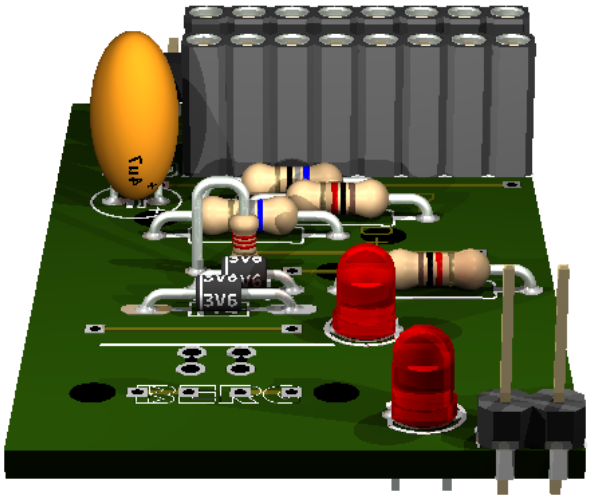
part	value	position
C1	100n	(0.9 0.25)
C2	4u7	(1.1 0.25)
D1	3V6	(1.7 0.45)
D2	3V6	(1.6 0.5)
JP1	Supply target	(2.3 1.05)
LED3	POW TARG	(1.8 0.75)
LED4	POW USB	(2.2 0.85)
R1	68	(1.1 0.6)
R2	68	(1.3 0.5)
R3	2k2	(1.5 0.45)
R7	1k	(1.6 0.9)
R8	1k	(1.2 0.7)
SV1		(0.5 0.65)
SV2		(0.7 0.75)
SV3		(0.9 0.75)
X1		(2.1 0.45)

16.4 3D view

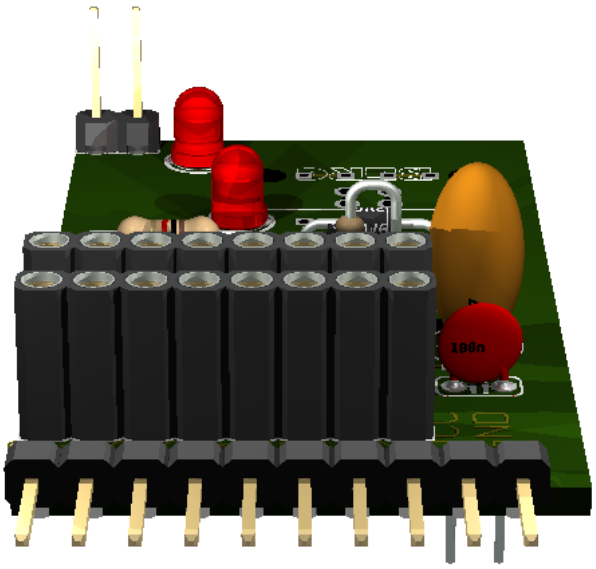
16.4.1 Front



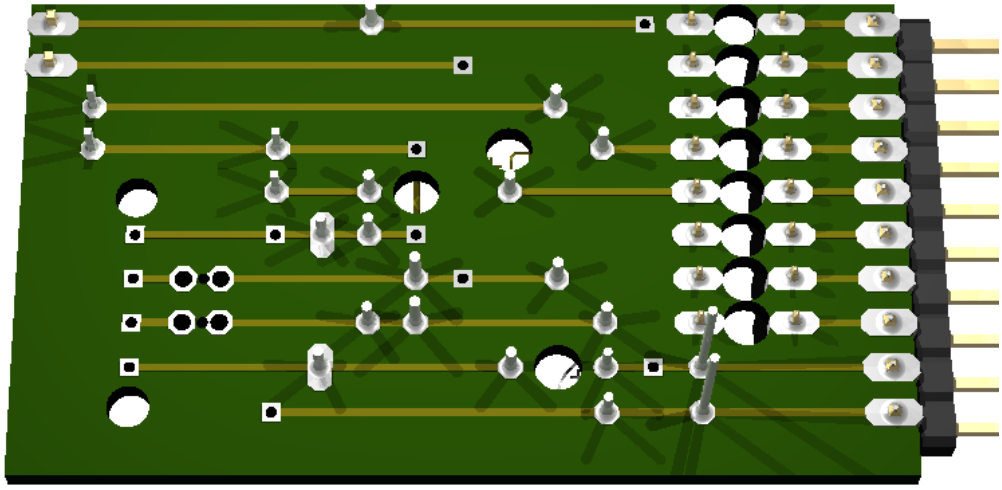
16.4.2 Right side



16.4.3 Left side



16.4.4 Bottom



16.5 original source

http://vusb.wikidot.com/hardware

“Solution B: Level conversion on D+ and D- Level conversion with Zener diodes.

Instead of reducing the AVR’s power supply, we can limit the output voltage on D+ and D- with Zener diodes. We recommend 3.6 V low power types, those that look like 1N4148 (usually 500 mW or less). Low power types are required because they have less capacitance and thus cause less distortion on the data lines. And 3.6 V is better than 3.3 V because 3.3 V diodes yield only ca. 2.7 V in conjunction with an 1.5 kΩ (or more exactly 10 kΩ) pull-up resistor. With 3.3 V diodes, the device may not be detected reliably.

If you use Zener diodes for level conversion, please measure the voltage levels to make sure that the diodes you have chosen match the requirements.

Advantages of the Zener diode approach:

- Low cost.
- Easy to obtain.
- Entire design can be at 5 V.
- AVR can be clocked at high rates.

Disadvantages:

- Not a clean solution, a compromise between all parameters must be found.

- Zener diodes come with a broad range of characteristics, especially at low currents, results may not be reproducible.
- High currents when sending high-level.
- High level is different for signaling and in idle state because signaling uses high currents to drive the diodes while idle state is driven by a 1.5 kΩ pull-up resistor."