2708/2716 EPROM Programmer

Instruction Manual & Functional Description

Contents

1 Introduction

This card has been designed to be a functional replacement for the Bits & PCs Nascom EPROM Programmer. It is fully compatible with the existing software.

The card is a completely new implementation of the design with a number of improvements over the original:

- Completely new track layout
- All components are readily available from commercial component suppliers (..and eBay!)
- Switches are fitted to standard 12 PIN DIL sockets
- LED power indicator
- Power test point
- Nice colour!

2 Components

Reference(s)	Value	Component
C5, C6, C7, C9	10nf	Ceramic disc capacitor
C8, C11	100nf	Ceramic disc capacitor
C10	47nf	Ceramic disc capacitor
D1, D2	BAT48RL	Signal diode
D3	24v (e.g. BZX85C24)	Zener diode
D4	4.7V (e.g. BZX55C4V7)	Zener diode
D5, D6	1N4148	Diode
D7	LED	LED
IC1	NE555P	555 Timer (*)
IC2	4049	Hex inverter
IC3	4040	12 stage counter
PL1	PIO Connection	26-way connector
PWR1	12V Feed	Pin
PWR2	-5V Feed	Pin
R1, R30	680	Resistor
R2, R4, R8, R13, R19, R20	10K	Resistor
R3	560	Resistor
R5	180	Resistor
R6	47	Resistor
R7	33K	Resistor
R9, R14, R15	1K	Resistor
R10	820K	Resistor
R11	47K	Resistor
R12, R16, R17, R18	1M	Resistor
R21, R22, R23, R24, R25, R26, R27, R28, R29	4K7	Resistor
SKT1-ZIF-Donor_1, SKT2-ZIF-Target_1	ZIF Socket 24 Pin DIP	ZIF sockets
SW_2708_2716_1, SW_POWER_1	4PDT Switch	Part ASE4204
T1, T2	22uf	Tantalum capacitor
T3, T4	2.2uf	Tantalum capacitor
TP1	Test point	N/A
TR1	2N2102	Transistor
TR2	BC558	Transistor
TR3, TR4, TR5, TR6, TR7	BC548	Transistor

3 Construction

3.1 Before you start construction

Inspect the PCB for any visible signs of damage

Select your components:

- Turned pin sockets are recommended due to robustness and reliability
- Tantalum capacitors can be temperamental. Make sure they are inserted with the correct polarity, are of good quality and are overrated voltage wise.

IC1 & IC2 are static sensitive. Handling precautions need to be observed.

3.2 Order of construction

The recommended order of construction is:

- Resistors
- Sockets
- Disc capacitors
- Tantalum capacitors
- Insert switches
- LED
- 26 Way connector
- Insert IC’s
- Connections for 12V and -5V

4 Switch Connections

The pins for the switches are organized in groups of connections, with the middle being the common.

For example, SW_POWER_1, selected either:

1-2, 4-5, 12-11, 9-8

Or

3-2, 6-5, 10-11, 7-8

4.1 Power Switch - SW_POWER_1

This is the On/Off switch for the unit. It enables the input of the +5V, -5V and 12V supplies to the circuitry

Use	Pin	Pin	Use
NC	1	12	NC
Switched 5V	2	11	12V Feed
Power LED	3	10	Switched 12V
NC	4	9	NC
-5V Feed	5	8	VCC (5V)
Switched -5V	6	7	Switched 5V

4.2 EPROM Type Selection - SW_2708_2716_1

This switches between 2708 and 2716 programming mode.

Use	Pin	Pin	Use
2716 PRG Power	1	12	Generated 24V
ZIF Pin 18	2	11	ZIF Pin 21
2708 PRG Power	3	10	Switched -5V
B5 (|PL1 Pin 1)	4	9	Pin 15 ((4040)
ZIF Pin 20	5	8	ZIF Pin 19
GND / 5V / 12V	6	7	Switched 12V

5 PL1 Connections

5.1 Pins

PL1	Use	PL1	Use
1	B5	2	B4
3	B6	4	B3
5	NC	6	B2
7	NC	8	B1
9	GND	10	B0
11	GND	12	NC
13	A0	14	NC
15	A1	16	GND
17	A2	18	GND
19	A3	20	VCC
21	A4	22	VCC
23	A5	24	A7
25	A6	26	NC

5.2 Control Pin Usage

Signal Line	Use
B0	Address counter clock (high to low)
B1	Address counter reset (low to high)
B2	2708 Read / program (low = read, high = program) (See below)
B3	ROM select (low = master selected)
B4	Program pulse (high to trigger)
B5	2716 Read / program (low = read, high = program)
B6	Pin 20 voltage selection (See below)
B7	Unused

5.3 Use of B2& B6

The combined use of B2 and B6 enables various output level to be generated depending on the read / write mode required and the type of device being addressed.

B2 allows the feed to switch pin 6 to be pulled down to ground via TR7 or left to float to the input voltage (12V). Low = ground, high = float

B6 allows the feed to switch pin 6 to be pulled down to +5V via TR6 / D5 or left to float to the input voltage (12V). Low = ground D5, high = float

Between these two controls, the feed to switch pin 6 can be ground, 5V or 12V

6 Usage of the Programmer

1. Ensure everything is powered down
2. Attach the ribbon cable to PL1 – make sure you align Pin 1 PL1 (programmer) to Pin 1 PL4 (Nascom)
3. Attach the 12V supply to PWR1
4. Attach the -5V supply to PWR2
5. Select the EPROM type being used (2708/2716) via the SW_2708_2716_1 switch
6. Insert an EPROM into the Source / Target socket, depending on the operation required (read or program)
7. Switch on the computer
8. Switch on the programmer via SW_POWER_1
9. Happy programming!

7 Notes on Components

All the components used have been selected at time of design to be readily available via commercial component suppliers.

7.1 IC1 & IC2

These parts are static sensitive. Handling precautions need to be observed.

7.2 555 Timer / 24V Generation

Not all 555s appear to be created equal. I have found that not all 555's appears to work correctly with the 24v generation circuit.

The following have been found to work:

- Texas Instruments NE555P
- LM555CN
- ICM7555IPAZ

To check for correct operation, look at TP1. If it is around 24v then it is working as expected. If it is around 12v then swap for another device.

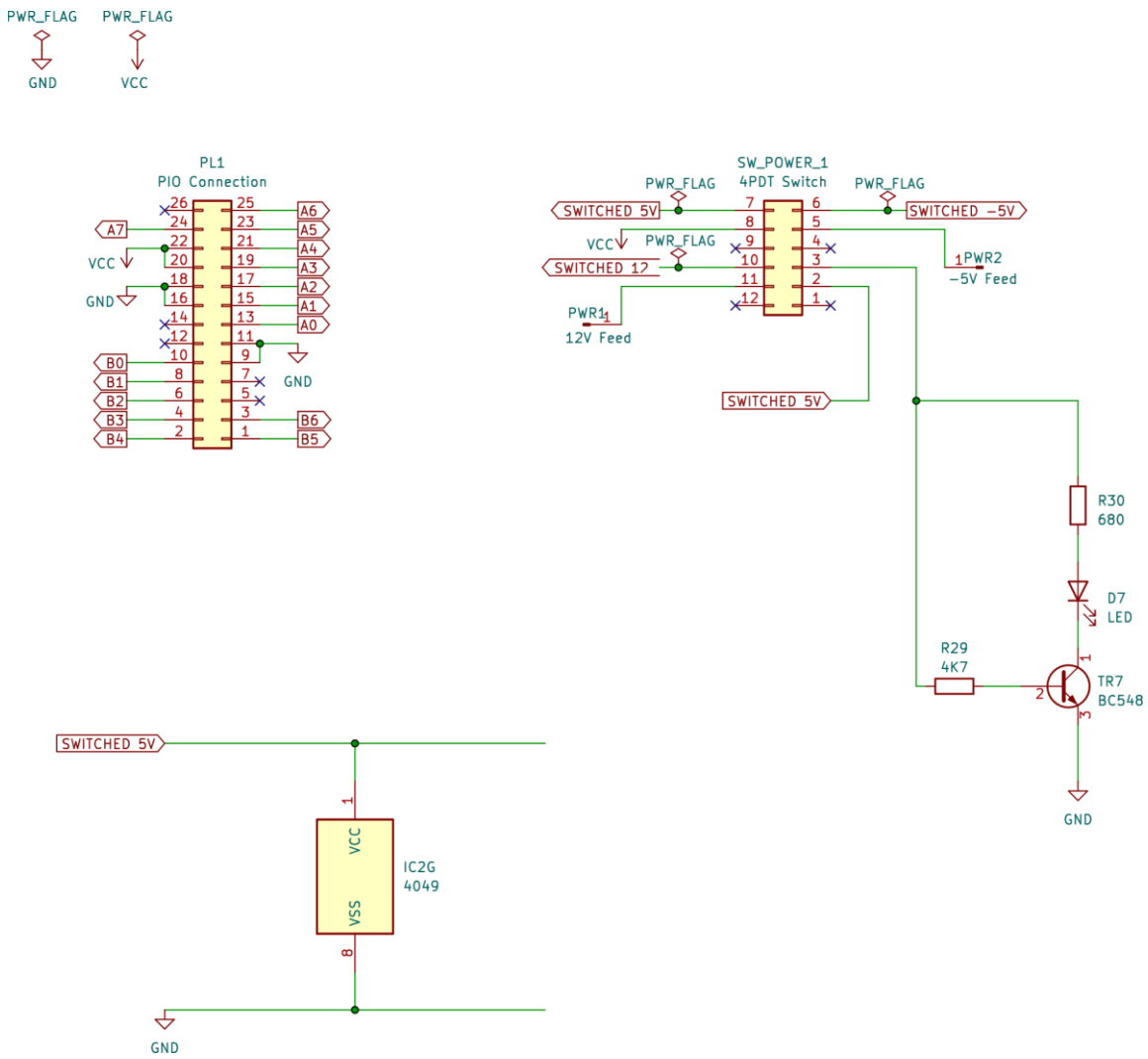
7.3 ZIF Sockets

7.3.1 Problems

- They can be expensive and easily damages by soldering!
- The pins are often too large to go into standard IC PCB pin holes

7.3.2 Solution

Put ordinary IC sockets in the locations for the ZIF sockets (Not the round pin type as the ZIF sockets will probably not be insertable) and mount the ZIF sockets into these.



25V Supply

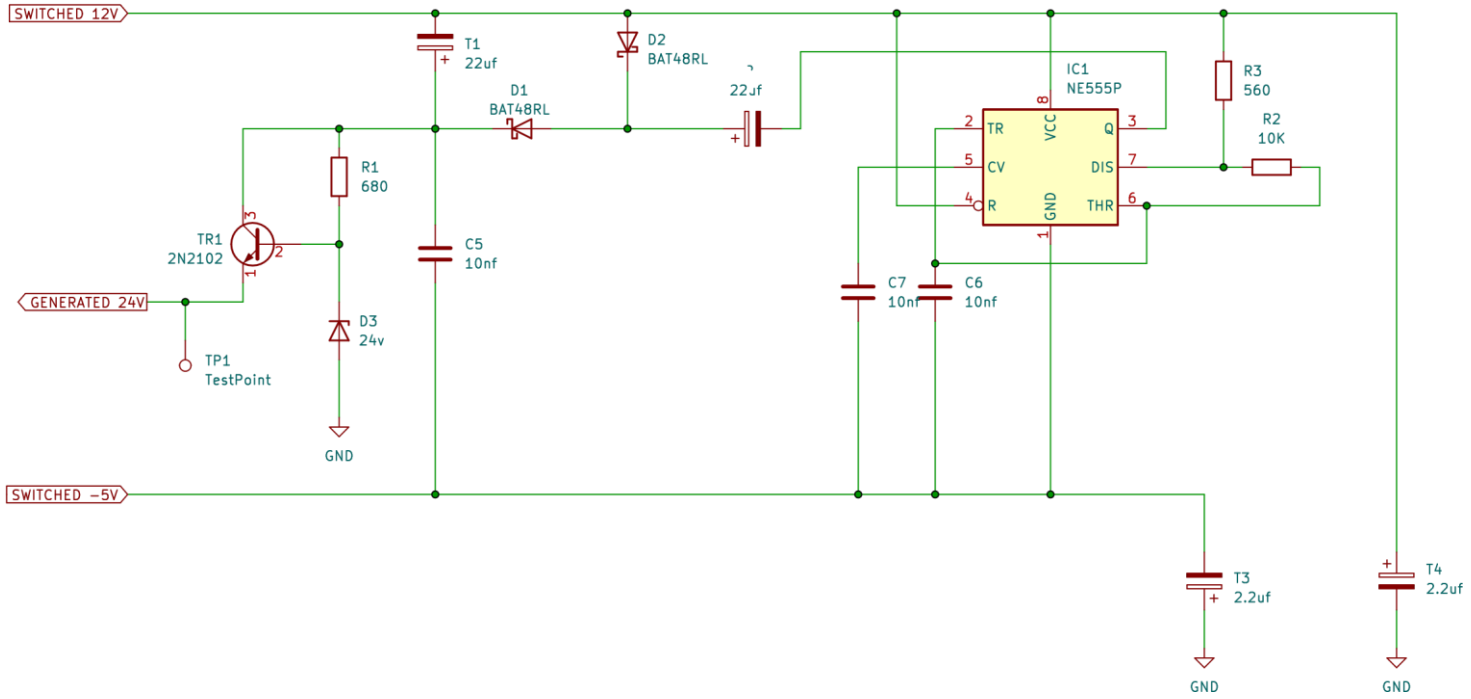
File: 25v-Supply.kicad_sch

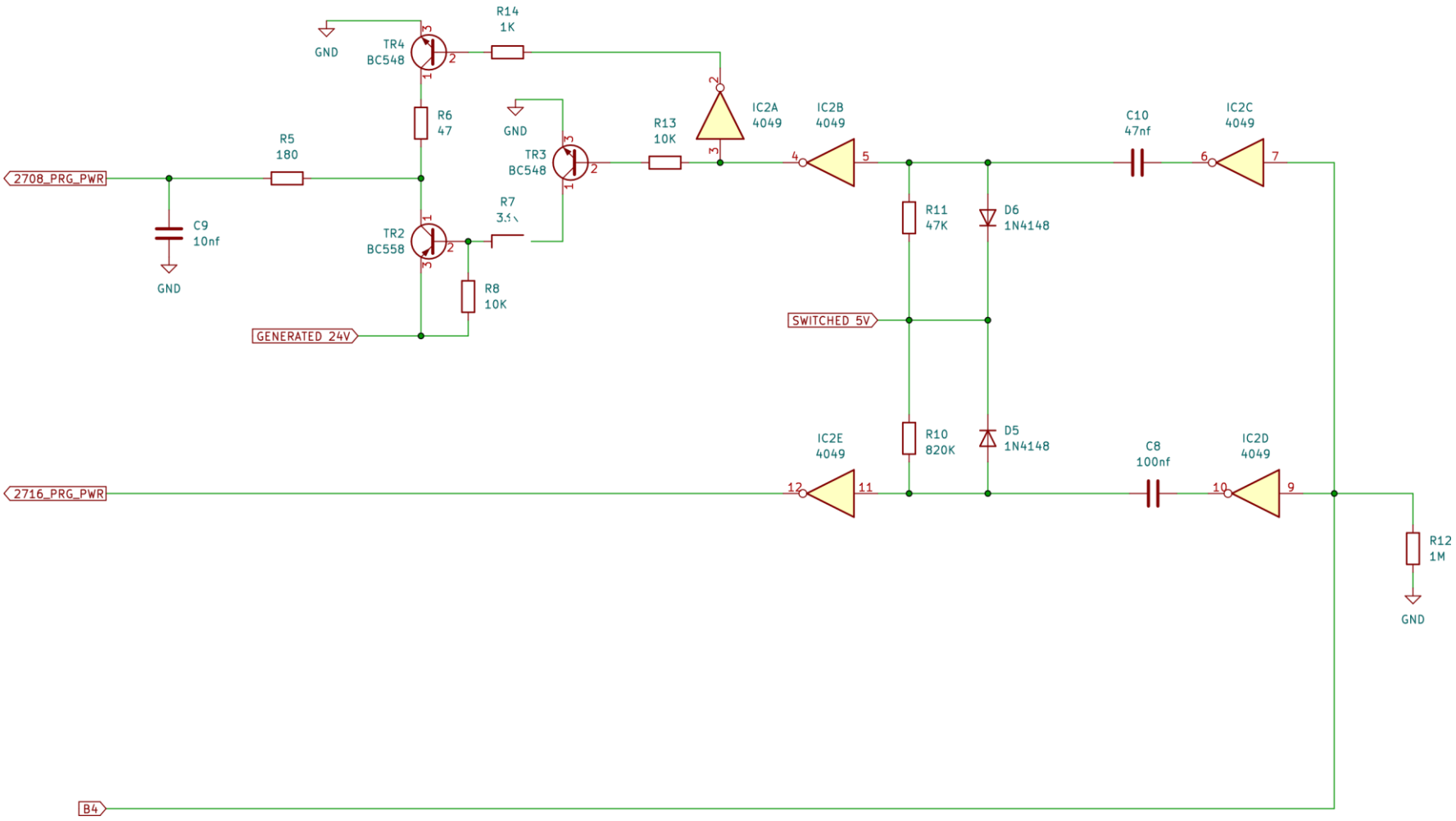
PRG Power

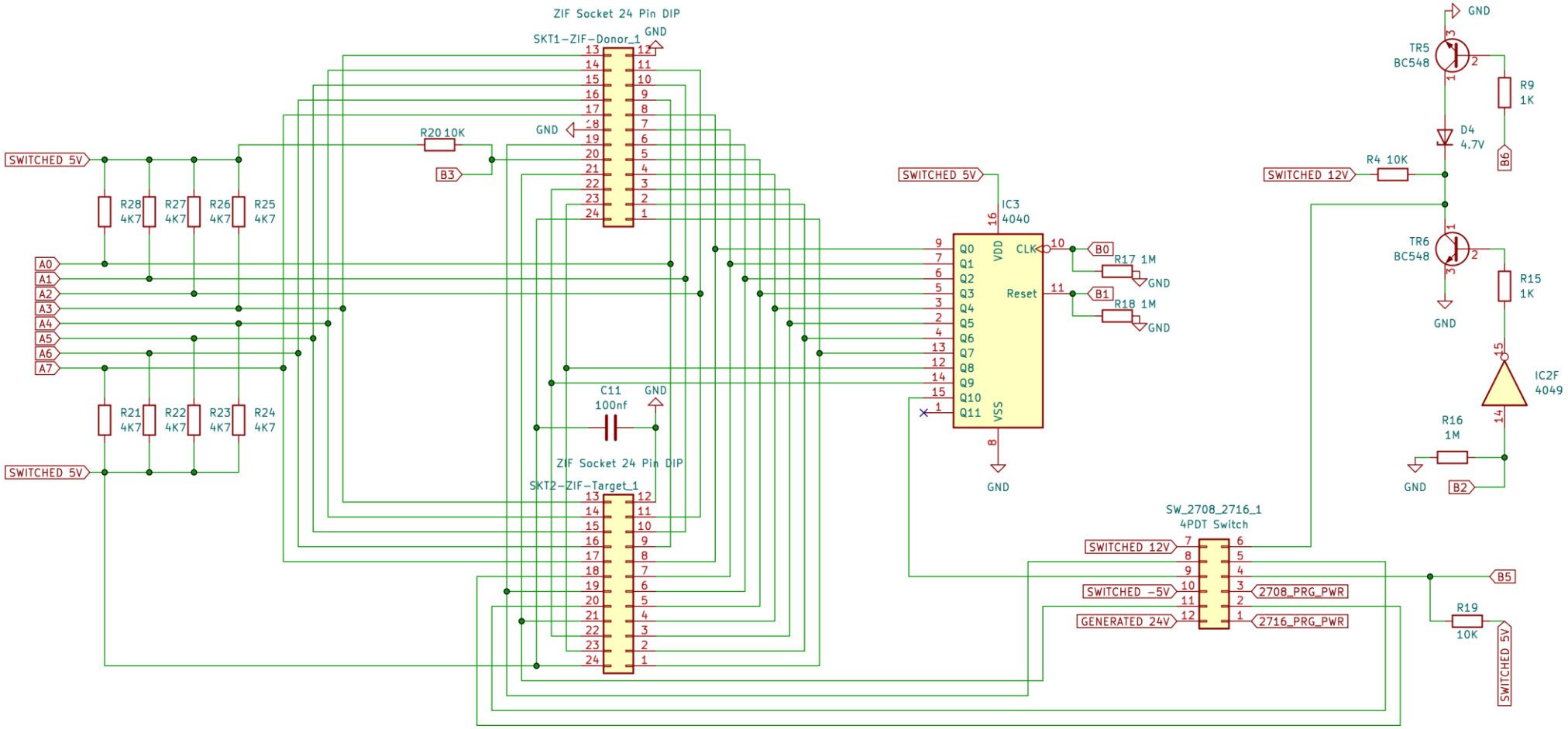
File: PRG_Power.kicad_sch

Sockets

File: Sockets.kicad_sch


SWITCHED 12V
T1
22uf
D2
BAT48RL
D1
BAT48RL
22uf
IC1
NE555P
R3
560
R2
10K
R1
680
TR
VCC
Q
CV
DIS
R
GND
THR
TR1
2N2102
C5
10nf
C7
10nf
C6
10nf
GENERATED 24V
D3
24v
TP1
TestPoint
GND
SWITCHED −5V
T3
2.2uf
T4
2.2uf
GND
GND


R14
1K
GND
TR4
BC548
R6
47
GND
TR3
BC548
R13
10K
IC2A
4049
IC2B
4049
C10
47nf
IC2C
4049
R5
180
2708_PRG_PWR
C9
10nf
GND
TR2
BC558
R7
R8
10K
GENERATED 24V
R11
47K
D6
1N4148
SWITCHED 5V
R10
820K
D5
1N4148
IC2E
4049
C8
100nf
IC2D
4049
2716_PRG_PWR
R12
1M
GND
B4


ZIF Socket 24 Pin DIP
SKT1-ZIF-Donor_1
GND
R20 10K
B3
SWITCHED 5V
R28 4K7
R27 4K7
R26 4K7
R25 4K7
A0
A1
A2
A3
A4
A5
A6
A7
R21 4K7
R22 4K7
R23 4K7
R24 4K7
C11 100nf
ZIF Socket 24 Pin DIP
SKT2-ZIF-Target_1
IC3 4040
VDD
CLK
Reset
VSS
Q0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
B0
B1
R17 1M
R18 1M
TR5 BC548
TR6 BC548
D4 4.7V
R4 10K
SWITCHED 12V
R9 1K
R15 1K
IC2F 4049
R16 1M
B2
B6
SW_2708_2716_1
4PDT Switch
SWITCHED -5V
GENERATED 24V
2708_PRG_PWR
2716_PRG_PWR
B5
R19 10K

8 Errata

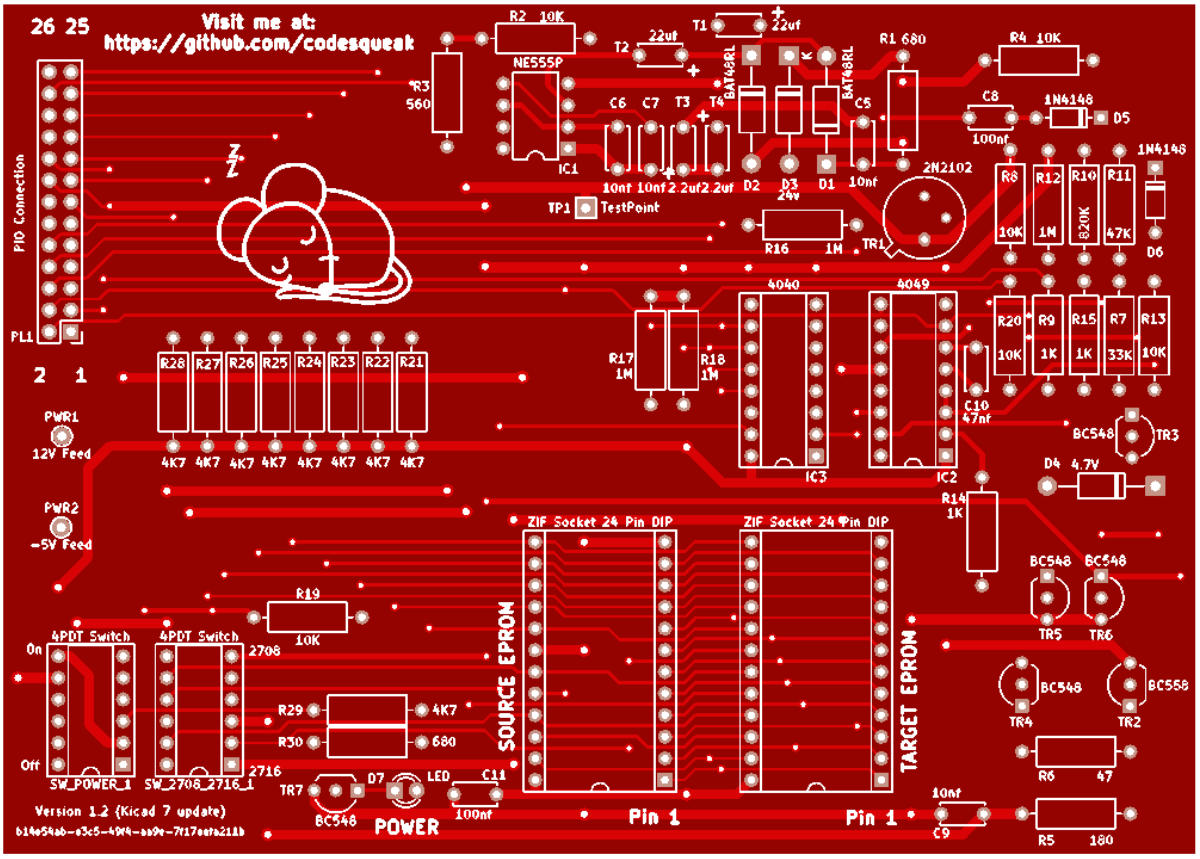
8.1 Version 1.1 to Version 1.2

Minor updates

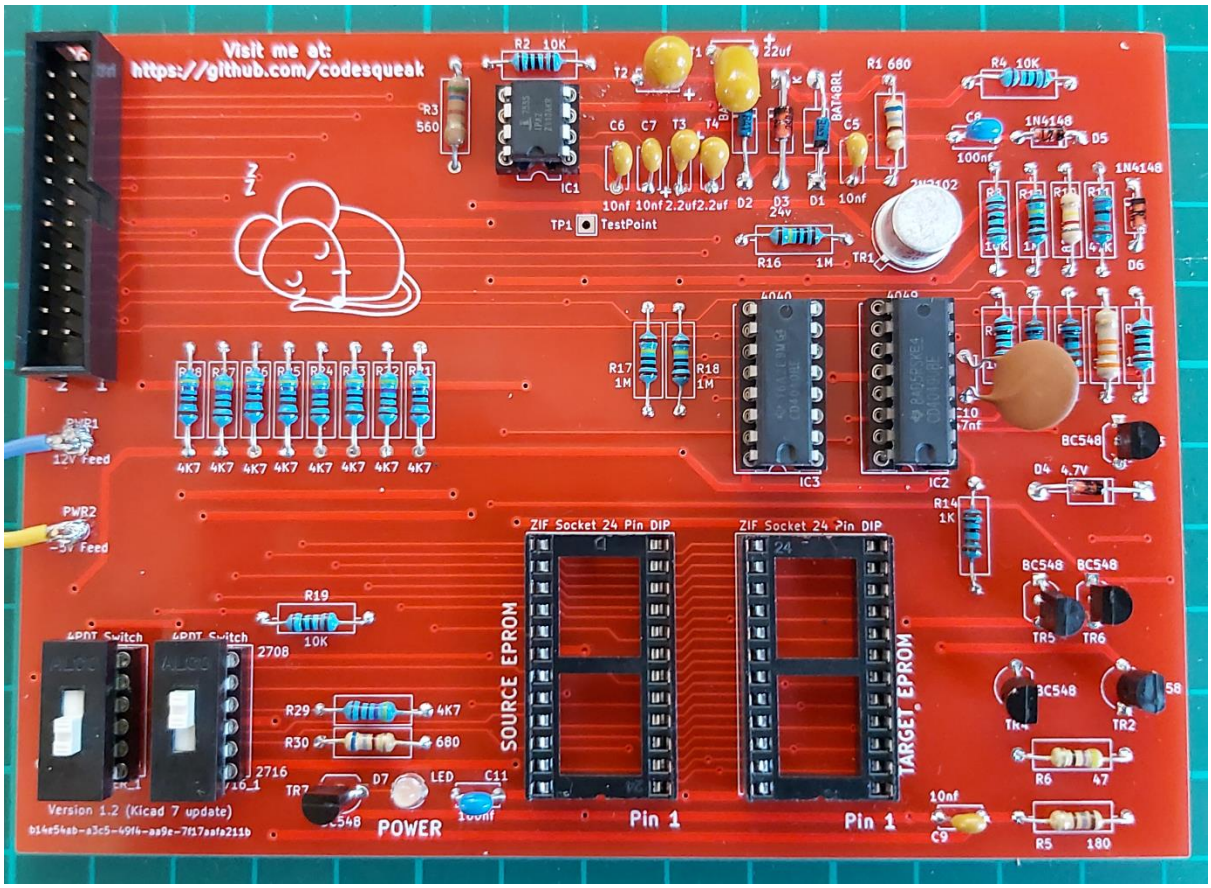
- R10 should be 820K not 820
- Add missing component values from silkscreen
- Tidy silkscreen
- T1 Swapped orientation in design

9 Reference Images

9.1 PCB



9.2 Built


Visit me at:
https://github.com/codesqueak
ZIF Socket 24 Pin DIP
ZIF Socket 24 Pin DIP
SOURCE EPROM
TARGET EPROM
Pin 1
Pin 1
POWER
Version 1.2 (Kicad 7 update)