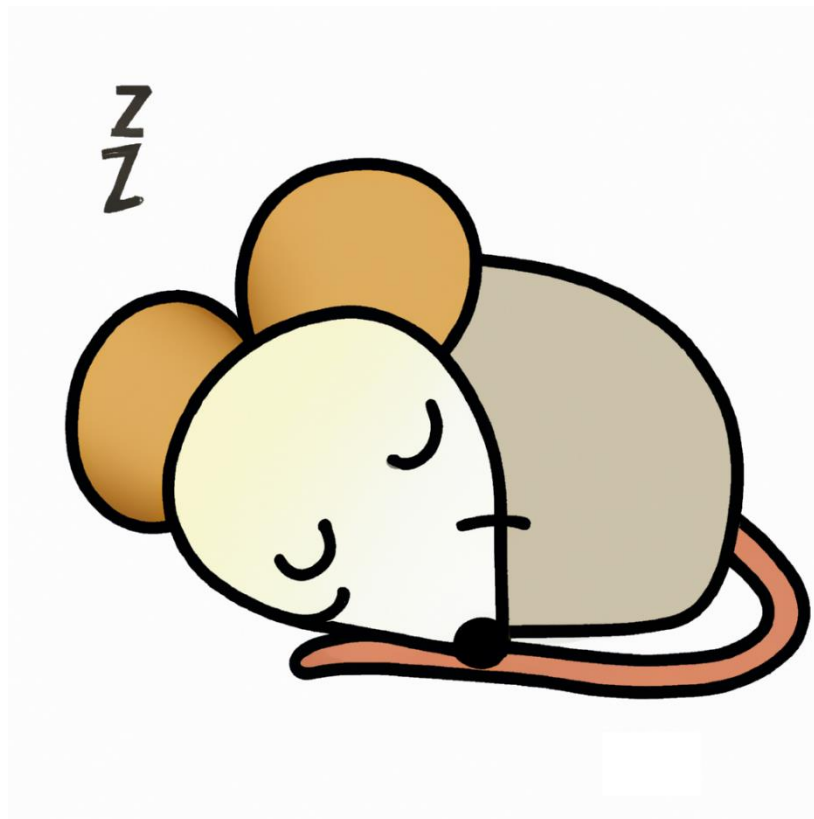


2708/2716 Enhanced EPROM Programmer

Instruction Manual & Functional Description



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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 significant number of improvements over the original:

- Single 5V supply required
- 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 points
- Nice colour!

2 Components

| Qty | Reference(s) | Value | Notes |
|-----|------------------------|--------------------------|----------------------------|
| 1 | C1 | 120uF | Electrolytic |
| 1 | C2 | 220pF | |
| 1 | C3 | 22uF | Electrolytic |
| 2 | C4, C9 | 10nf | |
| 1 | C5 | 47nf | |
| 2 | C6, C7 | 100nf | |
| 1 | C8 | 330nF | |
| 1 | C10 | 100nF | |
| 1 | C11 | 22nF | |
| 1 | D1 | LED | |
| 1 | D2 | 25v | Recommend 1N5360B |
| 2 | D3, D4 | 1N4148 | |
| 1 | D5 | 4.7V | Recommend 1N5337B |
| 1 | D6 | 1N4001 | |
| 1 | JP1 | PIO_AUX_PWR | |
| 1 | JP2 | PIO_AUX_GND | |
| 1 | L1 | 220uH | Recommend MCSCH895-221KU |
| 1 | PL1 | PIO Connection | |
| 1 | PWR1 | AUX_5V | |
| 1 | PWR2 | AUX_GND | |
| 1 | Q1 | VP3203N3-G | FET |
| 1 | R1 | 4K7 | |
| 4 | R2, R9, R21, R22 | 1K | |
| 1 | R3 | 1K2 | |
| 1 | R4 | 1 | |
| 1 | R5 | 680 | |
| 1 | R6 | 180 | |
| 1 | R7 | 47 | |
| 5 | R8, R11, R15, R18, R20 | 10K | |
| 1 | R10 | 33K | |
| 1 | R12 | 47K | |
| 1 | R13 | 820K | |
| 4 | R14, R16, R17, R19 | 1M | |
| 1 | R23 | 2M | |
| 1 | RN1 | 4K7 | Recommend MCRNLA09G0472B0E |
| 1 | RV1 | 50K | Recommend 3006P-1-503LF |
| 2 | SKT2-ZIF-Target_1 | ZIF Socket 24 Pin DIP | |
| 1 | SW1 | SW_SPST | 7.62mm pitch |
| 1 | SW_2708_2716_1 | 4PDT Switch | Recommend ASE4204 |
| 2 | T1, T2 | 10uF | Tantalum |

Enhanced 2708/2716 EPROM Programmer

| Qty | Reference(s) | Value | Notes |
|-----|-------------------------|---------|------------------|
| 1 | TP1 | 25V | |
| 1 | TP2 | 12V | |
| 1 | TP3 | -5V | |
| 1 | TP4 | Res2 | |
| 1 | TP5 | Res1 | |
| 1 | TP6 | PIO_GND | |
| 1 | TP7 | GND | |
| 5 | TR1, TR3, TR5, TR6, TR7 | BC548 | |
| 1 | TR2 | 2N2102 | |
| 1 | TR4 | BC558 | |
| 1 | U1 | 4049 | Static sensitive |
| 1 | U2 | TL497 | 14 Pin DIP |
| 1 | U3 | LM78L12 | TO-92 Package |
| 1 | U4 | 4040 | Static sensitive |
| 1 | U5 | LMC7660 | 8 Pin DIP |

3 Notes on Components

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

3.1 IC1 & IC2

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

3.2 ZIF Sockets

3.2.1 Problems

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

3.2.2 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.

3.3 25V Zener Diode D2

Depending on the setting of RV1, this diode may have to dissipate sufficient energy to become hot during operation. It is recommended to use a higher wattage component, such as a 1N5360B which is safe up to 5W so is less likely to be damaged due to mis-adjustment of RV1.

3.4 Power Input

If it is intended that the +5v supply is derived from the PIO connector, JP1 and JP2 can be replaced with links.

4 Construction

4.1 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.

4.2 Order of construction

The recommended order of construction is:

- Resistors
- Sockets
- Disc capacitors
- Tantalum capacitors
- Insert switches
- LED
- 26 Way connector
- Insert IC's
- Remaining components

5 Voltage Testing

With this new design, all required voltages are derived from a single +5V supply. It is recommended that the voltage generation is tested before trying to use the programmer.

5.1 25V Generator

The 25V supply is derived from a TL497 switching voltage regulator. The derived voltage is determined by the value of RV1. An initial nominal value of 27K should be used. The resistance can be determined by measuring between TP4 and TP5

Warning: Note that the Zener diode at D2 is used to limit the voltage to 25V. Since it has to limit any excess, this can become hot if too high a voltage is selected via RV1.

The output voltage from this stage can be measured at TP1. A voltage between 24v and 25v is normally acceptable for most devices.

5.2 12V Generator

The 12V supply is derived from an LM78L12 voltage regulator.

The output voltage from this stage can be measured at TP2

5.3 -5V Generator

The -5V is derived from an LMC7660 voltage converter. This useful device takes a +ve voltage and outputs the -ve equivalent.

The output voltage from this stage can be measured at TP3

6 Switch Connections

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

For example, selected either:

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

Or

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

6.1 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 |

7 PL1 Connections

7.1 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 |

7.2 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 |

7.3 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

8 Usage of the Programmer

8.1 Power Input

The device is primarily designed to use the +5v supply present on the parallel connection. This can draw up to approximately 250ma. At power up, this can be sufficient to cause the +5v rail to sag sufficiently to crash the attached computer depending on the power supply being used and other power usage factors.

To mitigate this, two solutions have been applied.

8.1.1 Soft Start

A software start circuit has been implemented around a VP3203 FET. This causes the device voltage to rise over approximately 200ms. This is usually sufficient to mitigate any sag on the +5v rail.

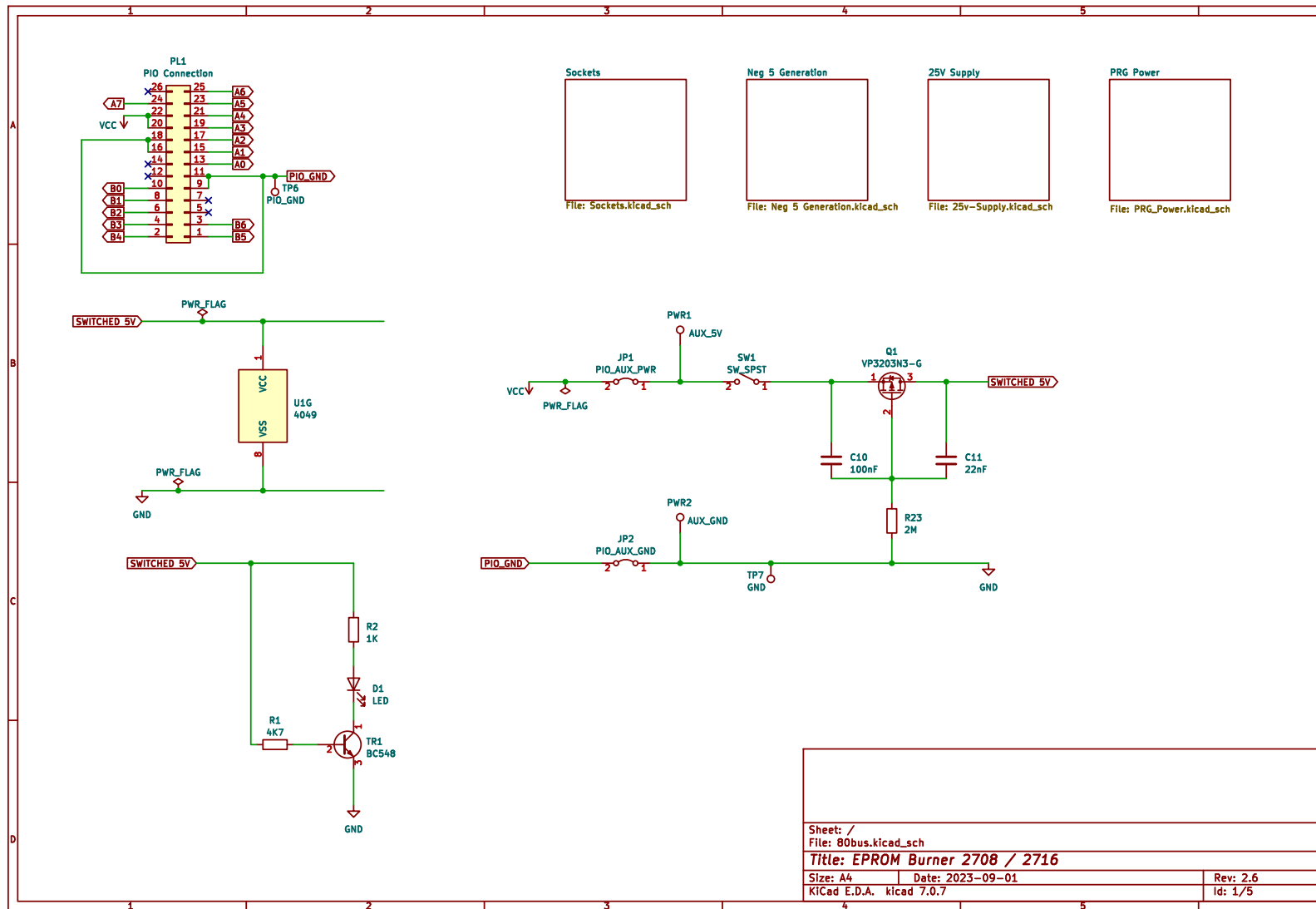
8.1.2 Auxiliary Power Input

Pads are available to allow direct connection of power. Cables can be attached at AUX_GND and AUX_5V. The jumpers at JP1 and JP2 should be removed.

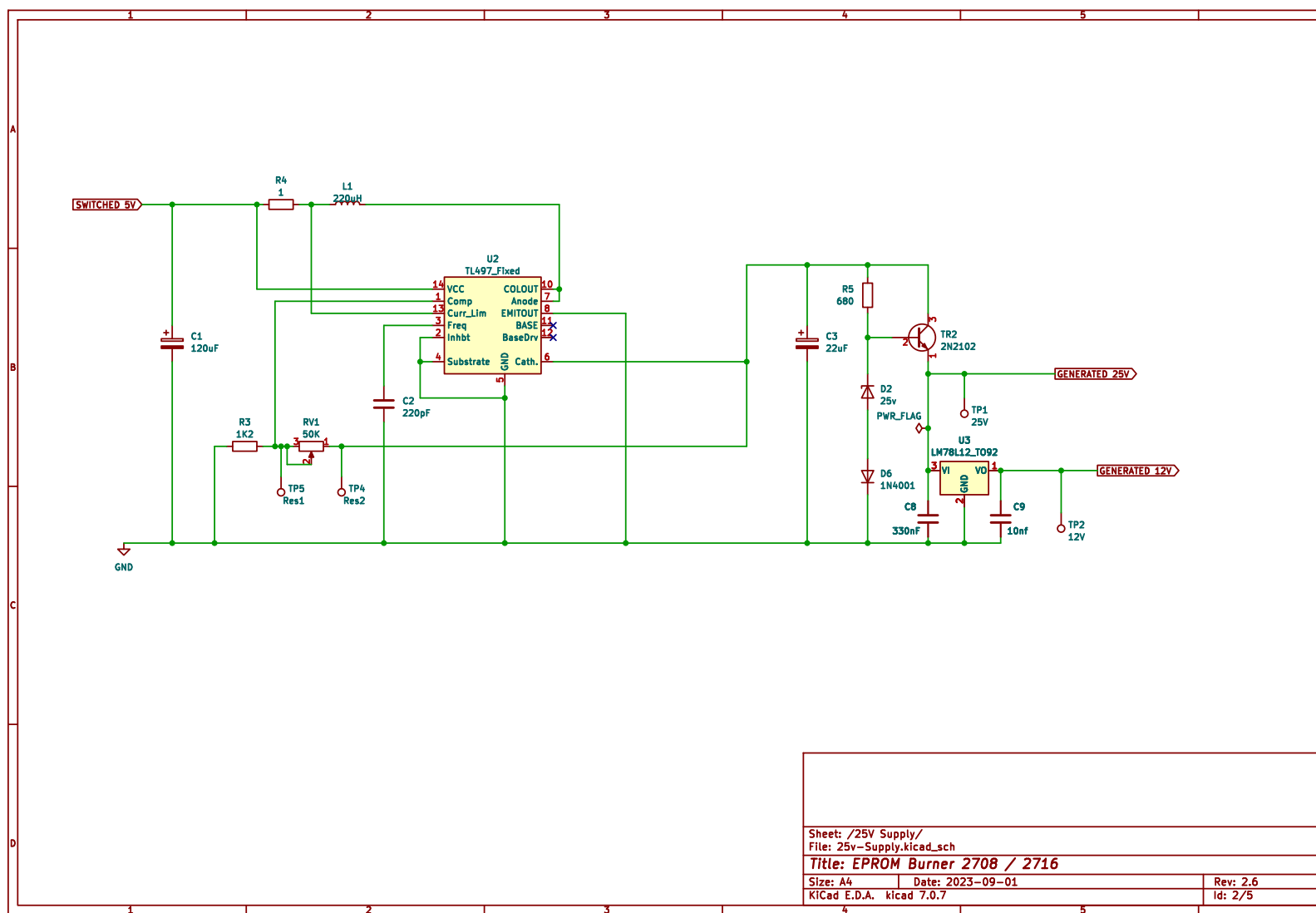
8.2 Programmer Usage

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. Connect the optional auxiliary +5V / GND inputs if being used.
4. Select the EPROM type being used (2708/2716) via the SW_2708_2716_1 switch
5. Insert an EPROM into the Source / Target socket, depending on the operation required (read or program)
6. Switch on the computer
7. Switch on the programmer via SW_POWER_1
8. Happy programming!

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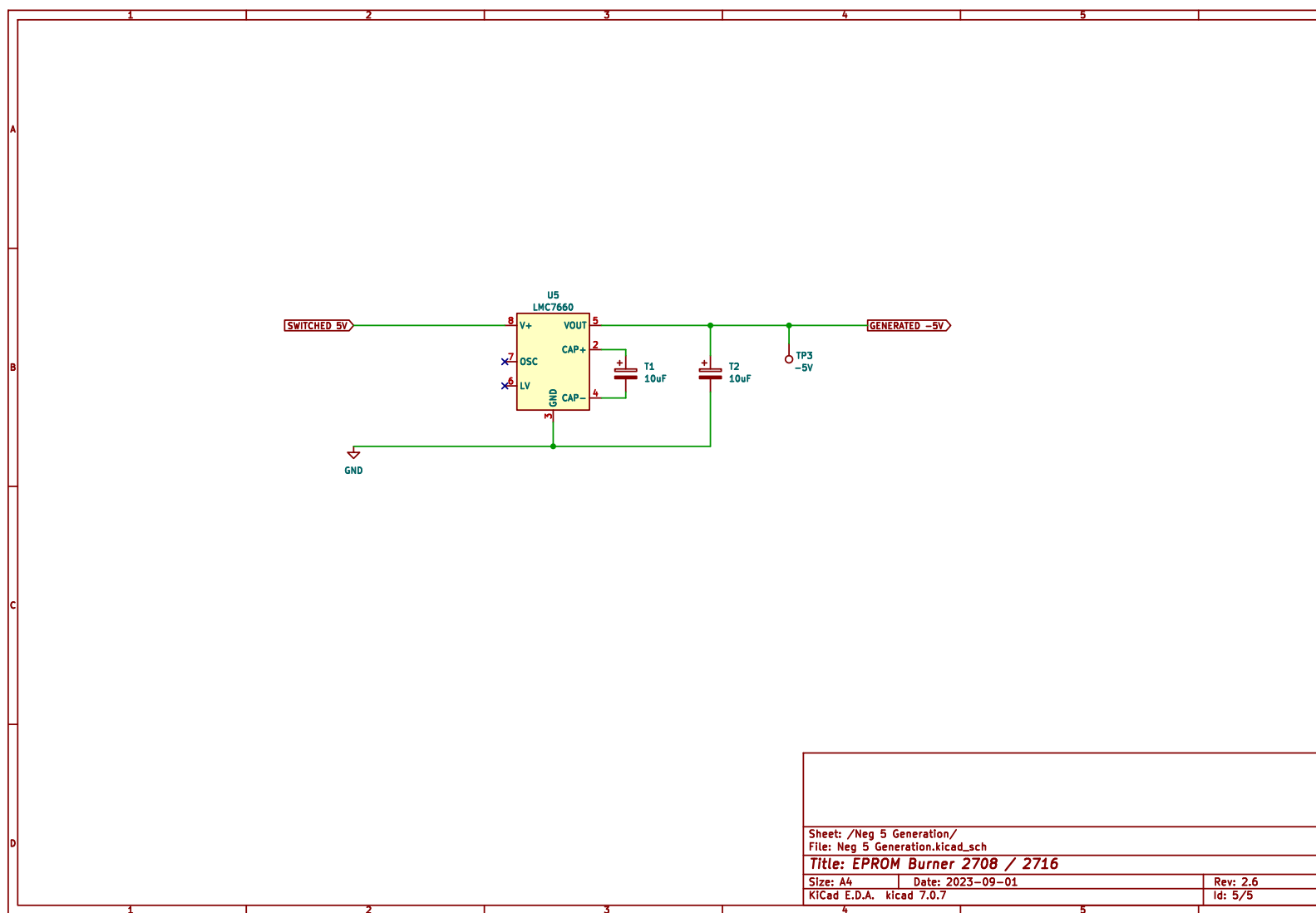


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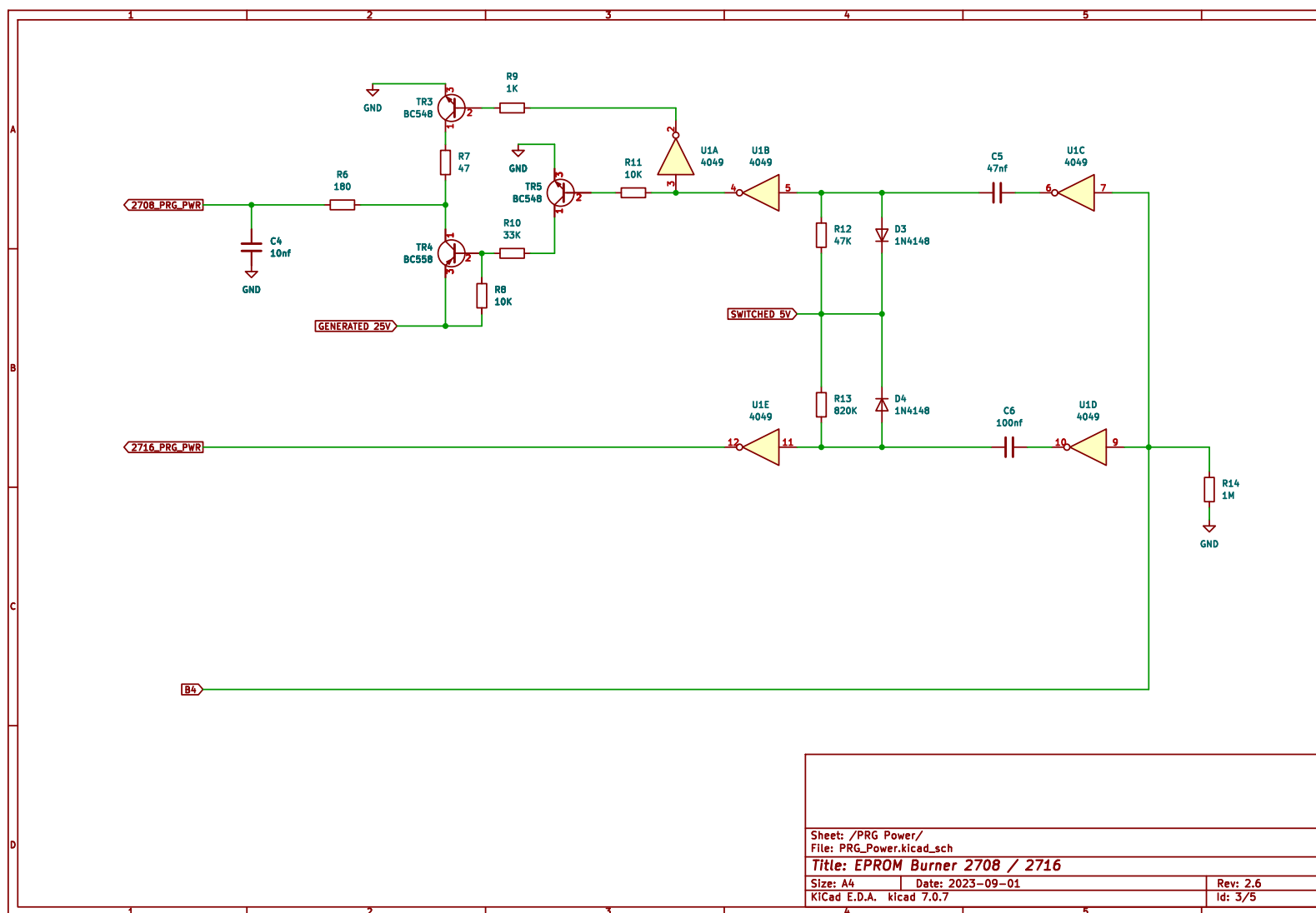


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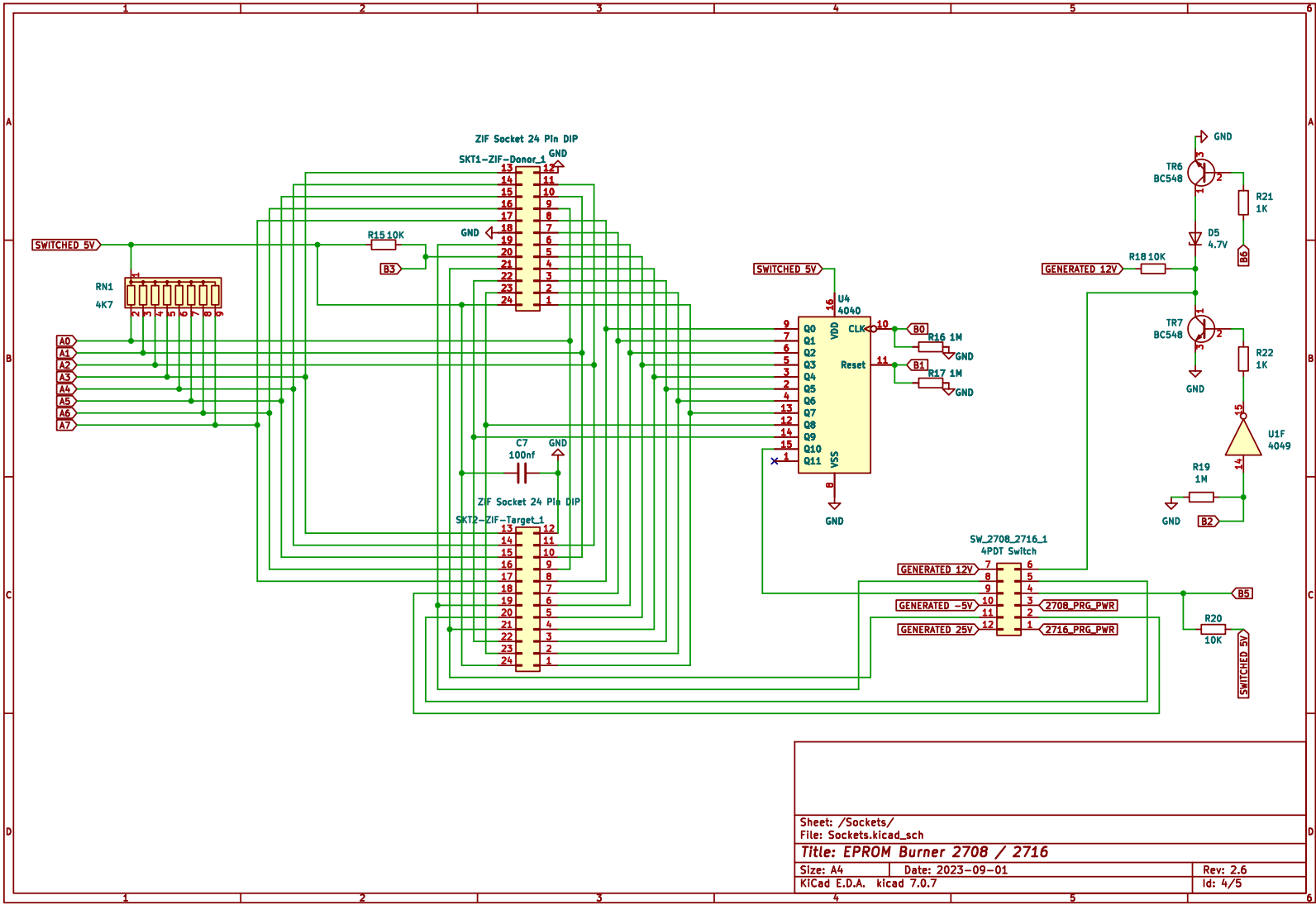
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9 Errata

9.1 Version 2.5

- R13 should be 820K not 820

10 Reference Images

