

# 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 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.

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.

### 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 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

### 6.1 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

### 6.2 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

## 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.

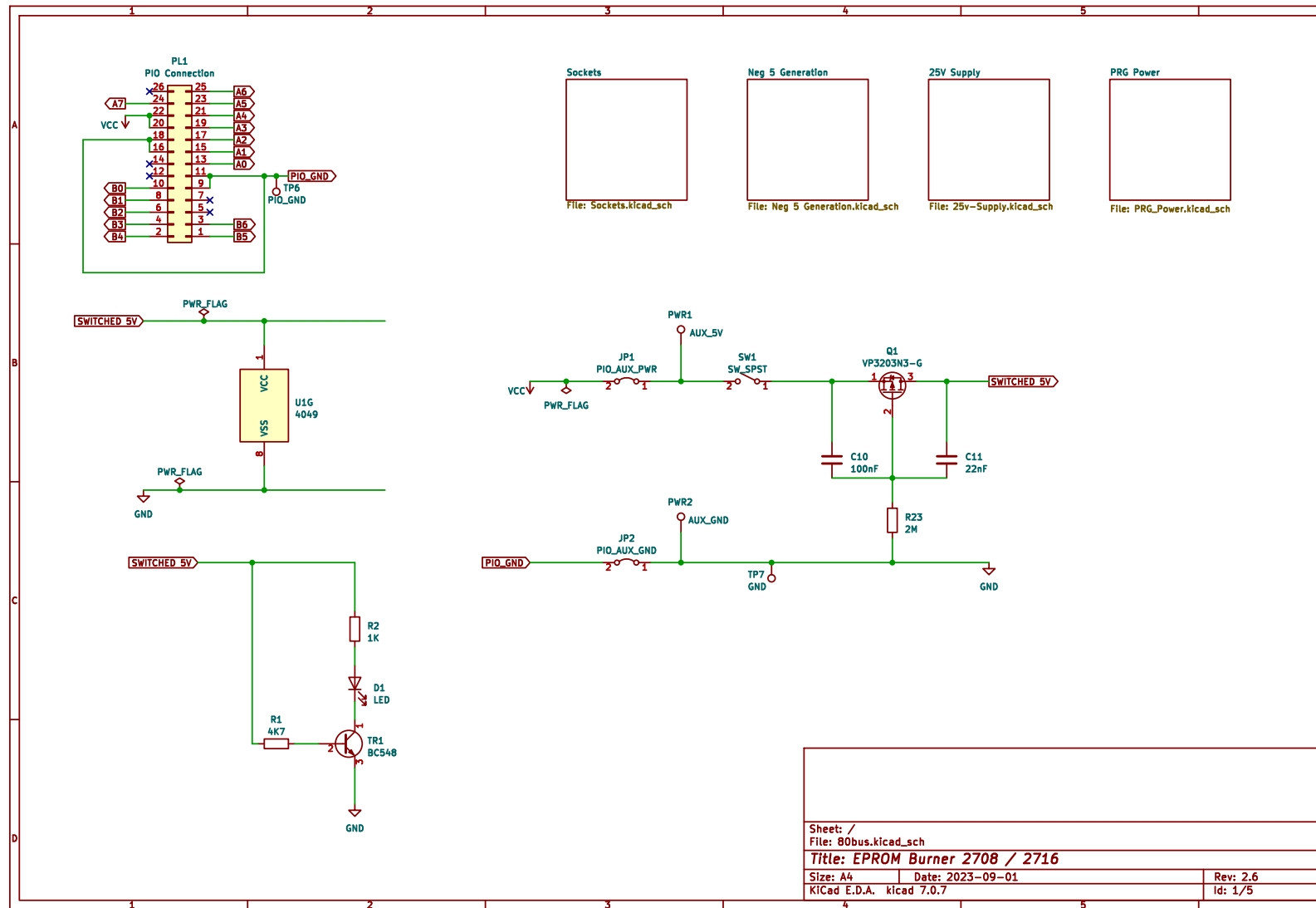
#### 8.1.2 Auxiliary Power Input

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.

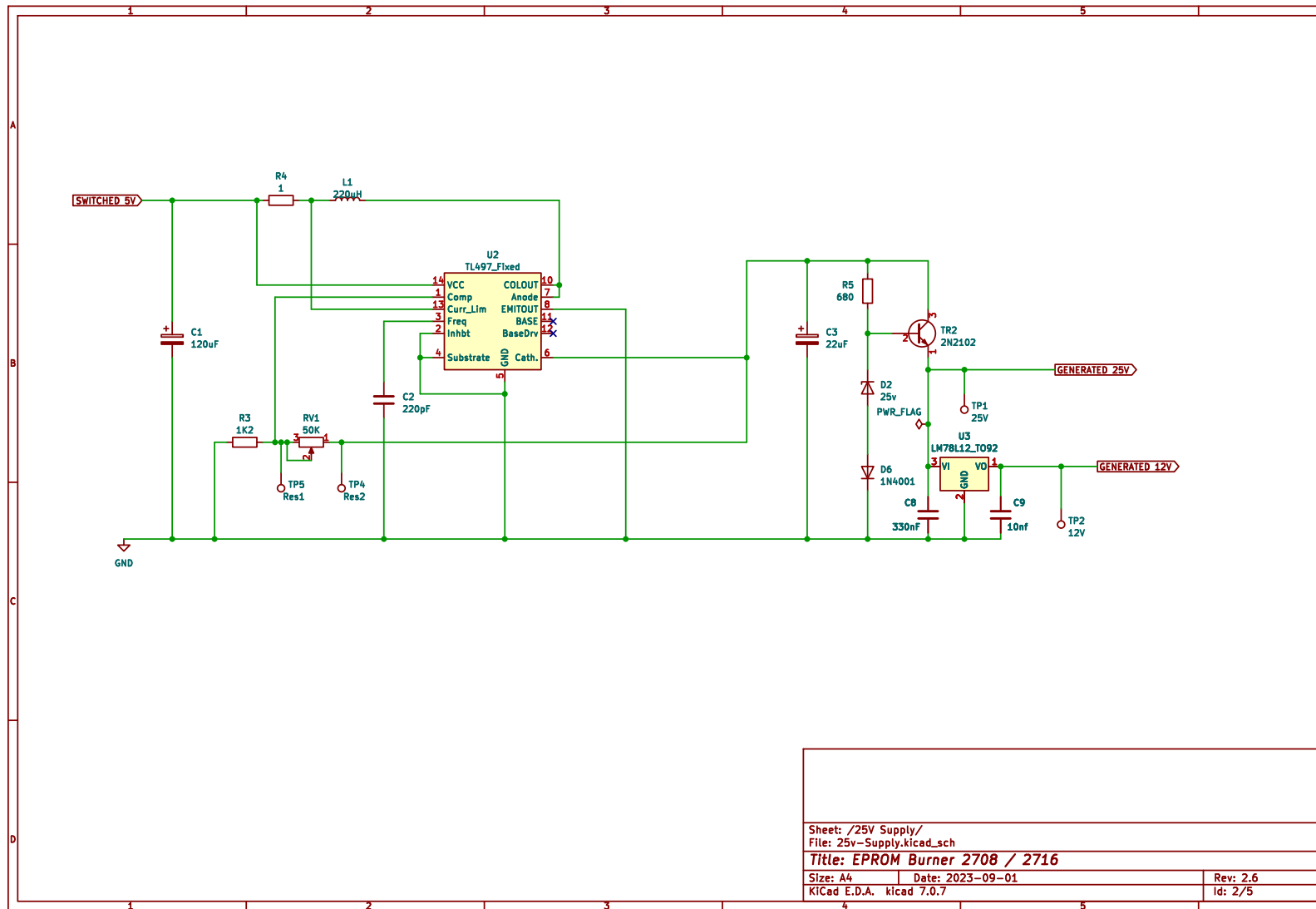
### 8.2 Control Pin Usage

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!

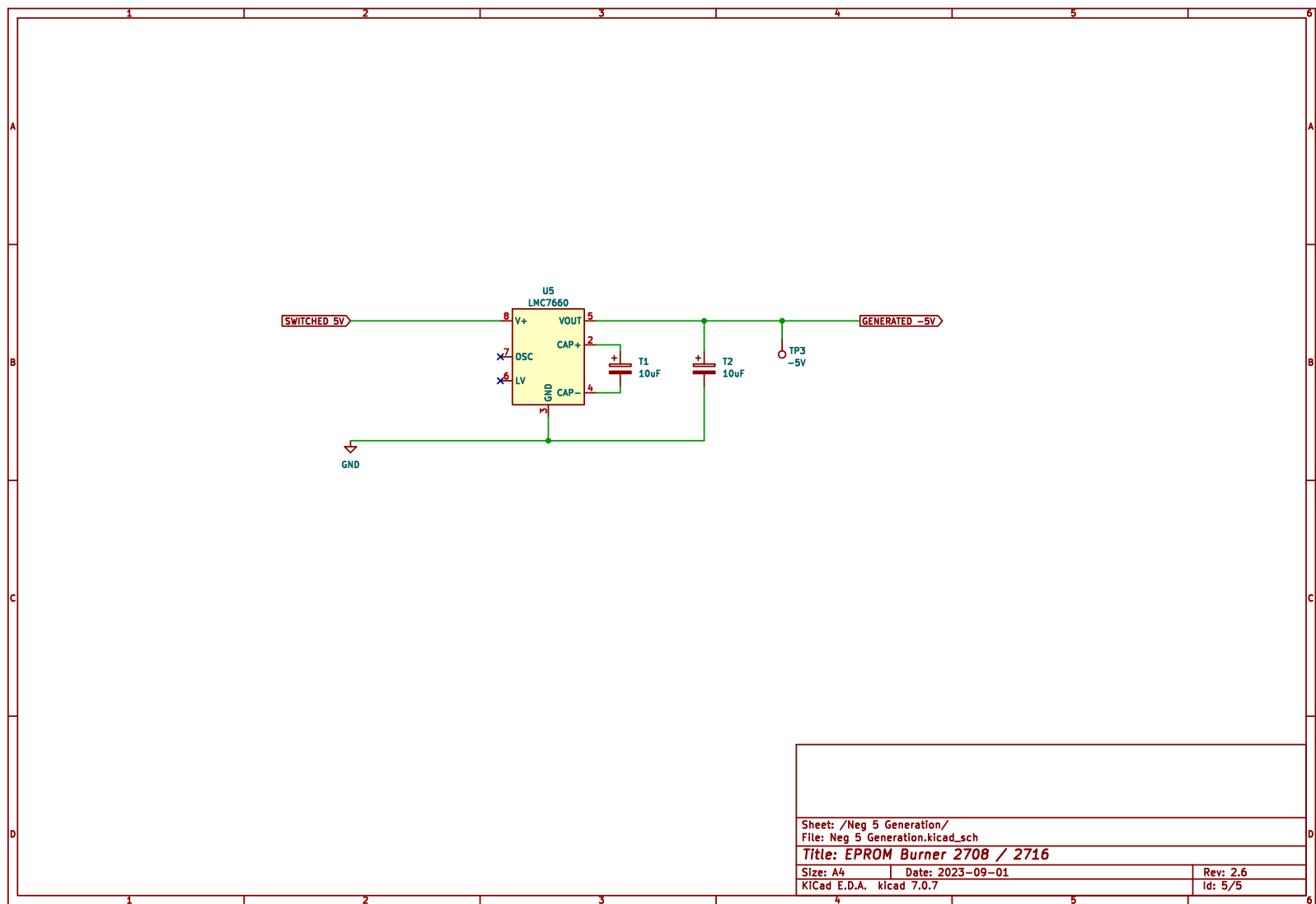
# Enhanced 2708/2716 EPROM Programmer



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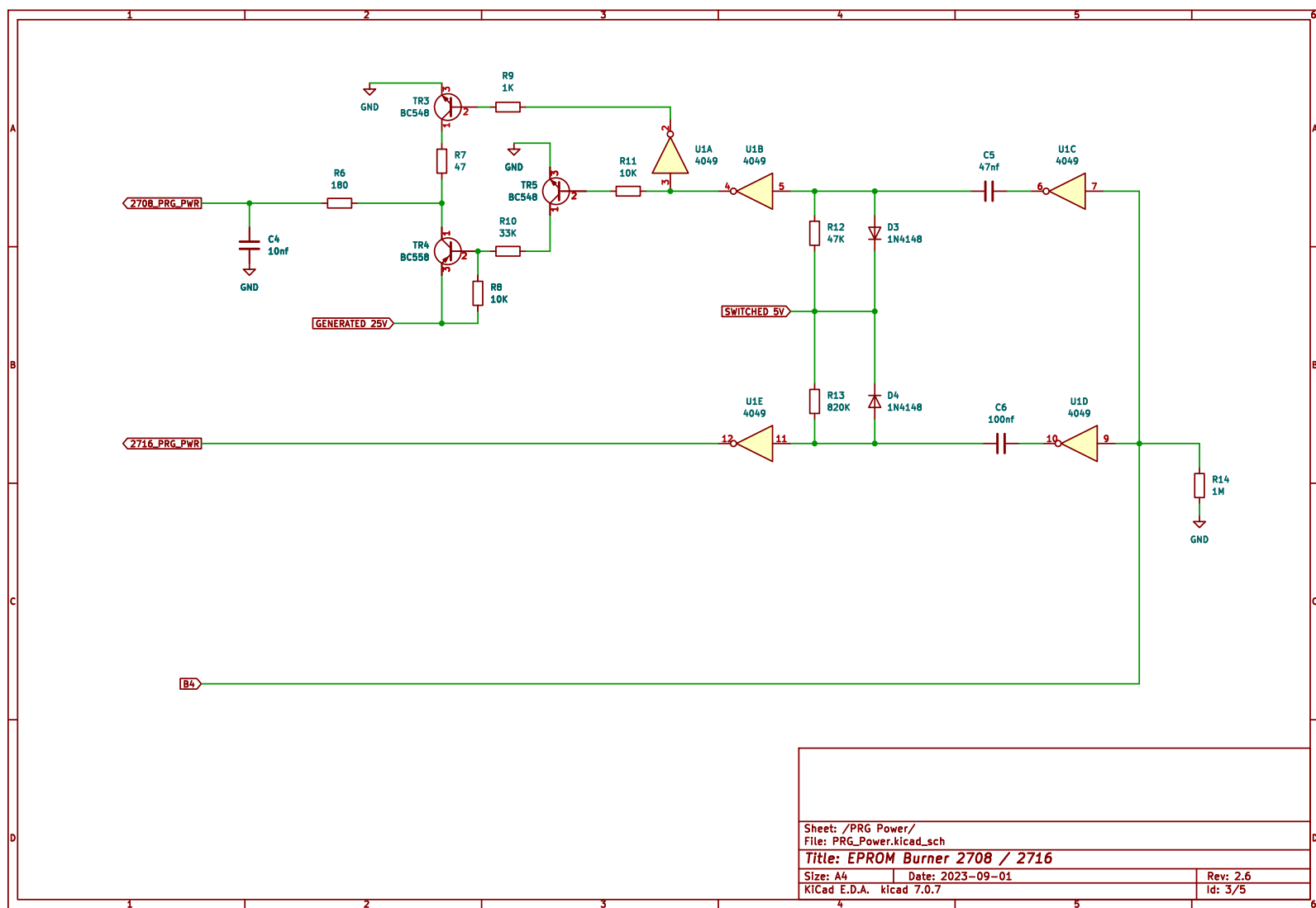


# Enhanced 2708/2716 EPROM Programmer

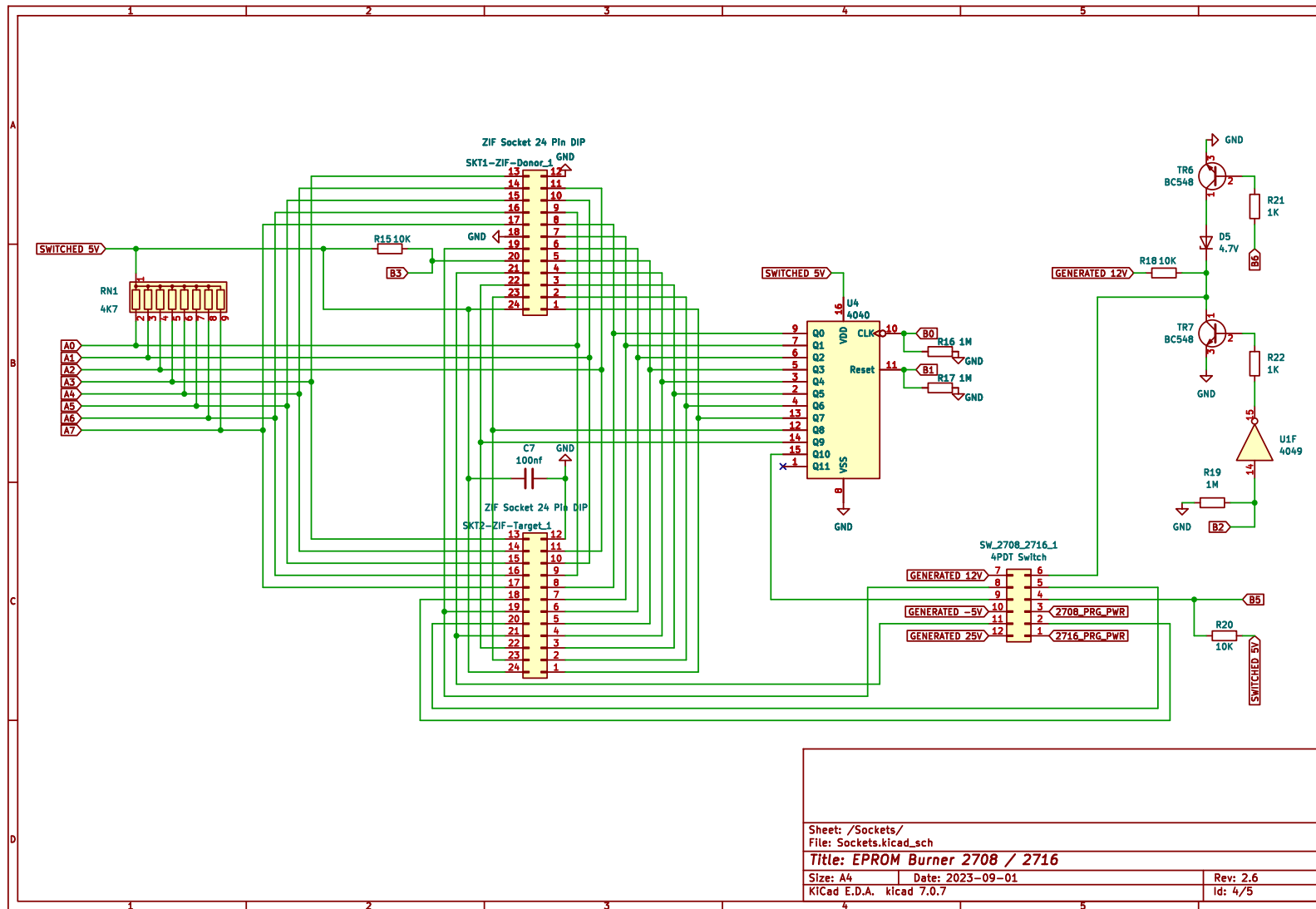




# Enhanced 2708/2716 EPROM Programmer



# Enhanced 2708/2716 EPROM Programmer





## 9 Errata

### 9.1 Version 2.5

- R10 should be 820K not 820

## 10 Reference Images

