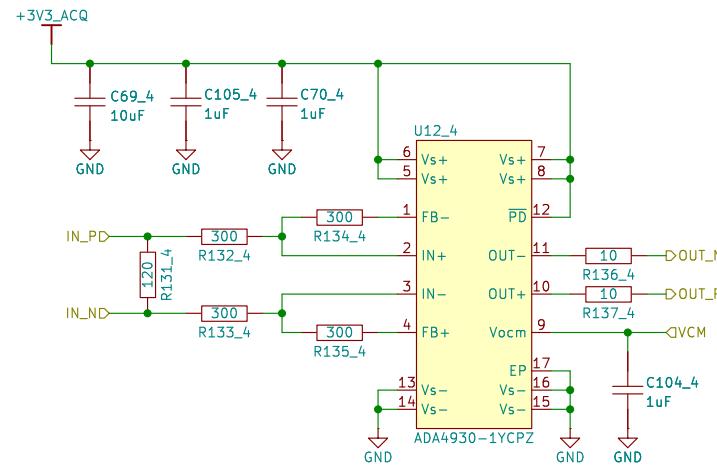


ADC Driver**EEVengers**

Sheet: /ADC Driver 4/
File: ADC_Driver.kicad_sch

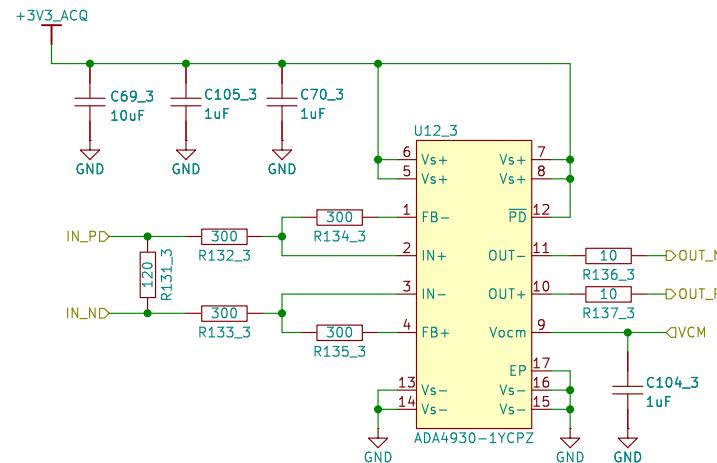
Title: ThunderScope

Size: A4 Date:
KiCad E.D.A. 9.0.3

Drawn by: Aleksa Bjelogrlic

Rev: 5.3
Id: 3/20

ADC Driver



EEVengers

Sheet: /ADC Driver 3/
File: ADC_Driver.kicad_sch

Title: ThunderScope

Size: A4 Date:
KiCad E.D.A. 9.0.3

Drawn by: Aleksa Bjelogrlic

Rev: 5.3
Id: 3/20

ADC Driver

A

A

B

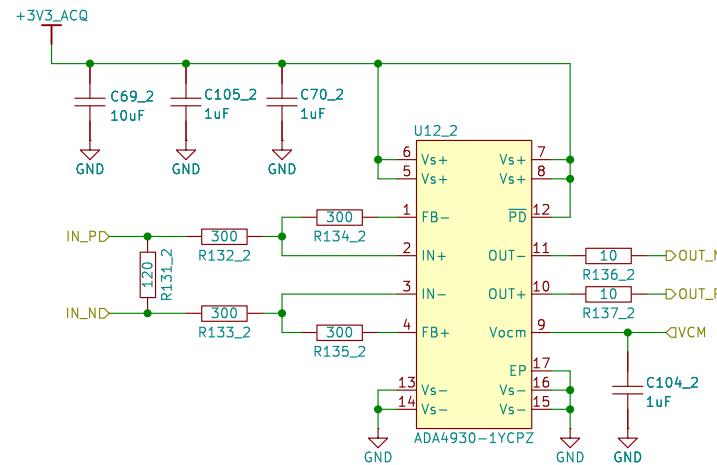
B

C

C

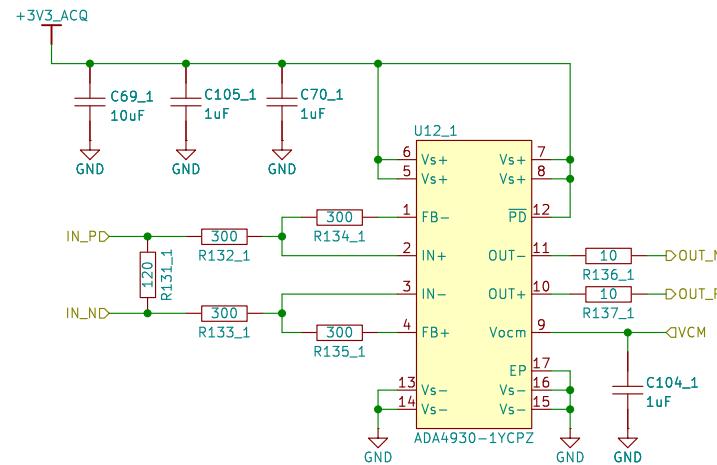
D

D

**EEVengers**

Drawn by: Aleksa Bjelogrlic

Sheet: /ADC Driver 2/
File: ADC_Driver.kicad_sch**Title: ThunderScope**Size: A4 Date:
KiCad E.D.A. 9.0.3Rev: 5.3
Id: 3/20

ADC Driver**EEVengers**Sheet: /ADC Driver 1/
File: ADC_Driver.kicad_sch**Title: ThunderScope**Size: A4 Date:
KiCad E.D.A. 9.0.3

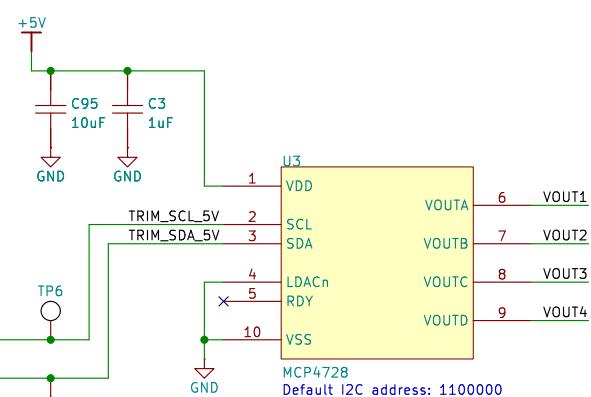
Drawn by: Aleksa Bjelogrlic

Rev: 5.3
Id: 3/20

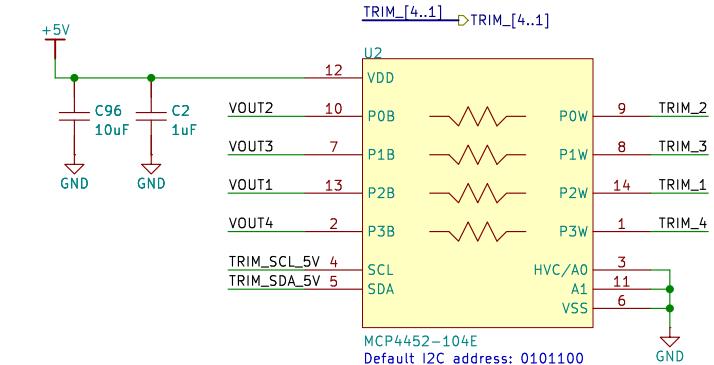
1 2 3 4 5 6

Offset Voltage Trim and User Offset Control

A

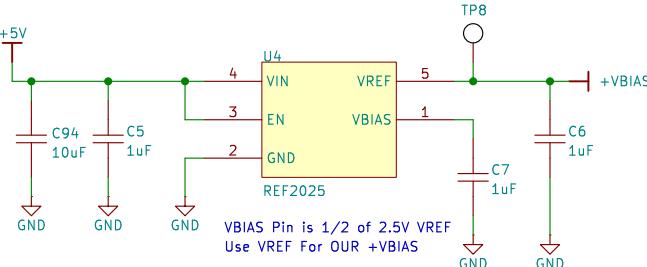


B

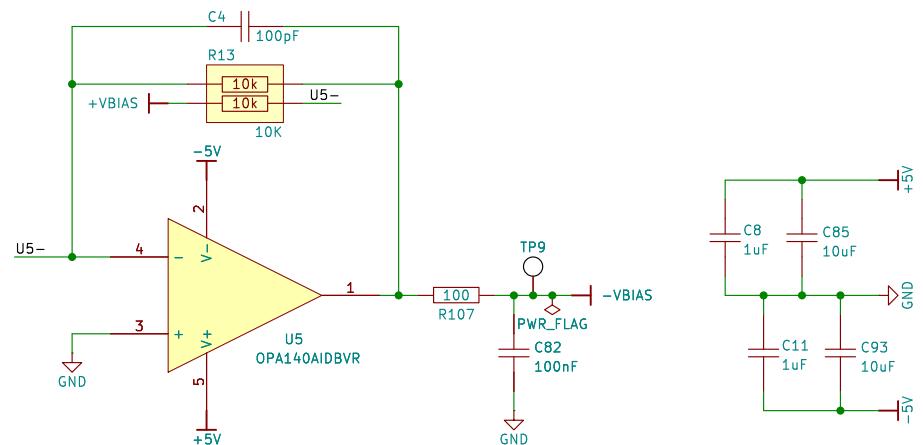


Bias Voltage Generation

C



D



EEVengers

Sheet: /Front End Trim and Bias/
File: FE.kicad_sch

Title: ThunderScope

Size: A4 Date:

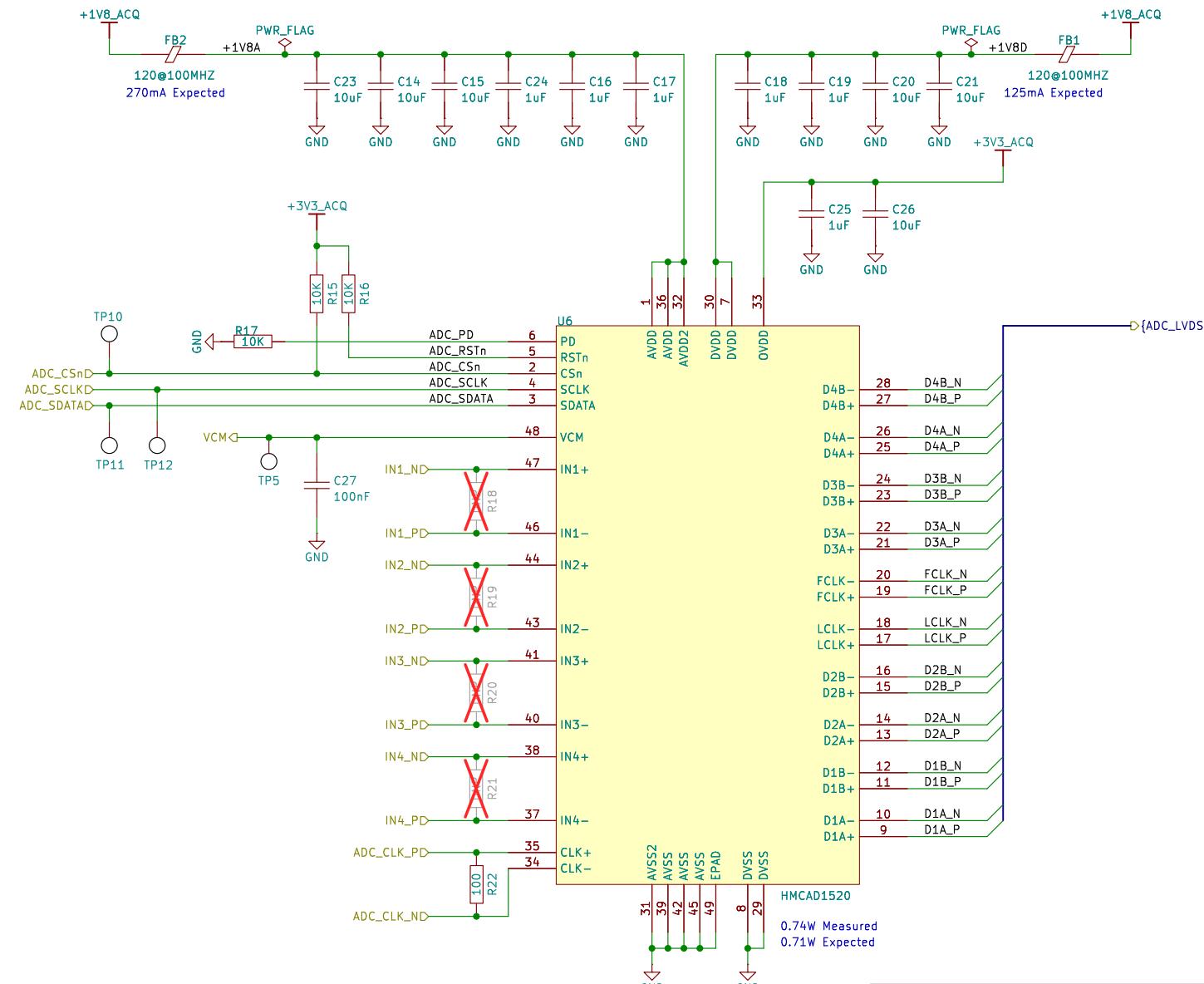
KiCad E.D.A. 9.0.3

Drawn by: Aleksa Bjelogrlic

Rev: 5.3
Id: 4/20

1 2 3 4 5 6

1 2 3 4 5 6

ADC

EEVengers

Sheet: /ADC/
File: ADC.kicad_sch

Drawn by: Aleksa Bjelogrlic

Title: ThunderScope

Size: A4 Date:

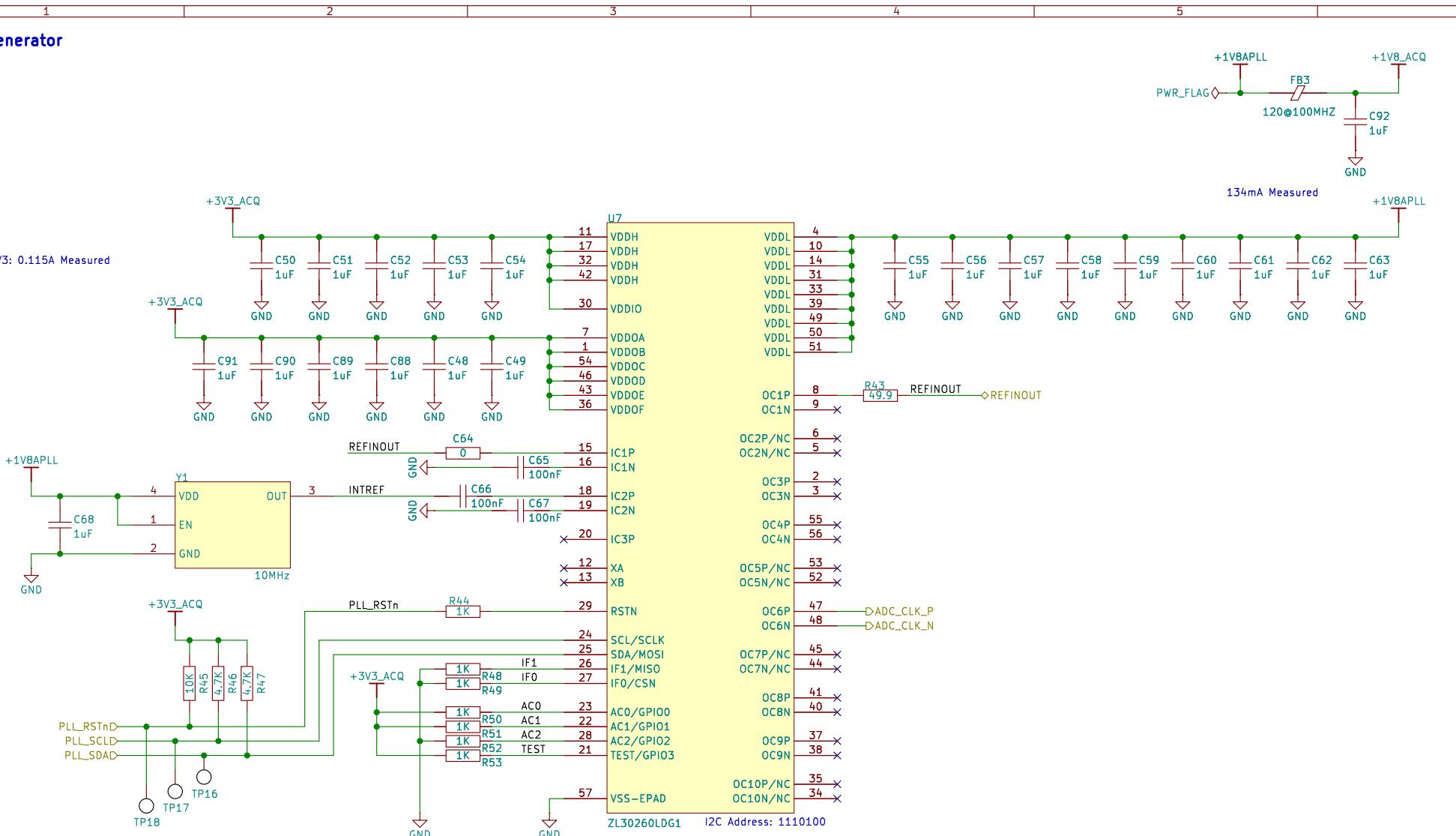
KiCad E.D.A. 9.0.3

Rev: 5.3

Id: 5/20

1 2 3 4 5 6

Clock Generator



| Processor Interface | Configuration Memory to Use |
|---------------------|--|
| 0 0 | I ² C, slave address 11101 00 |
| 0 1 | I ² C, slave address 11101 01 |
| 1 0 | SPI Slave |
| 1 1 | SPI Master during auto-configuration then SPI Slave |
| | External SPI EEPROM |

To configure the device as specified in the first three rows above but without auto-configuring from internal ROM, wire devices pins as follows: TEST=1 and ACI2[0]=011, as described in section 5.2.

| AC2 | AC1 | AC0 | Auto Configuration |
|-----|-----|-----|--------------------|
| 0 | 0 | 0 | Configuration 0 |
| 0 | 0 | 1 | Configuration 1 |
| 0 | 1 | 0 | Configuration 2 |
| 0 | 1 | 1 | Configuration 3 |
| 1 | 0 | 0 | Configuration 4 |
| 1 | 0 | 1 | Configuration 5 |
| 1 | 1 | 0 | Configuration 6 |
| 1 | 1 | 1 | Configuration 7 |

3.3 + 1.8V operation w/ one input one output: 0.67W Expected
0.62W Measured

EEVengers

Sheet: /Clock Generator/
File: PLL.kicad_sch

Title: ThunderScope

Size: A4 Date:

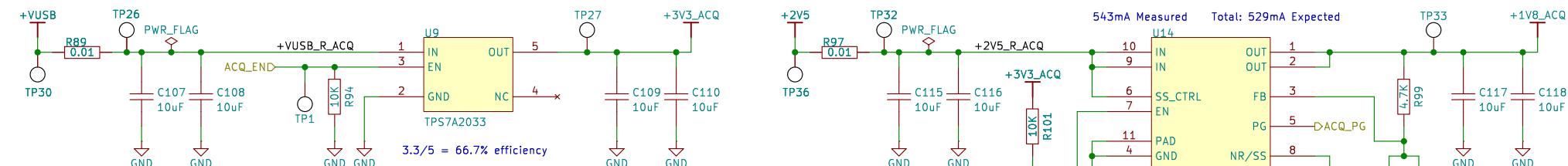
KiCad E.D.A. 9.0.3

Drawn by: Aleksa Bjelogrlic

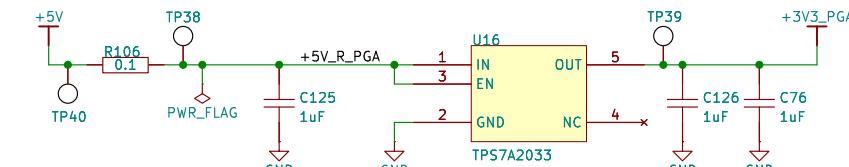
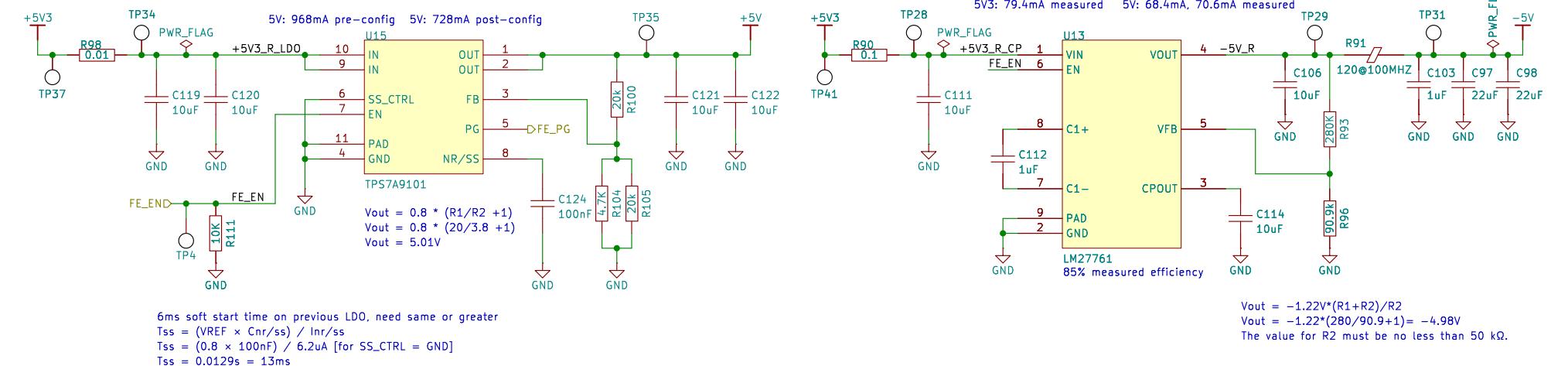
Rev: 5.3

Id: 6/20

Acquisition Voltage Regulators



Front End Voltage Regulators



EEV

EEvengers
Sheet: /ACQ and FE Voltage Regs/
File: ACQ_FE_VREG.kicad_sch

Title: ThunderScope

Size: A4

KiCad E.D.A. 9.0.3

4

Drawn by Alaska Biographics

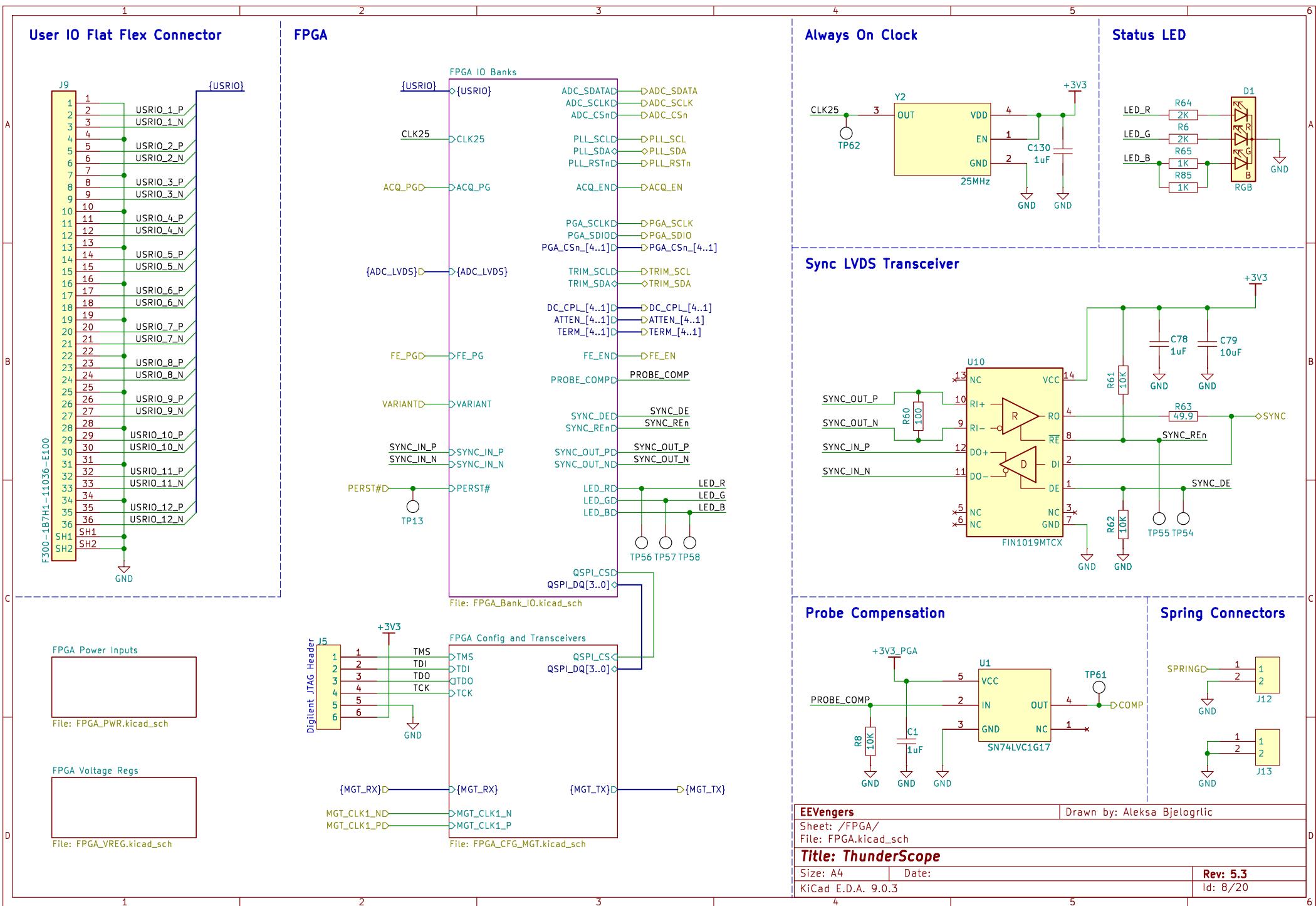
Drawn by: Aleksa Bjelogrlic

100

1

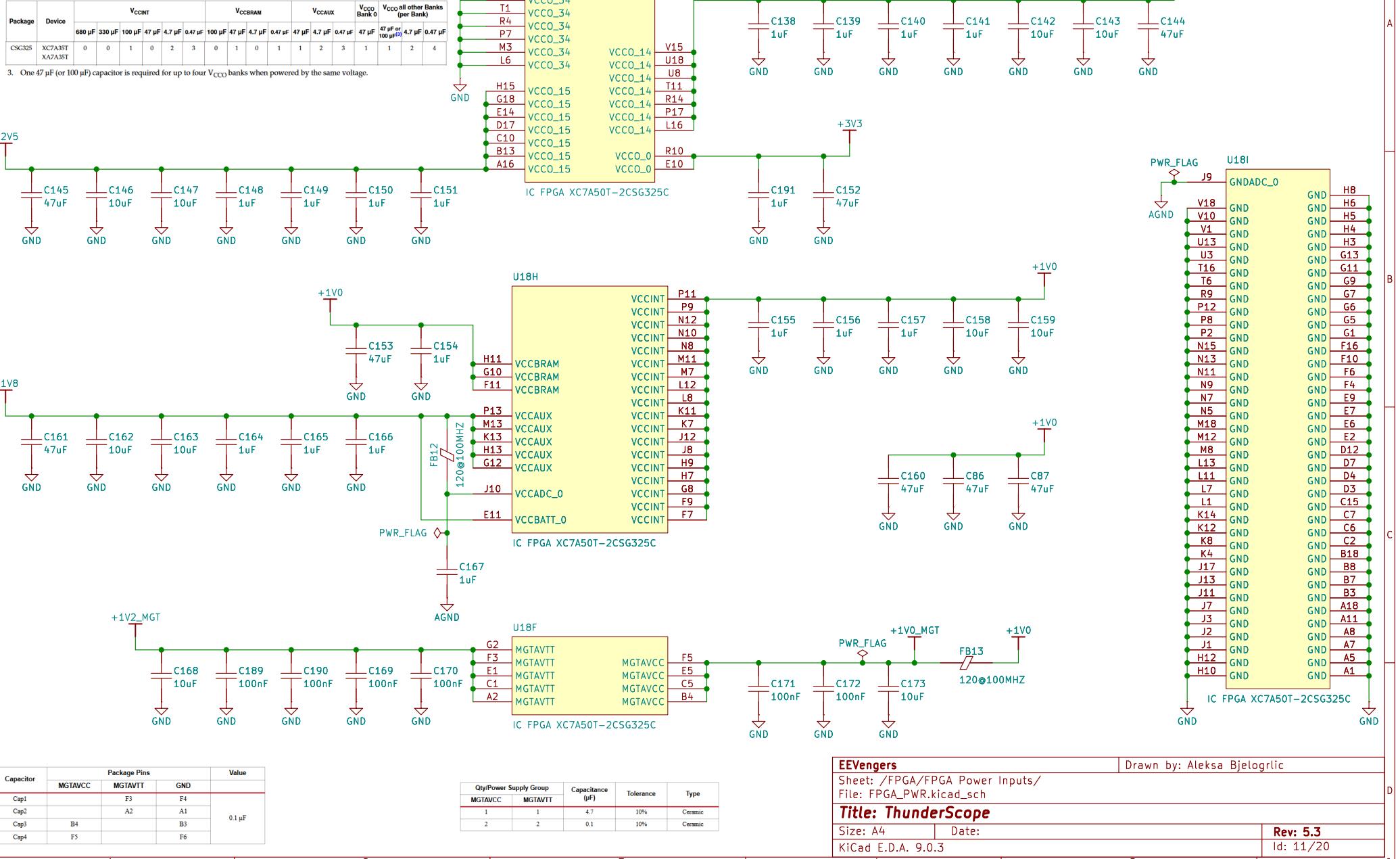
10

5



1 2 3 4 5 6

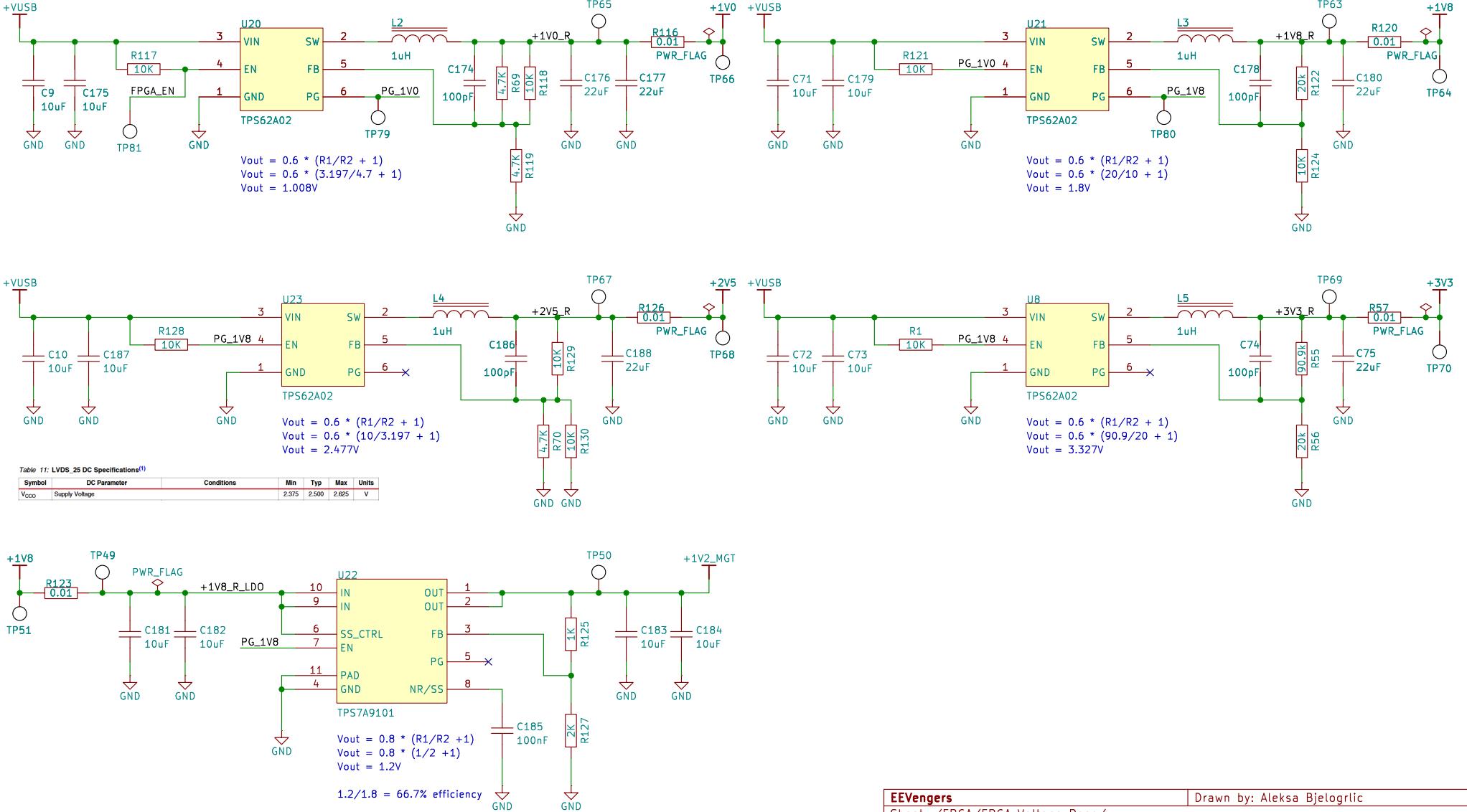
FPGA Power Inputs



1 2 3 4 5 6

FPGA Voltage Regulators

The recommended power-on sequence is VCCINT, VCCBRAM, VCCAUX, and VCCO
1V,1V,1.8V,2.5V and 3.3V



EEVengers

Sheet: /FPGA/FPGA Voltage Regs/
File: FPGA_VREG.kicad_sch

Title: ThunderScope

Size: A4 Date:

KiCad E.D.A. 9.0.3

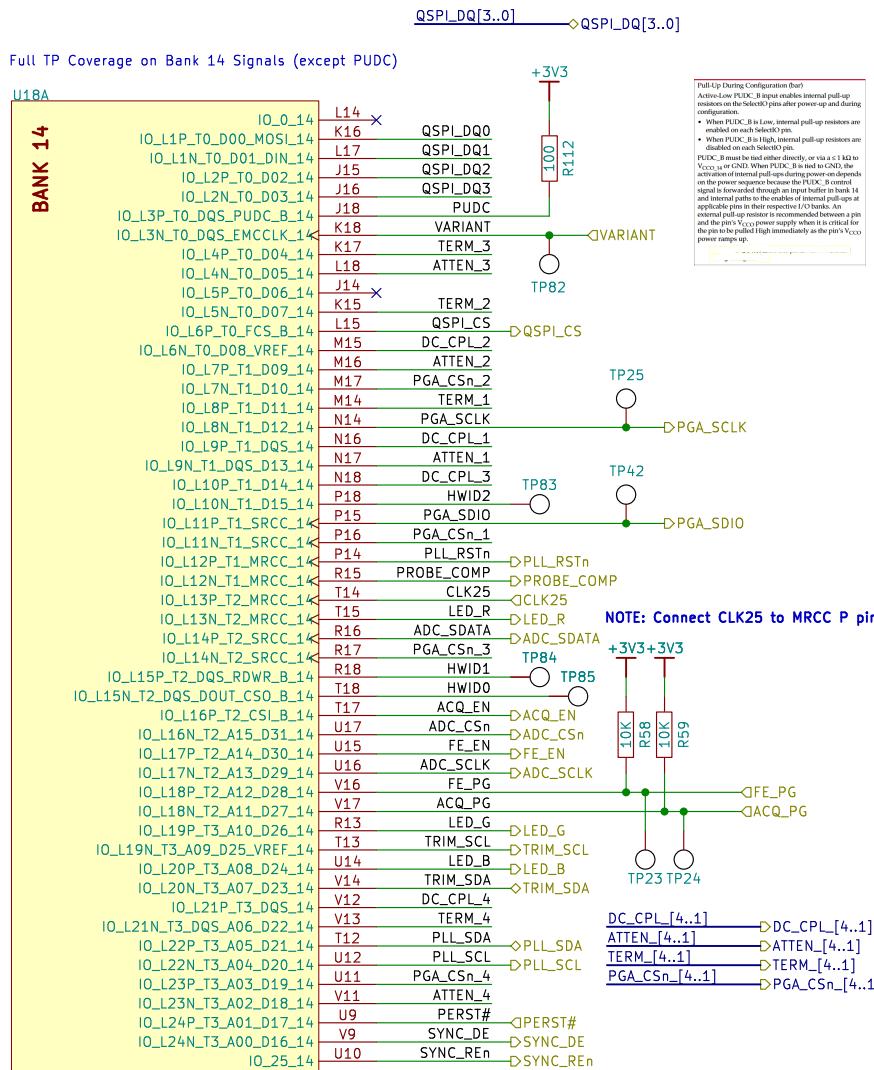
Drawn by: Aleksa Bjelogrlic

Rev: 5.3

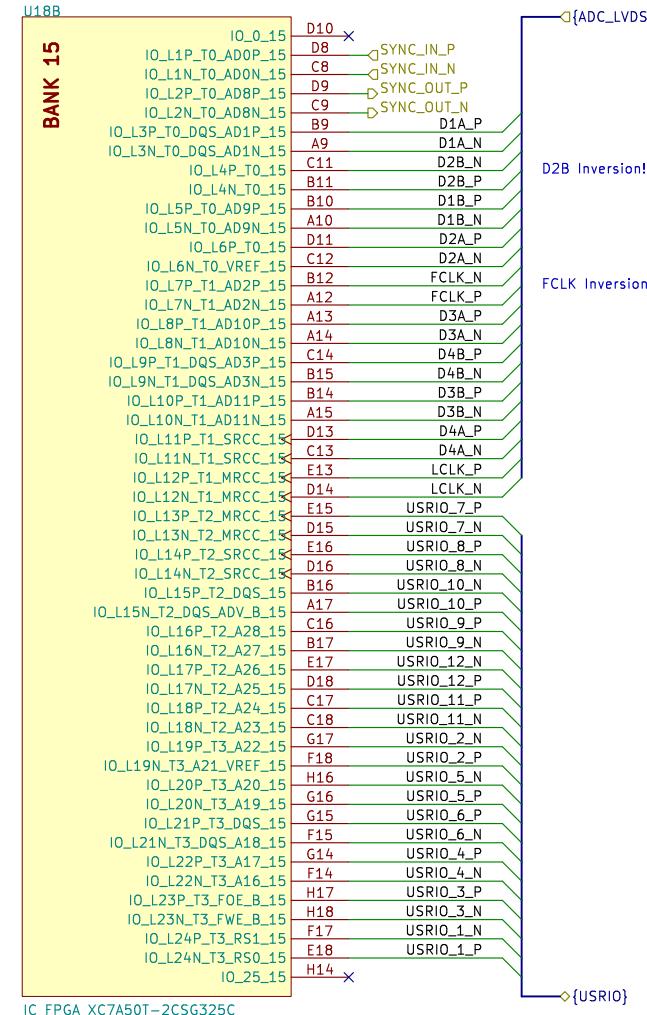
Id: 12/20

1 2 3 4 5 6

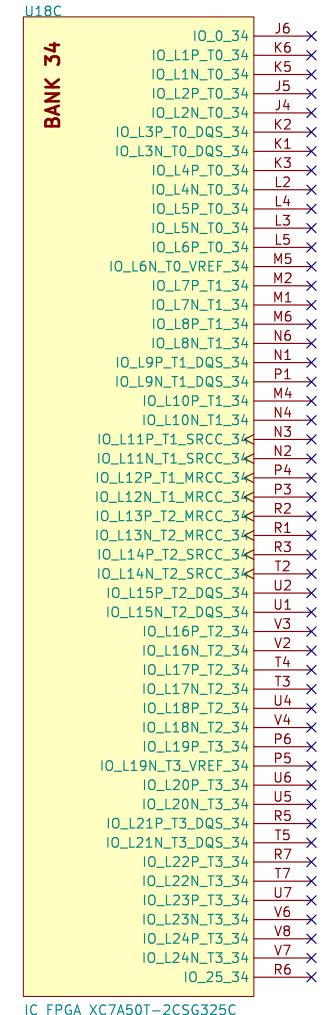
FPGA IO Banks



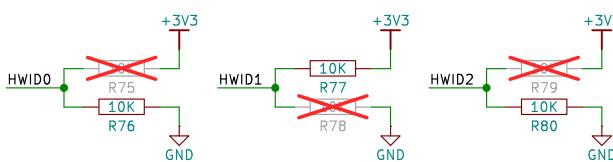
IC FPGA XC7A50T-2CSG325C



IC FPGA XC7A50T-2CSG325C



IC FPGA XC7A50T-2CSG325C



EEV

EEvengers

Drawn by Alaska Biogeographic

Sheet: /EPGA/EPGA IO E

File: FPGA_Bank_I0.kicad

Title: Thunder

Size: A4 Date:

Page 1

Rev. 5.3

FPGA Configuration

A High signal on the DONE pin indicates completion of the configuration sequence. The DONE output is an open-drain output by default.

Note: DONE has an internal pull-up resistor of approximately 10 kΩ. There is no setup/hold requirement for the DONE register. These changes, along with the DonePipe register software default, eliminate the need for the DriveDONE driver-option. External 330Ω resistor circuits are not required but can be used as they have been in previous generations.

Connect INIT_B to a ≤ 4.7 kΩ pull-up resistor to V_{CCO_0} to ensure clean Low-to-High transitions.

Connect PROGRAM_B to an external ≤ 4.7 kΩ pull-up resistor to V_{CCO_0} to ensure a stable High input, and

| Table 2-1: 7 Series FPGA Configuration Modes | | | |
|--|-------|------------|----------------|
| Configuration Mode | M2[0] | Bus Width | CCLK Direction |
| Master SPI | 001 | x1, x2, x4 | Output |

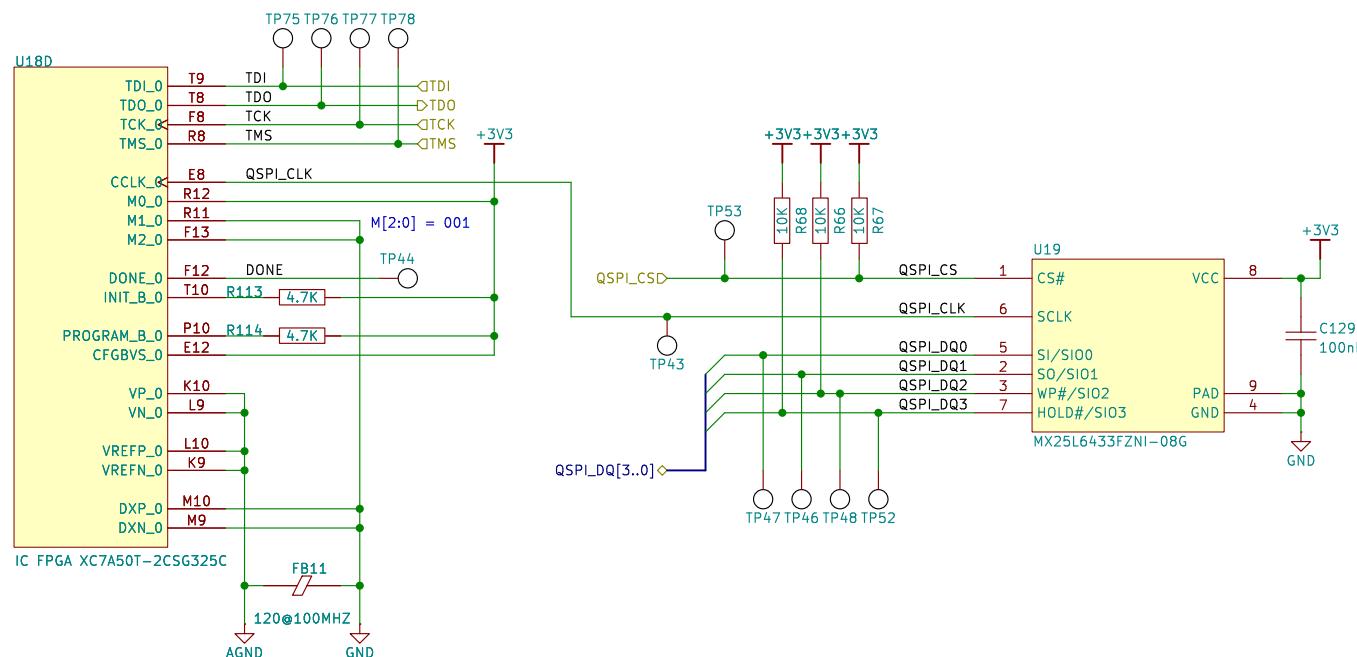
Table 2-2: Spartan-7, Artix-7 and Kintex-7 FPGA Configuration Mode, Compatible Voltages, and CFGBVS Connection

| Configuration Mode | Banks Used | Configuration Interface I/O | HR Bank 0 V _{CCO} | HR Bank 14 V _{CCO} | HR Bank 15 V _{CCO} | CFGBVS |
|-------------------------|----------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|------------------------|
| JTAG (only) | 0 | V _{PP} | 3.3V | 3.3V | Any | V _{CCO_0} , 0 |
| | | V _{REFP_0} | 2.5V | 2.5V | Any | V _{CCO_0} , 0 |
| | | V _{REFN_0} | 1.8V | 1.8V | Any | GND |
| | | V _{REFP_0} | 1.5V | 1.5V | Any | GND |
| Serial SPI or SelectMAP | 0, 14 ⁽¹⁾ | V _{PP} | 3.3V | 3.3V | 3.3V | V _{CCO_0} , 0 |
| | | V _{REFP_0} | 2.5V | 2.5V | 2.5V | V _{CCO_0} , 0 |
| | | V _{REFN_0} | 1.8V | 1.8V | 1.8V | GND |
| | | V _{REFP_0} | 1.5V | 1.5V | 1.5V | GND |
| | | V _{PP} | 3.3V | 3.3V | 3.3V | V _{CCO_0} , 0 |
| | | V _{REFP_0} | 2.5V | 2.5V | 2.5V | V _{CCO_0} , 0 |
| | | V _{REFN_0} | 1.8V | 1.8V | 1.8V | GND |
| | | V _{PP} | 3.3V | 3.3V | 3.3V | V _{CCO_0} , 0 |
| | | V _{REFP_0} | 2.5V | 2.5V | 2.5V | V _{CCO_0} , 0 |
| | | V _{REFN_0} | 1.8V | 1.8V | 1.8V | GND |
| BPI ⁽²⁾ | 0, 14, 15 | V _{PP} | 3.3V | 3.3V | 3.3V | GND |
| | | V _{REFP_0} | 1.5V | 1.5V | 1.5V | GND |

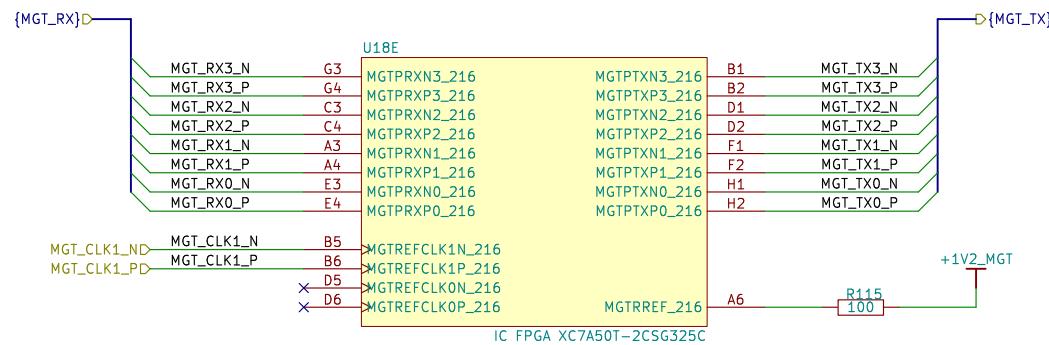
Notes:

1. RS1_0 for Multifuse or Fallback use in bank 15 but are typically only used in BPI mode and not supported in SPI mode.

2. BPI mode is not available in the Spartan-7 family.



FPGA Transceivers



EEVengers

Sheet: /FPGA/FPGA Config and Transceivers/
File: FPGA_CFG_MGT.kicad_sch

Title: ThunderScope

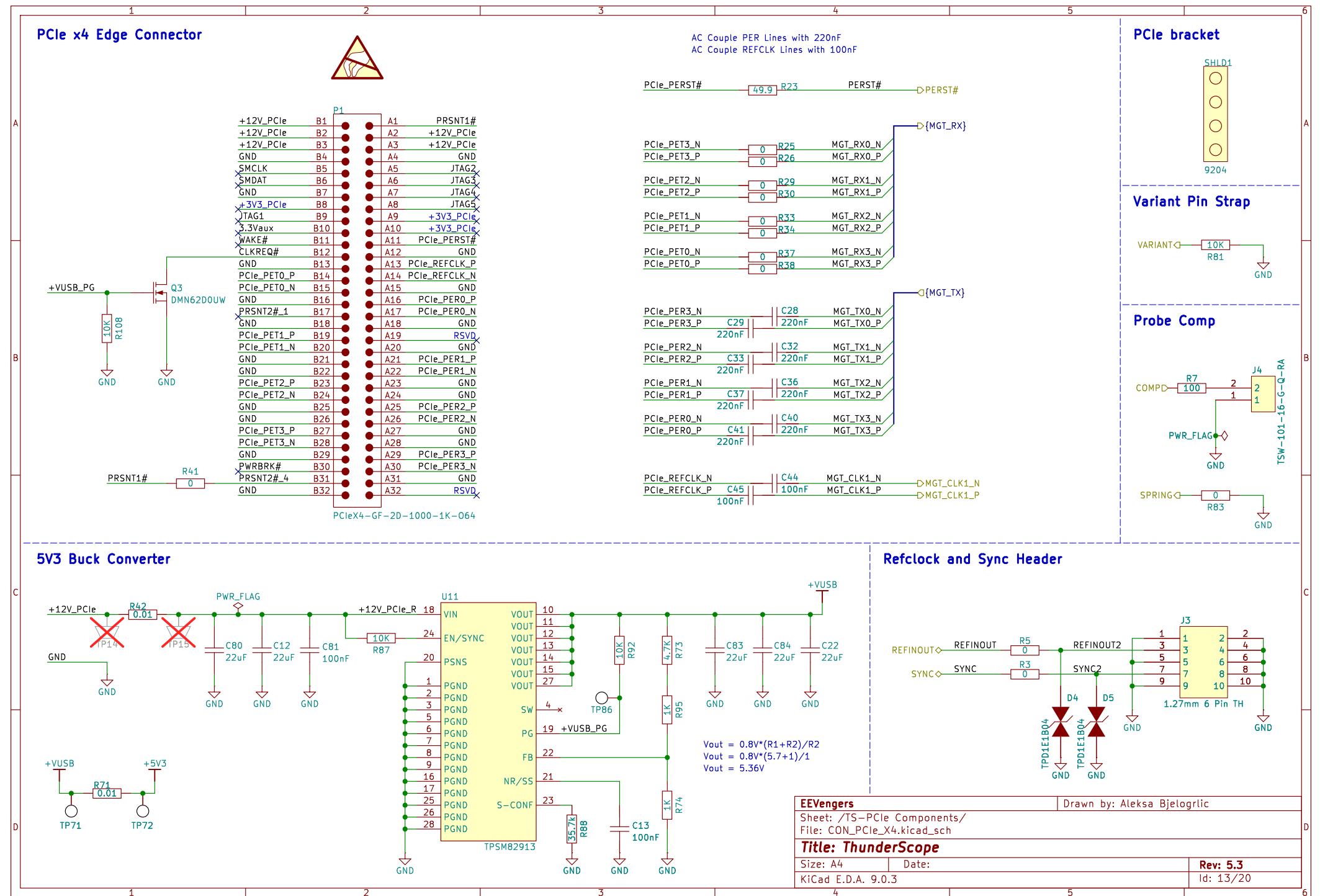
Size: A4 Date:

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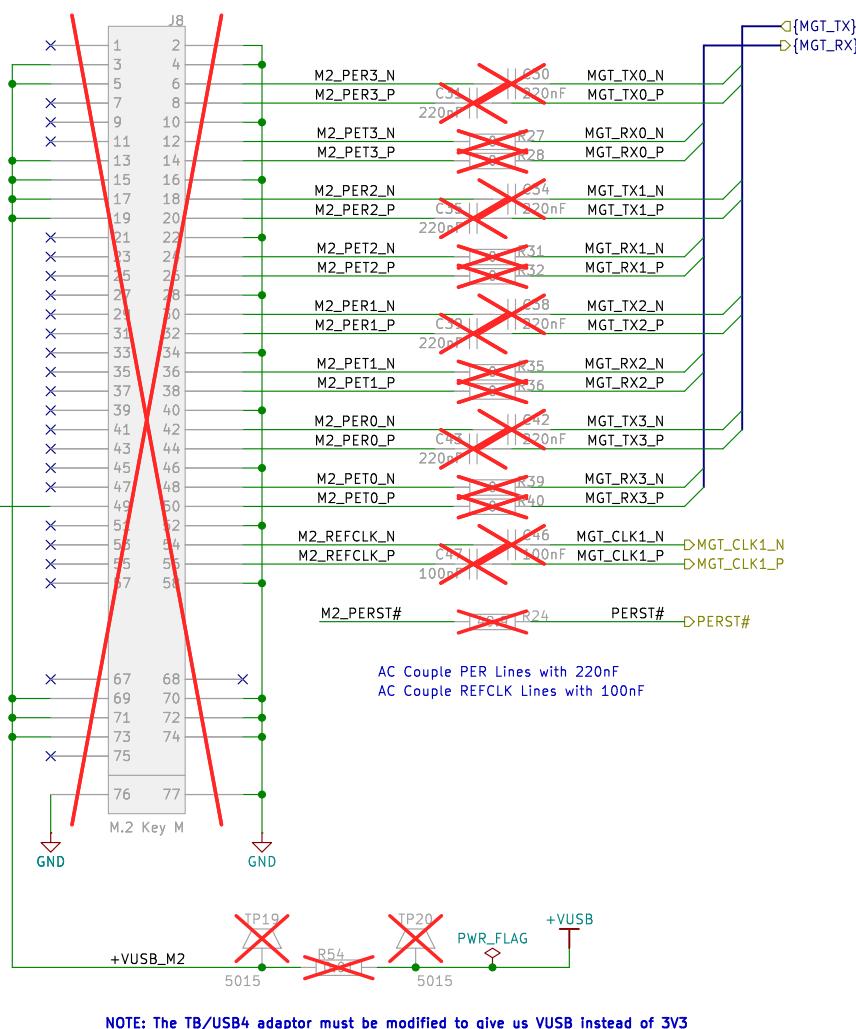
Drawn by: Aleksa Bjelogrlic

Rev: 5.3

Id: 10/20



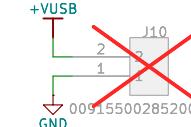
M.2 Key M Connector – Custom Pinout



Probe Comp



Fan Connector



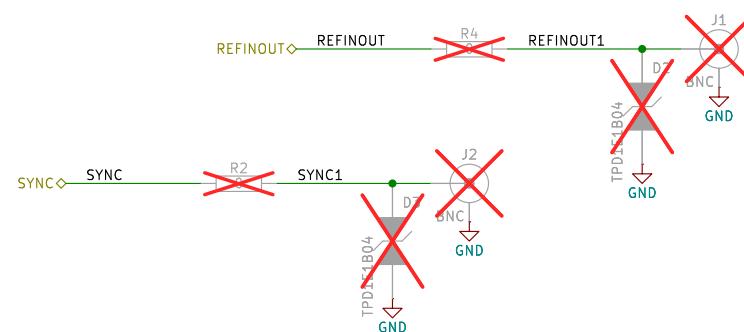
Ground Lug



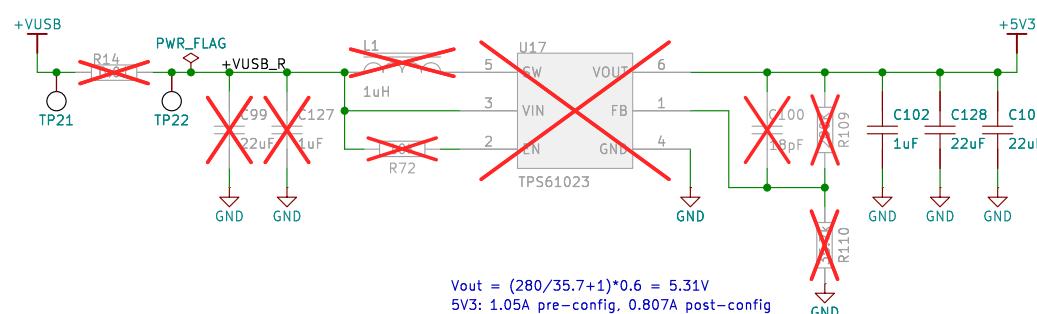
Variant Pin Strap



Refclock and Sync BNCs



5V3 Boost Converter



Interposer Standoffs



EEVengers

Sheet: /TS-USB4 Components/
File: M2_KEY_M.kicad_sch

Title: ThunderScope

Size: A4 Date:

KiCad E.D.A. 9.0.3

Drawn by: Aleksa Bjelogrlic

Rev: 5.3

Id: 14/20