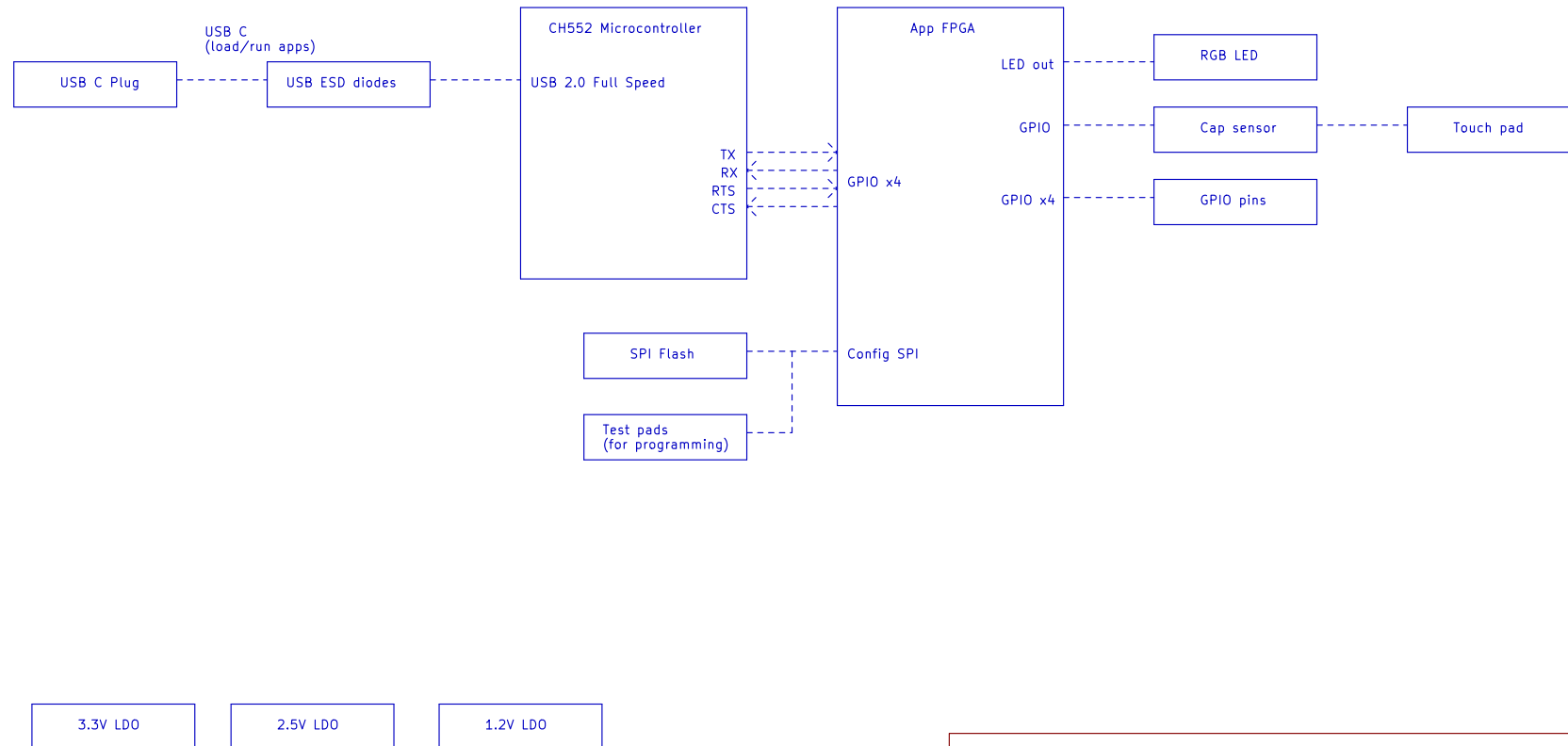


# MTA1 – USB – V1



Application FPGA

File: application\_fpga.kicad\_sch

USB to Serial converter

File: usb\_to\_serial.kicad\_sch

Power Supply

File: powersupply.kicad\_sch

## Copyright Tillitis AB 2022

This document describes Open Hardware and is licensed under the CERN-OHL-S v2.

You may redistribute and modify this source and make products using it under the terms of the CERN-OHL-S v2 ([https://ohwr.org/cern\\_ohl\\_s\\_v2.txt](https://ohwr.org/cern_ohl_s_v2.txt)).

This source is distributed WITHOUT ANY EXPRESS OR IMPLIED WARRANTY, INCLUDING OF MERCHANTABILITY, SATISFACTORY QUALITY AND FITNESS FOR A PARTICULAR PURPOSE. Please see the CERN-OHL-S v2 for applicable conditions.

Sheet: /  
File: mta1-usb-v1.kicad\_sch

**Title: MTA1-USB-V1**

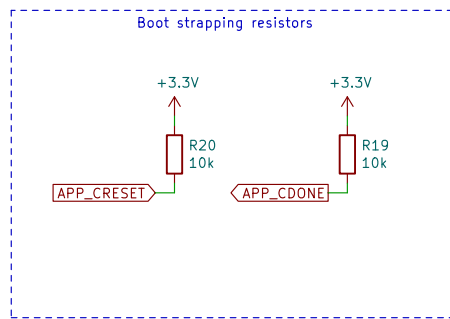
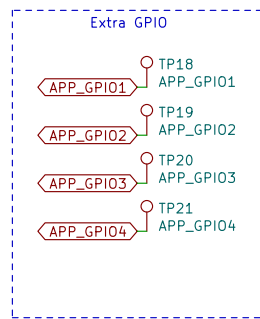
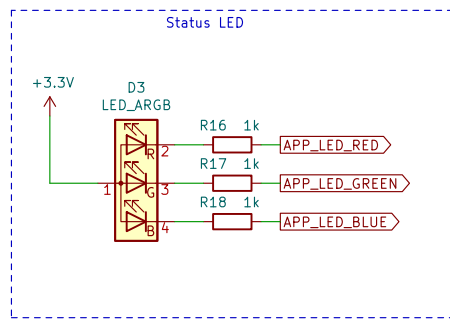
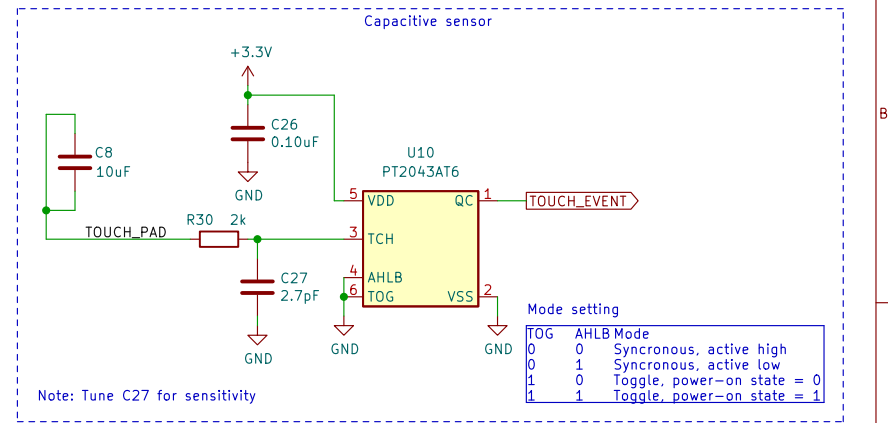
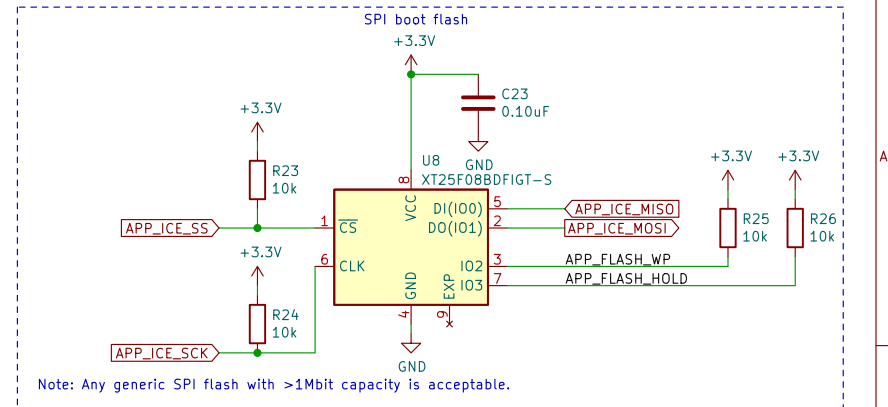
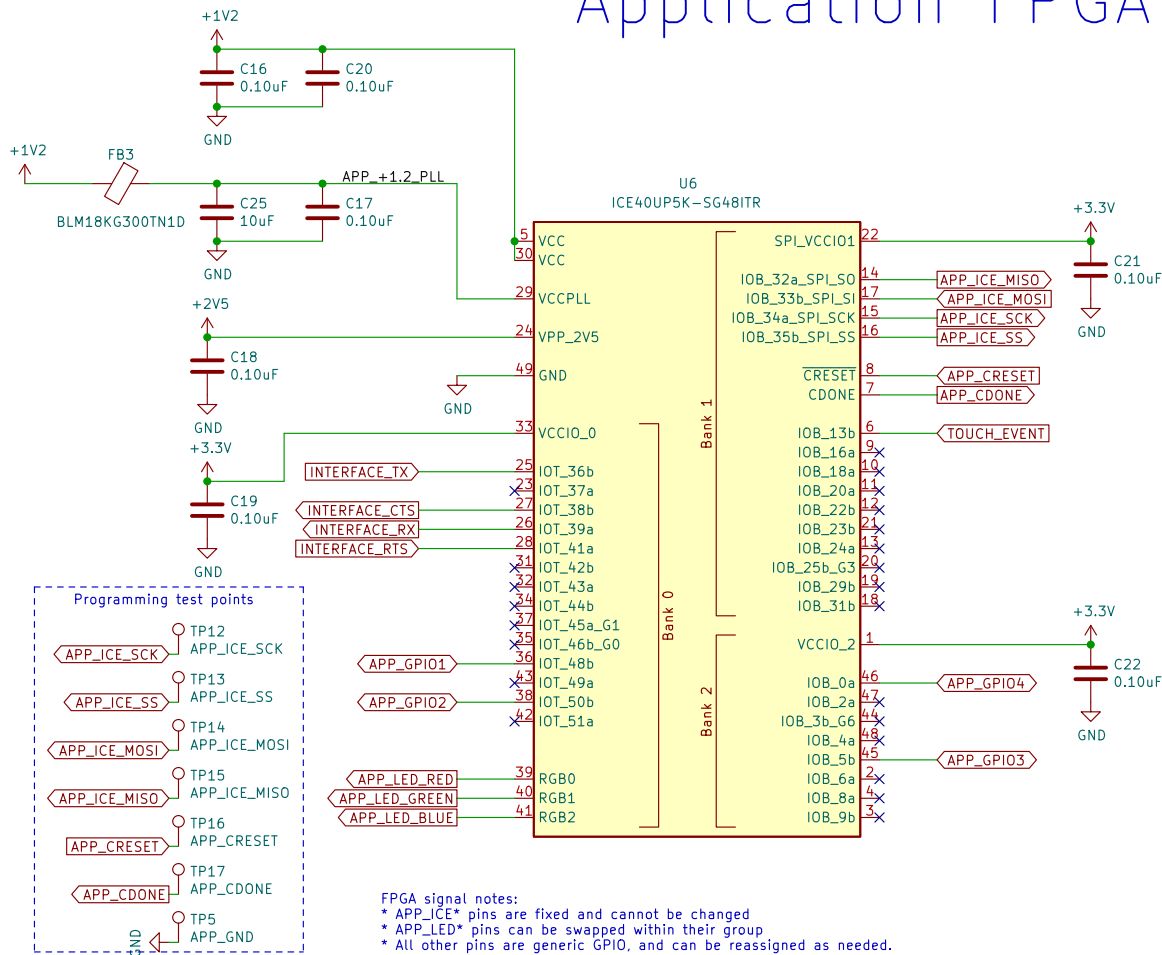
Size: A4 | Date: 2021-09-29

KiCad E.D.A. kicad (6.0.4)

**Rev: V1**

Id: 1/4

# Application FPGA



## Copyright Tillitis AB 2022

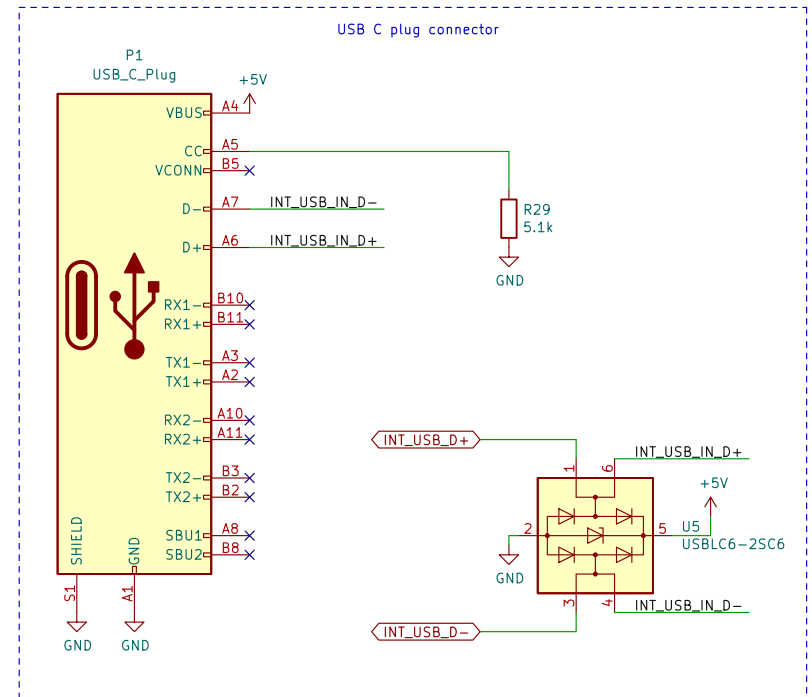
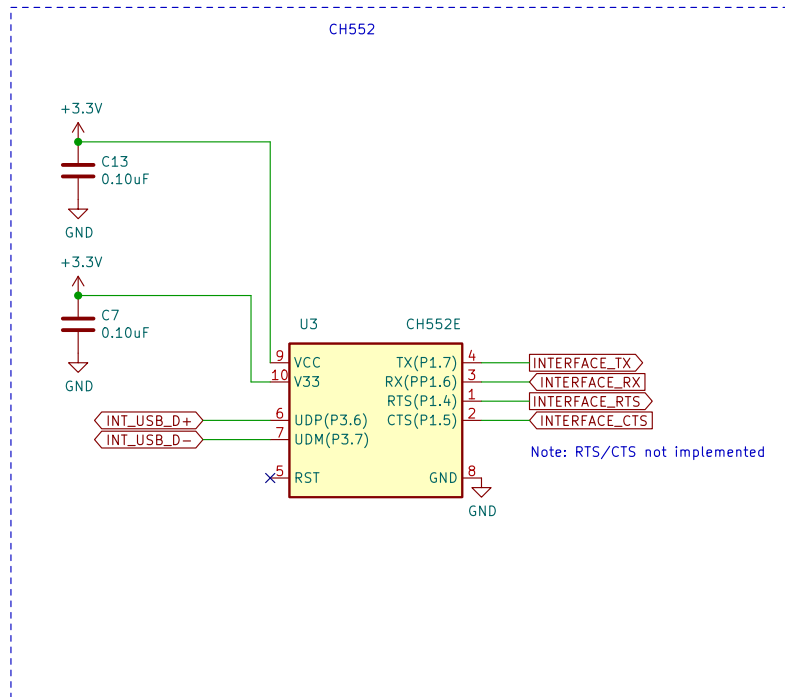
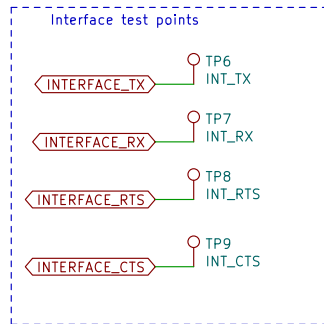
This document describes Open Hardware and is licensed under the CERN-OHL-S v2.

You may redistribute and modify this source and make products using it under the terms of the CERN-OHL-S v2 ([https://ohwr.org/cern\\_ohl\\_s\\_v2.txt](https://ohwr.org/cern_ohl_s_v2.txt)).

This source is distributed WITHOUT ANY EXPRESS OR IMPLIED WARRANTY, INCLUDING OF MERCHANTABILITY, SATISFACTORY QUALITY AND FITNESS FOR A PARTICULAR PURPOSE. Please see the CERN-OHL-S v2 for applicable conditions.

|                                  |                  |
|----------------------------------|------------------|
| Sheet: /Application FPGA/        |                  |
| File: application_fpga.kicad_sch |                  |
| <b>Title: Application FPGA</b>   |                  |
| Size: A4                         | Date: 2021-09-29 |
| KiCad E.D.A. kicad (6.0.4)       | Rev: V1          |
|                                  | Id: 2/4          |

# USB-to-Serial Interface



The CH552 is loaded with a TTY ACM firmware, to act as a USB-to-Serial converter

Due to the processor speed, not all baud rates are accurate. Here are the baud rates achieved for common settings:

| Setting | Actual    | % error |
|---------|-----------|---------|
| 9600    | 9615.38   | 0.16%   |
| 14400   | 14492.75  | 0.64%   |
| 19200   | 19230.77  | 0.16%   |
| 38400   | 38461.54  | 0.16%   |
| 57600   | 58823.53  | 2.12%   |
| 100000  | 100000    | 0.00%   |
| 115200  | 125000    | 8.51%   |
| 128000  | 142857.14 | 11.61%  |
| 256000  | 333333.33 | 30.21%  |
| 1000000 | 1000000   | 0.00%   |

Note: RTS/CTS lines are not implemented in the device firmware, but are included in the hardware design in case they need to be implemented. The intent is to use them in the 'modern' sense: Each receiving device asserts its RTS signal as long as it is able to receive at least one byte of data on its RX line, and clears it when it is not able to receive data. Each transmitting device will check their RTS input before transmitting on their TX line.

Copyright Tillitis AB 2022

This document describes Open Hardware and is licensed under the CERN-OHL-S v2.

You may redistribute and modify this source and make products using it under the terms of the CERN-OHL-S v2 ([https://ohwr.org/cern\\_ohLs\\_v2.txt](https://ohwr.org/cern_ohLs_v2.txt)).

This source is distributed WITHOUT ANY EXPRESS OR IMPLIED WARRANTY, INCLUDING OF MERCHANTABILITY, SATISFACTORY QUALITY AND FITNESS FOR A PARTICULAR PURPOSE. Please see the CERN-OHL-S v2 for applicable conditions.

Sheet: /USB to Serial converter/  
File: usb\_to\_serial.kicad\_sch

**Title: USB-to-Serial Interface**

Size: A4 Date: 2021-09-29

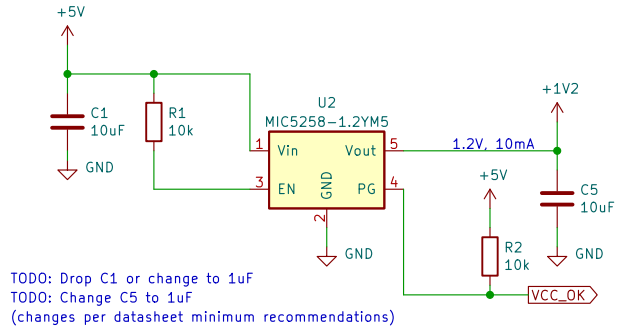
KiCad E.D.A. kicad (6.0.4)

Rev: V1

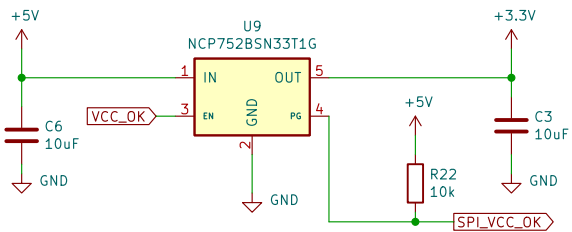
Id: 3/4

# Power Supply

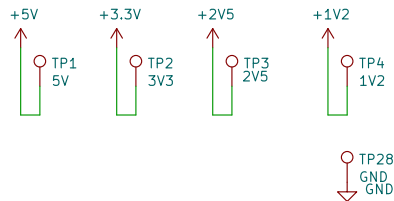
1.2V regulator, supplies VCC and VCC\_PLL



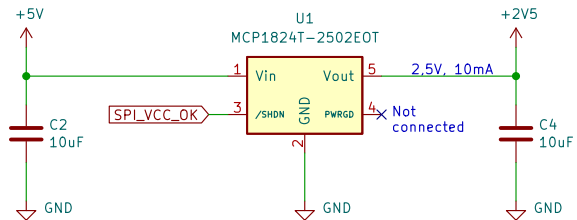
3.3V regulator, supplies VCCIO



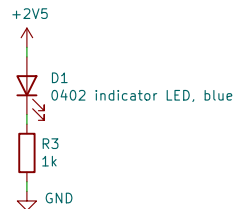
Power Supply Test Points



Regulator for 2.5V supply from 5V USB



Power LED



## From the Lattice documentation:

### 4.5. Power-up Supply Sequence

It is recommended to bring up the power supplies in the following order. Note that there is no specified timing delay between the power supplies, however, there is a requirement for each supply to reach a level of 0.5 V, or higher, before any subsequent power supplies in the sequence are applied.

1. Vcc and Vcc<sub>PLL</sub> should be the first two supplies to be applied. Note that these two supplies can be tied together subject to the recommendation to include a RC-based noise filter on the Vcc<sub>PLL</sub>. Refer to [ICE40 Hardware Checklist \(FPGA-TN-02006\)](#).
2. SPL\_Vcc<sub>IO</sub> should be the next supply, and can be applied any time after the previous supplies (Vcc and Vcc<sub>PLL</sub>) have reached a level of 0.5 V or higher.
3. Vpp\_2vs should be the next supply, and can be applied any time after previous supplies (Vcc, Vcc<sub>PLL</sub> and SPL\_Vcc<sub>IO</sub>) have reached a level of 0.5 V or higher.
4. Other Supplies (Vcc<sub>IO</sub> and Vcc<sub>IO2</sub>) do not affect device power-up functionality, and they can be applied any time after the initial power supplies (Vcc and Vcc<sub>PLL</sub>) have reached a level of 0.5 V or greater. There is no power down sequence required. However, when partial power supplies are powered down, it is required the above sequence to be followed when these supplies are re-powered up again.

### Power-on sequence:

1. External power (3.3V\_IN) is applied.
2. U2 (1.2V regulator) turns on.
3. Once 1.2V output is stable, U1 releases its PG output, allowing VCC\_OK to go high.
4. U9 (3.3V regulator) turns on.
5. Once the 3.3V output is stable, U9 releases its PG output, allowing SPL\_VCC\_OK to go high.
6. U31 (2.5V regulator) turns on.
7. After a short time, the internal POR circuit in the ICE40 allows it to boot.

## Copyright Tillitis AB 2022

This document describes Open Hardware and is licensed under the CERN-OHL-S v2.

You may redistribute and modify this source and make products using it under the terms of the CERN-OHL-S v2 ([https://ohwr.org/cern\\_ohl\\_s\\_v2.txt](https://ohwr.org/cern_ohl_s_v2.txt)).

This source is distributed WITHOUT ANY EXPRESS OR IMPLIED WARRANTY, INCLUDING OF MERCHANTABILITY, SATISFACTORY QUALITY AND FITNESS FOR A PARTICULAR PURPOSE. Please see the CERN-OHL-S v2 for applicable conditions.

Sheet: /Power Supply/  
File: powersupply.kicad\_sch

### Title: Power Supply

Size: A4 Date: 2021-09-29

KiCad E.D.A. kicad (6.0.4)

Rev: V1

Id: 4/4