AstraControl

23 June 2024

In review

ESP32 Based control PCB for other light fixture pcbs.

Features

- 5V 10A Input
- USB C
- External WiFi Antenna
- 5Mbps RS485 (half-duplex)
- ESP32
- I2C Auxilary
- GPIO Breakout
- Button
- -
- -
- -
- -

Render placeholder

File: overview.kicad_sch

File: block_diagram.kicad_sch

LiveAstra Technologies

Sheet: /

File: AstraControl.kicad_sch

Title: AstraControl – ESP32 Based Controller

Size: A4	Date:	Rev: A
KiCad E.D.A. 8.0.3		Id: 1/16

Overview

22 April 2024

Page	Description
1	Cover
2	Overview
3	Block Diagram
4	MCU Power
5	MCU
6	LED Drivers

Page	Description
7	Misc

Render placeholder

Notes

- Components marked with will not be fitted.

Design Considerations

Information

Generic information box to inform about specifics of the part or layout, notes, helpful information.

Caution

Extra care is required here. Pay attention to details, routing, and try your best to follow the advice.

Critical

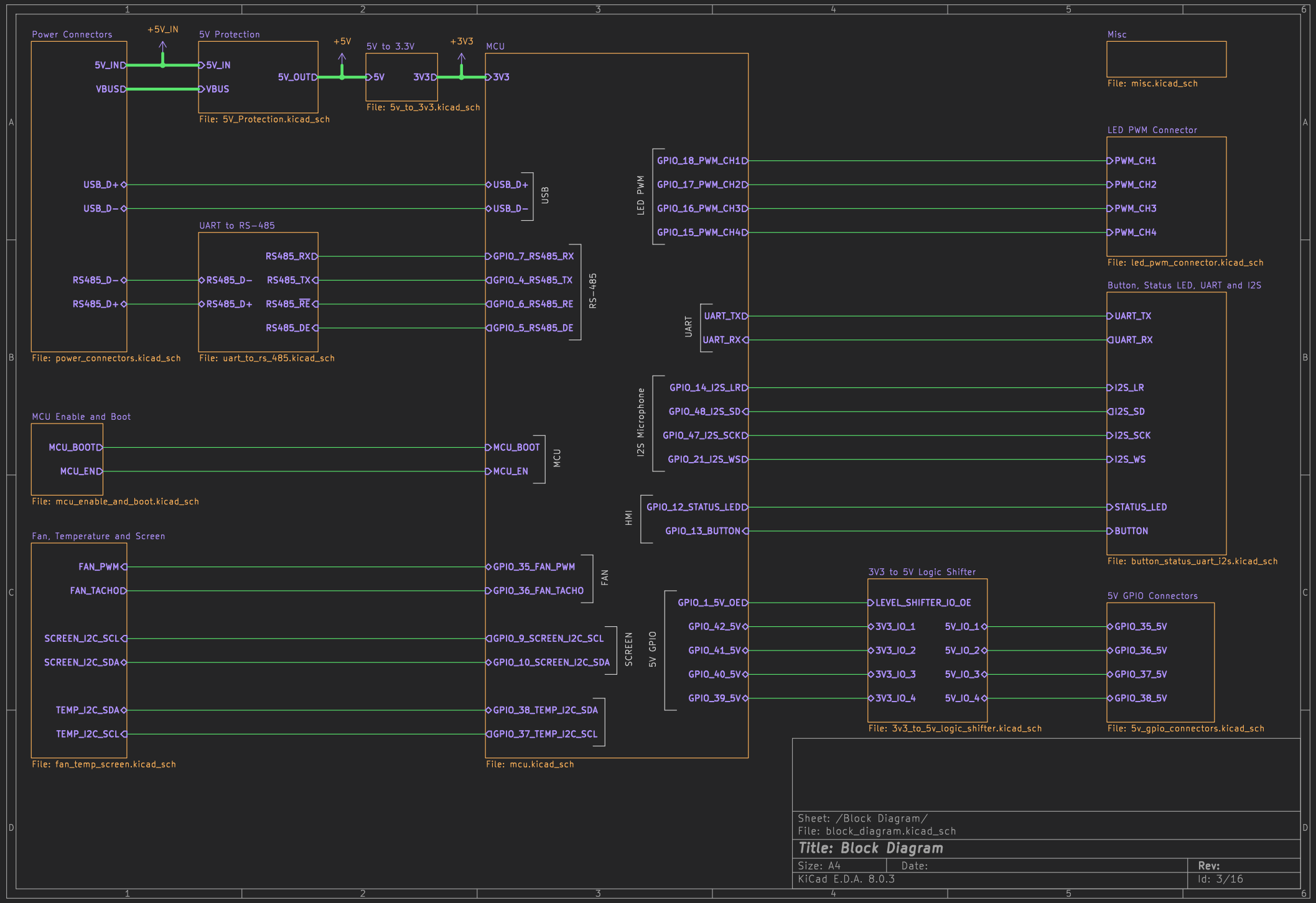
It is critical to follow the instructions here. Failure to do so will result in poor performance or failuire.

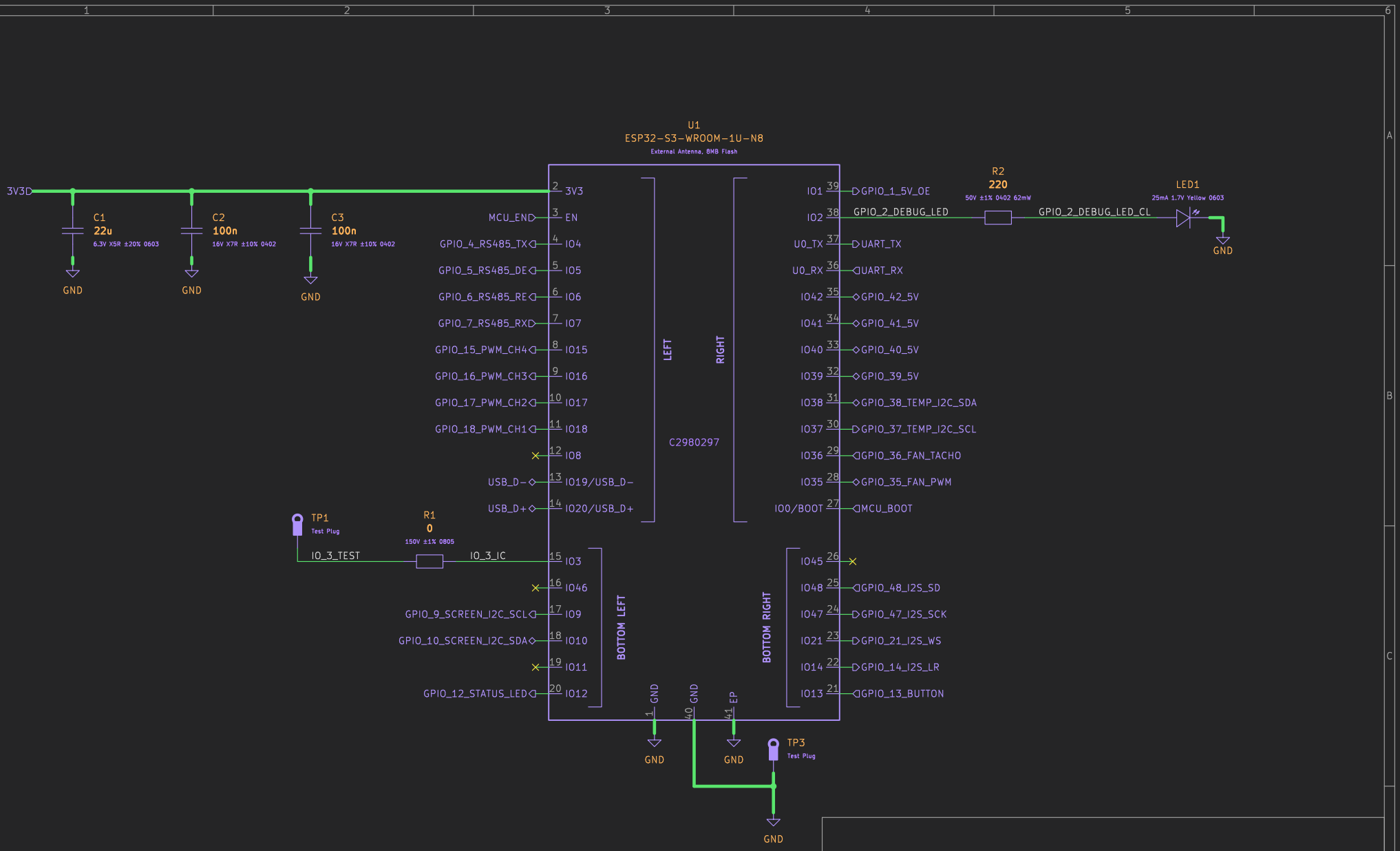
Sheet: /Overview/
File: overview.kicad_sch

Title: Overview

Size: A4 | Date: | Rev:

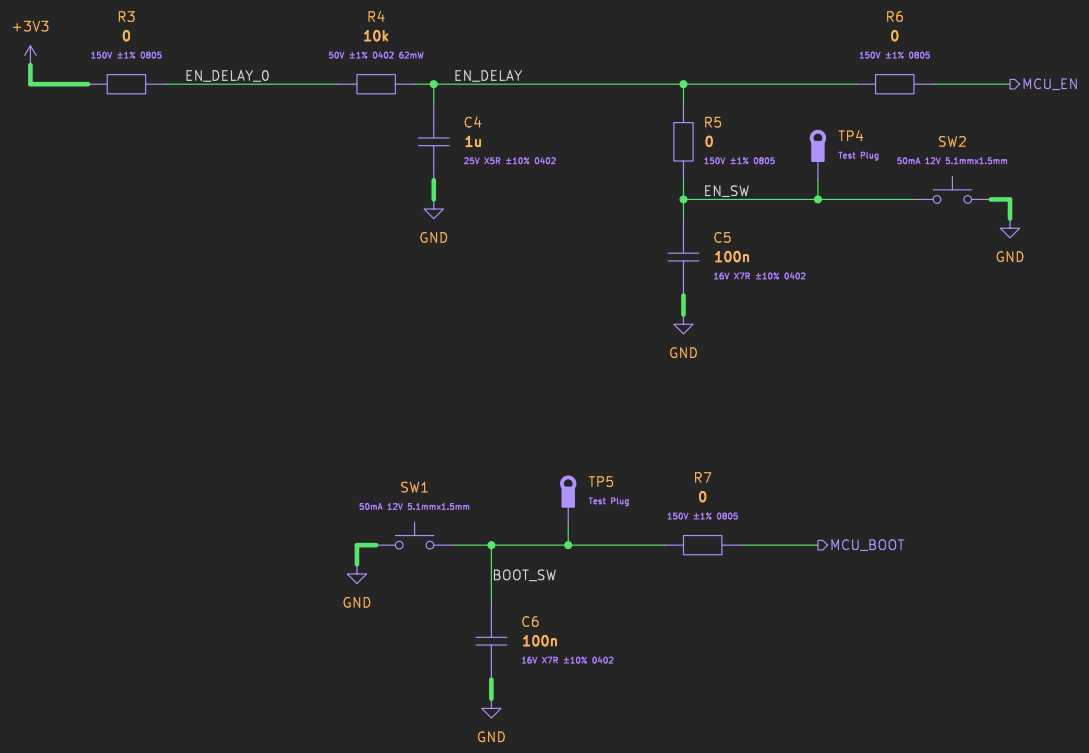
KiCad E.D.A. 8.0.3 | Id: 2/16


Power Connectors
5V_IND
VBUSD
+5V_IN
5V Protection
5V_IN
VBUS
5V_OUTD
File: 5V_Protection.kicad_sch
+5V
5V to 3.3V
5V
3V3D
+3V3
File: 5v_to_3v3.kicad_sch
MCU
3V3
Misc
File: misc.kicad_sch
USB_D+
USB_D−
USB_D+
USB_D−
USB
LED PWM
GPIO_18_PWM_CH1D
GPIO_17_PWM_CH2D
GPIO_16_PWM_CH3D
GPIO_15_PWM_CH4D
LED PWM Connector
PWM_CH1
PWM_CH2
PWM_CH3
PWM_CH4
File: led_pwm_connector.kicad_sch
UART to RS−485
RS485_D−
RS485_D+
RS485_RXD
RS485_TX
RS485_RE
RS485_DE
GPIO_7_RS485_RX
GPIO_4_RS485_TX
GPIO_6_RS485_RE
GPIO_5_RS485_DE
RS−485
RS485_D−
RS485_D+
File: power_connectors.kicad_sch
File: uart_to_rs_485.kicad_sch
UART
UART_TXD
UART_RX
Button, Status LED, UART and I2S
UART_TX
UART_RX
I2S Microphone
GPIO_14_I2S_LRD
GPIO_48_I2S_SD
GPIO_47_I2S_SCKD
GPIO_21_I2S_WSD
I2S_LR
I2S_SD
I2S_SCK
I2S_WS
HMI
GPIO_12_STATUS_LEDD
GPIO_13_BUTTON
STATUS_LED
BUTTON
File: button_status_uart_i2s.kicad_sch
MCU Enable and Boot
MCU_BOOTD
MCU_END
MCU_BOOT
MCU_EN
MCU
File: mcu_enable_and_boot.kicad_sch
Fan, Temperature and Screen
FAN_PWM
FAN_TACHOD
GPIO_35_FAN_PWM
GPIO_36_FAN_TACHO
FAN
SCREEN_I2C_SCL
SCREEN_I2C_SDA
GPIO_9_SCREEN_I2C_SCL
GPIO_10_SCREEN_I2C_SDA
SCREEN
TEMP_I2C_SDA
TEMP_I2C_SCL
GPIO_38_TEMP_I2C_SDA
GPIO_37_TEMP_I2C_SCL
File: fan_temp_screen.kicad_sch
File: mcu.kicad_sch
5V GPIO
GPIO_1_5V_OED
GPIO_42_5V
GPIO_41_5V
GPIO_40_5V
GPIO_39_5V
3V3 to 5V Logic Shifter
LEVEL_SHIFTER_IO_OE
3V3_IO_1
3V3_IO_2
3V3_IO_3
3V3_IO_4
5V_IO_1
5V_IO_2
5V_IO_3
5V_IO_4
File: 3v3_to_5v_logic_shifter.kicad_sch
5V GPIO Connectors
GPIO_35_5V
GPIO_36_5V
GPIO_37_5V
GPIO_38_5V
File: 5v_gpio_connectors.kicad_sch
Sheet: /Block Diagram/
File: block_diagram.kicad_sch
Title: Block Diagram
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.3
Id: 3/16


U1
ESP32-S3-WROOM-1U-N8
External Antenna, 8MB Flash
C2980297
LEFT
RIGHT
BOTTOM LEFT
BOTTOM RIGHT
3V3D
C1
22u
6.3V X5R ±20% 0603
C2
100n
16V X7R ±10% 0402
C3
100n
16V X7R ±10% 0402
GND
2 3V3
3 EN
MCU_EN
4 IO4
GPIO_4_RS485_TX
5 IO5
GPIO_5_RS485_DE
6 IO6
GPIO_6_RS485_RE
7 IO7
GPIO_7_RS485_RX
8 IO15
GPIO_15_PWM_CH4
9 IO16
GPIO_16_PWM_CH3
10 IO17
GPIO_17_PWM_CH2
11 IO18
GPIO_18_PWM_CH1
12 IO8
13 IO19/USB_D-
USB_D-
14 IO20/USB_D+
USB_D+
TP1
Test Plug
R1
0
150V ±1% 0805
IO_3_TEST
IO_3_IC
15 IO3
16 IO46
17 IO9
GPIO_9_SCREEN_I2C_SCL
18 IO10
GPIO_10_SCREEN_I2C_SDA
19 IO11
20 IO12
GPIO_12_STATUS_LED
1 GND
40 GND
41 EP
TP3
Test Plug
39 IO1
GPIO_1_5V_OE
38 IO2
GPIO_2_DEBUG_LED
37 U0_TX
UART_TX
36 U0_RX
UART_RX
35 IO42
GPIO_42_5V
34 IO41
GPIO_41_5V
33 IO40
GPIO_40_5V
32 IO39
GPIO_39_5V
31 IO38
GPIO_38_TEMP_I2C_SDA
30 IO37
GPIO_37_TEMP_I2C_SCL
29 IO36
GPIO_36_FAN_TACHO
28 IO35
GPIO_35_FAN_PWM
27 IO0/BOOT
MCU_BOOT
26 IO45
25 IO48
GPIO_48_I2S_SD
24 IO47
GPIO_47_I2S_SCK
23 IO21
GPIO_21_I2S_WS
22 IO14
GPIO_14_I2S_LR
21 IO13
GPIO_13_BUTTON
R2
220
50V ±1% 0402 62mW
GPIO_2_DEBUG_LED_CL
LED1
25mA 1.7V Yellow 0603
Sheet: /Block Diagram/MCU/
File: mcu.kicad_sch
Title: MCU
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.3
Id: 4/16

Information

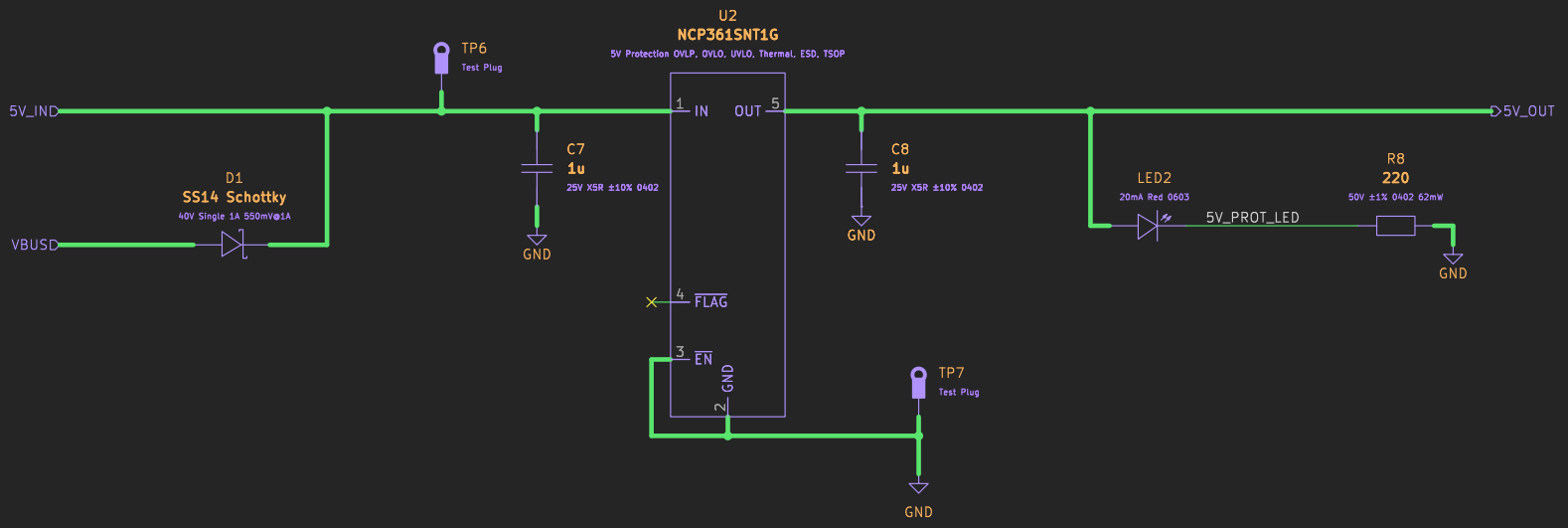
To ensure that the power supply to the ESP32-S3 chip is stable during power-up, it is advised to add an RC delay circuit at the EN pin.



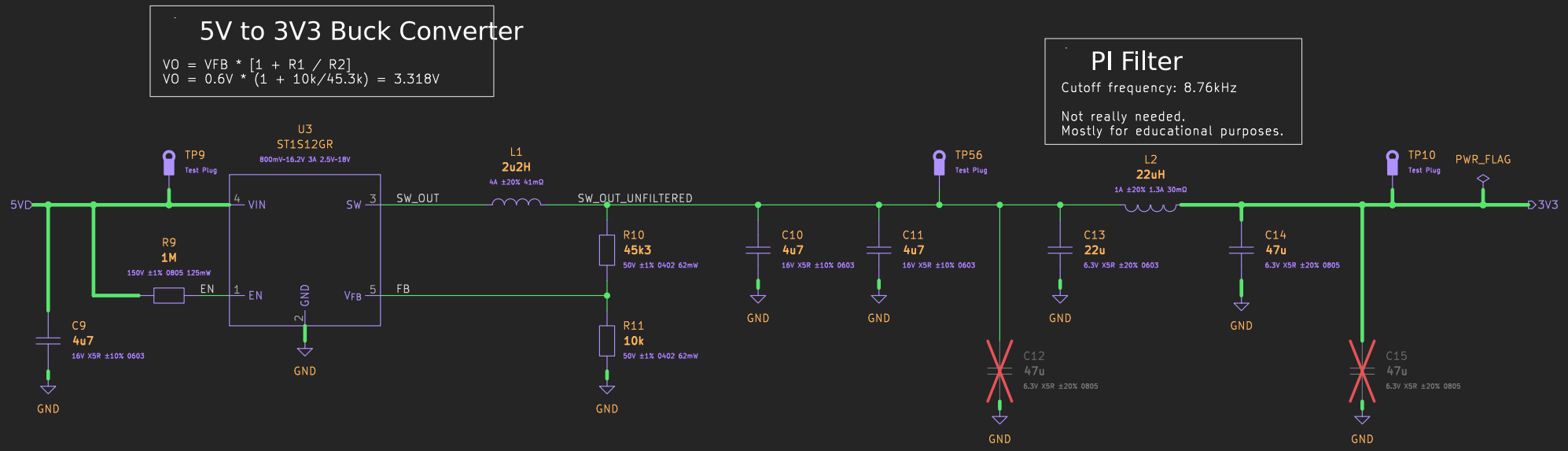
Sheet: /Block Diagram/MCU Enable and Boot/		
File: mcu_enable_and_boot.kicad_sch		
Title: MCU Enable and Boot		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 5/16

Information

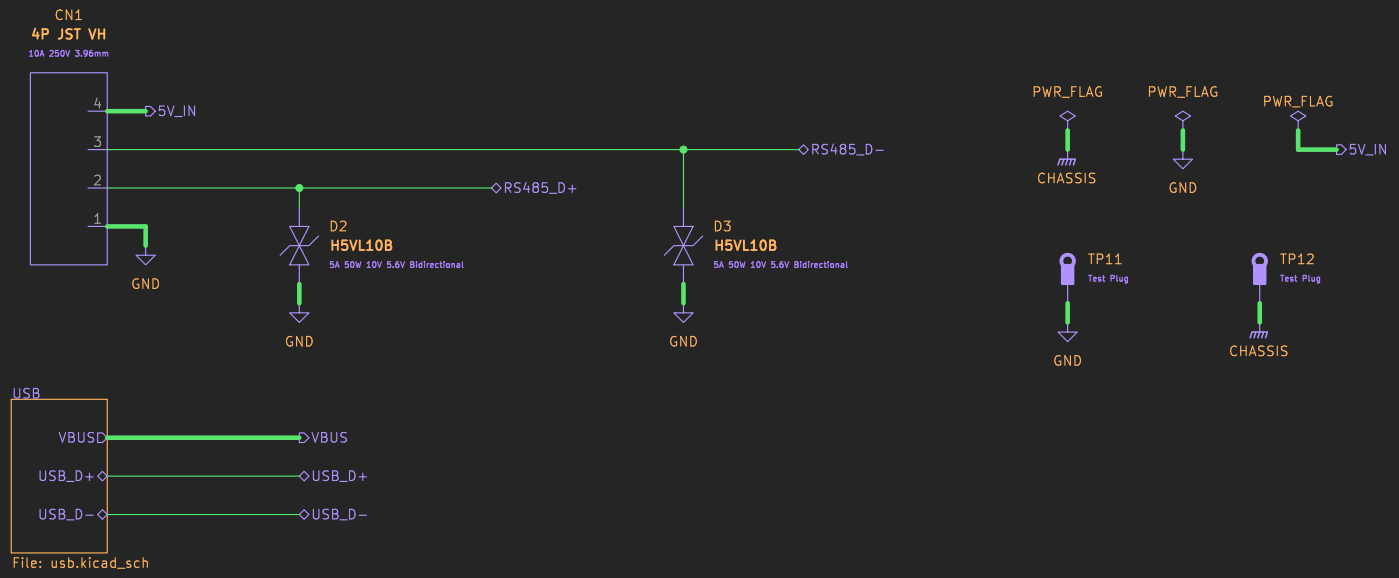
Overvoltage: 5.67V
Undervoltage: 3V
Max current: 600mA – 780mA
Max V_{IN}: 21V



Sheet: /Block Diagram/5V Protection/		
File: 5V_Protection.kicad_sch		
Title: 5V Protection		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 6/16



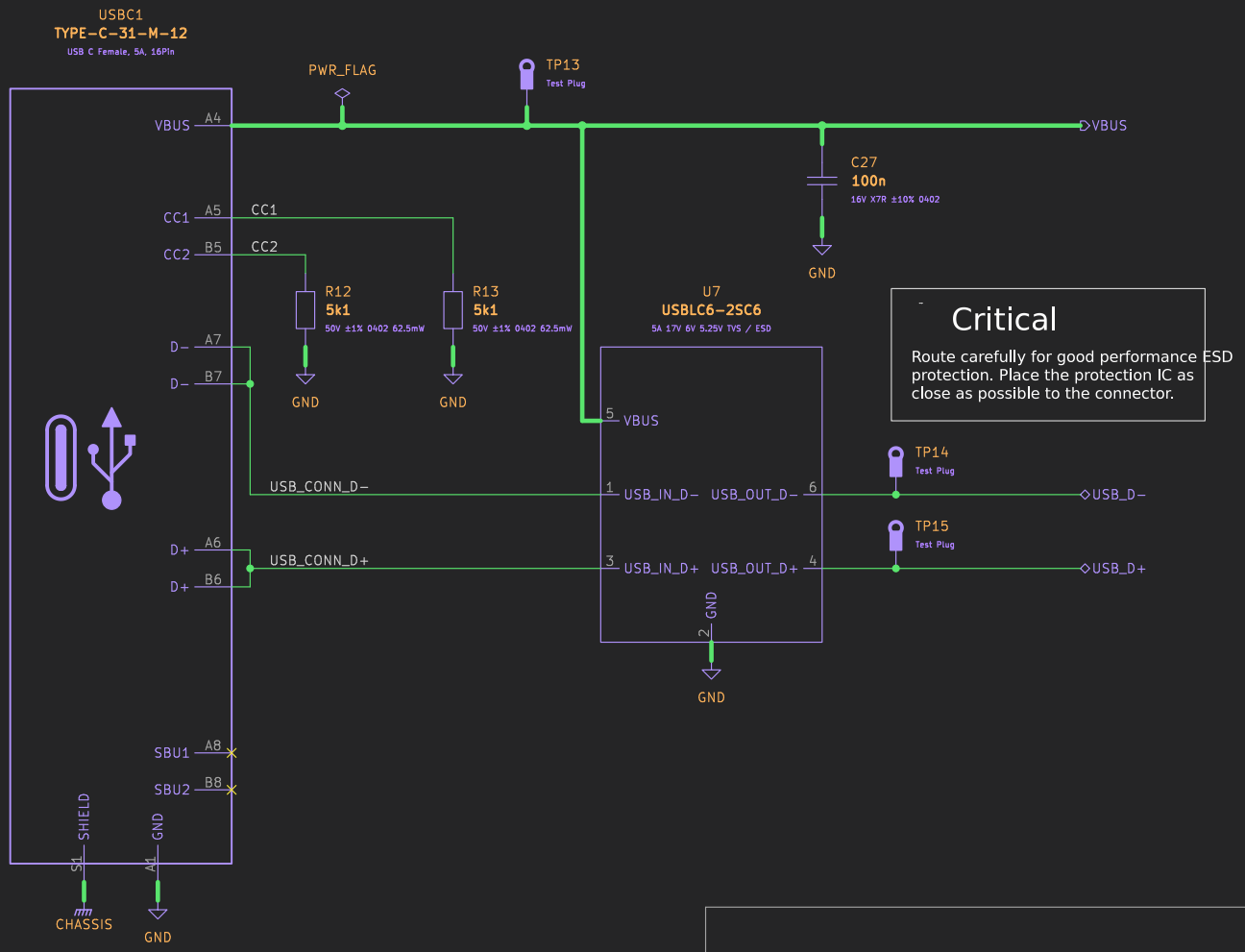
Sheet: /Block Diagram/5V to 3.3V/		
File: 5v_to_3v3.kicad_sch		
Title: 5V to 3V3		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 7/16



Sheet: /Block Diagram/Power Connectors/
File: power_connectors.kicad_sch

Title: Power Connectors

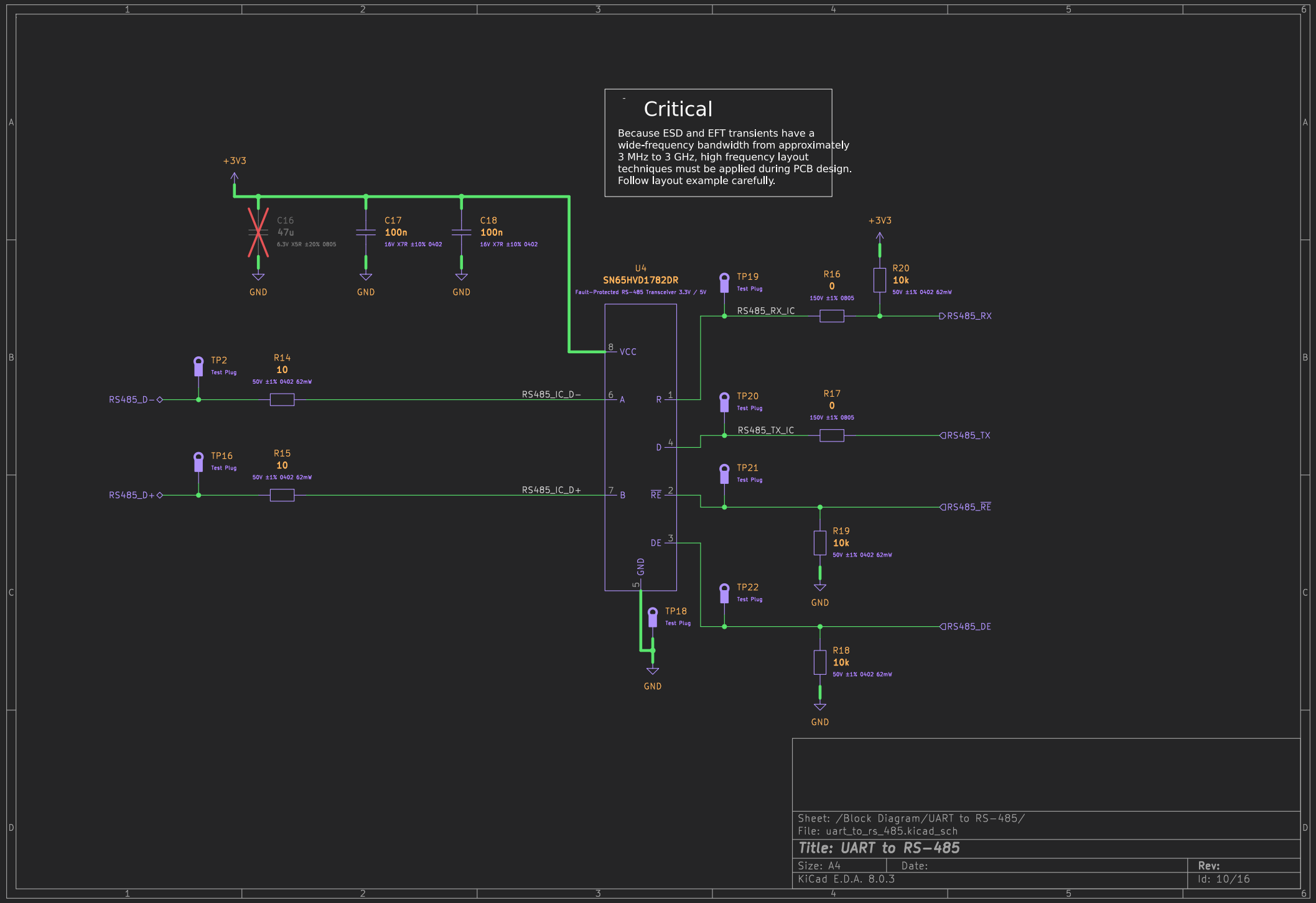
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 8/16

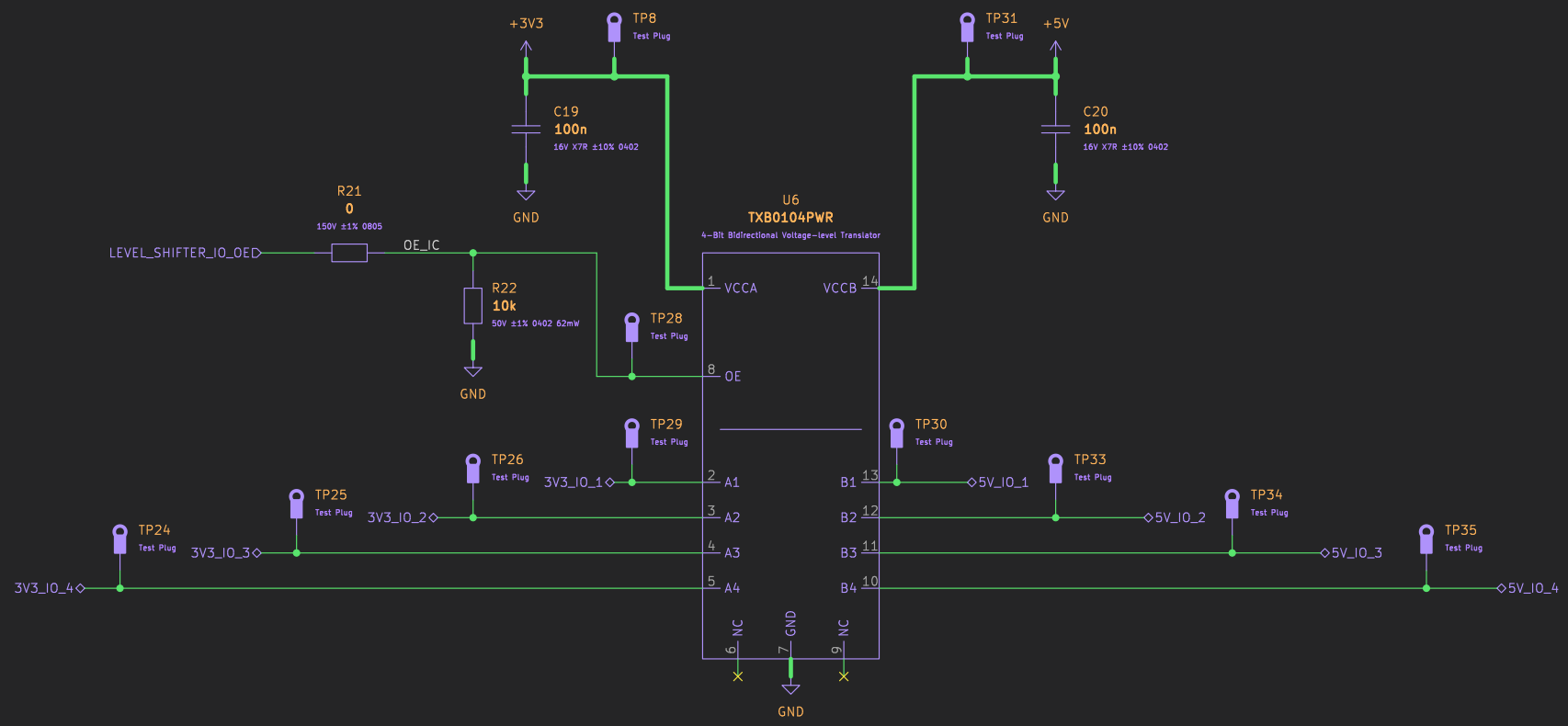


Sheet: /Block Diagram/Power Connectors/USB/
File: usb.kicad_sch

Title: USB

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 9/16

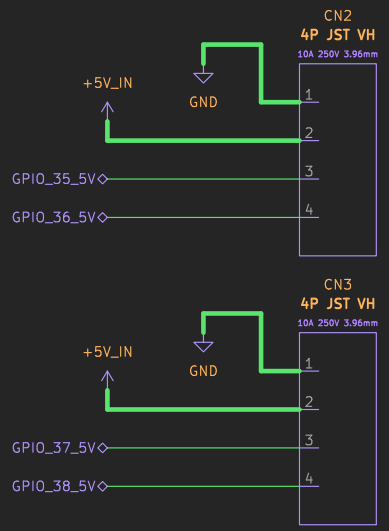

Critical
Because ESD and EFT transients have a wide-frequency bandwidth from approximately 3 MHz to 3 GHz, high frequency layout techniques must be applied during PCB design. Follow layout example carefully.
+3V3
C16
47u
6.3V X5R ±20% 0805
C17
100n
16V X7R ±10% 0402
C18
100n
16V X7R ±10% 0402
GND
U4
SN65HVD1782DR
Fault-Protected RS-485 Transceiver 3.3V / 5V
VCC
GND
R
D
RE
DE
A
B
TP19
Test Plug
R16
0
150V ±1% 0805
R20
10k
50V ±1% 0402 62mW
RS485_RX_IC
RS485_RX
TP20
R17
RS485_TX_IC
RS485_TX
TP21
RS485_RE
R19
TP22
RS485_DE
R18
TP2
R14
10
RS485_D-
RS485_IC_D-
TP16
R15
RS485_D+
RS485_IC_D+
TP18
Sheet: /Block Diagram/UART to RS-485/
File: uart_to_rs_485.kicad_sch
Title: UART to RS-485
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.3
Id: 10/16



Sheet: /Block Diagram/3V3 to 5V Logic Shifter/
File: 3v3_to_5v_logic_shifter.kicad_sch

Title: 3V3 to 5V Logic Shifter

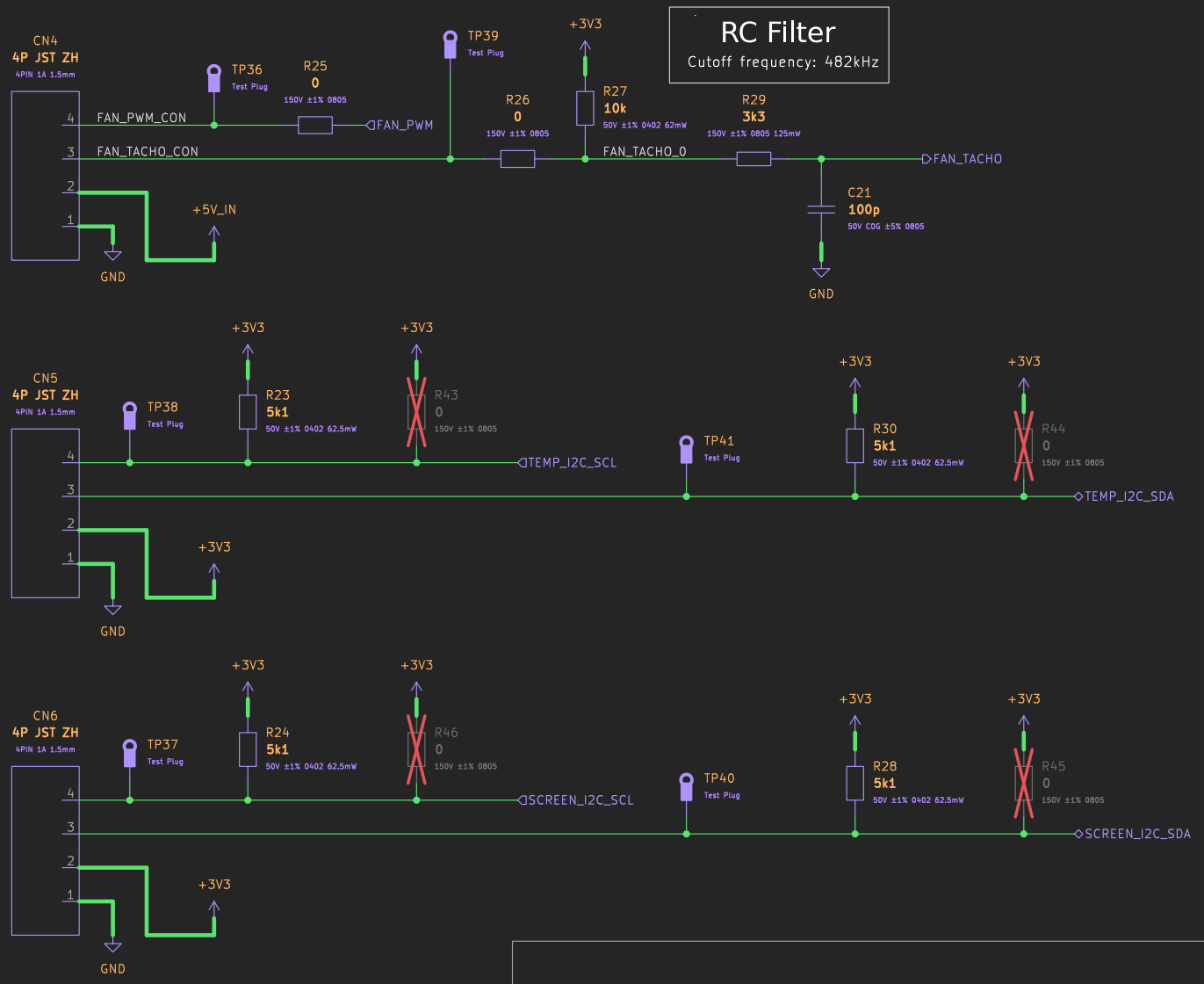
Size: A4	Date:	Rev:
KiCad E.D.A. 8.0.3		Id: 11/16



Sheet: /Block Diagram/5V GPIO Connectors/
File: 5v_gpio_connectors.kicad_sch

Title: 5V GPIO Connectors

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 12/16



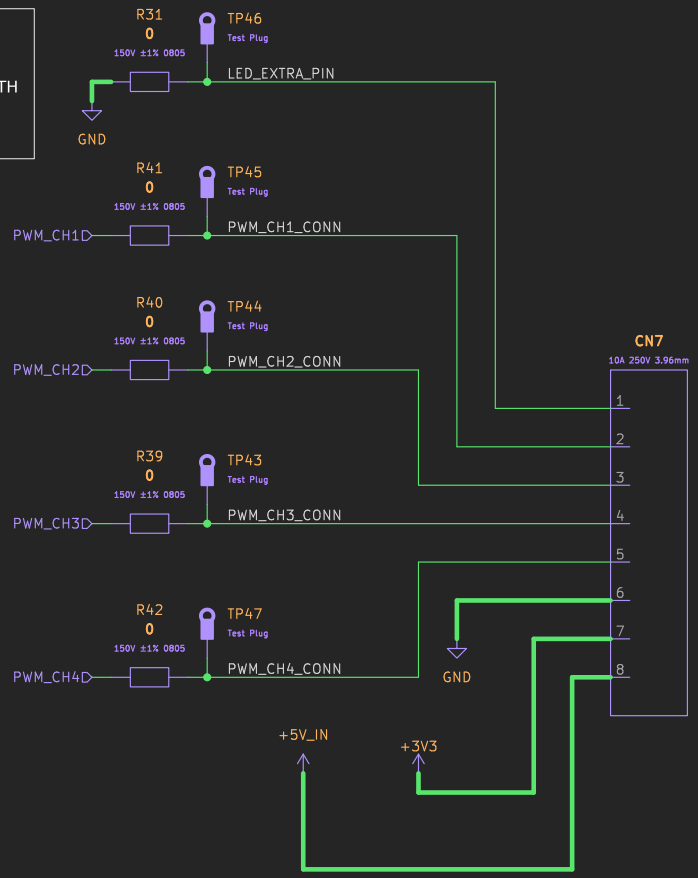
Sheet: /Block Diagram/Fan, Temperature and Screen/
File: fan_temp_screen.kicad_sch

Title: Fan, Temperature and Screen

Size: A4	Date:	Rev:
KiCad E.D.A. 8.0.3		Id: 13/16

Information

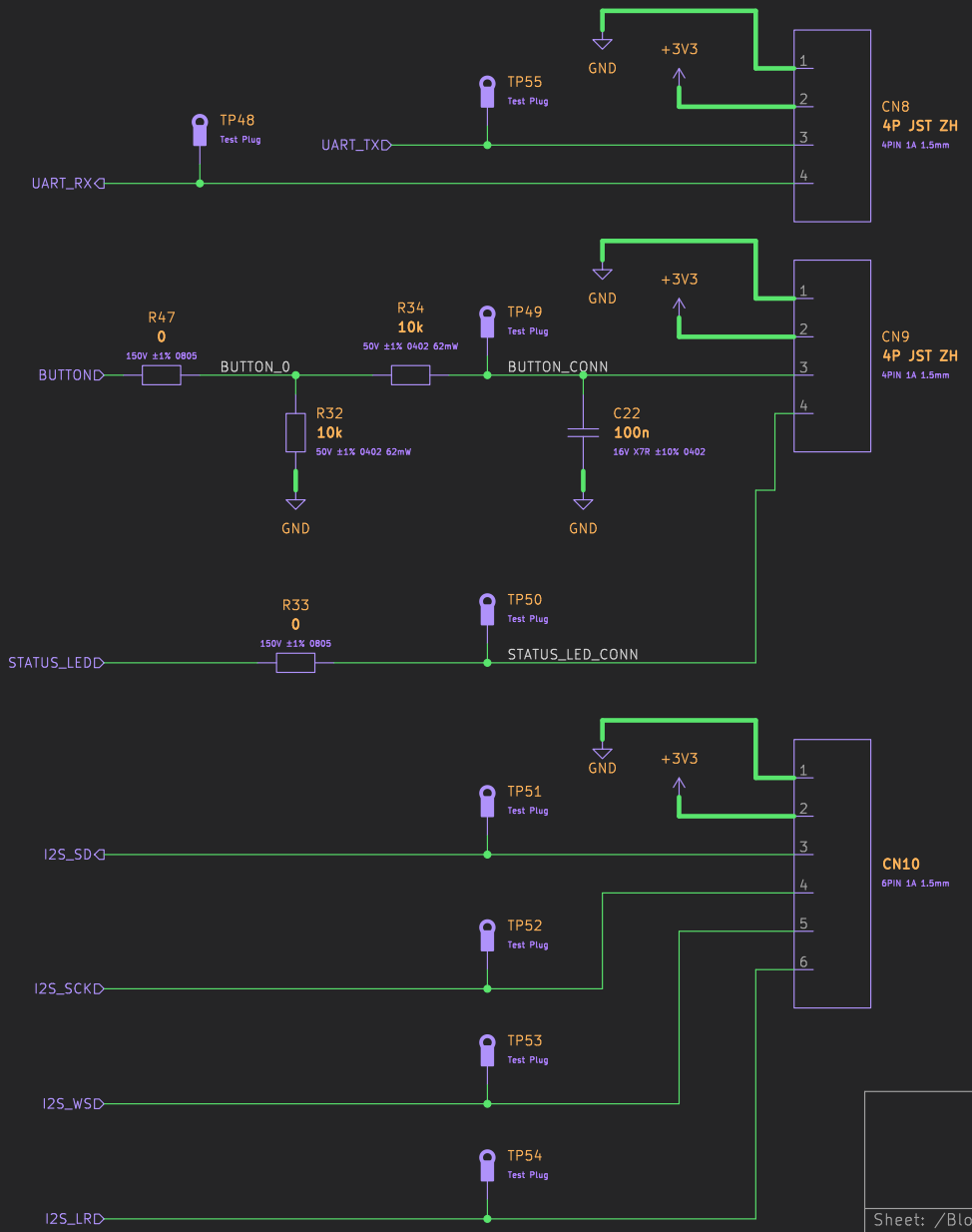
If a different signal is required here the 0Ohm + PTH will allow a post assembly fix / experimentation. Otherwise, just GND.



Sheet: /Block Diagram/LED PWM Connector/
File: led_pwm_connector.kicad_sch

Title: PWM Connector

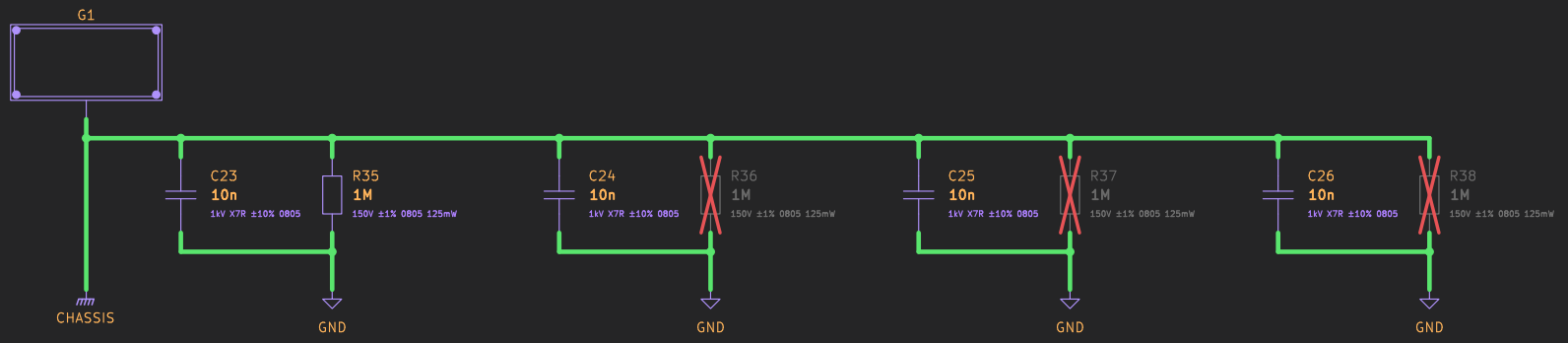
Size: A4	Date:	Rev:
KiCad E.D.A. 8.0.3		Id: 14/16



Sheet: /Block Diagram/Button, Status LED, UART and I2S/
File: button_status_uart_i2s.kicad_sch

Title: Button, Status LED, UART, I2S

Size: A4	Date:	Rev:
KiCad E.D.A. 8.0.3		Id: 15/16



Sheet: /Block Diagram/Misc/
File: misc.kicad_sch

Title: Miscellaneous

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 16/16