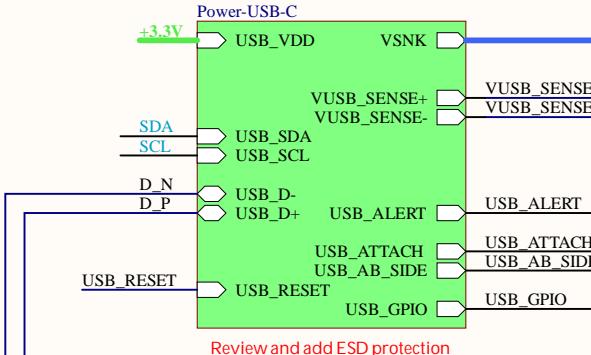
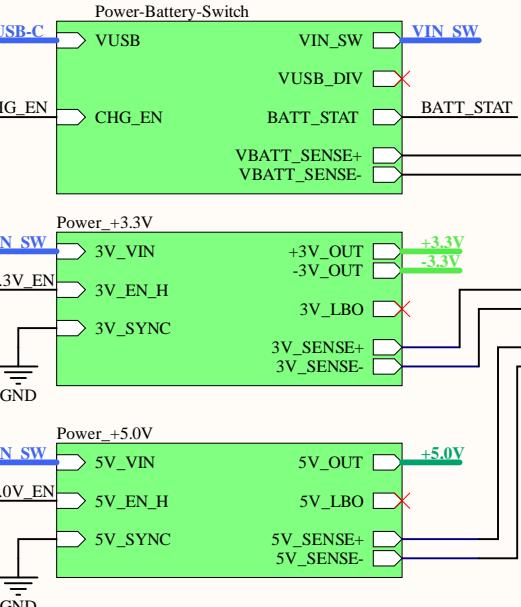


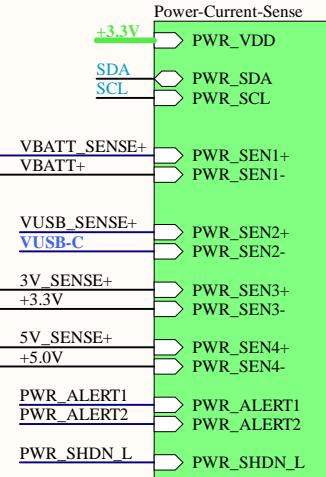
USB-C Power Delivery



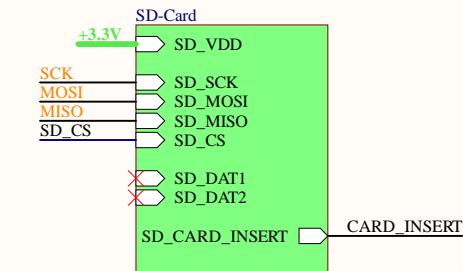
Power Selection



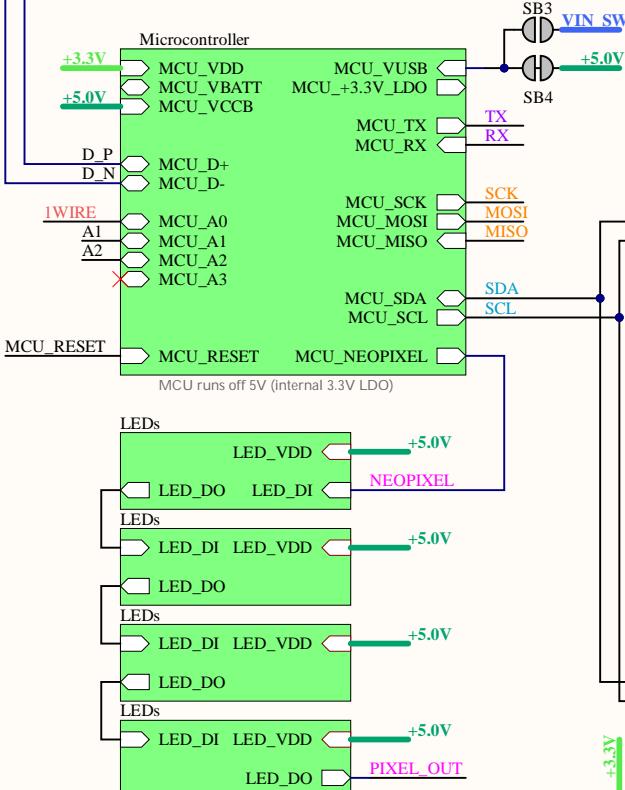
Power Measurement



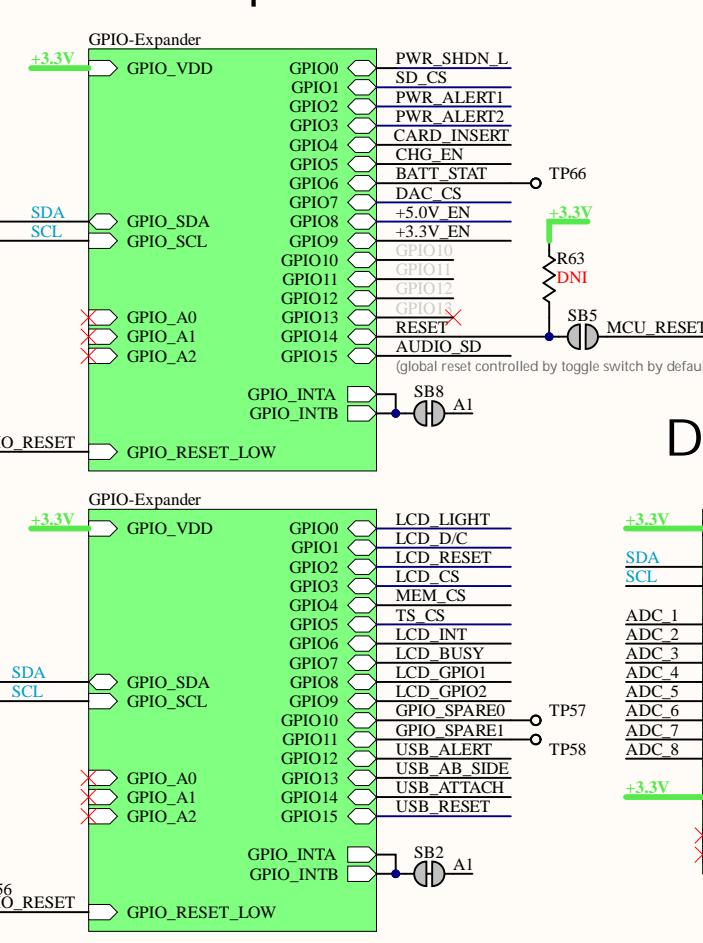
SD-Card



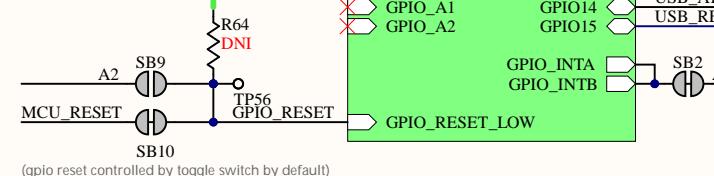
Wireless MCU



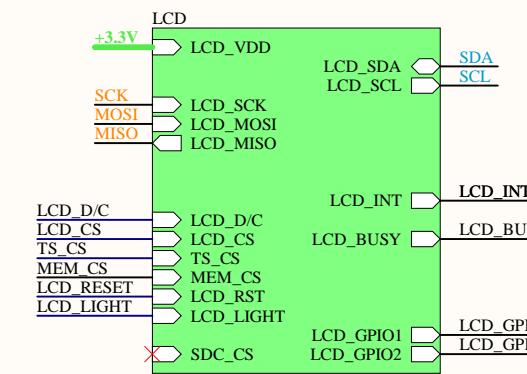
GPIO Expanders



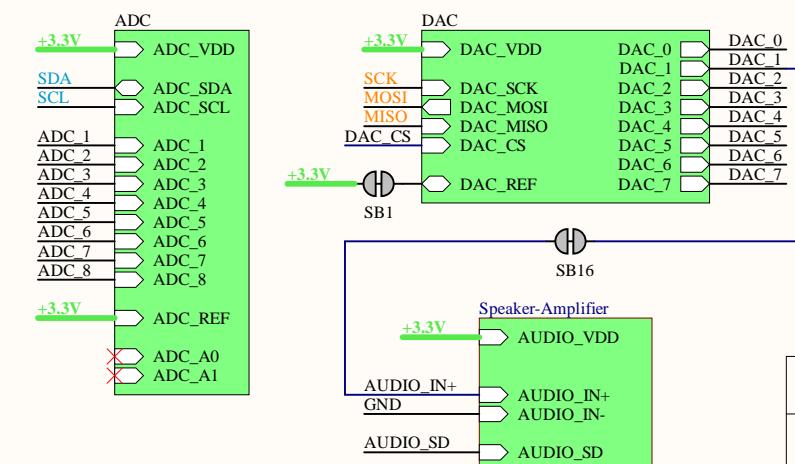
NeoPixel LEDs



LCD Connector



Digital/Analog Converters

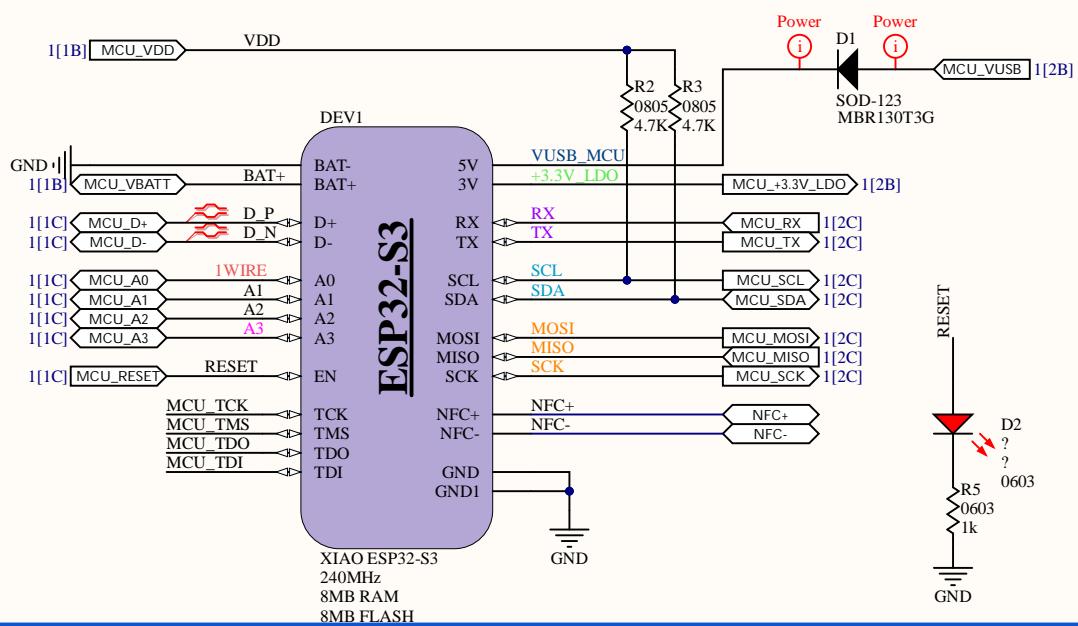


(Top) (Bot)

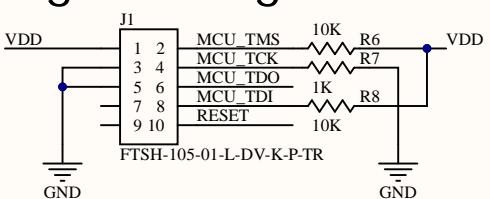


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ESP32-S3 Wireless MCU



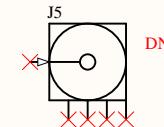
Programming Header



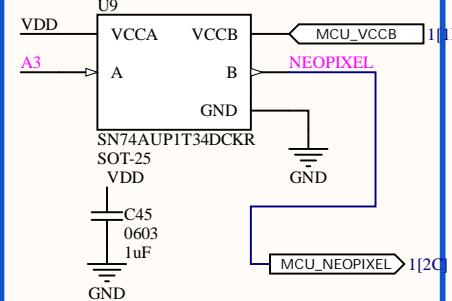
Test Points

TP3	MOSI	TP4	BAT+
TP5	MISO	TP5	VUSB MCU
TP7	SCK	TP6	+3.3V LDO
TP13	1WIRE	TP8	RESET
TP15	A1	TP10	RX
TP17	A2	TP12	TX
TP19	A3	TP14	SCL
TP21	GND	TP16	SDA
TP33	NFC+	TP20	NEOPIXEL
TP47	NFC-	TP82	

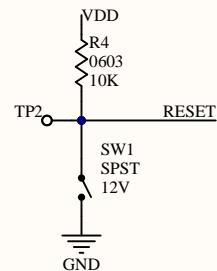
RF Connector



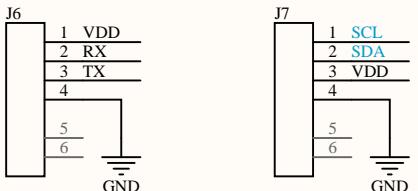
Level Translator



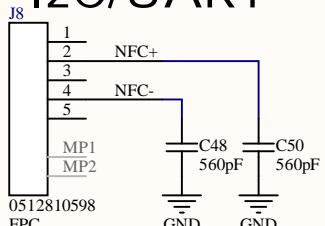
Reset Switch



I2C/UART



I2C/UART



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Drawn By:

Power Sensing

EQUATION 5-2: CALCULATING R_{SENSE}

$$R_{SENSE} = \frac{FSR}{I_{Max}}$$

Where:

FSR = Full-scale V_{SENSE} voltage input
 R_{SENSE} = External R_{SENSE} resistor value
 I_{Max} = Maximum current to measure

Full-Scale Current (FSC) can be calculated with Equation 5-3.

EQUATION 5-1: BUS VOLTAGE

$$V_{SOURCE} = \frac{V_{BUS}}{\text{Denominator}}$$

Where:

V_{SOURCE} = The measured voltage on the SENSE+ pin
 V_{BUS} = The value read from the V_{BUS} results registers
 Denominator = 2^{16} for unipolar measurements
= 2^{16} for FSR/2 measurements
= 2^{15} for bipolar measurements

EQUATION 5-3: FULL-SCALE CURRENT

$$FSC = \frac{100 \text{ mV}}{R_{SENSE}}$$

Where:

FSC = Full-Scale Current
 R_{SENSE} = External sense resistor value

The actual current through R_{SENSE} can then be calculated using Equation 5-4.

EQUATION 5-4: SENSE CURRENT

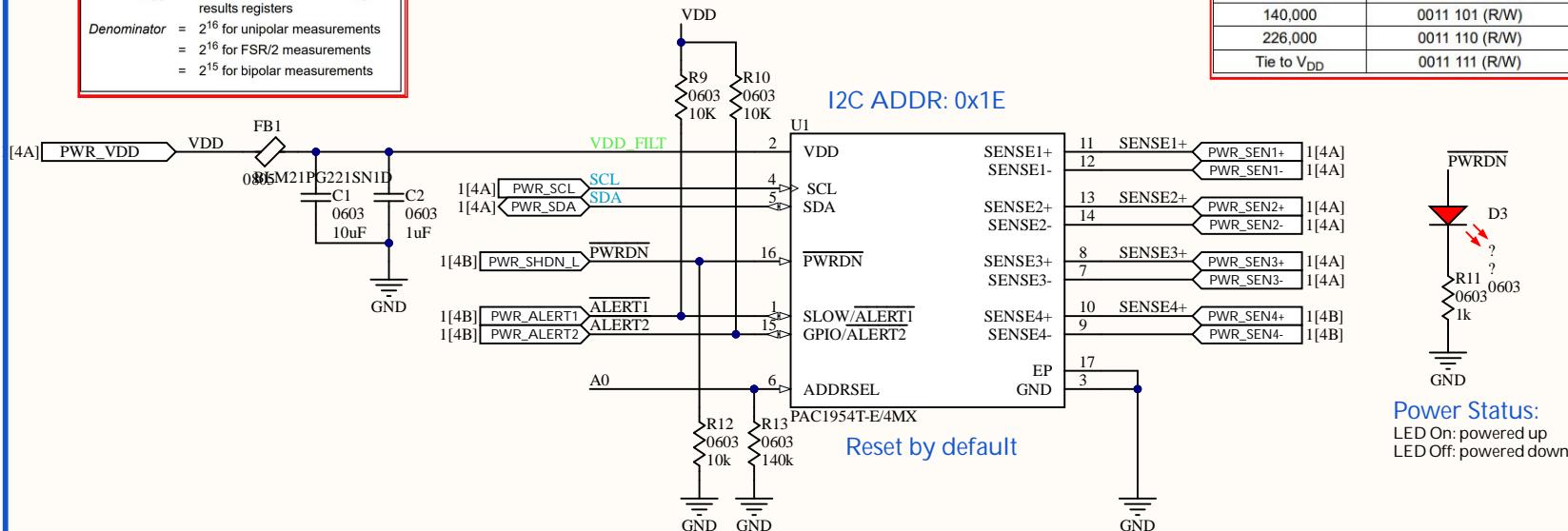
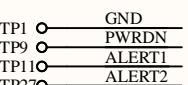
$$I_{SENSE} = FSC \times \frac{V_{SENSE}}{\text{Denominator}}$$

Where:

I_{SENSE} = Actual bus current
 FSC = Full-Scale Current value (from Equation 5-3)
 V_{SENSE} = The value read from the V_{SENSE} results registers
 Denominator = 2^{16} for unipolar measurements
= 2^{16} for FSR/2 measurements
= 2^{15} for bipolar measurements

TABLE 6-1: ADDRESS SELECT RESISTOR

RESISTOR (1%)	SMBus Address
0 (GND)	0010 000 (R/W)
499	0010 001 (R/W)
806	0010 010 (R/W)
1,270	0010 011 (R/W)
2,050	0010 100 (R/W)
3,240	0010 101 (R/W)
5,230	0010 110 (R/W)
8,450	0010 111 (R/W)
13,300	0011 000 (R/W)
21,500	0011 001 (R/W)
34,000	0011 010 (R/W)
54,900	0011 011 (R/W)
88,700	0011 100 (R/W)
140,000	0011 101 (R/W)
226,000	0011 110 (R/W)
Tie to V_{DD}	0011 111 (R/W)



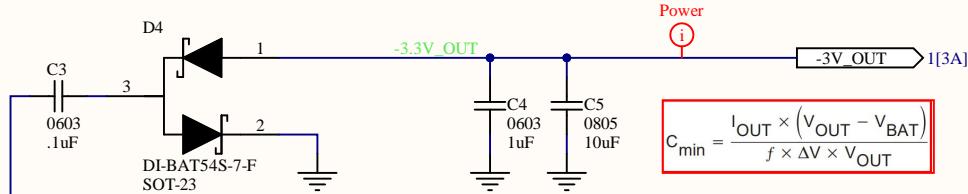
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+3.3V Power Supply

$$L = \frac{V_{BAT} \times (V_{OUT} - V_{BAT})}{\Delta I_L \times f \times V_{OUT}}$$

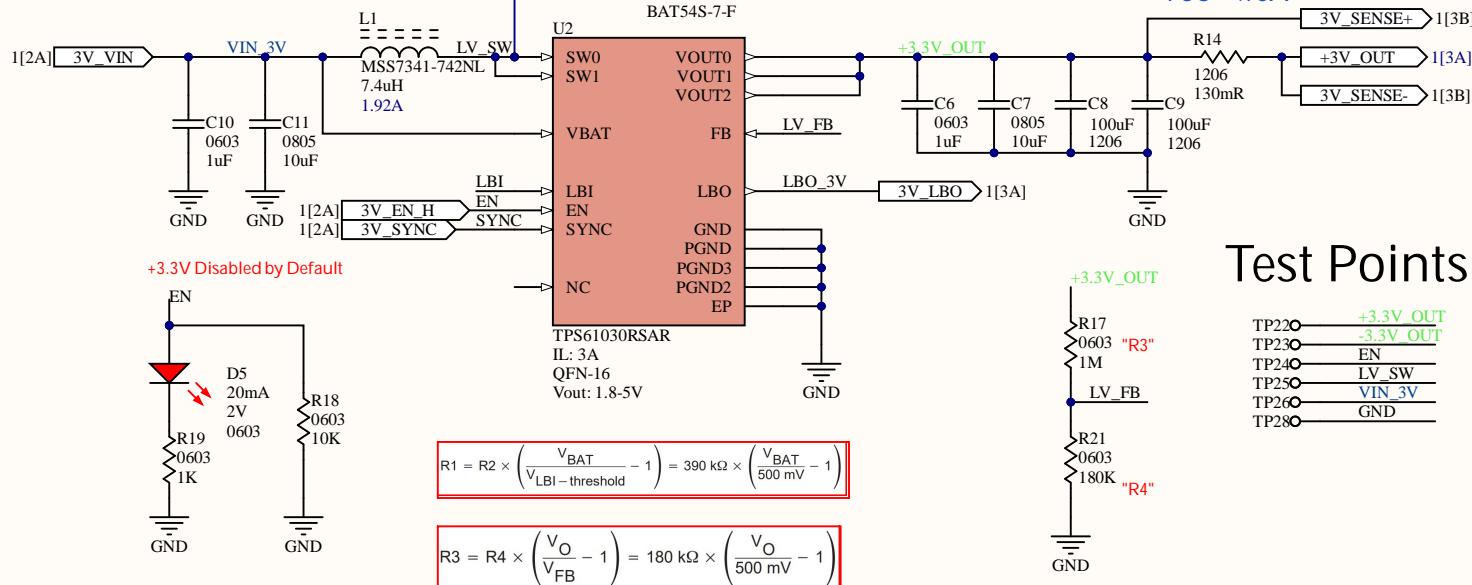
$$I_L = I_{OUT} \times \frac{V_{OUT}}{V_{BAT}} \times 0.8$$



Power

$$C_{min} = \frac{I_{OUT} \times (V_{OUT} - V_{BAT})}{f \times \Delta V \times V_{OUT}}$$

FSC = .75A



Title

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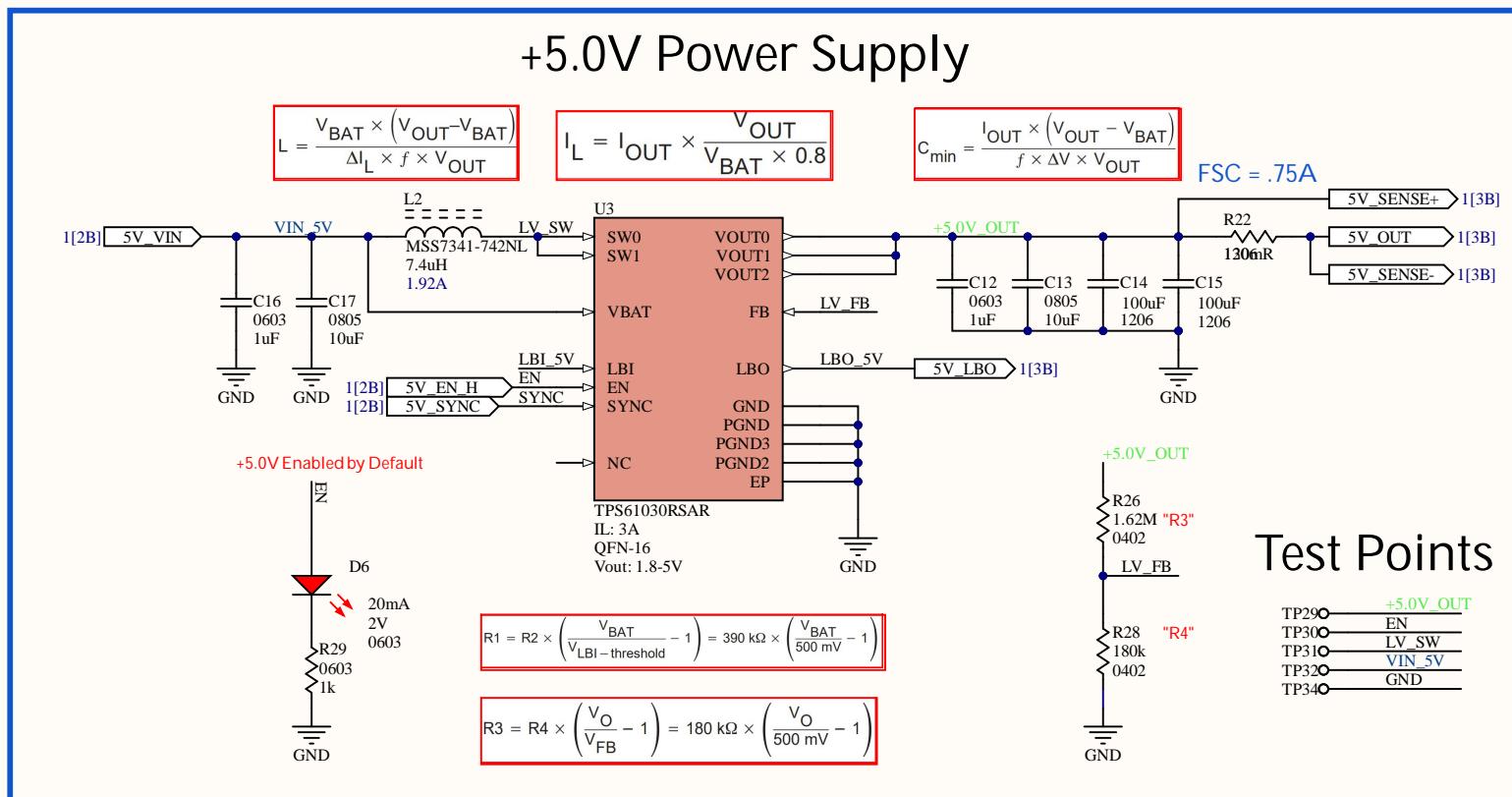
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USB-C Power Device Controller

A

Test Points

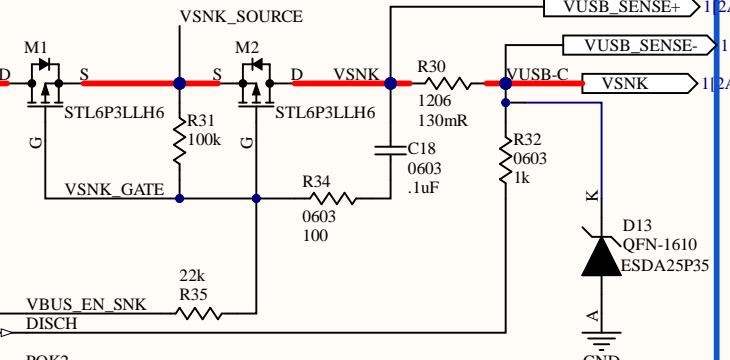
TP35	VBUS
TP36	VSNK GATE
TP37	VSNK SOURCE
TP38	+1V2
TP39	+2V7
TP40	VSNK
TP41	CC1
TP42	CC2
TP43	RESET
TP44	ALERT
TP50	POK2
TP60	POK3
TP61	GND

C46
0603
4.7uF
GND

R33
0603
1k

VBUS SB15 VSNK

U4
VSYS
VBUS VS DISCH
VDD
VREG 1V2
VREG 2V7



Status

I[1A] USB_VDD +3.3V SB14

I[1A] USB_SDA SDA

I[1A] USB_SCL SCL

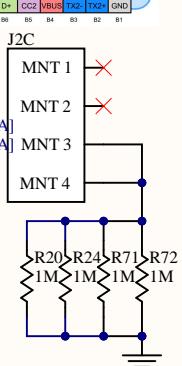
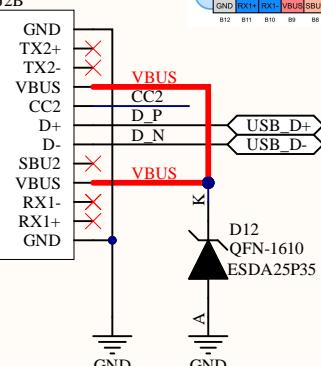
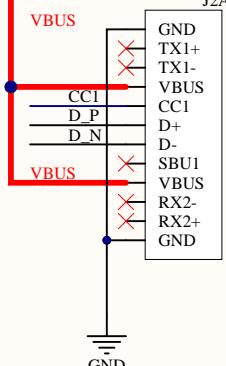
I[1A] USB_RESET

SW3 12V SPST

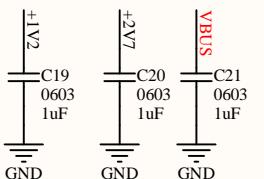
Reset

STUSB4500QTR

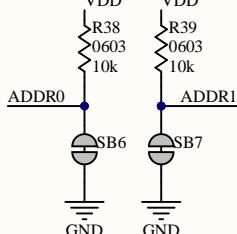
USB-C Connector



Decoupling



I2C ADDR



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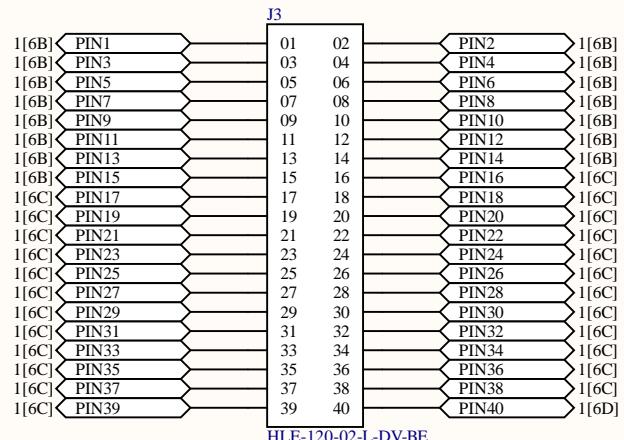
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C

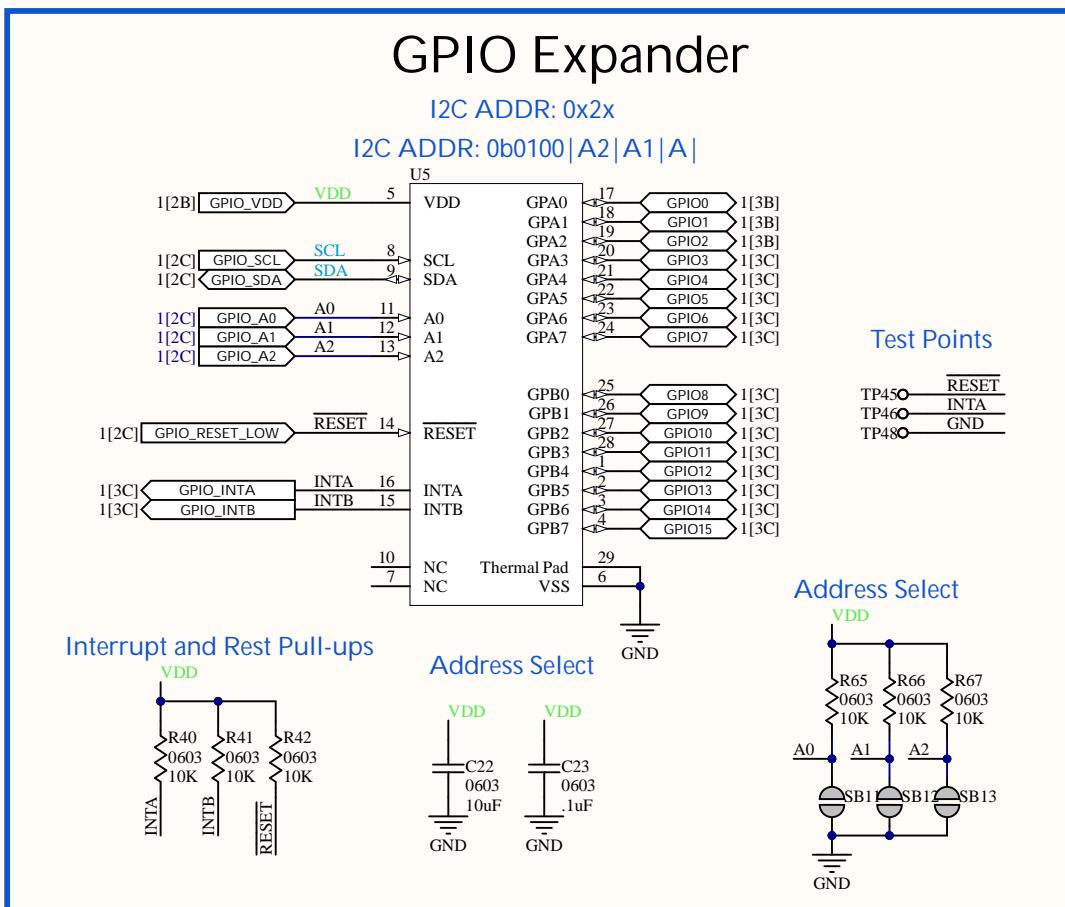
D

D

Expansion Port

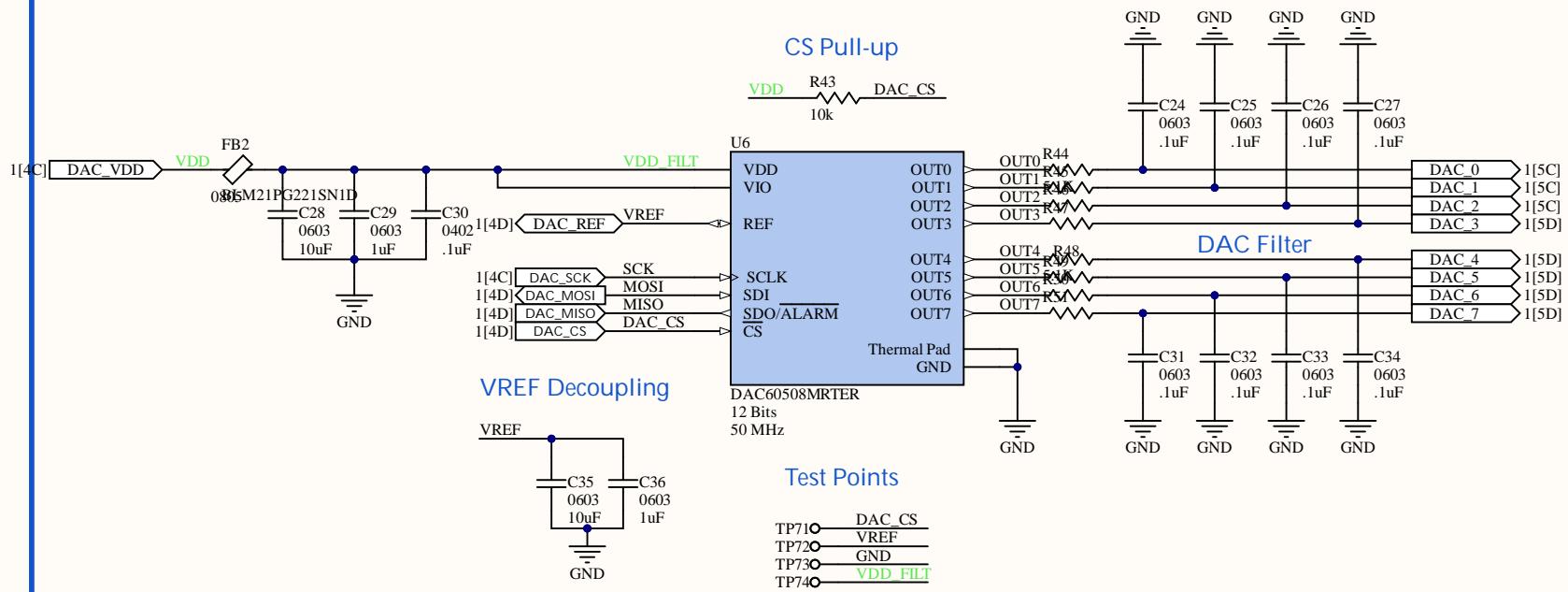


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Analog to Digital



A

A

B

B

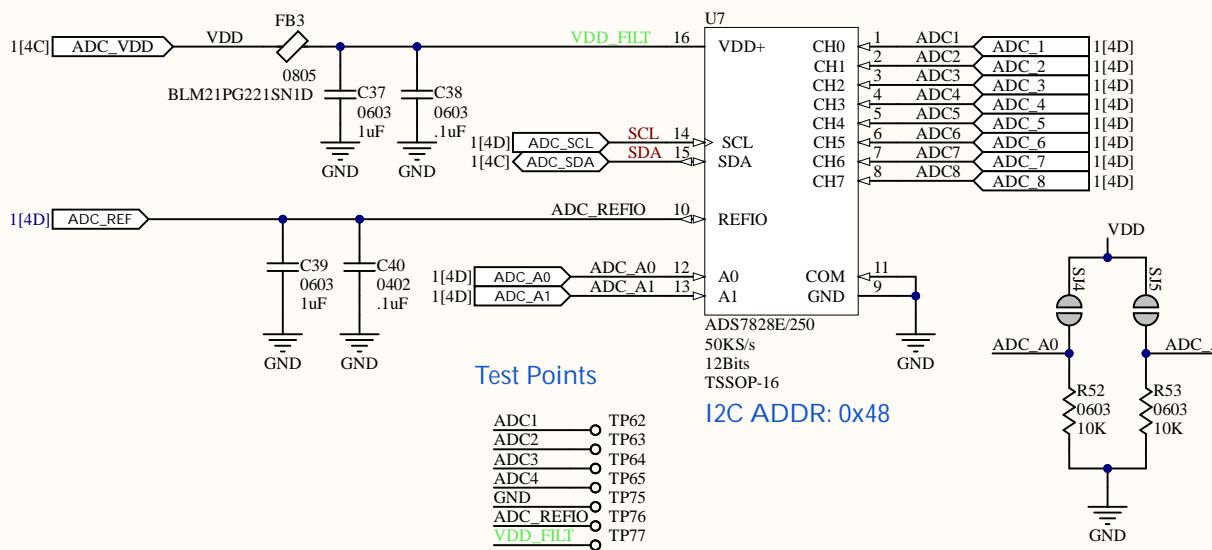
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D

D

Analog to Digital

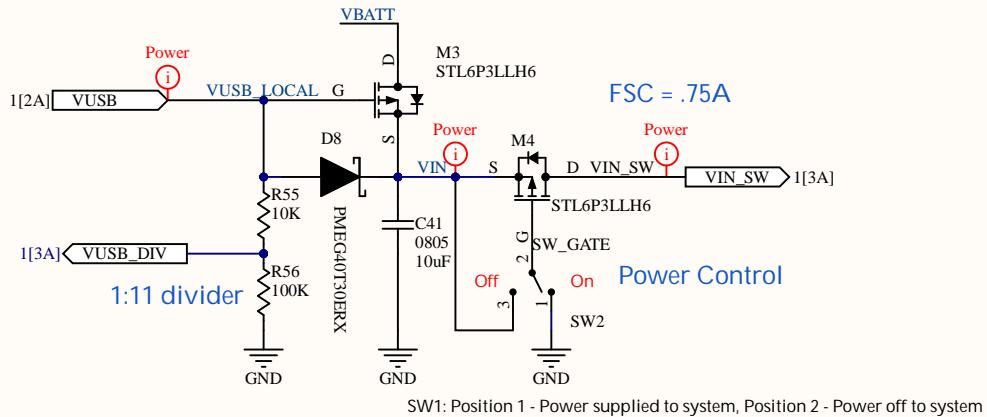


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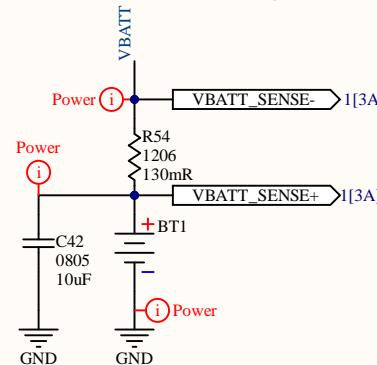
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Battery, Charging and On/Off Switch

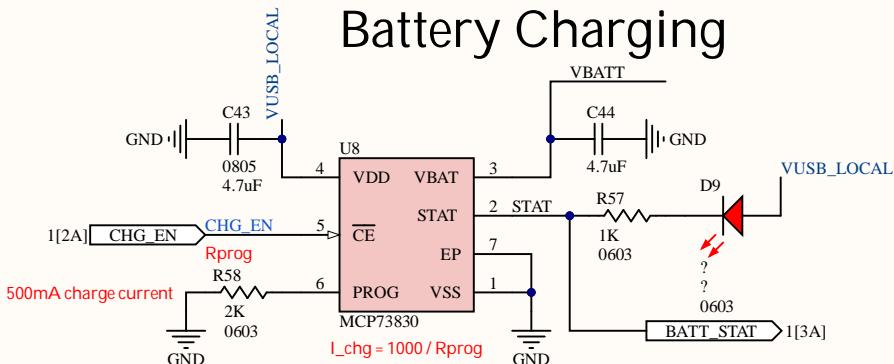
Input Power Switch



Li-Po Battery



Battery Charging



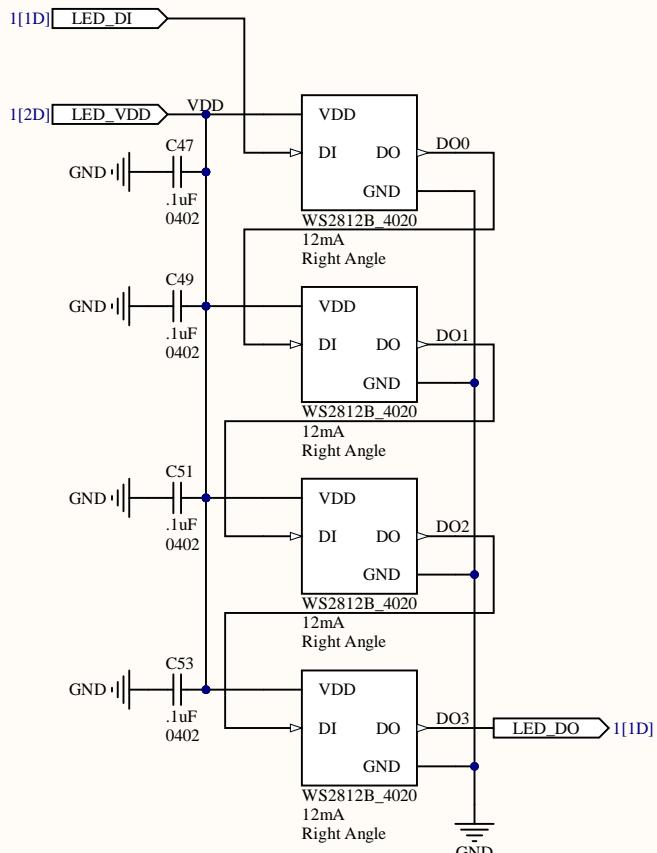
Test Points

TP49	VIN_SW
TP50	VIN
TP51	VUSB_LOCAL
TP52	VBATT
TP53	STAT
TP54	SW_GATE
TP55	GND

Title

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RGB LEDs



Title

Size Number

A

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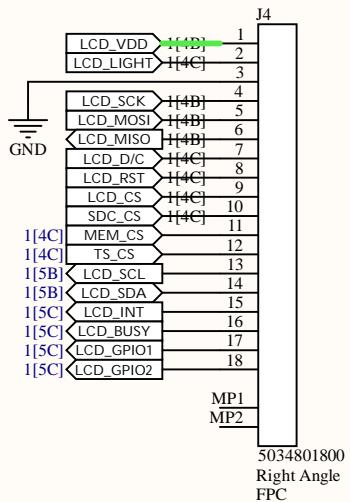
C

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LCD Connector (Eye SPI)



Title

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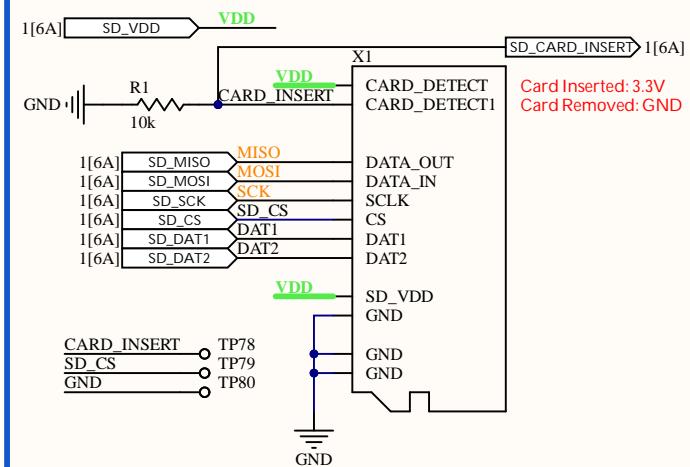
C

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D

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SD-Card Port



Title

Size

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Number

Revision

Date:

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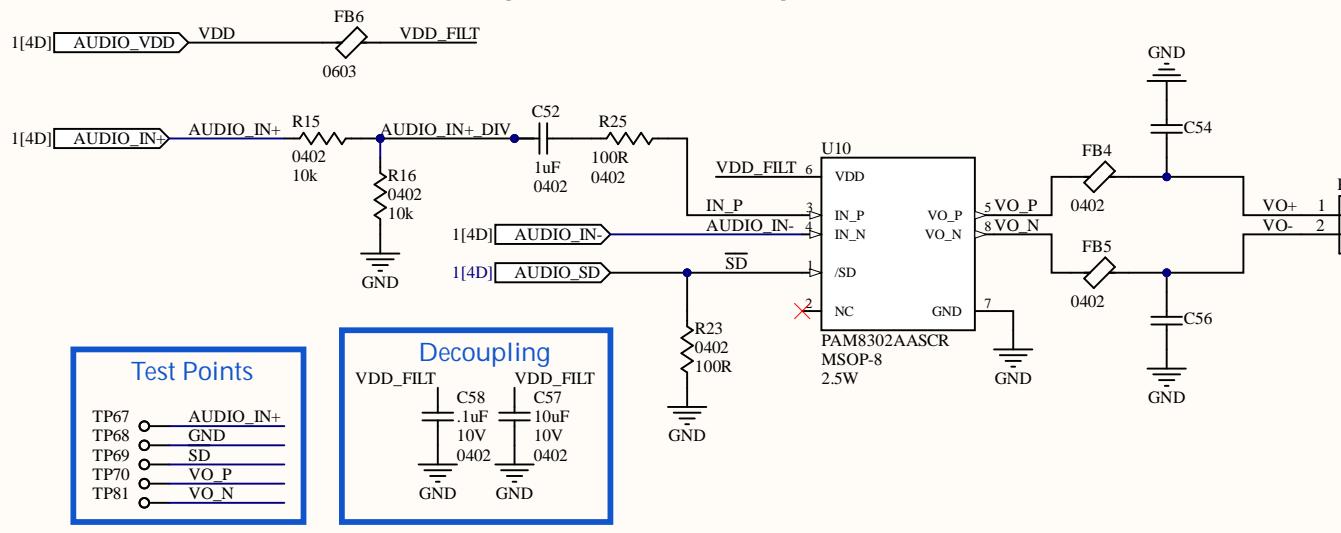
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Amplifier and Speaker Connector



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