

# Mr. Truman: An Embedded Friend

Team 5

Maxwell Strange, Eric Heinz, Spencer Fricke

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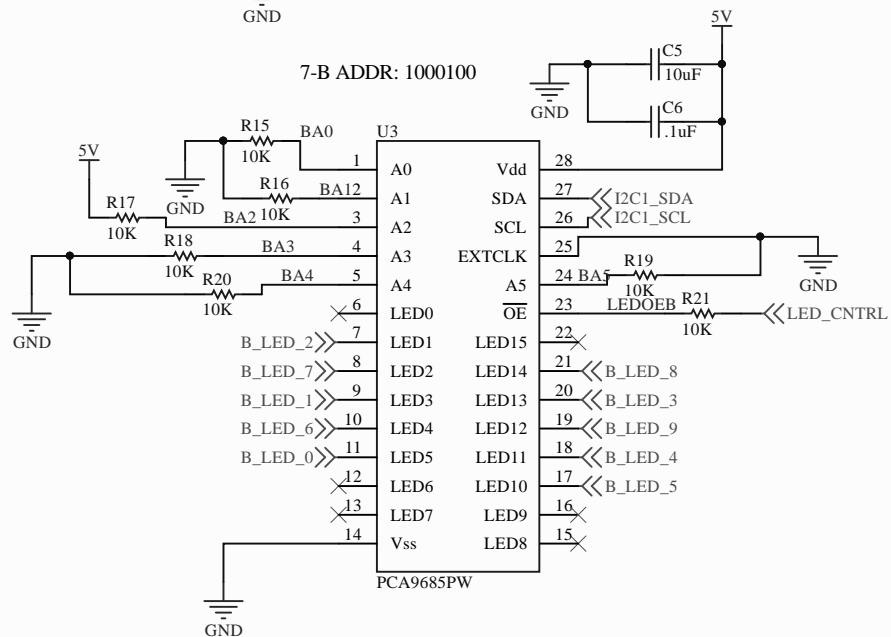
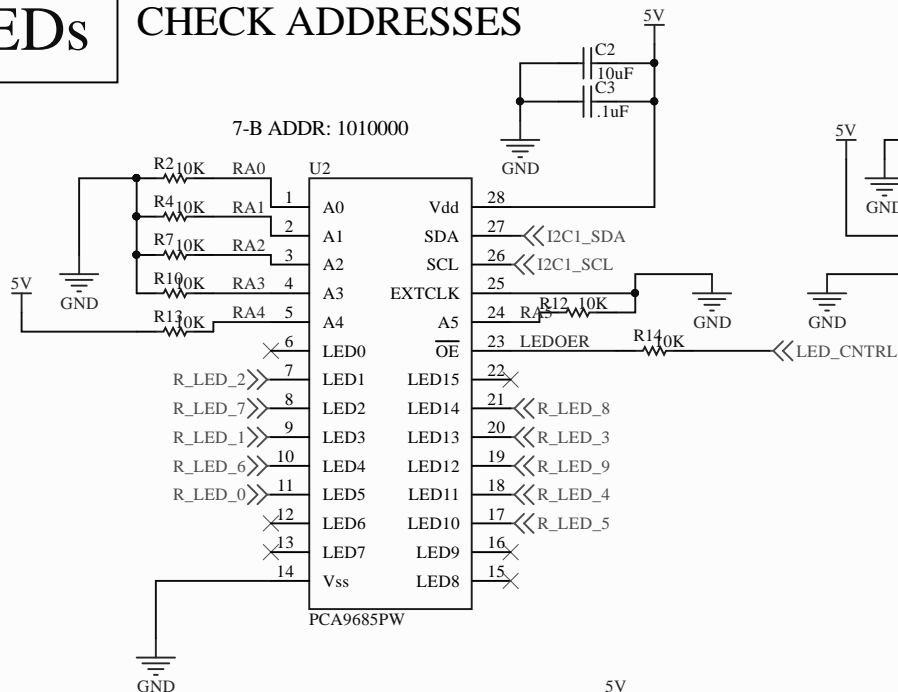
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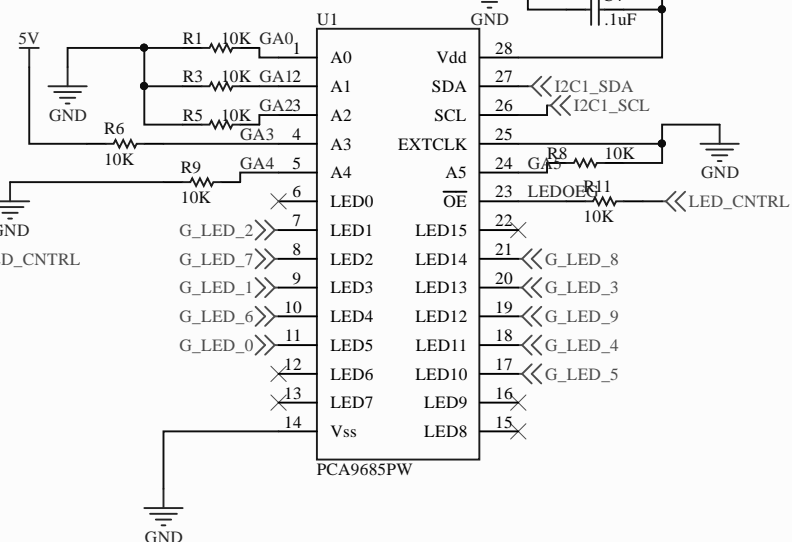
LEDs

CHECK ADDRESSES



Using 3 PWM units to individually control color on the RGB LEDs, where each is responsible for the intensity of the color. Each color channel can be controlled at once, as the PCA9685 supports sending the same signal to all LEDx pins. These will all be on the same I2C bus.

7-B ADDR: 1001000



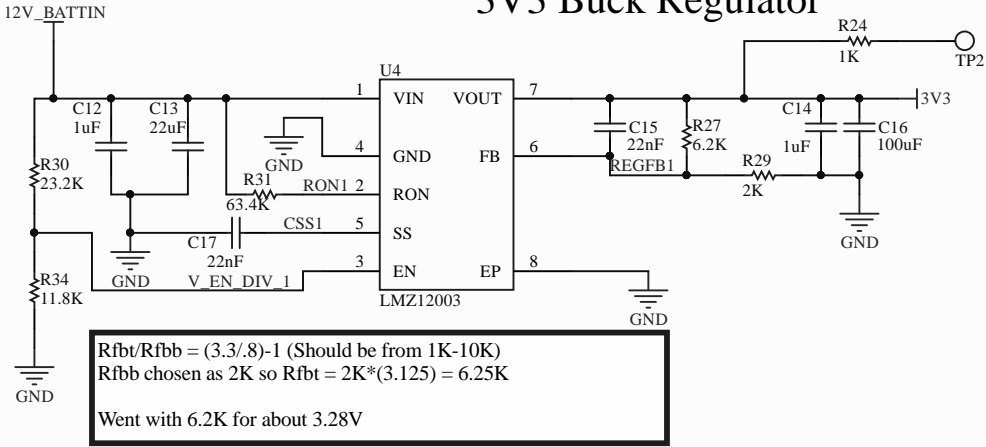
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POWER

Mounting Holes

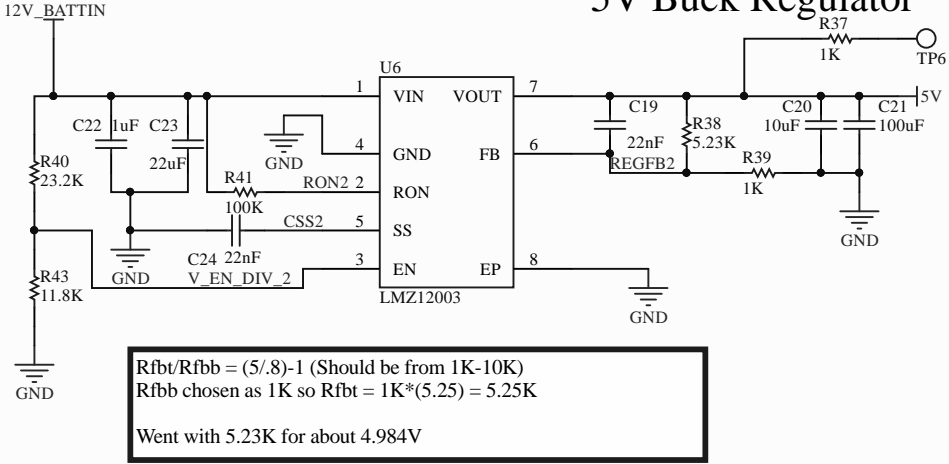


3V3 Buck Regulator



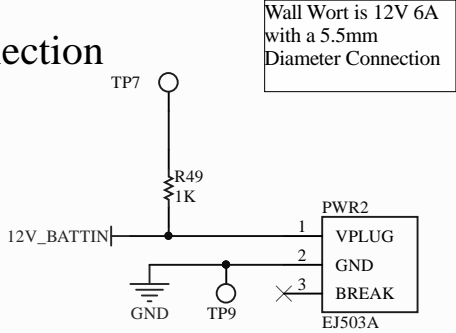
$R_{fbt}/R_{fbb} = (3.3/8) - 1$  (Should be from 1K-10K)  
 $R_{fbb}$  chosen as 2K so  $R_{fbt} = 2K * (3.125) = 6.25K$   
Went with 6.2K for about 3.28V

5V Buck Regulator



$R_{fbt}/R_{fbb} = (5/8) - 1$  (Should be from 1K-10K)  
 $R_{fbb}$  chosen as 1K so  $R_{fbt} = 1K * (5.25) = 5.25K$   
Went with 5.23K for about 4.984V

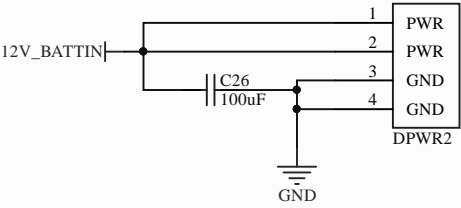
Wall Connection



Wall Wart is 12V 6A  
with a 5.5mm  
Diameter Connection

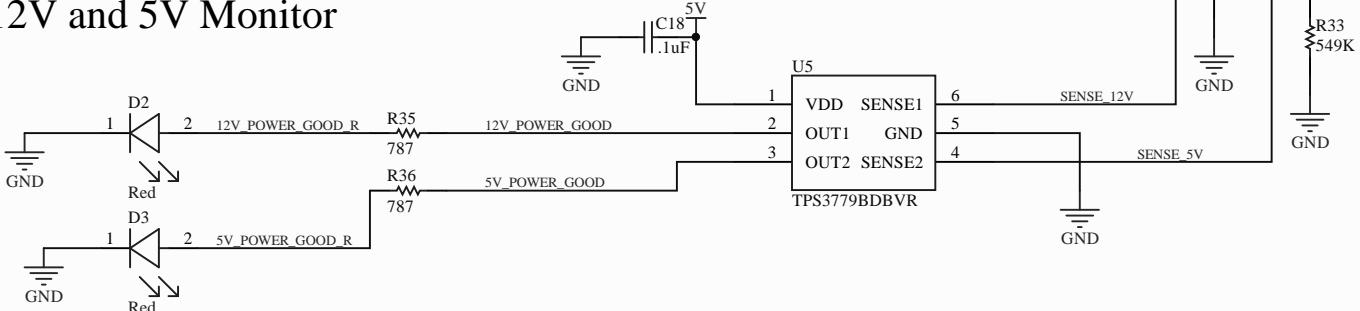
Basic power stuff for  
voltage regulators and  
monitors.

Connection to power the display

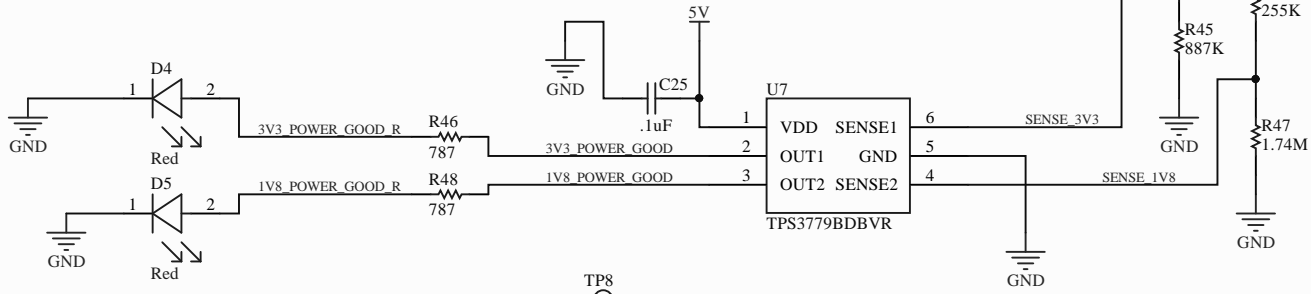


Bulk Capacitance

12V and 5V Monitor



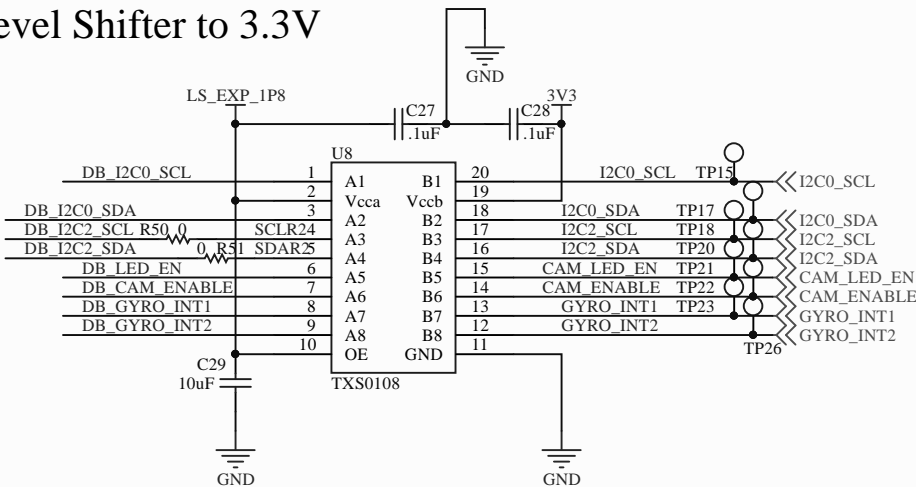
3V3 and 1V8 Monitor



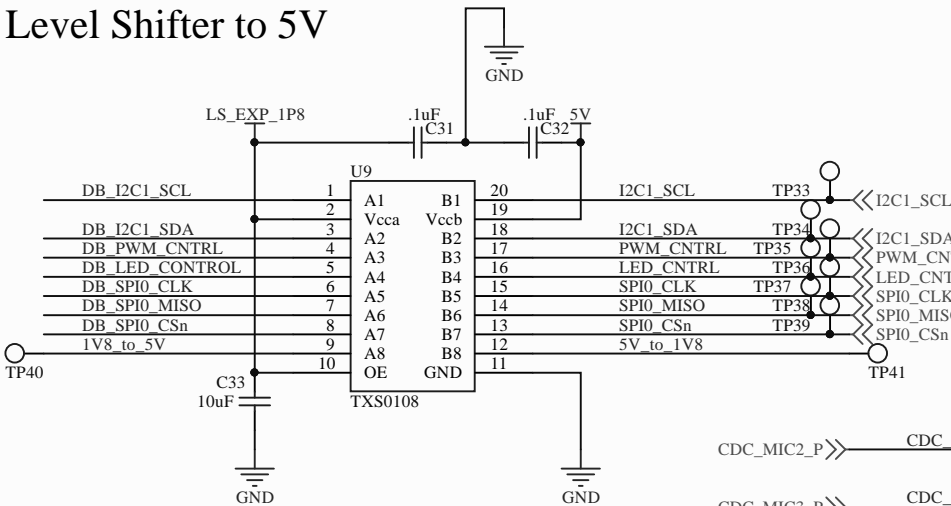
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DRAGONBOARD INTERFACE

Level Shifter to 3.3V



Level Shifter to 5V



The level shifters are bidirectional and do not require any direction control.

This schematic contains the three connectors to the dragonboard as well as the necessary level shifters to the peripheral ICs.

Wires in PINK need to be level shifted to 5V  
Wires in GREEN need to be level shifted to 3V3  
Wires in BLUE don't need level shifting.

LineIn\_Detect

FUSE3

CDC\_MIC2\_P

CDC\_MIC3\_P

J5

DragonBoard\_ANALOG  
WM18703-ND

DragonBoard\_LOW\_SPEED  
609-2632-ND

J3

DragonBoard\_LOW\_SPEED  
609-2632-ND

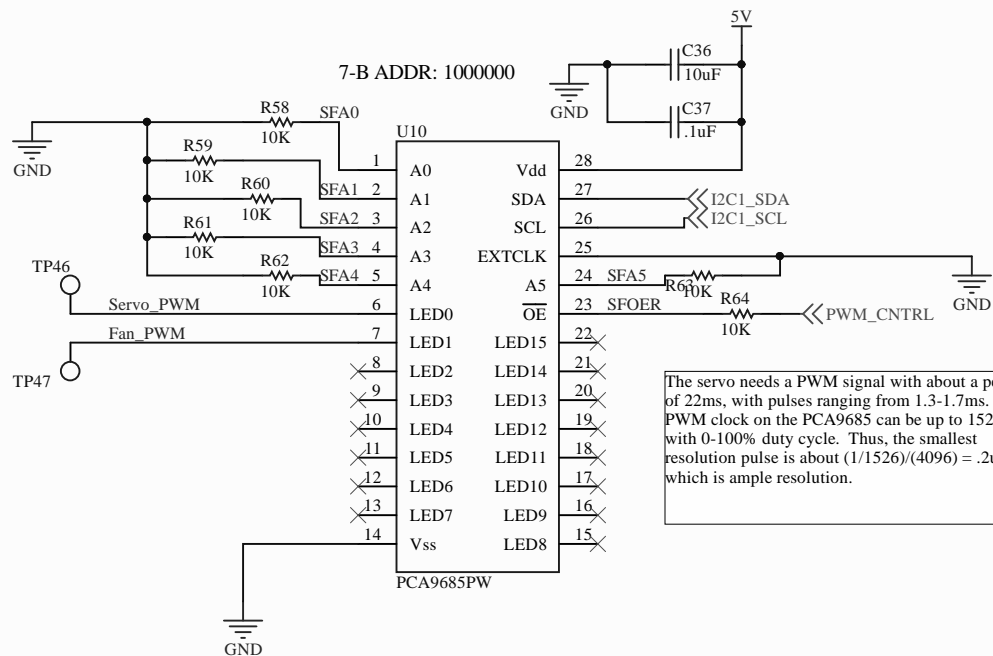
J4

DragonBoard\_HIGH\_SPEED  
609-1681-1-ND

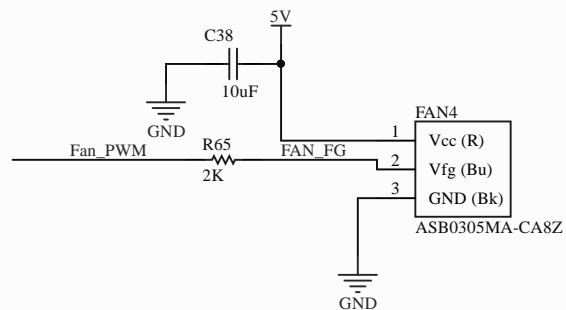
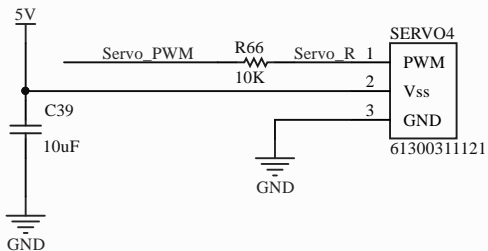
The CSI pins are to be directly connected to the dragonboard without levelshifting. All other voltages must be shifted to be compatible with our devices.

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# SERVO+FAN



The servo needs a PWM signal with about a period of 22ms, with pulses ranging from 1.3-1.7ms. The PWM clock on the PCA9685 can be up to 1526Hz, with 0-100% duty cycle. Thus, the smallest resolution pulse is about  $(1/1526)/(4096) = .2\mu\text{s}$ , which is ample resolution.

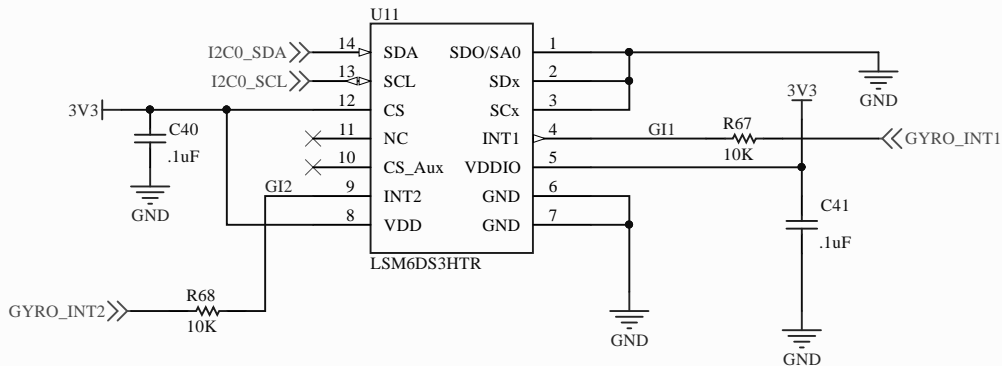


Using the same PWM driver that we are using to control the LEDs to control the servo and fan, since there are push-pull outputs on the PCA. The servo is used to extend the speakers

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# GYROSCOPE

7-B ADDR: 1101010



The gyroscope will be used to detect rotation of the device as well as provide information via its built in temperature sensor. The chip can be configured to generate an interrupt upon a certain rotation.

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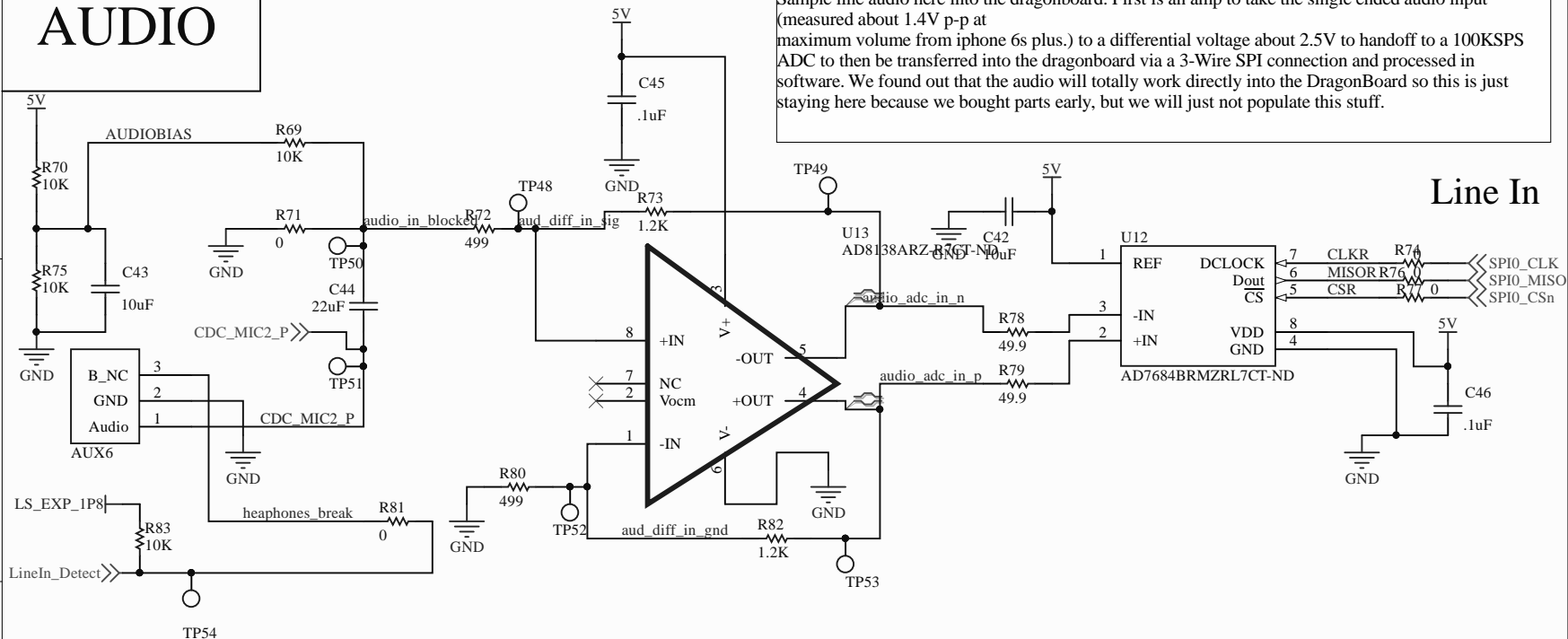
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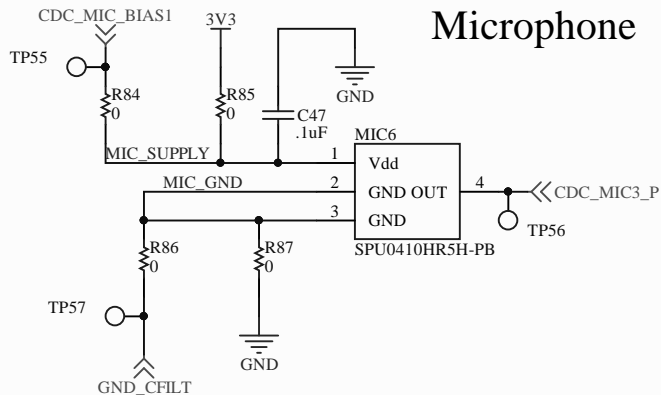
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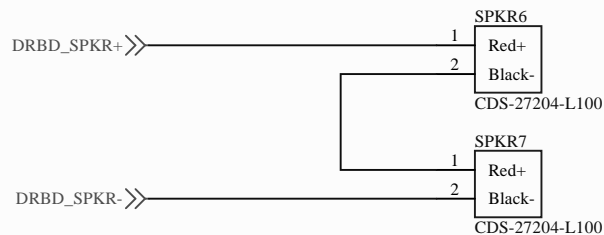
# AUDIO



## Microphone



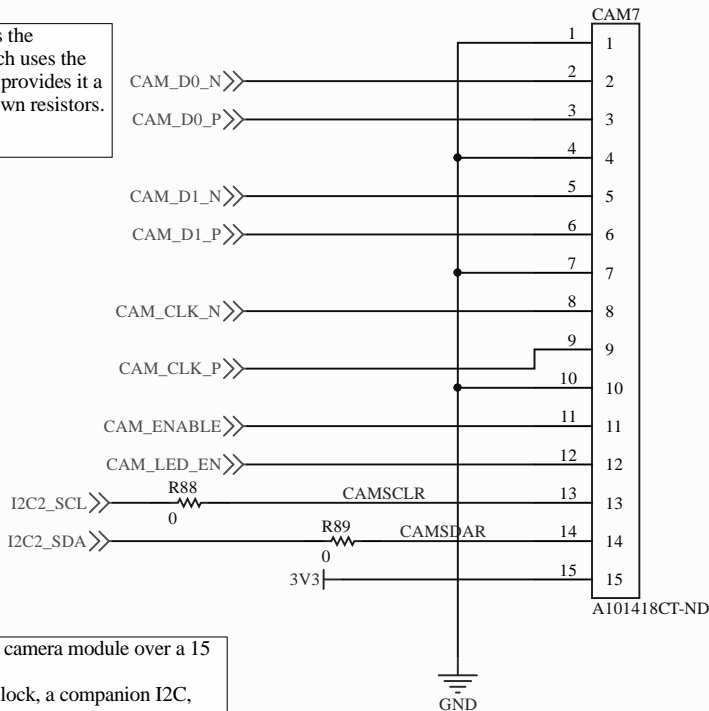
## Speakers



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# CAMERA

The camera that will be used is the Raspberry Pi Camera 1.3, which uses the OmniVision 5647 module and provides it a clock and necessary pull up/down resistors.



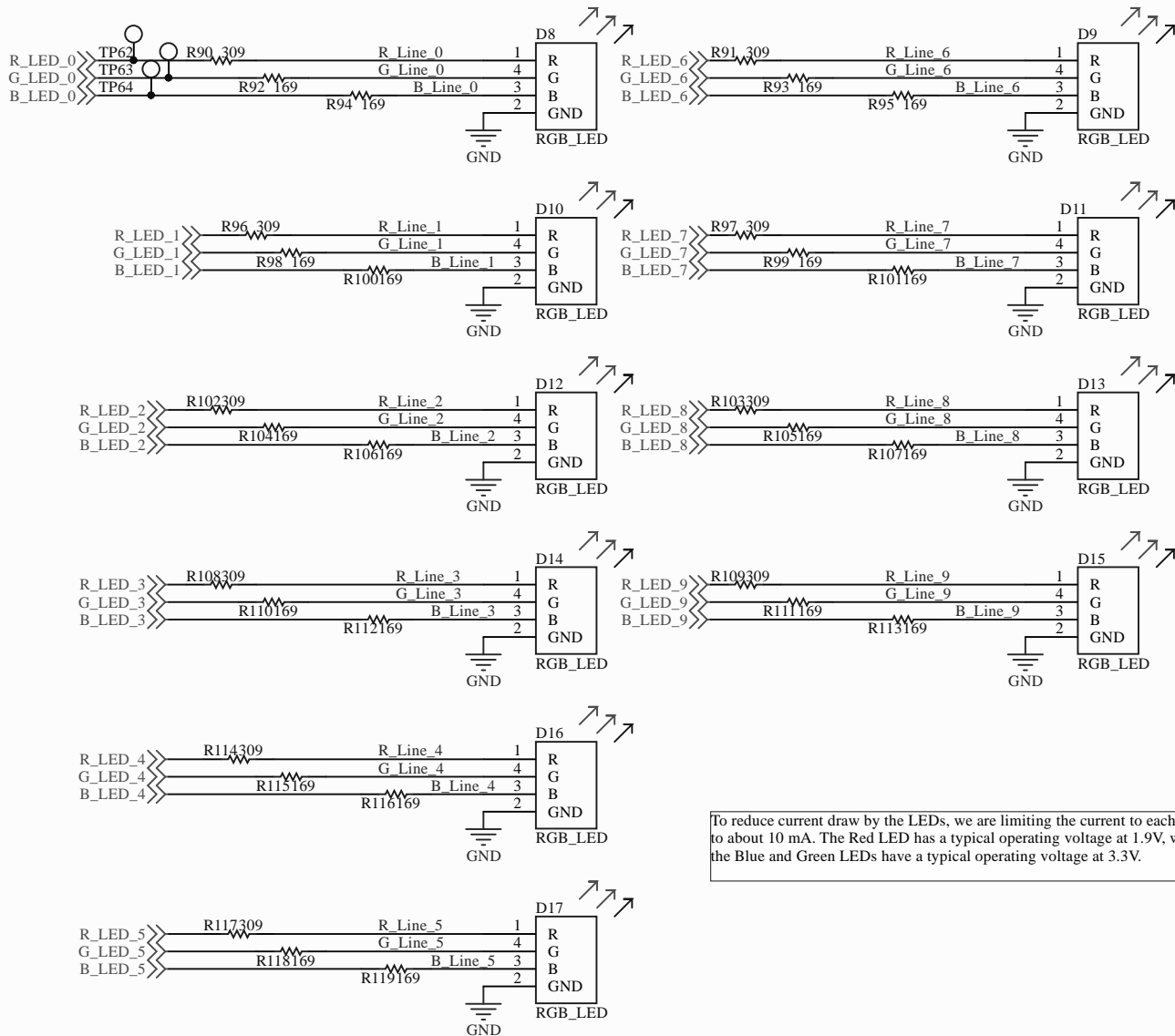
This is the connection to the camera module over a 15 pin FPC ribbon cable.  
There are two data lanes, a clock, a companion I2C, and power.

In case we don't need level shifting on the I2C pins, I've added jumpers

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# LEDs(2)



To reduce current draw by the LEDs, we are limiting the current to each LED to about 10 mA. The Red LED has a typical operating voltage at 1.9V, while the Blue and Green LEDs have a typical operating voltage at 3.3V.

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