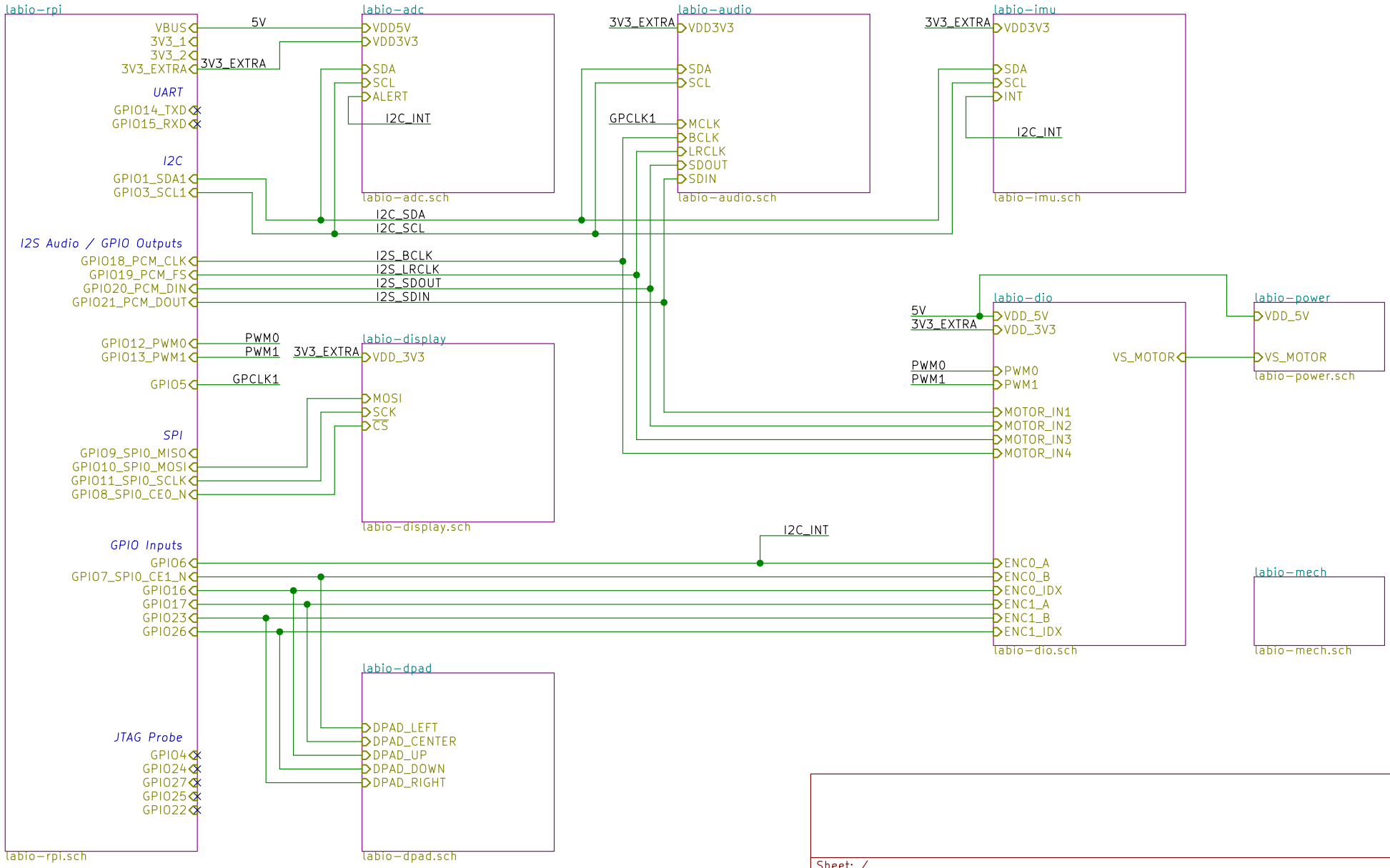
labio-rpi
VBUS
3V3_1
3V3_2
3V3_EXTRA
UART
GPIO14_TXD
GPIO15_RXD
I2C
GPIO1_SDA1
GPIO3_SCL1
I2S Audio / GPIO Outputs
GPIO18_PCM_CLK
GPIO19_PCM_FS
GPIO20_PCM_DIN
GPIO21_PCM_DOUT
GPIO12_PWM0
GPIO13_PWM1
GPIO5
SPI
GPIO9_SPI0_MISO
GPIO10_SPI0_MOSI
GPIO11_SPI0_SCLK
GPIO8_SPI0_CE0_N
GPIO Inputs
GPIO6
GPIO7_SPI0_CE1_N
GPIO16
GPIO17
GPIO23
GPIO26
JTAG Probe
GPIO4
GPIO24
GPIO27
GPIO25
GPIO22
labio-rpi.sch
5V
3V3_EXTRA
PWM0
PWM1
GPCLK1
labio-adc
VDD5V
VDD3V3
SDA
SCL
ALERT
I2C_INT
labio-adc.sch
labio-audio
3V3_EXTRA
VDD3V3
SDA
SCL
GPCLK1
MCLK
BCLK
LRCLK
SDOUT
SDIN
labio-audio.sch
labio-imu
3V3_EXTRA
VDD3V3
SDA
SCL
INT
I2C_INT
labio-imu.sch
I2C_SDA
I2C_SCL
I2S_BCLK
I2S_LRCLK
I2S_SDOUT
I2S_SDIN
labio-display
3V3_EXTRA
VDD_3V3
MOSI
SCK
CS
labio-display.sch
labio-dio
5V
3V3_EXTRA
VDD_5V
VDD_3V3
PWM0
PWM1
MOTOR_IN1
MOTOR_IN2
MOTOR_IN3
MOTOR_IN4
ENC0_A
ENC0_B
ENC0_IDX
ENC1_A
ENC1_B
ENC1_IDX
labio-dio.sch
labio-power
VDD_5V
VS_MOTOR
labio-power.sch
labio-mech
labio-mech.sch
labio-dpad
DPAD_LEFT
DPAD_CENTER
DPAD_UP
DPAD_DOWN
DPAD_RIGHT
labio-dpad.sch
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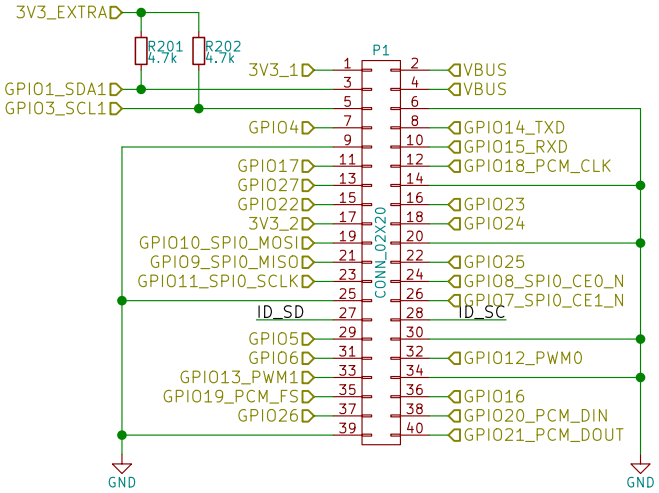

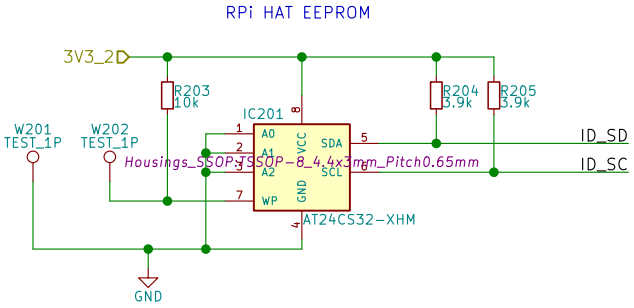

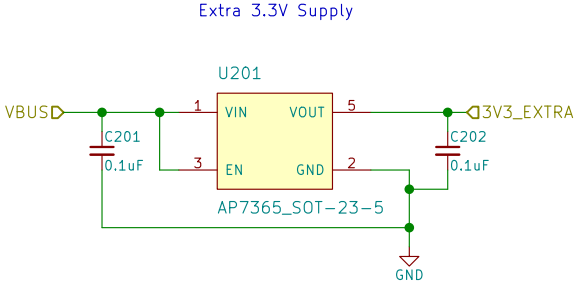

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Size: A4	Date:	**Rev:**
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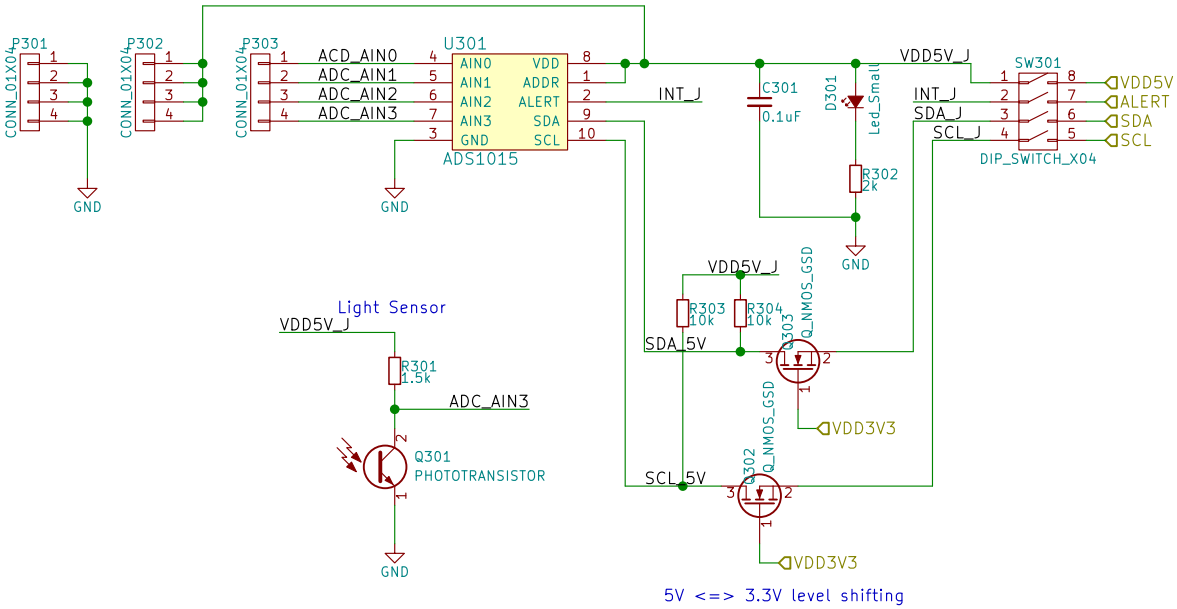
12-bit (ADS1015) or 16-bit (ADS1115) ADC
with differential PGA and 4-channel mux.
7-bit addr: 0x73
5V VDD to safely sample RPi VBUS.
P301
P302
P303
CONN_01X04
ACD_AIN0
ADC_AIN1
ADC_AIN2
ADC_AIN3
U301
AIN0
AIN1
AIN2
AIN3
GND
VDD
ADDR
ALERT
SDA
SCL
ADS1015
INT_J
C301
0.1uF
D301
Led_Small
R302
2k
VDD5V_J
SW301
DIP_SWITCH_X04
VDD5V
ALERT
SDA
SCL
SDA_J
SCL_J
Light Sensor
R301
1.5k
Q301
PHOTOTRANSISTOR
R303
10k
R304
10k
Q_NMOS_GSD
Q303
Q302
SDA_5V
SCL_5V
VDD3V3
5V <=> 3.3V level shifting
Sheet: /labio-adc/
File: labio-adc.sch
Title:
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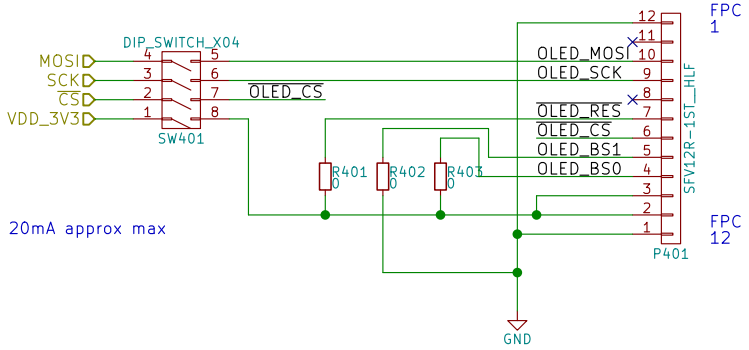
CFAL12832D-B* OLED Display
3-wire SPI mode.

Note: top side ZIF connector has pins reversed from FPC.



20mA approx max

Interface

Pin No	Sym	3 Wire SPI	4 Wire SPI	I2C
1	GND	**GND**	**GND**	**GND**
2	D2	NC	NC	SDA*
3	D1	SDA	SDA	SDA*
4	D0	CLK	SCLK	SCL
5	D/C#	NC	D/C	**Vcc**
6	RES#	RESET	RESET	RESET
7	CS#	**GND**	**GND**	**GND**
8	BS1	**GND**	**GND**	**Vcc**
9	BS0	**Vcc**	**GND**	**GND**
10	Vdd	**Vcc****	**Vcc****	**Vcc****
11	Vbat	**Vcc****	**Vcc****	**Vcc****
12	GND	**GND**	**GND**	**GND**

Microcontroller	Control lines defined by layout / code
+3.3v	Supply voltage
Ground	Supply ground

Notes:

*	Tie D2 and D1 together
**	Okay to Tie Vdd and Vbat together

Sheet: /labio-display/
File: labio-display.sch

Title:

Size: A4	Date:	**Rev:**
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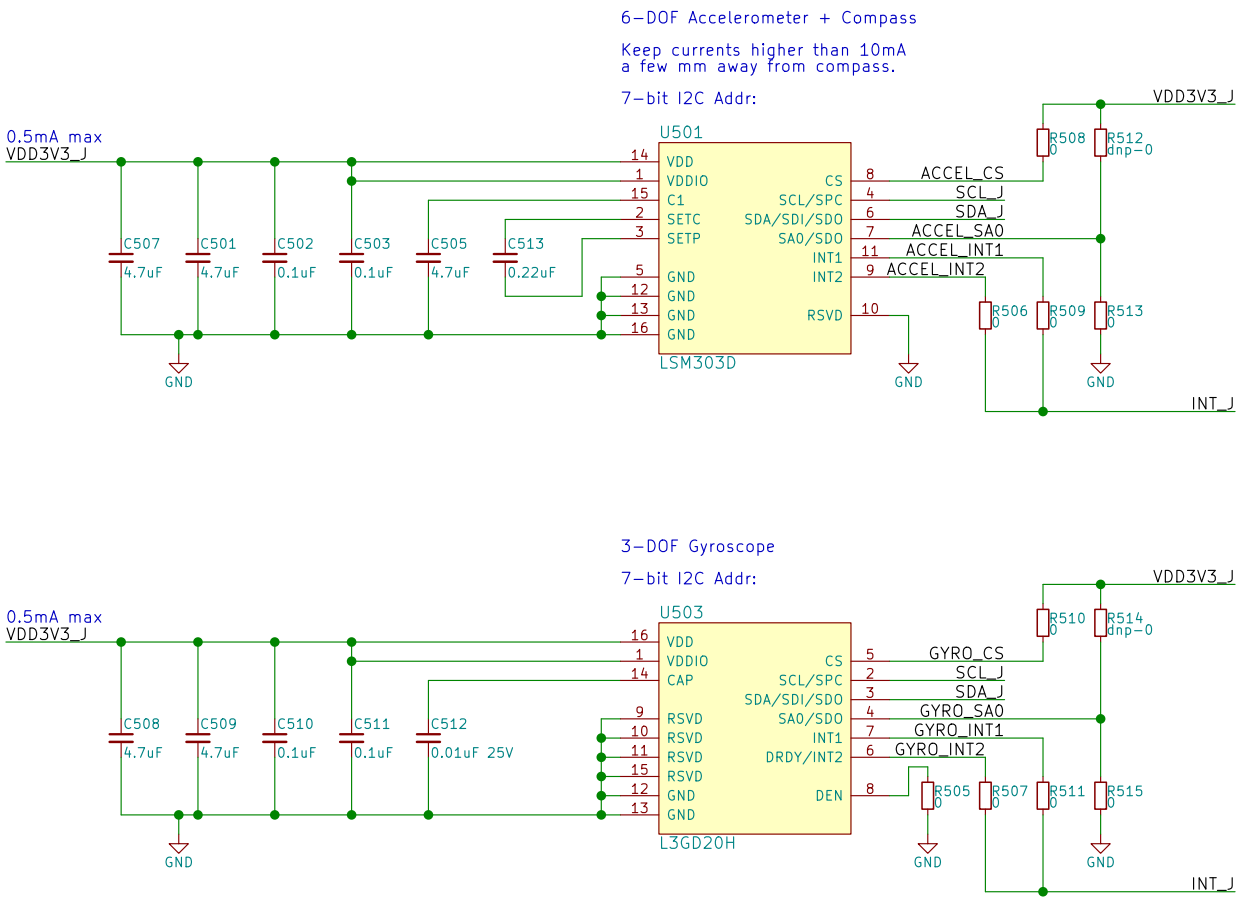
6-DOF Accelerometer + Compass
Keep currents higher than 10mA
a few mm away from compass.
7-bit I2C Addr:
0.5mA max
VDD3V3_J
U501
VDD
VDDIO
C1
SETC
SETP
GND
GND
GND
GND
CS
SCL/SPC
SDA/SDI/SDO
SA0/SDO
INT1
INT2
RSVD
LSM303D
C507 4.7uF
C501 4.7uF
C502 0.1uF
C503 0.1uF
C505 4.7uF
C513 0.22uF
ACCEL_CS
SCL_J
SDA_J
ACCEL_SA0
ACCEL_INT1
ACCEL_INT2
R508 0
R512 dnp-0
R506 0
R509 0
R513 0
INT_J
3-DOF Gyroscope
7-bit I2C Addr:
U503
VDD
VDDIO
CAP
RSVD
RSVD
RSVD
RSVD
GND
GND
CS
SCL/SPC
SDA/SDI/SDO
SA0/SDO
INT1
DRDY/INT2
DEN
L3GD20H
C508 4.7uF
C509 4.7uF
C510 0.1uF
C511 0.1uF
C512 0.01uF 25V
GYRO_CS
SCL_J
SDA_J
GYRO_SA0
GYRO_INT1
GYRO_INT2
R510 0
R514 dnp-0
R505 0
R507 0
R511 0
R515 0
Pressure + Temperature
7-bit I2C Addr: 0x77
1mA max
U502
VDD
VDDIO
GND
GND
CSB
SCL/SCK
SDA/SDI
ADDR/SDO
BMP280
C504 0.1uF
C506 0.1uF
BMP_CS
SCL_J
SDA_J
BMP_ADDR
R502 0
R503 dnp-0
R504 0
D501
Led_Small
R501 2k
SW501
DIP_SWITCH_X04
VDD3V3
SCL
SDA
INT
Sheet: /labio-imu/
File: labio-imu.sch
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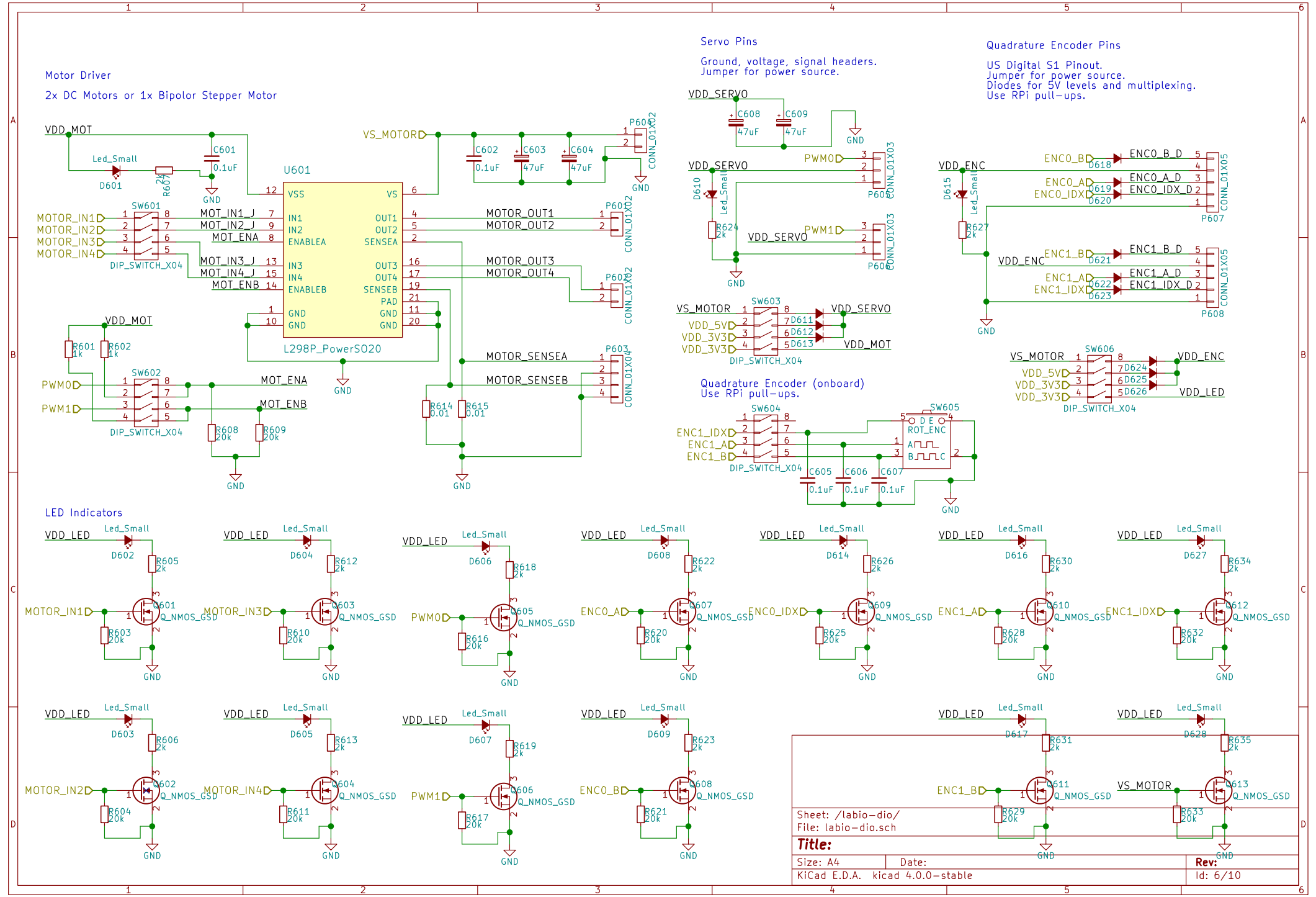
Motor Driver
2x DC Motors or 1x Bipolor Stepper Motor
Servo Pins
Ground, voltage, signal headers.
Jumper for power source.
Quadrature Encoder Pins
US Digital S1 Pinout.
Jumper for power source.
Diodes for 5V levels and multiplexing.
Use RPi pull-ups.
Quadrature Encoder (onboard)
Use RPi pull-ups.
LED Indicators
U601
L298P_PowerSO20
VDD_MOT
VS_MOTOR
VDD_SERVO
VDD_ENC
VDD_LED
VDD_5V
VDD_3V3
GND
MOTOR_IN1
MOTOR_IN2
MOTOR_IN3
MOTOR_IN4
MOT_IN1_J
MOT_IN2_J
MOT_IN3_J
MOT_IN4_J
MOT_ENA
MOT_ENB
MOTOR_OUT1
MOTOR_OUT2
MOTOR_OUT3
MOTOR_OUT4
MOTOR_SENSEA
MOTOR_SENSEB
PWM0
PWM1
ENC0_A
ENC0_B
ENC0_IDX
ENC1_A
ENC1_B
ENC1_IDX
ENC0_A_D
ENC0_B_D
ENC0_IDX_D
ENC1_A_D
ENC1_B_D
ENC1_IDX_D
ROT_ENC
Led_Small
Q_NMOS_GSD
DIP_SWITCH_X04
CONN_01X02
CONN_01X03
CONN_01X04
CONN_01X05
Sheet: /labio-dio/
File: labio-dio.sch
Title:
Size: A4
Date:
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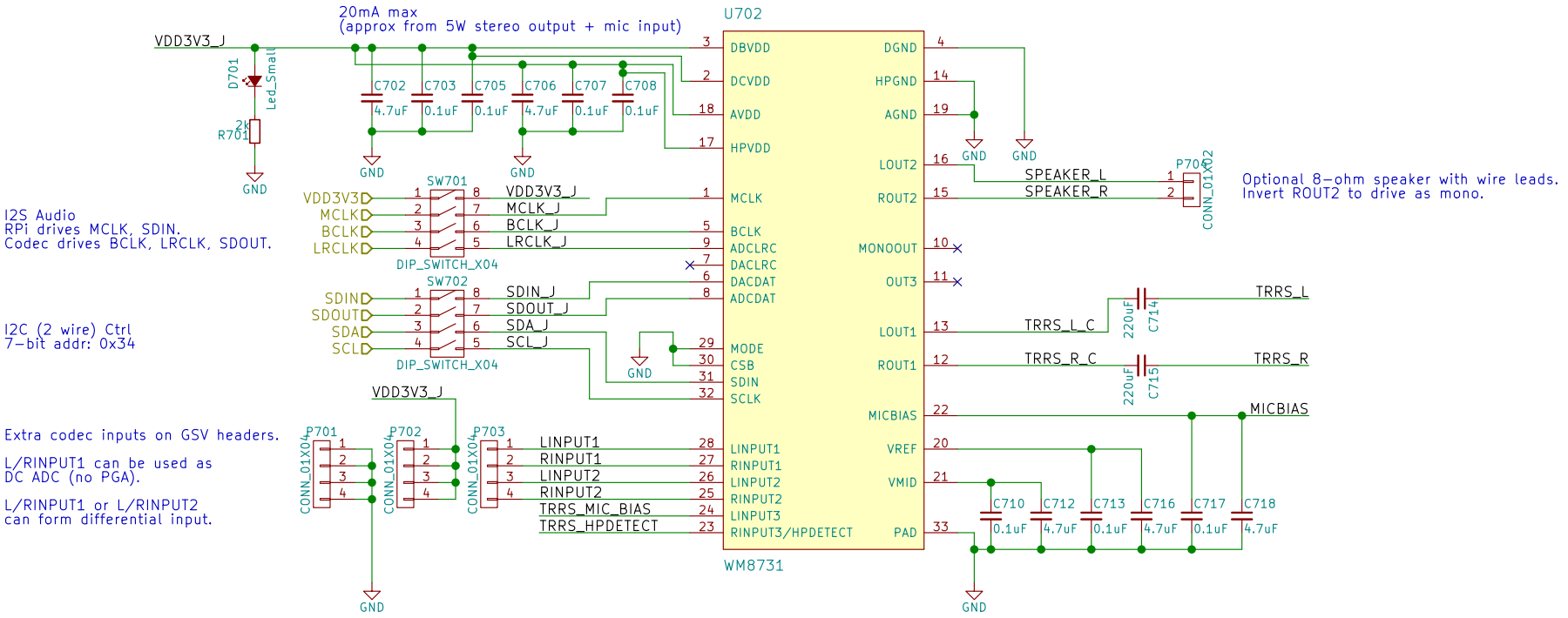
20mA max
(approx from 5W stereo output + mic input)
U702
VDD3V3_J
D701
Led_Small
R701
2k
C702
4.7uF
C703
0.1uF
C705
0.1uF
C706
4.7uF
C707
0.1uF
C708
0.1uF
GND
SW701
VDD3V3
MCLK
BCLK
LRCLK
VDD3V3_J
MCLK_J
BCLK_J
LRCLK_J
DIP_SWITCH_X04
SW702
SDIN
SDOUT
SDA
SCL
SDIN_J
SDOUT_J
SDA_J
SCL_J
DBVDD
DCVDD
AVDD
HPVDD
MCLK
BCLK
ADCLRC
DACLRC
DACDAT
ADCDAT
MODE
CSB
SDIN
SCLK
LINPUT1
RINPUT1
LINPUT2
RINPUT2
LINPUT3
RINPUT3/HPDETECT
DGND
HPGND
AGND
LOUT2
ROUT2
MONOOUT
OUT3
LOUT1
ROUT1
MICBIAS
VREF
VMID
PAD
WM8731
P701
P702
P703
CONN_01X04
LINPUT1
RINPUT1
LINPUT2
RINPUT2
TRRS_MIC_BIAS
TRRS_HPDETECT
P706
CONN_01X02
SPEAKER_L
SPEAKER_R
TRRS_L_C
TRRS_R_C
220uF
C714
C715
TRRS_L
TRRS_R
MICBIAS
C710
0.1uF
C712
4.7uF
C713
0.1uF
C716
4.7uF
C717
0.1uF
C718
4.7uF
I2S Audio
RPi drives MCLK, SDIN.
Codec drives BCLK, LRCLK, SDOUT.
I2C (2 wire) Ctrl
7-bit addr: 0x34
Extra codec inputs on GSV headers.
L/RINPUT1 can be used as
DC ADC (no PGA).
L/RINPUT1 or L/RINPUT2
can form differential input.
Optional 8-ohm speaker with wire leads.
Invert ROUT2 to drive as mono.
MEMS Microphone
0.25mA max
U701
VDD
SIG
GND
GND
SPU0410HR5H
0.1uF
C701
MEMS_MIC
2.2uF
C704
LINPUT2
Headset mic bias
Suggested by WM8750BL datasheet (pg. 56).
MICBIAS
R703
2.2k
C711
1uF
TRRS_MIC_BIAS
R702
47k
C709
220pF
TRRS headset connector
for typical smartphone headset.
J701
TRRS_MIC
TRRS_R
TRRS_HPDETECT
TRRS_L
S
R2
R1
RN
TN
T
JACK_TRRS_6PINS
TRRS headset connector
for typical smartphone headset.
Sheet: /labio-audio/
File: labio-audio.sch
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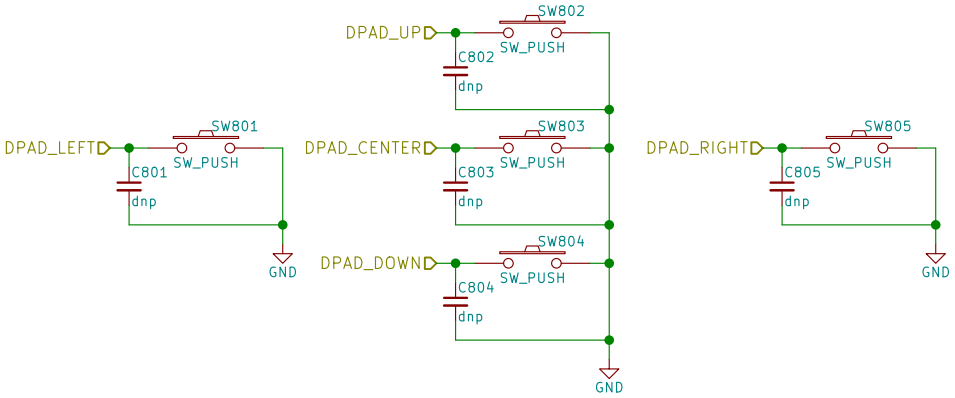
D-Pad

Use RPi pull-ups.
Optional C for decoupling.
Individual IO lines for interrupts.



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File: labio-dpad.sch		
Title:		
Size: A4	Date:	**Rev:**
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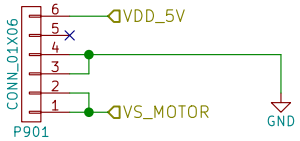
External Power (Future)

Provides logic and motor power from power supply or
battery pack with possible charging from USB (rpi) power.
2x motor power for current rating.



Sheet: /labio-power/		
File: labio-power.sch		
Title:		
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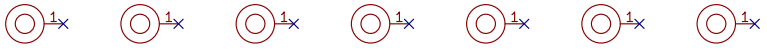
RPi-like Mounting Holes

M3 for M3/no 4/M2.5 hardware.

H1001 H1003 H1004 H1005 H1007 H1008 H1009



hole hole hole hole hole hole hole

Heatsink Mounting

25x25mm with 30x30mm M3 holes

H1002 H1006

hole hole

Sheet: /labio-mech/		
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