21M.370 Digital Instrument Design

PCB overview

Created Apr 26 2020
Modified May 6 2020

This document covers how you can use available pins on the PCB breakout. There are three sections:

1. description of pin functionality
2. chart of pin functionality by pin
3. pictures of pin locations on the PCB

To be able to use digital inputs you will need to be using the following:
ESP32 firmware: M370_PRIMARY
- 20_05_01: added support for digital inputs
Python script: 370_PRIMARYv2

Pin functionality

There are several types of pin functions:
- analog: reads continuous analog values. In our system we stream these values to python at the data rate we specific.
- digital: reads only high or low values, e.g. 0 and 1. In our system when a digital pin changes state it sends the new state immediately, and the streams the current state at the data rate we specify. We stream the state because it is possible that changes of state may be lost when transmitted over wifi.
- I2C and SPI: special functions for digital communication to digital sensors

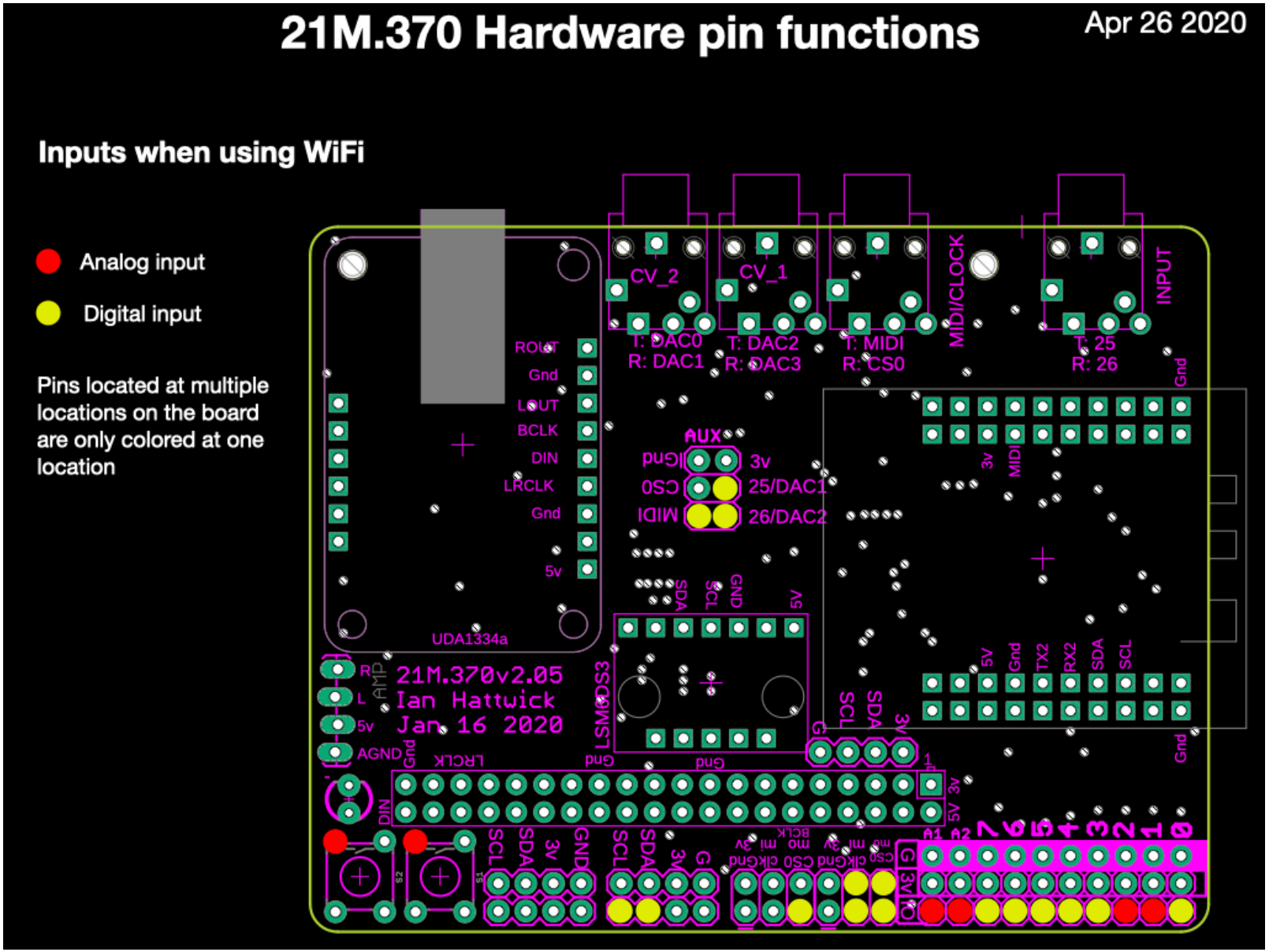
- DAC and analog/digital output: currently not implemented in our system.
- CapSense: capacitive sensing using selected analog pins of the ESP32.

If a pin is not functioning the way you expect, review the details on that pins usage on the chart below. Note that when using wifi many of the analog pins are not available for analog input, but are still usable for digital input.

pin functionality by pin

	PCB label	*ESP32 pin*	*possible uses*	*alternate PCB location*	*notes*
Analog pins					
A0	0	27	Analog IO, capSense		
A1	1	33	Analog IO, capSense		
A2	2	32	Analog IO, capSense		
A3	3	14	Analog IO, capSense		outputs PWM signal at boot
A4	4	4	Analog IO, capSense		
A5	5	0	Analog IO, capSense		pullup, outputs PWM on reset
A6	6	15	Analog IO, capSense		
A7	7	13	Analog IO, capSense	PCB LED	
A8	8	36	Analog input only		low-noise?
A9	9	39	Analog input only		low-noise?
SPI					
CLK	CLK	18	Digital IO		digital IO only
MISO	MISO	19	Digital IO		digital IO only
MOSI	MOSI	23	Digital IO		digital IO only
CS0	CS0	2	Analog IO, capSense	Aux	

	PCB label	*ESP32 pin*	*possible uses*	*alternate PCB location*	*notes*
CS1	CS1	12	Analog IO, capSense		boot fail if pulled high
I2C					
SDA	SDA	21	Digital IO		digital IO only
SCL	SCL	22	Digital IO		digital IO only, ESP32 built-in led
Controls on PCB					
Button		34	Analog input only		pullup
Button		35	Analog input only		pullup
LED		13	Analog IO, capSense	A7	
Aux					
	CS0	2	Analog IO, capSense	SPI	
	MIDI	5	Digital IO		digital IO only
	25/DAC1	25	Analog IO, DAC		
	26/DAC2	26	Analog IO, DAC		


21M.370 Hardware pin functions
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Inputs when using WiFi
Analog input
Digital input
Pins located at multiple locations on the board are only colored at one location
CV_2
CV_1
MIDI/CLOCK
INPUT
T: DAC0
R: DAC1
T: DAC2
R: DAC3
T: MIDI
R: CS0
T: 25
R: 26
ROUT
Gnd
LOUT
BCLK
DIN
LRCLK
Gnd
5v
UDA1334a
AUX
3v
25/DAC1
26/DAC2
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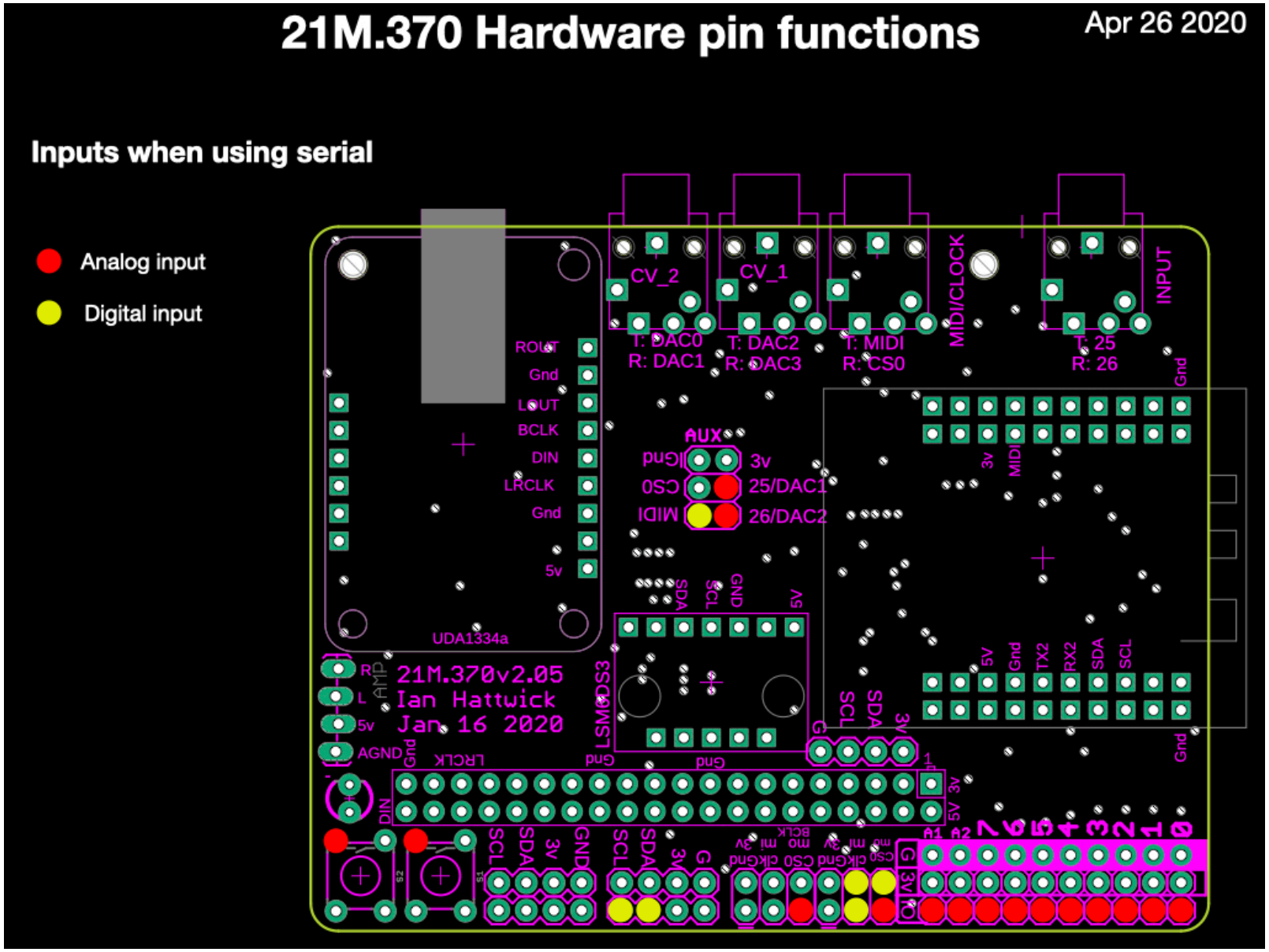
AGND
LSM6DS3
SDA
SCL
GND
5V
TX2
RX2
MIDI
A1
A2


21M.370 Hardware pin functions
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Inputs when using serial
Analog input
Digital input
CV_2
CV_1
MIDI/CLOCK
INPUT
T: DAC0
R: DAC1
T: DAC2
R: DAC3
T: MIDI
R: CS0
T: 25
R: 26
ROUT
Gnd
LOUT
BCLK
DIN
LRCLK
Gnd
5v
AUX
Gnd
CS0
MIDI
3v
25/DAC1
26/DAC2
UDA1334a
21M.370v2.05
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LSM6DS3
AGND
SDA
SCL
GND
5V
TX2
RX2
A1
A2