ENERGY

Bat + BMS + PowerPath

J1
USB_C_Receptacle_USB2.0_14P

SEL set to VCC
allow to chip to
draw up to 1.8A
otherwise, limited to 500mA
if issue, swap the resistor
on SEL pin

Resistor to
negotiate 5V/3A
from USB

ESD protection

U3
MCP73871-2CA

THE BMS MUST BE PRESENT ON THE CELL SIDE !

TE = safety timer
CE = charge enabled

U6
INA199xxDCK
gain = 200

PROG2 :
The MCP73871 device
USB-Port current
regulation set
input (PROG2) is a digital
input selection. A logic Low
selects a one unit load
input current from the USB
port
(100 mA) while a logic
high selects a five unit
load input
current from the USB port
(500 mA).

PROG3 Set the charging
termination current
threshold
Itresh = 1000V/R_prog3
1000V/10'000 = 100mA

acceptable range :
200mA-10mA

This affect cell lifetime,
current should be as big
as possible to make the
cell last as long as
possible

PROG1 Set the charging
current
Itresh = 1000V/R_prog1
1000V/1'000 = 1000mA
This is limited by battery
capacity,
slow charge relative to
capacity
to extend lifetime of the
cell

TODO : switch to LFP chemistry and implement PD charging

5V Boost

DC BOOST 5V 2A
(but 1A max, limited by MCP73871)

U2 1 uH, 5A
TPS61230DRC

Vout = 1V*(1+R23/R24)=5V

3V3 LDO

3V3 LDO, 600 mA

U7
AP2112K-3.3

SENSORS

6 AXIS IMU

SDO = I2C
least
significant
bit for
address

not used
for mode 1
datasheet
say to connect
to GND or VCC

1101010b = 0x5A

U11
LSM6DS3

SDO = I2C
least
significant
bit for
address

not used
for mode 1
datasheet
say to connect
to GND or VCC

1101011b = 0x5B

U10
LSM6DS3

duplicated to infer rotation / translation
around real donut center.
if not wanted, leave unpopulated

Microphone

MICMBIAS
MIC_N
MIC_P

Microphone
MKTD4015BPN1

IR Remote Receiver

U8
IRM-H6xxT

Buttons/switch

we use MCP23017 internal pull-ups

IR Proximity sensor

U13
74HC4051

U9
74HC4051

there is -70 Ohm trough the chip, beware

Vee is for negative voltage but the lowest here is GND

U12
MCP6L01x-xOT

Low cutoff = 100 Hz
High cutoff = 50 KHz
Gain = -10 (inverting)
add 0.5*VCC Offset

0.1-5 mA for the collector current

U20
U19
U18
U17
U16
U15
U14
U23
ITR9909

Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
NX7002AK

ACTUATOR

AUDIO SPEAKER

U22
MCP6L01x-xOT

100 gain + low pass

ES8374

600 Ohms AC
2A
0.1 Ohm CC

Speaker

RGB LED

32 RGB LEDs

4 side IR proximity
6*4 led per capacitive buttons
4 center led for the button

WS2812B

COMPUTE

USB-Serial transceiver

RST need a
pull-up as the
pin is pulled
low during boot

5V from
USB when
connected

U1
CP2102N-Axx-xQFN28

ESP32 WIFI MCU

ESP32-WROOM-32E

BOOT mode selection

tricks to set the ESP32 in upload mode
whithouth having to press the RST + BOOT btn

hold RST until 3v3 is stable

auto program
DTR RTS -> EN IO0
0 0 1 1
0 1 1 0
1 0 0 1
1 1 1 1

GPIO expander

U5
MCP23017_SO

0100000 = 0x20

Daughterboard

Motors / H-bridge / servo / more LED
Color Sensor (over I2C)

for current draw on 5V and VBUS,
check regulators

use SX1509, MCP23017 or PCA9685
they work over I2C
and can be paired
to an H bridge

J4
Conn_01x06

Sheet: /		
File: Sthymuli-motherboard.kicad_sch		
Title:		
Size: A2	Date:	**Rev:**
KiCad E.D.A. 9.0.7		Id: 1/1