## MCU RP2040

GPIO25
R6 330
GPIO25-led
D1 LED_Small Red

+1V1
+3V3
+3V3

C4 100n
C5 100n
C8 10u
C9 100n
C12 100n
C13 100n
C14 100n
C15 100n
C16 100n
C17 100n

Make sure C8 is close to pin 45 of RP2040
C6 1u
C10 1u    Make sure C10 is close to pin 44 of RP2040

R4 27
R5 27
Make sure R3 and R4 are close to RP2040
D+
D-

U2

DVDD 50
DVDD 23
VREG_VOUT 45
VREG_IN 44
IOVDD 49
IOVDD 42
IOVDD 33
IOVDD 7
IOVDD 28
IOVDD 1
USB_VDD 48
ADC_AVDD 43

USB_DP 47  USB+
USB_DM 46  USB-

QSPI_SS 56   QSPI_SS
QSPI_SD0 53  QSPI_SD0
QSPI_SD1 55  QSPI_SD1
QSPI_SD2 54  QSPI_SD2
QSPI_SD3 51  QSPI_SD3
QSPI_SCLK 52 QSPI_SCLK

Raspberry Pi
RP2040

GPIO0 2   GPIO0
GPIO1 3   GPIO1
GPIO2 4   GPIO2
GPIO3 5   GPIO3
GPIO4 6   GPIO4
GPIO5 7   GPIO5
GPIO6 8   GPIO6
GPIO7 9   GPIO7
GPIO8 11  GPIO8
GPIO9 12  GPIO9
GPIO10 13 GPIO10
GPIO11 14 GPIO11
GPIO12 15 GPIO12
GPIO13 16 GPIO13
GPIO14 17 GPIO14
GPIO15 18 GPIO15
GPIO16 27 GPIO16
GPIO17 28 GPIO17
GPIO18 29 GPIO18
GPIO19 30 GPIO19
GPIO20 31 GPIO20
GPIO21 32 GPIO21
GPIO22 34 GPIO22
GPIO23 35 GPIO23
GPIO24 36 GPIO24
GPIO25 37 GPIO25   GPIO24

GPIO26_ADC0 38 GPIO26_ADC0
GPIO27_ADC1 39 GPIO27_ADC1
GPIO28_ADC2 40 GPIO28_ADC2
GPIO29_ADC3 41 GPIO29_ADC3

SPI 0 used for SD card
I2C 1 used for RTC

### Crystal
1-15MHz usable
C27 DNP
ABLS-12.000MHZ-B4-T
Y1
C28 DNP
XOUT-raw
R3 1k
XIN
XOUT
XIN 20
XOUT 21

+3V3
R7 10k
RUN 26  RUN
reset buton
SWCLK 24 SWCLK
SWD 25 SWD
C1 100n
SW1 SW_SPST

TESTEN 19
GND 57

50mA absolute max sunk/sourced by IC GPIO
The GPIOs on RP2040 have four different output drive strengths, which are nominally called 2, 4, 8 and 12mA modes.
These are not hard limits, nor do they mean that they will always be sourcing (or sinking) the selected amount of
milliamps

## SD card

GPIO21 ___ SPI_SS
GPIO20 ___ SPI_MISO
GPIO19 ___ SPI_MOSI
GPIO18 ___ SPI_CLK

SD card interface
4 bit 2 bit and SPI
+ card detection

SPI 0 used for SD card

+3V3
10k R11
GPIO22

J2
MEM2051-00-195-00-A

+3.3V
GPIO17 P1 DAT2       DAT1 P8 GPIO16
SPI_SS P2 CD/DAT3    MP1 MP1
SPI_MOSI P3 CMD      MP2 MP2
P4 VDD               MP3 MP3
SPI_CLK P5 CLK       MP4 MP4
SPI_MISO P6 VSS      MP5 MP5
P7 DAT0

C11 10u
GND

D3
D5V0P4UR6SO-7
SPI_MOSI I/O1  I/O4 SPI_MISO
VSS  VCC
I/O2  I/O3 SPI_SS
ESD protection

+3V3

D9
D5V0P4UR6SO-7
GPIO16 I/O1  I/O4 GPIO17
VSS  VCC
I/O2  I/O3 SPI_CLK

+3V3

### Batt measurement
+VDC
R20 10k
GPIO29_ADC3
R22 10k

Power

## IOs

Same as Rpi Zero board on the upper side
but with some extrapins on the power side
ADC_ref is floating
powering from VSYS lower then 3v3 may
not work since i only implemented a
buck not a boost-buck (chip shortage 2022)

GPIO0 1
GPIO1 2
3
GPIO2 4
GPIO3 5
GPIO4 6
GPIO5 7
8
GPIO6 9
GPIO7 10
GPIO8 11
GPIO9 12
13
GPIO10 14
GPIO11 15
GPIO12 16
GPIO13 17
18
GPIO14 19
GPIO15 20

J4 lefl_side

+VDC  VBUS
VSYS
3v3_enable  ground this for shutdown
+3.3V
GPIO28_ADC2
GPIO27_ADC1
GPIO26_ADC0
RUN
GPIO22
GPIO21
GPIO20
GPIO19
GPIO18
GPIO17
GPIO16

J5 right_side

J6 debug
SWCLK  SWD

+3.3V  J10 Conn_01x01
GPIO23
J7 Conn_01x01

## Flash

Max memory:
128Mbit chip (16Mbyte)
must be :
quad SPI flash memory

+3V3
R2 DNF
C7 100n

J1
USB_BOOT
R1 1k
Conn_01x02
GND
SW2 SW_SPST

U1
CS  DI(IO0)
CLK  DO(IO1)
VCC
IO2
IO3
GND
W25Q128JVS

QSPI_SS
QSPI_SCLK
QSPI_SD0
QSPI_SD1
QSPI_SD2
QSPI_SD3

## OTHER
+3.3V

pin
SolderJumper JP1
RTC
MFP
RTC_SDA
RTC_SCL
R12 10k
R14 10k
I2C_SDA
I2C_CLK

+3.3V
U4 DHT11
VCC
GND  IO
R13 4k7
GPIO23
SolderJumper JP2

adress
JP5
LSD
GND 0
VCC 1

+3.3V
SDO  VDD
SCK  VDDIO
SDI
CSB  GND  GND
U8 BME280
pin ___ GPIO14
CSB is SS pin
active high

C22 100n

I2C_SDA ___ GPIO12
I2C_CLK ___ GPIO13

I2C 1 used for RTC

## Fiducial+graphics+orientation

FID1 Fiducial
FID2 Fiducial
FID3 Fiducial

H1 MountingHole
H2 MountingHole
H3 MountingHole
H4 MountingHole

# Power

## USB Data+Power Input filtering and fuse

ESD protection IC

VBUS

U5
D1213A-02SM

| | | |
|---|---|---|
| VSS VCC | | |
| CH2 | 4 | D+ |
| CH1 | 3 | D- |
| NC | 1 | |

J9
USB_B_Mini

FB1
HI1806T600R-10

F1
Polyfuse_Small

VBUS

R23
5k6

R21
10k

GPIO24

J11
Conn_01x01

## Linear regulator
just in case the buck fails
or i need lower noise power

+VDC

IC1
AP2112M-3.3TRG1

| | | | |
|---|---|---|---|
| 8 | VIN | VOUT | 1 |
| 7 | GND_2 | NC_1 | 2 |
| 6 | GND_1 | NC_2 | 3 |
| 5 | EN | NC_3 | 4 |

active high

lin_reg

1u
C21

R19
10k+ pullup

3v3_enable

## Power source switching

+VDC

buck

+3.3V

BUCK_OUTPUT
BUCK_INPUT
BUCK_ENABLE

buck_out

lin_reg

3v3_enable

S1
EG1224 SPDT switch
200-300mA
<100 typical

| PIN1 | COM | PIN2 |
|---|---|---|
| MH2 | MH3 | MH4 | MH1 |
| MH2 | MH3 | MH4 | MH1 |

400-500mA+ max power usage of MCU

## BATT TO USB POWER AUTO SHITCHING WITH REVERSE POWER PROTECTION AND PROTECTED CHARGEING CCCV

VBUS

1u
C25

D7
LED_Small

R25
470

LED_Small
D8

R27
470

IC2
MCP73834T-FCI_UN

| | | | |
|---|---|---|---|
| 1 | VDD_1 | VBAT_2 | 10 |
| 2 | VDD_2 | VBAT_1 | 9 |
| 3 | STAT1 | THERM | 8 |
| 4 | STAT2 | PG(TE) | 7 |
| 5 | VSS | PROG | 6 |

+BATT

R26
10k

TE

4.7u
C26

TE uses 1.8V logic
active high
activates a timer

timer enable

Set_charge_current

R28
10k

## BATT TO USB POWER AUTO SHITCHING WITH REVERSE POWER PROTECTION

+VDC

J8
Conn_01x02_Male

+BATT

U9A
DMG9933USD-13

U9B
DMG9933USD-13

U3

APX810S05

| | | |
|---|---|---|
| 3 | Vcc | |
| 2 | GND | RESET |

active when Vbat is under 3.08V
active high

R24
10k

R10
10k

D2
D_Shockley

VBUS

## Power indicator leds

VBUS

+3.3V

vbus_led-jumper

JP3
SolderJumper

SolderJumper
JP4

3v3_led-jumper

D4
vbus_led
LED_Small Green

R15
4.7k

R17
330

3v3_led
D5
LED_Small Green

J3
Conn_01x03

+BATT

+VDC

led_select

R18
330

custom_led
D6
LED_Small Green

U6
MCP79412

15pF C19
Y2
32.7680kHz
15pF C20

Li-Ion-20mm-cell

X1

| | |
|---|---|
| 1 X1 | VCC 8 |
| 2 X2 | MFP 7 |
| 3 BATT | SCL 6 |
| 4 VSS | SDA 5 |

+3V3 1,3-5,5V

MFP pin can be used as wake up

RTC_SCL
RTC_SDA

BT2
Battery_Cell

3V cell normaly

The RTCC registers are contained in addresses
0x00h-0x1fh. 64 bytes of user-accessable SRAM are
located in the address range 0x20-0x5

U7
DIO6012BCST6

BUCK_INPUT

C23
22u

BUCK_ENABLED

active high

inductor_buck

L1
NRH3012T2R2MN  2,2uH

IN    LX
EN    FB
GND
NC

4
1
2
5
3
6

buck_output

C24
22p optional

FB

RR1
91k

RR2
20k

RR2=0.6*RR1/(Vout-0.6)

RR1      RR2
81.81k   18,19k   -100k pot
100k     450k
222k     1M
47k      211.5k

buck_output

C3
10u

C18
10u

C2
10u

BUCK_OUTPUT