MCU

according to DC doc:
https://docs.espressif.com/projects/esp-idf/en/latest/esp32/api-reference/peripherals/sdmmc_host.html

https://www.espressif.com/sites/default/files/documentation/esp32-c3_hardware_design_guidelines_en.pdf
anteena is on the left
pull up/down resitors are 45k

MCU can:
push 40mA out
pull 28mA in
350mA max consumption (wifi)

+3.3V

R2 10k
10u C3
reset
SW1 SW_SPST

U1
ESP32-C3-MINI-1

ESP32-C3-MINI-1

Pin	Signal
4	NC
7	NC
9	NC
10	NC
15	NC
17	NC
24	NC
28	NC
32	NC
33	NC
34	NC
35	NC

EN/CHIP_PU 8

GPIO2/ADC1_CH2   GPIO2 5   SPI2_MISO
GPIO3/ADC1_CH3   GPIO3 6   SPI2_CLK
GPIO0/ADC1_CH0/XTAL_32K_P   GPIO0 12   SPI2_MOSI
GPIO1/ADC1_CH1/XTAL_32K_N   GPIO1 13   DATA2
GPIO10   GPIO10 16   DATA1
GPIO4/ADC1_CH4   GPIO4 18   IRQ
GPIO5/ADC2_CH0   GPIO5 19
GPIO6   GPIO6 20
GPIO7   GPIO7 21
GPIO8   GPIO8 22
GPIO9   GPIO9 23

GPIO0   GPIO1   GPIO2   GPIO3   GPIO4   GPIO5   SD +SPI2

GPIO6   SDA
GPIO7   SCL   I2C bus

GPIO8
GPIO9
GPIO10   I2S pins/
SPI1 for ADC

GPIO18/USB_D- 26   D-
GPIO19/USB_D+ 27   D+

GPIO20/U0RXD 30   RX
GPIO21/U0TXD 31   TX

+3.3V

Pin	GND
1	GND
2	GND
11	GND
14	GND
36	GND

3V3 3

C1 10u   C2 1u   C5 100n

Pull ups

+3.3V

R5 10k   R7 10k   R10 10k   R11 10k   R12 10k   R13 10k   R14 10k   R15 10k

SPI2_SS2
SPI2_MOSI
SPI2_CLK
SPI2_MISO
SDA   SCL   DATA2   DATA1

Power indicator leds

+5V   +3.3V   P3

R20 4.7k   R44 330   R45 330

D1 LED_Small Green   D5 LED_Small Green   D6 LED_Small Green

GPIO EXTENDER

+3.3V

R16 10k   R17 10k   interupt pin to MCU

100n C23

IC1
XRA1203IG24TR-F

Pin	Signal		Pin	Signal
1	IRQ#	IRQ	24	VCC
2	A1	A1	23	SDA	SDA
3	RESET#		22	SCL	SCL
4	P0	SPI2_SS1	21	A0	A0
5	P1	SPI2_SS2	20	P15	TP1 R30 330 D7 LED_Small Green
6	P2	SD_sense	19	P14	TP2
7	P3	P3	18	P13	R46 330 D8 LED_Small Green
8	P4		17	P12	TP3
9	P5		16	P11	R47 330 D9 LED_Small Green
10	P6		15	P10	
11	P7		14	P9	
12	GND		13	P8	

Jumper_2_Bridged JP1

R18 10k   TE

R19 10k

TestPoint
TestPoint
TestPoint
test points for
bodges later one

A1 A0   I2C adredd
GND GND   0x40 (0100 000X)
GND VCC   0x42 (0100 001X)
VCC GND   0x44 (0100 010X)
VCC VCC   0x46 (0100 011X)

SD CARD

USD CARD SOCKET
J3
MEM2051-00-195-00-A

+3.3V   R21 10k   +3.3V

+3.3V

DATA2   SPI2_SS2 DATA3   SPI2_MOSI

	Pin	Signal		Pin	
DAT2	P1		DAT1	P8	DATA1
CD/DAT3	P2		MP1	MP1	
CMD	P3		MP2	MP2	SD_sense
VDD	P4		MP3	MP3	
CLK	P5		MP4	MP4	
VSS	P6		MP5	MP5	
DAT0	P7				

SPI2_MOSI   SPI2_CLK   SPI2_MISO DATA0

C26 10u

DIP SWITCHES

S1
DS01C-254-S-08BE

Signal	Pin	COM	NO	Pin	Signal
SPI1_MISO	1	COM_1	NO_1	2	
	3	COM_2	NO_2	4	GPIO8
GPIO8	5	COM_3	NO_3	6	DATA_IN
SPI1_CLK	7	COM_4	NO_4	8	
GPIO9	9	COM_5	NO_5	10	GPIO9
SPI1_MOSI	11	COM_6	NO_6	12	BCLK
GPIO9	13	COM_7	NO_7	14	GPIO10
GPIO10	15	COM_8	NO_8	16	LRC

ADC ON SIDE   AUDIO ON SIDE

+3.3V

R4 10k   10k R6

S2
DS01C-254-S-08BE

GPIO9
A1
A0

Pin	COM	NO	Pin
1	COM_1	NO_1	2
3	COM_2	NO_2	4
5	COM_3	NO_3	6
7	COM_4	NO_4	8
9	COM_5	NO_5	10
11	COM_6	NO_6	12
13	COM_7	NO_7	14
15	COM_8	NO_8	16

+VDC

on/off+mode   10k R8

gain   R9 10k

20k R3

+3.3V

3v3_enable

pull down since this way it is by default off
and it doent draw power as oposed to a pull
up that is turned off when tied to GND

graphics+ mechanical

H1 MountingHole_Pad
H2 MountingHole_Pad
H3 MountingHole_Pad
H4 MountingHole_Pad

FID1 Fiducial
FID2 Fiducial
FID3 Fiducial
FID4 Fiducial
FID5 Fiducial

ADC

+VDC

R1 1k

1.2mA max at 4.2V
0.3mA min at 3V3

Vref

C6 100n   100n C7

U2
LM4040DBZ-3

100n C4

POWER_MEASUREMENTS

U3
MCP3208

Signal	Pin			Pin	Signal
ADC_CH0	1	CH0	Vref	15	
ADC_CH1	2	CH1	Vdd	16	
ADC_CH2	3	CH2	CLK	13	SPI1_CLK
ADC_CH3	4	CH3	Dout	12	SPI1_MISO
ADC_CH4	5	CH4	Din	11	SPI1_MOSI
	6	CH5	CS/SHDN	10	SPI1_SS1
ADC_CH6	7	CH6			
	8	CH7			

MUX   ADC   CNTRL   AGND 14   DGND 9

AUDIO Board + JACK

J1
STX-3120-5B

Audio jack

MH1	1		2	
MH2		MH2	3	MH3
			4	MH3
			5	

U4
Adafruit_MAX98357

Signal	Pin			Pin	Signal
LRC	5	LRC_(Left/Right_Clock)	speaker-		
BCLK	6	BCLK_(Bit_Clock)	speaker+		
DATA_IN	7	DIN_(Data_In)			
gain	8	GAIN			
on/off+mode	9	SD_/_MODE	VSS		
			VDD		

10u C8

this board has screw terminals
at thee audio outpur

+VDC

USB POWER+DATA

FB1
HI1806T600R-10
VBUS

150% rating so 1.5A-2A for me

J2
SS-52100-001

F1 1.5 A   +5V

Power-IN-OUT-BMS
5v

	Pin
MH1	1
MH1	2
MH2	3
MH2	4

D-   D+

C9 1u

VBUS

U5
D1213A-02SM

	Pin		Pin	
CH2	4	VCC	5	
CH1	1	VSS	2	
NC	3			

ESD protection IC

VBUS

TX		J8
RX		Conn_01x06
reset		
GPIO0		
+3.3V		

LARGE CURRENT
24V 3A MAX

input port

J4
Barrel_Jack_Switch

J5
Barrel_Jack_Switch

J6
Conn_01x03

source_vcc

output port

J7
Conn_01x03

load_vcc

10k
R28

100k
R29

ADC_CH2

U6B
LM324A

1/11 voltage ratio

source_vcc

R31
5m

load_vcc

SMALL CURRENT
5V OR LESS

10k
R33

10k
R34

mini_power_source

ADC_CH0

U6A
LM324A

USB input for power only

J10
10033527-N3112MLF

MP1
MP2
MP3
MP4

J11
Conn_01x02

ext_5v

+5V

JP2
Jumper_3_Open

ext_5v

mini_power_source

R35
30m

mini_power_load

J9
USB_A

VBUS
D+
D-
Shield GND

D2+
D2-

mini_power_load

J12
Conn_01x02

C10
0.1u

R32
1M

optimusdigital USB2 normal

SELF POWER CONSUMPTION
+ LI ION CHARGEING CURRENT

Power_in-

1k
R24

100k
R27

Power_in+

1k
R25

R22
10k

R26
100k

ADC_CH6

R23
10k

100 gain

U6C
LM324A

ADC_CH5

5m shunt with 2A max current
so 10mV drop so max gain is
3/0.01= 300 so 100-300 gain is fine
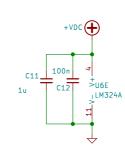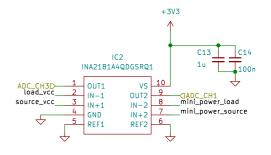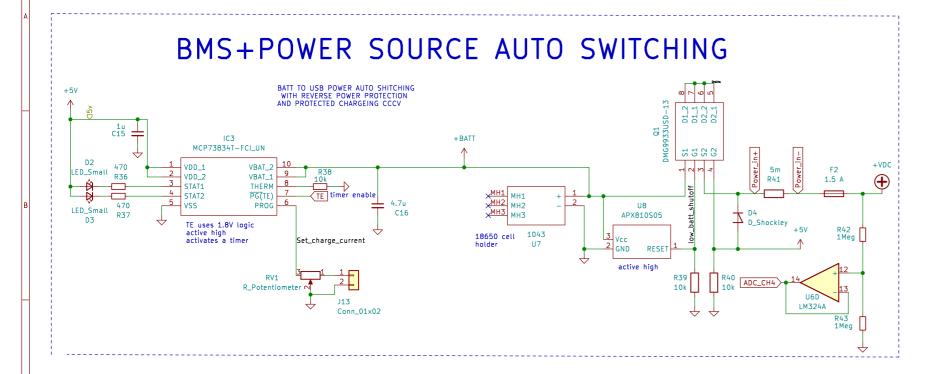
MAIN ICs POWER AND CIRCUITRY

+VDC

C11
1u

C12
100n

V+
U6E
V-
LM324A

+3V3

C13
1u

C14
100n

IC2
INA2181A4QDGSRQ1

ADC_CH3
load_vcc
source_vcc

OUT1
IN-1
IN+1
GND
REF1

VS
OUT2
IN-2
IN+2
REF2

ADC_CH1
mini_power_load
mini_power_source

BMS+POWER SOURCE AUTO SWITCHING

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

+5V

1u
C15

D2
LED_Small

470
R36

LED_Small
D3

470
R37

IC3
MCP73834T-FCI_UN

1 VDD_1
2 VDD_2
3 STAT1
4 STAT2
5 VSS

VBAT_2 10
VBAT_1 9
THERM 8
PG(TE) 7
PROG 6

R38
10k

TE timer enable

4.7u
C16

+BATT

TE uses 1.8V logic
active high
activates a timer

Set_charge_current

RV1
R_Potentiometer

J13
Conn_01x02

MH1
MH2
MH3

MH1
MH2
MH3

18650 cell
holder

1043
U7

1
2

+
–

U8
APX810S05

3 Vcc
2 GND RESET 1

active high

R39
10k

R40
10k

Q1
DMG9935USD-13

D1-2 8
D1-1 7
D2-2 6
D2-1 5

S1 1
G1 2
S2 3
G2 4

low_batt_shutoff

Power_in+

5m
R41

Power_in–

F2
1.5 A

+VDC

D4
D_Shockley

+5V

R42
1Meg

ADC_CH4

14
+
13
–

12

U6D
LM324A

R43
1Meg

LDO

+VDC

1u
C17

IC4
AP2112M-3.3TRG1

8 VIN
7 GND_2
6 GND_1
5 EN

VOUT 1
NC_1 2
NC_2 3
NC_3 4

lin_reg

1u
C18

3v3_enable
active high

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

BUCK

+VDC

+3.3V

buck

BUCK_OUTPUT
BUCK_INPUT
BUCK_ENABLE

buck_out

lin_reg

3v3_enable

PIN1 1
COM 2
PIN2 3

S3
EG1224 SPDT switch

MH2
MH3
MH4
MH1

200-300mA
<100 typical

MH2
MH3
MH4
MH1

400-500mA+ max power usage of MCU

FB2
FerriteBead_Small

U10
DIO6012BCST6

buck_input_filtered

BUCK_INPUT

C19
22u

BUCK_ENABLED

active high

IN
EN
GND
NC
LX
FB

L1
NRH3012T2R2MN 2,2uH

inductor_buck

buck_output

C20
22p optional

RR1
91k

RR2
20k

C21
10u

C22
10u

C24
10u

C25
10u

BUCK_OUTPUT

RR2=0,6*RR1/(Vout−0.6)

RR1   RR2
81.81k   18.19k   −100k pot
100k   450k
222k   1M
47k   211.5k
10k   2k22
47k   10k444
91k   20k222

for rr1 47k and rr2 10k we have : 3.42V
for rr1 91k and rr2 20k we have : 3.33V