Microcontroller

D−
D+
PWM_R
PWM_L

SPI_SELECT
SDA
SCL
DIN
DOUT
MCLK
BCLK
WCLK

File: microcontroller.kicad_sch

Power

File: power.kicad_sch

Codec

SPI_SELECT
SDA
SCL
DIN
DOUT
MCLK
BCLK
WCLK

HPL
HPR
LOL
LOR
IN1_L
IN1_R
IN2_L
IN2_R
IN3_L
IN3_R

File: codec.kicad_sch

Connectors

HPL
HPR
LOL
LOR
IN1_L
IN1_R
IN2_L
IN2_R
IN3_L
IN3_R

PWM_L
PWM_R
D+
D−

File: connectors.kicad_sch

H1
MountingHole
H2
MountingHole
H3
MountingHole

eT

+5V

IC4
AMS1117-3.3

R4
1k

C4
10u
X5R
25V

VI   VO
GND

+3V3

C6
10u
X5R
25V

R6
1k

D1
Green_0603

GND

GND

D3
Green_0603

GND

+3V3

TP6
TestPoint_Alt
TP7
TestPoint_Alt
TP8
TestPoint_Alt
TP9
TestPoint_Alt

TP10
TestPoint_Alt
TP11
TestPoint_Alt
TP12
TestPoint_Alt
TP13
TestPoint_Alt

GND

MICROCONTROLLER

FLASH

S1 TS-1101-C-W
R1 1k
QSPI_SS
QSPI_SCLK
+3V3
C8 100n X7R 50V
GND
R2 DNF_0805
IC1 W25Q128JVSIQ
VCC
C5
CLK
GND
DI(IO0)
DO(IO1)
IO2
IO3
QSPI_SD0
QSPI_SD1
QSPI_SD2
QSPI_SD3

ADC GPIO pins have diode to VDDIO (other GPIO do not)
FET stops leakage through ADC3 pin diode into 3V3 net
when 3V3 supply is off (VSYS present but 3V3_EN low)

+5V
R7 200k
+3V3
C7 1n X7R
R8 100k
Q1 2N7002
GPIO29_ADC3
GND

MEMS MIC & AMP

+3V3
C47 100n X7R 50V
MK1 AP2718AT
MEMS_Amp
VDD OUT
GND
GND
AMP_MIC_OUT
MIC_IN
GPIO26_ADC0
GND
File: memsamp.kicad_sch

DEBUG

SWCLK
SWDIO
J1 Conn_01x03
GND

Microcontroller central — IC2 RP2040

+1V1
C9 100n X7R 50V
C10 100n X7R 50V
TP3 TestPoint_Alt
GND
C11 1u X5R 25V
GND

+3V3
C12 100n X7R 50V
C14 100n X7R 50V
C15 100n X7R 50V
C16 100n X7R 50V
C17 100n X7R 50V
C18 100n X7R 50V
C19 100n X7R 50V
C13 1u X5R 25V
GND

IC2 RP2040
DVDD_1 23
DVDD_2 50
VREG_VOUT 45
VREG_VIN 44
IOVDD_1 1
IOVDD_2 10
IOVDD_3 22
IOVDD_4 33
IOVDD_5 42
IOVDD_6 49
USB_VDD 48
ADC_AVDD 43

USB_DP 47
USB_DM 46
DP R9 27 D+
DN R10 27 D-

QSPI_SS 56 QSPI_SS_N
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

C3 27p C0G 50V
C2 27p C0G 50V
Y1 12MHz X322512MSB4Si
R3 1k
XIN 20
XOUT 21
GND

RUN 26 RUN
SWCLK 24 SWCLK
SWDIO 25 SWDIO

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

GPIO26/ADC0 38 GPIO26_ADC0
GPIO27/ADC1 39 GPIO27_ADC1
GPIO28/ADC2 40 GPIO28_ADC2
GPIO29/ADC3 41 GPIO29_ADC3

TESTEN 19
GND 57
GND

LED

R28 1k
GPIO25
D2 Green_0603
GND

PIN ASSIGNMENTS

GPIO17	PWM_R
GPIO16	PWM_L
GPIO8	SPI_SELECT
GPIO6	SDA
GPIO7	SCL
GPIO9	DOUT
GPIO5	DIN
GPIO4	WCLK
GPIO3	BCLK
GPIO2	MCLK

HEADERS

J8 Conn_01x20
GPIO0, GPIO1, GPIO2, GPIO3, GPIO4, GPIO5, GPIO6, GPIO7, GPIO8, GPIO9, GPIO10, GPIO11, GPIO12, GPIO13, GPIO14, GPIO15

J10 Conn_01x20
+5V +3V3
GPIO25, GPIO24, GPIO23, GPIO28_ADC2, GPIO27_ADC1, GPIO26_ADC0, RUN, GPIO22, GPIO21, GPIO20, GPIO19, GPIO18, GPIO17, GPIO16
GND

+3V3+1V8

TP4
TestPoint_Alt

C28
10u
X5R
25V

C30
1u
X5R
25V

GND

C31
10u
X5R
25V

C32
10u
X5R
25V

GND

IC3
TLV320AIC3254IRHBT

IOVDD 26
LDOIN 24
AVDD   29
DVDD

C33
10u X5R
25V

GND

+3V3

TODO

GND

R20
10k

R11
10k

R12
10k

SCLD
SDAD

SPI_SELECTD

TP1
TestPoint_Alt

1 MCLK
2 BCLK
3 WCLK
4 DIN/MFP1
5 DOUT/MFP2
9 SCL/SS
10 SDA/MOSI
11 MISO/MFP4
12 SPI_SELECT

MCLKD
BCLKD
WCLKD
DIND
DOUTD

REF   18

MICBIAS   19
SCLK/MFP3   8

MICBIAS

R5
2.7k

IN3_R

LOL   22
LOR   23
HPL   25
HPR   27

LOL
LOR

C34
47uF X5R
10V

R30
0

HPL

47uF   10V
C35   X5R

R31
0

HPR

For SPI, SPI_SELECT should be tied high;
for I2C, SPI_SELECT should be tied low.

IN1_LD
IN1_RD

C20
470n
X5R
10V

C21
470n
X5R
10V

13 IN1_L
14 IN1_R
15 IN2_L
16 IN2_R
20 IN3_L
21 IN3_R

LDO_SELECT 30
RESET   31
GPIO/MFP5   32

PULLED UP
PULLED UP

TP2
TestPoint_Alt

+3V3

10k
R24

DNF_0805
R25

GND

+3V3

10k
R26

DNF_0805
R27

IN2_LD

C22
470n
X5R
10V

IN2_RD

C23
470n
X5R
10V

R19
1k

R21
1k

R22
1k

R23
1k

GND

MICBIAS

IN3_LD

C1
470n
X5R
10V

IN3_RD

470n   10V
C5   X5R

GND
DVSS
AVSS
IOVSS

33
28
17
7

GND
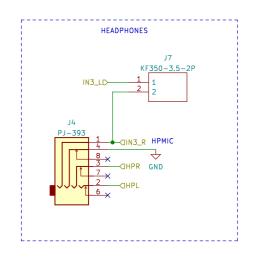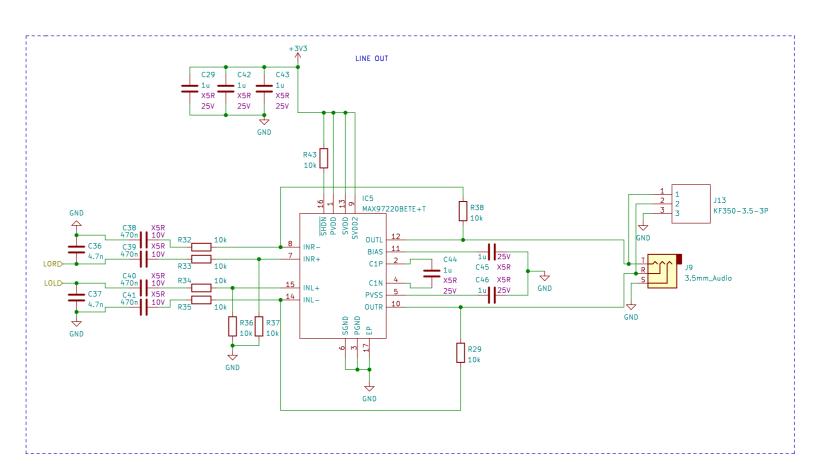
eT

Reference
https://www.circuitvalley.com/2015/01/audio-codec-breakout-tvl32aic23b-raspberry-linux.html
https://www.ti.com/lit/ug/slau266a/slau266a.pdf?ts=1646220003191&ref_url=https%253A%252F%252Fwww.ti.com%252Ftool%252FTLV320AIC3204EVM-K

USB

J3
U254-051T-4BH23-S2B

	VBUS	1
	D-	2
	D+	3
	ID	4
	GND	5

MH1
MH2
MH3
MH4

+5V

GND

IC6
USBLC6-2SC6

1	I/O1_1	I/O1_2	6
2	GND	VBUS	5
3	I/O2_1	I/O2_2	4

D-
+5V
D+

TP5
USB Test Point

VBUS	1
D-	2
D+	3
GND	4

PWM OUTPUT

R13
220
PWM_LD

C24
100n
X7R
50V

R15
100

C26
47uF
X5R
10V

R17
1.8k

GND

GND

R14
220
PWM_RD

C25
100n
X7R
50V

R16
100

C27
47uF
X5R
10V

R18
1.8k

	1
	2
	3

J12
KF350-3.5-3P

| T |
| R |
| S |

J2
3.5mm_Audio

GND

MIC IN

IN1_LD — 1
IN1_RD — 2

| 1 |
| 2 |

J5
KF350-3.5-2P

IN2_LD — 1
IN2_RD — 2

| 1 |
| 2 |

J6
KF350-3.5-2P

LINE OUT

+3V3

C29
1u
X5R
25V

C42
1u
X5R
25V

C43
1u
X5R
25V

GND

R43
10k

IC5
MAX97220BETE+T

SHDN 16
PVDD 1
SVDD 13
SVDD2 9

GND

C38
470n
X5R
10V

C39
470n
X5R
10V

R32
10k

| 8 | INR- |
| 7 | INR+ |

C36
4.7n

LORD

GND

R33
10k

C40
470n
X5R
10V

R34
10k

| 15 | INL+ |
| 14 | INL- |

C41
470n
X5R
10V

R35
10k

LOLD

C37
4.7n

GND

R36
10k

R37
10k

GND

R38
10k

OUTL	12
BIAS	11
C1P	2
C1N	1
PVSS	5
OUTR	10

C44
1u
X5R
25V

C45
1u
X5R
25V

C46
1u
X5R
25V

GND

R29
10k

SGND 6
PGND 3
EP 17

GND

| 1 |
| 2 |
| 3 |

J13
KF350-3.5-3P

GND

| T |
| R |
| S |

J9
3.5mm_Audio

GND

HEADPHONES

J7
KF350-3.5-2P

IN3_LD — 1

| 1 |
| 2 |

J4
PJ-393

| 1 |
| 4 |
| 8 |
| 3 |
| 7 |
| 2 |
| 6 |

IN3_R
HPMIC
HPR
GND
HPL

Reference
https://www.hackster.io/news/learn-how-to-use-pwm-to-generate-an-audio-signal-from-your-raspberry-pi-pico-00347dece8b8

C50
C0G
27p
50V

R42
300k

+3V3

X7R   C51
50V   100n

GND

C48
4.7u
X7R

R39
4.7k

MIC_IN

AMP_MIC_OUT

U1
LMV321

C49
1u
X5R
25V

R40
10k

R41
10k

GND