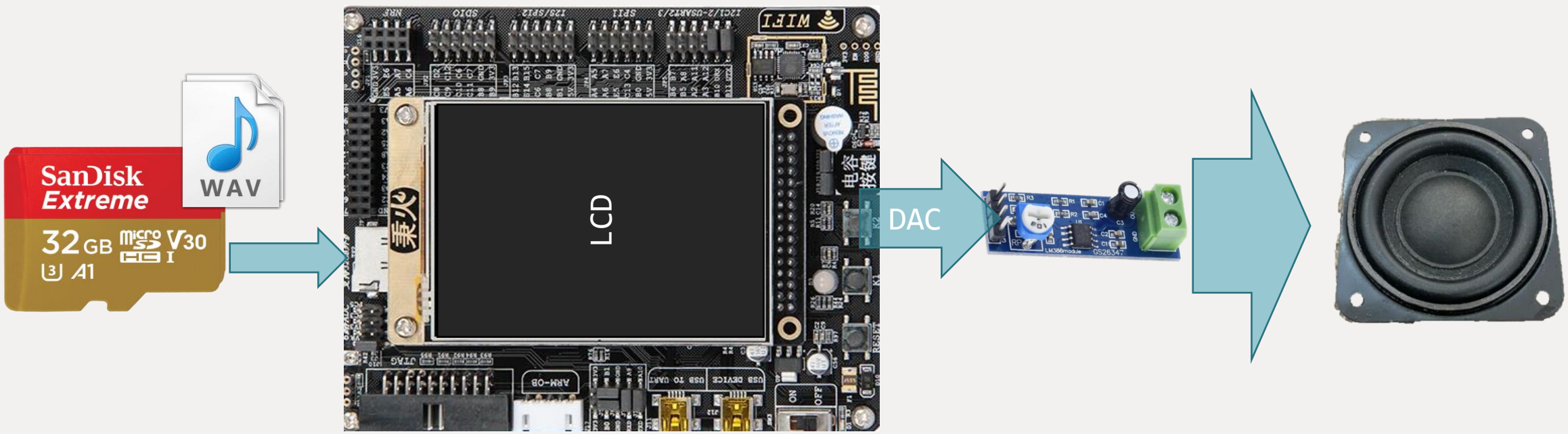
ELEC 3300
Project Demo

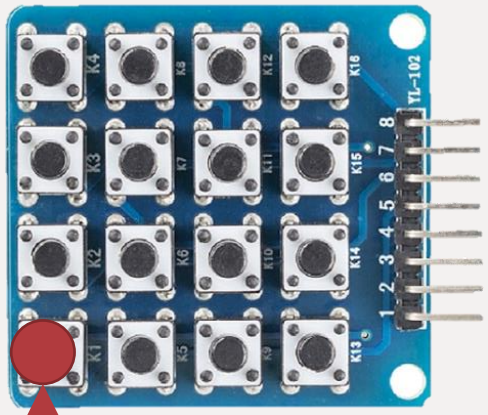
By Group 43 (Gunwoo, Juho, Sungje)

Basic Music Play: Plug & Play

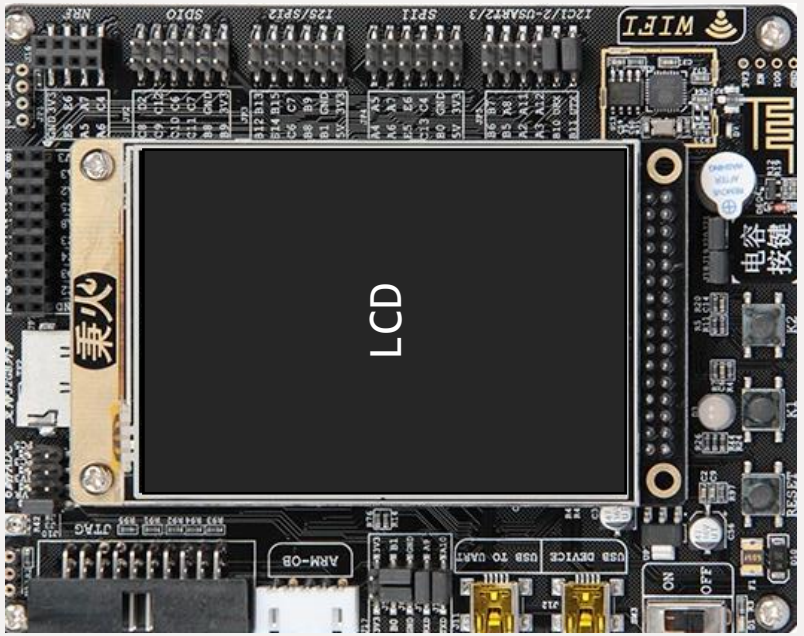


Simply put the microSD into the board and turn on the machine,
IT JUST WORKS

Audio Digital Signal Processing: Play and Pause



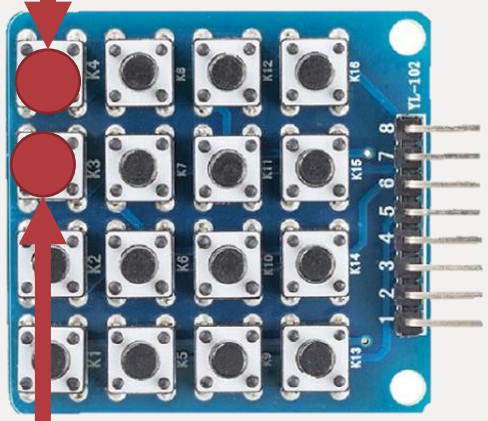
Play & Pause Button (K1)



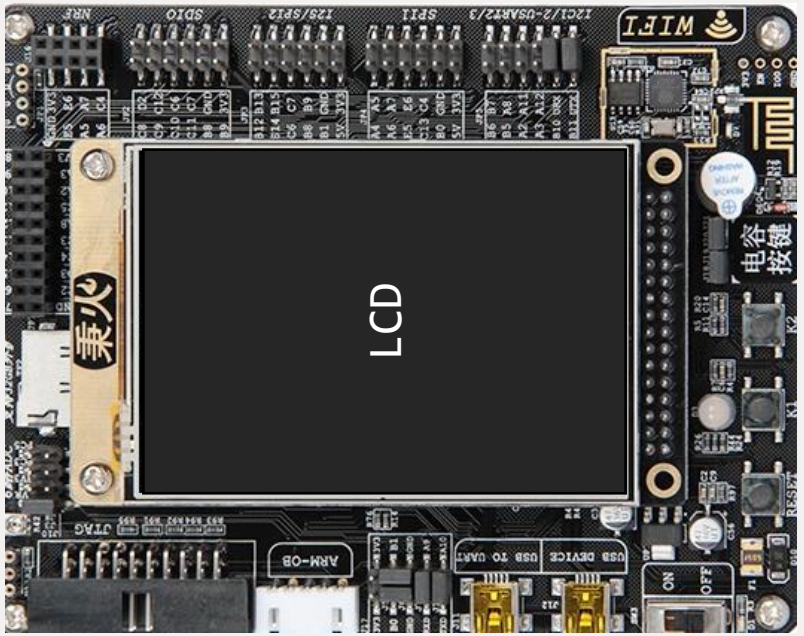
Audio Digital Signal Processing:

Tempo Shift

Tempo Down Button (K4)

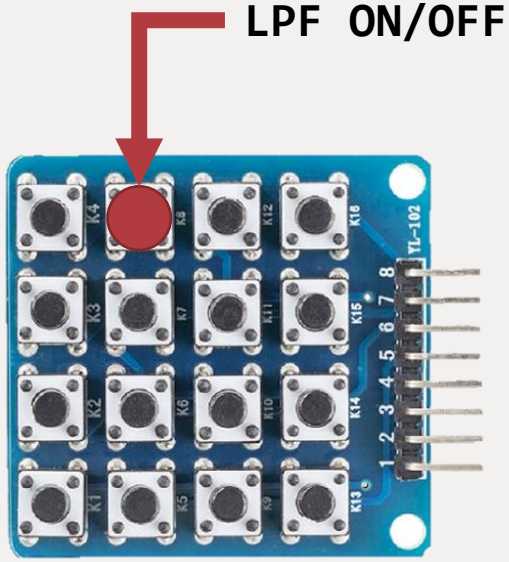


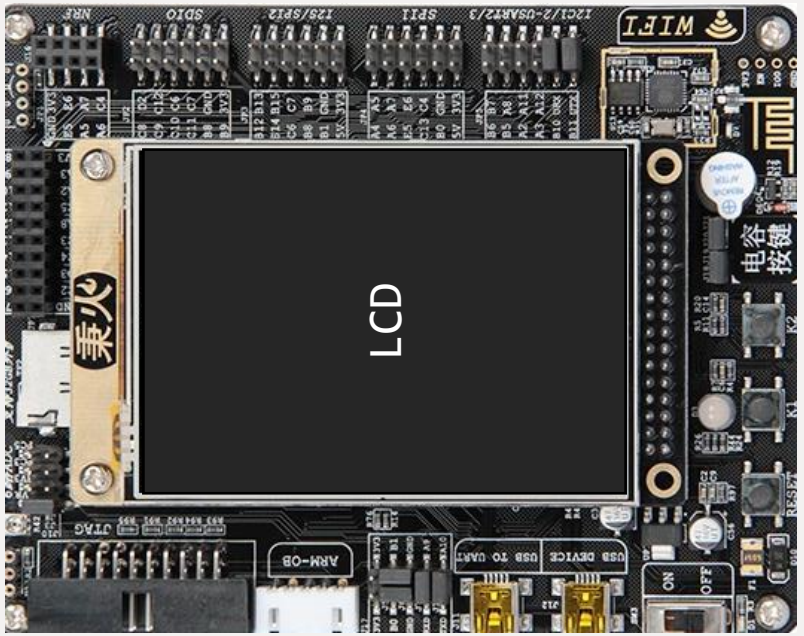
Tempo Up Button (K3)



Audio Digital Signal Processing: Low Pass Filter (LPF)

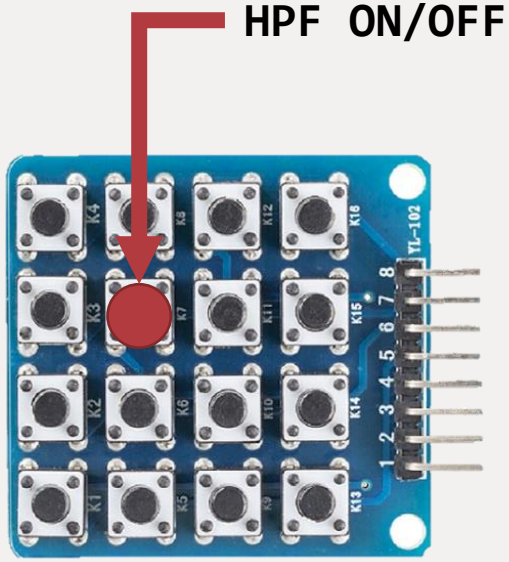
LPF ON/OFF Button (K8)

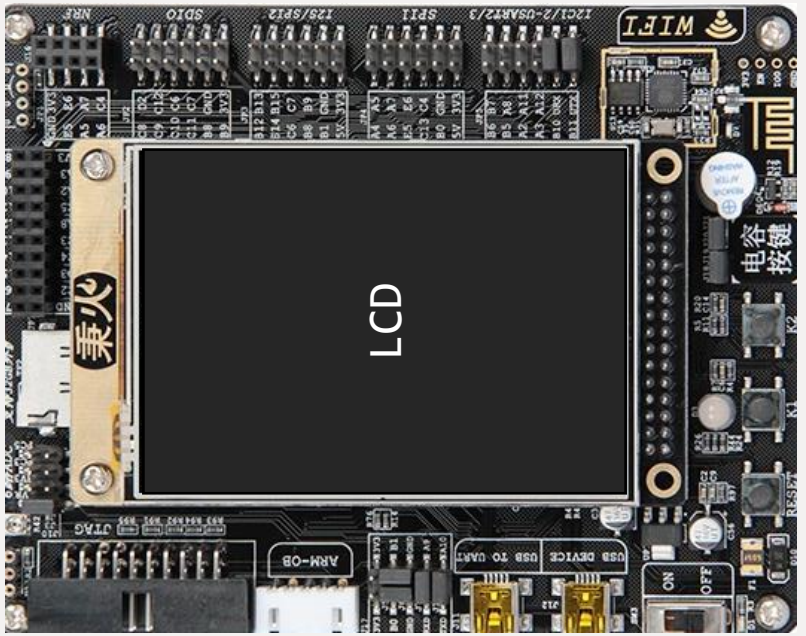




Audio Digital Signal Processing:
High Pass Filter (HPF)

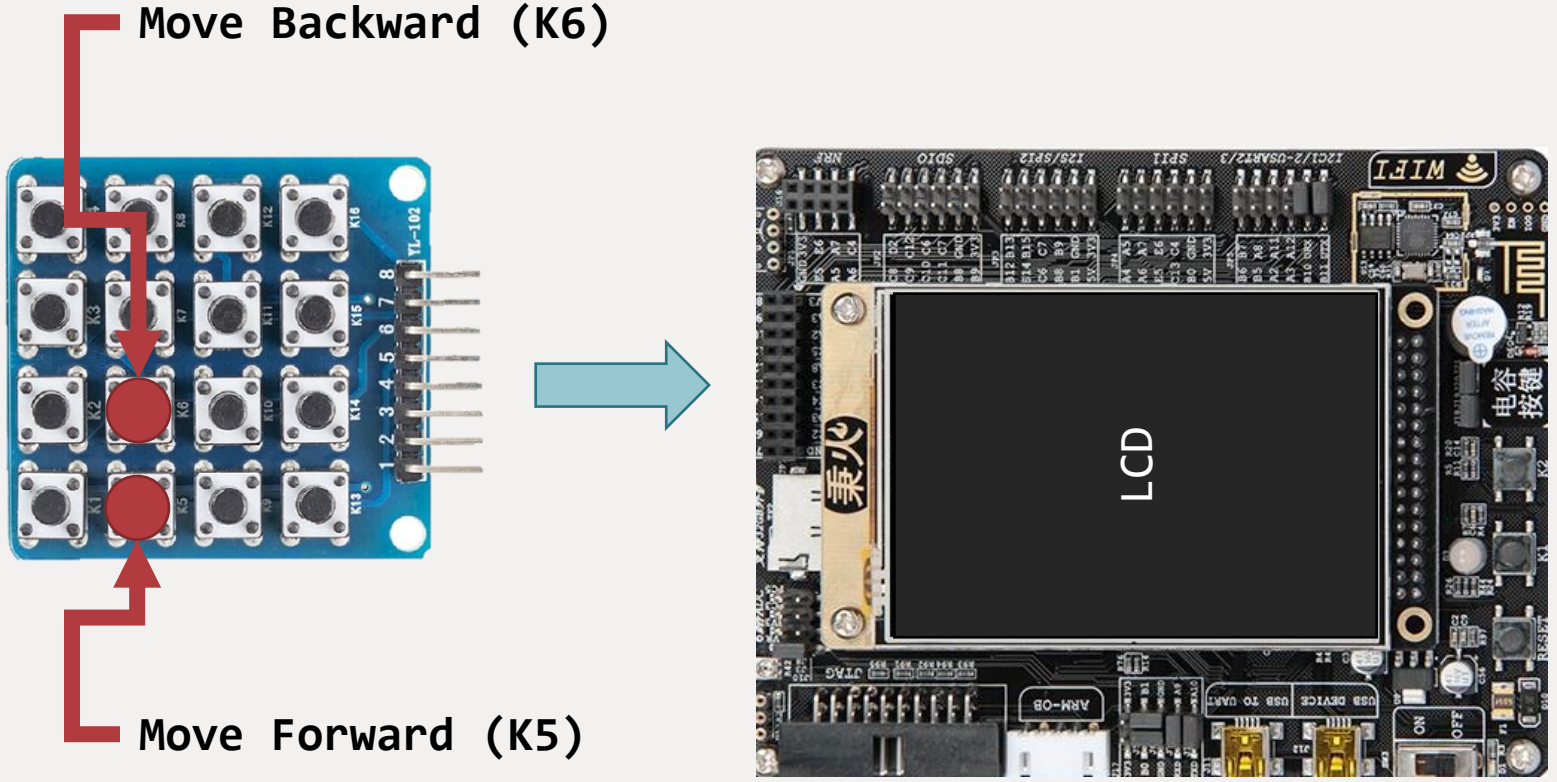
HPF ON/OFF Button (K7)





Audio Digital Signal Processing:

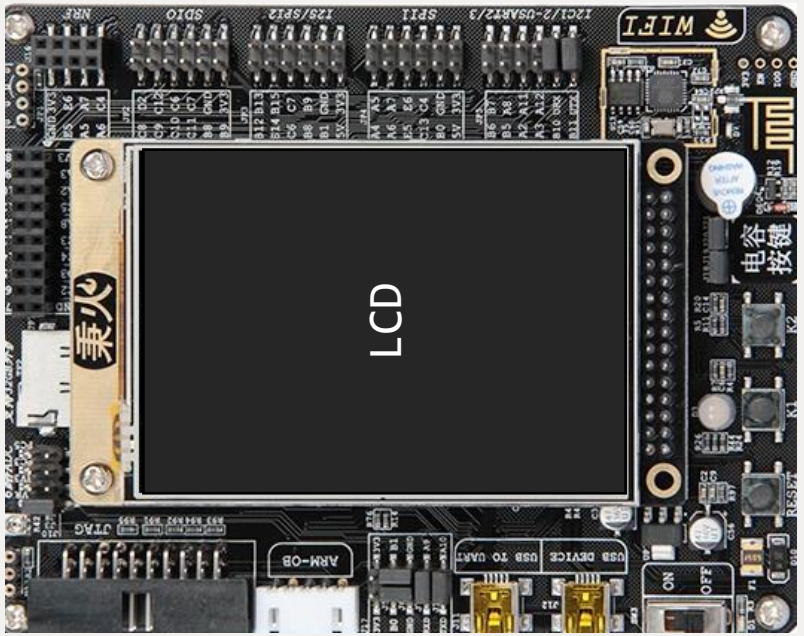
Play Time Movement



Audio Digital Signal Processing: Adjust Cut-off Frequency

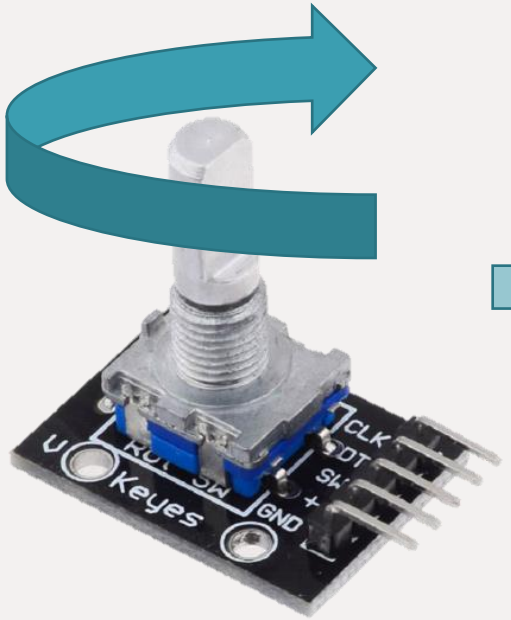
Rotate the potentiometer to adjust cut-off frequency

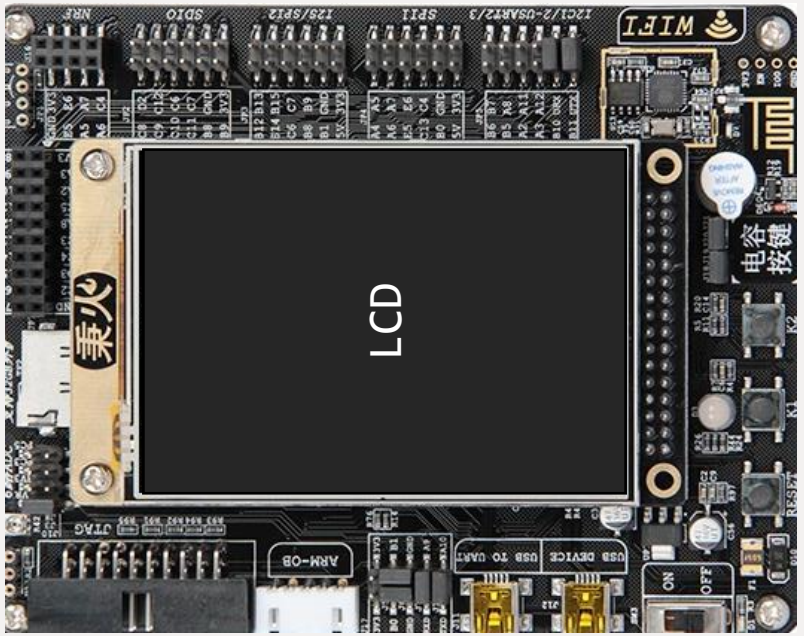
ADC



Audio Digital Signal Processing:
Play Time Movement Minutely

Rotate the rotary encoder to fine-tune music play time

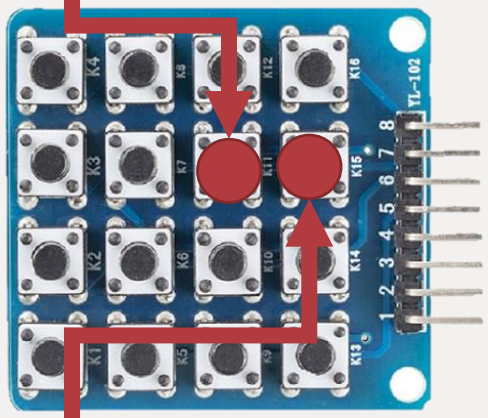




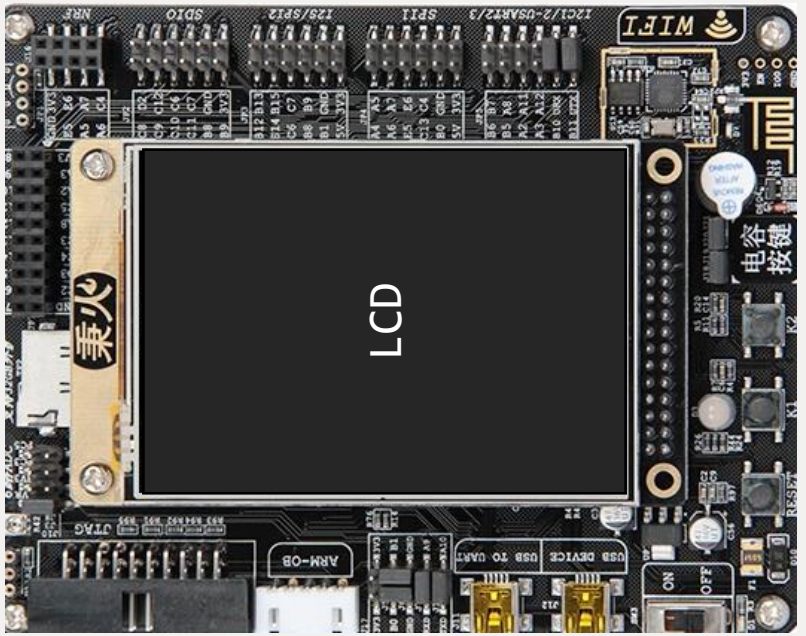
Audio Digital Signal Processing:

Pitch Shift

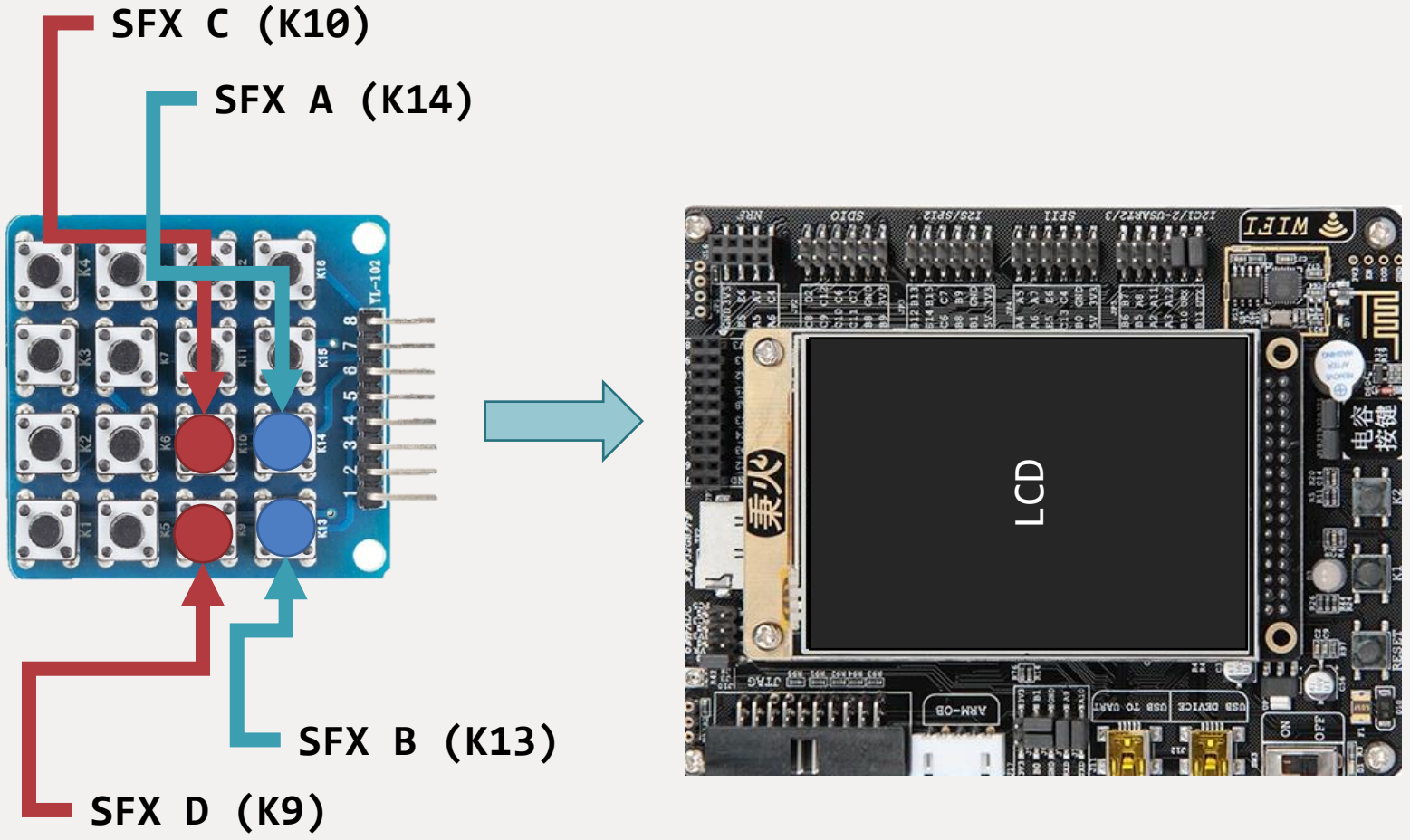
Pitch Down Button (K11)



Pitch Up Button (K15)

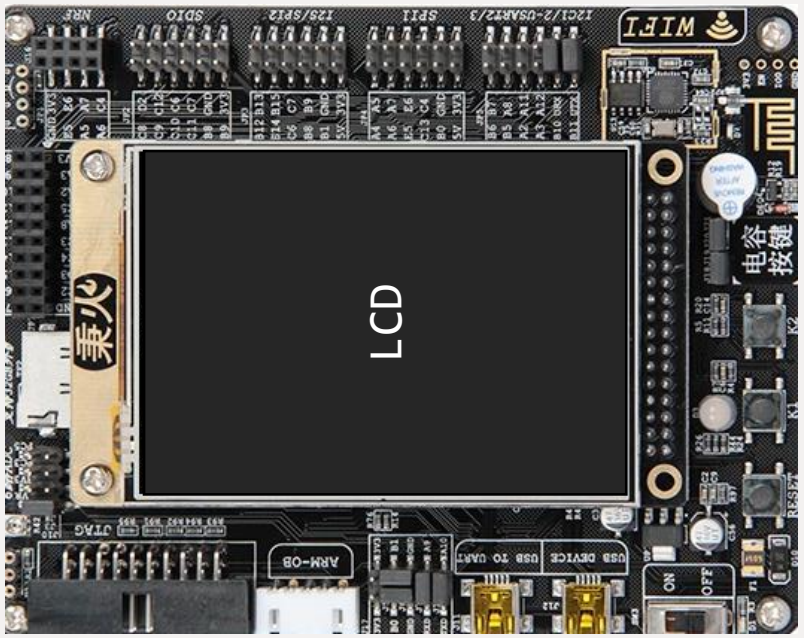


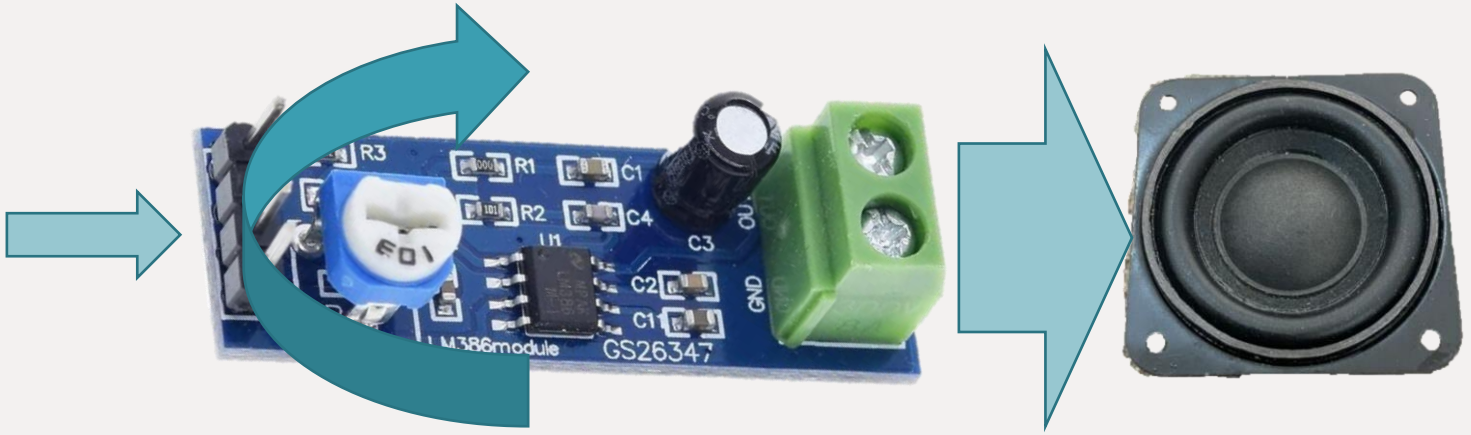
Audio Digital Signal Processing:
Real-time Sound Effects (SFX)



Audio Digital Signal Processing: Adjust Audio Volume

Rotate the variable resistor on LM386 to adjust the music volume





Audio Play Dashboard:

Graphic User Interface On LCD

* Our Actual Board

Pitch Level

Tempo Level

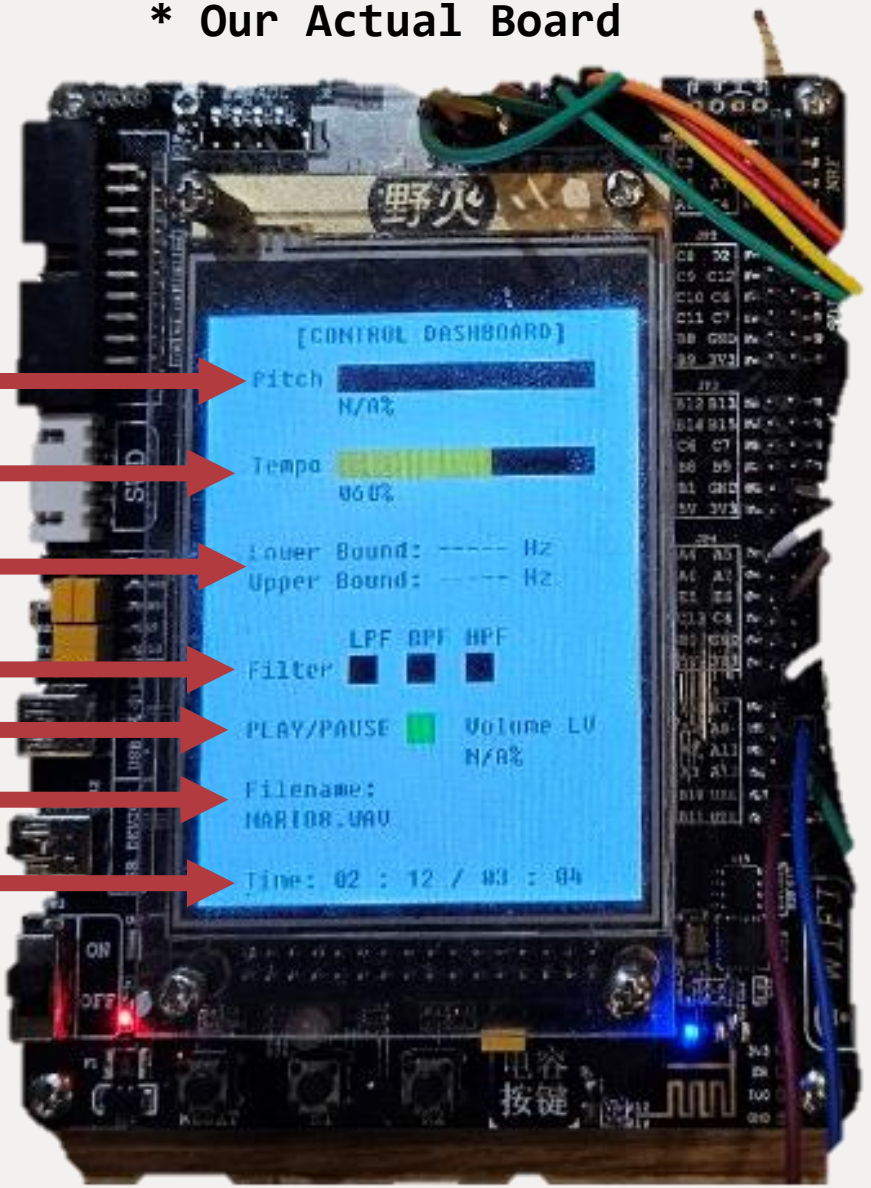
Cut-off Frequency for Filters

Filter on/off Status

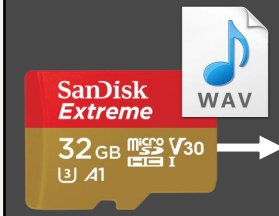
Play / Pause Status

Filename

Music Playtime



Overview Of Our Project



MicroSD with WAV

SDIO interface

Input Data

Frequency shift, Pitch shift
Low / High Pass Filter

integrated DAC

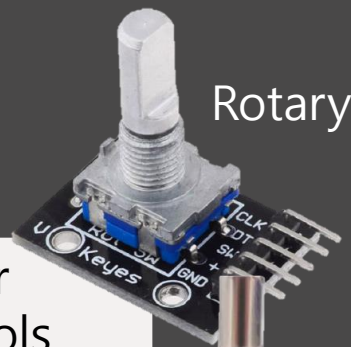
Analogue Audio Signal

LM386 Audio Amplifier

Amplifed Audio Signal

Speaker

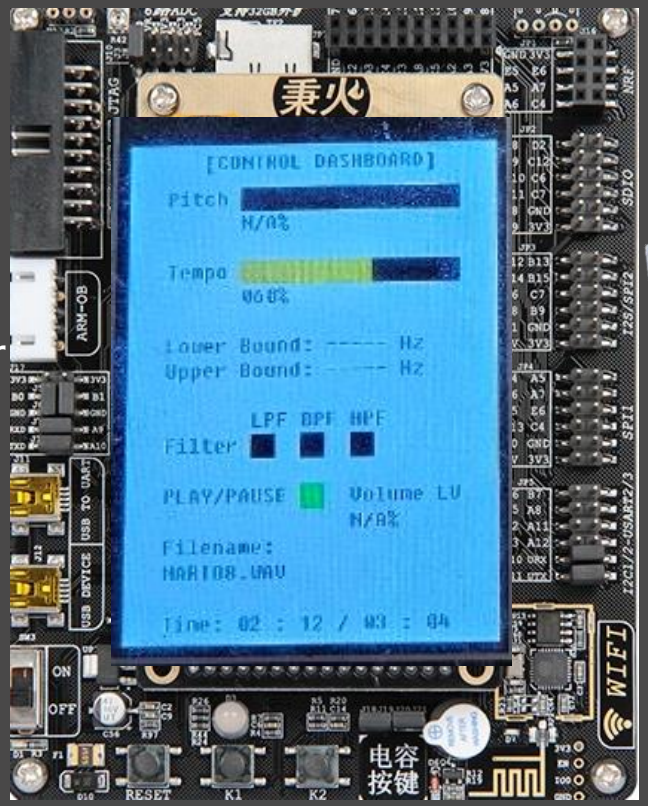
User Controls



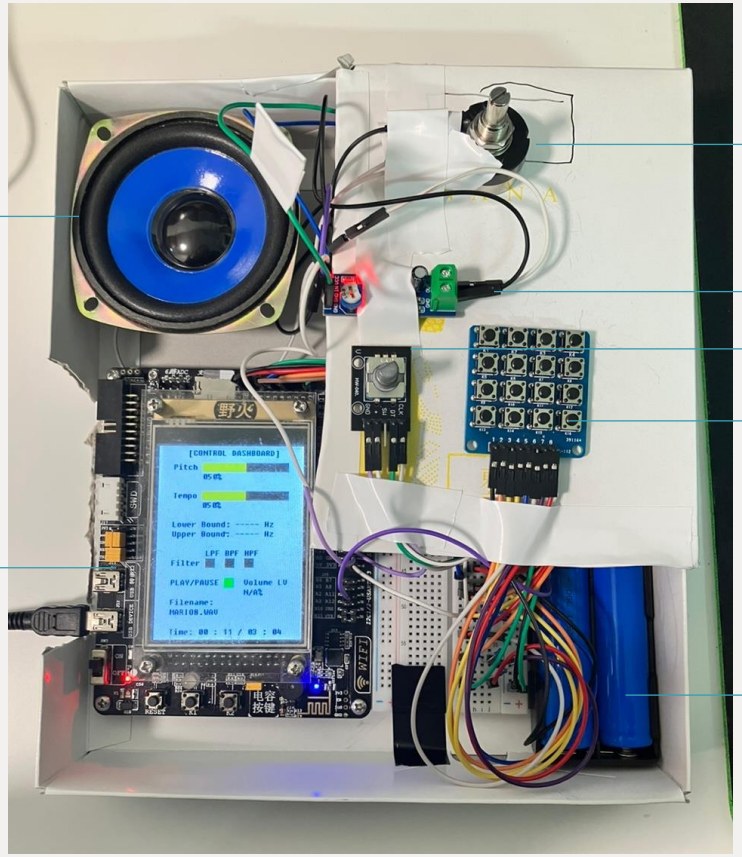
Rotary Encoder

Potentiometer

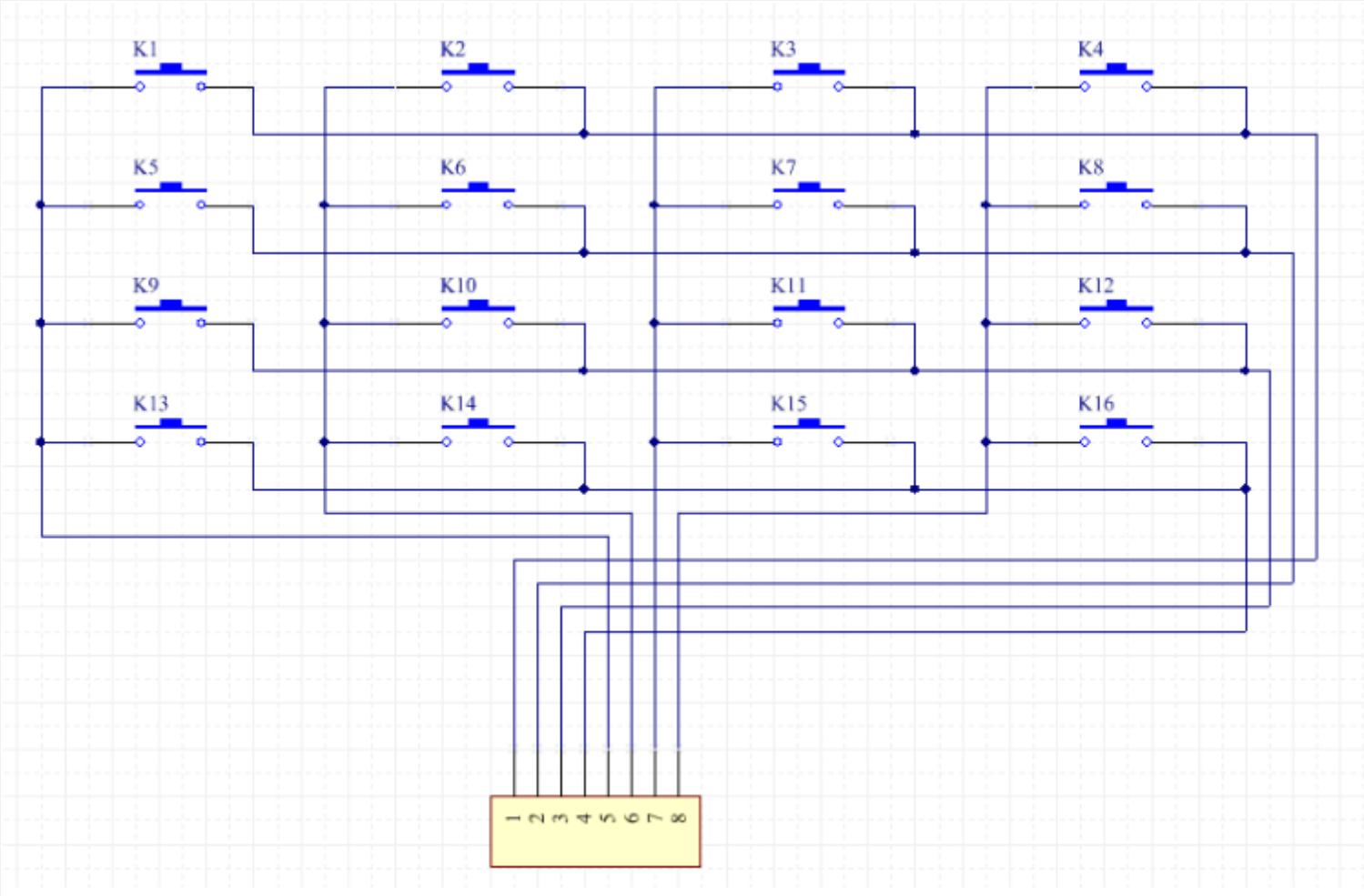
4x4 Keypad



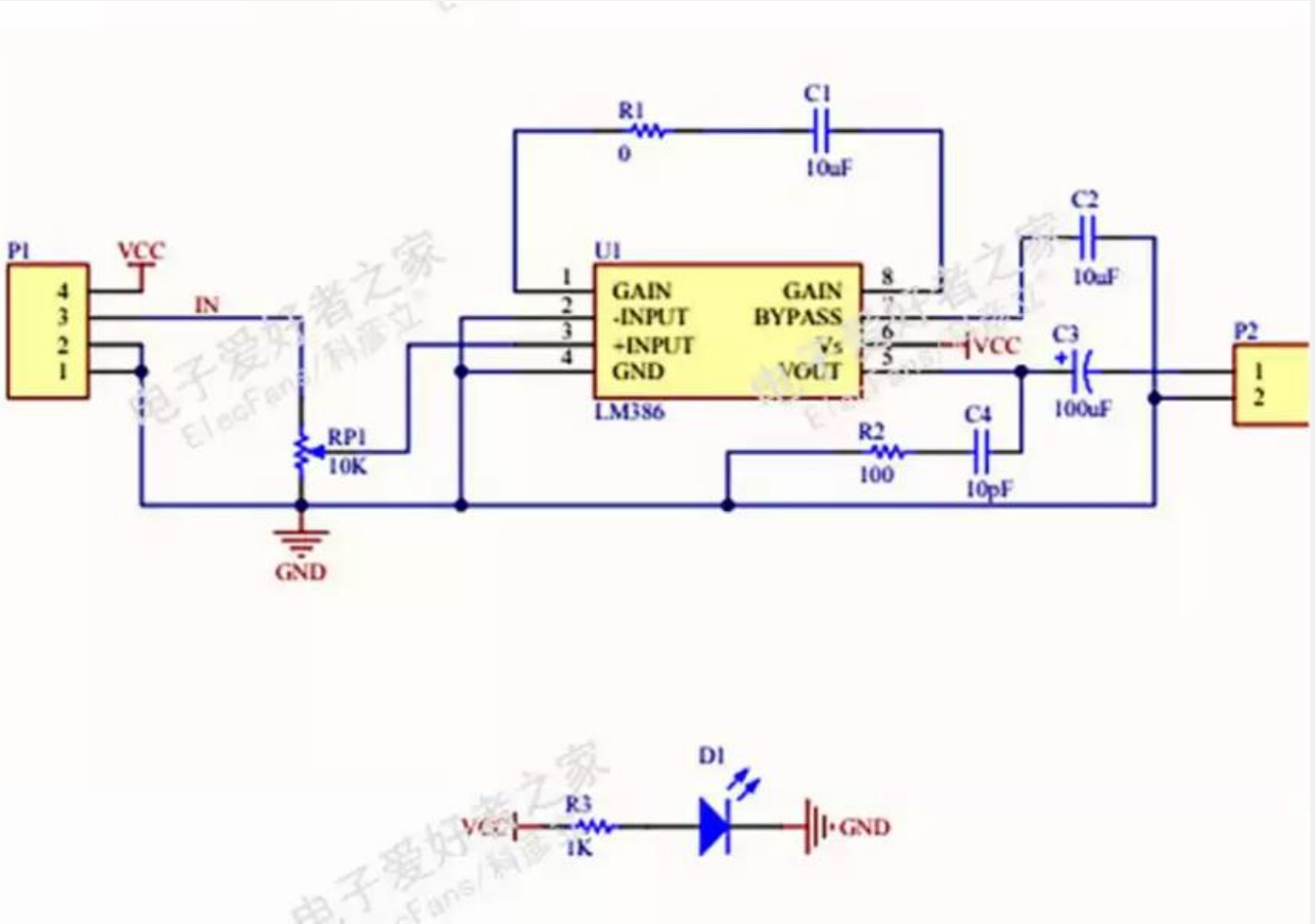
Our Final Embedded System Image

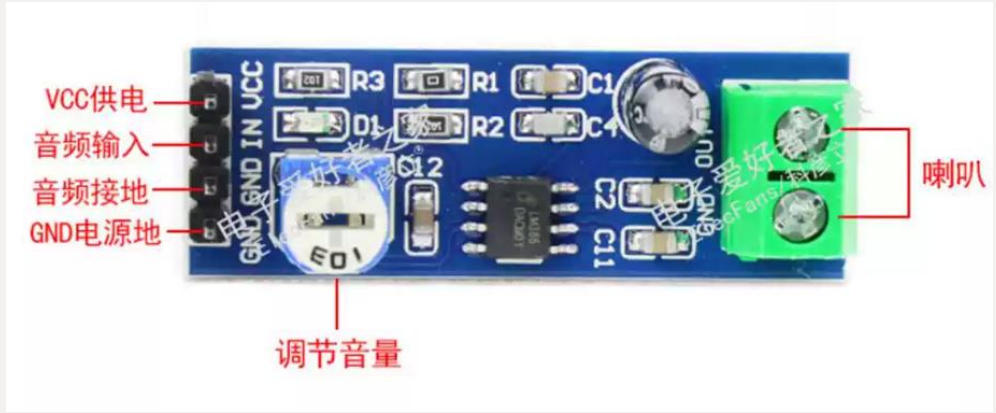


Appendix 1 : 4x4 Switch Schematic



Appendix 2 : LM386 Amplifier Module





- 产品名称：LM386单声道功放板
- 供电电压：DC5V-12V
- 驱动喇叭：0.5W-10W
- 板子尺寸：长41mm 宽14mm 高13mm
- 产品重量：5g

Appendix 3: Potentiometer

型号：RV24YN20S-B1K(G)

电气特性 EIECTRICAL CHARACTERISTCS
阻值允许偏差：±10%
阻抗特性型式:B
最高工作电压：Lineat Taper B:AC 315V
负载功率:Linear TaperB: 2W
转动杂音:Less than 47mV
绝缘阻抗:More than 100MΩ at DC 1000V
耐电压：1minute at AC 1000V

残留阻抗值:Term.1~2:Less than 3Ω
机构特性MECHANICAL SPECIFICATION
全回转角度/滑动行程:300°±5°（mm±　mm）
旋转力矩/滑动力矩:51~306gf.cm(~　gf.cm)
旋转止动强度/滑动止动强度：8Kgf.cm Max.(Kgf.cm Max.)
轴推位/推柄推拉 承受强度：pull:5Kg.f Max.
(Kgf.cm Max. at 10 sec)
耐久次数值:15000 Cycles
标准包装：20只/盒（20pcs.per box）

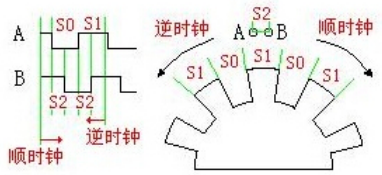
Appendix 4 : Rotary Encoder

Working voltage: 5V
Number of pulses per circle: 20

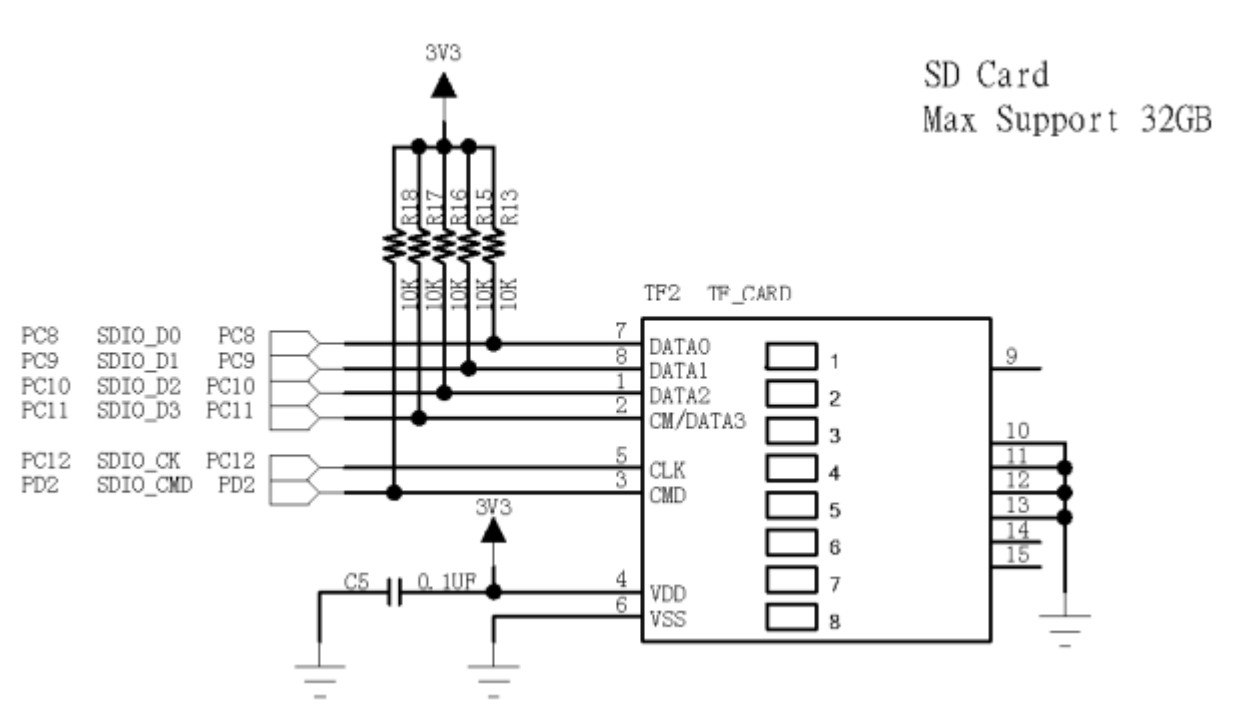
The rotary encoder can count the number of output pulses during forward and reverse rotation by rotation. Unlike the potentiometer, the rotation count is unlimited. With the button on the rotary encoder, it can be reset to the initial state, that is, counting from 0.

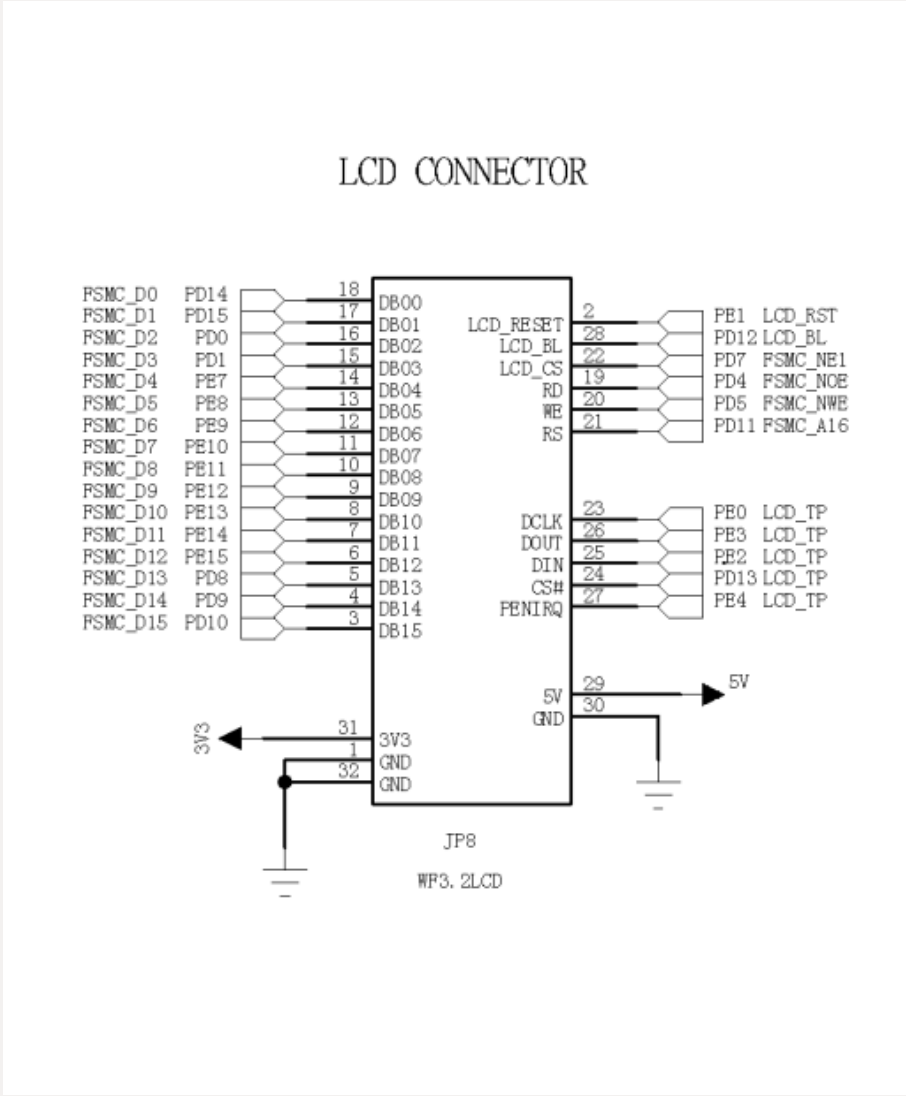
Incremental encoder:

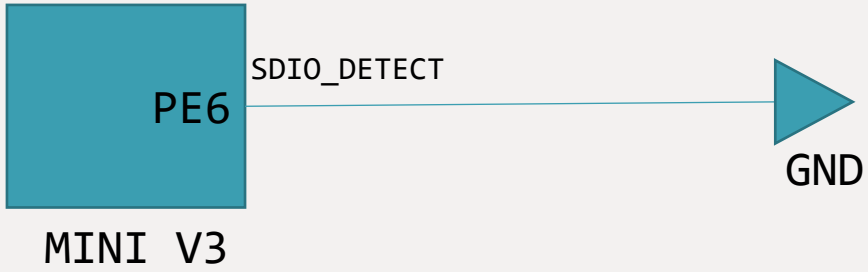
Incremental encoders give two-phase square waves with a phase difference of 90°, usually called A-channel and B-channel. One of the channels gives the information related to the rotational speed. At the same time, the information of the direction of rotation is obtained by sequentially comparing the signals of the two channels. There is also a special signal called the Z or zero channel, which gives the absolute zero position of the encoder. This signal is a square wave coincident with the center line of the A channel square wave.

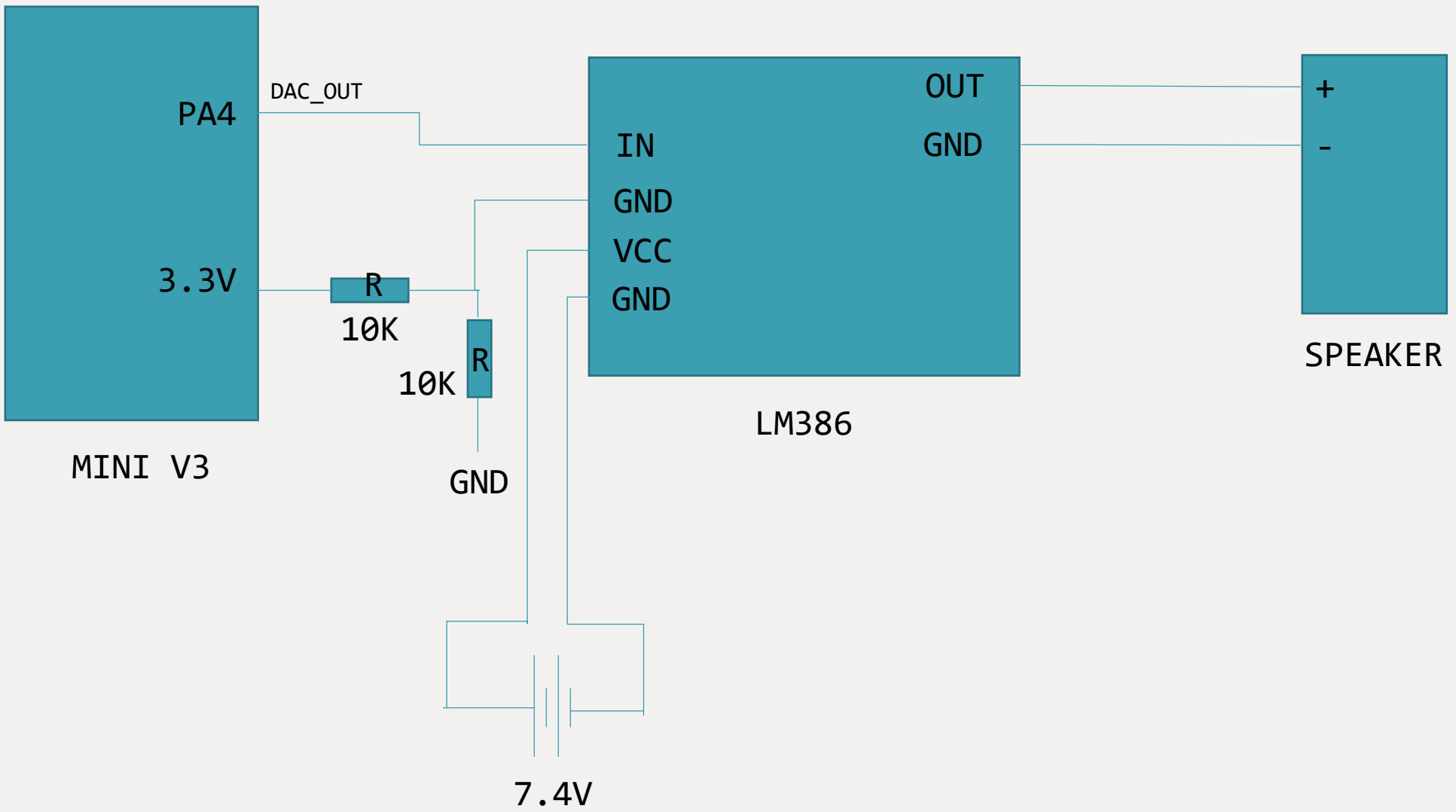


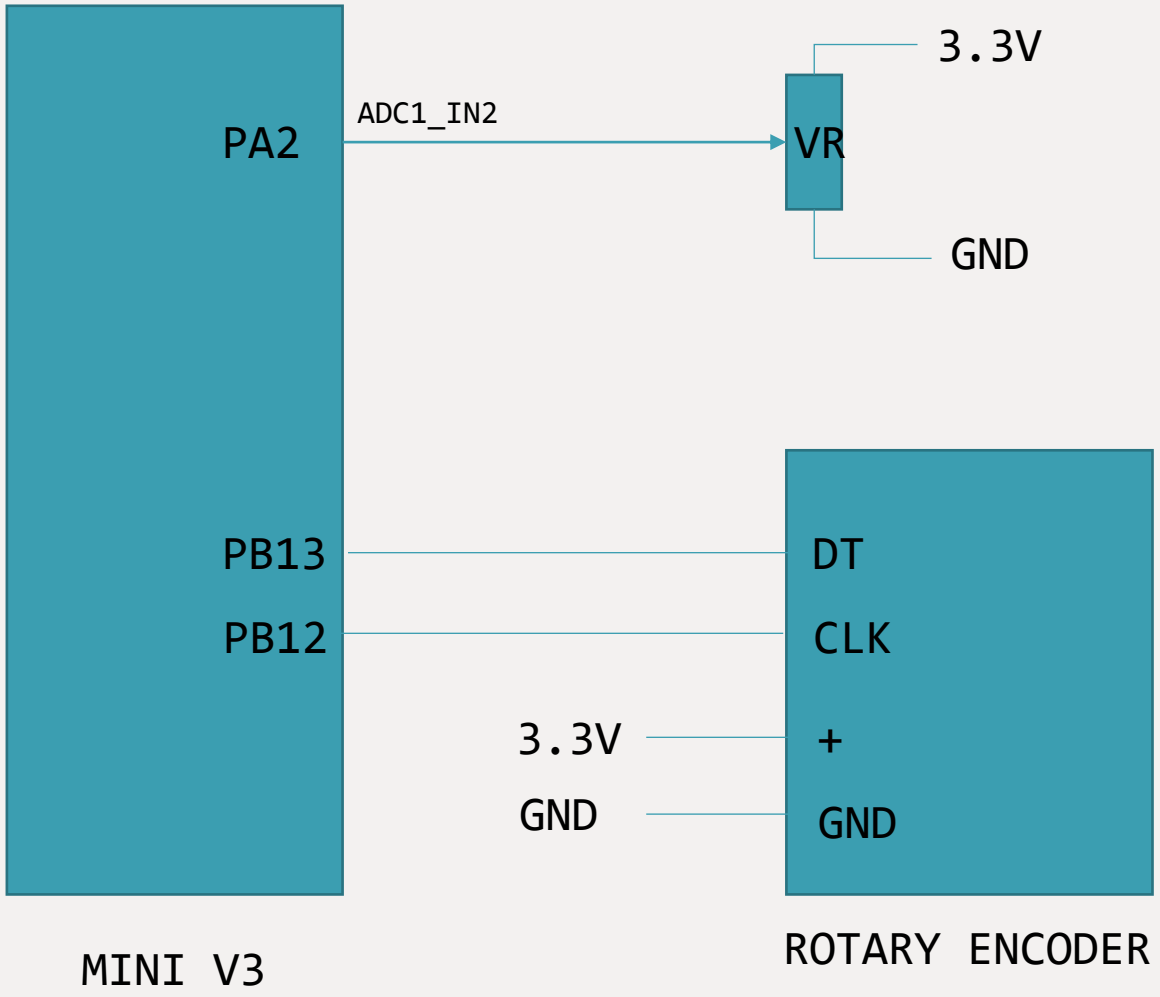
Appendix 5 Schematic of Project

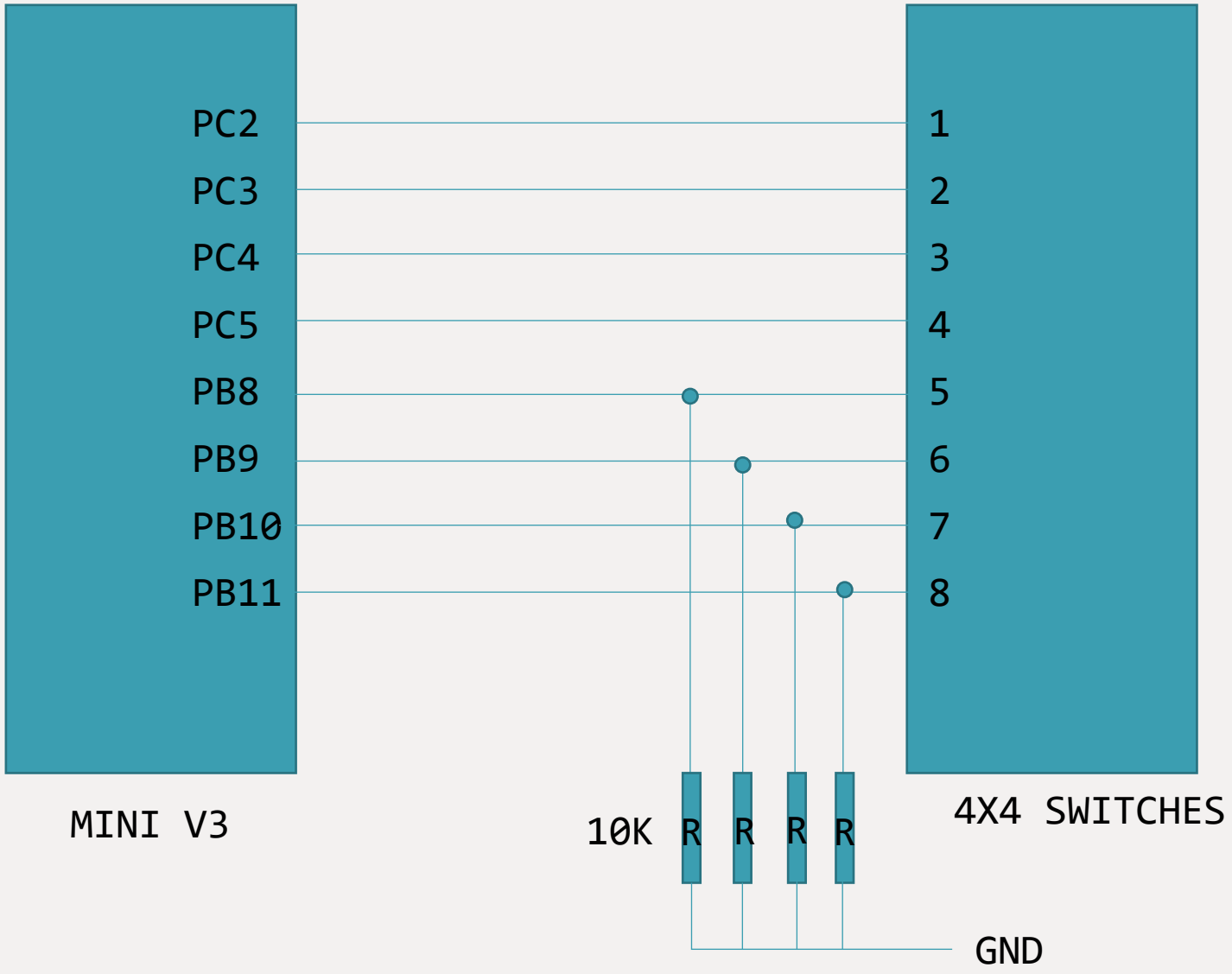


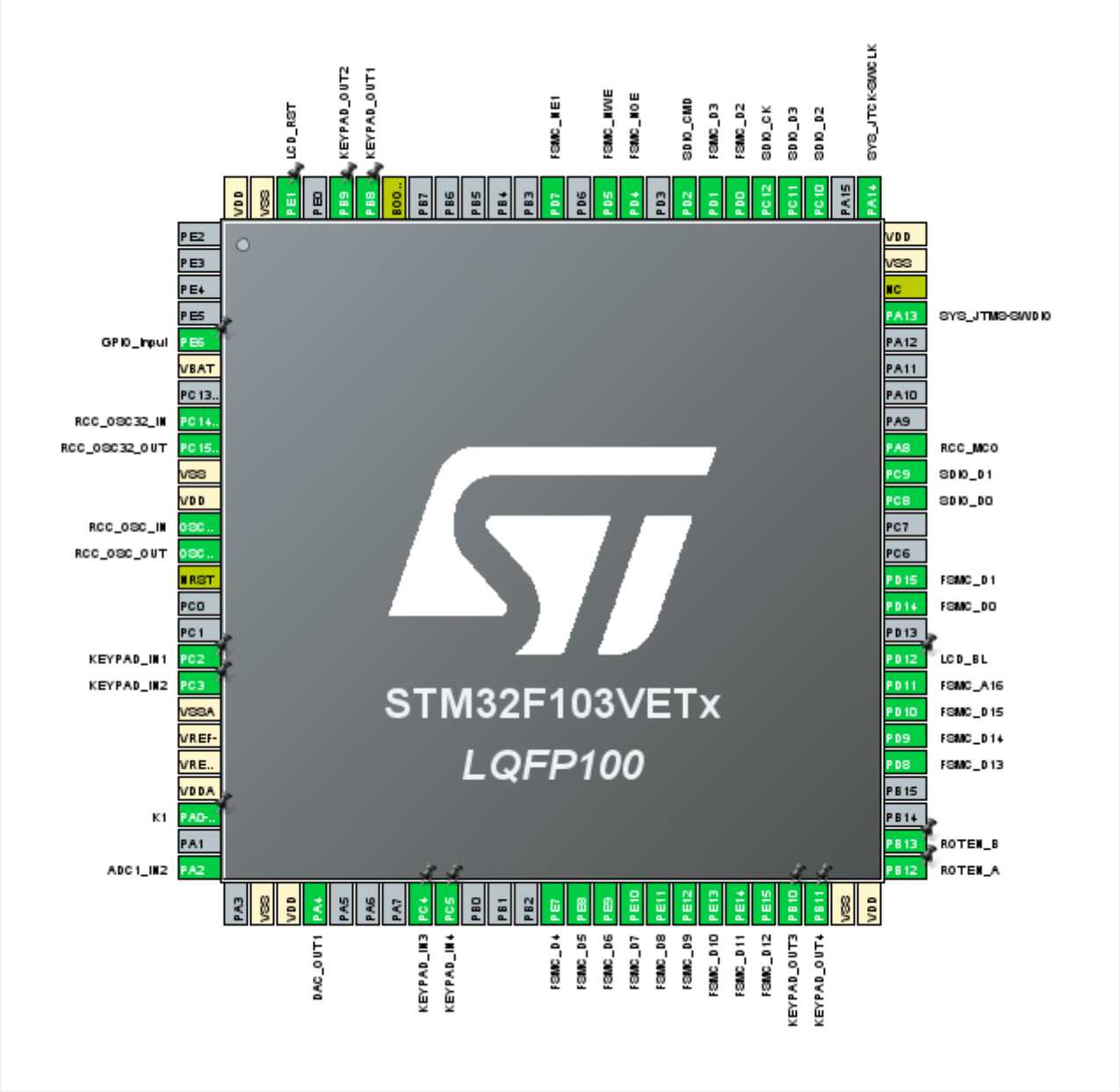





PA4
3.3V
DAC_OUT
R
10K
R
10K
GND
MINI V3
IN
GND
VCC
GND
OUT
GND
LM386
+
-
SPEAKER
7.4V


PA2
ADC1_IN2
3.3V
VR
GND
PB13
PB12
DT
CLK
3.3V
+
GND
GND
MINI V3
ROTARY ENCODER


PC2
PC3
PC4
PC5
PB8
PB9
PB10
PB11
1
2
3
4
5
6
7
8
MINI V3
10K
R
R
R
R
4X4 SWITCHES
GND


STM32F103VETx
LQFP100
LCD_RST
KEYPAD_OUT2
KEYPAD_OUT1
FSMC_NE1
FSMC_NWE
FSMC_NOE
SDIO_CMD
FSMC_D3
FSMC_D2
SDIO_CK
SDIO_D3
SDIO_D2
SYS_JTCK-SWCLK
GPIO_Input
RCC_OSC32_IN
RCC_OSC32_OUT
RCC_OSC_IN
RCC_OSC_OUT
KEYPAD_IN1
KEYPAD_IN2
ADC1_IN2
SYS_JTMS-SWDIO
RCC_MCO
SDIO_D1
SDIO_D0
FSMC_D1
FSMC_D0
LCD_BL
FSMC_A16
FSMC_D15
FSMC_D14
FSMC_D13
ROTEN_B
ROTEN_A
DAC_OUT1
KEYPAD_IN3
KEYPAD_IN4
FSMC_D4
FSMC_D5
FSMC_D6
FSMC_D7
FSMC_D8
FSMC_D9
FSMC_D10
FSMC_D11
FSMC_D12
KEYPAD_OUT3
KEYPAD_OUT4