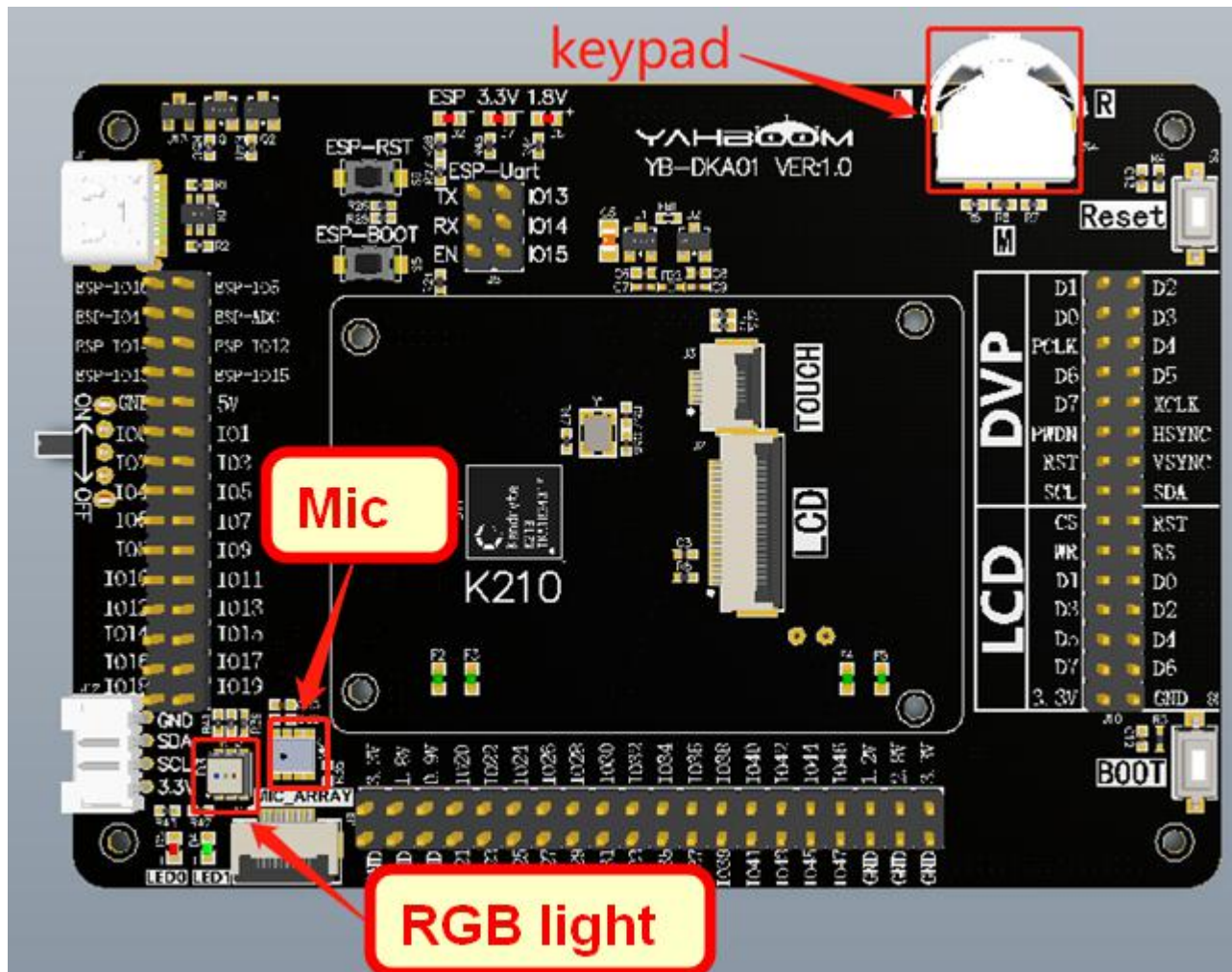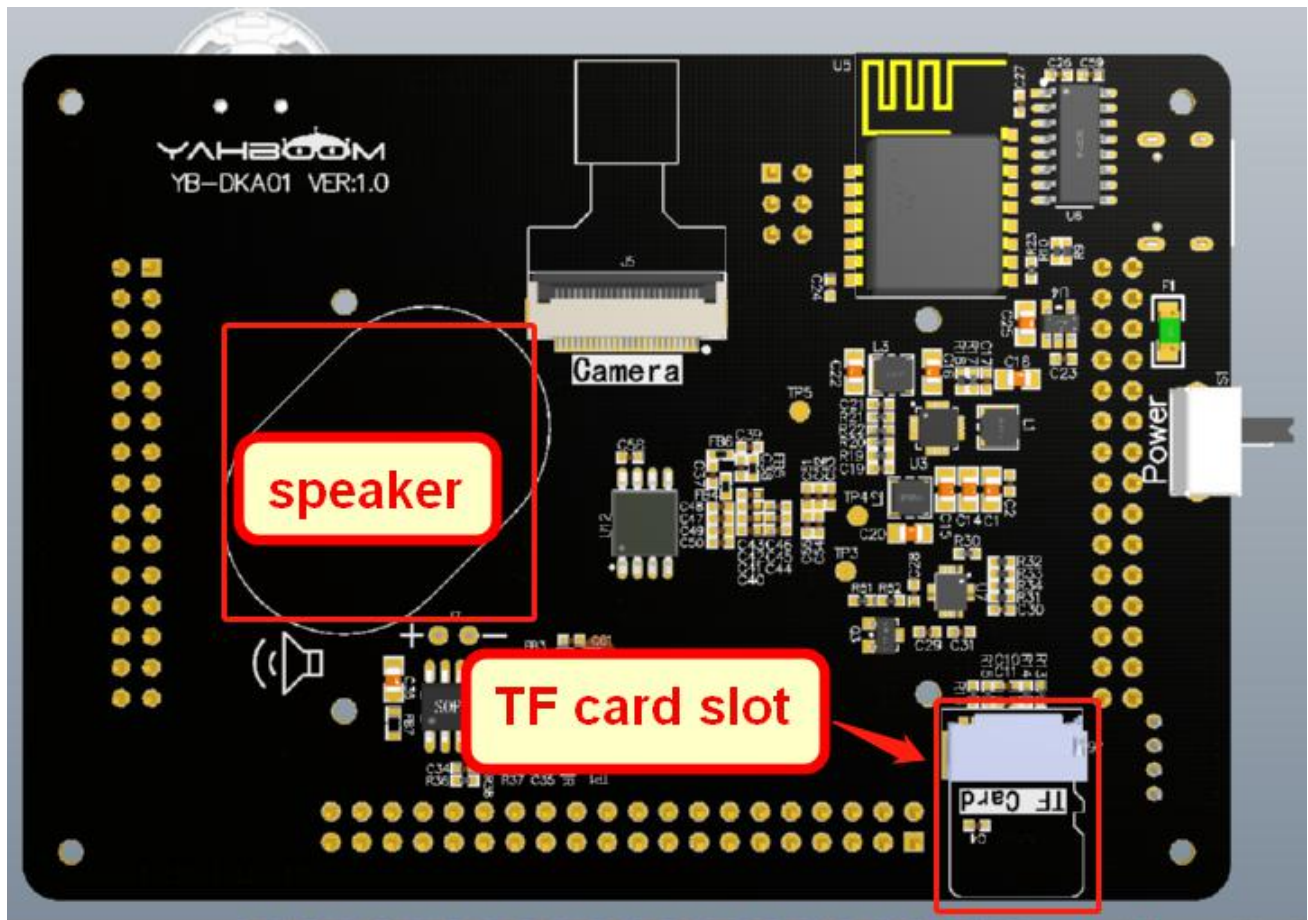# 5.4 K210 recorder

1. Experiment purpose

This lesson mainly learns how to open the microphone for recording on K210, save it to the TF card. Then, read the recorded content from the TF card, and play it through the speaker.

2.Experiment preparation

2.1 components

Microphone, dial switch keypad, RGB light, speaker, TF card slot and TF card

3. Experiment procedure

3.1 K210's hardware pins and software functions use the FPIOA mapping relationship.

```
static void hardware_init(void)
{
    /* TF card */
    //io26--miso--d1
    //io27--clk---sclk
    //io28--mosi--d0
    //io29--cs----cs
    fpioa_set_function(PIN_TF_MISO, FUNC_TF_SPI_MISO);
    fpioa_set_function(PIN_TF_CLK,  FUNC_TF_SPI_CLK);
    fpioa_set_function(PIN_TF_MOSI, FUNC_TF_SPI_MOSI);
    fpioa_set_function(PIN_TF_CS,   FUNC_TF_SPI_CS);

    /* speaker */
    fpioa_set_function(PIN_I2S_WS,  FUNC_I2S2_WS);
    fpioa_set_function(PIN_I2S_DA,  FUNC_I2S2_OUT_D1);
    fpioa_set_function(PIN_I2S_BCK, FUNC_I2S2_SCLK);

    /* mic */
    fpioa_set_function(PIN_MIC0_WS,   FUNC_I2S0_WS);
    fpioa_set_function(PIN_MIC0_DATA, FUNC_I2S0_IN_D0);
    fpioa_set_function(PIN_MIC0_SCK,  FUNC_I2S0_SCLK);

    /* keypad */
    fpioa_set_function(PIN_KEYPAD_LEFT,   FUNC_KEYPAD_LEFT);
    fpioa_set_function(PIN_KEYPAD_MIDDLE, FUNC_KEYPAD_MIDDLE);
    fpioa_set_function(PIN_KEYPAD_RIGHT,  FUNC_KEYPAD_RIGHT);

    /* RGB light */
    fpioa_set_function(PIN_RGB_R, FUNC_RGB_R);
    fpioa_set_function(PIN_RGB_G, FUNC_RGB_G);
    fpioa_set_function(PIN_RGB_B, FUNC_RGB_B);
}
```

3.2 System clock setting

```
/* System clock setting */
sysctl_pll_set_freq(SYSCTL_PLL0, 320000000UL);
sysctl_pll_set_freq(SYSCTL_PLL1, 160000000UL);
sysctl_pll_set_freq(SYSCTL_PLL2, 45158400UL);
```

3.3 Initialize system interrupt, enable system global interrupt, initialize keypad and RGB lights.

```
hardware_init();        // Hardware pin initialization
dmac_init();            // dmac initialization
plic_init();            // Interrupt initialization
sysctl_enable_irq();    // Enable global interrupt
keypad_init();          // keypad initialization
rgb_init(EN_RGB_ALL);   // LED initialization
```

3.4 The TF card must be initialized before it can be used, and the format of the TF card must be determined.

```
if(sdcard_test())
{
    printf("SD card err\r\n");
    return -1;
}
if(fs_test())
{
    printf("FAT32 err\r\n");
    return -1;
}
```

3.5 Reading the state of the keypad and start recording if the middle key is pressed.

```
case EN_KEY_MIDDLE_DOWN: //Recording
    printf("EN_KEY_MIDDLE_DOWN\r\n");
    if(g_record_state != 1)
    {
        bsp_recorder_start(_T("0:REC.wav"));
        g_record_state = 1;
    }

    break;
```

3.6 Keypad swipes to the left to save the recording file.

```
//Get key value
key_value = key_out_fifo();
switch(key_value)
{
    case EN_KEY_LEFT_DOWN: //Stop and save the recording
        printf("EN_KEY_LEFT_DOWN\r\n");
        if(g_record_state == 1)
        {
            bsp_recorder_stopsave("0:REC.wav");
            g_record_state = 2;
        }
        app_rgb_red_state(LIGHT_OFF); //Shut down the red light
        break;

    case EN_KEY_MIDDLE_DOWN: //Recording
        printf("EN_KEY_MIDDLE_DOWN\r\n");
        if(g_record_state != 1)
        {
            bsp_recorder_start(_T("0:REC.wav"));
            g_record_state = 1;
        }

        break;
```

3.7 Keypad swipes to the right to play the recording file.

```
case EN_KEY_RIGHT_DOWN: //Play the recording (only in the non-recording state)
    printf("EN_KEY_RIGHT_DOWN\r\n");
    app_rgb_blue_state(LIGHT_ON);
    if(g_record_state == 2)
    {
        bsp_play_wav(_T("0:REC.wav"));
        //g_record_state = 2;
    }
    break;
```

3.8 Compile and debug, burn and run

Copy the record_play to the src directory in the SDK.

Then, enter the build directory and run the following command to compile.

cmake .. -DPROJ=record_play -G "MinGW Makefiles"

make

```
[ 80%] Linking C executable record_play
Generating .bin file ...
[100%] Built target record_play
PS C:\K210\SDK\kendryte-standalone-sdk-develop\build> 
```

After the compilation is complete, the **record_play.bin** file will be generated in the build folder.

We need to use the type-C data cable to connect the computer and the K210 development board.

Open kflash, select the corresponding device, and then burn the **record_play.bin** file to the K210 development board.

5. Experimental phenomenon

After the firmware is write, a terminal interface will pop up. **If the terminal interface does not pop up, we can open the serial port assistant to display the debugging content.**

The terminal interface will print the SD card Information.

If it appears following prompt, please check whether the TF card is correctly inserted into the card slot.

Then, you can disconnect the power supply of the K210 development board, and open the power switch again.

When we press the button in the middle of the keypad, the RGB red light starts to flash.

At this time, it start record, and you can speak into the microphone.

Then, move the keypad to the left, the red light will off, the recording is saved.

Finally, move the keypad to the right, it will play the content you just recorded.

6. Experiment summary

6.1 The recorded file is a .wav file saved to the TF card, which can be played on the computer using a card reader.

6.2 Sometimes after burning the program, there will be a problem of TF card reading failure.

Re-switch the power switch of the K210 development board and power it on again.