M031 Play WAV File from SPI Flash

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	This sample code uses external codec NAU88L25 to play WAV file stored in external SPI Flash W25Q32.
BSP Version	M031 BSP CMSIS V3.00.001
Hardware	NuMaker-M032KG Ver1.0

1 Overview

This sample code uses external codec NAU88L25 to play WAV file stored in external SPI Flash W25Q32. First, user needs to store the WAV file into SPI Flash first with file system. Then, the user can run the USBD_Mass_Storage_QSPI_Flash sample code first and put the WAV file into QSPI Flash.

The Play WAV file supports mono/stereo mode. The data length is 16 bits and sampling rate is 8 kHz.

1.1 Demo Result

The demo result is shown below.

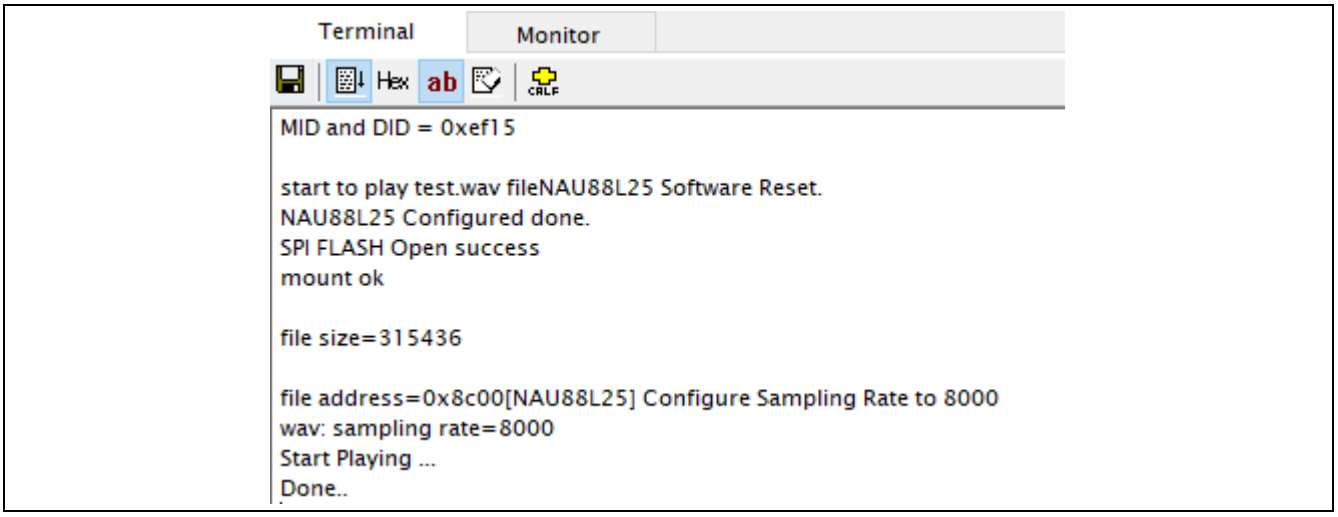

Figure 1-1 Demo Result

2 Code Description

First, initialize the M031 in main.c, initial I²C, UART, SPI-I2S, QSPI and NAU88L25. Then, call play wave function.

```
int32_t main(void)
{
    uint32_t MidDid;
    TCHAR sd_path[] = { '0', ':', 0 };    /* SD drive started from 0 */
    /* Unlock protected registers */
    SYS_UnlockReg();
    /* Init System, IP clock and multi-function I/O. */
    SYS_Init();

    /* Init UART to 115200-8n1 for print message */
    UART_Open(UART0, 115200);
    QSpiInit();
    MidDid = QSpiReadMidDid();
    printf("\nMID and DID = 0x%x\n\r", MidDid);
    printf("\nstart to play test.wav file");
    f_chdrive(sd_path);          /* set default path */
    /* Init I2C1 to access NAU8822 */
    I2C1_Init();

    /* Reset NAU88L25 codec */
    NAU88L25_Reset();

    /* Set PE.13 low to enable phone jack on NuMaker board. */
    SYS->GPE_MFPH &= ~(SYS_GPE_MFPH_PE13MFP_Msk);
    GPIO_SetMode(PE, BIT13, GPIO_MODE_OUTPUT);
    PE13 = 0;

    /* Initialize NAU88L25 codec */
    CLK_SysTickDelay(20000);
    NAU88L25_Setup();

    /* Configure PDMA and use Scatter-Gather mode */
    PDMA_Init();

    WAVPlayer();
    while(1);
}
```

3 Software and Hardware Requirements

3.1 Software Requirements

- BSP version
  - M031 Series BSP CMSIS v3.00.001
- IDE version
  - Keil uVersion 5.26

3.2 Hardware Requirements

- Circuit components
  - NuMaker-M032KG Ver1.0
  - SPI FLASH W25Q32
  - Audio codec NAU88L25

- Pin Connect

V_{DD}	↔	V_{DD}
GND	↔	GND
PA.5	↔	WP
PA.4	↔	HOLD
PA.3	↔	SPI_FLASH_SS
PA.2	↔	SPI_FLASH _CLOCK
PA.0	↔	SPI_FLASH _SI
PA.1	↔	SPI_FLASH _SO
QSPI		SPI Flash
V_{DD}	↔	V_{DD}
GND	↔	GND
PB0	↔	I2C_DAT
PB1	↔	I2C_CLK
PF10	↔	I2S_MCLK
PF9	↔	I2S_LRCLK
PF8	↔	I2S_BCLK
PF7	↔	I2S_DO
PF6	↔	I2S_DI
NuMaker-M032KG		NAU88L25

Figure 3-1 Pin Connect

4 Directory Information

The directory structure is shown below.

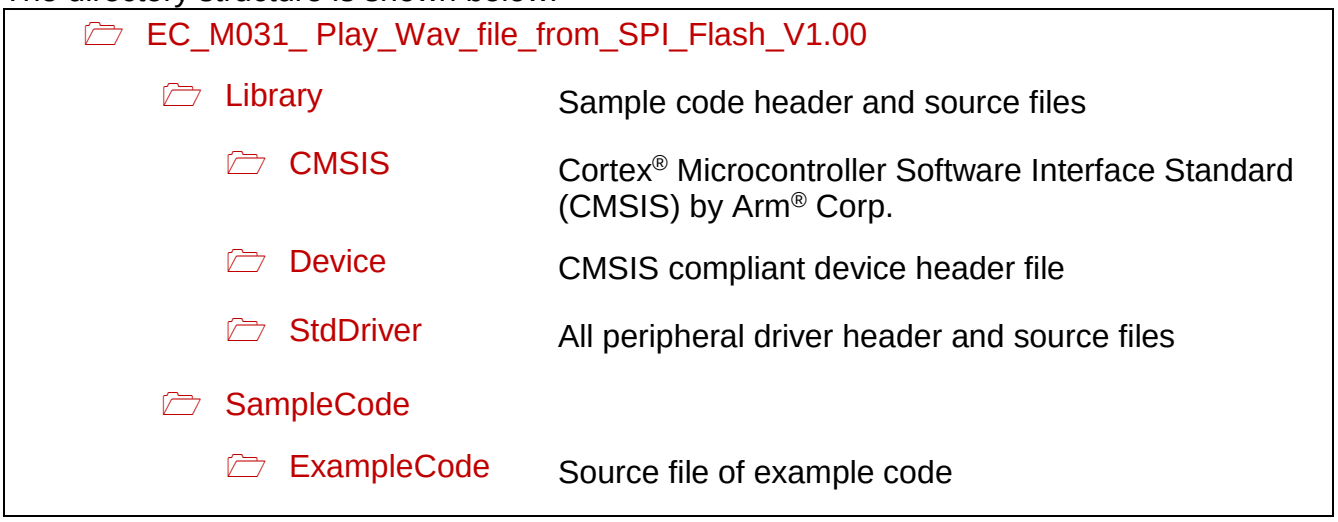

Figure 4-1 Directory Structure

5 Example Code Execution

1. Browse the sample code folder as described in the Directory Information section and double-click *I2S_PDMA_NAU88L25_QSPI_FATFS.uvproj*.
2. Enter Keil compile mode.
   - Build
   - Download
   - Start/Stop debug session
3. Enter debug mode.
   - Run

6 Revision History

Date	Revision	Description
2021.05.18	1.00	1. Initially issued.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.