# ESK32-2x001
# Expansion Board User Manual

Revision: V1.00 Date: November 18, 2016

www.holtek.com

# Table of Contents

# List of Figures

# List of Tables

# 1 Introduction

The ESK32-2x001 Expansion board is designed for use with the HT32F52xxx series of microcontrollers. The HT32F52xxx series of microcontrollers contain a variety of peripherals such as high speed SAR ADC, I²S, EBI, CRC, COMPARATOR, USB, I²C, USART, UART, SPI, GPTM, MCTM, WDT, RTC, SW-DP (Serial Wire) and etc.

There are some specific components to assist with device peripheral evaluation such as the RS232 transceiver, EEPROM, series NOR flash, Microphone, Stereo jack, potentiometer etc.

Note: There are only three components which are different between the ESK32-21001 and the ESK32-20001. These are the CMOS sensor connector, smart card connector and audio in/out which are only available in the ESK32-21001.



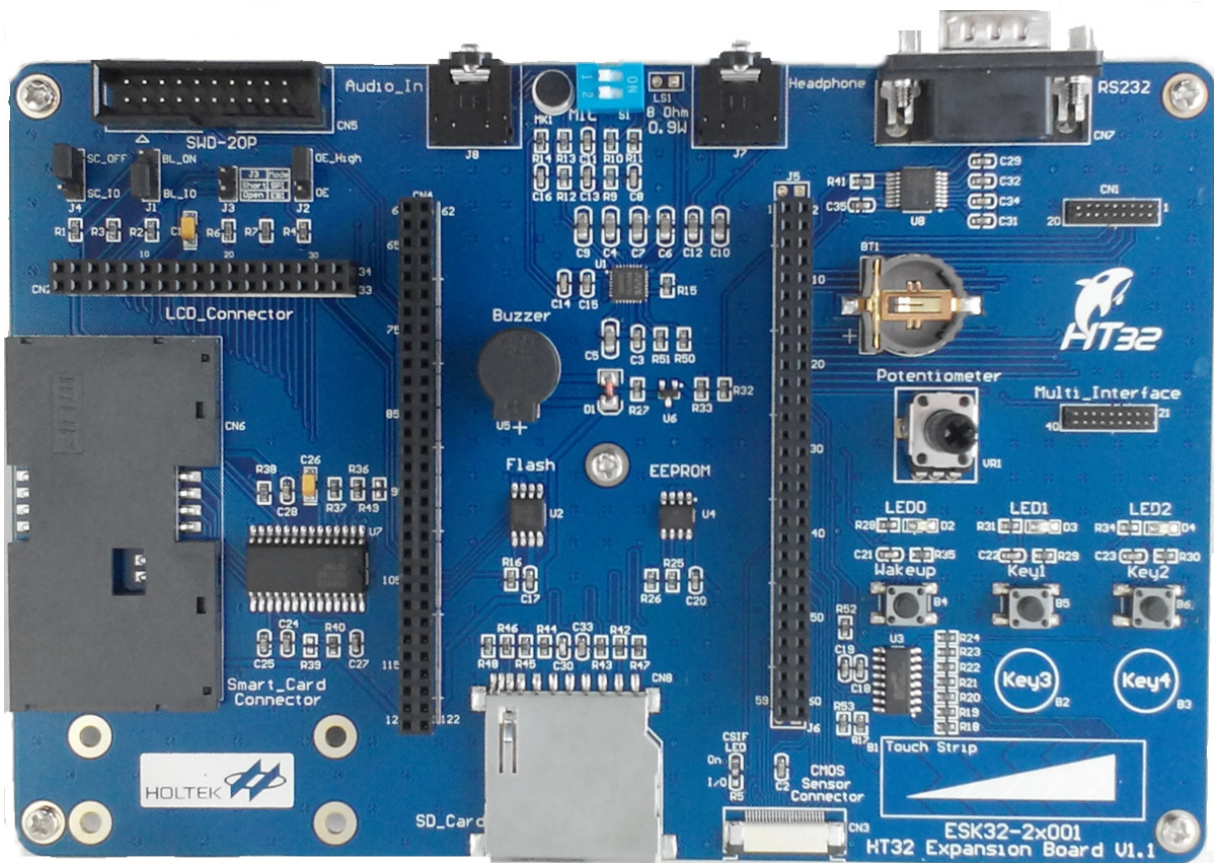



**Figure 1. ESK32-2x001 Expansion Board**

## Features

- RS232 connector
- Wakeup and two key buttons
- Touch keys
- Three LEDs
- $I^2C$ – compatible serial interface EEPROM
- SPI – compatible serial interface Flash
- SPI and EBI extension interfaces for LCD display applications
- SD card slot – SPI mode
- PWM output for Buzzer driving
- Backup battery
- SWD-20P debug Port interface
- Smart card connector
- CMOS sensor connector
- Multi interface including UART, $I^2C$, SPI and GPIO functions for connecting various modules
- Audio input contains microphone and stereo jack
- Audio output contains speaker connector and stereo jack

# 2 Hardware Layout

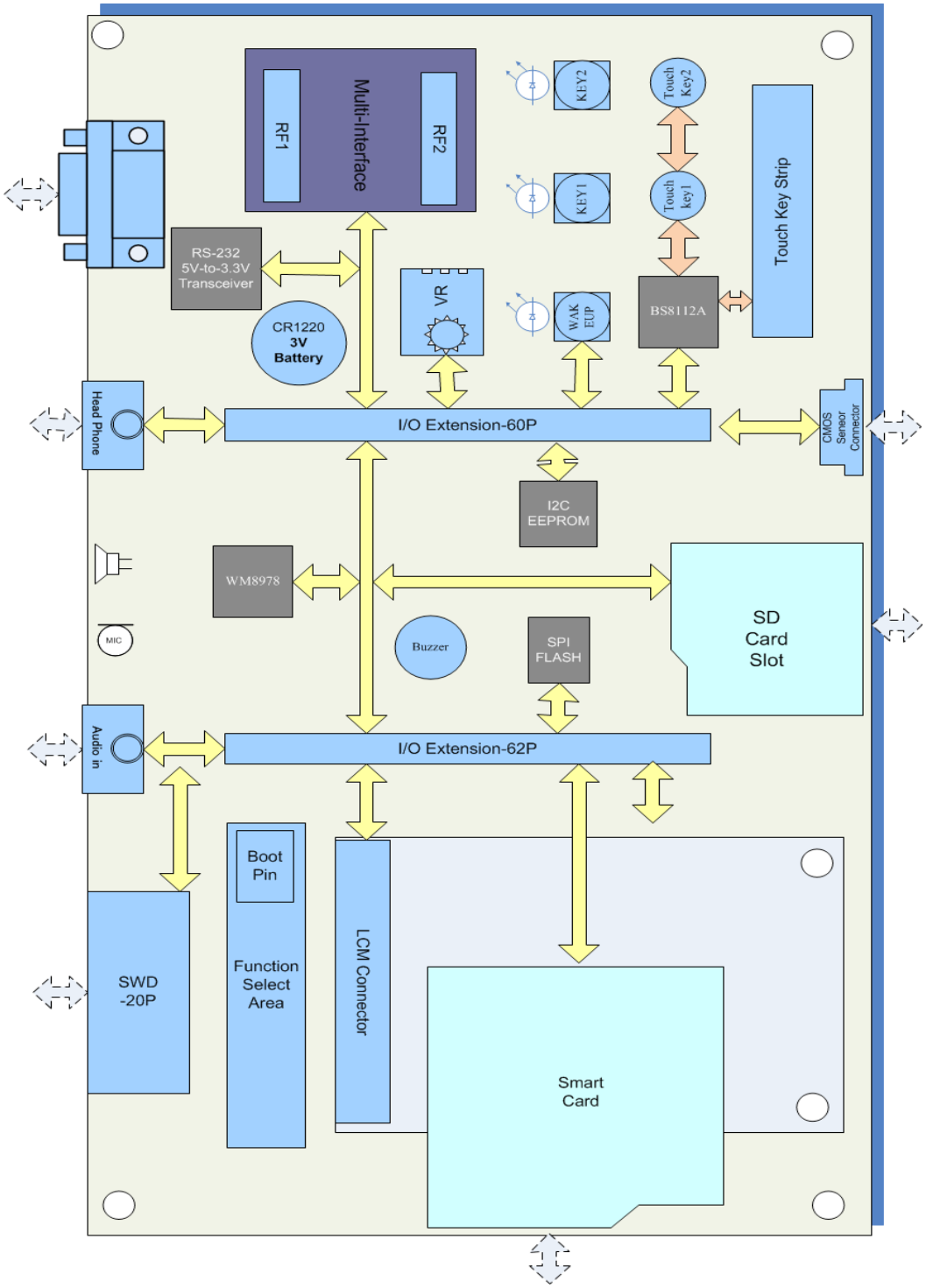



**Figure 2. ESK32-2x001 Expansion Board Block Diagram**

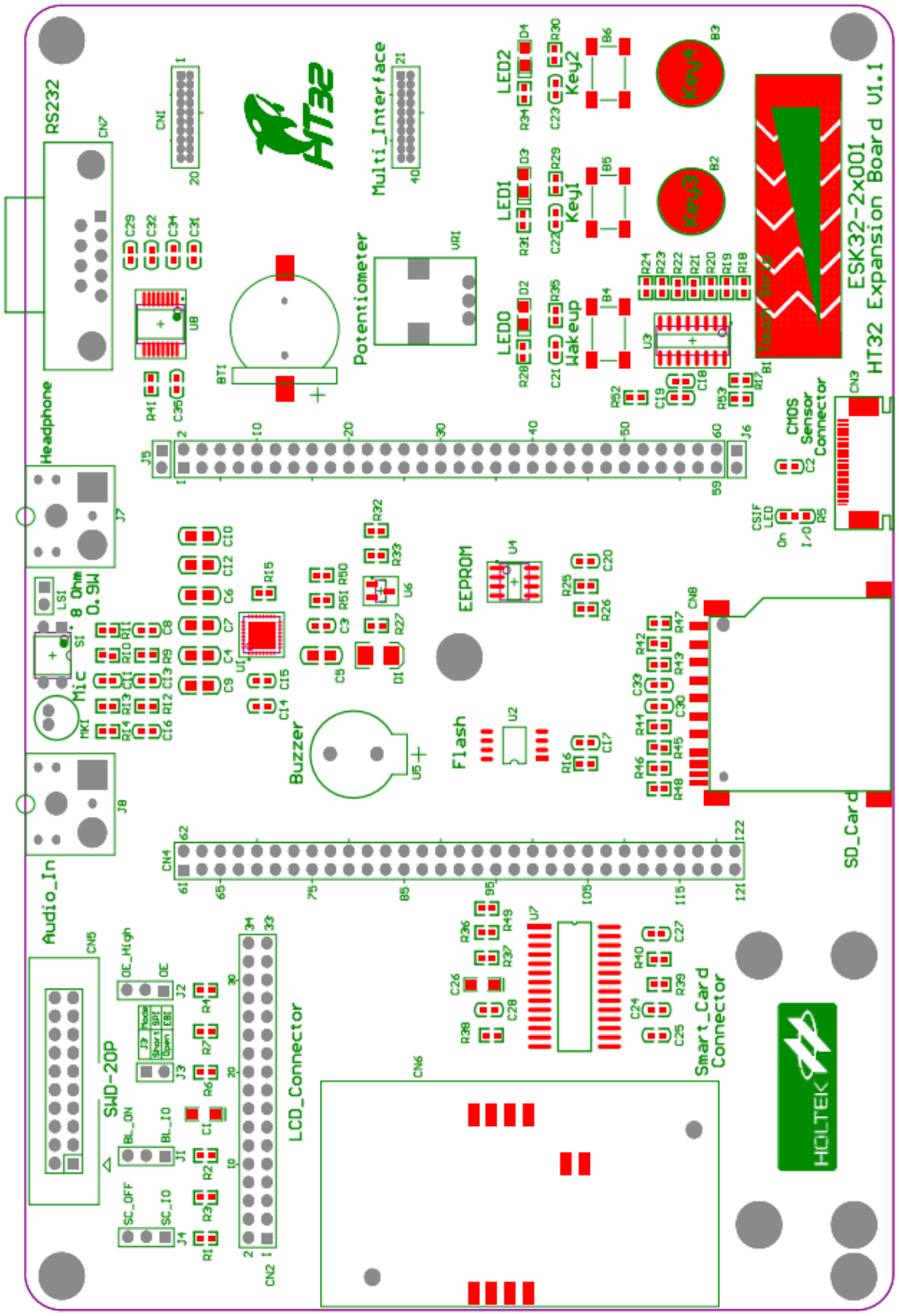
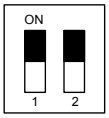
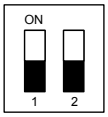



**Figure 3. ESK32-2x001 Expansion Board Layout**

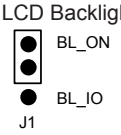
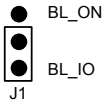
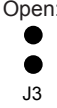
# Audio Input Option

### Table 1. Audio Input DIP Switch

| Jumper | Description |
|---|---|
| S1 | For audio inputs sourced from the Microphone (MK1) – default setting<br>  |
| | For audio inputs sourced from the stereo jack (J2)<br>  |

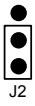
# LCD Interface Option

### Table 2. EBI Interface Switch

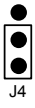
| Jumper | Description |
|---|---|
| J1 | LCD Backlight will always be on<br>  |
| | LCD Backlight controlled by IO pin<br>  |
| J3 | Short: LCD SPI mode<br>  |
| | Open: LCD EBI mode – note that only the HT32F52342/52 can work in this mode<br>  |

# Function Switch Description

## Table 3. PC1 Switch Description

| Jumper | Description |
|---|---|
| J2 | The GPIO pin PC1 is switched to the EBI_OE pin<br>  <br> |
| | The GPIO pin PC1 is switched to a pull high<br>  <br> |

## Table 4. Smart Card Switch Description

| Jumper | Description |
|---|---|
| J4 | Smart Card function is off<br>  <br> |
| | Smart Card function is on – note that the Smart Card function and EBI function are unable to operate at the same time as they share a common pin<br>  <br> |

## SWD-20P Connector CN5

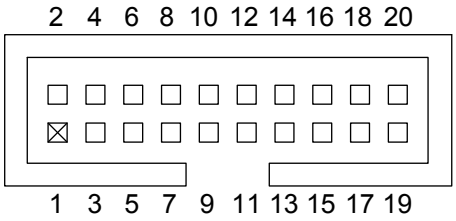



**Figure 4. SWD-20P Connector CN5**

**Table 5. SWD-10P Connector CN7**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | 3.3V | 2 | 3.3 |
| 3 | NC | 4 | GND |
| 5 | NC | 6 | GND |
| 7 | SWDIO(PA13) | 8 | GND |
| 9 | SWCLK(PA12) | 10 | GND |
| 11 | NC | 12 | GND |
| 13 | SWO | 14 | GND |
| 15 | nRST | 16 | GND |
| 17 | NC | 18 | GND |
| 19 | NC | 20 | GND |

# Extension Connector 1 – CN4.1

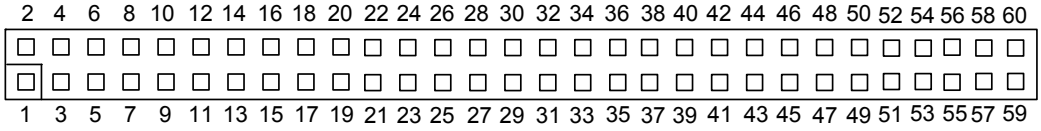



**Figure 5. Extension Connector 1**

**Table 6. Extension Connector 1**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | GND | 2 | GND |
| 3 | I2S_BCLK(PC11) | 4 | I2S_WS(PC10) |
| 5 | RS232_RX(PA4) | 6 | RS232_TX(PA5) |
| 7 | PA9_BOOT1/M_IO4 | 8 | BUZZER(PA10) |
| 9 | M_IO2(PB13) | 10 | M_IO3(PB14) |
| 11 | M_IO0(PB15) | 12 | M_IO1(PC0) |
| 13 | M_TX(PA2) | 14 | M_RX(PA3) |
| 15 | M_RTS(PA0) | 16 | M_CTS(PA1) |
| 17 | M_MISO(PC9) | 18 | M_CS(PA7) |
| 19 | M_SCK(PC5) | 20 | M_MOSI(PC8) |
| 21 | M_SDA(PA1) | 22 | M_SCL(PA0) |
| 23 | Touch_SDA(PA1) | 24 | Touch_SCL(PA0) |
| 25 | EE_SDA(PA1) | 26 | EE_SCL(PA0) |
| 27 | B0_WAKEUP(PB12) | 28 | V_BAT |
| 29 | Potentiometer(PA6) | 30 | GND |
| 31 | NC | 32 | Touch_IRQ(PB11) |
| 33 | SD_DP/MISO(PC9) | 34 | SD_D1 |
| 35 | SD_D2 | 36 | SD_D3/CS |
| 37 | SD_CLK(PC5) | 38 | SD_CMD/MOSI(PC8) |
| 39 | CSIF_LED | 40 | SD_CD |
| 41 | CSIF_SDA | 42 | CSIF_SCL |
| 43 | CSIF_RESB | 44 | CSIF_PWDN |
| 45 | CSIF_PCLK | 46 | CSIF_MCLK |
| 47 | CSIF_HSYNC | 48 | CSIF_VSYNC |
| 49 | CSIF_D6 | 50 | CSIF_D7 |
| 51 | CSIF_D4 | 52 | CSIF_D5 |
| 53 | CSIF_D2 | 54 | CSIF_D3 |
| 55 | CSIF_D0 | 56 | CSIF_D1 |
| 57 | GND | 58 | GND |
| 59 | VDD33 | 60 | VDD33 |

# Extension Connector 2 – CN4.2

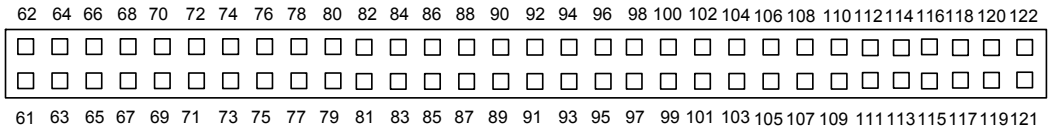



**Figure 6. Extension Connector 2**

**Table 7. Extension Connector 2**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 61 | VDD33 | 62 | VDD33 |
| 63 | GND | 64 | GND |
| 65 | I2S_SDA(PA1) | 66 | I2S_SCL(PA0) |
| 67 | I2S_SDO(PC12) | 68 | I2S_SDI(PC13) |
| 69 | PA9_BOOT1 | 70 | I2S_MCLK(PA8) |
| 71 | SWO | 72 | Nrst |
| 73 | SWCLK(PA12) | 74 | SWDIO(PA13) |
| 75 | LCD_BL(PB6) | 76 | LCD_WE(PC3) |
| 77 | LCD_SDA(PA1) | 78 | LCD_SCL(PA0) |
| 79 | LCD_CS(PC2) | 80 | LCD_MISO(PC9) |
| 81 | LCD_SCK(PC5) | 82 | LCD_MOSI(PC8) |
| 83 | LCD_INT(PC0) | 84 | LCD_RST(PB7) |
| 85 | LCD_AD0(PA14) | 86 | LCD_AD1(PA15) |
| 87 | LCD_AD2(PB0) | 88 | LCD_AD3(PB1) |
| 89 | LCD_AD4(PB2) | 90 | LCD_AD5(PB3) |
| 91 | LCD_AD6(PB4) | 92 | LCD_AD7(PB5) |
| 93 | LCD_AD8(PC14) | 94 | LCD_AD9(PC15) |
| 95 | LCD_AD10(PD1) | 96 | LCD_AC11(PD2) |
| 97 | LCD_AD12(PD3) | 98 | LCD_AD13(PC10) |
| 99 | LCD_AD14(PC11) | 100 | LCD_AD15(PC12) |
| 101 | LCD_OE(PC1) | 102 | LCD_A0(PA11) |
| 103 | LCD_TS | 104 | GND |
| 105 | Flash_SCK(PC5) | 106 | Flash_MOSI(PC8) |
| 107 | Flash_MISO(PC9) | 108 | Flash_CS(PD0) |
| 109 | Button1(PD1) | 110 | Button2(PD2) |
| 111 | LED0(PC14) | 112 | LED1(PC15) |
| 113 | LED2(PC1) | 114 | SCI_CMD(PD3) |
| 115 | SCI_RST(PC15) | 116 | SCI_CLK(PB6) |
| 117 | SCI_DET(PB7) | 118 | SCI_DIO(PB8) |
| 119 | GND | 120 | GND |
| 121 | DC5V | 122 | DC5V |

## Multi-Interface CN1

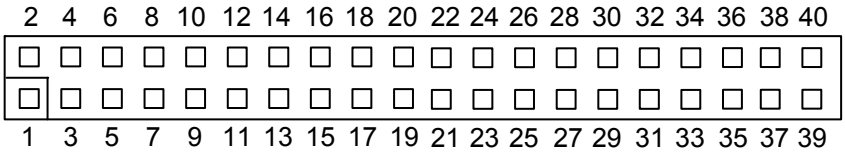



**Figure 7. Multi-Interface CN1**

**Table 8. Multi-Interface CN1**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | VSS | 2 | NC |
| 3 | M_RTS(PA0) | 4 | NC |
| 5 | NC | 6 | M_TX(PA2) |
| 7 | M_TX(PA2) | 8 | M_RX(PA3) |
| 9 | M_RX(PA3) | 10 | M_IO0(PB15) |
| 11 | NC | 12 | M_IO1(PC0) |
| 13 | NC | 14 | M_CS(PA7) |
| 15 | NC | 16 | M_SCK(PC5) |
| 17 | NC | 18 | M_MOSI(PC8) |
| 19 | GND | 20 | M_MISO(PC9) |
| 21 | NC | 22 | VSS |
| 23 | NC | 24 | NC |
| 25 | NC | 26 | NC |
| 27 | 3.3V | 28 | NC |
| 29 | 3.3V | 30 | NC |
| 31 | NC | 32 | M_SCL(PA0) |
| 33 | M_IO2(PB13) | 34 | M_SDA(PA1) |
| 35 | NC | 36 | NC |
| 37 | NC | 38 | M_CTS(PA1) |
| 39 | M_IO3(PB14) | 40 | M_IO4(PA9) |

## RS232 Port Connector CN7

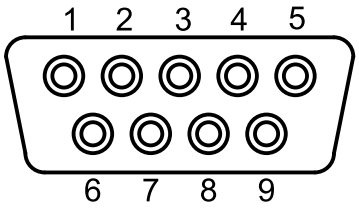



**Figure 8. RS232 Port Connector CN7**

**Table 9. RS232 Port 0 Connector CN7**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | Connect to PIN4 | 2 | UART0_Rx (PA4) |
| 3 | UART0_Tx (PA5) | 4 | Connect to PIN6 |
| 5 | GND | 6 | Connect to PIN1 |
| 7 | Connect to PIN8 | 8 | Connect to PIN7 |
| 9 | NC | | |

## SD Card Connector CN8

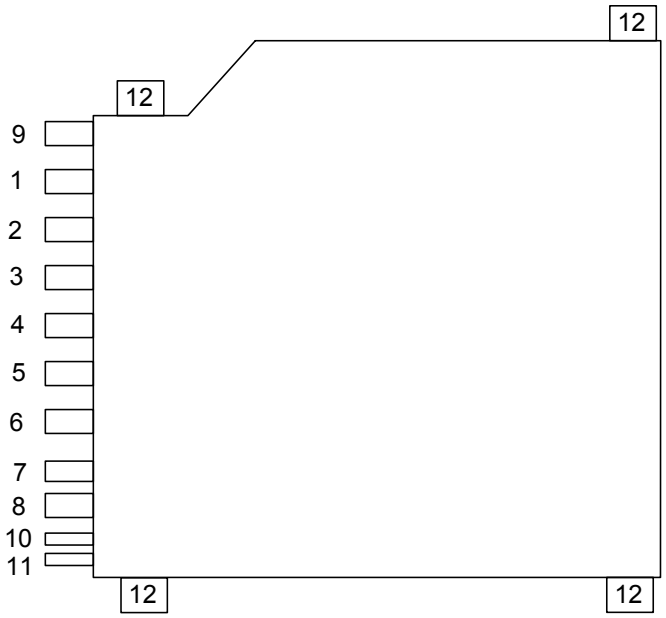



**Figure 9. SD Card Connector CN8**

**Table 10. SD Card Connector CN10**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | SD_D3/CS(PC4) | 2 | SD_CMD/MOSI(PC8) |
| 3 | GND | 4 | 3.3V |
| 5 | SD_SCK(PC5) | 6 | GND |
| 7 | SD_D0/MISO(PC9) | 8 | NC |
| 9 | NC | 10 | Pull high |
| 11 | NC | 12 | GND |

# LCD Connector CN2

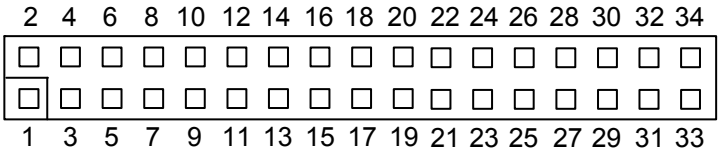



**Figure 10. LCD Connector CN2**

**Table 11. LCD Connector CN2**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | 5V | 2 | GND |
| 3 | LCD_BL(J1) | 4 | LCD_SDA(PA1) |
| 5 | LCD_SCL(PA0) | 6 | WE_WE(PC3) |
| 7 | LCD_MISO(PC9) | 8 | LCD_MOSI(PC8) |
| 9 | LCD_CS(PC2) | 10 | LCD_INT(PC0) |
| 11 | NC | 12 | LCD_RST(PB7) |
| 13 | GND | 14 | 3.3V |
| 15 | LCD_AD0(PA14) | 16 | LCD_AD1(PA15) |
| 17 | LCD_AD2(PB0) | 18 | LCD_AD3(PB1) |
| 19 | LCD_AD4(PB2) | 20 | LCD_AD5(PB3) |
| 21 | LCD_AD6(PB4) | 22 | LCD_AD7(PB5) |
| 23 | LCD_AD8(PC14) | 24 | LCD_AD9(PC15) |
| 25 | LCD_AD10(PD1) | 26 | LCD_AD11(PD2) |
| 27 | LCD_AD12(PD3) | 28 | LCD_AD13(PC10) |
| 29 | LCD_AD14(PC11) | 30 | LCD_AD15(PC12) |
| 31 | NC | 32 | NC |
| 33 | LCD_OE(PC1) | 34 | LCD_A0(PA11) |

## CMOS Sensor Connector CN3

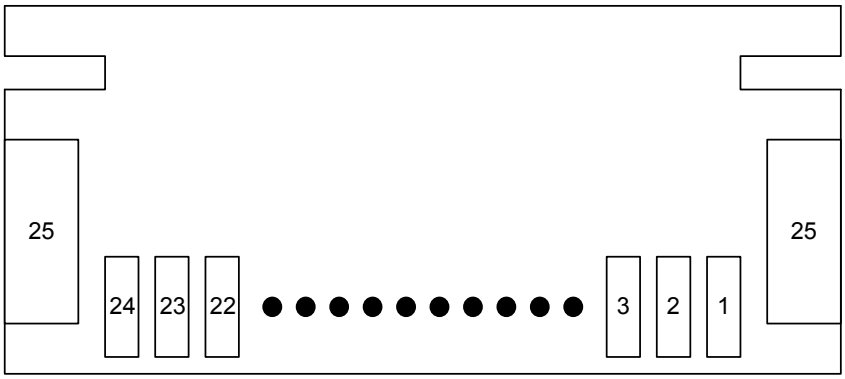



**Figure 11. CMOS Sensor Connector CN3**

**Table 12. CMOS Sensor Connector CN3**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | NC | 2 | CSIF_LED |
| 3 | CSIF_RESB | 4 | CSIF_D0 |
| 5 | CSIF_D1 | 6 | CSIF_D2 |
| 7 | CSIF_D3 | 8 | CSIF_D4 |
| 9 | CSIF_D5 | 10 | CSIF_D6 |
| 11 | CSIF_D7 | 12 | 3.3V |
| 13 | 3.3V | 14 | CSIF_SCL |
| 15 | CSIF_SDA | 16 | GND |
| 17 | GND | 18 | CSIF_VSYNC |
| 19 | CSIF_HSYNC | 20 | GND |
| 21 | CSIF_MCLK | 22 | GND |
| 23 | CSIF_PCLK | 24 | CSIF_PWDN |
| 25 | GND | | |

## Smart Card Connector CN6

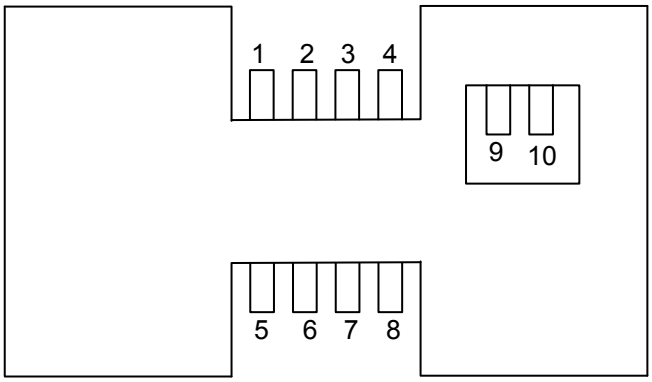



**Figure 12. Smart Card Connector CN6**

**Table 13. Smart Card Connector CN6**

| Pin# | Description | Pin# | Description |
|---|---|---|---|
| 1 | VCC | 2 | RST |
| 3 | CLK | 4 | NC |
| 5 | GND | 6 | NC |
| 7 | I/O | 8 | NC |
| 9 | PRES | 10 | VDD |

# 3 Schematics

This section shows the complete circuit for the ESK32-2x001 Expansion Board:

- Figure 13. includes the LCD Connector, Multi-Interface and CMOS sensor.
- Figure 14. includes the DVB to SK Connector, SWJ Connector and Fool Proofing.
- Figure 15. includes the FLASH, EEPROM, TouchKey, Buttons, BUZZER, LED Display and Potentiometer.
- Figure 16. includes the $I^2S$ Audio Codec.
- Figure 17. includes the Smart Card, SSI-SD Card and RS-232 Port0.

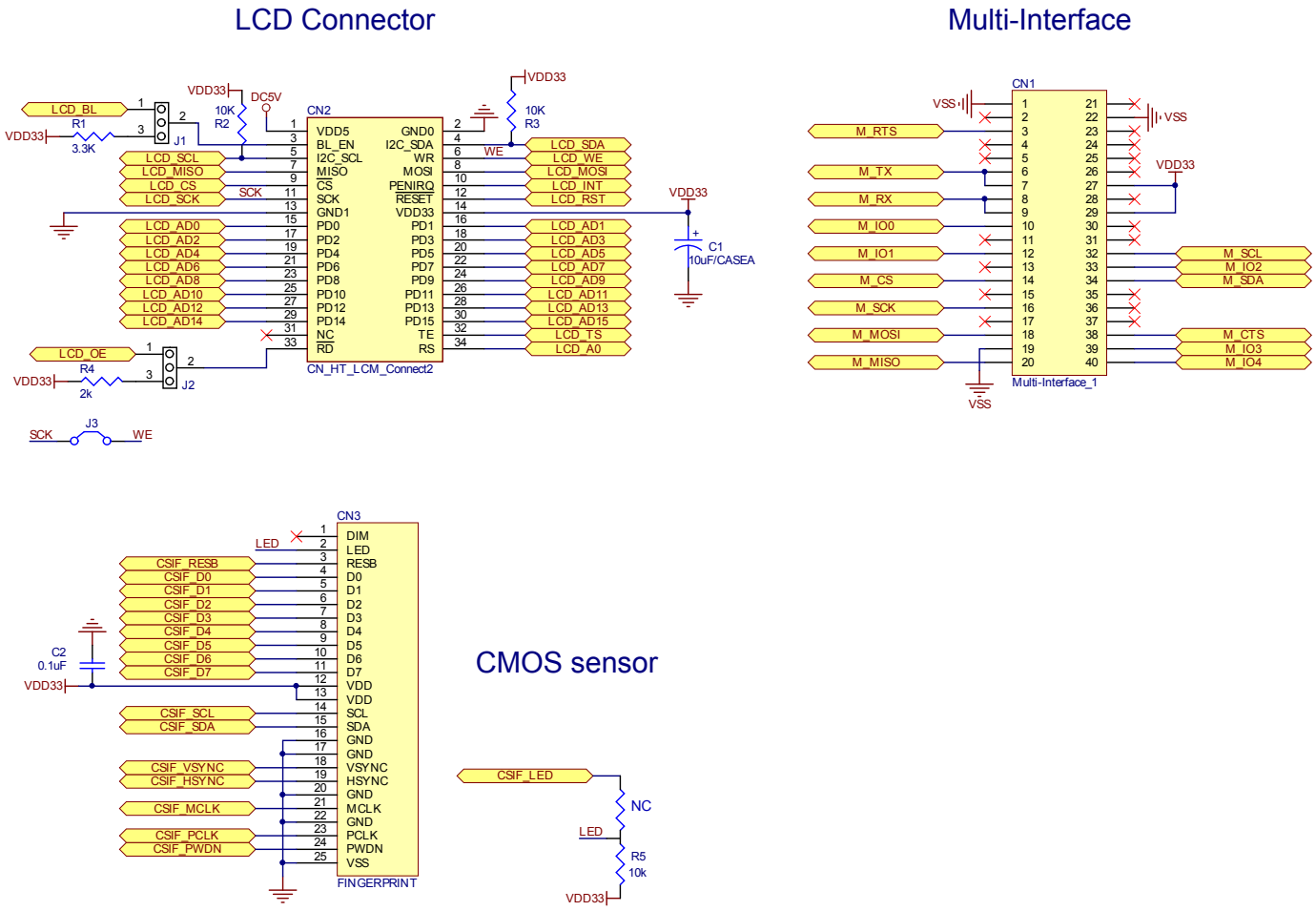



**Figure 13. LCD Connector, Multi-Interface and CMOS sensor**

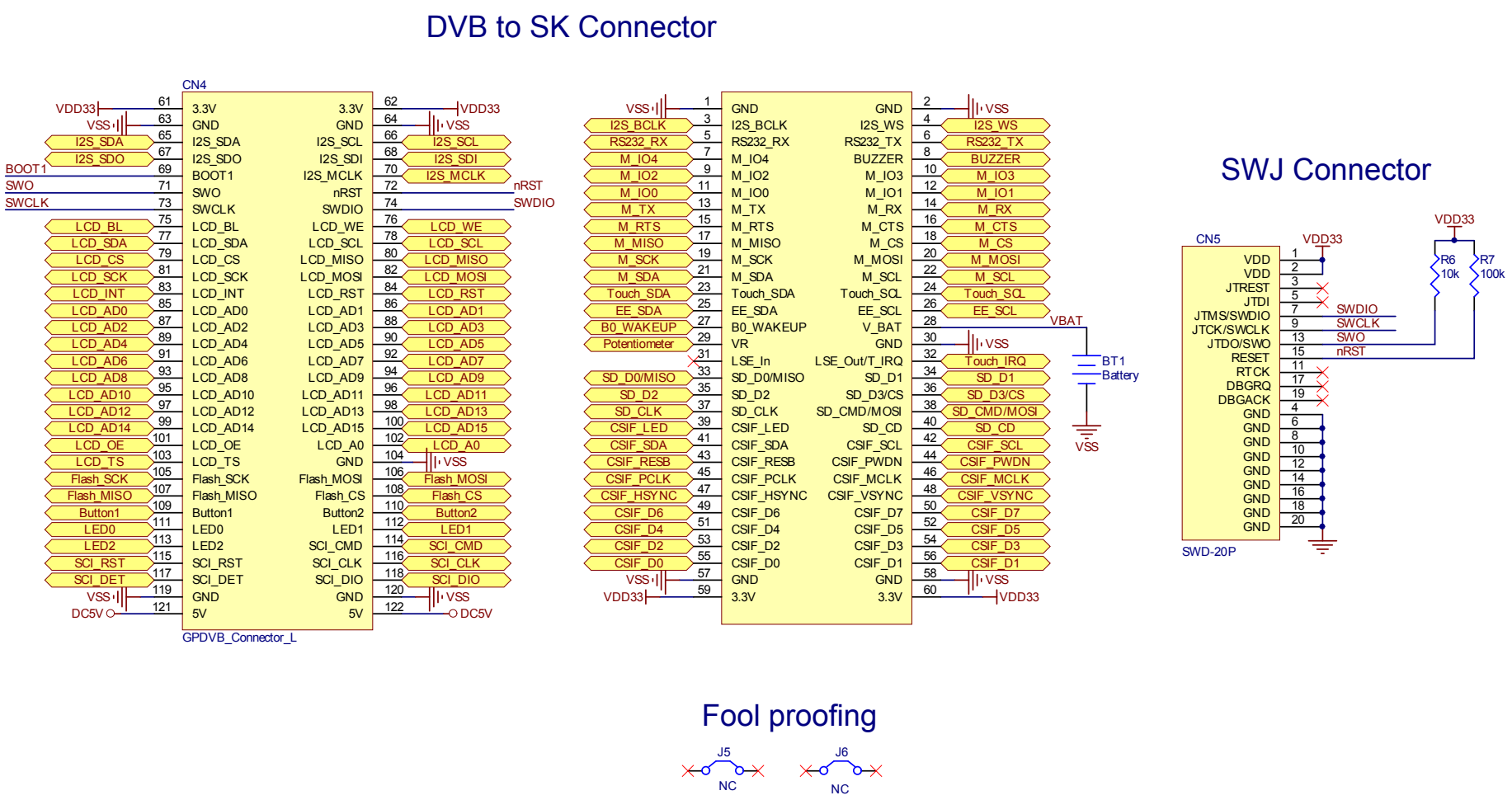



**Figure 14. DVB to SK Connector, SWJ Connector and Fool Proofing**

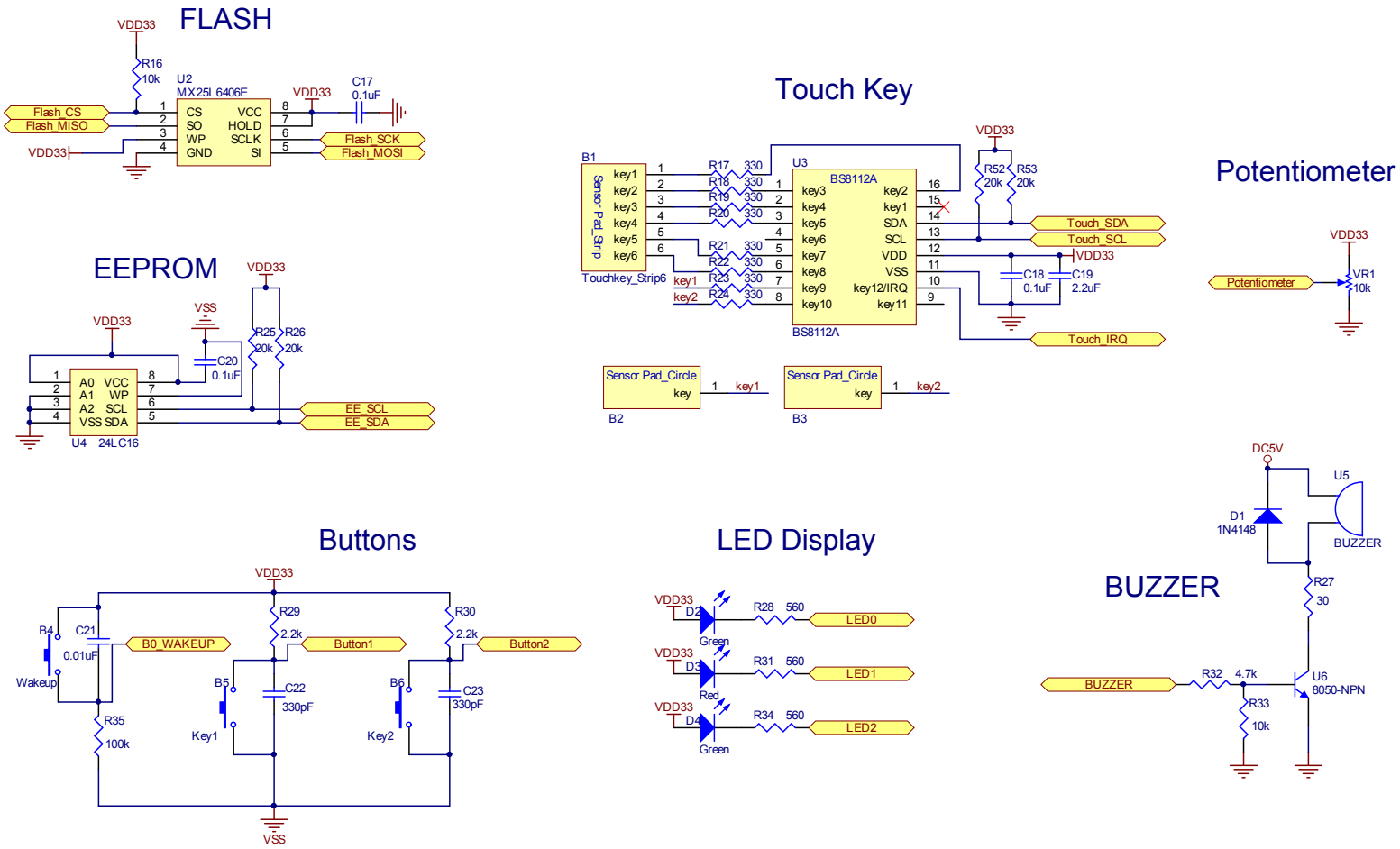



**Figure 15. FLASH, EEPROM, TouchKey, Buttons, BUZZER, LED Display and Potentiometer**

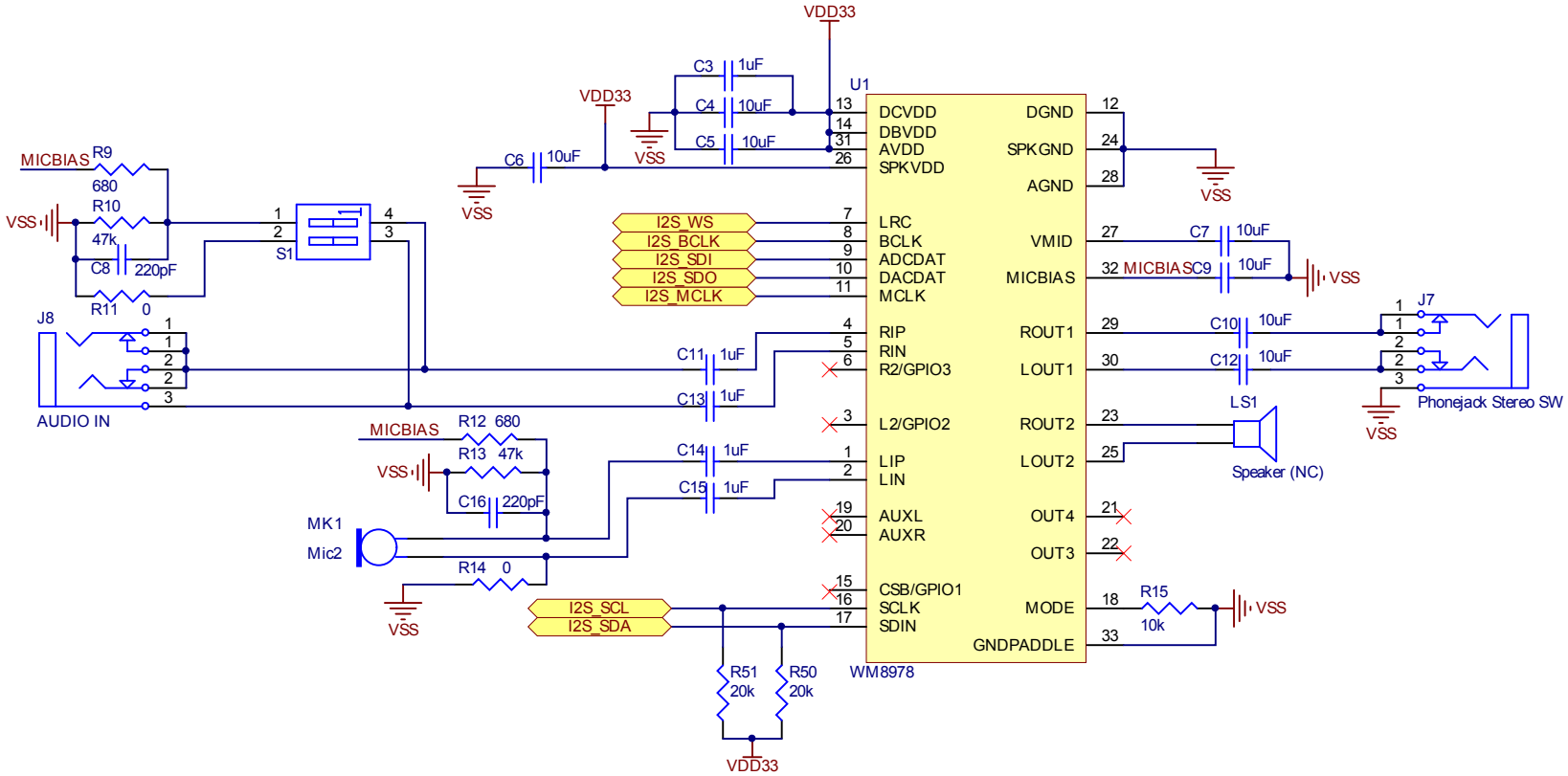



**Figure 16. I²S Audio Codec**

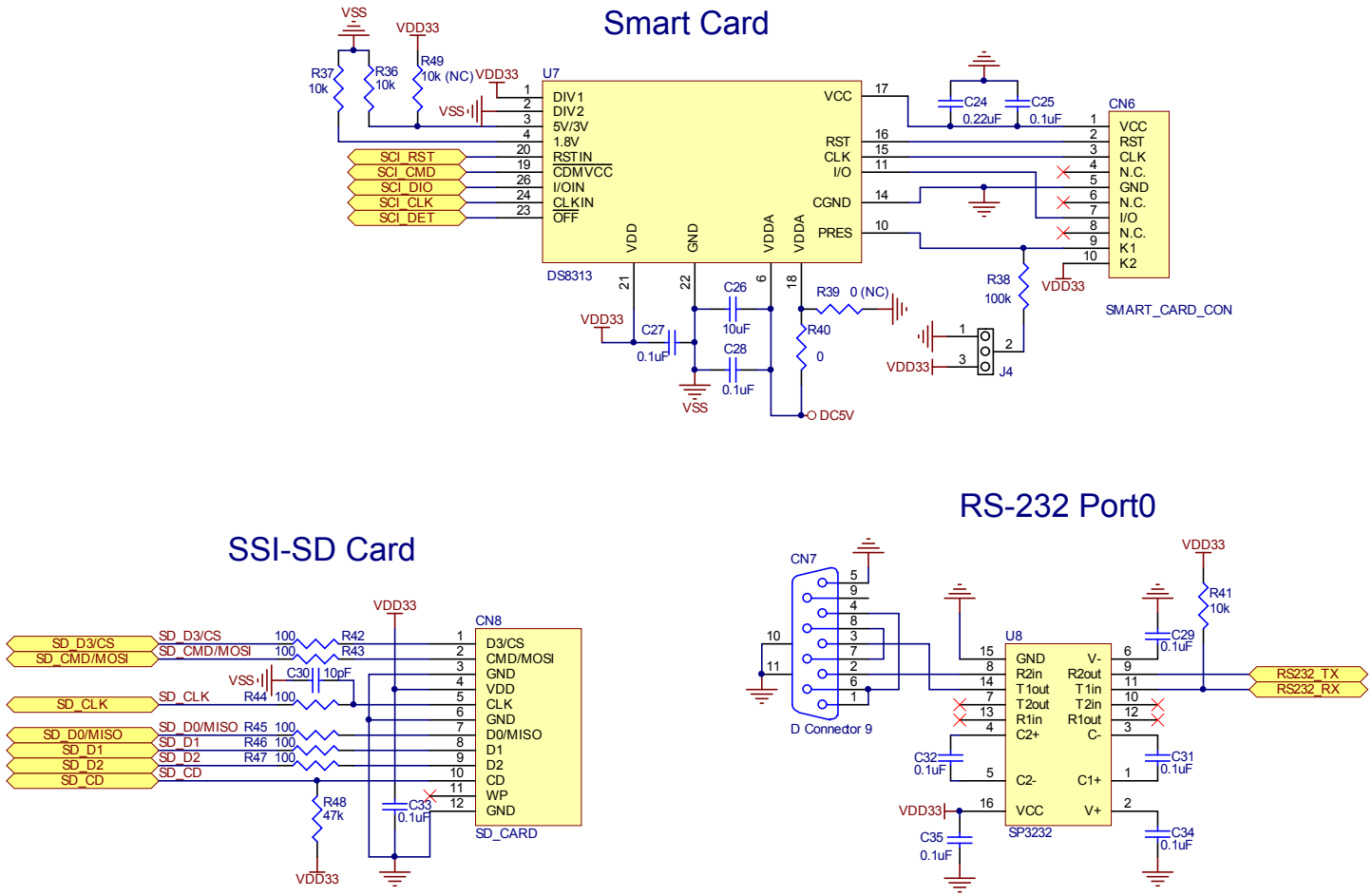



**Figure 17. Smart Card, SSI-SD Card and RS-232 Port0**