

Overview

The CT7602 serial chip is a high performance USB audio bridge. It more power saving, more convenient to use and more function. It supports digital microphone and external OSC, DSD512, DoP256 and PCM 768K 32bit.

CT7602_EVM-J-A is a full function audio evaluation system for QFN 48pin type package. The SPDIF, I2S, DSD/DOP, SRC, DAC, ADC, Digital microphone and MCU control are combined on this board. This architecture is simple to verify and apply CT7602 family chip to any audio system product.

The CT7602_EVM-J-A interface:

- digital audio output port
 - USB SPDIF output port x1
- digital audio input port
 - Digital microphone input
- Analog audio output port
 - AUX analog output with high performance ESS9018K2M DAC.
- analog audio input port
 - high performance 2 channel record port
- Software control
 - External I2C control path to access CT7602 directly
 - Internal 8051 MCU with GPIO/I2C control

Block Diagram

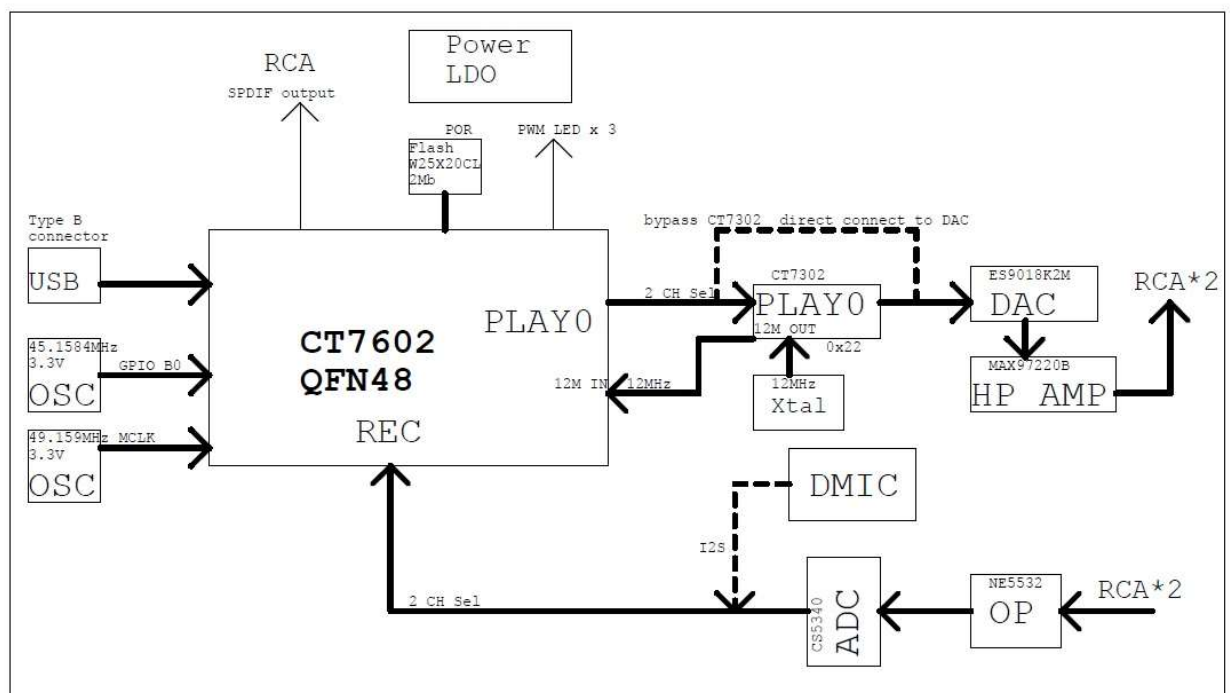


Figure1. Block diagram

PCB Overview

EVM-J-A for QFN 48 pin

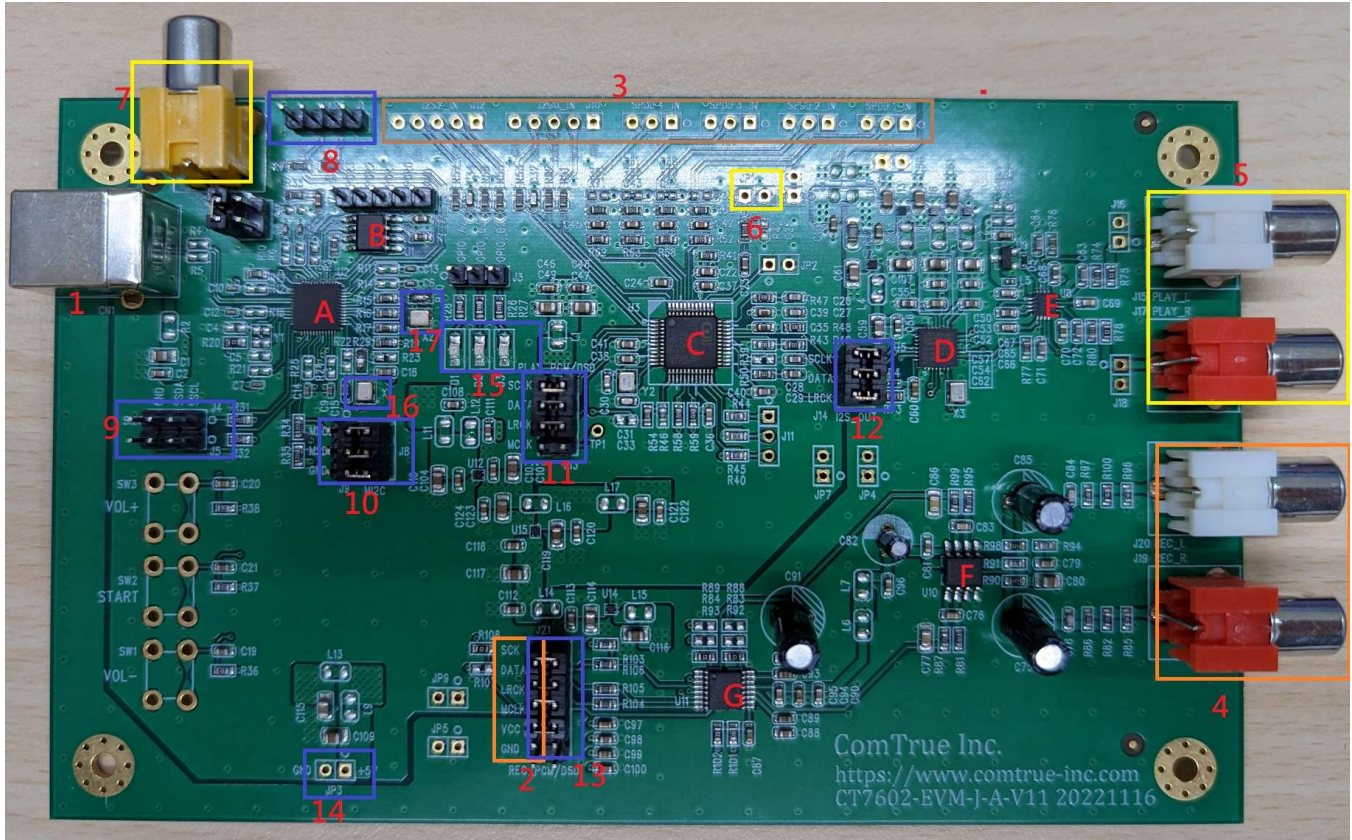


Figure2. PCB Overview

INPUT PORT		
No	Function	Description
1	USB connector	Connect to USB host port
2	Digital MIC IN	Digital microphone input port
3	CT7302 input port	CT7302 input solder pad, it need use firmware control it
4	Record analog input	Record analog input
OUTPUT PORT		
No	Function	Description
5	Play analog output	Play analog output
6	SRC SPDIF output	CT7302(U3) SPDIF output solder pad
7	USB SPDIF output	USB SPDIF output
POWER PORT		
No	Function	Description
14	Self power jump	Provide external +5V power to demo board

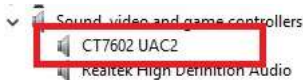
JUMP SETTING		
No	Function	Description
8	USB UART control port	USB UART control port
9	Slave I2C	I2C control select
10	Master I2C	I2C control select (default use)
11	USB(CT7602) to SRC(CT7302) Audio Data	Playback audio data jump, default is short
12	SRC(CT7302) to DAC(ES9018) Audio Data	Playback audio data jump, default is short
13	Record Audio Data	Record audio data jump, default is short
15	PWM LED	Default : Breathing light mode(D1) Play Music : Rhythm light mode(D1)
16	External OSC(45.1584MHz)	44.1K external OSC. Default is open, it must short R29 and use firmware control
17	External OSC(49.152MHz)	48K external OSC Default is open, it must short R30 and use firmware control
Chipset		
No	Part Number	Description
A	CT7602(U2)	USB2.0 Audio bridge
B	W25X20CL(U1)	SPI Flash
C	CT7302(U3)	SRC for Playback use
D	ES9018K2M(U4)	DAC
E	MAX97220B(U8)	Audio amplifier
F	NE5532(U10)	Amplifiers
G	CS5340(U11)	ADC

Quickly Start

Playback Connection Diagram

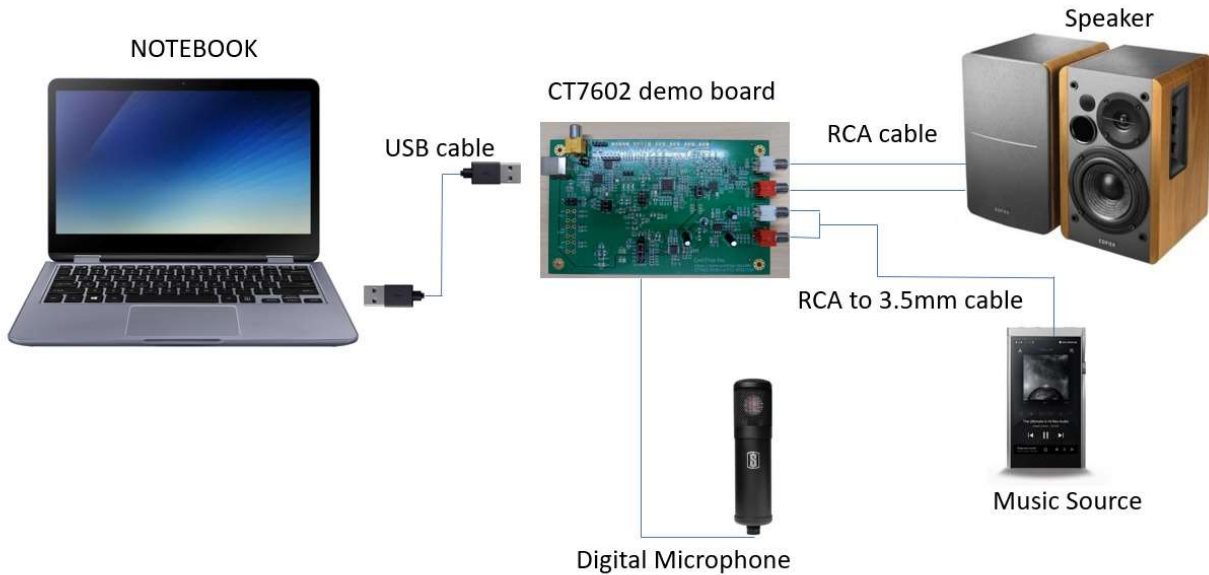


This EVM board is ready for use immediately. User can follow the procedure to set up the evaluation system for test.

1. Connect USB B-TYPE cable to EVM board's USB port and another side USB cable connect to windows / MAC or Linux USB port.
2. Download and Install ct7602_setup.exe as below link
<https://reurl.cc/l7MRx9>
3. Check Device Manager. Under "Sound, video and game controllers", it will have new device "CT7602 UAC2" like below picture.


The screenshot shows the Windows Device Manager window. Under the 'Sound, video and game controllers' category, a new device named 'CT7602 UAC2' is listed. It is highlighted with a red rectangle. Below it, 'Realtek High Definition Audio' is also visible.
4. If you use win7 and can't install driver, please install Microsoft hotfixed as below link
<https://www.microsoft.com/en-us/download/details.aspx?id=46148>
5. The EVM board's driver have two play music mode. One is WDM mode another one is ASIO mode. For WDM mode it can use Microsoft Media Player to play it. The maximum support PCM 384K/32bit. For ASIO mode need use third party software to play it. We suggest use foobar2000 to play it. Please see how to install foobar2000 as below.
6. Download latest stable version and Install foobar2000 to play ASIO driver.
<https://reurl.cc/KMk41M>
7. Download and install ASIO support 2.1.2 component for foobar2000
<https://reurl.cc/lvVgrA>
8. Download and install foo_input_sacd component for foobar2000
<https://reurl.cc/1ex3EX>
9. Download and install DSDtranscoder
<https://reurl.cc/Y81V5D>
10. Connect analog output to your speaker.
11. Start play music and enjoy it

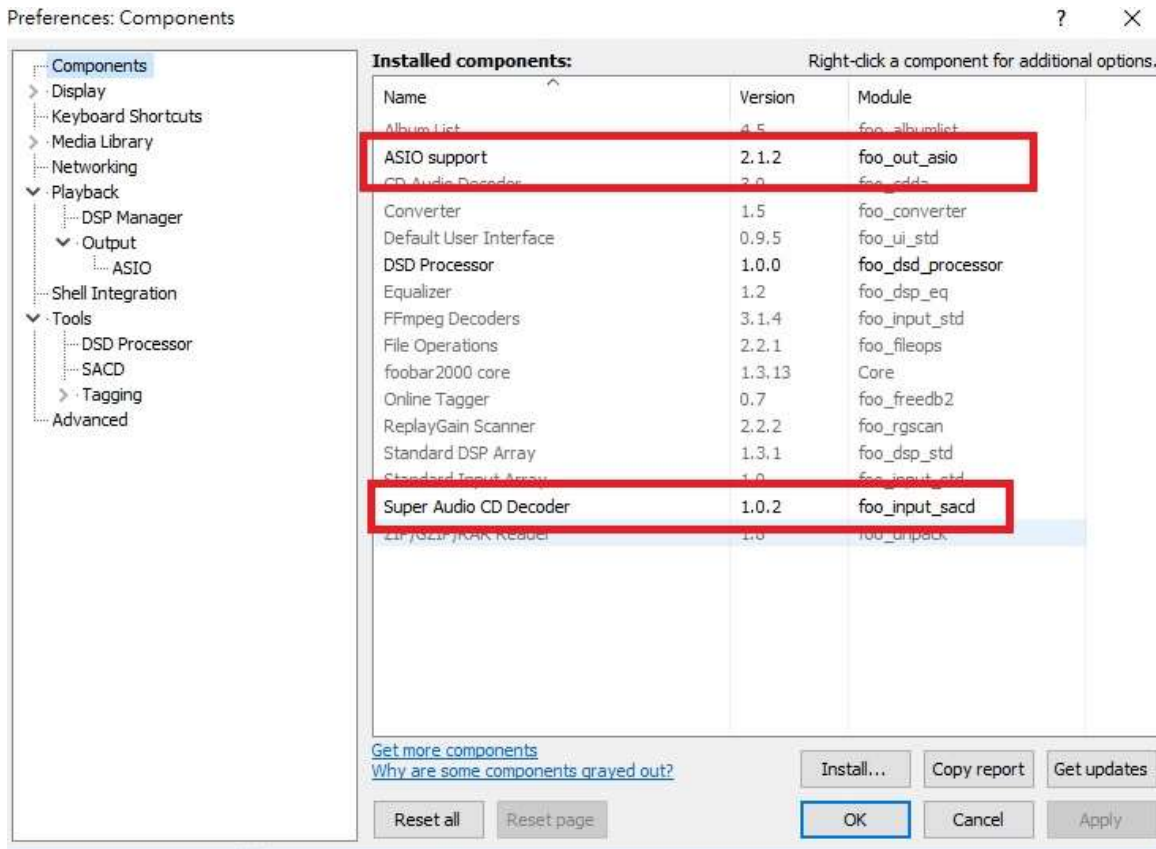
Record Connection Diagram



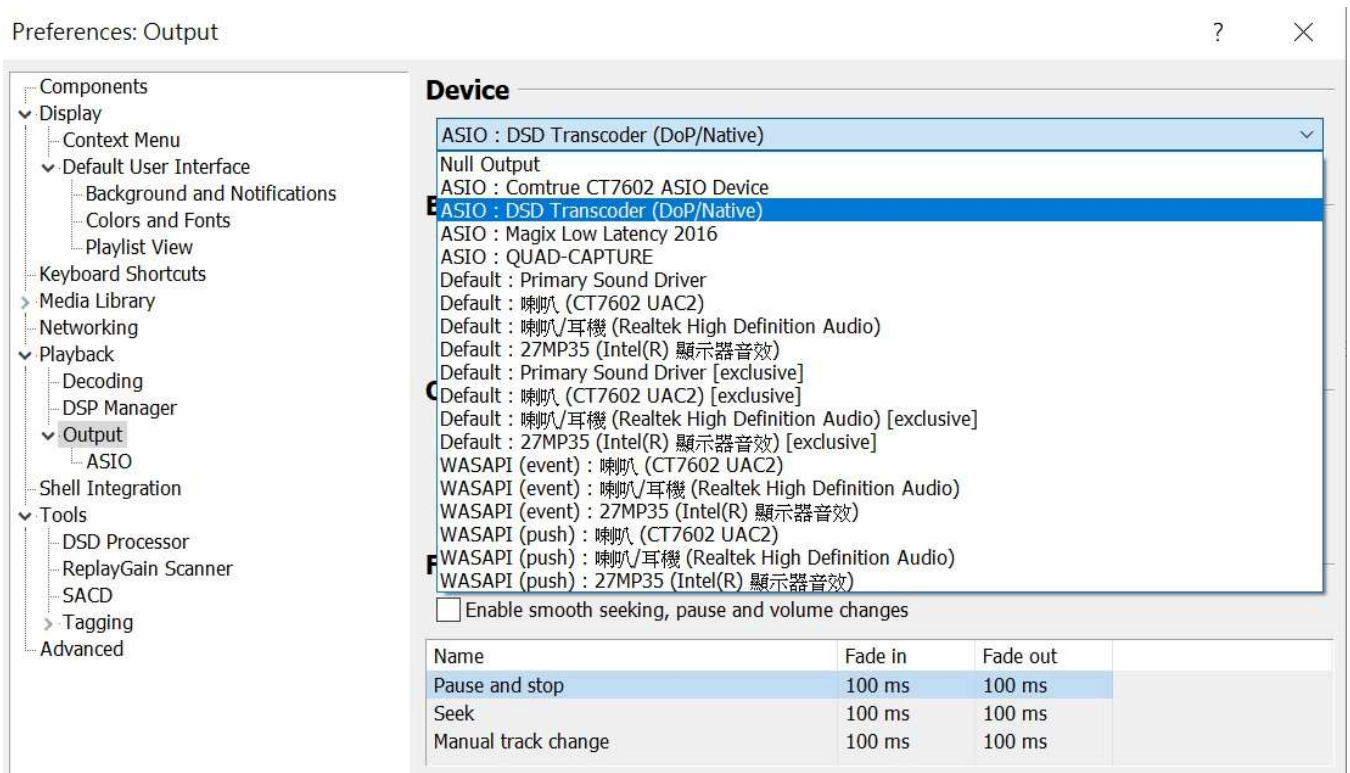
1. Connect USB B-TYPE cable to EVM board's USB port and another side USB cable connect to windows / MAC or Linux USB port.
2. Connect music source to EVM board's like DVD player , media player , mobile phone to analog input or connect digital microphone to CT7602 record I2S input
3. Connect analog output to your speaker if you want to listen it.
4. Use Microsoft default tool "Sound Recorder" or other recorder software to record file
5. Start record music and enjoy it

How to setup foobar2000

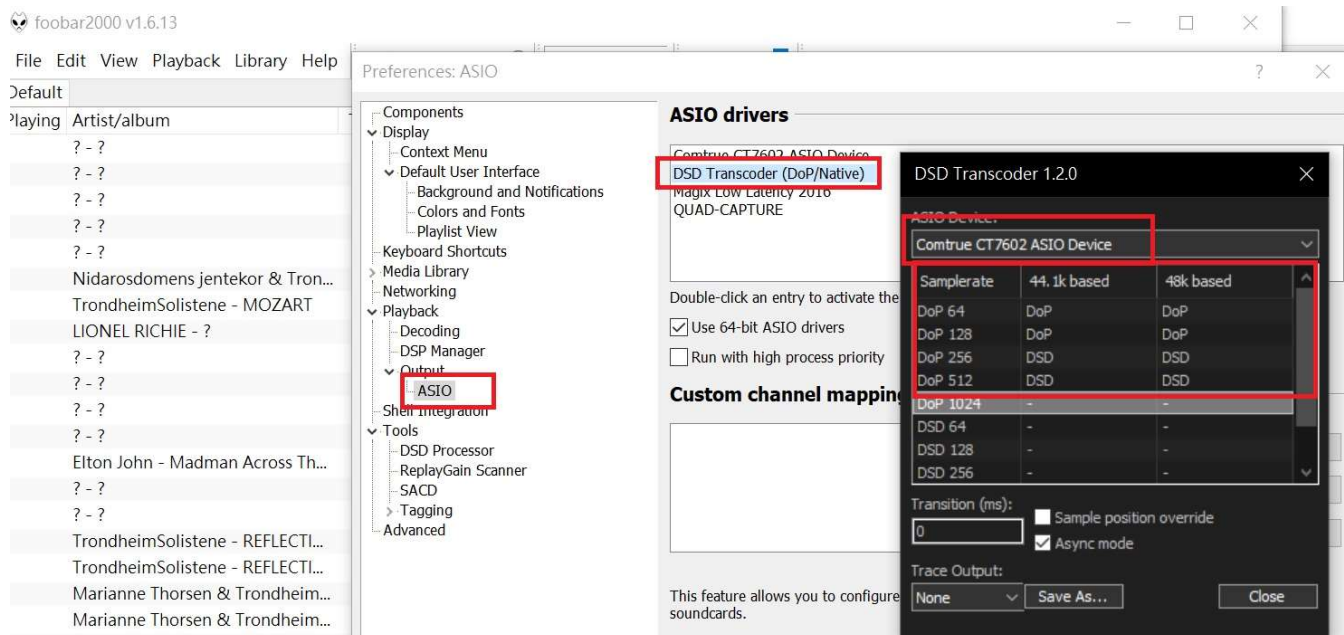
- Go to file/Preferences/Components Check external component install success, the will add new component like as below picture



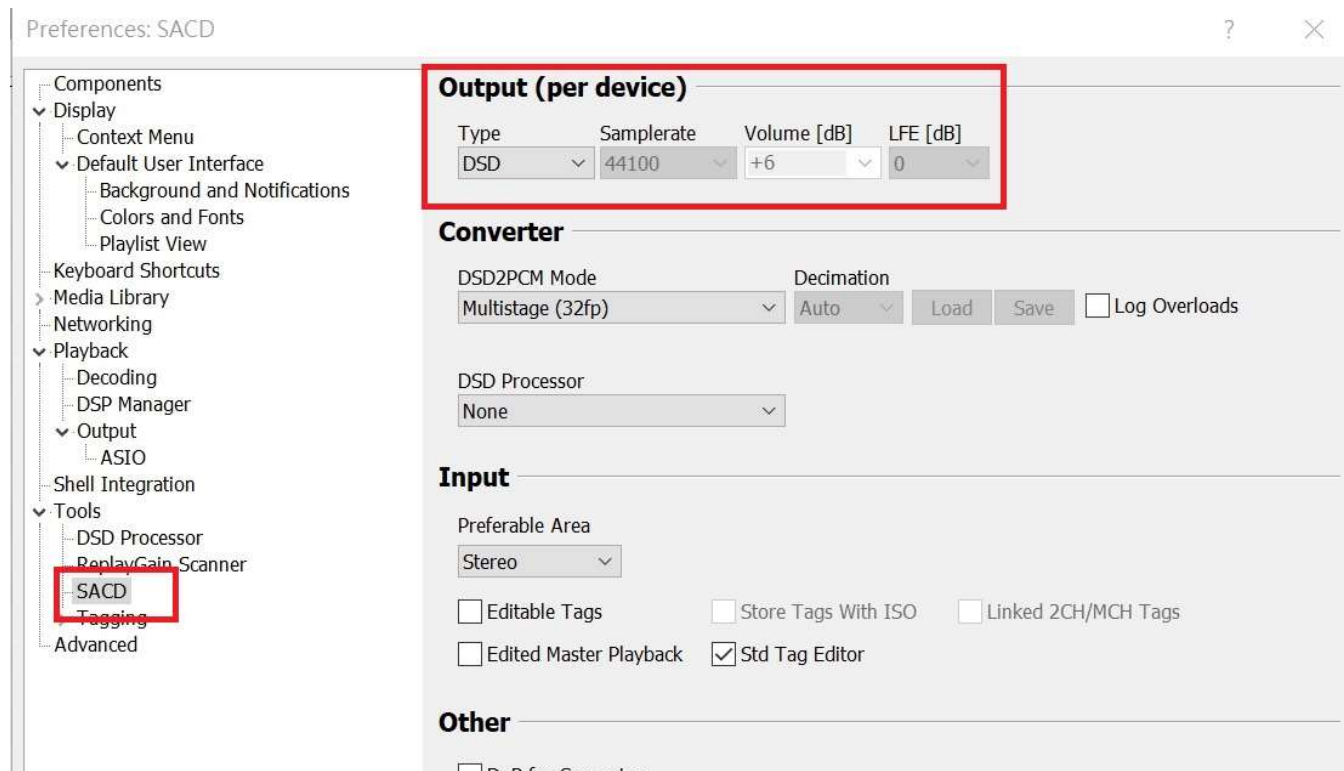
- Go to file/Preferences/Playback/Output, please choose ASIO : DSD Transcoder(DoP/Native)



- Go to file/Preferences/Playback/Output/ASIO, double click “DSD Transcoder(DoP/Native)” and choose “Comtrue CT7602 ASIO Device to setup 44.1K and 48K based play DoP or DSD”

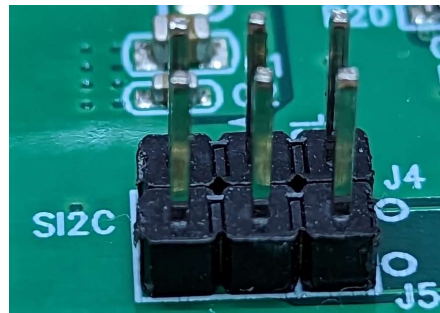
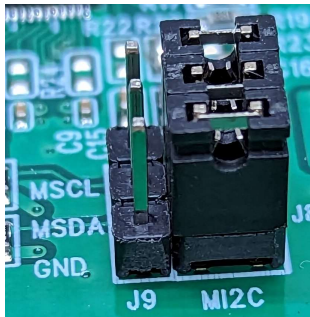


- Go to file/Preferences/Tools/SACD, Output Mode please choose DSD



- Choose music and you can play it now.

I2C Function



NAME	Description
SI2C(J4)	Slave I2C mode, use external I2C to control CT7601 and others chipset
MI2C(J9)	Master I2C mode, CT7601 use internal 8051 control others chipset

How to use I2S PCM/DSD directly output

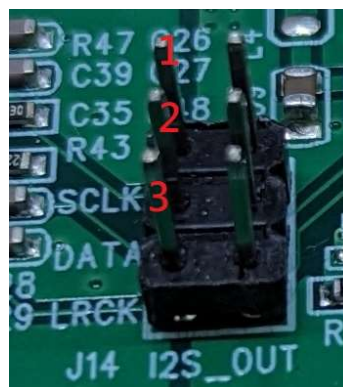
1. It can use CT7601 I2S PCM/DSD output function (J49) jump to your system I2S PCM/DSD input.

NO.	NAME
1	SCLK
2	DATA
3	LRCK

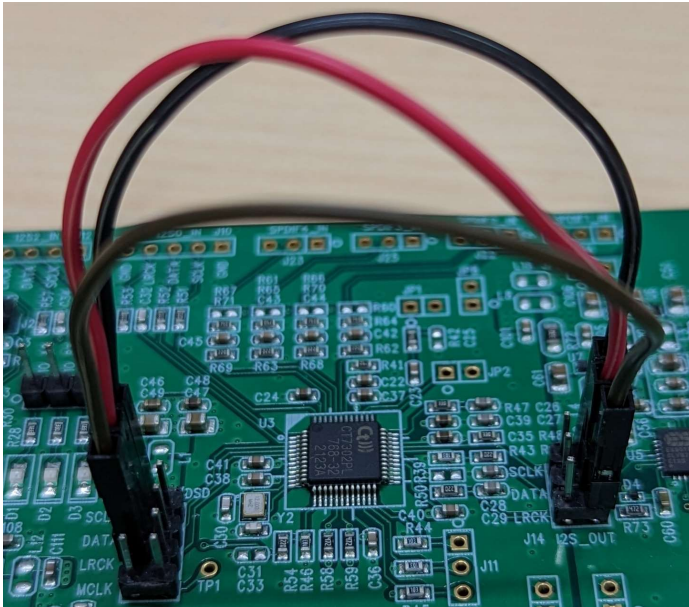


2. It can use CT7302 I2S PCM output function (J23) jump to your system I2S PCM input.

NO.	NAME
1	SCLK
2	DATA
3	LRCK



CT7602 I2S output Bypass CT7302 directly output to DAC



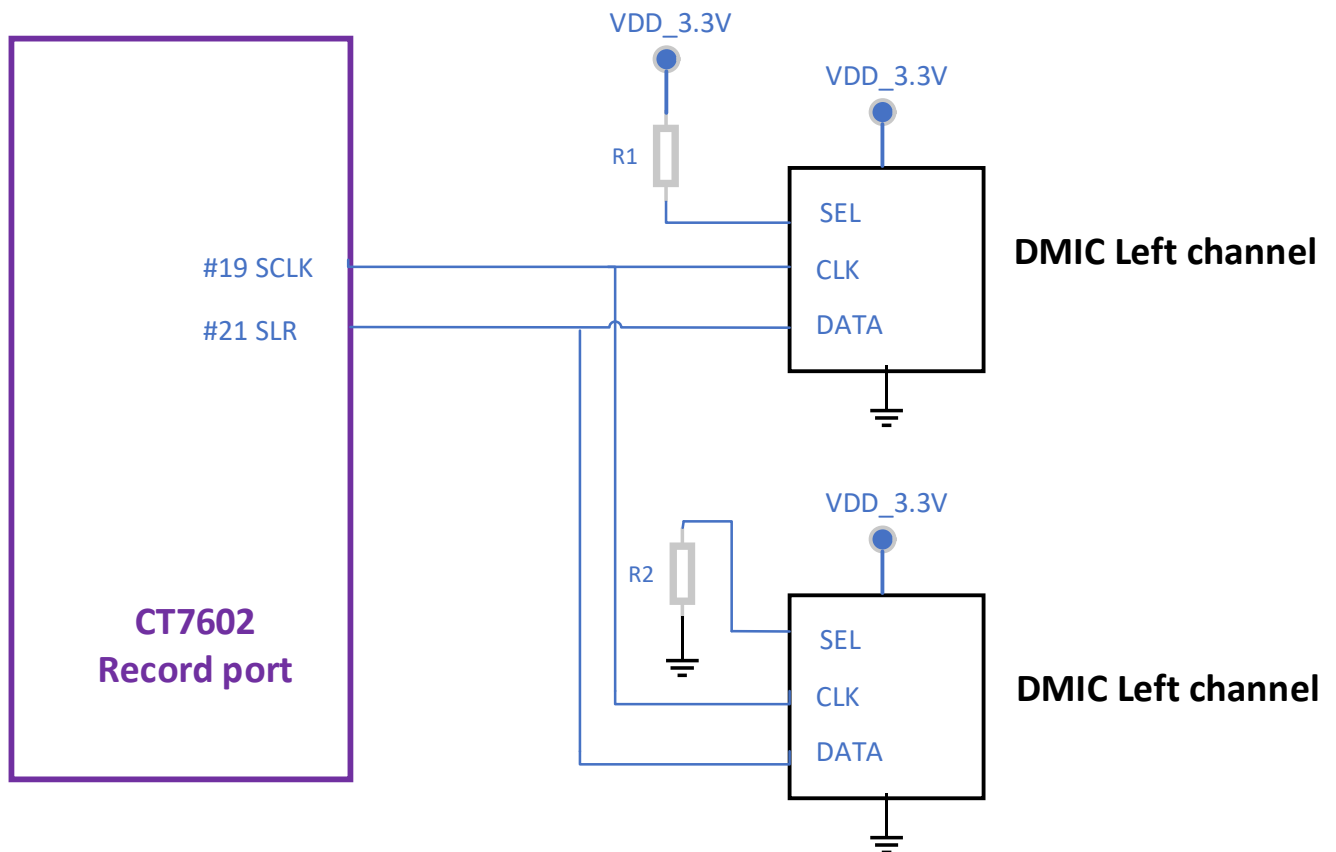
1. Bypass CT7302 SRC function, CT7602 directly jump wire I2S output to DAC ES9018K2M I2S input port.

DMIC Function

Feature

CT7602 can support Digital Microphone (D-MIC) input to instead ADC input on recording path. It can get higher performance input signal and reduce the BOM cost and PCB size on system application.

System Function block



For stereo record application, there are 2 D-MIC is necessary. The schematic is simple and just need connect pin #19 **SCLK** and pin #21 **SLR** of CT7602 to D-MIC is enough.

When Digital clock is generated from pin #19 **SCLK** (about 3.072MHz) and connect to D-MIC's **CLK** pin, it will feedback current data on its **DATA** pin and feedback to CT7602's #21 **SLR**. CT7602 will separate these signals and transfer them into stereo PCM format automatically.

Register Setting

Function Enable

1. The control register is allocated at Bank01_F0[7]. Set this bit to enable bit clock output for D-MIC.
Band01_F0[6:4] can change the output clock frequency.
2. Set BK05_46[0] to enable D-MIC input mode.
3. Set BK05_45[2:1] to select which D-MIC's output data is selected into Left or Right channel input according to the SEL is high or low.

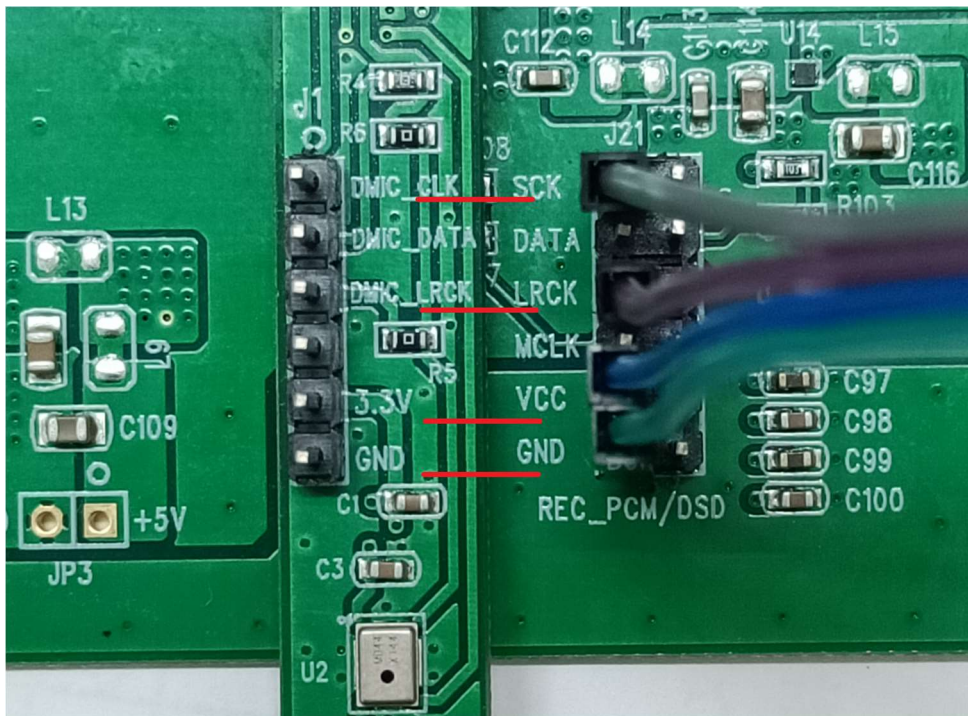
Mono mode record by one D-MIC

CT7602 also can use one D-MIC to capture the sound and distribute to Left/Right channel. Set register bit1 and bit2 of BK05_45 to select the available D-MIC chip is enough.

Demo board application stereo input

Hardware:

1. Use CT7602 demo board EVM-J and DMIC module board.
2. Remove the jumper on J21 which between CT7602 and ADC U11 CS5340.
3. Connect signal between DMIC board and J21 as below:
DMIC_CLK $\leftrightarrow$ SCK, DMIC_LRCK $\leftrightarrow$ LRCK, 3.3V $\leftrightarrow$ VCC, GND $\leftrightarrow$ GND



Firmware:

Set `#define USE_D_MIC 1` in Setting.h to enable this function.

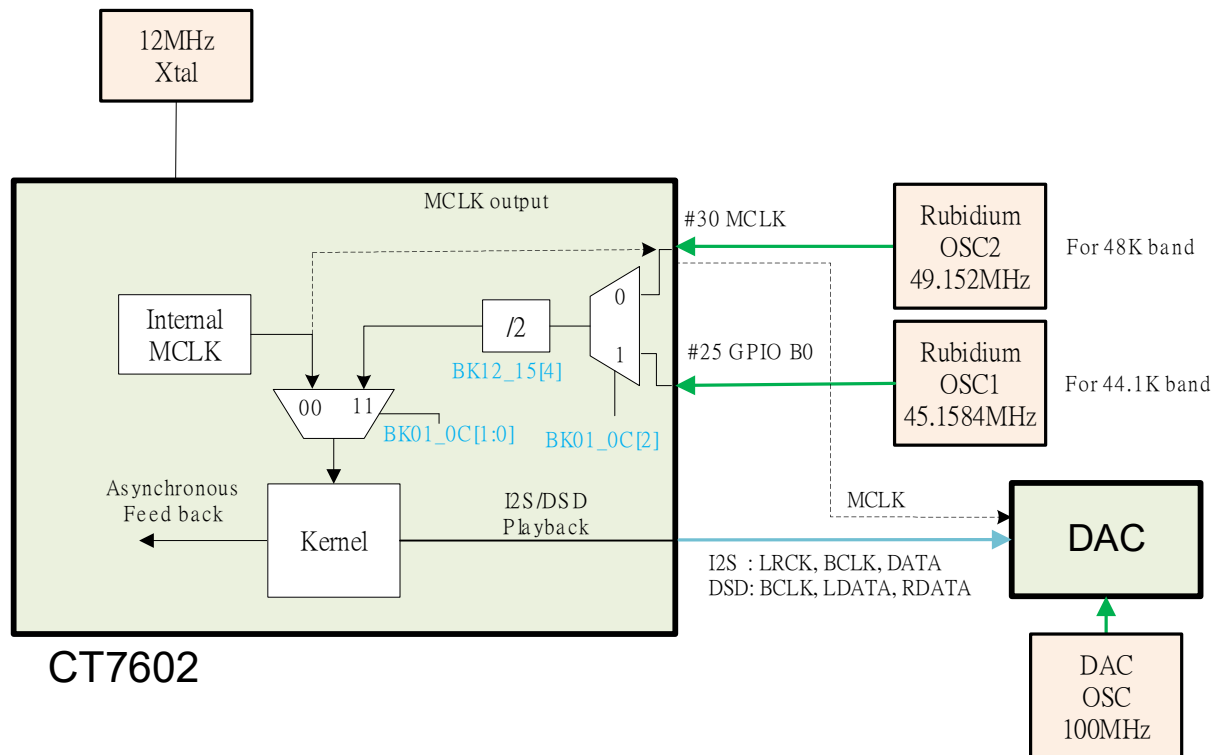
External OSC

Feature

For high end audio DAC system, it needs an ultra high precision clock system with low jitter MCLK on its chip to enhance the audio performance.

CT7602 serial chip support external MCLK input mode. The chip output I2S clock system is synchronized to this external clock.

System Function block



CT7602's MCLK output pin can be switched to input pin when external clock mode is enabled. There are two pins used for high precision oscillator clock input for different frequency band. It can switch which one is selected into kernel by register setting according to current playback frequency.

Register Setting

Function Enable

The control register is allocate at Bank01_OC[2]. Set this bit to enable external MCLK sync mode.

External Oscillator selection

There are two groups of OSC frequency selection on system application as the table below. User can select one group OSC pair on its system and set related register according to selection.

CT7602 IO pin	Playback frequency band	OSC group A	OSC group B
#30	Fb = 48K	24.576MHz	49.152MHz
#25	Fb = 44.1K	22.5792MHz	45.1584MHz
Register: Bank12_15[4] setting value		0	1

There is no need to set the other registers to meet current playback frequency. The chip internal PLL system will adjust its divider to meet current frequency. For example, 48K, 96K, 192K, 384K, 768K...

For different frequency 48K or 44.1K band, it has to switch the clock input port by register Bank01_OC[2] to select correct MCLK clock.

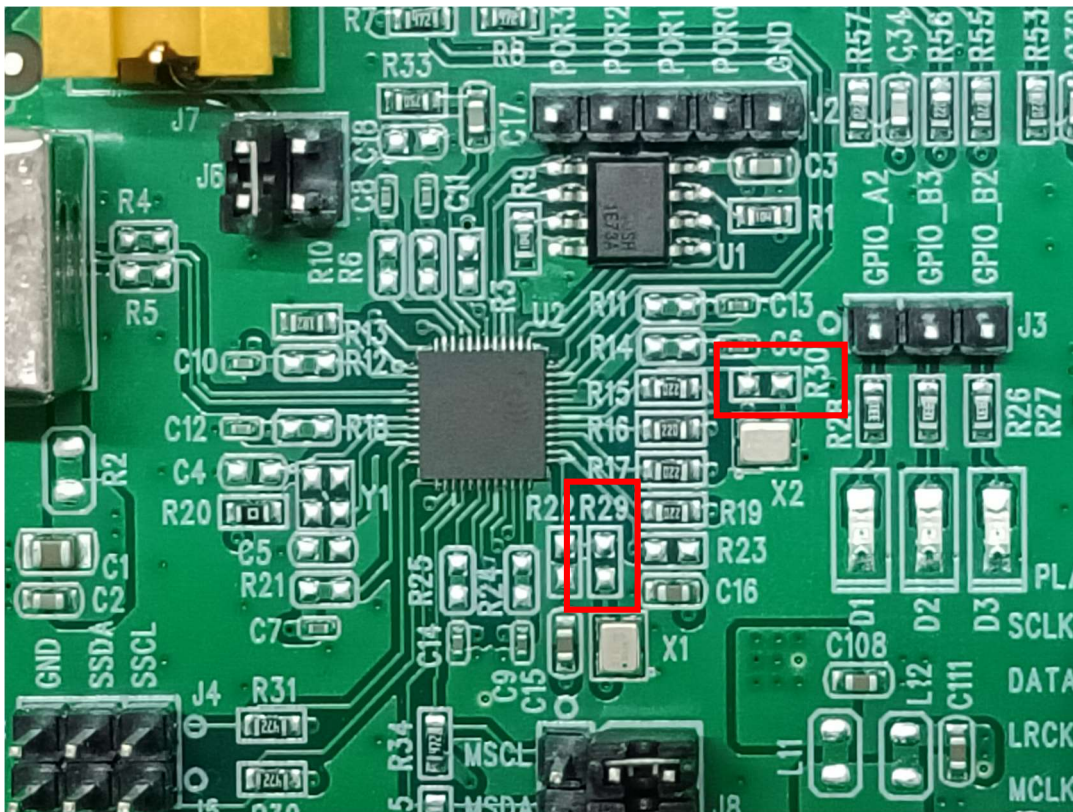
Address	Bit	Value	Function
0x0C	2	0	mclk ext in mode selection 0 = MCLK DAC_IN (play0) 1 = MCLK_DAC_IN_2(gpio B0)

Demo board application

Hardware:

The external OSC 45.1584MHz (X1) and 49.152MHz (X2) have embedded on demo board and connected to pin via resistors. The resistors R29, R30 are empty on default state. It has to add 0 ohm resistor on this position to active this external OSC function.

Make sure the firmware (or register) setting already enable this function, and MCLK output pin become input before add R30. Or two MCLK are interference each other on pin #30.



Firmware:

Set `#define PLAY_EXTERNAL_MCLK 1` in Setting.h to enable this function.

MAC Play mode setup

1. MAC use UAC2 standard driver, so demo board don't need install driver. Please directly plug demo board to MAC USB port.
2. Use Spotlight to search "Midi" and use it to select Play mode. Primary Play Interface=> Play0 mode
3. The MIDI also can select audio format and channels. The audio format maximum can support to 768K/32bit.

