curryman DAC

User manual V1.1

The curryman DAC is a stereo digital to analog converter with I2S input featuring the ES9023 Sabre Premier Stereo DAC and an analog LCR output filter plus JFET buffer ("JG Filter Buffer" developed by Joachim Gerhard) for improved high frequency noise suppression and output drive capability.

Features:

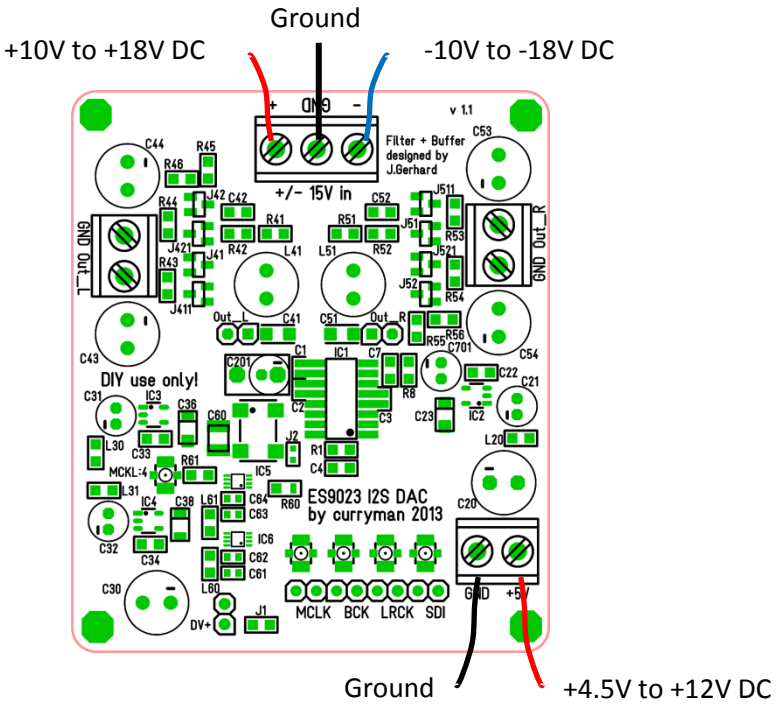
- I2S Input
- Stereo 2Vrms output unbalanced
- Improved LCR output filter for reduced HF noise
- JFET buffer/line driver with low output impedance (< 70 Ohm)
- On board low jitter 50MHz crystal oscillator (XO)
- On board low noise LDO regulators for DAC (3.6V) and XO (3.3V)
- Supported I2S input sample rates (kHz): 32, 44.1, 48, 88.2, 96, 176.4, 196
- Asynchronous mode operation using local XO as MCLK
- Power Supply:
    - +4.5V to +12V DC (regulated or unregulated) for DAC and XO
    - +/- 10V to +/- 18V DC (regulated, low noise) for output buffer

DC Connectivity:

The DAC board requires two power supplies:

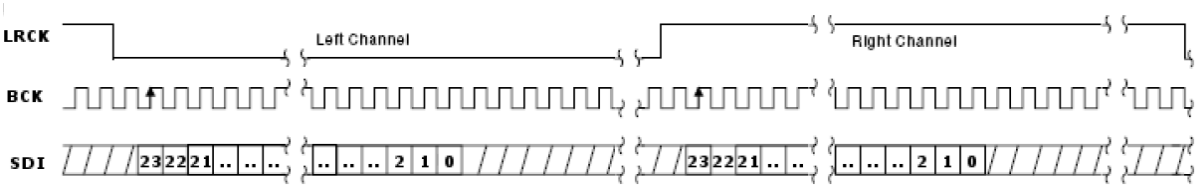
- a (regulated or unregulated) DC power supply for the DAC and XO in the range from 4.5V to 12V (max. 65mA) and
- a regulated bipolar DC power supply between +/-10V and +/-18V (max. 35mA per rail).

Make sure to carefully follow the below wiring diagram to prevent any short circuits or damage to the board.



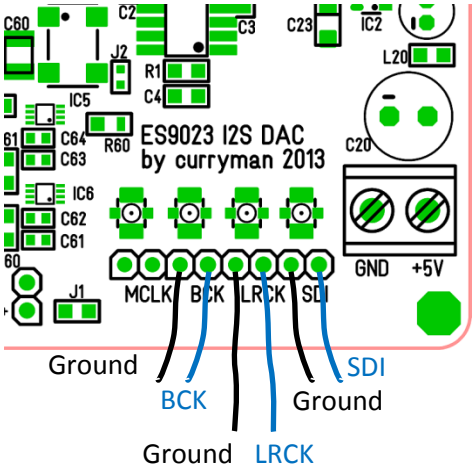
I2S Connectivity:

The ES9023 is configured to I2S slave mode and will work with I2S signals according to the following timing diagram (standard I2S timing):



It will lock on to any of the following sample rates (kHz): 32, 44.1, 48, 88.2, 96, 176.4, and 196.

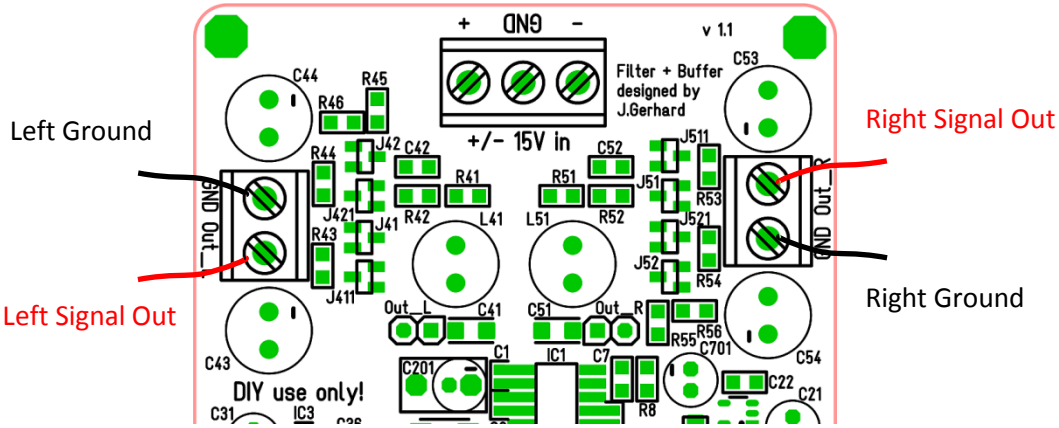
The DAC is configured to run in asynchronous mode and does **not** require external MCLK. Thus only BCK (bit clock), LRCK (left/right clock or word clock) and I2S data lines (SDI) have to be connected as per the following diagram:



Please keep I2S signal lines as short as possible and provide a separate ground wire for each I2S signal line (e.g. ribbon cable).

Analog Output Connectivity:

The unbalanced left and right analog outputs are provided via two screw terminals. The output levels are 2Vrms at digital full scale (0dB[FS]) and the output impedance is < 70 Ohms. The following diagram shows the correct wiring of the analog outputs:

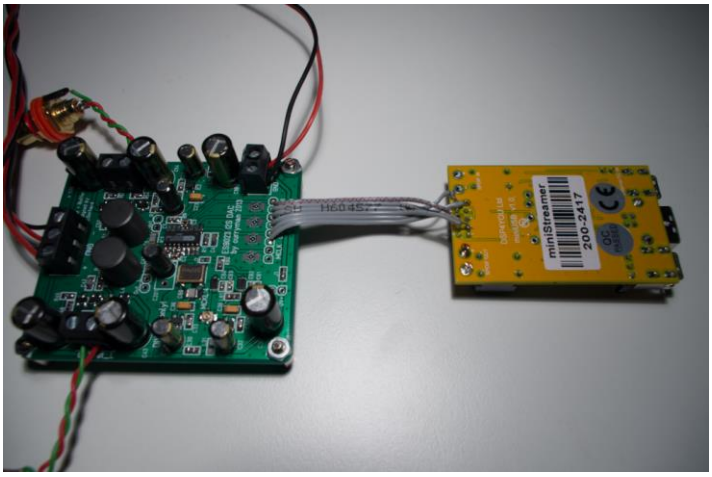


Application examples:

Combination with miniSTREAMER:

miniSTREAMER must be set to I2S Master. The I2S input of the DAC can be connected to the buffered I2S output at the I2S Expansion connector (please refer to miniSTREAMER datasheet) using the following pin assignment:

curryman DAC	miniSTREAMER
SDI Pin	Pin #6 (SDOUT)
BCK Pin	Pin #1 (SCLKOUT)
LRCK Pin	Pin #2 (LRCLKOUT)
GND Pins	Pin #7 (GND)



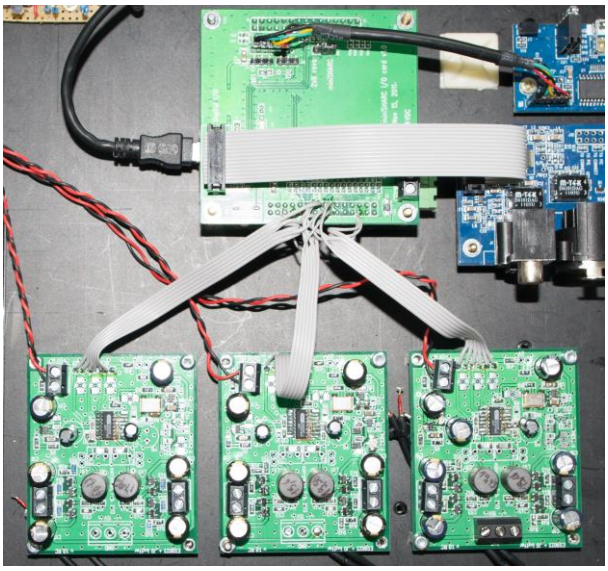
Example 1 : Connection between miniSTREAMER and curryman DAC using ribbon cable

Combination with miniSHARC:

The I2S input of the DAC can be connected to the I2S outputs of the miniSHARC via the I2S In&Out Expansion port (J2, please refer to miniSHARC datasheet/user manual) using the following pin assignment:

curryman DAC	miniSHARC
SDI Pin	Pin #16 for output channels 1&2 (I2S_DATA_OUT1&2) Pin #17 for output channels 3&4 (I2S_DATA_OUT3&4) Pin #18 for output channels 5&6 (I2S_DATA_OUT5&6) Pin #19 for output channels 7&8 (I2S_DATA_OUT7&8)
BCK Pin	Pin #15 (I2S_IN_BCLK)
LRCK Pin	Pin #14 (I2S_IN_LRCK)
GND Pins	Pins #5 - #8

The combination of the miniSHARC with 3 curryman DACs (6ch, Stereo 3way setup) has been successfully tested without using an additional active buffer circuit. I2S connections should be kept as short as possible!



Example 2: Connection between miniSHARC and 3 curryman DAC using ribbon cable