I2SoverUSB v.III Fully Isolated outputs

The **I2SoverUSB v.III Fully Isolated outputs** is compatible with *I2SoverUSB v.III* board. Main difference between both boards is that all outputs of *I2SoverUSB v.III Fully Isolated board* are isolated from USB ground, also supports more output protocols.

H1 header 10x1 raw 2.54 pitch

Pin #	Name	Type	Description
1	VDD	Power	If external power jumper is not cut +5.00VDC output. If external power jumper is cut power supply input 3.9V to +5.2VDC for USB input part.
2	GND	Ground	Electrical ground
3	GP_IN/OUT	In/Out	General purpose input/ output pin.
4	A0	ISO_Output	Selecting external master frequency Low: the sampling frequency is a multiple of 44.1kHz. High: the sampling frequency is a multiple of 48kHz.
5	A1	ISO_Output	Sampling rate information.
6	A2	ISO_Output	Sampling rate information.
7	MUTE	ISO_Output	Mute signal Low: the audio data stream is not valid and the DAC must be muted. High: the audio data stream is valid
8	DSD_PCM	ISO_Output	Audio Stream Format Low: the digital audio output stream format is PCM High: the digital audio output stream format is DSD
9	A3	ISO_Output	Sampling rate information.
10	I_GND	ISO_Ground	Isolated electrical ground

1 VDD	2 GND	3 GP_I/O	4 A0	5 A1	6 A2	7 MUTE	8 DSD_P	9 A3	10 I_GND

Note: H1.7 – is for header H1, pin7; All outputs are 3.3V

H3 header 10x2 raw 2.54 pitch

Pin #	Name	Type	Description
1	A0_inv	ISO_Output	Selecting external master frequency isolated Low: the sampling frequency is a multiple of 48kHz. High: the sampling frequency is a multiple of 44.1kHz.
2	I_GND	ISO_Ground	Isolated ground connection
3	Ex_MCLK	Input	External master clock input
4	I_GND	ISO_Ground	Isolated ground connection
5	MCLK_out	ISO_Output	General purpose output MCLK
6	I_GND	ISO_Ground	Isolated ground connection
7	GP_IN/OUT	ISO_ In/Out	GP_IN/OUT for future options
8	I_GND	ISO_Ground	Isolated ground connection
9	SPDIF	ISO_Output	S/PDIF output for direct control of TOTX, use at least 12MBPS --- Data R, after configuration
10	I_GND	ISO_Ground	Isolated ground connection
11	BCLK_I2S	ISO_Output	BCLK_I2S / CLK DSD
12	I_GND	ISO_Ground	Isolated ground connection
13	DATA_I2S	ISO_Output	DATA_I2S / DATA_L DSD default --- Data L, after configuration
14	I_GND	ISO_Ground	Isolated ground connection
15	LR_CLK_I2S	ISO_Output	LRCLK_I2S / DATA_R DSD default
16	I_GND	ISO_Ground	Isolated ground connection
17	VDD	ISO_Power	Isolated power supply input +5.00VDC for oscillators and reclock.
18	DSD_PCM_inv	ISO_Output	Low: the digital audio output stream format is DSD High: the digital audio output stream format is PCM
19	I_GND	ISO_Ground	Isolated ground connection
20	MUTE_inv	ISO_Output	Mute signal Low: the audio data stream is valid High: the audio data stream is not valid and the DAC must be muted.

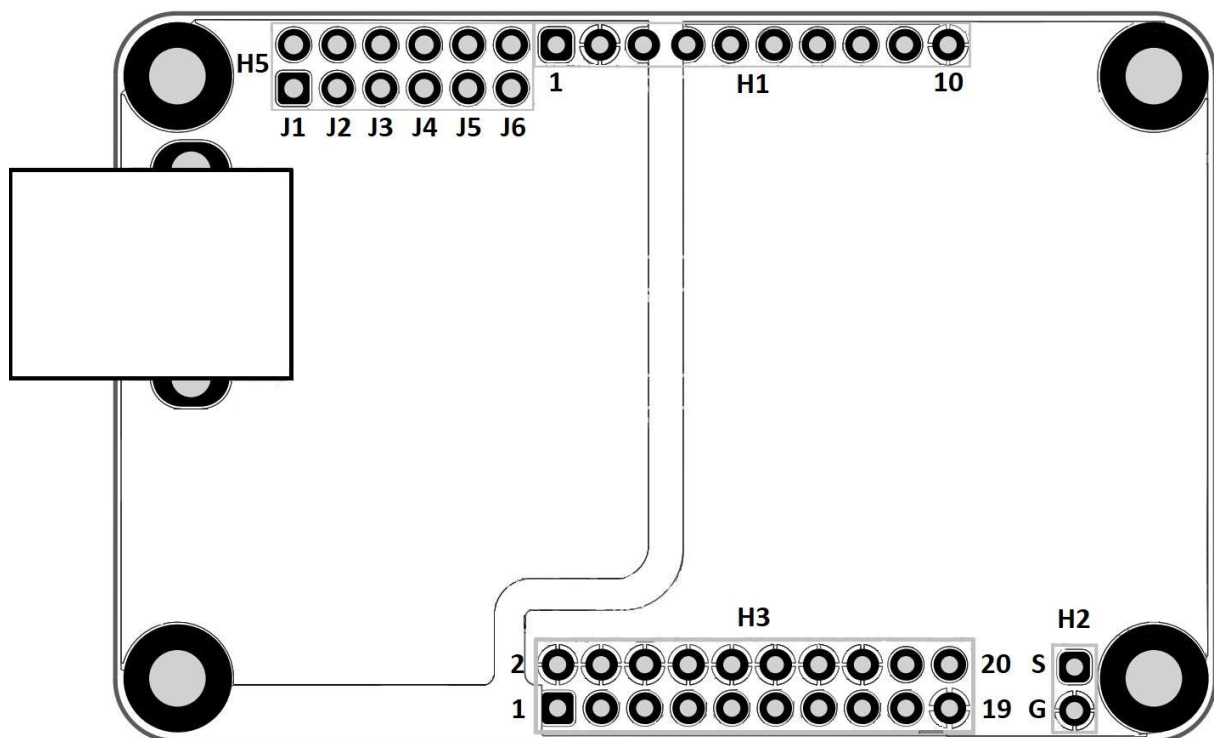| 2 I_GND	4 I_GND	6 I_GND	8 I_GND	10 I_GND	12 I_GND	14 I_GND	16 I_GND	18 DSD_i	20 MUTE_i
1 A0_inv	3 ExMCLK	5 MCLK_o	7 GP_I/O	9 SPDIF	11 BCLK	13 DATA	15 LR	17 VDD	19 I_GND

The USB host recognizes the *I2SoverUSB v.III Fully Isolated outputs* board if it's plugged in, but the board will start to play only if there is power supply on H3.17 (pin17 of H3) and H3.19 (pin19 of H3).

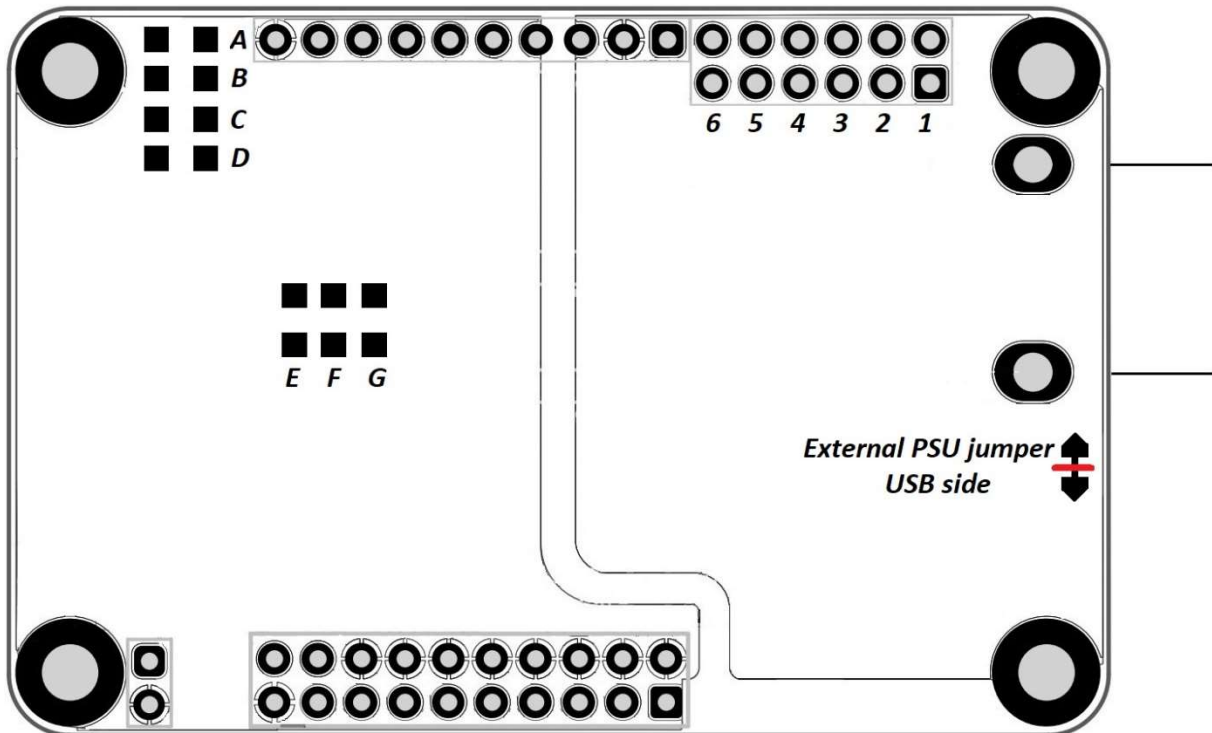Power **I2SoverUSB** *v.III Fully Isolated outputs* board:

1. Bus-powered option. In this case, there is no galvanic isolation between the USB side and the user application side. In order the board to play, one must connect H1.1 to H3.17; and H1.2 (GND) to H3.19(GND). Consumption is less than 500mA.
2. Bus-powered USB side and external power supply for oscillators and reclock. In this case there is galvanic isolation between the USB side and user application side. Plug the USB cable to USB B connector, provide external power supply to H3.17 and H3.19 (4.5V to 5.3V). Consumption from USB host is less than 400mA, consumption from external power supply for oscillators and reclock is less than 100mA.
3. Using two external power supplies. One must cut external power supply jumper located on the bottom side of the board, then provide external power supply for USB side (400mA; 3.9V to 5.2V) on H1.1 and H1.2, provide external power supply to H3.17 and H3.19 (100mA, 4.5V to 5.3V).

The USB host recognize the **I2SoverUSB** *v.III Fully Isolated outputs* board when there is power supply on H1.1 and H1.2, but the board will start to play after providing and power supply on H3.17 and H3.19 (no matter of which power supply comes first).

1 VDD	2 GND	3 GP_I/O	4 A0	5 A1	6 A2	7 MUTE	8 DSD_P	9 A3	10 I_GND

2 I_GND	4 I_GND	6 I_GND	8 I_GND	10 I_GND	12 I_GND	14 I_GND	16 I_GND	18 DSD_i	20 MUTE_i
1 A0_inv	3 ExMCLK	5 MCLK_o	7 GP_I/O	9 SPDIF	11 BCLK	13 DATA	15 LR	17 VDD	19 I_GND

Configuring the *I2SoverUSB v.III Fully Isolated outputs* board for different types of DACs.

For configuration of the board H5 header is used (J1 to J6, 6x2 raw 2.54 pitch, 0R 0805 resistors are needed). A to G (on the bottom side of the board (0R 0805 resistors are needed).

Note: Open – no configurational resistor; Close – 0R resistor must be soldered.

1. I2S like protocols

AKM, TI, ESS, ROHM, CIRRUS LOGIC and all DACs in I2S like protocols.

	J3	J4	J5	J6
I2S	Open	Open	Open	Open
LJ	Open	Open	Open	Close
S/PDIF	Open	Open	Close	Open
RJ24	Open	Open	Close	Close
RJ20	Open	Close	Open	Open
RJ18	Open	Close	Open	Close
RJ16	Open	Close	Close	Open
TDA1541 I2S	Open	Close	Close	Close
LJ16	Close	Close	Close	Close

If your DAC needs MCLK, just like AK449X, PCM1794, BD34301, set proper MCLK_out via A to G configuration resistors.

AK4490, AK4493, AK4495, AK4497 and all DACs in I2S like protocols.
On MCLK_out (H3.5) pin, one will have 22.5792MHz/ 24.576MHz MCLK.

	J3	J4	J5	J6	A	B – F
I2S	Open	Open	Open	Open	Close	Open

ES90XX DACs I2S mode.

	J2	J3	J4	J5	J6	A – F
I2S	Close	Open	Open	Open	Open	Open

S/PDIF output configuration

	J3	J4	J5	J6	A – F
SPDIF	Open	Open	Close	Open	Open

TDA1541

TDA1541 in I2S mode in 32-bit frame.

	J3	J4	J5	J6	A – F
I2S	Open	Close	Close	Close	Open

Pin27 of the TDA1541 must be connected to +5V, pin2 of TDA1541 and pin4 of TDA1541 must be tied together. The DAC is working up to 192kHz in this mode.
TDA1541 in simultaneous mode please check page 6 and 8

SM5813 output configuration

	J3	J4	J5	J6	A – B	C – F
LJ	Open	Open	Open	Close	Close	Open

2. PCM1704 like protocols

	J3	J4	J5	J6
24-bit	Close	Open	Open	Open
20-bit	Close	Open	Open	Close
18-bit	Close	Open	Close	Open
16-bit	Close	Open	Close	Close
TDA1541 S	Close	Close	Open	Open
32-bit	Close	Close	Open	Close

PCM1704

	J3	J4	J5	J6	A – F
24-bit	Close	Open	Open	Open	Open

PCM1702, PCM63, AD1862, SM5813

	J3	J4	J5	J6	A – F
20-bit	Close	Open	Open	Close	Open

PCM58, AD1865, PCM61, AD1861, AD1860

	J3	J4	J5	J6	A – F
18-bit	Close	Open	Close	Open	Open

PCM56, AD1851

	J3	J4	J5	J6	A – F
16-bit	Close	Open	Close	Close	Open

TDA1541 simultaneous mode

	J3	J4	J5	J6	A – C	D – F
TDA1541	Close	Close	Open	Open	Open	Close

TDA1541 in simultaneous mode. Pin27 of the TDA1541 must be connected to -5V. The DAC is working up to 384kHz in this mode. *In this mode we recommend one to use mute circuit.*

3. Working with external MCLK

	G
On board oscillators	Open
External Master clock	Close

4. DSD channels swap

	J2 Open	**J2 Close**
H3.13 DATA_I2S	DSD_L	DSD_R
H3.15 LR_CLK_I2S	DSD_R	DSD_L

J2 is used to swap DSD channels. If J2 is open the DSD channels are configured for AK4XXX DACs, if J2 is closed DSD channels are configured for ESS9XXX DACs.

Schemes for connecting different DACs and digital filters

SM5813ART · PCM58

AD1865 · PCM56, PCM61, AD1862 / AD1861, AD1860, AD1851
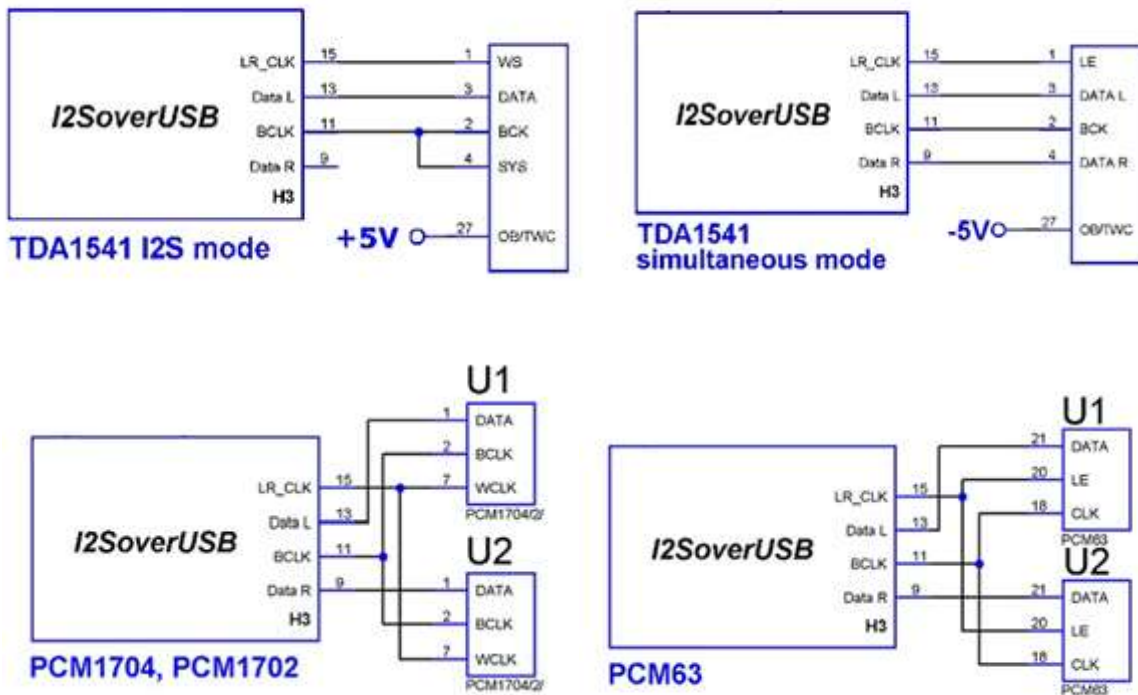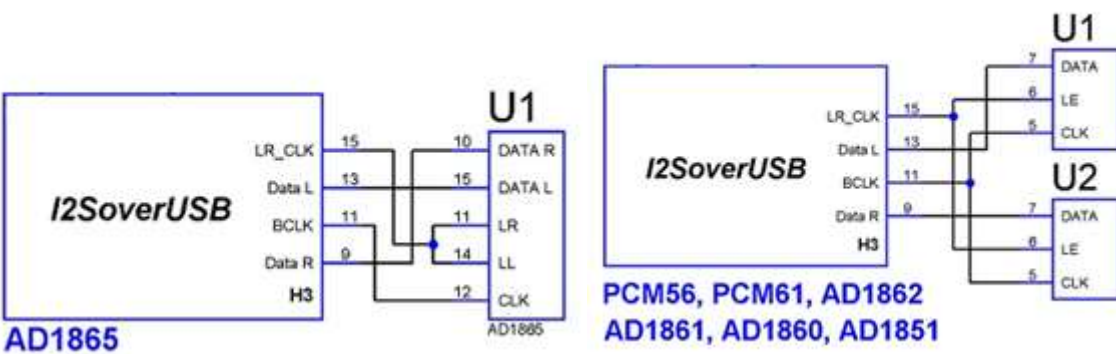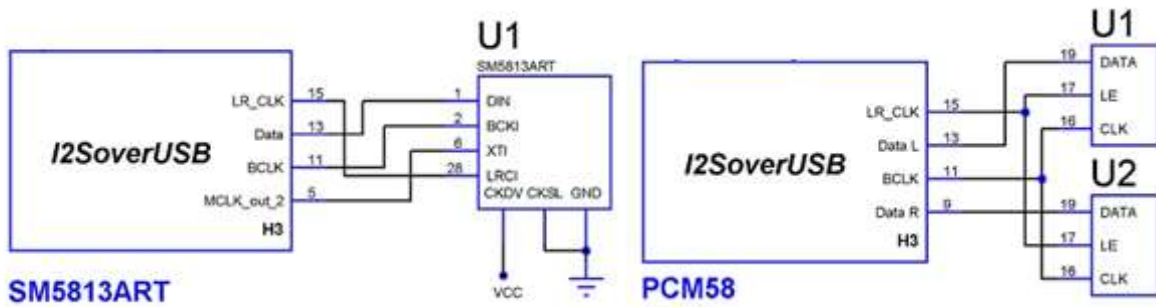
Configuring MLCK_out

	A	B	D	E	F	G	Description
On board MCLK	Open	Open	Open	Open	Open	Open	No MLCK
On board MCLK	Close	Open	Open	Open	Open	Open	MCLK div 2
On board MCLK	Open	Close	Open	Open	Open	Open	MCLK
On board MCLK	Close	Close	Open	Open	Open	Open	MCLK div 4
On board MCLK	Close	Open	Open	Close	Open	Open	AK4493
On board MCLK	Open	Open	Close	Close	Close	Open	TDA1541 simultaneous mode
External MCLK	Open	Open	Open	Open	Open	Close	No MLCK
External MCLK	Close	Open	Open	Open	Open	Close	MCLK div 2
External MCLK	Open	Close	Open	Open	Open	Close	MCLK
External MCLK	Close	Close	Open	Open	Open	Close	MCLK div 4
External MCLK	Close	Open	Open	Close	Open	Close	AK4493
External MCLK	Open	Open	Close	Close	Close	Close	TDA1541 simultaneous mode

Indicating input sample rate (H1 header)

Sample rate	DSD_PCM	A3	A2	A1	A0
44.1kHz	0	0	0	0	0
48kHz	0	0	0	0	1
88.2kHz	0	0	0	1	0
96kHz	0	0	0	1	1
176.4kHz	0	0	1	0	0
192kHz	0	0	1	0	1
352.8kHz	0	0	1	1	0
384kHz	0	0	1	1	1
705.6kHz	0	1	0	0	0
768kHz	0	1	0	0	1
DSD64 DoP	1	0	1	0	0
DSD64 DoP	1	0	1	0	1
DSD128 DoP	1	0	1	1	0
DSD128 DoP	1	0	1	1	1
DSD256 DoP	1	0	0	1	0
DSD256 DoP	1	0	0	1	1
DSD64 N	1	1	1	0	0
DSD64 N	1	1	1	0	1
DSD128 N	1	1	1	1	0
DSD128 N	1	1	1	1	1
DSD256 N	1	1	0	1	0
DSD256 N	1	1	0	1	1
DSD512 N	1	1	0	0	0
DSD512 N	1	1	0	0	1