I2SoverUSB v.III

The *I2SoverUSB v.III* is compatible with I2SoverUSB board, except configuration and pin 20, i.e. the *I2SoverUSB v.III* will fully work with oscillator board, AK4396 DAC, AK4490 DAC.

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	Input	General purpose input for selecting I2S or PCM704 output like protocols.
4	A0	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	Output	Sampling rate information.
6	A2	Output	Sampling rate information.
7	MUTE	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	Output	Audio Stream Format Low: the digital audio output stream format is PCM High: the digital audio output stream format is DSD
9	A3	Output	Sampling rate information.
10	GND	Ground	Electrical ground

1 VDD	**2** GND	**3** GP-IN	**4** A0	**5** A1	**6** A2	**7** MUTE	**8** DSD_P	**9** A3	**10** GND

***Note**:* H1.7 – is for header H1, pin7

H3 header 10x2 raw 2.54 pitch

Pin #	Name	Type	Description
1	A0_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	GND	Ground	Isolated ground connection
3	Ex_MCLK	Input	External master clock input
4	GND	Ground	Isolated ground connection
5	MCLK_out_2	Output	General purpose for MCLK_2
6	GND	Ground	Isolated ground connection
7	MCLK_out_1	Output	General purpose for MCLK_1
8	GND	Ground	Isolated ground connection
9	SPDIF	Output	S/PDIF output for direct control of TOTX, use at least 12MBPS --- Data R, after configuration
10	GND	Ground	Isolated ground connection
11	BCLK_I2S	Output	BCLK_I2S / CLK DSD
12	GND	Ground	Isolated ground connection
13	DATA_I2S	Output	DATA_I2S / DATA_L DSD default --- Data L, after configuration
14	GND	Ground	Isolated ground connection
15	LR_CLK_I2S	Output	LRCLK_I2S / DATA_R DSD default
16	GND	Ground	Isolated ground connection
17	VDD	Power	Isolated power supply input +5.00VDC for oscillators and reclock.
18	DSD_PCM_iso	Output	Audio Stream Format isolated Low: the digital audio output stream format is DSD High: the digital audio output stream format is PCM
19	GND	Ground	Isolated ground connection
20	MUTE_iso	Output	Mute signal isolated Low: the audio data stream is valid High: the audio data stream is not valid and the DAC must be muted.

2 GND	**4** GND	**6** GND	**8** GND	**10** GND	**12** GND	**14** GND	**16** GND	**18** DSD_i	**20** MUTE_i
1 A0_iso	**3** ExMCLK	**5** MCLK_2	**7** MCLK_1	**9** SPDIF	**11** BCLK	**13** DATA	**15** LR	**17** VDD	**19** GND

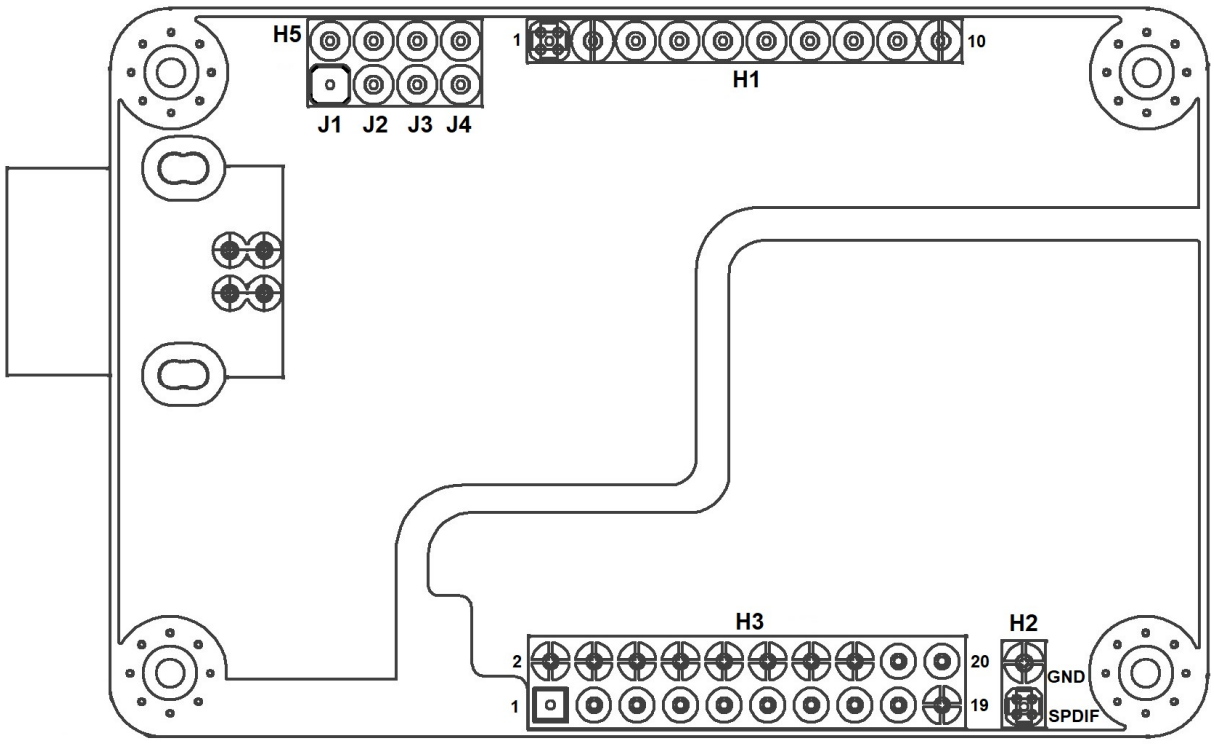
The USB host recognizes the *I2SoverUSB v.III* board if it's plugged in, but the board will start to play only if there is power supply on H3.17 (pin17 of H3) and H3.19 (pin19 of H3).

Power **I2SoverUSB *v.III*** board:

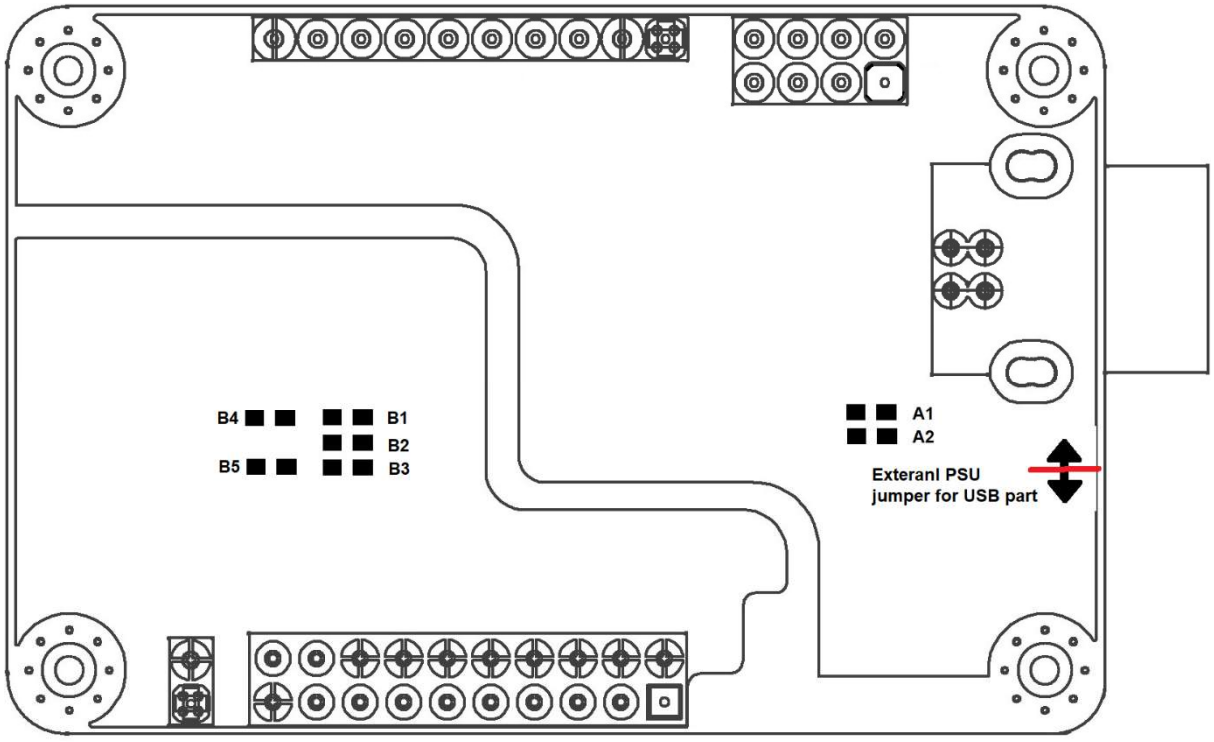
1. Bus-powered option. In this case, there is no galvanic isolation between the USB side and the user application side. In order the board to play, one must connect H1.1 to H3.17; and H1.2 (GND) to H3.19(GND). Consumption is less than 500mA.
2. Bus-powered USB side and external power supply for oscillators 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; 4.0V to 5.3V) 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*** 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-IN	**4** A0	**5** A1	**6** A2	**7** MUTE	**8** DSD_P	**9** A3	**10** GND



2 GND	**4** GND	**6** GND	**8** GND	**10** GND	**12** GND	**14** GND	**16** GND	**18** DSD_i	**20** MUTE_i
1 A0_iso	**3** ExMCLK	**5** MCLK_2	**7** MCLK_1	**9** SPDIF	**11** BCLK	**13** DATA	**15** LR	**17** VDD	**19** GND



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

For configuration of the board H5 header is used (J1 to J4, 4x2 raw 2.54 pitch). A1 and A2 on the bottom side of the *I2SoverUSB v.III* (0R 0805 resistors are needed, it's **different** from A0 and A1 on H1 header). B1 to B5 (on the bottom side of the *I2SoverUSB v.III* (0R 0805 resistors are needed).

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

I2S like protocols

1. I2S like protocols on board oscillators

AK4490, AK4493, AK4495, AK4497 and all DACs in I2S like protocols.
On MCLK_out_1 (H3.7) pin, one will have 22.5792MHz/ 24.576MHz MCLK.

	J3	J4	B1	B2	B3	B5
I2S	Open	Open	Close	Open	Close	Open
LJ	Open	Close	Close	Open	Close	Open
RJ24	Close	Open	Close	Open	Close	Open
RJ16	Close	Close	Close	Open	Close	Open

ES90XX DACs I2S mode.

	J1	J3	J4	B1	B2	B3	B5
I2S	Close	Open	Open	Open	Open	Open	Open

JLsounds AK4396 DAC board I2S mode (old I2SoverUSB board).

	J3	J4	B1	B2	B3	B5
I2S	Open	Open	Close	Close	Close	Open

S/PDIF output configuration

	J2	J3	J4	B1	B2	B3	B5
S/PDIF	Close	Open	Open	Close	Open	Close	Open

TDA1541

TDA1541 in I2S mode in 32-bit frame.

	J2	J3	J4	A2	B1	B2	B3	B5
I2S	Close	Open	Close	Close	Close	Open	Close	Open

SM5813 output configuration

	J3	J4	B1	B2	B3	B5
LJ	Open	Close	Open	Close	Open	Open

2. I2S like protocols with external MCLK

AK4490, AK4493, AK4495, AK4497 and all DACs in I2S like protocols.
On MCLK_out_1 (H3.7) pin, one will have 22.5792MHz/ 24.576MHz MCLK.

	J3	J4	B1	B2	B3	B5
I2S	Open	Open	Close	Close	Open	Close
LJ	Open	Close	Close	Close	Open	Close
RJ24	Close	Open	Close	Close	Open	Close
RJ16	Close	Close	Close	Close	Open	Close

ES90XX DACs I2S mode.

	J1	J3	J4	B1	B2	B3	B5
I2S	Close	Open	Open	Open	Open	Open	Close

S/PDIF output configuration

	J2	J3	J4	B1	B2	B3	B5
S/PDIF	Close	Open	Open	Close	Close	Open	Close

TDA1541 in I2S mode in 32-bit frame with external MCLK.

	J2	J3	J4	A2	B1	B2	B3	B5
I2S	Close	Open	Close	Close	Close	Close	Open	Close

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 10

SM5813 output configuration

	J3	J4	B1	B2	B3	B5
LJ	Open	Close	Open	Close	Open	Close

J1 is used to swap DSD channels. If J1 is open the DSD channels are configured for AK4XXX DACs, if J1 is closed DSD channels are configured for ESS9XXX DACs.

	J3	J4
I2S	Open	Open
LJ	Open	Close
RJ24	Close	Open
RJ16	Close	Close

PCM1704 like protocols

H1.3 pin must be connected to H1.1 through external R1 4.7kΩ configuration resistance. Changes takes part after USB reset.

1. PCM1704 like protocols on board oscillators

PCM1704

	J2	J3	J4	B1	B2	B3	B5
24-bit	Open	Open	Open	Open	Open	Open	Open

PCM1702, PCM63, AD1862, SM5813

	J2	J3	J4	B1	B2	B3	B5
20-bit	Open	Open	Close	Open	Open	Open	Open

PCM58, AD1865, PCM61, AD1861, AD1860

	J2	J3	J4	B1	B2	B3	B5
18-bit	Open	Close	Open	Open	Open	Open	Open

PCM56, AD1851

	J2	J3	J4	B1	B2	B3	B5
16-bit	Open	Close	Close	Open	Open	Open	Open

TDA1541 simultaneous mode

TDA1541 in simultaneous mode with on board oscillators. 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.*

	J2	J3	J4	B1	B2	B3	B4	B5
16-bit	Close	Open	Close	Open	Open	Close	Close	Open

2. PCM1704 like protocols with external MCLK

PCM1704

	J2	J3	J4	B1	B2	B3	B5
24-bit	Open	Open	Open	Open	Open	Open	Close

PCM1702, PCM63, AD1862, SM5813

	J2	J3	J4	B1	B2	B3	B5
20-bit	Open	Open	Close	Open	Open	Open	Close

PCM58, AD1865, PCM61, AD1861, AD1860

	J2	J3	J4	B1	B2	B3	B5
18-bit	Open	Close	Open	Open	Open	Open	Close

PCM58, AD1851

	J2	J3	J4	B1	B2	B3	B5
16-bit	Open	Close	Close	Open	Open	Open	Close

TDA1541 simultaneous mode

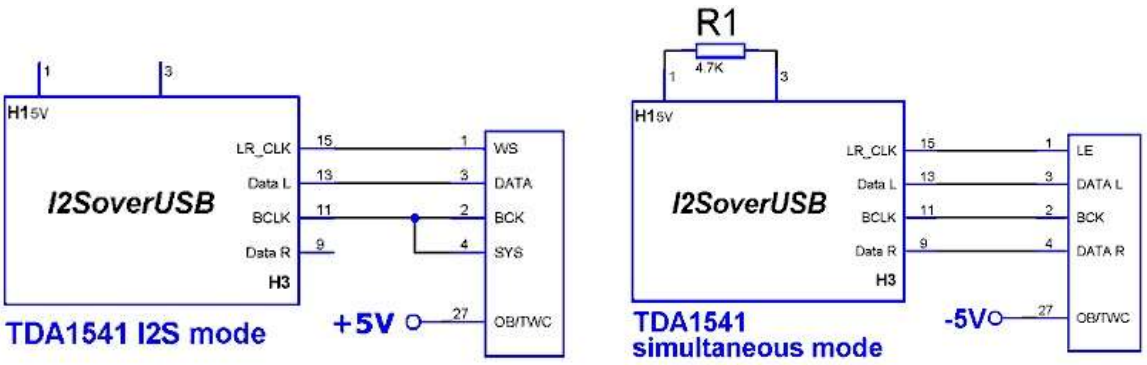
	J2	J3	J4	B1	B2	B3	B4	B5
16-bit	Close	Open	Close	Close	Close	Close	Close	Close

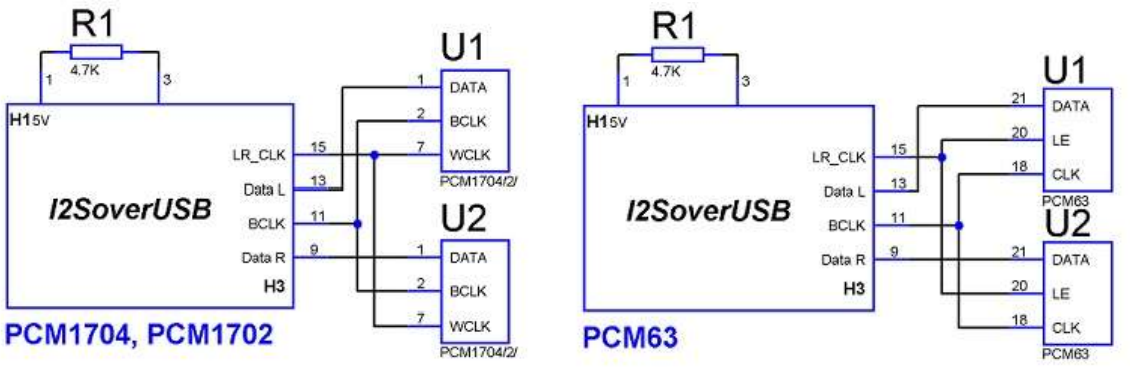
TDA1541 in simultaneous mode with external MCLK. Pin27 of the TDA1541 must be connected to -5V. The DAC is working up to 384kHz in this mode. *In this mode we recommend one to use mute circuit.*

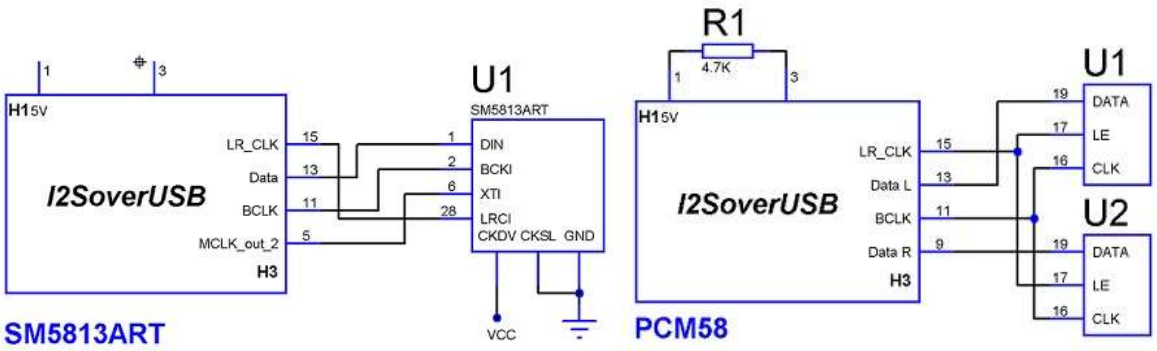
	J2	J3	J4
24-bit	Open	Open	Open
20-bit	Open	Open	Close
18-bit	Open	Close	Open
16-bit	Open	Close	Close
32-bit	Close	Open	Open

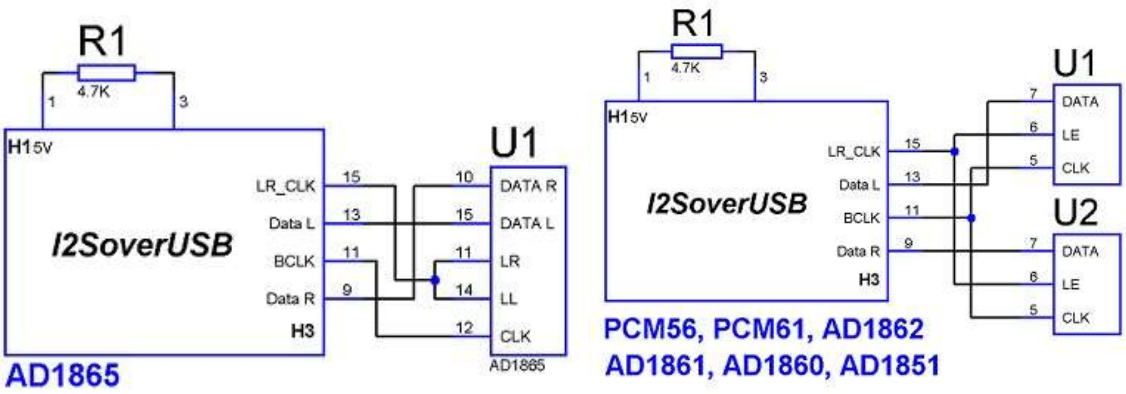
In both I2S and PCM1704 modes J1 is used to swap DSD channels. If J1 is open the DSD channels are configured for AK4XXX DACs, if J1 is closed DSD channels are configured for ESS9XXX DACs

Schemes for connecting different DACs and digital filters









Configuring MLCK_2 output

	B1	B2	B3	B5	Description
Ex. MCLK	Close	Close	Close	Close	TDA1541 in simultaneous mode, B4 must be closed *
Ex. MCLK	Close	Close	Open	Close	AK4490 ** S/PDIF
Ex. MCLK	Open	Close	Open	Close	MCLK_2/4
Ex. MCLK	Close	Open	Open	Close	MCLK_2/2
Ex. MCLK	Open	Open	Open	Close	No MLCK_2
Internal MCLK	Close	Close	Close	Open	Old I2SoverUSB board AK4396
Internal MCLK	Open	Close	Close	Open	Not used
Internal MCLK	Close	Open	Close	Open	AK4490 ** S/PDIF
Internal MCLK	Open	Open	Close	Open	TDA1541 in simultaneous mode, B4 must be closed *
Internal MCLK	Close	Close	Open	Open	MCLK_2
Internal MCLK	Open	Close	Open	Open	MCLK_2/4
Internal MCLK	Close	Open	Open	Open	MCLK_2/2
Internal MCLK	Open	Open	Open	Open	No MLCK_2

* - For simultaneous mode of TDA1541 also J2 and J4 must be closed. H1.3 pin must be connected to H1.1 through external R1 4.7kΩ configuration resistance.

** - To enable S/PDIF output J2 must be closed

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