



# AN4118

## Application note

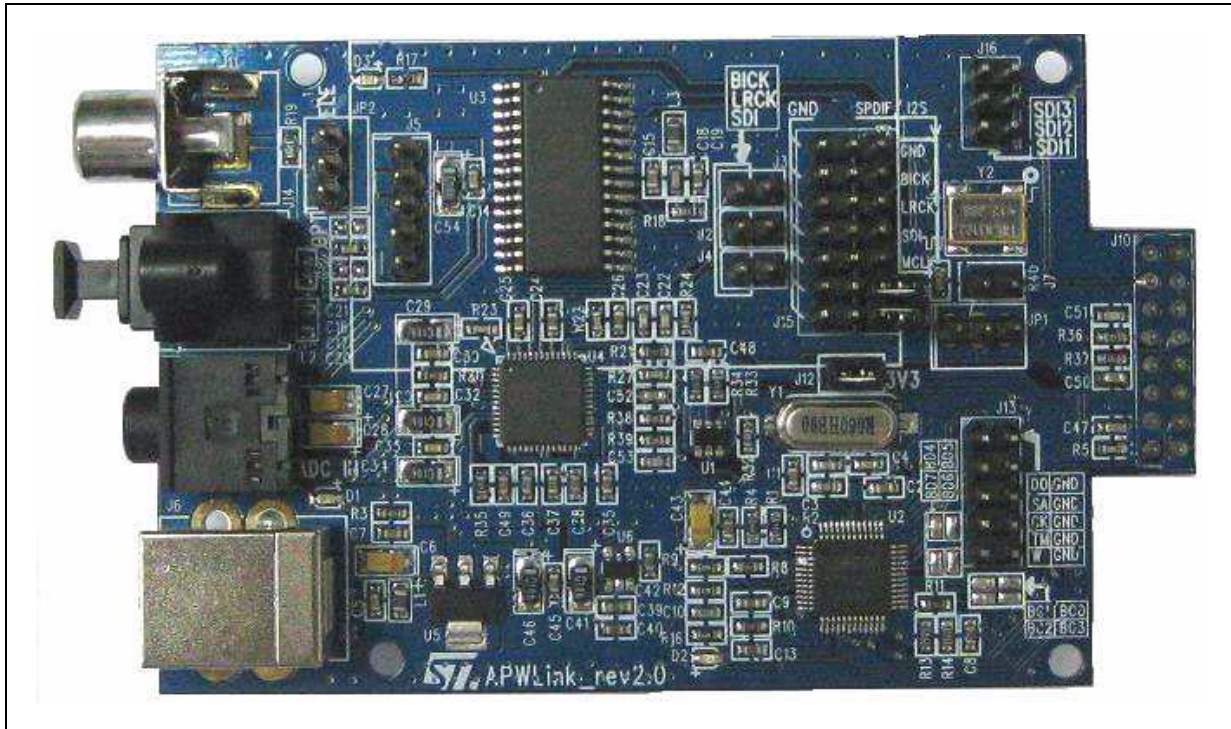
### APWLink USB interface board for Sound Terminal® demonstration boards

## Introduction

This document describes APWLink which has been designed as a USB interface board to control ST Sound Terminal® demonstration boards through APWorkbench, please refer to user manual UM1545, “Using the Audio Processor Workbench (APWorkbench)”.

The orderable part number for APWLink is STEVAL-CCA035V1.

**Figure 1. APWLink interface board (STEVAL-CCA035V1)**



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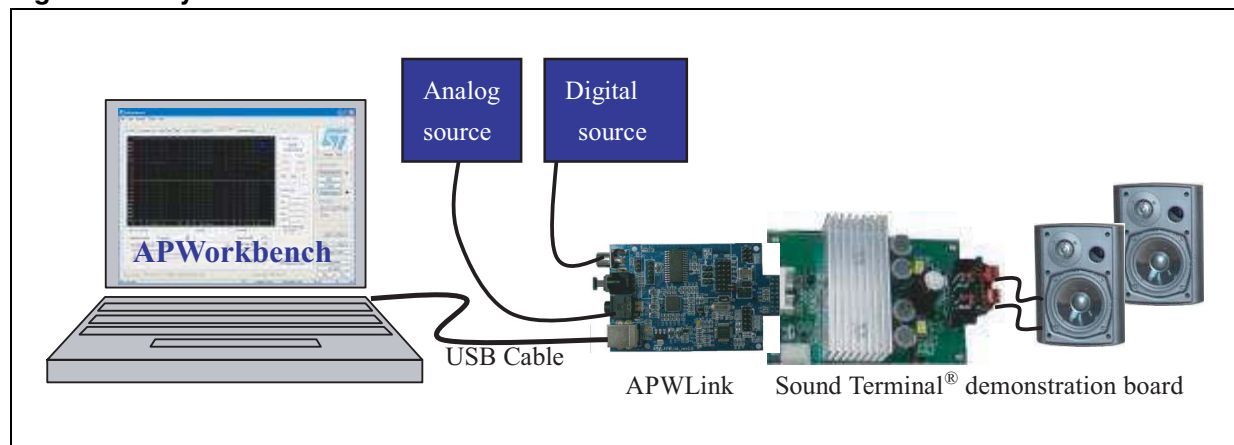
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# 1 Overview

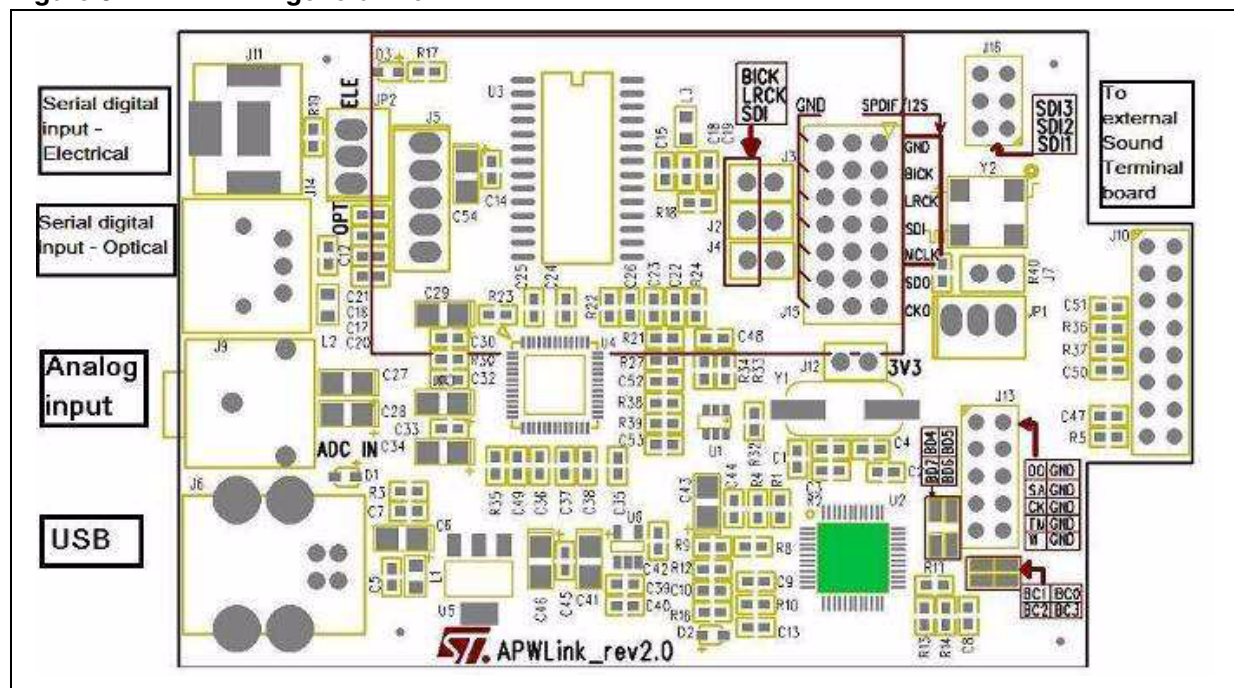
In addition to providing control signals to the external Sound Terminal<sup>®</sup> demonstration board, analog/digital audio inputs are also provided from APWLink.

The system connections are shown below in the following figure.

**Figure 2. System connections**



**Figure 3. APWLink general view**



## 2 Configuration

### 2.1 Power supply

APWLink is directly powered by a USB cable (Type B). No external power supply is needed.

Note that this power supply is NOT for the power bridge supply on the Sound Terminal<sup>®</sup> demonstration board. Please refer to the application note of each specific Sound Terminal<sup>®</sup> demonstration board.

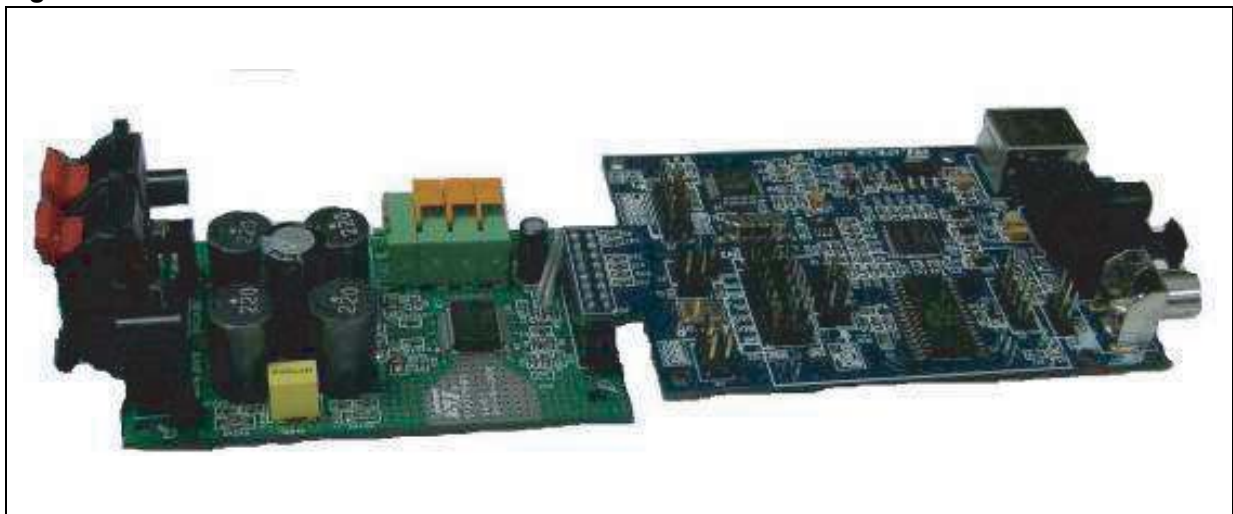
### 2.2 3.3 V digital power output to Sound Terminal<sup>®</sup> demonstration board

Jumper J12 is used for the selection of the external Sound Terminal<sup>®</sup> demonstration board digital power supply. When J12 is closed, 3.3 VDC is provided to the external Sound Terminal<sup>®</sup> demonstration board, and if the external Sound Terminal<sup>®</sup> demonstration board has its own 3.3 V digital power supply, J12 has to be left open to avoid any current loop.

### 2.3 Connection to Sound Terminal<sup>®</sup> demonstration board

APWLink is simply connected to the Sound Terminal<sup>®</sup> demonstration board through J10, an on-board 16-pin female 8x2 2.54 mm connector as shown below.

Figure 4. Connection to Sound Terminal<sup>®</sup> demonstration board





## 2.4 LEDs

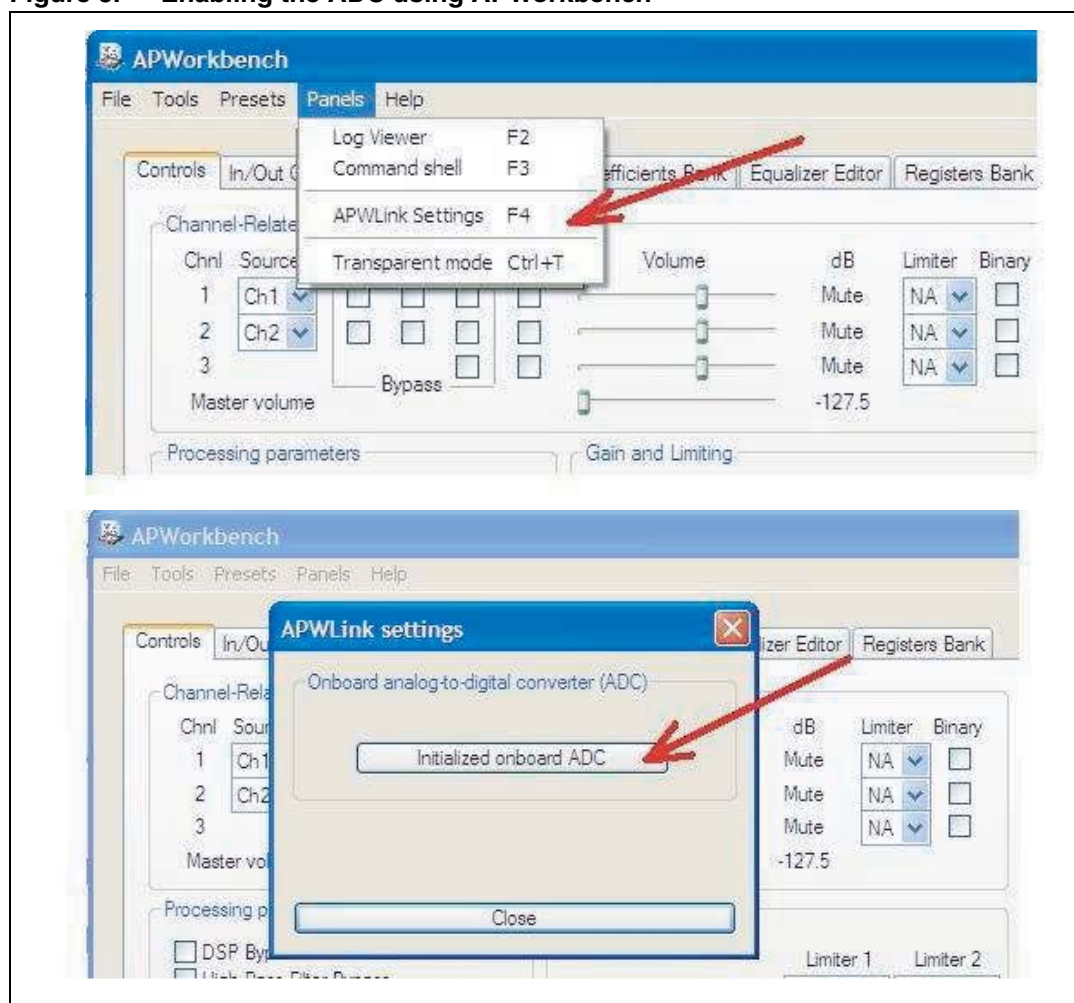
APWLink provides the following three LEDs:

- D1: power supply
  - ON when USB power is supplied
- D2: communication wrong
  - ON when communication between PC and APWLink is wrong
- Digital audio input error
  - ON when the digital input signal is not validated or no digital signal is input

## 2.5 Analog input

An analog signal (can be DC coupled) can be input from J9 (3.5 mm phone jack). There is an on-board ADC (ST part number: STA529Q) to convert the analog signal to a digital I<sup>2</sup>S format signal and feed it to the external Sound Terminal<sup>®</sup> demonstration board. To enable the on-board STA529Q ADC, the following actions should be taken within APWorkbench as shown in the screenshots below.

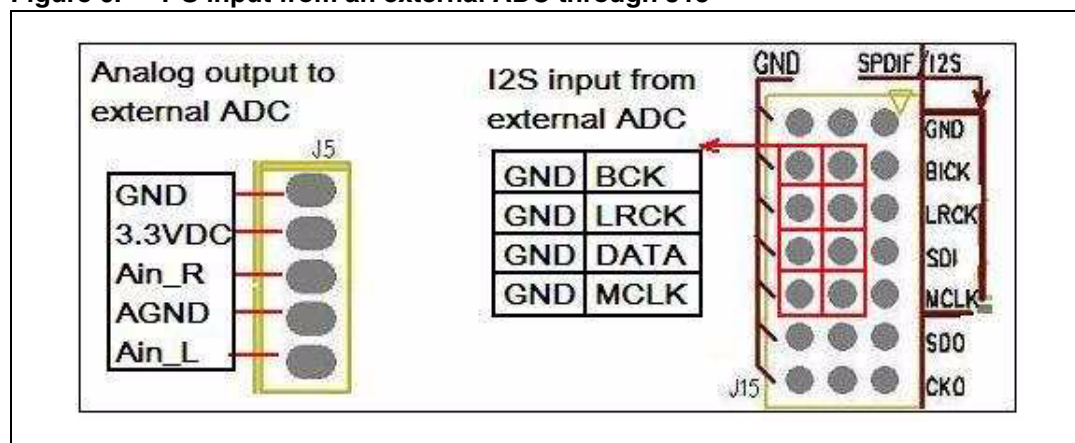
**Figure 5. Enabling the ADC using APWorkbench**



## 2.6 External I<sup>2</sup>S input

The external I<sup>2</sup>S signal can be input to APWLink through J15 directly. For example, the external I<sup>2</sup>S signal can come from an external ADC if the on-board ADC is bypassed. J5 includes the analog signals from J9 (stereo analog input jack), plus 3.3 VDC power supply, which can be fed to the external ADC. The I<sup>2</sup>S from the external ADC can be fed into APWLink through J15, as indicated below.

**Figure 6. I<sup>2</sup>S input from an external ADC through J15**



## 2.7 Serial digital audio input

Electrical and optical inputs are supported on-board to receive serial digital audio signals. A jumper (JP2) is used to select either the electrical or optical signal. The input signal is then converted to an I<sup>2</sup>S format by the on-board decoder (ST part number: STA120D) and fed to the external Sound Terminal<sup>®</sup> demonstration board.

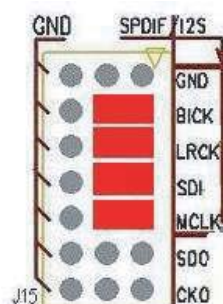


Serial digital formats supported by the STA120D:

- S/PDIF
- AES/EBU
- IEC 958
- EIAJ CP-340/1201

The proper jumper setting is described in [Section 2.8: Jumper configuration](#).

## 2.8 Jumper configuration

**Table 1. Jumper configuration**

Jumper	Mode	Serial digital input	External I <sup>2</sup> S	On-board ADC <sup>(1)</sup>
J2	LR clock from STA529Q - on-board ADC	Open	Open	Close
J3	Bit clock from STA529Q - on-board ADC	Open	Open	Close
J4	I <sup>2</sup> S data from STA529Q - on-board ADC	Open	Open	Close
J5	Analog output / 3.3 VDC for external ADC	All open	See footnote <sup>(2)</sup>	All open
J7	MCLK to STA529Q – on-board ADC	Open	Open	Close
J12	3.3 VDC to external Sound Terminal <sup>®</sup> demonstration board	Close	Close	Close
J13	Reserved, not used	All open	All open	All open
J15	I <sup>2</sup> S selector for external Sound Terminal <sup>®</sup> demonstration board	Close only the relevant pins 	See footnote <sup>(3)</sup>	All open
J16	I <sup>2</sup> S data selector for external Sound Terminal <sup>®</sup> demonstration board	All close	All close	All close
JP1	Reserved, not used	All open	All open	All open
JP2	Serial digital audio source selector	For electrical:  For optical: 	Do not care	Do not care

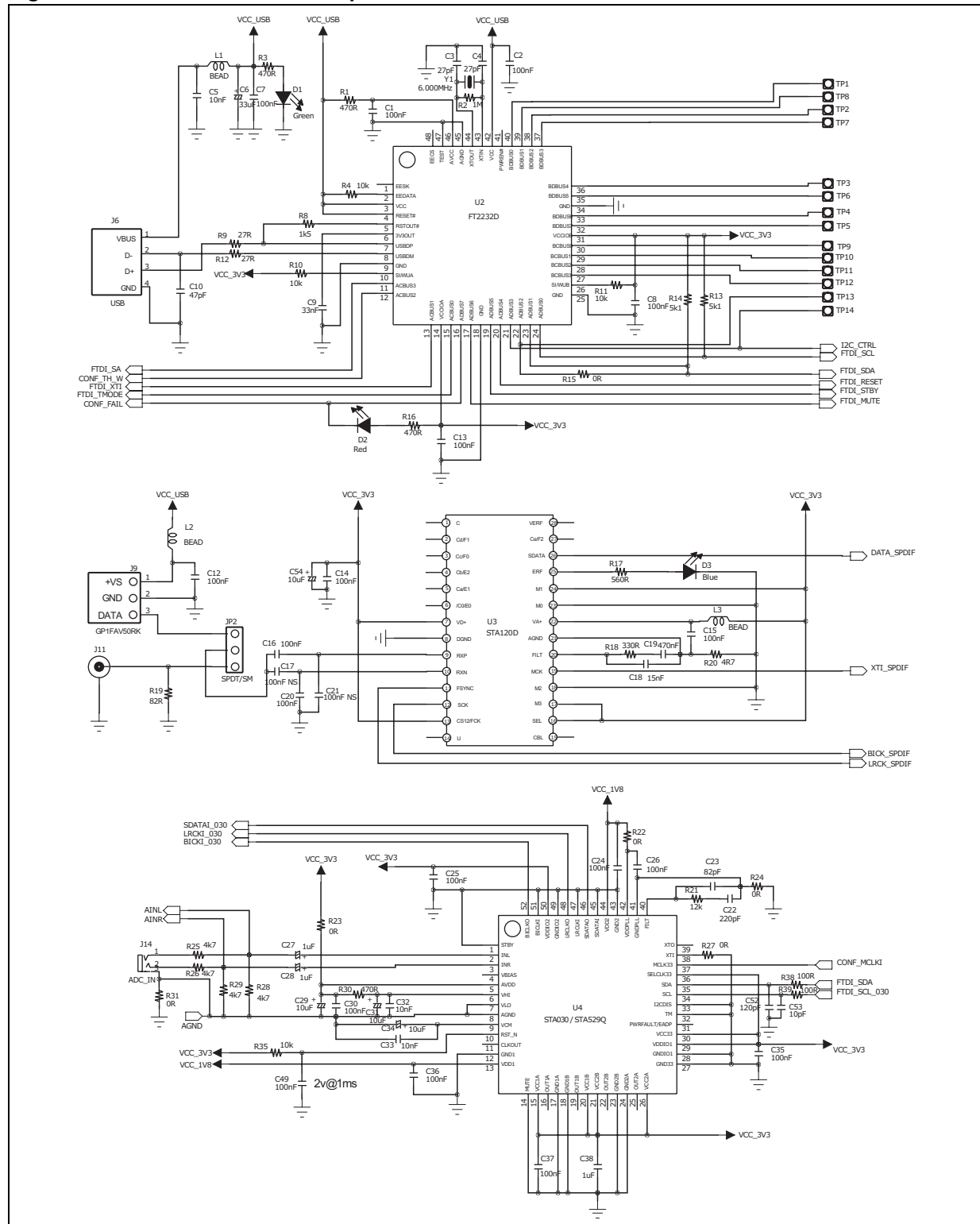
1. APWorkbench supports on-board ADC function.

2. Please refer to [Section 2.6: External I<sup>2</sup>S input on page 6](#) for detailed signal definition for each pin.

3. Please refer to [Section 2.6: External I<sup>2</sup>S input on page 6](#) for detailed signal definition for relevant pins. All other pins can be left open.

### 3 Schematic and bill of material

Figure 7. APWLink schematic - part 1





**Figure 8. APWLink schematic - part 2**

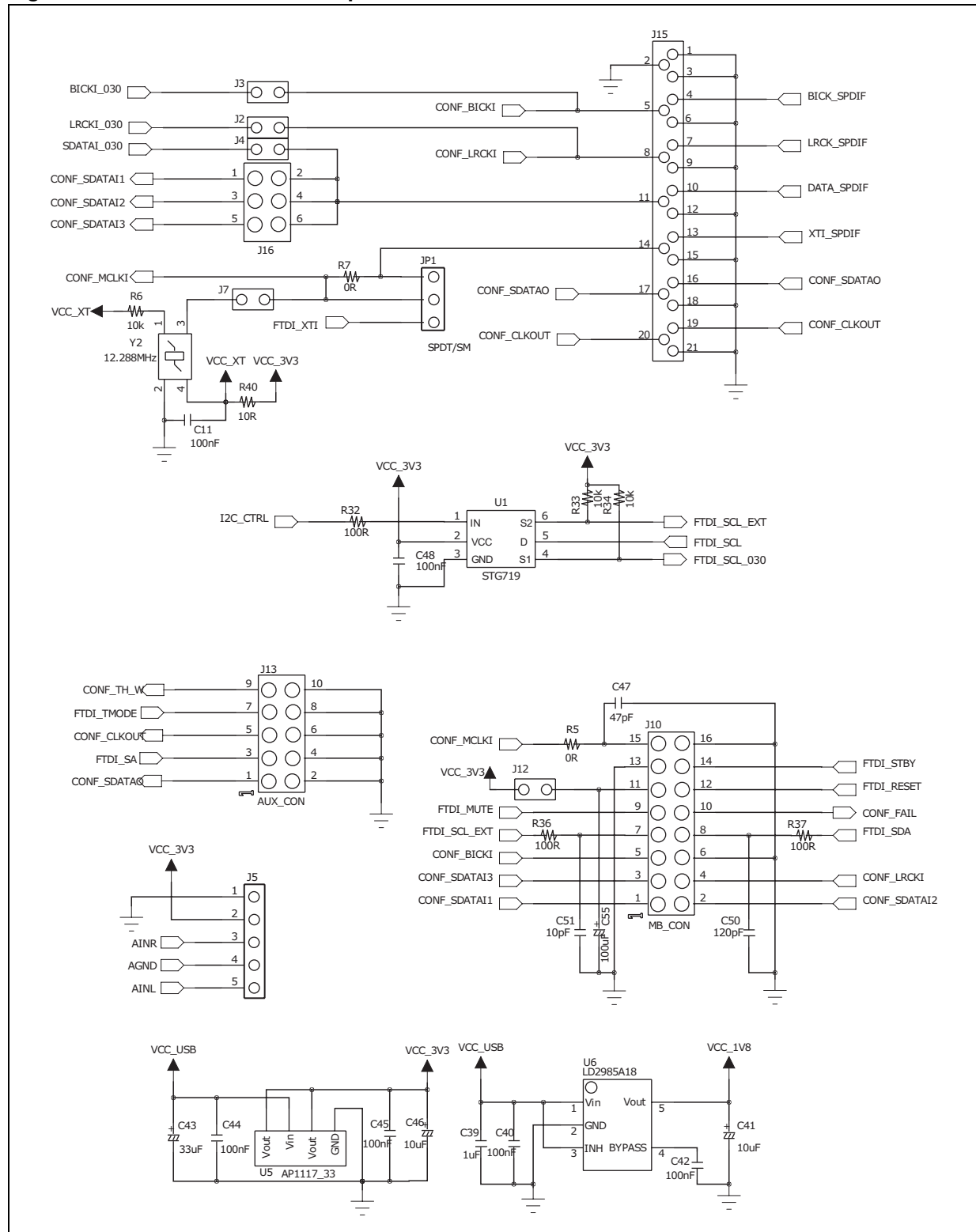


Table 2. Bill of material

Item	Qty	Reference	Part name	Value	Footprint	Remarks
1	1	U1	IC	STG719	SOT23-6L	
2	1	U2	IC	FT2232D	LQFP48	
3	1	U3	IC	STA120D	SO28	
4	1	U4	IC	STA529Q	VFQFPN52	
5	1	U5	IC	LD1117	SOT223	
6	1	U6	IC	LD2985B18	SOT23-5L	
7	1	D1	LED	Green	0603	
8	1	D2	LED	Red	0603	
9	1	D3	LED	Blue	0603	
10	3	L1-3	Ferrite bead	600 ohms / 100 MHz	0805	
11	1	Y1	Crystal, 6.000 MHz	6.000 MHz	XTAL_HC49SMT	
12	1	Y2	Oscillator, 12.288 MHz	12.288 MHz	SMD, 7 mm x 5 mm	
13	5	J2-4, J7, J12	Header	Header 2 x 1	2.54 mm x 2	
14	1	J5	Header	Header 5 x 1	2.54 mm x 5	
15	1	J6	USB connector	Type B	Type B	
16	1	J9	Optical receiver	GP1F31R		
17	1	J10	Female connector	Female 8 x 2	2.54 mm x 8 x 2	bottom side
18	1	J11	RCA	RCA connector	RCA	
19	1	J13	Header	Header 5 x 2	2.54 mm x 5 x 2	
20	1	J14	Headphone jack	Stereo headphone jack		
21	1	J15	Header	Header 7 x 3	2.54 mm x 7 x 3	
22	1	J16	Header	Header 3 x 2	2.54 mm x 3 x 2	
23	2	JP1-2	Header	Header 3 x 1	2.54 mm x 3	
24	24	C1-2, C7-8, C11-16, C20, C24-26, C30, C35-37, C40, C42, C44-45, C48-49	CAP	100 nF	0603	
25	2	C17, C21	CAP	100 nF NS	0603	Not fitted
26	3	C5, C32-33	CAP	10 nF	0603	
27	2	C51, C53	CAP	10 pF	0603	
28	2	C50, C52	CAP	120 pF	0603	
29	1	C18	CAP	15 nF	0603	

**Table 2. Bill of material**

Item	Qty	Reference	Part name	Value	Footprint	Remarks
30	2	C38-39	CAP	1 $\mu$ F	0603	
31	1	C22	CAP	220 pF	0603	
32	2	C3-4	CAP	27 pF	0603	
33	1	C9	CAP	33 nF	0603	
34	1	C19	CAP	470 nF	0603	
35	2	C10, C47	CAP	47 pF	0603	
36	1	C23	CAP	82 pF	0603	
37	1	C55	Tantalum-CAP	100 $\mu$ F	Sized	
38	6	C29, C31, C34, C41, C46, C54	Tantalum-CAP	10 $\mu$ F	1206	
39	2	C27-28	Tantalum-CAP	1 $\mu$ F	1206	
40	2	C6, C43	Tantalum-CAP	33 $\mu$ F	1206	
41	8	R5, R7, R15, R22-24, R27, R31	RES	0R	0603	
42	5	R32, R36-39	RES	100R	0603	
43	1	R40	RES	10R	0603	
44	7	R4, R6, R10-11, R33-35	RES	10K	0603	
45	1	R21	RES	12K	0603	
46	1	R2	RES	1M	0603	
47	1	R8	RES	1K5	0603	
48	2	R9, R12	RES	27R	0603	
49	1	R18	RES	330R	0603	
50	4	R1, R3, R16, R30	RES	470R	0603	
51	1	R20	RES	4R7	0603	
52	4	R25-26, R28-29	RES	4K7	0603	
53	1	R17	RES	560R	0603	
54	2	R13-14	RES	5K1	0603	
55	1	R19	RES	82R	0603	

## 4 Revision history

**Table 3. Document revision history**

Date	Revision	Changes
22-Jun-2012	1	Initial release.
16-Oct-2012	2	Minor textual updates; revised presentation of schematics.

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