CC85xx Development Kit Hardware User's Guide

SWRU251A

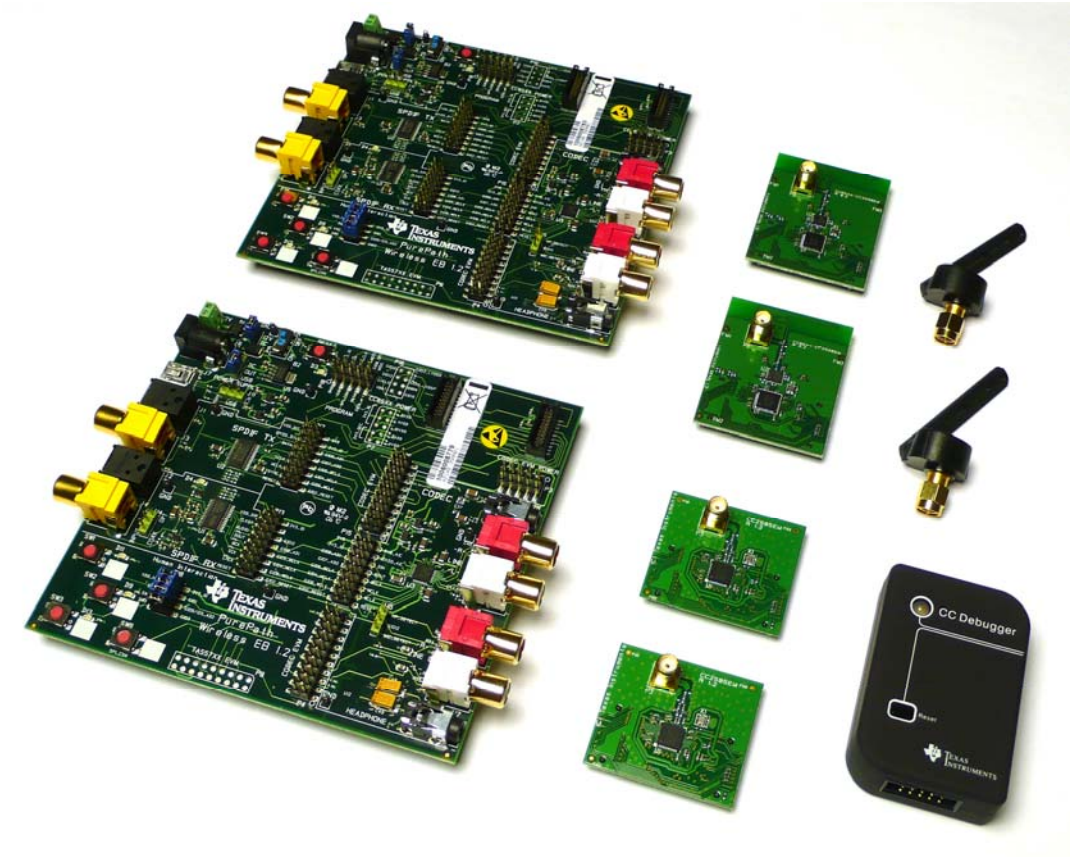


Table of Contents

1 INTRODUCTION 3
2 ABOUT THIS MANUAL 3
3 ACRONYMS 4
4 CC85XXDK OVERVIEW 5
5 GETTING STARTED WITH THE CC85XXDK 7
6 PUREPATH WIRELESS CC85XXDK FUNCTIONALITY 9
7 PUREPATH WIRELESS AUDIOEB OVERVIEW 10
7.1.1 I2S Audio Interface 10
7.2 POWER SUPPLY 11
7.2.1 Power supply for TAS57XX amplifier plug-in modules 11
7.3 TLV320AIC3101 CODEC 11
7.3.1 Measurements Analog-Input/Output 12
7.4 CONNECTOR FOR EXTERNAL TI CODEC EVM 13
7.5 S/PDIF RECEIVER 15
7.6 S/PDIF TRANSMITTER 17
7.7 CONNECTOR INTERFACE FOR TAS57XX CLASS-D AMPLIFIER 18
7.8 HUMAN INTERACTION 18
7.9 USB INTERFACE 19
7.10 JUMPER SETTINGS 19
7.11 CC85XX PROGRAMMING CONNECTOR 20
8 CC85XX EVALUATION MODULES 20
8.1 CC85XXEM FUNCTIONALITY 20
8.2 CC85XXEM 20
8.3 CC85XX+CC2590EM 21
8.4 CC85XXEM PIN MAPPING 22
9 REFERENCES 23
10 DOCUMENT HISTORY 24
APPENDIX A: PUREPATH WIRELESS AUDIOEB SCHEMATIC 25
APPENDIX B PUREPATH WIRELESS AUDIOEB COMPONENTS PLACEMENT 31

1 Introduction

Thank you for purchasing the CC85xx Development Kit.

The CC85xx is Texas Instrument's wireless audio SoCs for the 2.4 GHz unlicensed ISM band. Upon the release of the CC85xxDK, only the CC8520 is released to the market, the subsequent devices in the CC85xx family will be released in the future. For the CC85xx family roadmap, please see the PurePath Wireless Audio page [1].

This CC85xx family offers state-of-the-art co-existence, excellent link budget and low power operation while transmitting audio data wirelessly. The CC8520 product folder on the web [12] has more information, with datasheets, user guides and application notes.

The CC85xx Development Kit includes all the necessary hardware to evaluate, demonstrate, prototype and develop with the CC85xx.

2 About this manual

This manual describes all the hardware included in the CC85xx Development Kit (CC85xxDK) and points the user to other useful information sources.

Chapter 4 briefly describes the contents of the development kit and chapter 5 gives a quick introduction to how to get started with the kit. Chapter 6, 7 and 8 describe the hardware in the kit and where to find more information about how to use it. Appendix A includes schematics of the hardware in the CC85xxDK.

The CC85xxDK Quick Start Guide [4] has a short tutorial on how to get started with the kit and is delivered with the kit.

For more details about the CC85xx devices, see the CC85xx User's Guide [5].

Please visit the CC85xx development kit web page[10] and CC8520 product page[12] for additional information.

Further information can be found on the TI LPRF Online Community[13]. Also see chapter 9 for a list of additional relevant documents and links.

3 Acronyms

AudioEB	Audio Evaluation Board
CC85xxDK	CC85xx Development Kit
CC85xxEM	CC85xx Evaluation Module
EM	Evaluation Module
I2C	Inter-integrated circuit
I2S	Inter-IC sound
PurePath Wireless	PurePath Wireless
RF	Radio Frequency
SMA	SubMiniature version A
S/PDIF	Sony/Philips Digital Interconnect Format

4 CC85xxDK Overview

The CC85xxDK is a complete development kit for the CC85xx from Texas Instruments. The hardware included in the kit must be used together with the PurePath Wireless (PurePath Wireless) Configurator[9], which can be downloaded from the TI website. The development kit can be used through all stages of development of applications with CC85xx:

- Evaluate CC85xx RF performance and range testing
- Test wireless sound quality
- Interface to a variety of interfaces including codec and digital/optical inputs and outputs
- Support some TI Codec interface board platforms
- Support for programming interface with the PurePath Wireless Configurator PC software.

Figure 1 shows the main components of the CC85xxDK.

- 2 pcs Purepath Wireless AudioEB
- 2 pcs CC8531EM Evaluation Module, RF reference design to be plugged into PurePath Wireless AudioEB
- 2 pcs CC8531+CC2590EM, RF reference design with extended range to be plugged into PurePath Wireless AudioEB
- 1 pcs CC debugger, used for program CC85xx in a PurePath Wireless AudioEB or in an end customer application

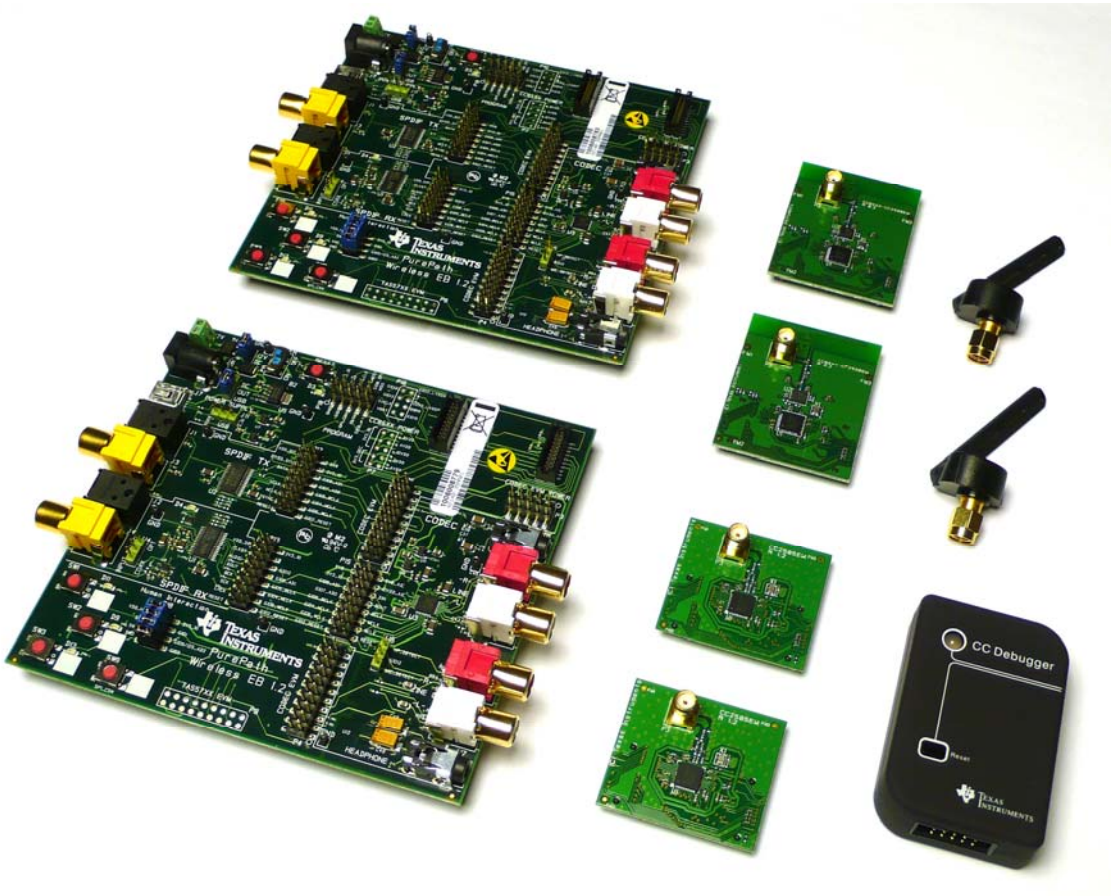


Figure 1. The main components included in the CC85xxDK.

Also included in the CC85xxDK is

- 2 pcs USB cables. The cables are used to power the PurePath Wireless audioEB.
- 2 pcs Audio cables. To be used at the analog input and analog output.
- Documentation

5 Getting Started With the CC85xxDK

The CC85xx is delivered pre-programmed with firmware to be used with the analog inputs and outputs. For details how to use the CC85xxEMs and the CC85xx+CC2590EMs with the pre-programmed firmware, see the CC85xxDK Quick start user's guide [2]. Please note that CC8531 is mounted abd programmed in the CC85xxEM production. The CC85xx chip itself comes un-programmed from production. The CC85xxDK should have some jumpers mounted by default to function properly with the pre-programmed image. The default jumper settings are shown in section 7.9. Figure 2 shows an overview of the PurePath Wireless AudioEB.

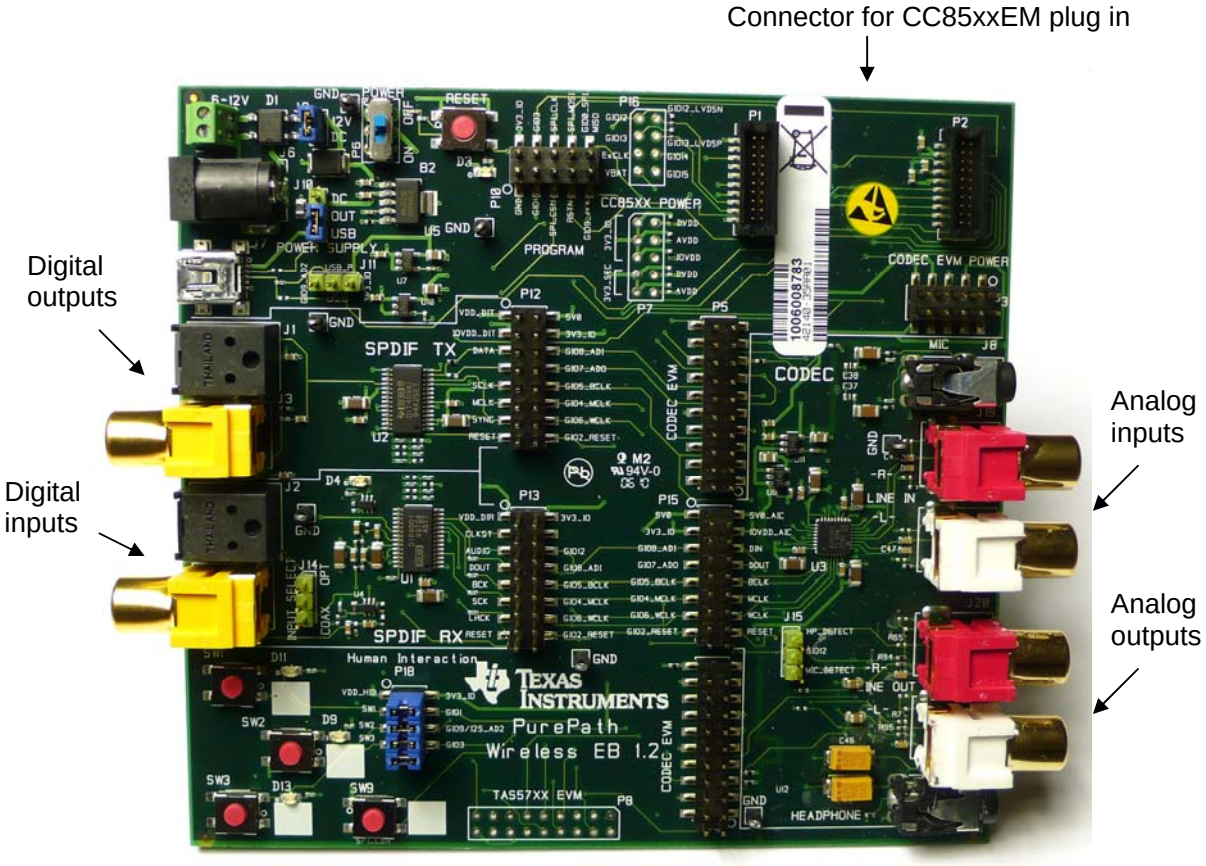


Figure 2. PurePath Wireless AudioEB overview

To change the functionality e.g. changes to digital input, the CC85xx must be configured and re-programmed using the PurePath Wireless Configurator [9] and the jumper block needs to be mounted on the correct pin header i.e., P12 for Digital out (S/PDIF Transmitter), P13 for digital in (S/PDIF Receiver) or P15 for the Analog input/outputs (Codec).

Figure 3 shows how to connect the CC debugger and the CC85xxEM to the PurePath Wireless AudioEB. For more details about the programming connector see section 7.11. After connecting the CC debugger when a CC85xxEM is plugged into the PurePath Wireless AudioEB, the LED on the CC debugger should be green after pressing reset on the CC debugger. If so, the CC debugger is ready to download firmware images from the PurePath Wireless Configurator.

The PurePath Wireless Configurator is used to configure the functionality of the CC85xx and it can be downloaded from the PurePath Wireless configurator product page [9]. A screen shot of the PurePath Wireless Configurator is shown in Figure 4.

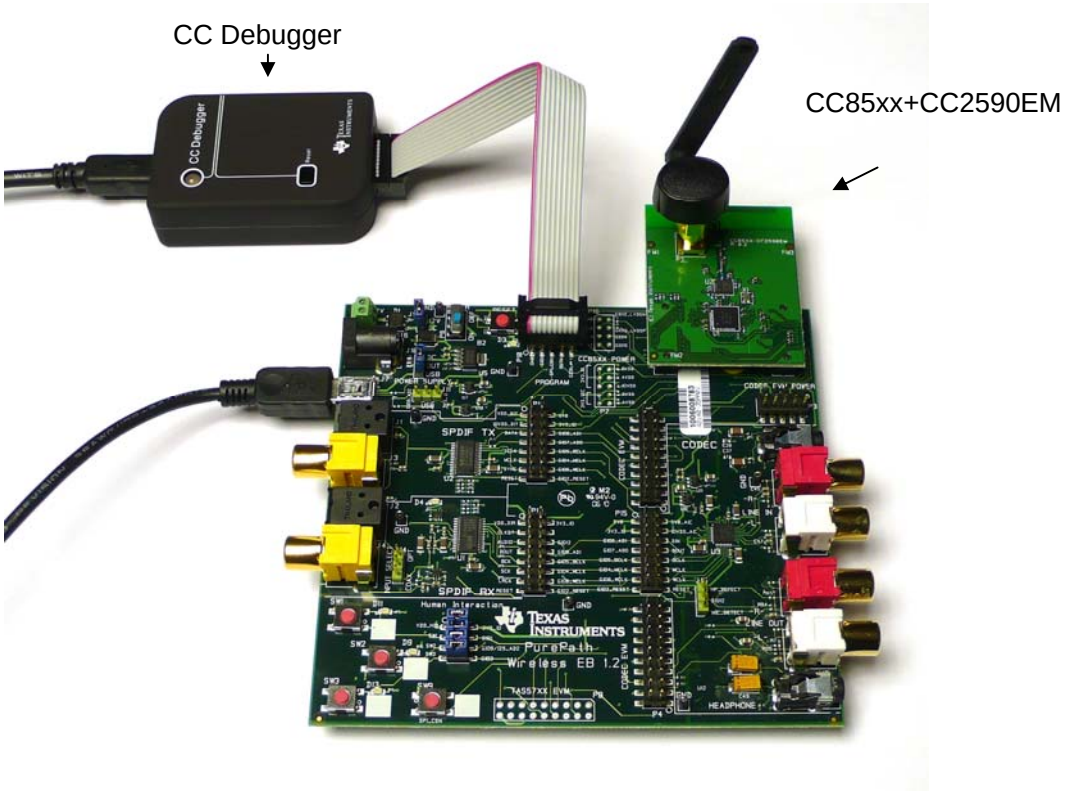


Figure 3. CC debugger connected to the AudioEB

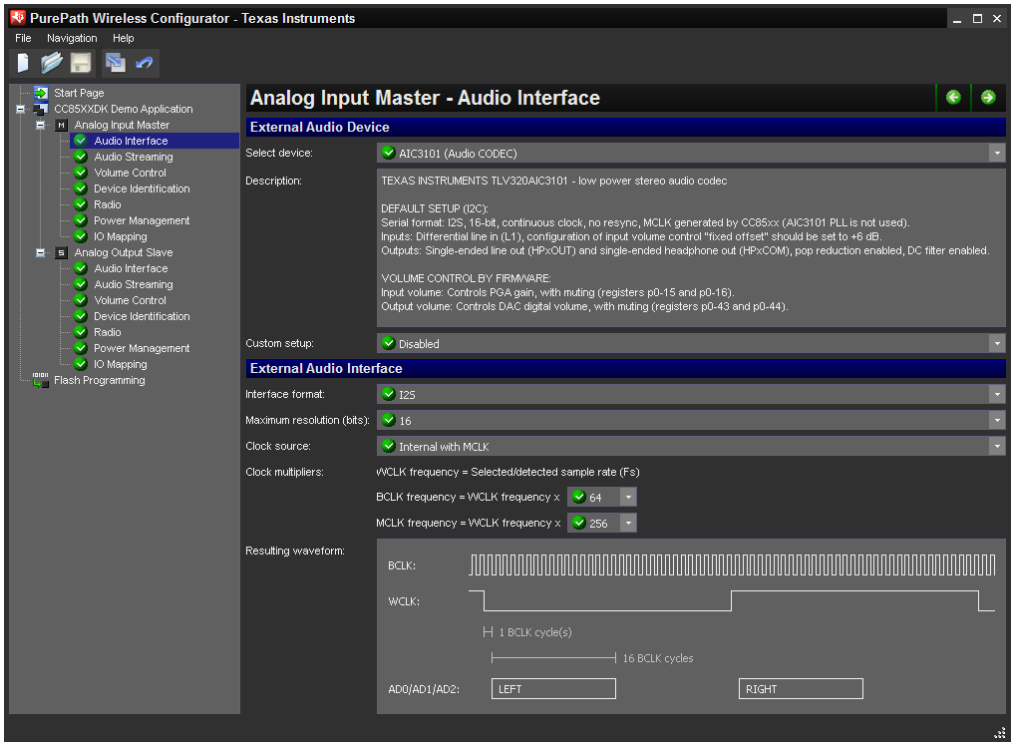


Figure 4 Screen shot of the PurePath Wireless Configurator

6 PurePath Wireless CC85xxDK Functionality

The CC85xxDK is designed to test and evaluate high quality wireless audio with CC85xx with a variety standard input and output audio format. The development kit also has a programming interface to ease testing and development of complete audio applications.

The AudioEB can easily be set up to demonstrate:

- Wireless headsets
- Wireless speaker systems
- Wireless Audio Cable Replacement
- Simple Human Interaction functionality (Volume control, link indication and pairing)

The following audio interfaces are supported directly on the board:

- Optical and coaxial S/PDIF inputs
- Optical and coaxial S/PDIF outputs
- Line in
- Line out
- Microphone/stereo audio input
- Headphone output

In addition to the audio interface supported directly the following interfaces are supported using plug-in boards

- Texas Instruments ADC/DAC/CODEC EVM modules
- Texas Instruments Class D amplifier EVM modules (TAS57XX series)

7 PurePath Wireless AudioEB Overview

The PurePath Wireless AudioEB is divided in to different blocks or modules as shown in Figure 5. The different audio modules i.e., S/PDIF transmitter, S/PDIF receiver and Codec are connected with the CC85xx with a I2S bus as shown in Figure 5. The audio modules, as well as the other modules, are described in more details in the following sections.

Please refer to Appendix A for the schematic of the PurePath Wireless AudioEB.

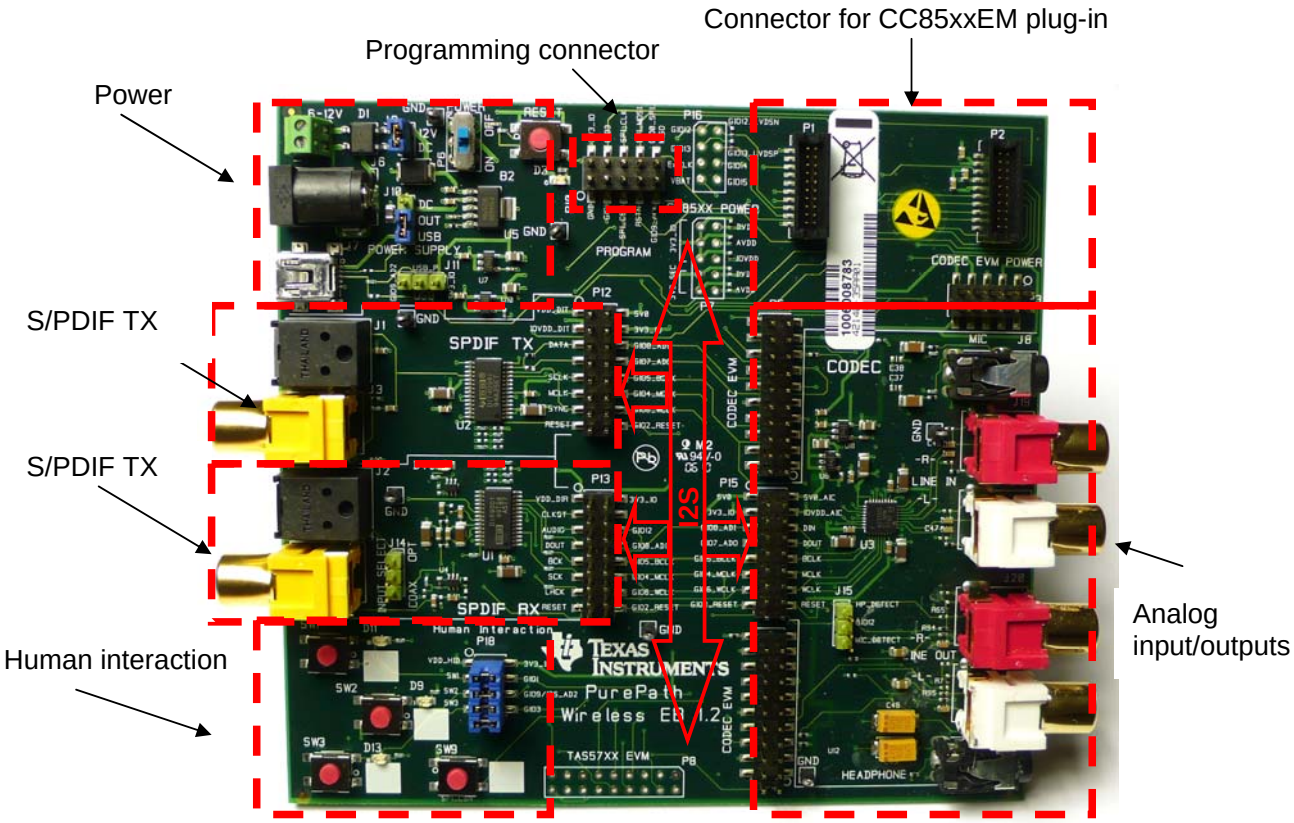


Figure 5: Main blocks in the AudioEB

7.1.1 I2S Audio Interface

The audio interface consists of four audio modules shown in Table 1. These modules are connected to a common I2S audio bus. Some of the modules are always I2S *masters,* some modules are always I2S *slaves*, and some can be both master and slave depending on the configuration.

Module	Mode	I2S mode
S/PDIF transmitter		Slave
S/PDIF Receiver		Master
Codec	Audio input on Microphone or line in	Master
Codec	Audio output on Headphone or line out	Slave
CC85xx	Receiving RF data	Master
CC85xx	Transmitting RF data	Slave
TAS57XX amplifiers	---	Slave

Table 1: I2S module master/slave overview

I2S master modules outputs data on the data line, I2S slaves receives data on the data line. I2S master devices usually supply the I2S clock signals. The Codec in master mode supply the WCLK

and BLCK clock signals but requires an external MCLK signal. The MCLK can be supplied from the CC85xx, this is configurable in the PurePath Wireless Configurator.

7.2 Power supply

The PurePath Wireless AudioEB can be powered from the following sources

- USB interface, mini-USB type (Default)
- 6-12V DC jack with positive center pin
- Block connector for 12V external power supply(can be used to connect the battery)

Table 2:PurePath Wireless AudioEB Power supply and I/O voltages for main parts

Number	Type	Name	Description	Default position
J9	On/off	>12V supply	Remove jumper to use separate power supply for Audio amplifier	Mounted
J10	1,2,3	DC/USB power	Select USB or DC power as main power supply	Mounted on pins 1-2 for USB power
J12	On/off	Vdd EVM	Seperates Analog and Digital Vdd.	Mounted

Table 3 shows the supply voltage for each of the main components on the board. The parts on the board uses a common I/O voltage (VDD_{io}) for all parts, which is 3.3V.

Table 3: PurePath Wireless AudioEB Power supply and I/O voltages for main parts

Part	Manufacturer	I/O supply	Vdd
CC85xxEVM	Texas Instruments	3.3V	3.3V
TLV320AIC3101	Texas Instruments	3.3V	A: 3.3V D: 1.8V
DIR9001	Texas Instruments	3.3V	3.3 V
DIT4096	Texas Instruments	3.3V	5.0V
TORX147PL	TOSHIBA		5.0V
TOTX177PL	TOSHIBA		3.3V

7.2.1 Power supply for TAS57XX amplifier plug-in modules

When using the EB board with a TAS57XX Class-D amplifier plug-in board a 12-25V supply voltage must be applied to the DC jack or to the block connector. The Audio amplifier can be used with Vdd voltages up to 24V, but the voltage regulator for the rest of the system allows maximum 12V. Thus, the J9 jumper on the 12V supply line **must** be removed to allow separate power supply for the audio amplifier and the other devices. When using a Class-D amplifier plug-in board both the 12-25V DC power plug and the 5V USB power connector must be connected. A more detailed description of how to connect the TAS57xxEVM to the CC85xxDK is described in Appendix D. Please see the PurePath Wireless Configuration for the latest updates of supported devices[9].

7.3 TLV320AIC3101 Codec

The codec mounted on the PurePath Wireless AudioEB is the TLV320AIC3101 from Texas Instruments [3]. The TLV320AIC3101 codec supports 6 input channels and 6 output channels. Two input channels are used for microphone inputs and two channels are used for line in RCA connectors. Two analog outputs are connected to a headset connector and two outputs are connected to line out RCA connectors.

The line in and line out of the codec on the AudioEB is configured to be differential. By changing the on-board 0-ohm resistors, the inputs and outputs can be configured as single ended. For more details see the PurePath Wireless AudioEB schematic in Appendix A.

The headphone output is using output capacitors, however, the TLV320AIC3101 also supports cap-less configurations. The TLV320AIC3101 EVM users guide shows details how to connect the analog interface more in details. The Codec settings can be changed by changing the I2C configuration of the Codec in the Purepath Wireless Configurator. For more details on how to configure the Codec, see the PurePath Wireless Configurator. The Codec is connected to the CC85xx by mounting the jumper block on P15 as shown in Figure 6. Table 4 shows the signal names on the codec interface to the CC85xx. Please also note that the Codec also is connected to the CC85xx via the I2C interface. For more details about the I2C interface available on the CC85xx see the CC85xx family user's guide [11].

Pin number	AudioEB Global Signal Name	CC85xx pin	Codec
1-2	5V0	--	5V0_AIC
3-4	3V3_IO	--	IOVDD_AIC
5-6	GIO8_AD1	AD1	DIN
7-8	GIO7_AD0	AD0	DOUT
9-10	GIO5_BCLK	BCLK	BCK
11-12	GIO4_MCLK	MCLK	MCLK
13-14	GIO6_WCLK	WCLK	WCLK
15-16	GIO2_RESET	GIO2	RESET

Table 4: P15 Codec interface pins

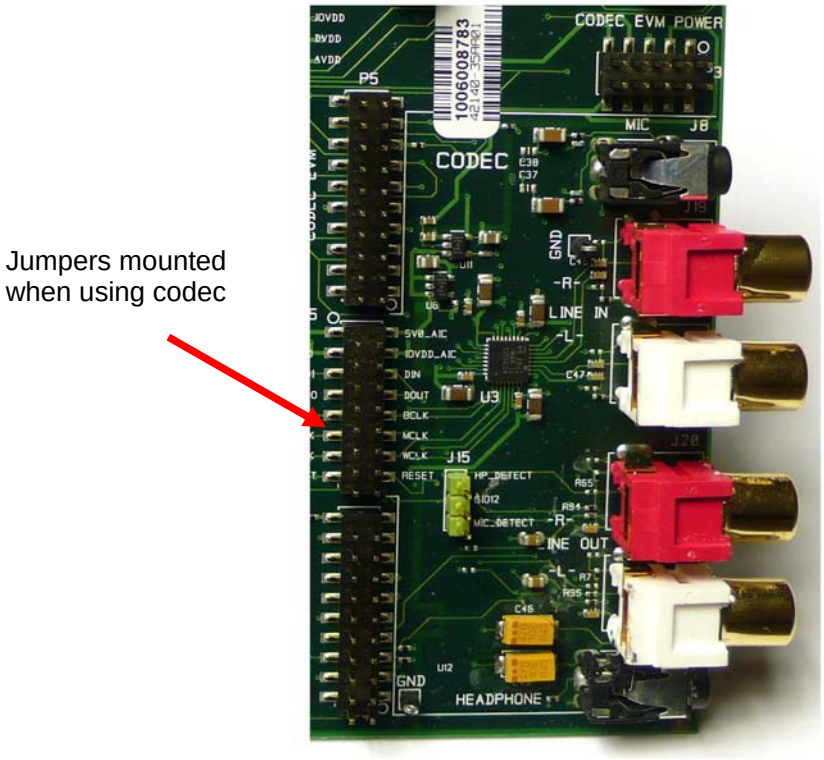


Figure 6: Shows where to mount the Jumper block to connect the codec with CC85xx

7.3.1 Measurements Analog-Input/Output

To measure the performance of the TLV320AIC3101 on the PurePath Wireless AudioEB, measurements from the analog input of the AudioEB with the Master CC8520EM plugged in to the analog output of the AudioEB with the CC8520EM slave plugged in are performed. The

measurements are done using a UPV from Rhode Schwartz. The measurement set-up is shown in Figure 7. Thus, it is a measurement of both DAC and the ADC of the TLV320AIC3101, as well as the wireless connection.

The measurement results of the SNR, it is approximately 93 dBm, which is as expected from the TLV320AIC3101 data sheet[3]. Measurement of THD+N is also done, during measurements of THD+N, it is important not to have to large input signal. The TLV320AIC3101 have a maximum input signal of 2 Vdiffp-p[3]. During the THD+N measurements the input signal shown is at 0.6VRMS (Vdiffp-p = 1.75 V). The measured THD+N was approximately -81 dB.

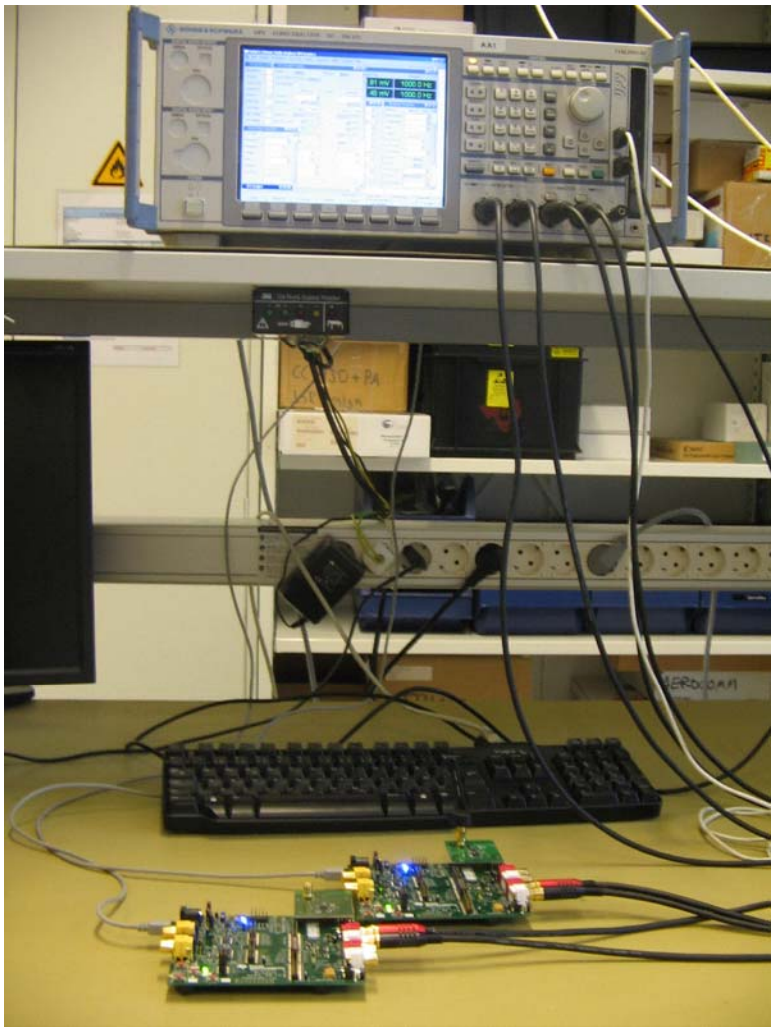


Figure 7 Photo of the measurement set-up.

7.4 Connector for External TI Codec EVM

Development kits for many TI Codec EVMs are using a common interface. To allow support for other Codecs than TLV320AIC3101 the digital interface for these connectors are supported on the AudioEB. The Codec EVMs are flexible and gives access to test points on all digital and analog signals as well as jumper settings to configure the Codec. The external connectors allow evaluation of DACs that supports the EVM interface and is supported by the CC85xx.

To use TLV320AIC3101 in other settings than the default settings on the main board or to use other Codecs, remove the jumper block on the interface connector and plug in the Codec EVM as shown in Figure 8. Please note that jumpers on P15.1-P15.2 and P15.3-P15.4 must be mounted to

power the external codec via P3. Also note that P15.16 (onboard Codec reset) should be hardwired to 0 if a codec with the same I2C address is used. The tables below show the details of the interfaces between an external TLV320AIC3101 and the interface connector.

Table 5: P4 Codec EVM SPI digital interface connector

Pin Number	AudioEB name	CC85xx	External AIC3101	Description
P4.1	NC			NC
P4.2	NC			NC
P4.3	SPI_SCLK	SCLK	SCLK	SPI Serial clock
P4.4	DGND			DGND
P4.5	SPI_CS	CS_N		CC85xx chip select
P4.6	GIO10_SCL	GIO10_SCL	SCL	I2C Clock
P4.7	GIO12	GIO12		GIO12
P4.8	GIO13	GIO13		GIO13
P4.9	NC			NC
P4.10	DGND			DGND
P4.11	SPI_MOSI	MOSI	MOSI	SPI MOSI
P4.12	SPI SEL	GIO14		SPI/I2C select pin
P4.13	GIO0_SPI_MISO	MISO	MISO	SPI MISO
P4.14	GIO2_RESET	GIO2	RESET	Codec reset
P4.15	NC			NC
P4.16	NC			NC
P4.17	NC			NC
P4.18	DGND			DGND
P4.19	NC			NC
P4.20	NC			NC, added layout for 0 ohm resistor to GND(not mounted)

Table 6: P5 Codec EVM I2C and I2S digital interface connector

Pin Number	Pin name	CC85xx connect	AIC3101 connect	Description
P5.1	NC			NC
P5.2	NC			NC
P5.3	GIO5_BCLK	I2S_BCLK	BCLK	Bit clock output from CC85xx
P5.4	NC			NC
P5.5	NC			NC
P5.6	NC			NC
P5.7	GIO6_WCLK	I2S_WCLK	WCLK	Word clock output from CC85xx
P5.8	NC			NC
P5.9	NC			NC
P5.10	DGND	DGND	DGND	DGND
P5.11	GIO8_AD1	I2S_AD1	DIN	Data output from CC85xx
P5.12	NC			NC
P5.13	GIO7_AD0	I2S_AD0	DOUT	Data input to CC85xx
P5.14	NC			NC
P5.15	NC			
P5.16	GIO10_SCL	I2C_SCL	SCL	I2C serial clock
P5.17	GIO4_MCLK	I2S_MCLK	MCLK	Master clock output from CC85xx
P5.18	NC			
P5.19	NC			
P5.20	I2C_SDA	I2C_SDA	SDA	I2C serial data

Table 7: P3 CODEC EVM Power connector

Pin Number	Pin name	Description
P6.1	NC	NC
P6.2	NC	NC
P6.3	+5V_AIC	5V analog supply
P6.4	NC	NC
P6.5	DGND	Digital Ground
P6.6	AGND	Analog Ground
P6.7	1V8_AIC	1.8V Digital Supply voltage

P6.8	NC	NC
P6.9	3V3_AIC	3.3V I/O Supply voltage
P6.10	5V0_AIC	5V digital supply (optional)

Figure 8 shows the use of the external plug-in of TI CODEC EVM boards. Note P3 supplies power to the CODEC EVM.

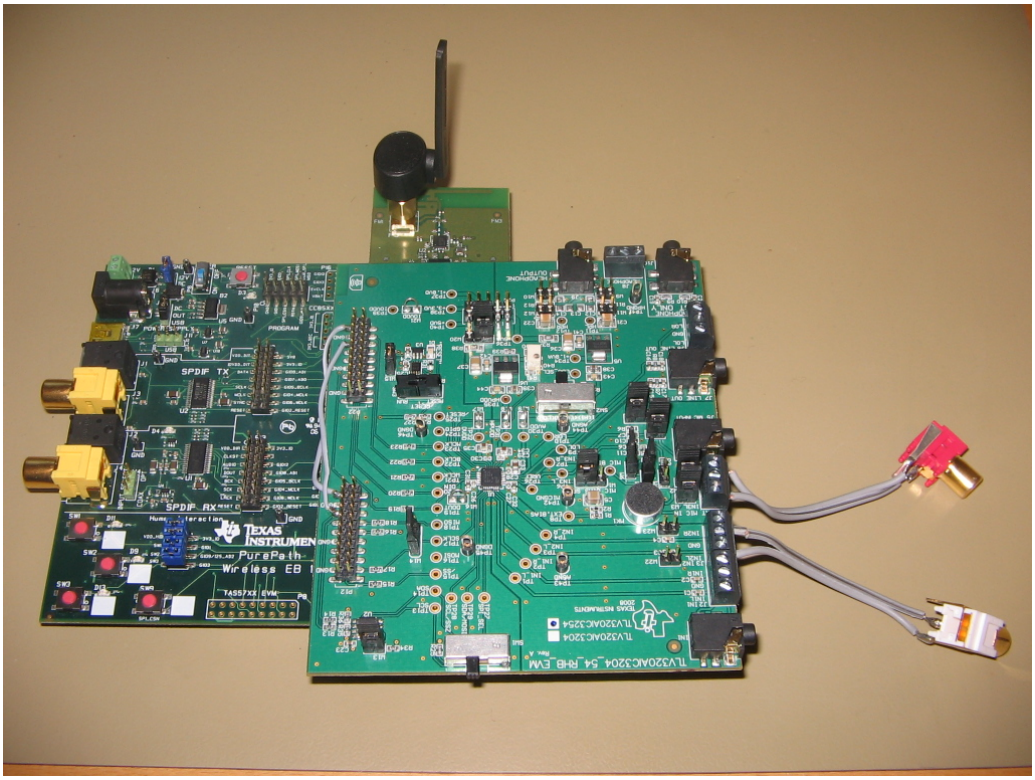


Figure 8: Photo of an external CODEC EVM pluged into the PurePath Wireless AudioEB.

In the future, there will be support for more TI Codecs/DACs/ADCs. For more details on the supported Codecs, please see the PurePath Wireless Configurator and the CC8520 product page [12].

7.5 S/PDIF Receiver

The S/PDIF receiver interface allows connection of digital audio signals from CD/DVD players and other digital audio sources. The S/PDIF receiver translates the signals from S/PDIF format to I2S format that can be connected to the bus to CC85xx. The S/PDIF receiver supports optical (TOSLINK) and coax single ended and differential inputs. The J14 jumper selects if optical or coax input is used.

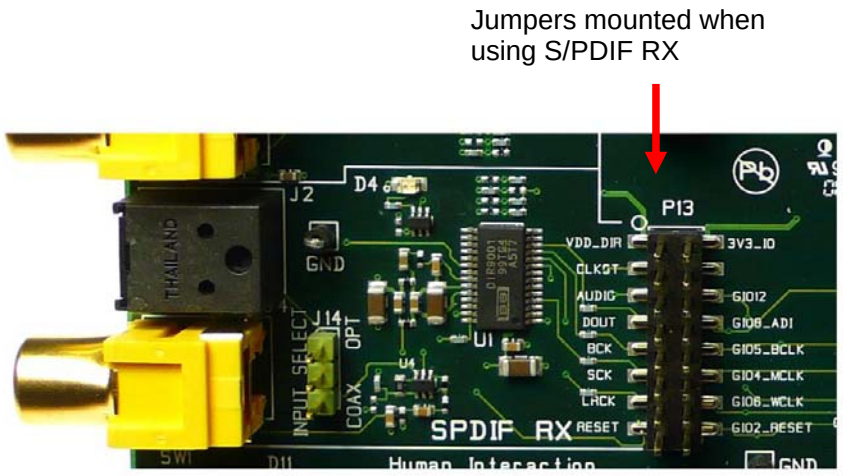


Figure 9: S/PDIF Receiver

To connect the interface between the S/PDIF receiver and CC85xx the jumper block should be mounted on header P13. The interface between CC85xx and S/PDIF receiver is shown in Table 8.

Table 8: P13 S/PDIF receiver interface pins

Pin number	S/PDIF RX	AudioEB Global Signal Name	CC85xx pin
1-2	VDD_DIR	3V3_IO	3V3_IO
3-4	CLKST		
5-6	AUDIO	GIO12	GIO12
7-8	DOUT	GIO8_AD1	IAD1
9-10	BCK	GIO5_BCLK	BCLK
11-12	SCK	GIO4_MCLK	MCLK
13-14	LRCK	GIO6_WCLK	WCLK
15-16	/RESET	GIO2_RESET	GIO2

Table 9: J14 S/PDIF receiver jumper settings

Number	Type	Name	Description	Default position
J14	1,2,3	S-PDIF input	Selects optical or coaxial input signal for S-PDIF signal	Mounted on pins 1-2 for coaxial input

The S/PDIF receiver is controlled by a DIR9001 S/PDIF receiver from Texas Instruments. DIR9001 supports sample rates from 32 KHz to 96 KHz, for more detail about the DIR9001 see the [6]. The configuration of the device is controlled by hardwired configuration pins.

The default settings for data format and sample clock rate can be changed by replacing the 0-ohm resistors connected to the DIR9001 on the PurePath Wireless AudioEB. For more details how it is the DIR9001 is set-up, see the schematics and placement of the configuration resistors in Appendix A and B

The default setting of the DIR9001 device is

- **24-bit I2S data format, MSB first**
- **256 x Sample clock rate**

7.6 S/PDIF Transmitter

The S/PDIF transmitter interface allows connection of digital audio signals output to amplifier or digital recorders. The S/PDIF transmitter translates the signals from the CC85xx I2S bus to S/PDIF format. The S/PDIF interface supports optical (TOSLINK) and coax single ended and differential outputs. The output signal of the DIT4096 is connected to both coax and optical output.

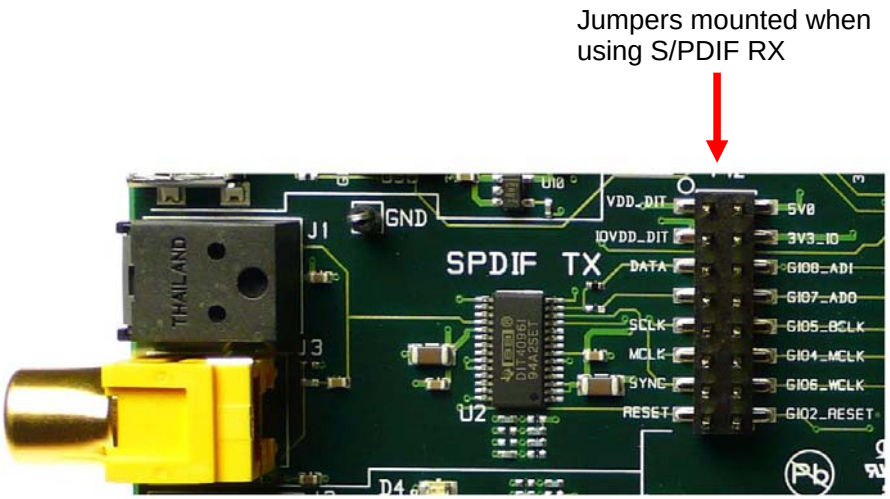


Figure 10: S/PDIF Transmitter

To connect the interface between the S/PDIF transmitter and CC85xx the jumper block should be mounted on header P13. The interface between CC85xx and S/PDIF transmitter is shown in Table 10.

Table 10: P12 S/PDIF Transmitter interface pins

Pin number	S/PDIF TX	AudioEB Global Signal Name	CC85xx
1-2	VDD_DIT_5V	5V0	---
3-4	IOVDD_DIT	3V3_IO	VDD
5-6	DATA	GIO8_AD1	AD1
7-8	Not Used	GIO7_AD0	AD0
9-10	SCLK	GIO5_BCLK	BCLK
11-12	MCLK	GIO4_MCLK	MCLK
13-14	SYNC	GIO6_WCLK	WCLK
15-16	/RESET	GIO2_RESET	GIO2

The S/PDIF transmitter interface is controlled by a DIT4096 from Texas Instruments. The DIT4096 supports sampling frequencies from 22.05 to 96 kHz. The default settings for data format and sample clock rate can be changed by replacing the 0-ohm resistors connected to the DIT4096. For more details how it is the DIR9001 is set-up, see the schematics and placement of the configuration resistors in Appendix A and B

The default setting of the DIT4096 device is

- **24-bit I2S data format, MSB first**
- **256 x Sample clock rate**

7.7 Connector Interface for TAS57XX Class-D Amplifier

A connector on the AudioEB can be used to plug in TAS57XX Evaluation Modules form TAS57XX from Texas Instruments. Please see the PurePath Wireless Configurator for the list of supported devices and the corresponding application notes.

The interface requires a 10-24V power supply on one pin. This is supplied from the 12V DC jack connector. Note that this supply voltage should not be higher than 12V because the voltage regulator for the rest of the board is specified to max 12V. For more details on how to supply the power to the TAS57XX amplifier see section 7.2.1 or the corresponding application note(when released). Table 11 shows the pin-out of the TAS57XX interface connector P8.

Table 11: P8 TAS57XX Interface

Pin Number	AudioEB Pin name
1	GND
2	3V3_IO
3	NC
4	GIO2_RESET
5	NC
6	NC
7	GIO5_BCLK
8	GIO6_WCLK
9	GIO8_AD1
10	GIO9_AD2
11	GIO10_SCL
12	GIO11_SDA
13	GND
14	GND
15	PVDD, 12V
16	PVDD, 12V
17	GIO4_MCLK
18	3V3_IO

7.8 Human Interaction

The human interaction consists of a 4 push buttons and 3 LEDs which are connected to the CC85xxs GPIOs as shown in Table 12. The CS_N pin of the CC85xx is connected to button SW9 on the AudioEB. The GPIOs (Buttons and LEDs) are configurable in the PurePath Wireless Configurator and have normally these primary functions:

- Volume up
- Volume down
- Pairing

The LEDs can be configured to indicate the link status. For more details on how to configure the GPIOs, please see the CC85xx family user's guide [11] and the PurePath Wireless Configurator[9]. The Table 12 shows which LED and Buttons are connected together when jumpers are mounted on P18.

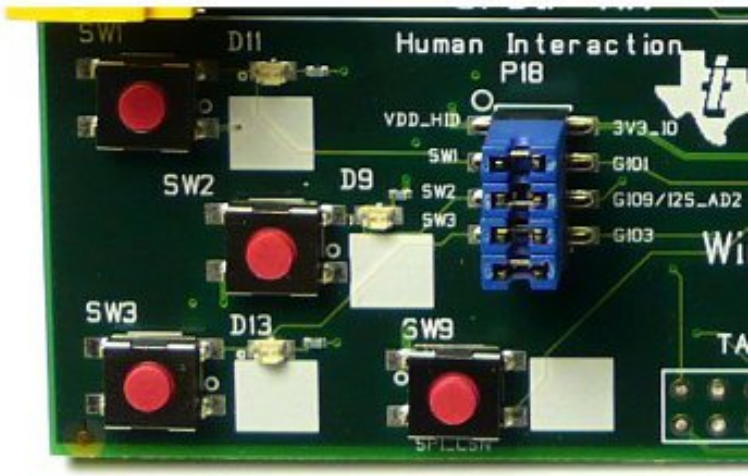


Figure 11: Photo of the human interaction block

There is a white area next to each button and LED to allow the user to write comments when the interface is configured for custom functions in the PurePath Wireless Configurator.

Table 12: P18 Human interaction interface

Pin number	AudioEB Global Signal Name	LED/Button	CC85xx
1-2	3V3_IO	3V3_HID	IOVDD
3-4	GIO1	D11/SW1	GIO1
5-6	GIO9_AD2	D9/SW2	GIO9_AD2
7-8	GIO3	D13/SW3	GIO3

In addition, the PurePath Wireless AudioEB has 2 LEDs for indicating:

- Power on LED, blue, connected to 5V main power supply (D3)
- DIR9001 AUDIO to indicated S/PDIF lock (D4)

7.9 USB Interface

The PurePath Wireless AudioEB has the USB interface of the CC85xxEM routed to the USB connector J7. Hence, the PurePath Wireless AudioEB can be used to evaluate the USB functionality of the CC85x1. However, the AudioEB rev. 1.2 and earlier the components R52 and R53, 33 ohm resistors (0402), need to be mounted. Please refer to Appendix B for the placement of these components. Also note that jumper J11 must be in position 2-3 when using the USB functionality of the CC85x1.

7.10 Jumper Settings

Table 13 below gives an overview of the all jumpers on the AudioEB. All jumper settings are marked with jumper numbers and explanation on the silk screen on the AudioEB.

Table 13: Jumper setting on the AudioEB

Number	Type	Name	Description	Default position
J9	On/off	>12V supply	Remove jumper to use separate power supply for power amplifier	Mounted
J10	1,2,3	DC/USB power	Select USB or DC power as main power supply	Mounted on pins 1-2 for USB power
J14	1,2,3	S-PDIF input	Selects optical or coaxial input signal for S-PDIF	Mounted on pins 1-2 for

			signal	coaxial input
J15	On/off	HP Int	Headphone sense pin connect. Connects the Headphone detect signal to GIO12 on CC85xx when mounted	Not Mounted
P16	--	CC85xx power	Current measurement jumper. Remove 0 ohm resistors and connect ampere meter to measure current consumption	Not mounted

7.11 CC85xx Programming Connector

The CC85xx Program connector P10 is used to program the CC85xx using the CC debugger. The pinout of the program interface is listed in Table 14. Figure 3 shows how to connect the CC debugger to the AudioEB. For more details about the CC debugger, see the CC debugger product page [13].

The connector P10 can also be used to connect an external MCU to control the CC85xx with the external host interface. For more details about the external host interface, see the CC85xx User's Guide[11]. Please note that GIO1 and GIO3 is not needed for programming the CC85xx, but can be utilized as interrupt pins for the external host interface.

Table 14: P10 Program interface pin mapping

EB P10	AudioEB Signal Name	CC debugger Pin name	CC85xx pin
1	GND	GND	GND
2	IO_VDD	Target Vdd	IO_VDD
3	GIO1		GIO1
4	GIO3		GIO3
5	CS_N	CSn	CS_N
6	SPI_CLK	SCLK	SCLK
7	RSTN	Reset	RSTN
8	SPI_MOSI	SI (Slave In)	MOSI
9		3.3V Vdd	NC
10	GPIO0_SPI_MISO	SO (Slave Out)	MIS)

8 CC85xx Evaluation Modules

The CC85xxDK includes 2 different evaluation modules i.e., the CC85xxEM and the CC85xxEM+CC2590EM. The EMs are the boards that are populated with the CC85xx chip and connectors to AudioEB. The CC85xxEM have a minimum BOM for low cost and the CC85xx+CC2590 have added the CC2590 for higher performance (longer range). The RF characterization numbers of both of the EMs can be found in the CC8520 data sheet [12].

8.1 CC85xxEM Functionality

The purpose of the CC85xxEM is to be a reference design for customer to copy and to be a daughterboard for PurePath Wireless AudioEB. The board shows how to route power, the RF matching and where to place decoupling capacitors to get best radio performance of CC85xx. This CC85xxEM and the CC85xx+CC2590EM should be copied as closely as possible for optimum performance of the CC85xx. The complete schematics, BOM and layout files of the reference designs are available in the CC8520 product folder [12].

8.2 CC85xxEM

Figure 12shows a photo of the CC85xxEM. The CC85xxEM comes with both a SMA connector to connect an external antenna and a PCB antenna. To change from the default SMA connector to the PCB antenna, move the 0 ohm resistor to connect the PCB antenna instead of the SMA connector.

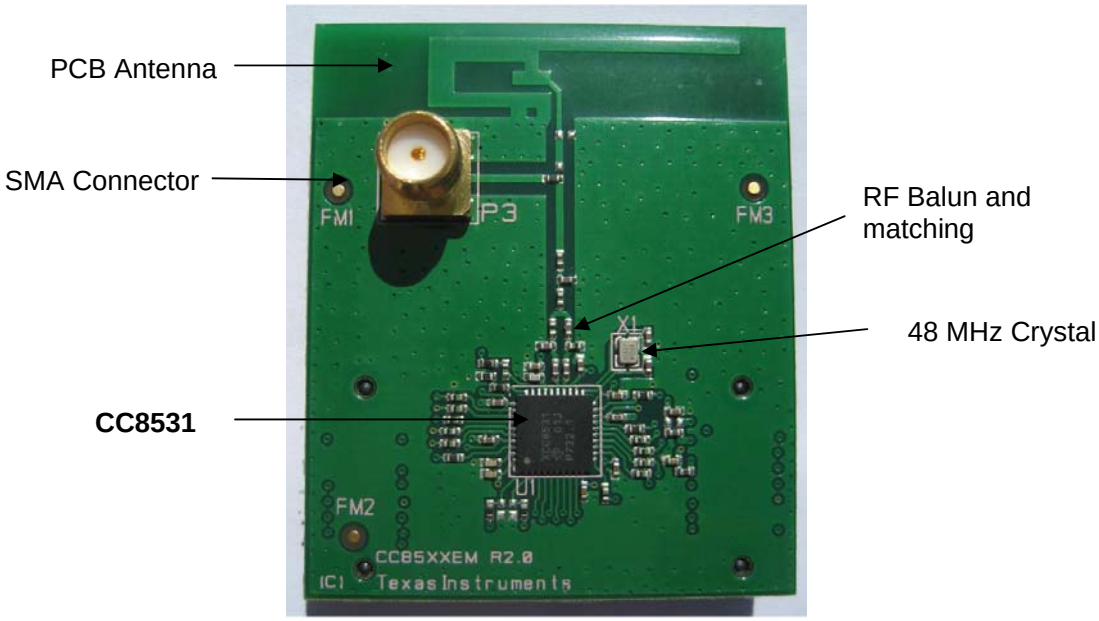


Figure 12: Photo of the CC8531EM

8.3 CC85xx+CC2590EM

A photo of the CC8531EM+CC2590EM is shown in Figure 13. The CC2590 is a range extender from Texas Instruments. For more details about the CC2590, see the CC2590 product page[16]. The EM comes with both a SMA connector for an external antenna and a PCB antenna. To change from the default SMA connector to the PCB antenna, move the 0 ohm resistor to connect the PCB antenna instead of the SMA connector.

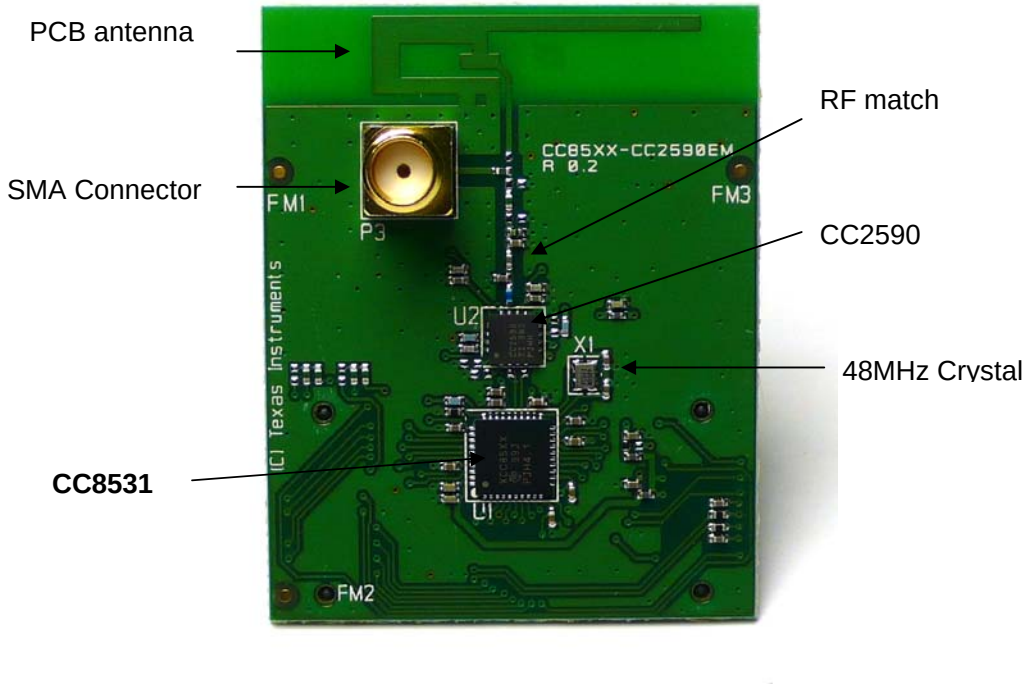


Figure 13: Photo of the CC8531+CC2590EM

8.4 CC85xxEM Pin Mapping

Table 15 shows the pin mapping between the CC85xxEM (and CC85xx+CC2590EM) connector (P1 and P2), the CC85xx and the names of the signals on the AudioEB. The EM interface connectors on the AudioEB are BB02-BY201-KA8-A00000 from Gradconn. The connector used on the CC85xxEM is: Samtec SFM-110-02-SM-D-A-K-TR. The connectors are spaced 1200mils apart (centre to centre).

AudioEB	AudioEB Signal Name	CC85xx pin	AudioEB	AudioEB Signal Name	CC85xx pin
P1_01	GND	PAD	P2_01		
P1_03			P2_03	VDD_IO	10,12,18,37
P1_05	GIO14	36	P2_05	VBAT	29
P1_07			P2_07	DVDD	40
P1_09			P2_09	AVDD	20,23,26,27,28,31
P1_11	GIO11_SDA	33	P2_11	GIO6_WCLK	15
P1_13	GIO10_SCL	32	P2_13	GIO4_MCLK	13
P1_15	GIO12_LVDSN	34	P2_15	RSTN	11
P1_17	GIO13_LVDSP	35	P2_17	GIO5_BCLK	14
P1_19	GND	PAD	P2_19		
P1_02			P2_02	GND	PAD
P1_04			P2_04	EXT_CLK	21
P1_06	GIO15	38	P2_06	GIO9_AD2	19
P1_08			P2_08	GIO8_AD1	17
P1_10	GIO1	7	P2_10	GIO7_AD0	16
P1_12	GIO2_RESET	8	P2_12	USBM	1
P1_14	SPI_CSN	3	P2_14	USBP	2
P1_16	SPI_CLK	4	P2_16		
P1_18	SPI_MOSI	5	P2_18	GIO3	9
P1_20	GIO0_SPI_MISO	6	P2_20		

Table 15: CC85xxEM pin mapping table

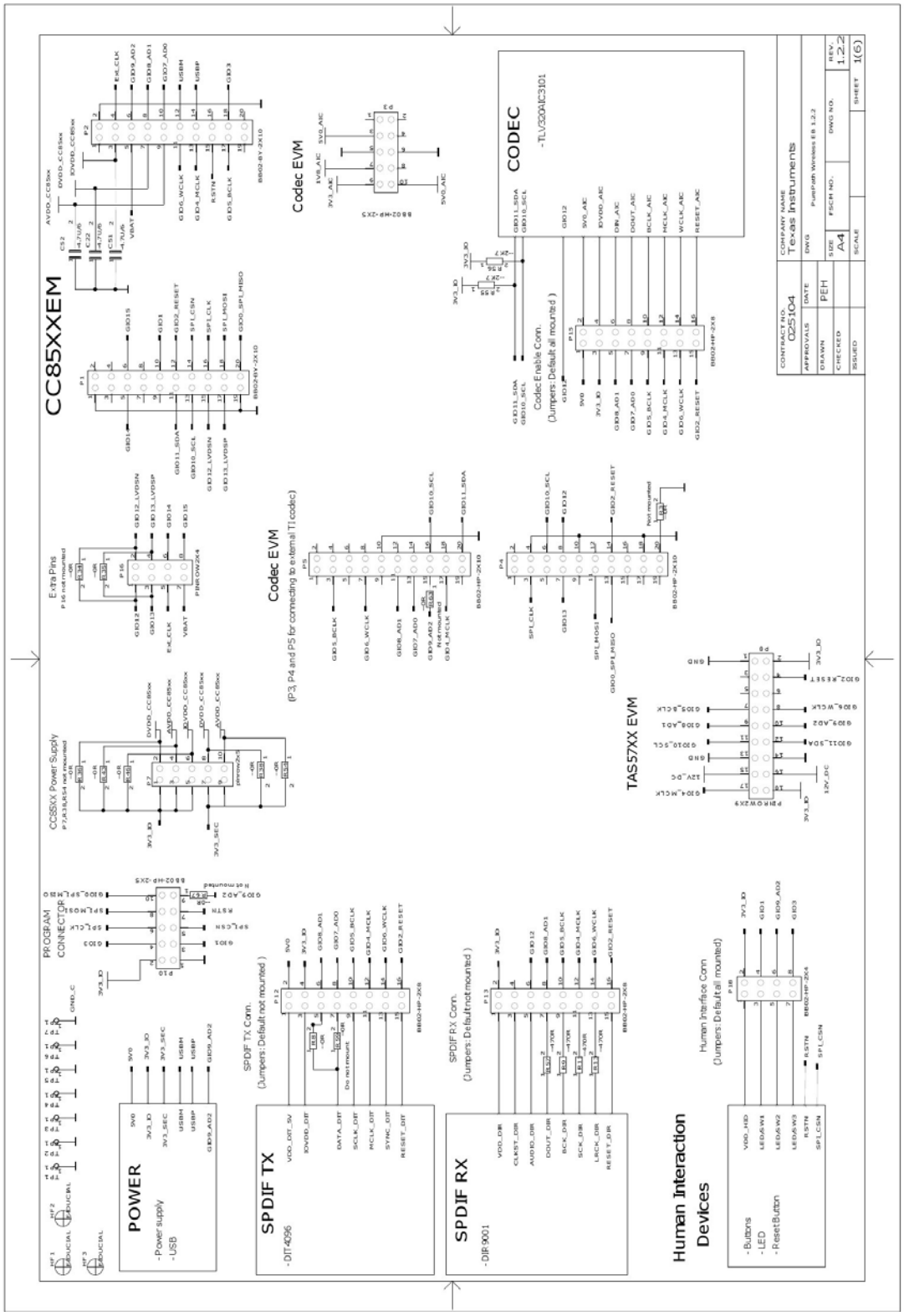
9 References

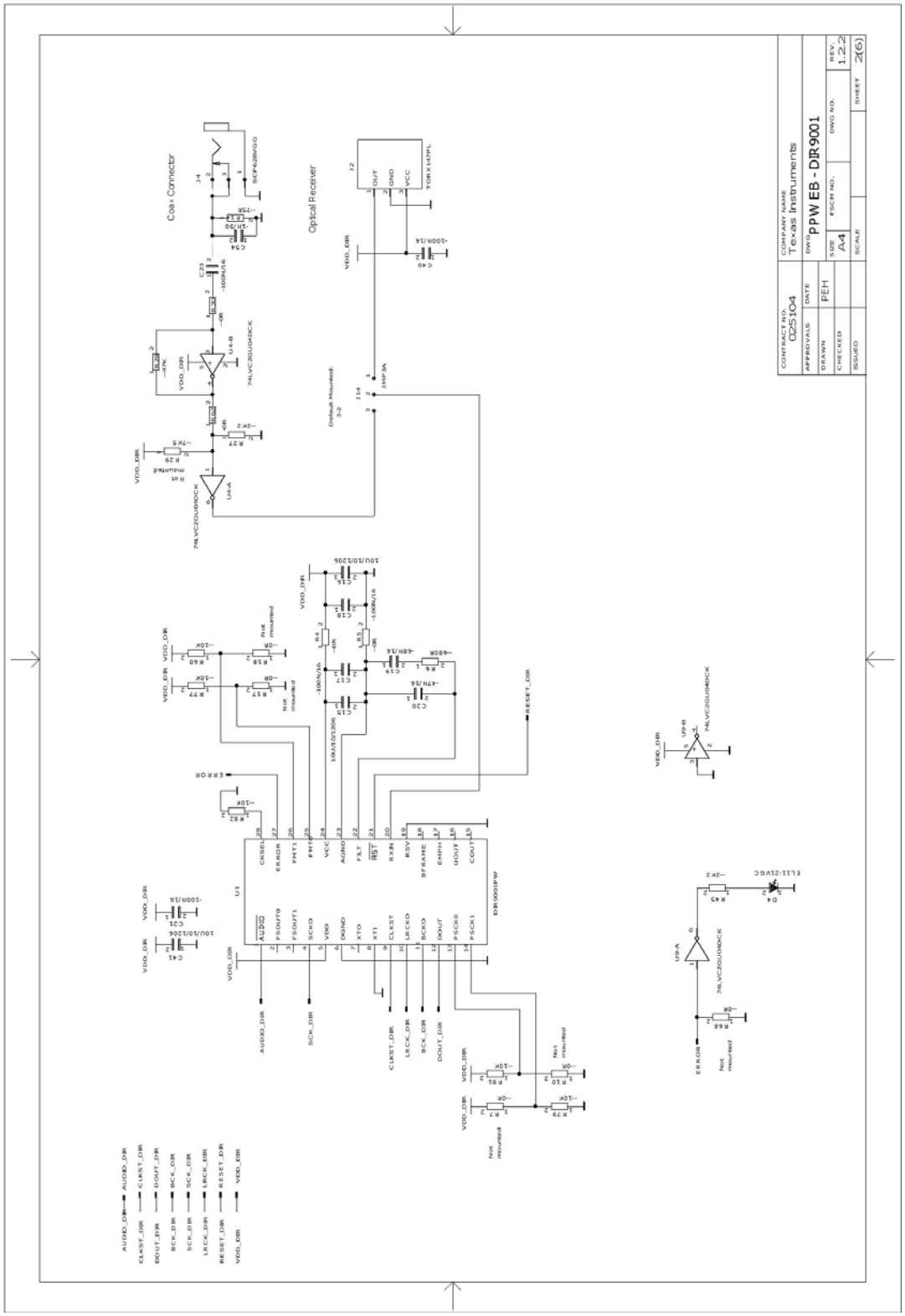
[1] Purepath Wireless Audio product page
http://www.ti.com/ww/en/analog/cc8520/index.shtml
[2] CC85xxDK Quick Start Guide
http://www.ti.com/lit/swru252
[3] TLV320AIC3101 Product folder:
http://focus.ti.com/docs/prod/folders/print/tlv320aic3101.html
[4] TLV320AIC3101 EVM users guide:
http://www.ti.com/litv/pdf/sbau113
[5] DIT4096 product page
http://focus.ti.com/docs/prod/folders/print/dit4096.html
[6] DIR9001 product page:
http://focus.ti.com/docs/prod/folders/print/dir9001.html
[7] DIR9001 EM users guide:
http://www.ti.com/litv/pdf/slau225
[8] TAS5710 product page:
http://focus.ti.com/docs/prod/folders/print/tas5710.html
[9] PurePath Wireless Configurator product page
http://focus.ti.com/docs/toolsw/folders/print/purepath-wl-cfg.html
[10] CC85xx Development Kit product page
http://focus.ti.com/docs/toolsw/folders/print/CC85xxdk.html
[11] CC85xx Family User's Guide
http://focus.ti.com/general/docs/lit/getliterature.tsp?baseLiteratureNumber=swru250
[12] CC8520 Product folder
http://focus.ti.com/docs/prod/folders/print/cc8520.html
[13] CC Debugger product page
http://focus.ti.com/docs/toolsw/folders/print/cc-debugger.html
[14] Using the CC85xx with the TAS57xx
http://focus.ti.com/general/docs/lit/getliterature.tsp?baseLiteratureNumber=SWRA324
[15] Using the CC85xx with the TLV320AIC3204
http://focus.ti.com/general/docs/lit/getliterature.tsp?baseLiteratureNumber=SWRA325
[16] CC2590 Product page
http://focus.ti.com/docs/prod/folders/print/cc2590.html
[17] Texas Instruments Low Power RF forum
http://www.ti.com/lprf-forum
[18] Texas Instruments Support
http://support.ti.com

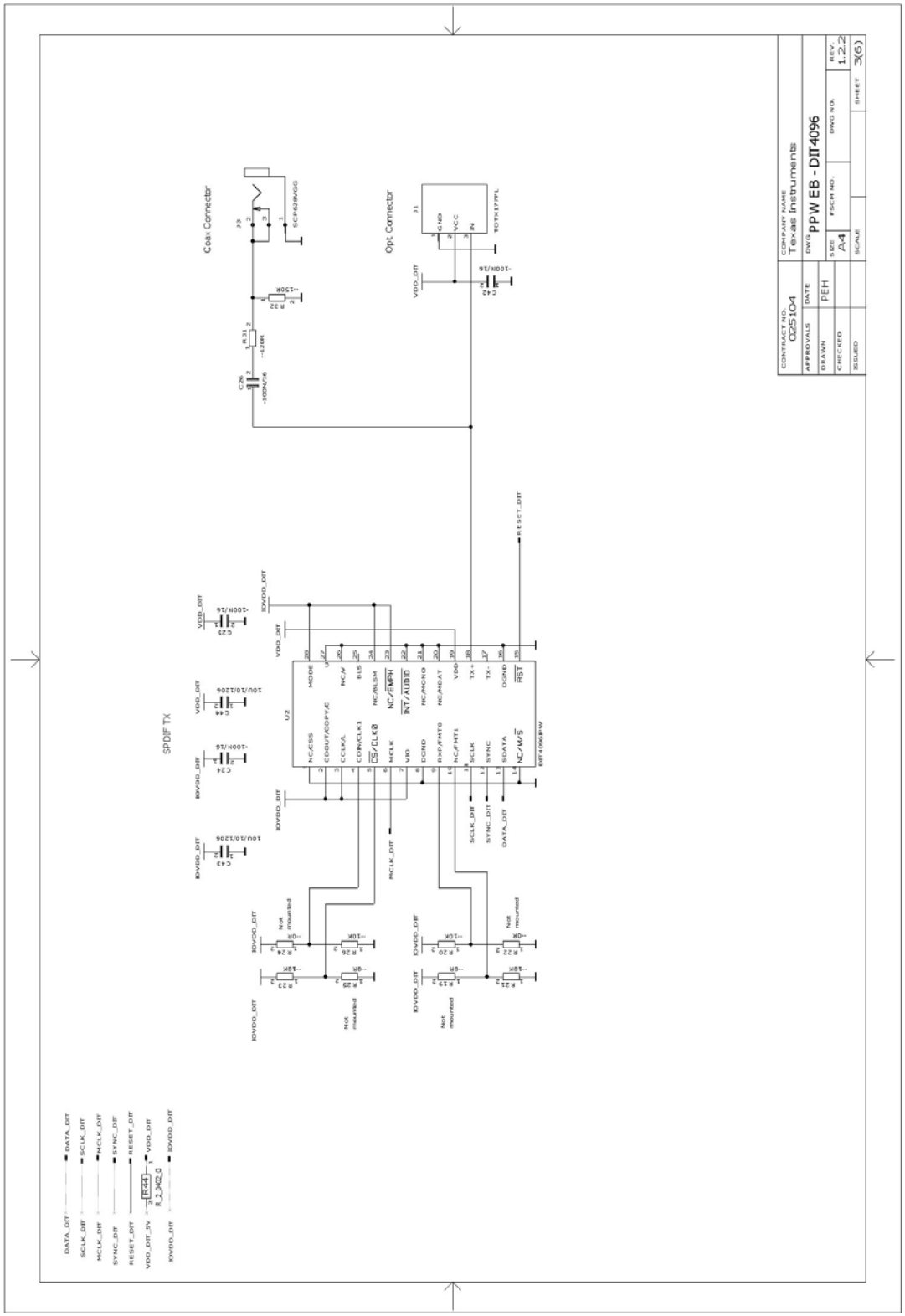
10 Document History

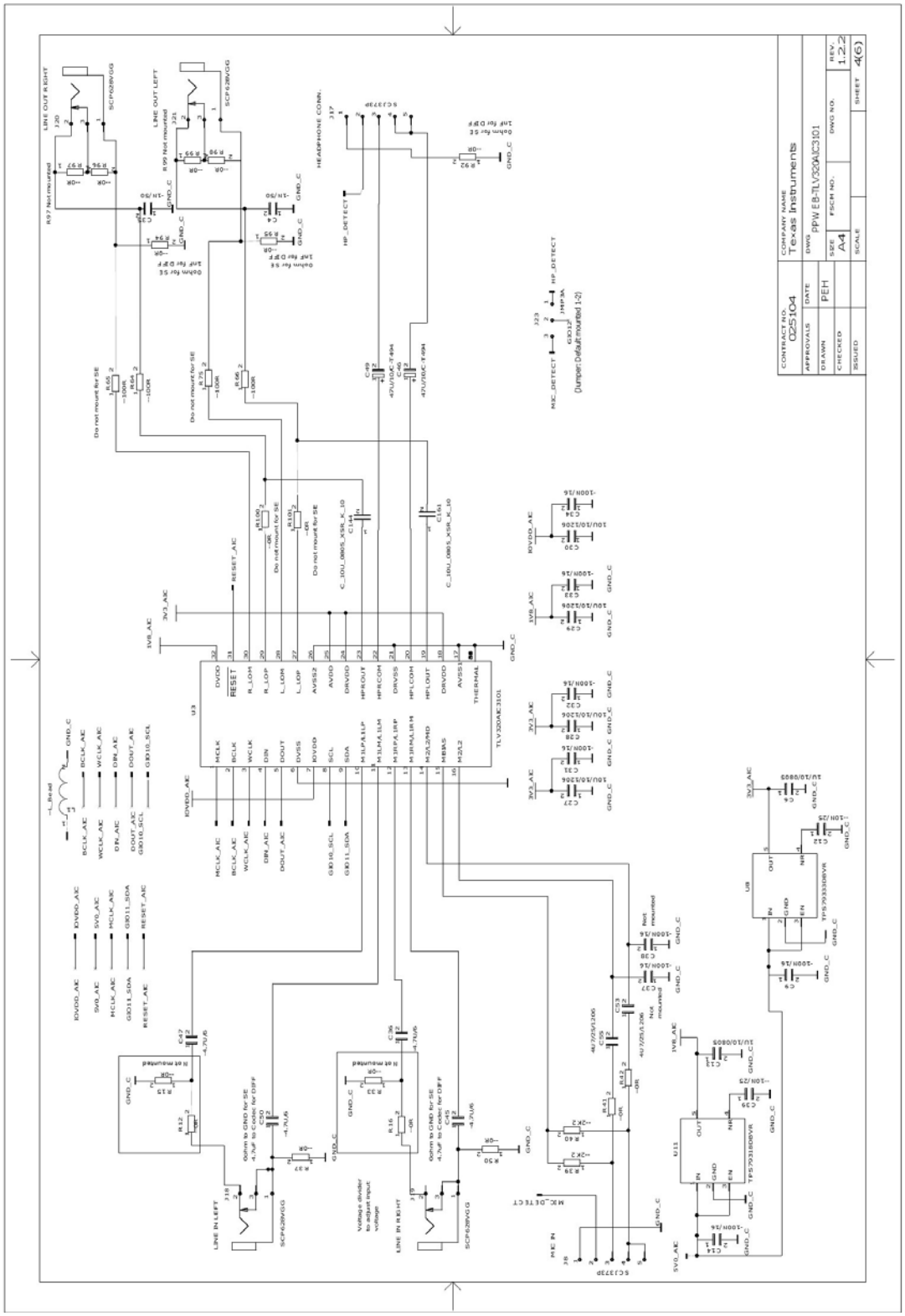
Revision	Date	Description/Changes
A	2010-07-18	Added USB Interface section
	2010-06-30	Initial release

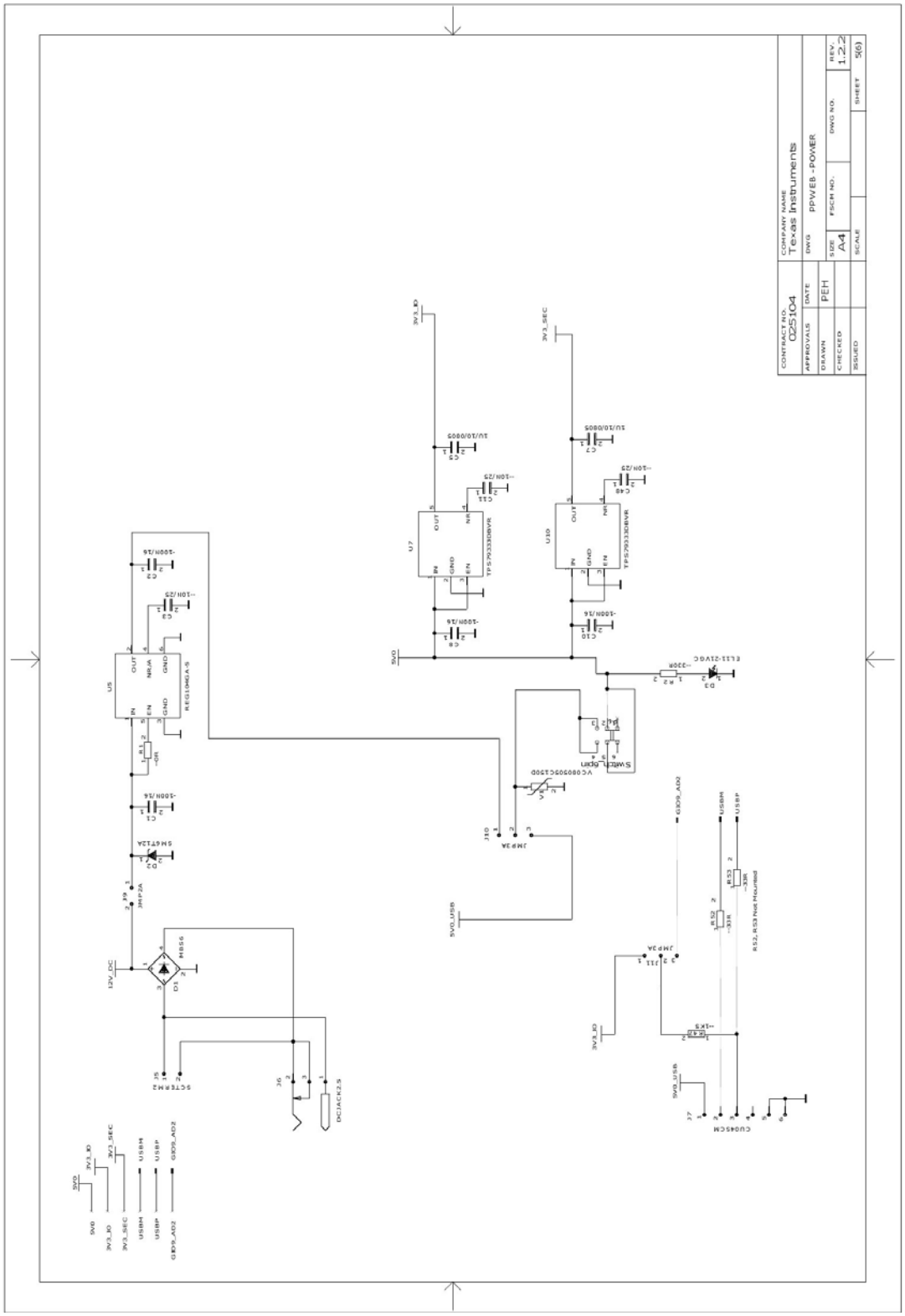
Appendix A: PurePath Wireless AudioEB Schematic

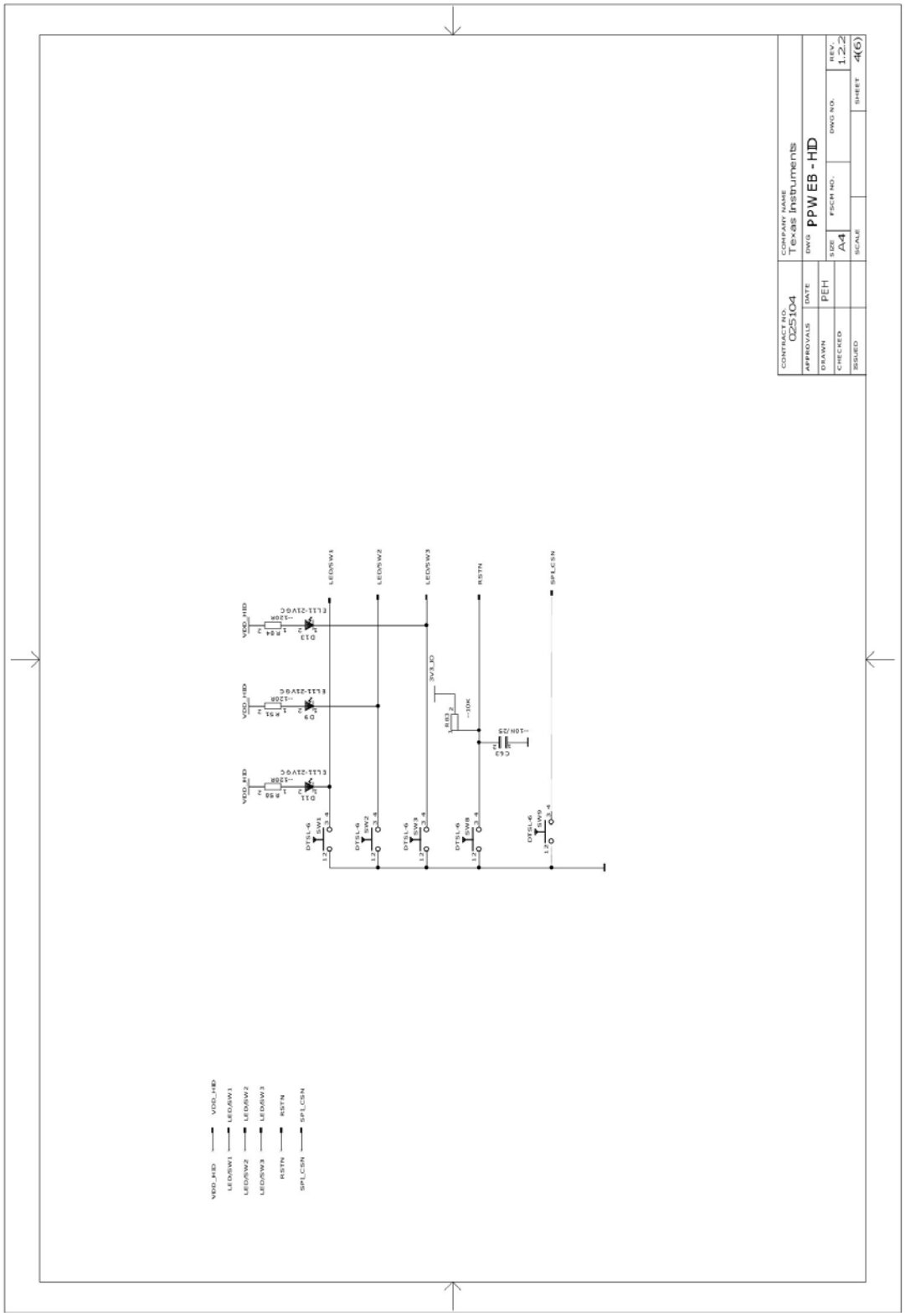



Coax Connector
Optical Receiver
Default Mounted
Not mounted
DIR9001PW
74LVC2GU04DCK
CONTRACT NO.
025104
COMPANY NAME
Texas Instruments
DWG
PPW EB - DIR9001
DRAWN
PEH
SIZE
A4
REV.
1.2.2
SHEET
2(6)

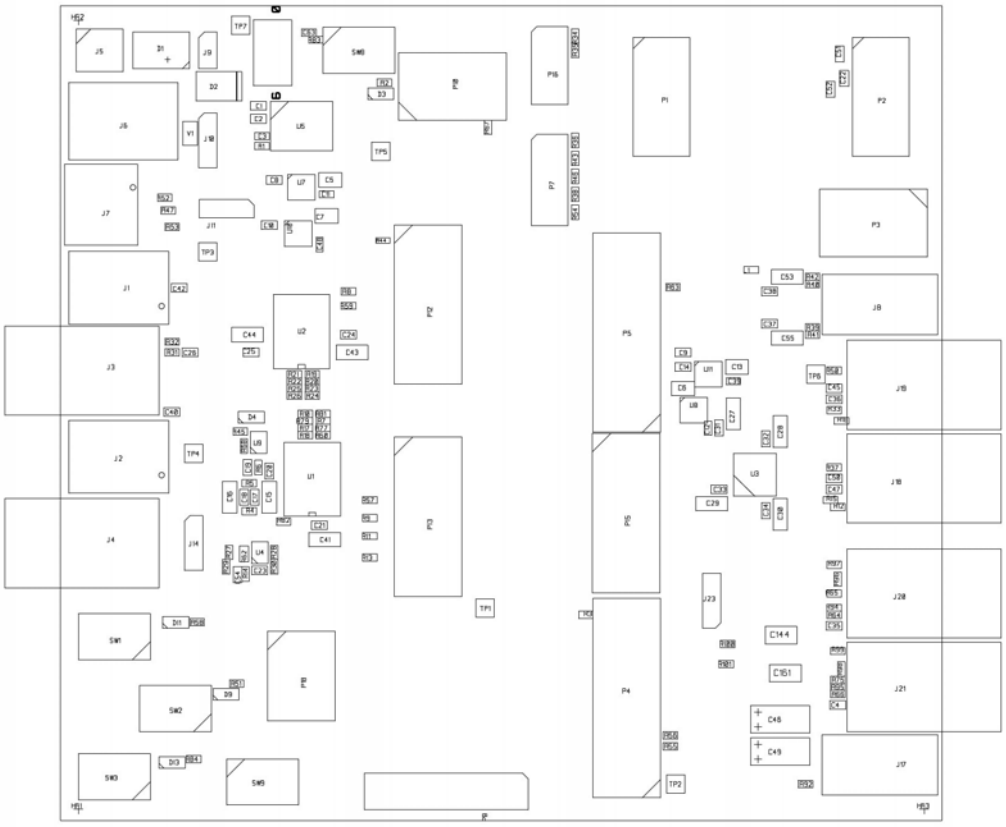

Coax Connector
Opt Connector
SPDIF TX
COMPANY NAME
Texas Instruments
PPW EB - DIT4096
CONTRACT NO.
025104
DATE
PEH
SIZE
A4
REV.
1.2.2
SHEET
3(6)


COMPANY NAME
Texas Instruments
DWG
PPW EB-TLV320AIC3101
SIZE
A4
FSCM NO.
DWG NO.
REV.
1.2.2
SHEET
4(6)
CONTRACT NO.
025104
APPROVALS
DATE
DRAWN
PEH
CHECKED
ISSUED
SCALE
LINE OUT RIGHT
LINE OUT LEFT
HEADPHONE CONN.
HP_DETECT
MIC_DETECT
LINE IN LEFT
LINE IN RIGHT
MIC IN
TLV320AIC3101
TPS79333DBVR
TPS79318DBVR
SCP628VGG
SCJ373P
Voltage divider to adjust input voltage
Not mounted
Do not mount for SE
Ohm for SE
1nF for DIFF
GND_C
RESET_AIC
MCLK_AIC
BCLK_AIC
WCLK_AIC
DIN_AIC
DOUT_AIC
GIO10_SCL
GIO11_SDA
IOVDD_AIC
SVD_AIC
MCLK_AIC
GIO11_SDA
RESET_AIC
IOVDD_AIC
1V8_AIC
3V3_AIC
2V3_AIC
1V8_AIC
3V3_AIC
SV0_AIC
GND_C


CONTRACT NO.
025104
COMPANY NAME
Texas Instruments
APPROVALS
DATE
DRAWN
PEH
CHECKED
ISSUED
DWG
PPWEB-POWER
SIZE
A4
FSCM NO.
DWG NO.
REV.
1.2.2
SCALE
SHEET
5(6)


CONTRACT NO.
025104
COMPANY NAME
Texas Instruments
APPROVALS
DATE
DRAWN
PEH
CHECKED
ISSUED
DWG
PPWEB-HID
SIZE
A4
FSCM NO.
DWG NO.
REV.
1.2.2
SCALE
SHEET
4(6)
VDD_HID
LED/SW1
LED/SW2
LED/SW3
RSTN
SPI_CSN
3V3_ID
R83
-10K
C63
-10N/25
DTSL-6
SW1
SW2
SW3
SW8
SW9

Appendix B PurePath Wireless AudioEB Components Placement



ASSEMBLY DRAWING PRIMARY SIDE
VIEWED FROM PRIMARY SIDE

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com	Wireless	www.ti.com/wireless-apps
RF/IF and ZigBee® Solutions	www.ti.com/lprf		
	TI E2E Community Home Page		e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated