

TC321X Development Board User Manual

1. Board overview

The TC321X Development Board is designed based on the TC321X chip and is used to verify the TC321X series of chips. It can be used to verify the following chips:

- TC321X
- TC3215C
- TC3215E
- TC3215F
- TC3216F

TC321X Bluetooth LE and 2.4G Private Protocol, etc.

This board supports testing of various features, such as RF conduction test, current test, audio input and output test, arbitrary combination of li

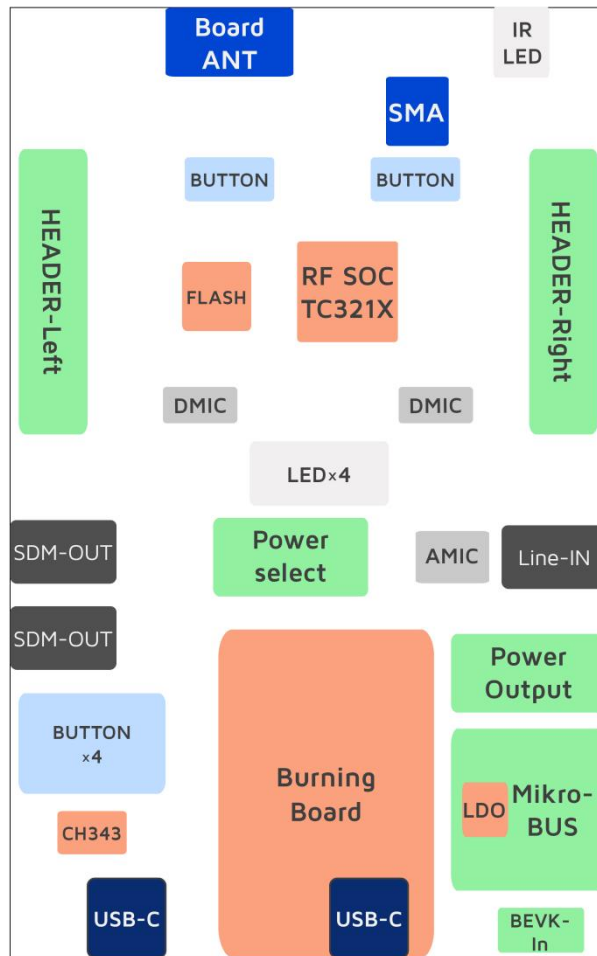
The TC321X Development Board is designed based on the TC321X chip and is used to verify the TC321X series of chips. It can be used to verify the following chips:

This document provides a detailed description of the interfaces, power supply, debugging methods, audio jack, button

s, lights, and jumpers of the TC321X development board, facilitating users to familiarize themselves with the board for subsequent development and debugging.

1.1 Block diagram

Figure 1 shows the top view of the board



1.2 Board features

Table 1 lists the features supported by the board.

Board feature	Description	Reference section
Current measurement interface	Supports current testing of each branch and the total current through jumper combinations	Section 2.3
RF interface	Supports RF conduction testing through the SMA connector or on-board antenna	Section 2.4
Debug interface	Supports Full-speed USB interface	Section 2.2
GPIO interface	Supports flexible jumper connection of all GPIOs	Section 2.5
Peripheral interface	Supports peripherals such as buttons, LEDs, DMIC, and AMIC	Section 2.6 Section 2.7
Mikro-BUS interface	Supports connecting Mikro-BUS to expand additional functions for software development	Section 2.8

On-board burning moudle	Supports burning and debugging using the on-board burner	Section 2.9
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1.3 Kit 内容

Table 2 lists the main items included in the sales kit of the TC321X Development Board.

Item	Quantity
TC321X Development Board	1
Whip antenna	1
USB 2.0 Type-A to Type-C cable	1

1.4 Board pictures

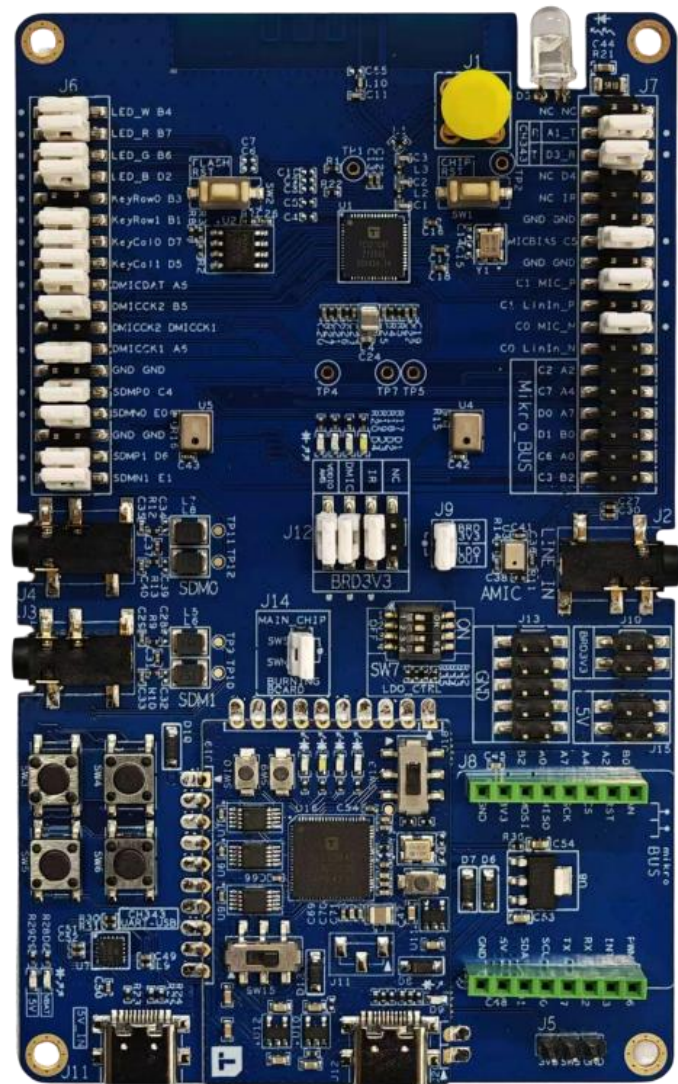


Figure 5 shows the details of the jumpers and sockets on the front of the board.

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1.6 LED

Figure 6 shows details of LEDs on boards.

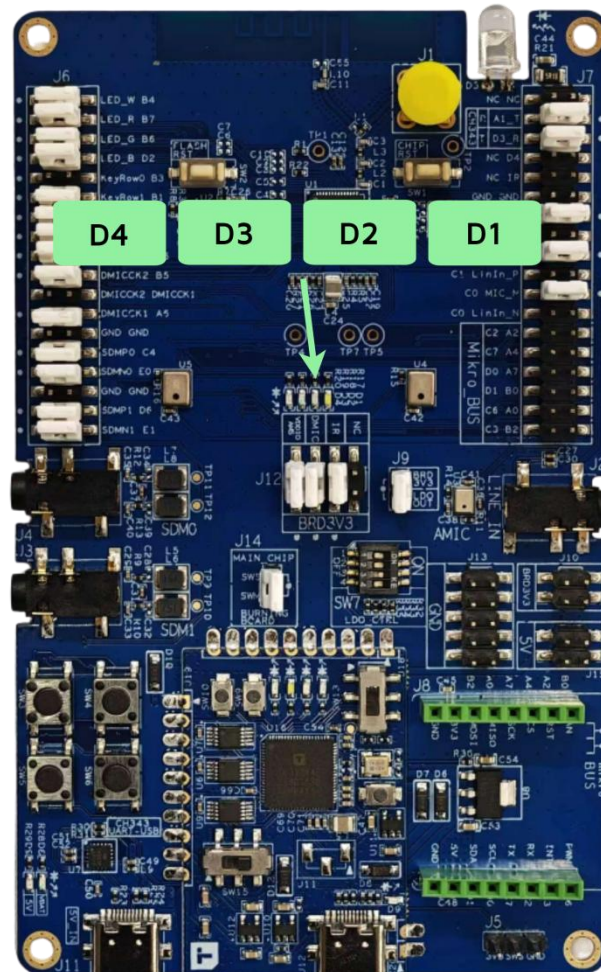


Table 4 列出了正面的 LED 灯的详情。

Part Number	LED color	Description
D1	White	1. PB4 of TC321X is connected to PIN1 of J6. 2. PIN1 and PIN2 of J6 are short-circuited by a jumper by default. 3. If you want to control D1 with another GPIO of TC321X, please remove this jumper. Then connect PIN2 of J6 to the other GPIO you want to use.
D2	Red	1. PB7 of TC321X is connected to PIN3 of J6. 2. PIN3 and PIN4 of J6 are short-circuited by a jumper by default. 3. If you want to control D2 with another GPIO of TC321X, please remove this jumper. Then connect PIN4 of J6 to the other GPIO you want to use.
D3	Green	1. PB6 of TC321X is connected to PIN5 of J6. 2. PIN5 and PIN6 of J6 are short-circuited by a jumper by default. 3. If you want to control D3 with another GPIO of TC321X, please remove

		this jumper. Then connect PIN6 of J6 to the other GPIO you want to use.
D4	Blue	1. PD2 of TC321X is connected to PIN7 of J6. 2. PIN7 and PIN8 of J6 are short-circuited by a jumper by default. 3. If you want to control D4 with another GPIO of TC321X, please remove this jumper. Then connect PIN8 of J6 to the other GPIO you want to use.

1.7 Button

Figure 8 gives the details of the keys on the board.

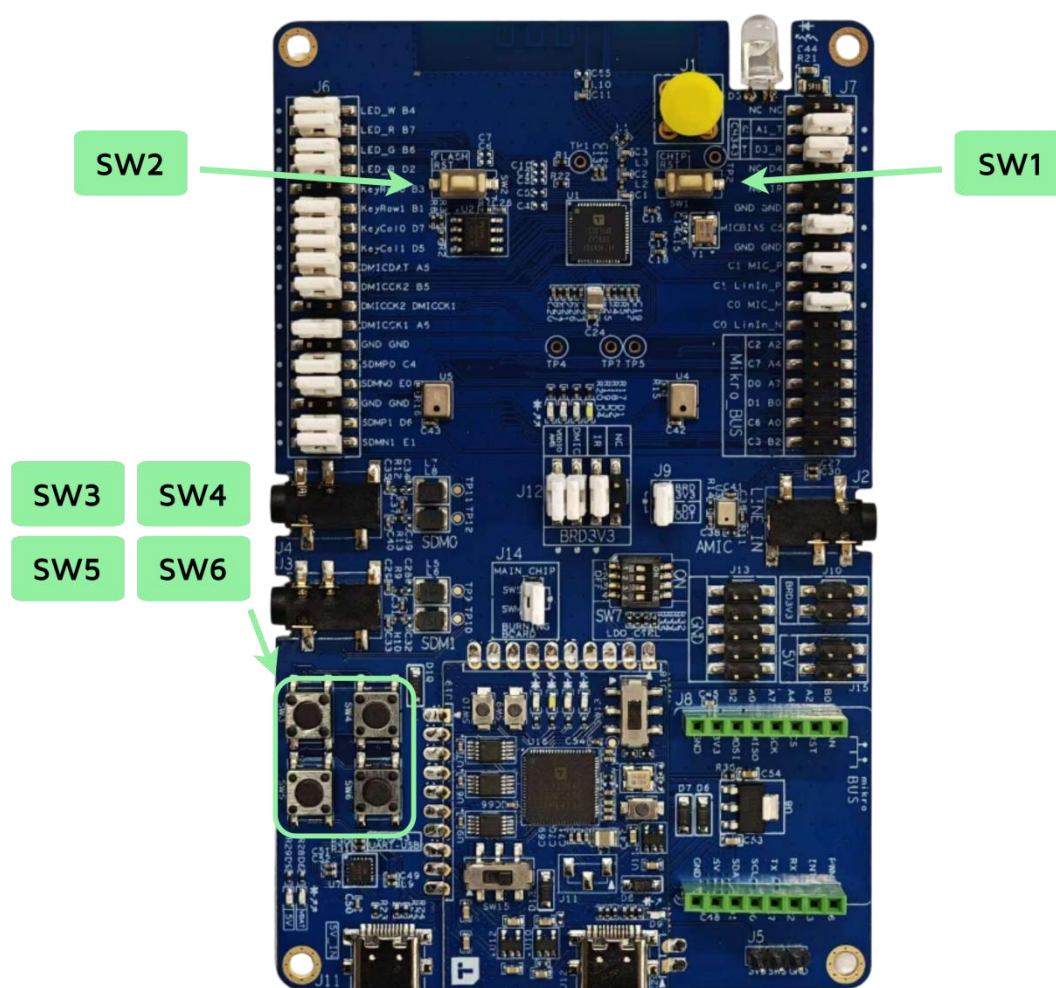


Table 5 列出了 5 个按键的详情。

Part Number	Function	Description
SW1	Chip rest	Pressing this button will reset the main chip
SW2	Flash rest	Pressing this button will reset the flash chip
SW3		1. SW3、SW4、SW5、SW6 组成 2x2 的按键矩阵。 2. SW3 The two ends of the net is J6 Pin10、Pin14 3. SW4 The two ends of the net is J6 Pin10、Pin16
SW4		
SW5		

SW6		4. SW5 The two ends of the net is J6 Pin12、Pin14 5. SW6 The two ends of the net is J6 Pin12、Pin16 6. J6 Pin10 and PB3 Connected by default via the jumper; J6 Pin12 and PB1 Connected by default via the jumper; J6 Pin14 and PD7 Connected by default via the jumper; J6 Pin16 and PD5 Connected by default via the jumper。
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2. Functional Description

2.1 Power supplies

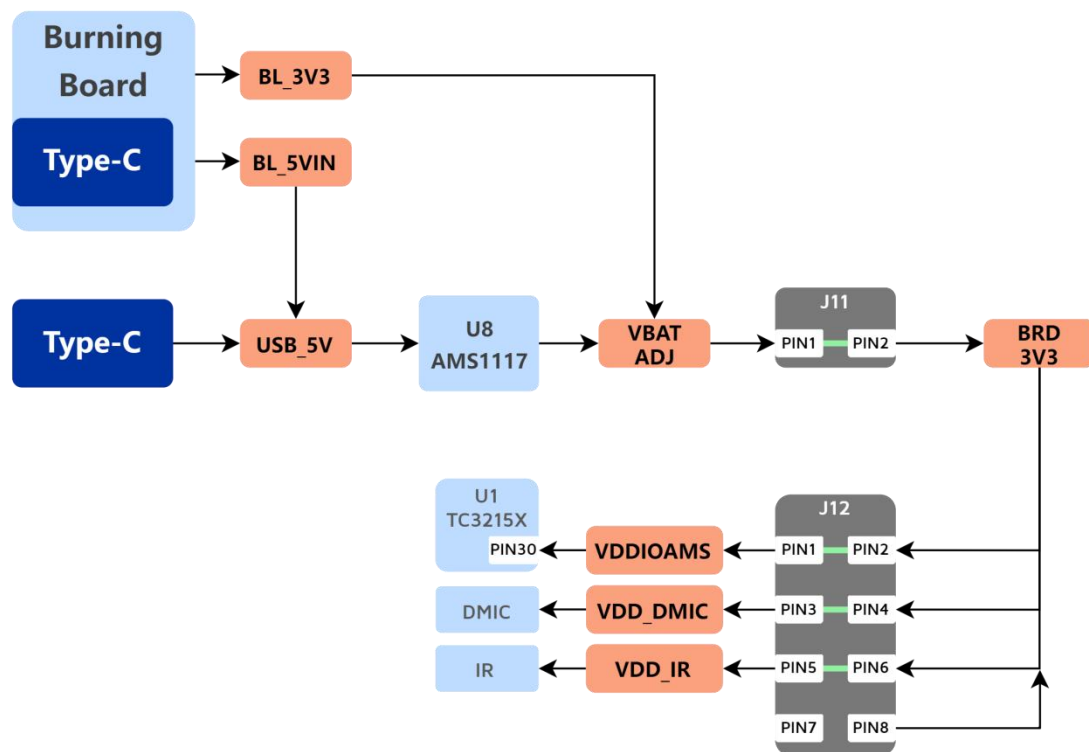
TC321X Development Board can use below methods as power supply :

- Connect to 5V via Type-C USB or the Type-C port of the onboard burner
- Provide a voltage between 1.8V and 3.6V through the VDDIO_AMS pin of J12, PIN8 U1

Table 7 Lists the power supply paths

Power Source	Power Supply	Description
Method1: 5V supply through Typc-C J11 or Type-C on burning board	VBUS	1. Provides 5V to AMS-1117 (U8), which outputs 3.3V through this LDO. Then it is connected to J12 pin1 via 12 Pin2 jumper, and further connected to Pin19, Pin20, Pin30, and Pin44 of U1 for power supply. These 4 pins are the voltage input pins of the chip. 2. 5V voltage is provided through the on-board burning module, and the subsequent power supply path is the same as Method 1.
Method2: External supply through connector J6, pin 12	TL_VDD	1. Apply an external voltage between 3.3V to J12 Pin8, which is routed to J12 Pin2. This pin is connected to J12 Pin1 by a jumper by default, thereby supplying power to the chip's power pins and simultaneously supplying power to peripherals such as DMIC and IR lights through the adjacent jumper.

Figure 9 shows the main power supply paths.

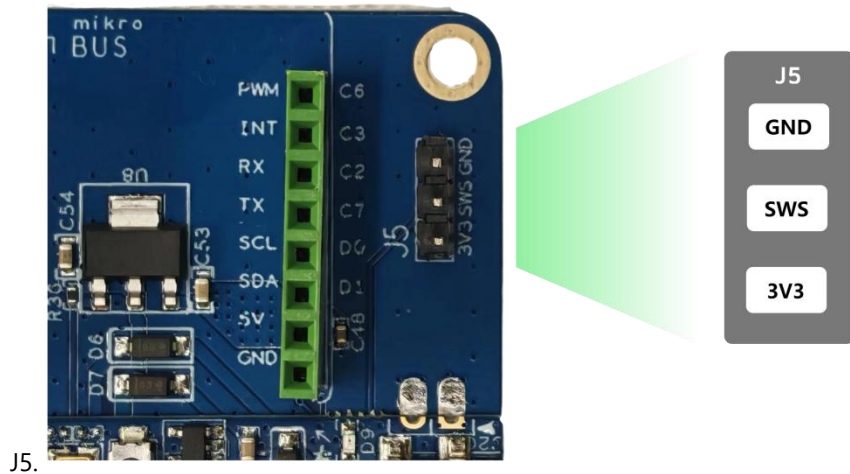


2.2 Debug interface

The TC321X Development Board provides a Single Wire Debug method. Table 9 lists the two supported debugging methods.

Debug Method	Connector	Description
Single Wire	J5	1. 1. Supplies power to the chip and 3.3V peripherals. 2. J5 supports Telink's private debugging protocol, single wire. 3. U1.Pin48.PA3 is connected to J5.PIN2 - SWS. 4. Connect the SWM of the burner to the SWS here.
Burning module	Right Type-C	1. 1. Supplies power to the chip and 3.3V peripherals. 2. Supports Telink's private debugging protocol, single wire. 3. Insert USB-C into this interface to use BDT for burning. (Note: Unplug the left Type-C power supply during burning)

Figure 11 shows the description of each pin of



2.3 Current measurement

The TC321X Development Board provides a method for testing the current of each pin. Table 10 lists the method for testing current.

Item	Power Supply	Description
Chip consumption	TL_VDDPST TL_VDD3_DCDC TL_VDDIO_AMS	1. When powering on, remove the jumper between J12 PIN1 and PIN2, and connect an ammeter in series between them. At this time, the total current of the chip can be tested. 2. Note: Ensure that no peripherals are consuming power and that there is no GPIO current injection (including JTAG and SWS) to avoid high chip current test results. 3. For details, refer to Figure 10.

2.4 RF measurement

The TC321X Development Board provides methods for RF conduction testing and radiation testing. Table 11 lists the methods for conducting RF testing.

Item	Connector	Description
RF test	J1	a) RF radiation testing is performed through the PCB antenna

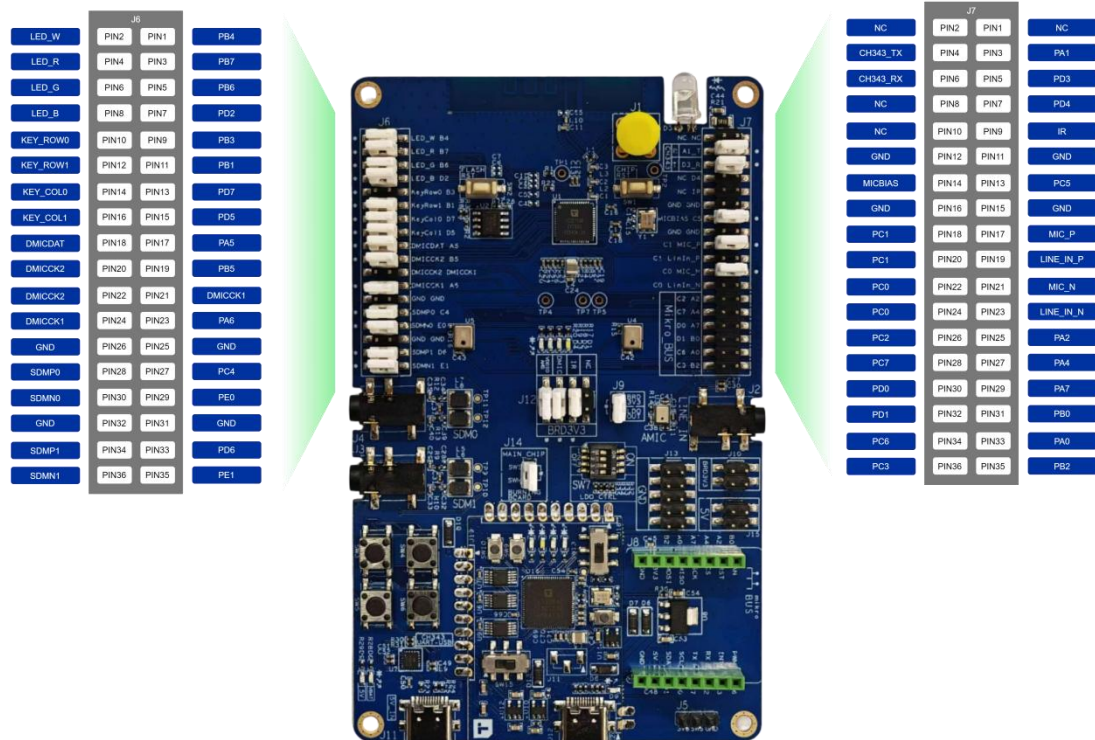
2.5 GPIO interface

The TC321X Development Board connects all GPIOs to pin headers for easy use by users. Table 12 lists the connection destinations of all IOs.

Pin Number	IO Name	Connector
U1.PIN06	PD7	J6 PIN13
U1.PIN08	PD6	J6 PIN33

U1.PIN09	PD5	J6 PIN15
U1.PIN10	PD4	J7 PIN07
U1.PIN11	PD3	J7 PIN05
U1.PIN12	PD2	J6 PIN07
U1.PIN13	PD1	J7 PIN32
U1.PIN14	PD0	J7 PIN30
U1.PIN15	PE0	J6 PIN29
U1.PIN16	PE1	J6 PIN35
U1.PIN25	PB4	J6 PIN01
U1.PIN26	PB5	J6 PIN19
U1.PIN27	PB6	J6 PIN05
U1.PIN28	PB7	J6 PIN03
U1.PIN31	PC0	J7 PIN22\PIN24
U1.PIN32	PC1	J7 PIN18\PIN20
U1.PIN33	PC2	J7 PIN26
U1.PIN34	PC3	J7 PIN36
U1.PIN38	PC4	J6 PIN27
U1.PIN39	PC5	J7 PIN13
U1.PIN40	PC6	J7 PIN34
U1.PIN41	PC7	J7 PIN28
U1.PIN45	PA0	J7 PIN33
U1.PIN46	PA1	J7 PIN03
U1.PIN47	PA2	J7 PIN25
U1.PIN49	PA4	J7 PIN27
U1.PIN50	PA5	J6 PIN17
U1.PIN51	PA6	J6 PIN23
U1.PIN52	PA7	J7 PIN29
U1.PIN53	PB3	J6 PIN09
U1.PIN54	PB2	J7 PIN35
U1.PIN55	PB1	J6 PIN11
U1.PIN56	PB0	J7 PIN31

Figure 14 shows the network names of all pins of J6 and J7 for easy query. On the default connected jumpers, there are white dot silk screen prompts adjacent to the pin headers.



2.6 Peripheral interface – DMIC

The TC321X Development Board is designed with two DMICs, model WMM7047DTFN0, for demonstration purposes. Table 15 lists the connection methods of the DMIC pins.

Pin Number	IO Name	Connector	Description
U1.PIN08	PA5	J6.PIN17	1. 1. The chip is connected to J6.PIN17, and then to J6.PIN18 through a jumper. 2. Then it is connected to the data pin of DMIC. 3. Refer to Figure 14.
U1.PIN09	PB5	J6.PIN20	1. 1. The chip is connected to J6.PIN19, and then to J6.PIN20 through a jumper. 2. Then it is connected to the clock pin of DMIC2. 3. Refer to Figure 14.
U1.PIN10	PA6	J6.PIN23	1. 1. The chip is connected to J6.PIN23, and then to J6.PIN24 through a jumper. 2. Then it is connected to the clock pin of DMIC1. 3. Refer to Figure 14.

2.7 Peripheral interface – FLASH

An external flash, model P25Q16SU, is installed on the TC321X Development Board to facilitate customers' expansion or verification of new FLASH. Table 16 lists the connection methods of the FLASH pins.

Pin Number	IO Name	FLASH
U1.PIN03	PF0	U5.PIN05
U1.PIN02	PF1	U5.PIN06
U1.PIN04	PF2	U5.PIN01
U1.PIN05	PF3	U5.PIN02

2.8 Uplink interface

The TC321X Development Board supports one differential AMIC or LINE-IN path configuration. All the above can be configured through jumpers. Table 17 lists the configuration methods of the uplink path.

Item	Description
Differential AMIC configuration	1. The default connection of the development board is the AMIC differential connection mode. 2. For better performance, the differential connection mode is basically used in practical applications.
Differential LINE-IN configuration	1. Remove the two jumpers J7 PIN17-PIN18 and J7 PIN21-PIN22, and insert the two jumpers J7 PIN19-PIN20 and J7 PIN23-PIN24. At this time, it is LINE-IN input.

2.9 Downlink interface

The downlink of the TC321X Development Board supports two differential outputs. Note that single-ended configuration is not supported. Table 18 lists the configuration methods of the downlink path.

Item	Description
Two-channel differential SDM-OUT configuration	1. The default connection of the development board is the two-channel differential connection mode. At this time, audio test instruments can be connected through the two 3.5mm sockets J3 and J4 for downlink performance testing. 2. The chip's PC4, PE0, PD6, and PE1 are connected to 4 pins of J6 to facilitate customers to connect external speakers for demo.

3.Related Documents

Table 18 lists some other documents and resources. You can refer to these documents and resources for more information. Some of these documents may only provide protocols under Non-Disclosure Agreement (NDA). To access such documents, please contact the local Telink Field Application Engineer (FAE) or sales representative.

Table 18 lists the related documents.

Document	Description	Link/how to obtain
TC321X data sheet	Provides electrical characteristics, hardware descriptions, and ordering methods of TC321X.	Contact a Telink FAE / sales representative
TC321X Hardware Guideline	Provides hardware design considerations for TC321X.	Obtain from WIKI http://wiki.telink-semi.cn/wiki/chip-series/TLSR951x-Series/
TC321X board files	Provides design files such as schematics and PCB of the TC321X Development Board.	

FCC warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

***RF warning for Mobile device:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.