

Telink

User Manual for TL3228X-DG96D Dongle Board

UM-TL3228X-DG96D-E1

Ver 1.0.0

2026/06/16

Keyword

TL3228X-DG96D, Bluetooth[®] LE, Zigbee, Thread, Matter, 2.4 GHz

Brief

This document is the dongle board user manual for the Telink multi-standard wireless SoC TL3228X. It mainly introduces the development board diagram, features, peripheral interfaces, and detailed function descriptions.

Published by
Telink Semiconductor

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Pudong District, Shanghai, China 201203**

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Revision History

Version	Change Description
1.0.0	Initial release.

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1 Overview

The TL3228X-DG96D dongle board is designed based on the TL3228X chip.

The TL3228X is a wireless SoC for Bluetooth® LE 6.0, 802.15.4, and 2.4 GHz proprietary. This chip supports industrial alliance standards including Bluetooth® LE, Zigbee, Thread, Matter, and 2.4 GHz proprietary standard.

This development board supports testing of various functions, such as RF conduction testing, lights, and buttons. Sufficient GPIOs are reserved for debugging.

This document provides a detailed description of the TL3228X-DG96D dongle board's interfaces, power supply, debugging methods, buttons, LEDs, and other components to help users familiarize themselves with the board and use it for subsequent development and debugging.

1.1 Block Diagram

The top and bottom views of the TL3228X-DG96D dongle board are shown below.

Figure 1-1 Board Top View

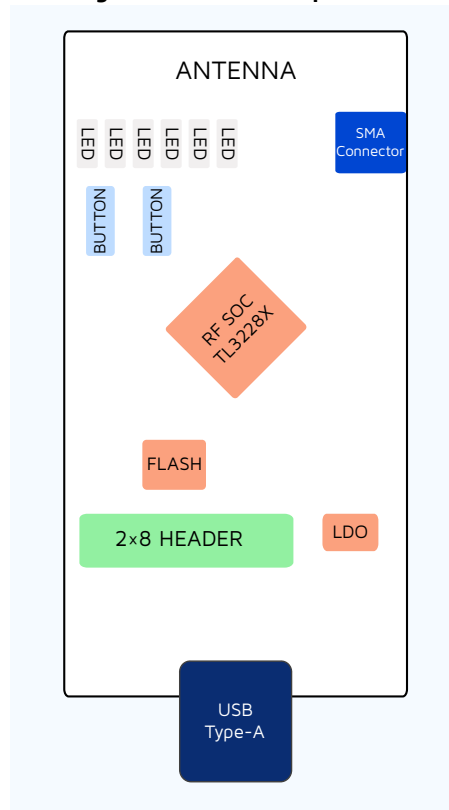
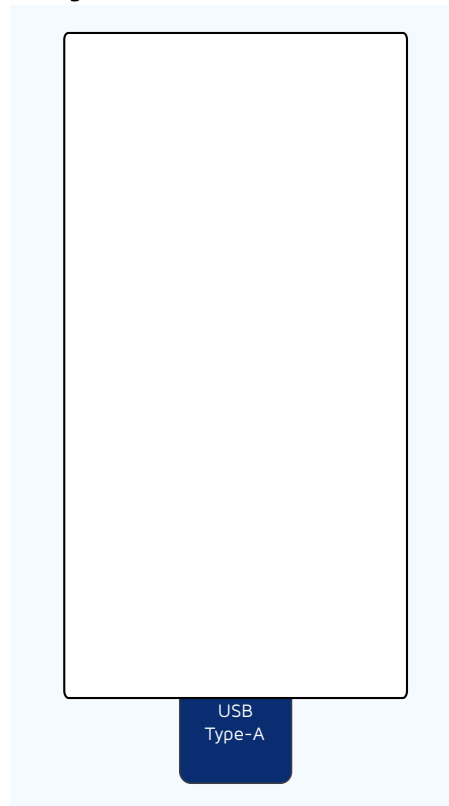


Figure 1-2 Board Bottom View



1.2 Board Features

The following table lists the features of the TL3228X-DG96D dongle board.

Table 1-1 Board Features

No.	Name	Description	Reference section
1	Power supply interface	Power supply via USB Type-A	2.1 Power Supply
2	Debug and GPIO interfaces	• Supports 2-wire SDP and 4-wire JTAG interface • Supports High-speed USB interface • 6 GPIOs are reserved for debugging	2.2 Debug and GPIO Interfaces
3	RF interface	• Supports external whip antenna • Supports onboard inverted-F PCB antenna	2.3 RF Test
4	Peripheral interface	Supports peripherals such as buttons, LEDs, and external flash.	2.4 Peripheral Interface - USB Type-A 2.5 Peripheral Interface - Flash

1.3 Kit List

The following table lists the main materials in this development kit.

Table 1-2 Kit List

No.	Name	Quantity
1	TL3228X-DG96D dongle board	1
2	Whip antenna	1
3	Display (optional)	1

1.4 Board Pictures

The following picture shows the board's default state for user verification.

Figure 1-3 Real Board Top View

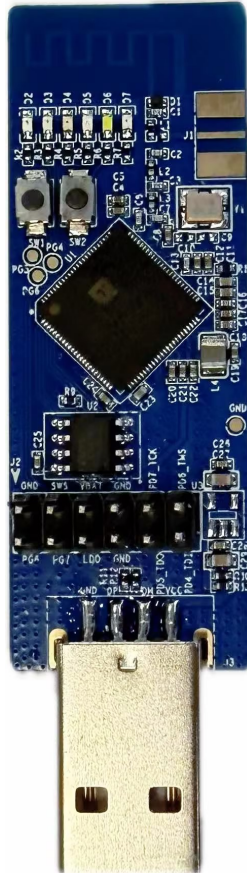


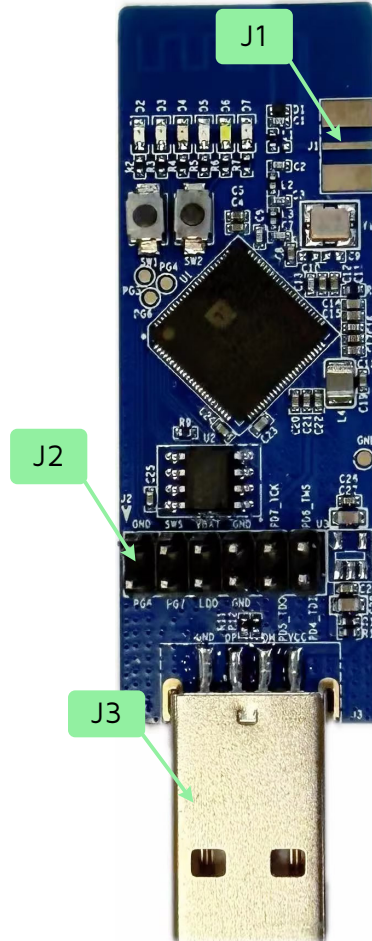
Figure 1-4 Real Board Bottom View



1.5 Connectors

The following figure identifies the connectors such as test headers and sockets on the top of the development board.

Figure 1-5 Board Top Connectors



The following table lists the connectors on the top of the development board.

Table 1-3 Board Top Connector List

No.	Ref. Des.	Connector type	Description	Reference section
1	J1	SMA connector	RF connector	2.3 RF Test
2	J2	2x6-pin header	JTAG, single wire, debug and GPIO connector	2.2 Debug and GPIO Interfaces
3	J3	USB Type-A	High-speed USB connector	2.4 Peripheral Interface - USB Type-A

1.6 LED

The following figure identifies the LEDs on the top of the development board.

Figure 1-6 Board Top LEDs



The following table lists the LEDs on the top of the board.

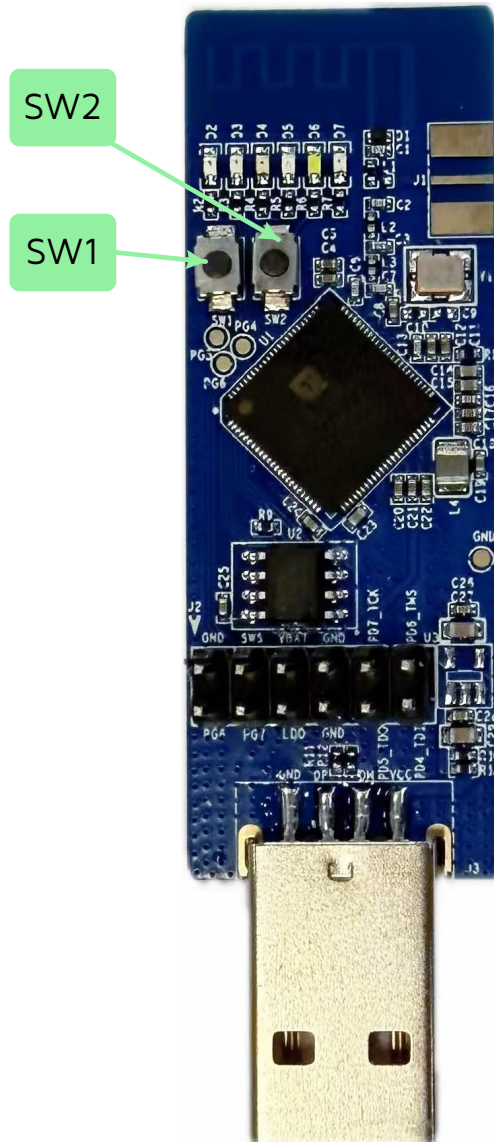
Table 1-4 Board Top LEDs

No.	Ref. Des.	LED color	Description
1	D2	Green	PF6 of TL3228X connects to D2 via current-limiting resistor R2.
2	D3	Red	PF5 of TL3228X connects to D3 via current-limiting resistor R3.
3	D4	Yellow	PF4 of TL3228X connects to D4 via current-limiting resistor R4.
4	D5	Blue	PF3 of TL3228X connects to D5 via current-limiting resistor R5.
5	D6	White	PF1 of TL3228X connects to D6 via current-limiting resistor R6.
6	D7	Orange	PFO of TL3228X connects to D7 via current-limiting resistor R7.

1.7 Button

The following figure identifies the Buttons on the top of the board.

Figure 1-7 Board Top Buttons



The following table lists the buttons on the top of the board.

Table 1-5 Board Top Button List

No.	Ref. Des.	Function	Description
1	SW2	GPIO KEY	PF2 of TL3228X connects to SW2.
2	SW1	GPIO KEY	PF7 of TL3228X connects to SW1.

2 Function Description

2.1 Power Supply

The TL3228X-DG96D dongle board can be powered in the following ways:

- 5 V via the USB Type-A port, directly supplying the chip VBUS pin.

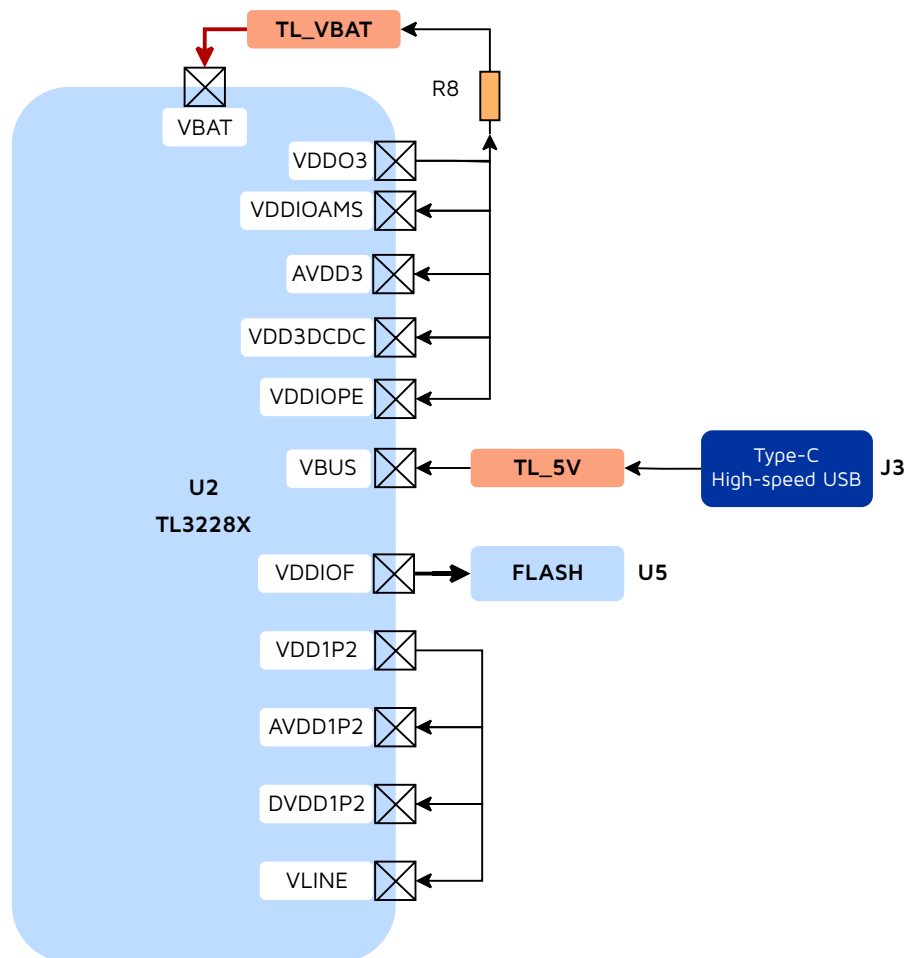
The following table shows the chip's power path.

Table 2-1 Power Supply of the Chip

No.	Power source	Power supply	Description
1	External power via USB Type-A J5	5V	Directly supplying the chip VBUS pin. The chip VDDO3 is connected to VBAT by default through the 0 Ω resistor at R8.

The following figure shows the power supply path of the main power sources.

Figure 2-1 Power Supply Path



2.2 Debug and GPIO Interfaces

The TL3228X-DG96D dongle board supports the following two debug methods.

Table 2-2 Debug Methods

No.	Debug method	Connector	Description
1	JTAG	J4	(1) Power up the TL3228X-DG96D dongle board. (2) J2 supports a 4-wire JTAG function - U1.PIN19.PD4 to J2.PIN12 - TDI - U1.PIN18.PD5 to J2.PIN10 - TDO - U1.PIN17.PD6 to J2.PIN11 - TMS - U1.PIN16.PD7 to J2.PIN09 - TCK
2	Single Wire		(1) Power up the TL3228X-DG96D dongle board. (2) J2 supports Telink proprietary debug protocol, single wire. U1.PIN37.PA7 to J2.PIN03 - SWS (3) Connect the SWM of the burner with this SWS. (4) The SWS connects to U1.PIN37 of the chip.

On the TL3228X-DG96D dongle board, some GPIOs are connected to the connectors for easy access.

The following table lists the connections of all GPIOs.

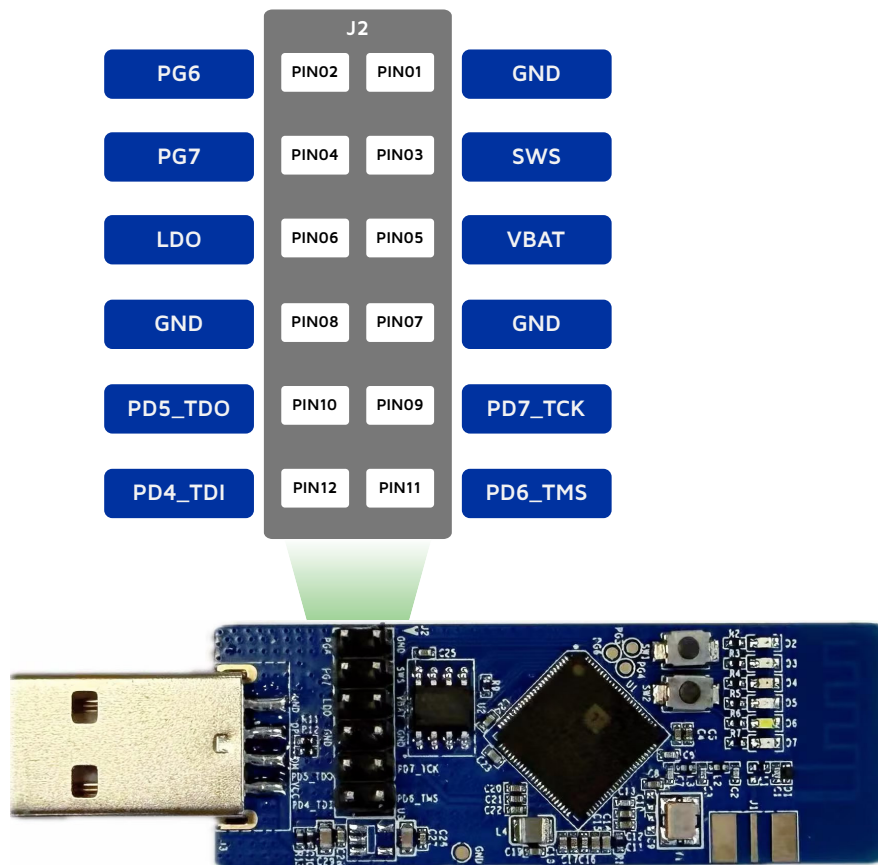
Table 2-3 GPIO Connections

No.	Chip pins	IO name	Connector pins
1	U1.PIN92	PG6	J2.PIN02
2	U1.PIN93	PG7	J2.PIN04
3	U1.PIN16	PD7	J2.PIN09
4	U1.PIN17	PD6	J2.PIN11
5	U1.PIN18	PD5	J2.PIN10
6	U1.PIN19	PD4	J2.PIN12

The following figure shows the details of each J2 pin, including the debug and GPIO interfaces.



Figure 2-2 Debug and GPIO Interfaces on the Board



2.3 RF Test

The methods for conducting and radiating RF tests on the TL3228X-DG96D dongle board are provided.

The following table lists the methods of RF test.

Table 2-4 RF Test Method

No.	Test item	Connector	Description
1	RF test	J1	(1) Power up the TL3228X-DG96D dongle board normally. (2) RF radiation test: The on-board PCB antenna is used by default, allowing RF radiation testing to be performed directly. (3) RF conduction test: Move the default 0 Ω resistor populated at L1 to R1, then solder an SMA connector to perform RF conduction testing.

2.4 Peripheral Interface - USB Type-A

The TL3228X-DG96D dongle board is designed with a USB Type-A connector for power supply and high-speed communication support.

The following table lists the connections of DM and DP.

Table 2-5 DM and DP of USB

No.	Chip pins	IO name	Connector pins	Description
1	U1.PIN34	PA3	J3.PIN02	Connects to the USB DM pin.
2	U1.PIN33	PA4	J3.PIN03	Connects to the USB DP pin.

2.5 Peripheral Interface - Flash

The TL3228X-DG96D dongle board is equipped with an external flash (part number P25Q16SU), which makes it convenient for customers to extend its use or verify the new flash.

The following table lists the connections of the flash pins.

Table 2-6 Connections of Flash Pins

No.	Chip pins	IO name	Flash	Description
1	U1.PIN01	PIO	U2.PIN05	Connects to the flash MSPI_MOSI pin.
2	U1.PIN02	PI1	U2.PIN06	Connects to the flash MSPI_CK pin.
3	U1.PIN03	PI2	U2.PIN07	Connects to the flash MSPI_IO3 pin.
4	U1.PIN04	PI3	U2.PIN01	Connects to the flash MSPI_CN pin.
5	U1.PIN05	PI4	U2.PIN02	Connects to the flash MSPI_MISO pin.
6	U1.PIN06	PI5	U2.PIN03	Connects to the flash MSPI_IO2 pin.

3 Related Documents

The following table lists other documents and resources that you can refer to for more information. Some of these documents are only available under a Non-Disclosure Agreement (NDA). To access these documents, please contact your local Telink Field Application Engineer (FAE) or sales representative.

Table 3-1 Related Documents

No.	Name	Description	Link / Obtain method
1	TL3228X datasheet	Provides information on the electrical characteristics, hardware description, and ordering options for the TL3228X chip.	Contact a Telink FAE / Sales representative.
2	TL3228X hardware guideline	Provides a hardware design guide for the TL3228X chip.	Contact a Telink FAE / Sales representative.
3	TL3228X-DG96D dongle board files	Provides design files for the schematic, PCB layout, and Gerber files for the TL3228X-DG96D dongle board.	Contact a Telink FAE / Sales representative.

4 Certification Statement

4.1 FCC Statement

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.

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 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.

Changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

RF warning statement:

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

The EUT is for indoor use only.