

BLE Mesh SoC Based Wireless Module

(TELINK TLSR8250F512)

SPECIFICATION

Model No.: DL-TL8250-A

Version: V1.0



Before using this module, please pay attention to the following important matters:

This module is an electrostatic sensitive product. Please operate it on an anti-static workbench during installation and testing.

This DL-TL8250-A BLE Module uses a PCB-on-board antenna by default, which is intended to be embedded in your product or application, and does equip with a metal shield itself for a better anti-interference ability. .

Metal objects and wires should be kept away from the antenna part as far as possible. If the product uses a metal shell, be sure to lead the antenna out of the casing through an external IPEX/SMA RF connector. Otherwise, the RF signal will be seriously attenuated, which will affect the effective distance.

Disclaimer:

This specification is just for your information; all the charts and pictures used in this specification are for reference only. The actual test shall prevail for details. We do not assume any responsibility for personal injury or property loss caused by user's improper operation.

This specification is subject to change due to the continuous improvement and upgrading of the product version, and the latest version specification shall prevail. DREAMLNK reserves the right of final interpretation and modification of all contents in this specification.

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Revision History

Date	Version	Formulation / Revision of Contents	Approved by
2025-3-21	V1.0	DL-TL8250-A Standard Version BLE Module	Fagan Xu

1. Module Overview

1.1 Brief Introduction

The **DL-TL8250-A** module is a high-performance, low-power Bluetooth 5.0 SoC module based on the TLSR8250F512 chip. It features BLE and SIG MESH capabilities, with a transmit power of 10dBm and a sensitivity of -98dBm at 1Mbps, delivering fast operation and high processing efficiency to meet the demands of complex application scenarios.

The module supports direct control via Tmall Genie and enables Bluetooth mesh networking, where devices communicate through a star network topology using Bluetooth broadcasting. The mesh network can be flexibly expanded to cover larger areas. Designed to meet the requirements for low power consumption, low latency, and short-range wireless data communication, the module offers enhanced, stable, flexible, and reliable connectivity for applications in the Internet of Things (IoT), smart homes, smart cities, etc. It supports standard and industry alliance specifications, including Bluetooth Low Energy (up to Bluetooth 5.0), BLE Mesh, 6LoWPAN, ZigBee, RF4CE, HomeKit, ANT, and 2.4 GHz proprietary protocols.

The module integrates SIG MESH transparent transmission functionality in its software and communicates via a serial interface, allowing developers to easily build wireless products with stable performance and high reliability while significantly shortening the product development cycle.

1.2 Features

- Supports Bluetooth 5.0 and BLE Mesh
- Integrated high-performance 32-bit microcontroller
- Large Flash memory: 512KB Flash memory, providing ample storage space
- High-speed built-in SRAM: 48KB on-chip SRAM for accelerated data caching and access
- High-precision ADC: On-board 14-bit high-precision ADC (analog-to-digital converter) for accurate acquisition and conversion of analog signals
- Rich interface support: UART / GPIO / I2C / PWM / ADC / SPI
- Supply voltage range: 1.8–3.6 V, with 3.3 V recommended
- Supports secondary development

1.3 Typical Application

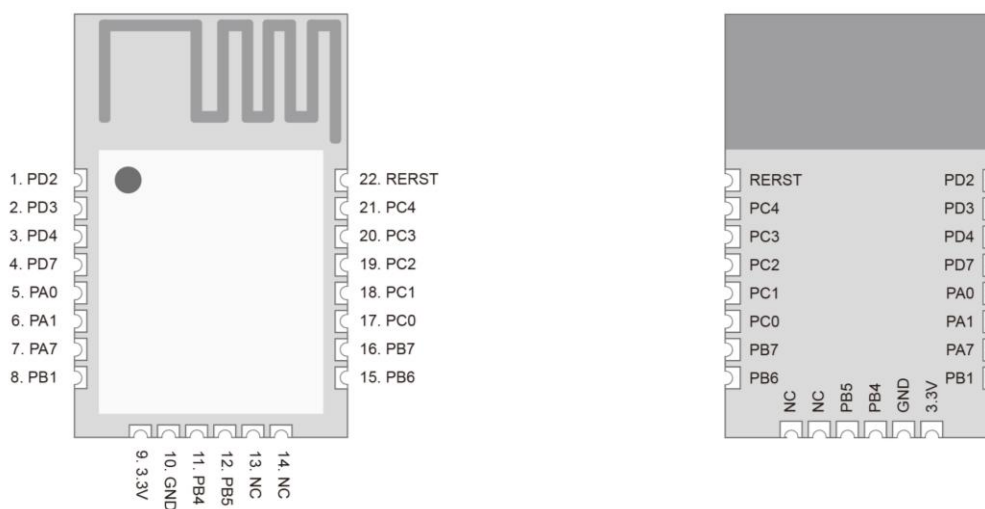
- SIG MESH
- Smart Wearable Devices
- Smart City
- Wireless Remote Control
- Industrial Wireless Control
- Smart Home Systems
- Smart Lighting
- Smart Agriculture
- Smart Building Automation
- Health Products

2. Technical Parameters

Parameter	Min.	Typical	Max.	Unit	Remark
Operating Conditions					
Working Voltage (VDD)	1.8	3.3	3.6	V	Unable to output Max. power when the voltage is below 3.0V;
Communication Level	-0.3	3.3	VDD +0.2	V	Exceeding this range may damage the RF chip
Working Temperature	-40	25	85	°C	The larger the temperature difference, the greater the required bandwidth
Current Consumption					
RX Current	14	16	18	mA	@DCDC
TX Current	21	23	25	mA	@2401MHz @DCDC ANT 50Ω; TX Power @ +10dBm
	4	5	7		ANT 50Ω; TX Power @ 0dBm
Sleep Current	1	2	10	uA	MCU power-down, software at minimum current.
RF Parameters					
Transmission Power Range	-10	10	10	dBm	The internal configuration power must not exceed 5dBm, otherwise it will be burned out
Sensitivity		-98		dBm	@1Mbps, MESH defaulted
		-104		dBm	@250Kbps reference, MESH does not support

Table 1: Technical Parameter

3. Pin Diagram



Pin Diagram of DL-TL8250-A

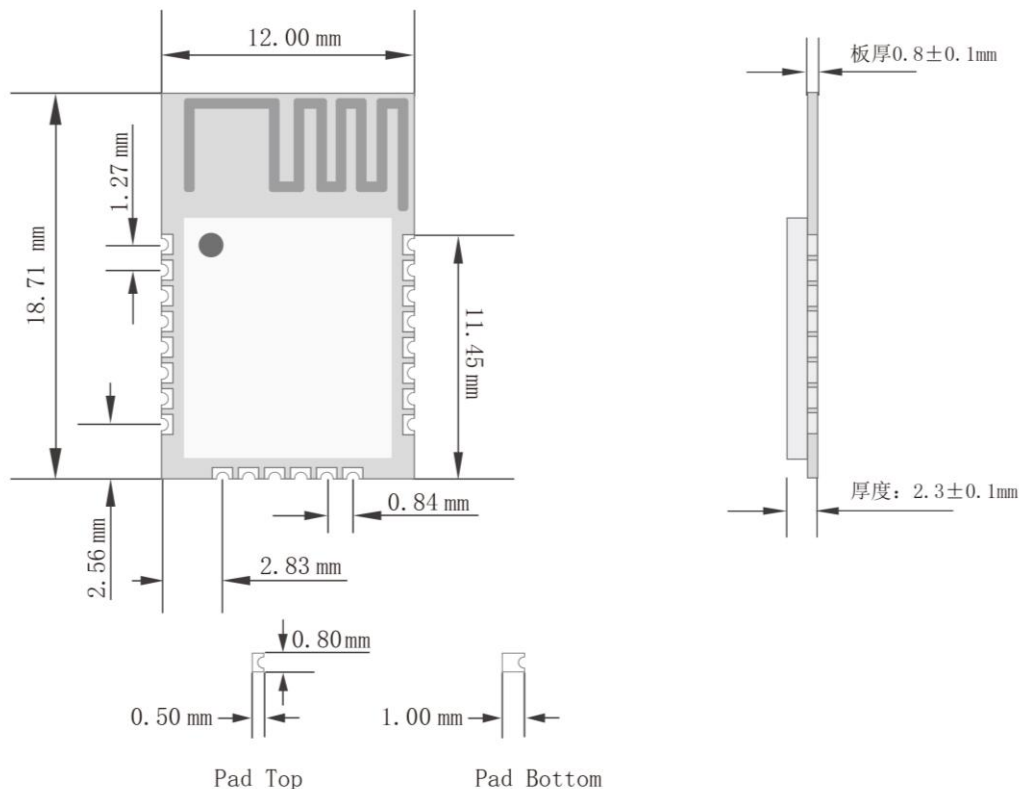
Pin Functions:

NO.	Pin Name	Pin Description
1	PD2	General I/O port, SPI_CN, PWM3
2	PD3	General I/O port, PWM1_N, UART_TX
3	PD4	General I/O port, SWM, PWM2_N
4	PD7	Defined as UART_TX in the MESH firmware; requires external connection to RXD
5	PA0	Defined as UART_RX in the MESH firmware; requires external connection to TXD
6	PA1	General I/O port
7	PA7	SWS module firmware download port 3.3V, SWS, GND – these three pins are sufficient for programming
8	PB1	General I/O port, PWM4, UART_TX, SAR_ADC
9	3.3V	Power supply
10	GND	Reliable grounding
11	PB4	General I/O port, PWM5, SAR_ADC
12	PB5	General I/O port, PWM5, SAR_ADC

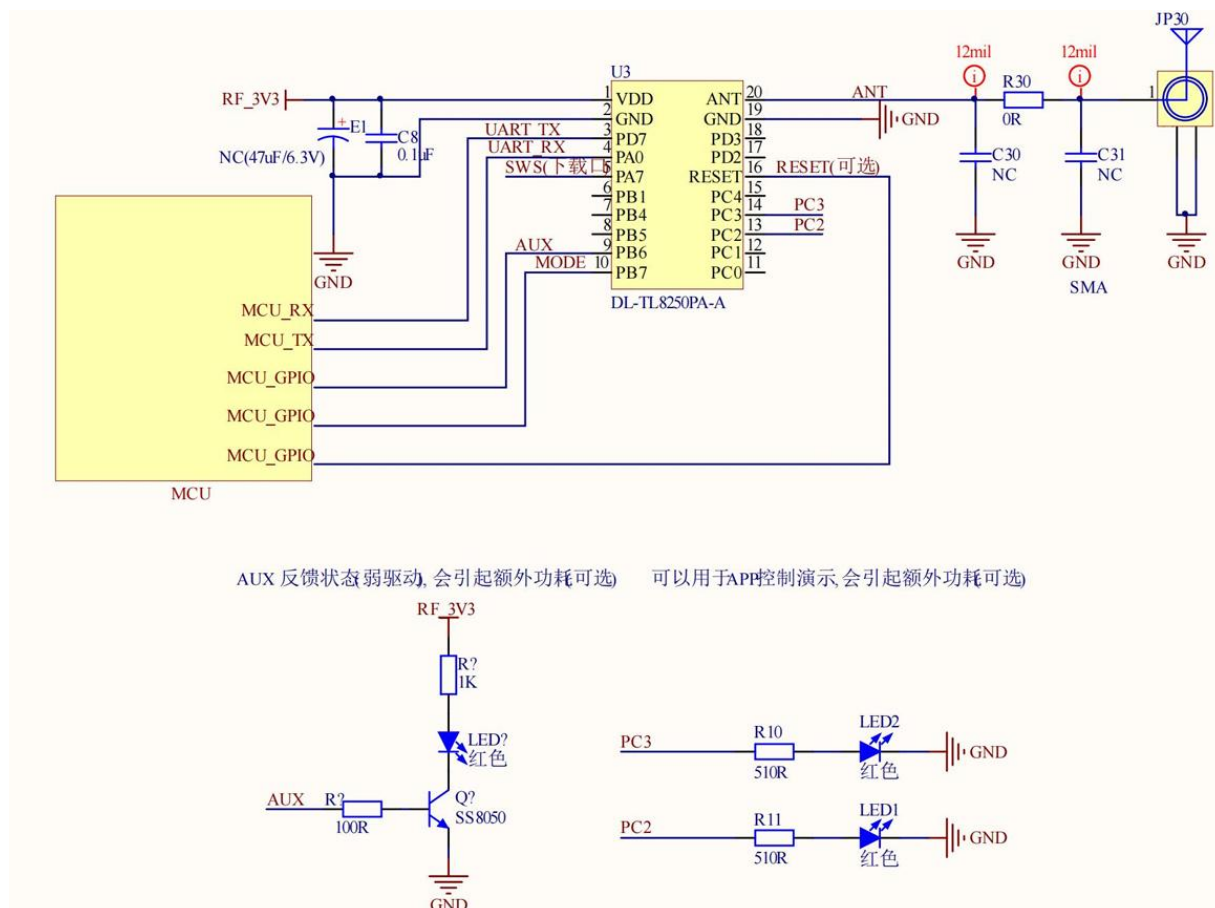
13	NC	No Connection
14	NC	No Connection
15	PB6	General I/O port, SPI_DI, UART_RTS, SAR_ADC
16	PB7	Defined as AUX in the MESH firmware; used to indicate MESH status
17	PC0	Defined as MODE in the MESH firmware; used to control MESH status
18	PC1	General I/O port, I2C_SCK, PWM1_N, PWM0
19	PC2	Defined as SIG standard model output in the MESH firmware; it is recommended to route an LED for APP debugging and range testing during validation
20	PC3	Defined as SIG standard model output in the MESH firmware; it is recommended to route an LED for APP debugging and range testing during validation
21	PC4	General-purpose I/O, PWM2, UART_CTS, PWM0_N, SAR_ADC
22	RESET	Hardware reset; initializes the chip and enhances stability; active low

Table 2: Pin Functions of DL-TL8250-A

4. Module Size



5. Application Connection Diagram



Remark:

1. PD7 (TX) and PA0 (RX) are used for data transmission. They should be cross-connected with the UART pins of the external MCU.
2. The AUX pin is a module status indicator and should be connected to a GPIO pin of the external MCU.
3. MODE is used to control the MESH status (this pin is currently not used and has no function).
4. Unused pins can be left floating (N/C).

6. Circuit Design

6.1 Power Supply Design

- Please pay attention to the power supply voltage of the device, exceeding the recommended voltage range may cause function abnormally and permanently damage;
- Try to use a DC stabilized power supply, and the power ripple coefficient should be as small as possible; the power load when transmitting the maximum power needs to be also considered;

- The RF module needs to be grounded reliably, and try to reduce the loops in PCB layout (especially the loop between ANT Pin and GND Pin should be as short as possible); a good grounding can achieve better performance and reduce the impact of RF on other sensitive devices.

6.2 RF Routing Design

- The module should be far away from RF interference sources, such as high-frequency circuit transformer, and please do not directly route at the lower layer of the RF module. Otherwise, the receiving sensitivity may be affected;
- When using the on-board antenna, the antenna needs to be clear on both sides, and the ground (copper foil) should not be too close to the antenna at the same time, otherwise it will absorb the radiated energy;
- Route 50Ω impedance line, lay the ground and add more via holes around it
- If there is enough space on your PCBA, please reserve a π -type matching circuit, and it needs to be placed as close to the chip end as possible, please make it grounded and add via holes around it. Do remember to connect it through a 0R resistor, otherwise the antenna will open circuit; SMA ANT circular through-hole requires clearance treatment

6.3 Antenna Design

- There are many types of antennas, please choose the appropriate antenna according to your needs;
- Choose a suitable position to place the antenna, according to the antenna polarity. And it is recommended to be vertically upward;
- There should be no metal objects in the antenna radiation path, otherwise the transmission distance will be affected (such as a closed metal casing).

6.4 Wireless Interference

For high-power wireless transmission, wireless interference may occur, which may affect the functions of some sensitive circuits, such as amplifiers, ADCs, RESETs, and data pins with low driving force. This situation has a significant impact on high-power transmission at 20dbm and above. The interference mainly comes from the antenna power being amplified and coupled to longer lines or devices through conduction or radiation. Therefore, when making the hardware design, the signal routing should be as short as possible; when using high power, try to use external antennas as much as possible, stay away from PCB sensitive devices, and add 100pF ground capacitance in sensitive device circuits to filter out high-frequency interference in low-speed signals to reduce wireless interference in other circuits.

7. AT Commands

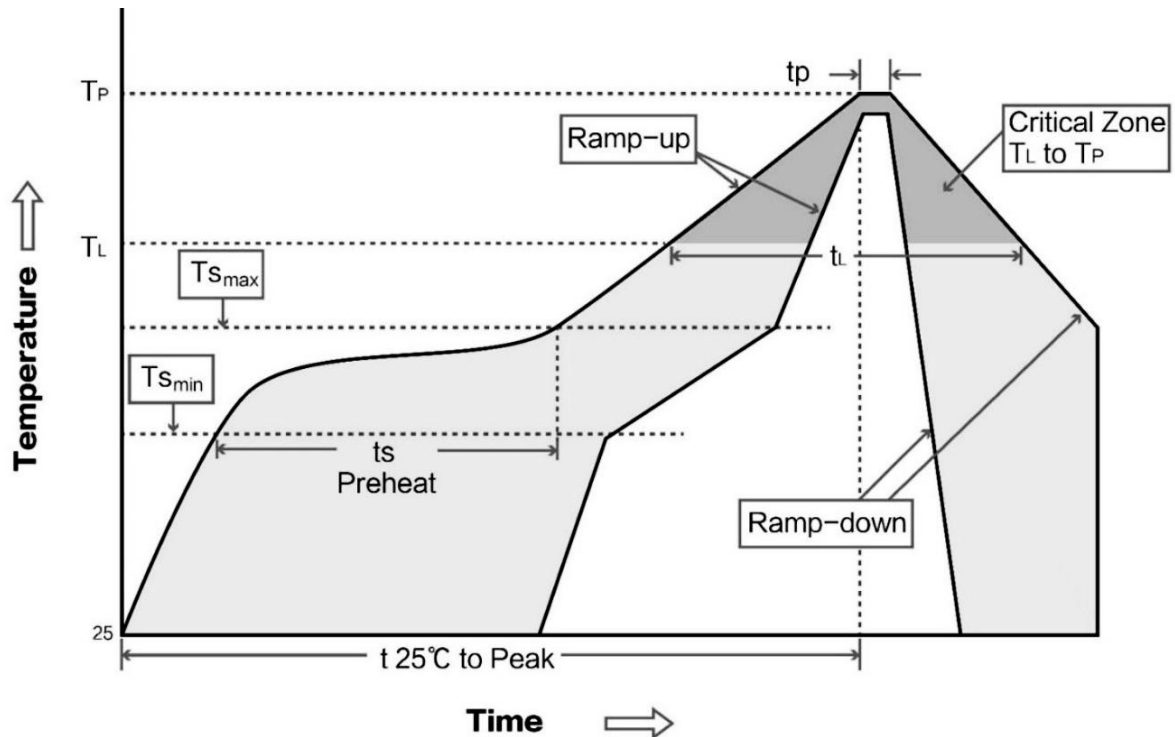
AT commands	Function Description	Parameter Description (Query Return)
+++	Enter AT command mode (basic command)	N/M
AT+BADDR?	Query its BLE Bluetooth address	Parameter: BLE Bluetooth address
AT+NETINFO?	Query MESH network joining information	Parameter 1: Network joining status (flag bit); Parameter 2: ele_adr assigned upon network joining
AT+RLPRM?	Query BLE actual connection parameters	Parameter 1: interval; Parameter 2: latency; Parameter 3: timeout
AT+NETTRAN?	Query MESH network transmission parameters	Parameter 1: Number of transmissions; Parameter 2: Transmission interval (in ms)
AT+FEATURE?	Query MESH feature status	Parameter 1: Proxy enabled or not; Parameter 2: Friendship enabled or not
AT+RELAY?	Query MESH relay related parameters	Relay enabled status, relay retransmission count, relay retransmission interval, relay number of hops
AT+PKGL?	Query serial port packing length	Parameter: Serial port data packing length. The serial port packing length can be set. Note: if the length of the data to be sent is greater than the PKGL length, it will be split into packets, causing delays. It is recommended that the length of the data to be sent be less than or equal to PKGL.
AT+ENTM	Let the module into transparent transmission mode (execution command, not query)	N/M
AT+DEFAULT	Restore factory settings after the module joins the network (execution command, not query)	N/M

Remarks:

- 1). Instructions for querying MESH node parameters: please note that the node can only be queried and cannot be configured.
- 2). How to enter AT mode: in transparent transmission mode, send "+++" to enter AT command mode.

8. Welding Operation Guidance

8.1 Reflow Soldering Curve Chart



8.2 Reflow Soldering Temperature

IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	Big size components (thickness ≥ 2.5 mm)
The ramp-up rate (Tl to Tp)	3°C/s (max.)
Preheat Temperature	
- Temperature Minimum (Tsmmin)	150°C
- Temperature Maximum (Tsmmax)	200°C
- Preheat Time (ts)	60~180s
Average ramp-up rate (Tsmmax to Tp)	3°C/s (Max.)
- Liquidous temperature (TL)	217°C
- Time at liquidous(tL)	60~150 second
Peak Temperature (Tp)	245+/-5°C

9. Model Selection Table:

Model No.	Picture	Feature	Frequency
DL-TL8250-A		TL8250F512 BLE Module w/o PA (PCB On-board Antenna)	Freq.: 2.38~2.5GHz TX power @ 10dBm
DL-TL8250-PA		TL8250F512 BLE Module with PA (w/o Antenna)	Freq.: 2.38~2.5GHz TX power @ 22dBm

10. Notice for module application

- (1) This module is an electrostatic sensitive product. Please operate on an anti-static workbench during installation and testing;
- (2) When installing the module, make sure that nearby objects keep a sufficient safe distance from the module to prevent short-circuit damage;
- (3) Liquid substance is not allowed to come into contact with this module, and this module should be used in a dry environment;
- (4) Please use an independent voltage stabilizing circuit to supply power to this module, and avoid sharing with other circuits. The tolerance of the power supply should not be less than 5%.
- (5) The indicators of this module are accord to commonly used international standard. If special certifications needed, we can adjust certain indicators according to your needs.

11. Contact us

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★ Data collection, Smart home, Internet of Things applications, Wireless remote control technology, Remote active RFID, Antennas ★

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