

TIANDONGLI TECHNOLOGY

AB2036A

5.4 BLUETOOTH MODULE DA BLE TASHEET

VERSION 1.0

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1 Introduction

1.1 Overview

The AB2036A is a BLE Bluetooth 5.4 module developed by Shenzhen Tiandongli Technology Co., Ltd. This module supports standard Bluetooth specifications and configuration profiles including HID, GATT, and ATT, utilizing the UART serial port as its primary data transmission interface. Users can send AT commands through this interface to query and modify module parameters, such as adjusting baud rates or changing Bluetooth names. For detailed AT command formats and usage instructions, refer to the "Tiandongli Technology Bluetooth Serial Port Command Set".

1.2 Features

- BLE Bluetooth 5.4
- Stamp hole encapsulation
- Low power consumption
- Default transmission power: 0 dBm
- UART baud rate: 9600 bps (default), supports ranges from 1200 bps to 921.6 kbps
- UART Hardware Interface
- Supports serial port upgrade
- Supported Bluetooth profiles: GATT, ATT, GAP
- Power consumption in operating mode (VDDIO_3V3 at 3.3 V)
- RX Mode: 12 mA @ 3.3 V, 0 dBm
- TX Mode: 13 mA @ 3.3 V, 0 dBm
- Deep sleep mode: 2.1 μ A (RTC wake-up + GPIO wake-up)
- Supports Bluetooth SIG Mesh
- Supports private mesh

1.3 Applications

- Health and Medical Equipment
- Measurement and Monitoring System
- mouse
- Bluetooth car key
- toy
- Lighting fixtures
- Wireless transmission for home appliances

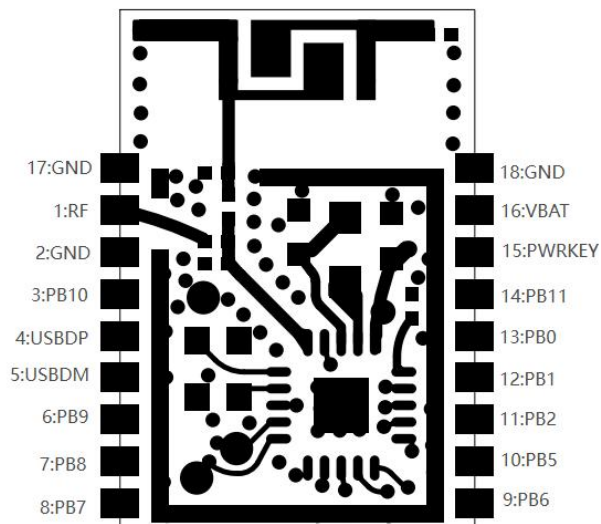
2 General Specifications

Table 1:

feature	detailed information
model	AB2036A
Dimension	8.5mm(W) X 12.5mm(L) X 2.3mm(H)
Bluetooth Specifications	Bluetooth BLE 5.4
Working Voltage Range	3.3 ~ 4.2V
transmitting power	Maximum: 9 dBm
sensitivity	-98dBm @1M BLE , -96.5dBm @2M BLE
frequency range	2.402GHz -2.480GHz ISM band
modulation mode	GFSK
Baseband crystal oscillator	24MHz
Frequency hopping and channels	N/A
Radio frequency input impedance	50 ohms
Antenna Type	PCB-Based Antenna
hardware interface	UART
protocol	HID, GATT, ATT
Other Features	Supports low power consumption
working temperature	-40°C to +80°C
Storage Temperature	-40°C to +105°C
humidity	10%–95% non-condensable
environment	accord with RoHS

3 Hardware Specifications

Pinout Diagram (Top View)



3.2 Pin Definition Explanation

Table 2:

pin	Pin Name	type	Pin Description
1	RF	ANT	antenna
2	GND	GND	Power Supply Location
3	PB10	I/O	Programmable Input/Output Pin
4	PB3	I/O	Programmable Input/Output Pin/USBDP
5	PB4	I/O	Programmable Input/Output Pin/USB DM
6	PB9	I/O	Programmable Input/Output Pin
7	PB8	I/O	Programmable Input/Output Pin
8	PB7	I/O	Programmable Input/Output Pin
9	PB6	I/O	Programmable Input/Output Pin
10	PB5	I/O	Programmable Input/Output Pin
11	PB2	I/O	Programmable Input/Output Pin
12	PB1	I/O	UART_TX
13	PB0	I/O	UART_RX
14	PB11	I/O	Programmable Input/Output Pin
15	PWRKEY	A	By default, it pulls up; short press to lower it below 0.7 V to trigger reset. The software can be configured to disable the reset function.
16	VBAT	P	power input
17	GND	GND	Power Supply Location
18	GND	GND	Power Supply Location

4 Physical Interfaces

4.1 Universal Digital IO Port

The module integrates 12 universal GPIO ports. All GPIOs can be flexibly configured via software, supporting functions such as button detection, LED driving, and interrupt signal output. Unused pins should remain unconnected to external circuits. Each I/O pin can be independently configured for input or output mode.

4.2 RF Interface

- 2402–2480 MHz Bluetooth LE 5.4
- TX transmission power: -20 dBm to +9 dBm, maximum +9 dBm
- RX Sensitivity: 1 M BLE sensitivity – 98 dBm; 2 M BLE sensitivity – 96.5 dBm (PER = 30.8%, 37 bytes)

4.3 UART Interface

The module features a standardized UART serial interface with two pins—UART_TX (send) and UART_RX (receive)—for bidirectional data transmission with other digital devices.

Table 3:

parameter	probable value
Baud rate, baud rate, baud rate	Minimum 1200 baud ($\leq 2\%$ Error)
	standard 9600bps ($\leq 1\%$ Error)

	maximum	921600bps($\leq 1\%$ Error)
Flow Control		RTS/CTS
Parity Bit		None, Odd or Even
Stop Bit Count		1
Data Bits Per Frame		8

4.4 ADC Interface

- 10-bit resolution ADC with 11 input channels, sampling rate up to 1MSPS
 - Supports single conversion mode or continuous mode
 - Supports DMA data reading functionality
 - Voice function, Sampling rate: 8K
 - Supports power supply voltage acquisition
 - Supports single-ended inputs for up to 11 channels
 - Data width is 10 bits, with an effective width of up to 9 bits

5 Electrical Characteristics

5.1 Maximum Rated Value

The following lists the power supply voltages and their absolute maximum rated values for both digital and analog pins of the module. Exceeding these values may cause permanent damage. The average GPIO pin output current is defined as the average current value flowing through any given pin over a 100 ms period. The total average GPIO pin output current is defined as the average current value flowing through all corresponding pins over the same 100 ms period. The maximum output current is defined as the peak current value flowing through any given pin.

Table 4:

parameter	least value	crest value	unit
V_{IN} – I/O Power Voltage (VDDIO):	-0.3	+3.6	V
V_{IN} – Analog/Digital Power Voltage (VDD):	-0.3	+3.6	V
T_{OT} – Operating Temperature	-40	+80	°C
T_{ST} – Storage Temperature	-40	+105	°C

5.2 Recommended Working Conditions

Table 5:

parameter	Min.	Typ.	Max	unit
V_{IN} - Core Power Supply Voltage(VDD)	3.0	3.3	3.6	v
V_{IN} - I/O Supply Voltage (VDDIO)	3.0	3.3	3.6	v

6 Humidity Sensitivity Level & Anti-static Level

Table 6:

parameter	Value
Humidity Sensitivity Level	Level 3
ESD Protection Grade	Human discharge pattern: Class 2 Machine Discharge Mode: Class-B

7 Reflow soldering

Before performing any reflow soldering, it is essential to ensure the module is packaged moisture-proof. The packaging contains desiccant (to absorb moisture) and a humidity indicator card showing the dryness level maintained during storage and transportation. If baking the module is required, refer to the table below and follow the instructions specified in IPC/JEDEC J-STD-033.

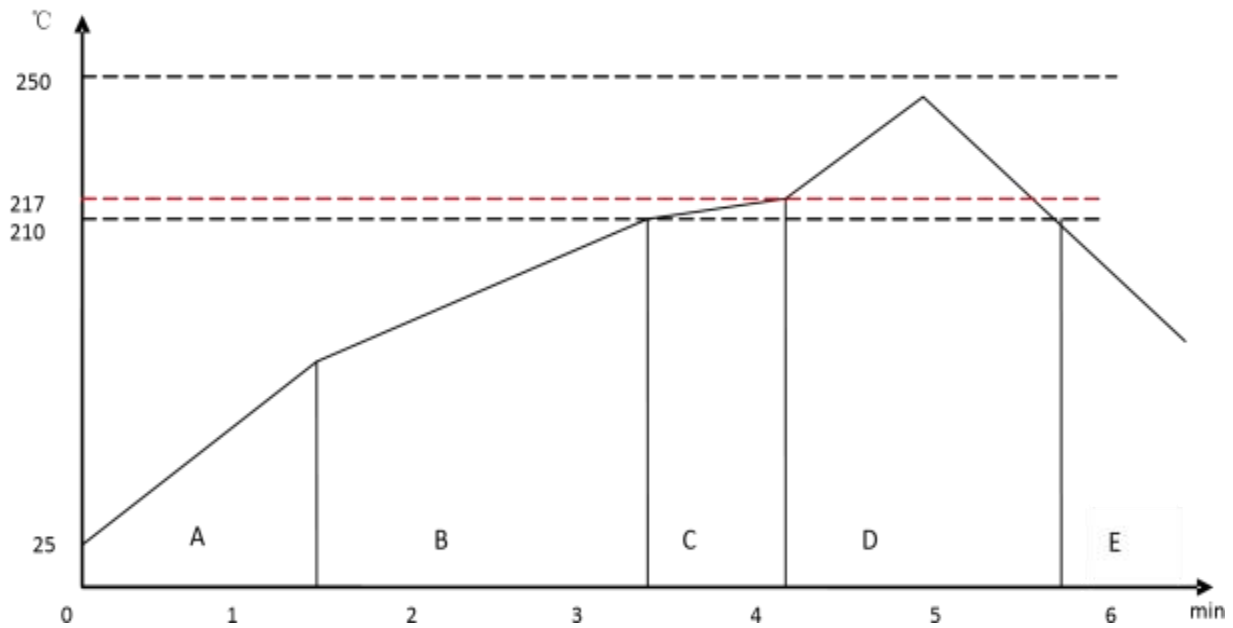
Note: The tray must not be heated above 65°C. If using the high-temperature baking method listed in the table (above 65°C), remove the module from the transport tray.

Any module that has been opened but does not contain the adhesive patch within the specified time frame shall be repackaged, with effective desiccant and a temperature/humidity indicator card placed inside the packaging. Under ambient conditions of 30 °C/60% RH, MSL (Humidity-Sensitive Level) 3 modules shall not remain exposed to air for more than 168 hours. The recommended baking duration and temperature are as follows:

Table 7:

MSL	Baking temperature: 125°C		Baking temperature: 90°C/ ≤ 5% RH		Baking temperature: 40°C/ ≤5% RH	
	saturated @ 30°C/85%	Minimum limit + 72 hours at 30°C/60%	saturated @ 30°C/85%	Minimum limit + 72 hours at 30 °C/60%	saturated @ 30°C/85%	Minimum limit + 72 hours at 30° C/60%
3	9 hours	7 hours	33 hours	23 hours	13 days	9 days

Surface-mount modules are designed for easy manufacturing, including reflow soldering onto the PCB substrate. Ultimately, customers are responsible for selecting the appropriate solder paste and ensuring that the furnace temperature during reflow meets the paste's specifications. Surface-mount modules comply with the J-STD-020D1 standard for reflow soldering temperatures. The soldering configuration depends on various parameters required for each application; the provided data serves solely as guidance for reflow soldering.



Typical lead-free reflow process

Preheating Zone (A) – This zone is heated at a controlled rate, typically 0.5–2 °C/s. Its purpose is to preheat the PCB board and components to 120–150 °C. During this stage, heat must be evenly distributed across the PCB board, and all solvents must be completely removed to minimize thermal shock on the components.

Balancing Zone 1 (B) – At this stage, the flux becomes soft and uniformly encapsulates solder particles while distributing them across the PCB board to prevent re-oxidation. As temperature rises and the flux liquefies, all activators and rosin are activated, initiating removal of oxide films formed on both solder particles and the PCB surface. For this zone, the recommended conditions are temperatures of 150 °C to 210 °C for 60 to 120 seconds.

Balancing Zone 2 (C) (optional) – To address the issue with upright components, it is recommended to maintain the temperature at 210–217°C for approximately 20 to 30 seconds.

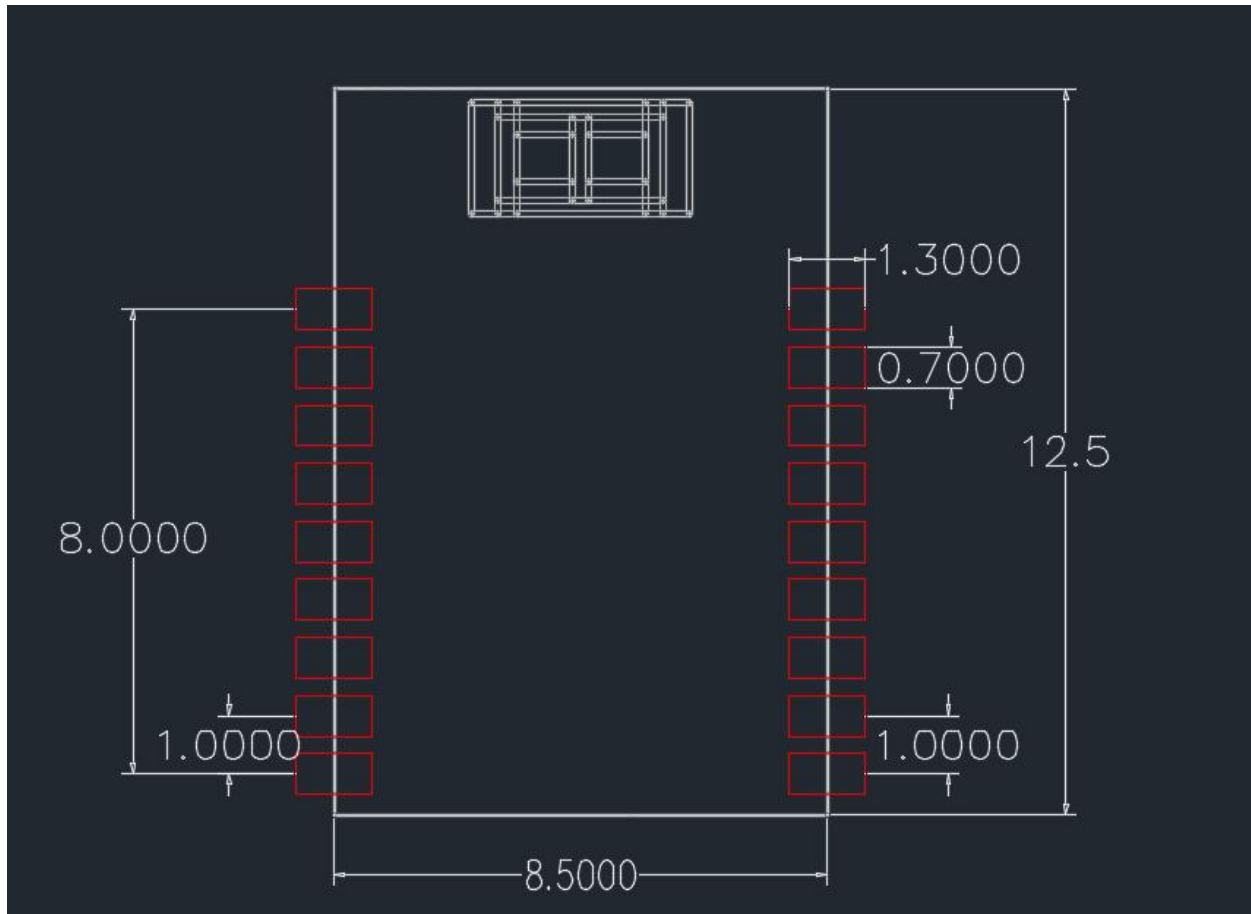
Reflow Zone (D) – The curve shown in the figure is designed for $\text{Sn}/\text{Ag}_{3.0}/\text{Cu}_{0.5}$ and serves as a reference for other lead-free solder formulations. The peak temperature should be sufficiently high to ensure adequate wetting, but not so high as to cause component discoloration or damage. Excessive soldering time can promote intermetallic growth, leading to brittle joints. The recommended peak temperature (T_p) ranges from 230 to 250 °C; when temperatures exceed 217 °C, the soldering duration should be 30 to 90 seconds.

Cooling zone (E) – The cooling rate should be rapid to maintain small solder particles, resulting in a more durable weld joint. The typical cooling rate is 4°C.

8 Module Structure Parameters

8.1 Physical Dimensions

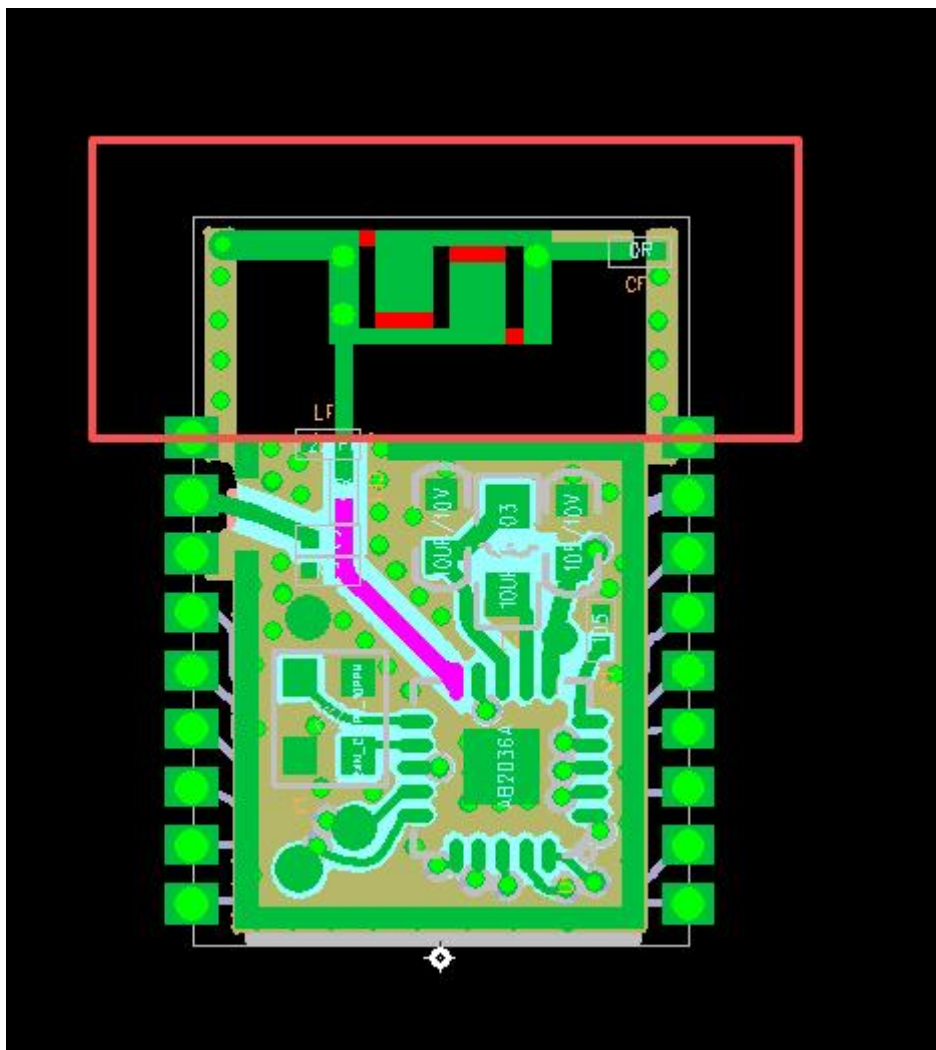
- Unit: mm



Package Outline Drawing (Top View)

The AB2036A is compatible with industrial standard reflow curves for lead-free solder. The selected reflow curve depends on the thermal mass of the entire assembled PCB, the heat transfer efficiency of the oven, and the specific type of solder paste used. Refer to the data sheet of the particular solder paste for profile specifications. Recommended reflow curves are provided for the following solder modules to ensure reliable solder joints and performance after assembly. Since the appropriate reflow curve varies depending on process conditions and layout design, optimal selection should be determined case-by-case. These recommendations serve as a starting point for guidance.

It is strongly recommended to adopt proper layout practices to ensure optimal module performance. Placing copper or any metal near the antenna can impair its performance and reduce efficiency. Metal shielding around the antenna blocks signal radiation; therefore, metal enclosures should not be used with modules. Use multiple grounding vias at the edges of ground areas. The following recommendations help prevent EMC issues in design: Note that each design is unique, and this description does not cover all fundamental design principles (e.g., avoiding capacitive coupling between signal lines). These guidelines focus on mitigating EMC problems caused by the module's RF components. Carefully consider these measures to avoid digital signal issues: Keep signal line paths as short as possible. For signals entering inner layers via vias, always use grounding vias around pads and place them symmetrically around signal traces. Critical signal paths should be routed entirely on inner PCB layers. Sensitivity-sensitive traces should be surrounded by ground planes above and below. If this isn't feasible, ensure the return path is minimized (e.g., using a ground trace adjacent to the signal line). Leave sufficient clearance on the PCB beneath the module antenna.



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. NOTE: 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.

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

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

1. This Modular Approval is limited to OEM installation only. The antenna installation and operating configurations of this transmitter, including any applicable source-based time averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements.

2. The EUT is exempt from SAR measurement and must not transmit simultaneously with any other antenna or transmitter.

3. A label with the following statements must be attached to the host end product: This device contains **FCC ID: 2BWTD-TDLGDBLE001**.

4. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed:

-0.58 dBi

5. This module must not transmit simultaneously with any other antenna or transmitter

6. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

For portable devices, in addition to the conditions 3 through 6 described above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093.

If the device is used for other equipment that separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

For this device, OEM integrators must be provided with labeling instructions of finished products.

Please refer to KDB784748 D01 v07, section 8. Page 6/7 last two paragraphs:

A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labeled with an FCC ID - Section 2.926 (see 2.2 Certification (labeling requirements) above)

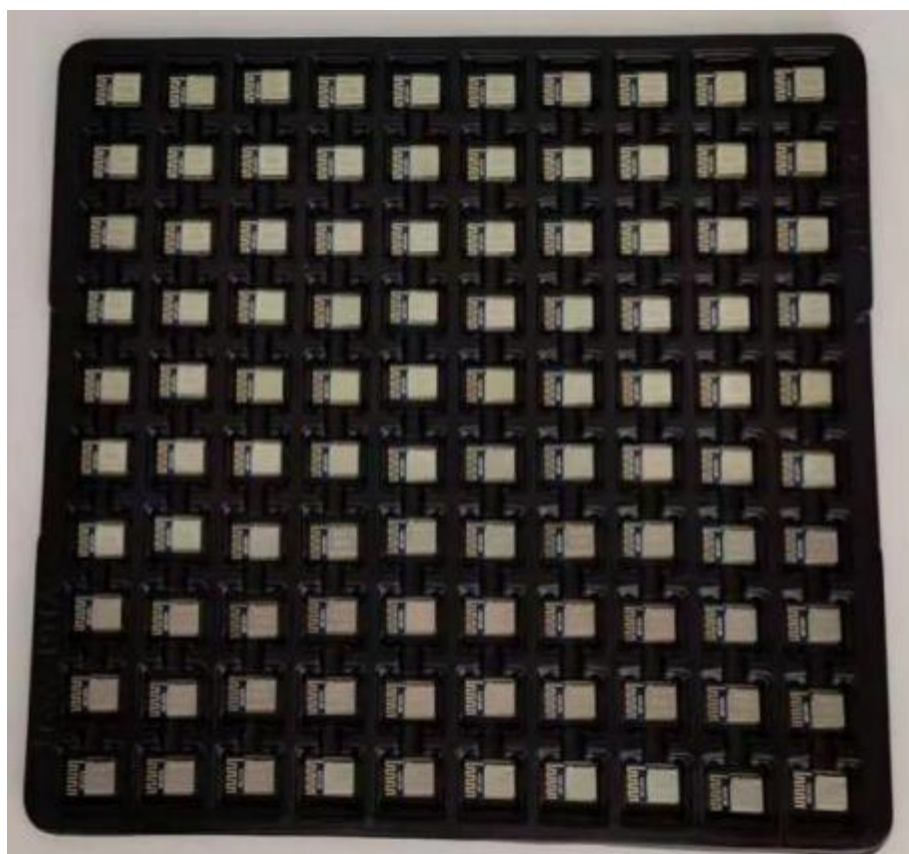
. The OEM manual must provide clear instructions explaining to the OEM the labeling requirements, options and OEM user manual instructions that are required (see next paragraph).

For a host using a certified modular with a standard fixed label, if (1) the module's FCC ID is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: "Contains Transmitter Module FCC ID: 2BWTD-TDLGDBLE001" or "Contains FCC ID: 2BWTD-TDLGDBLE001" must be used. The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

10 Product Packaging Information

- Tape & Tray Packaging
- Tray Dimension: 270mm × 220mm
- 100 pieces per tray
- Minimum Order Packaging Quantity: 2000 pieces



Translation Note

1. All electronic/Bluetooth industry terms follow TI/Nordic official BLE datasheet standard expression;
2. Standards such as IPC/JEDEC, RoHS, AFH, GFSK retain original English naming;
3. Pin functions, electrical parameters, reflow process sections fully conform to international hardware specification writing norms;
4. Company name "添动力科技" unified as Tiandongli Technology for foreign customer communication;
5. Tables, section numbering, document structure fully consistent with the original Chinese file.