

BW20-12F-Kit Specification

Version V1.0.1

Copyright ©2026

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

Document Revision History

Version	Date	Created / Revised Content	Prepared by	Approved by
V1.0.0	2024-08-07	First edition	Zeng Xiangfei	Xu Hong
V1.0.1	2026-10-30	Added the supply voltage range; updated pin names and functions	Liu Hong'en	Xu Hong

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

Contents

1. Product Overview 4
1.1. Features 5
2. Key Specifications 6
2.1. Power Supply Selection 6
2.2. Electrostatic Requirements 6
2.3. Electrical Characteristics 7
2.4. Wi-Fi RF Performance 7
2.5. BLE RF Performance 8
3. Appearance and Dimensions 9
4. LED and Button Description 10
5. Pin Definition 11
6. Schematic 14
7. Product Precautions 14
8. Packaging Information 15
9. Contact Us 15
Disclaimer and Copyright Notice 16
Notice 16
Important Statement 17

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

1. Product Overview

The BW20-12F-Kit is a development board designed for the BW20-12F module. The BW20-12F is a dual-band Wi-Fi + BLE SoC module developed by Shenzhen Ai-Thinker Technology Co., Ltd. based on the RTL8711DAx series chip. It supports dual-band 2.4GHz and 5GHz IEEE 802.11a/b/g/n WLAN protocols and Bluetooth 5.0 protocol. The BW20-12F integrates a dual-core MCU: a high-performance MCU compatible with the Cortex-M55 instruction set, operating at a maximum clock frequency of 345MHz, and a low-power MCU compatible with the Cortex-M23 instruction set, operating at a maximum clock frequency of 115MHz.

The BW20-12F module features a rich set of peripheral interfaces, including UART, GPIO, ADC, PWM, I2C, SPI, SDIO, IR, SWD, and USB. It can be widely applied in the Internet of Things (IoT), mobile devices, wearable electronics, and smart homes.

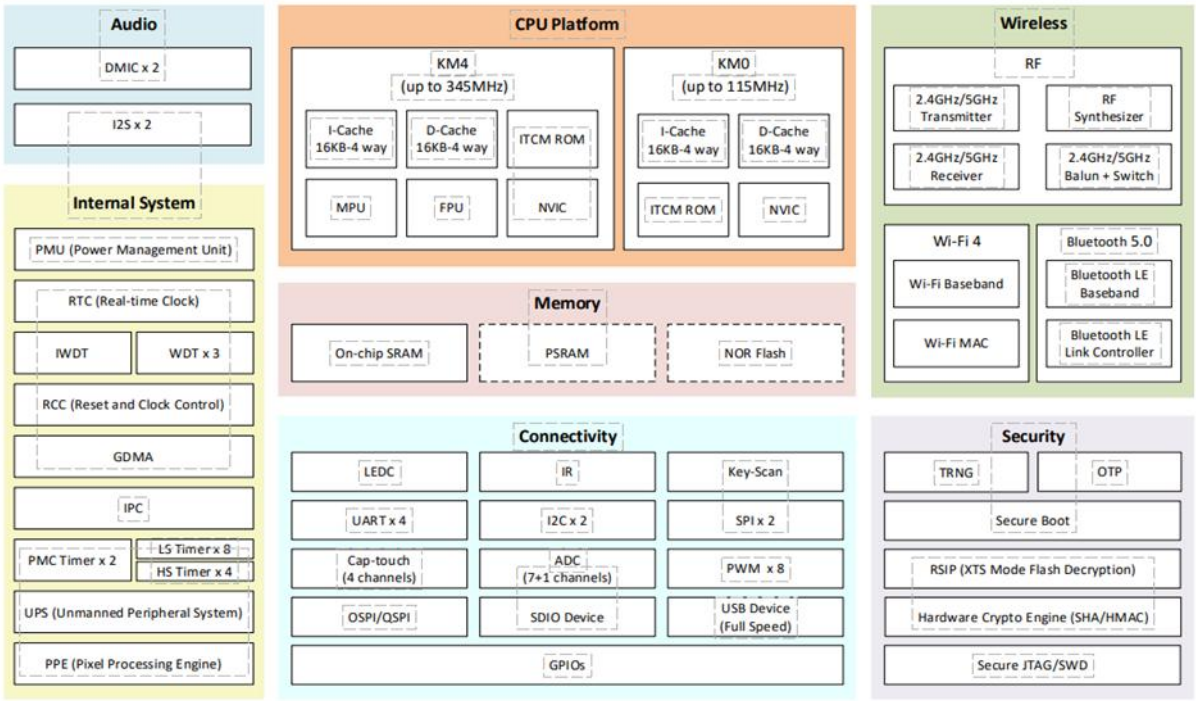


Figure 1 Main Chip Architecture Diagram

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

1.1. Features

- Supports IEEE 802.11a/b/g/n protocols
- Supports 2.4GHz and 5GHz bands
- Supports HT20 and HT40 modes
- Supports BLE 5.0
- Supports BLE Long Range
- Supports Bluetooth high-power mode
- Supports LE Data Length Extension
- Supports Link Layer Privacy
- Supports hardware encryption engine
- Integrates a dual-core MCU, with a maximum clock frequency of 345MHz
- Provides rich peripheral interfaces and 17 configurable I/Os
- Uses a shared antenna for Wi-Fi and Bluetooth
- Supports secondary development and programming under Linux

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

2. Key Specifications

Table 1 Key Specifications

Development Board Model	BW20-12F-Kit
Compatible Module	BW20-12F
Package	DIP-28
Dimensions	60.00×28.00mm
Antenna Type	Onboard antenna
Frequency Range	2400–2483.5MHz and 5180–5825MHz
Operating Temperature	-40℃–85℃
Storage Conditions	-40℃–125℃, <90% RH
Power Supply Range	Supply voltage: 3.3V or 5V; supply current ≥500mA
Supported Interfaces	UART/GPIO/ADC/PWM/I2C/SPI/SDIO/IR/SWD/USB
Available I/Os	17 by default
UART Baud Rate	115200bps by default
Bluetooth	BLE 5.0
SPI Flash	4MByte by default, up to 16MByte supported

2.1. Power Supply Selection

The BW20-12F-Kit supports three power supply modes:

- Type-C interface (recommended)
- 5V and GND pin header
- 3V3 and GND pin header

2.2. Electrostatic Requirements

The BW20-12F-Kit is an ESD-sensitive device and requires special precautions during handling.



Figure 2 ESD Protection Symbol

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

2.3. Electrical Characteristics

Table 2 Electrical Characteristics

Parameter		Condition	Min	Typ	Max	Unit
Power Supply		3V3	3.0	3.3	3.6	V
		5V	4.5	5	5.3	V
I/O	VIL	-	-	-	0.3×VDD	V
	VIH	-	0.65×VDD	-	-	V
	VOL	-	-	-	0.15×VDD	V
	VOH	-	0.85×VDD	-	-	V

2.4. Wi-Fi RF Performance

Table 3 Wi-Fi RF Performance

Description	Typ			Unit
Frequency Range	2400–2483.5 and 5180–5825			MHz
Output Power				
Mode	**Min**	**Typ**	**Max**	**Unit**
11a mode, PA output power	-	18	-	dBm
11b mode, PA output power	-	19	-	dBm
11g mode, PA output power	-	18	-	dBm
11n mode, PA output power	-	17	-	dBm
Receiver Sensitivity				
Mode	**Min**	**Typ**	**Max**	**Unit**
11b, 1Mbps	-	-99	-	dBm
11b, 11Mbps	-	-90	-	dBm
11a/g, 6Mbps	-	-94	-	dBm
11a/g, 54Mbps	-	-76	-	dBm
HT20 (MCS0)	-	-93	-	dBm
HT20 (MCS7)	-	-74	-	dBm
HT40 (MCS0)	-	-91	-	dBm
HT40 (MCS7)	-	-71	-	dBm

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

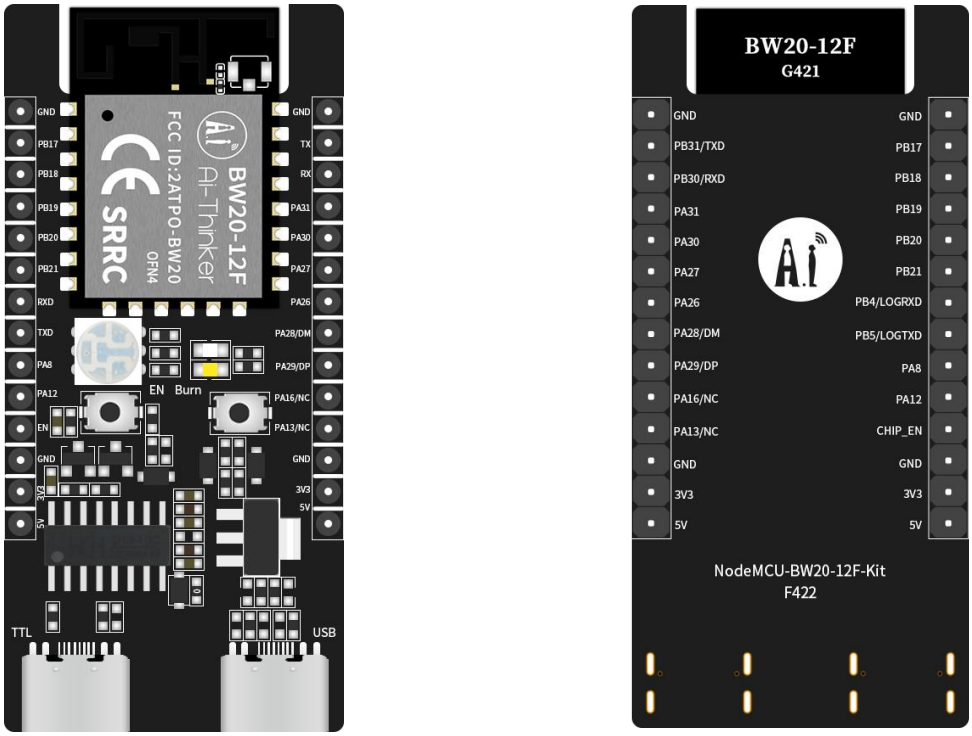
2.5. BLE RF Performance

Table 4 BLE RF Performance

Description	Typ			Unit
Frequency Range	2400–2483.5			MHz
Output Power				
Mode	**Min**	**Typ**	**Max**	**Unit**
1Mbps	-	15	-	dBm
2Mbps	-	15	-	dBm
Receiver Sensitivity				
Mode	**Min**	**Typ**	**Max**	**Unit**
1Mbps @30.8% PER	-	-99	-	dBm
2Mbps @30.8% PER	-	-97	-	dBm

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

3. Appearance and Dimensions



Top View Bottom View

Figure 3 Development Board Appearance
(Renderings are for reference only. The actual product shall prevail.)

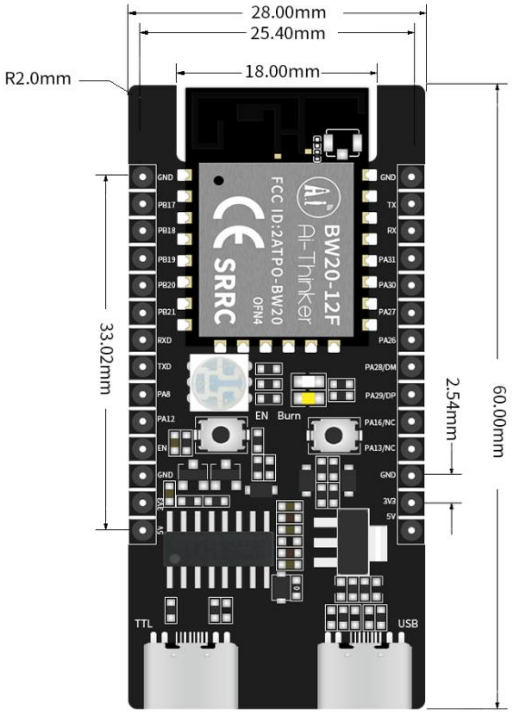


Figure 4 Development Board Dimensions

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

4. LED and Button Description

The BW20-12F-Kit development board has two LEDs (one warm white LED and one cool white LED), one RGB LED, two buttons, and two USB ports, as shown in the figure below.

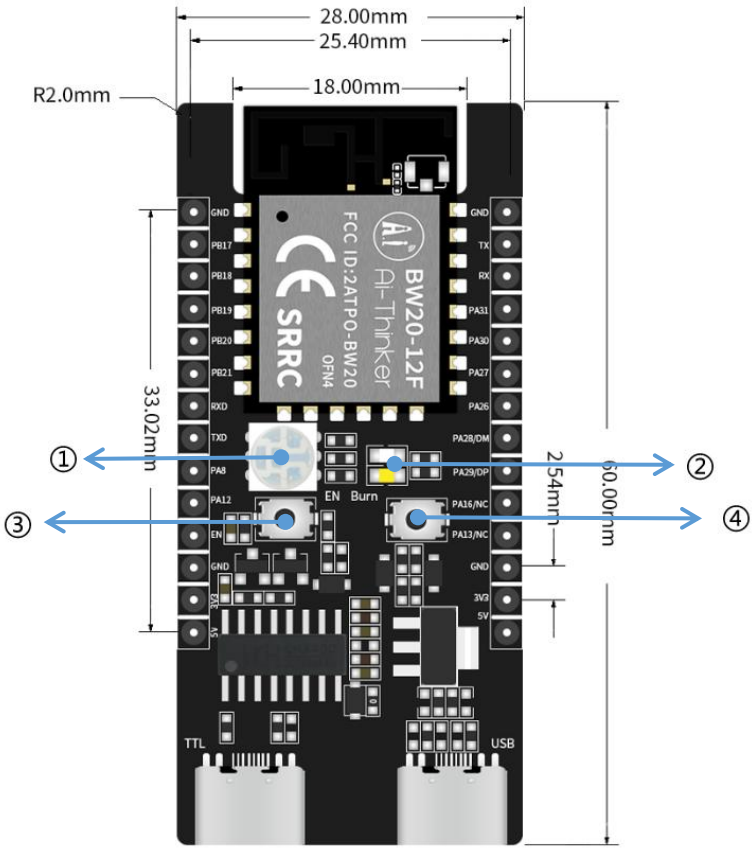


Figure 5 LED and Button Location

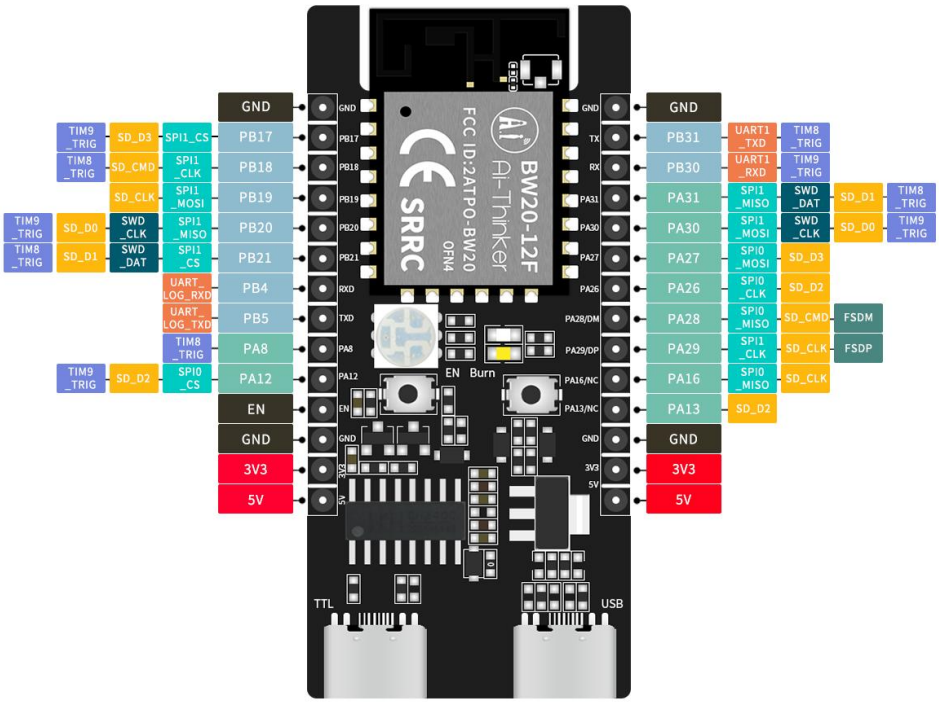
Table 5 LED Status and Button Function Description

No.	Function Description
①	RGB LED (The red LED is connected to PB18, the green LED is connected to PB19, and the blue LED is connected to PB17. Active high.)
②	LED lights (The lower warm white LED is connected to PB20, and the upper cool white LED is connected to PB21. Active high.)
③	Reset button; connected to CHIP_EN. Press and release the button to reset the board.
④	Flash button; connected to LOGTXD. When flashing firmware, press and hold the Flash button, and while holding it, briefly press the reset button.

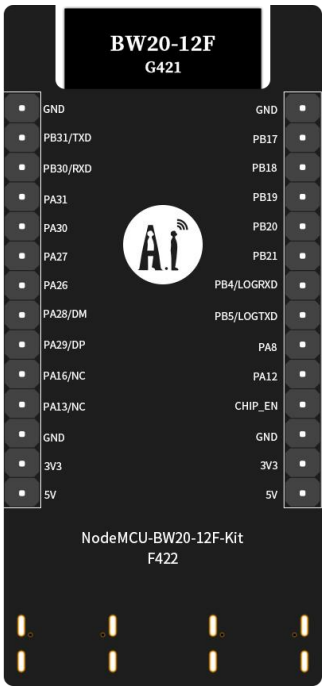
Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

5. Pin Definition

The BW20-12F-Kit exposes a total of 28 pins, as shown in the pin diagram. The pin function definition table provides the detailed interface specifications.



Top View



Bottom View

Figure 6 Development Board Pin Diagram

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

Table 6 Pin Function Definition

No.	Name	Function
1	GND	Ground
2	PB17	SPI1_CS/SD_D3
3	PB18	SPI1_CLK/SD_CMD
4	PB19	SPI1_MOSI/SD_CLK
5	PB20	SPI1_MISO/SWD_CLK/SD_D0
6	PB21	SPI1_CS/SWD_DAT/SD_D1
7	PB4/LOGRXD	UART_LOG_RXD; RX pin for firmware downloading
8	PB5/LOGTXD	UART_LOG_TXD; TX pin for firmware downloading
9	PA8	TIM8_TRIG
10	PA12	SPI0_CS/SD_D2/TIM9_TRIG
11	CHIP_EN	Chip enable input; pull high to enable
12	GND	Ground
13	3V3	3.3V power supply (VDD); the external power supply output current is recommended to be above 500mA.
14	5V	5V power supply (VBUS); the external power supply output current is recommended to be above 500mA.
15	GND	Ground
16	PB31/TXD	UART1_TXD
17	PB30/RXD	UART1_RXD
18	PA31	SPI1_MISO/SWD_DAT/SD_D1. The default function is SWD_DATA and it can be configured as PA31 after the IC boots.
19	PA30	SPI1_MOSI/SWD_CLK/SD_D0. The default function is SWD_CLK and it can be configured as PA30 after the IC boots.
20	PA27	SPI0_MOSI/SD_D3
21	PA26	SPI0_CLK/SD_D2
22	PA28/DM	PA28/SPI0_MISO/SD_CMD/FSDM
23	PA29/DP	PA29/SPI1_CLK/SD_CLK/FSDP
24	PA16/NC	Unavailable by default because this I/O is used by the module's internal flash. Contact Ai-Thinker if this pin is required. SPI0_MISO/SD_CLK; this pin is NC when external flash is used.

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

25	PA13/NC	Unavailable by default because this I/O is used by the module's internal flash. Contact Ai-Thinker if this pin is required. SD_D2; this pin is NC when external flash is used.
26	GND	Ground
27	3V3	3.3V power supply (VDD); the external power supply output current is recommended to be above 500mA.
28	5V	5V power supply (VBUS); the external power supply output current is recommended to be above 500mA.

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

6. Schematic

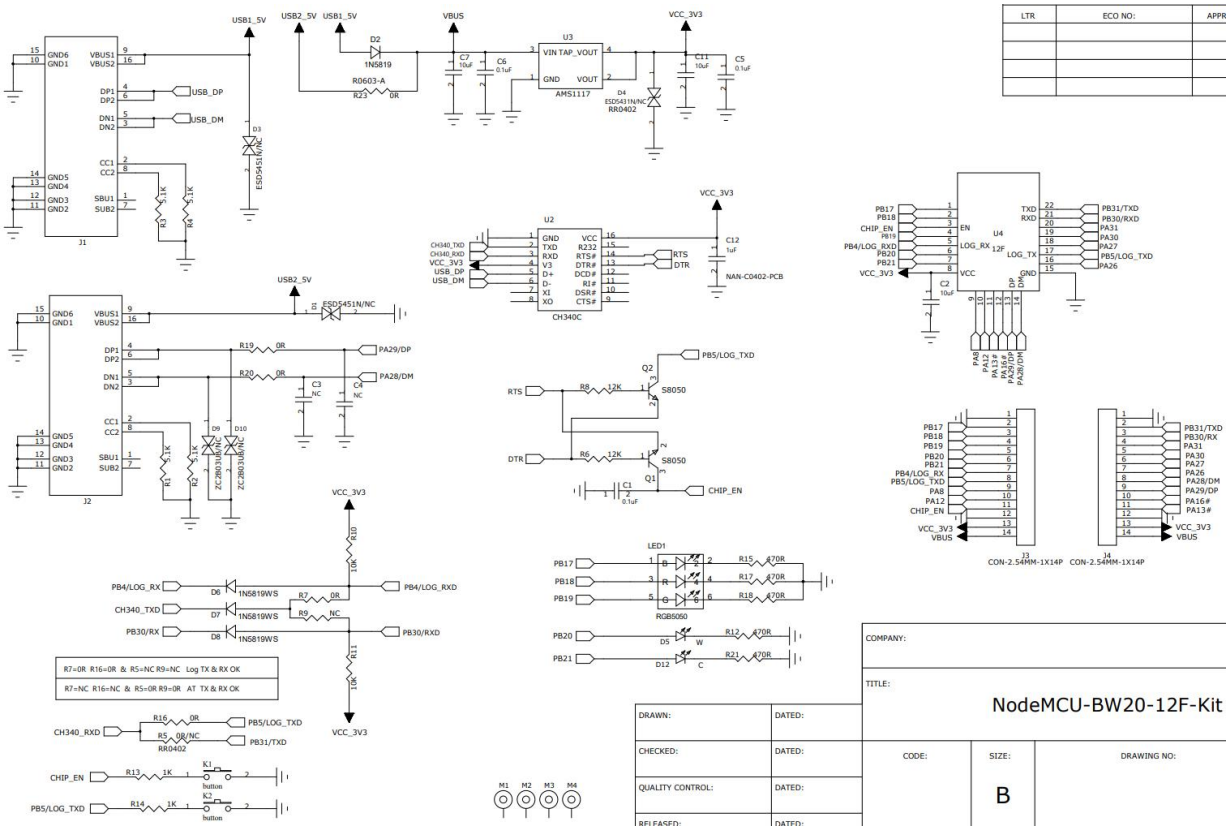


Figure 7 Development Board Schematic

7. Product Precautions

The onboard USB serial port of the BW20-12F-Kit corresponds to UART 0, which uses the LOGRXD and LOGTXD pins. New firmware can only be programmed through either the onboard USB serial port or an external TTL serial adapter connected to LOGRXD and LOGTXD to complete a firmware upgrade.

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

8. Packaging Information

Table 7 Packaging Information

Packing List	Packaging Method	Quantity per Bag (ESD Bag)	Quantity per Bag (Sealed Bag)
BW20-12F-Kit	Foam+ESD bag	1pcs	20pcs

9. Contact Us

Official Website Official Forum Development DOCS LinkedIn

Tmall Store Taobao Store Alibaba Store

Technical Support: support@aithinker.com

Domestic Business Cooperation: sales@aithinker.com

Overseas Business Cooperation: overseas@aithinker.com

Company Address: Room 403–405, 408–410, Building C, Huafeng Smart Innovation Port, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China

Contact Hotline: 0755-29162996

WeChat Mini Program

WeChat Official Account

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

Disclaimer and Copyright Notice

The information in this document, including referenced URLs, is subject to change without notice.

The document is provided “as is” without warranty of any kind, express or implied, including but not limited to the warranties of merchantability, fitness for a particular purpose, or non-infringement. Furthermore, no warranty is given regarding proposals, specifications, or samples mentioned elsewhere. The publisher bears no responsibility, including for any infringement of patent rights arising from the use of information contained herein. This document does not grant, expressly or impliedly, by estoppel or otherwise, any license to intellectual property rights.

All test data presented herein are obtained from Ai-Thinker laboratories. Actual results may vary slightly.

All trade names, trademarks, and registered trademarks mentioned are the property of their respective owners.

Shenzhen Ai-Thinker Technology Co., Ltd. reserves the final right of interpretation of this document.

Notice

This manual may be updated due to product version upgrades or other reasons.

Shenzhen Ai-Thinker Technology Co., Ltd. reserves the right to modify the content of this manual without prior notice or announcement.

This manual is intended as a usage guide only. While Shenzhen Ai-Thinker Technology Co., Ltd. strives to provide accurate information, it does not guarantee that the content is entirely free of errors. All statements, information, and recommendations in this manual do not constitute any express or implied warranty.

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved

Important Statement

Shenzhen Ai-Thinker Technology Co., Ltd. (hereinafter "Ai-Thinker") may provide all technical and reliability data (including datasheets), design resources (including reference designs), application or other design advice, web tools, security information, and other resources (collectively referred to as "these Resources") on an "as is" basis, without warranty of any kind, express or implied, including but not limited to warranties of merchantability, fitness for a particular purpose, or non-infringement of any third-party intellectual property rights. Ai-Thinker specifically disclaims any liability for losses, whether direct or consequential, arising from the application or use of any Ai-Thinker products or circuits.

Ai-Thinker reserves the right to modify the content of this document (including but not limited to specifications and product descriptions) and any related products without prior notice. This document automatically supersedes and replaces all previous versions of the same document number.

These Resources are intended for use by skilled developers designing with Ai-Thinker products. You are solely responsible for: (1) Selecting the appropriate Ai-Thinker products for your application; (2) Designing, validating, and operating your application and product throughout its life cycle; (3) Ensuring your application complies with all applicable standards, laws, and any other functional safety, information security, regulatory, or other requirements.

Ai-Thinker may authorize you to use these Resources solely for developing applications incorporating the Ai-Thinker products described herein. No part of these Resources may be copied, reproduced, or distributed in any form without prior written permission from Ai-Thinker. You are not permitted to use any other intellectual property of Ai-Thinker or any third party. You shall fully indemnify Ai-Thinker and its representatives against any claims, damages, costs, losses, or liabilities arising from your use of these Resources, for which Ai-Thinker assumes no liability.

Ai-Thinker's products are supplied under Ai-Thinker's general sales terms and conditions or other applicable terms accompanying the products. The provision of these Resources does not expand or otherwise alter the warranties or warranty disclaimers applicable to the product as delivered.

Copyright ©2026 Shenzhen Ai-Thinker Technology Co., Ltd. All Rights Reserved