

# Product Specification

Product Name: BLE Cloud Module

Model Name: **DSM-05D**

## Revision History

Specification		Sect.	Update Description	By
Rev	Date			
1.0	2020-12-30		New version release	Alpha

## Approvals

Organization	Name	Title	Date

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## 1 Introduction

### 1.1 Purpose& Description

DSM-05D is a low power-consuming embedded BLE module developed By Roombanker. It consists of the highly integrated wireless radio processor chip, EFR32BG21A020F768IM32-B, and several peripherals, with a built-in BLE protocol stack and robust library functions.

This data terminal device is embedded with the high-performance 32-bit 80 MHz ARM Cortex®-M33 CPU with DSP instructions and floating point unit for efficient signal processing, 768 KB flash memory, 64 KB RAM data memory, and robust peripheral resources. It is mainly used for BLE coordinator device to support BLE 5.1 protocol stack.

### 1.2 Product Feature Summary

- High-performance 32-bit 80 MHz ARM Cortex®-M33 with DSP instructions and floating point unit for efficient signal processing
- Up to 768kB Flash programming memory
- Up to 64kB RAM data memory
- Working voltage: 1.71 V to 3.8 V
- BLE operating feature
  - Bluetooth 5.1 and Bluetooth Mesh supported
  - Working channel: 12@2.400 GHz to 2.483 GHz, with an air interface, rate of 2Mbps
  - Maximum output power: +19.5 dBm; dynamic difference of output power: > 35 dB
  - Working Distance:
    - Min 200m @Output power 8dBm (longrange)
    - Min 400m @output power 19dBm (longrange)
- Dimension: 17 x 22 x 2.8 mm
- Working temperature: -40°C to +85°C
- Certification CE, FCC, SRRC

### 1.3 Scenario

- Intelligent Building
- Intelligent Home And Household Applications
- Industrial Wireless Control
- Intelligent Public Traffic

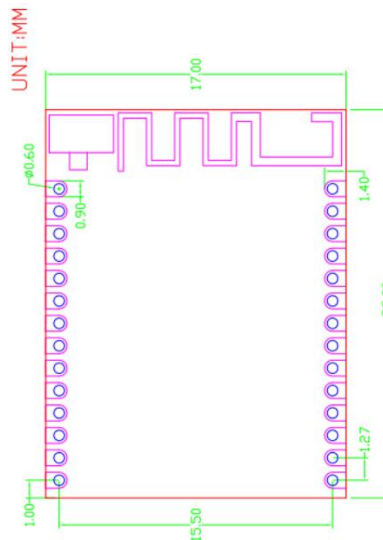
## 2 Mechanical Requirement

### 2.1 Drawing

### 2.2 Dimensions

DSM-05D provides two rows of pins(2 \* 14) with the pin pitch of  $1.27 \pm 0.1 \text{mm}$

Dimensions:  $17 \pm 0.35 \text{ mm}$  (W) x  $22 \pm 0.35 \text{ mm}$  (L) x  $2.8 \pm 0.15 \text{ mm}$  (H).



### 2.3 Pin Definition

Pin Number	Symbol	IO Type	Function
1	GND	P	Power supply reference ground pin
2	ANT	RF	RF signal input/output port, which corresponds to ANT of IC
3	GND	P	Power supply reference ground pin
4	NC		Not connect
5	PA0	I/O	Corresponding to PA0 of IC
6	PC5	I/O	Corresponding to PC5 of IC
7	PC4	I/O	Corresponding to PC4 of IC
8	PA3	I/O	Corresponding to PA3 of IC
9	PA4	I/O	Corresponding to PA4 of IC
10	PC1	I/O	Corresponding to PC1 of IC

11	PC0	I/O	Corresponding to PC0 of IC
12	PD4	I/O	Corresponding to PD4 of IC
13	PD3	I/O	Corresponding to PD3 of IC
14	PD2	I/O	Corresponding to PD2 of IC
15	NC		Not connect
16	NC		Not connect
17	PB0	I/O	Corresponding to PB0 of IC
18	PB1	I/O	Corresponding to PB1 of IC
19	NC		Not connect
20	GND	P	Power supply reference ground pin
21	VCC	P	Power supply pin (3.3V)
22	RX0	I	Corresponding to internal RXD0 of IC
23	TX0	O	Corresponding to internal TXD0 of IC
24	SWDIO	I/O	Corresponding to internal SWDIO of IC
25	SWCLK	I/O	Corresponding to PF2 of IC
26	PC3	I/O	Corresponding to PF3 of IC
27	PC2	I/O	Not connect
28	nRESET	I	Hardware reset pin, which is at a high level by default and is active at a low level

- P indicates power supply pins, I/O indicates input/output pins

### 3 Electrical parameters

#### 3.1 Absolute electrical parameters

Parameter	Description	Typical value	Minimum value	Maximum value	Unit
Ts	Storage temperature		-50	105	°C
VCC	Power supply voltage		1.71	3.8	V
Static electricity voltage (human body model)	TAMB-25°C		-		KV
Static electricity voltage (machine model)	TAMB-25°C		-		KV

### 3.2 Working conditions

Parameter	Description	Minimum value	Maximum value	Typical Value	Unit
Ta	Working temperature	-40	125	-	°C
VCC	Power supply voltage	1.71	3.8	3.0	V
VIL	I/O low-level input	-	IOVDD*0.3		V
VIH	I/O high-level input	IOVDD*0.7	-	-	V
VOL	I/O low-level output	-	IOVDD*0.2	-	V
VOH	I/O high-level output	IOVDD*0.8	-	-	V

### 3.3 Current consumption during constant transmission and receiving

Working status	Mode	TX Power/ Receiving	Typical value	Average value	Unit
TX	CW Mode	+20dBm		185	mA
TX	CW Mode	+10dBm		60.8	mA
TX	CW Mode	+0dBm		10.5	mA
RX	2Mbps	Constant receiving		9.4	mA
RX	1Mbps	Constant receiving		8.8	mA
RX	500Kbps	Constant receiving		9.1	mA
RX	125Kbps	Constant receiving		9.0	

## 4 RF features

### 4.1 Basic RF feature

Parameter	Description
Frequency band	2.412~2.484GHz
Wi-Fi standard	BLE5.1
Data transmission rate	2Mbps max
Antenna type	PCB antenna with a gain of 1dBi. IPEX (optional)

## 4.2 TX performance (Performance during constant transmission)

Parameter	Minimum value	Typical value	Maximum value	Unit
Maximum output power	-	19.5	-	dBm
Minimum output power	-	-20.5	-	dBm
Output power adjustment step	-	0.5		dBm
Output spectrum adjacent-channel rejection ratio	-	-47	-	dBc
Frequency error	-15	-	15	ppm

## 4.3 RX performance (RX sensitivity)

Parameter	Minimum value	Typical value	Maximum value	Unit
PER<1%, RX sensitivity(BLE 250Kbps)	-95	-94	-93	dBm

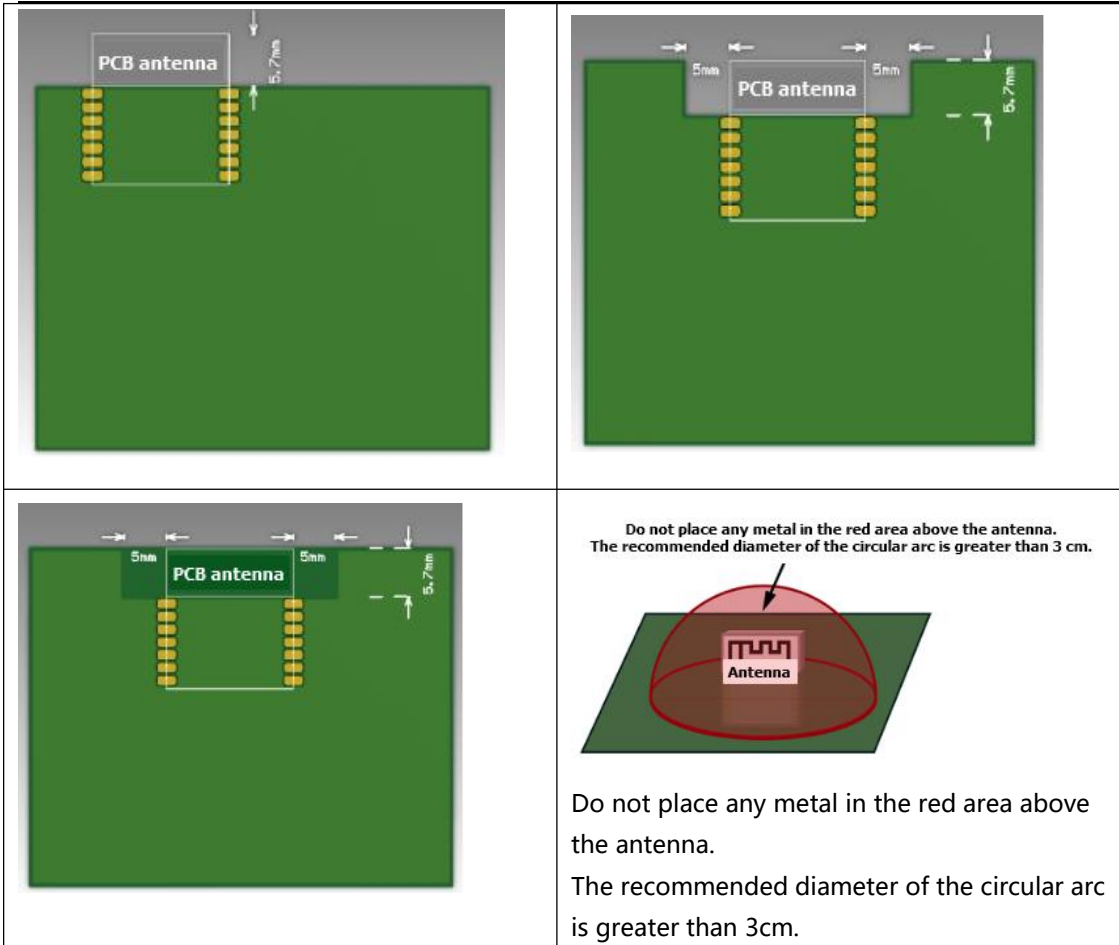
# 5 Antenna

## 5.1 Antenna type

This product uses an onboard PCB antenna or IPEX.

## 5.2 Antenna interference reduction

To ensure optimal RF performance, it is recommended that the antenna be at least 15 mm away from other metal parts. If metal materials are wrapped around the antenna, the wireless signals will be reduced greatly, deteriorating the RF performance.



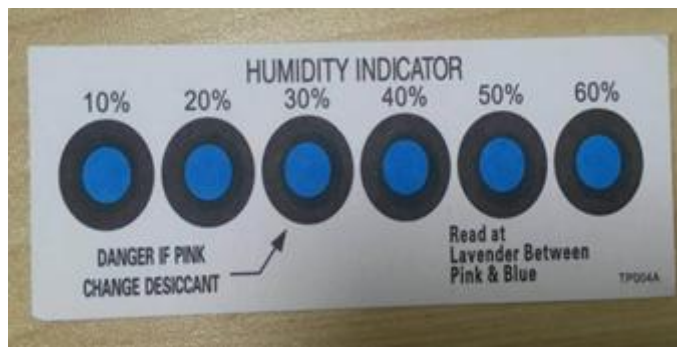
## 7 Production instructions

1. Use an SMT placement machine to mount components to the stamp hole module that DUSUN produces within 24 hours after the module is unpacked and the firmware is burned. If not, vacuum packs the module again. Bake the module before mounting components to the module.
  - SMT placement equipment:
    - Reflow soldering machine
    - Automated optical inspection (AOI) equipment
    - Nozzle with a 6 mm to 8 mm diameter
  - Baking equipment:
    - Cabinet oven
    - Anti-static heat-resistant trays
    - Anti-static heat-resistant gloves
2. Storage conditions for a delivered module are as follows:
  - The moisture-proof bag is placed in an environment where the temperature is below 30°C



and the relative humidity is lower than 70%.

- The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed.
- The package contains a humidity indicator card (HIC).



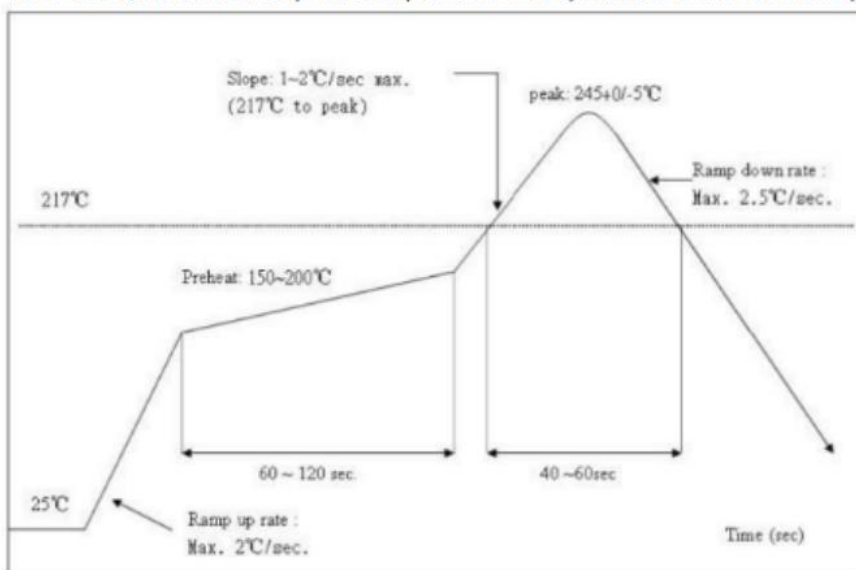
3. Bake a module based on HIC status as follows when you unpack the module package:
  - If the 30%, 40%, and 50% circles are blue, bake the module for 2 consecutive hours.
  - If the 30% circle is pink, bake the module for 4 consecutive hours.
  - If the 30% and 40% circles are pink, bake the module for 6 consecutive hours.
  - If the 30%, 40%, and 50% circles are pink, bake the module for 12 consecutive hours.
4. Baking settings:
  - Baking temperature:  $125 \pm 5^{\circ}\text{C}$
  - Alarm temperature:  $130^{\circ}\text{C}$
  - SMT placement ready temperature after natural cooling:  $< 36^{\circ}\text{C}$
  - Number of drying times: 1
  - Rebaking condition: The module is not soldered within 12 hours after baking.
5. Do not use SMT to process modules that have been unpacked for over three months. Electroless nickel immersion gold (ENIG) is used for the PCBs. If the solder pads are exposed to the air for over three months, they will be oxidized severely and dry joints or solder skips may occur. Roombanker is not liable for such problems and consequences.
6. Before SMT placement, take electrostatic discharge (ESD) protective measures.
7. To reduce the reflow defect rate, draw 10% of the products for visual inspection and AOI before first SMT placement to determine a proper oven temperature and component placement method. Draw 5 to 10 modules every hour from subsequent batches for visual inspection and AOI.

### 7.1 Recommended oven temperature curve

Perform SMT placement based on the following reflow oven temperature curve. The highest temperature is  $245^{\circ}\text{C}$ .

Based on the IPC/JEDEC standard, perform reflow soldering on a module at most twice.

Refer to IPC/JEDEC standard; Peak Temperature: <245°C; Number of Times: ≤2 times;



## 7.2 Storage conditions



**CAUTION**  
This bag contains  
**MOISTURE-SENSITIVE DEVICES**

**LEVEL**  
**3**

If Blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 260 °C  
If Blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
  - a) Mounted within: 168 hrs. of factory conditions  
If Blank, see adjacent bar code label
  - ≤ 30°C/60%RH, OR
  - b) Stored at <10% RH
4. Devices require bake, before mounting, if:
  - a) Humidity Indicator Card is > 10% when read at 23 ± 5°C
  - b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hrs. at 125 ± 5°C

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: \_\_\_\_\_  
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Note: Level and body temperature defined by IPC/JEDEC J-STD-020

## 8 MOQ and packing

Product model	MOQ (pcs)	Packing method	Number of Modules in each reel pack	Number of reel packs in each box
DSM-05D	2800	Carrier tape and reel packing	700	4