Product Datasheet

Product Name: Bluetooth Cloud Module
Model Name: DSM-055

Revision History

Specification		Sect.	Update Description	By
Rev	**Date**			

Approvals

Organization	*Name*	*Title*	*Date*

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1 Product overview

DSM-055 are 2.4 GHz wireless SOCs optimized for line-powered Bluetooth Low Energy and Bluetooth mesh applications, including connected lighting, smart plugs, gateways and voice assistants. An 80 MHz ARM® Cortex®-M33 core provides plenty of processing capability while an integrated security subsystem provides leading security features that greatly reduce the risk of IoT security breaches and compromised intellectual property. With better than -104dBm sensitivity and up to +19 dBm output power.

The module can support plug-in and patch mode, the production process is simple and convenient, the transmission power is large, and the receiving sensitivity is high, and it can be widely used in the field of smart home.

2 Features

- ARM Cortex-M33, Floating-Point Unit
- Up to 80 MHz Clock Speed
- Up to 1024 KB of Programmable Flash
- Up to 96 KB SRAM
- BLE RF features
  Compatible with Bluetooth 5.0 and Bluetooth mesh specification
  Excellent receive sensitivity:
  -101dBm @125 kbps GFSK
  Programmable output power: Up to +19dBm
  Active mode RX:8.8mA
  Active mode TX:9.3mA@0dBm
  Active mode TX: 33.8 mA@10dBm
  Antenna: PCB
- Support master mode, slave mode, broadcast mode (Beacon),
- Support master-slave integration, connecting up to 8 slave devices
- Support multi-master and multi-slave, can connect 3 masters and 4 slaves
- Support SIG mesh, support multiple node types of mesh
- Working temperature: -30℃ to +105℃
- Humidly:<85%RH(No condensation)

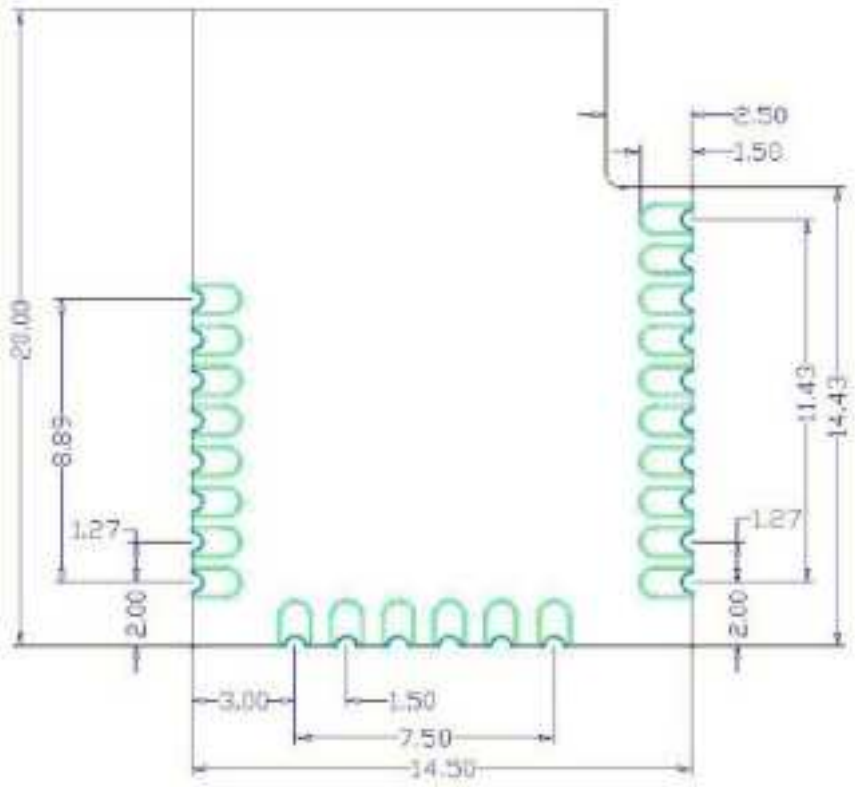
3 Applications

- Intelligent building
- Smart household and home appliances
- Smart socket and light
- Industrial wireless control
- Baby monitor
- Network camera
- Intelligent bus

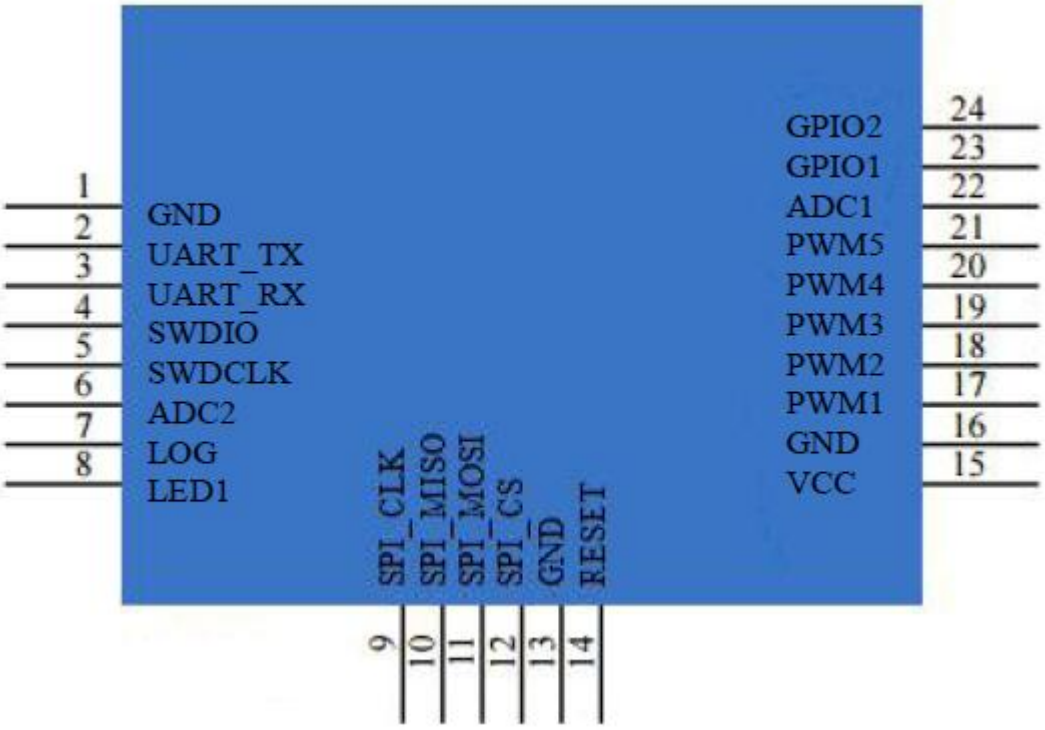
4 Module interfaces

4.1 Dimensions and package

DSM-055 dimensions are 14.5 (±0.35) mm (W)×20 (±0.35) mm (L) ×2.8(±0.15) mm（H）:



4.2 Pin definition



The definition of interface pins is shown in the following table:

Pin No.	Symbol	I/O type	Function
1	GND	P	Power supply reference ground pin
2	UART_TX	PA05	MP test points need to be reserved for calibration
3	UART_RX	PA06	MP test points need to be reserved for calibration
4	SWDIO	PA02	GPIO interface; 8mA drive capability. Wake-up function. Internal strong/weak pull-up and pull-down. SWDIO (default)
5	SWDCLK	PA01	
6	ADC2	PB02	GPIO interface, which can be configured as an ADC
7	LOG	PB01	Power-on mode: normal operation pull-down, bypassing the program code executed in the flash (the PAD internal pull-down by default).
8	LED1	PB00	Common GPIO interface
9	SPI_CLK	PC02	Common GPIO interface
10	SPI_MISO	PC01	Common GPIO interface
11	SPI_MOSI	PC00	Common GPIO interface
12	SPI_CSN	PC03	Common GPIO interface
13	GND	GND	Power supply reference ground pin
14	RESET	RESET	MP test points need to be reserved for calibration
15	VCC	VCC	1. Power: 2V ~ 3.6V 2. MP test points need to be reserved for calibration
16	GND	P	Power supply reference ground pin
Pin No.	Symbol	I/O type	Function
17	PWM1	PD04	Support PWM function LED (fixed timer), default connection cold LED
18	PWM2	PD03	Support PWM function LED (fixed timer), default connection warm LED
19	PWM3	PD02	1. The I2C SDA 2. LED support PWM such as breathing light (adjustable timer) 3. Red LED by default
20	PWM4	PC04	1. The I2C SCL 2. LED support PWM such as breathing light (adjustable timer) 3. Green LED by default
21	PWM5	PC05	1. LED support PWM such as breathing light (adjustable timer) 2. Blue LED by default
22	ADC1	PD00	Common GPIO interface
23	GPIO1	PA03	Common GPIO interface
24	GPIO2	PA04	Common GPIO interface

Note: P indicates a power supply pin, I/O indicates an input/output pin and AI indicates an analog input pin. If you have your requirements on the light color controlled by PWM output, please contact the business representative of Dusun.

5 Electrical parameters

5.1 Absolute electrical parameters

Parameter	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	-30	125	℃
VCC	Power supply voltage	-0.3	3.8	V
Static electricity discharge voltage (human body model)	TAMB-25℃	-	2	KV
Static electricity discharge voltage (machine model)	TAMB-25℃	-	1	KV

5.2 Working conditions

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
Ta	Working temperature	-30	-	105	℃
VCC	Working voltage	1.75	3.3	3.8	V
V_{IL}	I/O low level input	-0.3	-	VCC*0.3	V
V_{IH}	I/O high level input	VCC*0.7	-	VCC	V
V_{OL}	I/O low level output	VSS	-	0.3	V
V_{OH}	I/O high level output	VCC-0.3	-	VCC	V

5.3 Power consumption in working mode

Symbol	Conditions	Typical value	Unit
Itx	Constantly transmit, output power of 0 dBm	10.5	mA
Irx	Constantly receive	9.4	mA

6 RF features

6.1 RF output power

Unless otherwise indicated, typical conditions are: TA = 25℃, VCC = 3.0V, RF center frequency 2.45 GHz.

Parameter	Minimum value	Typical value	Maximum value	Unit
Average RF output power	-20	0	20	dBm

6.2 RF receiving sensitivity

Unless otherwise indicated, typical conditions are: TA = 25℃, VCC = 3.0V, RF center frequency 2.45 GHz.

Parameter	Minimum value	Typical value	Maximum value	Unit
RX sensitivity	1 Mbps	-95	-97	dBm
RX sensitivity	2 Mbps	-93	-94	dBm

7 Antenna

7.1 Antenna type

DSM-055 uses an onboard PCB antenna

7.2 Antenna interference reduction

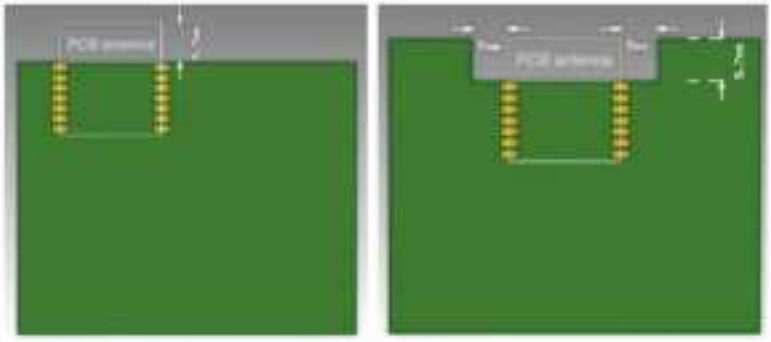
To ensure the optimal RF performance, it is recommended that the antenna be at least 15 mm away from other metal parts.

Because DSM-055 is mounted to the main control panel through SMT, the placement location and manner of the PCB directly affect the RF performance. The following are placement positions recommended and not recommended.

Among them, placement positions in Solution 1 and 2 are recommended, that is, the antenna is placed outside the frame of the panel, or the antenna is placed along the frame edge of the panel with a carved area below. In the above two solutions, the RF performance is not different from that of an independent module.

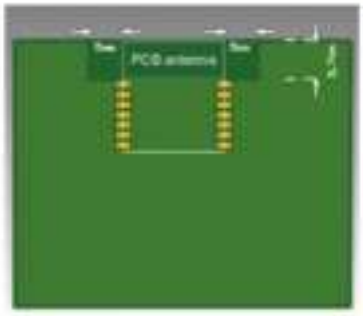
If the PCB antenna must be placed on the panel due to the design limit, you can refer to the placement manner in Solution 3. That is, the antenna is placed along with the frame of the panel without copper or traces below. However, the RF performance is still reduced by 1 to 2 dBm.

The placement position in Solution 4 is not recommended. In this solution, the antenna is placed on the PCB without a clearance area below, which greatly affects the strength of the RF signal.

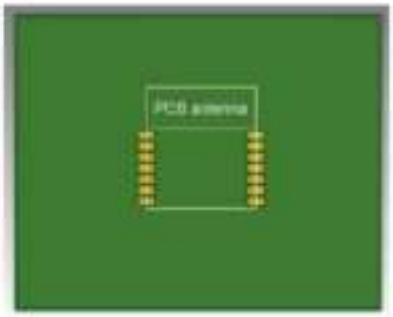


Solution 1: antenna placed outside the PCB frame

Solution 2: antenna placed along the frame edge with a carved area below



Solution 3: antenna placed along the frame edge without copper below



Solution 4: antenna placed on the PCB without a clearance area below (not recommended)

8 Production Instructions

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 pack 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
- 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).

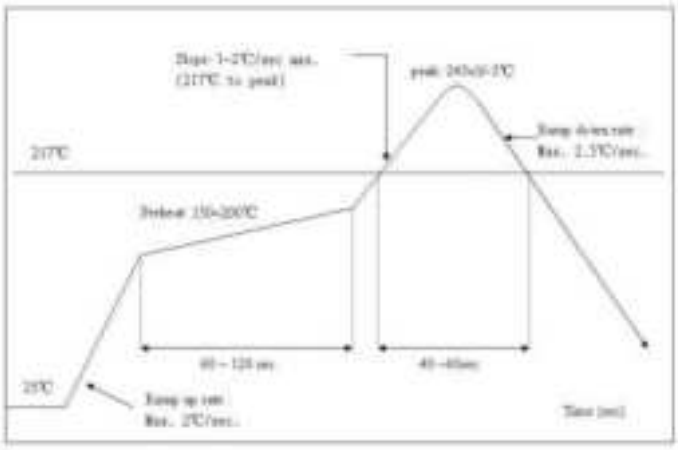
- Bake a module based on HIC status as follows when you unpack the module package:
  If the 30%, 40%, and 50% circles are blue, bake the module for 2 consecutive hours.
  If the 30% circle is pink, bake the module for 4 consecutive hours.
  If the 30% and 40% circles are pink, bake the module for 6 consecutive hours.
  If the 30%, 40%, and 50% circles are pink, bake the module for 12 consecutive hours.

- Baking settings:
  Baking temperature: 125±5℃
  Alarm temperature: 130℃
  SMT placement ready temperature after natural cooling:<36℃
  Number of drying times: 1
  Rebaking condition: The module is not soldered within 12 hours after baking.
- Do not use SMT to process modules that have been unpacked for more than 3 months, because electroless nickel/immersion gold (ENIG) is used for PCBs and they are seriously oxidized for over 3 months. SMT is very likely to cause pseudo and missing soldering. Dusun is not liable for such problems and consequences.
- Before using SMT, take electrostatic discharge (ESD) protective measures.
- To reduce the reflow defect rate, draw 10% of the products for visual inspection and AOI before the first mounting, to determine the rationality of oven temperature control and component attachment and placement manners. Draw 5 to 10 modules from subsequent batches each hour for visual inspection and AOI.

9 Recommended oven temperature curve

Perform SMT based on the following reflow oven temperature curve. The highest temperature is 245℃. The reflow oven temperature curve is as below:

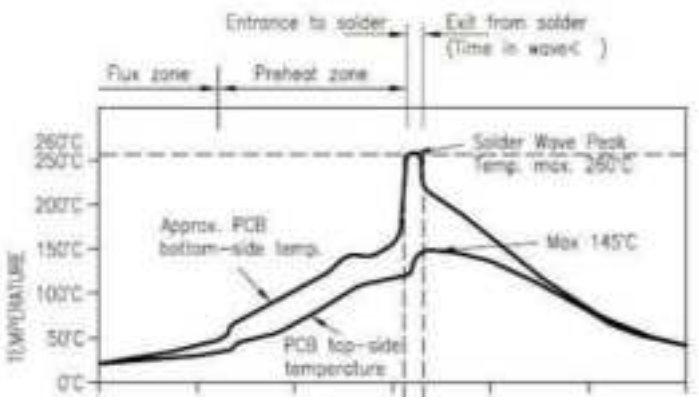
Refer to IPC/JEDEC standard; Peak Temperature:<245℃; Number of Times: ≤2 times



10 Recommended oven temperature curve and temperature

For oven temperature setting, refer to oven temperatures for wave soldering. The peak temperature is 260℃±5℃. The wave soldering temperature curve is shown below:

DIP Type Product Pass Wavesolder Graph



Recommended soldering temperature:

Recommended wave soldering oven temperature		Recommended manual soldering temperature	
Preheat temperature	80 to 130℃	Soldering temperature	360±2℃
Preheat time	75 to 100s	Soldering time	＜3s/point
Peak contact time	3 to 5s	NA	NA
Temperature of tin cylinder	260±5℃	NA	NA
Ramp-up slope	≤2℃/s	NA	NA
Ramp-down slope	≤6℃/s	NA	NA

11 Storage conditions

12 MOQ and packaging information

Product No.	MOQ (pcs)	Shipping packaging method	Number of modules per reel (pcs)	Number of reels per carton (reel)

DSM-055	4000	Tape reel	1000	4

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 device 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 device 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 device does cause harmful interference to radio or television reception, which can be determined by turning the device 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 device and receiver.
--Connect the device 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

FCC Radiation Exposure Statement The antennas used for this transmitter must be installed to provide a separati on distance of at least 20 cm from all persons and must
not be co-located for operating in conjunction with any other antenna
or transmitter.

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains FCC ID: 2AWWFDSM-055” any similar wording that expresses the same meaning may be used.
The module is limited to OEM installation ONLY. The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
PCB antenna with antenna gain 1.5 dBi

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

FCC Radiation Exposure Statement
The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device if without further approval include SAR.
This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: 2AWWFDSM-055 Or Contains FCC ID:2AWWFDSM-055 ”
When the module is installed inside another device, the user manual of the host must contain below warning statements;
1. 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.
(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.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.
Any company of the host device which install modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission,etc. according to FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement， then host can be sold legally.