

Product Specification

Product Name: RBF SiP Module

Product Model: RB4331/RB8681/RB9151

Revision History

Specification		Sect.	Update Description	By
Rev.	Date			
1.0	2024-06-18		New version release	Arvin

Approvals

Organization	Name	Title	Date

1. Product Description

1.1. Purpose and Description

SiP (System-in-package) is to preferentially assemble multiple active electronic components with different functions, optional passive devices, and other devices such as MEMS or optical devices into a single standard package that can achieve certain functions to form a system or subsystem. Roombanker encapsulates the RBF radio frequency chip, crystal oscillator, and antenna matching circuit into a SiP module, which has the following advantages:

1. Short development time

The SiP module itself is a system or subsystem. When used in a larger system, it can complete prediction and pre-trial faster in the debugging stage.

2. Low manufacturing cost

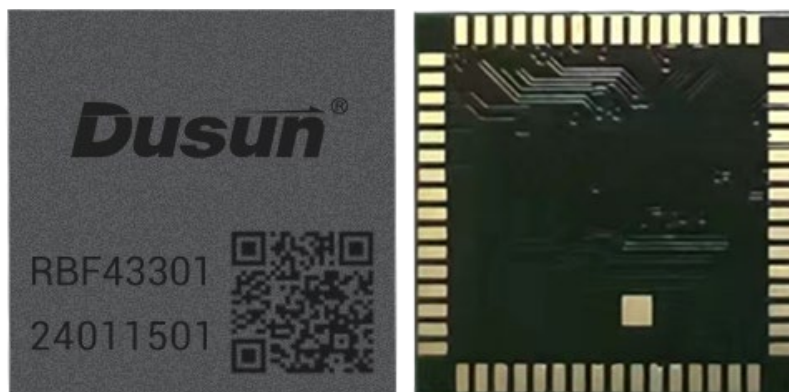
Although the price of the SiP module is more expensive than a single part, the PCB space is reduced, the failure rate is low, the test cost is low, and the system design is simplified, so the overall cost is reduced.

3. High production efficiency

By integrating and separating passive components in SiP, the defect rate is reduced, thereby improving the yield of the overall product. The module adopts a high-order IC packaging process to reduce the system failure rate.

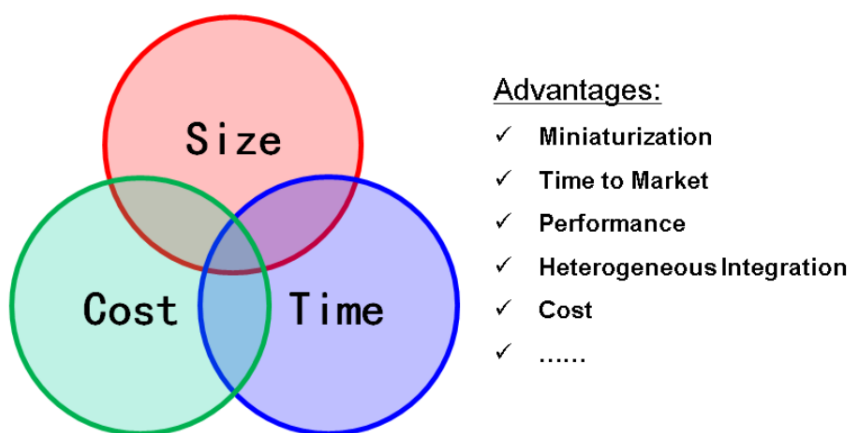
4. Simplify system design

SiP integrates the complex circuit into the module and reduces the complexity of PCB circuit design. The SiP module provides a quick replacement function, making it easy for system designers to add the required functions.



1.2. Product Feature Summary

- Low-power CE/RED certified wireless module with ultra-low energy consumption, enabling easy battery operation.
- Communication range of up to 3.5 kilometers (in open space), supporting star and mesh network configurations with a capacity of up to 10,000 devices.
- Utilizes advanced technologies such as FHSS, TDMA, and AES-CCM+ encryption for secure and reliable data transmission.
- Low-code development with a packaged protocol stack and user-friendly API accelerates the production process.
- OTA multicast technology allows simultaneous firmware updates to multiple devices.
- High RF integration enables the use of external antennas, reducing the need for in-house development.
- Low PCB layer count minimizes manufacturing costs.

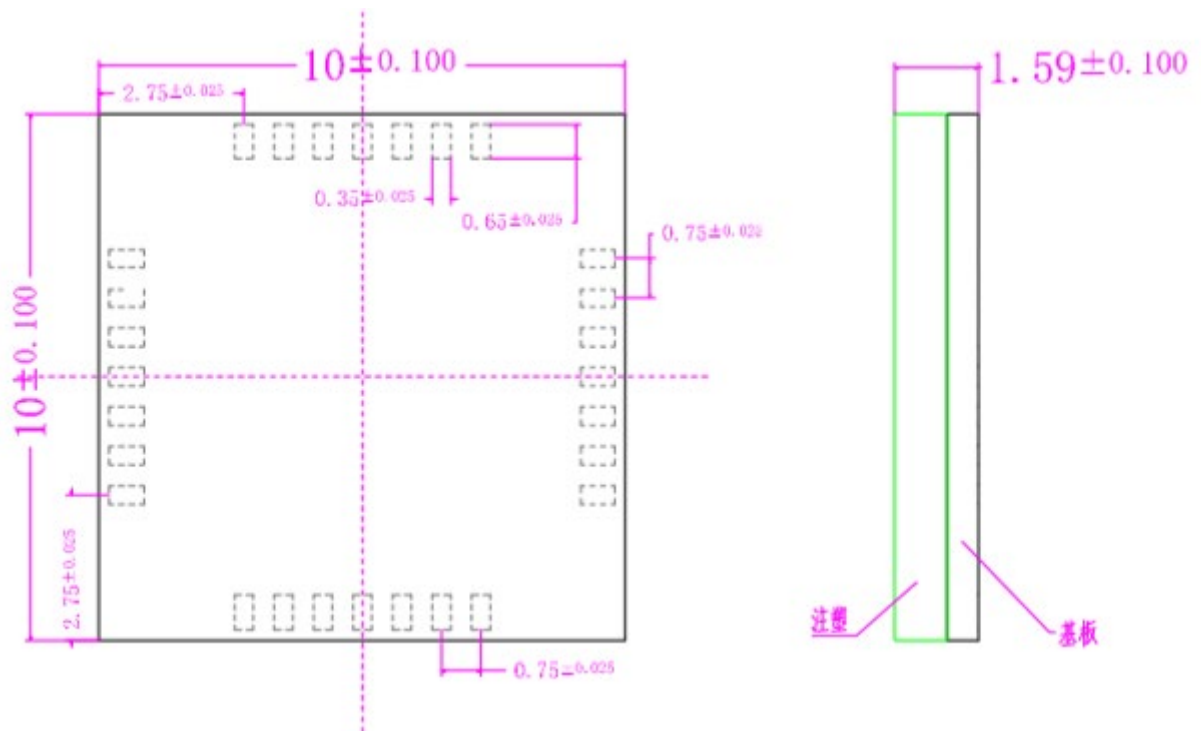
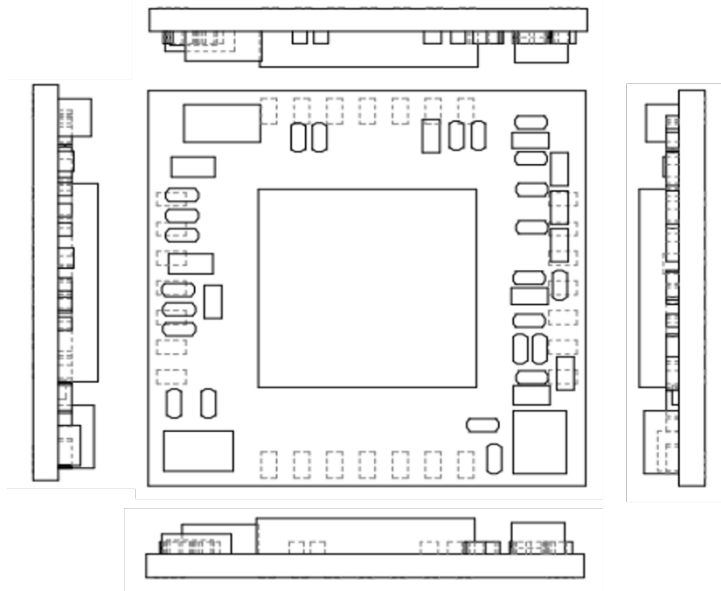


1.3. Typical Application

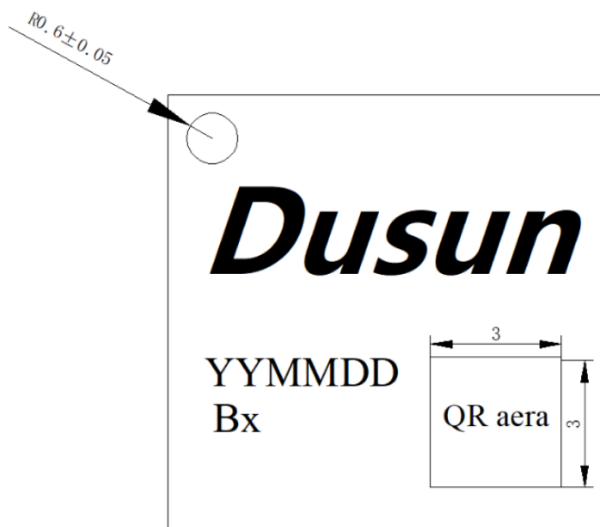
- Wireless Meter Reading System (Water meter, gas meter, heat meter, electricity meter, etc)
- Wireless Security System in House/Villa, Office, Retail and other SMB scenarios
- Electric Vehicles and Charging Points
- Smart Apartment (Express Cabinet, Smart Lock, etc)
- Industrial Automation

2. Product Detail

2.1. Component Layout, External Dimensions and Pad Design



2.2. Mark Specification Range

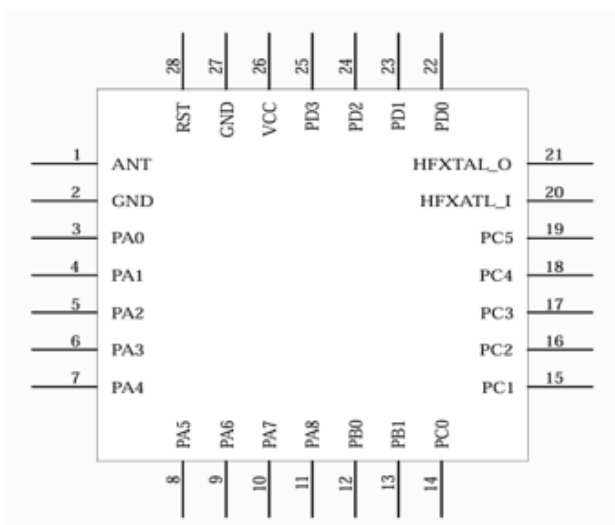


Code	Bx	YY	MM	DD
Explanation	Production batch	Year	Month	Day
Code - printing	B1	24	06	27

Mark accuracy: 20um~40um

Mark depth: ±50um

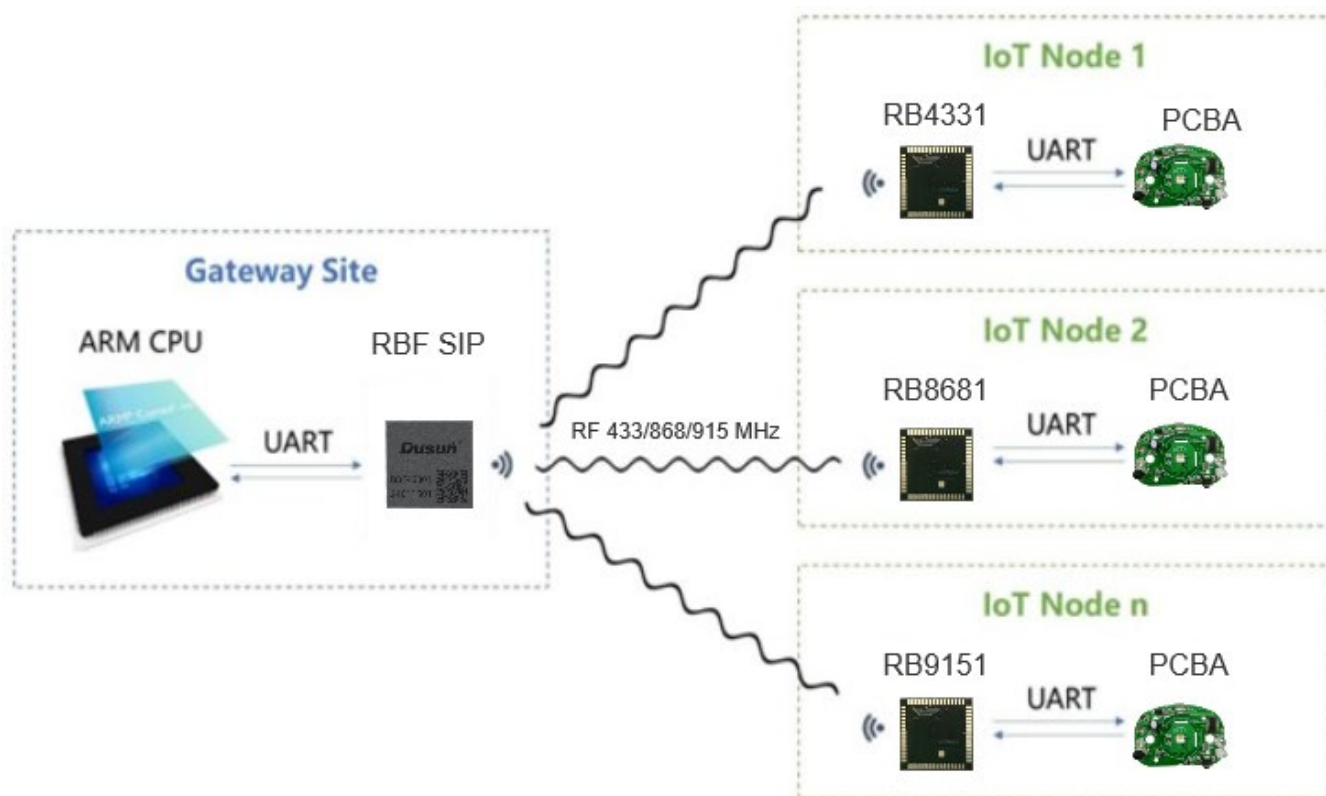
2.3. Pin Definition



Pin number	symbol	IO type	function
1	ANT	ANT	RF transmitting and receiving pi
2	GND	P	general I/O (Configurable features)
3	PA0	I/O	general I/O (Configurable features)
4	PA1	I/O	general I/O (Configurable features)
5	PA2	I/O	general I/O (Configurable features)
6	PA3	I/O	general I/O (Configurable features)
7	PA4	I/O	general I/O (Configurable features)
8	PA5	I/O	general I/O (Configurable features)
9	PA6	I/O	general I/O (Configurable features)
10	PA7	I/O	general I/O (Configurable features)
11	PA8	I/O	general I/O (Configurable features)
12	PB0	I/O	general I/O (Configurable features)
13	PB1	I/O	general I/O (Configurable features)
14	PC0	I/O	general I/O (Configurable features)
15	PC1	I/O	general I/O (Configurable features)
16	PC2	I/O	general I/O (Configurable features)
17	PC3	I/O	general I/O (Configurable features)
18	PC4	I/O	general I/O (Configurable features)
19	PC5	I/O	general I/O (Configurable features)
20	HFX TAL_O	I/O	High Frequency XTAL output pin
21	HFX TAL_I	I/O	High Frequency XTAL input pin
22	PD0	I/O	general I/O (Configurable features)
23	PD1	I/O	general I/O (Configurable features)
24	PD2	I/O	general I/O (Configurable features)
25	PD3	I/O	general I/O (Configurable features)
26	VCC	P	Power supply pins of the chip (typical supply voltage: 3.3V)

27	GND	P	Chip power reference ground
28	RST	I	Chip hardware reset pin, default high level, effective when pulled low

2.4. Topology & Usage



3. Specification

3.1. Technical Specification

Technical Specification			
Model	RB4331	RB8681	RB9151
Hardware			
Processor	Silicon Labs EFR32		
Frequency Band	433.12MHz~435.12MHz	863 MHz ~ 870 MHz	902 MHz ~ 928 MHz
Antenna Option	U.FL, RF pad		
RAM	64 KB	64 KB	64 KB

Flash	512 KB	512 KB	512 KB
Performance			
RF Data Rate	2 kbps ~ 100 kbps		
Transmit Range (Open Area)	Up to 3.5 km with -1.92 dBi antenna		
Transmit Power	Max. 20dBm		
Receiver Sensitivity	-113.3 dBm @ 38.4 kbps		
Spectrum Utilization	FHSS		
Modulation	FSK Narrowband / DSSS Spreading		
Feature			
Digital I/O	21-ch Digital I/O		
Analog Input	21-ch Analog Inputs		
Networking Topology	Star Connection / Mesh Connection		
Encryption	AES-CCM+Random Number Key		
Image Transmit	Support		
OTA	Multicast OTA, Background Upgrading		
Power			
Supply Voltage	1.7 V ~ 3.8V		
Transmit Current	Max. 85.5 mA		
Receive Current	< 3.7 mA		
Sleep Current	< 2 μ A		
General			
Dimension	17 mm (W) \times 22 mm (H) \times 4 mm (D)		
Weight	DSM-140: 1.7g DSM-141: 1.8g		
Operating Temperature	-40 $^{\circ}$ C ~ 85 $^{\circ}$ C (-40 $^{\circ}$ F ~ 185 $^{\circ}$ F)		
Storage Temperature	-40 $^{\circ}$ C ~ 125 $^{\circ}$ C (-40 $^{\circ}$ F ~ 257 $^{\circ}$ F)		
Regulatory Approval			
ETSI (Europe)	CE/RED		
RoHS	Compliant		

4. QA Requirement

Information Description	Standard(Yes) Custom(No)
ESD Testing	Yes
RF Antenna Analysis	Yes
Environmental Testing	Yes
Reliability Testing	Yes
Certification	FCC, CE, RoHS

5. Package Information

5.1. Package

Packing Type	Tape Reel
Packing Quantity	2000 pcs / tape