
LoRa Wireless Module CC68-C1-915

Product specification

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Note: Revision History

Revision	Date	Comment

1.Overview

The CC68-C1 wireless module uses Semtech's LLCC68 device, ultra-low receive current and sleep current, and sensitivity of -129dBm. Built-in 64KHz crystal oscillator can wake up the microcontroller periodically under low power consumption. The module antenna switch is integrated and controlled by the chip, which saves the resources of the external MCU. The compact size and 22dBm (160mW) output power have great advantages in IoT and battery-powered applications.

CC68-C1 comply with lead-free craft in production and testing and meets RoHS and Reach standards.

Module	Chip	Frequency Band	Crystal
CC68-C1-868	LLCC68	Center 868 MHz	10ppm Industrial grade crystal oscillator
CC68-C1-915	LLCC68	Center 915 MHz	10ppm Industrial grade crystal oscillator

2.Features

- Frequency Range: 868/915 MHz
- Sensitivity: -129dBm @LoRa
- Maximum output power: 22 dBm (160mW)
- Industrial grade high precision crystal oscillator
 - LoRa,(G)FSK
- 255 bytes FiFo
- Data transfer rate:
 - 0.6-300 Kbps @FSK
 - 1.76-62.5 Kbps @Lora

3.Applications

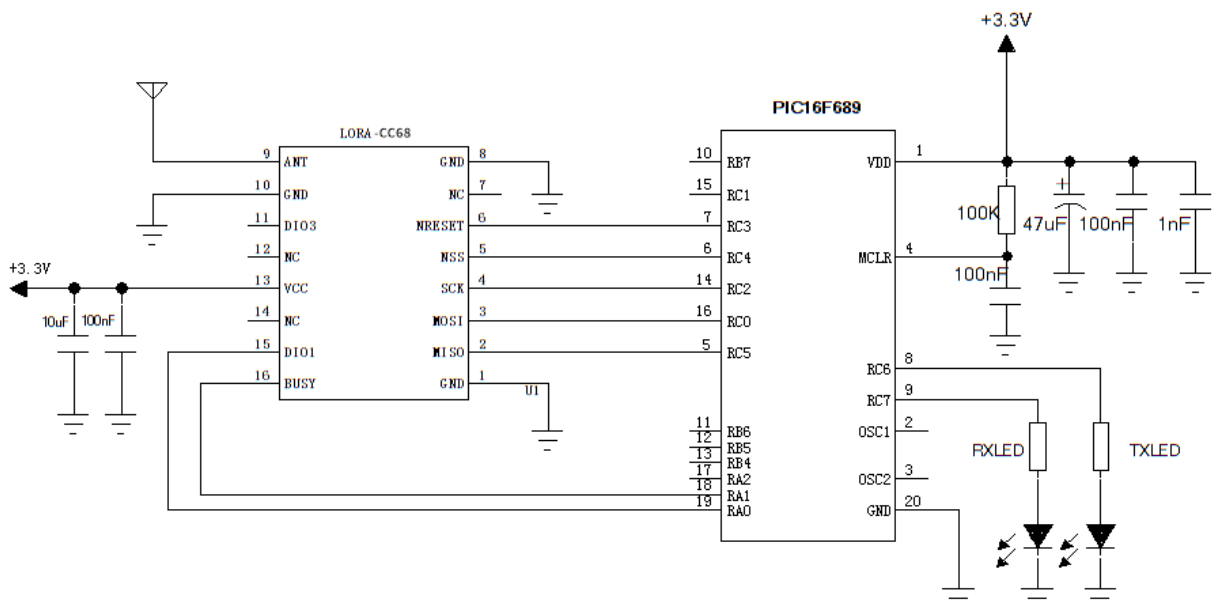
- Industrial meter reading
- Parking lot sensor management
- Industrial automation
- Agricultural sensor
- Smart city
- Remote control
- Street lights
- Logistics management
- Environmental sensor
- Health products
- Security products
- Warehouse management

4.Electrical Characteristics(@Vcc=3.3v ANT connected to 50 ohm load)

★Note: The default shipment is ordinary crystal oscillator version. If needs, the TCXO crystal oscillator version can also be customized.

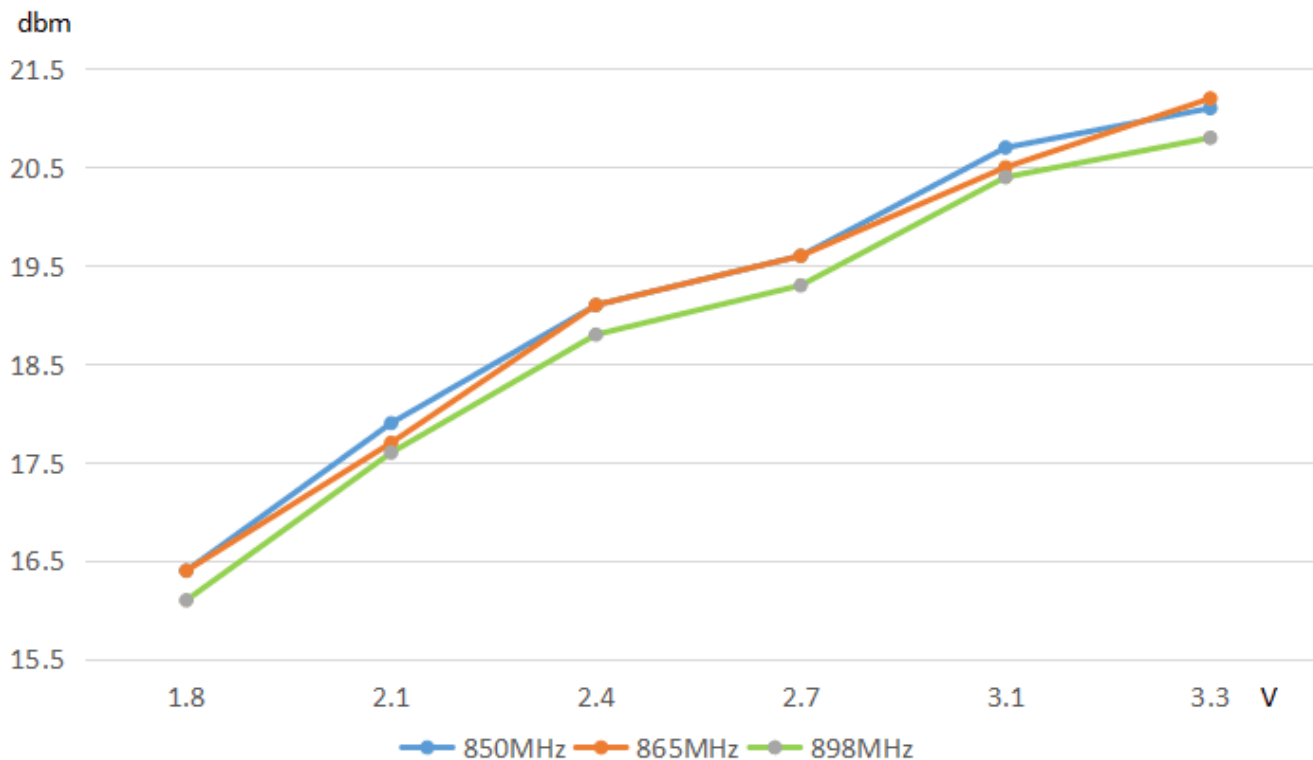
Parameter	Min.	Typ.	Max.	Unit	Condition
Operation Condition					
Working voltage	1.8	3.3	3.7	V	
Temperature range	-40	25	85	°C	
Current Consumption					
RX current		< 5		mA	@ crystal oscillator
TX current		< 130		mA	@868MHz @915MHz
		< 110		mA	@433MHz @490MHz
Sleep current		1.9		uA	OFF mode (SLEEP mode with cold start) All blocks off
		2.3		uA	SLEEP mode (SLEEP mode with warm start) Configuration retained
		2.9		uA	SLEEP mode (SLEEP mode with warm start) Configuration retained + RC64k
		0.56		mA	STDBY_RC mode , RC13M, XOSC OFF
		2.35		mA	STDBY_XOSC mode , XOSC ON
RF Parameter					
	848	868	888	MHz	@868MHz
	900	915	940	MHz	@915MHz
Output power	-15	22		dBm	
Receiving sensitivity		-129		dBm	@LoRa BW=250KHz_SF = 10_CR=4/5

5. Typical application circuit



6. Module performance index

Frequency band	Power level	Current (mA)	Power (dBm)	Register value
CC68-C1 @ 868MHz @ 915MHz	9	123.5	21.2	22
	8	110.5	18.03	19
	7	102.2	14.67	16
	6	88.7	11.79	13
	5	74.2	9.15	10
	4	62.9	6.6	7
	3	53.6	3.5	4
	2	44.2	0.53	1
	1	36.8	-2.15	-2
	0	31.7	-4.8	-5

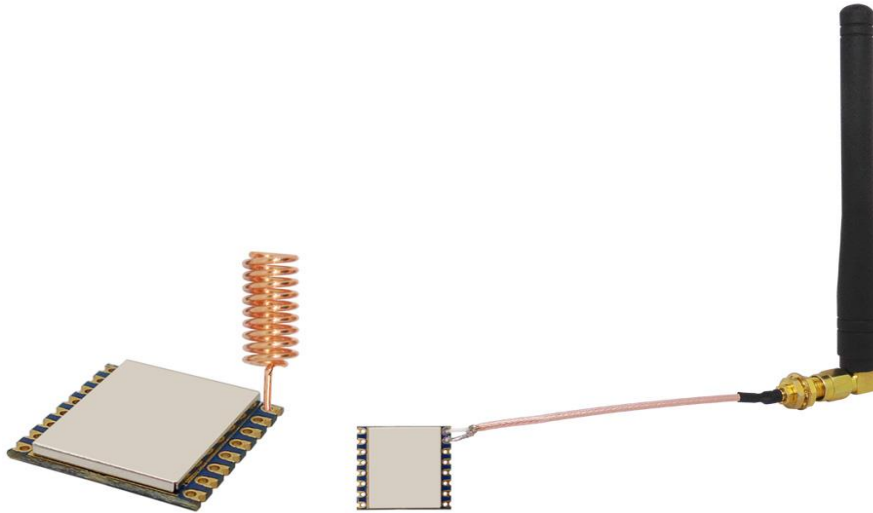


7.Pin definition

Pin NO.	Pin name	Description
1	GND	Power ground
2	MISO	SPI Output for SPI data
3	MOSI	SPI Input for SPI data
4	SCK	Serial clock for SPI interface
5	NSS	SPI enable
6	NRESET	Reset input
7、12、14	NC	Empty
8	GND	Power ground
9	ANT	Connect with 50 ohm coaxial antenna
10	GND	Power ground
11	DIO3	Digital I/O
13	VCC	Connected power supply (default3.3V)
15	DIO1	Digital I/O
16	BUSY	Used for status indication, see datasheet for details.

8. Communication Antenna

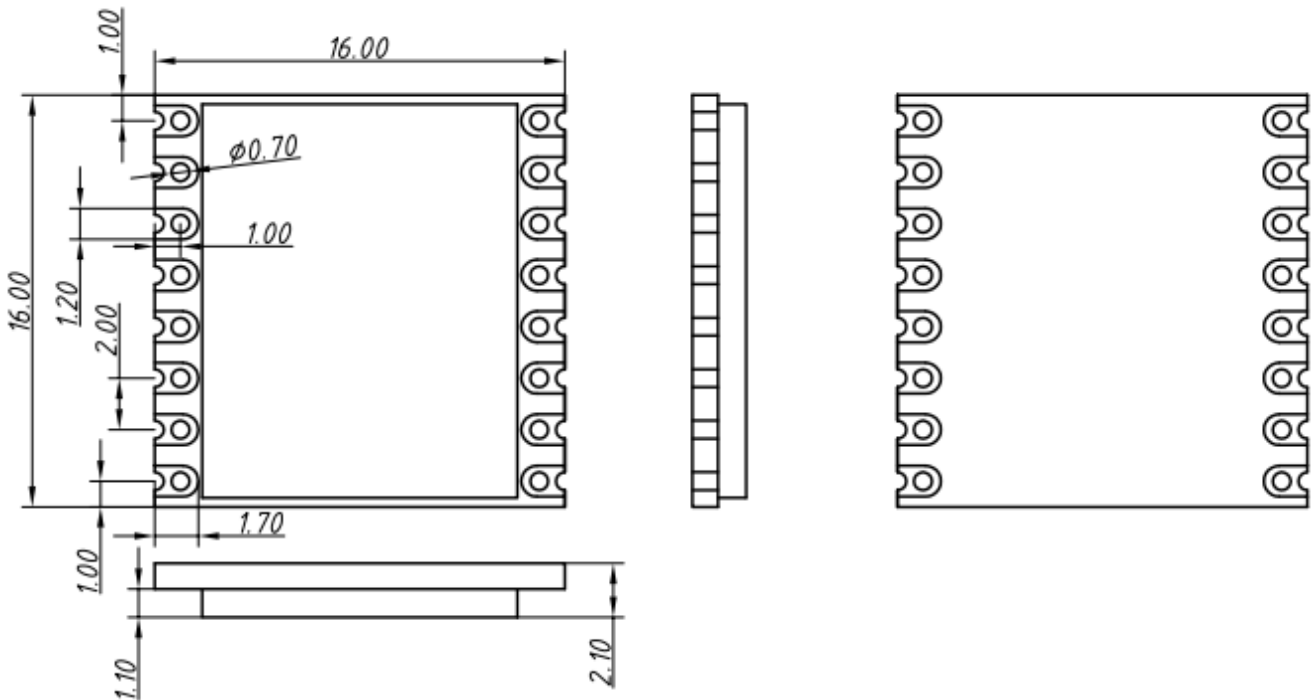
Antenna is very important for RF communication, its performance will affect the communication directly. Module needs antenna in 50ohm.SMA can also be used to transfer straight/elbow/folded rod. Users can order accordingly. To ensure module in the best performance, we suggest to use the our antenna.



★To ensure modules get the best performance, user must obey the following principles when using the antennas:

- Put the antenna away from the ground and obstacles as possible as you could;
- If you choose the sucker antenna, pull straight the lead wire as possible as it can be, the sucker under arches should be attached on the metal object.

9.Mechanical Dimensions(Unit:mm)



10.Product order information

For example: If the customer needs 868MHz Frequency, the order no. shall be CC68-C1-868.

Product Name	Description

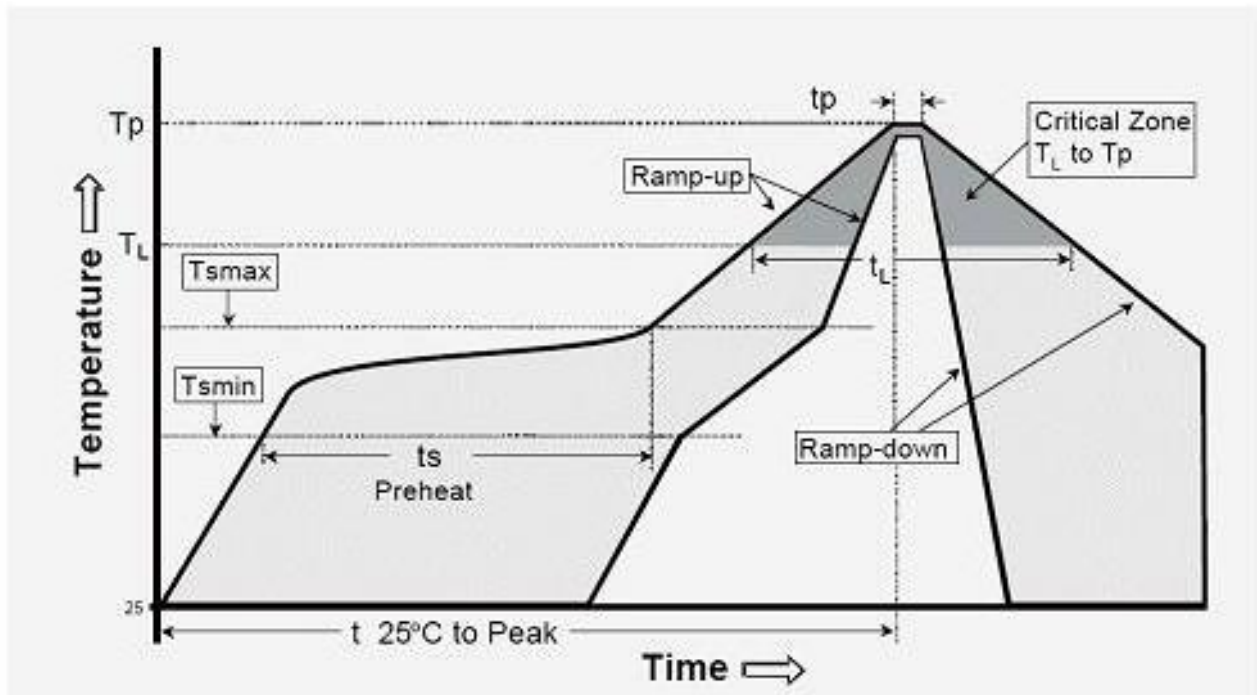
CC68-C1-868	LLCC68 chip. Working frequency 868MHz
CC68-C1-915	LLCC68 chip., Working frequency 915MHz

11.Common problem

- a) Why can't the normal communication between the modules?
- 1) The power connection is wrong and the module is not working normally;
 - 2) Check whether the frequency bands of each module and other RF parameters are consistent;
 - 3) Whether the module is damaged.
- b) Why is the transmission distance not far?
- 1) The power supply ripple is too large;
 - 2) The antenna type is not matched or installed incorrectly;
 - 3) Surrounding co-channel interference;
 - 4) The surrounding environment is harsh and there are strong interference sources.

Appendix 1:SMD Reflow Chart

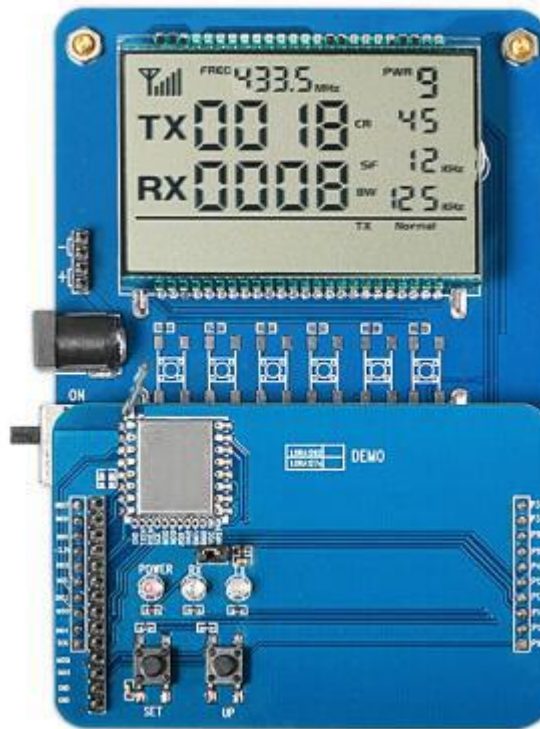
We recommend you should obey the IPC related standards in setting the reflow profile:



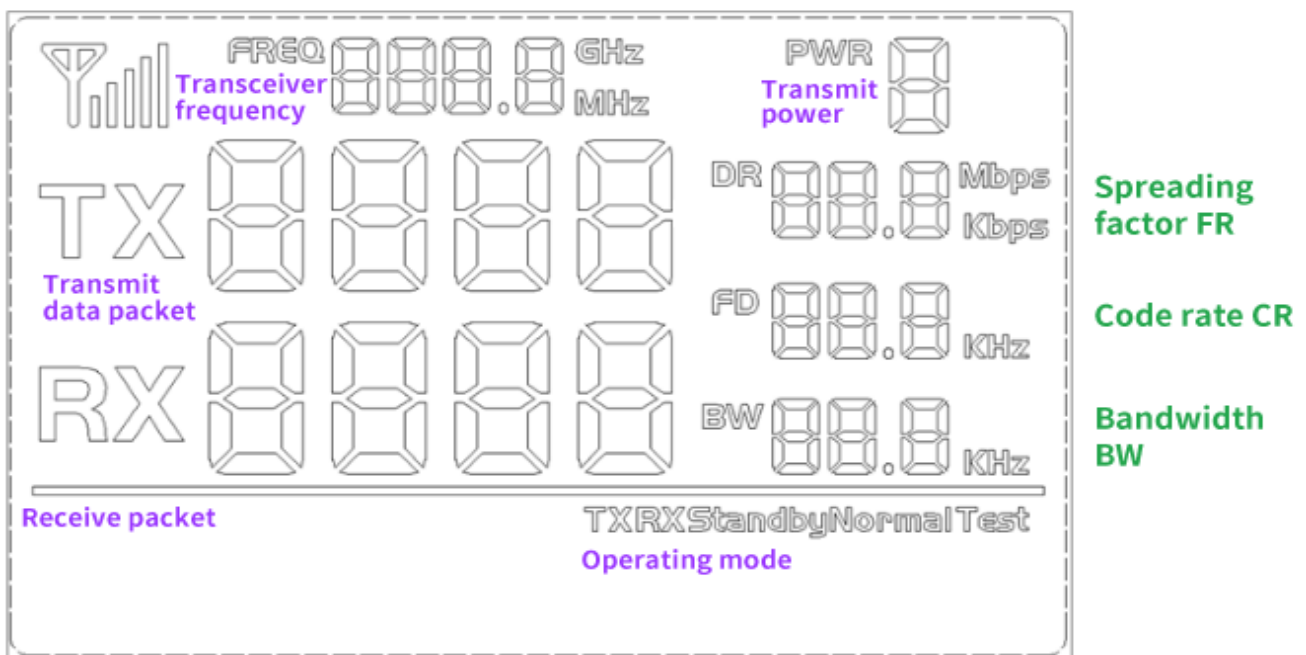
IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness $\geq 2.5\text{mm}$)
The ramp-up rate (TL to Tp)	3°C/s (max.)
preheat temperature	
- Temperature minimum (Tsmmin)	150°C
- Temperature maximum (Tsmmax)	200°C
- preheat time (ts)	60~180s
Average ramp-up rate(Tsmmax to Tp)	3°C/s (Max.)
- Liquidous temperature(TL)	217°C
- Time at liquidous(tL)	60~150 second
peak temperature(Tp)	245+/-5°C

Appendix 2: Demo Board

The module is equipped with a standard DEMO board for customer to debug the program and test distance. The power supply voltage range: 3.3V~6.0V. It shows as below:



The LCD Full Segment is as below:



The users can set the parameters of the RF module such as frequency /transmitter power / transmission data rate through the buttons.

➤ **Working Mode**

- 1) Tx normal mode: send data packets regularly (in the setting mode, data packets will not be sent temporarily);

- 2) Rx normal mode: Power on and enter the receiving state, receive data packets, and then send out the correctly received data packets;
- 3) Tx Test Mode: RF module continuously transmit signal;
- 4) Rx Test Mode: RF module is always in Rx mode;
- 5) Standby Mode: RF module is always in standby state.

➤ **Button Operation**

- 1) [SET] Button

Press the key to enter the setting mode. If the last parameter is set, the key will exit the setting mode.

- 2) UP /Down Button

In setting mode,press to modify the corresponding setting parameters.

Note: The DEMO board has FLASH memory inside, all the setting parameters will behave automatically and keep unchanged even power-off.

FCC Statements:

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: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or changes to this equipment. Such modifications or changes 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. Federal Communication Commission

(FCC) Radiation Exposure Statement Power is so low that no RF exposure calculation is needed.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users.
2. The transmitter module may not be co-located with any other transmitter or antenna. As long as the two conditions above are met, additional transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required for the installed module.

Important Note: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Federal Communications Commission of the U. S. Government (FCC) and the Canadian Government

authorizations are no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator shall be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate FCC authorization in the U.S. and Canada.

OEM Integrators - End Product Labeling Considerations: This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains, FCCID: 2AD66-CC68-C1". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

OEM Integrators - End Product Manual Provided to the End User: The OEM integrator shall not provide information to the end user regarding how to install or remove this RF module in end product user manual. The end user manual must include all required regulatory information and warnings as outlined in this document.