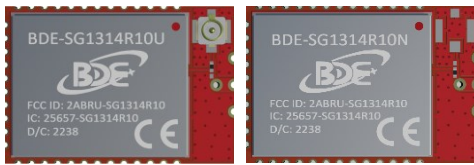


## General Description



The BDE-SG1314R10 is a low power, multiprotocol Sub-1 GHz wireless module series that provides two options: BDE-SG1314R10U (U.FL connector version) and BDE-SG1314R10N (RF pad version). It supports IEEE 802.15.4, IPv6-enabled smart objects (6LoWPAN), Wireless M-Bus, Wi-SUN, Amazon Sidewalk, mioty, proprietary systems, and TI 15.4-Stack (Sub-1 GHz). The module is based on an Arm® Cortex® M33 main processor and optimized for low-power wireless communication and advanced sensing in building security systems, HVAC, smart meters, medical, wired networking, gateways and grid communications, home theater & entertainment, and connected peripherals markets.

The BDE-SG1314R10 has a software defined radio powered by an Arm® Cortex® M33, which allows support for multiple physical layers and RF standards. The device supports industry standard frequency bands (868MHz, 915MHz) to meet the industrial needs. The module has an efficient built-in PA that supports +14 dBm TX at 25.8 mA current consumption, In RX it has -121 dBm sensitivity in SimpleLink™ long-range mode.

The module has a low standby current of 0.98  $\mu$ A and full RAM retention. Consistent with many customers' 10 to 15 years or longer life cycle requirements. BDE-SG1314R10 integrates all required system-level hardware components including clocks, passives and low-cost PCB design.

## Key Features

- Wireless microcontroller
  - Powerful 48-MHz Arm® Cortex®-M33 processor with TrustZone®
  - FPU and DSP extension
  - 1024kB flash program memory
  - 8kB of Cache SRAM
  - 256kB of ultra-low leakage SRAM with parity for high-reliability operation
    - ◇ 32kB of additional SRAM is available if parity is disabled
  - Dynamic multiprotocol manager (DNM) driver
  - Supports over-the-air upgrade (OTA)
- Ultra-Low power sensor controller
  - Autonomous MCU with 4kB of SRAM
  - Sample, store, and process sensor data
  - Fast wake-up for low-power operation
  - Software defined peripherals; capacitive touch, flow meter, LCD
- Low power consumption
  - MCU consumption:
    - ◇ 3.4 mA active mode, CoreMark®
    - ◇ 71  $\mu$ A/MHz running CoreMark
    - ◇ 0.98  $\mu$ A standby mode, RTC, 256KB RAM
    - ◇ 0.17  $\mu$ A shutdown mode, wake-up on pin
  - Ultra Low-power sensor controller consumption:
    - ◇ 30  $\mu$ A in 2 MHz mode
    - ◇ 809  $\mu$ A in 24 MHz mode
  - Radio Consumption:
    - ◇ 25.8 mA TX at 14 dBm at 868 MHz
- Wireless protocol support
  - Wi-SUN®
  - mioty®
  - Amazon Sidewalk
  - Wireless M-Bus
  - SimpleLink™ TI 15.4-stack (Sub- 1 GHz)
  - Proprietary systems

- High performance radio
  - Coherent modem, 802.15.4 O-QPSK
  - -121 dBm for 2.5 kbps long-range mode
  - -110 dBm at 50 kbps, 802.15.4, 868 MHz
- Regulatory compliance (On-going)
  - FCC
  - IC
  - CE-RED
- MCU peripherals
  - Most digital peripherals can be routed to any GPIO
  - Four 32-bit or eight 16-bit general-purpose timers
  - 12-bit SAR ADC, 200 ksp/s, 8 channels
  - 8-bit DAC
  - Two Comparators
  - Programmable current source
  - Four UART, four SPI, two I<sup>2</sup>C, I<sup>2</sup>S
  - Real-time clock (RTC)
  - Integrated temperature and battery monitor
- Security enablers
  - Supports secure boot
  - Supports secure key storage and device ID
  - Arm TrustZone for trusted execution environment
  - AES 128- and 256-bit cryptographic accelerator
  - Public key accelerator
  - SHA2 accelerator (full suite up to SHA-512)
  - True random number generator (TRNG)
  - Secure debug lock
  - Software anti-rollback protection
- Operating range
  - On-chip buck DC/DC converter
  - 1.8-V to 3.8-V single supply voltage
  - -40 to +85°C
- Antenna: No antenna or U.FL connector
- Package
  - Dimension: 22 mm x 15 mm x 2.15 mm
  - QFM-39 (30 GPIOs)
  - RoHS-compliant package

## Applications

- 868, and 902 to 928 MHz ISM and SRD systems with down to 4 kHz of receive bandwidth
- Building automation
  - Building security systems – motion detector, electronic smart lock, door and window sensor, garage door system, gateway
  - HVAC – thermostat, wireless environmental sensor, HVAC system controller, gateway
  - Fire safety system – smoke and heat detector, fire alarm control panel (FACP)
  - Video surveillance – IP network camera
  - Elevators and escalators – elevator main control panel for elevators and escalators
- Grid infrastructure
  - Smart meters – water meter, gas meter, electricity meter, and heat cost allocator
  - Grid communications – wireless communications – Long-range sensor applications
  - Other alternative energy – energy harvesting, solar inverters
- Industrial transport – asset tracking
- Factory automation and control
- Medical
- Electronic point of sale (EPOS) – Electronic Shelf Label (ESL)
- Personal Electronics
  - Connected peripherals – consumer wireless module
  - Home theater & entertainment – smart speakers, set-top box
  - Gaming
  - Wearables (non-medical)
- Wireless Modules
  - Wireless third party modules
  - Wireless communications modules

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## 1. References

- [1] CC1314R10 resources: <https://www.ti.com/product/CC1314R10>

## 2. Block Diagram

BDE-SG1314R10 module is based on the Texas Instruments' CC1314R10 single chip wireless MCU. With integrated clocks, and other required passives, it allows faster time to market at reduced development cost.

The module, as seen in Figure 2-1, comprises of:

- 48-MHz XTAL
- 32.768-kHz XTAL
- Power inductors and capacitors
- Pull-up resistor
- Passive balun filter
- Decoupling capacitors
- Matching circuit

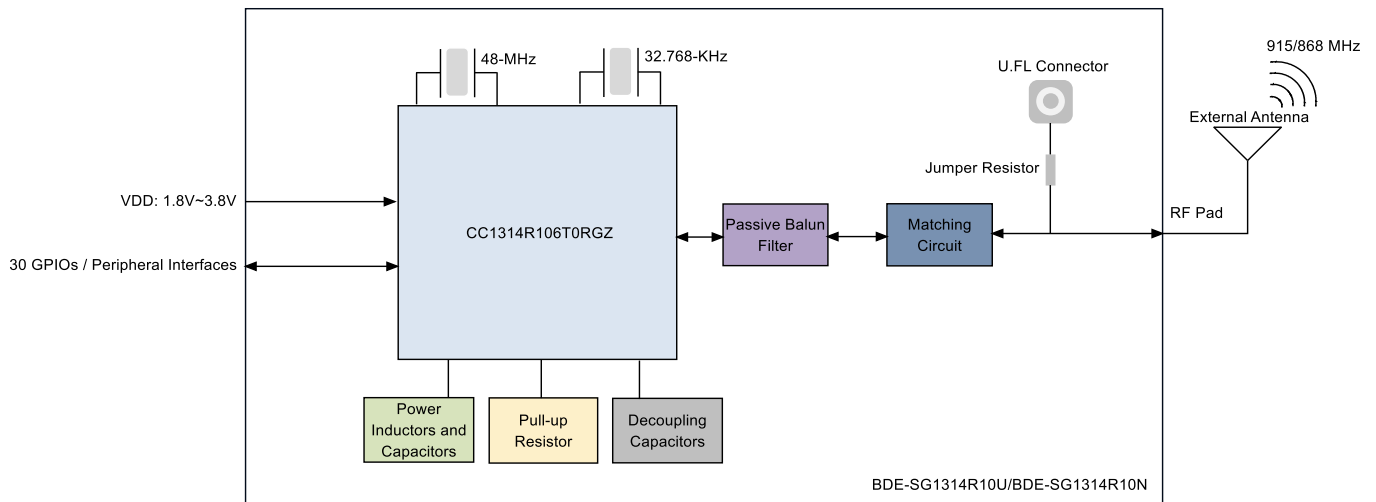


Figure 2-1. BDE-SG1314R10 Module Block Diagram

### 3. Terminal Configuration and Functions

#### 3.1 Pin Diagram

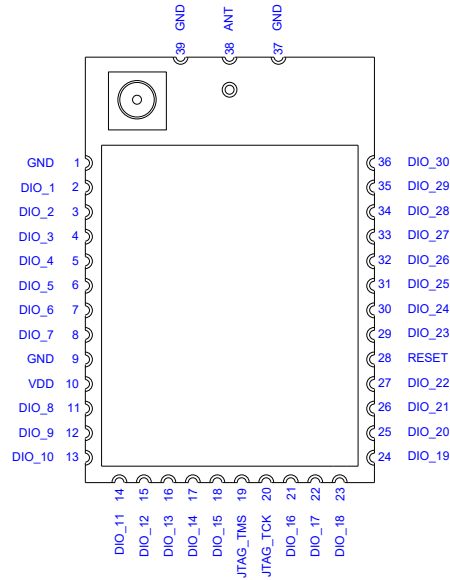


Figure 3-1. Pin Diagram (Top View)

#### 3.2 Pin Attributes and Pin Multiplexing

Table 3-1 describes the definitions of the pins of the module. Pin number of CC1314R10 chip is also stated here, because the VQFN pin is referred to in the software design kit (SDK).

Table 3-1. Pin Description <sup>(1)</sup>

Module Pin #	Pin Name	Type	CC1314R10 Pin #	Description
1	GND	Ground	-	Power ground
2	DIO_1	I/O	6	GPIO, Sensor Controller
3	DIO_2	I/O	7	GPIO, Sensor Controller
4	DIO_3	I/O	8	GPIO, Sensor Controller
5	DIO_4	I/O	9	GPIO, Sensor Controller
6	DIO_5	I/O	10	GPIO, Sensor Controller, high-drive capability
7	DIO_6	I/O	11	GPIO, Sensor Controller, high-drive capability
8	DIO_7	I/O	12	GPIO, Sensor Controller, high-drive capability
9	GND	Ground	-	Power ground
10	VDD	Power	-	Power supply
11	DIO_8	I/O	14	GPIO
12	DIO_9	I/O	15	GPIO
13	DIO_10	I/O	16	GPIO
14	DIO_11	I/O	17	GPIO
15	DIO_12	I/O	18	GPIO
16	DIO_13	I/O	19	GPIO
17	DIO_14	I/O	20	GPIO
18	DIO_15	I/O	21	GPIO
19	JTAG_TMS	I/O	24	JTAG TMSC, high-drive capability
20	JTAG_TCK	I	25	JTAG TCKC
21	DIO_16	I/O	26	GPIO, JTAG_TDO, high-drive capability
22	DIO_17	I/O	27	GPIO, JTAG_TDI, high-drive capability

Module Pin #	Pin Name	Type	CC1314R10 Pin #	Description
23	DIO_18	I/O	28	GPIO
24	DIO_19	I/O	29	GPIO
25	DIO_20	I/O	30	GPIO
26	DIO_21	I/O	31	GPIO
27	DIO_22	I/O	32	GPIO
28	RESET	I	35	Reset, active-low
29	DIO_23	I/O	36	GPIO, Sensor Controller, analog capability
30	DIO_24	I/O	37	GPIO, Sensor Controller, analog capability
31	DIO_25	I/O	38	GPIO, Sensor Controller, analog capability
32	DIO_26	I/O	39	GPIO, Sensor Controller, analog capability
33	DIO_27	I/O	40	GPIO, Sensor Controller, analog capability
34	DIO_28	I/O	41	GPIO, Sensor Controller, analog capability
35	DIO_29	I/O	42	GPIO, Sensor Controller, analog capability
36	DIO_30	I/O	43	GPIO, Sensor Controller, analog capability
37	GND	Ground	-	Power ground
38	ANT	-	-	Antenna port (When disconnected with UFL, this port can be used)
39	GND	Ground	-	Power ground

Note <sup>(1)</sup>: For more information, please refer to [CC1314R10](#) datasheet.

## 4. Specifications

### 4.1 Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

PARAMETER	MIN	MAX	UNIT	Notes
VDD	-0.3	4.1	V	
Voltage on any digital pins	-0.3	VDD+0.3≤4.1	V	
Voltage on ADC input	-0.3	VDDS	V	Voltage scaling enabled
	-0.3	1.49	V	Voltage scaling disabled, internal reference
	-0.3	VDD/2.9	V	Voltage scaling disabled, VDD as reference
Storage temperature	-40	125	°C	

### 4.2 Recommended Operating Conditions

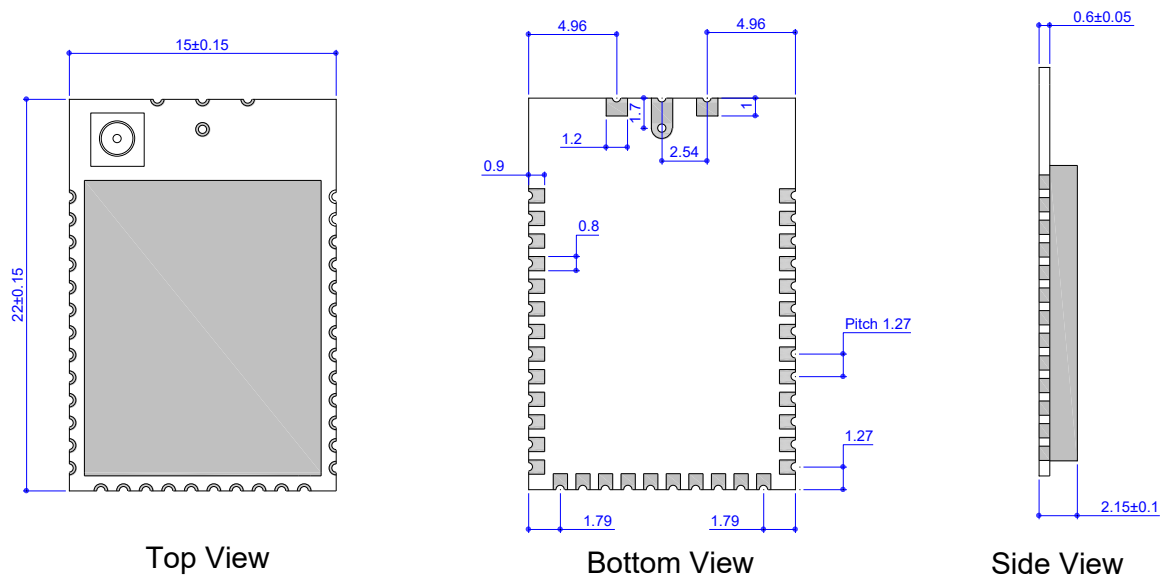
PARAMETER	MIN	TYP	MAX	UNIT
VDDS	1.8	3.3	3.8	V
Operating temperature	-40	-	85	°C
Rising supply voltage slew rate	0		100	mV/μs
Falling supply voltage slew rate	0		20	mV/μs



## 5. Mechanical Specifications

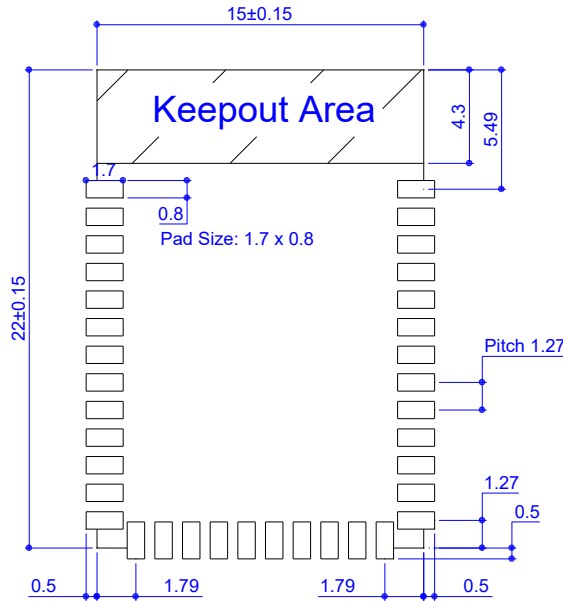
### 5.1 Dimensions

The following pages include mechanical, footprint drawings, and marking information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document.



**Fig 5-1. Mechanical Drawing**

### 5.2 PCB Footprint



Note:

- 1. All dimensions are in millimeter
- 2. Solder mask should be the same or 5% larger than the dimension of the pad
- 3. Solder paste must be the same as the pin for all peripheral pads. For ground pins, make the solder paste 20% smaller than the pad.

Fig 5-2. Module Footprint Top View

### 5.3 Marking

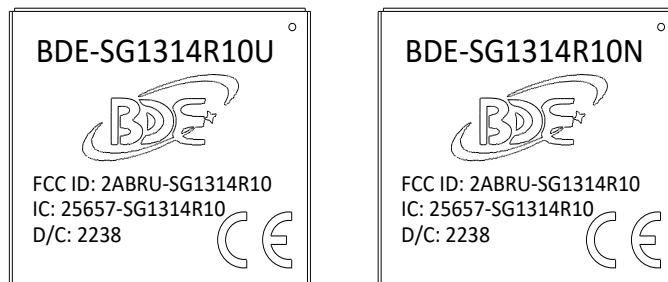


Fig 5-3. Module Marking

## 6. Typical Reflow Profile

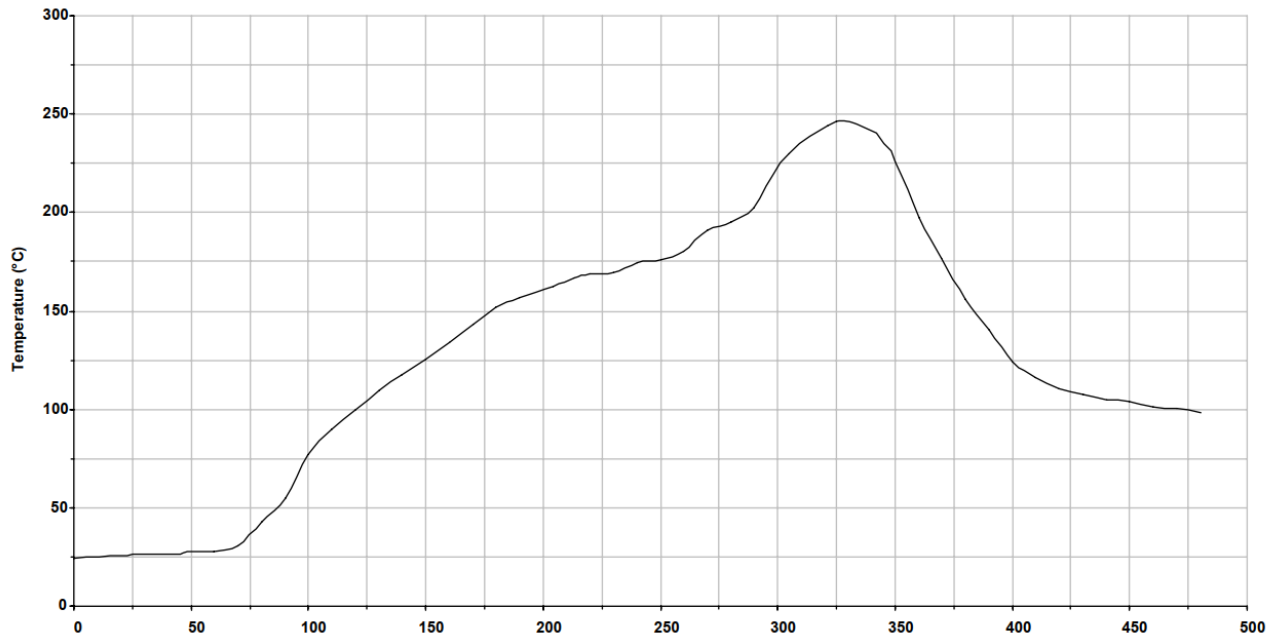


Figure 6-1. Typical Reflow Profile

Key features of the profile:

- Initial ramp = 1-2.5°C/sec to 175°C ±25°C equilibrium
- Equilibrium time = 60 to 180 seconds
- Ramp to maximum temperature (245°C) = 3°C/sec max.
- Time above liquidus temperature (217°C): 45-90 seconds
- Device absolute maximum reflow temperature: 260°C

## 7. Ordering Information

Part Number	Size (mm)	Core Chip	Shipping Form	MOQ
BDE-SG1314R10U	22 × 15 × 2.15	CC1314R10	Tape & Reel	1K
BDE-SG1314R10N	22 × 15 × 2.15	CC1314R10	Tape & Reel	1K

## 8. Revision History

Revision	Date	Description
V0.1	8-June-2023	Preliminary, draft

You can find the latest documentation in this [Link](#).

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