General Description

BDE-MP2755R10 is a Bluetooth® Low Energy (6.x and the upcoming versions), Zigbee (3.0 and the upcoming versions), Thread (1.3 and the upcoming versions), Matter (1.2 and the upcoming versions) and Proprietary 2.4-GHz wireless module series based on Texas Instrument (TI)'s single-chip wireless microcontroller (MCU) CC2755R10. In order to fulfil different integration scenarios, we provide different variants for this module series. They are listed and described in Table 1.

BDE-MP2755R10 module series integrates an Arm® Cortex®-M33 MCU, which supports Bluetooth® 6.0 Low Energy, ZigBee®, Thread and Proprietary 2.4GHz systems. This device is optimized for low-power wireless communication with Over the Air Download (OAD) support in building automation (wireless sensors, lighting control, beacons), appliances, asset tracking, medical, and personal electronics (toys, HID, stylus pens) markets.

BDE-MP2755R10 module series can support up to **+10** dBm output power and a receive sensitivity of -103.5 dBm for 125 kbps Bluetooth® Low Energy Coded PHY. The module series supports for Bluetooth® 6.0 and earlier version features: LE Coded PHYs (Long Range), LE 2Mbit PHY (high speed), advertising extensions, multiple advertisement Sets, CSA#2, as well as backward compatibility with earlier Low Energy specifications, Bluetooth® Channel Sounding technology and Algorithm Processing Unit (APU) to enable high accuracy, low cost, and secure phase-based ranging mechanism for distance estimation.

The module series have advanced security for connected wireless MCUs, and with ultra-low standby current with full 162KB RAM retention and RTC operation that enables significant battery life extension especially for applications with longer sleep intervals.

BDE-MP2755R10 module series highly integrates the radio with required passives, high-frequency clock, low-frequency clock, filter, antenna, etc., and also a fully-qualified Bluetooth® 6.0 software protocol stack and profiles from TI. It can work standalone without using an external MCU. With its best-in-class radio performance, ultra-low power, small form factor and low cost, the BDE-MP2755R10 module series is the best choice for the applications that are sensitive to power consumption, size and cost.

The module series is pre-certified with FCC, ISED, CE and Bluetooth SIG to make easy integration and fast time-to-market for customers.

Table 1. Module Variants

Model Number	Orderable Part Number	Chipset	Flash (KB)	SRAM (KB)	Antenna on 2.4G	On-Board SPI Flash Support	Operating Temperature
BDE-MP2755R10	BDE-MP2755R10A32	CC2755R10	1024	162	PCB Trace Antenna	32Mbit	-40℃ to +85℃
	BDE-MP2755R10U32				U.FL Connector		
	BDE-MP2755R10N32				ANT Pin		

Model Number	Orderable Part Number	Chipset	Flash (KB)	SRAM (KB)	Antenna on 2.4G	On-Board SPI Flash Support	Operating Temperature
	BDE-MP2755R10A0				PCB Trace Antenna	Not Included	
	BDE-MP2755R10U0				U.FL Connector		
	BDE-MP2755R10N0				ANT Pin		
	BDE-MP2755R10A32-IN				PCB Trace Antenna	32Mbit	-40℃ to +105℃
	BDE-MP2755R10U32-IN				U.FL Connector		
	BDE-MP2755R10N32-IN				ANT Pin		
	BDE-MP2755R10A0-IN				PCB Trace Antenna	Not Included	
	BDE-MP2755R10U0-IN				U.FL Connector		
	BDE-MP2755R10N0-IN				ANT Pin		

Note: This module series orderable part number and series name are not fully determined, and this table is only a brief illustration. The series model will be updated after the product is officially released on the BDE website.

Key Features

- **Wireless MCU Processing Elements**
  - Arm® Cortex®-M33 processor (96MHz) with FPU (floating point unit), TrustZone®-M support and CDE (custom datapath extension) for machine learning acceleration
  - Algorithm Processing Unit (APU) (96MHz)
    - Mathematical accelerator for efficient vector and matrix operations
    - Bluetooth® 6.0 Channel Sounding post-processing support for IFFT and advanced super-resolution algorithms like MUSIC (MUltiple SIgnal Classification)
- **Wireless MCU Memory**
  - Up to 1MB of in-system programmable flash
  - Up to 162KB of SRAM
  - 32KB of System ROM with secure boot root of trust (ROT) and a serial (SPI/UART) bootloader
  - Serial wire debug (SWD)
- **MCU peripherals**
    - Up to 23 I/O Pads
    - 2 IO pads SWD, multiplexed with GPIOs
    - 2 IO pads LFXT, multiplexed with GPIOs (On-board LFXT populated by default, these two IOs are not exposed by default)
    - 19 DIOs (analog or digital IOs)
  - All GPIOs with wakeup and interrupt capabilities
  - 3x 16-bit or 1x 32-bit general-purpose timers, quadrature decode mode support
  - Real-time clock (RTC)
  - Watchdog timer
  - System timer for radio, RTOS, and application operations for Bluetooth channel sounding postprocessing
  - 12-bit ADC, up to 1.2 Msps, 8 external inputs
  - Temperature sensor and battery monitor
  - 1x low power comparator
  - 2x UART with LIN capability
  - 2x SPI
  - 1x I^2C
  - 1x I^2S
- **Security enablers**
  - Global Platform SESIP (Security Evaluation Standard for IoT Platforms) Level 3 and Arm PSA (Platform Security Architecture) Level 3 Certification
  - Hardware Security Module (HSM) with proprietary controller and dedicated memories

supporting accelerated cryptographic operations and secure key storage:
  - ✧ AES (up to 256 bits) crypto accelerator
  - ✧ ECC (up to 521 bits), RSA (up to 3072 bits) public key accelerator
  - ✧ SHA-2 (up to 512 bits) accelerator
  - ✧ True random number generator
  - ✧ HSM firmware update support
- ➢ Separate AES 128bit crypto accelerator (LAES) for latency-critical link-layer crypto operations
- ➢ Secure boot and secure firmware updates
- ➢ Cortex®-M33 TrustZone-M, MPU, memory firewalls for software isolation
- ➢ Voltage glitch monitor (VGM)

■ **Low power consumption**
- ➢ MCU consumption:
  - ✧ 6.8 mA active mode, MCU 96MHz (CoreMark®)
  - ✧ 0.9 uA Standby (low power mode), RTC on, full RAM retention
  - ✧ 160 nA Reset or Shutdown
- ➢ Radio Consumption:
  - ✧ 6.1 mA RX
  - ✧ 7.7 mA TX at +0 dBm
  - ✧ 24 mA TX at +10 dBm

■ **Wireless protocol support**
- ➢ Bluetooth® 6.x Low Energy
  - ✧ Support for Bluetooth Channel Sounding (High Accuracy Distance Measurement)
- ➢ Zigbee®
- ➢ Thread
- ➢ Matter
- ➢ Proprietary systems

■ **High performance radio**
- ➢ -103.5 dBm for Bluetooth® LE 125 kbps
- ➢ -97 dBm for Bluetooth® LE 1 Mbps
- ➢ -103 dBm for IEEE 802.15.4 (2.4 GHz)
- ➢ Output power up to +10 dBm

■ **Operating range**
- ➢ 1.71-V to 3.8-V single supply voltage
- ➢ 2.3-V to 3.6-V single supply voltage (SPI flash variants)
- ➢ Operating temperature range:
  - ✧ -40℃ to +85℃
  - ✧ -40℃ to +105℃ (-IN variants)

■ **Package**
- ➢ Dimension:
  - ✧ 14 mm x 17 mm x 2.2 mm
- ➢ RoHS-compliant package

■ **Antenna**
- ➢ BDE-MP2755R10A variants: Integrated PCB Trace antenna
- ➢ BDE-MP2755R10U variants: U.FL connector for external antenna
- ➢ BDE-MP2755R10N variants: ANT pin for external antenna

■ **Additional integrated components**
- ➢ 48.0-MHz HFXT
- ➢ 32.768-kHz LFXT
- ➢ 32-Mbit SPI flash
  - ✧ BDE-MP2755R10X32(-IN)
- ➢ RF filter and passive components

■ **Regulatory compliance (On-going)**
- ➢ FCC ID: 2ABRU-LE2755R10
- ➢ IC: 25657-LE2755R10
- ➢ CE-RED
- ➢ Bluetooth SIG

Applications

■ **Medical**
- ➢ Home healthcare – blood glucose monitors, blood pressure monitor, CPAP machine, electronic thermometer
- ➢ Patient monitoring & diagnostics – medical sensor patches
- ➢ Personal care & Fitness – electric toothbrush, wearable fitness & activity monitor

- **Building automation**
  - Building security systems – motion detector, electronic smart lock, door and window sensor, garage door system, gateway
  - HVAC – thermostat, wireless environmental sensor
  - Fire safety system – smoke and heat detector
  - Video surveillance – IP network camera
- **Lighting**
  - LED luminaire
  - Lighting Control – daylight sensor, lighting sensor, wireless control
- **Factory automation and control**
- **Retail automation & payment – Electronic point of sale**
  - Electronic shelf label
- **Grid infrastructure**
  - Smart meters – water meter, gas meter, electricity meter, and heat cost allocators
  - Grid communications – wireless communications
  - Long – range sensor applications
  - Other alternative energy – energy harvesting
- **Communication equipment**
  - Wired networking
  - Wireless LAN or Wi-Fi access points, edge router
- **Personal electronics**
  - Connected peripherals – consumer wireless module, pointing devices, keyboards and keypads
  - Gaming – electronic and robotic toys
  - Wearables (non-medical) – smart trackers, smart clothing

Naming Convention

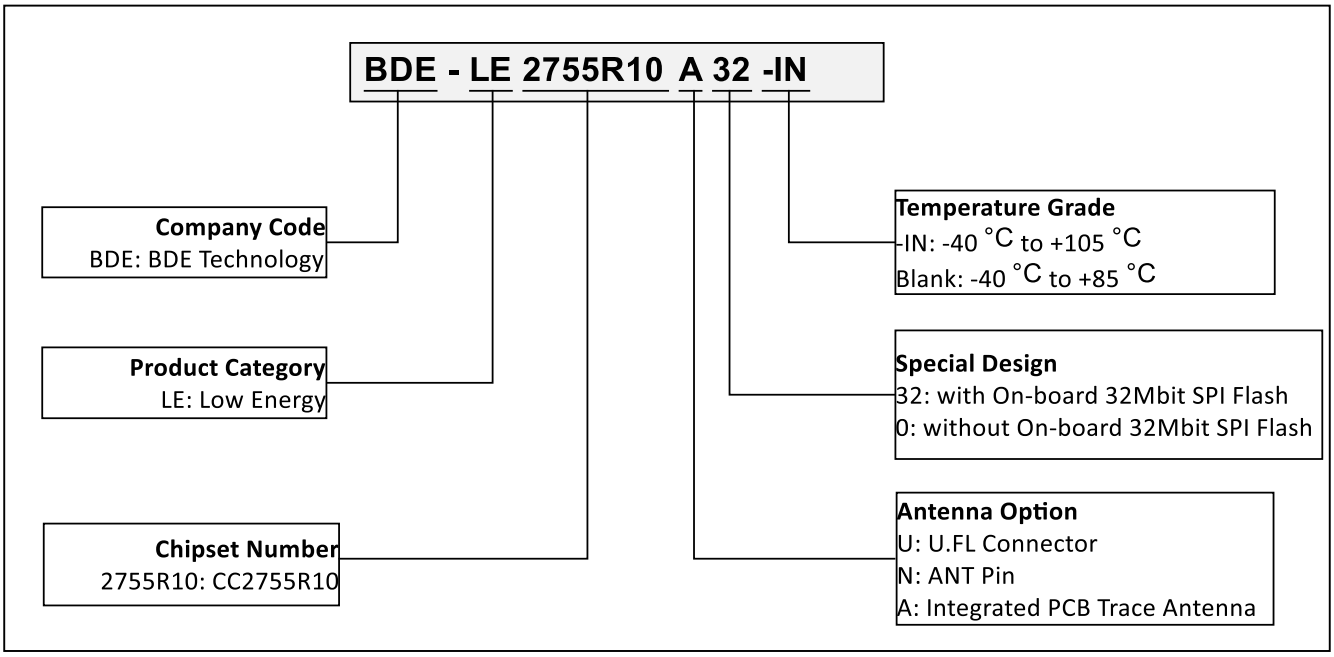

Figure 1. Module Naming Convention

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Reference

[1] CC2755R10 resources: https://www.ti.com/product/CC2755R10

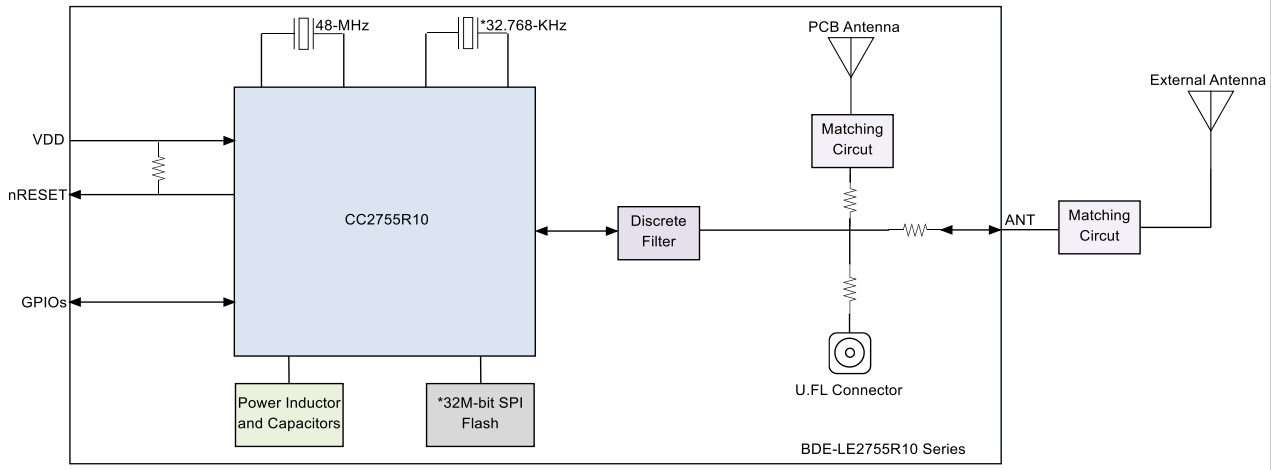
1. System Overview

1.1. Block Diagram

BDE-MP2755R10 module series is based on the TI's CC2755R10 single chip wireless MCU. With clocks, other required passives and antenna/connector (optional) integrated, it allows faster time to market at reduced development cost.

The block diagram of the series modules can be seen in Figure 2, comprises of:

- 48-MHz HFXT
- 32.768-kHz LFXT
- 32-Mbit SPI flash (SPI flash variants)
- Power Inductors and capacitors
- Pull-up resistor
- Matching circuit
- PCB Trace antenna / U.FL connector for external antenna/ ANT pin for external antenna



(1) This block diagram is for BDE-MP2755R10 variants;
(2) The 32-Mbit SPI flash is only for SPI flash variants;
(3) The 32.768-KHz LFXT is populated by default on module, but the crystal can be removed by request for the applications that are not sensitive to the low frequency clock. When the LFXT is removed, the IOs assigned for this XTAL can be exposed to the module pinout and used as GPIOs.

Figure 2. The block diagram of BDE-MP2755R10

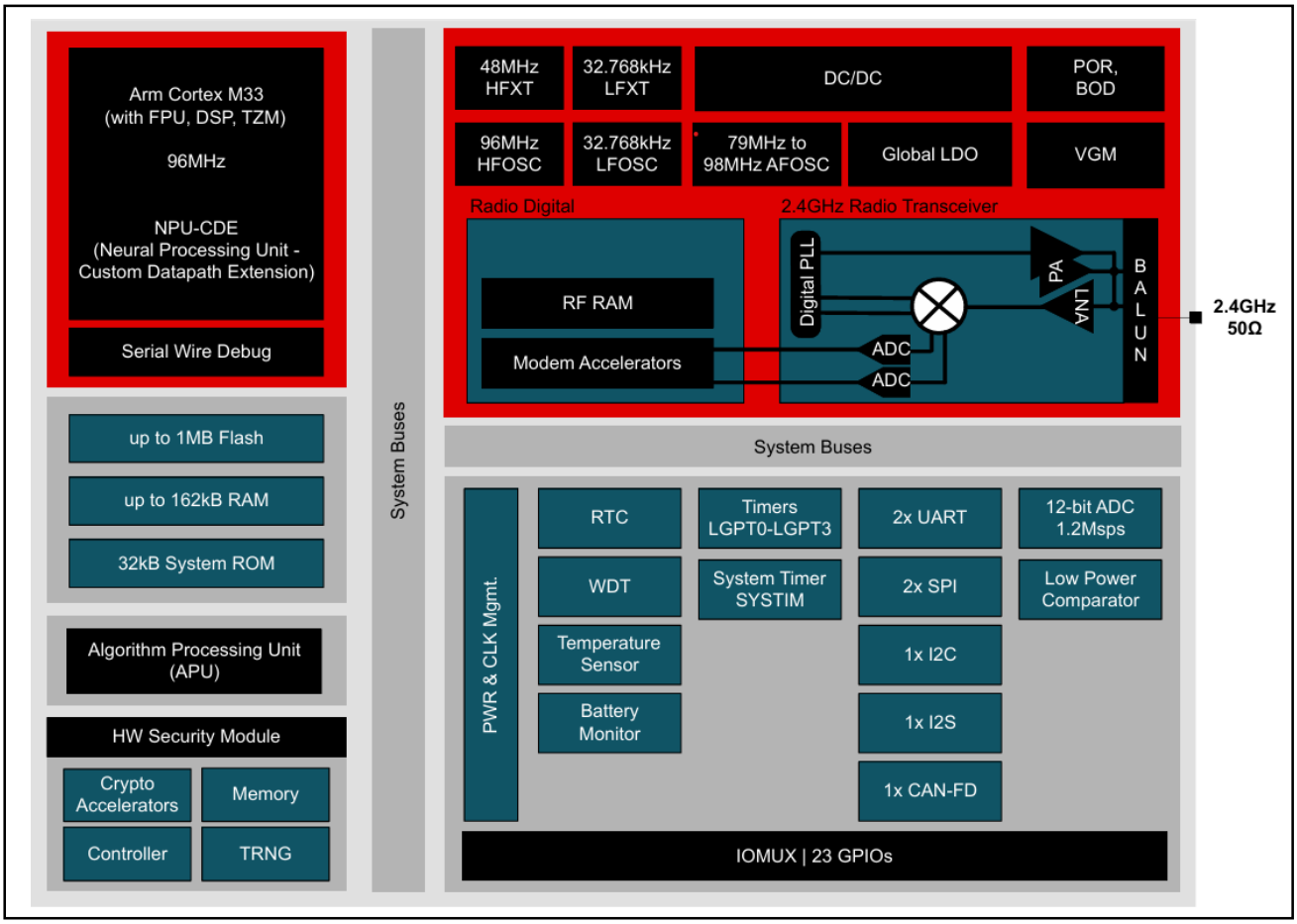
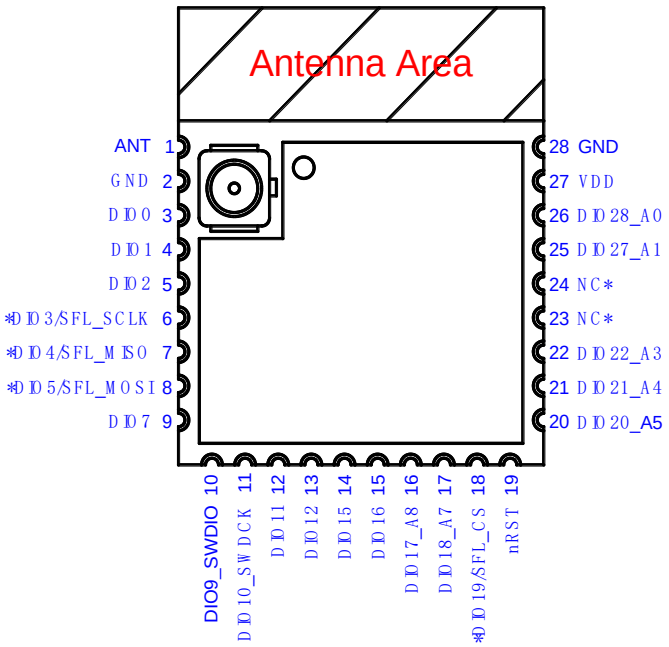


Figure 3. The block diagram of CC2755R10 (Adopted from CC2755R10 datasheet)

2. Pinout Functions

The module series is with LCC-28 package, 28 pads are exposed for user. This section describes pinout functions of the module in details.

2.1. Pinout Diagram



Note: The top view now is in a preview state, if there are any modifications to the pin definition or package size in the future, please refer to the product release status on the BDE website.

Figure 4. Pinout Diagram of BDE-MP2755R10 Top View

The following I/O pins marked in Figure 4 in **bold** have high-drive capabilities:

- Pin 5, DIO2
- Pin 6, DIO3
- Pin 10, DIO9_SWDIO
- Pin 11, DIO10_SWDCK
- Pin 16, DIO17_A8
- Pin 17, DIO18_A7

The following I/O pins marked in Figure 4 in *italics* have analog capabilities:

- Pin 17, DIO17_A8
- Pin 18, DIO18_A7
- Pin 19, DIO19_A6
- Pin 20, DIO20_A5
- Pin 21, DIO21_A4

• Pin 22, DIO22_A3
• Pin 24, DIO27_A1
• Pin 26, DIO28_A0

The following four I/O pins are assigned to on-board 32-Mbit SPI flash for SPI flash variants series:
• Pin 6, DIO3_SFL_SCLK
• Pin 7, DIO4_SFL_MISO
• Pin 8, DIO5_SFL_MOSI
• Pin 18, DIO19_SFL_CS

2.2. Pinout Descriptions

Table 2 describes the definitions of the pins of the module. Pin number of CC2755R10 chip is also stated here, because the chip pin is referred to in the software design kit (SDK).

Table 2. Pinout Description (1)

Module Pin #	Pin Name	Type	CC2755R10 Pin #	Description
1	ANT	ANT	-	Antenna port for the –N series(3)
2	GND	GND	-	Ground
3	DIO0	I/O	3	GPIO
4	DIO1	I/O	4	GPIO
5	DIO2	I/O	5	GPIO, high-drive capability
6	DIO3/SFL_SCLK	I/O	6	SFL_SCLK(2), GPIO, high-drive capability
7	DIO4/SFL_MISO	I/O	7	SFL_MISO(2), GPIO
8	DIO5/SFL_MOSI	I/O	8	SFL_MOSI(2), GPIO
9	DIO7	I/O	10	GPIO
10	DIO9_SWDIO	I/O	11	GPIO, SWD interface: mode select or SWDIO, high-drive capability
11	DIO10_SWDCK	I/O	12	GPIO, SWD interface: clock, high-drive capability
12	DIO11	I/O	13	GPIO
13	DIO12	I/O	14	GPIO
14	DIO15	I/O	15	GPIO
15	DIO16	I/O	16	GPIO
16	DIO17_A8	I/O	19	GPIO, analog capability, high-drive capability
17	DIO18_A7	I/O	20	GPIO, analog capability, high-drive capability
18	DIO19/SFL_CS	I/O	21	SFL_CS(2), GPIO, analog capability
19	nRST	I	-	Reset, active low, 100K ohm internal pull-up resistor
20	DIO20_A5	I/O	22	GPIO, analog capability
21	DIO21_A4	I/O	23	GPIO, analog capability
22	DIO22_A3	I/O	24	GPIO, analog capability
23	NC	-		NC or DIO23(4)
24	NC	-		NC or DIO24(4)

Module Pin #	Pin Name	Type	CC2755R10 Pin #	Description
25	DIO27_A1	-	32	GPIO, analog capability
26	DIO28_A0	I/O	33	GPIO, analog capability
27	VDD	Power	-	Power supply, 1.71V to 3.8V, or 2.3V to 3.8V for SPI variants
28	GND	GND	-	Ground

(1) For pin multiplexing details, refer to CC2755R10 SimpleLink™ 32-bit Arm® Cortex®-M33 Bluetooth® Low Energy wireless MCU;
(2) These four pins are assigned as SPI for on-board 32-Mbit flash in SPI flash variants modules and are not exposed for user;
(3) Pin 1 used as antenna port in modules BDE-MP2755R10N32 and BDE-MP2755R10N0. Leave NC in other modules;
(4) Pin 23 (DIO23) and pin 24 (DIO24) are assigned as LFXT pins by default. They can be used as GPIOs if the on-board LFXT are unpopulated (by request);

2.3. Connections for Unused Pins

Table 3. Connections for Unused Pins

Function	Signal Name	Acceptable Practice	Preferred Practice
GPIO (Digital or analog)	DIOn	NC, GND or VDD	NC
SWD	DIO9_SWDIO, DIO10_SWDCK	NC, GND or VDD	GND or VDD

3. Mechanical Specifications

3.1. Module Dimensions

The following pages include mechanical, footprint drawings, and marking information. This information is the most current data available for the designated devices.

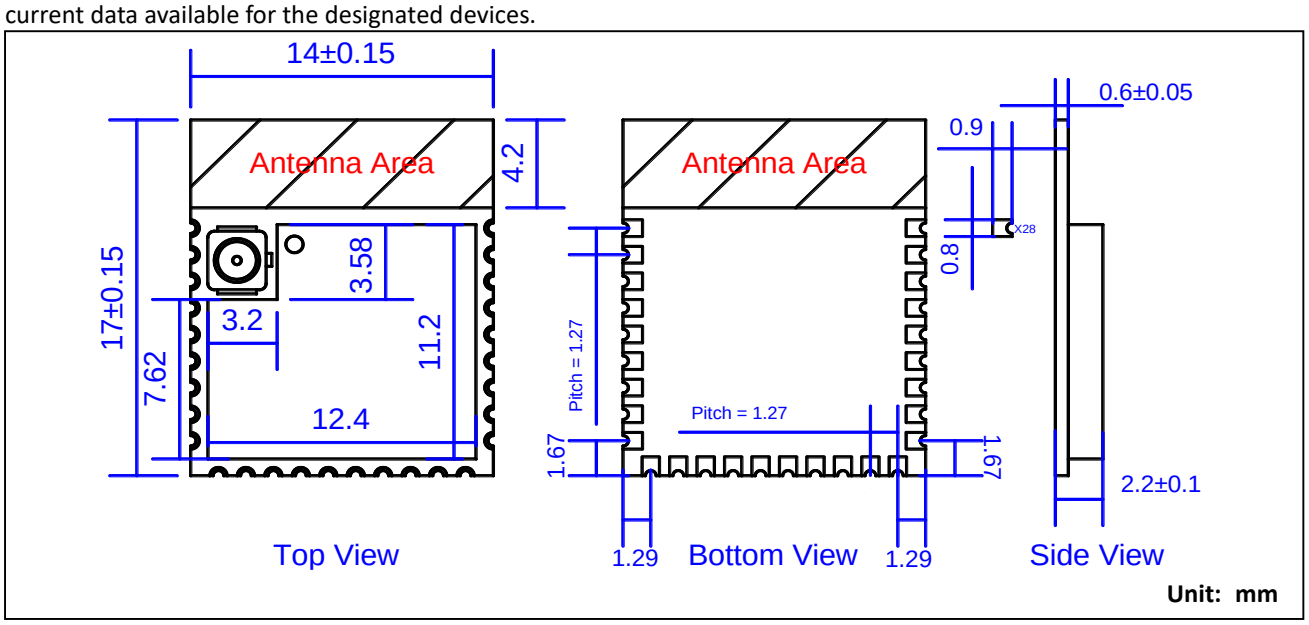
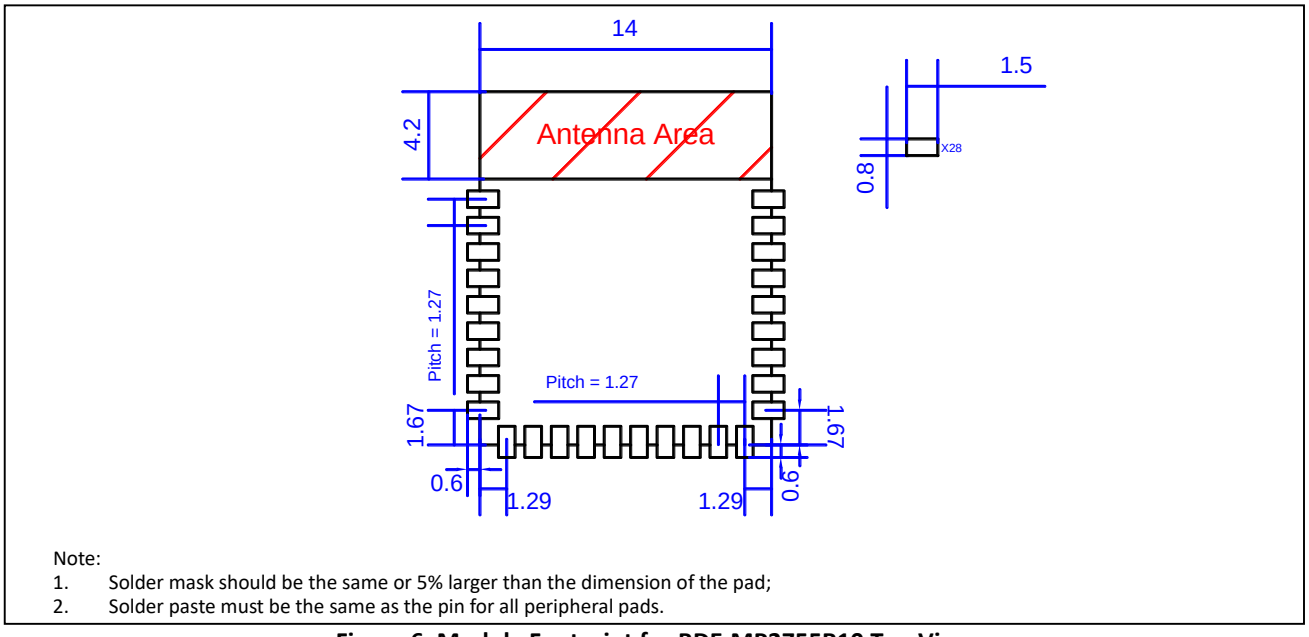


Figure 5. Mechanical Drawing for BDE-MP2755R10

3.2. PCB Footprint



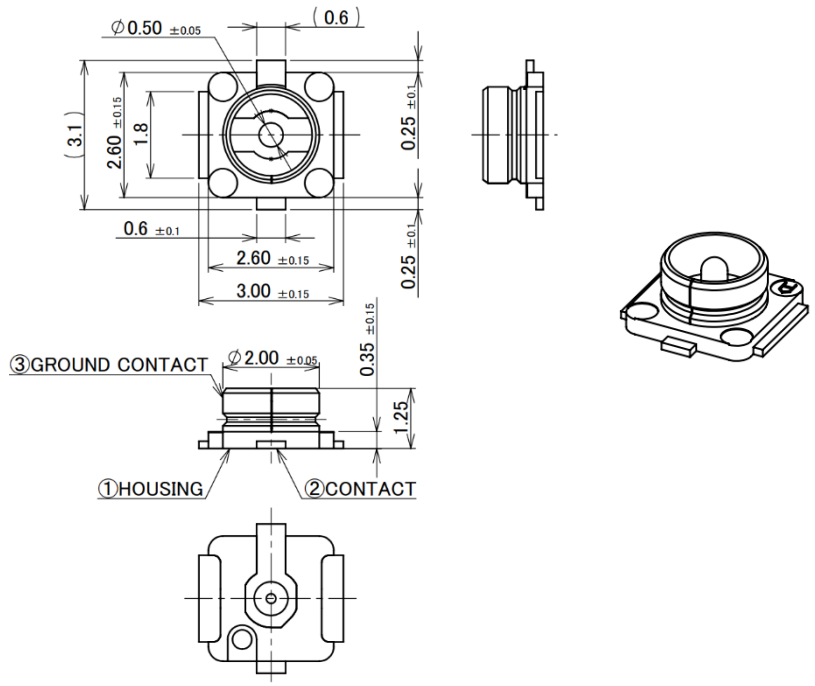
Note:
1. Solder mask should be the same or 5% larger than the dimension of the pad;
2. Solder paste must be the same as the pin for all peripheral pads.

Figure 6. Module Footprint for BDE-MP2755R10 Top View

Note: The mechanical drawing and the module footprint now is in a preview state, if there are any modifications to the pin definition or package size in the future, please refer to the product release status on the BDE website.

3.3. U.FL Connector Specification

The drawing and specification of the U.FL connector utilized in the card is as below for reference.
The dimension unit in below drawing is millimeter.



RATING VOLTAGE	60 V AC (R.M.S)	
RATING FREQUENCY	DC～9GHz	
OPERATING TEMPERATURE	233～363K (-40℃～+90℃)	
VSWR	RECEPTACLE: 1.3 MAX. AT 0.1～3 GHz, 1.4 MAX. AT 3～6 GHz, 1.8 MAX. AT 6～9 GHz	
MAIN CONTACT RESISTANCE	INITIAL: 20 mohm MAX. / AFTER TEST: ⊿R 20 mohm MAX.	
GROUND CONTACT RESISTANCE	INITIAL: 20 mohm MAX. / AFTER TEST: ⊿R 100 mohm MAX.	
INSULATION RESISTANCE	INITIAL: 500 Mohm MIN. / AFTER TEST: 100 Mohm MIN.	
DIELECTRIC WITHSTANDING VOLTAGE	200 V AC, 1 MINUTE	
DURABILITY	30 CYCLES	
UNMATING FORCE (INITIAL / AFTER TEST)	INITIAL: 5 N MIN. AFTER TEST: 3 N MIN.	INITIAL: 4 N MIN. AFTER TEST: 2 N MIN.

Figure 7. U.FL Connector Drawing and Specification

4. Ordering Information

Table 4. Ordering Information

Part Number	Description	Size (mm)	Shipping Form	MOQ
BDE-MP2755R10A32	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with PCB Trace Antenna and On-board 32Mbit SPI Flash, -40℃ to +85℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10U32	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with U.FL Connector and On-board 32Mbit SPI Flash, -40℃ to +85℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10N32	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with ANT Pin and On-board 32Mbit SPI Flash, -40℃ to +85℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10A0	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with PCB Trace Antenna and without On-board 32Mbit SPI Flash, -40℃ to +85℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10U0	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with U.FL Connector and without On-board 32Mbit SPI Flash, -40℃ to +85℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10N0	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with ANT Pin and without On-board 32Mbit SPI Flash, -40℃ to +85℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10A32-IN	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with PCB Trace Antenna and On-board 32Mbit SPI Flash, -40℃ to +105℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10U32-IN	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with U.FL Connector and On-board 32Mbit SPI Flash, -40℃ to +105℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10N32-IN	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with ANT Pin and On-board 32Mbit SPI Flash, -40℃ to +105℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10A0-IN	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with PCB Trace Antenna and without On-board 32Mbit SPI Flash, -40℃ to +105℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10U0-IN	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with U.FL Connector and without On-board 32Mbit SPI Flash, -40℃ to +105℃	14 x 17 x 2.2	Tape & Reel	TBD
BDE-MP2755R10N0-IN	BDE Bluetooth 6.0 Low Energy Wireless Module Based on CC2755R10, with ANT Pin and without On-board 32Mbit SPI Flash, -40℃ to +105℃	14 x 17 x 2.2	Tape & Reel	TBD

5. Revision History

Table 5. Revision History

Revision	Date	Description
V0.1	19-Mar-2025	Preliminary, draft

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