



BCM-LN200-AS

Specification



Revision 1.0 – 2021/02/05

Revision History

Rev. No	Issued Date	Page	Description	Summary
V0.1	2020-04-08		Initial Release	Draft version
V0.2	2020-05-29			Add RF information, Add Layout guide
V1.0	2021-02-05			Change ANT Spec / Module Dimension

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1. General

1.1 Overview

The BCM-LN200-AS module is a cost-effective, low-power, true system-on-chip (SoC) for Bluetooth Smart (Bluetooth low energy) applications. It enables robust BLE master or slave nodes to be built with very low total bill-of-material costs. BCM-LN200-AS combines an excellent RF transceiver with an industry-standard enhanced Cortex-M4F CPU, in-system programmable flash memory, 24kB RAM, and many other powerful supporting features and peripherals. The BCM-LN200-AS is suitable for systems where very low power

Consumption is required. Very low-power sleep modes are available. Short transition times between operating modes further enable low power consumption.

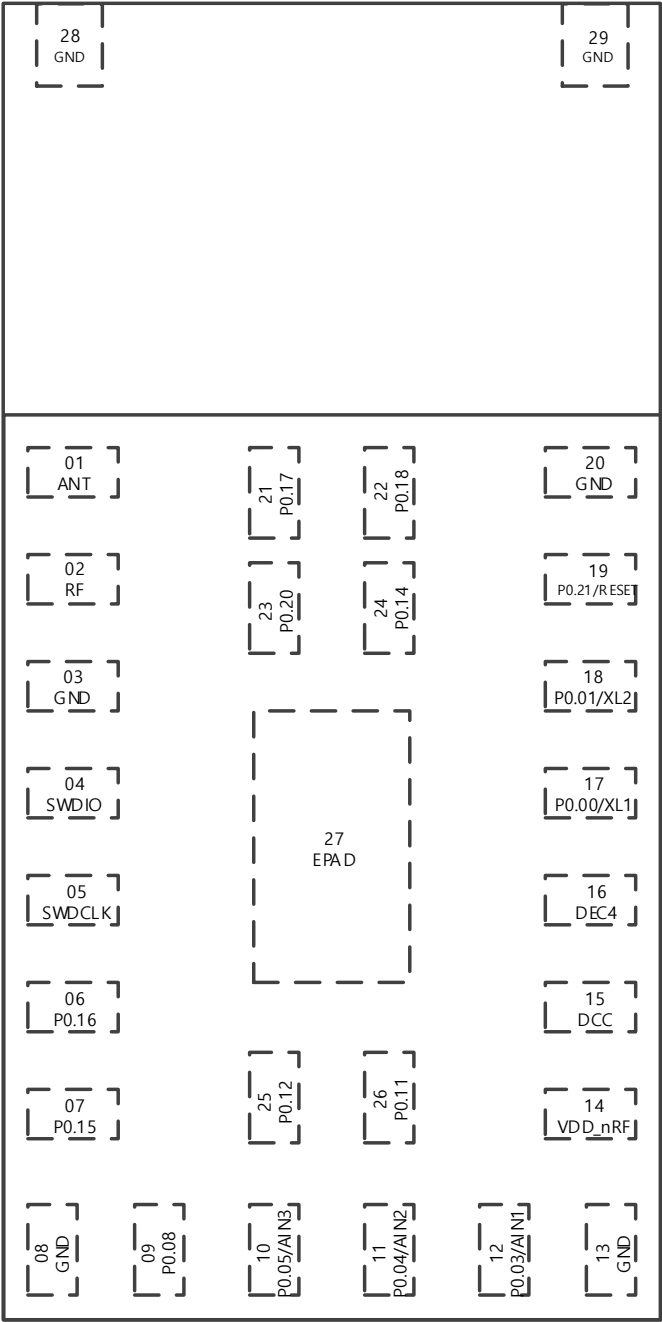
1.2 Features

- Built in Antenna Bluetooth Smart (Bluetooth Low Energy) Module.
- Bluetooth® v5.2 specification compliant
- ARM® Cortex®-M4 32-bit processor, 64 MHz
- Memory: 129 kB Flash/24 kB RAM
- RF Output Power: MAX +4 dBm (-20 ~ 4 dBm)
- RF Receive Sensitivity: -96 dBm
- Fully automatic LDO and DC/DC regulator system (Used LDO by Default)
- Temperature Sensor
- UART (CTS/RTS) with EasyDMA, SPI, and I2C data interfaces.
- 12-Bit 200 ksps ADC - 8 configurable channels with programmable gain
- Size: 4.0 mm x 8.0 mm x 1.3 mm
- Operating Voltage: 1.7V to 3.6V
- Operating Temperature: -40 to +85°C
- RoHS compliant

1.3 Application

- 2.4 GHz Bluetooth Low Energy Systems
- Human-Interface Devices
- Sports and Leisure Equipment
- Mobile Phone Accessories
- Consumer Electronics

1.4 Pin Configuration



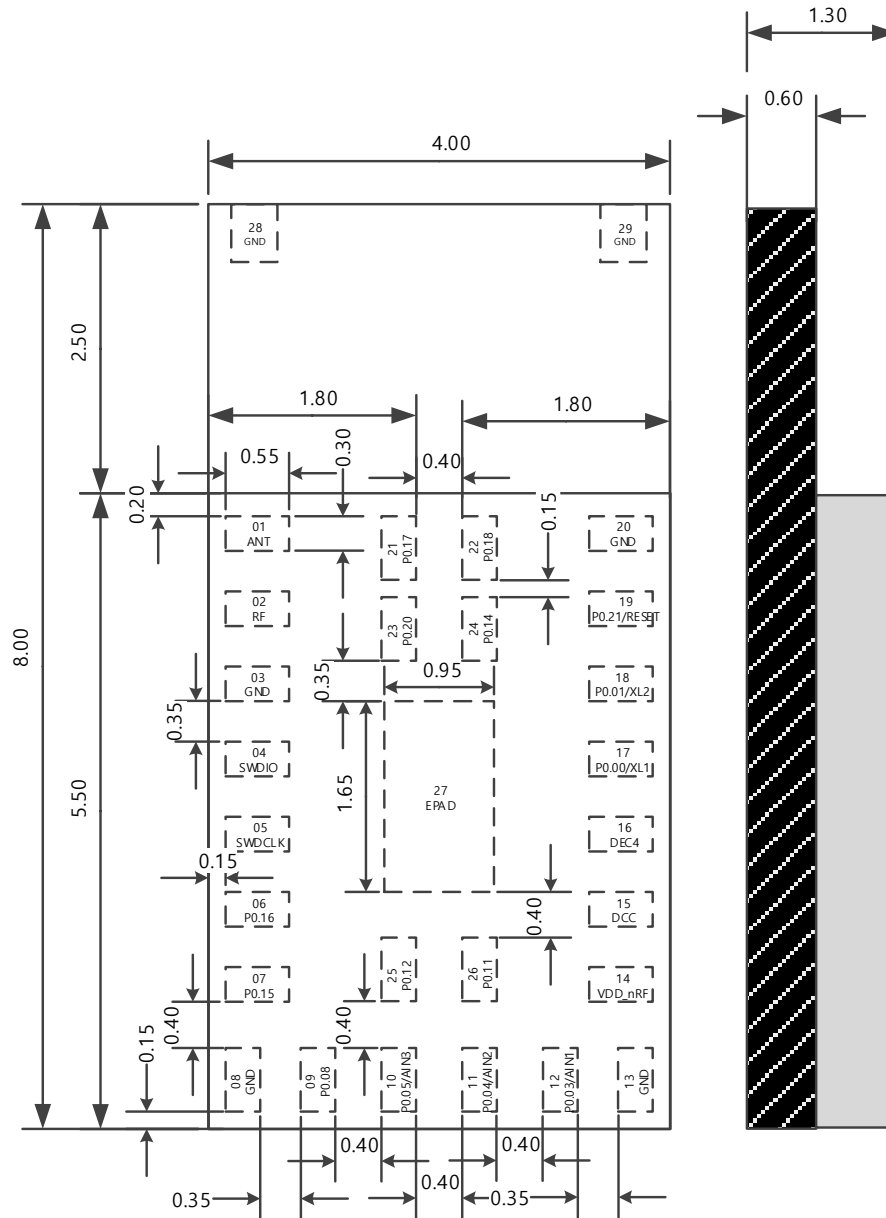
Pin Configuration (TOP VIEW)

1.5 Device Terminal Functions

Pin No.	Pin Name	Pin Function	Description
01	ANT	INTERNAL ANTENNA IN / OUT	Internal antenna. It should be connected to Pin 02 RF for normal operation.
02	RF	RF IN / OUT PORT	Bluetooth 50Ω transmitter output / receiver input
03	GND	GROUND	Ground Pin.
04	SWDIO	DIGITAL I/O	Serial Wire Debug I/O for debug and programming
05	SWDCLK	DIGITAL INPUT	Serial Wire Debug clock input for debug and programming
06	P0.16	DIGITAL I/O	General purpose I/O pin.
	RXD	DIGITAL INPUT	UART RXD
07	P0.15	DIGITAL I/O	General purpose I/O pin.
	TXD	DIGITAL OUTPUT	UART TXD
08	GND	DIGITAL I/O	Ground Pin.
09	P.0.08	DIGITAL I/O	General purpose I/O pin.
	CTS	DIGITAL OUTPUT	General purpose I/O pin.
10	P0.05	DIGITAL I/O	General purpose I/O pin.
	AIN3	ANALOG INPUT	SAADC/COMP/LPCOMP input
	RTS	DIGITAL INPUT	UART RTS
11	P0.04	DIGITAL I/O	General purpose I/O pin.
	AIN2	ANALOG INPUT	SAADC/COMP/LPCOMP input
12	P0.03	DIGITAL I/O	General purpose I/O pin.
	AIN1	ANALOG INPUT	SAADC/COMP/LPCOMP input
13	GND	GROUND	Ground Pin.
14	VDD	POWER	Power supply pin.
15	DCC	POWER	DC/DC regulator output.
16	DEC4	POWER	1.3V regulator supply decoupling input from DC/DC converter. Output from 1.3V LDO.
17	P0.00	DIGITAL I/O	General purpose I/O pin.
	XL1	ANALOG INPUT	Connection for 32.768 kHz crystal (LFXO)
18	P0.01	DIGITAL I/O	General purpose I/O pin.
	XL2	ANALOG INPUT	Connection for 32.768 kHz crystal (LFXO)
19	P0.21	DIGITAL I/O	General purpose I/O pin.
	nRESET	nReset	Configurable as system RESET pin.
20	GND	GROUND	Ground Pin.
21	P0.17	DIGITAL I/O	General purpose I/O pin.
22	P0.18	DIGITAL I/O	General purpose I/O pin.
23	P0.20	DIGITAL I/O	General purpose I/O pin.
24	P0.14	DIGITAL I/O	General purpose I/O pin.
25	P0.12	DIGITAL I/O	General purpose I/O pin.
26	P0.11	DIGITAL I/O	General purpose I/O pin.
27	EPAD	GROUND	Ground Pin.
28	GND	GROUND	Ground Pin.
29	GND	GROUND	Ground Pin.

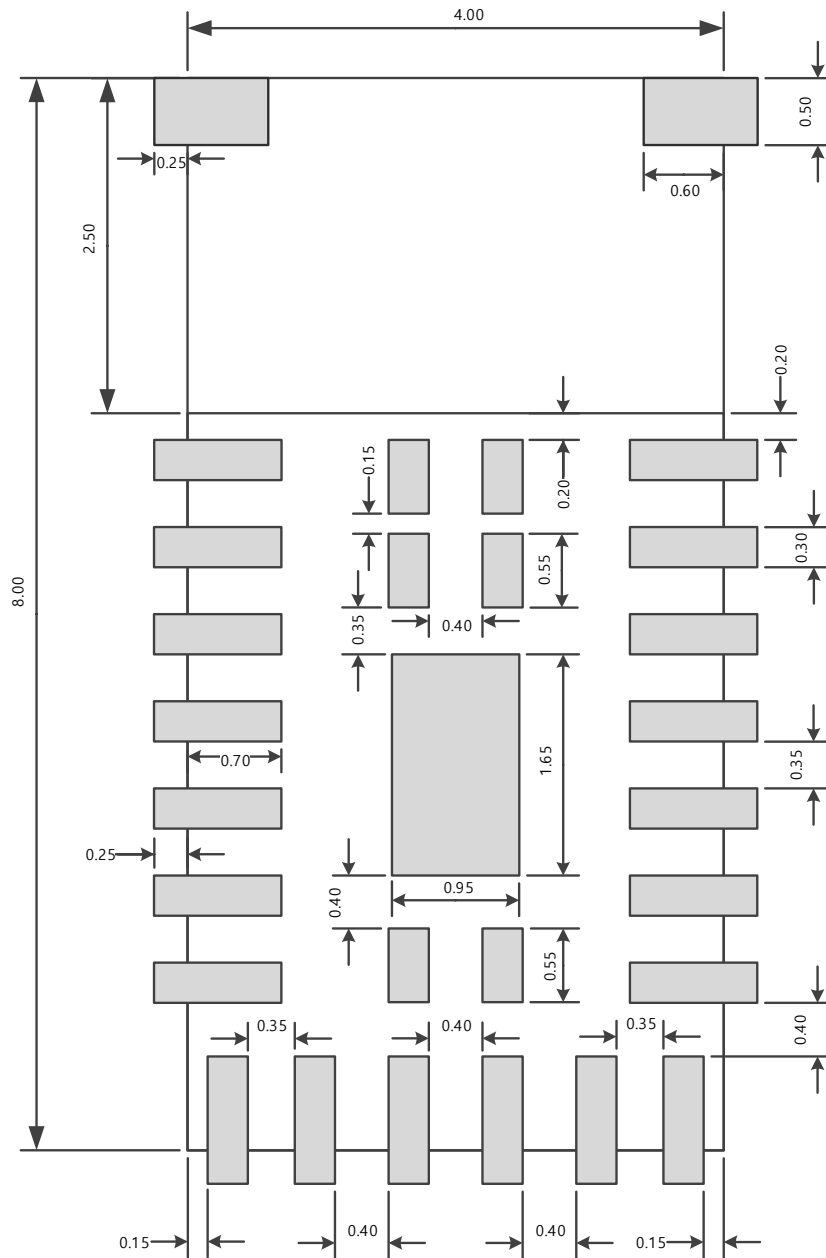
1.6 Package Dimensions

1.6.1 Package Dimensions



Top view

1.6.2 Land Pattern



Top View

2. Characteristics

2.1 Electrical Characteristics

■ Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Units
VDD		-0.3	+3.9	V
GND			0	V
V _{I/O} , VDD ≤ 3.6V		-0.3	VDD + 0.3	V
V _{I/O} , VDD > 3.6V		-0.3	+3.9	V
Storage temperature		-40	+85	°C
Radio	RF Input Level		10	dBm
MSL	Moisture Sensitivity Level	2		
ESD HBM	Human Body Model		1	kV
ESD MM	Machine Model		100	V
Endurance	Flash Memory Endurance	10000		write/erase cycles
Retention	Flash Memory Retention	10 years		At 40 °C

■ Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Units
VDD	LDO Regulator Operation (Default Mode)	1.7	3.0	3.6	V
VDD	DC/DC Regulator Operation	2.1	3.0	3.6	V
t _r _VDD	Supply rise time (0V to 1.7V)			60	ms
TA	Operation temperature	-40	25	85	°C

■ DC Characteristics

- The Specification applies for Temperature: 25°C, VDD = 3.0V

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
V _{IH}	Input high voltage	0.7 X VDD		VDD	V
V _{IL}	Input low voltage	VSS		0.3 X VDD	V
V _{OH,SD}	Output high voltage, standard drive, 0.5 mA, VDD ≥ 1.7	VDD-0.4		VDD	V
V _{OH,HDL}	Output high voltage, high drive, 5 mA, VDD ≥ 2.7 V	VDD-0.4		VDD	V
V _{OH,HDL}	Output high voltage, high drive, 3 mA, VDD ≥ 1.7 V	VDD-0.4		VDD	V
V _{OL,SD}	Output low voltage, standard drive, 0.5 mA, VDD ≥ 1.7	VSS		VSS +0.4	V
V _{OL,HDL}	Output low voltage, high drive, 5 mA, VDD ≥ 2.7 V	VSS		VSS +0.4	V
V _{OL,HDL}	Output low voltage, high drive, 3 mA, VDD ≥ 1.7 V	VSS		VSS +0.4	V
R _{PU}	Pull-up resistance	11	13	16	kΩ
R _{PD}	Pull-down resistance	11	13	16	kΩ
IRADIO_TX0	Radio transmitting @ 4 dBm output power, 1 Mbps Bluetooth low energy mode, Clock = HFXO, Regulator = DCDC		8		mA
IRADIO_RX0	Radio receiving @ 1 Mbps Bluetooth low energy mode, Clock = HFXO, Regulator = DCDC		6.1		mA
IRADIO_TX3	Radio transmitting @ 0 dBm output power, 1 Mbps Bluetooth low energy mode, Clock = HFXO		10.5		mA
IRADIO_RX1	Radio receiving @ 1 Mbps Bluetooth low energy mode, Clock = HFXO		10.8		mA
IOFF_RAMOFF_RESET	System OFF, No RAM retention, Wake on reset		0.3		uA
ION_RAMOFF_EVENT	System ON, No RAM retention, Wake on any event		0.6		uA

2.2 RF Characteristics

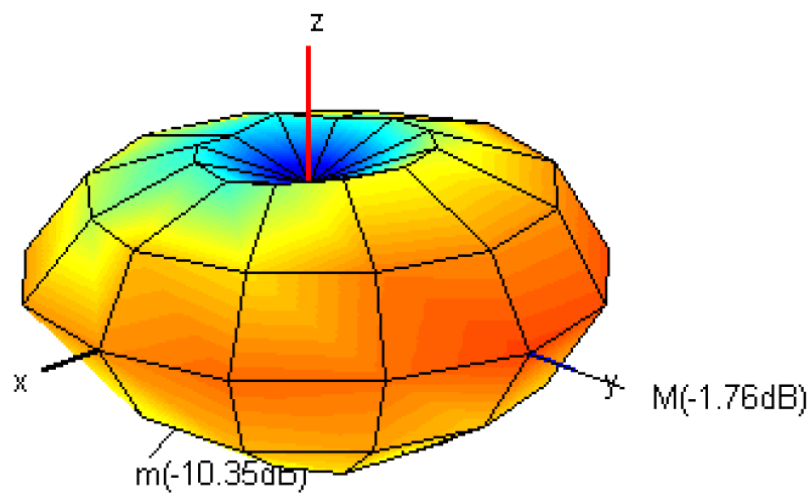
- Frequency Range : 2402 Mhz ~ 2480 Mhz
- Channels : 38CH
- Modulation : GFSK
- Output Power : BLE (4dBm +/- 1.5dBm)

RF Characteristics	Bluetooth Specification	0CH	19CH	39CH	UNIT
Output Power (TRM/CA/01/C)	-20.00dBm ~ 10dBm	3.91	4	3.98	dBm
In-band emissions (TRM-LE/CA/03/C)	P(f1) ≤ -20dBm	-46.23			
	P(f2) ≤ -30dBm	-46.43			
	-30dBm ≤ P(f3) ≤ -20dBm	-21.17			
Modulation Characteristics (TRM-LE/CA/05/C)	225.0KHz ≤ df1_avg ≤ 275.0KHz	260.3	260	259.7	kHz
	df2_pass_rate ≥ 99.90%	100	100	100	%
	df2/df1 ≥ 0.80	0.95	0.95	0.96	
Carrier Frequency offset and drft (TRM-LE/CA/06/C)	fTX-f[n] ≤ 150.0KHz	14.6	14.9	14.8	kHz
	f[0]-f[n] ≤ 50.0KHz	-4.5	4.2	-5.5	
	f[1]-f[0] ≤ 23.0KHz	-1.8	2.9	1.9	
	f[n]-f[n-5] ≤ 20.0KHz	-3.8	-4.2	-5.2	
Receiver sensitivity (RCV-LE/CA/06/C)	PER < 30.80%	21.933	11.733	19.6	%
	≤ -90dBm	-93	-93	-94	dBm
PER Report integrity (RCV-LE/CA/07/C)	50.00% ≤ PER ≤ 65.40%	50	50	50	%

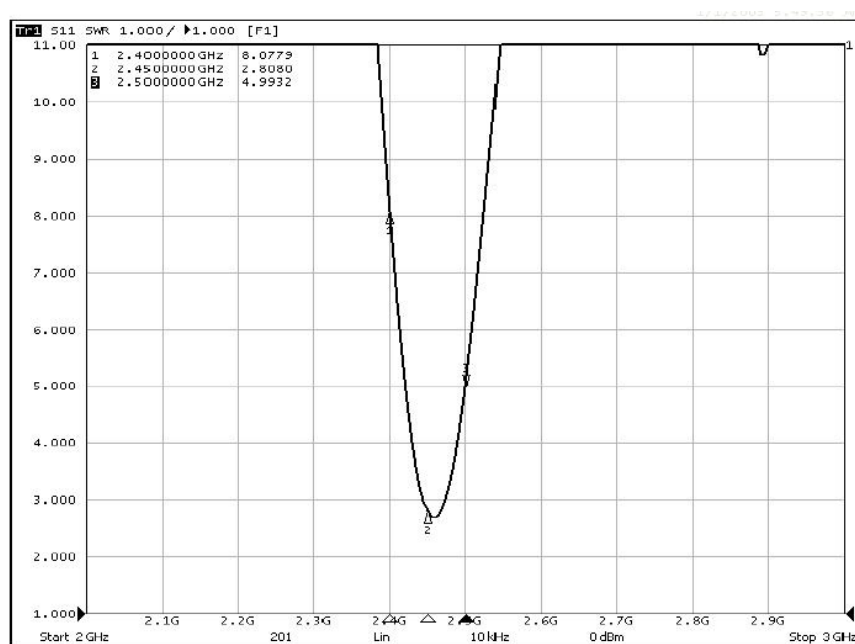
2.3 Antenna Characteristics

Average Efficiency	-5.08dBi,	31.03%
Peak Gain	-1.52dBi,	

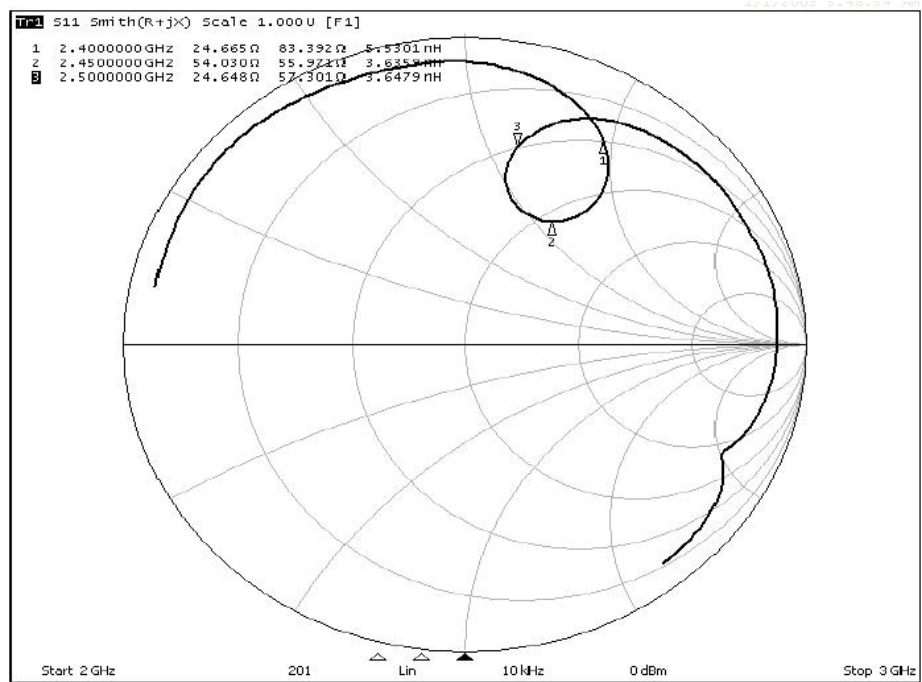
2.3.1 3D-PLOT



2.3.2 VSWR



2.3.3 SMITH CHART



3. Terminal Description

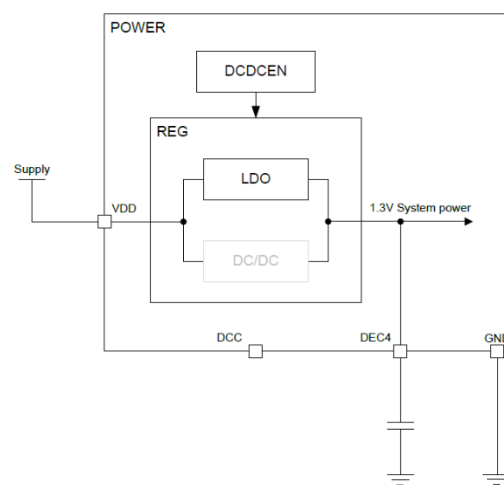
3.1 Regulator

The following internal power regulator alternatives are supported:

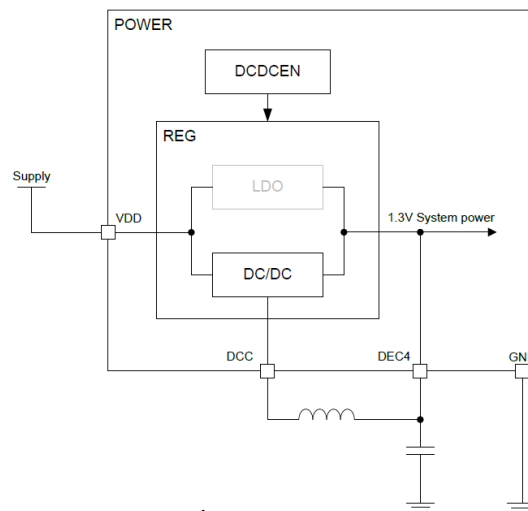
- Internal LDO regulator
- Internal DC/DC regulator

The LDO is the default regulator.

Using the DC/DC regulator will reduce current consumption compared to when using the LDO regulator, but the DC/DC regulator requires an external LC filter to be connected, as shown in Figure.



LDO Regulator Setup



DC/DC Regulator Setup

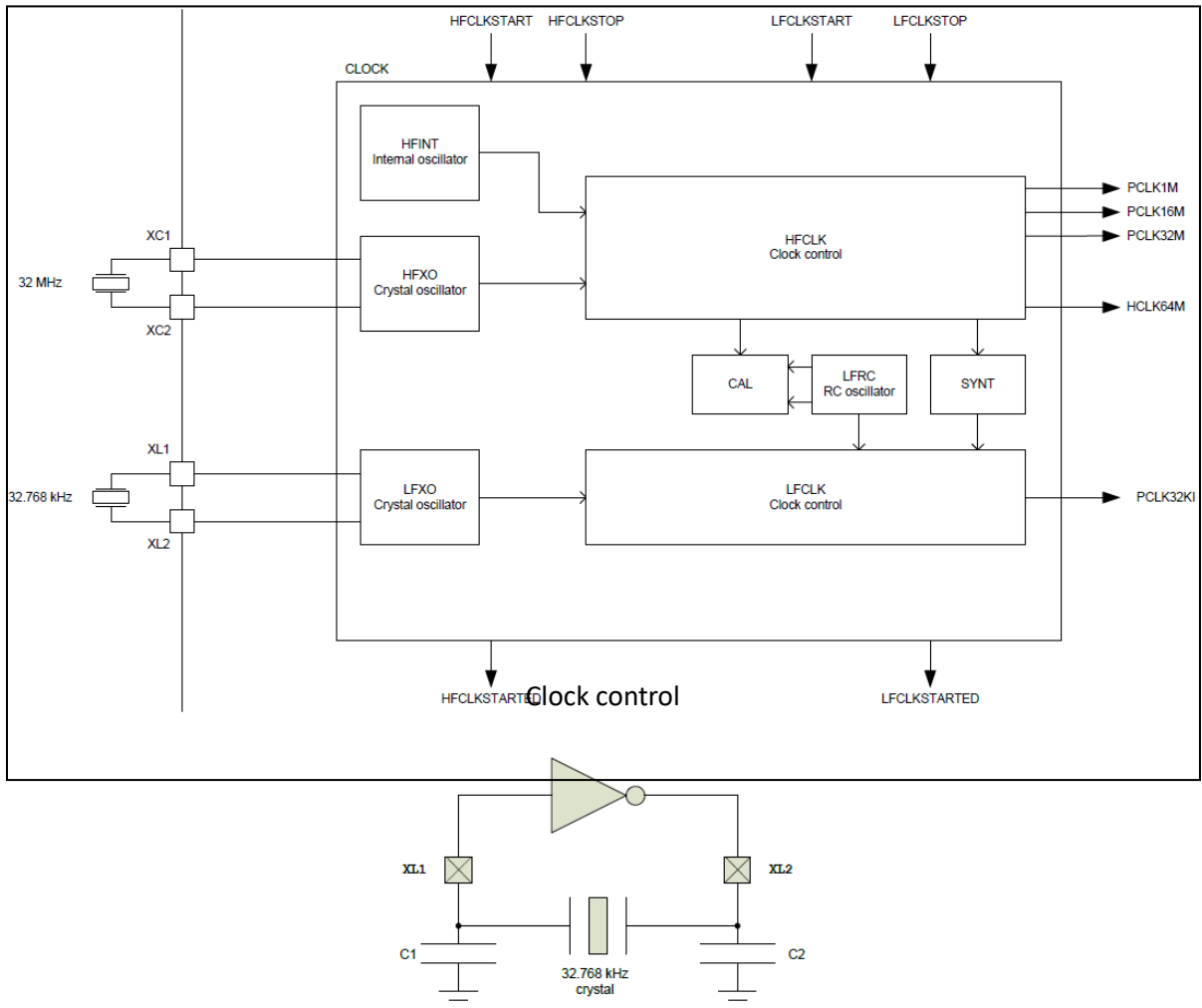
3.2 32.768KHz Crystal Oscillator

The BCM-LN200-AS external 32.768KHz Crystal does not required for BLE mode

If you choose to use an internal 32.768kHz oscillator, an average of 10uA of current is consumed compared to an external crystal.

The ANT specification requires ± 50 ppm accuracy for a 32.768kHz clock. The internal 32.768kHz oscillator may not meet specifications.

BCM-LN200-AS F/W does not yet support ANT Mode.



Circuit diagram of the 32.768 kHz crystal oscillator

The load capacitance (CL) is the total capacitance seen by the crystal across its terminals and is given by:

$$CL = \frac{(C1' \cdot C2')}{(C1' + C2')}$$

$$C1' = C1 + C_{pcb1} + C_{pin}$$

$$C2' = C2 + C_{pcb2} + C_{pin}$$

C1 and C2 are ceramic SMD capacitors connected between each crystal terminal and ground. Cpcb1 and Cpcb2 are stray capacitances on the PCB.

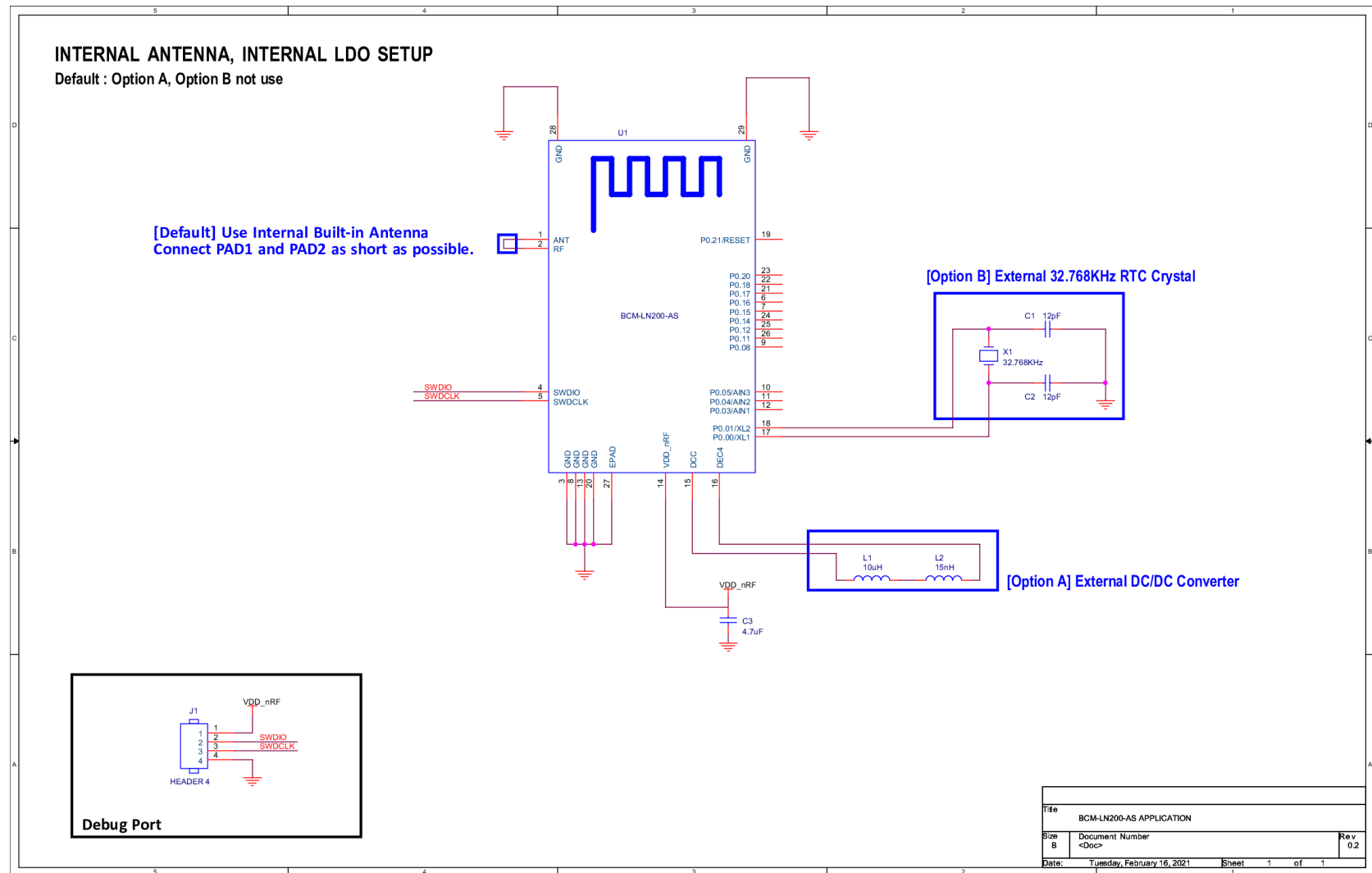
■ **32.768 kHz RC oscillator (LFRC)**

Symbol	Description	Min.	Typ.	Max.	Units
$f_{\text{NOM_LFRC}}$	Nominal frequency		32.768		kHz
$f_{\text{TOL_LFRC}}$	Frequency tolerance		± 2		%
$f_{\text{TOL_CAL_LFRC}}$	Frequency tolerance for LFRC after calibration		± 250		ppm

■ **32.768 kHz crystal oscillator (LFXO)**

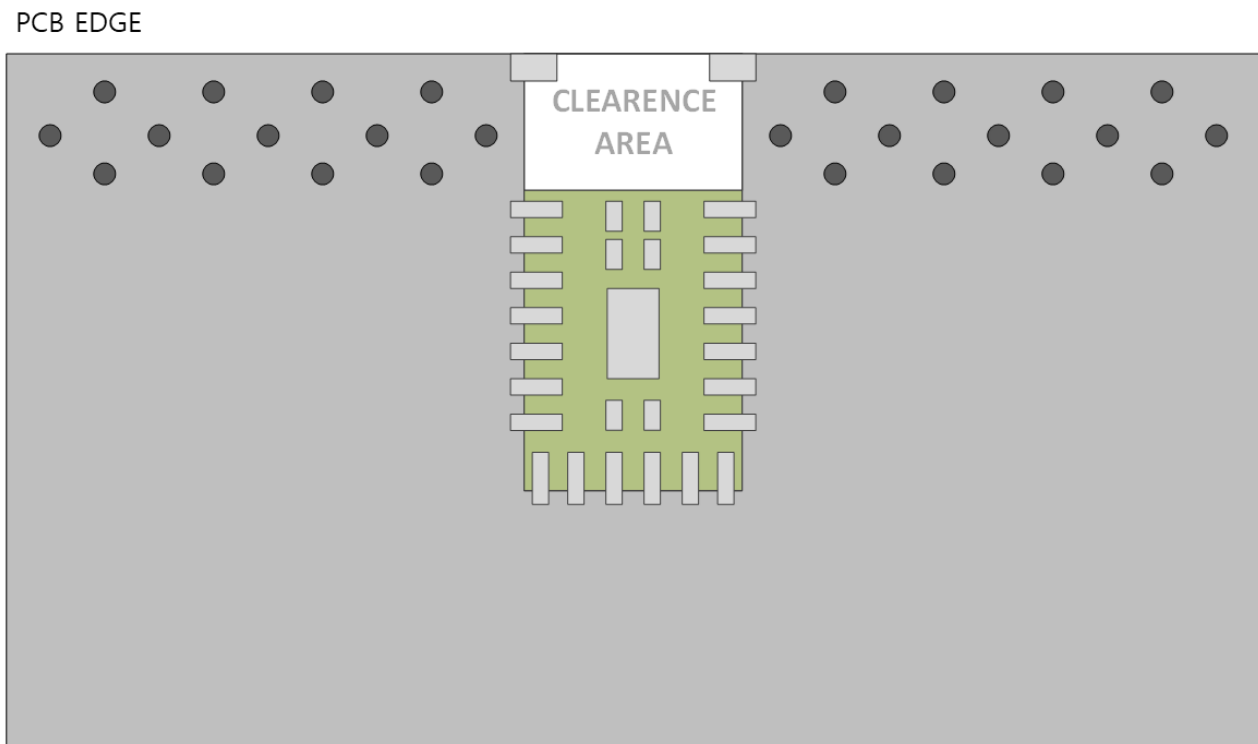
Symbol	Description	Min.	Typ.	Max.	Units
$f_{\text{NOM_LFXO}}$	Crystal frequency		32.768		kHz
$f_{\text{TOL_LFXO_BLE}}$	Frequency tolerance requirement for BLE stack		± 250		ppm
$f_{\text{TOL_LFXO_ANT}}$	Frequency tolerance requirement for ANT stack		± 50		ppm
$C_{\text{L_LFXO}}$	Load capacitance			12.5	pF
$C_{\text{O_LFXO}}$	Shunt capacitance			2	pF
$R_{\text{S_LFXO}}$	Equivalent series resistance			100	
$P_{\text{D_LFXO}}$	Drive level			1	
C_{pin}	Input capacitance on XL1 and XL2 pads		4		

4.1 Internal Antenna Application Schematic



5. Layout Guide

5.1 Internal Antenna Design Guide



- No vias , patterns and copper in the clearance area of entire layer.
- Apply as many vias as possible around the clearance area.

6. Reflow Temperature Profile

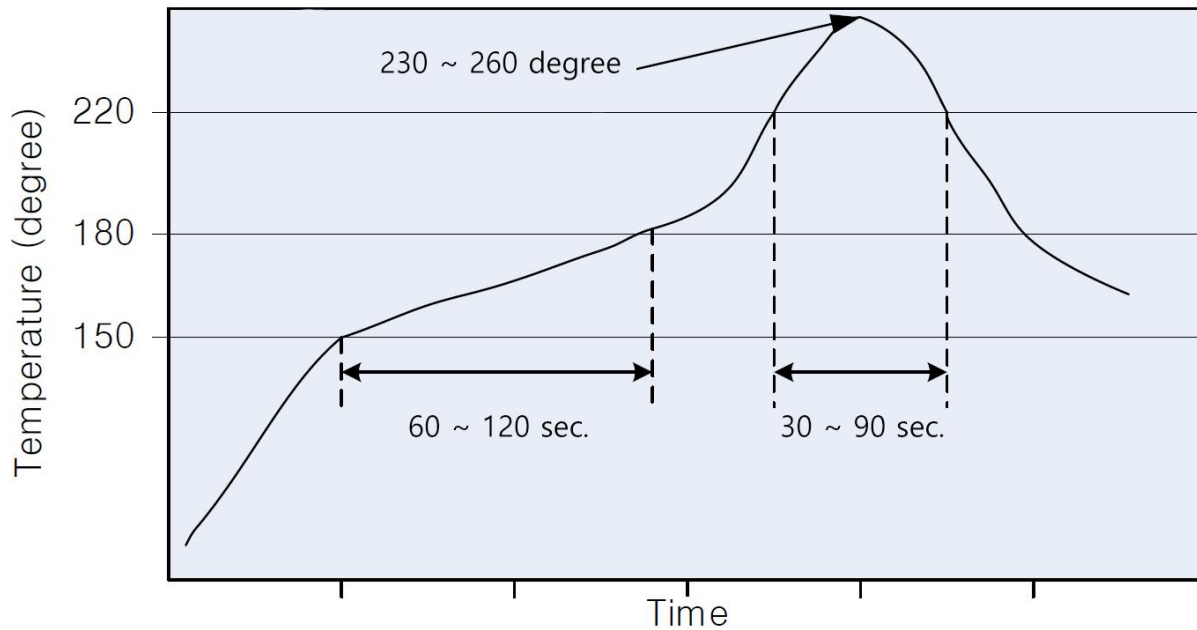
Recommended solder reflow profile are shown in below and follow the lead-free profile I accordance with JEDEC Std 20C.

Table lists the critical reflow temperatures.

Flux residue remaining from board assembly can contribute to lectrochemical migration over time.

This depends on number of factors, including flux type, amount of flux residue remaining after reflow, and stress conditions during product use, such as temperature, humidity, and potential difference between pins.

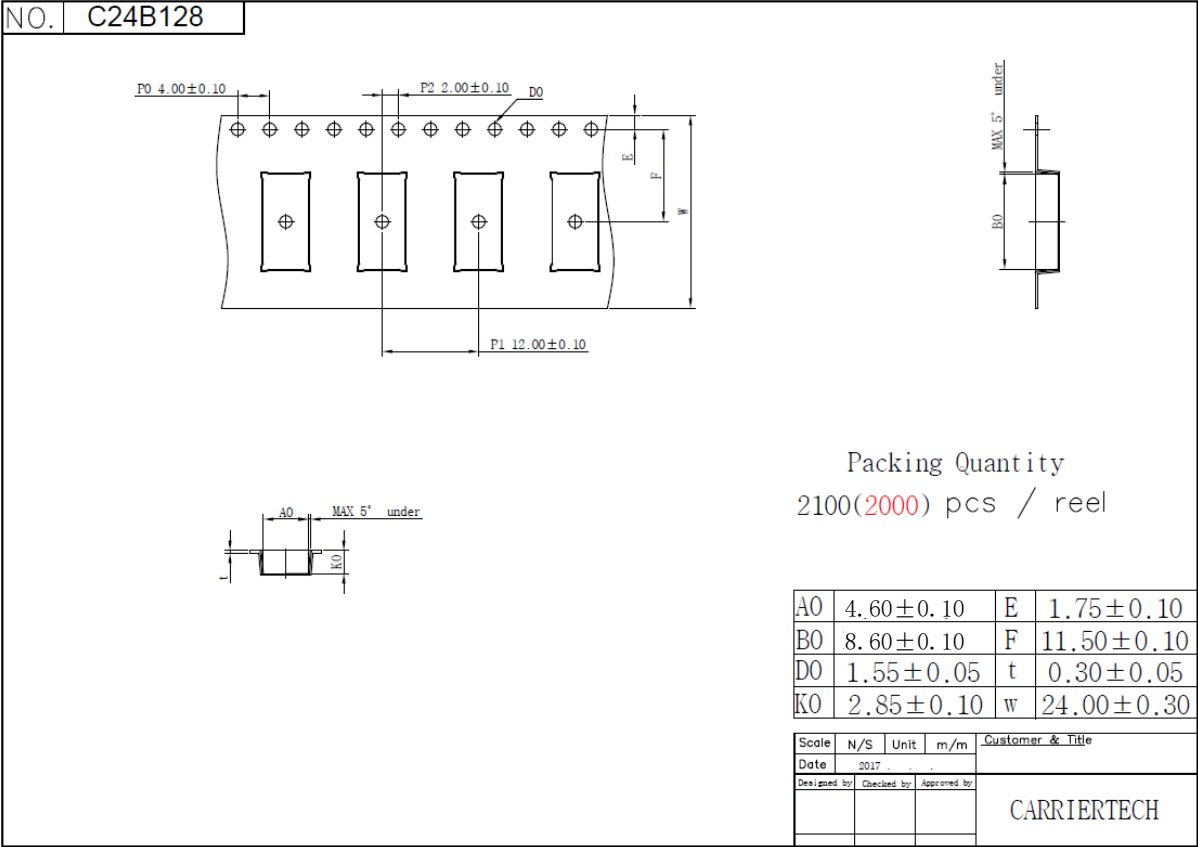
Care should be taken in selecting production board/module assembly processes and materials, taking into account these factors.



Process Step	Lead-Free Solder
Ramp rate	3°C/sec
Preheat	Max. 150°C to 180°C, 60 to 120 sec
Time above liquidus	+220°C 30 to 90 sec
Peak temperature	+255°C ±5°C
Time within 5°C of peak temperature	10 to 20 sec
Ramp-down rate	6°C/sec max

7.Package Information

7.1 Reel Package Information



7.2 Certification Label Information



End Product Labeling

These modules are designed to comply with the FCC single modular FCC grant, BCM-LN200-AS.

The host system using this module must display a visible label indicating the following text:

Contains FCC ID: 2APDI-BCM-LN200-AS

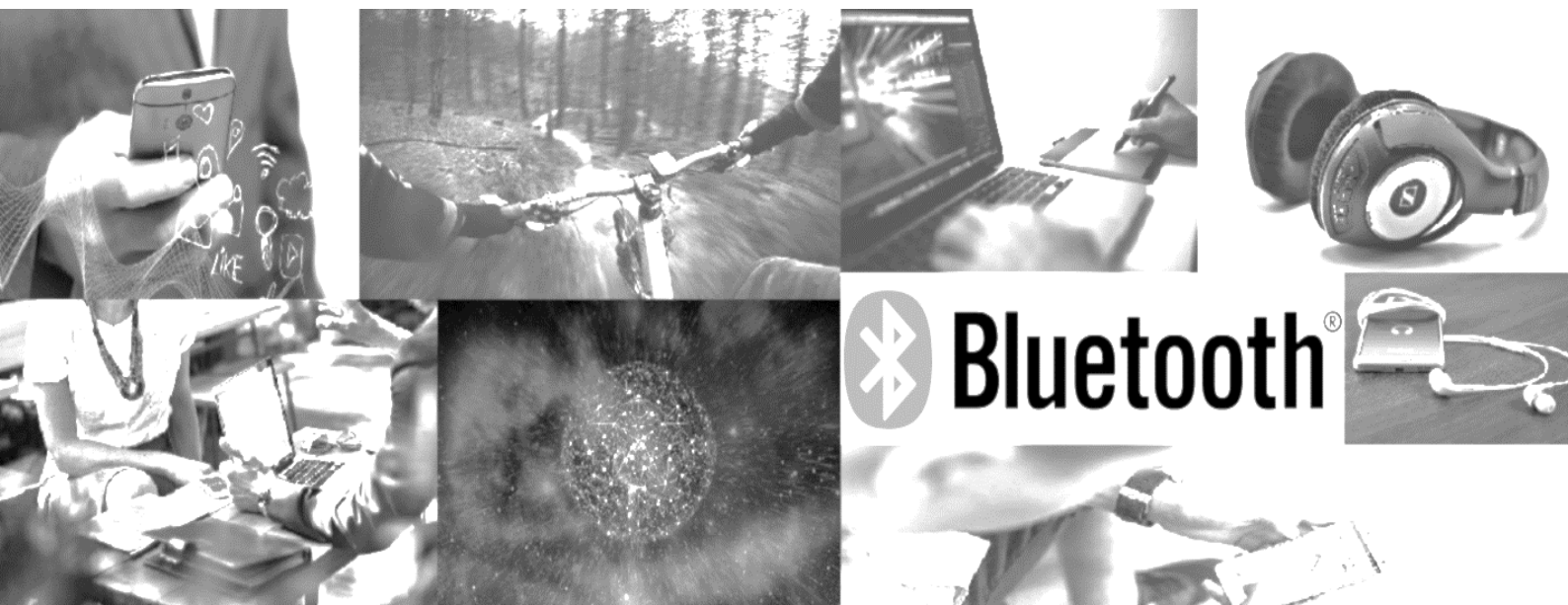
wireless
solutions



BCM-LN200-AS

AT Command Reference

v.1.0.0 – 2020-07-28



■ Revision History

Version	Distribution Date	Revision Content
1.0.0	2020.06.10	Created the document draft
1.0.0	2020.07.06	Changed the description of operation functions; added OTA function.
1.0.0	2020.07.20	Changed the description of functions; added LTK command
1.0.0	2020.07.24	Added sleep mode GPIO setting.
1.0.0	2020.07.28	Changed the description of the sleep mode GPIO; added AT command.

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1. Introduction

This document defines the communication protocol through UART (serial port) between the "BCM-LN200-AS Module" (hereinafter "BT") and the client's MCU (hereinafter "HOST") connected by UART interface.

1.1 Basic Protocol Rules

Data transmission/reception between HOST and BT is made based on UART (serial port) interface.

- UART(serial port) default settings:
 - Baud rate: 115200 bps
 - Data bit: 8
 - Parity bit: none
 - Stop bit: 1
 - Flow control: RTS/CTS Enable

The above are default setting values. In case you want to change them, please make a request for modification when writing BT firmware or modify them using the corresponding AT command .

- Communication Direction
 - REQUEST (HOST→BT): Generated from HOST and transmitted to BT.
 - NOTIFY(BT → HOST): A message is generated from BT and delivered to HOST. It informs the basic state of BT.
 - RESPONSE(BT → HOST): A message is generated from BT and delivered to HOST, which is a response to a request.
- Communication Rule

All protocols consist of a combination of ASCII values, and the protocol command announces the end of the command through Carriage Return (0x0D).

e.g.) RESPONSE – REQUEST 'request success': "+OK\r"

Command	ERROR					
Command Set	+	O	K	\r		
ASCII Set	0x2B	0x4F	0x4B	0x0D		

1.2 Basic protocol operation

BT transmits the corresponding RESPONSE after receiving a request from HOST. HOST may basically expect a RESPONSE of "+OK" or "+ERROR, N", and may receive a specific RESPONSE corresponding to a request.

2. Bluetooth Low Energy

When BT operates, it operates as BLE Peripheral, and provides the following functions:

2.1. Classification of BLE Service UUIDs

BT provides Data Service for data communication. Each UUID is shown in the table below. Smartphones or other devices can access each service through the following UUID.

Class.	UUID	Property
Data Service (Primary)	0xE4E20000C74011EA87D074F07D000000	N/A
Notification (Characteristic)	0xE4E20001C74011EA87D074F07D000000	Notification
Write No Response (Characteristic)	0xE4E20002C74011EA87D074F07D000000	Write without Response

2.2. BLE Advertising Data

Advertising data transmitted from the factory reset status of BT during BLE operation is as shown in the "Advertising Data Table" below.

"Host" can set the Advertiser manufacture/Service data information through AT command.

■ Advertising Data Table

Total 31Byte	AD Structure 1	Length	0x02	Length of this data
		Type	0x01	Advertising type flag
		AD Data	0x06	LE Flag
	AD Structure 2	Length	0x02	Length of this data
		Type	0x0A	BLE TX Power
		AD Data	0x87	0 dBm
	AD Structure 3	Length	0x11	Length of this data
		Type	0x09	Complete Local Name
		AD Data BLE Name	0x42	B
			0x43	C
			0x4D	M
			0x2D	-
			0x4C	L
			0x4E	N
			0x32	2
			0x30	0
			0x30	0
			0x2D	-
			0x41	A
			0x53	S
	AD Structure 4	Length	NULL	
		Type	NULL	
		Manufacture Data (User settings Data)	NULL	

3. BT GPIO

A separate GPIO is allocated to notify the status information of BT or control specific functions of BT from HOST.

GPIO	Name	Direction	I/O	Description
PIO.18	Connected State	Output	Low	BLE Device Disconnected.
			High	BLE Device Connected.
PIO.14	Command Mode State	Input	Low	Command Mode (When the other device is connected.)
			High	BLE Data Transfer Mode (when the other device is connected.)
PIO.01	Sleep Wakeup	Input	Both (default : Low)	1. When BT is in an uart off sleep mode through AT command, Uart On. 2. When BT is in a Deep sleep mode through AT command, Device Reset wake up.

e.g.> BT Uart wake up : PIO.01 (default : LOW) -> PIO.01 (High) -> PIO.01 (LOW) = BT Uart Init

4. Summary of Notify Protocols

Through a Notify message notifying the status change of BT, HOST can detect the status change of BT in real time.

Command	Description	Remark
+READY\r	Initialization completed with power applied.	
+CONNECTED\r	BT device connects with other device.	
+DISCONNECTED\r	BT device disconnects from the other device.	
+IDLE	BT device goes into standby state.	
+ADVERTISING\r	BT device starts BLE Advertising.	
+COMMAND\r	BT operates in an AT Command state while it is connected to the other device.	
+TRANSFER\r	BT operates in a Data Transfer state while it is connected to the other device.	

5. Summary of General Response Protocols

The response messages notifying the result of processing commands that control various actions of BT are as follows.

Command	Description	비고
+OK\r	Response to a command reception	
+ERROR,1\r	No command received	
+ERROR,2\r	Error in the value of parameters transmitted in a command	
+ERROR,3\r	Error in the number of parameters transmitted a in command	
+ERROR,4\r	The command cannot be processed	
+ERROR,5\r	The command was executed, but the operation	

	was not normal.	
--	-----------------	--

6. Summary of AT Request Command Protocols

As the commands provided by BT may need to be reset after executing them, ensure to use them by referring to the table below.

6.1 Summary of General Commands

Command	Function	Factory Default (Initialization) Setting Value	Need to Reset	Remark
AT	Data transmission and reception test.			
ATZ	Device reset.			
ATO	BLE Data transmission mode setting.			
AT&F	Factory reset device settings			
AT&S	Save device setting information.			
AT+DISCONNECT	Disconnect BLE device.			
AT+VER?	Device firmware version information.	1.0.0		
AT+REMOTEADDR?	Mac address information of a connected device.			
AT+NAME?	Device name information.	BCM-LN200-AS		
AT+NAME=xxx	Set a device name.			
AT+ADVINFO?	BLE Advertiser information.			
AT+ADVERTISING?	BLE Advertiser operation status information.	" +ADVERTISING"		
AT+ADVERTISING=x	BLE Advertiser operation status setting.			
AT+UART?	Device Uart communication setting information.	Baudrate : 115,200 Paritybit : None FlowControl : Enable		
AT+UART=b,p,f	Device Uart communication settings		O	
AT+MANUFDATA?	BLE Advertiser Manufacture information.			
AT+MANUFDATA=xxx	BLE Advertiser Manufacture setting.			
AT+ADVINTERVAL?	BLE Advertising Interval information.			
AT+ADVINTERVAL=ms	BLE Advertising Interval setting.			
AT+CONNINTERVAL?	BLE Connection Interval information.	Min : 6 (7.5ms) Max : 20 (25ms) Latency : 0 S_Timeout : 400 (4s)		
AT+CONNINTERVAL=m,m,l,s	BLE Connection Interval setting.			

AT+TXPWR?	BLE wireless output strength information.	6 (0dBm)		
AT+TXPWR=x	BLE wireless output strength setting.			
AT+ADDRTYPE?	BLE Advertiser Address type information.	0 (Public Address)		
AT+ADDRTYPE=x	BLE Advertiser Address type setting.		O	
AT+SECURITY?	BLE Security information.	3 (IO caps none)		
AT+SECURITY=x	BLE Security settings.			
AT+LTK?	BLE bonded LTK information.			
AT+PASSKEY=xxxxxx	Enter BLE Passkey security data.			
AT+DELBOND	BLE all bonded data deleted.			
AT+SLEEP=x	BT Sleep mode operation setting.			

6..2 General Commands

6.2.1 AT

■ Description

UART TX/RX Path test between a BT module and Host device.

■ Examples

```
(HOST→BT) : AT\r
(BT→HOST) : +OK\r
```

6.2.2 ATZ

■ Description

BT Device Software Reset.

■ Examples

```
(HOST→BT) : ATZ\r
(BT→HOST) : +OK\r
--- Rebooting ---
--- Restart ---
(BT→HOST) : +READY\r
--- When 'Advertiser Enable' operates ---
--- In case of Advertiser Enable operation ---
(BT→HOST) : +ADVERTISING\r
```

6.2.3 ATO

■ Description

To change the state to transmit data to the other device after the BT module is connected to another BLE device,
An error responds if connection with the other device is not established.

When BT connects with the other device, the default operation is data transmission.

■ Examples

```
(HOST→BT) : ATO\r
(BT→HOST) : +OK\r
```

6.2.4 AT&F

■ Description

This is a command for factory initialization of BT setting values. When using this command, the BT module initializes the device settings and executes Software Reset.

An error responds if BT is connected to the other device.

■ Examples

```
(HOST→BT) : AT&F\r
(BT→HOST) : +OK\r
--- Rebooting ---
(BT→HOST) : +READY\r
(BT→HOST) : +ADVERTISING\r
```

6.2.5 AT&S

■ Description

A command to save BT configuration information to Flash Memory

■ Info

When using this command, the entire information used for setting Flash Memory in BT is saved.

Data storage list:

1. Device Name ("AT+NAME=xxx")
2. Device Mac Address ("AT+ADDR=xxx")
3. Device Uart Config ("AT+UART=b,p,f")
4. BLE Manufacture data ("AT+MANUFDATA=ci,md")
5. BLE Advertiser Interval ("AT+ADVINTERVAL=x")
6. BLE Connection Interval ("AT+CONNINTERVAL=min,max")
7. BLE TX Power ("AT+TXPWR=x")
8. BLE Mac Address Type Config ("AT+ADDRTYPE=x")
9. BLE Security Config ("AT+SECURITY=xxx")
10. BLE Connection peer device Mac Address (none command)

■ Command Guide

```
(HOST→BT) : AT+UART=xxx,x,x,x
(BT→HOST) : +OK\r
(HOST→BT) : AT+NAME=xxxxx
(BT→HOST) : +OK\r
(HOST→BT) : AT&S
(BT→HOST) : +OK\r
```

```
(HOST→BT) : ATZ\r
(BT→HOST) : +OK\r
--- Rebooting ---
(BT→HOST) : +READY\r
--- When 'Advertiser Enable' operates ---
(BT→HOST) : +ADVERTISING\r
```

■ Examples

```
(HOST→BT) : AT&S\r
(BT→HOST) : +OK\r
```

6.2.6 AT+DISCONNECT

■ Description

Disconnects the BT connected with the other device.
An error responds if BT is not connected with the other device.

■ Examples

```
(HOST→BT) : AT+DISCONNECT
(BT→HOST) : +OK\r
--- Device disconnection completed ---
(BT→HOST) : +DISCONNECTED
```

6.2.7 AT+VER?

■ Description

Information on the module firmware version of BT

■ Examples

```
(HOST→BT) : AT+VER?
(BT→HOST) : 1.0.0\r
```

6.2.8 AT+REMOTEADDR?

■ Description

MAC Address information on the other device to which BT was last connected.

■ Info

A response "000000000000" is shown if there is no connection information with the other device

■ Info

Data format : ASCII code in Hex data format

■ Examples

```
(HOST→BT) : AT+REMOTEADDR?
(BT→HOST) : 74F07DABCDEF\r
```

6.2.9 AT+NAME?

- **Description**

Information on the BT device name

- **Examples**

(HOST→BT) : AT+NAME?\r

(BT→HOST) : BCM-LN200-AS\r

6.2.1 AT+NAME=xxx

- **Description**

Set the name of the BT device using the parameter data as ASCII data.
An error responds if BT is connected to the other device.

- **Info**

Data format : ASCII code

- **Info**

Data beyond the maximum length that can be set is not applied. (Max 26byte)
Name Lens = total(31byte) – (manufacture data lens+2) - flag(3byte) – tx power(3byte)

- **Examples**

(HOST→BT) : AT+NAME=BCM-LN200\r

(BT→HOST) : +OK\r

6.2.2. AT+ADVINFO

- **Description**

Information on the BT Advertiser operation. Displays the current advertising data value.

- **Info**

Data format : ASCII code in Hex data format

- **Examples**

(HOST→BT) : AT+ADVINFO?\r

(BT→HOST) : 020106020A5F0D0942434D2D4C4E3230302D4153\r

6.2.3. AT+ADVERTISING?

- **Description**

Information on the BT Advertiser operation

- **Examples**

(HOST→BT) : AT+ADVERTISING?\r

(BT→HOST) : +ADVERTISING\r or +IDLE\r

6.2.4 AT+ADVERTISING=x

■ **Description**

Set the BT Advertiser operation using the parameter data as Decimal data.
An error responds if BT is connected to the other device.

■ **Info**

An Advertiser +OK\r response when the existing operation and a command input are the same.

■ **Info**

Data format : ASCII code in Decimal data format

■ **Range**

0 : Advertiser Disable.
1 : Advertiser Enable.
Other value error.

■ **Examples**

(HOST→BT) : AT+ADVERTISING=1\r
(BT→HOST) : +IDLE\r or +ADVERTISING\r
(BT→HOST) : +OK\r

6.2.5 AT+UART?

■ **Description**

Information on BT Uart setting

■ **Info**

Response data : Baudrate, ParityBit, FlowControl

■ **Info**

Data format : ASCII code in Decimal data format

■ **Examples**

(HOST→BT) : AT+UART?\r
(BT→HOST) : 1000000,0,1\r

6.2.6 AT+UART=B,P,F

■ **Description**

Set the BT Uart using the parameter data as Decimal data.
Data need to be saved when applied after reset.
An error responds if BT is connected to the other device.

■ **Range**

B = BaudRate	1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400,
--------------	--

	57600, 76800, 115200, 230400, 250000, 460800, 921600, 1000000, Other value is error.
P = ParityBit	1 = Even Parity Bit 0 = None Parity Bit Other value error.
F = FlowControl	1 = Enable 0 = Disable Other value error.

■ **Info**

Data format : ASCII code in Decimal data format

■ **Examples**

(HOST→BT) : AT+UART=1000000,0,1\r
(BT→HOST) : +OK\r

6.2..7 AT+MANUFDATA?

■ **Description**

Information on BT Advertiser Manufacture data

■ **Info**

Response data : Company identifier, Manufacture Data

■ **Info**

Data format : ASCII code in Decimal data format

■ **Examples**

(HOST→BT) : AT+MANUFDATA?\r
(BT→HOST) : 29936,12345\r

6.2.8 AT+MANUFDATA=CI,MD

■ **Description**

Set the BT Advertiser Manufacture data using the parameter data as Decimal data.
Parameter data is 0x2C ("", ": comma), 0x00 (NULL) data is not used.
An error responds if BT is connected to the other device.

■ **Info**

CI = Company identifier. (2byte decimal data)
MD = Manufacture data.

■ **Info**

Data format : ASCII code in Decimal data format

■ **Info**

An error responds if it exceeds the maximum length that can be set.

Manufacture Lens = total(31byte) – (Device Name Lnes+2) – flag(3byte) – tx power(3byte)

■ **Examples**

(HOST→BT) : AT+MANUFDATA=29937,12345\r

(BT→HOST) : +OK\r

6.2.9 AT+ADVINTERVAL?

■ **Description**

Information on BT Advertising Interval

■ **Info**

Data format : ASCII code in Decimal data format

Unit : 1 ms

■ **Range**

Min : 20 ms

Max : 10240 ms

Other value error.

■ **Examples**

(HOST→BT) : AT+ADVINTERVAL?\r

(BT→HOST) : 160\r

6.2.10 AT+ADVINTERVAL=ms

■ **Description**

Information on BT Advertising Interval. Use the parameter data as Decimal data.

An error responds if BT is connected to the other device.

■ **Info**

Data format : ASCII code in Decimal data format

Unit : 1 ms

■ **Range**

20ms(min) ~ 10240ms(max)

Other value error.

■ **Examples**

(HOST→BT) : AT+ADVINTERVAL=160\r

(BT→HOST) : +OK\r

6.2.11 AT+CONNINTERVAL?

■ Description

Information on BT Connection Interval

■ Info

Data format : ASCII code in Decimal data format

■ Range

Min (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s)
Max (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s)
Latency : 0~ 499 (0x01F3)
S_timeout (Unit : 10ms) : 0x000A (10 * 10ms = 100ms) ~ 0x0C80 (3200 * 10ms = 32s)
Other value error.

■ Examples

(HOST→BT) : AT+CONNINTERVAL?\r
(BT→HOST) : 6,6\r

6.2.12 AT+CONNINTERVAL=min,max,latency,s_timeout

■ Description

Set the BT Connection Interval using the parameter data as Decimal data.
An error responds if BT is connected to the other device.

■ Info

Data format : ASCII code in Decimal data format.
S_timeout = Supervision time out.
Supervision time out setting value should be greater than ((latency+1)*MAX)*2.

■ Range

Min (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s)
Max (Unit : 1.25ms) : 0x0006 (6 * 1.25ms = 7.5ms) ~ 0x0C80 (3200 * 1.25ms = 4s)
Latency : 0~ 499 (0x01F3)
S_timeout (Unit : 10ms) : 0x000A (10 * 10ms = 100ms) ~ 0x0C80 (3200 * 10ms = 32s)
Other value error.

■ Examples

(HOST→BT) : AT+CONNINTERVAL=6,20,0,400\r
(BT→HOST) : +OK\r

6.2.13 AT+TXPWR?

■ Description

Information on BT Advertiser TX Power

■ Info

Data format : ASCII code in Decimal data format

■ Range

0 : -40dBm
1 : -20dBm
2 : -16Bm

3 : -12 dBm
4 : -8 dBm
5 : -4 dBm
6 : 0 dBm
7 : 4dBm
Other value error.

■ Examples

(HOST→BT) : AT+TXPWR?\r
(BT→HOST) : 6\r

6.2.14 AT+TXPWR=P

■ Description

Set the BT Advertiser TX Power using the parameter data as Decimal data.
An error responds if BT is connected to the other device.

■ Info

Data format : ASCII code in Decimal data format

■ Range

0 : -40dBm
1 : -20dBm
2 : -16Bm
3 : -12 dBm
4 : -8 dBm
5 : -4 dBm
6 : 0 dBm
7 : 4dBm
Other value error.

■ Examples

(HOST→BT) : AT+TXPWR=6\r
(BT→HOST) : +OK\r

6.2.15 AT+ADDRTYPE?

■ Description

Information on BT Advertiser Address type

■ Info

Data format : ASCII code in Decimal data format

■ Range

0 : Advertiser Public Address
1 : Advertiser Static Random Address
Other value error.

■ Examples

(HOST→BT) : AT+ADDRTYPE?\r
(BT→HOST) : 0\r

6.2.16 AT+ADDRTYPE=x

■ Description

Set the BT Advertiser Address type setting using the parameter data as Decimal data.
An error responds if BT is connected to the other device.
When using BLE Random Address, reset is required after saving data.
When using Random Address setting, BLE OTA function is not used.

The BLE OTA function can only be operated by setting PUBLIC Address.
When setting the Random Address, BT changes the BT Address information to Random every 15 minutes, or changes the Address information to Random after disconnecting the device.

■ Info

Data format : ASCII code in Decimal data format

■ Range

0 : Advertiser Public Address
1 : Advertiser Static Random Address
Other value error.

■ Examples

(HOST→BT) : AT+ADDRTYPE=1\r
(BT→HOST) : +OK\r
(HOST→BT) : AT+S\r
(BT→HOST) : +OK\r
(HOST→BT) : ATZ\r
(BT→HOST) : +OK\r
--- Rebooting ---
--- Restart ---
(BT→HOST) : +READY\r
--- When 'Advertiser Enable' operates ---
(BT→HOST) : +ADVERTISING\r

6.2.17 AT+SECURITY?

■ Description

Information on BT Security

■ Info

Data format : ASCII code in Decimal data format

■ Range

0 : IO Capabilities Display Only.

1 : IO Capabilities Display YES or NO.
2 : IO Capabilities Keyboard Only.
3 : IO Capabilities None.
4 : IO Capabilities Keyboard Display.
Other value error.

■ Examples

(HOST→BT) : AT+SECURITY?\r
(BT→HOST) : 3\r

6.2.18 AT+SECURITY=x

■ Description

Set the BT Security using the parameter data as Decimal data.
An error responds if BT is connected to the other device.

■ Info

Data format : ASCII code in Decimal data format

■ Range

0 : IO Capabilities Display Only.
1 : IO Capabilities Display YES or NO.
2 : IO Capabilities Keyboard Only.
3 : IO Capabilities None.
4 : IO Capabilities Keyboard Display.
Other value error.

■ Examples

(HOST→BT) : AT+SECURITY=3\r
(BT→HOST) : +OK\r

6.2.19 AT+PASSKEY=xxxxxx

■ Description

Enter the 6-digit data displayed on the Central device when using the BT Security Keyboard setting.
Using parameter data as Decimal data.
An error responds if BT is not connected to the other device or does not receive Passkey input event.

■ Info

Data format : ASCII code in Decimal data format

■ Examples

(HOST→BT) : AT+PASSKEY=123456\r
(BT→HOST) : +OK\r

6.2.20 AT+DELBOND

■ **Description**

Delete all BT BONDED data.

An error responds if BT is connected to the other device.

■ **Examples**

(HOST→BT) : AT+DELBOND\r

(BT→HOST) : +OK\r

6.2.21 AT+SLEEP=x

■ **Description**

Set the BT module sleep mode operation. The default 'idle sleep' mode operates (Uart ON sleep mode) if a sleep mode operation is not set through a command

■ **Info**

Data format : ASCII code in Decimal data format

■ **Range**

0 : BT Uart module off sleep mode.

1 : BT Deep sleep mode.

Other value error.

■ **Wakeup**

0 : BT Uart off sleep mode

→ PIO.01 both edge. (default low -> high -> low) -> Uart module init.

→ Wakeup Delay (500mS)

1 : BT Deep sleep mode.

→ PIO.01 both edge. (default low -> high -> low) -> BT Device reset wake up.

→ Wakeup Delay (500mS)

■ **Examples**

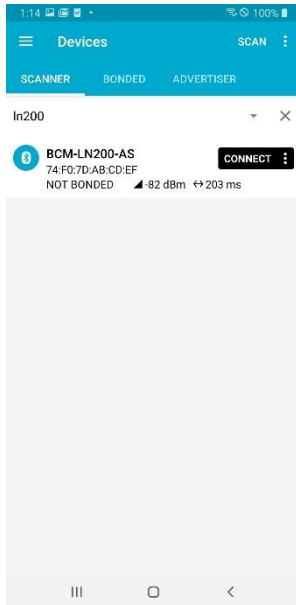
(HOST→BT) : AT+SLEEP=0\r

(BT→HOST) : +OK\r

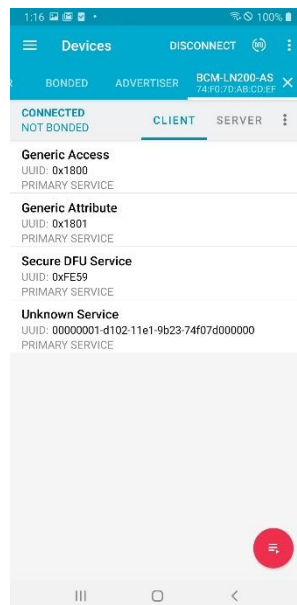
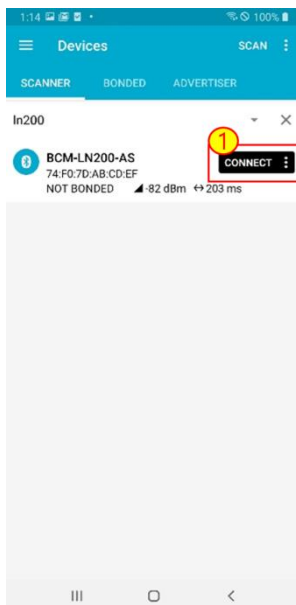
7. Over The Air Device Firmware Update Guide

Nordic Application “nRF Connect” User Guide. Play store Download.

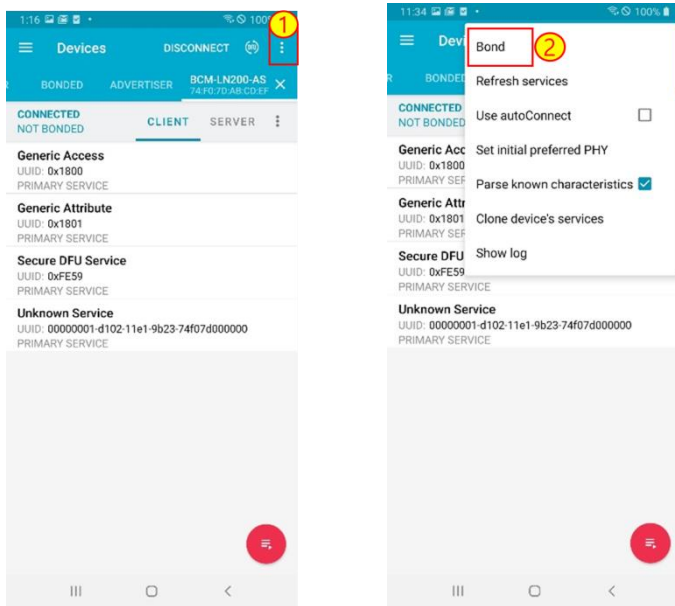
7.1 Ble Device Scan



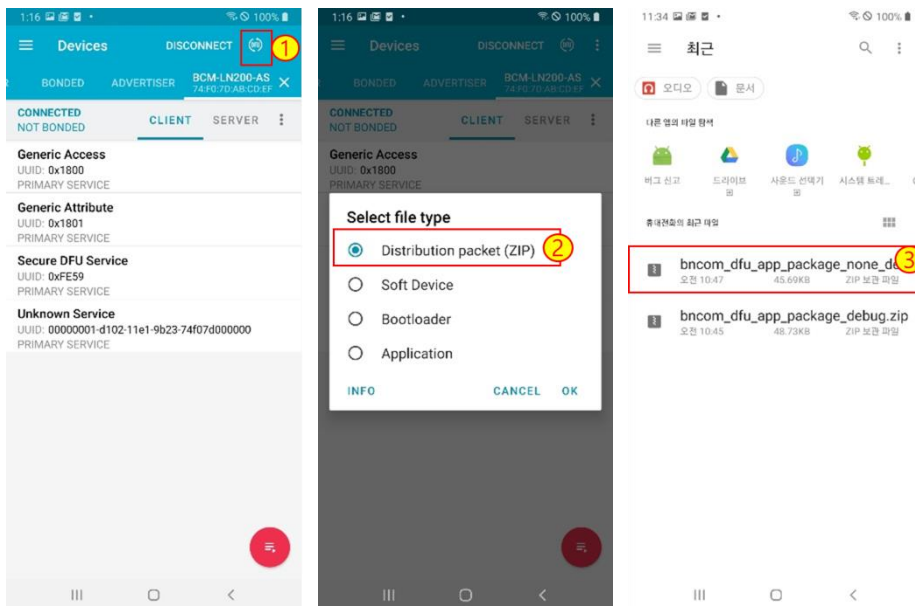
7.2 BLE Device Connect



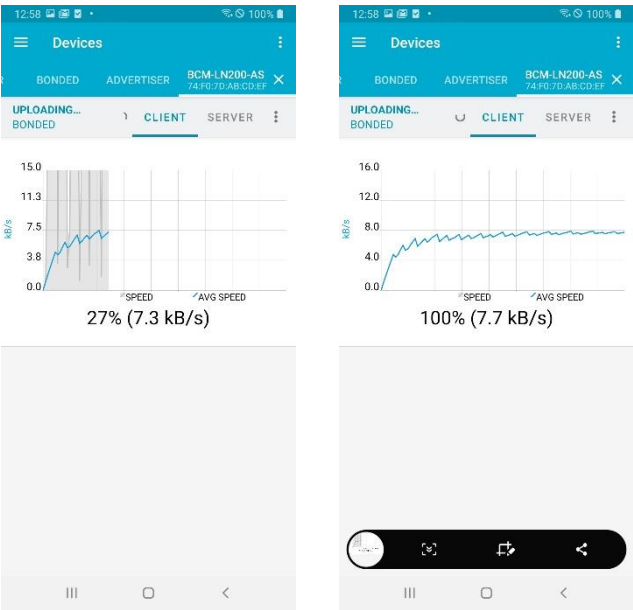
7.3 BLE Device Bonded



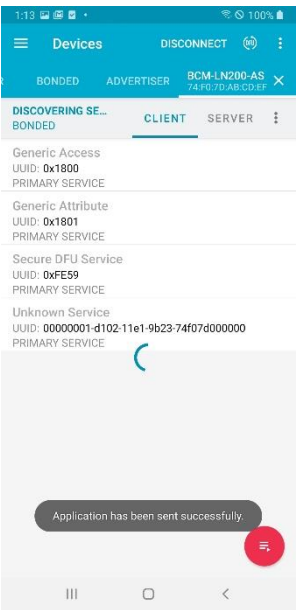
7.4 Update File Select



7.5 BLE Device Firmware Updating



7.6 BLE Device Update Complete



FCC Certification and Statement

The BCM-LN200-AS modules from BNCOM are certified for the FCC as a single-modular transmitter. The modules are FCC-certified radio modules that carries a modular grant. Users are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the authority of the user to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation of the device.

FCC Information to User

Caution

THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

Exposure to Radio Frequency Radiation.

To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

Any Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

IMPORTANT NOTE : FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

OEM/integrators Installation Manual

the modules 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.

the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Instructions to the OEM/integrator

The OEM integrator must include the instructions or statements required by part 15.19 and 15.21 in the user manual.

the OEM integrator must include a separate section in the host user's manual concerning the operating conditions to satisfy RF exposure compliance.

there is requirement that the grantee provide

Traceability requirements information

Model Name : BCM-LN200-AS

Manufacturer : BNCOM.CO.LTD

Manufacturer Logo :



Address : #1106, M-Techno Center, 46, Gongdan-ro 140 Beon-gil,
Gunpo-si, Gyeonggi-do, 15847, Korea.

Information on test modes and additional testing requirements

A separate test firmware is provided for the RF test and Proceeds as follows:

Provides input voltage according to spec to module.

Connect the serial port of the module to the PC using the external UART interface board.

Download and run 'nRF connect APP' below link and then run 'direct test mode'

<https://www.nordicsemi.com/Software-and-tools/Development-Tools/nRF-Connect-for-desktop/Download#infotabs>

When running the APP, it looks like the following and RF test is possible by setting options. For details, a separate test guide is provided.

