User Manual

PRODUCT NAME : Bluetooth Low Energy Module

MODEL NAME : ETWBCLUL08

Designed	Checked	Approved	LG Innotek Co., Ltd.	
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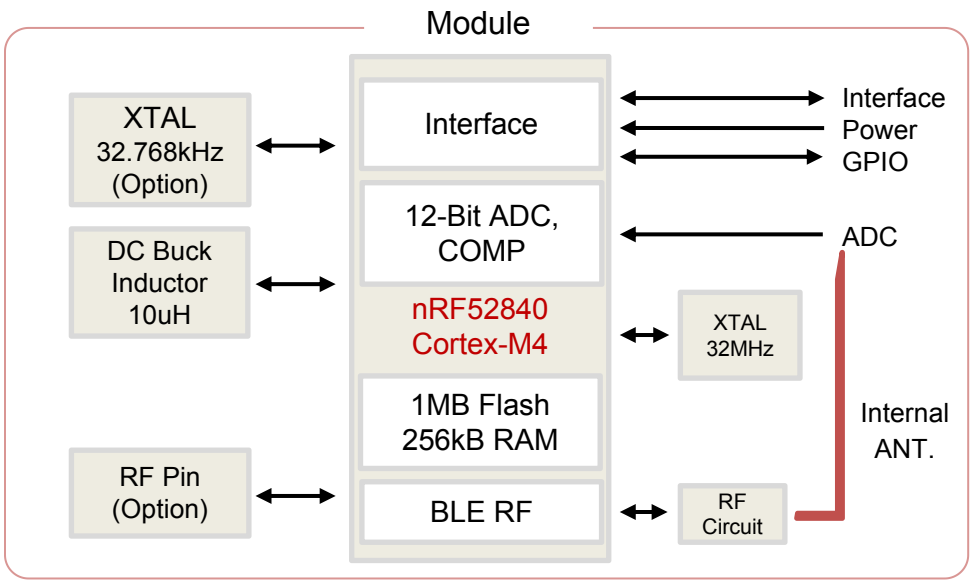
1. Features

ETWBCLUL04 is the small size with antenna BLE 5, IEEE 802.15.4-2006, 2.4 GHz transceiver based on nRF52840(Nordic) solution.

- Supported data rates
  1) Bluetooth® 5 : 2 Mbps, 1 Mbps, 500 kbps, and 125 kbps
  2) IEEE 802.15.4-2006 : 250 kbps
  3) Proprietary 2.4 GHz : 2 Mbps, 1 Mbps
- 128-bit AES/ECB/CCM/AAR co-processor (on-the-fly packet encryption)
- ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz
- Support DC/DC regulator system
- Integrated 2.4GHz PCB Printed Antenna(not used)
- 1MB flash and 256kB RAM
- 12-bit, 200ksps, ADC-8 configurable channels with programmable gain
- Support GPIO,PDM,PWM,SPI,I2C,I2S,UART,RTC , 64level comparator
- Size : 15.6 x 9.9 x 2.3mm
- Application: used in mobile devices with external antenna only, ex. Enterprise lighting

2. Block diagram



3. Absolute maximum ratings

Caution : Stresses exceeding the absolute maximum ratings in Table 1 may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended.
In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

< Table 1 >

Parameter	Min	Max	Unit
VCC	-	+3.9	V
Junction temperature		110	℃
Storage Humidity (40℃)	-	90	%
Storage Temperature	-40	+85	℃
MSL (Moisture Sensitivity Level)	3		
ESD HBM	±1		kV
ESD MM	±500	-	V

※ Other conditions

1) Do not use or store modules in the corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are contained. Also, avoid exposure to moisture.
2) Store the modules where the temperature and relative humidity do not exceed 5 to 40℃ and 20 to 60%.
3) Assemble the modules within 6 months. Check the soldering ability in case of 6 months over.
4) MSL Level 3 (Floor Life Time : 168Hrs. / Condition : ≤30℃, 60% RH), Standard : IPC / JEDEC J-STD-020C

4. Recommendation operating conditions

Parameter	Min	Typ	Max	Unit
Operating temperature	-40	-	85	℃
Ambient Humidity (40℃)	-	-	85	%
VCC	1.8	3.3	3.6	V

5. Standard test conditions

The Test for electrical specification shall be performed under the following condition.
Otherwise this following conditions, not guaranteed this performance.

5-1. Ambient condition

Temperature	25 ± 5℃
Humidity	65 ± 5%

5-2. Power supply voltages

Input power	Supply Voltage
VCC	3.3V

5-3. ESD Information

ESD	Min.	Max.	Unit
Human Body Model (HBM)	±1		kV
Machine Model (MM)	±500		V

Note 1) Discharge : Contact, Interval : 1sec, Count : 1 time
Condition : C1(100pF), R2(1500ohm), R1(1M~10Mohm) @ HBM Class 1C, JDEC

5-4. MSL

MSL Level 3 (Floor Life Time : 168Hrs. / Condition : ≤30℃, 60% RH)
Standard : IPC / JEDEC J-STD-020C

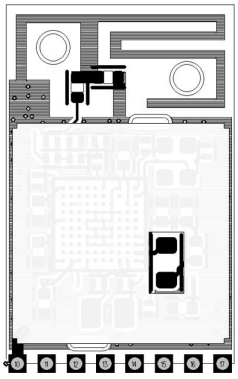
6. RF Specifications(Conducted Test)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Receiver sensitivity	1 Mbps	Packet length<=37 bytes, PER=30.8%	-	-93	-80	dBm
	2 Mbps	Packet length<=37 bytes, PER=30.8%	-	-91	-80	
Maximum received signal strength		Maximum received signal strength at < 30.8% PER	-10	5	-	dBm
Maximum output power		Conducted Test	5	8	-	dBm
Modulation Characteristics	1 Mbps	delta F1 average	225	-	275	kHz
		ratio(delta F2/delta F1)	80	-	-	%
	2 Mbps	delta F1 average	450	-	550	kHz
		ratio(delta F2/delta F1)	80	-	-	%
Carrier frequency offset and drift	1 Mbps	| f[n] |	-	-	150	kHz
		| f0 –fn |	-	-	50	kHz
Carrier frequency offset and drift	2 Mbps	| f[n] |	-	-	150	kHz
		| f0 –fn |	-	-	50	kHz

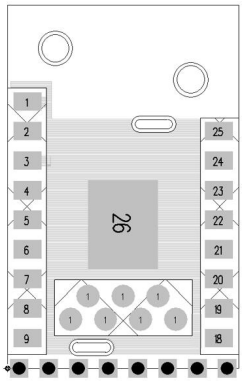
7. Pin Description

Pin No.	Pin Name	Pin Description
1	GND	Ground
2	ANT	Antenna pin for assembly option "external antenna" Not connected for assembly option “PCB antenna”.
3	GND	Ground
4	P0.02/AIN0	Analog input or General purpose I/O pin
5	P0.03/AIN1	Analog input or General purpose I/O pin
6	P0.04/AIN2	Analog input or General purpose I/O pin
7	P0.05/AIN3	Analog input or General purpose I/O pin
8	P0.30/AIN6	Analog input or General purpose I/O pin
9	P0.31/AIN7	Analog input or General purpose I/O pin
10	GND	Ground
11	VCC	Supply voltage
12	P0.15	General purpose I/O pin
13	P0.16	General purpose I/O pin
14	P0.28/AIN4	Analog input or General purpose I/O pin
15	P0.29/AIN5	Analog input or General purpose I/O pin
16	P0.11	General purpose I/O pin
17	P0.12	General purpose I/O pin
18	SWDCLK	Serial wire debug clock input for debug and programming
19	SWDIO	Serial wire debug I/O for debug and programming
20	nRESET	Reset
21	P0.13	General purpose I/O pin
22	P0.14	General purpose I/O pin
23	P0.26	General purpose I/O pin
24	P0.27	General purpose I/O pin
25	P1.00	General purpose I/O pin
26	GND	Ground

Pin N0. 1 →

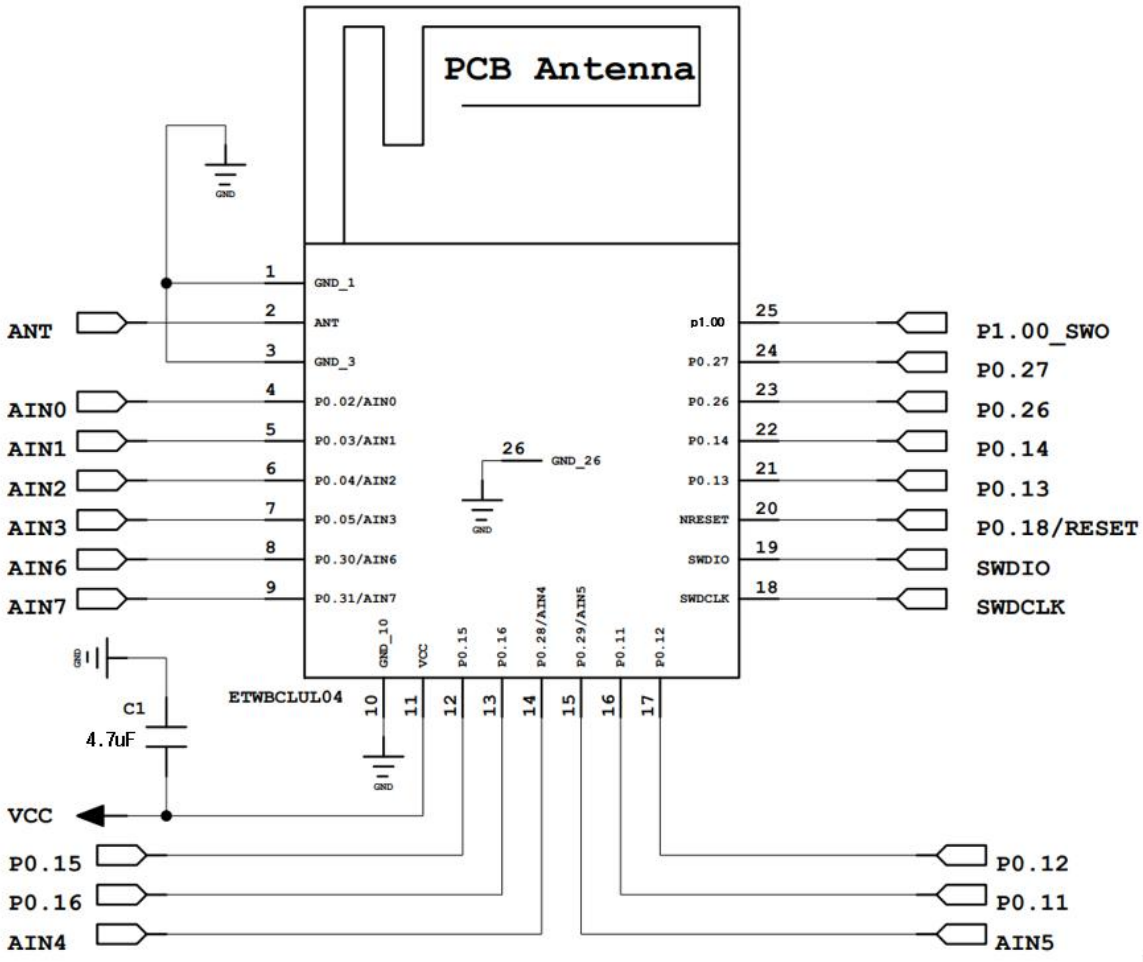


TOP View

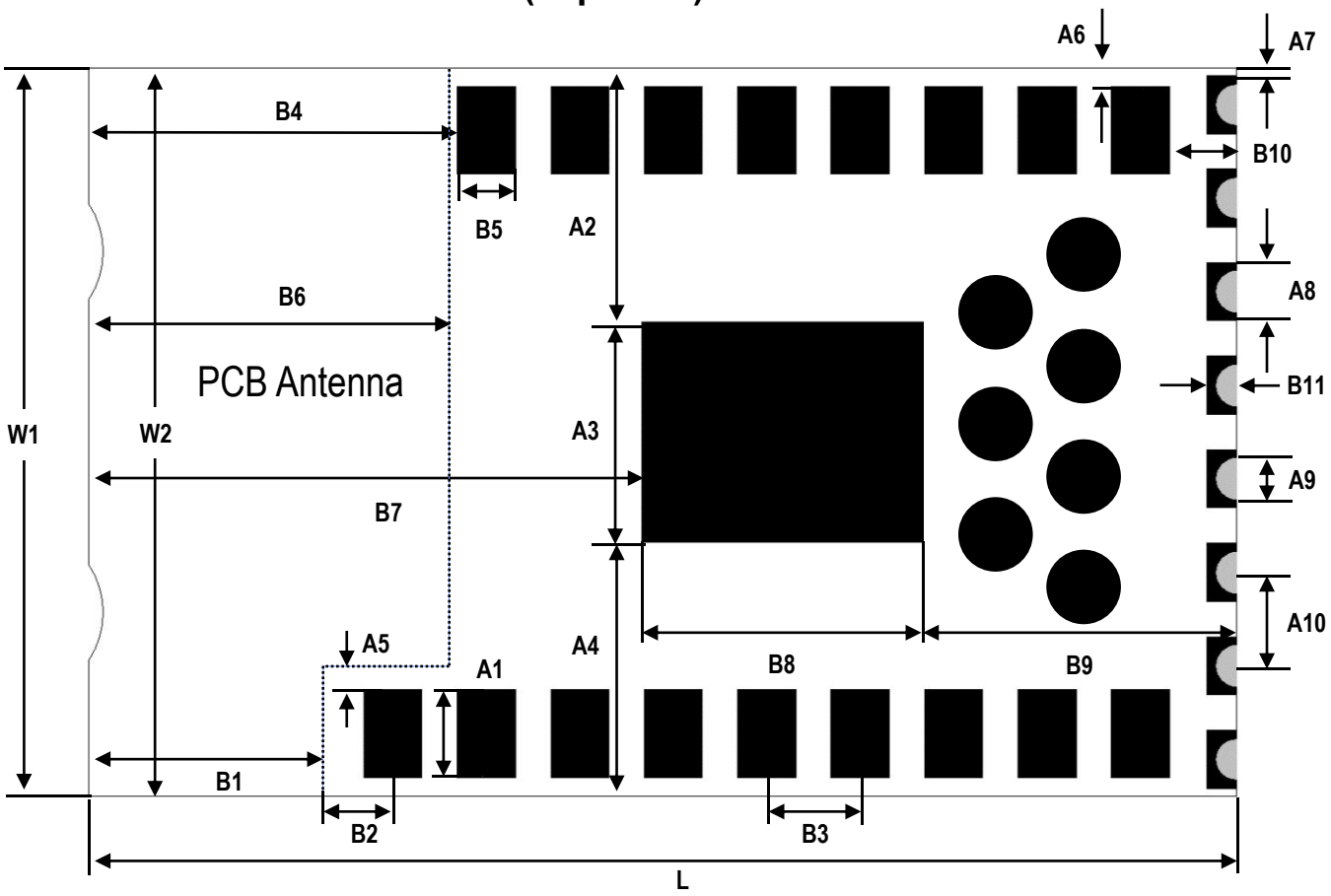


BOTTOM View

8. Application Schematic

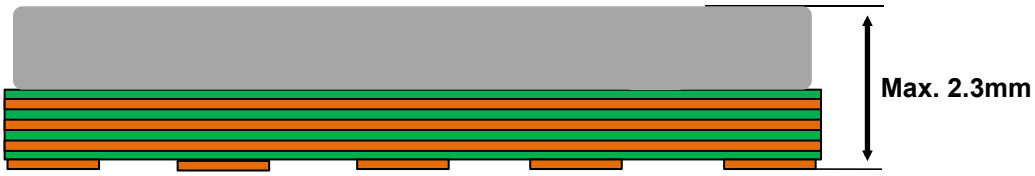


9. Mechanical Dimension (Top View)



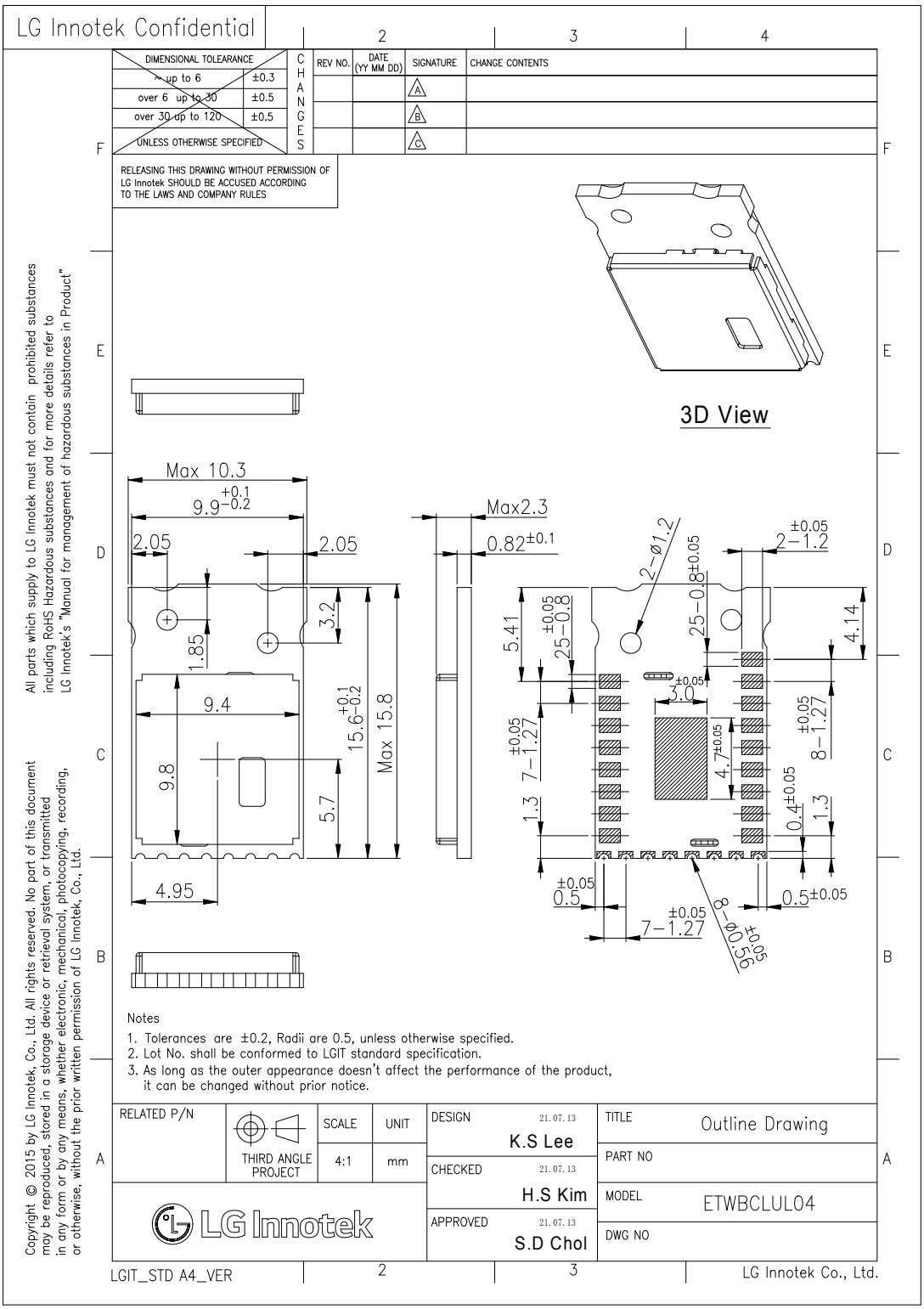
DIM	mm	DIM	mm	DIM	mm
W1	9.9 +0.1/-0.2	W2[1)]	9.9 +0.4/-0.4	L	15.6 +0.1/-0.2
A1	1.2 ± 0.05	A8	0.8 ± 0.05	B5	0.8 ± 0.05
A2	3.45 ± 0.05	A9	0.56 ± 0.05	B6	4.85 ± 0.05
A3	3.0 ± 0.05	A10	1.27 ± 0.05	B7[1)]	7.51 +0.25/-0.5
A4	3.45 ± 0.05	B1	3.24 ± 0.05	B8	3.85. ± 0.05
A5	0.45 ± 0.05	B2	0.9 ± 0.05	B9	4.24 ± 0.05
A6	0.25 ± 0.05	B3	1.27 ± 0.05	B10	0.9 ± 0.05
A7	0.1 ± 0.05	B4	5.01 ± 0.05	B11	0.4 ± 0.05

<ETWBCLUL04>



※ Notes
1) Router Area

10. Outline Drawing



Radiation Exposure Statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The module is limited to OEM installation only The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install module If the FCC dentification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: Contains Transmitter Module FCC ID: **2BC8G-LUL08**
When the module is installed inside another device, the user manual of the host must contain below warning statements;

1.1 List of applicable FCC rules
FCC Part 15 Subpart C 15.247 & 15.209

1.2 Specific operational use conditions
The module is a BLEModule

BLEModule	Operation Frequency	Number of Channel	Modulation	Antenna Spec.
		BLE	BLE	BLE
	2402-2480MHz	40	GFSK	Single External antenna 1dBi Max.

The module can be used for mobile applications with antennas up to 1dBi. The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operaition. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

1.3 Limited module procedures Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

1.4 Trace antenna designs
Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

1.5 RF exposure considerations
The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

1.6 Antennas
Antenna Specification are as follows:
Type: Single External antenna Gain: 1dBi .
This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employa 'unique' antenna coupler. As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

1.7 Label and compliance information
Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: **2BC8G-LUL08**" with their finished product.

1.8 Information on test modes and additional testing requirements
Operation Frequency: 2402-2480MHz
Number of Channel: 40
Modulation: GFSK

Host manufacturer must perfom test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

1.9 Additional testing, Part 15 Subpart B disclaimer The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.209 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter
installed.