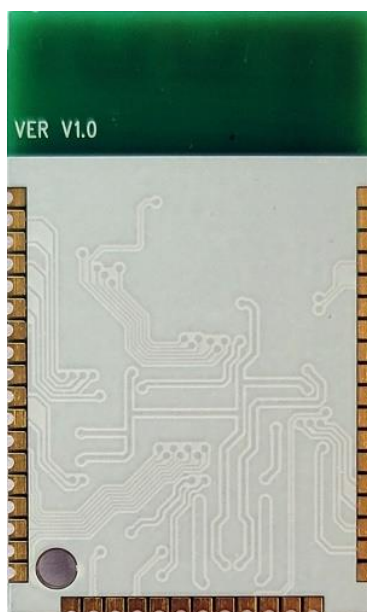


1. Module : MB3021



[Top]



[Bottom]

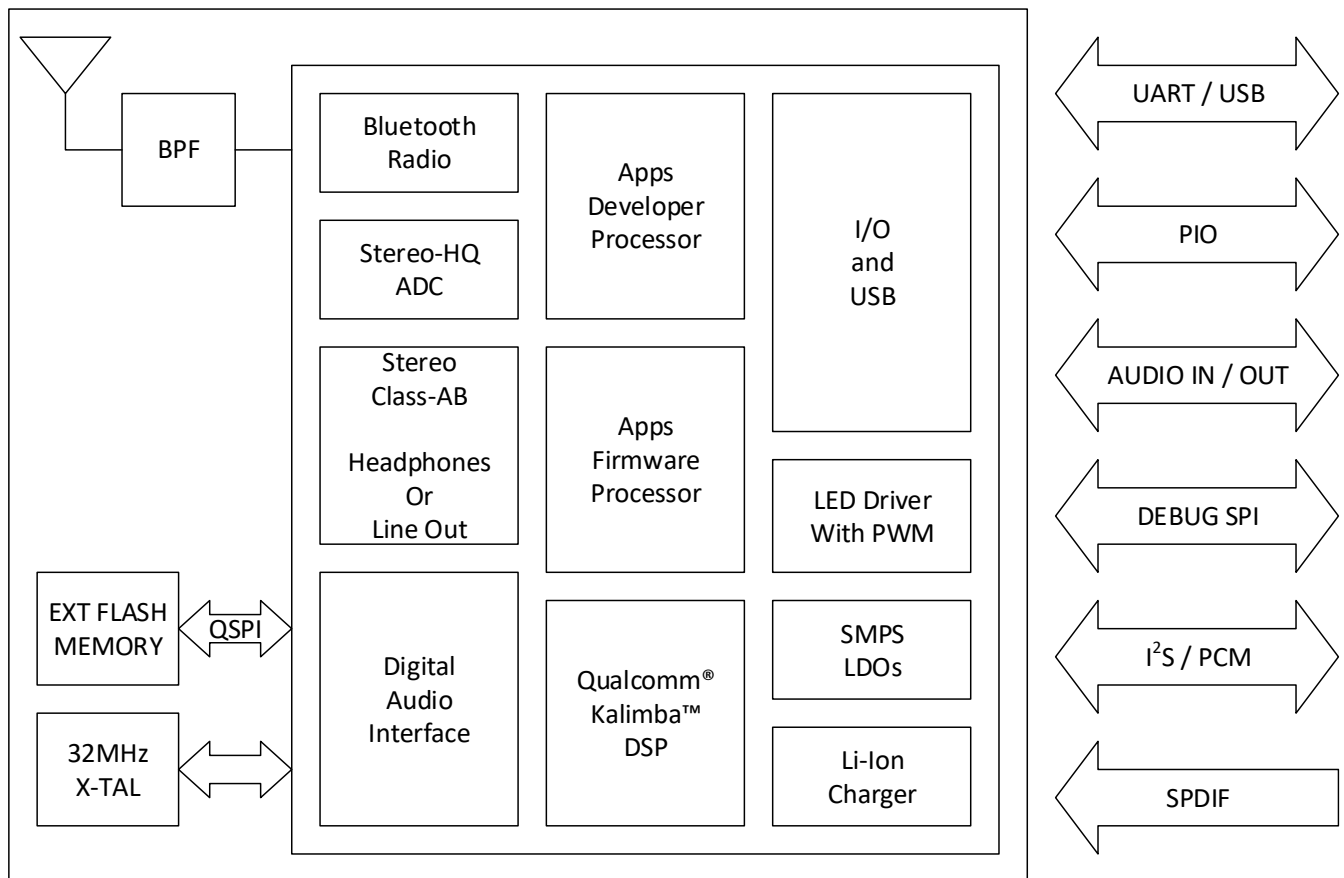
MB3021 is a fully integrated Bluetooth module. It is based on Qualcomm's QCC3021 chip with specific interface design to meet Customer's needs.

MB3021 is compatible with Bluetooth specification version 5.1. It integrates RF, Baseband controller, etc., a completed Bluetooth subsystem.

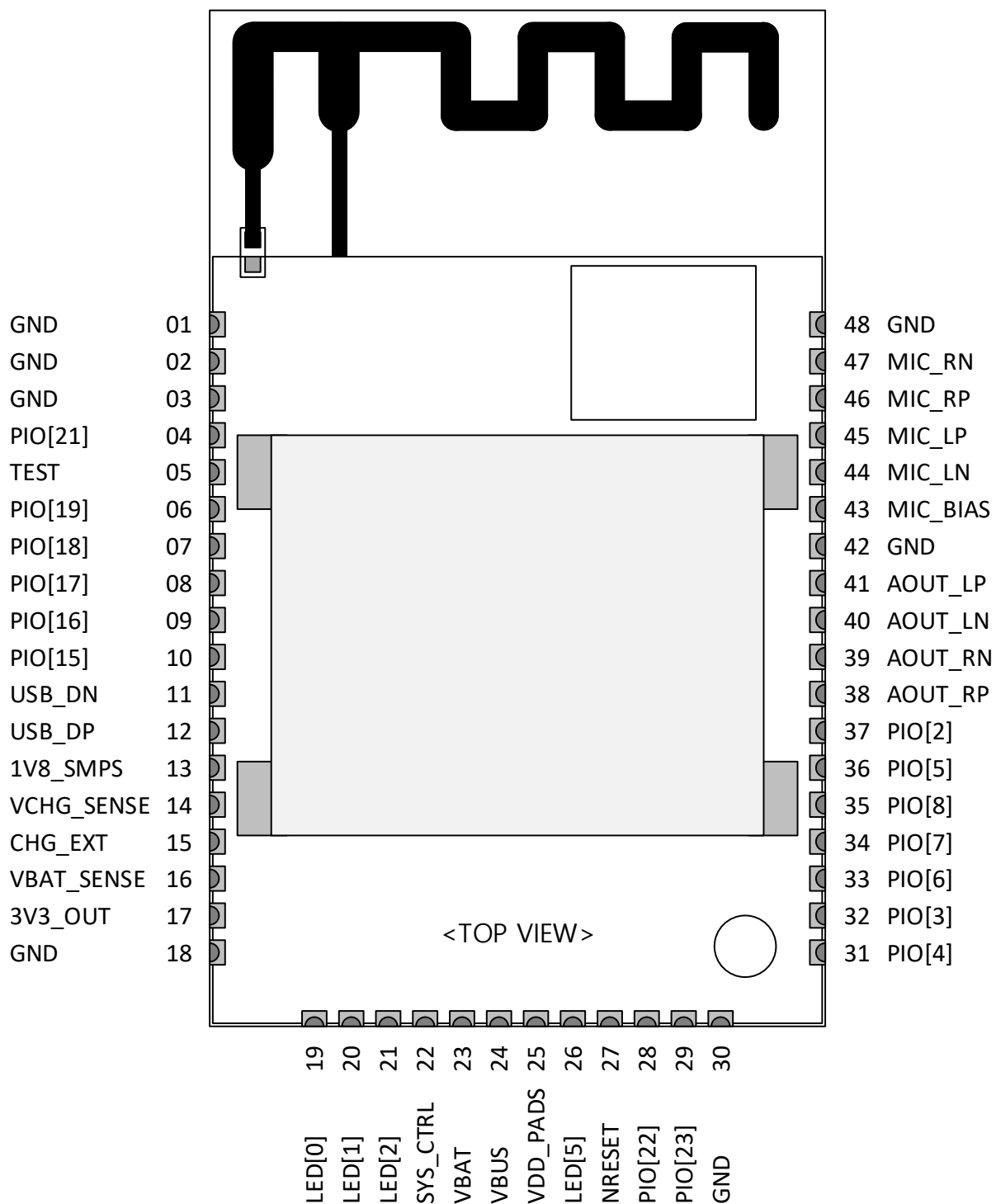
2. Module Specification

Chips	QCC3021
Bluetooth Spec	Bluetooth 5.1
Frequency Band	2402 ~ 2480 MHz
Tx Power	2.51mW ~ 6.31mW (Bluetooth Power Class I)
Rx Sensitivity	< -70dBm (BER 0.1%)
Distance	< 100m (Open Space)
Power Voltage	3.3V
Dimension	20.0 x 33.0 x 3.0 mm
Environmental Range	Operation temperature : -30 ~ +80℃
Modulation	GFSK, $\pi/4$ -DQPSK, 8DPSK
Communication Method	FHSS

3. Block Diagram



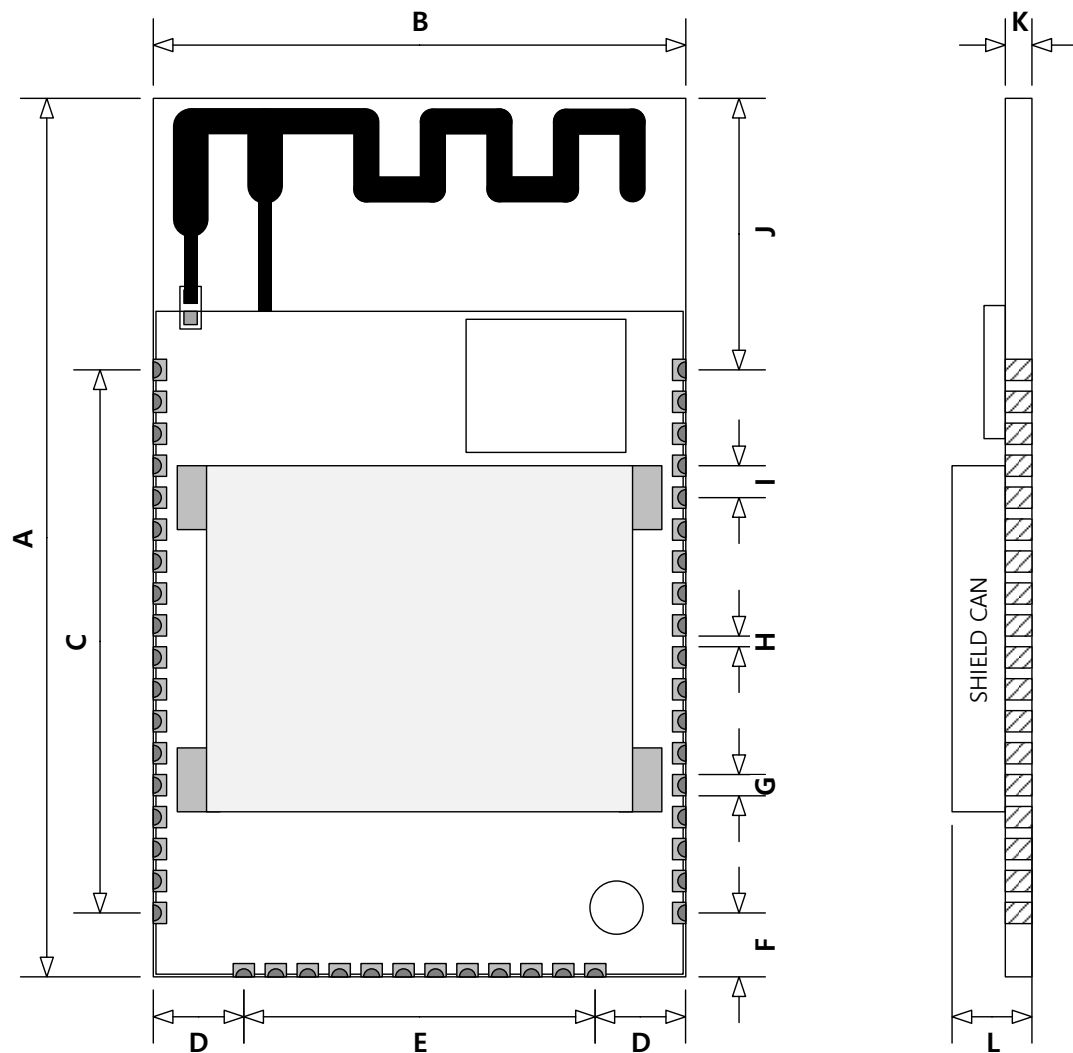
4. Pin Define



No	Pin Name	I/O	Reset State	Description
1	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS
2	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS
3	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS
4	PIO[21]	I/O	Pull-down	GPIO
5	TEST	I	Pull-down	Must be connected to ground
6	I2S_SDIN	I/O	Pull-down	SYNCHRONOUS DATA INPUT , Alternative function PIO[19]
7	I2S_SDOUT	I/O	Pull-down	SYNCHRONOUS DATA OUTPUT, Alternative function PIO[18]
8	I2S_WS	I/O	Pull-down	SYNCHRONOUS DATA SYNC , Alternative function PIO[17]
9	I2S_SCLK	I/O	Pull-down	SYNCHRONOUS DATA CLOCK, Alternative function PIO[16]
10	PIO[15]	I/O	Pull-down	Alternative function MCLK_OUT
11	USB_DN	I/O		USB DATA MINUS
12	USB_DP	I/O		USB DATA PLUS
13	1V8_SMPS	O		1.8V REGULATOR OUTPUT
14	VCHG_SENSE	I		CHARGER INPUT SENSE PIN
15	CHG_EXT	I		EXTERNAL BATTERY CHARGER CONTROL
16	VBAT_SENSE	I		BATTERY CHARGER SENSE INPUT
17	3V3_OUT	O		ALTERNATIVE SUPPLY VIA BYPASS REGULATOR FOR 1.8V AND 1.35V REGULATOR INPUTS. MUST BE THE SAME POTENTIAL AS VBAT.
18	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS
19	LED[0]	O		General-purpose analog/digital input or open drain LED output.
20	LED[1]	O		General-purpose analog/digital input or open drain LED output.
21	LED[2]	O		General-purpose analog/digital input or open drain LED output.
22	SYS_CTRL	I	Pull-down	REGULATOR ENABLE INPUT
23	VBAT	I		BATTERY POSITIVE TERMINAL
24	VBUS	I		BATTERY CHARGER INPUT
25	VDD_PADS	I		1.7~3.6V SUPPLY INPUT FOR IO PORTS

26	LED[5]	O		General-purpose analog/digital input or open drain LED output.
27	NRESET	I	Pull-up	RESET IF LOW (>5ms)
28	UART_TX	O	Pull-down	UART DATA OUT, Alternative function PIO[22]
29	UART_RX	I	Pull-down	UART DATA IN, Alternative function PIO[23]
30	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS
31	PIO[4]	I/O		PIO[4], Alternative function UART Request to Send
32	PIO[3]	I/O		PIO[3], Alternative function UART Clear to Send
33	PIO[6]	I/O		GPIO, Alternative function TBR_MOSI[0]
34	PIO[7]	I/O	Pull-up	GPIO, Alternative function TBR_MISO[0]
35	PIO[8]	I/O	Pull-down	GPIO, Alternative function TBR_CLK
36	PIO[5]	I/O	Pull-down	GPIO
37	PIO[2]	I/O	Pull-down	GPIO
38	AOUT_RP	O		SPEAKER OUTPUT POSITIVE RIGHT
39	AOUT_RN	O		SPEAKER OUTPUT NEGATIVE RIGHT
40	AOUT_LN	O		SPEAKER OUTPUT NEGATIVE LEFT
41	AOUT_LP	O		SPEAKER OUTPUT POSITIVE LEFT
42	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS
43	MIC_BIAS	O		MIC BIAS OUTPUT
44	MIC_LN	I		MIC INPUT NEGATIVE LEFT
45	MIC_LP	I		MIC INPUT POSITIVE LEFT
46	MIC_RN	I		MIC INPUT NEGATIVE RIGHT
47	MIC_RP	I		MIC INPUT POSITIVE RIGHT
48	GND	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITRY AND PADS

5. Mechanical Dimension



TOP VIEW

Mark	Dimension	Mark	Dimension	Mark	Dimension	Mark	Dimension
A	33.0±0.3	D	3.4±0.3	G	0.8±0.15	J	10.2±0.3
B	20.0±0.3	E	13.2±0.3	H	0.4±0.15	K	1.0±0.3
C	20.4±0.3	F	2.4±0.3	I	1.2±0.15	L	3.0±0.3

(Unit : mm)

Module PCB coplanarity measured from seating plane ≤ 0.1 mm

6. Electrical Characteristics

Conditions: VDD = 3.3V, Ta = 25 °C, unless otherwise noted.

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power Supply Voltage : VBAT	-0.4V	4.8V	DCV
Power Supply Voltage : VBUS	-0.4V	7.0V	DCV
Power Supply Voltage : VDD PADS	-0.4V	3.8V	DCV
Storage Temperature	-40	85	°C

Recommended Operating Conditions

Parameter	Min	Max	Unit
Power Supply Voltage : VBAT	3.0V	4.6V	DCV
Power Supply Voltage : VBUS	4.75V	5.5V	DCV
Power Supply Voltage : VDD PADS	3.0V	3.6V	DCV
Operation Temperature	-30	80	°C

Current consumption

Parameter	Connection Type	Avg	Peak	Unit
Page scan, Time interval = 1.28s	-	<1	1	mA
Inquiry and Page scan, Time interval = 1.28s	-	<1	1	mA
ACL No data transfer	Master	1.5	2	mA
ACL data transfer	Master	17	43	mA

Input/Output Characteristics

Parameter	Min	Max	Unit
V _{IL} Input Voltage Low	-0.4	0.8	V
V _{IH} Input Voltage High	0.7*VDD	VDD+0.4	V
V _{OL} Output Voltage Low	-	0.2	V
V _{OH} Output Voltage High	VDD-0.2	-	V

General Performance					
Parameter	Condition	Min	Typ	Max	Unit
Frequency Range	Normal	2402	-	2480	MHz

Transmitter Performance					
Parameter	Condition	Min	Avg	Max	Unit
Transmit Power	Normal	4	-	10	dBm
Parameter	Condition	Min	Typ	Max	Unit
Power density	Normal	-	-	<20	dBm
20dB bandwidth	Normal			1000	KHz
Adjacent channel power ($F_0 = 2441\text{MHz}$)	$F = F_0 \pm 2\text{MHz}$	-	-	-20	dBm
	$F = F_0 \pm 3\text{MHz}$	-	-	-40	dBm
	$F = F_0 \pm 4\text{MHz}$	-	-	-40	dBm
Out-band Spurious Emission	30MHz ~ 1GHz	-	-	-36	dBm
	1GHz ~ 12.75GHz	-	-	-30	dBm
	1.8GHz ~ 1.9GHz	-	-	-47	dBm
	5.1GHz ~ 5.3GHz	-	-	-47	dBm
Modulation Characteristic	$\Delta F_{1\text{avg}}$	140	-	175	KHz
	$\Delta F_{2\text{max}}$	115	-	-	KHz
	$\Delta F_{2\text{avg}} / \Delta F_{1\text{avg}}$	80	-	-	%
Initial Carrier Frequency Tolerance	DH1 packet	-75	-	75	KHz
Carrier Frequency Drift	DH5 packet	-25		25	KHz

Receiver Performance					
Parameter	Condition	Min	Type	Max	Unit
Sensitivity at 0.1% BER	Single slot (DH1 packet)	-	-	-70	dBm
Sensitivity at 0.1% BER	Multi slot (DH5 packet)	-	-	-70	dBm
Maximum received signal at 0.1% BER		-20	-	-	dBm
Maximum level of intermodulation interferers	$f_1 - f_2 = 5 \text{ MHz}$, $P_{\text{wanted}} = -64 \text{ dBm}$	-39	-	-	dBm

Regulatory Statement (FCC)

• Part 15.19 Statement

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.

• Part 15.105 Statement (Class B)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

• Part 15.21 Statement

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

• Responsible Party Information (Supplier's Declaration of Conformity)

LG Electronics USA
1000 Sylvan Avenue Englewood Cliffs
New Jersey, United States, 07632

Regulatory Statement (FCC)

Regulatory notice to host manufacturer according to KDB 996369 D03 OEM Manual v01

List of applicable FCC rules

This module has been granted modular approval as below listed FCC rule parts.

- FCC Rule parts 15C(15.247)

Summarize the specific operational use conditions

The OEM integrator should use equivalent antennas which is the same type and equal or less gain than an antenna listed in this instruction manual.

RF exposure considerations

The module has been certified for integration into products only by OEM integrators under the following condition:

- The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.
- The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.
- Mobile use

As long as the three conditions above are met, further transmitter testing will not be required.

OEM integrators should provide the minimum separation distance to end users in their end-product manuals.

Regulatory Statement (FCC)

- **Antennas list**

This module is certified with the following integrated antenna.

-Type: PCB Trace Antenna

-Max. peak Antenna gain

BT Ant: 2.90 dBi (2402 - 2480 MHz)

Any new antenna type, higher gain than listed antenna should be met the requirements of FCC rule 15.203 and 2.1043 as permissive change procedure.

- **Label and compliance information**

End Product Labeling

The module is labeled with its own FCC ID and IC Certification Number. If the FCC ID and IC Certification Number are 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. In that case, the final end product must be labeled in a visible area with the following:

Contains FCC ID: BEJ-MB3021

Contains IC: 2703H-MB3021

- **Information on test modes and additional testing requirements**

OEM integrator 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, additional transmitter in the host, etc.).

- **Additional testing, Part 15 Subpart B disclaimer**

The final host product also requires Part 15 subpart B compliance testing with the modular transmitter installed to be properly authorized for operation as a Part 15 digital device.

Regulatory Statement (ISED)

RSS-GEN, Sec. 7.1.3—(licence-exempt radio apparatus)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure

The antenna (or antennas) must be installed so as to maintain at all times a distance minimum of at least 20 cm between the radiation source (antenna) and any individual. This device may not be installed or used in conjunction with any other antenna or transmitter.

l'exposition aux RF

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation (l'antenne) et toute personne physique.

Étiquetage du produit final (IC)

Le module MB3021 est étiqueté avec sa propre identification FCC et son propre numéro de certification IC. Si l'identification FCC et le numéro de certification IC ne sont pas visibles lorsque le module est installé à l'intérieur d'un autre dispositif, la partie externe du dispositif dans lequel le module est installé devra également présenter une étiquette faisant référence au module inclus. Dans ce cas, le produit final devra être étiqueté sur une zone visible avec les informations suivantes :

Contient module émetteur identification FCC ID: BEJ-MB3021

Contient module émetteur IC : 2703H-MB3021

CE Statement

RF Exposure

The antenna (or antennas) must be installed so as to maintain at all times a distance minimum of at least 20 cm between the radiation source (antenna) and any individual. This device may not be installed or used in conjunction with any other antenna or transmitter

Simplified Declaration of Conformity (CE / UK)

Hereby, LG Electronics declares that hat MB3021 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <http://www.lg.com/global/support/cedoc/cedoc#>

Hereby, [LG Electronics Inc.]. declares that MB3021 is in compliance with the Radio Equipment Regulations 2017. The full text of the UK declaration of conformity is available at the following internet address: <http://www.lg.com/global/support/cedoc/cedoc#>

This restriction will be applied in all member states.

The postal address: LG Electronics European Shared Service Center B.V. Krijgsman 1, 1186 DM Amstelveen, The Netherlands

UK Importer: LG Electronics U.K. Ltd

The postal Address: Velocity 2, Brooklands Drive, Weybridge, KT13 0SL