LG MB3021 Bluetooth 5.1 Smart Device Module User Manual

Bluetooth 5.1 Smart Device Module
User Manual

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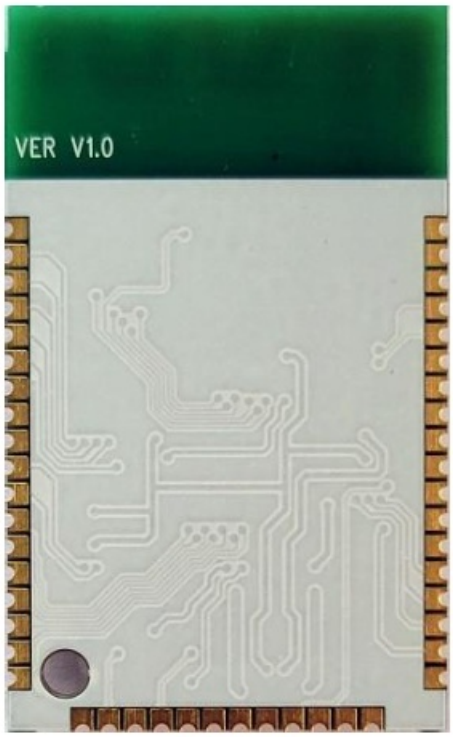
MB3021 Bluetooth 5.1 Smart Device Module

Module : MB3021

[Top]



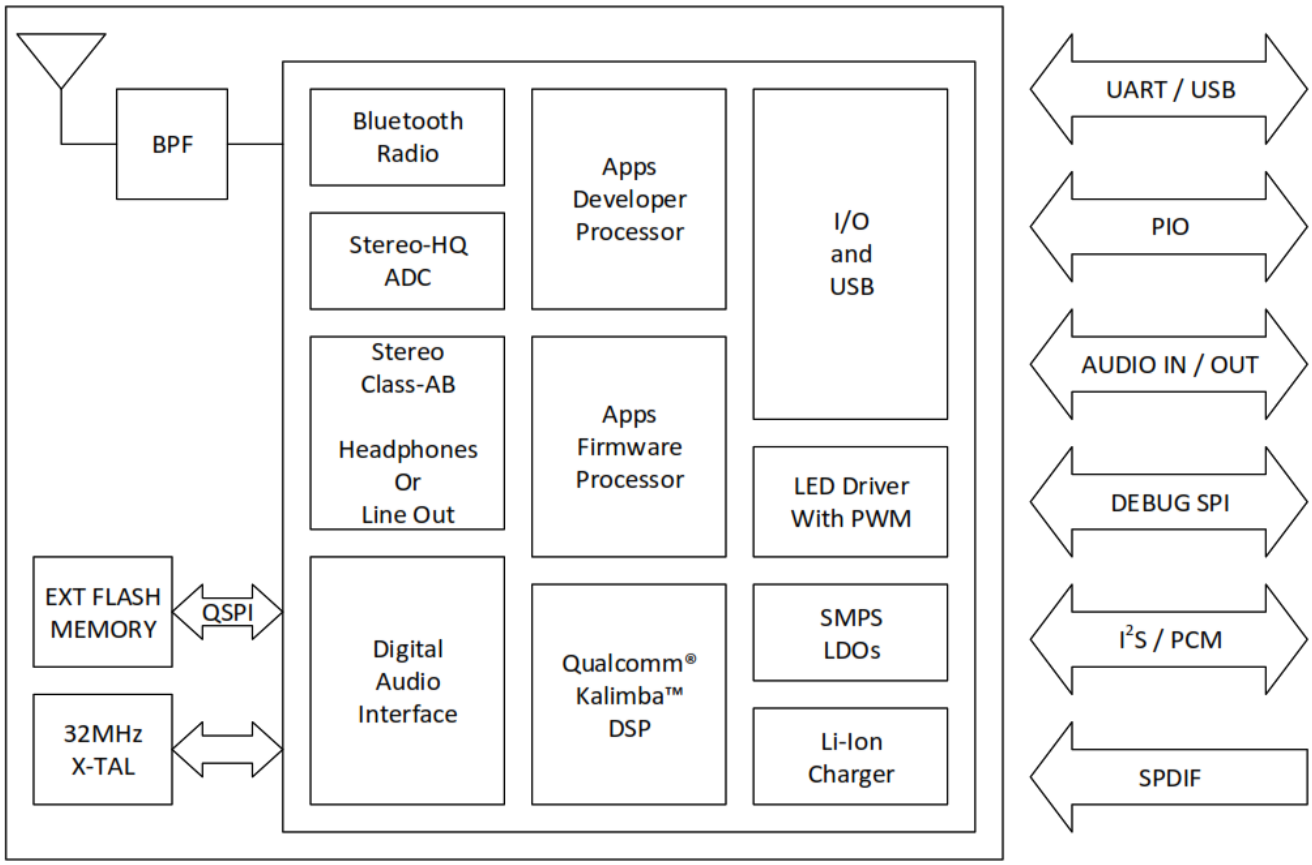
[Bottom]

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.

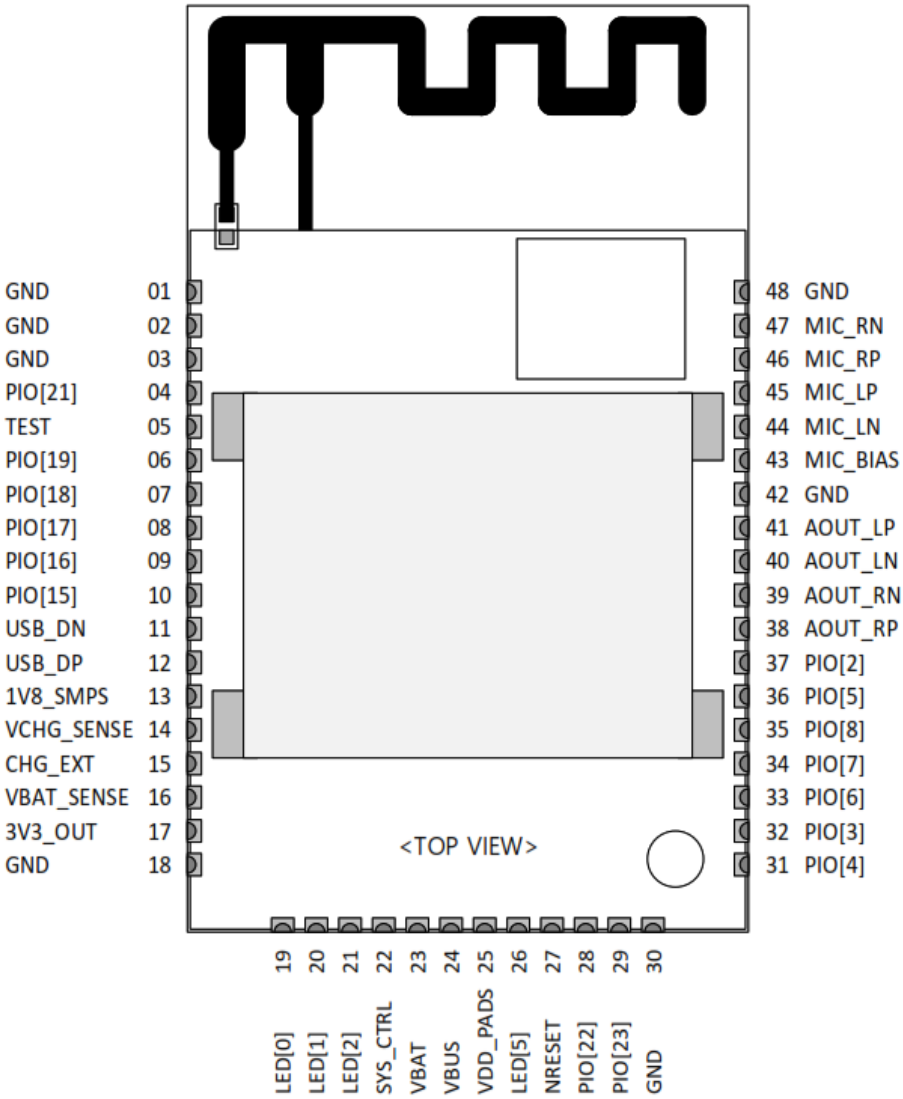
Module Specification

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	20.0x33.0 x3.0 mm
Environmental Range	Operation temperature : -30 ~ +80℃
Modulation	GFSK, π/4-DQPSK, 8DPSK
Communication Method	FHSS

Block Diagram


BPF
Bluetooth Radio
Stereo-HQ ADC
Stereo Class-AB
Headphones Or Line Out
Digital Audio Interface
Apps Developer Processor
Apps Firmware Processor
Qualcomm® Kalimba™ DSP
I/O and USB
LED Driver With PWM
SMPS LDOs
Li-Ion Charger
EXT FLASH MEMORY
QSPI
32MHz X-TAL
UART / USB
PIO
AUDIO IN / OUT
DEBUG SPI
I²S / PCM
SPDIF

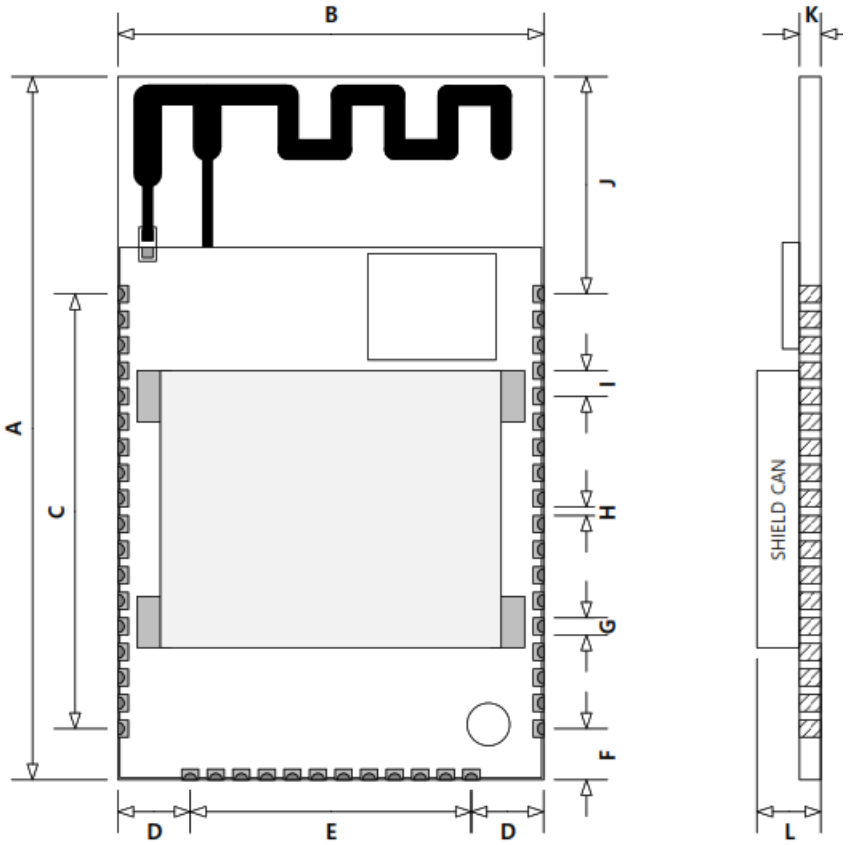
Pin Define


GND 01
GND 02
GND 03
PIO[21] 04
TEST 05
PIO[19] 06
PIO[18] 07
PIO[17] 08
PIO[16] 09
PIO[15] 10
USB_DN 11
USB_DP 12
1V8_SMPS 13
VCHG_SENSE 14
CHG_EXT 15
VBAT_SENSE 16
3V3_OUT 17
GND 18
48 GND
47 MIC_RN
46 MIC_RP
45 MIC_LP
44 MIC_LN
43 MIC_BIAS
42 GND
41 AOUT_LP
40 AOUT_LN
39 AOUT_RN
38 AOUT_RP
37 PIO[2]
36 PIO[5]
35 PIO[8]
34 PIO[7]
33 PIO[6]
32 PIO[3]
31 PIO[4]
<TOP VIEW>
19 LED[0]
20 LED[1]
21 LED[2]
22 SYS_CTRL
23 VBAT
24 VBUS
25 VDD_PADS
26 LED[5]
27 NRESET
28 PIO[22]
29 PIO[23]
30 GND

No	Pin Name	I/O	Reset State	Description
1	**GND**	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITTRY AND PADS
2	**GND**	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITTRY AND PADS
3	**GND**	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITTRY 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		ALTERMATIVE SUPPLY VIA BYPASS REGULATOR FOR 1.8V AND 1.35V REGULATOR INPUTS. MUSET BE THE SAME POTENTIAL AS VBAT.
18	**GND**	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITTRY 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 CIRCUITTRY 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 CIRCUITTRY AND PADS
43	**MIC_BIAS**	O		MIC BIAS OUTPUT
44	**MIC_LN**	I		MIC INPUT NEGATIVE LEFT
45	**MIC_LP**	I		MIC INPUT POSITIVIE LEFT
46	**MIC_RN**	I		MIC INPUT NEGATIVE RIGHT
47	**MIC_RP**	I		MIC INPUT POSITIVIE RIGHT
48	**GND**	I		GND CONNECTION FOR INTERNAL DIGITAL CIRCUITTRY AND PADS

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

Module PCB coplanarity measured from seating plane ≤ 0.1 mm

Electrical Characteristics

Conditions: VDD = 3.3V, Ta = 25 ℃, 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	**℃**

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	**℃**

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
VIL Input Voltage Low	-0.4	0.8	V
VIH Input Voltage High	0.7*VDD	VDD+0.4	V
VOL Output Voltage Low	–	0.2	V
VOH 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 (F0 = 2441 MHz)	F=F0 ±2MHz	–	–	-20	dBm
	F=F0 ±3MHz	–	–	-40	dBm
	F=F0 ±4MHz	–	–	-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	ΔF1avg	140	–	175	KHz
	ΔF2max	115	–	–	KHz
	ΔF2avg / ΔF1avg	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	f1-f2 = 5 MHz, Pwanted= -64 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 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 then 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.

- 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

  • BEContains 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.

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.

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

Documents / Resources

	LG MB3021 Bluetooth 5.1 Smart Device Module [pdf] User Manual MB3021, BEJ-MB3021, BEJMB3021, MB3021 Bluetooth 5.1 Smart Device Module, Bluetooth 5.1 Smart Device Module, Smart Device Module, Device Module, Module

References

- CeDoc