

User Manual

PRODUCT NAME : 802.11a/b/g/n/ac + Bluetooth Combo Module

MODEL NAME : ETWCERBC01

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LGSBWAC22 (LGE)

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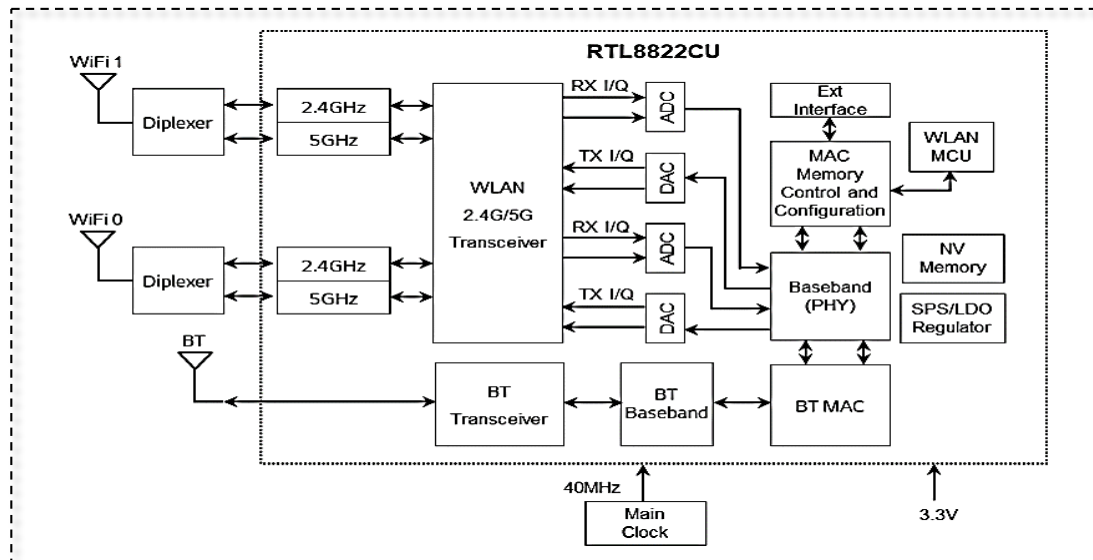
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1. Features

ETWCERBC01 is the small size and low power module for IEEE 802.11ac wireless LAN & BT5.0 + HS. ETWCERBC01 is based on Realtek RTL8822CU solution.

- IEEE 802.11 a/b/g/n/ac Dual Band
- Bluetooth 5.0+ HS , BLE
- Size : 68.0 x 30.0 x 6.65mm
- Two stream spatial multiplexing up to 300Mbps (802.11n) / 866.7Mbps (802.11ac)
- Use on-chip OTP (One-Time Programmable)
- Host Interface : USB2.0 (WLAN & BT)
 - This model is using the common USB2.0 to control WLAN and BT
- Security : 802.11e 802.11i (WPA, WPA2), WAPI
- WAPI, WEP, WPA, WPA2, WMM, AES, TKIP, CKP
- Application: DTV, DVR, HD DVD Player, Blue-ray Disk Player, STB

2. Block Diagram



3. Absolute Maximum Ratings

Caution : The specifications in Table 1 define levels at which permanent damage to the device can occur. Function operation is not guaranteed under these conditions.

Operating at absolute maximum conditions for extend periods can adversely affect the long-term reliability of the device.

Parameter	Min	Max	Unit
Storage Temperature	-20	+80	°C
Storage Humidity (40°C)	-	90	%

< Table 1 >

. 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°C and 20 to 60%.
- 3) Assemble the modules within 6 months.
Check the soldering ability in case of 6 months over.

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4. Operating Conditions

Parameter	Min	Typ	Max	Unit
Ambient Temperature	0	-	60	°C
Ambient Humidity (40°C)	-	-	85	%
Supply Voltage	3.135	3.3	3.6	Vdc

5. Standard Test Conditions

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

7-1. Ambient condition

Temperature	25 ± 5°C
Humidity	65 ± 5%

7-2. Power supply voltages

Input power	Supply Voltage
VDD_3.3V	3.135 ~ 3.6V

7-3. Current consumption

Current Consumption	Min.	Typ.	Max.	Unit
TX Mode (11ac/80MHz)			1200	mA
Idle and Associated state			300	
Radio disabled state			70	

Note 1. This figure is the RMS(root mean square) Value.

7-4. ESD Information

Human Body Model (HBM)	Min.	Max.	Unit
Contact	-	± 4	kV
Air	-	± 15	

Note 1. IEC 61000-4-2 (150pF, 330R)

Note 2. Test condition : After 8-pin USB Cable connect to module, progress ESD test.

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6. Electrical Specifications for Wi-Fi

6-1. RF Characteristics for IEEE802.11b (11Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11b			
Mode	DSSS/CCK			
Channel frequency	2400 ~ 2483.5 MHz			
Data rate	1, 2, 5.5, 11Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	14	17	20	dBm
Spectrum Mask				
1 st side lobes (to fc \pm 11MHz)			-30	dBr
2 nd side lobes (to fc \pm 22MHz)			-50	dBr
Modulation Accuracy (EVM)			35	%
Power On/Off ramp			2.1	Usec
Freq. Tolerance	-20		20	ppm
Chip Clock Freq. Tolerance	-20		20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (FER \leq 8%)			-82	dBm
Maximum Input Level (FER \leq 8%)	-10		-	dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. This varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain.

Note 3. The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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6-2. RF Characteristics for IEEE802.11g (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM			
Channel frequency	2400 ~ 2483.5 MHz			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	12	15	18	dBm
Spectrum Mask				
at $f_c \pm 11\text{MHz}$			-20	dBr
at $f_c \pm 20\text{MHz}$			-28	dBr
at $f_c \geq \pm 30\text{MHz}$			-40	dBr
Constellation Error (EVM)			-25	dB
Freq. Tolerance	-20		20	ppm
Chip Clock Freq. Tolerance	-20		20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (PER $\leq 10\%$)			-67	dBm
Maximum Input Level (PER $\leq 10\%$)	-20			dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. This varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain.

Note 3. The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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6-3. RF Characteristics for IEEE802.11a (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11a			
Mode	OFDM			
Channel frequency	5150~5850 MHz			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	10	13	16	dBm
Spectrum Mask				
at $f_c \pm 11\text{MHz}$			-20	dBr
at $f_c \pm 20\text{MHz}$			-28	dBr
at $f_c \geq \pm 30\text{MHz}$			-40	dBr
Constellation Error (EVM)			-25	dB
Freq. Tolerance	-20		20	ppm
Chip Clock Freq. Tolerance	-20		20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (PER $\leq 10\%$)			-67	dBm
Maximum Input Level (PER $\leq 10\%$)	-30			dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. This varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain.

Note 3. The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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6-4. RF Characteristics for IEEE802.11gn (MCS7 mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11n – 2.4GHz			
Mode	OFDM			
Channel frequency	2400 ~ 2483.5 MHz			
Data rate	6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (HT20:MCS7)	12	15	18	dBm
Spectrum Mask (HT20)				
at fc ± 11 MHz			-20	dBr
at fc ± 20 MHz			-28	dBr
at fc ± 30 MHz			-40	dBr
Constellation Error (EVM)			-28	dB
Freq. Tolerance	-20		20	ppm
Chip Clock Freq. Tolerance	-20		20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (HT20, PER $\leq 10\%$)			-65	dBm
Maximum Input Level (PER $\leq 10\%$)	-20			dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. This varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain.

Note 3. The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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6-5. RF Characteristics for IEEE802.11an (MCS7 mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11n – 5GHz			
Mode	OFDM			
Channel frequency	5150~5850 MHz			
Data rate	6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (HT20/HT40:MCS7)	10	13	16	dBm
Spectrum Mask (HT20)				
at fc ± 11 MHz			-20	dBr
at fc ± 20 MHz			-28	dBr
at fc ± 30 MHz			-40	dBr
Constellation Error (EVM)			-28	dB
Freq. Tolerance	-20		20	ppm
Chip Clock Freq. Tolerance	-20		20	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (HT20, PER $\leq 10\%$)			-65	dBm
Minimum Input Level Sens. (HT40, PER $\leq 10\%$)			-62	dBm
Maximum Input Level (PER $\leq 10\%$)	-30			dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. This varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain.

Note 3. The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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6-6. RF Characteristics for IEEE802.11ac (MCS8/9 mode unless otherwise specified)

Items		Contents			
Specification		IEEE802.11ac – 5GHz			
Mode		OFDM			
Channel frequency		5150 ~ 5850 MHz			
Data rate		6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78Mbps			
TX Characteristics		Min.	Typ.	Max.	Unit
Power Level	VHT20(MCS8)	9	12	15	dBm
	VHT40(MCS9)	9	12	15	dBm
	VHT80(MCS9)	9	12	15	dBm
Spectrum Mask (HT20)					
at $f_c \pm 11\text{MHz}$				-20	dBr
at $f_c \pm 20\text{MHz}$				-28	dBr
at $f_c \pm 30\text{MHz}$				-40	dBr
Constellation Error (EVM)	VHT20(MCS8)			-30	dB
	VHT40(MCS9)			-32	dB
	VHT80(MCS9)			-32	dB
Freq. Tolerance				20	ppm
Chip Clock Freq. Tolerance		-20		20	ppm
RX Characteristics		Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (VHT20, PER $\leq 10\%$)				-57	dBm
Minimum Input Level Sens. (VHT40, PER $\leq 10\%$)				-54	dBm
Minimum Input Level Sens. (VHT80, PER $\leq 10\%$)				-51	dBm
Maximum Input Level (PER $\leq 10\%$)		-30			dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. This varies by regulatory domain.

Refer to the product documentation for specific details for each regulatory domain.

Note 3. The maximum power setting will vary by channel and according to individual country regulations.

Refer to the product documentation for specific details.

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7. Electrical Specifications for Bluetooth

7-1. Transmitter Performance

Parameter (Condition)	Min.	Typ.	Max.	Unit
Transmit Power (P_{GPSK})	5	8	10	dBm
Power Density			20	dBm
Frequency Range	2400		2483.5	MHz
20dB Bandwidth			1000	kHz
In-band Spurious Emissions				
$\pm 500\text{kHz}$			-20	dBc
$ M-N = 2\text{MHz}$			-20	dBm
$ M-N \geq 3\text{MHz}$			-40	dBm
Modulation Characteristics, frequency Deviation				
$\Delta F_{1\text{avg}}$ (00001111 sequence in payload)	140		175	kHz
$\Delta F_{2\text{max}}$ (10101010 sequence in payload)	115			kHz
$\Delta F_{1\text{avg}} / \Delta F_{2\text{max}}$	80			%
Initial Carrier Frequency Tolerance	-75		75	kHz
Carrier Frequency Drift				
DH1 Packet	-25		25	kHz
DH3 Packet	-25		25	kHz
DH5 Packet	-40		40	kHz
Drift rate	-20		20	kHz / μs

Note 1. Normal Condition : 25°C, VDD=3.3V.

Note 2. Supported Bluetooth TX power class 1.

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7-2. Transmitter Performance

Parameter (Condition)		Min.	Typ.	Max.	Unit
EDR Relative Transmit Power		-4		1	dB
EDR Carrier Frequency Stability					
ω_i (2-DH5 and 3-DH5)		-75		75	kHz
ω_0 (2-DH5 and 3-DH5)		-10		10	kHz
$\omega_i + \omega_0$ (2-DH5 and 3-DH5)		-75		75	kHz
EDR Modulation Accuracy					
RMS DEVM	2-DH5			20	%
	3-DH5			13	%
99% DEVM DEVM < 0.30, $\pi/4$ -DQPSK DEVM < 0.20, 8DPSK symbols	2-DH5	99			%
	3-DH5	99			%
Peak DEVM	2-DH5			35	%
	3-DH5			25	%
EDR Differential Phase Encoding (packet with 0 error > 99%)		99			%
EDR In-band Spurious Emissions					
$ M-N = 1\text{MHz}$				Ptx_ref-26	dBm
$ M-N = 2\text{MHz}$				-20	dBm
$ M-N = 3\text{MHz}$				-40	dBm
Enhanced Power Control				4	dBm

7-3. BLE RF Performance

Parameter (Condition)	Min.	Typ.	Max.	Unit
Tx Power	5	8	10	dBm
Rx sensitivity (GFSK, BER, 1 Mbps)			-80	dBm
Mod Char : delta F1 average	225		275	kHz
Mod Char : delta F2 max	99.9		-	%
Mod Char : ratio	80		-	%

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7-4. Receiver Performance

Parameter (Condition)	Min.	Typ.	Max.	Unit
Rx sensitivity				
GPSK, 0.1% BER, 1Mbps			-70	dBm
$\pi/4$ -DQPSK, 0.01% BER, 2Mbps			-70	dBm
8-DPSK, 0.01% BER, 3Mbps			-70	dBm
C/I performance				
C/I co-channel (GFSK, 0.1%BER)			11	dB
C/I 1MHz (GFSK, 0.1%BER)			0	dB
C/I 2MHz (GFSK, 0.1%BER)			-30	dB
C/I ≥ 3 MHz (GFSK, 0.1%BER)			-40	dB
C/I image (GFSK, 0.1%BER)			-9	dB
C/I image \pm 1MHz (GFSK, 0.1%BER)			-20	dB
C/I co-channel ($\pi/4$ -DQPSK, 0.1%BER)			13	dB
C/I 1MHz ($\pi/4$ -DQPSK, 0.1%BER)			0	dB
C/I 2MHz ($\pi/4$ -DQPSK, 0.1%BER)			-30	dB
C/I ≥ 3 MHz ($\pi/4$ -DQPSK, 0.1%BER)			-40	dB
C/I image ($\pi/4$ -DQPSK, 0.1%BER)			-7	dB
C/I image \pm 1MHz ($\pi/4$ -DQPSK, 0.1%BER)			-20	dB
C/I co-channel (8-DPSK, 0.1%BER)			21	dB
C/I 1MHz (8-DPSK, 0.1%BER)			5	dB
C/I 2MHz (8-DPSK, 0.1%BER)			-25	dB
C/I ≥ 3 MHz (8-DPSK, 0.1%BER)			-33	dB
C/I image (8-DPSK, 0.1%BER)			0	dB
C/I image \pm 1MHz (8-DPSK, 0.1%BER)			-13	dB
Intermodulation(BER \leq 0.1%) Input = -64dBm, n=5	-39			dBm
Out-of-band blocking (CW, BER \leq 0.1%)				
30MHz ~ 2000MHz	-10			dBm
2000MHz ~ 2399MHz	-27			dBm
2498MHz ~ 3000MHz	-27			dBm
3000MHz ~ 12.75GHz	-10			dBm
Maximum input (GFSK, 0.1% BER)	-20			dBm

Note 1. Normal Condition : 25°C, VDD=3.3V.

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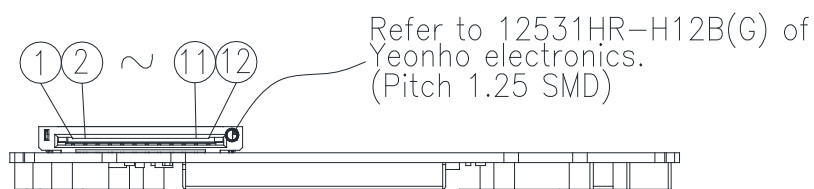
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8. Pin Description

Pin No.	Pin Name	I/O	Pin Description
1	VCC	I	VDD 3.3V
2	D-	I/O	USB Communication signal USB_DN
3	D+	I/O	USB Communication signal USB_DP
4	GND	-	GND
5	WOWL	O	Wake On WLAN
6	VCC	I	VDD 3.3V
7	RESUME	I	SUSPEND_RESUME
8	GND	-	GND
9	RESET	I	RESET
10	WOBLE	O	Host wake up. (Signal from Wi-Fi module to the host)
11	GND	-	GND
12	VCC	-	VDD 3.3V



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9. Mechanical Characteristics

1) Outline view

Item	Test Conditions
Assembly	No defects of wiring, soldering and assembling
Appearance	No dirt, rust, corrosion or foreign material

2) Appearance structure

Item	Test Conditions
Dimension	As assembly drawing
Mounting	As assembly drawing
Weight	8.5g

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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

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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(15.247,15.407)

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.

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Regulatory Statement (FCC)

- **Antennas list**

This module is certified with the following integrated antenna.

-Type: Metal Press Antenna

-Max. peak Antenna gain

1) ANT 1: -0.94 dBi (2412-2472MHz)/0.05 dBi (UNII-1)/0.98 dBi(UNII-2A)/1.41 dBi(UNII-2C)/1.44 dBi(UNII-3)

2) ANT 2: 1.50 dBi (2412-2472MHz)/1.42 dBi (UNII-1)/1.45 dBi(UNII-2A)/1.37 dBi(UNII-2C)/1.42 dBi(UNII-3)

3) BT Ant: 1.19 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: BEJLGSBWAC22

▪Contains IC: 2703H-LGSBWAC22

- **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.

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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 LGSBWAC22 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: BEJLGSBWAC22

Contient module émetteur IC : 2703H-LGSBWAC22