

User manual

PRODUCT NAME : Wi-Fi / BLE + MCU Module

MODEL NAME : LCWB-002EA

H/W version : V1.0

S/W version : V1.0

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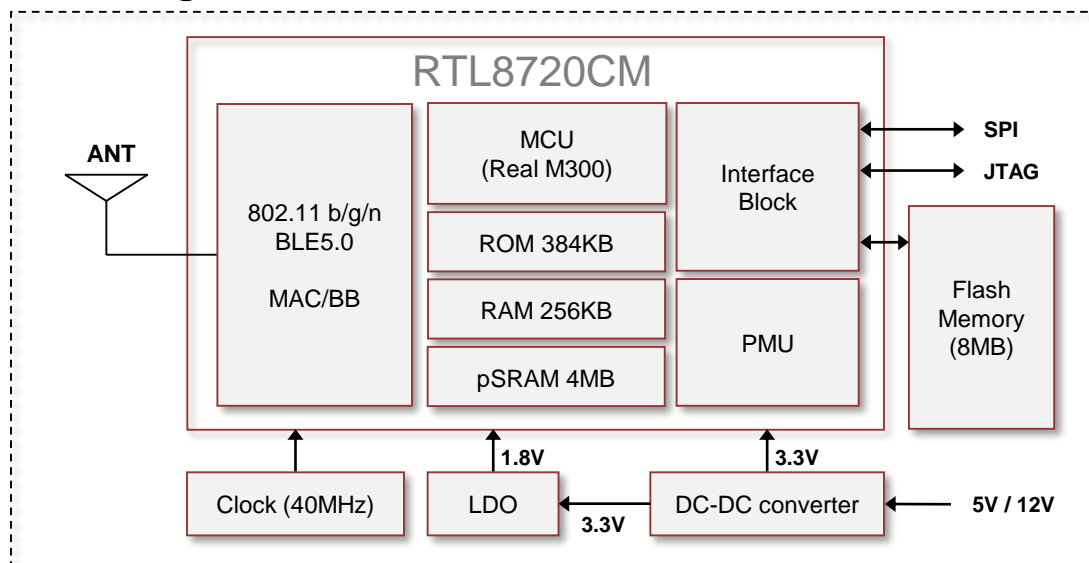
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1. Features

LCWB-002EA is the module for IEEE 802.11 b/g/n wireless LAN + BLE5.0 + MCU.
LCWB-002EA is based on Realtek RTL8720CM solution.

- IEEE 802.11 b/g/n HT20 single band WLAN infra-structure
- Bluetooth Low Energy 5.0 (BLE5.0)
- Size : 20 mm x 45 mm x 9.35 mm
- Auto-calibration (RF, Crystal)
- Data rates up to 72.2Mbps PHY rate
- SPI interface
- Integrated IPv4/IPv6 TCP/IP stack
- Integrated Network services such as HTTP, DNS, FTP
- Security : WFA, WPA, WPA2, WEP, WAPI, TKIP
- Application : Home Appliance

2. Block Diagram



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3. Absolute Maximum Ratings

Parameter	Min	Max	Unit
Storage Temperature	-40	+100	°C
Storage Humidity (@ 40°C)	-	90	%

Caution : The specifications above the Table 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.

- 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

4. Operating Test Conditions

Parameter	Min	Typ	Max	Unit
Operating Temperature	0	-	+85	°C
Operating Humidity (40°C)	-	-	85	%
Supply Voltage	4.5	5.0	5.5	Vdc
	10.8	12	13.2	

1) Test condition : AP connection Ping test mode(not continuous Tx and T-Put mode)

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5. Electrical Characteristics**5-1. RF Characteristics for IEEE802.11b** (11Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11b			
Mode	DSSS / CCK			
Channel frequency	2400 ~ 2483MHz			
Data rate	1, 2, 5.5, 11Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	11	14	17	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	-	-	2.0	usec
Freq. Tolerance	-25	-	25	ppm
Chip Clock Freq. Tolerance	-25	-	25	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
Minimum Input Level Sens. (FER \leq 8%)	-	-	-76	dBm
Maximum Input Level (FER \leq 8%)	-10	-	-	dBm

* Normal Condition : 25°C, VDD=5V.

* RF characteristics is board limit. It can differ according to standards

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5-2. RF Characteristics for IEEE802.11g (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM			
Channel frequency	2400 ~ 2483MHz			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	11	14	17	dBm
Spectrum Mask				
at fc \pm 11MHz	-	-	-20	dBr
at fc \pm 20MHz	-	-	-28	dBr
at fc $\geq \pm$ 30MHz	-	-	-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%)	-	-	-65	dBm
Maximum Input Level (PER \leq 10%)	-20	-	-	dBm

* Normal Condition : 25°C, VDD=5V.

* RF characteristics is board limit. It can differ according to standards

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5-3. RF Characteristics for IEEE802.11gn (MCS7 mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11n – 2.4GHz			
Mode	OFDM			
Channel frequency	2400 ~ 2483MHz			
Data rate	6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (HT20 : MCS7)	11	14	17	dBm
Spectrum Mask (HT20)				
at fc ±11MHz	-	-	-20	dBr
at fc ±20MHz	-	-	-28	dBr
at fc ±30MHz	-	-	-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 ≤ 10%)	-	-	-64	dBm
Maximum Input Level (PER ≤ 10%)	-20	-	-	dBm

* Normal Condition : 25°C, VDD=5V.

* RF characteristics is board limit. It can differ according to standards

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5-4. RF Characteristics for BLE

TX characteristics	Min.	Typ.	Max.	Unit
Power level	1.5	4.5	7.5	dBm
Adjacent channel transmit power				
@ F = F0 ± 1MHz	-	-	0	dBr
@ F = F0 ± 2MHz	-	-	-30	dBr
@ F = F0 ± 3MHz	-	-	-40	dBr
@ F > F0 ±3MHz	-	-	-40	dBr
Modulation characteristics – Frequency derivation				
$\Delta F1_{AVG}$	225	-	275	KHz
$\Delta F2_{MAX}$	180	-	-	KHz
$\Delta F2_{MAX} / \Delta F1_{AVG}$	80	-	-	%
RX characteristics	Min.	Typ.	Max.	Unit
Min. input level (BER ≤ 0.1%)	-	-	-84	dBm
Max. input level (BER ≤ 0.1%)	-20	-	-	dBm

* Normal Condition : 25°C, VDD=5V.

* RF characteristics is board limit. It can differ according to standards

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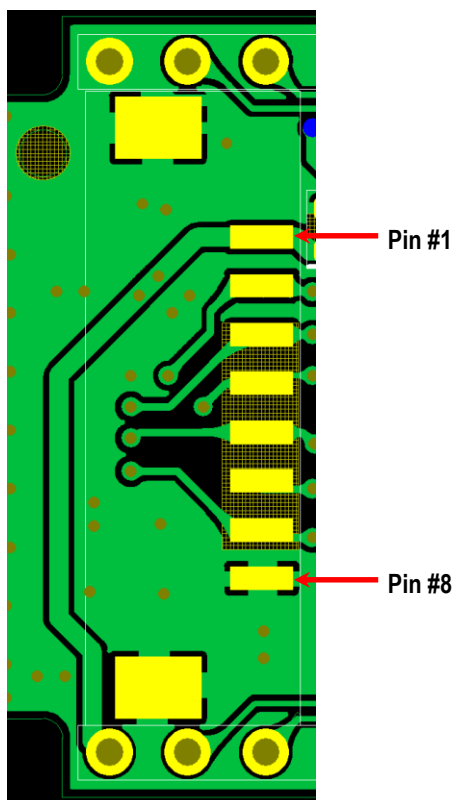
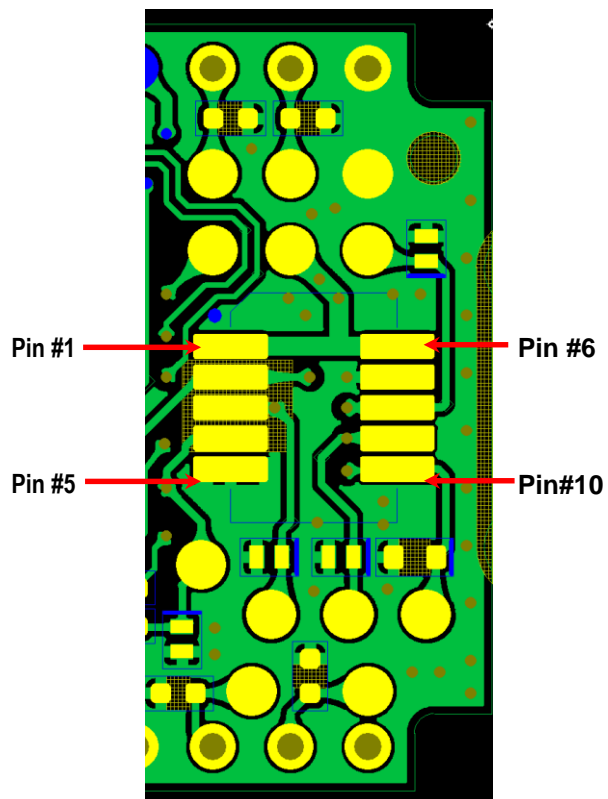
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6. Pin Description

NO	Board to wire	Board to board
1	VDD	VDD
2	MODE	MODE
3	SPI_SCL	CS_N
4	SPI_CSN	MOSI
5	SPI_MISO	GND
6	SPI_MOSI	VDD
7	STATUS	GND
8	GND	SCLK
9	-	MISO
10	-	STATUS

Top - Board to wire**Bottom - Board to board**

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7. Outline Drawing

LG Innotek Confidential		2	3	4																																
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">DIMENSIONAL TOLERANCE</th> <th rowspan="4" style="writing-mode: vertical-rl; text-orientation: mixed;">CHANGES</th> <th>REV. NO.</th> <th>DATE (YY MM DD)</th> <th>SIGNATURE</th> <th>CHANGE CONTENTS</th> </tr> <tr> <td>~ up to 10</td> <td>±0.2</td> <td></td> <td></td> <td style="text-align: center;">△</td> <td></td> </tr> <tr> <td>over 10 up to 30</td> <td>±0.3</td> <td></td> <td></td> <td style="text-align: center;">△</td> <td></td> </tr> <tr> <td>over 30 up to 120</td> <td>±0.5</td> <td></td> <td></td> <td style="text-align: center;">△</td> <td></td> </tr> <tr> <td colspan="2">UNLESS OTHERWISE SPECIFIED</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>		DIMENSIONAL TOLERANCE		CHANGES	REV. NO.	DATE (YY MM DD)	SIGNATURE	CHANGE CONTENTS	~ up to 10	±0.2			△		over 10 up to 30	±0.3			△		over 30 up to 120	±0.5			△		UNLESS OTHERWISE SPECIFIED							<p>RELEASING THIS DRAWING WITHOUT PERMISSION OF LG Innotek SHOULD BE ACCUSED ACCORDING TO THE LAWS AND COMPANY RULES</p>		
DIMENSIONAL TOLERANCE		CHANGES	REV. NO.		DATE (YY MM DD)	SIGNATURE	CHANGE CONTENTS																													
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UNLESS OTHERWISE SPECIFIED																																				
<p>Labels: Max. 45.4, 45±0.2, 0.7, 16.7, 4-R1.1, 4-2, 7.3, 20±0.2, 16, 2.6, 12.55, 18.6, 5.7, 9.35, PCB thickness $t \pm 0.1$, 2-PCB Array cutting area. (Burr is Max 0.2mm), (A), (B), (3-Ø1.2), (2.35), (6.6), 1.5, 3.5, 3.95, Label, Shield can : Nickel Silver or S-Tin plate steel sheet, PCB : FR-4, Molex 53307-1071, Refer to 12505WS-08 of Yeonho electronics. (Pitch 125 SMD)</p>																																				
<p>Notes</p> <ol style="list-style-type: none"> Refer to the tolerance table, Radii are 0.5 unless otherwise specified. Lot No. shall be conformed to LGIT standard specification. As long as the outer appearance doesn't affect the performance of the product, it can be changed without prior notice. PCB Warpages are max. 0.6mm. Caution for handling. <ol style="list-style-type: none"> Don't touch the circuit components. Don't drop the wifi module 50cm high. (Allowed 1 time for 50cm high Max) Don't twist the wifi module. Reliability for PCB bending. <ol style="list-style-type: none"> Requirement : No apparent damage Test method : Solder the sample PCB, band down to 2mm Fig 																																				
<p>RELATED P/N</p> <p>THIRD ANGLE PROJECT</p>		<p>SCALE</p> <p>1:1</p>	<p>UNIT</p> <p>mm</p>	<p>DESIGN '23. 02. 07</p> <p>Kap soul Lee</p> <p>CHECKED '23. 02. 07</p> <p>Sung woo Jang</p> <p>APPROVED '23. 02. 07</p> <p>Kwang jae Park</p>	<p>TITLE</p> <p>Outline Drawing</p> <p>PART NO</p> <p>MODEL</p> <p>ETWCARIC03</p> <p>DWG NO</p>																															
		2	3	LG Innotek Co., Ltd.																																

All parts which supply to LG Innotek must not contain prohibited substances including RoHS Hazardous substances and for more details refer to LG Innotek's "Manual for management of hazardous substances in Product"

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Regulatory Notice

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 Notice

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

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.

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Regulatory Notice

Antennas list

This module is certified with the following PCB antenna.

- Type: PCB Antenna
- Max. peak Antenna gain: 4.2 dBi

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.

* The antenna connector is permanently soldered prior to shipping to comply with FCC Rule 15.203 requirements

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: Label and compliance information

- Contains FCC ID: BEJ-LCWB002EA
- Contains IC: 2703N-LCWB002EA

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.

Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

How to make changes

Since only Grantees are permitted to make permissive changes, when the module will be used differently than granted, please contact the module manufacture.

Regulatory Notice (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 RFL 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 LCWB-002EA 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-LCWB002EA

Contient module émetteur IC : 2703N-LCWB002EA