LITE-ON 802.11b g n 1Tx1R + BT5.0 IOT Combo Module featured

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Contents

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FEATURE AND SPECIFICATIONS

DESCRIPTION

RTL8721CSM is a higjly integrated single-chip low power single band(2.4GHz) Wireless LAN (WLAN) and Bluetooth Low Energy (BLE5.0) communication controller. It consists of a high performance MCU (ARMv8-M, Cortex-M33 instruction set compatible) called Real-M300 (or KM4 thereafter) and a low power MCU (ARMv8-M, Cortex-M23 instruction set compatible) called Real-M200 (or KM0 thereafter), WLAN(802.11 b/g/n) MAC, an 1T1R capable WLAN baseband, RF, Bluetooth and peripherals.

PRODUCT FEATURES

RTL8721CSM device contains dual processors:

- **KM4 CPU**
  - Cortex-M33 instruction set compatible
    - Floating Point Unit (FPU)
    - DSP
    - TrustZone-M
  - Running at a frequency of up to 200MHZ (configurable)
  - Memory Protection (MPU)
  - Built-in Nested Vectored Interrupt Controller (NVIC)
  - Non-maskable Interrupt (NMI) with a selection of sources
  - 32KB I-Cache and 4KB D-Cache
  - Up to 512KB contiguous main SRAM@200MHz
  - Optional 4MB PSRAM@50MHz
- **KM0 CPU**
  - Cortex-M33 instruction set compatible
  - Running at a frequency of up to 20MHZ
  - Built-in Nested Vectored Interrupt Controller (NVIC)
  - Non-maskable Interrupt (NMI) with a selection of sources
  - 16KB I-Cache and 4KB D-Cache
  - Up to 64KB contiguous main SRAM
  - Up to 1KB retention SRAM for keeping data in power saving mode
- **Module feature includes:**
  - Bluetooth Low Energy V5.0
  - Bluetooth Class I transmission power
  - Both central and peripheral modes
  - Internal co-existence mechanism between Wi-Fi and BT to share the same antenna
  - Operate at ISM frequency Band (2.4GHz)
  - IEEE Standards Support, 802.11b, 802.11g, 802.11n
  - Support for both 20 MHz, 40MHz channel width in 2.4GHz band
  - Low power architecture
  - Low power Tx/Rx for short range application @1.8V
  - Low power beacon listen mode
  - Low power RX mode
  - Very low power suspends mode (DLPS)

- Built-in PA, also supports external PA and LNA
- Supports Antenna Diversity
- RoHS directive compliance

MAIN CHIPSET
Realtek RTL8721CSM

FUNCTIONAL SPECIFICATIONS

BT Function	
Standard	Bluetooth V5.0LE
Bus Interface	UART
Data Rate	1 Mbps, 2Mbps
Modulation Scheme	GFSK
Frequency Range	2.400~2.4835 GHz
Operating Channel	0~39
Transmit Output Power	Typical 4.5dBm
Receiver Sensitivity	< 0.1% BER at -88dBm

Wi-Fi Function	
Standard	IEEE802.11b; IEEE 802.11g; IEEE 802.11n
Bus Interface	UART
Data Rate	***802.11b:*** 11, 5.5, 2, 1 Mbps ***802.11g:*** 54, 48, 36, 24, 18, 12, 9, 6 Mbps ***802.11n:*** MCS 0 to 7 for HT20MHz MCS 0 to 7 for HT40MHz
Media Access Control	CSMA/CA with ACK
Modulation Technique	***802.11b***: CCK, DQPSK, DBPSK ***802.11g***: 64QAM, 16QAM, QPSK, BPSK ***802.11n***: 64QAM, 16QAM, QPSK, BPSK

Network Architecture	Infrastructure mode
Operation Channel	***2.4GHz*** 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan
Frequency Range	***802.11bg*** 2.400 ~ 2.4835 GHz
EVM	CCK < 35% OFDM < -25dB MCS0(HT20/40MHz) < -5dB MCS7(HT20/40MHz) < -28dB
Frequency Offset	**2.4GHz** -20ppm < Center Frequency < +20ppm

Transmit Output Power – single chain @ant
Tolerance: ±1.5dBm@2.4GHz

802.11b	***1Mbps***	***2Mbps***	***5.5Mbps***	***11Mbps***
Tgtpwr (dBm)	18	18	18	18

802.11g	***6~24Mbps***	***36Mbps***	***48Mbps***	***54Mbps***
Tgtpwr (dBm)	18	18	16	16

802.11n HT20	***MCS0***	***MCS1***	***MCS2***	***MCS3***	***MCS4***
Tgtpwr (dBm)	18	18	18	18	18
	MCS5	***MCS6***	***MCS7***		
	16	16	16		

802.11n HT40	***MCS0***	***MCS1***	***MCS2***	***MCS3***	***MCS4***
Tgtpwr (dBm)	18	18	18	18	18
	MCS5	***MCS6***	***MCS7***		
	16	16	16		

Receiver Sensitivity

Frequency Band	***Rate***	***Condition***	***Typical (1SS) (dBm)***
2.4G	11b-1M	PER < 8%	-94
	11b-11M	PER < 8%	-86
	11g-6M	PER < 10%	-90
	11g-54M	PER < 10%	-71
	11n-HT20MCS0	PER < 10%	-87
	11n-HT20MCS7	PER < 10%	-70
	11n-HT40MCS0	PER < 10%	-84
	11n-HT40MCS7	PER < 10%	-67

Security	**Items**	**Description**		
	Hardware engine	AES/DES/SHA hardware engine		
	TrustZone	TrustZone-M supported		
	Secure boot	Secure boot supported		
	SWD protection	Debug port access protection and prohibition modes		
	eFuse protection	Secure eFuse		
	RSIP	Flash decryption on-the-fly		
Operating Voltage	3.3V ±5% I/O supply voltage			
Power Consumption	**Mode**	**Average**	**Peak**	
	TX	*TBDmA*	*TBDmA*	
	RX	*TBDmA*	*TBDmA*	
	Suspend Mode	*TBDmA*	*TBDmA*	
Antenna Type	2x Printed Antenna on PCBA and 1x U.FL connector for antenna diversity 1x FAKRA connector reserved(optional)			

Operation Conditions

Table 3-2 Recommended Operation Conditions

Symbol	Rating	Min	Typ	Max	Units
3.3V_In	3.3V Supply Voltage	3.135	3.3	3.465	V
T_A	Ambient operating temperature	-20	25	85	0C
T_S	Storage temperature	-40	25	85	0C

Table 3-3 DC Characteristics

Symbol	Parameter	Min	Typ	Max	Units
VIL	Input Low Voltage	–	–	0.8	V
VIH	Input High Voltage	2.0	–	–	V
VOL	Output Low Voltage	–	–	0.4	V
VOH	Output High Voltage	2.4	–	–	V

WARNINGS

FCC Statement
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.

FCC Caution:

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 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 device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

FCC Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

ISED Statement
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

ISED Radiation Exposure Statement:
This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. The

transmitter module may not be co-located with any other transmitter or antenna.

This module is intended for OEM integrators under the following conditions:

1. Ensure that the end-user has no manual instructions to remove or install module.
2. This module is certified pursuant to Part 15 rules section 15.247 and RSS-247.
3. This module has been approved to operate with the antenna types listed below, with the maximum permissible gain indicated.

Antenna Number	Brand Name	Model Name	Ant. Type	Cable length	Connector	Support	Max Peak Gain
Antenna 1	LITEON	WCBN3605L	Printed Ant	N/A	N/A	2.4G+BT	2.06
Antenna 2	LITEON	WCBN3605L	Printed Ant	N/A	N/A	2.4G+BT	2.1
Antenna 3	MOLEX	2167990001	PIFA	N/A	Fakra	2.4G+BT	2.4
Antenna 4	MOLEX	1461530050	PIFA	50 mm	I-PEX	2.4G+BT	3.2
Antenna 5	MOLEX	1461530100	PIFA	100 mm	I-PEX	2.4G+BT	3.0
Antenna 6	MOLEX	1461530150	PIFA	150 mm	I-PEX	2.4G+BT	2.8
Antenna 7	MOLEX	1461530200	PIFA	200 mm	I-PEX	2.4G+BT	2.6
Antenna 8	MOLEX	1461530250	PIFA	250 mm	I-PEX	2.4G+BT	2.4
Antenna 9	MOLEX	1461530300	PIFA	300 mm	I-PEX	2.4G+BT	2.2

Label and compliance information

Label of the end product:

FCC
The host product must be labeled in a visible area with the following ” Contains FCC ID: PPQ-WCBN3605L”. The end product shall bear the following 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.

ISED
This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains transmitter module IC: 4491A-WCBN3605L” or “Contains IC: 4491A-WCBN3605L”

Information on test modes and additional testing requirements

1. This module has been approved under stand-alone configuration. OEM integrator has be limited the operation channels in channel 1-11 for 2.4GHz band. The separate approval is required for all other operating configurations, including portable configurations with respect to Part
2. 1093/RSS-102 and different antenna configurations
   The information on how to configure test modes for host product evaluation for different operational conditions

for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host can be found at KDB Publication 996369 D04.

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, etc.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/ISED authorization is no longer considered valid and the FCC/IC No. cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC/ISED authorization.

Additional testing, Part 15 Subpart B and ICES-003 disclaimer
Appropriate measurements (e.g. Part 15 Subpart B compliance) and if applicable additional equipment authorizations (e.g. SDoC) of the host product to be addressed by the integrator/manufacturer. This module is only FCC/ISED authorized for the specific rule parts 15.247, RSS-247 listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC/ISED rules that apply to the host product as being Part 15 Subpart B/ICES-003 compliant.

The user manual of the end product should include:

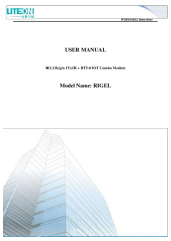
FCC:
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons. This device complies 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. The antenna(s) used for this transmitter must not transmit simultaneously with any other antenna or transmitter.

ISED:
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

ISED Radiation Exposure Statement:
This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Documents / Resources

	**LITE-ON 802.11b g n 1Tx1R + BT5.0 IOT Combo Module** [pdf] User Manual 802.11b g n 1Tx1R BT5.0 IOT Combo Module, 802.11b, g n 1Tx1R BT5.0 IOT Combo Module, BT5.0 IOT Combo Module, IOT Combo Module, Combo Module

References

- **User Manual**