PRODUCT SPECIFICATION

Wi-Fi 6E BT 5.2 M.2 2230 Module

WCBN814A

User Manual

Smart Application Solutions

LITE-ON Technology Corporation

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Neihu, Taipei 11492, Taiwan, R.O.C.

FCC Statement:

Federal Communication Commission Interference 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 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 with any other transmitters except in accordance with FCC multi transmitter product procedures.

Referring to the multi transmitter policy, multiple transmitter(s) and module(s) can be operated simultaneously without C2PC.

This device is restricted for indoor use.

FCC regulations restrict the operation of this device to indoor use only.

The operation of this device is prohibited on oil, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

This device cannot operate as a subordinate between separate buildings or structures.

IMPORTANT NOTE:

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 20 cm between the radiator & your body.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.
Additional testing and certification may be necessary when multiple modules are used.

20 cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

The antenna gain

Antenna Set	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Cable Loss (dB)	Antenna Type	Connector Type	Cable Length
1	Chain0/1	HONGBO	260-25094	3.53	2.4~2.4835 GHz	0.76	PIFA	i-pex(MHF 4L)	300mm
				3.06	5.15~5.25 GHz	1.16			
				3.07	5.25~5.35 GHz	1.18			
				4.81	5.47~5.725 GHz	1.2			
				4.2	5.725~5.850 GHz	1.27			
2	Chain0/1	HONGBO	260-25083	5.09	5.850~5.895 GHz	1.29	PIFA	i-pex(MHF 4L)	300mm
				5.14	5.925~6.425 GHz	1.32			
				5.09	6.425~6.525 GHz	1.35			
				5.16	6.525~6.875 GHz	1.4			
				5.12	6.875~7.125 GHz	1.45			
3	Chain0/1	HONGBO	260-25084	3.22	2.4~2.4835 GHz	0.5	Monopole	i-pex(MHF 4L)	200mm
				3.35	5.150~5.250 GHz	0.76			
				3.42	5.250~5.350 GHz	0.78			
				4.77	5.470~5.725 GHz	0.81			
				4.72	5.725~5.850 GHz	0.85			
				4.71	5.850~5.895 GHz	0.86			
				4.75	5.925~6.425 GHz	0.87			
				4.29	6.425~6.525 GHz	0.91			
				4.81	6.525~6.875 GHz	0.96			
				4.74	6.875~7.125 GHz	0.98			

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20 cm

separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains FCC ID: PPQ-WCBN814A ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.

OEM Integrator Checklist

The party below will implement the LITE-ON Module in host systems in accordance with the instructions specified in this document and the documents referenced herein.

1. The OEM integrator will ensure the Module is integrated in a host systems using only the approved antenna model(s) described in this document.
2. The OEM integrator will ensure the antenna placement inside the host system will maintain the required spacing to end user for RF Exposure compliance, as specified in this document.
3. If other radios are integrated inside the host with the LITE-ON Module, the OEM integrator will contact its test lab, TCB or LITE-ON to determine if additional FCC compliance evaluation is required to meet FCC collocation rules.
4. The OEM integrator will ensure end user documentation will contain the specified regulatory wording and ensure the host system and the Module itself are labeled as specified in this document.
5. The OEM integrator will ensure the Module is programmed in the factory with compliant transmit power not exceeding the levels specified in this document.

LITE-ON requests that the OEM integrator acknowledge its receipt of this document and the above instructions. You may contact LITE-ON with any questions concerning this document or the responsibilities of the OEM integrator.

IC Statement:

This device complies with Industry Canada license 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.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi transmitter product procedures.
Referring to the multi transmitter policy, multiple transmitter(s) and module(s) can be operated simultaneously without reassessment permissive change.
Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.
les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

The maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and
Non-point-to-point operation as appropriate.
le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5850 MHz)
doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non-point à point, selon le cas.

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz, 5470-5600 MHz and 5650-5725 MHz.

Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz.

The maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit.
le gain maximal d'antenne permis pour les dispositifs utilisant les bandes 5250-5350 MHz et

5470-5725 MHz doit se conformer à la limite de p.i.r.e.

Users should also be advised that high power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE•LAN devices.

De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.•à•d., qu'ils ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN•EL.

Pour une utilisation en intérieur uniquement.

Operation shall be limited to indoor use only;

Utilisation limitée à l'intérieur seulement;

Operation on oil platforms, cars, trains, boats and aircraft shall be prohibited except for on large aircraft flying above 10,000 ft.

Utilisation interdite à bord de plateformes de forage pétrolier, de voitures, de trains, de bateaux et d'aéronefs, sauf à bord d'un gros aéronef volant à plus de 10 000 pieds d'altitude.

The antenna gain

Antenna Set	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Cable Loss (dB)	Antenna Type	Connector Type	Cable Length
1	Chain0/1	HONGBO	260-25094	3.53	2.4~2.4835 GHz	0.76	PIFA	i-pex(MHF 4L)	300mm
				3.06	5.15~5.25 GHz	1.16			
				3.07	5.25~5.35 GHz	1.18			
				4.81	5.47~5.725 GHz	1.2			
				4.2	5.725~5.850 GHz	1.27			
2	Chain0/1	HONGBO	260-25083	5.09	5.850~5.895 GHz	1.29	PIFA	i-pex(MHF 4L)	300mm
				5.14	5.925~6.425 GHz	1.32			
				5.09	6.425~6.525 GHz	1.35			
				5.16	6.525~6.875 GHz	1.4			
				5.12	6.875~7.125 GHz	1.45			
3	Chain0/1	HONGBO	260-25084	3.22	2.4~2.4835 GHz	0.5	Monopole	i-pex(MHF 4L)	200mm
				3.35	5.150~5.250 GHz	0.76			
				3.42	5.250~5.350 GHz	0.78			
				4.77	5.470~5.725 GHz	0.81			
				4.72	5.725~5.850 GHz	0.85			
				4.71	5.850~5.895 GHz	0.86			
				4.75	5.925~6.425 GHz	0.87			
				4.29	6.425~6.525 GHz	0.91			
				4.81	6.525~6.875 GHz	0.96			
				4.74	6.875~7.125 GHz	0.98			

IMPORTANT NOTE:

IC 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 20 cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This module is intended for OEM integrator. The OEM integrator is still responsible for the IC compliance requirement of the end product, which integrates this module.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20 cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains IC: 4491A-WCBN814A ".

1.1 PRODUCT FEATURES

Module feature includes:

- Bluetooth V5.2 system
  Backwards compatible with BT version of 1.1, 1.2, 2.0, 2.1, 3.0+HS, 4.0LE and 5.0
- Support Bluetooth Class I and Class II power level transmission power without requiring an external PA
- Dual eSCO and dual A2DP streams
- Supports 2Mbps Bluetooth Low (BLE), BLE long range
- Split ACL support for A2DP true stereo(earbuds)
- Flexible interface Slimbus/PCM/I^{2}S for Bluetooth Audio
- Support Wake On Bluetooth
- Operate at ISM frequency Band (2.4/5/6GHz)
- IEEE Standards Support, 802.11a ,802.11b, 802.11g, 802.11n, 802.11ac and 802.11ax
- Supports 2x2 Multi-User Multiple-Input Multiple-Output (MU-MIMO)
- Dual Band Simultaneous (DBS), up to 3Gbps data rate (2x2+2x2 11ax DBS)
- Support for both 20 MHz, and 40 MHz channel width in 2.4GHz, 20 MHz, 40MHz, 80 MHz and 160MHz channel width in 5GHz and 80 MHz and 160MHz channel width in 6GHz band
- Enterprise level security supporting: WPS2.0, WAPI, WPA, WPA2
- Dual-stream IEEE 802.11n support for 40MHz channels provides PHY layer rates up to 300Mbps
- Dual-stream IEEE 802.11ac support for 80MHz channels provides PHY layer rates up to 867Mbps
- Dual-stream IEEE 802.11ax support for 80MHz channels provides PHY layer rates up to 1200Mbps
- Dual-stream IEEE 802.11ax support for 160MHz channels provides PHY layer rates up to 2400Mbps
- Dynamic Frequency Selection (DFS, radar detection)
- Qffloading traffic for minimal host utilization at 802.11ac/ax speeds
- Low-power PCIe (with L1 sub-tate) interface
- Integrated BT/WLAN coexistence
- Support Wake On WLAN
- RoHS compliance

1.2 PRODUCT SPECIFICATIONS

FUNCTIONAL SPECIFICATIONS

BT Function	
Standard	Bluetooth V5.2
Bus Interface	UART
Data Rate	1 Mbps, 2Mbps and Up to 3Mbps
Modulation Scheme	GFSK, π/4-DQPSK and 8-DPSK
Frequency Range	2.402~2.480 GHz
Operating Channel	BR/EDR: 0~78 BLE: 0~39
Transmit Output Power	$+4 \leq$ Output Power $\leq +10$dBm; Class I Device
Receiver Sensitivity	BER<0.1% Typical: -90dBm BLE 1Mbps(PER <30.8%) Typical: -93dBm BLE 2Mbps(PER <30.8%) Typical: -90dBm

Wi-Fi Function	
Standard	IEEE802.11a; IEEE802.11b; IEEE 802.11g; IEEE 802.11n. IEEE802.11ac; IEEE802.11ax
Bus Interface	PCIe 3.0

Data Rate	*802.11a:*
	    54, 48, 36, 24, 18, 12, 9, 6 Mbps
	802.11b:
	    11, 5.5, 2, 1 Mbps
	802.11g:
	    54, 48, 36, 24, 18, 12, 9, 6 Mbps
	802.11n:
	    MCS 0 to 11 for HT20MHz
	    MCS 0 to 11 for HT40MHz
	802.11ac:
	    MCS 0 to 8 for VHT20MHz
	    MCS 0 to 9 for VHT40MHz
	    MCS 0 to 9 for VHT80MHz
	802.11ax:
	    MCS 0 to 11 for HE20MHz
	    MCS 0 to 11 for HE40MHz
	    MCS 0 to 11 for HE80MHz
	    MCS 0 to 11 for HE160MHz

Media Access Control	CSMA/CA with ACK

Modulation Technique	*802.11a*:
	    64QAM, 16QAM, QPSK, BPSK
	802.11b:
	    CCK, DQPSK, DBPSK
	802.11g:
	    64QAM, 16QAM, QPSK, BPSK

	802.11n:
	    64QAM, 16QAM, QPSK, BPSK
	802.11ac:
	    256QAM, 64QAM, 16QAM, QPSK, BPSK
	802.11ax:
	    1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK

Network Architecture	Infrastructure mode

Operation Channel	*2.4GHz*
	    13: (Ch. 1-13) – United States
	    13: (Ch. 1-13) – Europe
	    14: (Ch. 1-14) – Japan
	5GHz
	    21: USA
	    19: EU
	     8: Japan
	6GHz
	     CH1~CH233

Frequency Range	*802.11bg*
	    2.400 ~ 2.4835 GHz
	802.11a/ax
	    5.15 ~ 5.85 GHz
	Wi-Fi 6E
	    5.925~7.125GHz

EVM	CCK < 35% OFDM < -25dB MCS0(HT20/40MHz) < -5dB MCS7(HT20/40MHz) < -28dB MCS0(VHT20/40/80MHz) < -5dB MCS7(VHT 20/40/80MHz) < -27dB MCS8(VHT 20/40/80MHz) < -30dB MCS9(HE 20/40/80MHz) < -32dB MCS10(HE 20/40/80/160MHz) < -35dB MCS11(HE 20/40/80/160MHz) < -35dB
Frequency Offset	**2.4GHz** -20ppm < Center Frequency < +20ppm **5GHz** -15ppm < Center Frequency < +15ppm

Transmit Output Power - single chain @ant
Tolerance: ±1.5dBm@2.4GHz; ±2dBm@5GHz

2.4GHz

802.11b	*1Mbps*	*2Mbps*	*5.5Mbps*	*11Mbps*
Tgtpwr (dBm)	17	17	17	17

802.11g	*6~24Mbps*	*36Mbps*	*48Mbps*	*54Mbps*
Tgtpwr (dBm)	18	15	15	14.5

802.11n HT20	*MCS0*	*MCS1*	*MCS2*	*MCS3*	*MCS4*

Tgtpwr (dBm)	18	17	17	16.5	16
	MCS5	MCS6	MCS7		
	16	16	15		

802.11n HT40	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	15.5	14.5	14.5	14.5	14
	MCS5	MCS6	MCS7		
	14	14	13		

802.11ax HE20	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	18	17	17	16	16	16
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	16	14	14	14	13	13

802.11ax HE40	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	15	14	14	14	14	14
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	14	13	12	12	11	11

5GHz

802.11a	6~24Mbps	36Mbps	48Mbps	54Mbps
Tgtpwr (dBm)	17	15	15	14

802.11n HT20	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	16	15	15	15	13
	MCS5	MCS6	MCS7		
	13	13	13		

802.11n HT40	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr	15	14	14	14	13

(dBm)	MCS5	MCS6	MCS7		
	13	13	13		

802.11ac VHT20	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	16	15	15	15	13
	MCS5	MCS6	MCS7	MCS8	
	13	13	13	13	

802.11ac VHT40	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	15	14	14	14	13
	MCS5	MCS6	MCS7	MCS8	MCS9
	13	13	13	13	13

802.11ac VHT80	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	15	14	14	14	12
	MCS5	MCS6	MCS7	MCS8	MCS9
	12	12	12	12	12

802.11ac VHT160	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	15	14	14	14	11
	MCS5	MCS6	MCS7	MCS8	MCS9
	11	11	11	11	11

802.11ax HE20	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	18	17	17	16	16	16
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	16	15	14	14	13	1

802.11ax HE40	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5

Tgtpwr (dBm)	15	14	14	14	14	14
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	14	13	12	12	11	11

802.11ax HE80	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	15	14	12	12	12	12
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	12	12	12	12	12	12

802.11ax HE160	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	14	13	13	13	11	11
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	11	11	11	11	10	10

6GHz

802.11ax HE80	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	13	12	12	12	11	11
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	11	10	10	10	9	9

802.11ax HE160	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5
Tgtpwr (dBm)	13	12	12	12	11	11
	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
	11	10	9	9	8	8

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%	-73
	11n-HT20MCS0	PER < 10%	-87
	11n-HT20MCS7	PER < 10%	-70
	11n-HT40MCS0	PER < 10%	-84
	11n-HT40MCS7	PER < 10%	-67
5G	11a-6M	PER < 10%	-88
	11a-54M	PER < 10%	-71
	11n-HT20MCS0	PER < 10%	-85
	11n-HT20MCS7	PER < 10%	-68
	11n-HT40MCS0	PER < 10%	-65
	11n-HT40MCS7	PER < 10%	-82
	11ac-VHT80MCS0	PER < 10%	-80
	11ac-VHT80MCS7	PER < 10%	-63
	11ac-VHT80MCS9	PER < 10%	-57
	11ax-HE40MCS0	PER < 10%	-83
	11ax-HE40MCS9	PER < 10%	-62
	11ax-HE40MCS10	PER < 10%	-59
	11ax-HE40MCS11	PER < 10%	-56
	11ax-HE80MCS0	PER < 10%	-80
	11ax-HE80MCS9	PER < 10%	-59
	11ax-HE80MCS10	PER < 10%	-56
	11ax-HE80MCS11	PER < 10%	-53
	11ax-HE160MCS10	PER < 10%	-53
	11ax-HE160MCS11	PER < 10%	-50
6G	11ax-HE80MCS10	PER < 10%	-54
	11ax-HE80MCS11	PER < 10%	-51
	11ax-HE160MCS10	PER < 10%	-51
	11ax-HE160MCS11	PER < 10%	-48

Operating Voltage   3.3V ±10% I/O supply voltage

Power Consumption	Mode	Average (mA)			MAX (mA)		
		11n	11ac	11ax	11n	11ac	11ax
	TX	907	934	1148	1229	1253	1307
	Note: The peak current might reach up to 1.9A						

Antenna Type   2x MHF 4 connectors for BT&Wi-Fi

1. MODULE PINOUT

Table 2-1   Module pinout definition (M.2 Key E)

* The following signal type is defined:
I: Input; O: Output; I/O: Input/Output; G: Ground; P: Voltage Supply

Pin.	Pin Define	I/O	Description	Status
1	GND	G	Ground	YES
2	3.3V	I	3.3V source	YES
3	USB_D+	I/O	USB Data+ differential serial data interface	NC
4	3.3V	I	3.3V source	YES
5	USB_D-	I/O	USB Data- differential serial data interface	NC
6	LED_WLAN#	OD	Open drain, active low signal. WiFi status indicator	YES
7	GND	G	Ground	YES
8	PCMCLK	I/O	PCM Clock	NC
9	SDIO_CLK	I	SDIO3.0 Clock	NC
10	PCMSYNC	I/O	PCM synchronous data SYNC	NC
11	SDIO_CMD	I/O	SDIO Command Interface	NC
12	PCM_OUT	O	PCM synchronous data Output	NC
13	SDIO_DATA0	I/O	SDIO Data Line0	NC
14	PCM_IN	I	PCM synchronous data Input	NC
15	SDIO_DATA1	I/O	SDIO Data Line1	NC
16	LED_BT#	OD	Open drain, active low signal. BT status indicator	YES
17	SDIO_DATA2	I/O	SDIO Data Line2	NC
18	GND	G	Ground	YES
19	SDIO DATA3	I/O	SDIO Data Line3	NC
20	UART WAKE#	O	Active low to wake up host via BT (1.8V)	YES
21	SDIO WAKE#	O	Active low to wake up host	NC
22	BT_UART TXD	O	UART Transmit Data (1.8V)	YES
23	SDIO RESET#	I	Active low to reset the WiFi function	NC
24-31	NOTCH	-		-
32	BT_UART RXD	I	UART Receive Data (1.8V)	YES
33	GND	G	Ground	YES
34	UART RTS	O	UART Ready to Send (1.8V)	YES
35	PERp0	I/O	PCIe RX differential signal shall be connected to transmitter differential pair on the system board	YES
36	UART CTS	I	UART Clear to Send (1.8V)	YES
37	PERn0	I/O	PCIe RX differential signal shall be connected to transmitter differential pair on the system board	YES
38	RESERVED	-		NC

39	GND	G	Ground	YES
40	RESERVED	-		NC
41	PETp0	I/O	PCIe TX differential signal shall be connected to receiver differential pair on the system board	YES
42	RESERVED	-		NC
43	PETn0	I/O	PCIe TX differential signal shall be connected to receiver differential pair on the system board	YES
44	COEX0 (LTE_ACTIVE)	I/O	Coexistence between WiFi+BT and WWAN	NC
45	GND	G	Ground	YES
46	COEX1 (LTE_PRI)	I/O	Coexistence between WiFi+BT and WWAN	NC
47	REFCLK+	I	PCIe reference clock signals(100MHz)	YES
48	COEX2 (LTE_SYNC)	I/O	Coexistence between WiFi+BT and WWAN	NC
49	REFCLK-	I	PCIe reference clock signals(100MHz)	YES
50	SUSCLK(32kHz)	I	Suspend Clock is a 32.768KHz clock supply input that is provided by platform to enable WLAN to enter reduce power consumption mode. Optional	NC
51	GND	G	Ground	YES
52	PERST#	I	PCIe Reset is a functional reset to WLAN; Active Low	YES
53	CLKREQ#	I/O	Clock request is a reference clock request signal. An external pull-up resistor on the platform is required; Active Low	YES
54	BT_EN#	I	Active Low to disable BT radio operation	YES
55	PEWAKE#	O	Request to service a function initiated wake event. An external pull-up resistor on the platform is required; Active Low	YES
56	WL_EN#	I	Active Low to disable WLAN radio operation	YES
57	GND	G	Ground	YES
58	I2C DATA	I/O	I2C Data; Open Drain with pull up on platform	NC
59	RESERVED			NC
60	I2C CLK	I	I2C clock input from host	NC
61	RESERVED			NC
62	ALERT#	O	IRQ line to host processor; Active low	NC
63	GND	G	Ground	YES
64-68	RESERVED			NC
69	GND	G	Ground	YES
70-71	RESERVED			NC
72	3.3V	I	3.3V source	YES
73	RESERVED			NC
74	3.3V	I	3.3V source	YES
75	GND	G	Ground	YES

2. ELECTRICAL SPECIFICATIONS

3.1 Operation Conditions

Table 3-1   Recommended Operation Conditions

Symbol	Rating	Min	Typ	Max	Units
3.3V	3.3V Supply Voltage	2.97	3.3	3.63	V
T_A	Ambient operating temperature	-10	25	70	^0C
T_S	Storage temperature	-40	25	85	^0C

Table 3-2   DC Characteristics

Symbol	Parameter	Min	Typ	Max	Units
V_{IL}	Input Low Voltage	-0.3	-	0.99	V
V_{IH}	Input High Voltage	2.145	-	3.6	V
V_{OL}	Output Low Voltage	0	-	0.45	V
V_{OH}	Output High Voltage	2.85	-	3.3	V

3.2 Power Sequence Timing
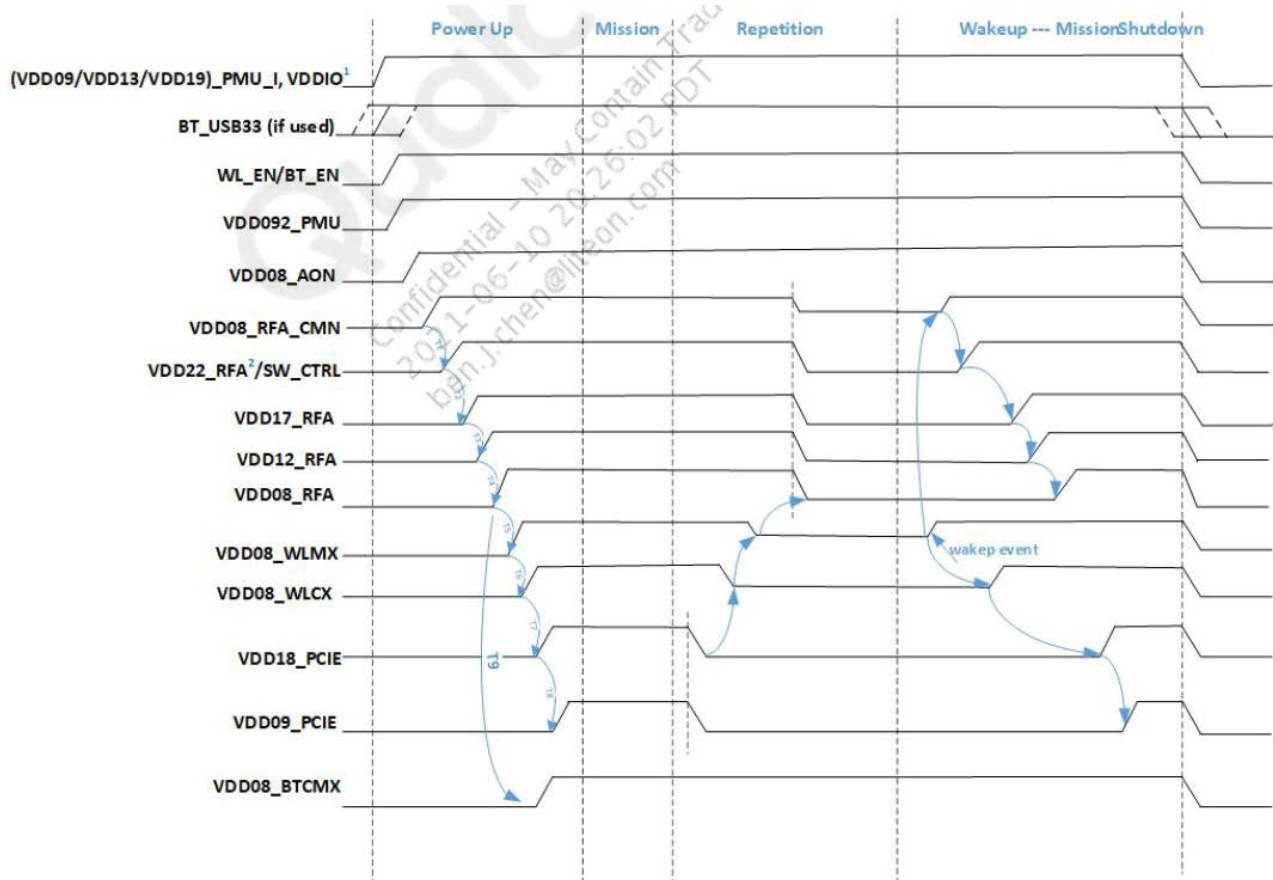
Figure 3-1　Power sequence timing parameters

Symbol	Description	Timing	Unit
T1	The delay time from RFACMN LDO to SW_CTRL = H	1.35	ms
T2	The delay time from SW_CTRL = H to enable RFA_VDD17	2	ms
T3	The delay time from turn on RFA_VDD17 to turn on RFA_VDD12	80	µs
T4	The delay time from turn on RFA_VDD12 to turn on RFA_VDD08	80	µs
T5	The delay time from turn on RFA_VDD08 to turn on both WL_MX	3.43	ms
T6	The delay time from turn on WL_MX to turn on WL_CX	1.205	ms
T7	The delay time from turn on WL_CX to turn on PCIE_VDD_18	1.205	ms
T8	The delay time from turn on PCIE_VDD_18 to turn on PCIE_VDD_95	1.13	ms
T9	The delay time from turn on RFA_VDD08 to turn on BT_CMX	4.33[1]	ms

3. MODULE DIMENSION
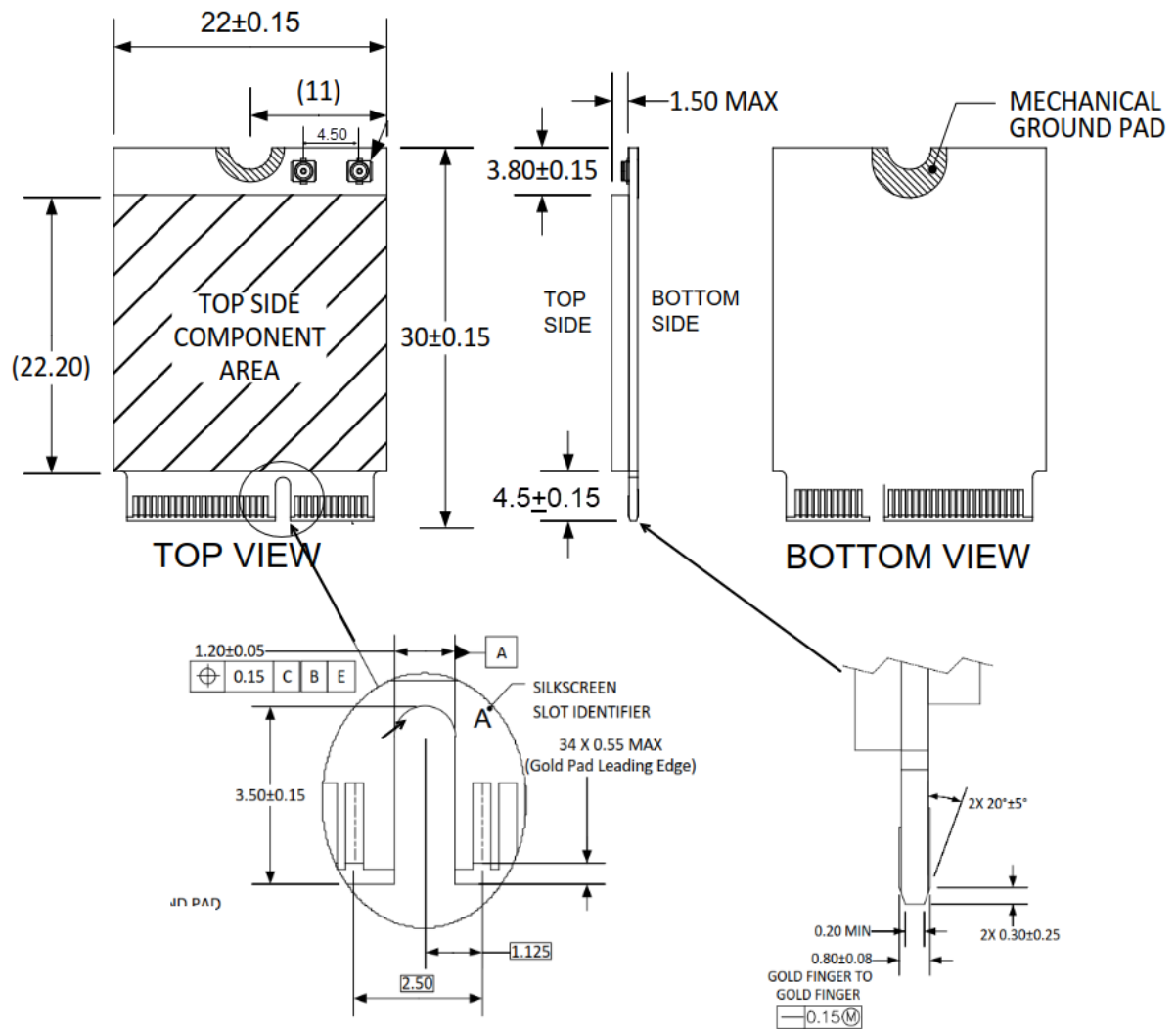
Unit: mm

4. I-PEX CONNECTOR SPEC

Table 5-1   Specifications for MFH 4 connector on the module

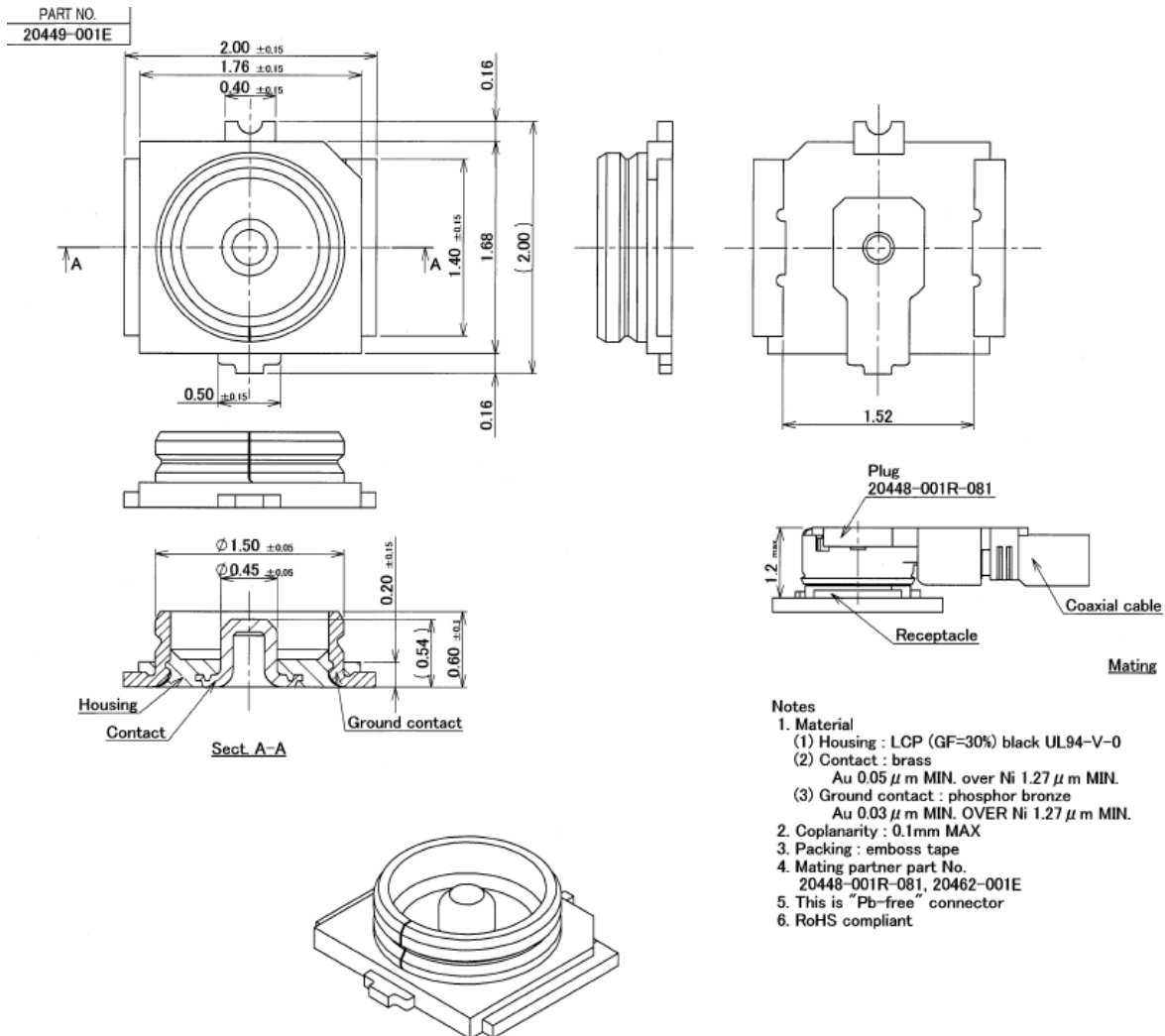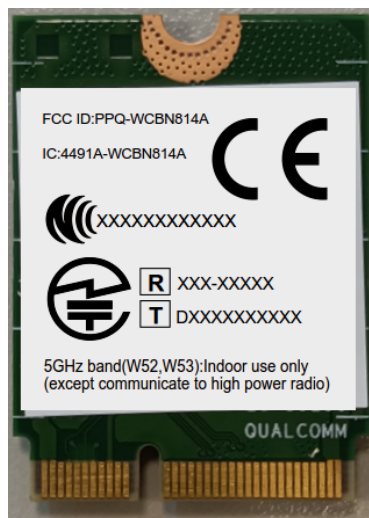| Manufactuer	I-PEX
Manufactuer part number	20449-001E

Figure 5-1   Specifications for MFH4 connector

5. MODULE PHOTO

Front   Back

6. EEPROM INFORMATION

WI-FI

Reg Domain	Most of World SKU
	0x006C
Vendor ID	0x17CB
Device ID	0x1103
SubDevice ID	0x3374
SubVendor ID	0x17CB