
1.Module:WXT5FM2101

This document is to specify the product requirements for 802.11a/b/g/n/ac/ax and Bluetooth v5.4 combo PCIE 2230-S3-E Key Module. This Card is based on MediaTek MT7920QEN chip .It provides feature-rich wireless connectivity at high standards, and delivering reliable throughput from an extended distance.

Optimized RF architecture and baseband algorithms provide superb performance and low power consumption. Intelligent MAC design deploys a high efficient offload engine and hardware data support standard based features in the areas of security, quality of service and international regulations, giving end users the greatest performance any time and in any circumstance.

2.Features

Chips	MT7920QEN
Spec	IEEE 802.11a/b/g/n/ac/ax 2.4G+5G 2T2R WiFi with Bluetooth 5.4
Frequency Band	2400 ~ 2483.5 MHz、 5150~5850 MHz
Power Voltage	3.3V
Dimension	22mm*30mm*2.4mm
Environmental Range	Operation temperature:0~70°C
Modulation	BPSK/QPSK/16QAM/64QAM/256QAM/102QAM/DBPSK/DQPSK/CCK、 GFSK π /4-DQPSK 8DPSK

3. Electrical Characteristics

Parameter	Min	Max	Unit
Power Supply Voltage	3.135V	3.6V	V
Ambient Temperature	0	70	°C

Digital I/O

Symbol	Parameter	Min	TYPE	Max	Unit
V _{IL}	Input Low Voltage	-0.3	-	0.825	V
V _{IH}	Input High Voltage	2.0625	-	3.6	V
V _{OL}	Output Low Voltage	-0.3	-	0.4	V
V _{OH}	Output High Voltage	2.475	-	3.6	V

4. Electrical Specifications for Wi-Fi (Radiation Test)

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

	Feature	Detailed Description
3.2.1.1	Standard	• IEEE 802.11b
3.2.1.2	Radio and Modulation Schemes	• DQPSK , DBPSK and CCK with DSSS
3.2.1.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
3.2.1.4	Channel Numbers	• 13 channels for Worldwide
3.2.1.5	Data Rate	• at most 11Mbps
3.2.1.6	Media Access Protocol	• CSMA/CA with ACK
3.2.1.7	Transmitter Output Power at Antenna Connector	• Typical RF Output Power at each RF chain, and at room Temp. 25°C • 21±2 dBm at 11Mbps
3.2.1.8	Receiver Sensitivity at Antenna Connector	• Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate<8% at room Temp 25°C • -84 dBm for 11Mbps

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

	Feature	Detailed Description
3.2.1.1	Standard	• IEEE 802.11b
3.2.1.2	Radio and Modulation Schemes	• DQPSK , DBPSK and CCK with DSSS
3.2.1.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
3.2.1.4	Channel Numbers	• 13 channels for Worldwide
3.2.1.5	Data Rate	• at most 11Mbps
3.2.1.6	Media Access Protocol	• CSMA/CA with ACK
3.2.1.7	Transmitter Output Power at Antenna Connector	• Typical RF Output Power at each RF chain, and at room Temp. 25°C • 21±2 dBm at 11Mbps
3.2.1.8	Receiver Sensitivity at Antenna Connector	• Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate<8% at room Temp 25°C • -84 dBm for 11Mbps

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

	Feature	Detailed Description
3.2.3.1	Standard	IEEE 802.11a
3.2.3.2	Radio and Modulation Type	QPSK , BPSK , 16QAM ,64QAM with OFDM
3.2.3.3	Operating Frequency	5.15~5.25GHz 5.25~5.35GHz 5.47~5.725GHz 5.725~5.85GHz
3.2.3.4	Data Rate	at most 54Mbps
3.2.3.5	Media Access Protocol	CSMA/CA with ACK
3.2.3.6	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain, at room Temp. 25°C 17±2 dBm at 54Mbps
3.2.3.7	Receiver Sensitivity at Antenna Connector	- Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate<10% at room Temp 25°C -70 dBm for 54Mbps

RF Characteristics for IEEE802.11n (MCS7 mode unless otherwise specified)

	Feature	Detailed Description
3.2.4.1	Standard	IEEE 802.11n
3.2.4.2	Radio and Modulation Type	BPSK , QPSK , 16QAM ,64QAM with OFDM
3.2.4.3	Operating Frequency	2.4GHz :2400 ~ 2483.5MHz for ISM band 5GHz : 5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.725GHz; 5.725~5.85GHz;
3.2.4.4	Data Rate	at most 300 Mbps
3.2.4.5	Media Access Protocol	CSMA/CA with ACK
3.2.4.6	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain,and at roomTemp. 25°C 2.4GHz Band/HT20 17±2 dBm at MCS7 2.4GHz Band/HT40 16.5±2 dBm at MCS7 5GHz Band/HT20 16.5±2 dBm at MCS7 5GHz Band/HT40 16±2 dBm at MCS7

3.2.4.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate=10% and at room Temp. 25°C • 2.4GHz Band/HT20 -69dBm at MCS7 • 2.4GHz Band/HT40 -67dBm at MCS7 • 5GHz Band/HT20 -68dBm at MCS7 • 5GHz Band/HT40 -66dBm at MCS7
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RF Characteristics for IEEE802.11ac (MCS8/9 mode unless otherwise specified)

	Feature	Detailed Description
3.2.5.1	Standard	• IEEE 802.11ac
3.2.5.2	Radio and Modulation Type	• QPSK , BPSK , 16QAM ,64QAM,256QAM with OFDM
3.2.5.3	Operating Frequency	• 5GHz : 5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.725GHz; 5.725~5.85GHz;
3.2.5.4	Data Rate	• at most 866.7 Mbps
3.2.5.5	Media Access Protocol	• CSMA/CA with ACK
3.2.5.6	Transmitter Output Power at Antenna Connector	• Typical RF Output Power at each RF chain, at room Temp. 25°C • 5GHZ Band: 15±2 dBm at VHT20 MCS7 • 5GHZ Band: 15±2 dBm at VHT40 MCS9 • 5GHZ Band: 14.5±2 dBm at VHT80 MCS9
3.2.5.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate<10% at room Temp 25°C • 5GHz Band / VHT20 -61dBm at MCS8 • 5GHz Band / VHT40 -59dBm at MCS9 • 5GHz Band / VHT80 -56dBm at MCS9

RF Characteristics for IEEE802.11ax (MCS11 mode unless otherwise specified)

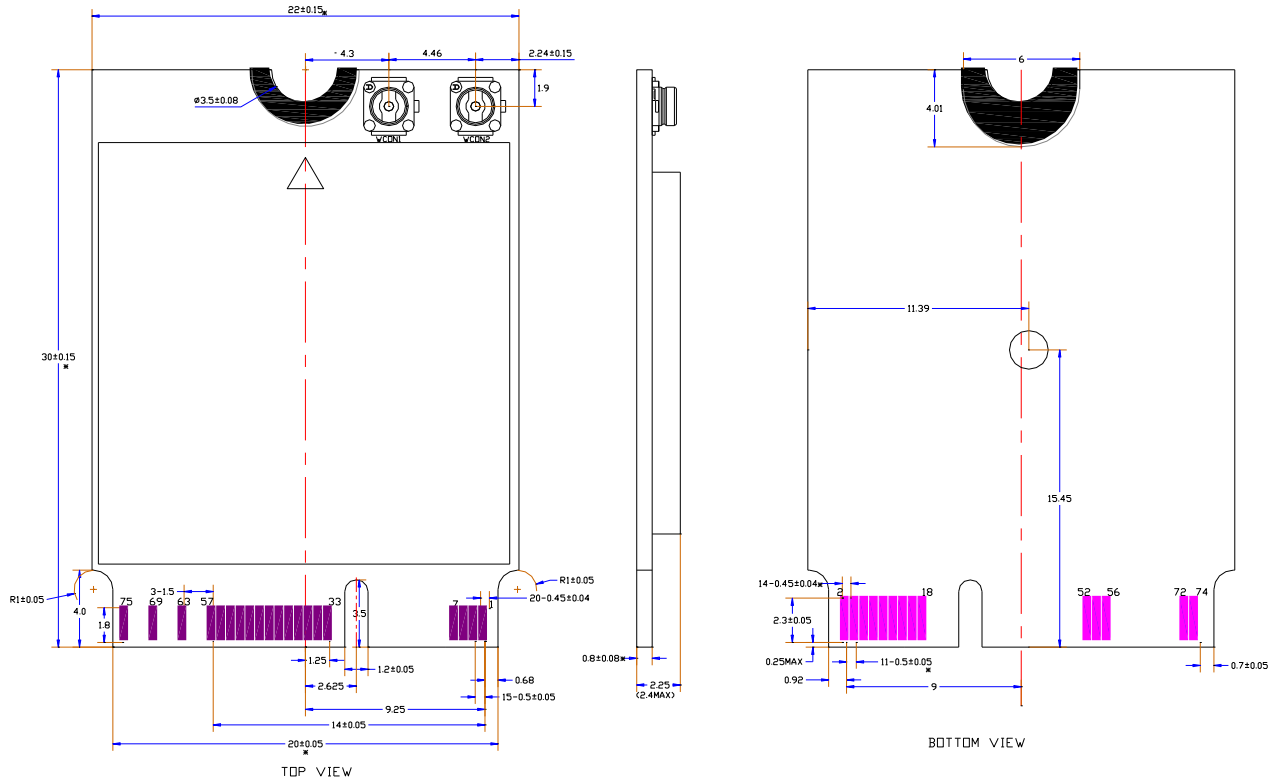
	Feature	Detailed Description
3.2.6.1	Standard	• IEEE 802.11ax
3.2.6.2	Radio and Modulation Type	• QPSK , BPSK , 16QAM ,64QAM,256QAM, 1024QAM with OFDMA
3.2.6.3	Operating Frequency	• 2G: 2400 ~ 2483.5MHz ISM band • 5GHz : 5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.725GHz; 5.725~5.85GHz;

3.2.6.4	Data Rate	at most 1201 Mbps
3.2.6.5	Media Access Protocol	CSMA/CA with ACK
3.2.6.6	Transmitter Output Power at Antenna Connector	- Typical RF Output Power at each RF chain, at room Temp. 25°C 2GHZ Band: 13±2 dBm at HE20 MCS11 13±2 dBm at HE40 MCS11 5GHZ Band: 13±2 dBm at HE20 MCS11 13±2 dBm at HE40 MCS11 12.5±2 dBm at HE80 MCS11
3.2.6.7	Receiver Sensitivity at Antenna Connector	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate<10% at room Temp 25°C 2GHz Band / HE20 -60dBm at MCS11 2GHz Band / HE40 -56dBm at MCS11 5GHz Band / HE20 -58dBm at MCS11 5GHz Band / HE40 -54dBm at MCS11 5GHz Band / HE80 -51dBm at MCS11

BT Transmitter Performance

Feature		Description	
General specification			
Bluetooth standard	Bluetooth V2.1/3.0/4.2/5.4		
Frequency band	2402MHz-2480MHz		
Channel Numbers	79 channels for BDR+EDR 40 channels for BLE		
Modulation	GFSK, $\pi/4$ -DQPSK and 8DPSK		
RF specification			
	Min (dBm)	Type (dBm)	Max (dBm)
BDR Output Power		10	
EDR Output Power		7	
BLE Output Power		10	
Sensitivity @BER=0.1% FOR GFSK(1Mbps)		-89	
Sensitivity @BER=0.01% FOR $\pi/4$ -DQPSK(2Mbps)		-88	
Sensitivity @BER=0.01% FOR 8DPSK(3Mbps)		-81	
Maximum input level	GFSK(1Mbps) -20dBm		
	$\pi/4$ -DQPSK(2Mbps) -20dBm		
	8DQPSK(3Mbps) -20dBm		
Sensitivity @PER=30.8% FOR 1LE		-92	

5. Pin Description and Outline



PIN	Name	Description	I/O	Note
1,7,18,33,39,4 5,51,57,63,69, 75	GND	Ground	-	
2,4,72,74	VD33	●3.3V power source,platform M.2 connector (Pin 2 & 4) add a 10uF Cap at 3.3V input ●Suggest an individual controllable power supply/switch ($\geq 2A$) as module power source (for pin 2/4/72/74)	I	
3	USB D+	●USB DP ● Connect Host USB_D+ directly. ●If connect to host via common mode choke, need check its Spec	I/O	
5	USB D-	●USB DM ● Connect Host USB_D- directly. ● If connect to host via common mode choke, need check its Spec	I/O	
6	LED#1	G0_WF_LED/3.3V	O	

8	PCM_CLK	●PCM signal path for BLE audio offload(0/1.8V), optional. ●Default pull down for IC power on strapping of configuration ●Platform MUST NC if no use,if needs connection, please refer platform IO condition requirement in section 6.2 for detail.	I/O	
10	PCM_SYNC	●PCM signal path for BLE audio offload(0/1.8V), optional.	I/O	
12	PCM_OUT	●PCM signal path for BLE audio offload(0/1.8V), optional. ●Default pull down for IC power on strapping of configuration ●Platform MUST NC if no use, if needs connection, please refer platform IO condition requirement in section 6.3 for detail.	O	
14	PCM_IN	● PCM signal path for BLE audio offload(0/1.8V), optional.	I	
16	LED#2	G14_BT_LED/3.3V	O	
35	PERp0	●This pin is written from the module point of view when referencing signal direction. ●To connect PCIE Host TX. ●Connect a capacitor to be as DC block ●The capacitance ranges from 75nF~220nF,and 100nF is typical	I	Note 4
37	PERn0	●This pin is written from the module point of view when referencing signal direction. ●To connect PCIE Host TX. ●Connect a capacitor to be as DC block ●The capacitance ranges from 75nF~220nF,and 100nF is typical	I	Note 4
41	PETp0	●This pin is written from the module point of view when referencing signal direction. ●To connect PCIE Host RX	O	Note 4
43	PETn0	●This pin is written from the module point of view when referencing signal direction. ●To connect PCIE Host RX	O	Note 4
47	PEFCLKp0	●This pin is written from the module point of view when referencing signal direction. ● To connect PCIE Host REFCLK	I	Note 4
49	PEFCLKn0	●This pin is written from the module point of view when referencing signal direction. ●To connect PCIE Host REFCLK	I	Note 4
52	G2_PERST_N	● PERST# (0/3.3V tolerates to 1.8V) ● No Pull or pull up resistor on platform ● The resistance ranges from 9K ~ 60K ohm, and 10K is suggested.	I	Note 1 Note 3

		• Suggest dedicated pin with host and not share with other devices.		
53	G16_CLKR EQ0_N_1	• CLKREQ# (OPEN Drain)(0/3.3V tolerates to 1.8V) • Pull up resistor on platform • The resistance ranges from 9K ~ 60K ohm, and 10K is suggested • Suggest dedicated pin with host and not share with other devices	OD	Note 2 Note 3
54	W_DISABL E#2(I)	• BT_RF_DIS_B(0/3.3V tolerates to 1.8V) • Pull up resistor on platform to prevent unexpected false trigger. • The resistance ranges from 9K ~ 60K ohm, and 10K is suggested.	I	Note 1
55	G1_Wake _N	• WAKE# (3.3V NMOS on Module for OPEN Drain) (0/3.3V tolerates to 1.8V) • Pull up resistor on platform • The resistance ranges from 9K ~ 60K ohm, and 10K is suggested.	OD	Note 1
56	W_DISABL E#1(I)	• WF_RF_DIS_B(0/3.3V tolerates to 1.8V) • Pull up resistor on platform to prevent unexpected false trigger. • The resistance ranges from 9K ~ 60K ohm, and 10K is suggested.	I	Note 1
9,11,13,15,17, 19,20,21,22,2 3,32,34,36,38, 40,42,44,46,4 8,50,58,59,60, 61,62,64,65,6 6,67,68,70,71, 73	NC	-	-	
Main	WIFI0	WIFI_RF0		
Aux	WIFI1/BT0	WIFI_RF1/BT_RF0		

FCC Statement

1. 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. (2) This device must accept any interference received, including interference that may cause undesired operation.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: 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.

The device has been evaluated to meet general RF exposure requirements. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

The Module is designed to comply with the FCC statement. FCC ID is A3LWXT5FM2101. The host system using the Module should have a label indicating it

contains the modular's FCC ID is A3LWXT5FM2101. This radio module must not be installed to co-locate and operating simultaneously with other radios in host system additional testing and equipment authorization may be required to operating simultaneously with other radio. The Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device.

The modular must be installed in the host that is assigned by Company name: Samsung Electronics Co Ltd, Model no.: WXT5FM2101. If other host types used would need further evaluation and possible C2PC if they are not significantly similar to the one tested The WIFI Module is designed for a compact PCB design. It should be installed and operated with host or other minimum distance of 20 centimeters between the radiator and your body." To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed 3.90 dBi in the BT/BLE band, 3.64 dBi in the 2.4G WIFI band and 3.67 dBi in the 5G WIFI band. The module uses External Antenna interface and ping angle interface antenna, this antenna is sold with the module.

Notice to OEM integrator

The end user manual shall include all required regulatory information/warning as shown in this manual. The OEM integrator is responsible for testing their end product for any additional compliance requirements required with this module installed. If the final product contains circuits of other FCC PART 15 Subparts, the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The intended use is generally not for the general public, it is generally for industry/commercial use. The connector is within the transmitter enclosure and can only be accessed by disassembly of the transmitter that is not normally required, the user has no access to the connector. Installation must be controlled. Installation requires special training.

This device complies with Part 15 of the FCC Rules.

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

ISED Statement

The Module is designed to comply with the ISED statement. ISED Certification Number is 649E-WXT5FM2101. The host system using the Module should have a label indicating it contains the modular's IC: 649E-WXT5FM2101. This radio module must not be installed to co-locate and operating simultaneously with other radios in host system additional testing and equipment authorization may be required to operating simultaneously with other radio. The Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device.

Le module est conçu pour se conformer à la déclaration d'ISDE. Le numéro de certification d'ISDE est 649E-WXT5FM2101. Le système hôte utilisant le module doit avoir une étiquette indiquant qu'il contient le circuit intégré du module : 649E-WXT5FM2101. Ce module radio ne doit pas être installé pour co-localiser et fonctionner simultanément avec d'autres radios dans le système hôte, des tests supplémentaires et une autorisation d'équipement peuvent être nécessaires pour fonctionner simultanément avec d'autres radios. Le module et son antenne ne doivent pas être co-localisés ou fonctionner en conjonction avec un autre émetteur ou antenne au sein d'un appareil hôte.

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.

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

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.

Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.

BT/BLE:

The max antenna gain (in dBi): 3.90 dBi

Antenna type: External Antenna

2.4G WIFI:

The max antenna gain (in dBi): 3.64 dBi

Antenna type: External Antenna

5G WIFI:

The max antenna gain (in dBi): 3.67 dBi

Antenna type: External Antenna

Declaration of conformity

This product complies with the radio interference requirements of the European community. Hereby, SAMSUNG ELECTRONICS CO., LTD declares that the product is in compliance with the essential requirements and other relevant provisions of RE Directive 2014/53/EU. You can find the Declaration of Conformity on www.samsung.com.

RF frequency:

BT: 2402 MHz to 2480 MHz

BLE: 2402 MHz to 2480 MHz

2.4G WIFI: 2412 MHz to 2472 MHz

5G WIFI: 5180 MHz to 5320 MHz; 5500 MHz to 5700 MHz

5745 MHz to 5825 MHz

RF power:

BT: 9.96 dBm

BLE: 9.96 dBm

2.4G WIFI: 17.83 dBm

5G WIFI:

5180 MHz to 5320 MHz: 17.65 dBm

5500 MHz to 5700 MHz: 17.52 dBm

5745 MHz to 5825 MHz: 13.78 dBm

Manufacturer Name: SAMSUNG ELECTRONICS CO., LTD

Address: 129 Samsung-ro Yeongtong-gu Suwon-si, Gyeonggi-do, 16677, Republic of
Korea

Product Name: Wifi&BT Module

Model: WXT5FM2101