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Approval Sheet of J20H084ac

Customer Name: Sony Corporation

Project Name	WiFi+BT module
Approval Sheet Rev.	1.0
Foxconn Part No.	J20H084.00
Sony Part No.	

Prepared by	Reviewed by	Approved by
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1 Revision History

Date	Document revision	Change Description
2014/02/19	1.0	Initial release

2 Manufacturing Information

Manufacture Country:
Made in China

Manufacturer:
Ambit Microsystems (Shanghai) LTD.

Manufacture Address:
No 1925, Nanle Road Songjiang Export Processing Zone Shanghai, China

3 Product Overview

The J20H084.00 802.11a/b/g/n/ac 2X2 and BT4.0+LE module provides wireless modem functionality utilizing direct sequence spread spectrum and OFDM/CCK technology. This module is based on MTK MT7662U solution .It fully complies with IEEE 802.11n,IEEE 802.11 a/b/g and ,IEEE 802.11 ac standards, Bluetooth v2.1+EDR, V4.0 standard, offering feature-rich wireless connectivity at high standards, and delivering reliable, cost-effective 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 DMA engine and hardware data processing accelerators which offloads the host processor.

3.1 Application scope

The wireless LAN is compliant to IEEE 802.11n,IEEE 802.11 a/b/g and IEEE 802.11 ac standards.
Channel Spacing
2.4GHz -> 5MHz, 5GHz-> 20MHz (BW on 20MHz),40MHz (BW on 40MHz)
Data rate:
1, 2, 5.5, 11Mbps for 802.11b;
6, 9, 12, 18, 24, 36, 48 and 54Mbps for 802.11a/g;
MCS0(6.5Mbps)~MCS7(72.2Mbps) for 802.11n HT20 mode (single chain);
MCS0(13Mbps)~MCS15(144.4Mbps) for 802.11n HT20 mode (dual chains);
MCS0(13Mbps)~MCS7(150Mbps) for 802.11n HT40 (5G only) mode (single chain);
MCS0(26Mbps)~MCS15(300Mbps) for 802.11n HT40 (5G only) mode (dual chains);
MCS0(6.5Mbps)~MCS8(86.7Mbps) for 802.11ac VHT20 mode (single chain);
MCS0(13Mbps)~MCS8(173.3Mbps) for 802.11ac VHT20 mode (dual chains);
MCS0(13.5Mbps)~MCS9(200Mbps) for 802.11ac VHT40 mode (single chain);
MCS0(27Mbps)~MCS9(400Mbps) for 802.11ac VHT40 mode (dual chains);
MCS0(32.5Mbps)~MCS9(433.3Mbps) for 802.11ac VHT80 mode (single chain);
MCS0(65Mbps)~MCS9(866.6Mbps) for 802.11ac VHT80 mode (dual chains);

BT:
The BT Module is compliant to Bluetooth 4.0 and EDR standard:
Carrier Frequency: 2402MHz ~ 2480 MHz
Carrier Spacing: 1.0MHz (classic), 2MHz (LE)
Duplexing: TDD
Modulation: FHSS
1Mbps (GFSK), 2Mbps (π/4-DQPSK), 3Mbps (8DPSK),LE (GFSK)

4 Module Hardware Overview

4.1 Block Diagram

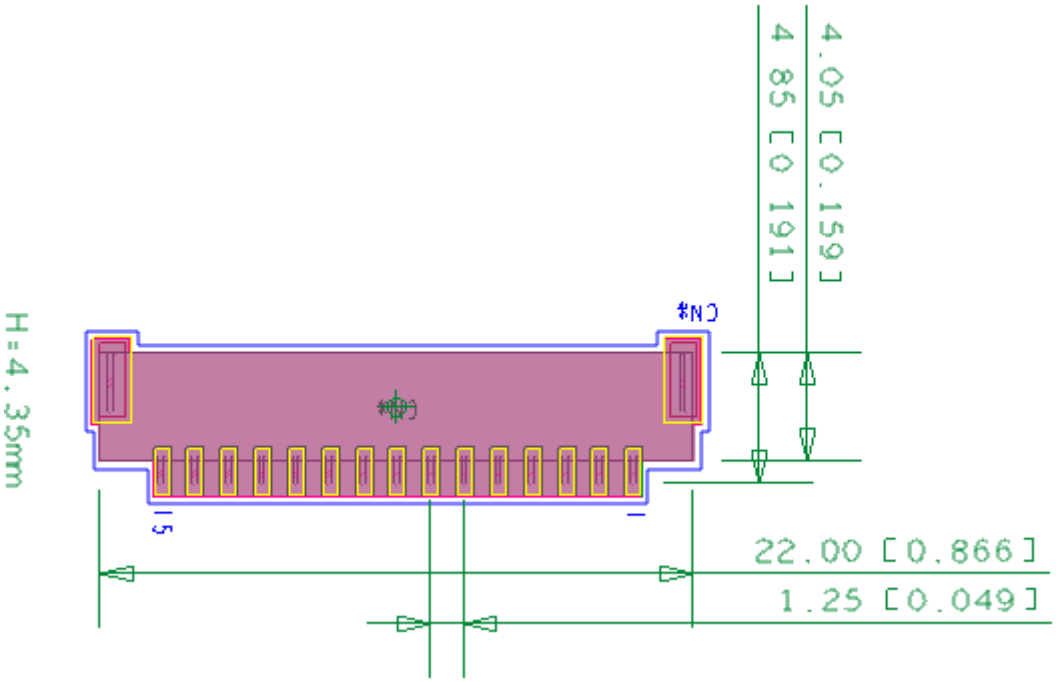
NA

4.2 Features

- IEEE802.11a/b/g/n/ac (2X2) based on MTK MT7662U solution.
- Support BT4.0+LE
- USB 2.0 Interface, High and Full Speeds supported.
- Module is powered by the host with a 3.3V +/- 5% supply.
- External PCB printed antennas.
- 4 layers through hole PCB design with FR4 material

4.3 Interface and Connector

- **Pin definition:**
- **Vendor: JST**
- **Vendor P/N: SM15B-GHS-TB**



Pin Number	Symbol Name	Status	Pin definition
1	UART_RX	Input	UART_RX for BT
2	UART_TX	Output	UART_TX for BT
3	GND	-	Ground
4	RST_L	Input	“L”-drive reset signal input from Host.
5	WOW_H	Output	Wake on WLAN signal output. “H”-drive is hoped when awake Host.
6	WOBT_H	Output	Wake on Bluetooth signal output. “H”-drive is hoped when awake Host.

			(old: Host_wake)
7	GND	-	Ground
8	DM	I/O	USB_DATA-
9	DP	I/O	USB_DATA+
10	GND	-	Shield Ground
11	VSYNC	Input	3D Video sync Signal
12	GND	-	Ground
13	GND	-	Ground
14	VCC	PWR	DC 3.3V
15	VCC	PWR	DC 3.3V
S1			Ground
S2			Ground

5 Electrical Specification

5.1 Absolute maximum rating

Element	Symbol	Min	Typ	Max	Unit
DC supply voltage	UV+		3.3	3.65	(V)

5.2 Recommended operating rating

Element	Symbol	Min	Typ	Max	Unit
DC supply voltage	UV+	2.97	3.3	3.63	(V)

5.3 DC Characteristics

Symbol	Parameter	Min	Typ.	Max	Unit
UV+	Supply voltage	2.97	3.3	3.63	(V)
	2.412GHz Tx Current(1M/16dBm)		470		(mA)
	2.412GHz Tx Current(MCS0/15dBm)		440		(mA)
	5.18GHz Tx Current(6M/13Bm/HT20)		580		(mA)
	5.19GHz Tx Current(MCS0/13dBm/HT40)		560		(mA)
	Rx Current		-		(mA)
	5.21GHz Tx Current(MCS9/11dBm/VHT80)		450		(mA)

5.4 ESD Information

Mode	Level	Unit
HBM	+/-1000	V

5.5 Environment Storage Condition

Environment condition	
Temperature	Operating Temperature: -10 deg.C ~60 deg.C
	Storage Temperature: -40 deg.C ~85 deg.C
Humidity	Operating Humidity: 20% ~90%
	Storage Humidity: 20% ~90%

6 RF Specification

6.1 IEEE802.11b

Items	Contents			
Specification	IEEE802.11b			
Mode	DSSS / CCK			
Channel	CH1 to CH13			
Data rate	1, 2, 5.5, 11Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@1Mbps	14.5	16	17.5	dBm
2) Target Power@2Mbps	14.5	16	17.5	dBm
3) Target Power@5.5Mbps	14.5	16	17.5	dBm
4) Target Power@11Mbps	14.5	16	17.5	dBm
2. Spectrum Mask @15dBm				
1) fc-33MHz ＜ f ＜ fc-22MHz	-	-	-50	dBr
2) fc-22MHz ＜ f ＜ fc-11MHz	-	-	-30	dBr
3) fc+11MHz ＜ f ＜ fc+22MHz	-	-	-30	dBr
4) fc+22MHz ＜ f ＜ fc+33MHz	-	-	-50	dBr
3. Frequency Error@25℃	-5	-	+5	ppm
4 Modulation Accuracy(EVM)@15dBm				
1) 1Mbps	-		-10	dB
2) 2Mbps	-		-10	dB
3) 5.5Mbps	-		-10	dB
4) 11Mbps	-		-10	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5 Minimum Input Level Sensitivity				
1) 1Mbps (FER≦8%)	-	-95	-91	dBm
2) 2Mbps (FER≦8%)	-	-91	-88	dBm
3) 5.5Mbps (FER≦8%)	-	-90	-87	dBm
4) 11Mbps (FER≦8%)	-	-89	-85	dBm
6 Maximum Input Level (FER≦8%)	-10	0	-	dBm

6.2 IEEE802.11g

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM			
Channel	CH1 to CH13			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@6Mbps	13.5	15	16.5	dBm
2) Target Power@9Mbps	13.5	15	16.5	dBm
3) Target Power@12Mbps	13.5	15	16.5	dBm
4) Target Power@18Mbps	13.5	15	16.5	dBm
5) Target Power@24Mbps	12.5	14	15.5	dBm
6) Target Power@36Mbps	12.5	14	15.5	dBm
7) Target Power@48Mbps	12.5	14	15.5	dBm
8) Target Power@54Mbps	12.5	14	15.5	dBm
2. Spectrum Mask @15dBm				
1) at fc +/- 11MHz	-	-	-20	dBr
2) at fc +/- 20MHz	-	-	-28	dBr
3) at fc > +/-30MHz	-	-	-40	dBr
3 Modulation Accuracy(EVM)@15dBm				
1) 6Mbps	-	-	-5	dB
2) 9Mbps	-	-	-8	dB
3) 12Mbps	-	-	-10	dB
4) 18Mbps	-	-	-13	dB
5) 24Mbps	-	-	-16	dB
6) 36Mbps	-	-	-19	dB
7) 48Mbps	-	-	-22	dB
8) 54Mbps	-	-28	-25	dB
4 Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5 Minimum Input Level Sensitivity				
1) 6Mbps (PER <10%)	-	-92	-83	dBm
2) 9Mbps (PER < 10%)	-	-91	-81	dBm
3) 12Mbps (PER < 10%)	-	-90	-79	dBm
4) 18Mbps (PER < 10%)	-	-87	-77	dBm
5) 24Mbps (PER < 10%)	-	-85	-75	dBm
6) 36Mbps (PER < 10%)	-	-80	-73	dBm
7) 48Mbps (PER < 10%)	-	-77	-71	dBm
8) 54Mbps (PER < 10%)	-	-75	-69	dBm
6 Maximum Input Level (PER < 10%)	-20	-11	-	dBm

6.3 IEEE 802.11n HT20

Items	Contents			
Specification	IEEE802.11n HT20			
Mode	OFDM			
Channel	CH1 and CH11~CH13			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@MCS0	13.5	15	16.5	dBm
2) Target Power@ MCS1	13.5	15	16.5	dBm
3) Target Power@ MCS2	13.5	15	16.5	dBm
4) Target Power@ MCS3	13.5	15	16.5	dBm
5) Target Power@ MCS4	12.5	14	15.5	dBm
6) Target Power@ MCS5	12.5	14	15.5	dBm
7) Target Power@ MCS6	12.5	14	15.5	dBm
8) Target Power@ MCS7	12.5	14	15.5	dBm
2. Spectrum Mask @14dBm				
1) at fc +/- 11MHz	-	-	-20	dBr
2) at fc +/- 20MHz	-	-	-28	dBr
3) at fc > +/-30MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@14dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-28	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-91	-81	dBm
2) MCS1 (PER < 10%)	-	-89	-79	dBm
3) MCS2 (PER < 10%)	-	-87	-77	dBm
4) MCS3 (PER < 10%)	-	-84	-75	dBm
5) MCS4 (PER < 10%)	-	-80	-73	dBm
6) MCS5 (PER < 10%)	-	-75	-71	dBm
7) MCS6 (PER < 10%)	-	-74	-69	dBm
8) MCS7 (PER < 10%)	-	-72	-67	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

Items	Contents			
Specification	IEEE802.11n HT20			
Mode	OFDM			
Channel	CH2 to CH10			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@MCS0	13.5	15	16.5	dBm
2) Target Power@ MCS1	13.5	15	16.5	dBm
3) Target Power@ MCS2	13.5	15	16.5	dBm
4) Target Power@ MCS3	13.5	15	16.5	dBm
5) Target Power@ MCS4	12.5	14	15.5	dBm
6) Target Power@ MCS5	12.5	14	15.5	dBm
7) Target Power@ MCS6	12.5	14	15.5	dBm
8) Target Power@ MCS7	12.5	14	15.5	dBm
2. Spectrum Mask @15dBm				
1) at fc +/- 11MHz	-	-	-20	dBr
2) at fc +/- 20MHz	-	-	-28	dBr
3) at fc > +/-30MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@15dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-28	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-91	-81	dBm
2) MCS1 (PER < 10%)	-	-89	-79	dBm
3) MCS2 (PER < 10%)	-	-87	-77	dBm
4) MCS3 (PER < 10%)	-	-84	-75	dBm
5) MCS4 (PER < 10%)	-	-80	-73	dBm
6) MCS5 (PER < 10%)	-	-75	-71	dBm
7) MCS6 (PER < 10%)	-	-74	-69	dBm
8) MCS7 (PER < 10%)	-	-72	-67	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

6.4 IEEE 802.11a

Items	Contents			
Specification	IEEE802.11a			
Mode	OFDM			
Channel	CH36 to CH165			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@6Mbps	11.5	13	14.5	dBm
2) Target Power@9Mbps	11.5	13	14.5	dBm
3) Target Power@12Mbps	11.5	13	14.5	dBm
4) Target Power@18Mbps	11.5	13	14.5	dBm
5) Target Power@24Mbps	10.5	12	13.5	dBm
6) Target Power@36Mbps	10.5	12	13.5	dBm
7) Target Power@48Mbps	10.5	12	13.5	dBm
8) Target Power@54Mbps	10.5	12	13.5	dBm
2. Spectrum Mask @12dBm				
1) at fc +/- 11MHz	-	-	-20	dBr
2) at fc +/- 20MHz	-	-	-28	dBr
3) at fc > +/-30MHz	-	-	-40	dBr
3 Modulation Accuracy(EVM)@12dBm				
1) 6Mbps	-	-	-5	dB
2) 9Mbps	-	-	-8	dB
3) 12Mbps	-	-	-10	dB
4) 18Mbps	-	-	-13	dB
5) 24Mbps	-	-	-16	dB
6) 36Mbps	-	-	-19	dB
7) 48Mbps	-	-	-22	dB
8) 54Mbps	-	-28	-25	dB
4 Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5 Minimum Input Level Sensitivity				
1) 6Mbps (PER <10%)	-	-92	-83	dBm
2) 9Mbps (PER < 10%)	-	-91	-81	dBm
3) 12Mbps (PER < 10%)	-	-90	-79	dBm
4) 18Mbps (PER < 10%)	-	-87	-77	dBm
5) 24Mbps (PER < 10%)	-	-85	-75	dBm
6) 36Mbps (PER < 10%)	-	-80	-73	dBm
7) 48Mbps (PER < 10%)	-	-77	-71	dBm
8) 54Mbps (PER < 10%)	-	-75	-69	dBm
6 Maximum Input Level (PER < 10%)	-20	-11	-	dBm

6.5 IEEE 802.11an HT20

Items	Contents			
Specification	IEEE802.11an HT20			
Mode	OFDM			
Channel	CH36 to CH165			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@MCS0	11.5	13	14.5	dBm
2) Target Power@ MCS1	11.5	13	14.5	dBm
3) Target Power@ MCS2	11.5	13	14.5	dBm
4) Target Power@ MCS3	11.5	13	14.5	dBm
5) Target Power@ MCS4	10.5	12	13.5	dBm
6) Target Power@ MCS5	10.5	12	13.5	dBm
7) Target Power@ MCS6	10.5	12	13.5	dBm
8) Target Power@ MCS7	10.5	12	13.5	dBm
2. Spectrum Mask @12dBm				
1) at fc +/- 11MHz	-	-	-20	dBr
2) at fc +/- 20MHz	-	-	-28	dBr
3) at fc > +/-30MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@12dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-28	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-91	-81	dBm
2) MCS1 (PER < 10%)	-	-89	-79	dBm
3) MCS2 (PER < 10%)	-	-87	-77	dBm
4) MCS3 (PER < 10%)	-	-84	-75	dBm
5) MCS4 (PER < 10%)	-	-80	-73	dBm
6) MCS5 (PER < 10%)	-	-75	-71	dBm
7) MCS6 (PER < 10%)	-	-74	-69	dBm
8) MCS7 (PER < 10%)	-	-72	-67	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

6.6 IEEE 802.11an HT40

Items	Contents			
Specification	IEEE802.11an HT40			
Mode	OFDM			
Channel	CH38 to CH159			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@MCS0	10.5	12	13.5	dBm
2) Target Power@ MCS1	10.5	12	13.5	dBm
3) Target Power@ MCS2	10.5	12	13.5	dBm
4) Target Power@ MCS3	10.5	12	13.5	dBm
5) Target Power@ MCS4	10.5	12	13.5	dBm
6) Target Power@ MCS5	10.5	12	13.5	dBm
7) Target Power@ MCS6	10.5	12	13.5	dBm
8) Target Power@ MCS7	10.5	12	13.5	dBm
2. Spectrum Mask @12dBm				
1) at fc +/- 21MHz	-	-	-20	dBr
2) at fc +/- 40MHz	-	-	-28	dBr
3) at fc > +/-60MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@12dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-28	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-88	-78	dBm
2) MCS1 (PER < 10%)	-	-86	-76	dBm
3) MCS2 (PER < 10%)	-	-84	-74	dBm
4) MCS3 (PER < 10%)	-	-81	-72	dBm
5) MCS4 (PER < 10%)	-	-77	-70	dBm
6) MCS5 (PER < 10%)	-	-72	-68	dBm
7) MCS6 (PER < 10%)	-	-71	-66	dBm
8) MCS7 (PER < 10%)	-	-69	-64	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

6.7 IEEE 802.11ac VHT20

Items	Contents			
Specification	IEEE802.11ac VHT20			
Mode	OFDM			
Channel	CH36 to CH165			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@MCS0	11.5	13	14.5	dBm
2) Target Power@ MCS1	11.5	13	14.5	dBm
3) Target Power@ MCS2	11.5	13	14.5	dBm
4) Target Power@ MCS3	11.5	13	14.5	dBm
5) Target Power@ MCS4	10.5	12	13.5	dBm
6) Target Power@ MCS5	10.5	12	13.5	dBm
7) Target Power@ MCS6	10.5	12	13.5	dBm
8) Target Power@ MCS7	10.5	12	13.5	dBm
9) Target Power@ MCS8	9.5	11	12.5	dBm
2. Spectrum Mask @11dBm				
1) at fc +/- 11MHz	-	-	-20	dBr
2) at fc +/- 20MHz	-	-	-28	dBr
3) at fc > +/-30MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@11dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-27	dB
9) MCS8	-	-	-30	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-91	-81	dBm
2) MCS1 (PER < 10%)	-	-89	-79	dBm
3) MCS2 (PER < 10%)	-	-87	-77	dBm
4) MCS3 (PER < 10%)	-	-84	-75	dBm
5) MCS4 (PER < 10%)	-	-80	-73	dBm
6) MCS5 (PER < 10%)	-	-75	-71	dBm
7) MCS6 (PER < 10%)	-	-74	-69	dBm
8) MCS7 (PER < 10%)	-	-72	-67	dBm
8) MCS8 (PER < 10%)	-	-63	-58	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

6.8 IEEE 802.11ac VHT40

Items	Contents			
Specification	IEEE802.11ac VHT40			
Mode	OFDM			
Channel	CH38 to CH159			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@MCS0	11.5	13	14.5	dBm
2) Target Power@ MCS1	11.5	13	14.5	dBm
3) Target Power@ MCS2	11.5	13	14.5	dBm
4) Target Power@ MCS3	11.5	13	14.5	dBm
5) Target Power@ MCS4	10.5	12	13.5	dBm
6) Target Power@ MCS5	10.5	12	13.5	dBm
7) Target Power@ MCS6	10.5	12	13.5	dBm
8) Target Power@ MCS7	10.5	12	13.5	dBm
9) Target Power@ MCS8	9.5	11	12.5	dBm
10) Target Power@ MCS9	9.5	11	12.5	dBm
2. Spectrum Mask @11dBm				
1) at fc +/- 21MHz	-	-	-20	dBr
2) at fc +/- 40MHz	-	-	-28	dBr
3) at fc > +/- 60MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@11dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-27	dB
9) MCS8	-	-	-30	dB
10) MCS9	-	-	-32	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-88	-78	dBm
2) MCS1 (PER < 10%)	-	-86	-76	dBm
3) MCS2 (PER < 10%)	-	-84	-74	dBm
4) MCS3 (PER < 10%)	-	-81	-72	dBm
5) MCS4 (PER < 10%)	-	-77	-70	dBm
6) MCS5 (PER < 10%)	-	-72	-68	dBm
7) MCS6 (PER < 10%)	-	-71	-66	dBm
8) MCS7 (PER < 10%)	-	-69	-64	dBm
7) MCS8 (PER < 10%)	-	-64	-59	dBm
8) MCS9 (PER < 10%)	-	-60	-57	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

6.9 IEEE 802.11ac VHT80

Items	Contents			
Specification	IEEE802.11ac VHT80			
Mode	OFDM			
Channel	CH42 to CH155			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) Target Power@ MCS0	11.5	13	14.5	dBm
2) Target Power@ MCS1	11.5	13	14.5	dBm
3) Target Power@ MCS2	11.5	13	14.5	dBm
4) Target Power@ MCS3	11.5	13	14.5	dBm
5) Target Power@ MCS4	10.5	12	13.5	dBm
6) Target Power@ MCS5	10.5	12	13.5	dBm
7) Target Power@ MCS6	10.5	12	13.5	dBm
8) Target Power@ MCS7	10.5	12	13.5	dBm
9) Target Power@ MCS8	9.5	11	12.5	dBm
10) Target Power@ MCS9	9.5	11	12.5	dBm
2. Spectrum Mask @11dBm				
1) at fc +/- 41MHz	-	-	-20	dBr
2) at fc +/- 80MHz	-	-	-28	dBr
3) at fc > +/- 120MHz	-	-	-45	dBr
3. Modulation Accuracy(EVM)@11dBm				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-27	dB
9) MCS8	-	-	-30	dB
10) MCS9	-	-	-32	dB
4. Frequency Error@25℃	-5	-	+5	ppm
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0 (PER < 10%)	-	-80	-75	dBm
2) MCS1 (PER < 10%)	-	-78	-73	dBm
3) MCS2 (PER < 10%)	-	-76	-71	dBm
4) MCS3 (PER < 10%)	-	-74	-69	dBm
5) MCS4 (PER < 10%)	-	-72	-67	dBm
6) MCS5 (PER < 10%)	-	-70	-65	dBm
7) MCS6 (PER < 10%)	-	-68	-63	dBm
8) MCS7 (PER < 10%)	-	-66	-61	dBm
9) MCS8 (PER < 10%)	-	-63	-58	dBm
10) MCS9 (PER < 10%)	-	-59	-54	dBm
6. Maximum Input Level (PER < 10%)	-20	-10	-	dBm

6.10 Bluetooth 3.0

BT specification

BDR TX

PARAMETER	DESCRIPTION	PERFORMANCE			
		MIN	TYP	MAX	Unit
Frequency range		2402	-	2480	MHz
Output power	At maximum power output level	-1	1	3	dBm
Gain step		2	4	8	dB
Modulation characteristics	Δf1avg	140	157	175	KHz
	Δf2max(For at least 99.9% of all Δf2max)	115	140	-	KHz
	Δf1avg/Δf2avg	0.8	0.98	-	KHz
ICFT	Initial carrier frequency tolerance	-25		25	KHz
Carrier frequency drift	One slot packet(DH1)	-25		25	KHz
	Three slot packet(DH3)	-40		40	KHz
	Five slot packet(DH5)	-40		40	KHz
	Max drift	-20		20	KHz/50us
TX output spectrum	20dB bandwidth		922	1000	KHz
In-Band spurious emission	±2MHz offset		-45	-20	dBm
	±3MHz offset		-48	-40	dBm
	>±3MHz offset		-48	-40	dBm

BDR RX

PARAMETER	DESCRIPTION	PERFORMANCE			
		MIN	TYP	MAX	Unit
Frequency range		2402	-	2480	MHz
Receiver sensitivity	BER<0.1%		-93.5	-80	dBm
Maximum usable signal	BER<0.1%		-5		dBm
C/I co-channel (BER<0.1%)	Co channel selectivity		4	11	dB
C/I 1MHz (BER<0.1%)	Adjacent channel selectivity		-14	0	dB
C/I 2MHz (BER<0.1%)	2nd adjacent channel selectivity		-42	-30	dB
C/I >=3 MHz (BER<0.1%)	3rd adjacent channel selectivity		-49	-40	dB
C/I Image channel (BER<0.1%)	Image channel selectivity		-25	-9	dB
C/I Image 1MHz (BER<0.1%)	1MHz adjacent to image channel selectivity		-50	-20	dB
Inter-modulation			-13		dBm
Out-of-band blocking	30MHz to 2000MHz	-10			dBm
	2000MHz to 2399MHz	-27			dBm
	2498MHz to 3000MHz	-27			dBm
	3000MHz to 12.75GHz	-10			dBm

EDR TX

PARAMETER	DESCRIPTION		PERFORMANCE			
			MIN	TYP	MAX	Unit
Frequency range			2402	-	2480	MHz
Maximum transmit power[1]	π/4 DQPSK		-1	1	3	dBm
	8PSK		-	4.5	-	dBm
Relative transmit power	π/4 DQPSK		-	-1.7	-	dB
	8PSK		-	-1.7	-	dB
Frequency stability	maximum carrier frequency stability, ωo	π/4 DQPSK	-10	0	10	KHz
		8PSK	-10	0	10	KHz
	maximum carrier frequency stability, ωi	π/4 DQPSK	-25	±5	25	KHz
		8PSK	-25	±5	25	KHz
	maximum carrier frequency stability, |ωo + ωi|	π/4 DQPSK	-25	±5	25	KHz
		8PSK	-25	±5	25	KHz
Modulation accuracy	RMS DEVM	π/4 DQPSK	-	5	30	%
		8PSK	-	5	20	%
	99% DEVM	π/4 DQPSK	-	9	-	%
		8PSK	-	9	-	%
	Peak DEVM	π/4 DQPSK	-	14	35	%
		8PSK	-	15	25	%
In-Band spurious emission	±1MHz offset	π/4 DQPSK	-	-37	-26	dB
	±1MHz offset	8PSK	-	-36	-26	dB
	±2MHz offset	π/4 DQPSK	-	-33	-20	dBm
	±2MHz offset	8PSK	-	-32	-20	dBm
	±3MHz offset	π/4 DQPSK	-	-44	-40	dBm
	±3MHz offset	8PSK	-	-44	-40	dBm

EDR RX

PARAMETER	DESCRIPTION	PERFORMANCE			
		MIN	TYP	MAX	Unit
Frequency range		2402	-	2480	MHz
Receiver sensitivity (BER<0.01%)[1]	π/4 DQPSK	-	-93	-	dBm
	8PSK	-	-87.5	-	dBm
Maximum usable signal (BER<0.1%)	π/4 DQPSK	-	-5	-	dBm
	8PSK	-	-5	-	dBm
C/I co-channel (BER<0.1%)	π/4 DQPSK	-	8	13	dB
	8PSK	-	14	21	dB
C/I 1MHz (BER<0.1%)	π/4 DQPSK	-	-13	0	dB
	8PSK	-	-7	5	dB
C/I 2MHz (BER<0.1%)	π/4 DQPSK	-	-44	-30	dB
	8PSK	-	-42	-33	dB
C/I≥3MHz (BER<0.1%)	π/4 DQPSK	-	-52	-40	dB
	8PSK	-	-44	-33	dB
C/I Image channel (BER<0.1%)	π/4 DQPSK	-	-30	-7	dB
	8PSK	-	-25	0	dB
C/I Image 1MHz (BER<0.1%)	π/4 DQPSK	-	-53	-20	dB
	8PSK	-	-47	-13	dB

LE TX

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency Range		2402	-	2480	MHz
Output Power (*)	At max power output level	-2	0	2	dBm
Carrier Frequency Offset and Drift	Frequency offset	-150	±6	150	kHz
	Frequency drift	-50	±6	50	kHz
	Max. drift rate	-20	±3	20	Hz/us
Modulation Characteristic	$\Delta f1_{avg}$	225	251	275	kHz
	$\Delta f2_{max}$ (For at least 99% of all $\Delta f2_{max}$)	185	236	-	kHz
	$\Delta f2_{avg}/\Delta f1_{avg}$	0.8	0.94	-	Hz/Hz
In-band Spurious Emission	±2M offset	-	-53	-20	dBm
	>±3MHz offset	-	-55	-30	dBm

LE RX

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency Range		2402	-	2480	MHz
Receiver Sensitivity (*)	PER < 30.8%	-	-97	-70	dBm
Max. Usable Signal	PER < 30.8%	-10	-5	-	dBm
C/I Co-channel	Co-channel selectivity (PER < 30.8%)	-	6	21	dB
C/I 1MHz	Adjacent channel selectivity (PER < 30.8%)	-	-7	15	dB
C/I 2MHz	2nd adjacent channel selectivity (PER < 30.8%)	-	-32	-17	dB
C/I ≧3MHz	3rd adjacent channel selectivity (PER < 30.8%)	-	-35	-27	dB
C/I Image channel	Image channel selectivity (PER < 30.8%)	-	-26	-9	dB

Parameter	Description	Min.	Typ.	Max.	Unit
C/I Image 1MHz	1MHz adjacent to image channel selectivity (PER < 30.8%)	-	-28	-15	dB
Out-of-band Blocking	30MHz to 2000MHz	-30	-	-	dBm
	2001MHz to 2339MHz	-35	-	-	dBm
	2501MHz to 3000MHz	-35	-	-	dBm
	3001MHz to 12.75GHz	-30	-	-	dBm

6.11 Antenna Electrical Specification

WiFi:

	Frequency	Ant.1 Peak Gain (dBi)	Ant.2 Peak Gain (dBi)
WiFi antenna	2.40GHz	3.54dBi	3.06dBi
	2.45GHz	4.40dBi	3.12dBi
	2.50GHz	3.90dBi	3.19dBi
	5.15GHz	7.45dBi	7.63dBi
	5.45GHz	6.20dBi	6.99dBi
	5.85GHz	7.63dBi	7.87dBi

BT:

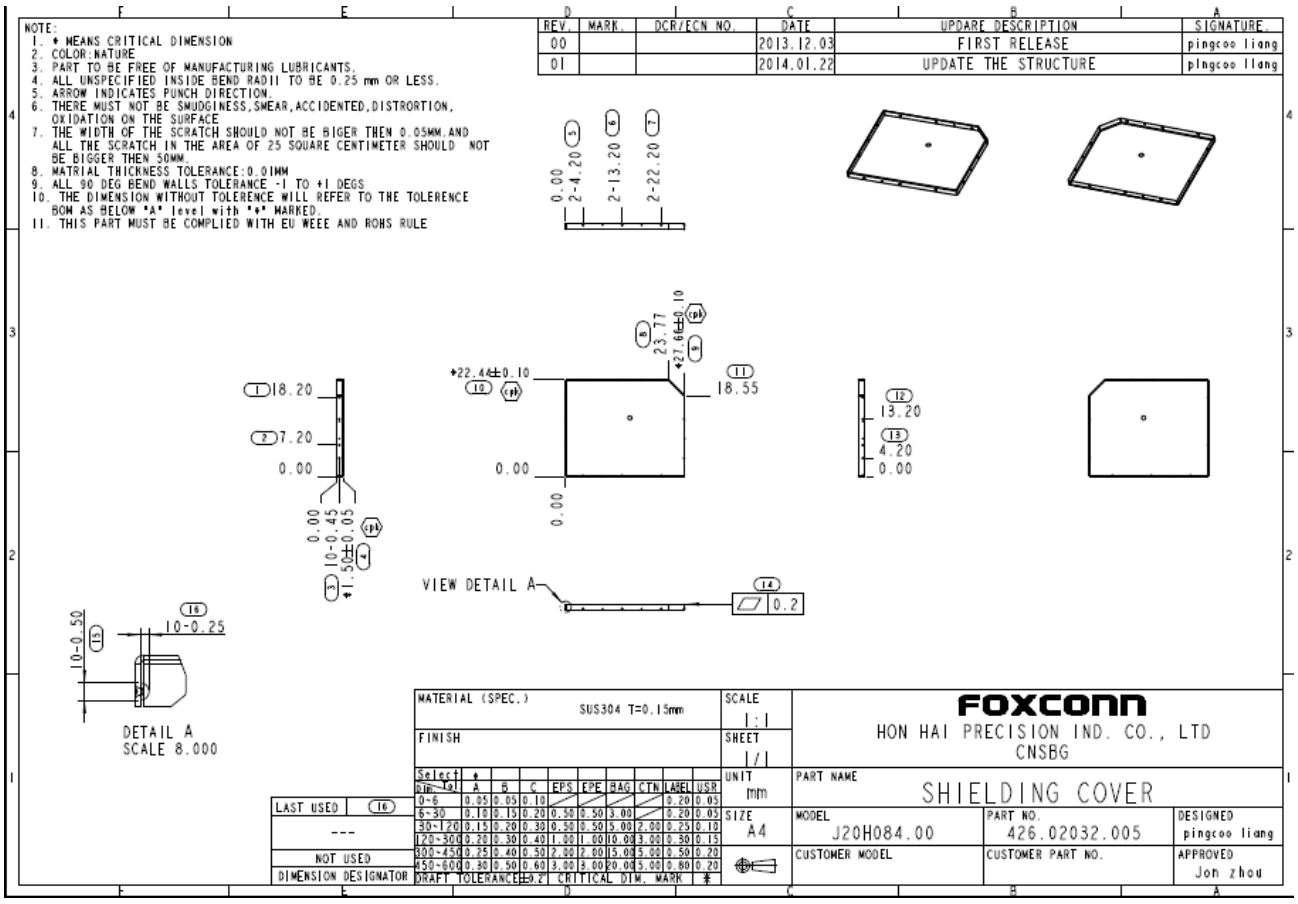
	Frequency	Cable Length: 500mm Peak Gain (dBi)
BT antenna	2.40GHz	3.45dBi
	2.45GHz	3.53dBi
	2.50GHz	3.27dBi

7 Mechanical Specifications

7.1 Shielding Cover Dimension

Dimension (LxWxH): 22.44mm x 27.66mm x 1.5mm

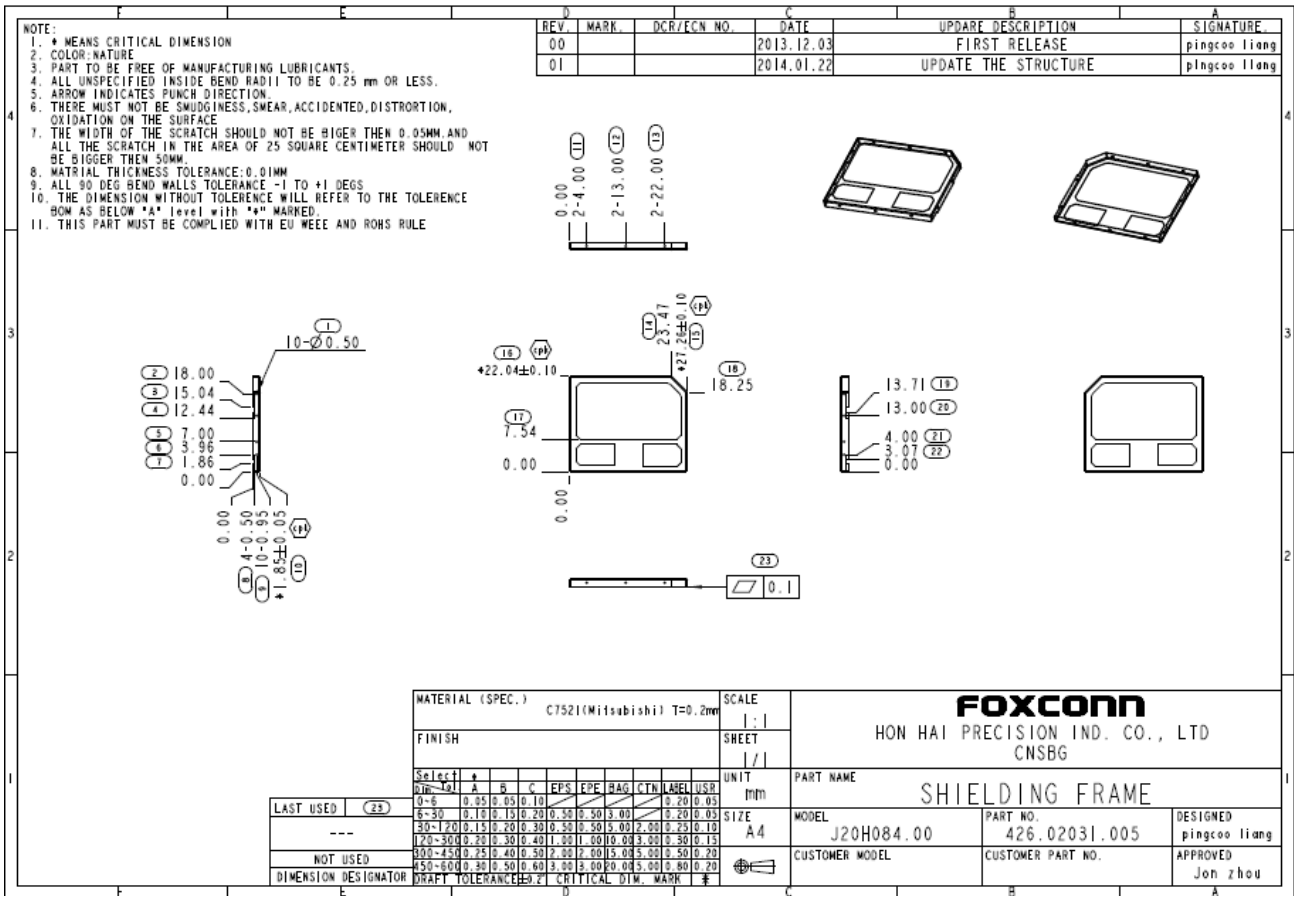
Thickness: 0.2mm



7.2 Shielding frame Dimension

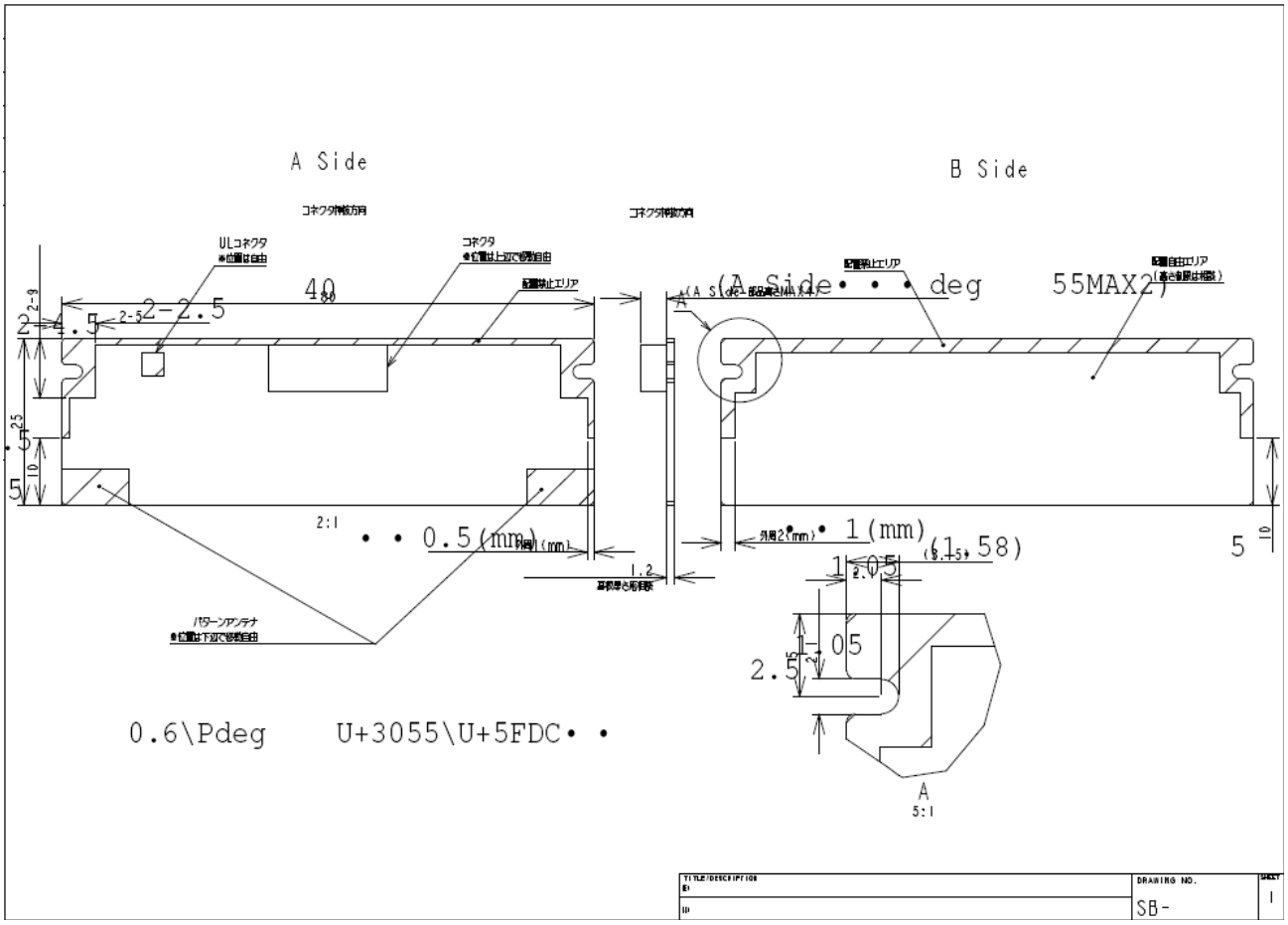
Dimension (LxWxH): 22.04mm x 27.26mm x 1.5mm

Thickness: 0.1mm



7.3 PCB Assembly Dimension

Dimension (W x Lx H): 80mmx25mmx1.0mm
PCB: 4 layer FR4 design



Industry Canada statement:

This device complies with RSS-210 of the Industry Canada 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.

Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Radiation Exposure Statement:

This equipment complies with IC 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.

Déclaration d'exposition aux radiations:

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 device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.
Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not 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 Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

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 IC: 2878D-J20H084AC”.

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 2878D-J20H084AC”.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

Federal Communication Commission Interference 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.

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 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

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

End Product Labeling

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 FCC

ID: AK8J20H084AC". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

For Taiwan 警語： **(**電信管制射頻器材使用**)**

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Note: 1. 本模組於取得認證後將依規定於模組本體標示審驗合格標籤 2. 系統廠商應於平台上標示「本產品內含射頻模組: XXXyyyLPDzzzz-x (NCC ID) 」字樣

Europe – EU Declaration of Conformity

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:

- EN 60950-1: 2006+A11:2009+A1:2010+A12:2011

Safety of Information Technology Equipment

- EN 62311: 2008

Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz-300 GHz)

(IEC 62311:2007 (Modified))

EN 300 328 V1.7.1: 2006

- Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

EN 301 489-1 V1.8.1: 2008

Electromagnetic compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

EN 301 489-17 V2.1.1 2009

Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment

National Authorities were informed according to Article 6.4 of Frequency Notification.

Special Requirements are considered. The product is labeled with CE Marking.

CE

Česky [Czech]	*[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk [Danish]	Undertegnede *[fabrikantens navn]* erklærer herved, at følgende udstyr *[udstyrets typebetegnelse]* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt *[Name des Herstellers]*, dass sich das Gerät *[Gerätetyp]* in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab *[tootja nimi = name of manufacturer]* seadme *[seadme tüüp = type of equipment]* vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, *[name of manufacturer]*, declares that this *[type of equipment]* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente *[nombre del fabricante]* declara que el *[clase de equipo]* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ *[name of manufacturer]* ΔΗΛΩΝΕΙ ΟΤΙ *[type of equipment]* ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français [French]	Par la présente *[nom du fabricant]* déclare que l'appareil *[type d'appareil]* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente *[nome del costruttore]* dichiara che questo *[tipo di apparecchio]* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo *[name of manufacturer / izgatavotāja nosaukums]* deklarē, ka *[type of equipment / iekārtas tips]* atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart *[naam van de fabrikant]* dat het toestel *[type van toestel]* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, *[isem tal-manifattur]*, jiddikjara li dan *[il-mudel tal-prodott]* jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar	Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó