

FPWB-A013BBKZ

AIoT WIRELESS MODULE

Product Specification 1.0

Revision History

Date	Number	Approver	Comments
May 22, 2024	1.0	Ben Ho	Initial Draft

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CHAPTER 1. MODULE OVERVIEW

The Foxconn B02 is a highly integrated module which features a low power 1x1 WLAN subsystem and a Bluetooth subsystem. The WLAN subsystem contains the 802.11a/b/g/n radio, baseband that are designed to meet both the low power and high throughput application.

B02 consists a high-performance MCU(KM4) and a low power MCU(KM0) that handles WLAN and Bluetooth tasks. The Bluetooth subsystem contains the Bluetooth radio, baseband, link controller. It also uses the MCUs for the Bluetooth protocols.

1-1 Key Characteristic

- Dual process core for WLAN/Bluetooth protocols
- IEEE 802.11 a/b/g/n 1x1 compliant
- Support 20MHz, 40MHz in 2.4GHz band 5GHz band
- Equal access to address space including SRAM, peripherals and registers
- Up to 64KB contiguous main SRAM @ 200MHz for KM4 CPU
- Support Bluetooth 5.0
- Low power beacon listen mode

1-2 Pin Definition

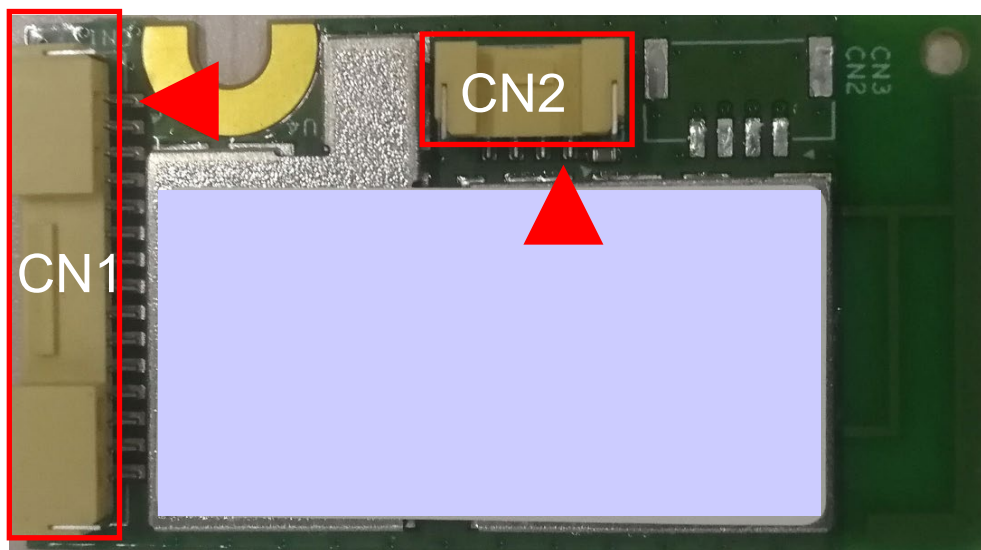


Figure 1 Pin Definitions

Table 1 CN1 Terminal for home appliance Pin Definitions

Pin Number	Symbol	Name	Type	Pin Description
1	VDD		POWER INPUT of VDD	DC 3.3V
2	VDD		POWER INPUT of VDD	DC 3.3V
3	UART0_RTS		O	UART RTS (3.3V)
4	UART0_CTS		I	UART CTS (3.3V)
5	UART0_RX		I	UART RX (3.3V)
6	UART0_TX		O	UART TX (3.3V)
7	CHIP_EN		I	Module enable control active (3.3V)
8	GPIO_1		I/O	GPIO
9	I2C_SCL		I/O	I2C clock (3.3V)
10	I2C_SDA		I/O	I2C data (3.3V)
11	GPIO_1		I/O	GPIO
12	GND		GND	Ground
13	SPKOUT_P		O	Speaker amplifier differential positive output
14	SPKOUT_N		O	Speaker amplifier differential negative output
15	GND		GND	Ground

Table 2 CN2 Service UART terminal Pin Definitions

Pin Number	Symbol	Name	Type	Pin Description
1	VCC		POWER	DC 3.3V
2	DEBUG_UART_TX		I/O	Debug UART TX (3.3V)
3	DEBUG_UART_RX		I/O	Debug UART RX (3.3V)
4	GND		GND	Ground

1-3 PCB Specification

PCB Vendor Name: CHAMPION ASIA TECH CO LTD (五株)

Material of the board: WH-1(EM-370(5))

UL File No : E170968

Board-thickness: 1.0mm (typ)

Product-height: 2.1mm (max)

Tolerance: 0.1mm

Flame class: UL94V-0

CTI: PLC 4(100-174v)

PCB Vendor Name: HONGHENGSHENG ELECTRONICAL TECHNOLOGY (HUAIAN) CO LTD

Material of the board: HD5

UL File No : E253117

Board-thickness: 1.0mm (typ)

Product-height: 2.1mm (max)

Tolerance: 0.1mm

Flame class: UL94V-0

CTI: PLC II(400-600)

1-4 Soldering Specification

Solder Paste

Vendor: SMIC(Senju Metal Industry Co.,Ltd.)

Model No.: M705-GRN360-K2-V

Composition: Sn96.5/Ag3/Cu0.5

Powder size: Type-4(20~38 μ m)

溫度設置 (攝氏)												
溫區	1	2	3	4	5	6	7	8	9	10	11	12
上溫區	150	160	165	165	170	180	190	205	235	250	250	220
下溫區	150	160	165	165	170	180	190	205	235	250	250	220
傳送帶速度 (公分/分):	76.0											

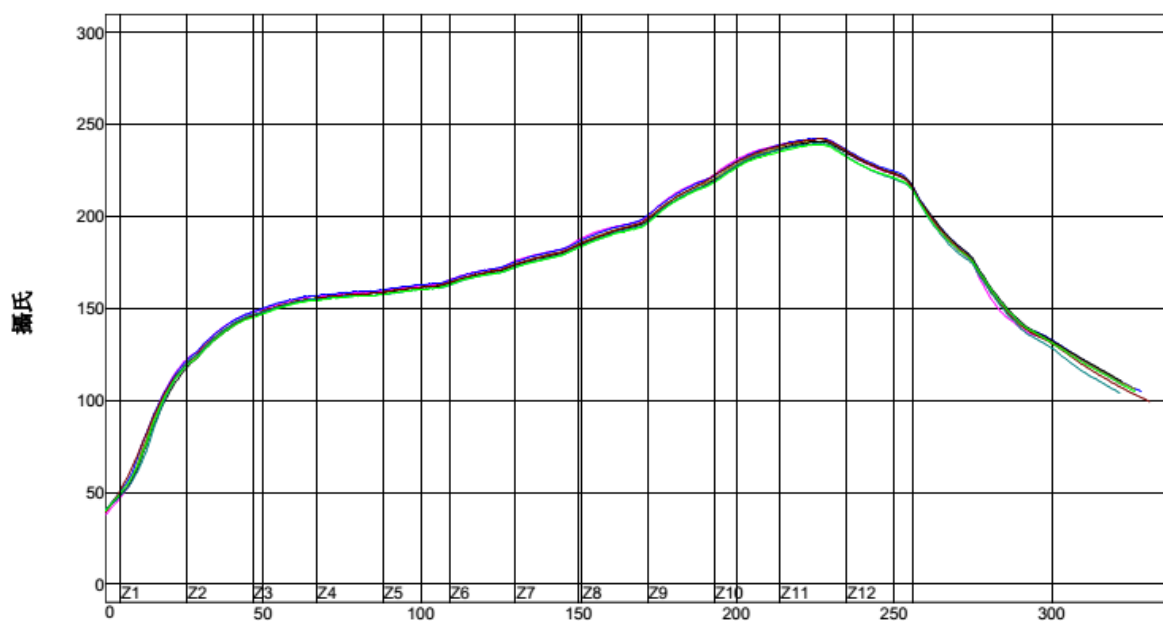


Figure 10 Reflow Temperature profile:

CHAPTER 2. ELECTRICAL AND RF SPECIFICATION

2-1 Recommended Operation Rating

Table 3 Operation Rating

Parameter	Condition	Min	Typ.	Max.	Unit
VCC	3.3V	3.0V	3.3V	3.6V	V
Current consumption	WLAN + Speaker			980	mA
	WLAN			330	mA
RF Interface	Zo		50		Ohm

2-2 Digital IO Pin DC Characteristic

Table 4 CN1 CHIP_EN Characteristic

Symbol	Parameter	Conditions	-10°C to +80°C			Unit
			Min	Type	Max	
VT+	positive-going threshold voltage	VCC = 3.1 V	1.36	1.45	1.56	V
		VCC = 3.5 V	1.78	1.87	1.97	V
IIL	Input-Leakage Current	VIN=5.0v or 0	-10	±1	10	μA

Table 5 CN1 UART IO Characteristic (3.3V)

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
V _{IH}	High-level input Voltage	LVTTL	V _{cc} *0.7	-	-	V
V _{IL}	Low-level input Voltage	LVTTL	-	-	V _{cc} *0.3	V
V _{OH}	High-level output Voltage	LVTTL	2.4	-	-	V
V _{OL}	Low-level output Voltage	LVTTL	-	-	0.4	V

2-3 Power Consumption

Table 6 Power Consumption

Description	WLAN only	WLAN + Speaker / Mic	Unit
IDLE (Disconnecting to AP)	70	720	mA
IDLE (Connecting to AP)	85	735	mA
2G/1T- N mode HT 40MHz MCS 7 (12dBm)	200	850	mA
2G/1T- N mode HT 20MHz MCS 7 (12dBm)	230	880	mA
2G/1T- G mode OFDM54M (15dBm)	270	920	mA
2G/1T- B mode CCK11M (16dBm)	330	980	mA
5G/1T- N mode HT 40MHz MCS 7 (12dBm)	250	900	mA
5G/1T- N mode HT 20MHz MCS 7 (12dBm)	280	930	mA
5G/1T- A mode OFDM54M (12dBm)	280	930	mA
2G/1R- N mode HT 40MHz MCS 7 (-60dBm)	95	745	mA
2G/1R- N mode HT 20MHz MCS 7 (-60dBm)	95	745	mA
2G/1R- G mode OFDM54M (-60dBm)	95	745	mA
2G/1R- B mode CCK11M (-60dBm)	95	745	mA
5G/1R- N mode HT 40MHz MCS 7 (-60dBm)	95	745	mA
5G/1R- N mode HT 20MHz MCS 7 (-60dBm)	95	745	mA
5G/1R- A mode OFDM54M (-60dBm)	95	745	mA

2-4 RF input and Output characteristic

- RF Input and Output characteristic (Ta=25° C)
- Transmitting and receiving frequency:2402~2483.5MHz @2.4GHz
:5150~5250/5250~5350/5470~5725/5725~5850MHz
- Wireless system IEEE 802.11a/b/g/n

2-5 WLAN RF Specification – TX

Table 7 IEEE 802.11 a/b/g/n TX Output Power

a-Mode

Data Rate(Mbps)	Modulation	Typical Power (dBm)	Data Rate (Mbps)	Modulation	Typical Power (dBm)
6	OFDM	12±2	24	OFDM	12±2
9	OFDM	12±2	36	OFDM	12±2
12	OFDM	12±2	48	OFDM	12±2
18	OFDM	12±2	54	OFDM	12±2

b-Mode

Data Rate(Mbps)	Modulation	Typical Power (dBm)	Data Rate (Mbps)	Modulation	Typical Power (dBm)
1	DBPSK	14±2	5.5	CCK	14±2
2	DQPSK	14±2	11	CCK	14±2

g-Mode

Data Rate(Mbps)	Modulation	Typical Power (dBm)	Data Rate (Mbps)	Modulation	Typical Power (dBm)
6	OFDM	13±2	24	OFDM	13±2
9	OFDM	13±2	36	OFDM	13±2
12	OFDM	13±2	48	OFDM	13±2
18	OFDM	13±2	54	OFDM	13±2

n(2G)-Mode

Data Rate(Mbps)	Modulation	Typical Power (dBm)	Data Rate (Mbps)	Modulation	Typical Power (dBm)
HT20-MCS0	BPSK	12±2	HT40-MCS0	BPSK	12±2
HT20-MCS1	BPSK	12±2	HT40-MCS1	QPSK	12±2
HT20-MCS2	QPSK	12±2	HT40-MCS2	QPSK	12±2
HT20-MCS3	QPSK	12±2	HT40-MCS3	16-QAM	12±2
HT20-MCS4	16-QAM	12±2	HT40-MCS4	16-QAM	12±2
HT20-MCS5	16-QAM	12±2	HT40-MCS5	64-QAM	12±2
HT20-MCS6	64-QAM	12±2	HT40-MCS6	64-QAM	12±2
HT20-MCS7	64-QAM	12±2	HT40-MCS7	64-QAM	12±2

n(5G)-mode

Data Rate(Mbps)	Modulation	Typical Power (dBm)	Data Rate (Mbps)	Modulation	Typical Power (dBm)
HT20-MCS0	BPSK	12±2	HT40-MCS0	BPSK	12±2
HT20-MCS1	BPSK	12±2	HT40-MCS1	BPSK	12±2
HT20-MCS2	QPSK	12±2	HT40-MCS2	QPSK	12±2
HT20-MCS3	QPSK	12±2	HT40-MCS3	QPSK	12±2
HT20-MCS4	16-QAM	12±2	HT40-MCS4	16-QAM	12±2
HT20-MCS5	16-QAM	12±2	HT40-MCS5	16-QAM	12±2
HT20-MCS6	64-QAM	12±2	HT40-MCS6	64-QAM	12±2
HT20-MCS7	64-QAM	12±2	HT40-MCS7	64-QAM	12±2

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This document superseded file #: B027900887910-00, Issue dated: June 13, 2024

2-6 WLAN RF Specification – RX

Table 8 IEEE 802.11 a/b/g/n RX Sensitivity

a-Mode

Data Rate (Mbps)	Modulation	Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
6	OFDM	-85	-90	24	OFDM	-77	-81
9	OFDM	-84	-88	36	OFDM	-73	-78
12	OFDM	-82	-87	48	OFDM	-69	-74
18	OFDM	-80	-84	54	OFDM	-68	-72

b-Mode

Data Rate (Mbps)	Modulation	Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
1	DBPSK	-83	-90	5.5	CCK	-82	-88
2	DQPSK	-80	-87	11	CCK	-79	-86

g-Mode

Data Rate (Mbps)	Modulation	Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
6	OFDM	-82	-90	24	OFDM	-74	-82
9	OFDM	-81	-88	36	OFDM	-70	-78
12	OFDM	-79	-87	48	OFDM	-66	-74
18	OFDM	-77	-85	54	OFDM	-65	-72

n(2G)-Mode

Data Rate (Mbps)	Modulation	Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
HT20-MCS0	BPSK	-82	-89	HT40-MCS0	BPSK	-82	-86
HT20-MCS1	QPSK	-79	-86	HT40-MCS1	QPSK	-79	-83
HT20-MCS2	QPSK	-77	-84	HT40-MCS2	QPSK	-77	-81
HT20-MCS3	16-QAM	-74	-81	HT40-MCS3	16-QAM	-74	-78
HT20-MCS4	16-QAM	-70	-77	HT40-MCS4	16-QAM	-70	-74
HT20-MCS5	64-QAM	-66	-73	HT40-MCS5	64-QAM	-66	-70
HT20-MCS6	64-QAM	-65	-72	HT40-MCS6	64-QAM	-65	-69
HT20-MCS7	64-QAM	-64	-71	HT40-MCS7	64-QAM	-64	-68

n(5G)-Mode

Data Rate (Mbps)	Modulation	Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
HT20-MCS0	BPSK	-82	-88	HT40-MCS0	BPSK	-79	-86
HT20-MCS1	QPSK	-79	-86	HT40-MCS1	QPSK	-76	-83
HT20-MCS2	QPSK	-77	-84	HT40-MCS2	QPSK	-74	-81
HT20-MCS3	16-QAM	-74	-81	HT40-MCS3	16-QAM	-71	-78
HT20-MCS4	16-QAM	-70	-77	HT40-MCS4	16-QAM	-67	-74
HT20-MCS5	64-QAM	-66	-73	HT40-MCS5	64-QAM	-63	-70
HT20-MCS6	64-QAM	-65	-72	HT40-MCS6	64-QAM	-62	-69
HT20-MCS7	64-QAM	-64	-71	HT40-MCS7	64-QAM	-61	-68

2-7 Bluetooth Low Energy RF Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Transmit Performance					
RF Transmit Power (TRM-LE01,02)		-1.5	2.5	4.0	dBm
In-Band Emission (TRM-LE03,04)	f-f ₀ = 2MHz	≤ -20			dBm
	f-f ₀ ≥ 3MHz	≤ -30			
TX Output Spectrum – Out of Band Spurious Emission	30MHz – 1GHz	≤ -36			dBm
	1GHz -12.75GHz	≤ -30			
	5.15GHz -5.35GHz	≤ -47			
	5.725GHz-5.825GHz	≤ -47			
Modulation Characteristic (TRM-LE05)	Delta f1 avg	225 ≤ Δf _{1avg} ≤ 275			kHz
	Delta f2 max	≥ 185 at 99.9%			
	Delta f2 avg/Delta f1 avg	≥ 0.8			
Carrier Frequency Drift (TRM-LE06,07)	Center frequency	≤± 150			kHz
	During any packet	≤± 50			
Maximum Drift Rate (TRM-LE06,07)		20 Hz/50 us			
Receiver Performance					
Sensitivity at 30.8% PER(0.1%BER) (RCV-LE01,02)		≤ -81			dBm
C/I Co-Channel interference (RCV-LE03)	Co-channel	≤ 21			dB
C/I Adjacent CH interference (RCV-LE03)	f-f ₀ = 1MHz	≤ 15			
	f-f ₀ = 2MHz	≤ -17			
	f-f ₀ ≥ 3MHz	≤ -27			
C/I Image CH interference (RCV-LE03)	C/I _{image}	≤ -9			
	C/I _{image} ±1MHz	≤ -15			
Out of band Blocking (RCV-LE04)	30MHz – 2000 MHz	-30			dBm
	2003MHz – 2399MHz	-35			
	2484MHz – 2997MHz	-35			
	3000MHz – 12750MHz	-30			
Intermodulation Performance at ≤30.8% (≤ 0.1% BER) (RCV-LE05)		-64			dBm
Maximum input power level (RCV-LE06)		≥ -10			dBm
PER Report Integrity 50% ≤ PER ≤ 65.4% (RCV-LE07)		-30			dBm
Spurious Emission	30MHz – 12.75GHz	≤ -57			dBm

2-8 Antenna Specification Requirements

Foxconn B02 Wireless Adapter (AloT module) integrate one PIFA (printed Inverted-F Antenna) for RF radiation

For regulatory requirements, it is assumed that the antenna gain is:

Antenna gain for the 2.4/5GHz band : 2.49dBi @2.4GHz

2.94dBi @5GHz

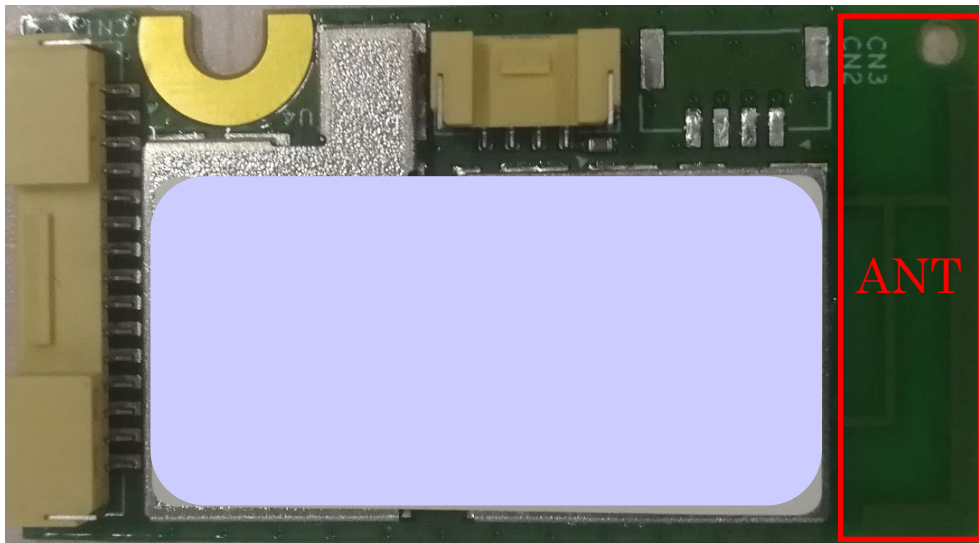
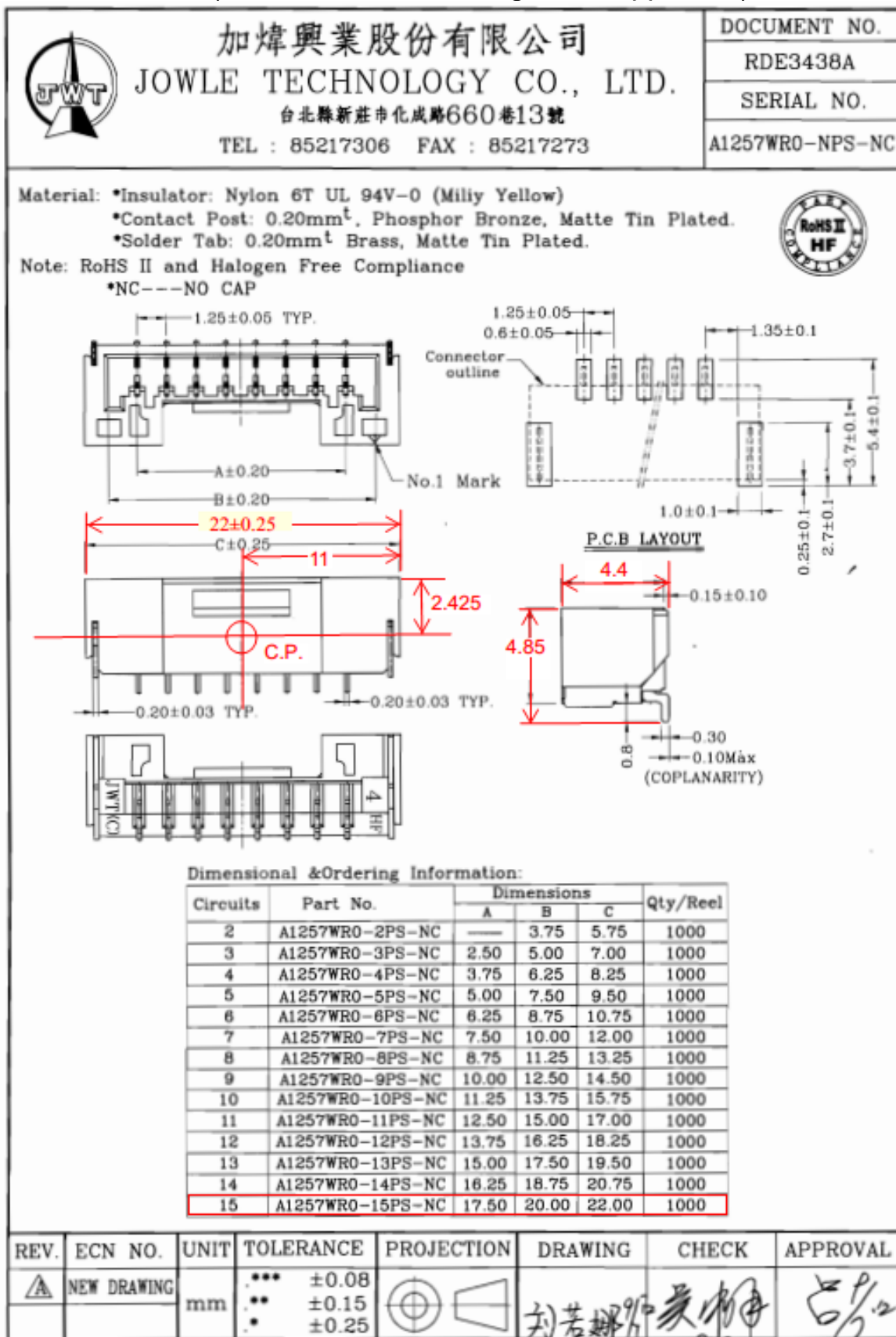


Figure 11 PIFA Antenna Pattern

CHAPTER 3. MECHANICAL SPECIFICATION

3-2 Connector Specification

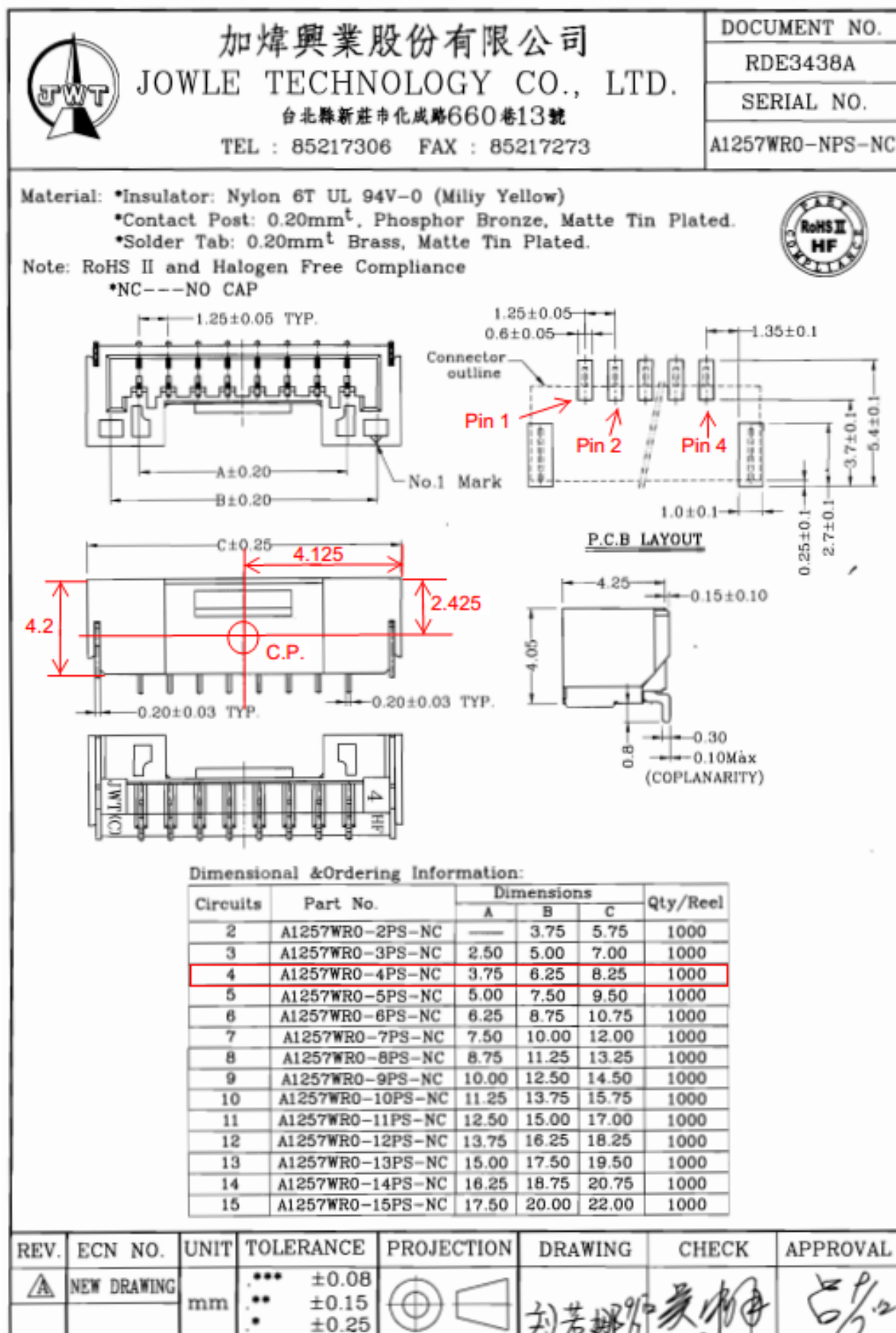
Specification of CN1 (Terminal for connecting home appliance)



B027900887910-01

This document superseded file #: B027900887910-00, Issue dated: June 13, 2024

Specification of CN2 (Service UART terminal)





CHAPTER 4. ADDITIONAL INFORMATION

4-1 Environment Specifications

Operating Conditions

Operation Temperature : -10 ~ 80°C

Relevant Humidity: 5 ~ 95% (non-condensing)

Storage Conditions

Non-Operation Temperature : -20 ~ 85°C (Typ. 25°C)

Relevant Humidity: 5 ~ 95% (non-condensing)

4-2 Guarantee period / Failure rate

Guarantee period

Guarantee period is 12 months after manufacture's factory shipment

Failure rate

600fit

4-3 Country of Origin / production Site

Country of origin

China

Production Site

Hong Fu Tai Precision Electrons(Yan Tai)CO.,LTD.

鴻富泰精密電子(煙台)有限公司

Production Site Address

NO.8,Jiaxing Road, Yantai Economic And Technological Development Area, Shandong,

P.R. China

中華人民共和國山東省煙台經濟技術開發區嘉興路8號 E10 棟

FCC 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.

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.

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

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains FCC ID: RX3-BZ02

Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the multi-transmitter procedures.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.

ISED Statement

This device contains licence-exempt transmitter(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 complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains IC: 2878F-BZ02

This 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.

ISED Déclaration

L'émetteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet équipement est conforme aux limites d'exposition aux rayonnements de la ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et un corps humain.

Si le numéro d'identification n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module fourni, Contient IC : 2878F-BZ02

cet appareil destiné à fonctionner dans la bande 5 150-5 250 MHz est uniquement destiné à une utilisation en intérieur afin de réduire le risque d'interférence nuisible aux systèmes par satellite mobiles co-canaux.

NCC statement

低功率射頻器材技術規範

「取得審驗證明之低功率射頻器材，非經核准，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。低功率射頻器材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。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材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。」

此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，並要求平台廠商於平台上標示本產品內含發射器模組  CCXXxxLPyyZzW

應避免影響附近雷達系統之操作。

高增益指向性天線只得應用於固定式點對點系統。