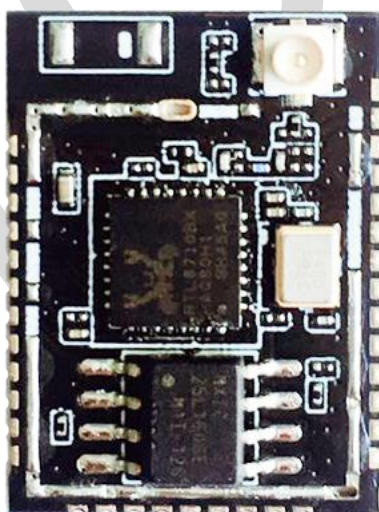


RW10BX-37P

IEEE802.11b/g/n 1T1R Module



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1 Device Overview

1.1 Features

1.1.1 General

- ARM Cortex™-M4 core up to 125 MHz
- 256 KB on-chip SRAM
- 802.11b/g/n compatible WLAN with MAC, baseband, and radio
- 2.4GHz 1T1R up to 150Mbps data rate
- 72.2Mbps receiving and transmitting PHY rate using 20MHz bandwidth
- Backward compatible to connect with 802.11b/g devices
- U.FL connector for external antenna

1.1.2 Standards Supported

- 802.11b/g/n compatible WLAN
- 802.11e QoS Enhancement (WMM)
- 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services
- Wi-Fi WPS support
- Wi-Fi Direct support
- Light Weight TCP/IP protocol

1.1.3 WLAN MAC Features

- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- Low latency high throughput block acknowledgement (HT-BA)
- Long NAV for media reservation with CF-End for NAV release
- PHY-level spoofing to enhance legacy compatibility
- Power saving mechanism

1.1.4 WLAN PHY Features

- 802.11n OFDM encoding scheme
- One transmitting and one receiving path (1T1R)
- 20MHz bandwidth transmission
- Short Guard Interval (400ns)
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble
- OFDM with BPSK, QPSK, 16QAM, and 64QAM modulation. Convolutional Coding Rate: 1/2, 2/3, 3/4, and 5/6
- Maximum data rate 54 Mbps in 802.11g and 72.2 Mbps in 802.11n
- Fast receiver Automatic Gain Control (AGC)

1.2 Applications

- Low-power IoT sensor hub
- Wi-Fi voice recognition device
- Smart outlet
- Home automation
- Mesh network
- Industrial control
- General low-power IoT recorder
- Video transmission
- OTT box/set-top box device

1.3 Description

ITON RW10BX-37P was built around Realtek RTL8710BX, a highly integrated single-chip low power 802.11n Wireless LAN (WLAN) network SoC. It combines an ARM-CM4 MCU, WLAN MAC, baseband, and radio into a single chip. It also provides a bunch of GPIOs which can be configured as digital peripherals for different applications. ITON RW10BX-37P has integrated flash memories for complete Wi-Fi protocol features.

Table 1. Specifications of RW10BX-37P

Item	Parameter
Dimension (L x W x H)	19.8 mm (± 0.15 mm) x 14.7 mm (± 0.15 mm) x 2.3 mm (± 0.15 mm)
Chip-set	RTL8710BX
Standard	IEEE802.11 n/g/b
Modulation Type	CCK, BPSK, QPSK, 16-QAM, 64-QAM
Frequency Band	2.412 GHz ~ 2.484 GHz
Interface	UART, I2C, PWM
Spread Spectrum	DSSS
Transmission Distance	Indoor ~100 m, outdoor ~300 m (depending on radio environment)
Data Security	64/128 bit WEP, WPA/WPA2
Transmit Power	2.4 G: 11b: 18 ± 2 dBm, 11g: 15 ± 2 dBm, 11n HT20: 15 ± 2 dBm;
Rx Sensitivity	11n HT20 MCS7: -71 dBm@10% PER 11g 54M: -75 dBm@10% PER 11b 11M: -88 dBm@8% PER
Data Rate	802.11b: 11, 5.5, 2 and 1 Mbps

	802.11g: 54, 48, 36, 24, 18, 12, 9 & 6 Mbps 802.11n (20 MHz): up to 72 Mbps
Clock	2.4 GHz: ± 20 ppm
Ambient Temperature	-20 °C ~ 85 °C
Storage Temperature	-55 °C ~ 125°C
Antenna	Internal PF or external PF
Operation System	Windows, OS, Linux
Operation Voltage	3.3 V DC (± 0.3 V)

1.4 Block Diagram

1.4.1 Functional Block Diagram

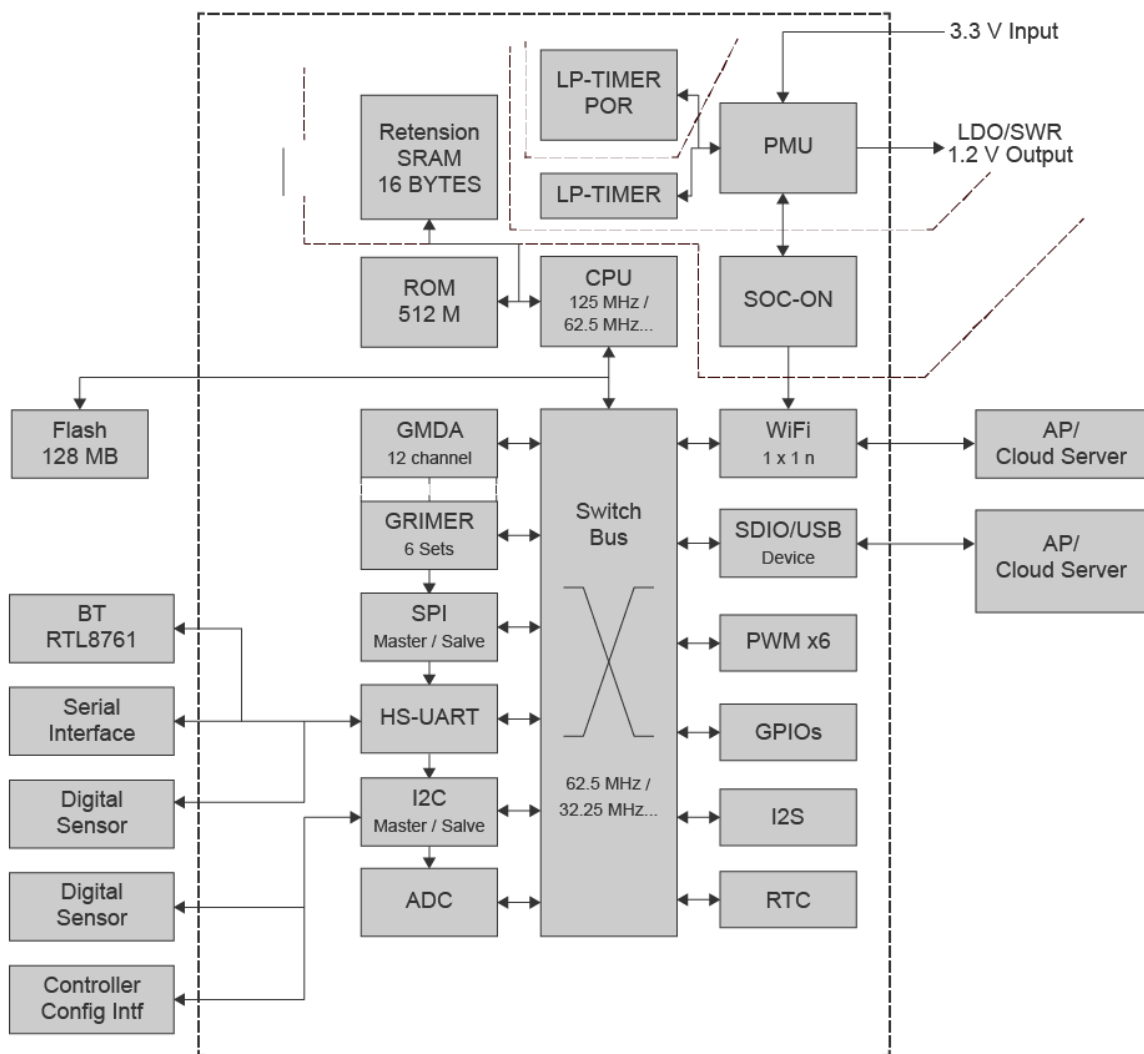


Figure 1. Functional Block Diagram of RW10BX-37P

1.4.2 Wi-Fi Application Diagram

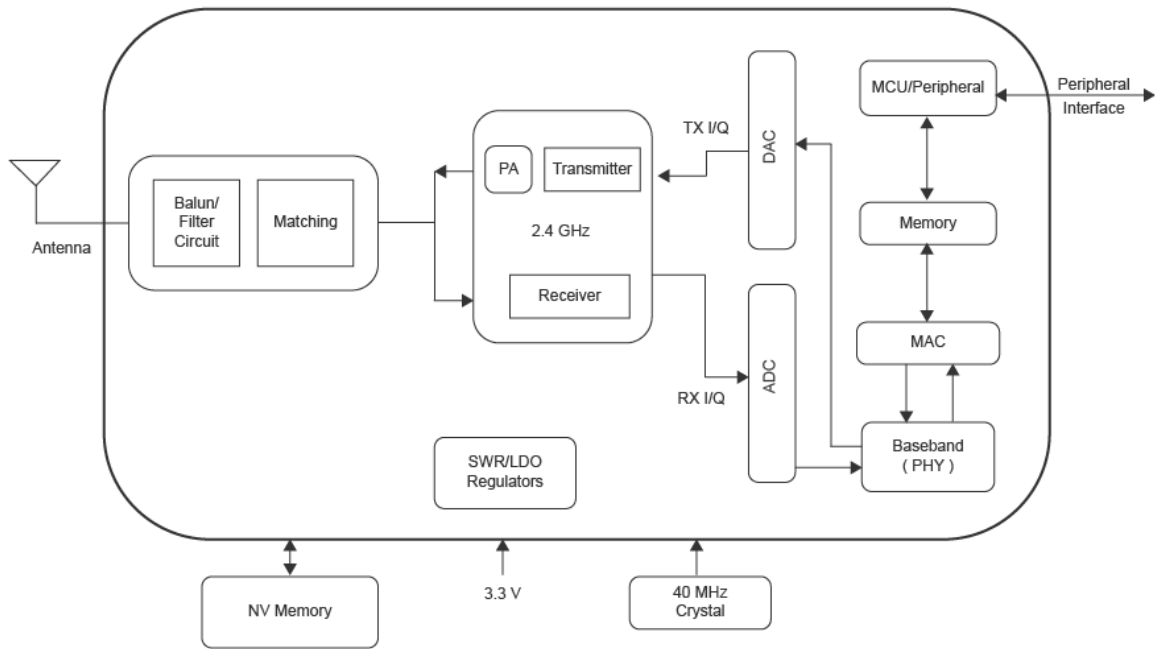


Figure 2. Single-Band 11n (1x1) Solution

1.4.3 Power Supply Application Diagram

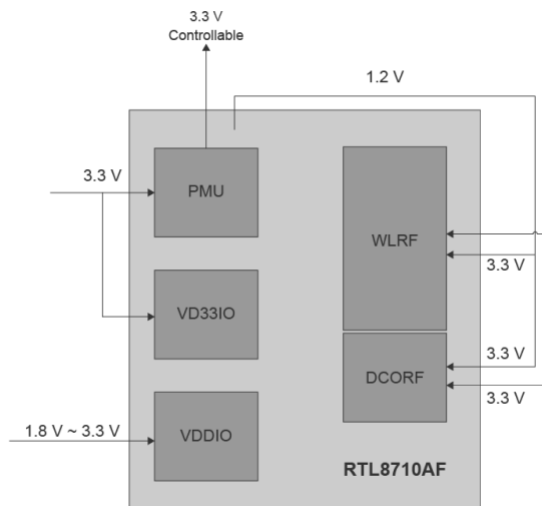


Figure 3. Power Supply Architecture

The integrated power management unit (PMU) provides the following features:

- 1.2 V LDO or SWR (Switching Regulator).
- 3.3 V voltage output controlled by the firmware.

2 Pin Configuration and Functions

2.1 Module Pin Diagram

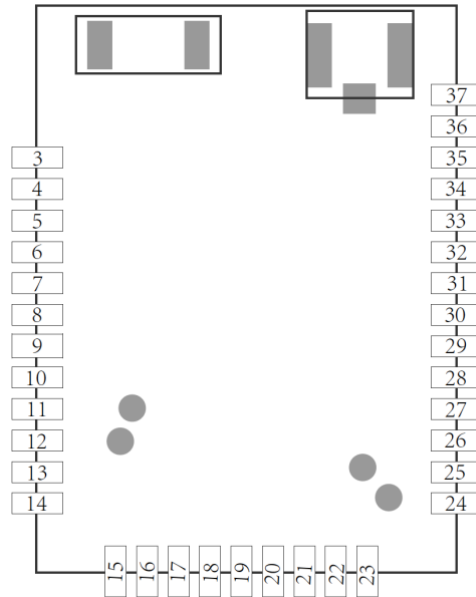


Figure 4. Pin Diagram of RW10BX-37P

2.2 Pin Functions

Table 2. Pin Attributes of RW10BX-37P

Pin	Name	Description
1		
2		
3	GND	Ground
4	NC	NC
5	VDD33	3.3 V power supply
6	CHIP_PU	Whole chip enable control. When asserted, chip function is enabled; when de-asserted, whole chip is shutdown; 1: enable chip; 0: shutdown chip.
7	GPIOA_8	GPIOA_8
8	GPIOA_11	GPIOA_11
9	GPIOA_5	GPIOA_5. Multiplexed with PWM4 (Pulse-Width Modulation)
10	NC	NC
11	NC	NC
12	NC	NC

13	NC	NC
14	GND	Ground
15	NC	NC
16	NC	NC
17	NC	NC
18	NC	NC
19	NC	NC
20	NC	NC
21	NC	NC
22	GPIOA_23/UART0_TXD	GPIOA_23. Multiplexed with UART0_TX (send data)
23	GPIOA_18/UART0_RXD	GPIOA_18. Multiplexed with UART0_RX (Receive data)
24	GND	Ground
25	NC	NC
26	NC	NC
27	GPIOA_22/U0RTS	UART 0 RTS (Request To send). Multiplexed with GPIOA_22
28	GPIOA_19/U0CTS	UART 0 CTS (Clear TO send). Multiplexed with GPIOA_19
29	GPIOA_12/PWM3	GPIOA_12. Multiplexed with PWM3 (Pulse-Width Modulation)
30	GPIOA_0/PWM2	GPIOA_0. Multiplexed with PWM2 (Pulse-Width Modulation)
31	GPIOA_14/SWD_CLK	SWD_CLK. Multiplexed with GPIOA_14
32	GPIOA_15/SWD_TMS	SWD_TMS. Multiplexed with GPIOA_15
33	GPIOA_30/UART2_log_TXD	GPIOA_30. Multiplexed with UART2_log_TXD
34	GPIOA_29/UART2_log_RXD	GPIOA_29. Multiplexed with UART2_log_RXD
35	GND	Ground
36	ANT	Wi-Fi Antenna
37	GND	Ground

3 Specifications

3.1 Absolute Maximum Rating

Caution! The absolute maximum ratings in the following table indicates voltages levels where permanent physical damage to the device can occur, even if these limits were exceeded for only a brief duration.

Parameter	Specification	Unit
-----------	---------------	------

	Min.	Typ.	Max.	
VA33, VD33IO, SW_HV3	3.0	3.3	3.6	V
VDD_IO	1.62	1.8 ~ 3.3	3.6	V
VA12_AFE, VA12_SYN, VA12_RF	1.08	1.2	1.32	V
IDD33	-	-	450	mA
IDD_IO	-	-	200	mA
IDD_IO_33	-	-	50	mA
Storage Temperature	-55	25	125	°C
Operating Ambient Temperature	-40	25	105	°C
Junction Temperature	0	-	125	°C

3.2 Electrical Specifications

Table 3. Typical Digital IO DC Parameters (3.3 V Case)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{IH}	Input-High Voltage	LVTTL	2.0	-	-	V
V _{IL}	Input-Low Voltage	LVTTL	-	-	0.8	V
V _{OH}	Output-High Voltage	LVTTL	2.4	-	-	V
V _{OL}	Output-Low Voltage		-	-	0.4	V
I _{T+}	Schmitt-trigger High Level		1.78	1.87	1.97	V
I _{T-}	Schmitt-trigger Low Level		1.36	1.45	1.56	V
I _{IL}	Input-Leakage Current	V _{IN} = 3.3 V or 0	-10	±1	10	μA

Table 4. Typical Digital IO DC Parameters (1.8 V Case)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{IH}	Input-High Voltage	CMOS	2.0	0.65 × V _{CC}	-	V
V _{IL}	Input-Low Voltage	CMOS	-	-	0.35 × V _{CC}	V
V _{OH}	Output-High Voltage	CMOS	V _{CC} - 0.45	-	-	V
V _{OL}	Output-Low Voltage	CMOS	-	-	0.45	V
I _{T+}	Schmitt-trigger High Level		1.02	1.09	1.14	V
I _{T-}	Schmitt-trigger Low Level		0.67	0.73	0.87	V
I _{IL}	Input-Leakage Current	V _{IN} = 1.8 V or 0	-10	±1	10	μA

3.3 Receiver RF Characteristics

Table 5. Receiver RF Characteristics

Parameters	Condition		Min.	Typ.	Max.	Unit
Receive Input Frequency						
2.4 GHz	802.11b/g/n mode		2401	-	2484	MHz
Receiver Sensitivity						
802.11b	1 Mbps	FER < 8%, Packet size = 1,024 bytes	-	-	-80	dBm
	2 Mbps		-	-	-80	dBm
	5.5 Mbps		-	-	-76	dBm
	11 Mbps		-	-	-76	dBm
802.11g	6 Mbps	PER < 10%, Packet size = 1,024 bytes	-	-	-82	dBm
	9 Mbps		-	-	-81	dBm
	12 Mbps		-	-	-79	dBm
	18 Mbps		-	-	-77	dBm
	24 Mbps		-	-	-74	dBm
	36 Mbps		-	-	-70	dBm
	48 Mbps		-	-	-66	dBm
	54 Mbps		-	-	-65	dBm
802.11g (HT20)	MCS0	PER < 10%, Packet size = 1,024 bytes	-	-	-82	dBm
	MCS1		-	-	-79	dBm
	MCS2		-	-	-77	dBm
	MCS3		-	-	-74	dBm
	MCS4		-	-	-70	dBm
	MCS5		-	-	-66	dBm
	MCS6		-	-	-65	dBm
	MCS7		-	-	-64	dBm
Maximum Input Level						
802.11b	FER < 8%		-10	-	-	dBm
802.11g/n	FER < 10%		-20	-	-	dBm

3.4 Transmitter RF Characteristics

Table 6. Transmitter RF Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Unit
Transmitter Input Frequency					
802.11b/g/n	2.4 GHz	2401	-	2483	MHz
Transmitter Channel Power					
802.11b	11 Mbps	16	18	20	dBm
802.11g	54 Mbps	13	15	17	dBm
802.11n	2.4 GHz, HT20, MCS0~7	13	15	17	dBm
Spectrum Mask					
802.11b	Fc \pm 11 MHz to \pm 22 MHz	-	-	-30	dBm
	Fc \pm 22 MHz and more	-	-	-50	dBm
802.11g	Fc \pm 11 MHz	-	-	-20	dBm
	Fc \pm 20 MHz	-	-	-28	dBm
	Fc \pm 30 MHz	-	-	-40	dBm
802.11n	Fc \pm 11 MHz (\pm 21 MHz @ HT20)	-	-	-20	dBm
	Fc \pm 20 MHz (\pm 40 MHz @ HT20)	-	-	-28	dBm
	Fc \pm 30 MHz (\pm 60 MHz @ HT20)	-	-	-45	dBm
Center Frequency Tolerance					
802.11b		-20	-	+20	ppm
		-20	-	+20	ppm
EVM (Error Vector Magnitude)					
802.11b	1 Mbps	-	-	35	%
	2 Mbps	-	-	35	%
	5.5 Mbps	-	-	35	%
	11 Mbps	-	-	35	%
802.11g	6 Mbps	-	-	-5	dB
	9 Mbps	-	-	-8	dB
	12 Mbps	-	-	-10	dB
	18 Mbps	-	-	-13	dB
	24 Mbps	-	-	-16	dB
	36 Mbps	-	-	-19	dB
	48 Mbps	-	-	-22	dB
	54 Mbps	-	-	-25	dB

802.11g (HT20)	MCS0	-	-	-5	dB
	MCS1	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3	-	-	-16	dB
	MCS4	-	-	-19	dB
	MCS5	-	-	-22	dB
	MCS6	-	-	-25	dB
	MCS7	-	-	-28	dB

EVM:

<Test condition>

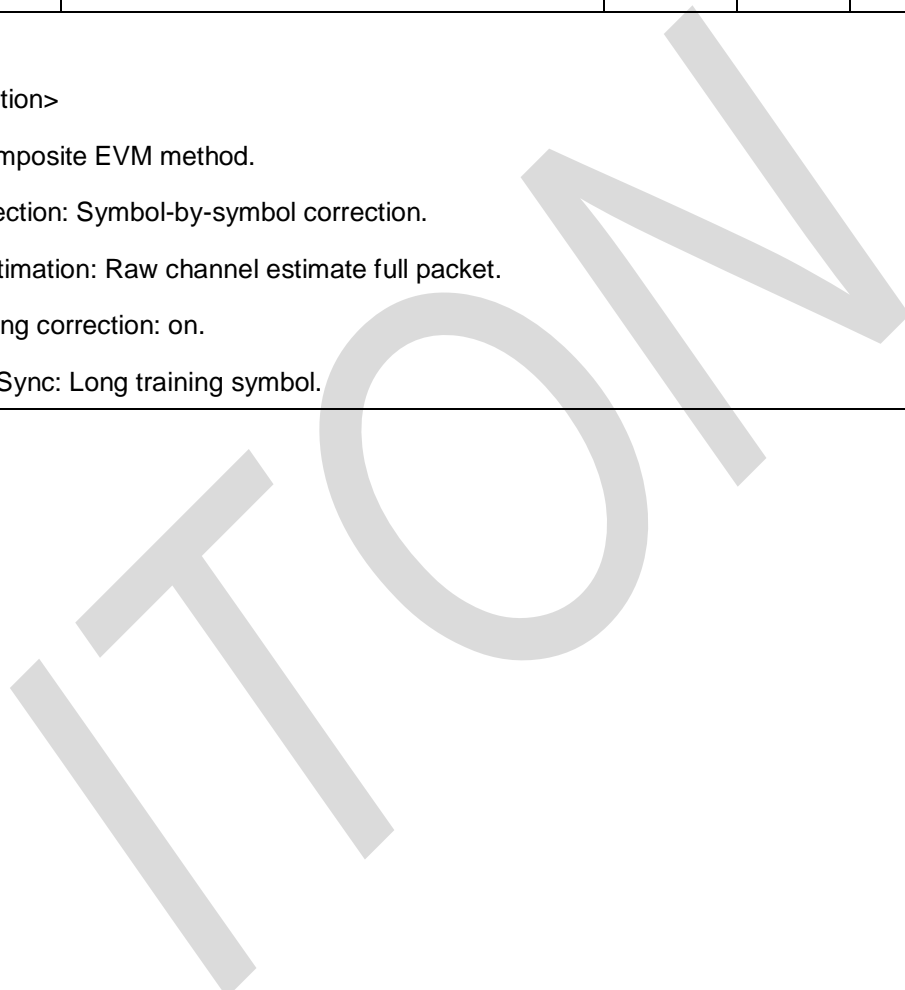
Method: composite EVM method.

Phase correction: Symbol-by-symbol correction.

Channel estimation: Raw channel estimate full packet.

Symbol timing correction: on.

Frequency Sync: Long training symbol.



4 Mechanical and Package

4.1 Recommended PCB Footprint

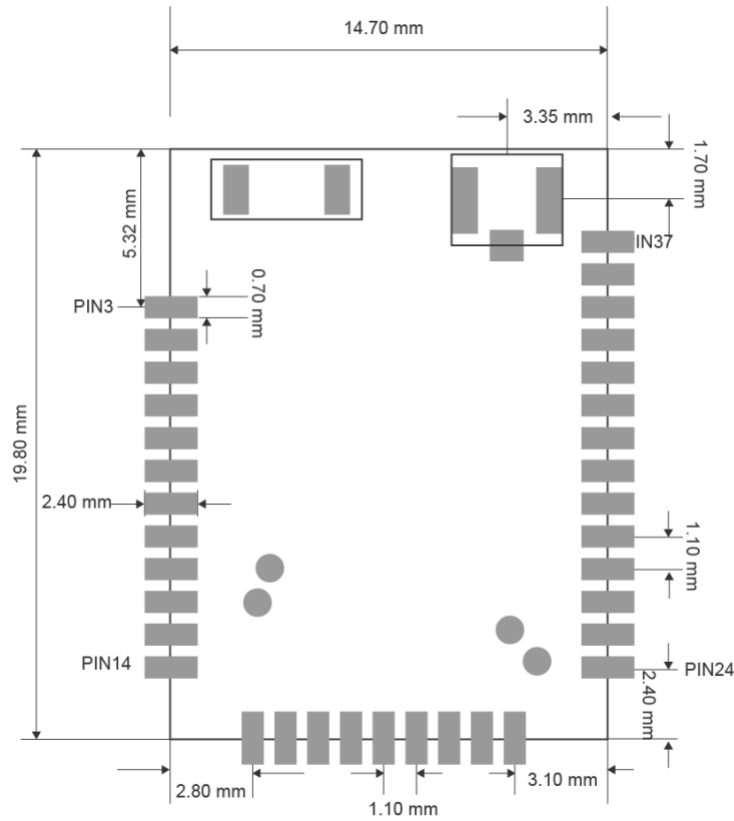


Figure 5. Recommended PCB Footprint of RW10BX-37P

4.2 Package Information

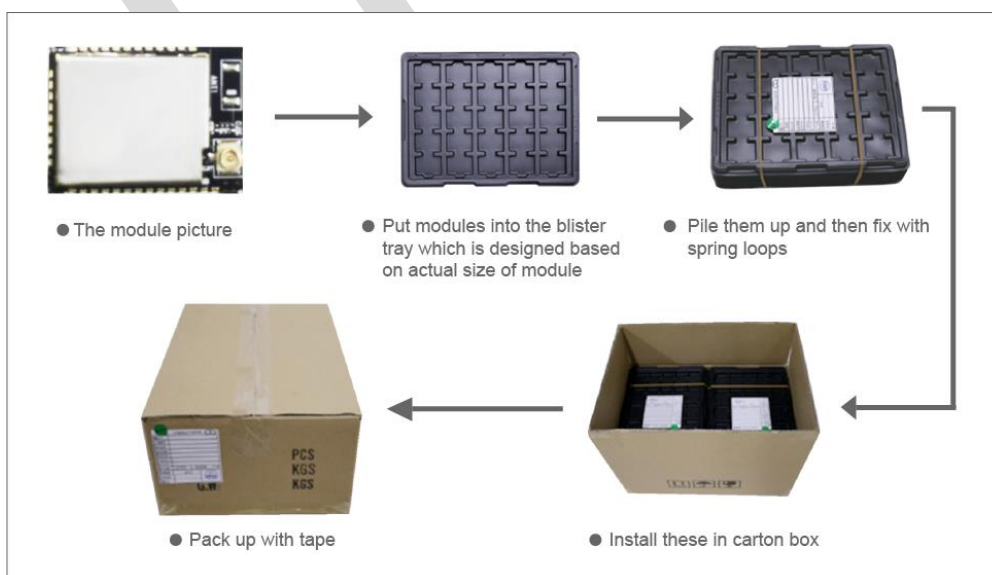


Figure 6. Packaging Information of RW10BX-37P

5 Thermal Reflow

Referred to IPC/JEDEC standard.

Peak temperature: <250°C

Number of times: ≤2

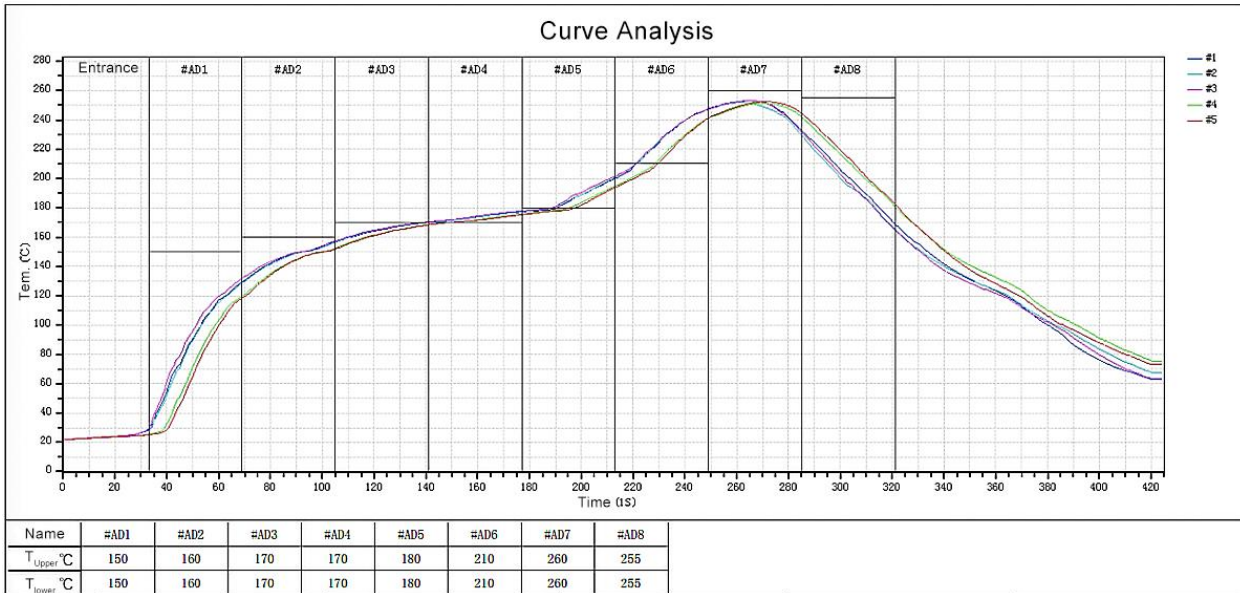


Figure 7. Recommended Reflow for Lead Free Solder

6 Order Information

Part No.	Description
RW10BX-37PA	IPEX generation antenna
RW10BX-37PB	Ceramic antenna
RW10BX-37PC	PIN37/Stamp hole pad

7 Revision History

Date	Version No.	Description	Author
2017.11.27	V1.0	Initial version	Liaojl
2017.12.15	V1.1	Add module definition	Liaojl
2018.03.21	V1.2	Modify the pin definition	Liaojl
2018.11.10	V1.3	Modify module description	Liaojl
2019.07.09	V1.4	English version rewritten	