



ITM-5830

Multi-Protocol BLE 5.3 / Zigbee 3.0
Thread/Matter Module Datasheet

V1.0

Revision History

Date	Revision Content	Revised By	Version
2023/12/15	- Initial released (Preliminary)	Issac Chen	0.1
2024/03/27	- Correct SoC P/N typo	Issac Chen	0.2
2024/10/16	- Brench part number	Issac Chen	0.3
2024/11/05	- Add Pin1 location	Issac Chen	0.4
2025/03/04	- Official Release	Issac Chen	1.0
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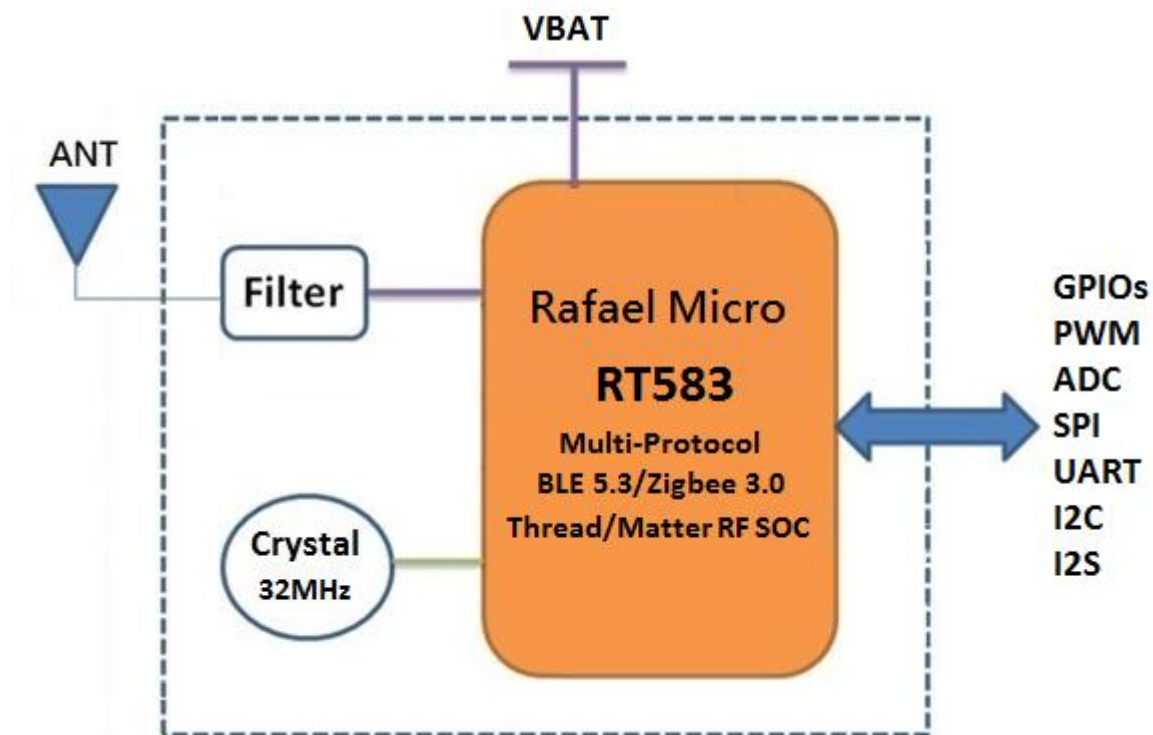
Contents

Revision History	1
Contents	2
1. General Description	3
2. Features	4
3. General Specification	6
3-1 Voltages	6
3-1-1 Absolute Maximum Ratings.....	6
3-1-2 Recommended Operating Ratings	6
3-2 RF Specification (RX)	6
3-2.1 RF Receiver Characteristics for GFSK.....	6
3-2.2 RF Receiver Characteristics for DSSS-OQPSK.....	8
3-3 RF Specification (TX).....	8
3-3.1 RF Transmitter Characteristics for GFSK.....	8
3-3.2 RF Transmitter Characteristics for DSSS-OQPSK.....	9
3-4 Power Consumption	10
4. Antenna	11
4-1 S11 Parameter.....	11
4-2 Gain Pattern.....	11
4-3 Efficiency	11
5. Pin Assignments	11
5-1 PCB Pin Outline (12.0mm x 16.0mm x 2.2mm)	12
5-2 Pin Definition.....	13
5-3 GPIO Pin MUX Table	14
6. Dimensions	15
6.1 Layout Recommendation.....	15
7. Reference Design	16
8. Recommended Reflow Profile	17
9. Packing Information	18
9.1 Label.....	18
9.2 Dimension.....	19

1. General Description

ITM-5830 is an ultra-low power, high performance ARM® Cortex®-M3 based Thread/Matter RF module with multi-protocol Bluetooth Low Energy 5.3, Zigbee 3.0 and proprietary 2.4G networking stacks to facilitate home & building automation, smart lighting, smart locks, sensor network applications, etc. A comprehensive mix of analog and digital peripherals is integrated with the 2.4GHz RF transceiver which is compliant with Bluetooth Low Energy 5.3 and IEEE® 802.15.4 requirements. Ultra-low current consumption is achieved in the RF receive & transmit modes and power-down modes to support the latest IPv6-based IoT applications.

The block diagram of ITM-5830 is shown as below.



- Please refer to the table below for different types of module

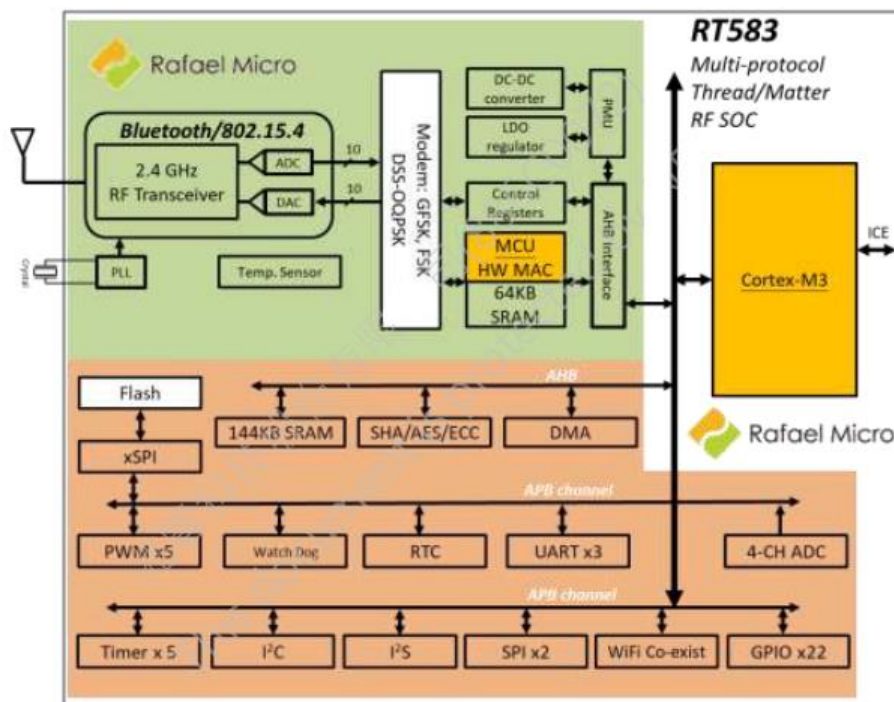
P/N	Antenna Type
ITM-5830-B	Using On-board PCB Antenna
ITM-5830	RF signal through pin 30 to connect external antenna

2. Features

- High TX power:
 - Bluetooth Low Energy: + 10dBm
 - Thread/Zigbee: + 10dBm with <2% EVM
- RX sensitivity:
 - Bluetooth Low Energy: -104dBm @125kbps
 - Thread/Zigbee: -100dBm
- Modulations:
 - Multi-rate FSK, GFSK
 - DSSS-OQPSK
- Data rates:
 - Bluetooth Low Energy: 125K/500K/1M/2Mbps
 - Thread/Zigbee: 250Kbps
- Multi-protocol support: Bluetooth® Low Energy 5.3 & IEEE 802.15.4, Zigbee 3.0
- Thread certified
- Supports Thread/Matter applications with Bluetooth Low Energy commissioning
- RF offset cancellation loop
- Frequency hopping capability
- Programmable channel filter bandwidth
- Embedded 32MHz high frequency crystal & low frequency RC Oscillator
- + 1.8 ~ + 3.6VDC Operating Voltage
 - POR (power-on reset) & UVLO (under voltage lockout)
 - Power Management Unit for power state switching
 - Integrated DC-DC converter and LDO regulator
- Various Power Saving Modes including
 - Sleep1: 5.2μA
 - Sleep2: 4.0μA
 - Deep Sleep: 1.5 μA
- Embedded ARM® Cortex-M3 CPU, internal MCU for MAC
 - ARM® CPU speed: 32M/48M/64MHz
 - SWD (2-pin Serial Wire Debug)
 - 32KB Boot ROM

- 208KB SRAM (CPU+MCU)
- 2MB Flash
- Multiple integrated peripherals
 - Integrated security: SHA/AES/ECC
 - DMA controller
 - UART interface x3 (1 with CTS/RTS, 2 without CTS/RTS)
 - I2S interface
 - I2C master interface
 - SPI interface x2
 - PWM x 5
 - 32-bit Timer x5
 - 32-bit Real Time Clock Timer x2
 - Temperature Sensor
 - 4CH 12-bit 350Ksps ADC
 - GPIO (w/interrupt) x22
 - WiFi Co-existence interface
 - Watchdog x1

ITM-5830 uses RafaelMicro high performance RF SoC RT583. The block diagram of RT583 is shown as below.



3. General Specification

3-1 Voltages

3-1-1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VBAT	Input supply Voltage	-0.3	3.6	V

Operating temperature	-30°C to 85°C
Storage temperature	-40°C to 85°C

3-1-2 Recommended Operating Ratings

Test conditions: At operating temperature -30°C ~ 85°C				
Symbol	Min.	Typ.	Max.	Unit
VBAT	1.8	3.3	3.6	V

3-2 RF Specification (RX)

3-2.1 RF Receiver Characteristics for GFSK

- GFSK Receiver General Characteristics for 2.4 GHz

Parameters	Condition	Min.	Typ.	Max.	Unit
RF Sensitivity	2 Mbps		-93		dBm
	1 Mbps		-96		dBm
	500 Kbps		-99		dBm
	125 Kbps		-104		dBm

The wanted signal for channel selectivity measurements = -67 dBm with modulated interference, BER = 0.1 %.

- GFSK Receiver Characteristics for 2.4 GHz at 1 Mbps

Parameters	Symbol	Min.	Typ.	Max.	Unit
Signal to Co-Channel Selectivity	C/I _{CO-CHANNEL}		+6.5		dBc
±1 MHz Adjacent Channel Selectivity	C/I _{-1MHz}		-5		dBc
-2 MHz Adjacent Channel Selectivity	C/I _{-2MHz}		-25		dBc
+2 MHz Adjacent Channel Selectivity	C/I _{+2MHz}		-35		dBc
-3 MHz Adjacent Channel Selectivity	C/I _{-3MHz}		-35		dBc
+3 MHz Adjacent Channel Selectivity	C/I _{+3MHz}		-40		dBc
Image Channel Selectivity	C/I _{IMAGE}		-25		dBc
Image - 1MHz Adjacent Channel Selectivity	C/I _{IMAGE1MHz}		-35		dBc
Intermodulation Interferer Level	IM		-35		dBc
Out-of-band Blocking: Interferer 30MHz ≤ f ≤ 2000MHz	OOB _{30-2000MHz}		-15		dBm
Out-of-band Blocking: Interferer 2003MHz ≤ f ≤ 2399MHz	OOB _{2000-2399MHz}		-20		dBm
Out-of-band Blocking: Interferer 2484MHz ≤ f ≤ 2997MHz	OOB _{2484-2997MHz}		-20		dBm
Out-of-band Blocking: Interferer 2997MHz ≤ f ≤ 6GHz	OOB _{2997-6000MHz}		-10		dBm
Out-of-band Blocking: Interferer 6GHz ≤ f ≤ 12.75GHz	OOB _{6-12.75GHz}		-10		dBm
RSSI	RSSI	-90		0	dB

● GFSK Receiver Characteristics for 2.4 GHz at 2 Mbps

Parameters	Symbol	Min.	Typ.	Max.	Unit
Signal to Co-Channel Selectivity	C/I _{CO-CHANNEL}		+6.5		dBc
±2 MHz Adjacent Channel Selectivity	C/I _{-1MHz}		-4		dBc
-4 MHz Adjacent Channel Selectivity	C/I _{-2MHz}		-24		dBc
+4 MHz Adjacent Channel Selectivity	C/I _{+2MHz}		-30		dBc
-6 MHz Adjacent Channel Selectivity	C/I _{-3MHz}		-35		dBc
+6 MHz Adjacent Channel Selectivity	C/I _{+3MHz}		-40		dBc
Image Channel Selectivity	C/I _{IMAGE}		-24		dBc
Image - 2MHz Adjacent Channel Selectivity	C/I _{IMAGE1MHz}		-35		dBc
Intermodulation Interferer Level	IM		-25		dBc
Out-of-band Blocking: Interferer 30MHz ≤ f ≤ 2000MHz	OOB _{30-2000MHz}		-15		dBm
Out-of-band Blocking: Interferer	OOB _{2000-2399MHz}		-20		dBm

2003MHz ≤ f ≤ 2399MHz					
Out-of-band Blocking: Interferer 2484MHz ≤ f ≤ 2997MHz	OOB _{2484-2997MHz}		-20		dBm
Out-of-band Blocking: Interferer 2997MHz ≤ f ≤ 6GHz	OOB _{2997-6000MHz}		-10		dBm
Out-of-band Blocking: Interferer 6GHz ≤ f ≤ 12.75GHz	OOB _{6-12.75GHz}		-10		dBm
RSSI	RSSI	-90		0	dB

3-2.2 RF Receiver Characteristics for DSSS-OQPSK

- DSSS-OQPSK Receiver Characteristics for 2.4 GHz at 250 kbps

Parameters	Symbol	Min.	Typ.	Max.	Unit
RF Sensitivity			-100		dBm
Signal to Co-Channel Selectivity	C/I _{CO-CHANNEL}		+1		dBc
-5 MHz Adjacent Channel Selectivity	C/I _{-5MHz}		-25		dBc
+5 MHz Adjacent Channel Selectivity	C/I _{+5MHz}		-30		dBc
-10 MHz Adjacent Channel Selectivity	C/I _{-10MHz}		-45		dBc
+10 MHz Adjacent Channel Selectivity	C/I _{+10MHz}		-45		dBc
Image Channel Selectivity	C/I _{IMAGE}		-25		dBc
Blocking other Channels: Interferer frequency < Desired frequency – 3 channel-spacing			-50		dBc
RSSI	RSSI	-90		0	dB

The wanted signal for channel selectivity measurements = -82 dBm with OQPSK PHY interference, PER = 1 %.

3-3 RF Specification (TX)

3-3.1 RF Transmitter Characteristics for GFSK

- GFSK Transmitter General Characteristics for 2.4 GHz

Parameters	Symbol	Min.	Typ.	Max.	Unit
RF Output Power	P _{OUT}	-10		+10	dBm
Operating Frequency	F _{OPERATING}	2402		2480	MHz
Frequency Drift	ΔF		< ±50		kHz
Frequency Drift Rate	F _{ΔF}		< ±20		kHz/50μs

● GFSK Transmitter Characteristics for 2.4 GHz at 1 Mbps

Parameters	Symbol	Min.	Typ.	Max.	Unit
Average Frequency Deviation (data pattern = 11110000...)	Δf_1	225	250	275	kHz
Instantaneous Deviation (data pattern = 10101010...)	Δf_2	185			kHz
Deviation Ratio	$\Delta f_2/\Delta f_1$		80		%
Spectrum Mask with Adjacent Channel Offset: ± 2 MHz			-20		dBm
Spectrum Mask with Adjacent Channel Offset: ≥ 3 MHz			-30		dBm

● GFSK Transmitter Characteristics for 2.4 GHz at 2 Mbps

Parameters	Symbol	Min.	Typ.	Max.	Unit
Average Frequency Deviation (data pattern = 11110000...)	Δf_1	450	500	550	kHz
Instantaneous Deviation (data pattern = 10101010...)	Δf_2	370			kHz
Deviation Ratio	$\Delta f_2/\Delta f_1$		80		%
Spectrum Mask with Adjacent Channel Offset: $\pm 4, \pm 5$ MHz			-20		dBm
Spectrum Mask with Adjacent Channel Offset: $\geq \pm 6$ MHz			-30		dBm

3-3.2 RF Transmitter Characteristics for DSSS-OQPSK

● DSSS-OQPSK Transmitter Characteristics for 2.4 GHz at 250 kbps

Parameters	Symbol	Min.	Typ.	Max.	Unit
RF Output Power		-10		+10	dBm
Operating Frequency		2405		2480	MHz
EVM at rated TX power (RMS)			2%		
Spectrum Mask with Adjacent Channel offset ± 3.5 MHz			-20		dB

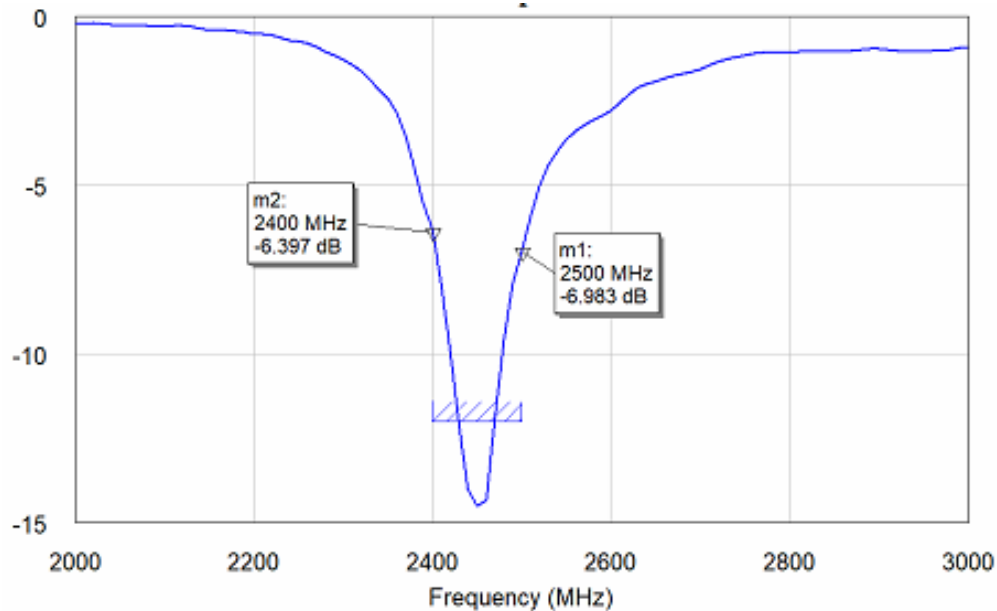
3-4 Power Consumption

Mode	Condition	Min.	Typ.	Max.	Unit
Sleep 1	Low power level sleep 1; wakeup by any event		5.2		uA
Sleep 2	Low power level sleep 2; wakeup by any event		4.0		uA
Deep sleep	Low power level sleep 3; wakeup only by GPIO		1.5		uA
Receive @ 1Mbps	Radio receiving @DCDC		11.0		mA
Receive @ 2Mbps	Radio receiving @DCDC		11.0		mA
Transmit @ 0dBm	Radio transmission @DCDC		13.0		mA
Transmit @ +4dBm	Radio transmission @DCDC		16.5		mA
Transmit @ +10dBm	Radio transmission @DCDC		25.0		mA

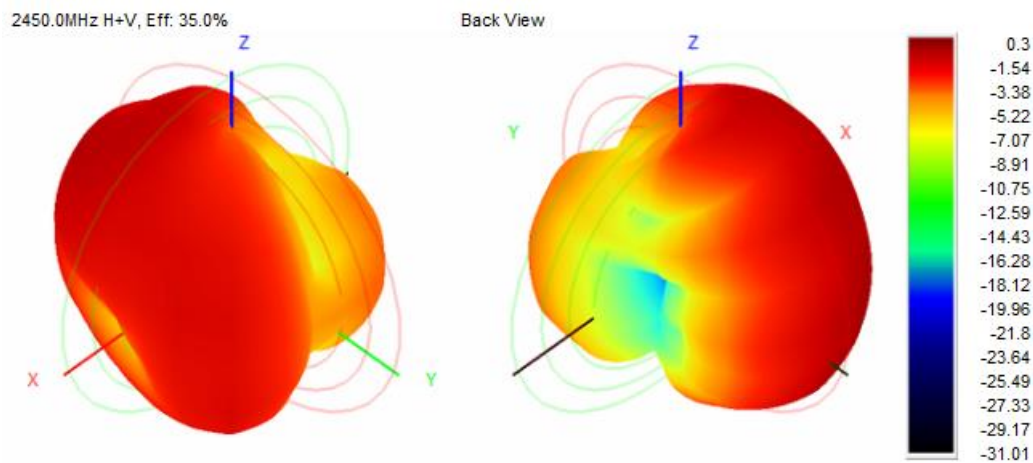
- VBAT=+3.3Vdc @ 25°C
- Receive & transmit current does not include the Cortex-M3 MCU domain current

4. Antenna

4-1 S11 Parameter



4-2 Gain Pattern



4-3 Efficiency

Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	2400.0	2410.0	2420.0	2430.0	2440.0	2450.0	2460.0	2470.0	2480.0	2490.0	2500.0
Efficiency (%)	28.27%	29.95%	29.78%	33.78%	34.21%	35.00%	35.63%	34.94%	34.34%	33.34%	31.73%
Gain (dBi)	-1.86	-1.52	-1.49	-0.76	-0.45	-0.23	0.30	0.10	0.41	0.32	-0.24
Directivity (dB)	5.00	5.03	5.08	5.13	5.37	5.47	5.90	5.81	6.21	6.29	5.99

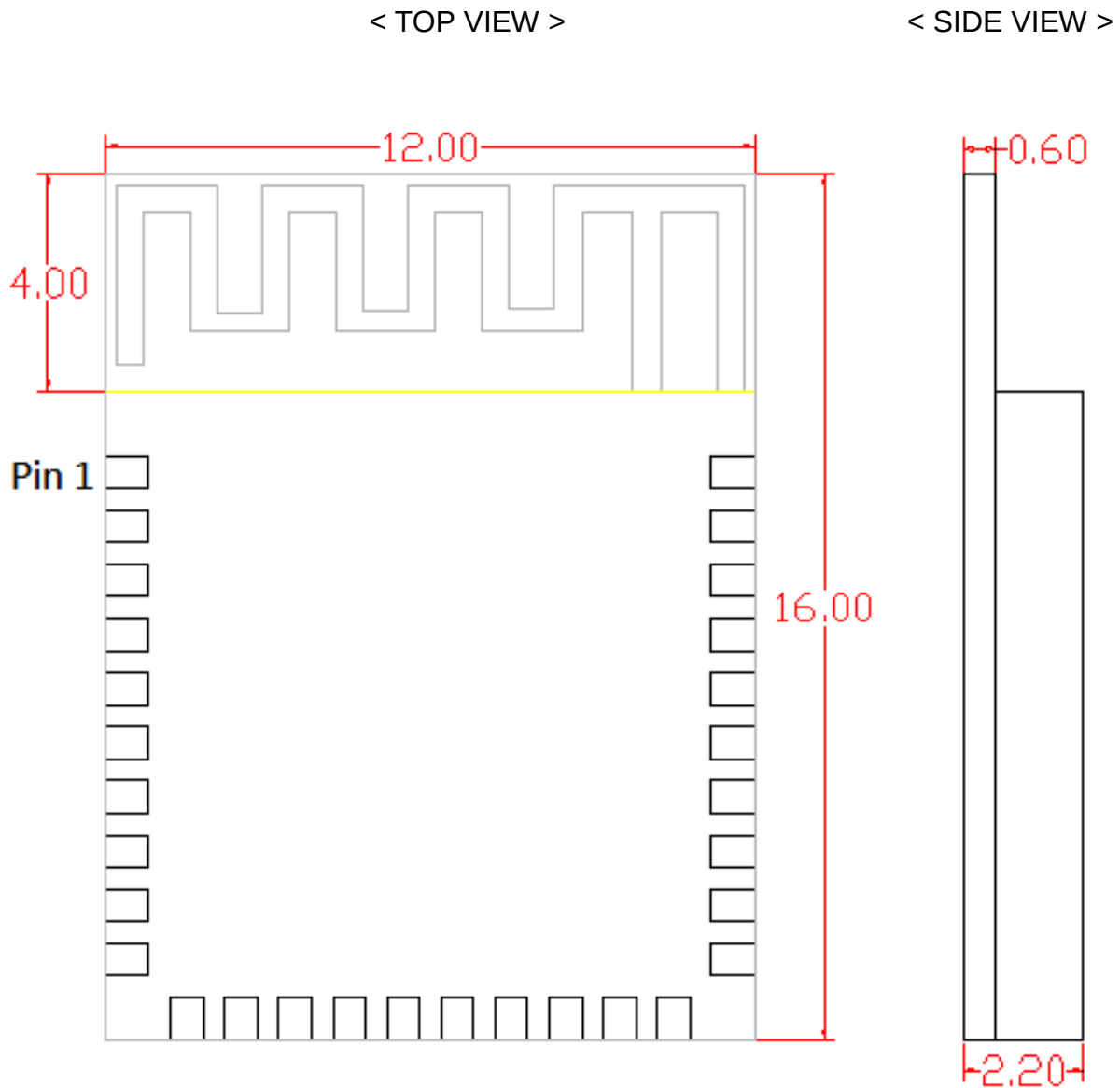
Note: PCB antenna described in this chapter is only for ITM-5830-B

Proprietary & Confidential Information

iotTech Corporation, Taiwan

5. Pin Assignments

5-1 PCB Pin Outline (12.0mm x 16.0mm x 2.2mm)



5-2 Pin Definition

Pin No.	Pin-Define	Type	Description
1	POR_EXT	DI	External Power-on Reset input
2	NC	--	Not Connected
3	GPIO22	DIO	Multi-Function Digital I/O
4	GPIO21	DIO	Multi-Function Digital I/O
5	GPIO20	DIO	Multi-Function Digital I/O
6	GND	G	Ground
7	GPIO15	DIO	Multi-Function Digital I/O
8	GPIO14	DIO	Multi-Function Digital I/O
9	GPIO9	DIO	Multi-Function Digital I/O
10	GPIO8	DIO	Multi-Function Digital I/O
11	GPIO7	DIO	Multi-Function Digital I/O
12	GPIO6	DIO	Multi-Function Digital I/O
13	GPIO5	DIO	Multi-Function Digital I/O
14	SWDIO	DIO	ARM MCU ICE data
15	SWCLK	DI	ARM MCU ICE clock
16	VBAT	P	Main Power Supply Input
17	GPIO4	DIO	Multi-Function Digital I/O
18	GPIO3	DIO	Multi-Function Digital I/O
19	GPIO16/UART_RX	DIO	Multi-Function Digital I/O / UART0 RX Default
20	GPIO17/UART_TX	DIO	Multi-Function Digital I/O / UART0 TX Default
21	GPIO2	DIO	Multi-Function Digital I/O
22	GPIO1	DIO	Multi-Function Digital I/O
23	GPIO0	DIO	Multi-Function Digital I/O
24	GPIO23	DIO	Multi-Function Digital I/O
25	GPIO28	DIO	Multi-Function Digital I/O
26	GPIO29	DIO	Multi-Function Digital I/O
27	GPIO30	DIO	Multi-Function Digital I/O
28	GPIO31	DIO	Multi-Function Digital I/O
29	GND	G	Ground
30	NC / RIFO	—	ITM-5830-B : NC (using on-board PCB antenna) ITM-5830 : RFIO (using external antenna)

5-3 GPIO Pin MUX Table

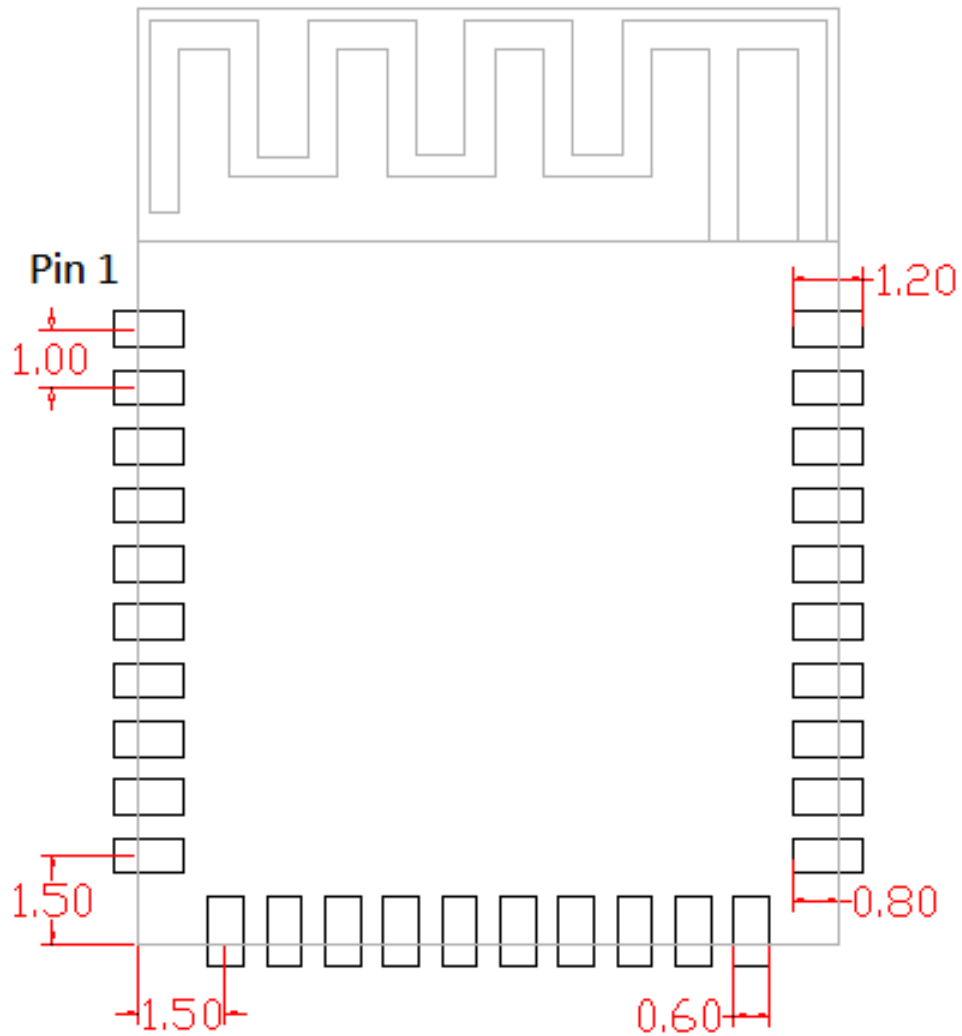
IO	SPI0	SPI1	UART	I ² C	PWM	I ² S
GPIO0(OD)	SPI0_CSN1/2/3					I2S0_BCK
GPIO1(OD)	SPI0_CSN1/2/3					I2S0_WCK
GPIO2(OD)	SPI0_CSN1/2/3					I2S0_SDO
GPIO3(OD)	SPI0_CSN1/2/3					I2S0_SDI
GPIO4(OD)	SPI0_SDATA2		UART1_TX			I2S0_MCLK
GPIO5(OD)	SPI0_SDATA3		UART1_RX			I2S0_MCLK
GPIO6(OD)	SPI0_SCLK		UART2_TX			
GPIO7(OD)	SPI0_CSN0		UART2_RX			
GPIO8(OD)	SPI0_SDATA0				PWM0	
GPIO9(OD)	SPI0_SDATA1				PWM1	
GPIO14(OD)	SPI0_SDATA2	SPI1_SDATA2	UART1_RTSN		PWM2	
GPIO15(OD)	SPI0_SDATA3	SPI1_SDATA3	UART1_CTSN		PWM3	
GPIO16(OD)			UART0_RX			
GPIO17(OD)			UART0_TX			
GPIO20(OD)			UART1_RTSN	SCL	PWM0/1/2/3/4	
GPIO21(OD)			UART1_CTSN	SDA	PWM0/1/2/3/4	
GPIO22(OD)				SCL	PWM0/1/2/3/4	
GPIO23(OD)				SDA	PWM0/1/2/3/4	
GPIO28(OD)(AIO4)	SPI0_SCLK	SPI1_SCLK	UART1_TX			
GPIO29(OD)(AIO5)	SPI0_CSN0	SPI1_CSN	UART1_RX			
GPIO30(OD)(AIO6)	SPI0_SDATA0	SPI1_SDATA0	UART2_TX			
GPIO31(OD)(AIO7)	SPI0_SDATA1	SPI1_SDATA1	UART2_RX			

6. Dimensions

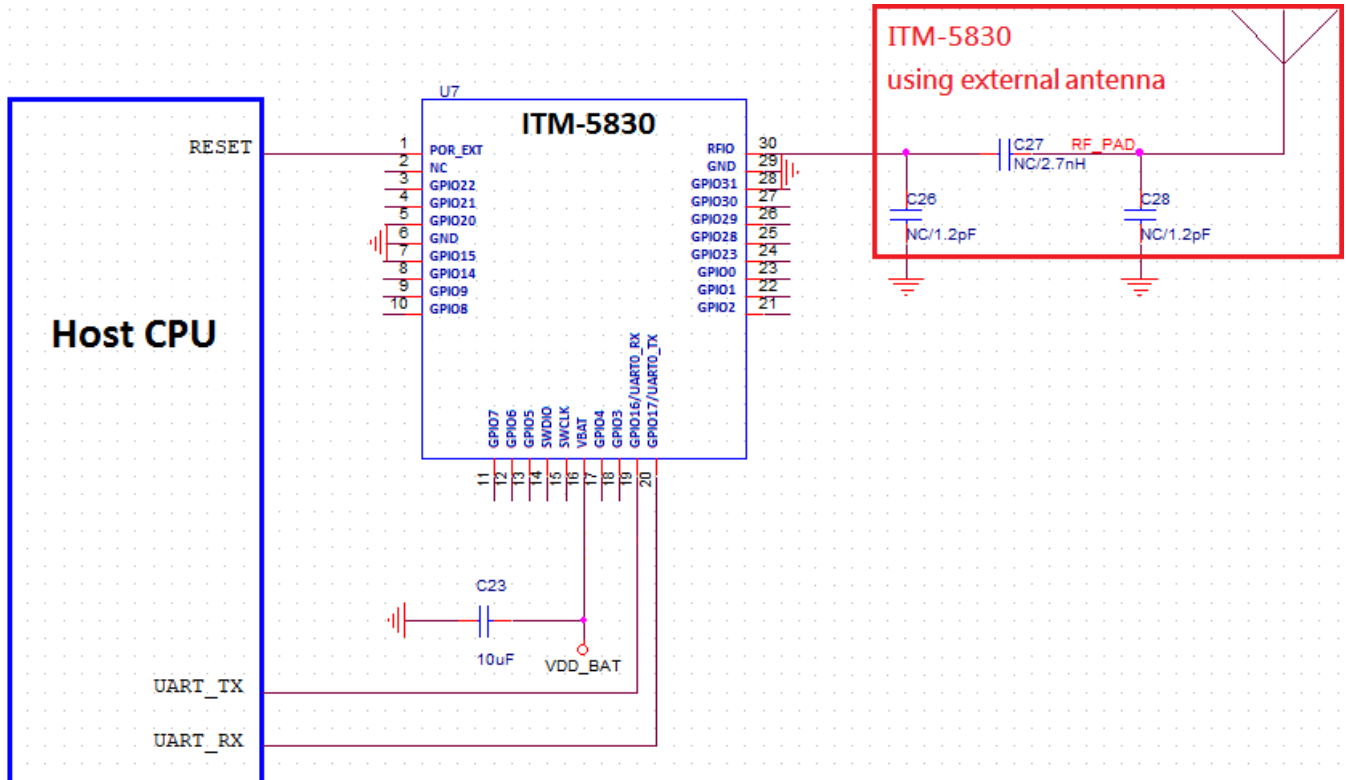
6.1 Layout Recommendation

(Unit: mm)

< TOP VIEW >



7. Reference Design

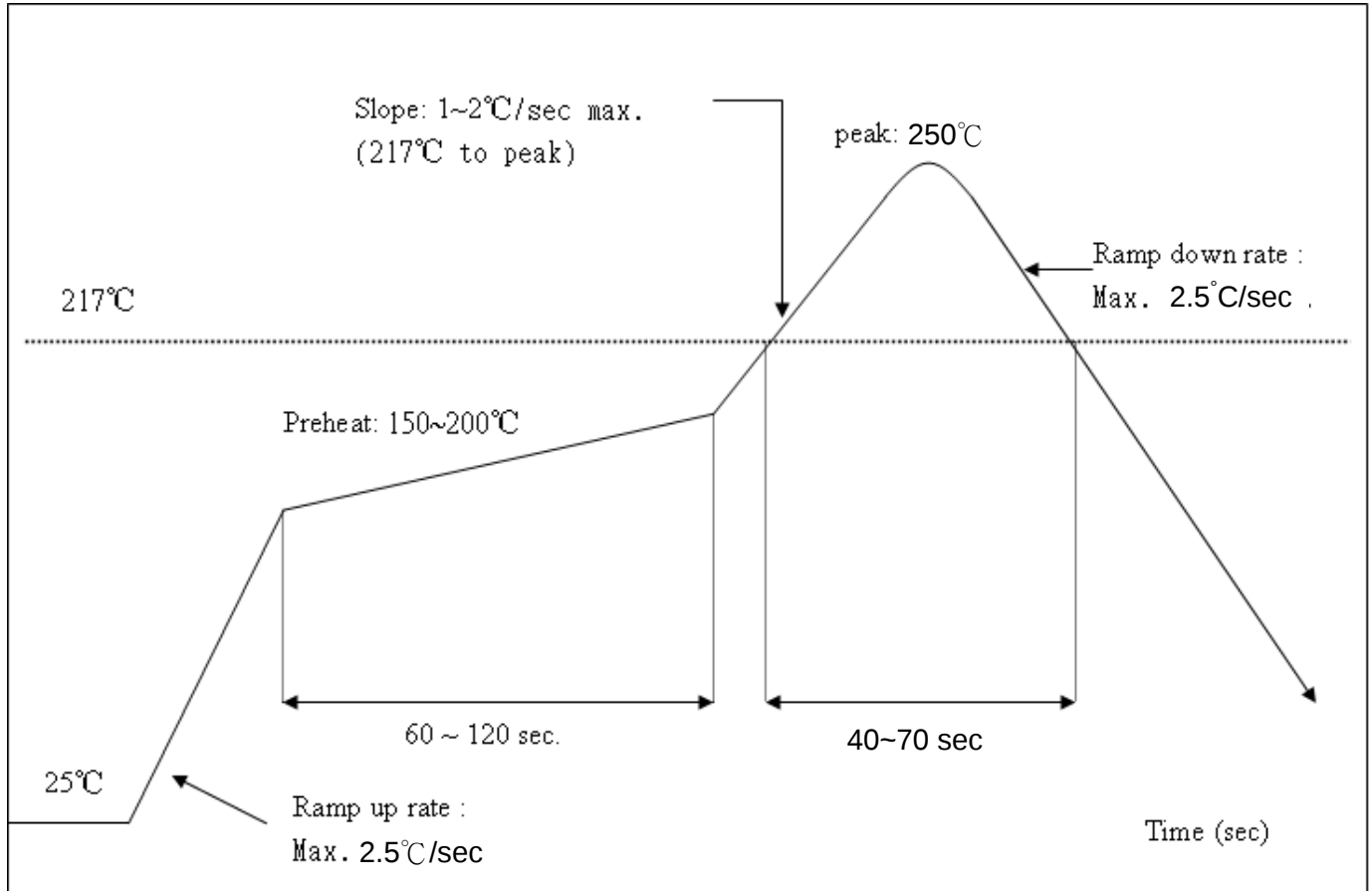


8. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<250^{\circ}\text{C}$

Number of Times : ≤ 2 times



9. Packing Information

9.1 Label

Label A → Anti-static and humidity notice



Label B → MSL caution / Storage Condition

	Caution	LEVEL
	This bag contains MOISTURE-SENSITIVE DEVICES	 If blank, see adjacent bar code label
1. Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH) 2. Peak package body temperature: _____ °C If blank, see adjacent bar code label 3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be a) Mounted within: _____ hours of factory conditions If blank, see adjacent bar code label ≤30°C/60% RH, or b) Stored per J-STD-033 4. Devices require bake, before mounting, if: a) Humidity Indicator Card reads >10% for level 2a - 5a devices or >60% for level 2 devices when read at 23 ± 5°C b) 3a or 3b are not met 5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure Bag Seal Date: _____ If blank, see adjacent bar code label Note: Level and body temperature defined by IPC/JEDEC J-STD-020		

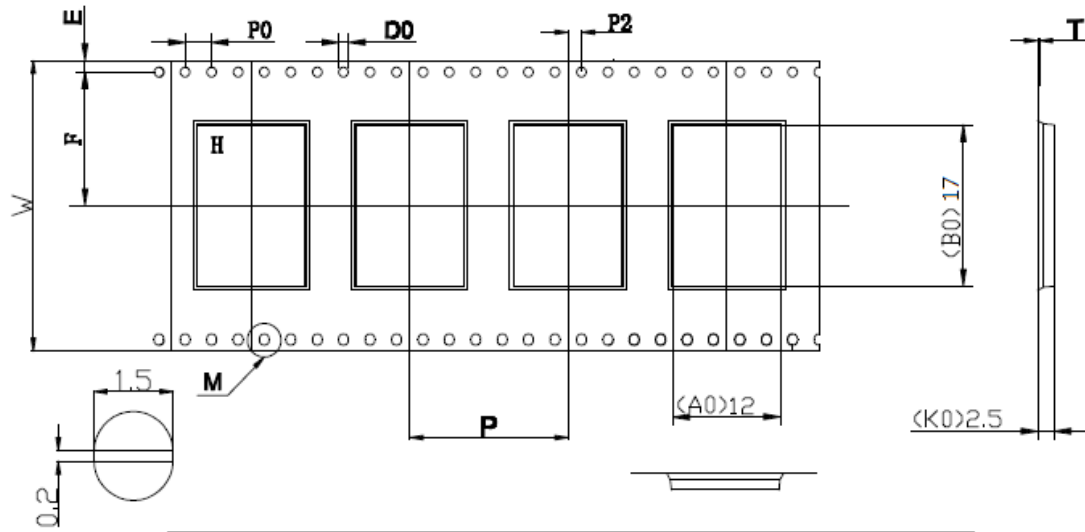
Label C → Inner box label .

PKG S/N :	
Model:	
P/N :	
Qty :	
Date Code :	
Lot Code :	

Label D → Carton box label .

iotTech Corporation	
Model Name :	
Part No :	
Quantity :	
Lot D/C :	
Manufacture :	

9.2 Dimension



Symbol	AO	BO	KO	PO	P	P2
Spec	12.0±0.10	17.0±0.10	2.50±0.10	3.00±0.10	17.0±0.10	2.00±0.10
Symbol	W	T	E	F	DO	
Spec	44.0±0.30	0.30±0.05	1.75±0.10	20.2±0.10	1.50±0.10	

1. 10 sprocket hole pitch cumulative tolerance ± 0.20 .
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481-D requirements.
5. Thickness : 0.30 ± 0.05 mm.
6. Packing length per 22" reel : 98.5 Meters.(1:3)
7. Component load per 13" reel : 1500 pcs.

