iotTech

ITM-1066A Series

IEEE802.11a/b/g/n 2.4+5GHz 1T1R

Wi-Fi IoT Module Datasheet

(Preliminary)

V0.4

Revision History

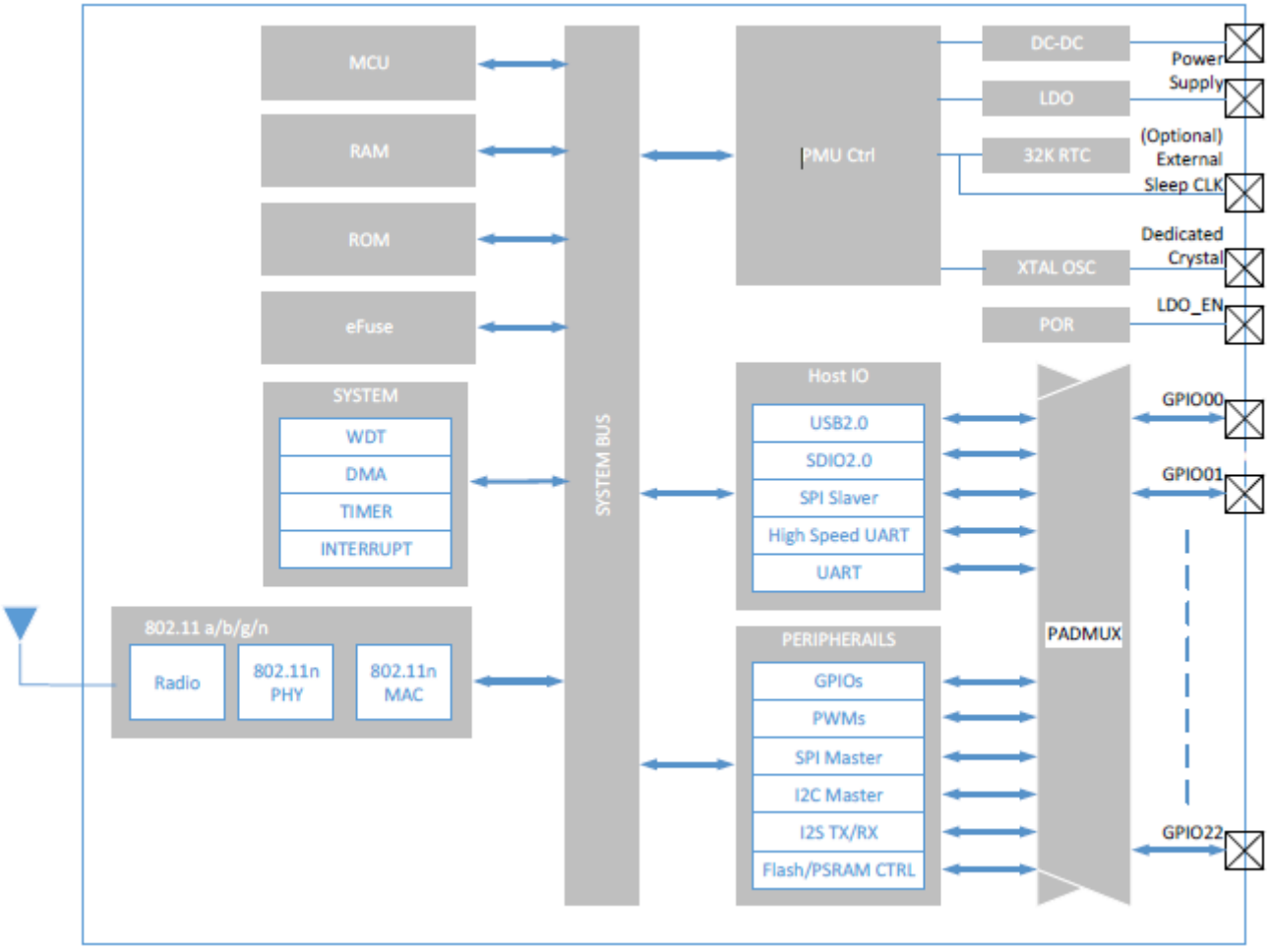
Date	Revision Content	Revised By	Version
2019/08/12	- Initial released (Preliminary)	Issac Chen	0.1
2020/02/04	- Update Sub-Class naming	Issac Chen	0.2
2020/04/07	- Add GPIO3/GPIO13 pull-up resistor	Issac Chen	0.3
2020/06/22	- Modify pull-up resistor for GPIO14/15	Issac Chen	0.4

Contents

1. General Description

iTM-1066A module features a fully integrated 2.4GHz+5GHz radio transceiver and baseband processor for Wi-Fi 802.11a/b/g/n IOT applications. It can be used as a standalone application-specific communication processor or as a wireless data link in hosted MCU systems.

iTM-1066A module uses a highly integrated dual-band WIFI IOT SoC chipset equipped with a powerful and cost-competitive RISC processor, Andes Technology N10. It can be connected to any external MCU through UART, SPI, SDIO, USB or I2C interfaces and sensors or other devices through GPIOs. It also includes RF switch, balun, power amplifier (PA) and low noise amplifier (LNA), to minimize PCB design area and external component requirement. The block diagram of WIFI IOT SoC is shown as below.



2. Features

- Processors
  - Andes Technology N10 processor w/ ILM/DLM and D-cache

- Wi-Fi
  - 2.4G+5G dual-band 1T1R IEEE 802.11a/b/g/n/e/i/d
  - 802.11n features
    - A-MPDU Tx & Rx
    - Support immediate Block-Ack
  - STA/AP mode
    - Soft-AP
  - Rate adaption mechanism
  - WFA features
    - WEP/TKIP/WPA/WPA2
    - WMM/WMM PS
  - Short Guard Interval
  - Greenfield mode
  - RIFS in RX mode
  - STBC in RX mode
  - Enhanced and robust sensitivity for wider coverage range
  - Supports calibration algorithm to handle no-idealities effects from CMOS RF block

- System
  - 128K ROM and 192 KB SRAM for Instruction and data SRAM in total
  - 8KB Retention SRAM
  - Integrate 8M byte (8MB) SPI PSRAM in package
    - Embedded 8MB PSRAM is Only for iTM-1066A-M and iTM-1066A-MX
  - Suspend/Wake-up manger controller.
  - Two channel DMA off load CPU loading.
  - One Flash controller supports both Flash and PSRAM up to 16MB/64Mb with XIP

- One I2S TX/RX channel for 8~32bits/8~192KHz in master/slave mode.
- One SPI master
- One I2C master
- Five PWMs
- Four millisecond timers
- Four microsecond timers
- Two watchdog
- All pins can be multiplexed to GPIO by user scenario

- Host Interfaces
  - USB 2.0
  - SDIO 2.0
    - Clock rate up to 50MHz
  - SPI slave
    - Provide proprietary/user CMD
  - High Speed UART
    - Support RTSN/CTSN/RX/TX, 4 pins
    - Baud rate up to 4.8MHz
  - UART
    - Support RX/TX, 2 pins
    - Baud rate up to 921600kHz

- Please refer to the table below for different types of ITM-1066A

P/N	Flash	PSRAM	Antenna Type
ITM-1066A-P	16Mb On-board	N/A	On-board PCB Antenna
ITM-1066A-M	16Mb On-board	8MB Built-In	On-board PCB Antenna
ITM-1066A-PX	16Mb On-board	N/A	IPEX Connector for External Ant.
ITM-1066A-MX	16Mb On-board	8MB Built-In	IPEX Connector for External Ant.

* “Built-in” means the PSRAM is embedded inside Wi-Fi chipset

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	-10°C to 70°C
Storage temperature	-40°C to 85°C

3.1.2 Recommended Operating Ratings

Test conditions: At room temperature				
Symbol	**Min.**	**Typ.**	**Max.**	**Unit**
VBAT	2.0	3.3	3.6	V

3.2 Wi-Fi RF Specification (RX)

2.4G WLAN

Parameters	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		2412		2484	MHz
RX Sensitivity 11b @ 8% PER	- 1Mbps		-95		dBm
	- 2Mbps		-93		dBm
	- 5.5Mbps		-91		dBm
	- 11Mbps		-88		dBm
RX Sensitivity 11g @ 10% PER	- 6Mbps		-91		dBm
	- 9Mbps		-90		dBm
	- 12Mbps		-88		dBm
	- 18Mbps		-86		dBm
	- 24Mbps		-82		dBm
	- 36Mbps		-79		dBm
	- 48Mbps		-74		dBm
	- 54Mbps		-73		dBm
Receive Sensitivity (11n,20MHz) @10% PER	- MCS0		-91		dBm
	- MCS=1		-88		dBm
	- MCS=2		-86		dBm
	- MCS=3		-81		dBm
	- MCS=4		-79		dBm
	- MCS=5		-74		dBm
	- MCS=6		-73		dBm
	- MCS=7		-72		dBm
Receive Sensitivity (11n,40MHz) @10% PER	- MCS0		-88		dBm
	- MCS=1		-85		dBm
	- MCS=2		-83		dBm
	- MCS=3		-78		dBm
	- MCS=4		-76		dBm
	- MCS=5		-71		dBm
	- MCS=6		-70		dBm
	- MCS=7		-69		dBm
Maximum Receive Level	802.11b		-10		dBm
	802.11g		-8		dBm
	802.11n		-8		dBm

5G WLAN

Parameters	Conditions	Min.	Typ.	Max.	Unit
Frequency Range		5180		5805	MHz
RX Sensitivity 11a @ 10% PER	- 6Mbps		-87		dBm
	- 9Mbps		-86		dBm
	- 12Mbps		-84		dBm
	- 18Mbps		-82		dBm
	- 24Mbps		-79		dBm
	- 36Mbps		-75		dBm
	- 48Mbps		-71		dBm
	- 54Mbps		-70		dBm
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0		-87		dBm
	- MCS=1		-84		dBm
	- MCS=2		-82		dBm
	- MCS=3		-79		dBm
	- MCS=4		-75		dBm
	- MCS=5		-71		dBm
	- MCS=6		-70		dBm
	- MCS=7		-69		dBm
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0		-84		dBm
	- MCS=1		-81		dBm
	- MCS=2		-79		dBm
	- MCS=3		-76		dBm
	- MCS=4		-72		dBm
	- MCS=5		-68		dBm
	- MCS=6		-67		dBm
	- MCS=7		-66		dBm

3.3 Wi-Fi RF Specification (TX)

2.4G WLAN

Parameters	Conditions	Min.	Typ.	Max.	Unit
Frequency Range		2412		2484	MHz
Output Power	802.11b	16.0	18.0		dBm
	802.11g	12.0	14.0		dBm
	802.11n	12.0	14.0		dBm

@EVM	802.11b		-30	-10	dB
	802.11g		-30	-25	dB
	802.11n		-30	-28	dB

5G WLAN

Parameters	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		5180		5805	MHz
Output Power	802.11a	12.0	14.0		dBm
	802.11n	12.0	14.0		dBm
@EVM	802.11a		-30	-25	dB
	802.11n		-30	-28	dB

3.4 Power Consumption

(Using embedded buck switching regulator, DCDC mode)

WLAN Operational Modes	Typ.	Unit
OFF[a]	2	uA
Rx, CCK, 1 Mbps	67	mA
Rx, OFDM, 54 Mbps	68	mA
Rx, HT20, MCS7	68	mA
Rx, HT40, MCS7	75	mA
Rx, 5.18G HT20, MCS7	88	mA
Rx, 5.805G HT20, MCS7	88	mA
Rx, 5.18 G HT40, MCS7	97	mA
Rx, 5.805G HT40, MCS7	97	mA
Tx, CCK, 1 Mbps	307	mA
Tx, 11B, 11 Mbps@18dBm	307	mA
Tx, OFDM, 54 Mbps@18dBm	256	mA
Tx, HT20, MCS7@15dBm	260	mA
Tx, HT40, MCS7@15dBm	261	mA
Tx, 5.18 G HT20, MCS7	310	mA
Tx, 5.805G HT20, MCS7	293	mA
Power-saving(MCU_on)[b] , DTIM1	31	mA
Power-saving(MCU_on)[b] , DTIM3	30.5	mA
Power-saving(MCU_off)[c] , DTIM1	3.5	mA
Power-saving(MCU_off)[c] , DTIM3	2.8	mA

a. OFF mode test condition: VBAT=3.3V, VIO=3.3V, LDO_EN=0V (excluding Flash/PSRAM).

b. Intra-beacon Sleep when MCU is turn on.
It is used in the applications that require the CPU to be working.

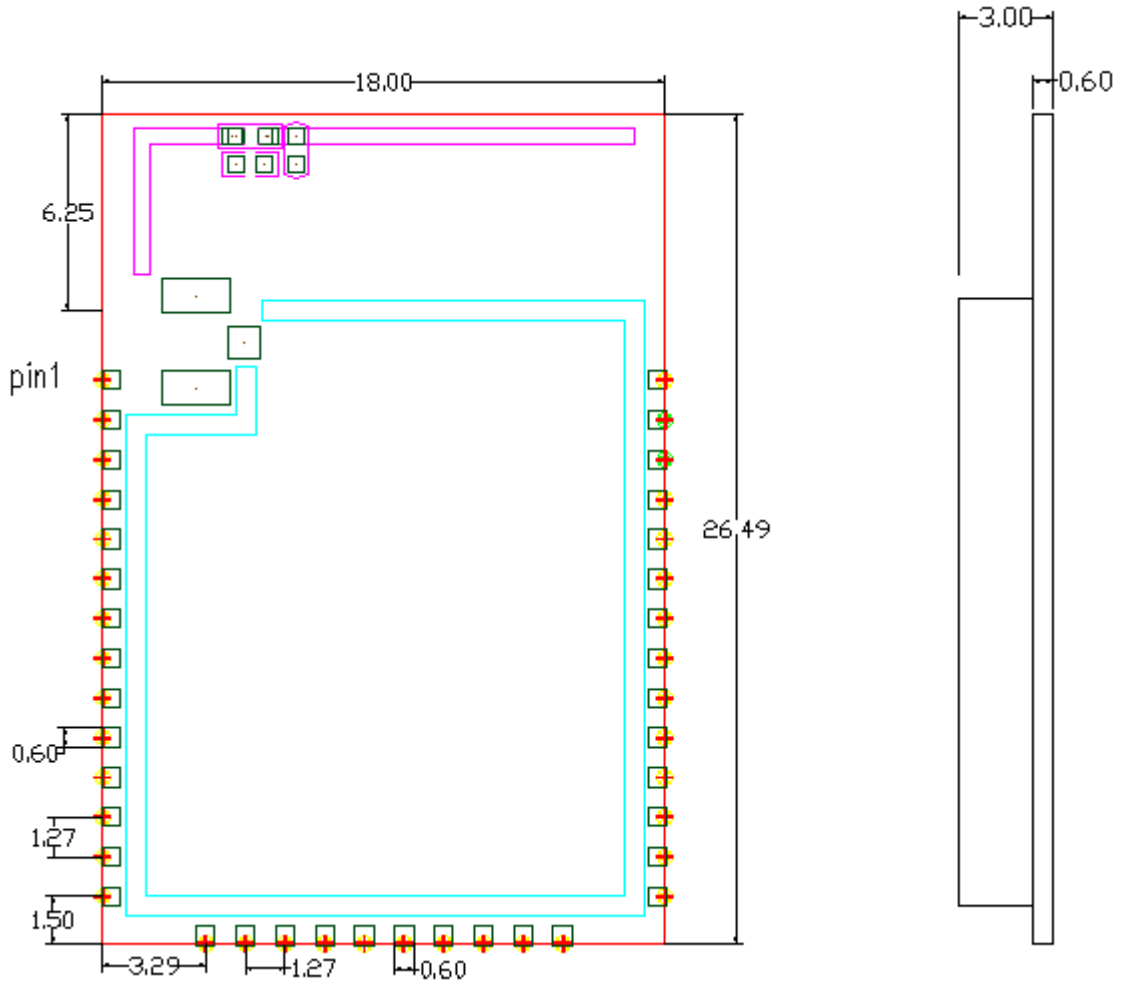
c. Intra-beacon Sleep when MCU is turn off.

4. Pin Assignments

4.1 PCB Pin Outline

< TOP VIEW >

< SIDE VIEW >



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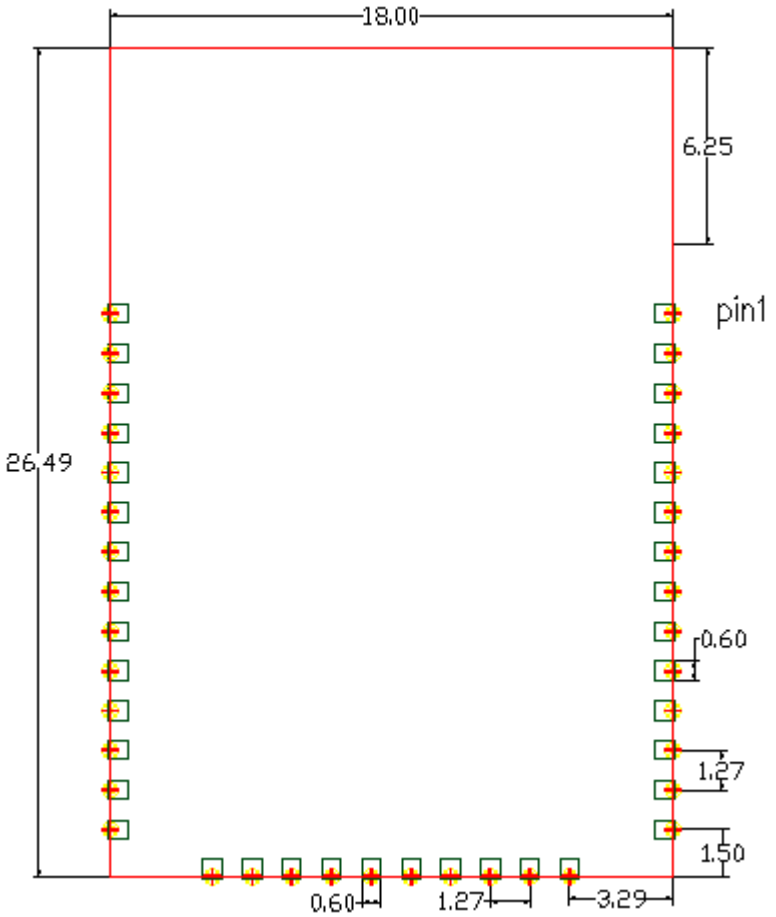

4.2 Pin Definition

Pin	Pin-Define	Type	Description
1	GND	P	Ground
2	VBAT	P	Main Power Supply Input 3.3V
3	LDO_EN	I	Active High to Enable Whole Module
4	GPIO22 / ADC0	I/O/AI	GPIO22 / I2C_ SDA / UART0_RXD / ADC0
5	GPIO21 / ADC1	I/O/AI	GPIO21 / I2C_ SCL / UART0_TXD / ADC1
6	GPIO20 / ADC2 / I2S_ MCLK	I/O/AI	GPIO20 / ADC2 / I2S_ MCLK
7	GPIO00 / ADC3 / PWM0	I/O/AI	GPIO00 / ADC3 / PWM0
8	NC	—	Not connected
9	NC	—	Not connected
10	GPIO01 / PWM1	I/O	GPIO01 / PWM1
11	GPIO02 / PWM2	I/O	GPIO02 / PWM2
12	GPIO05 / UART1_RTS / I2S_BCLK	I/O	GPIO05 / UART1_RTS / I2S_BCLK
13	GPIO06 / UART1_RXD / I2S_DI	I/O	GPIO06 / UART1_RXD / I2S_DI
14	GPIO07 / UART1_TXD / I2S_DO	I/O	GPIO07 / UART1_TXD / I2S_DO
15	GND	GND	Ground
16	NC	—	Not connected
17	GPIO09 / UART1_CTS / I2S_LRCLK	I/O	GPIO09 / UART1_CTS / I2S_LRCLK
18	GPIO11 / SPI_S_CLK	I/O	GPIO11 / SPI_S_CLK
19	NC	—	Not connected
20	NC	—	Not connected
21	NC	—	Not connected
22	NC	—	Not connected
23	GPIO08 / SPI_M_CLK	I/O	GPIO08 / SPI_M_CLK
24	GPIO13 / SPI_M_CS / SPI_S_CS	I/O	GPIO13 / SPI_M_CS / SPI_S_CS (NOT available in iTM-1066AM module because occupied by embedded PSRAM)
25	GPIO12 / SPI_M_MOSI / SPI_S_MISO	I/O	GPIO12 / SPI_M_MOSI / SPI_S_MISO
26	GPIO10 / SPI_M_MISO /	I/O	GPIO10 / SPI_M_MISO / SPI_S_MOSI

	SPI_S_MOSI		
27	NC	—	NC
28	USB HSDP	AIO	USB DP
29	USB HSDM	AIO	USB DM
30	GPIO14 / SPI_FLASH_IO0_DI	I/O	GPIO14 / SPI_FLASH_IO0_DI (For strapping and debugging only)
31	GPIO15 / SPI_FLASH_CLK	I/O	GPIO15 / SPI_FLASH_CLK (For strapping and debugging only)
32	NC	—	NC
33	NC	—	NC
34	GPIO03 / PWM3 / UART0_RXD	I/O	GPIO03 / PWM3 / UART0_RXD (default UART)
35	GPIO04 / PWM4 / UART0_TXD	I/O	GPIO04 / PWM4 / UART0_TXD (default UART)
36	NC	—	NC
37	NC	—	NC
38	GND	P	GND

■ **IO customization table is shown as below**

	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5
P00		PWM0			ADC3	GPIO0
P01		PWM1				GPIO1
P02		PWM2				GPIO2
P03	UART0	PWM3				GPIO3
P04	UART0	PWM4				GPIO4
P05	UART1	I2S				GPIO5
P06	UART1	I2S				GPIO6
P07	UART1	I2S				GPIO7
P08		SPIM	I2S			GPIO8
P09	UART1	I2S				GPIO9
P10		SPIM	I2S	I2CM	SPIS	GPIO10
P11					SPIS	GPIO11
P12		SPIM	I2S	I2CM	SPIS	GPIO12
P13		SPIM	I2S	PSRAM	SPIS	GPIO13
P14	FLASH			PSRAM		GPIO14
P15	FLASH			PSRAM		GPIO15
P16	FLASH			PSRAM		GPIO16
P17	FLASH			PSRAM		GPIO17
P18	FLASH			PSRAM		GPIO18
P19	FLASH			PSRAM		GPIO19
P20		I2S	I2S		ADC2	GPIO20
P21	I2CS	UART0	I2CM		ADC1	GPIO21
P22	I2CS	UART0	I2CM		ADC0	GPIO22

5. Dimensions

5.1 Layout Recommendation

(Unit: mm)

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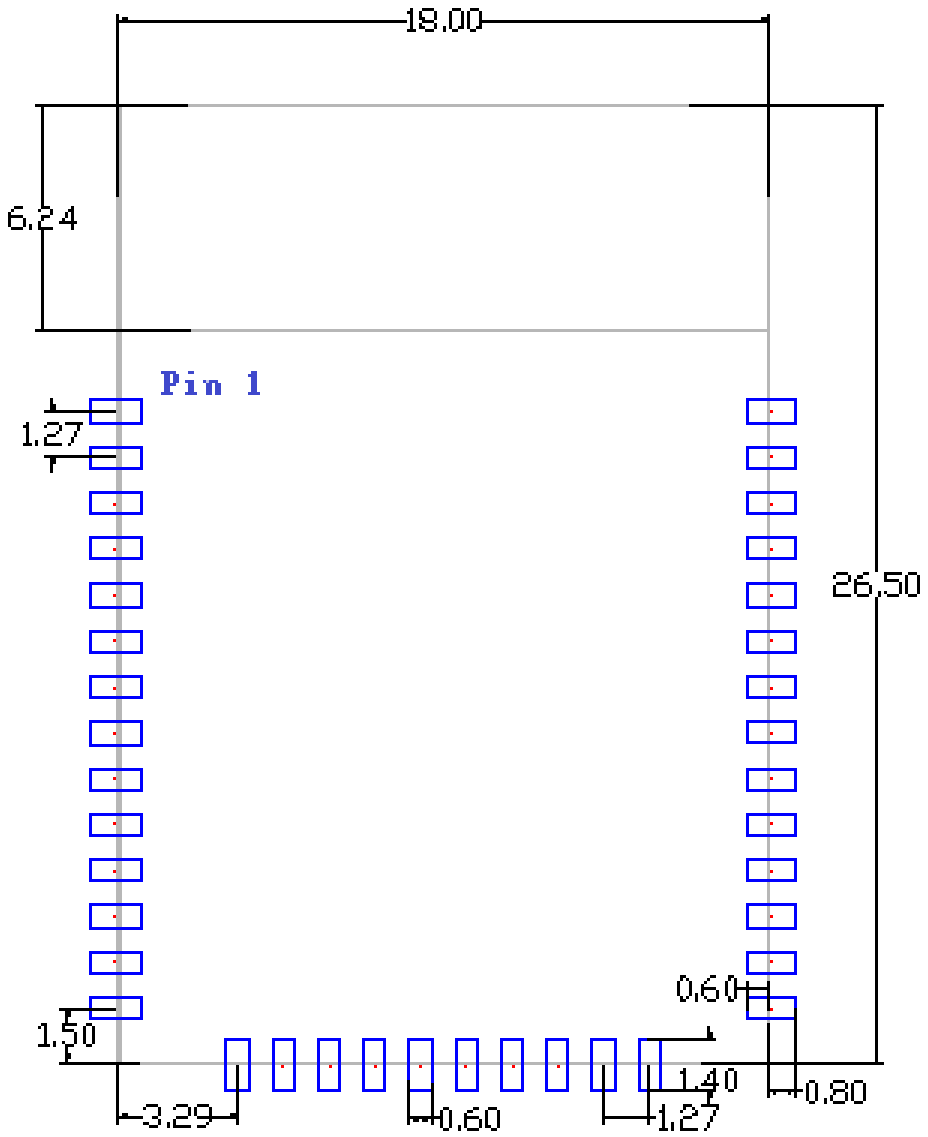
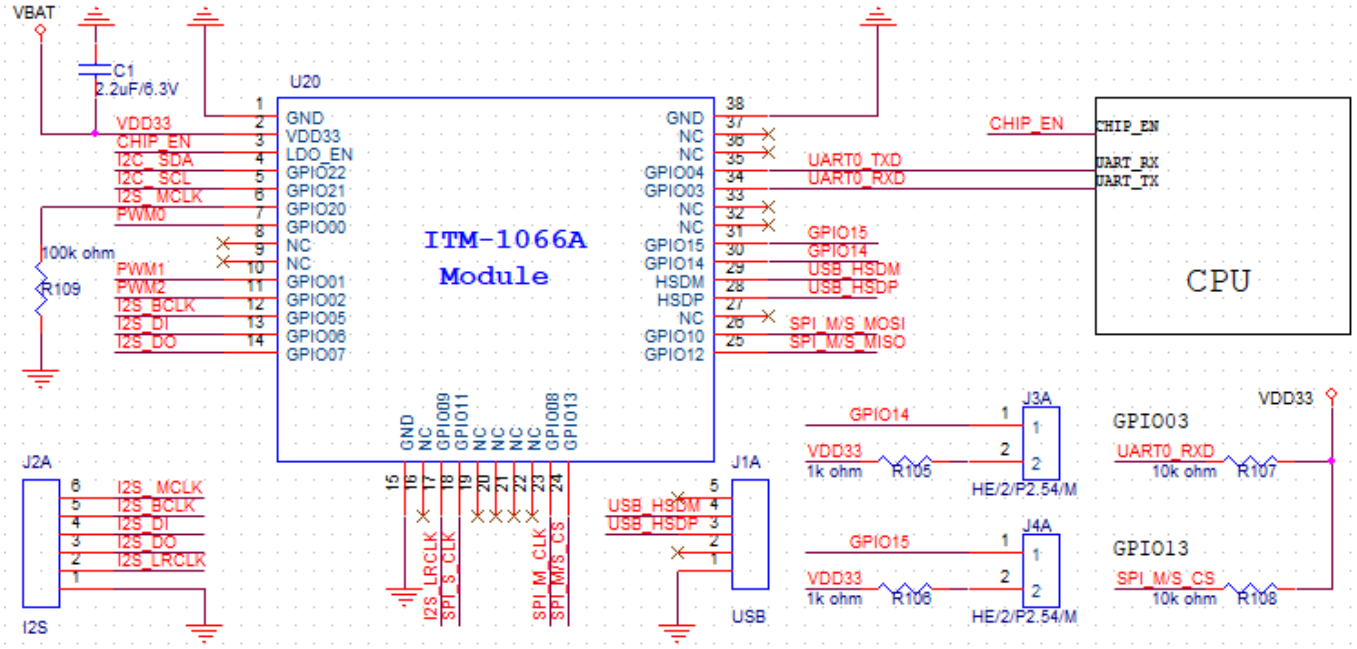


6. Reference Design



GPIO3 and GPIO13 must be HIGH when power-on.
GPIO20 MUST be LOW when power-on (A 100K-ohm pull-low resistor is recommended)
J3A and J4A are for firmware upgrade through USB interface – Pulling up GPIO14/15 when power-on will force the module enter USB mode for firmware upgrade.
However, J3A and J4A must be as close to GPIO14/15 pins as possible. Otherwise, the PCB traces of GPIO14/15 may cause EMI problem, because GPIO14 and GPIO15 are SPI flash clock/data pins when the module is in normal operation mode.

7. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times