iotTech

iTM-7682H

IEEE 802.11b/g/n 1T1R WLAN
Wide-Range Module Datasheet

(Preliminary)

V0.2

Revision History

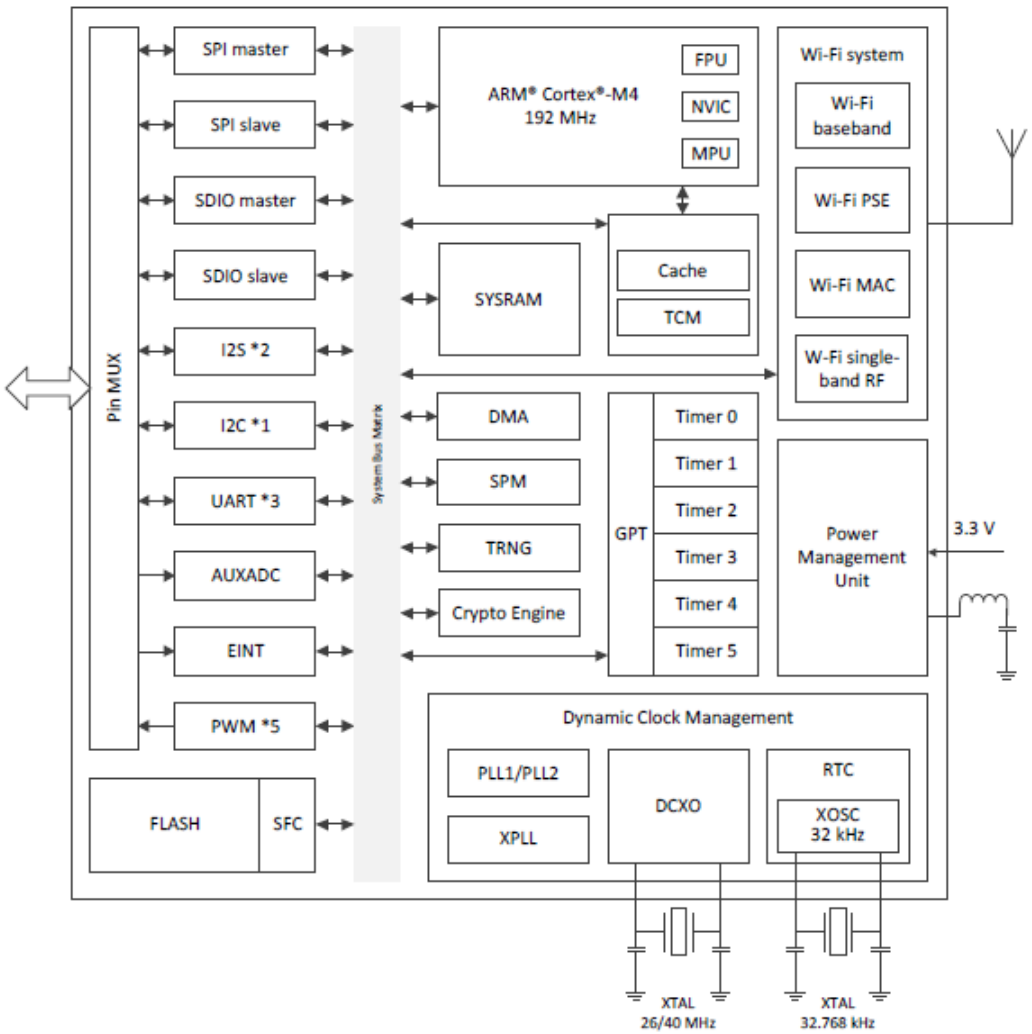
Date	Revision Content	Revised By	Version
2023/04/19	- Preliminary released	Pendro Wu	0.1
2023/06/02	- Pin out changed	Pendro Wu	0.2
	-		
	-		
	-		
	-		
	-		

Contents

1. General Description

iTM-7682H is a highly integrated module featuring an application processor, a wide-range 1T1R 11b/g/n 2.4GHz Wi-Fi subsystem and a power management unit (PMU).
iTM-7682H is based on ARM® Cortex®-M4 with floating point microcontroller unit (MCU) including integrated with 1MB flash memory. It supports interfaces including UART, I2C, SPI, I2S, PWM, SDIO and ADC. The Wi-Fi subsystem of iTM-7682H contains the 802.11b/g/n radio with high-efficiency PA/LNA, baseband and MAC that are designed to meet wide range and high throughput application requirements. It also contains a 32-bit RISC CPU that could fully offload the application processor.

The main chipset of iTM-7682H is MediaTek MT7682 Wi-Fi SoC. The system block diagram of MT7682 is shown as below.



2. Features

- Micro-Controller Subsystem
  - ARM® Cortex®-M4 with FPU as application processor with maximum frequency at 192MHz.
  - Up to 32KB L1 cache with high hit rate and zero wait state with maximum frequency at 192MHz.
  - 384KB SYSRAM with zero wait state with maximum frequency at 96MHz.
  - SiP 8Mbits low power flash with 0.1μA deep-down current (typical condition) with maximum frequency at 80MHz.
  - Crypto engine supporting AES, DES/3DES, MD5, SHA1/SHA2.
  - True random number generator
  - One RTC timer, one 64-bit and five 32-bit general purpose timers
  - 14 DMA channels
  - eXecute In Place (XIP) on flash
  - Up to 14 GPIO with 5V-tolerant fast IOs, each IO can be configured as external interrupt source.
- Interfaces:
  - The following interfaces are multiplexed with GPIO.
  - An SPI master interface, 1, 2 or 4-bit mode, up to 48MHz
  - An SPI slave interface, 1, 2 or 4-bit mode, up to 48MHz
  - An SDIO host interface (v2.0)
  - An SDIO device interface (v2.0)
  - An I2C master interface (3.4Mbps)
  - One channel of 12-bit ADC
  - Up to 2 UART interfaces with hardware flow control (~3Mbps)
  - Up to 4 PWM channels
- Wi-Fi Subsystem Features

  Wi-Fi MAC
  - Supports all data rates of 802.11g including 6, 9, 12, 18, 24, 36, 48 and 54Mbps.
  - Supports short GI and all data rates of 802.11n including MCS0 to MCS7.
  - Wi-Fi security WEP, WPA2, WPA3-Personal and WPS.
  - 802.11w PMF (protected management frames)
  - Supports SoftAP and sniffer modes.
  - Supports Airoha Smart Connection.
  - Supports multi-cloud connectivity.
  - Supports Wi-Fi/Bluetooth LE coexistence.

  WLAN baseband

- 20 and 40MHz channels
- MCS0-7 (BPSK, r=1/2 through 64QAM, r=5/6)
- Supports greenfield, mixed mode and legacy modes.
- Short Guard Interval
- Supports digital pre-distortion to enhance PA performance.
- Supports receiver antenna diversity.

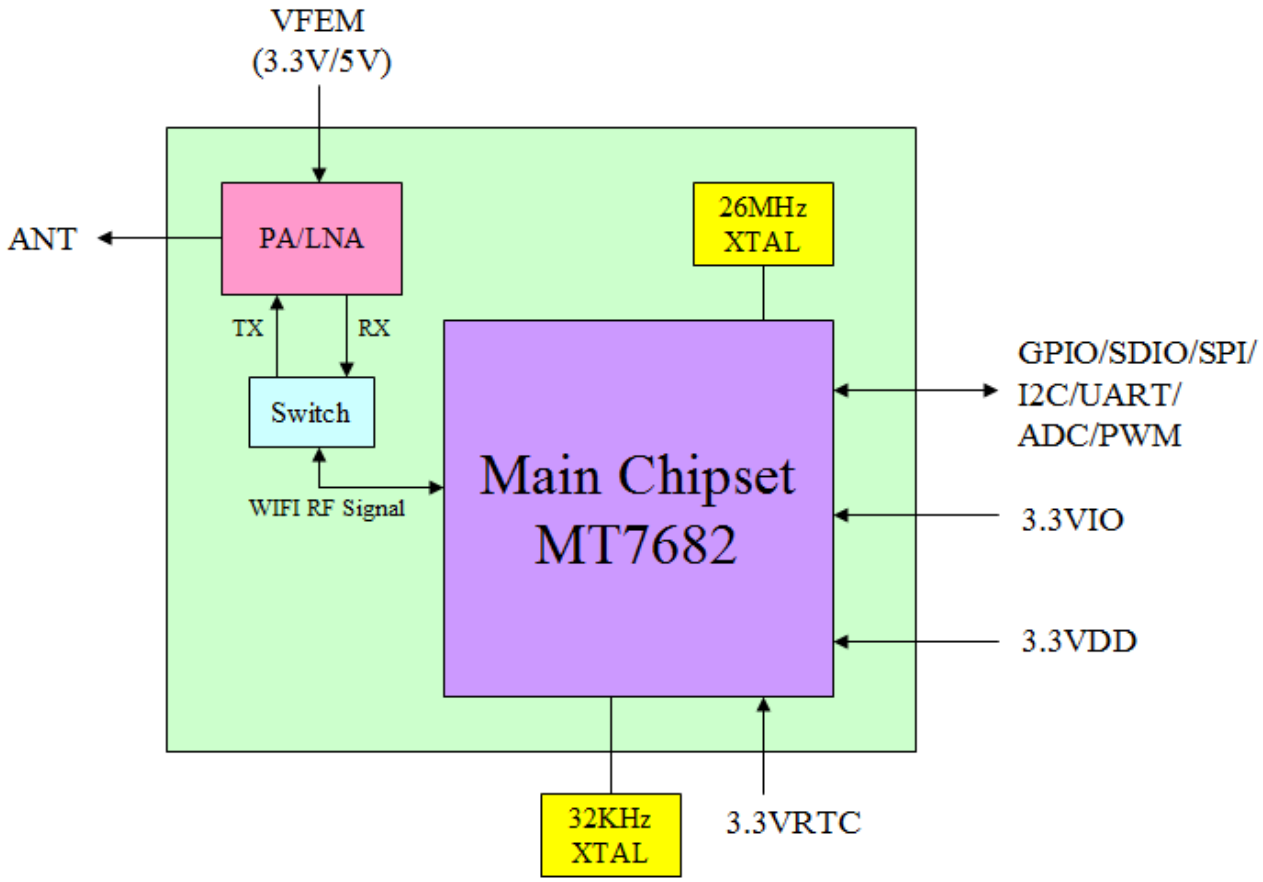
WLAN RF

- Integrated 2.4GHz PA and LNA, and T/R switch
- Supports frequency band from 2402 to 2494MHz.
- Single-ended RFIO with integrated balun
- Supports optional external LNA and PA.

Core

- Dedicated high-performance 32-bit RISC CPU N9 with up to 160MHz clock speed.
- Feasibility Wi-Fi host subsystem in Cortex-M4 to support custom applications.

The block diagram of iTM-7682H module is depicted in the figure below.



3. General Specification

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

3.1 Voltages

3.1.1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VDD	Input supply Voltage	-0.3	3.6	V
DVDD_IO_0	Digital I/O Voltage 0	-0.3	3.6	V
DVDD_IO_1	Digital I/O Voltage 1	-0.3	3.6	V
VDD_RTC	RTC Power Supply Voltage	-0.3	3.6	V
VDD_FEM	FEM Power Supply Voltage	-0.3	6.0	V

3.1.2 Recommended Operating Ratings

Test conditions: At operating temperature -20°C ~70°C				
Symbol	**Min.**	**Typ.**	**Max.**	**Unit**
VDD	3.0	3.3	3.6	V
DVDD_IO_0	3.0	3.3	3.6	V
DVDD_IO_1	3.0	3.3	3.6	V
VDD_RTC	3.0	3.3	3.6	V
VDD_FEM	3.0	3.3/5.0	5.5	V

3.2 Wi-Fi RF Specification (RX)

Parameters	Conditions	Min.	Typ.	Max.	Unit
Frequency Range		2412		2484	MHz
RX Sensitivity 11b @ 8% PER	- 1Mbps		-100		dBm
	- 2Mbps		-97		dBm
	- 5.5Mbps		-95		dBm
	- 11Mbps		-92		dBm
RX Sensitivity 11g @ 10% PER	- 6Mbps		-98		dBm
	- 9Mbps		-96		dBm
	- 12Mbps		-93		dBm
	- 18Mbps		-91		dBm
	- 24Mbps		-88		dBm
	- 36Mbps		-84		dBm
	- 48Mbps		-80		dBm
	- 54Mbps		-79		dBm
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0		-95		dBm
	- MCS=1		-92		dBm
	- MCS=2		-89		dBm
	- MCS=3		-86		dBm
	- MCS=4		-82		dBm
	- MCS=5		-78		dBm
	- MCS=6		-77		dBm
	- MCS=7		-75		dBm
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0		-90		dBm
	- MCS=1		-87		dBm
	- MCS=2		-85		dBm
	- MCS=3		-81		dBm
	- MCS=4		-78		dBm
	- MCS=5		-74		dBm
	- MCS=6		-72		dBm
	- MCS=7		-70		dBm
Maximum Receive Level	- 802.11b		-10		dBm
	- 802.11g		-10		dBm
	- 802.11n (MCS0)		-10		dBm

3.3 Wi-Fi RF Specification (TX)

VDD_FEM = 3.3V

Parameters	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		2412		2484	MHz
Output Power	802.11b		21.0		dBm
	802.11g		18.0		dBm
	802.11n		17.5		dBm
@EVM	802.11b		-27	-10	dB
	802.11g		-28	-25	dB
	802.11n		-30	-28	dB

VDD_FEM = 5.0V

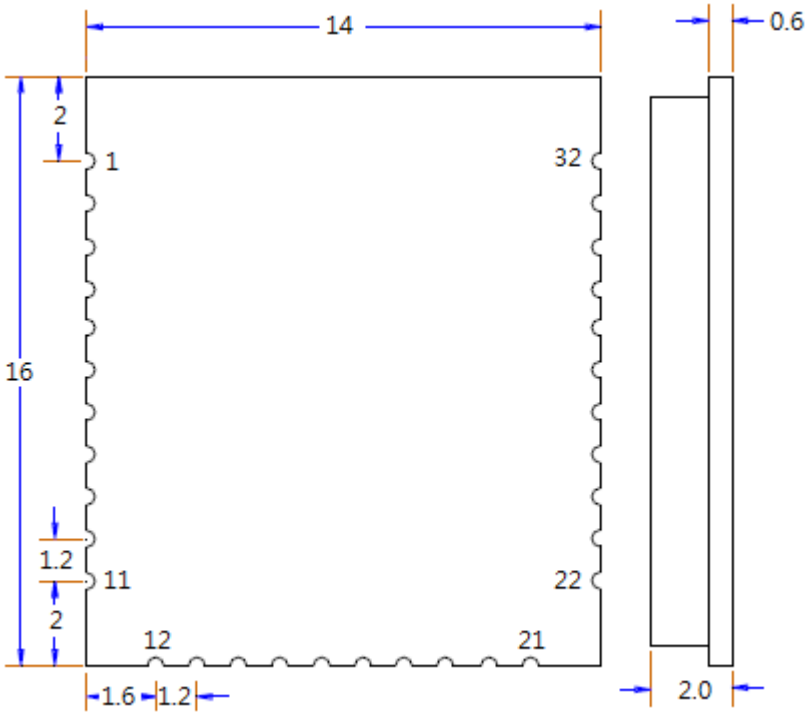
Parameters	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		2412		2484	MHz
Output Power	802.11b		23.0		dBm
	802.11g		20.0		dBm
	802.11n		19.0		dBm
@EVM	802.11b		-27	-10	dB
	802.11g		-28	-25	dB
	802.11n		-30	-28	dB

4. Pin Assignments

4.1 PCB Pin Outline

Module size = 16mm (L) x 14mm (W) x 2.2mm (H)

< TOP VIEW > <SIDE VIEW>



4.2 Pin Definition

No	Name	Function
1	GND	Ground
2	ANT	WIFI RF I/O (FEM antenna output)
3	GND	Ground
4	GND	Ground
5	VDD_FEM	3.3V~5V Power for FEM (PA/LNA Power, VCC1/VCC2/VDD)
6	GPIO17	MT7682 GPIO17
7	GPIO16	MT7682 GPIO16 Boot Trapping : Boot ROM bypass select GND : Boot up bypass boot ROM (directly jump to flash) DVDD_IO_0 : Boot up with boot ROM (default)

8	GPIO15	MT7682 GPIO15 Boot Trapping : JTAG pins fixed for use GND : JTAG pins fixed for JTAG use DVDD_IO_0 : JTAG pins as GPIO (configurable after boot up) (default)
9	GPIO14	MT7682 GPIO14 Boot Trapping : 32kHz clock source select GND : 32kHz source is from external DVDD_IO_0 : 32kHz source is from internal (divided from 26/40MHz clock) (default)
10	DVDD_IO_0	IO Power for MT7682 GPIO 11/12/13/14/15/16/17
11	GPIO13	MT7682 GPIO13 Boot Trapping : Host interface select (if HIF_EN is enabled) GND : Host interface via SPI slave DVDD_IO_0 : Host interface via SDIO slave (default)
12	GPIO12	MT7682 GPIO12. Boot Trapping : UART download GND: Enter UART download mode DVDD_IO_0: Skip UART download mode (default)
13	GPIO11	MT7682 GPIO11
14	GND	Ground
15	32K_XI	MT7682 XIN (IC Pin13)
16	32K_XO	MT7682 XOUT (IC Pin14)
17	RTC_EINT	MT7682 RTC_EINT (IC Pin15)
18	VDD_RTC	MT7682 AVDD33_VRTC (IC Pin16)
19	GND	Ground
20	EXT_PWR_EN	MT7682 EXT_PWR_EN (IC Pin17)
21	CHIP_EN	MT7682 CHIP_EN (IC Pin19)
22	VDD	3.3V Main Power for MT7682
23	GND	Ground
24	GPIO22	MT7682 GPIO22
25	GPIO21	MT7682 GPIO21
26	DVDD_IO_1	IO Power for MT7682 GPIO 0/1/2/3/4/21/22
27	GPIO4	MT7682 GPIO4. Boot Trapping: Boot with host interface (HIF_EN) GND : Boot with host interface disabled (default) DVDD_IO_1 : Boot with host interface enabled
28	NC	Not Connected

29	NC	Not Connected
30	GND	Ground
31	GND	Ground
32	GND	Ground

4.3 Pin Function Selection Table

Ball Name	Aux Func.0	Aux Func.1	Aux Func.2	Aux Func.3	Aux Func.4	Aux Func.5	Aux Func.6	Aux Func.7	Aux Func.8	Aux Func.9	Aux Func.10
GPIO_0	GPIO0	EINT0		U1RTS	SCL1	I2S_RX	JTDI		WIFI_ANT_SEL0	BT_PRI1	PWM0
GPIO_1	GPIO1	EINT1		U1CTS	SDA1	I2S_TX	JTMS		WIFI_ANT_SEL1	BT_PRI3	PWM1
GPIO_2	GPIO2	EINT2		URXD1	PWM0	I2S_WS	JTCK	CLKO0		BT_PRI0	WIFI_ANT_SEL4
GPIO_3	GPIO3	EINT3		UTXD1	PWM1	I2S_CK	JTRST_B			WIFI_ANT_SEL2	I2S_CK
GPIO_4	GPIO4	SPISLV_A_SIO2	SPIMST_A_SIO2	EINT4		I2S_MCLK	JTDO			WIFI_ANT_SEL3	I2S_MCLK
GPIO_11	GPIO11	EINT11	PWM3	URXD2	MA_MC0_CK	SLV_MC0_CK	CLKO2			WIFI_ANT_SEL0	I2S_RX
GPIO_12	GPIO12	SPISLV_B_SIO3	SPIMST_B_SIO3	UTXD2	MA_MC0_CM0	SLV_MC0_CM0	EINT12			WIFI_ANT_SEL1	I2S_TX
GPIO_13	GPIO13	SPISLV_B_SIO2	SPIMST_B_SIO2	U2RTS	MA_MC0_DA0	SLV_MC0_DA0	CLKO4		EINT13		I2S_WS
GPIO_14	GPIO14	SPISLV_B_SIO1	SPIMST_B_SIO1	TDM_RX	MA_MC0_DA1	SLV_MC0_DA1	PWM4		EINT14		CLKO4
GPIO_15	GPIO15	SPISLV_B_SIO0	SPIMST_B_SIO0	TDM_TX	MA_MC0_DA2	SLV_MC0_DA2	SCL1		EINT15		PWM3
GPIO_16	GPIO16	SPISLV_B_SCK	SPIMST_B_SCK	TDM_WS	MA_MC0_DA3	SLV_MC0_DA3	SDA1		EINT16		
GPIO_17	GPIO17	SPISLV_B_CS	SPIMST_B_CS	TDM_CK	PWM5	CLKO3	AUXADC0		EINT17		BT_PRI0
GPIO_21	GPIO21	URXD0	EINT19	SCL1		PWM5					
GPIO_22	GPIO22	UTXD0	EINT20								

Note:

GPIO 0/1/2/3 are not available (used for controlling RF PA/LNA internally).

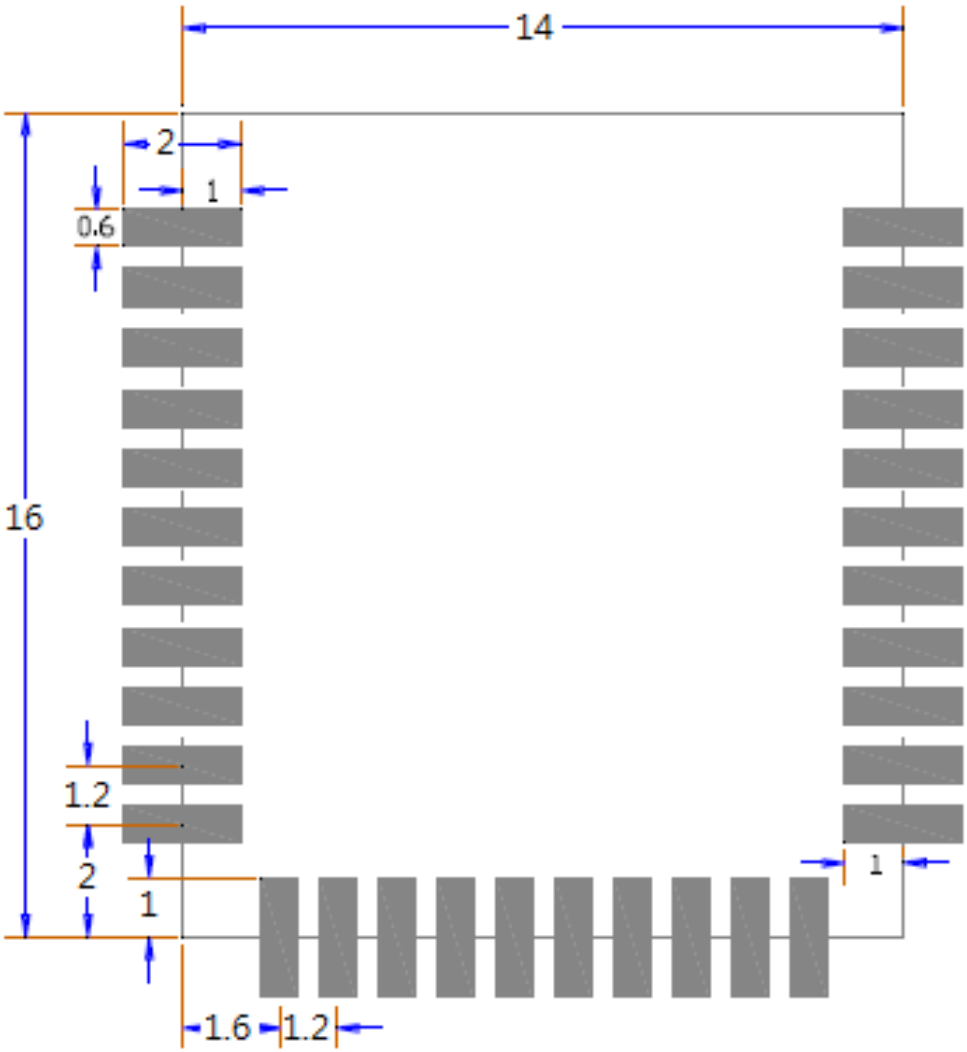
Please refer to MT7682 chipset datasheet about GPIO trapping and configuration.

5. Dimensions

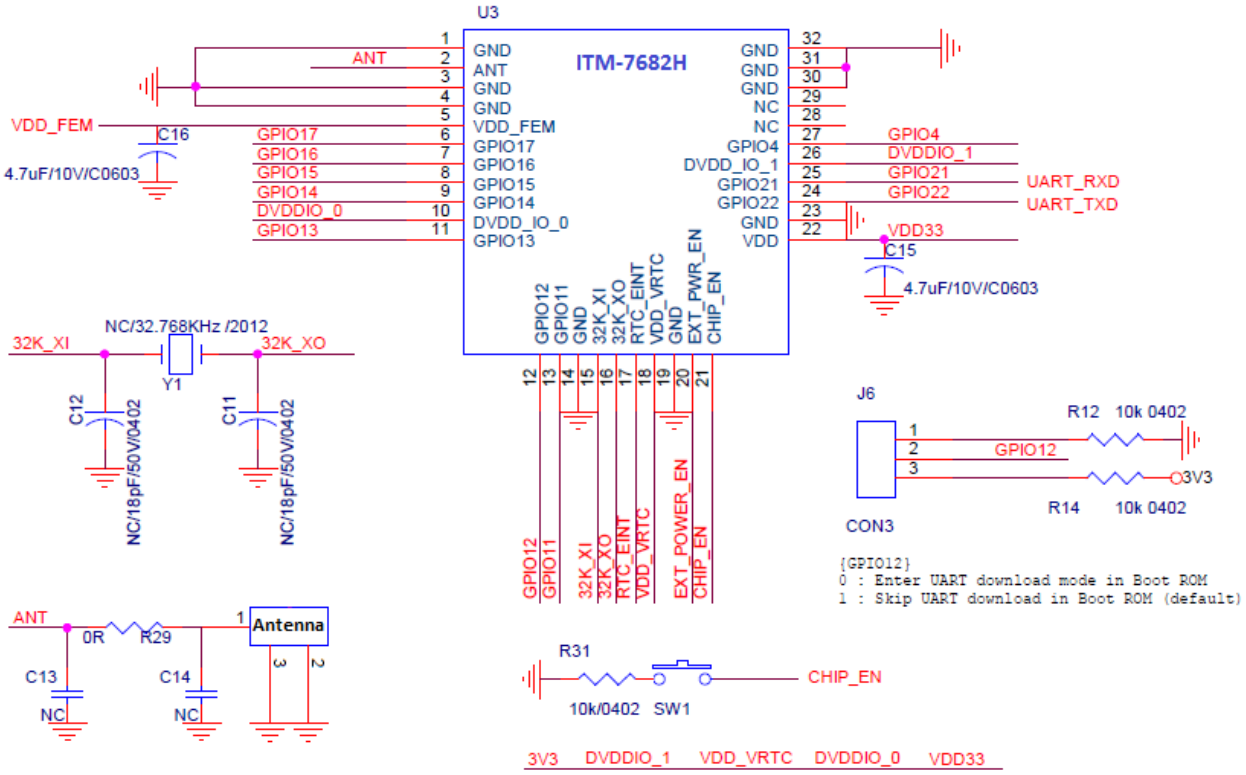
5.1 Layout Recommendation

(Unit: mm)

< TOP VIEW >

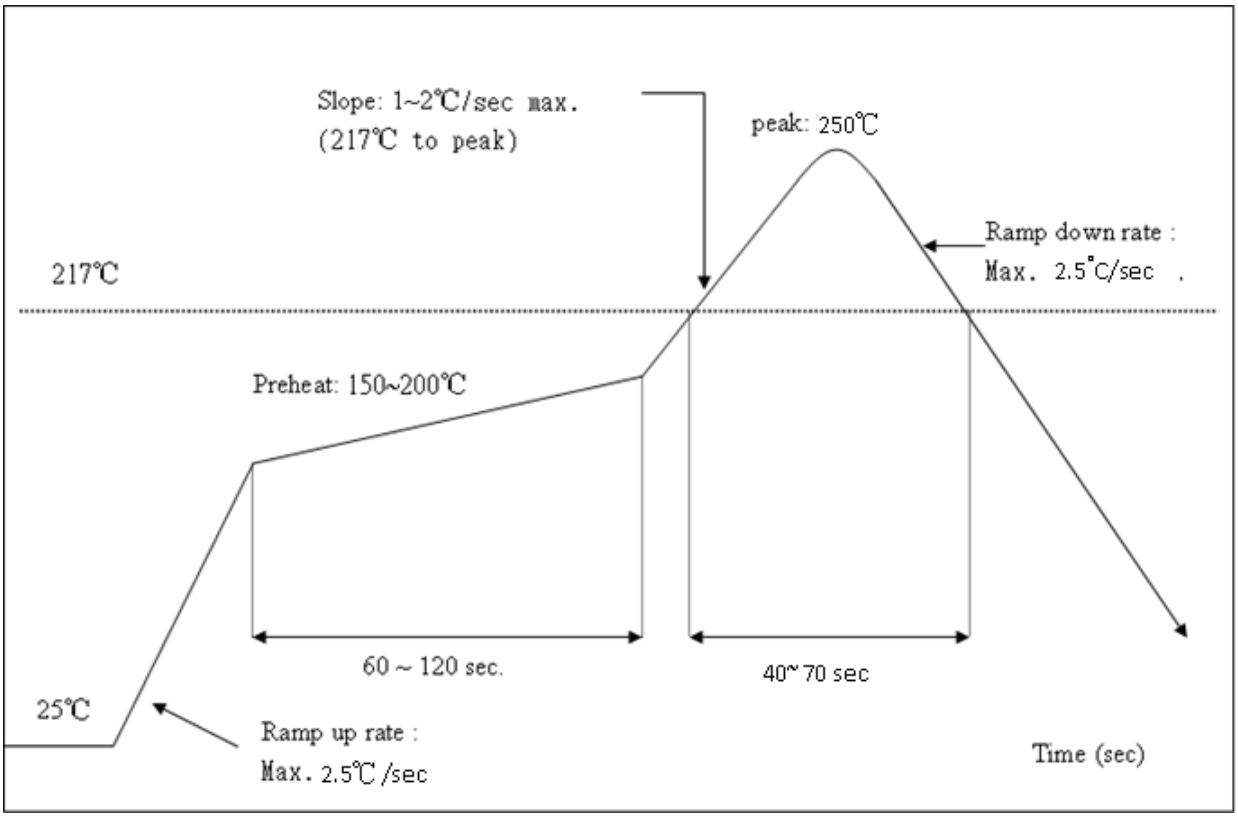


6. Reference Design



7. Recommended Reflow Profile

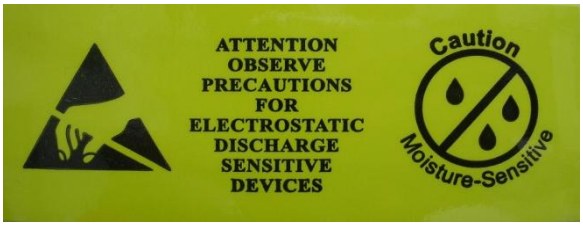
Referred to IPC/JEDEC standard.
Peak Temperature : <250°C
Number of Times : ≤2 times



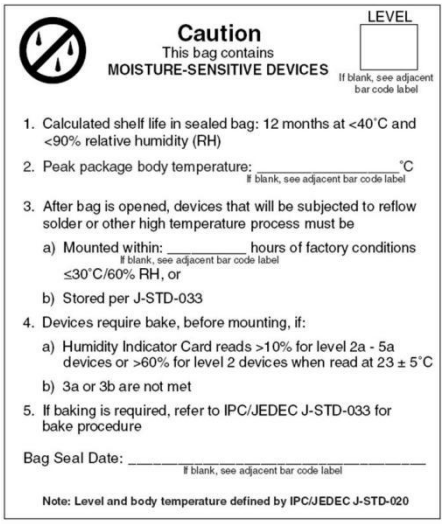
8. Packing Information

8.1 Label

Label A → Anti-static and humidity notice

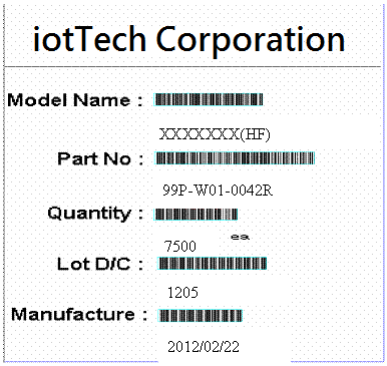


Label B → MSL caution / Storage Condition

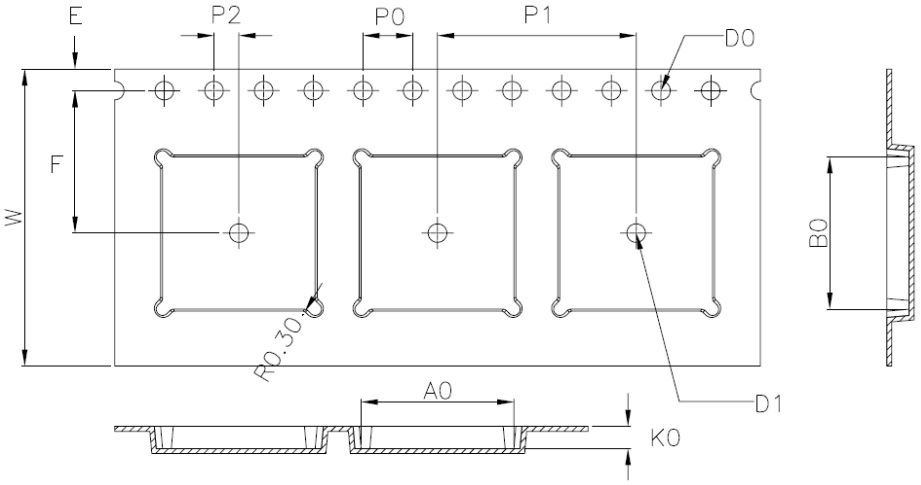


Label C → Inner box label .

Label D → Carton box label .

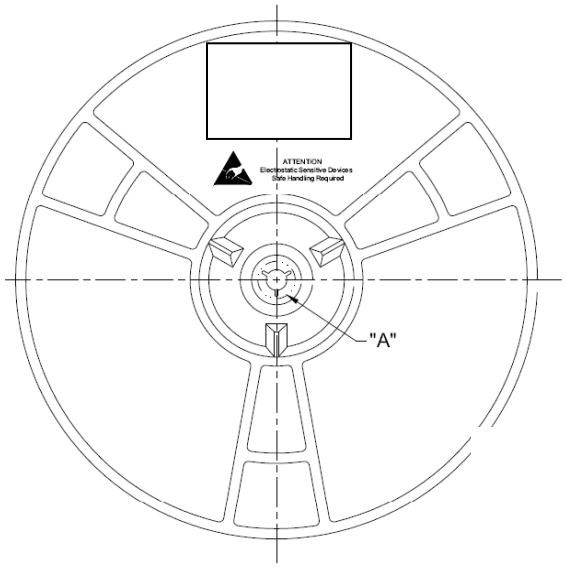


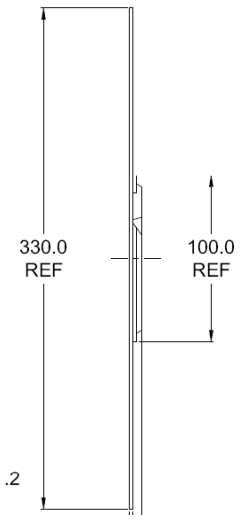
8.2 Dimension

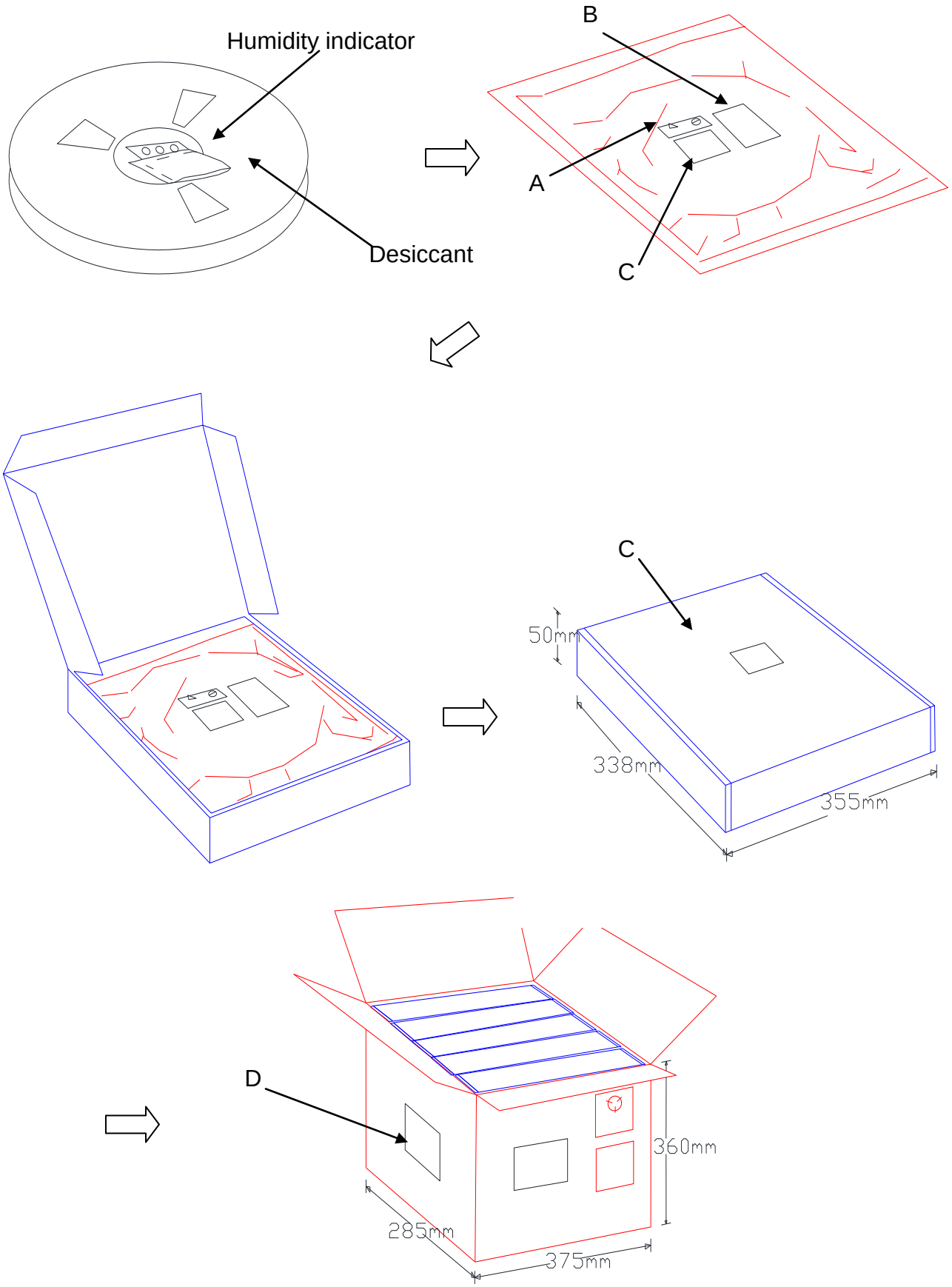


W	24.00±0.30
A0	14.30±0.10
B0	16.30±0.10
K0	2.50±0.10
E	1.75±0.10
F	130±0.10
P0	4.00±0.10
P1	16.50±0.10
P2	2.00±0.10
D0	1.50±0.05
D1	ø1.5MIN

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±0.05mm.
6. Packing length per 22" reel : 98.5 Meters.(1:3)
7. Component load per 13" reel : 1500 pcs.






Humidity indicator
Desiccant
B
A
C
C
50mm
338mm
355mm
D
360mm
285mm
375mm