

# GTI-ATM3430e Module

**Extreme Low Power Bluetooth 6.0 LE SoC Module**

**With Energy Harvesting & Channel Sounding**

**Datasheet**

Rev 1.3 Nov 18, 2025

## Revision history

Date	Revision	Board Rev	Section/ page	Description
Oct 22, 2025	Rev 1.0			Preliminary
Nov 10, 2025	Rev 1.1			Preliminary - Remove RF harvesting function - Remove RF wakeup receiver function - Remove 802.15.4 radio function
Nov 17, 2025	Rev 1.2			Preliminary, - Remove battery-less application - Adding Chap. 29-channel sounding
Nov 18, 2025	Rev 1.3			Typo correction

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## 1. Overview

The GTI-ATM3430e Bluetooth 6.0 module uses the ATM34e SoC Series with extremely low-power Bluetooth® 6.0 multi-protocol Bluetooth LE system-on-chip (SoC) solutions. This device integrates an ARM® Cortex® M33F application processor, Random Access Memory (RAM), Read Only Memory (ROM), and nonvolatile memory (NVM), with ARM® TrustZone® enabled security features, and state-of-the-art power management to enable maximum lifetime in battery-operated devices.

The GTI\_ATM3430e Bluetooth module encompasses the various application and protocol requirements for Bluetooth 6.0 devices.

Designed to extend the battery life for the Internet-of-Things, the radio uses 0.95 mA in receive and only 2.5 mA in transmit at 0 dBm. Support for low-duty cycle operation allows systems to run for significantly extended periods without battery replacement. In addition, this module supports direct operation from harvested energy sources, including RF, photovoltaic, thermal, and mechanical. Innovative wakeup mechanisms are supported to provide options for further power consumption reduction.

## 2. Key Features

### Bluetooth Low-Energy

- BT6.0 support for low-power data applications
- 2 Mbps, 1 Mbps, & Long Range PHY rates
- Bluetooth 6.0 Channel Sounding

### MCU and Memory

- 64 MHz ARM® Cortex® M33F MCU
- 64 KB ROM, 256 KB RAM, 2560 KB NVM
- Retention RAM: 16 KB to 256 KB in 16KB step sizes
- 16 MHz / External 32.768 KHz Crystal Oscillator
- UART Boot ROM option

### Security

- ARM® TrustZone®, HW Root of Trust, Secure Boot, Secure Execution & Debug
- AES-128/256, SHA-2/HMAC 256 Encryption/Cryptographic Hardware Accelerators
- True Random Number Generator (TRNG)

## Energy Harvesting

- Supports photovoltaic, thermal, motion, and other energy harvesting technologies
- External Harvesting/ Storage Interface

## RF and Power Management

- Fully integrated RF front-end
- 1.1 V to 4.5 V battery input voltage with integrated Power Management Unit (PMU)
- Radio power consumption with a 3V battery
  - Rx @ -97 dBm: 0.95 mA
  - Tx@ 0 dBm: 2.5 mA
- SoC typical power consumption with 3V battery with PMU
  - Retention@ 32 KB RAM: 1.9  $\mu$ A
  - Hibernate: 1.3  $\mu$ A
  - SoC Off: 500 nA
  - Soc Off with Harvesting Enabled: 800 nA

## RF Characteristics

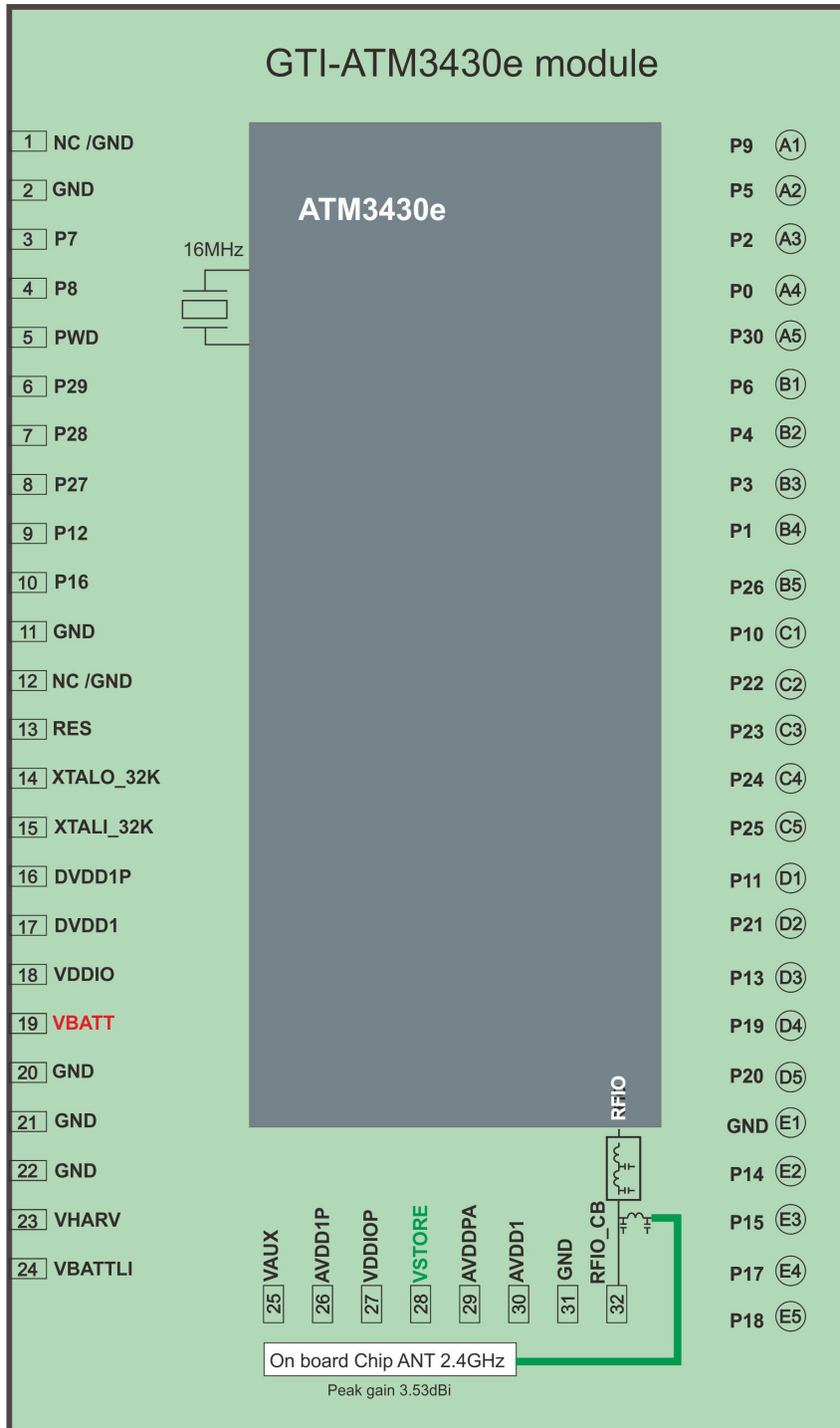
- Transmit: -20 to +10 dBm
- Rx Sensitivity : -97 dBm

## Interfaces

- I<sup>2</sup>C, I<sup>2</sup>S, SPI, UART, PWM, GPIOs
- Quad SPI
- 16-bit application ADC
- SWD for Interactive Debugging

## Module Dimension ([see CH. 7](#))

### 3. Block diagram



## 4. Applications

### Industrial and Enterprise

- Beacons
- Industrial IoT Sensors
- Remote Sensors
- Environmental Monitors
- Building Management
- Indoor Positioning and Asset Trackers (BTCS)

### Healthcare

- Asset Trackers
- Indoor Positioning (BTCS)
- Wearables
- Health monitors
- Sports and Fitness

### Home

- Asset Tracker and Tags
- Consumer Electronics
- Remote control
- Lighting
- Security
- Environmental Control & Advanced Home Automation
- Human Interface Devices (HID)
- Entertainment

### Personal

- Gaming
- Advanced Wearables

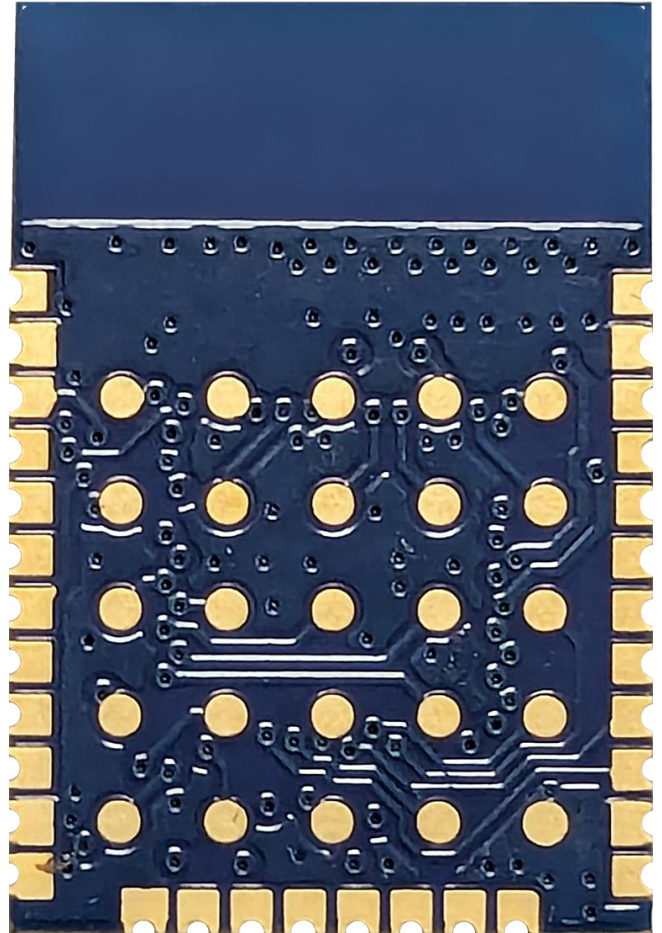
### Auto

- Key fobs and Accessories
- Infotainment

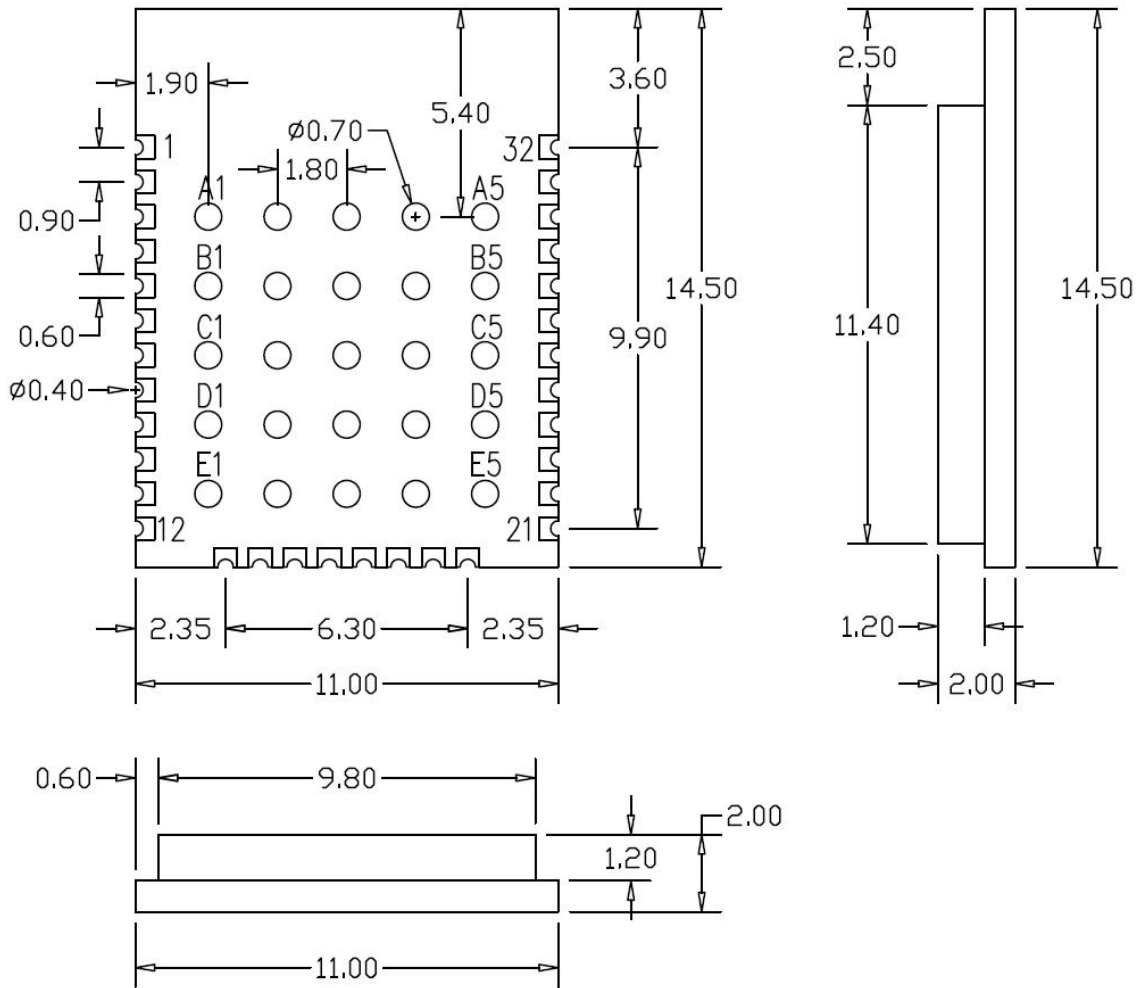
## 5. Specifications

Model	GTI-ATM3430e
Product Name	GTI-ATM3430e module
Major Chipset	ATM3430e
Wireless Standard	Bluetooth® V6.0 LE with Channel Sounding
RF Output Power	-20 to +10 dBm (typical)
RX Sensitivity	-97 dBm (typical)
Frequency Band	2.402~2.480 GHz
Supply Voltage (BATT)	+1.1V ~ +3.3V
Supply Rechargeable Voltage (VBATTLI)	Lithium-Ion battery +2.7V ~ +4.5V
Operating Temperature	-40 ~ 85°C
Storage Temperature	-40 ~ 125°C
ESD HBM Protection	2KV
ESD CDM Protection	500V
Dimension	14.5 x 11 x 2 mm (LxWxH) ±0.2mm

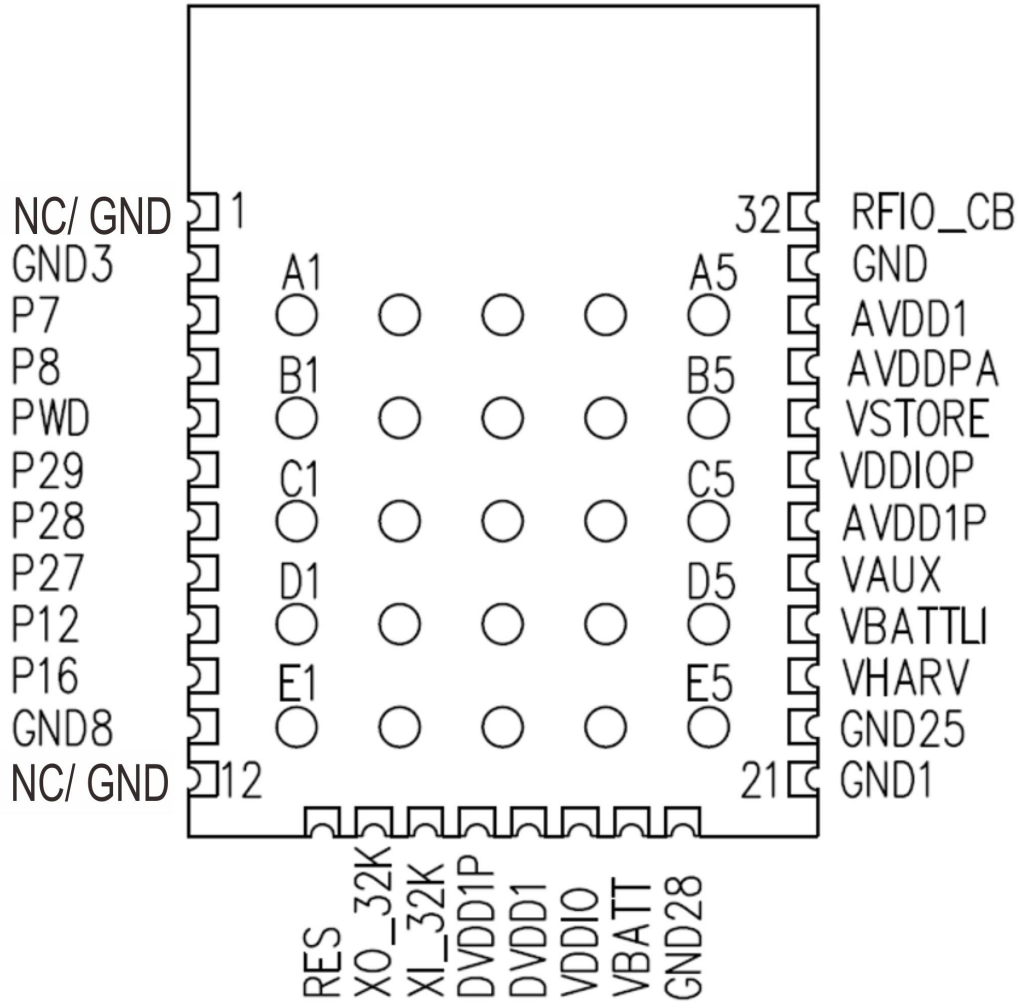
## 6. Module pictures



## 7. Module Dimensions



## 8. Pin name and layout



	1	2	3	4	5
A	P9	P5	P2	P0	P30
B	P6	P4	P3	P1	P26
C	P10	P22	P23	P24	P25
D	P11	P21	P13	P19	P20
E	GND10	P14	P15	P17	P18

## 9. Pin description

Pin#	Name	Description	Default I/O
1	RES	Reserved (connected to GND internally)	
2	GND	Ground	
3	P7	Programmable Digital I/O	I2C1_SDA
4	P8	Programmable Digital I/O	S3
5	PWD	Power Down Input (Active High)	External 1M resistor to GND needed
6	P29	Programmable Digital I/O	O/P, LED2
7	P28	Programmable Digital I/O	I/P, Harvest meter
8	P27	Programmable Digital I/O	
9	P12	Programmable Digital I/O	UR0_CTS
10	P16	Programmable Digital I/O	LTE_RI
11	GND	Ground	
12	RES	Reserved (connected to GND internally)	
13	RES	Reserved, must tie to ground	
14	XO_32K	External 32.768 kHz crystal oscillator output for sleep operation. <a href="#">Can be programmed by using internal 32KHz oscillator</a>	
15	XI_32K	External 32.768 kHz crystal oscillator input for sleep operation. <a href="#">Can be programmed by using internal 32KHz oscillator</a>	
16	DVDD1P	Digital core power supply generated by PMU	
17	DVDD1	Digital core power supply	
18	VDDIO	Digital and Analog I/O Power Supply	
19	VBATT	Battery supply from 1.1V to 3.3V. Must connect to a 10uF capacitor if VBATTI is used	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	VHARV	Connection to an external harvesting source Must be grounded when the harvester is not used	
24	VBATTI	2.7 V to 4.5 V Lithium-ion battery supply in place of VBAT. If Lithium-ion battery is not used, this pin must be connected to VBAT	
25	VAUX	Reserved for PMU internal use, must connect to a 4.7 $\mu$ F Cap.	
26	AVDD1P	PMU generated analog core supply output.	
27	VDDIOP	I/O power supply generated by PMU	
28	VSTORE	Storage node for energy harvesting	

## Pin description (continued)

Pin#	Name	Description	
29	AVDDPA	PA power supply	
30	AVDD1	Analog and RF core power supply	
31	GND	Ground	
32	RFIO_CB	2.4 GHz Single-ended RF I/O for the Bluetooth LE radio	
A1	P9	Programmable Digital I/O	UR_S0
A2	P5	Programmable Digital I/O	
A3	P2	Programmable Digital I/O	
A4	P0	Programmable Digital I/O	SWD_CLK
A5	P30	Programmable Digital I/O	
B1	P6	Programmable Digital I/O	I2C1_SCK
B2	P4	Programmable Digital I/O	
B3	P3	Programmable Digital I/O	
B4	P1	Programmable Digital I/O	SWD_IO
B5	P26	Programmable Digital I/O	
C1	P10	Programmable Digital I/O	UR_S1
C2	P22	Programmable Digital I/O	
C3	P23	Programmable Digital I/O	
C4	P24	Programmable Digital I/O	
C5	P25	Programmable Digital I/O	P25 should be connected to GND
D1	P11	Programmable Digital I/O	
D2	P21	Programmable Digital I/O	
D3	P13	Programmable Digital I/O	UR0_RTS
D4	P19	Programmable Digital I/O	
D5	P20	Programmable Digital I/O	
E1	GND	Ground	
E2	P14	Programmable Digital I/O	
E3	P15	Programmable Digital I/O	UR0_TX
E4	P17	Programmable Digital I/O	
E5	P18	Programmable Digital I/O	

## 10. More about PMU external pins

Pin	Description
VBATT (VBAT)	Battery input Battery voltages from 1.1 V to 3.3 V can be used. Must connect to a 10 $\mu$ F capacitor if VBATLI is used. <a href="#">Note: see CH 11 PMU configurations</a>
VBATTLI (VBATLI)	Lithium-ion battery input in place of VBAT Lithium-ion battery voltages from 2.7 to 4.2 V can be used. Must be connected to VBAT if not used.
VDDPA	Power supply input for the transmit power amplifier at output power levels greater than 4 dBm
VSTORE	Connection to a storage element for harvested energy Must be grounded when the harvester is not used
VHARV	Connection to an external harvesting source Must be grounded when the harvester is not used
DVDD1P, AVDD1P	DVDD1P and AVDD1P are PMU generated digital and analog core supply outputs
DVDD1, AVDD1	Power supply input for digital and analog core circuits
VDDIOP, VDDPAP	VDDIOP is a PMU generated 1.8 V I/O supply output VDDPAP is a PMU generated output for the transmit power amplifier <a href="#">Note: see CH 11 PMU configurations</a>
VAUX	PMU generated auxiliary supply output Must be connected to a capacitor $\geq$ 4.7 $\mu$ F
VDDIO	Power supply input for the digital and analog IO circuits <a href="#">Note: see CH11 PMU configurations</a>

## 11. PMU configurations

The PMU generates up to four power supply outputs: DVDD1P, AVDD1P, VDDIOP, VDDPAP, and a fifth auxiliary supply, VAUX, used internally by the PMU.

PMU Configuration	VBAT connection	VBATLI Connection	VDDIO Connection
Battery or external power supply (1.1 V-3.3 V) with internally generated I/O supply	Battery or power supply	VBAT	VDDIOP
Battery or external power supply (1.8 V-3.3 V) with externally generated I/O supply	Battery or power supply	VBAT	VBAT or other externally generated I/O supply (1.8 V - 3.3 V)
High Voltage battery or power source (2.7 V-4.5V) with internally generated I/O supply	10uF bypass capacitor	High-voltage battery or power source	VDDIOP or other externally generated I/O supply (1.8V-3.3V)

Note: the term VBAT is the same as VBATT, and the VBATLI as VBATTLI

## 12. Power modes

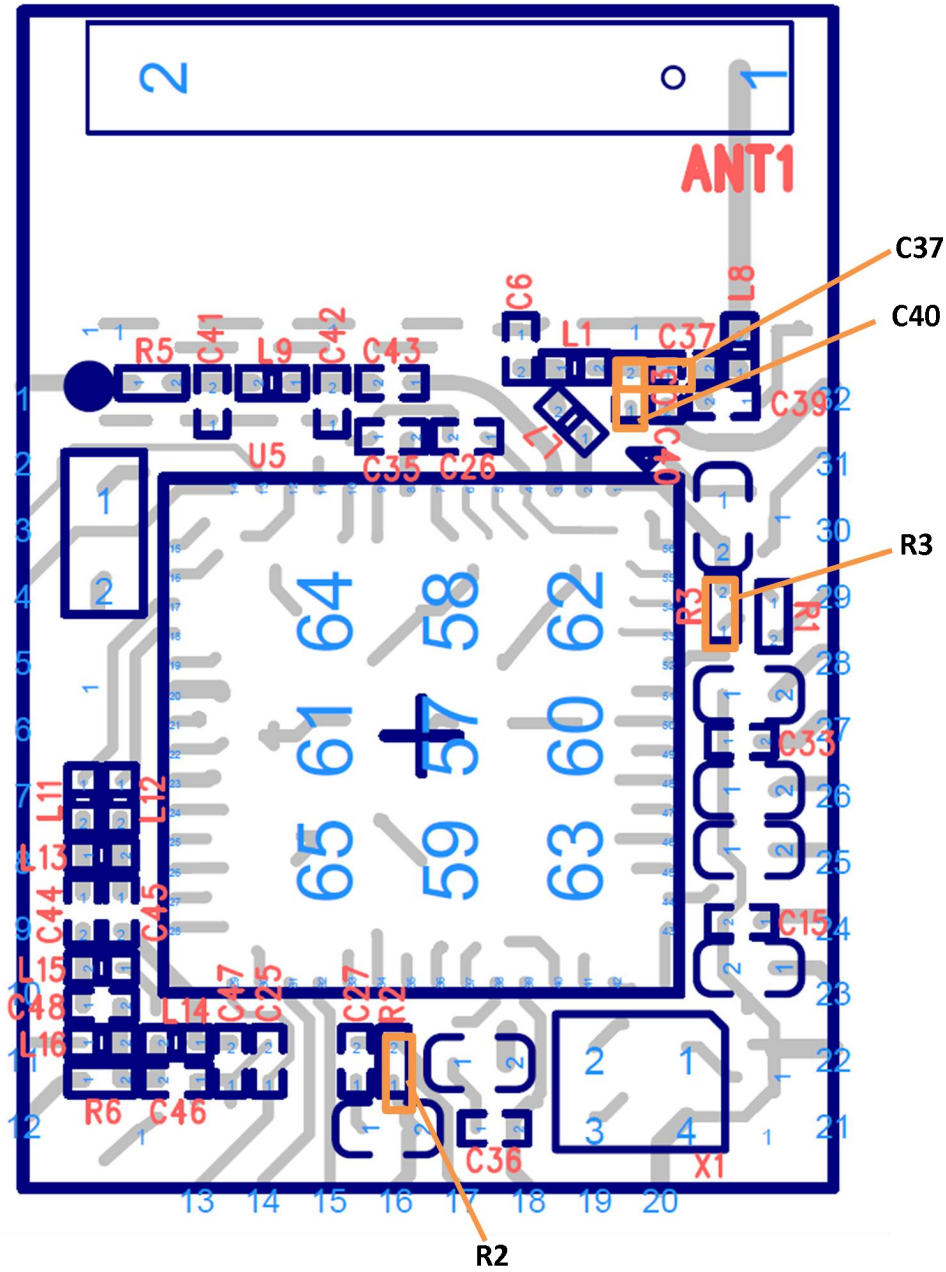
The ATM34/e supports five primary power states, which are Active, Retention, Hibernation, SoC Off, and Powerdown. Each primary state may have several secondary states depending on the number of active power domains and clock gating. All power states except Powerdown are managed by the power sequencer block (PSEQ).

1. **Active:** All regions of the ATM34/e are powered on. Active power can be optimized by clock-gating peripherals and/or entering these secondary states:
  - Radio Deep Sleep: The RF clock is gated while the remainder of the ATM34/e is active.
  - MCU Idle: MCU executes the Wait for Interrupt (WFI) instruction to gate internal clocks.
2. **Retention:** All or some of the 256 KB SRAM can be retained in increments of 16 KB. All register/flip-flop states needed to resume operation after waking up are retained. Digital I/Os will not lose state during Retention. The ATM34/e supports many wakeup options, including a timer expiring, activity detected on GPIOs, debug activity over SWD, and the analog comparator.
3. **Hibernation:** Powers down system memory. A minimal number of registers/flip-flops remain powered on. Digital I/Os will not lose state during Hibernation. The ATM34/e supports many wakeup options, including a timer expiring, activity detected on GPIOs, activity, debug activity over SWD, and the analog comparator. The MCU undergoes a reboot when waking from this state.
4. **SoC Off:** All digital domains, including the top-level digital domain and RTC, are powered off, but the PMU remains in an ultra-low-power state with limited functionality. The SoC undergoes a cold start when waking from this state. Wake mechanisms are limited to:
  - Special 40-bit timer
  - High-level input on P5/SOCOFF\_WAKE
  - Ultra-low power analog comparator with input on either P3 or P4.
5. **Powerdown** (PWD pin asserted): All power domains, including the PMU, are completely shut off. No supplies are internally generated or maintained.

### 12.1 OTP Access

The 64-bit one-time programmable memory (OTP) is used to store PMU and security configurations. The MCU can access The OTP via a controller that provides indirect access for byte reads and bit writes. VAUX needs to be configured to 2.5 V to program OTP bits.

### 13. Options by setting resistors

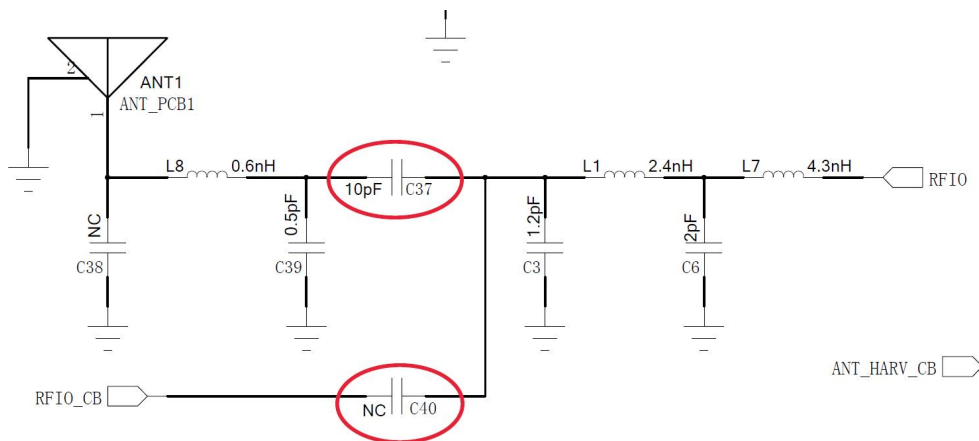


### ■ Digital and analog core power supply

- DVDD1 digital core power input has been connected to internal power DVDD1P through R2
- AVDD1 analog core power input has been connected to internal power AVDD1P through R3. If an external core power supply will be used, please remove R2 and R3, then connect DVDD1 and AVDD1 to the external power.

### ■ RF antenna

- RFIO output has been connected to the onboard Ceramic antenna ant1; just leave the RFIO\_CB pin with no connection.
- If using an external antenna, please remove C37 and then put on C40. The external antenna should be connected to the RFIO\_CB pin.



## 14. Maximum Electrical Ratings

Symbol	Parameter	Min.	Typ	Max.	Unit
VBATT	Battery voltage	-0.2		3.9	V
VBATTLI	Lithium-ion battery supply	2.4		6.0	V
	Charge ramp rate			15	V/s
VDDPA	PA supply	-0.2		3.6	V
VSTORE	Storage element	-0.2		3.6	V
VDDIO	I/O supply	-0.2		3.6	V
VAUX	PMU Auxiliary Supply	-0.2		3.6	V
VIO	I/O pin (VDDIO >3.4V)	-0.2		3.6	V
	I/O pin (VDDIO <=3.4V)	-0.2		VDDIO+0.2	
VRF	RF I/O pin as input			10	dBm
ESD (HBM)	ESD HBM (Preliminary)			2000	V
ESD (CDM)	ESD CDM (Preliminary)			500	V
T-store	Storage Temperature	-40		125	°C

## 15. Recommended Operating Conditions

Operating Condition		Min.	Typ	Max.	Unit
VDDIO	I/O supply	1.7	1.8	3.465	V
VBATT (VBAT)	Battery supply	1.1		3.6	V
VBATTLI (VBATLI)	Lithium-ion battery supply	2.7		4.5	V
VDDPA	PA supply	0.05	1.8	3.465	V
VAUX	PMA Auxiliary Supply	2.375	3.3	3.465	V
VIO	I/O pin	0		VDDIO+0.2	V
Crystal OSC	16.000 MHz	-50		50	ppm
32K-OSC (*)	Crystal 32.768KHz	-500		500	ppm
TA	Operating (Ambient) Temperature	-40	25	105	°C

## 16. Radio Transceiver Characteristics (VCC=3.0V Temperature =27°C)

Parameter	Conditions	Min.	Typical	Max.	Units
Frequency range		2.402		2.480	GHz
Rx sensitivity	37-byte packets, clean Tx				
	125 kbps		-103		dBm
	500 kbps		-100		dBm
	1 Mbps		-97		dBm
	2 Mbps		-95		dBm
	255-byte packets, dirty Tx				
	125 kbps		-101		dBm
	500 kbps		-98		dBm
Rx Carrier-to-Interferer	1 Mbps, Co-channel		15	21	dB
	1 Mbps, Adjacent 1 MHz		3	15	dB
	1 Mbps, Adjacent 2 MHz		-35	-17	dB
	1 Mbps, Adjacent 3 MHz		-40	-27	dB
Tx output power		-20		10	dBm
Tx power accuracy			+/- 1.5		dB
Tx spectral mask	1 Mbps, 2 MHz offset			-20	dBm
	1 Mbps, > 3 MHz offset			-30	dBm
RSSI resolution			1		dB
RSSI accuracy	-90 to -20 dBm		+/-2		dB

## 17. PMU Characteristics

Parameter	Conditions	Min.	Typ	Max.	Units
AVDD1P Output Voltage		0.95	1.0	1.05	V
DVDD1P Output Voltage		0.76	1.1	1.155	V
VDDIOP Output Voltage		1.71	1.8	1.89	V
VAUX Output Voltage		2.375	3.3	3.465	V

## 18. GPIO Characteristics

Parameter	Conditions	Min.	Typ	Max.	Units
Input VIH		VDDIO * 0.7			V V
Input VIL				VDDIO * 0.7	V V
Drive Strength, push-pull high	VIO=VDDIO-0.3V VDDIO = 3.3 V, PDSN=0 VDDIO = 3.3 V, PDSN=1 VDDIO = 3.3 V, PDSN=2 VDDIO = 3.3 V, PDSN=3 VDDIO = 1.8 V, PDSN=0 VDDIO = 1.8 V, PDSN=1 VDDIO = 1.8 V, PDSN=2 VDDIO = 1.8 V, PDSN=3		21 15 11 4 14 9 7 2		mA mA mA mA mA mA mA mA
Drive Strength, push-pull low	VIO is 0.3V VDDIO = 3.3 V, PDSN=0 VDDIO = 3.3 V, PDSN=1 VDDIO = 3.3 V, PDSN=2 VDDIO = 3.3 V, PDSN=3 VDDIO = 1.8 V, PDSN=0 VDDIO = 1.8 V, PDSN=1		27 18 14 5 18 12		mA mA mA mA mA mA

## 19. Radio Power Consumption

VBAT current at 3V with internally generated IO supply					
Parameter	Conditions	Min.	Typ	Max.	Units
Radio Receiver Rx	Sensitivity at -95 dBm		0.85		mA
Radio Transmitter Tx	Output power at 0dBm		2.1		mA

## 20. SoC Power consumption

### 20.1. VBAT current at 3 V with an internally generated I/O supply

(Active RX and Active Tx SoC Power Consumption includes Radio Power Consumption)

Parameter	Conditions	Min.	Typ	Max.	Units
Active RX	Sensitivity at -97 dBm		1.5		mA
Active TX	Output power at -20 dBm -10 dBm -8 dBm -6 dBm -4 dBm -2 dBm 0 dBm +2 dBm +4 dBm +6 dBm +8 dBm +10 dBm		1.2 1.5 1.6 1.9 2.1 2.4 2.8 3.5 4.1 7.5 9.5 11.5		mA mA mA mA mA mA mA mA mA mA mA mA
MCU Active (32 MHz)	Executing CoreMark from RAM at 32 MHz		1.5		mA
MCU Active (64 MHz)	Executing CoreMark from RAM at 32 MHz		3.0		mA
MCU Idle + Radio Deep Sleep			0.3		mA
Retention	0 KB SRAM 32 KB SRAM 128 KB SRAM 256 KB SRAM		1.8 1.9 2.1 2.4		$\mu$ A $\mu$ A $\mu$ A $\mu$ A
Hibernation			1.3		$\mu$ A
SoC Off with Harvesting Enabled			800		nA
SoC Off with Analog Comparator enabled			650		nA
SoC Off			500		nA
Powerdown	PWD pin asserted		120		nA

## 20.2. VBATLI current at 4.2 V with an internally generated I/O supply

(Active RX and Active Tx SoC Power Consumption includes Radio Power Consumption)

Parameter	Conditions	Min.	Typ	Max.	Units
Active RX	Sensitivity at -97 dBm		1.5		mA
Active TX	Output power at				
	-20 dBm		1.2		mA
	-10 dBm		1.5		mA
	-8 dBm		1.6		mA
	-6 dBm		1.9		mA
	-4 dBm		2.1		mA
	-2 dBm		2.4		mA
	0 dBm		2.8		mA
	+2 dBm		3.5		mA
	+4 dBm		4.1		mA
	+6 dBm		7.5		mA
+8 dBm		9.5		mA	
+10 dBm		11.5		mA	
MCU Active (32 MHz)	Executing CoreMark from RAM at 32 MHz		TBD		mA
MCU Active (64 MHz)	Executing CoreMark from RAM at 32 MHz		TBD		mA
MCU Idle + Radio Deep Sleep			TBD		mA
Retention	0 KB SRAM		TBD		μA
	32 KB SRAM		TBD		μA
	128 KB SRAM		TBD		μA
	256 KB SRAM		TBD		μA
Hibernation			TBD		μA
SoC Off with Harvesting Enabled			TBD		nA
SoC Off with Analog Comparator enabled			TBD		nA
SoC Off			TBD		nA
Powerdown	PWD pin asserted		TBD		nA

## 21. Energy Harvesting

Parameter	Conditions	Min.	Typ	Max.	Units
VHARV	Cold Start Voltage		0.5		V
	Steady State Regulated Voltage	0.4		3.3	V
	Input Current @ 3V	1	3.5	10,000	uA
VSTORE	Voltage		3.3		V

## 22. NVM Characteristics

Parameter	Conditions	Min.	Typ	Max.	Units
VDDIO		1.62	1.8	3.6	V
Endurance			10K		Cycles
Data Retention			10		Year
Read Cycle	VDDIO Current @ 1.8 V Duration (4 bytes at 32 MHz)		0.35		mA
			0.2		μs
Write Cycle Pattern: 0x55 -> 0xaa	VDDIO Current @ 1.8 V Duration (4 bytes at 32 MHz)		3100		mA
			167.3		μs

## 23. Wakeup Timer

The wakeup timer is a 40-bit timer based on the Low-power clock. When this timer is enabled during SoC Off mode, it will determine the SoC Off duration.

## 24. Peripherals and I/O

The following peripherals are supported by the SoC, and some are also supported by the module.

**Note:** Please refer to the software manual for the details

### ■ GPIO

There are some GPIOs available in this module, which are controlled through Software-accessible registers. In addition to drive, sample, pull-up, and pull-down functions, the GPIOs can also be used to generate interrupts and to wake this module from low-power states.

### ■ I<sup>2</sup>C

### ■ Serial Peripheral Interface (SPI)

### ■ Quad Serial Peripheral Interface (QSPI)

### ■ UART

### ■ I<sup>2</sup>S

### ■ PWM

### ■ Analog Comparator

### ■ Application ADC

## 25. Energy Harvesting

The GTI-ATM3430e module integrates a Bluetooth LE module with advanced energy harvesting and power management to support forever battery life.

### 25.1 Cold Start for GTI-ATM3430e

Cold start refers to the period from first applying power to the SoC to fully booting up. If there is enough energy on VBATLI or VSTORE, a cold start will happen immediately. If VBATLI and VSTORE have been depleted, GTI-ATM3430e has to harvest enough energy on VSTORE to allow a bootup.

VBATLI alone cannot be charged during a cold start. A capacitor on VSTORE is required for charging. VBATLI then could be charged through the internal circuit, or through an external booster, depending on VBATLI voltage.

When harvested energy is first applied, an internal charge pump will initially charge VAUX. Once enough charge has accumulated, the PMU takes over the charging from VHARV. When enough charge has been stored in VSTORE, the SoC will boot up and load the application. This is the end of the cold start.

### 25.2 Energy Harvesting sources supported

Here is a list of some power sources for GTI-ATM3430e to capture from:

#### ■ Photovoltaic PV cell energy harvesting

Actual measured data for a 10cm<sup>2</sup> PV cell operating at 320 lux (300-500 lux indoors, typical) produces sufficient power to support a typical beaconing application with a rechargeable battery.

#### ■ Thermal energy harvesting

Thermal harvesting can be considered anytime if there is an available heat source or air flow generating a temperature gradient.

#### ■ Mechanical or motion energy harvesting

As measured, harvesting the energy from the press and release of a switch button will generate 0.3mJ of energy. The press actuation creates a positive electrical pulse while the release actuation creates a negative pulse. Both pulses are captured directly from the generator into a storage capacitor attached to VSTORE through a full-wave rectifier and a Zener diode. For this type of energy harvesting, it is not necessary to use the VHARV input since the pulse energy is directly captured by the storage capacitor.

### 25.3 Energy Harvesting PMU Pins

The PMU manages two harvesting inputs:

1. ANT\_HARV\_CB antenna
2. VHARV

There are also two separate storage connections:

1. VBATT for a battery
2. VSTORE for capacitive storage elements

These are the potential energy sources for the PMU to draw from.

While the VBATT is only available as a source to the PMU, the VSTORE is also used by the PMU to store excess energy from the harvesting input.

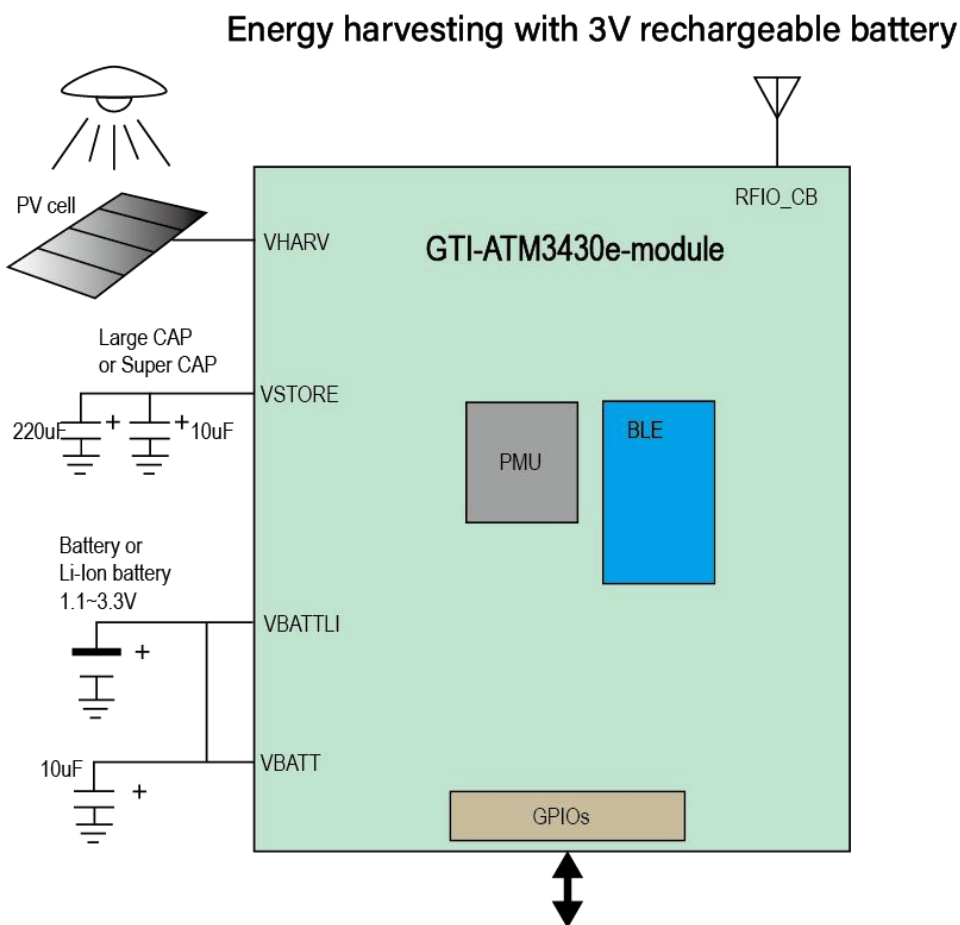
## 25.4 Energy Storage Options

There are two possible energy storage configurations: rechargeable battery and standard battery.

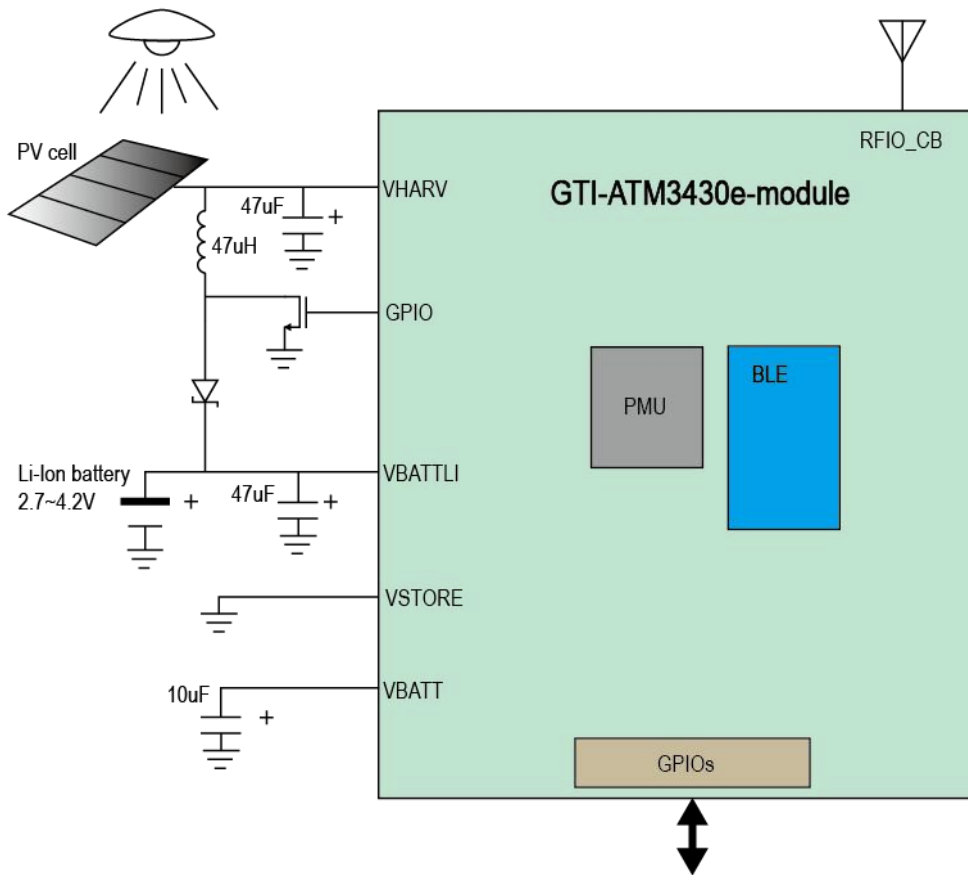
### 25.4.1 Rechargeable Battery

The rechargeable battery is connected to VSTORE through a series resistor for charging when excess harvesting energy is available, and to VBATTI directly as the power source when harvesting energy is not immediately available.

The PMU supports 2.7V to 4.2V Lithium-Ion battery.



### Energy harvesting with 4.2V rechargeable battery

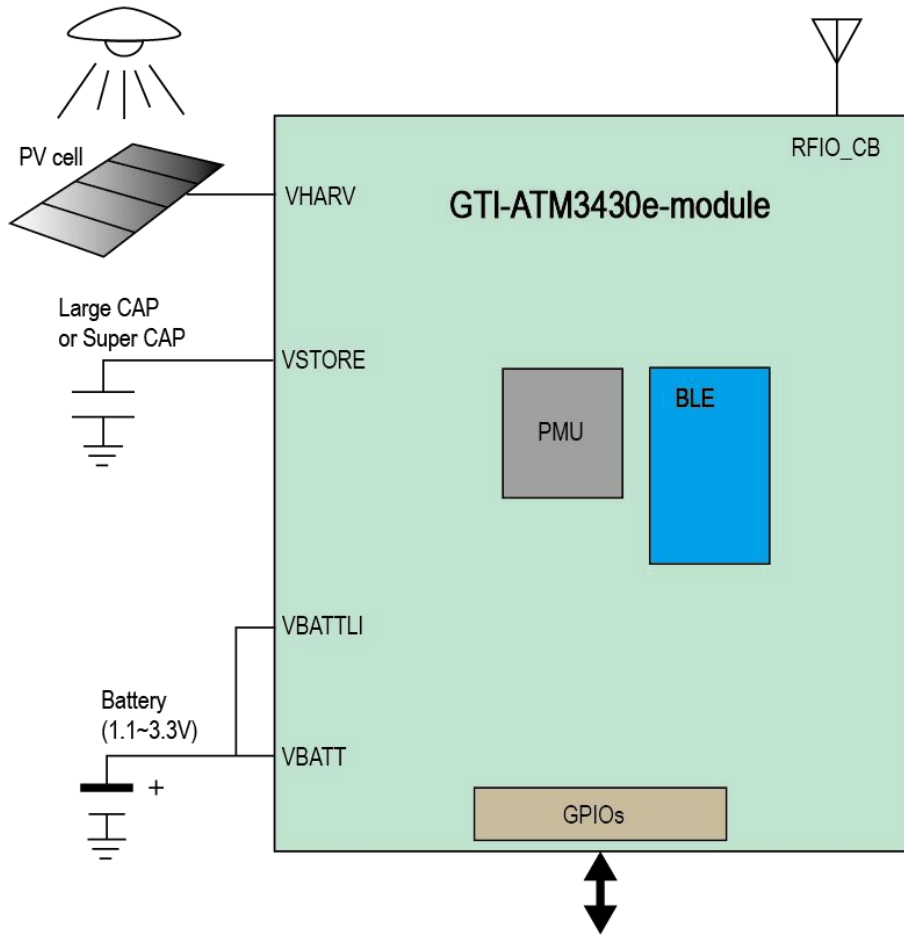


### 25.4.2 Standard Battery

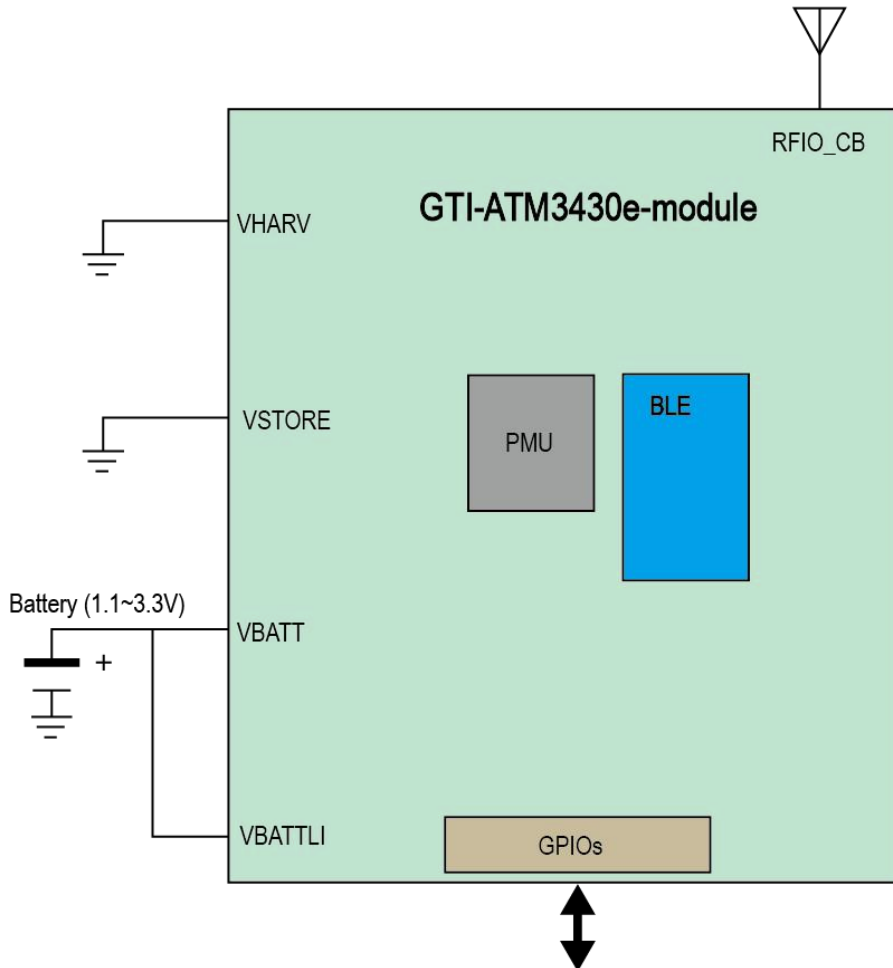
The GTI-ATM3430e module also supports operation from single or dual-cell battery voltage between 1.1V and 3.3V in conjunction with energy harvesting.

When energy harvesting is also applied, the battery is only used when there is insufficient energy available from VSTORE and energy harvesting.

#### Energy harvesting with standard battery



### Standard battery only



## 26. PMU Operation

### ■ Cold start

Please refer to Section. 25.1

### ■ Regular Operation

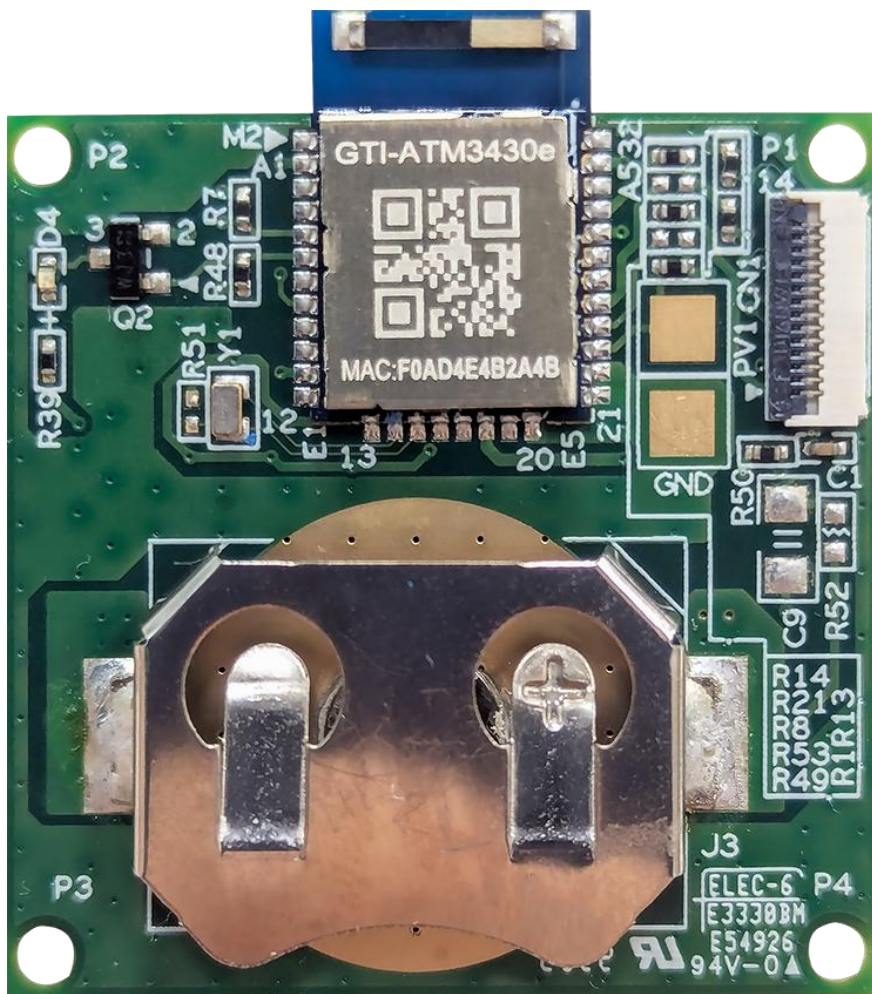
Once started, the PMU will endeavor to meet the power needs of the application while continuing to monitor the levels of VBATT, VSTORE, and VHARV.

### ■ Shutdown

The PMU will shut down the execution of the application when insufficient energy is available across VBATT and VSTORE, and VHARV. During this period, the PMU will continue to operate and harvest energy until sufficient energy has been restored. If there is not enough harvested energy available at this time, the system may lose power, and a cold start would be required again.

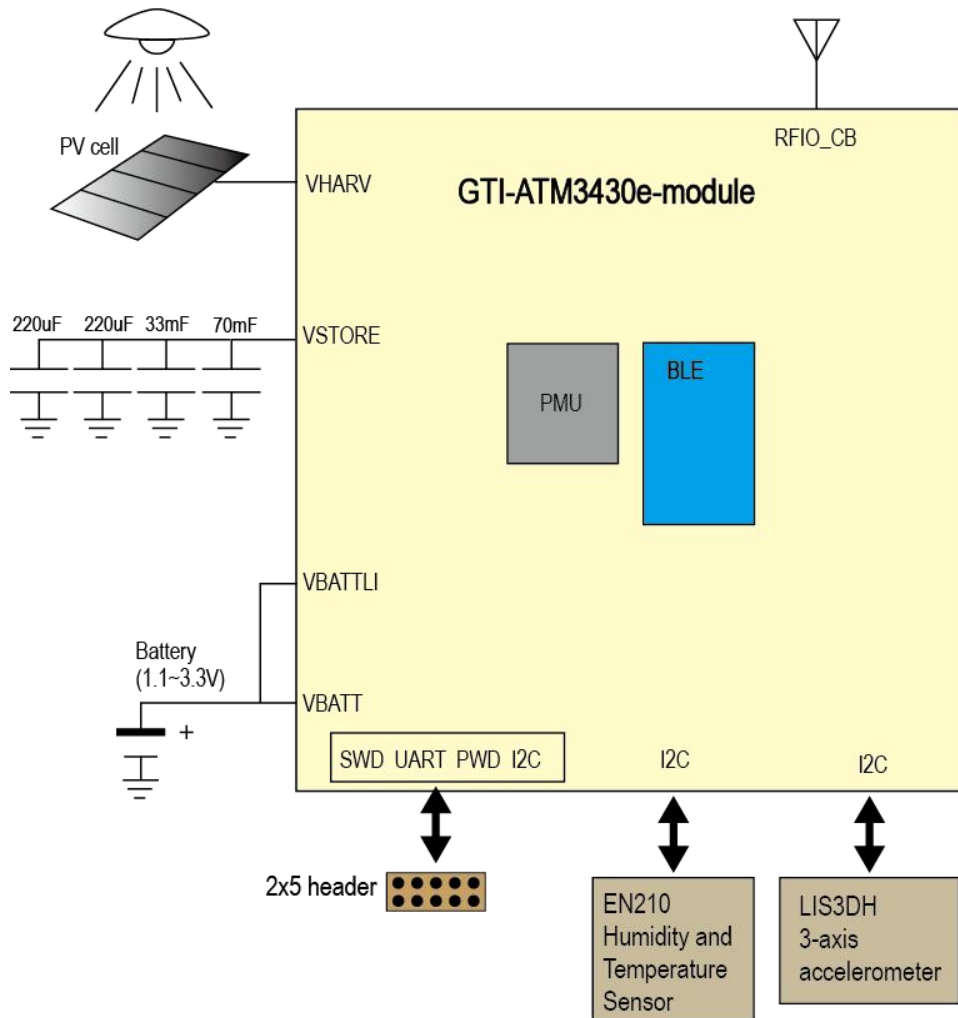
## 27. Application Example

### 27.1-PV beacon



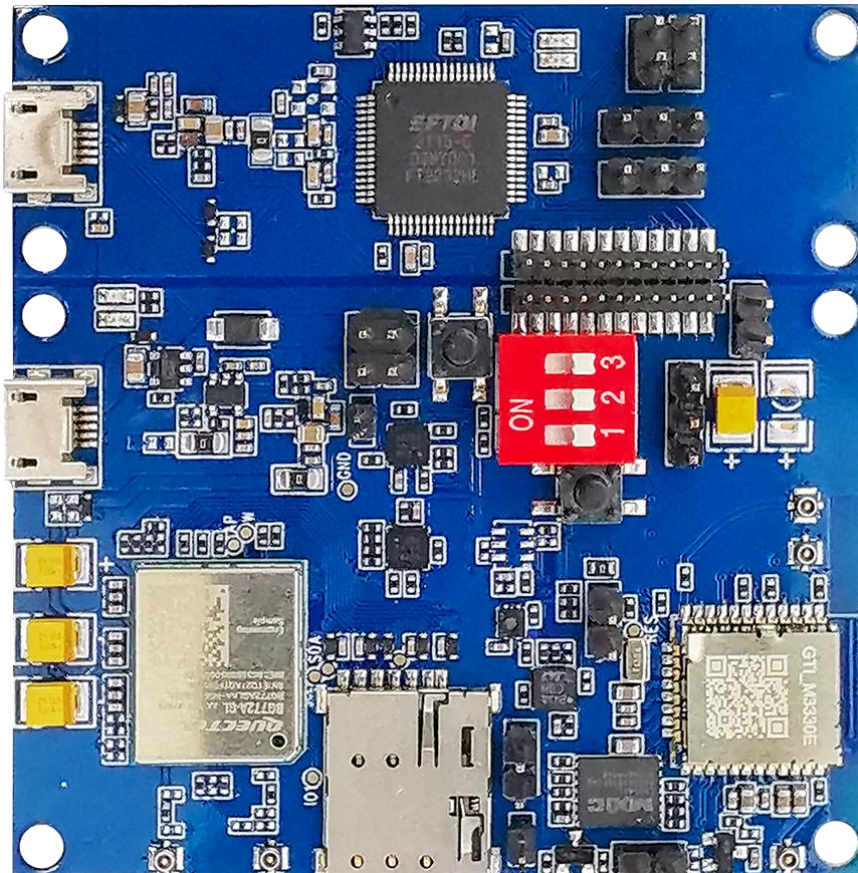
27.2- Humidity/ Temperature/ 3-axis accelerometer sensors

**PV Energy harvesting with sensor application**



## 28. Development Board

There is a development board (DVB) for the GTI-ATM3430E module. Please contact GlobalScale Technologies for more information.

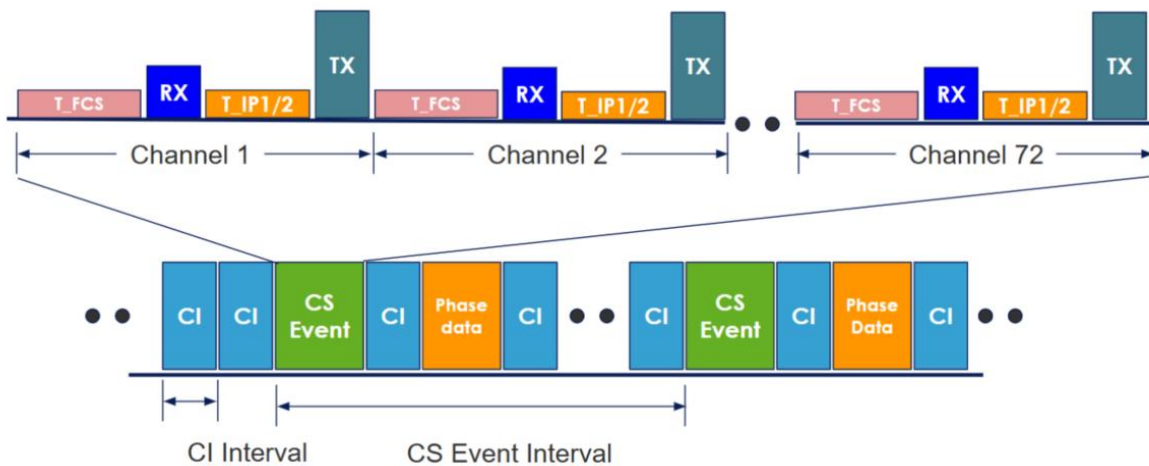


## 29. Bluetooth Channel Sounding (BTCS)

The Bluetooth Channel Sounding (BTCS or CS below) function will not be discussed in detail here; there will be an appended chapter or another datasheet. Here is only a brief introduction to the BTCS for this GTI-ATM3430e module.

### 29.1- BCTS Event Timeline

The BTCS timeline occurs within a normal encrypted BLE link, as shown in the figure below, where CI is the Empty PDU packet sync used to maintain a BLE link, and Phase Data is the data transfer from the reflector to the initiator after a CS Event using a standard BLE data packet of all of the PCT (phase correction term) measured. Distance calculations are done on the initiator node using the transferred reflector data and data collected directly on the initiator node.



Each CS Event consists of an exchange of CS packets across multiple channels (72 in total), as shown in the figure above, where each RX/TX pair is considered a CS Event step, T\_FCS is the time required for a channel change, and T\_IP1/2 is the time between the TX and RX within a step.

## 29.2 – BTCS Support Capabilities

The supported BTCS capabilities and timing parameters are listed in the following tables.

Feature	Supported
CS initiator	Yes
CS Reflector	Yes
Step Mode 0	Yes
Step Mode 1	Yes
Step Mode 2	Yes
Step Mode 3	No
Number of Antenna path	Yes, up to 4
Number of Antenna elements	Yes, up to 4
RTT with AA-only	Yes
RTT with Sounding Sequence	Yes
RTT with Randon Payload	Yes
Time-of-flight with 150ns precision	Yes
Time-of-flight with 10ns precision	No
Tone Quality Indicator	Yes
Channel Selection Algorithm #3c	Yes
Normalized Attack Detection Metric (NADM)	No
CS SYNC 1M PHY	Yes
CS SYNC 2M PHY	Yes
CS SYNC 2M BT2PHY	Yes
Zero Transmitter Frequency Actuation Error	Yes
Phase-based Ranging from RTT sounding sequence	No
TX SNR Control	No

## 29.3 – Supported Timing Parameters

Timing Parameter	Support Times
T-IP1	$\geq 40\mu\text{s}$
T-IP2	$\geq 40\mu\text{s}$
T-FCS	$\geq 80\mu\text{s}$
T-PM	$\geq 10\mu\text{s}$
T-SW	$\geq 2\mu\text{s}$

## 29.4 – Hardware and software requirements

For GTI-ATM3430e BCTS development, you need to get the tools below. Please contact GTI.

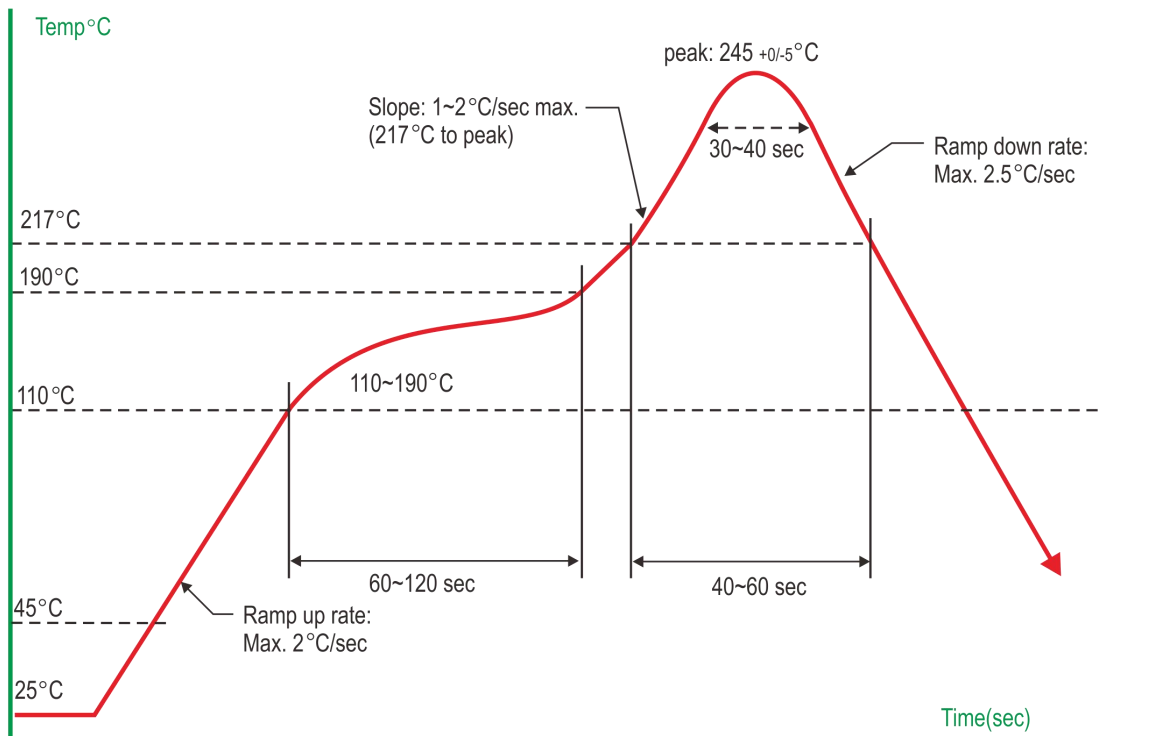
- Hardware EVB
- OpenAir SDK based on Zephyr
- Distance Measurement Tool

### 30. Reflow Profile

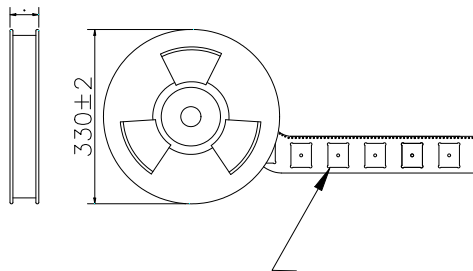
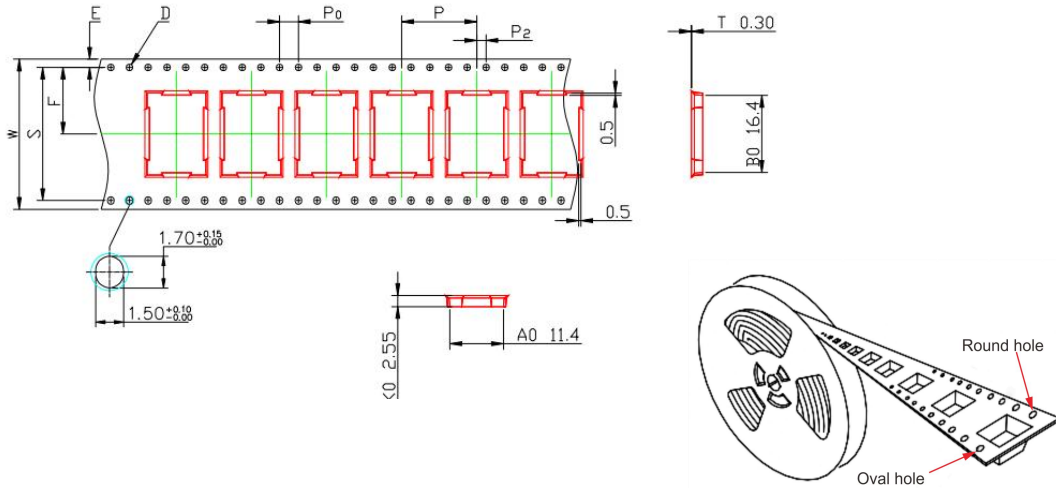
Referred to IPC/JEDEC standard.

Peak Temperature: < 250 ° C.

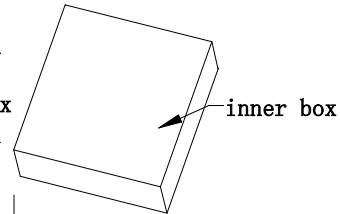
Number of Times: 2



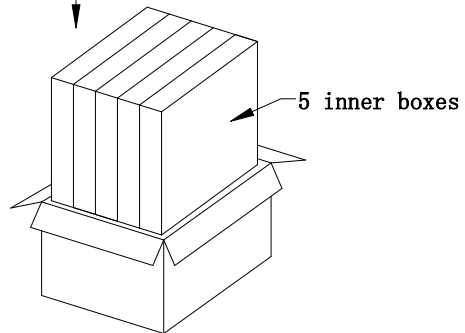
### 31. Packaging



After vacuum loading into the inner box



inner box K3K:  
33.5cm\*34.7cm\*7cm



Outer box K=A:  
36.4\*35.7\*37.5cm

1. Loading 1500pcs product into carrier tape, leave 15 empty spaces at the beginning and end of the reel without modules
2. Put in humidity card and desiccant then vacuum packaging is carried out.
3. Loading into the inner box. (1500pcs/BOX)
4. 500pcs\*5=7500pcs / Outer box

## 32. Onboard antenna specification

Parameter	Value	Unit
Central Frequency	2450	MHz
Bandwidth	100 (Min.)	MHz
Return Loss	-10 (Max.)	dB
Peak Gain	3.53	dBi
Impedance	50	Ohm
Maximum Power	4	W
Polarization	Linear	
Azimuth Beamwidth	Omni-directional	

### **33. FCC and CE compliant**

**FCC ID: TBD**

**CE RED Certificate : TBD**

## 34. FCC Warning: TBD

## **35. FCC Radiation Exposure Statement: TBD**

## 36. Contact information

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