

PUR3600

27dBm UHF RFID MODULE

Overview

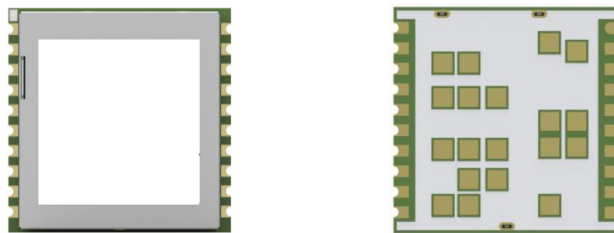
Output power can be set from 5dBm to 27dBm. Tag reading distance is more than 5m (depending on antenna gain and tag size), And has excellent multi-label inventory performance.

PUR3600 module has low power consumption, small size, stable and reliable, and adopts advanced multi-tag recognition algorithm. Tags can be quickly identified whether they are moving or stationary.

Superior anti-interference design and carrier cancellation function ensure stable operation in various environments.

Various configuration modes can be widely used in various applications such as warehousing, logistics, production lines, and inspections.

The PUR3600 module is only the size of a coin, comes in a half-hole postage stamp package, and weighs only 2.5g, making it easy to embed in mobile and portable devices.



Applications

- Handheld PDA
- Card reader
- Printers
- Integrated reader

Features

- ARMv7-M architecture 32bit Cortex-M4 CPU, integrated FPU, MPU, DSP, the highest work main frequency is 200MHz, 512KByte Flash
- Support UHF EPC Class1 Gen2/ISO 18000-6C/Gen2X
- Provide Windows, Linux and Android SDK, and API based on C, C#/.NET, JAVA
- Support inventory of temperature tags, the output parameters include the RSSI and phase value of the tag return signal
- Maximum 27dBm power output
- Excellent anti-collision algorithm and high sensitivity. The fastest speed of inventory tags is greater than 1000tag/s
- Multiple inventory modes suitable for most applications.
- The UART serial communication baud rate can be set from 9600bp to 921600bps
- 2 inputs 2 outputs GPIO
- The full power consumption of the North American frequency band is 3W
- Surface mount (SMT), stamp half-hole design, weight 2.5g, size 21mm x 21mm x 3.7mm
- Obtained CE, FCC and other certifications

Absolute Max Ratings Value

Parameter	Sign	Mini	Typical	Max	Unit
Input voltage	VCC	-0.3		5.25	V
Enable voltage	Ven	-0.3		5.25	V
Reset (NRST) GPI (IN1 IN2) input low voltage	Vil			0.6	V
Reset (NRST) GPI (IN1 IN2) input high voltage	Vih	2.7			V
GPO (OUT1 OUT2) output current	Ioh			15	mA
Module output current	AVCC			20	mA
ESD protection voltage for antenna interface ¹	Vesd	-1		1	kV
I/O port ESD protection voltage ¹	Vesd	-2		2	kV
Antenna port (ANT) standing wave ratio ²	VSWR			8	/
Operating temperature ³	Tc	-30		75	°C
Storage temperature	Ts	-55		100	°C

ESD Precautions



Proper precautions must be followed when transporting, packaging and testing the equipment.

1. Antenna port test conditions IEC61000-4-2 level 1, contact discharge; other interfaces are HBM model, contact discharge.
2. The maximum allowable standing wave ratio to prevent damage to the power amplifier chip. To ensure performance, it is recommended that the antenna standing wave ratio be less than 2.0.
3. Ambient temperature. The max temperature limit is related to the module heat dissipation conditions.

General Operating Conditions

Parameter	Sign	Mini	Typical	Max	Unit
Input voltage	VCC	3.6		5.25	V
Disabling voltage	VEN			0.4	V
Enable voltage		1.5			V
Reset (NRST) GPI (IN1 IN2) input low voltage	VIL			0.3	V
Reset (NRST) GPI (IN1 IN2) input high voltage	VIH		3.3		V
GPO (OUT1 OUT2) output current	IOH		10		mA
GPO (OUT1 OUT2) outputs low voltage	VIL			0.3	V
GPO (OUT1 OUT2) outputs high voltage	VIH		3.3		V
Module output current	AVCC		10		mA
Antenna port (ANT) standing wave ratio ¹	VSWR			2.5	/
Operating humidity (non-condensing)	RH	5		95	%
Operating temperature	TC	-20		65	°C
Storage temperature	TS	-40		85	°C

1. Within the operating frequency range, these are only recommended values. It will work above this value, but tag reading performance may be degraded.

General Electrical Parameters

Parameters		Condition	Mini	Typical	Max	Unit
Frequency	Range ¹		860		960	MHz
	Step value ²			250/500		KHz
	Deviation	@25℃	-10		10	ppm
Output	Output power		5		27	dBm
	Power step			1		dB
	Output power accuracy	5dBm~27dBm	-1		1	dB
	Output power flatness	5dBm~27dBm	-1		1	dB
	Adjacent channel leakage ratio*	1 st adjacent channel		-50		dB
		2 nd adjacent channel		-65		dB
	20dB occupied bandwidth*	RF_MODE 7		125		KHz
		RF_MODE 11		225		KHz
	Emission spectrum template* ³	margin	2			dB
	Spurious Emissions (Conducted) ⁴	2 nd harmonic		-60		dBm
		3 rd harmonic		-65		dBm
Measure	Module temperature accuracy	@-60dBm	-3		3	dB
	Tag RSSI test accuracy	@-60dBm	-5		5	degrees
	Tag PHASE test accuracy	RL>18dB Connect the attenuator	-4		4	dB
UART	Load return loss test accuracy	data format: 8N1		115200		bps
	Default baud rate		9600		921600	bps
Consumption	low power mode			0.1		W
	Configurable baud rate			0.75		W
	Normal standby mode ⁵	27dBm		3		W

1. Can support both FCC and CE frequency bands simultaneously, please contact technical personnel for other frequency requirements.
2. The required frequency step can be configured according to the frequency area.

3. Refer to "ETSI EN 302 208" 4.3.5 Transmitter spectrum masks, transmitting inventory signals, for RF_MODE 7.

4. Tested under full frequency band conditions.

5. Connect 50 Ω load, peak power consumption.

Marked * indicates that the inventory mode is used during testing. For RF_MODE 7, the spectrum analyzer is set to MAXHOLD.

Air Interface Mode Parameters and Performance

RF_MODE ID	Forward Link Modulation	Tari (us)	BLF (KHz)	PIE	Reverse Link Modulation	Receive Sensitivity Minimum ¹ (dBm)			Read Rate ² (tags/s)
						E710	E510	E310	
103	DSB-ASK	6.25	640	1.5	FM0	-64	N/A	N/A	>1000
11	PR-ASK	7.5	640	2	FM0	-64.1	N/A	N/A	>900
120	DSB-ASK	6.25	640	1.5	Miller M=2	-69.5	-65	N/A	>600
1	PR-ASK	7.5	640	2	Miller M=2	-70.4	-65.4	N/A	>600
*4124	PR-ASK	7.5	640	2	Miller M=2	-73.4	-68.4	N/A	>600
15	PR-ASK	7.5	640	2	Miller M=4	-76.2	-70.2	N/A	>450
345	PR-ASK	7.5	640	1.5	Miller M=4	-76.5	-70.8	N/A	>300
*4148	PR-ASK	7.5	640	1.5	Miller M=4	-79.5	-73.8	N/A	>300
12	PR-ASK	15	320	2	Miller M=2	-76.6	-71.4	-63	>300
3	PR-ASK	20	320	2	Miller M=2	-76.1	-71.4	-63	>300
*4123	PR-ASK	20	320	2	Miller M=2	-79.1	-74.4	-66	>300
5	PR-ASK	20	320	2	Miller M=4	-81.5	-75.5	-66.7	>200
*4141	PR-ASK	20	320	2	Miller M=4	-84.5	-78.5	-69.7	>200
7	PR-ASK	20	250	2	Miller M=4	-81.4	-76	-68	>150
*4146	PR-ASK	20	250	2	Miller M=4	-84.4	-79	-71	>150
13	PR-ASK	20	160	2	Miller M=8	-87.4	-80	-73.4	>70
*4185	PR-ASK	20	160	2	Miller M=8	-90.4	-83	-76.4	>70

1. Test instrument CISC XPLOER 200, PER 90%, output power 27dBm, antenna port echo less than -20dB.

2. Test antenna gain 14dBi, 4000 tags.

3.N/A indicate this mode is not supported.

4.The marked * MODE is newly added to Gen2x and requires label support when used

5.5123, 5124, 5141, 5146, 5148, and 5185 are mixed modes of Gen2 and Gen2x with the same parameters. For example, 5123 is a mixture of 3 and 4123.

From the above table, PUR3600 provides up to 17 configuration methods, listing the two most important indicators for measuring the reader module: sensitivity and multi-tag reading speed. There is a trade-off between sensitivity and multi-tag speed. When the sensitivity is better, the reading speed rate of tags is lower. Between reading better and reading more, need to choose the appropriate mode based on customer application needs. Another thing to note is that when multiple readers work at the same time, there will be interference. Although a smaller TARI speeds up the communication connection with the tag, it will increase the bandwidth of the emission channel, which is easier to interfere with other readers. Higher BLF of the tag will increase the speed of the tag's reverse transmission signal. The tag return signal will fall in the adjacent channel. When other readers happen to be working in this channel, the reader is likely to be unable to demodulate the return signal of the label.

Inventory Mode Parameters

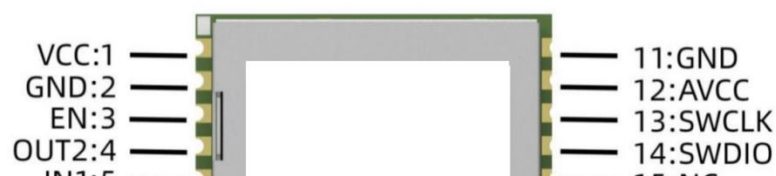
For different application scenarios, PUR3600 provides multiple working modes. Except for the

temperature-controlled multi-tag inventory mode, everything else is automatically completed by the reader module. This not only saves the command interaction time between the host and the reader module, but the excellent processing algorithm also greatly enhances the application adaptability of the product.

Application	Operating Mode	Description
Few tags, remote inventory	Normal mode	Recommend RF_MODE 13, session0, the reading time can be customized according to the reporting cycle. For multi-antenna products, it is recommended that the read time be set to the number of antennas used $n \times 200\text{ms}$ or more. The read interval can be set to 0ms at the lowest.
	Fast mode	Recommend RF_MODE 13, session0, Target A
Few tags multi-times inventory	Fast mode	Recommended RF_MODE 11/103 (E710), RF_MODE 1/120 (E510), RF_MODE 12/345 (E310), session1, Target A-B, static Q value ($2^Q \geq \text{number of tags}$) and even single frequency reading can be set
Multi-tag inventory	EX10 fast mode	RF_MODE, session and other Gen2 parameter devices are dynamically adjusted, and the tag reading speed is fast. Configuring related parameters in this mode does not take effect. It is recommended to use this mode for multi-tag testing.
Read all multi-tags	Fast mode	Recommended RF_MODE 7/13, session1, use the full frequency band 860-960MHz if conditions permit.
Temperature control/low power consumption Multi-label inventory	E7 temperature control mode	RF_MODE automatically adjusts. When the number of new tags is less than the specified number, the working duty cycle is automatically adjusted. When the number of new tags exceeds the specified number, the full-speed mode is restored. This mode is recommended for long-term battery life testing/low power consumption testing.
High read rate multi-tags inventory	Fast mode	RF_MODE 11/103 (E710)、RF_MODE 1/120 (E510)、RF_MODE 12/345 (E310), session2/3, Target A, Static Q value ($2^Q \geq \text{number of tags}$)

※If the above mode is supported by the motherboard and communication interface, it is better to increase the baud rate to 921600bps (the default baud rate is 115200bps).

Pin configuration and function

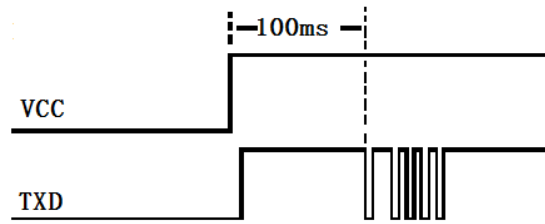


PIN No.	Define	Description
1	VCC	Power supply voltage, 3.6V~5V input
2	GND	GND
3	EN	Enable module power supply, high level input or floating to enable power supply
4	OUT2	GPO, push-pull output
5	IN1	GPI, internal pull-up resistor is connected
6	IN2	GPI, internal pull-up resistor is connected
7	RXD	Module UART input, 3.3V level
8	TXD	Module UART output, 3.3V level
9	NRST	Module reset, low level resets the module, it can be hang in the air when not in use
10	OUT1	GPO, push-pull output, 3.3V level
11	GND	GND
12	AVCC	3.3V output, it is recommended that the driving current is no more than 20mA
13	SWCLK	SWD programming interface, clock line, unconnected (hang in the air)
14	SWDIO	SWD programming interface, data transmission line, unconnected (hang in the air)
15	NC	ungrounded
16	NC	ungrounded
17	GND	GND
18	GND	GND
19	ANT	Antenna connection
20	GND	GND

Application Description

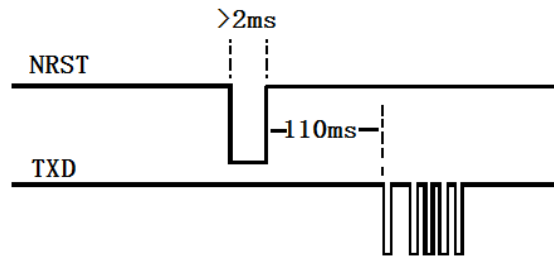
● Power-on Boot and IO Interface

After the module is powered on, it takes 100ms to initialize. Do not pull the reset pin low during this time, and the reader module will not respond to the received commands.



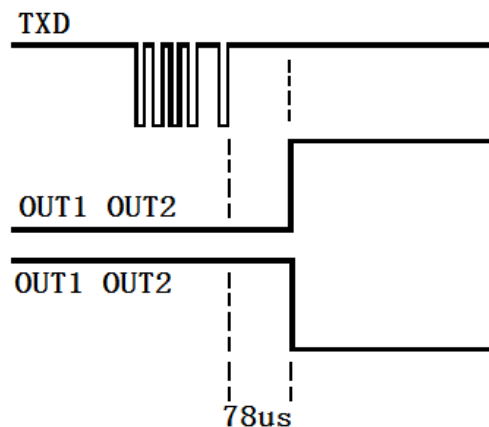
Power-on boot time

The NRST power-on reset release time is less than 3ms. After the module is powered on, pulling the NRST level low will cause the MCU of the internal module to restart. The NRST in the module has been connected to a 100K pull-up resistor. If the module is powered on, the low-level holding time that triggers the reset needs to be greater than 2ms. When reset occurs, the actual waiting time for reset needs to be greater than 110ms.

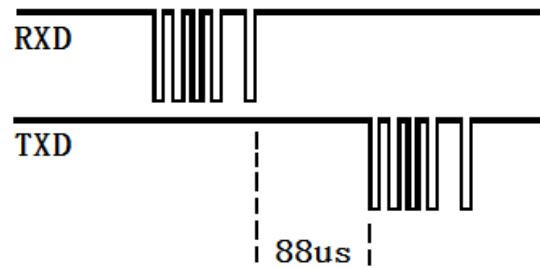


Reset waiting time

The response time is measured by the time difference between sending the GPIO command and the response. The command action time set by OUT1 and OUT2 is greater than 78us (not including command time). IN1, IN2 set command action time is greater than 88us (not including command time).



OUT1, OUT2 action time



IN1, IN2 action time

EN high level enables power-on, and the internal 100K resistor has been pulled up.

● Power Supply

It is recommended to use a 22-100uF tantalum capacitor for the VCC port. If the size is limited, it can be changed to a small-sized ceramic capacitor, and at least a 0.1uF and a 100pF ceramic capacitor are connected in parallel. The maximum current when the module is working is nearly 0.6A (when the antenna port is mismatched). When taking inventory of tags, the transmit signal will be turned on and off quickly, causing voltage fluctuations in the power supply at the input end of the module. Large-capacity capacitors can reduce the ripple amplitude. In addition to filtering out the interference of low-frequency signals, they also cause excessive instantaneous current. According to the driving capability of the power supply circuit, select a decoupling capacitor with a suitable capacity. 0.1uF and 100pF capacitors are used to filter out high-frequency power supply ripples, because high-frequency interference signals, especially interference signals in the working frequency band, entering the module will degrade the module's tag reading performance. In addition, the addition of ceramic capacitors can also Prevent high-frequency signals generated when the module is working from passing through the power path and interfering with other circuit systems.

Due to the large operating current of the module, the wiring connecting the VCC port of the module must be thick enough, otherwise there will be an excessive voltage difference at both ends of the connecting line. When the voltage at the input terminal of the module is lower than 3.3V, the module cannot work normally; too thin connecting wires are more likely to radiate interference signals.

If the input power supply voltage is relatively low, or the power supply voltage is unstable

(such as using a battery to power the module), it is recommended to first use a boost/step-down circuit to clamp the voltage to a fixed voltage (such as 5V), so as to ensure module performance consistency. If the boost/ step-down circuit is a DC-DC conversion circuit, give priority to a power conversion chip with a switching frequency exceeding 1.5MHz; compared with a power chip with a lower switching frequency, the conversion efficiency may be a little lower (generally within 5%), but avoid the weak signal interference returned by the tag.

● **Communication Serial Port**

The reader module adapts a 3.3V UART serial port for data communication. The data format is configured as 1 bit start, 8 bits data, 1 bit stop, and no check bit (8N1).

When the serial port communicates, the frequency of the serial port communication signal is close to the spurious and BLF signal returned by the tag, and may enter the receiving end of the module RF chip through conduction and radiation. Since the signal that the tag scatters back to the module is very weak, when such interference occurs, the module's reception performance will drop sharply.

If the PCB trace of the serial port is long, the trace can be laid on the inner layer of the PCB or on the PCB layer opposite to the antenna, and a matching resistor for series connection and a parallel capacitor to ground can be reserved. This can be used Reduce the ringing of the serial port signal; when it is necessary to use an inter-board connection cable, it is best to lay the connection cable close to the ground.

The baud rate of the serial port needs to meet the transmission rate requirements of the module for uploading tag data. When inventorying a large number of tags, the recommended baud rate is as shown in the following table:

● **Antenna Ports**

When the module and the antenna do not match, the power reflected from the antenna back to the reader module is too large, which will worsen the receiving sensitivity. In particular, the sensitivity of the module using the E710 chip will have a greater impact. For example, using RF_MODE 7 for testing and working at full power, compared with the situation with good

matching, when the standing wave ratio is 2.0 (return loss is about -9.5dB), the sensitivity of the module using the E710 chip deteriorates by about 4dB to 5dB. , the module using the E510 chip deteriorates by about 1dB to 2dB, and the module using the E310 chip deteriorates within 1dB. Therefore, when a module using the E710 chip is used in an application that requires fast reading of a large number of tags, if the antenna standing wave is large, it will greatly increase the time to read all tags; for applications with close distances and few tags, choose to use E510 Or the E310 module is more suitable.

Since no RF isolator or RF circulator is used for isolation between the power amplifier chip and the antenna in the module, when the power amplifier chip and the antenna do not match, the linearity and conversion efficiency of the power amplifier chip output will change. The former will cause changes in transmission performance, such as reduced power output, radiation spuriousness and spectrum templates that do not meet local radio regulations, etc.; the latter will increase the power consumption of the module and increase the operating temperature, thus reducing the service life. Small. When the power amplifier chip works in an unstable region, self-excitation occurs. In this case, the power amplifier chip is easily damaged. Although PUR3600 uses a power amplifier chip that has a high tolerance for mismatch, and has been tested for a long time (more than a week) in the worst case (module antenna end open circuit, VSWR=+∞) without damage, it does not cause any damage. Not all matching situations can be covered. If there are test conditions, during the overall test of the product, you can check its power consumption compared with the 50 Ω load. The increase in power consumption should not exceed 0.75W (depending on the heat dissipation of the module. When the heat dissipation is good, the restriction It can be relaxed, this is only used as an intuitive judgment of the degree of mismatch when the module is used, and is not necessarily accurate); in order to ensure the module's inventory performance and long-term stable operation, it is recommended to test the connected antenna after installing the antenna in the application environment. The standing wave ratio of the antenna should be less than 1.5 as much as possible (return loss -14dB). If the output power is lower, the standing wave ratio requirement can be reduced.

- **Electrostatic protection (ESD)**

The ESD test of PUR3600 can only reach $\pm 1\text{KV}$. If higher requirements need to be met, an ESD protection circuit must be added.

When excessive static electricity enters the antenna port, it will damage the power amplifier chip and reader chip. There is a situation where the module still works, but the performance has changed. Judging from the static electricity test of the antenna port, most of the manifestations are that the receiving sensitivity of the tag has deteriorated by about 7dB, and the situation may be more serious. Therefore, when testing the overall product, you need to pay attention to whether the performance of this item has changed. A simple test method is to compare it with a product that works normally, such as reading the same tag at a fixed frequency (first make sure the RSSI value is not less than -60), and compare the RSSI values of the two. Generally, the change in RSSI should be less than $\pm 3\text{dB}$.

The reference circuit provides an ESD protection circuit (the antenna port uses a high-pass filter circuit composed of inductors and capacitors). When the module is not powered on, the antenna port is not damaged at $\pm 8\text{KV}$, but the circuit will increase by about 0.3dB. About the insertion loss, the matching between the module and the antenna or load has also changed. Another method of ESD protection is to directly add bidirectional ESD protection diodes with low parasitic capacitance. Compared with the above method, the insertion loss will be lower and the degree of matching change will be smaller. However, attention should be paid to the use of ESD protection diodes. it is possible to distort the transmitted radio frequency waveform, and an increase in high-order harmonic components can be observed from the spectrum analyzer (generally the 2nd and 3rd harmonics increase more). To meet local radio regulatory requirements, select appropriate ESD protection diodes.

In practical applications, if the radiation surface of the antenna used can be fully connected to the ground, it can also provide partial ESD protection for the antenna port.

● Shielding instructions

PUR3600 uses a metal shielding cover for electromagnetic shielding. As described earlier, the stamp hole package module needs to be connected to different antennas or loads through a microstrip line, which will weaken the effect of the metal shielding cover, and due to changes in

matching, The RF parameters output by the power amplifier chip will also change accordingly, which may cause the product's radiation spurious indicators to exceed the required threshold.

When the product's radiation requirements are strict, it is recommended to add an additional layer of shielding around the PUR3600 module, which will reduce the risk of radiation spurious exceeding the standard.

● Heat dissipation instructions

PUR3600 is small in size and it is difficult to dissipate the heat generated during operation through the module itself, so the module provides as many heat dissipation pads as possible (see packaging information). It should be noted that in order to protect the module, when the module's detection temperature reaches 90 °C, the reader/writer module will automatically stop inventorying tags. When it is necessary to inventory tags again, the inventory command must be resent.

When the PUR3600 is attached to the base plate, the base plate needs to consider heat dissipation to ensure that the operating temperature of the module is not too high. When there are not many tags, or real-time inventory is not required, the working interval of the module can be adjusted according to the module temperature. If you feel that this method takes up time for inventorying tags, you can use the temperature-controlled multi-tag inventory mode provided by the module.

In the PUR3600 module, the power amplifier chip is the main heating chip, so its temperature requirements are mainly considered. The junction temperature of the power amplifier chip can be roughly calculated through the following formula:

Amplifier power dissipation:

$$P_{diss} = P_{mod} - P_{out} - P_{ext}$$

Power amplifier thermal resistance coefficient:

$$R_{th_PA} = 30^{\circ}\text{C/W}$$

Module coefficient thermal resistance: R_{th_BOARD} (related to the base plate and heat dissipation design, better heat dissipation, the thermal resistance will be reduced)

Thermal resistance coefficient of the power amplifier chip on the module:

$$R_{th} = R_{th_PA} + R_{th_BOARD}$$

PA junction temperature (Junction Temperature@55°C ambient)

$$T_J = 55^{\circ}\text{C} + P_{diss} \times R_{th} < 135^{\circ}\text{C}$$

The PA junction temperature limit of 135°C is lower than the maximum junction temperature of 155°C allowed by the power amplifier chip. This is to ensure the stable operation of the module and reduce the temperature limit.

From the above formula, we can know that if you want to increase the maximum ambient temperature at which the module can work normally, you need to reduce the thermal resistance coefficient R_{th_BOARD} of the module.

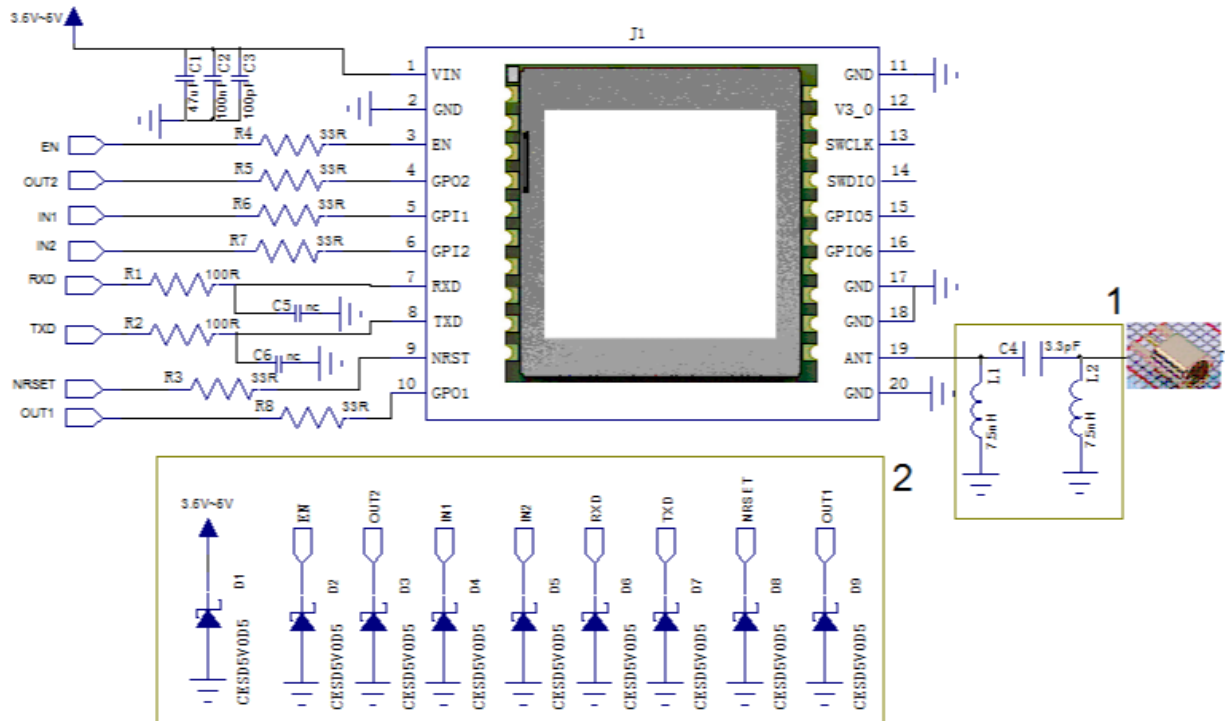
Sometimes the value of R_{th_BOARD} cannot be obtained accurately because it is related to the heat dissipation method of the product (using the PUR3600 module). For this reason, the value of R_{th_BOARD} can be roughly estimated through testing. For further explanation, the following test was done.

The SIM7600 module is attached to a base plate with a length of 29mm, a width of 29mm, and a thickness of 1.0mm. The board is made of FR4. The bottom of the SIM7600 is covered with thermal conductive silicone grease (Kafuter K-5211H). The measured ambient temperature is $T_{ambient}=28^{\circ}\text{C}$, $P_{out}=31.6\text{mW}$ (15dBm), $P_{mod}=1.65\text{W}$, $P_{ext}=1\text{W}$, the measured surface temperature of the power amplifier chip is 81°C , the surface temperature of the reader chip E710 is 70°C , the maximum temperature of other areas of the module is 67°C , and the base plate temperature is 70°C . Assuming that the difference between the junction temperature of the power amplifier chip and the surface temperature of the chip is 10°C (this value may be smaller), the calculation is (only for approximate evaluation, non-exact results, the actual higher the output power, the more accurate the calculation result):

$$\begin{aligned} R_{th_BOARD} &= (81^{\circ}\text{C} + 10^{\circ}\text{C} - 28^{\circ}\text{C}) / (1.65\text{W} - 1\text{W} - 0.0316\text{W}) - 30^{\circ}\text{C/W} \\ &= 71.8^{\circ}\text{C/W} \end{aligned}$$

Obviously, the heat dissipation capacity of the base plate is insufficient, causing R_{th_BOARD} to be too high, and a better heat dissipation method needs to be used.

● Reference circuit



1. Adding ESD protection capability will introduce additional insertion loss, and the antenna port matching will also change. If ESD meets the requirements, try not to add this circuit.

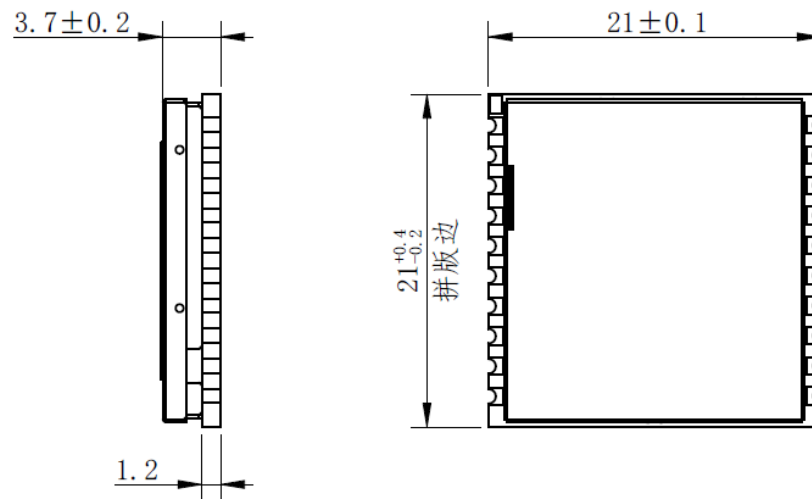
2. Select the appropriate ESD protection diode according to actual needs. If the PUR3600 communication and power interface are not connected to the product's external connector, the ESD protection diode can generally be omitted.

3. In order to work at a lower power supply voltage, the power supply voltage of the microcontroller is 3.3V. It is recommended to reserve a series resistor on the interface.

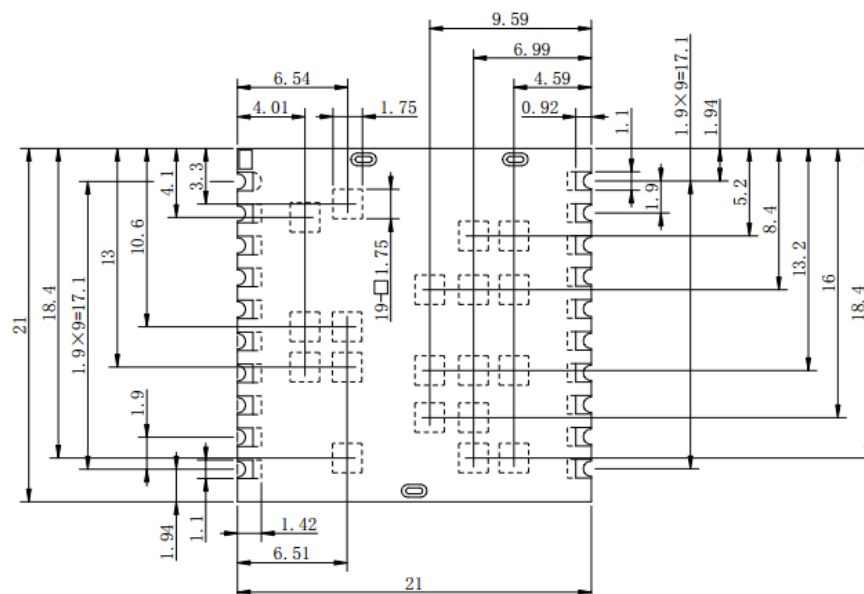
Dimensions and packaging information

● Dimensions

21mm x 21mm x 3.7mm (L x W x H), W: 2.5g



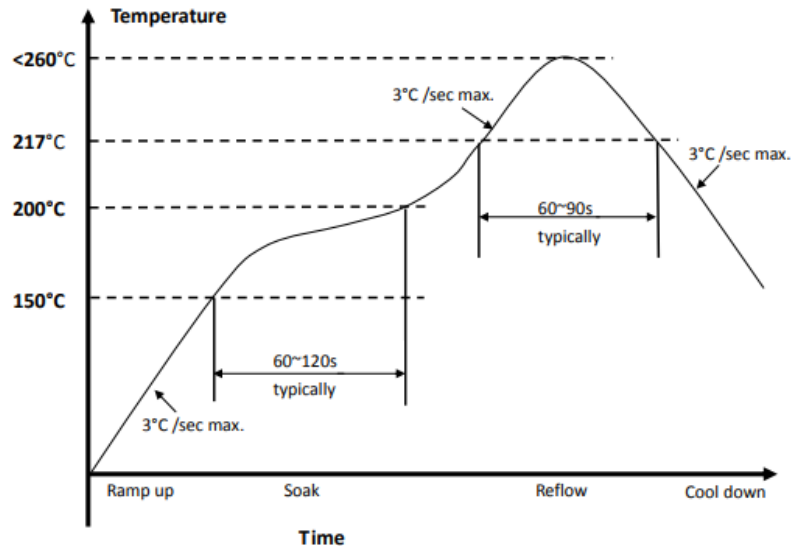
● PCB Pad



The inner hole of the circular pad is the RF wiring via hole. The base plate where the module is attached is not covered with copper. The next layer of the base plate must be paved with ground.

It is recommended to use the provided module package to reduce circuit design time.

SMT reflow soldering information



It is recommended to use the temperature control shown in the figure above for patch reflow soldering

1. Refer to IPC/JEDEC standards.
2. Peak temperature: <260°C.
3. Number of reflow soldering cycles: maximum 2 times.
4. Add nitrogen (N₂) during the reflow soldering process to achieve the oxygen concentration requirement of 2000ppm or less.
5. The baking temperature requirement is 125°C±5°C, and the baking time requirement is:
 - A. For more than three months and less than six months, the baking time is 4H.
 - B. For more than six months, the baking time is 24H.

*The default is to initialize the CHINA region, with a North American frequency range of 902MHz~928 MHz. Users can specify the factory frequency range. Please contact sales to confirm

product parameters before placing an order. Unless otherwise specified, the module will be shipped with the latest software and hardware versions by default.

FCC Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
 - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

Important Note:

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users,
and
2. The transmitter module may not be co-located with any other transmitter or antenna,

As long as the two conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains FCC ID: **PTS-PUR3600** "

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

2.7 Antennas

This radio transmitter **FCC ID: PTS-PUR3600** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
RFID	/	Ceramic Antenna	2.0dBi	902-928MHz

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains

FCC ID: PTS-PUR3600".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF

design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.