

6220N-IS

Wi-Fi Single-band 1X1 802.11b/g/n BLE5.0

IoT Module Datasheet



6220N-IS Module Datasheet

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Date

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Revision History

| Version | Date | Revision Content | Draft | Approved |
|---------|------------|--|-------|----------|
| 1.0 | 2019/07/11 | Initial release | Lgp | Stone |
| 2.0 | 2019/09/17 | Update figure 1-1; Update operating temperature; Update reference schematic; Add flash and PCB in key material list; Update package information; Correct typing error | Lgp | Stone |
| 3.0 | 2019/11/11 | Update operating temperature; Update key material list; Update logo Add BLE power consumption | Lgp | Stone |
| 4.0 | 2019/11/13 | Add certification information | Lgp | Stone |

CONTENTS

| | |
|---|-----------|
| 1 Overview | 1 |
| 1.1 Introduction | 1 |
| 1.2 Features | 1 |
| 1.2 General specification | 2 |
| 1.3 Operating Conditions | 2 |
| ※1.4 EEPROM Information | 2 |
| 2 Wi-Fi RF Specification | 3 |
| 2.1 2.4GHz RF Specification | 3 |
| 3 Bluetooth Specification | 5 |
| 4 Power Consumption | 6 |
| 5 Pin Assignments | 7 |
| 5.1 Pin outline | 7 |
| 5.2 Pin Definition | 8 |
| 6 Dimensions | 11 |
| 6.1 Module Picture | 11 |
| 6.2 Physical Dimensions | 11 |
| 6.3 Layout Recommendation | 12 |
| 7 Ordering Information | 13 |
| 8 The Key Material List | 13 |
| 9 Recommended Reflow Profile | 13 |
| 10 Package Information | 14 |
| 10.1 Tray | 14 |
| 10.2 Moisture sensitivity | 15 |

1 Overview

1.1 Introduction

6220N-IS is a highly integrated IoT module with low power 802.11b/g/n Wireless LAN (WLAN) and Bluetooth Low Energy communication controller. It combines a high-performance KM4 MCU, a low power KM0 MCU, WLAN (802.11 b/g/n) MAC, a 1T1R capable WLAN baseband, RF, Bluetooth. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

6220N-IS integrates internal memories for complete Wi-Fi protocol functions. The embedded memory configuration also provides simple application developments.

1.2 Features

Wi-Fi General

- 802.11b/g/n compatible WLAN
- 150Mbps transmit and receive PHY rate using 40MHz bandwidth
- Compatible with 802.11n specification
- Backward compatible with 802.11b/g devices while operating in 802.11n mode

Wi-Fi Standards Supported

- 802.11b/g/n compatible WLAN
- 802.11e QoS Enhancement (WMM)
- 802.11i (WPA, WP2). Open, shared key, and pair-wise key authentication services
- Wi-Fi Direct support

WLAN PHY Features

- 802.11n OFDM
- One Transmit and one Receive path(1T1R)
- 40MHz bandwidth transmission
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble

Bluetooth Features

- Supports Bluetooth 5.0 Low Energy (BLE)

Host Interface

- UART
- I2C
- GPIO

1.2 General specification

| | |
|-----------------|--|
| Model Name | 6220N-IS |
| Main Chipset | Realtek RTL8720CS |
| Host Interface | UART, I2C, GPIO |
| Wi-Fi Standards | 802.11b/g/n |
| Bluetooth | BLE5.0 |
| Dimension | L x W x H: 20.00mm*29.00mm*3.60mm |
| RoHS | All hardware components are fully compliant with EU RoHS directive |

1.3 Operating Conditions

| | |
|-----------------------|-----------------|
| Operating Voltage | 3.3±10% Vdc |
| Operating Temperature | -30°C to +65°C |
| Storage Temperature | -40°C to +125°C |

※1.4 EEPROM Information

Wi-Fi

| | |
|------------|--|
| Reg Domain | |
| Vendor ID | |
| Device ID | |

BT

| | |
|------------|--|
| Vendor ID | |
| Product ID | |

2 Wi-Fi RF Specification

2.1 2.4GHz RF Specification

| Feature | Description | | | |
|--|--|---------------|------------|-----------------------|
| WLAN Standard | IEEE 802.11 b/g/n Wi-Fi compliant | | | |
| Frequency Range | 2.400~2.4835GHz | | | |
| Number of Channels | Wi-Fi: USA/Canada: channel 1~11; Europe/China/Australia: channel 1~13; Japan: channel 1~14 | | | |
| Spectrum Mask | Min. b/g/n | Typ. b/g/n | Max. b/g/n | Unit b/g/n |
| 1st side lobes(to fc ± 11MHZ) | - | -43/-30/-40 | - | dBr |
| 2st side lobes(to fc ± 22MHZ) | - | -52/-33/-58 | - | dBr |
| Freq. Tolerance | -20/-20/-20 | - | 20/20/20 | ppm |
| Test Items | Typical Value | | | EVM |
| Output Power | 802.11b /11Mbps : 17dBm ± 1.5 dB | | | EVM ≤ -10dB |
| | 802.11g /54Mbps : 15dBm ± 1.5 dB | | | EVM ≤ -25dB |
| | 802.11n /MCS7 : 14dBm ± 1.5 dB | | | EVM ≤ -28dB |
| Test Items | Test Value | | | Standard Value |
| SISO Receive Sensitivity (11b,20MHz) @8% PER | - 1Mbps | PER @ -94 dBm | ≤-83 dBm | |
| | - 2Mbps | PER @ -92 dBm | ≤-80 dBm | |
| | - 5.5Mbps | PER @ -89 dBm | ≤-79 dBm | |
| | - 11Mbps | PER @ -87 dBm | ≤-76 dBm | |
| SISO Receive Sensitivity (11g,20MHz) @10% PER | - 6Mbps | PER @ -89 dBm | ≤-85 dBm | |
| | - 9Mbps | PER @ -88 dBm | ≤-84 dBm | |
| | - 12Mbps | PER @ -87 dBm | ≤-82 dBm | |
| | - 18Mbps | PER @ -86 dBm | ≤-80 dBm | |
| | - 24Mbps | PER @ -84 dBm | ≤-77 dBm | |
| | - 36Mbps | PER @ -80 dBm | ≤-73 dBm | |
| | - 48Mbps | PER @ -77 dBm | ≤-69 dBm | |
| SISO Receive Sensitivity (11n,20MHz) @10% PER | - 54Mbps | PER @ -75 dBm | ≤-68 dBm | |
| | - MCS=0 | PER @ -89 dBm | ≤-85 dBm | |
| | - MCS=1 | PER @ -86 dBm | ≤-82 dBm | |
| | - MCS=2 | PER @ -84 dBm | ≤-80 dBm | |
| | - MCS=3 | PER @ -82 dBm | ≤-77 dBm | |

| | | |
|---|------------------------------------|----------|
| | - MCS=4 PER @ -79 dBm | ≤-73 dBm |
| | - MCS=5 PER @ -76 dBm | ≤-69 dBm |
| | - MCS=6 PER @ -74 dBm | ≤-68 dBm |
| | - MCS=7 PER @ -72 dBm | ≤-67 dBm |
| SISO Receive Sensitivity (11n ,40MHz) @10% PER | - MCS=0 PER @ -89 dBm | ≤-82 dBm |
| | - MCS=1 PER @ -86 dBm | ≤-79 dBm |
| | - MCS=2 PER @ -83 dBm | ≤-77 dBm |
| | - MCS=3 PER @ -80 dBm | ≤-74 dBm |
| | - MCS=4 PER @ -77 dBm | ≤-70 dBm |
| | - MCS=5 PER @ -74 dBm | ≤-66 dBm |
| | - MCS=6 PER @ -72 dBm | ≤-65 dBm |
| | - MCS=7 PER @ -70 dBm | ≤-64 dBm |
| Maximum Input Level | 802.11b: -10 dBm | |
| | 802.11g/n: -20 dBm | |
| Antenna Reference | PCB antenna with 0~2 dBi peak gain | |

3 Bluetooth Specification

| Feature | Description | | |
|---|----------------------|-----------------|-------------|
| General Specification | | | |
| Bluetooth Standard | BLE 5.0 | | |
| Host Interface | UART | | |
| Frequency Band | 2402 MHz ~ 2480 MHz | | |
| Number of Channels | 40 channels for BLE | | |
| Modulation | GFSK, $\pi/4$ -DQPSK | | |
| RF Specification | | | |
| | Min. | Typical. | Max. |
| Output Power | | 6 dBm | |
| Sensitivity @ BER=0.1% for GFSK (1Mbps) | | TBD | |
| Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps) | | TBD | |
| Maximum Input Level | -10 dBm | | |
| Sensitive @PER=30.8% | | -90 dBm | |

4 Power Consumption

| | |
|--|---|
| Power consumption current Test condition: Power supply @3.3Vdc | Wi-Fi only: TX (typical): 19 dBm @1Mbps 240mA 17 dBm @11Mbps 226mA 15 dBm @54Mbps 164mA 14 dBm @HT20 MCS7 159mA 14 dBm @HT40 MCS7 136mA RX (typical): 58mA |
| | BLE only: TX (typical): 6dBm @1Mbps 103mA RX (typical):52mA |

5 Pin Assignments

5.1 Pin outline

< TOP VIEW >

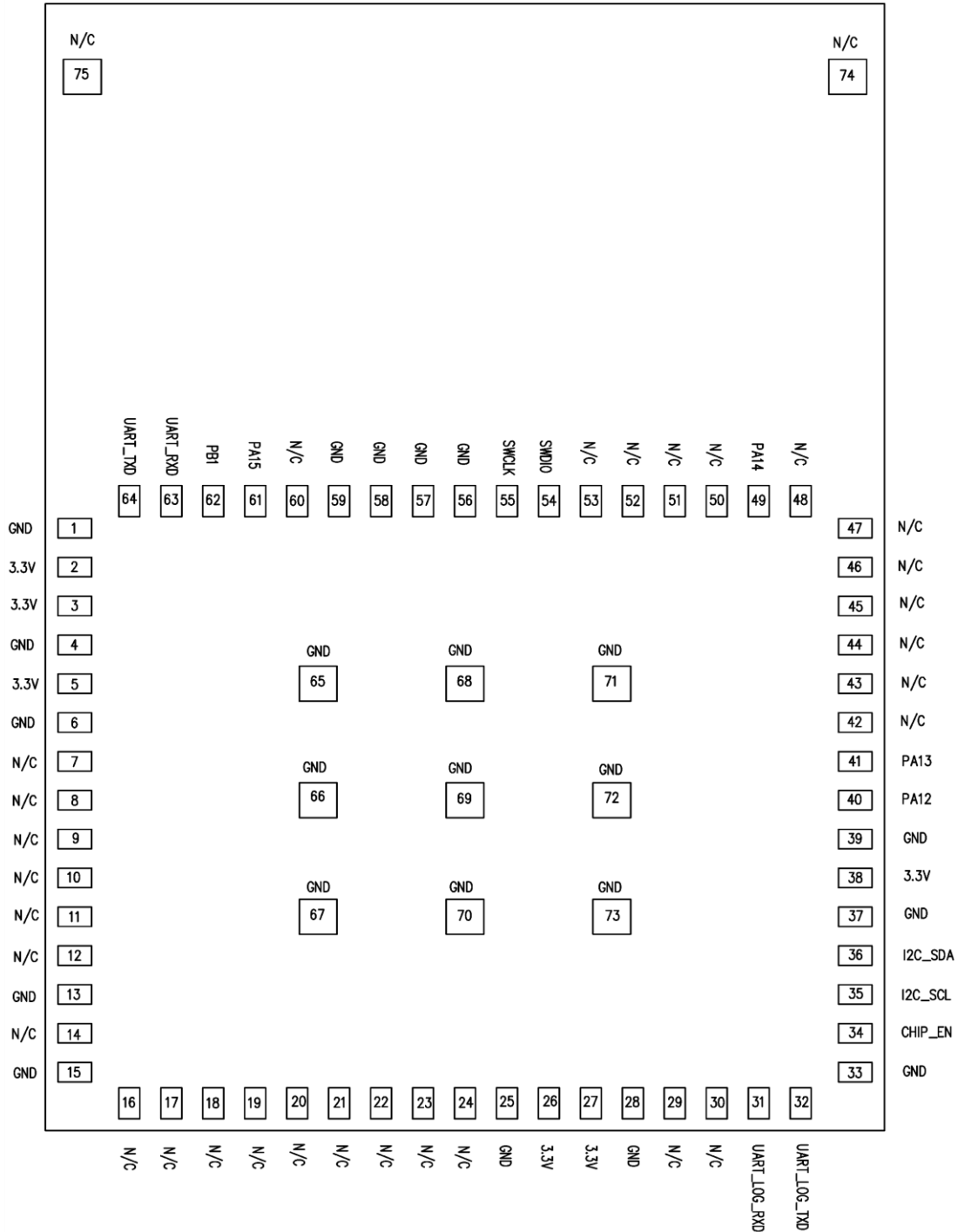


Figure 5-1 Pin Outline

5.2 Pin Definition

| Pin# | Name | Type | Description | Voltage |
|------|--------------|------|--------------------|---------|
| 1 | GND | | Ground connections | |
| 2 | 3.3V | P | 3.3V±10% input | 3.3V |
| 3 | 3.3V | P | 3.3V±10% input | 3.3V |
| 4 | GND | | Ground connections | |
| 5 | 3.3V | P | 3.3V±10% input | 3.3V |
| 6 | GND | | Ground connections | |
| 7 | N/C | | Not connected | |
| 8 | N/C | | Not connected | |
| 9 | N/C | | Not connected | |
| 10 | N/C | | Not connected | |
| 11 | N/C | | Not connected | |
| 12 | N/C | | Not connected | |
| 13 | GND | | Ground connections | |
| 14 | N/C | | Not connected | |
| 15 | GND | | Ground connections | |
| 16 | N/C | | Not connected | |
| 17 | N/C | | Not connected | |
| 18 | N/C | | Not connected | |
| 19 | N/C | | Not connected | |
| 20 | N/C | | Not connected | |
| 21 | N/C | | Not connected | |
| 22 | N/C | | Not connected | |
| 23 | N/C | | Not connected | |
| 24 | N/C | | Not connected | |
| 25 | GND | | Ground connections | |
| 26 | 3.3V | P | 3.3V±10% input | 3.3V |
| 27 | 3.3V | P | 3.3V±10% input | 3.3V |
| 28 | GND | | Ground connections | |
| 29 | N/C | | Not connected | |
| 30 | N/C | | Not connected | |
| 31 | UART_LOG_RXD | I | Log UART RXD | |
| 32 | UART_LOG_TXD | O | Log UART TXD | |

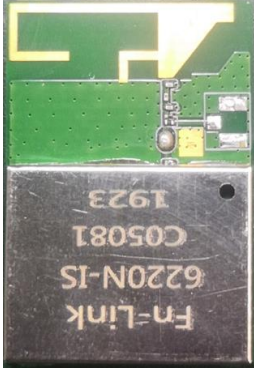
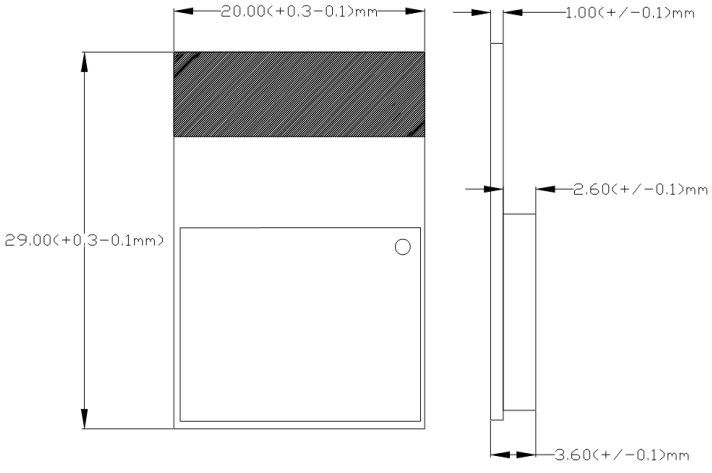
| | | | | |
|----|----------|-----|--|------|
| 33 | GND | | Ground connections | |
| 34 | CHIP_EN | I | Enable chip 1: Enable chip 0: Shut down chip Default pull high internal | 3.3V |
| 35 | I2C_SCL | I/O | I2C Clock | |
| 36 | I2C_SDA | I/O | I2C Data | |
| 37 | GND | | Ground connections | |
| 38 | 3.3V | P | 3.3V ± 10% input | 3.3V |
| 39 | GND | | Ground connections | |
| 40 | PA12 | I/O | General Purpose Input/Output | |
| 41 | PA13 | I/O | General Purpose Input/Output | |
| 42 | N/C | | Not connected | |
| 43 | N/C | | Not connected | |
| 44 | N/C | | Not connected | |
| 45 | N/C | | Not connected | |
| 46 | N/C | | Not connected | |
| 47 | N/C | | Not connected | |
| 48 | N/C | | Not connected | |
| 49 | PA14 | I/O | General Purpose Input/Output | |
| 50 | N/C | | Not connected | |
| 51 | N/C | | Not connected | |
| 52 | N/C | | Not connected | |
| 53 | N/C | | Not connected | |
| 54 | SWDIO | I/O | Serial Wire Debug interface; data | |
| 55 | SWCLK | I/O | Serial Wire Debug interface; clock | |
| 56 | GND | | Ground connections | |
| 57 | GND | | Ground connections | |
| 58 | GND | | Ground connections | |
| 59 | GND | | Ground connections | |
| 60 | N/C | | Not connected | |
| 61 | PA15 | I/O | General Purpose Input/Output | |
| 62 | PB1 | I/O | General Purpose Input/Output | |
| 63 | UART_RXD | I | Communication UART RXD | |
| 64 | UART_TXD | O | Communication UART TXD | |
| 65 | GND | | Ground connections | |
| 66 | GND | | Ground connections | |

| | | | | |
|----|-----|--|--------------------|--|
| 67 | GND | | Ground connections | |
| 68 | GND | | Ground connections | |
| 69 | GND | | Ground connections | |
| 70 | GND | | Ground connections | |
| 71 | GND | | Ground connections | |
| 72 | GND | | Ground connections | |
| 73 | GND | | Ground connections | |
| 74 | N/C | | Not connected | |
| 75 | N/C | | Not connected | |

P:POWER I:INPUT O:OUTPUT

6 Dimensions

6.1 Module Picture

| | |
|---|--|
| <p>L x W: 20 x 29 (+0.3-0.1) mm</p>  |  |
| <p>H: 3.6 (±0.1) mm</p> | |
| <p>Weight</p> | <p>2.40(±0.1) g</p> |

6.2 Physical Dimensions

(unit: mm)

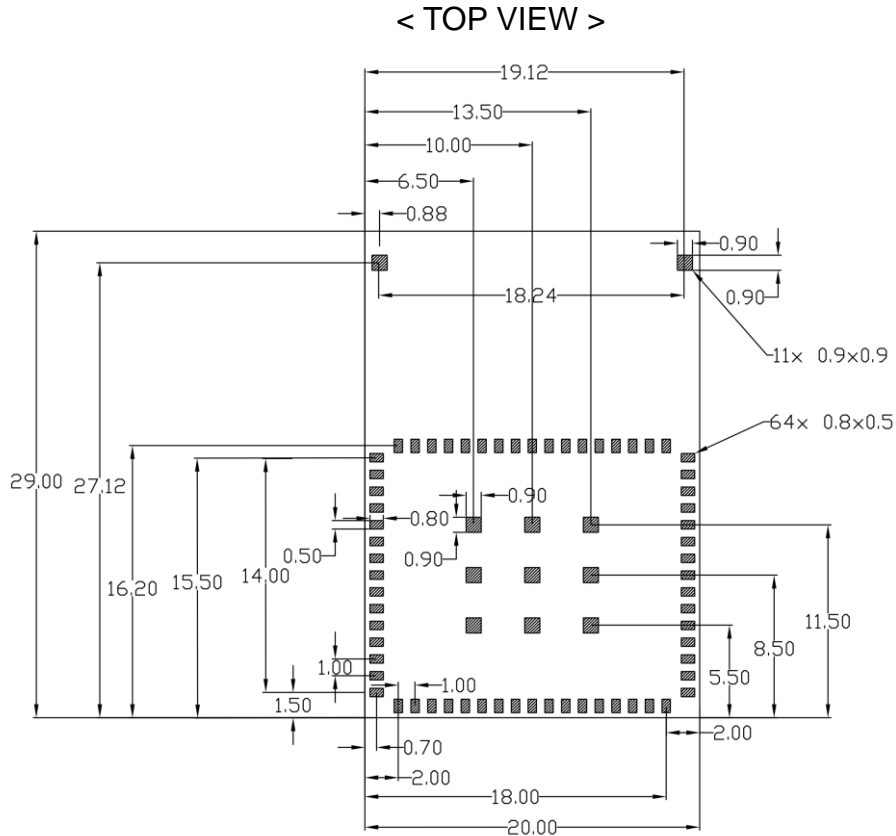


Figure 6-1 Physical Dimensions

6.3 Layout Recommendation

(unit: mm)

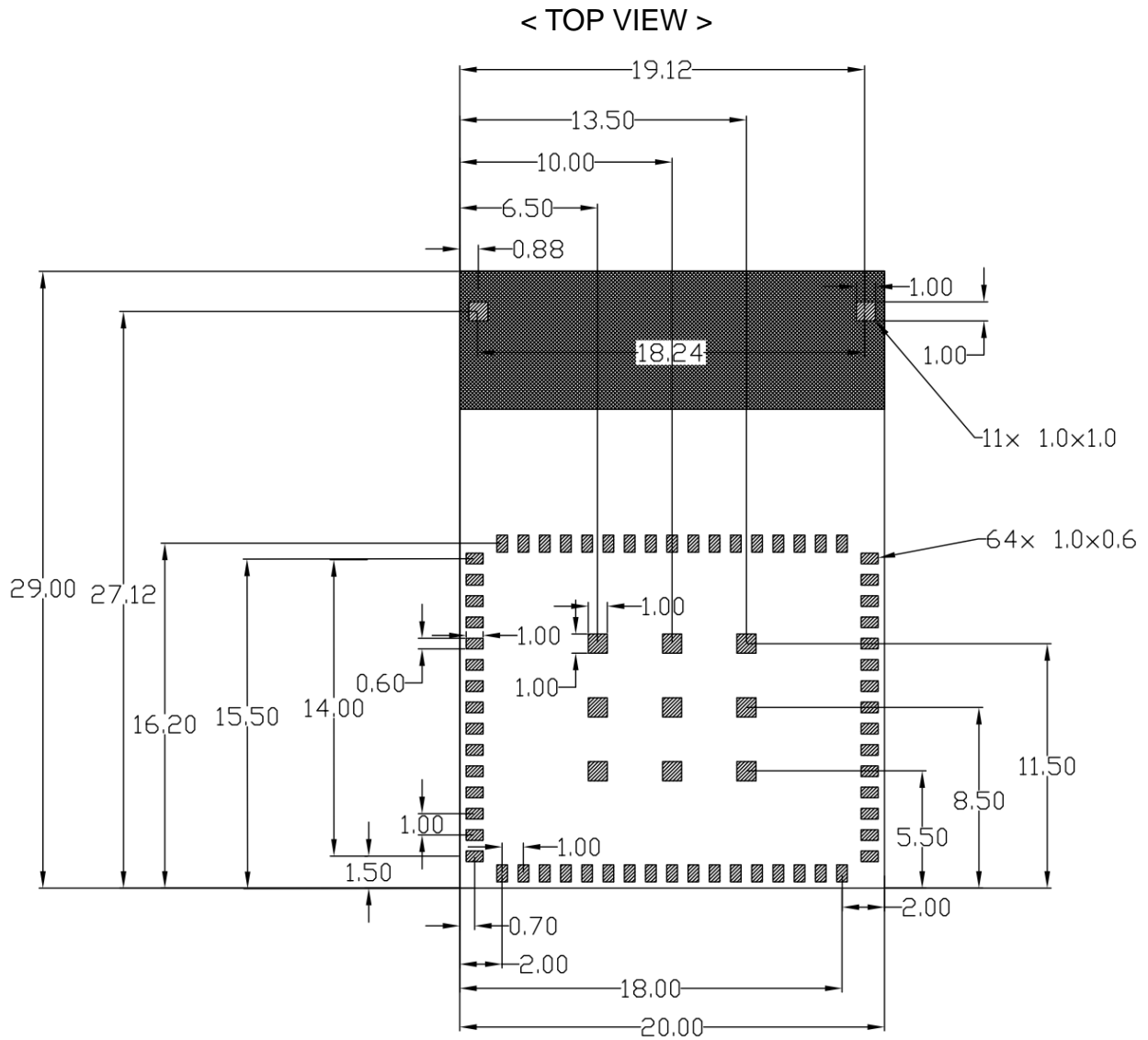


Figure 6-2 Layout recommendation

7 Ordering Information

| Part NO. | Description |
|---------------|---|
| FG6220NISX-00 | RTL8720CS-VA1, b/g/n, Wi-Fi+BLE5.0, 1T1R, UART, PCB ANT, 29*20 mm |

8 The Key Material List

| | | |
|------|-----------------|---|
| Main | Shielding Cover | 6220N-IS Shielding cover (material: copper) |
| Main | Crystal | 2520 40MHz 12PF 10ppm Q40000E087 (ECEC) |
| Main | Chipset | RTL8720CS-VA1, QFN-48 (Realtek) |
| Main | PCB | 6220N-IS-V1.0 GREEN PCB, FR4, 4 LAYER, 29*20mm, T=1.0mm, ENIG |
| Main | Flash | 8MB GD25Q64CSIG, SOP8, 208MIL (GigaDevice) |

9 Recommended Reflow Profile

Refer to IPC/JEDEC standard.

Peak Temperature: <250°C

Number of Times: ≤2 times

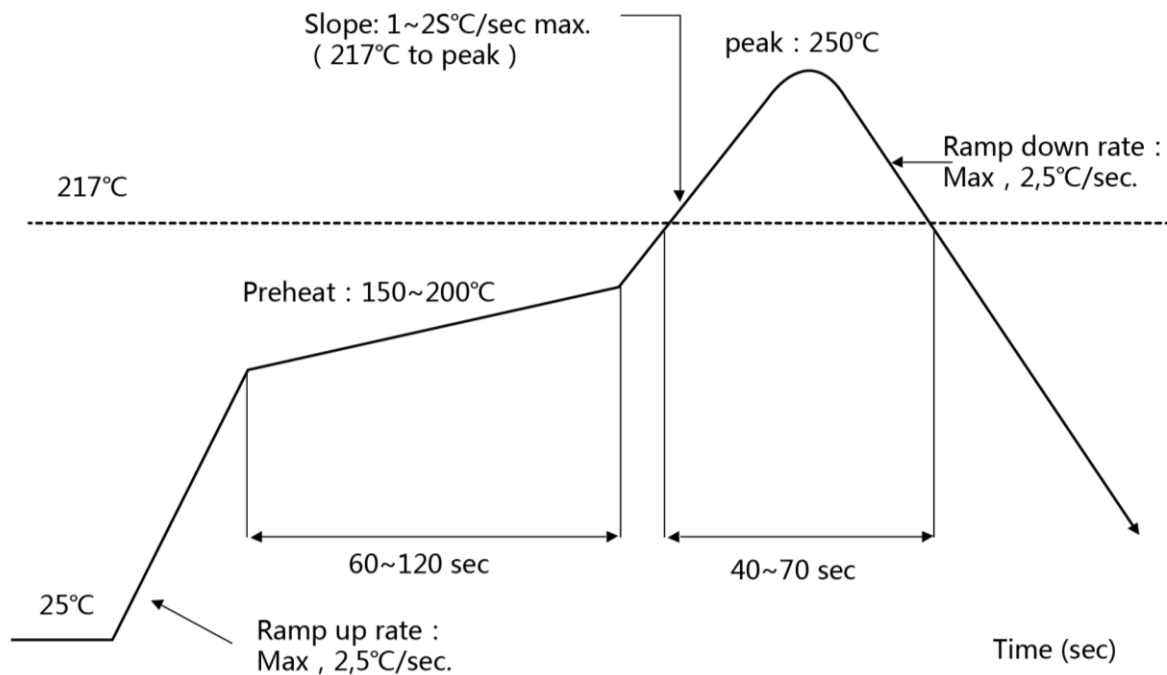


Figure 10-1 Reference reflow profile

10 Package Information

10.1 Tray

Note: The package information will be updated in next revision of this document.

Layer size: L300.0*W240.0 mm

Layer material: PVC

Carton size: L310.0*W260.0*H220.0 mm

Carton material: A=A

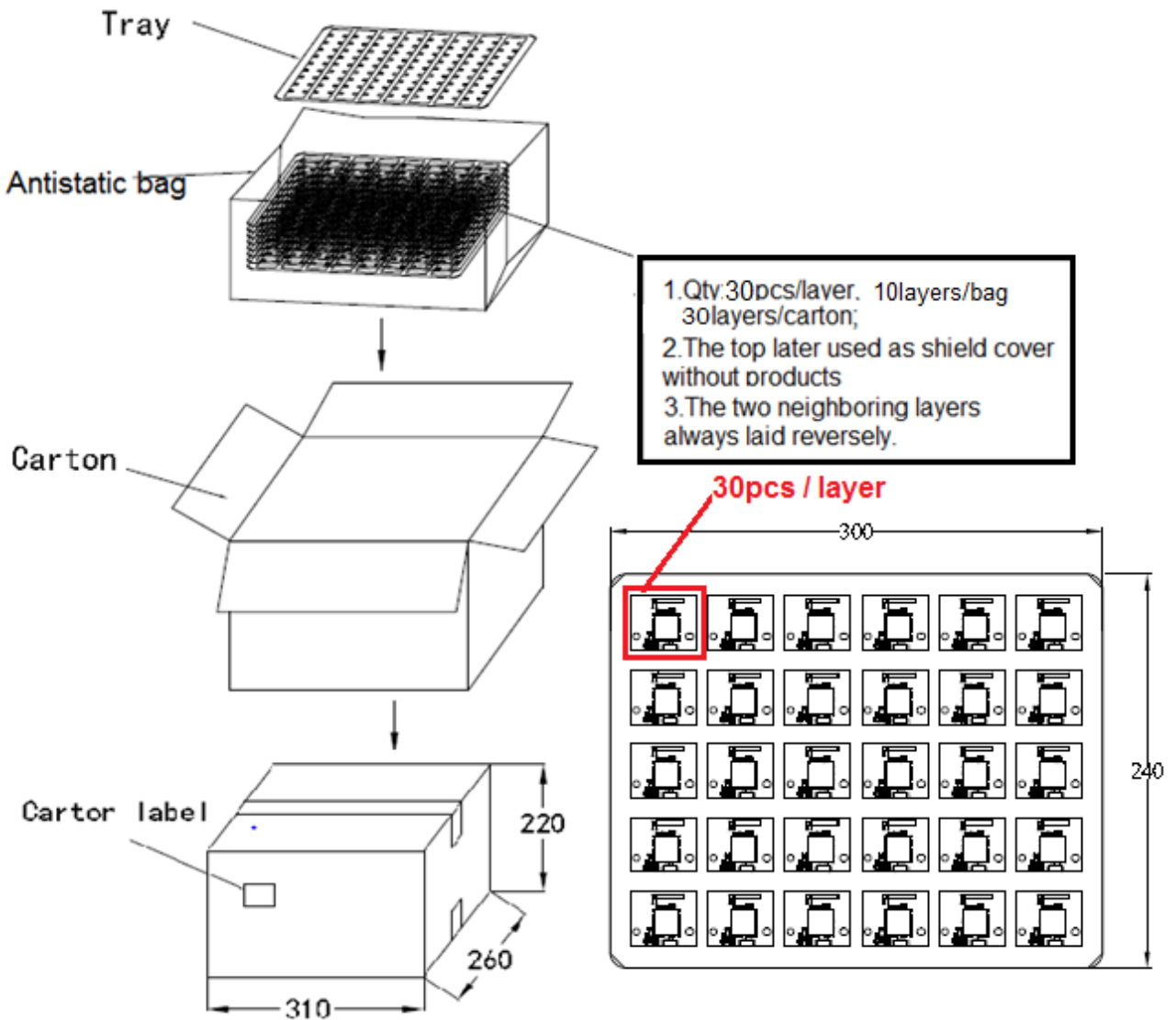


Figure 11-1 Reference Package

10.2 Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition
- d) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected
- e) Baking is required if conditions b) or c) are not respected
- f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

Regulatory Module Integration Instructions

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC / IC (Industry Canada) certification if they meet the following conditions. Otherwise, additional FCC / IC approvals must be obtained.

- The host product with the module installed must be evaluated for simultaneous transmission requirements.
- The users manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC / IC RF exposure guidelines.
- To comply with FCC / IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed 2dBi.
- A label must be affixed to the outside of the host product with the following statements:

This device contains FCCID: 2AATL-6220N-IS

This equipment contains equipment certified under ICID: 24844-6220NIS

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

If the final host / module combination is intended for use as a portable device (see classifications below) the host manufacturer is responsible for separate approvals for the SAR requirements from FCC Part 2.1093 and RSS-102.

Device Classifications

Since host devices vary widely with design features and configurations module integrators shall follow the guidelines below regarding device classification and simultaneous transmission, and seek guidance from their preferred regulatory test lab to determine how regulatory guidelines will impact the device compliance. Proactive management of the regulatory process will minimize unexpected schedule delays and costs due to unplanned testing activities.

The module integrator must determine the minimum distance required between their host device and the user's body. The FCC provides device classification definitions to assist in making the correct determination. Note that these classifications are guidelines only; strict adherence to a device classification may not satisfy the regulatory requirement as near-body device design details may vary widely. Your preferred test lab will be able to assist in determining the appropriate device category for your host product and if a KDB or PBA must be submitted to the FCC.

Note, the module you are using has been granted modular approval for mobile applications. Portable applications may require further RF exposure (SAR) evaluations. It is also likely that the host / module combination will need to undergo testing for FCC Part 15 regardless of the device classification. Your preferred test lab will be able to assist in determining the exact tests which are required on the host / module combination.

FCC Definitions

Portable: (§2.1093) — A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is / are within 20 centimeters of the body of the user.

Mobile: (§2.1091) (b) — A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Per §2.1091d(d)(4) In some cases (for example, modular or desktop transmitters), the potential conditions of use of a device may not allow easy classification of that device as either Mobile or Portable. In these cases, applicants are responsible for determining minimum distances for compliance for the intended use and installation of the device based on evaluation of either specific absorption rate (SAR), field strength, or power density, whichever is most appropriate.

Simultaneous Transmission Evaluation

This module has **not** been evaluated or approved for simultaneous transmission as it is impossible to determine the exact multi-transmission scenario that a host manufacturer may choose. Any simultaneous transmission condition established through module integration into a host product **must** be evaluated per the requirements in KDB447498D01(8) and KDB616217D01,D03 (for laptop, notebook, netbook, and tablet applications).

These requirements include, but are not limited to:

- Transmitters and modules certified for mobile or portable exposure conditions can be incorporated in mobile host devices without further testing or certification when:
- The closest separation among all simultaneous transmitting antennas is ≥ 20 cm,

Or

- Antenna separation distance and MPE compliance requirements for **ALL** simultaneous transmitting antennas have been specified in the application filing of at least one of the certified transmitters within the host device. In addition, when transmitters certified for portable use are incorporated in a mobile host device, the antenna(s) must be ≥ 5 cm from all other simultaneous transmitting antennas.
- All antennas in the final product must be at least 20 cm from users and nearby persons.

If Canadian approval is requested for devices incorporating 6220N-IS modules the below notes will have to be provided in the English and French language in the final user documentation. Manufacturers/OEM Integrators must ensure that the final user documentation does not contain any information on how to install or remove the module from the final product.

Notes (IC):

(EN) This Class B digital apparatus complies with Canadian ICES-003 and RSS-210. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

(FR) Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003 et RSS-210. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les

interférences qui peuvent affecter son fonctionnement.

(EN) Radio frequency (RF) Exposure Information

The radiated output power of the Wireless Device is below the Industry Canada (IC) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under mobile exposure conditions. (antennas at least 20cm from a person's body).

(FR) Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie émise par l'appareil de sans fil est inférieure à la limite d'exposition aux fréquences radio d'Industry Canada (IC). Utilisez l'appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (les antennes se situent à moins de 20cm du corps d'une personne).

CAN ICES-3(B)/NMB-3(B)

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et

Développement économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions

suivantes : (1)L'appareil ne doit pas produire de brouillage;(2)L'appareil doit accepter tout brouillage radioélectrique subi, même si le

brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3(B)/NMB-3(B)

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's

licence-exempt RSS(s). Operation is subject to the following two conditions:(1)This device may not cause interference.(2)This device must

accept any interference, including interference that may cause undesired operation of the device.

FCC Warning:

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.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

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.

RF Exposure Statement

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