

LS-3201 module

1. Product overview

LS-3201 is a Wi-Fi&BT module developed by DongGuan JuYang Electronic Co.,Ltd. which is equipped with BL602 chip as the core processor and supports Wi-Fi 802.11b/g/n protocol and BLE 5.0 protocol. The BL602 chip has built-in low-power 32-bit RISC CPU, 276KB RAM and abundant peripheral interfaces, including SDIO, SPI, UART, I2C, IR remote, PWM, ADC, DAC, PIR and GPIO. It can be widely used in Internet of Things (IoT), mobile devices, wearable electronic devices, smart homes ,lighting fixture and other fields.

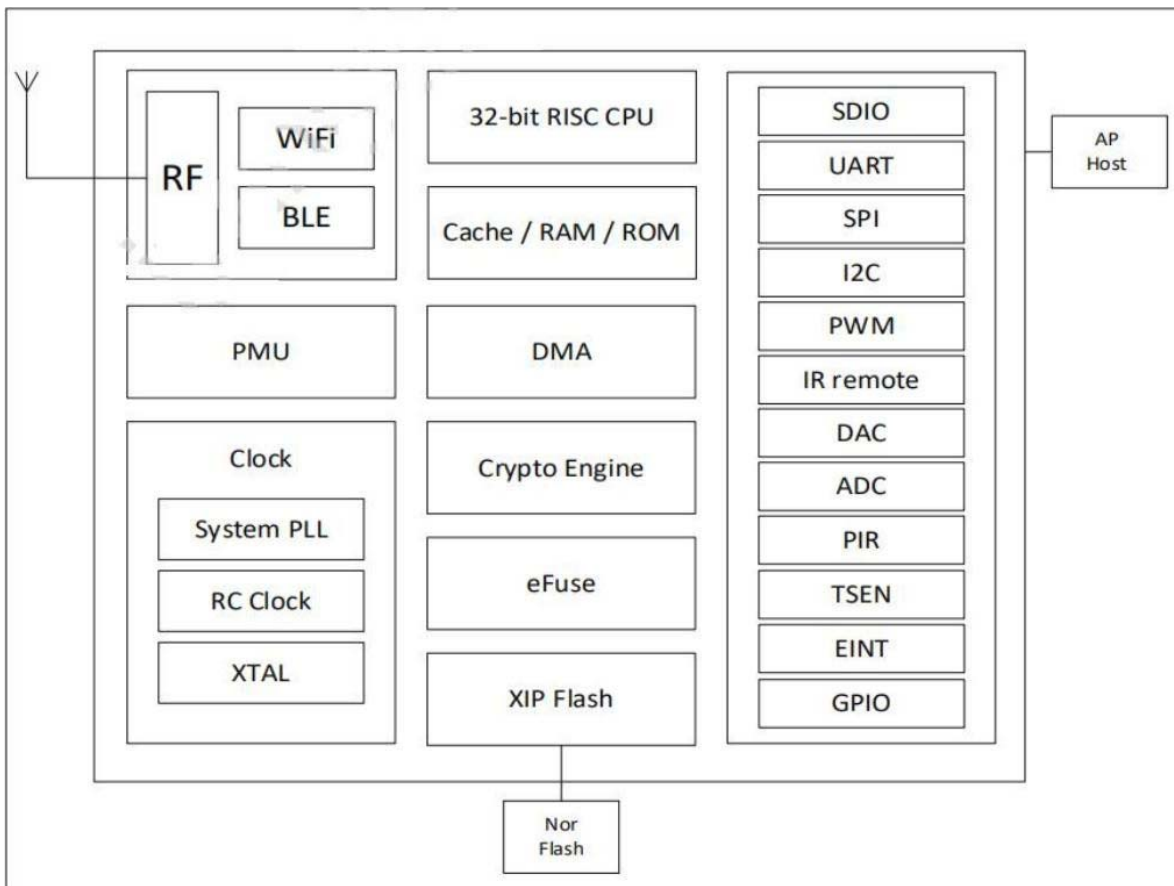


Fig. 1 Architecture diagram of main chip

1.1. trait

- Adopt SMD-22 package.
- Support IEEE 802.11 b/g/n protocol.
- Wi-Fi security supports wps/WEP/wpa/wpa2personal/wpa2enterprise/wpa3.
- Support 20MHz bandwidth, and the highest rate is 72.2 Mbps.
- Bluetooth low energy consumption 5.0, Bluetooth Mesh
- Support Station+BLE mode and Station+SoftAP+BLE mode.
- Support 32-bit RISC CPU, 276KB RAM.
- Safe startup, supporting mirroring with ECC-256 signature.
- Support QSPI/SPI Flash instant AES decryption (OTFAD) and AES 128 CTR mode.
- Support AES 128/192/256-bit encryption engine.
- Support SHA-1/224/256
- Support true random number generator (TRNG)
- Public Key Accelerator (PKA) supports the basic operation of large numbers, and the software provides application program interfaces such as signature and verification.
- Support SDIO, SPI, UART, I2C, IR remote, PWM, ADC, DAC, PIR, GPIO, etc.
- Integrated Wi-Fi MAC/BB/RF/PA/LNA/BT
- Support multiple sleep modes, and the deep sleep current is 12 μ A.
- General AT command can be used quickly.
- It supports secondary development and integrates Windows and Linux development environments.

2. Main parameter

Table 1 Description of main parameters

model	LS-3201
encapsulation	SMD-22
measure	24.0*16.0*3.1(±0.2)mm
Antenna form	Onboard antenna
Spectrum range	2400 ~ 2483.5MHz
Working temperature	-40°C ~ 85°C
Storage environment	-40°C ~ 125°C, < 90%RH
Power supply range	The power supply voltage is 2.7V ~ 3.6V, and the power supply current is ≥500mA.
Support interface	UART/GPIO/ADC/PWM/I2C/SPI
Available IO quantity	15
Serial port rate	Default is 115200 bps.
security	WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3
Flash	The default is 4MByte, and the maximum support is 16MByte.

2.1. Electrostatic requirements

LS-3201 is electrostatic sensitive equipment, so special precautions should be taken during handling.



2.2. electrical specification

Table 2 Table of Electrical Characteristics

parameter	condition	minimum value	typical value	maximum	unit
supply voltage	VDD	2.7	3.3	3.6	V
I/O	VIL	-	-	0.3*VDDIO	V
	VIH	-	0.7*VDDIO	-	V
	VOL	-	-	0.1*VDDIO	V
	VOH	-	-	0.9*VDDIO	V
	IMAX	-	-	-	15

2.3. Wi-Fi RF performance

Table 3 Wi-Fi RF performance table

describe	typical value			unit
Spectrum range	2400 ~ 2483.5MHz			MHz
output rating				
model	minimum value	typical value	maximum	unit
11n mode HT20, PA output power	-	16	-	dBm
11g mode, PA output power	-	17	-	dBm
11b mode, PA output power	-	19	-	dBm
receiving sensitivity				
model	minimum value	typical value	maximum	unit
11b, 1 Mbps	-	-98	-	dBm
11b, 11 Mbps	-	-90	-	dBm
11g, 6 Mbps	-	-93	-	dBm
11g, 54 Mbps	-	-76	-	dBm
11n, HT20 (MCS7)	-	-73	-	dBm

2.4. BLE RF performance

Table 4 BLE RF Performance Table

describe	typical value			unit
Spectrum range	2400 ~ 2483.5MHz			MHz
output rating				
Rate mode	minimum value	typical value	maximum	unit
1Mbps	-	nine	-	dBm
receiving sensitivity				
Rate mode	minimum value	typical value	maximum	unit
1Mbps sensitivity @30.8%PER	-	-96	-	dBm

2.5. power consumption

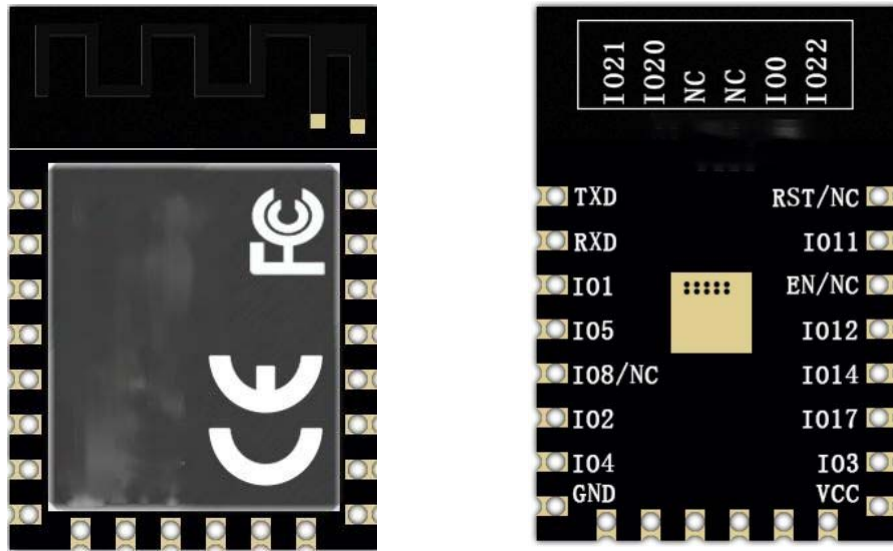
The following power consumption data are based on a power supply of 3.3V, an ambient temperature of 25°C, and measured with an internal regulator.

- All measurements are made at the antenna interface with a filter.
- All emission data are measured in continuous emission mode based on 100% duty cycle.

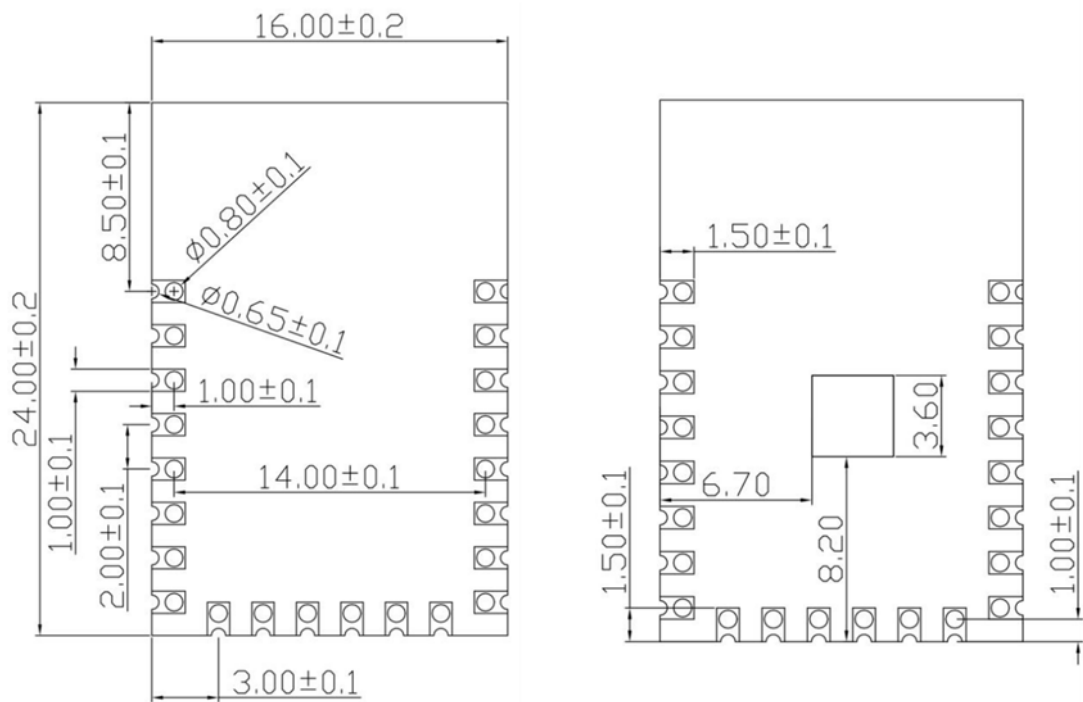
Table 5 Power consumption table

model	minimum value	average value	maximum	unit
Transmit 802.11b, 11Mbps, POUT=+21dBm.	-	260	-	mA
Transmit 802.11g, 54Mbps, POUT=+18dBm.	-	245	-	mA
Emission 802.11n, MCS7, POUT=+17dBm.	-	230	-	mA
Receive 802.11b, with a packet length of 1024 bytes.	-	65	-	mA
Received 802.11g, with a packet length of 1024 bytes.	-	65	-	mA
Received 802.11n, with a packet length of 1024 bytes.	-	65	-	mA
Deep-Sleep	-	12	-	μA

3. Appearance size



Front and back



Front and back

4. Design guidance

4.1. Application guidance circuit

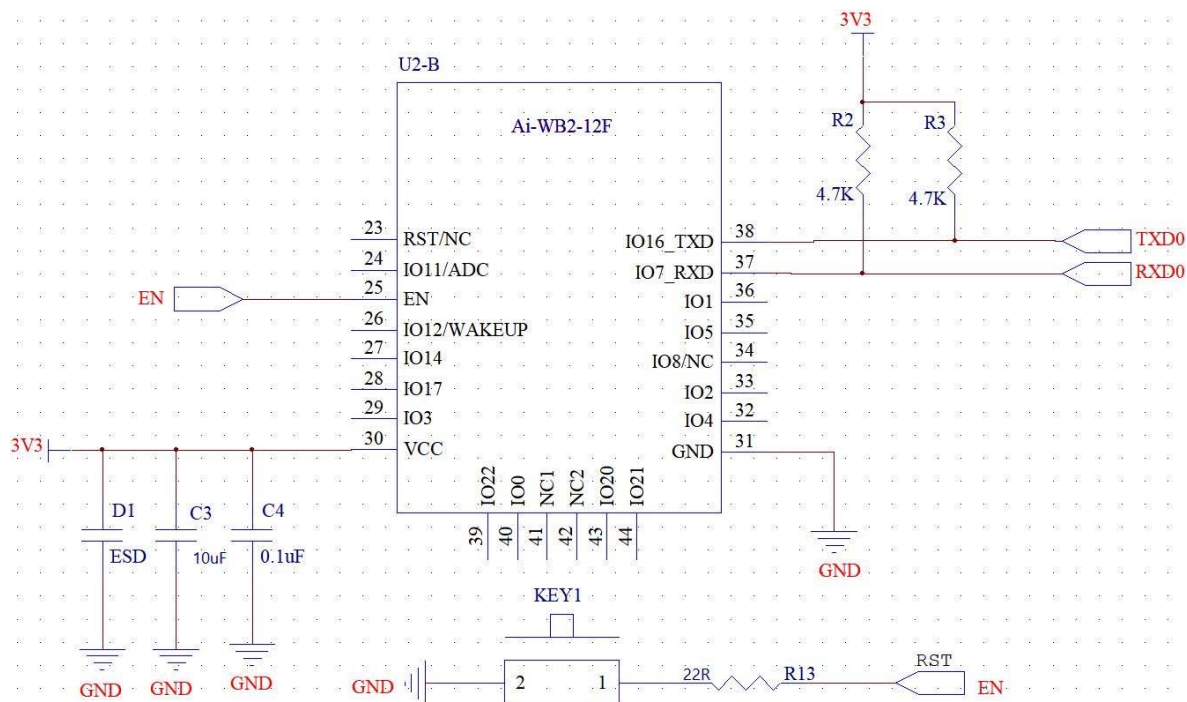


Fig 11 Application Guidance Circuit

4.2. Recommended PCB package size

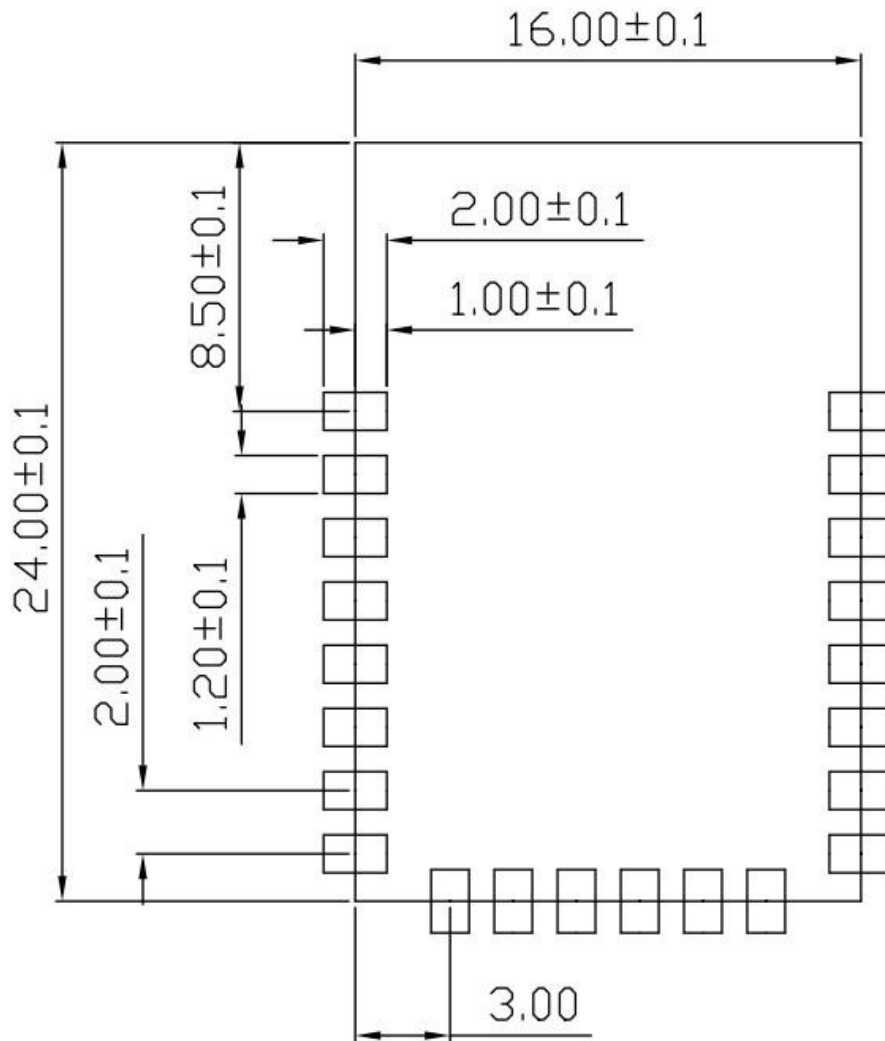


Figure 12 Recommended PCB package size

4.3. Antenna layout requirements

- In the installation position on the motherboard, the following two methods are recommended:

Scheme 1: Place the module on the edge of the motherboard, and the antenna area extends out of the edge of the motherboard.

Scheme 2: Put the module on the edge of the motherboard, and the edge of the motherboard hollows out an area at the antenna position.

- In order to meet the performance of onboard antenna, it is forbidden to place metal parts around the antenna, away from high-frequency devices.

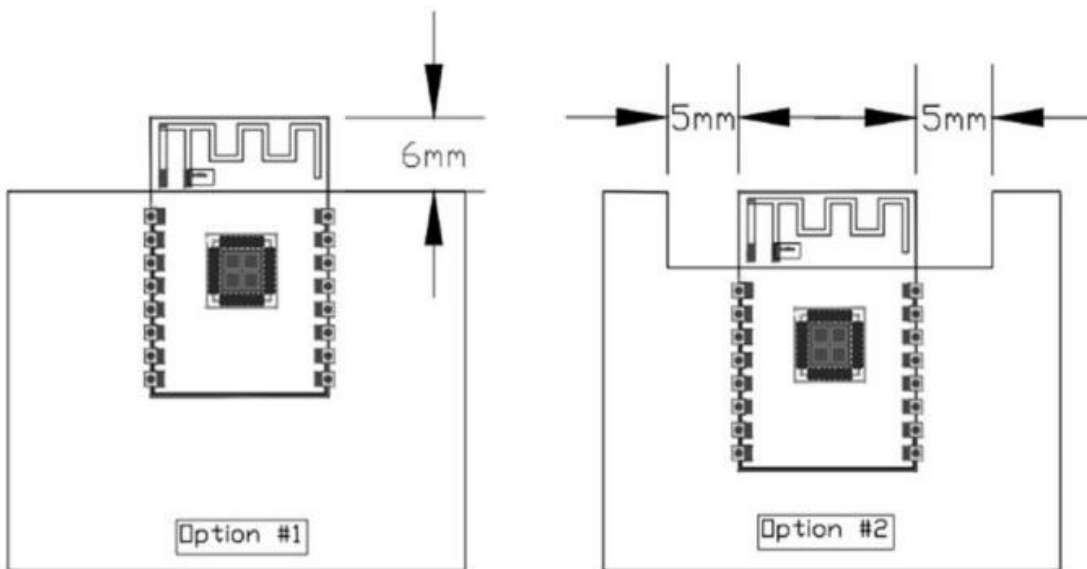
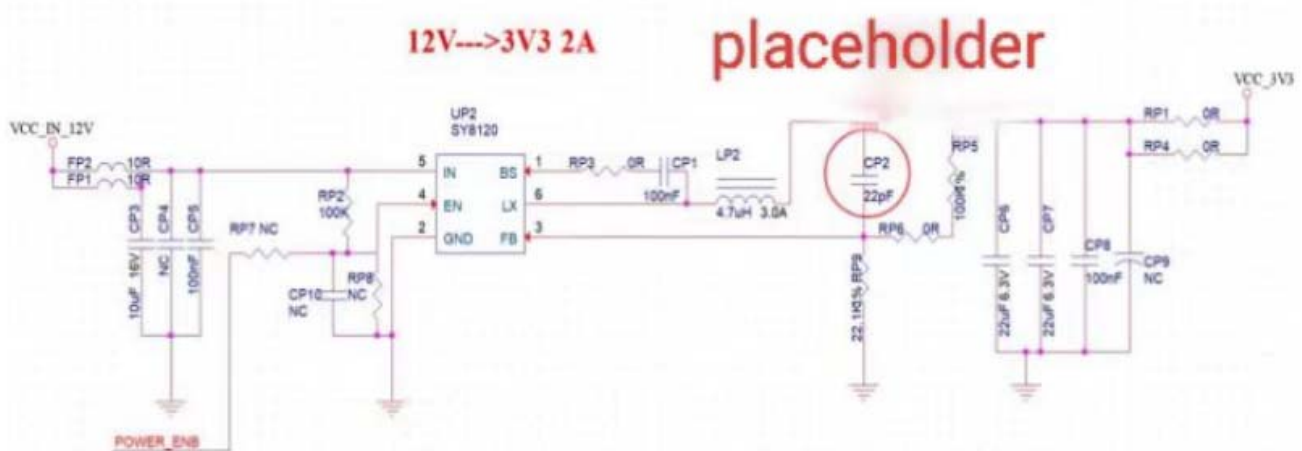


Fig. 13 Schematic diagram of antenna layout

4.4. supply electricity

- Recommended voltage is 3.3V, and peak current is above 500mA.
- It is recommended to use LDO for power supply; If DC-DC is used, it is recommended to control the ripple within 30mV.
- DC-DC power supply circuit suggests to reserve the position of dynamic response capacitor, which can optimize the output ripple when the load changes greatly.
- It is suggested to add ESD devices to the 3.3V power interface.

Fig. 14 DC-DC step-down circuit diagram



5. Storage condition

Products sealed in moisture-proof bags should be stored in non-condensing atmospheric environment of $< 40^{\circ}\text{C}/90\%\text{RH}$. The moisture sensitivity level MSL of the module is level 3.

After the vacuum bag is unpacked, it must be used within 168 hours at $25^{\circ}\text{C}/60\%\text{RH}$, otherwise it will need to be baked before it can be put on the line again.

2.2 List of applicable FCC rules

FCC Part 15.247

2.6 RF exposure considerations

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

2.8 Label and compliance information

Remind end customers to FCC ID label on the final system must be labeled with “Contains FCC ID: 2AVS6-LS-3201” or “Contains transmitter module FCC ID: 2AVS6-LS-3201”.

2.9 Information on test modes and additional testing requirements

Contact INNOVATION & PERFECT ENTERPRISES LIMITED will provide stand-alone modular transmitter test mode. Additional testing and certification may be necessary when multiple modules are used in a host.

2.10 Additional testing, Part 15 Subpart B disclaimer

To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier’s Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, INNOVATION & PERFECT ENTERPRISES LIMITED shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

This module certified that complies with RF exposure requirement under mobile or fixed condition, this module is to be installed only in mobile or fixed applications. A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Warning

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.

NOTE 1: This product 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 product 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 product 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.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE 3: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

NOTE 4: The module may be operated only with the antenna with which it is authorized. Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator.

NOTE 5: For all products market in US, OEM has to limit the operation channels to CH1 to CH11 for 802.11b/g/n-HT20 by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.