INGICS TECHNOLOGY

Guide
Ver.2

BLE_WiFi Gateway iGS01 User Guide

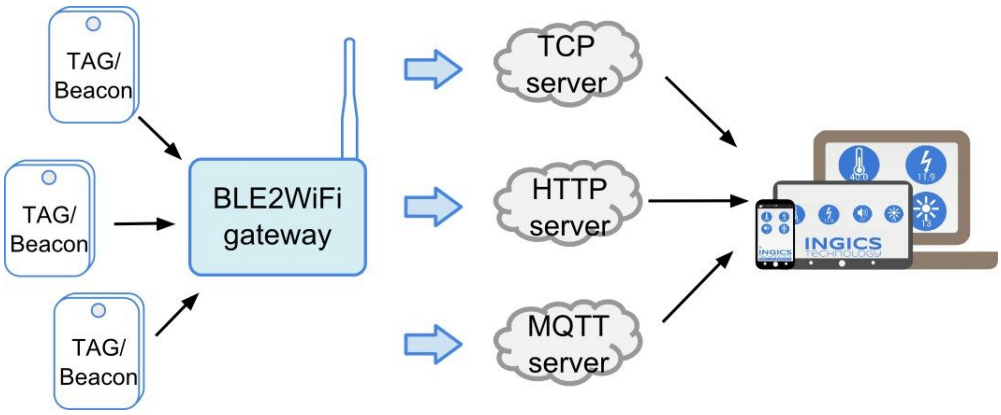
iGS01 is a bridge to connect the local BLE devices, sensors, or beacons to the internet by the WiFi. Through an easy web UI interface, one can configure the internet connection to a general cloud server, like TCP, HTTP(S), or MQTT. Management through the cloud to the BLE devices becomes simple through iGS01. This guide is to help the user to figure out how to operate and configure the iGS01.

Contents

- Contents
- Overview
  - Inside the box
  - WiFi
  - BLE
- Input and Output
  - Multi-function button
    - WPS
    - Reset to Default
    - Firmware Upgrade
  - LEDs
- Create Connection
- Web User Interface
  - Wi-Fi
    - Simple AP
    - Station
  - Network
    - AP Client Setting
    - AP Server Setting
  - Applications
    - M2M TCP Server
    - M2M TCP Client
    - HTTP Client
      - Request Interval
      - Throttle Control
    - MQTT Client
  - System
- Revision History

Overview

The iGS01 gateway reads beacons(like iBeacon or Eddystone), customized tags, or BLE sensors and sends the information to the local TCP server or internet HTTP or MQTT server. User can configure the transmit period and server information through a simple web UI. Below is the typical application diagram of iGS01.



Inside the box

Inside the Box, there are one iGS01 unit, one 1M USB cable, and one 2dBi dipole antenna. iGS01 is powered by a standard micro-USB cable, rated at 5V&500mA. You can power this device with a standard smartphone charger or the USB port of any host device that can support 500mA or above.

WiFi

For WiFi connection, it provides two modes -- Access Point mode(AP mode) and Station mode. In AP mode, it acts as a simple AP supporting DHCP. The main purpose of this mode is for configuration. In Station mode, it is a client device keeps trying to join to the AP in your home or office. After joining the AP, the gateway can bridge your BLE devices to the local TCP server of cloud server for management.

BLE

BLE is normally in listening mode. It collects the messages advertised by other BLE devices. These messages are then transferred to WiFi and sent to the cloud server configured by the user. The packet format sent to the cloud server is in below form

$<report type>,<tag id>,<gateway id>,<rssi>,<raw packet content>\r\n

examples:

```
$GPRP,CCB97E7361A4,CB412F0C8EDC,-49,1309696773206D6573682023322028544553542902010 6
$GPRP,E5A706E3923A,CB412F0C8EDC,-87,0201041AFF5900021501122334455667788 99AABBCCDDEEFF0000100C3BB
```

<report type>	Reserved for future tag/beacon type. Currently only GPRP(general purpose report) is defined.
<tag id>	MAC address or ID of tag/beacon
<gateway id>	MAC address of gateway's BLE
<rssi>	RSSI of tag/beacon
<raw packet content>	Raw packet received by the gateway

Input and Output

Multi-function button

One multi-function button is located under the iGS01 body as the figure showed.

It is used to act WPS, reset to default settings, and OTA (over-the-air FW upgrade). Below is how it

functions.

Function	Mode	Trigger Condition
WPS	Station	short press for over 1sec and release
Reset to default settings	Any	long press for over 5 sec
OTA	Boot up	press then power on, keep pressing till LEDs flash

WPS

When iGS01 is in Station mode, you may use WPS to connect it to your Access Point. First press the WPS button on your Access Point, when it ready, then press the WPS button on the iGS01 device(the WPS button need to be pressed for over 1 sec) to join it.

Reset to Default

In case you need to go back to the original settings, keep pressing the reset/default button in your device for over 5 secs no matter in which mode the device is. The WiFi LED will be turned off and when you release the button, the iGS01 will reboot to its default settings(AP mode).

Firmware Upgrade

Check *AP002_iGS01_Firmware_Upgrade* for details.

LEDs

There are two LEDs to indicate current status like the right figure. The upper one is BLE LED and the lower one is WiFi LED. Below is their behaviors,

	On	Flash
BLE LED	find tag/beacon in range	BLE transmission happening
WiFi LED	AP mode: AP is ready for connect Station mode: connect to assigned AP successfully	WiFi transmission happening

Create Connection

iGS01 is in Access Point(AP) mode defaultly. If you have no idea what mode currently it is in, please press the multi-function button to reset it to the default state. In AP mode, you could scan and connect it with the WiFi of your NB/PC/Mac/Tablet/Smartphone. It's name is just like above figure with part of the mac address. The default key to connect with it is "**12345678**". You can change it later when you get into the web UI.

After connection, enter IP address **192.168.10.1** in your broswer. The default account/password are both "**admin**". You can change the password later. In web UI, any change need to be saved first. After all changes made, click reboot to make the changes effective. When In Station mode, the IP address of the iGS01 is assigned by the the other AP. To get into the web UI, you have to find the assigned IP address. The following sections describe details of the web UI.

Web User Interface

Wi-Fi

iGS01 can work in Simple AP mode and Station mode. These modes and the related settings can be managed in this page.

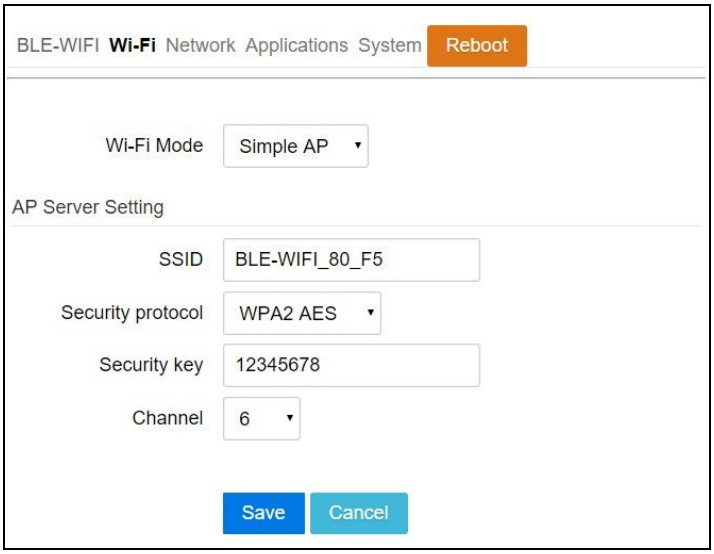
Simple AP

SSID: The default name is BLE-WiFi plus the last digits of the mac address. It's configurable by user.

Security Protocol: Open, WPA TKIP, WPA AES, WPA2 TKIP, WPA2 AES are supported. WPA2 AES is recommended.

Security Key: 8-63 characters can be input

Channel: 1~11(ch12 and ch13 could be supported by request)



Station

Scan: Click it to scan available APs.

Site Survey: The scan result is listed here and user can choose the correct AP from the list. The WiFi channel of the AP is also listed.

SSID: No manual input required. It is automatically filled once user choose an AP from the scan list.

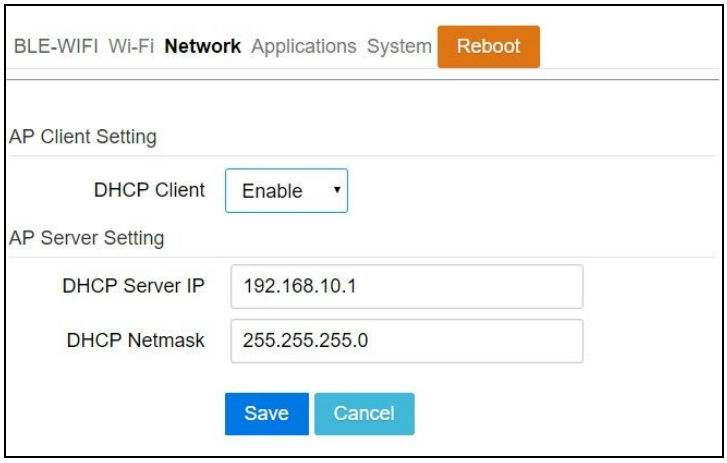
Security Protocol: Basically it is automatically detected and selected after choosing an AP from the scan list. But in case the AP setting is in WEP open or WEP shared, user has to confirm it by himself.

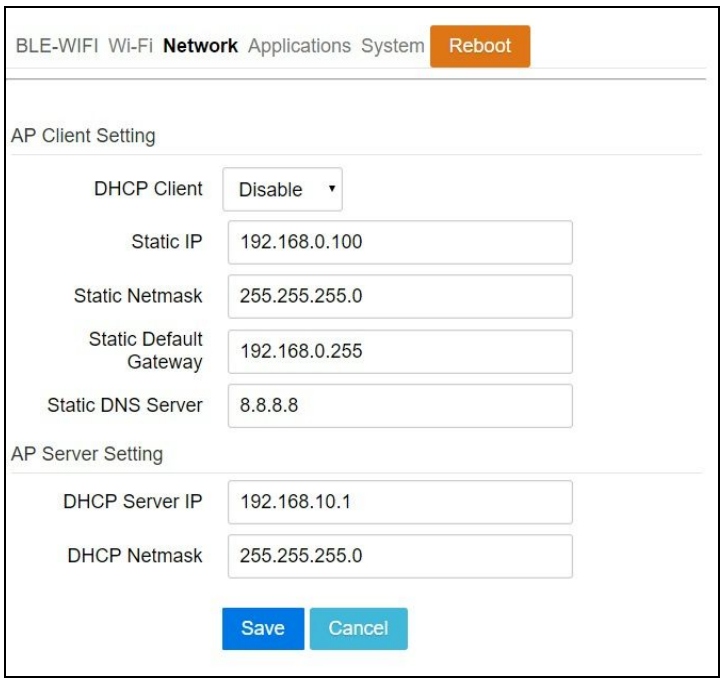
Security Key: Type the one assigned in your AP.

Network

AP Client Setting

This setting is mainly for Station mode. Normally DHCP client is enabled to join a WiFi AP w/ DHCP. If one wants to manually assign an IP address for iGS01, the DHCP client should be disabled. Once disabled, user should assign the IP, Netmask, Gateway, and/or DNS server.

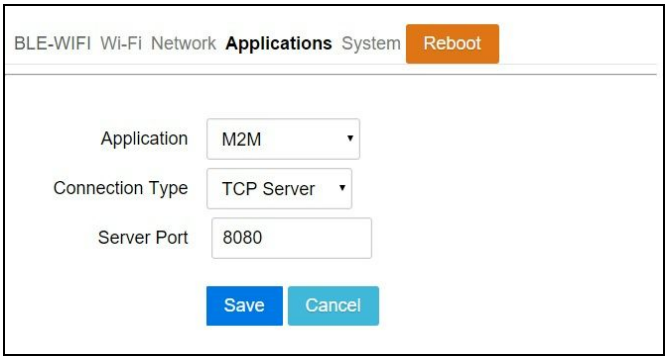




AP Server Setting

This setting is for AP mode. The default IP address of iGS01 in AP mode is

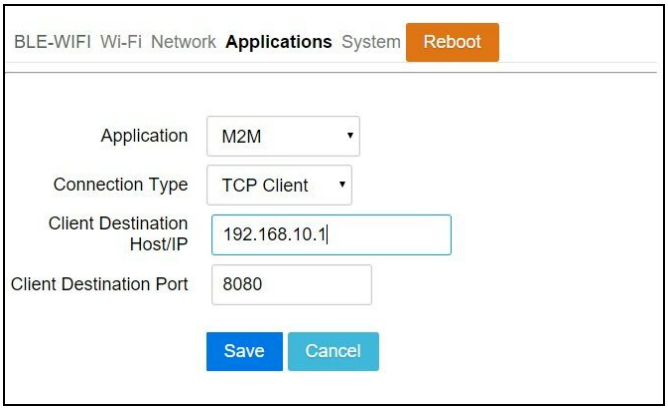
192.168.10.1 and the netmask is 255.255.255.. In case the user want to change the IP address in AP mode, just set the IP and Netmask here. The corresponding DHCP client address will be changed too. For example, if the DHCP server IP address is changed to 192.168.0.1., the DHCP clients associated to iGS01 AP will be 192.18.0.X.



Applications

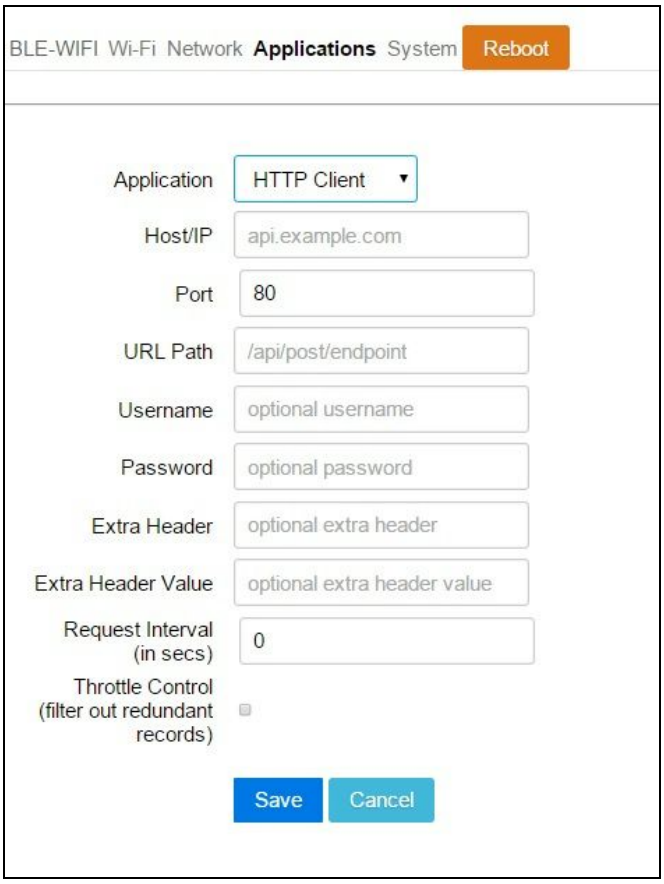
M2M TCP Server

iGS01 is a TCP server with fixed IP address 192.168.10.1. The default port is 8080 and user can also assign the port.



M2M TCP Client

If there is already a TCP server, one can set iGS01 as a TCP client to communicate with the server. Enter the address and port number of the TCP server to connect them.



HTTP Client

Another connection in application is through setting iGS01 as a HTTP client. In this scenario, one has to assign the HTTP host address and port number. Also the url path is necessary to bring the BLE data to the HTTP server through the gateway. Some HTTP servers may need username and password. The others may need extra header and value.

Request Interval

One can also assign the request interval to

upload the data to the HTTP server. This is useful and it can reduce the HTTP connections. When the interval is set as 0, the data will be sent immediately.When it is set as a non-zero value in second, the data will be sent whenever the buffer is full or the time interval is reached.

Throttle Control

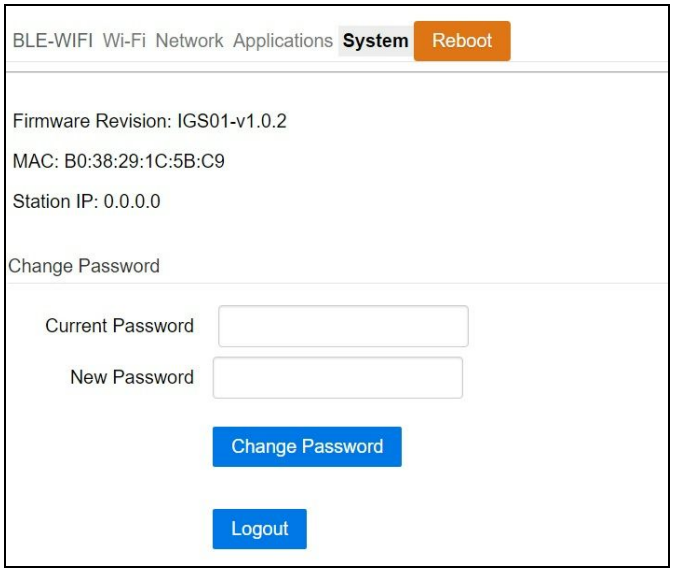
If user select to enable throttle control, iGS01 will keep the last record for each TAG/Beacon ID in the given interval(request interval). In this way, one can reduce the upload connections to the HTTP server.

MQTT Client

MQTT server is supported by the iGS01. In this scenario, one has to assign the MQTT host address and port number. Also the publish topic need to be assigned. Client ID is defaultly assigned as the gateway name with part of MAC address, user can change it as well. If Client ID is not set, system will generate a random number for it. Username and password are optional.

System

Firmware and device information, including MAC address and IP address in station mode are shown here. The web UI password can also be changed here(the username is fixed as “admin”).



Revision History

DATE	REVISION	CHANGES
Oct 7, 2015	1	Initial release
Oct 15, 2015	1a	Modify the HTTP client wording and add Request Interval setting
Nov 28, 2015	2	1. Update the photo of gateway in on cover page 2. Rename BLE2WiFi to iGS01 3. Update the overview chapter and add a “Inside the Box” sections. 4. Modify wording and add figure in LED section. The LED position is changed. 5. Update the HTTP client section in chapter Applications. 6. Update the AP Server Setting section in chapter Network

Specification
Ver.1

iGS01 Specification

BLE(Bluetooth Smart) to WiFi Gateway

iGS01 is a BLE to WiFi gateway and bridge. The gateway reads iBeacon and Eddystone like beacon or customized Tag(w/ sensor) format and sends to local TCP server or internet HTTP/MQTT server. User can configure the transmit period and server information through a simple web UI.

Features

- Size: 54mmx41mmx18mm(not including antenna)
- Input: 5V, 500mA, micro-USB
- Operating temperature: -20'C to 60'C
- Low power consumption, 80mA typical working current
- Over-The-Air software upgrade
- Reads multiple BLE devices in the same time
- Support TCP/HTTP/MQTT server

BLE

- Bluetooth Smart(BLE) is based on INGICS nBLE822
- Bluetooth with on board PCB antenna
- Bi-direction: Reads message advertised from BLE devices and/or advertise command to BLE devices(not standard, by request)
- 30M range in open space

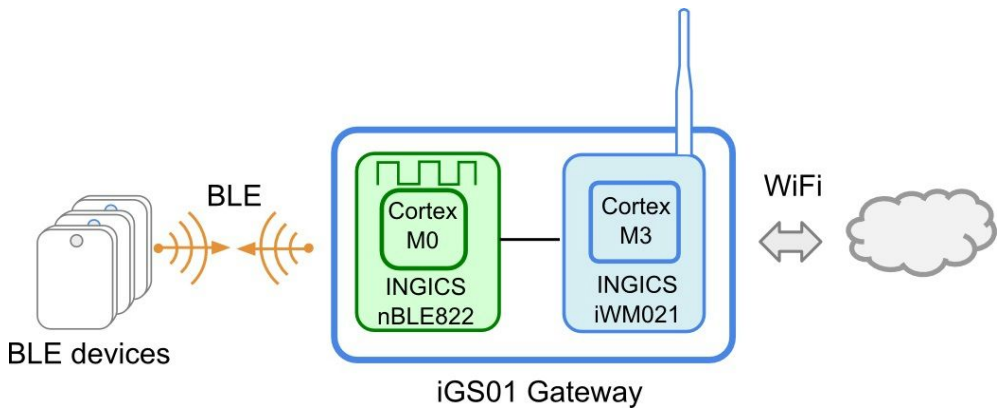
WiFi

- WiFi is based on INGICS iWM021
- Support 802.11b/g/n(single stream)
- 2.4GHz frequency band
- Transmit power:
  - +17dBm @802.11b
  - +13dBm @802.11g
  - +11dBm @802.11n
- WiFi data rate up to 72.2Mbps
- WiFi with 2dBi dipole Antenna
- Web based UI for configuration
- Connect to Cloud server or local server
- 100M range in open space

Applications

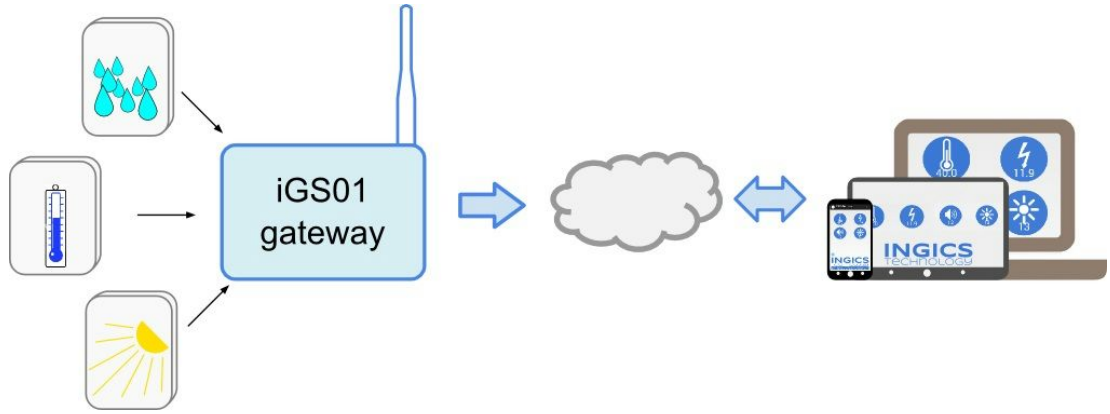
- iBeacon/Eddystone/tag receiver for location tracking
- BLE sensor reader for sensor network
- Building automation
- Health and wellness monitoring
- Cycling, biking
- Security
- Location tracking
- Access management
- Advertisement
- Industrial automation

Block Diagram

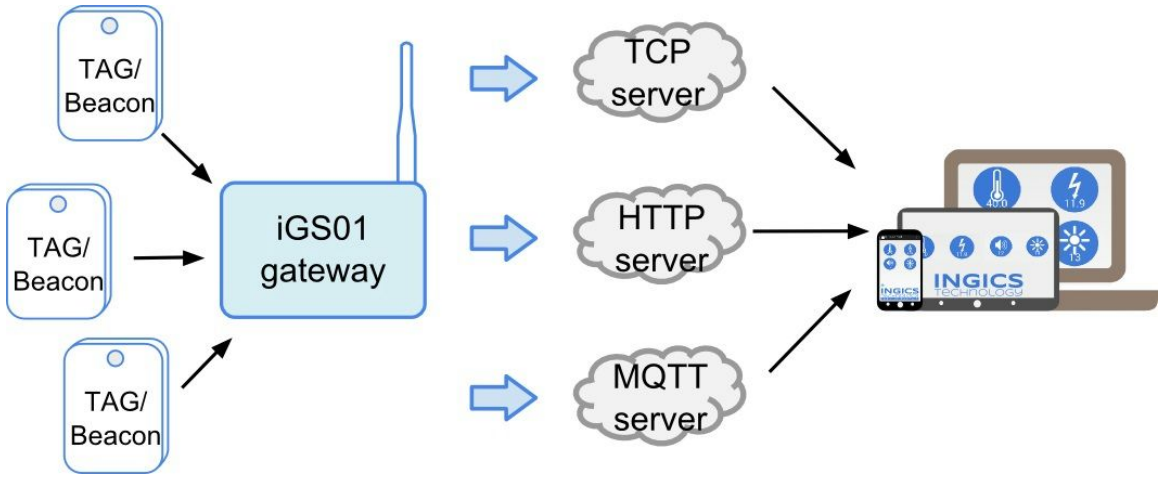


Typical Applications

1. Collecting BLE sensor data and sending to cloud server



2. Location Tracking with different kinds of server in the internet or cloud



Specification

Absolute Maximum Rating

Supply Power	Max. +5.5 Volt
Storage Temperature	-40° to 85° Celsius
Voltage Ripple	+-2%

Recommendable Operation Condition

Operating Temperature	-20° to 45° Celsius
Humidity	Max 95%, Non condensing, relative humidity
VDD	+5 Volt +- 5%

Current Consumption

Working mode (reading BLE and send to server)	Max.: 436 mA Average: 83 mA

WiFi RF Specification

Wireless	IEEE 802.11b/g/n(single stream)
Network modes	infrastructure, Ad-Hoc
Data rate	IEEE 802.11b, 1-11Mbps IEEE 802.11g, 6-54Mbps IEEE 802.11n(2.4GHz), 7.2-72.2 Mbps
Frequency band	2.400 – 2.484 GHz
Number of selectable Sub channels	14 channels
Channel Bandwidth	20MHz
Modulation	OFDM, DSSS (Direct Sequence Spread Spectrum), DBPSK, DQPSK, CCK , 16QAM, 64QAM
Maximum receive input level	- 10dBm (with PER < 8%@11 Mbps) - 20dBm (with PER < 10%@54 Mbps) - 20dBm (with PER < 10%@MCS7)
Minimum receive input level	- 87dBm (typ. with PER < 8%@11 Mbps) - 70dBm (typ. with PER < 10%@54 Mbps) - 70dBm (typ. with PER < 10%@MCS7)
Transmit Power	17dBm (typical)@ 802.11b 13dBm (typical)@ 802.11g 11dBm (typical)@ 802.11n
Carrier Frequency Accuracy	+/- 20ppm (crystal: 26MHz +/-10ppm in 25°C)
Antenna	2dBi dipole antenna
Range	up to 100M meters(in open area)
Security	WPA/WPA2

BLE RF Specification

Transmit Power	Max.: 4dBm
RF Power Accuracy	+- 4 dB
Receiver Sensibility	-96 dBm @250kbps, 0.1% BER -90 dBm @1Mbps, 0.1 %BER
Maximum Received Signal Strength at <0.1% PER	0dBm
Frequency Deviation	+-250 kHz @BLE
Antenna	on board PCB antenna
Range	30M in open space

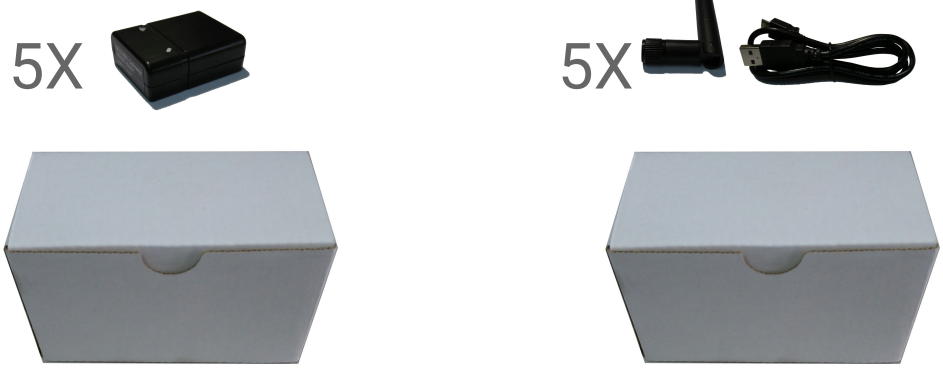
Dimension

Dimensions L x W x H (mm)	54 x 41 x 18 (not including dipole antenna)

Packing

Each iGS01 has it's accessory including a dipole antenna and micro-USB cable.

Two packing boxes(size: 11cmX5.5cmx6.5cm) contains 5 units of iGS01 and accessories.



Revision History

DATE	REVISION	CHANGES
Feb 3, 2016	1	Initial release

Federal Communication Commission Interference Statement

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 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.

FCC Caution: To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example - use only shielded interface cables when connecting to computer or peripheral devices).

FCC Radiation 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.

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

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

Industry Canada Statement

This device complies with Industry Canada licence-exempt RSS standard. 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.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limit set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Cet équipement est conforme aux CNR-102 d'Industrie Canada. Cet équipement doit êtreinstallé et utilisé avec une distance minimale de 20 centimètres entre le radiateur et votrecorps. Cet émetteur ne doit pas être co-localisées ou opérant en conjonction avec autreantenne ou émetteur. Les antennes utilisées pour cet émetteur doivent être installés etfournir une distance de séparation d'au moins 20 centimètre de toute personne et doit pas être co-située ni fonctionner en conjonction avec une autre antenne ou émetteur.

NCC 警語

第十二條

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信法規定作業之無線電通信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。