GTWXXXXX
Gateway Module

IoTaaP GTW series of gateways provides unseen connectivity in small package. Depending on the model, this gateway can support multiple protocols such as Modbus, CAN, I^{2}C and serial over RS485. Device can be powered by using standard power port or through the front connector, which gives the possibility to connect the module to OBD-II port or standard industrial equipment such as PLC by using only one cable/adapter. With microSD card support this gateway can act as offline data logger or IoT gateway with local data backup. With up to 1A power output at 5V, this gateway can directly power low voltage sensors and equipment. Standard IoTaaP Debug port enables an end user to easily configure or troubleshoot the device. With IoTaaP OS running in the background it provides you with the features like IoTaaP Web Configurator, OTA updates, remote logs and more.

Contents

Safety guidelines

This datasheet contains notices which you should observe to ensure your safety, as well to protect your environment, this product and connected equipment. **Please read the following safety warnings before proceeding:**

- This device may only be used for the application described in the official documentation and technical description. This device is intended to be used with IoTaaP modules and with third party modules only by following the safety guidelines.
- This product can only function correctly and safely if it is stored, transported, installed and operated correctly and per documentation.
- This product should be maintained only as recommended in documentation.
- Only qualified personnel should be allowed to install and work on this equipment and by following established safety practices and standards.
- If life threatening voltages are used, applicable protective equipment should be used.
- Do not allow contact of metallic objects with open electronic connectors.
- Never put the device in any liquid.
- Keep the device within the specified range of temperatures and environmental conditions.
- Do not connect or power the device with damaged cables or batteries.
- Place the device in a place only accessible to maintenance personnel.
- Keep children away from the device.
- If there is an electrical failure disconnect the main switch immediately as well as all other power supplies that are being used.
- If a battery is used, please ensure the safety of the battery and its internal management electronics.

Copyright

Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Nevertheless, discrepancies cannot be ruled out, and we therefore cannot guarantee full correspondence. However, the data in this manual is reviewed regularly and any necessary corrections included in subsequent editions.

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Specification

For both industrial and consumer usage, this gateway enables any device to go online in minutes. Please read all features and specifications before using the device.

Electrical

Input voltage	12V – 24V DC
Power consumption	< 4W
Output PSU	5V 1A & 3.3V 300mA
I^2C max voltage	3.3V (internally pulled up)
RS485 voltage range	-7V to 12V
CAN voltage range	-4V to 16V

Mechanical

Dimensions (W x H x D)	64.50 x 38.50 x 130.00 mm
Weight	320g
Casing material	Aluminum housing
Operating temperature	-20°C to 60°C
Mounting	Flat surfaces, distribution boxes

System characteristics

CPU	Xtensa® dual-core 32-bit LX6, 240 MHz
Flash	16MB
SD card type	microSD
SD card capacity	32GB

Wireless

WiFi frequency range	2412 MHz ~ 2472 MHz (region dependent)
Wireless mode	IEEE 802.11b/g/n, Access Point (AP), Station (STA)
WiFi security	WPA2-Enterprise - PEAP, WPA2-PSK
SSID	Auto generated based on MAC
Wireless hotspot	Web configurator server

Communication

Network protocols	TCP, UDP, DNS, HTTP, HTTPS, MQTT
MQTT QoS	0,1,2
MQTT latency	0.0028s
MQTT version	3.1.1
Local protocols	Modbus, CAN, I2C, serial over RS485
Debug serial port speed	9600 – 115200 bps
CAN speed	1 Mbit/s
RS485 speed	9600 – 115200 bps
I^{2}C speed	100kbit/s and 400kbit/s

Miscellaneous

I/O	RS485, CAN, I^{2}C
Buttons	Configuration & Reset buttons
Indicators	Power and Status LED's
Antenna	1 x SMA for Wi-Fi
Clock sync	Automatic IoTaaP Heartbeat sync
Data backup	Yes, if microSD card is installed
System logs	Yes, if microSD card is installed
Updates	Secured OTA Updates (HTTPS)
Web configurator	IoTaaP OS web configurator
Logs access	Debug port or via MQTT

Debug port functions	Configuration, logs, debugging, firmware upgrade, development
IoT cloud platforms	IoTaaP Cloud preferred; 3rd party platforms supported
Firmware customization	IoTaaP OS, Native firmware
Development tools	PlatformIO, IoTaaP SDK

Applications

- IoT Gateway
- Smart Appliances
- Intelligent Control Systems
- Data collection
- Data processing, Automation
- Energy management
- Facility management

Block diagram

IoTaaP GTWXXXXX module consists of five different building blocks in order to ensure highest performance and modularity. Integrated PSU (Power Supply Unit) ensures stable power for all crucial components, as well as external equipment. Main SoC that runs IoTaaP OS takes care about the data, connectivity and security. Optional SD card provides the possibility of local data logging and backup. With SD card system operational logs will be available to the user through multiple channels. Depending on the version of the module it comes with RS485 transceiver, CAN transceiver or only with I^2C interface support. GTWXXXXX modules can be powered via standard 4 pin power port, or through the front connector.
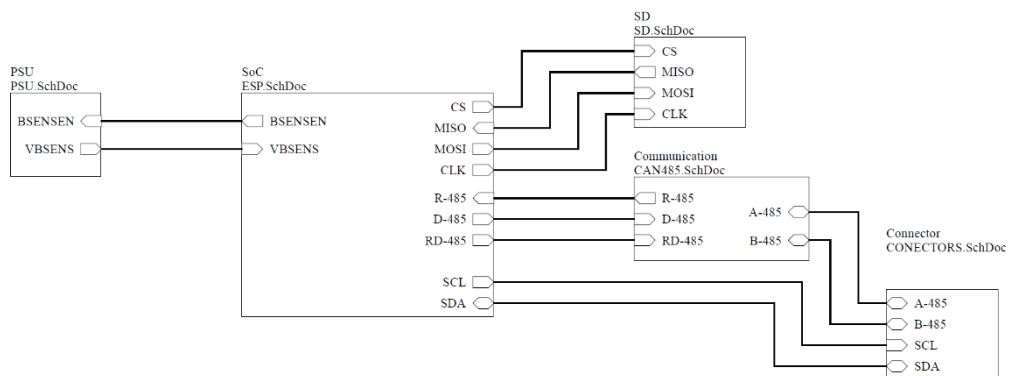

Figure 1 – Gateway module block diagram

Front connector pinout

GTWXXXXX module provides one D-SUB 9 pin connector on the front side. Male type connector can be used with standard female cable or with various D-SUB to Terminal adapters.
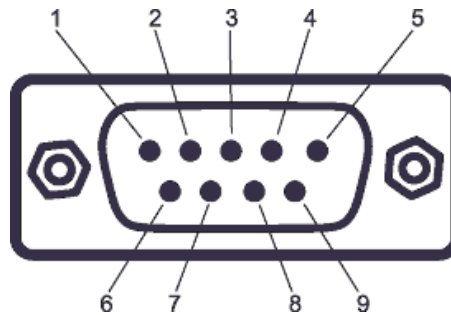

Figure 2 - GTW module pinout

Pin	Function	Note
1	A (485), CANH (CAN)	N/A on I^2C version
2	B (485), CANL (CAN)	N/A on I^2C version
3	SCL	5V tolerant
4	SDA	5V tolerant
5	5V output	1A max.
6	3.3V output	300mA max.
7	GND	-
8	VIN[1]	12V – 24V
9	GND	-

Table 1 - Front connector pinout

[1] VIN is internally connected with VIN pin of the power connector

Power connector

All IoTaaP Modules are using unified power connector to ensure compatibility with dedicated power supply and power splitting systems under IoTaaP Modules family.
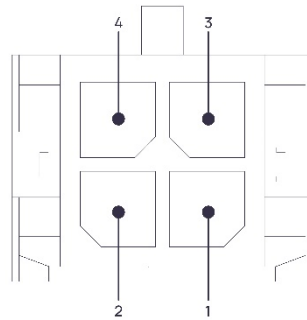

Figure 3 - IoTaaP Power connector

Pin	Function	Note
1	VIN	12V – 24V
2	VIN	12V – 24V
3	VBAT	12V – 24V
4	GND	-

Table 2 - Power connector pinout

Power connector with reverse polarity and accidental unplug protection ensures safe operation in rough conditions. Internally, system provides IEC 61000-4-2 level 4 ESD protection for ±15 kV. Absolute maximum ratings and special functions are described below:

VIN (Voltage input) - Minimum current provided by external PSU should not be less than 1500mA for normal operation. Maximum voltage should not exceed 24V, and minimum voltage should not be less than 12V.

VBAT (Battery voltage) – This pin is used **only** for monitoring PSU backup battery status. Since backup battery is optional feature, this pin should be connected to GND if not used. On official IoTaaP external PSU modules this pin will be internally grounded or routed for battery sensing. In case of using 3rd party PSU this pin should be connected to GND.

Front panel

Simple front panel of this gateway module simplifies its usage. Same D-SUB 9 pin connector is available on all module versions (CAN, RS485, I^{2}C) which gives you the possibility to easily exchange modules and enable different connectivity options. Easy accessible microSD card slot provides the possibility of switching microSD cards and reading logging data on PC or other equipment without disconnecting or opening the device.
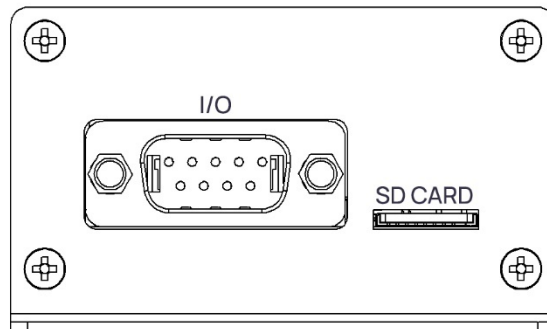

Figure 4 - Front panel

On all gateway modules fron panel consists of the D-SUB 9 pin I/O connector and microSD card slot (SD card is not included).

Standard back panel

Standardized IoTaaP Modules back panel consists of 4 pin power connector, SMA WiFi antenna connector, RJ11 debug connector, **ON** and **STAT** LED's, **RST** and **CFG** buttons.
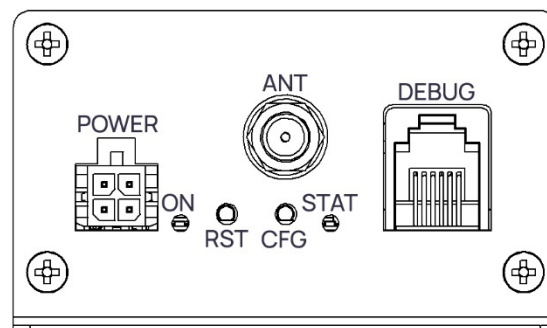

Figure 5 - Back panel

Although IoTaaP Modules can be used with 3rd party accessories it is recommended to use official accessories to ensure maximum safety and performance. All connector, indicator and button functions are described below:

Power – four pin connector with reverse polarity and accidental unplug protection that is directly compatible with external IoTaaP power supplies and accessories.

ON – indicator that shows if device internal PSU is operational, it should turn on if proper power supply is connected and enabled.

STAT – indicator that shows current status of the device, it is controller exclusively by IoTaaP OS. Operation is described in the *Status indicator* section.

ANT – SMA connector for WiFi antenna.

DEBUG – standard debug port of IoTaaP Modules, to be used with IoTaaP Debug dongle.

RST – reset button. Button is used to reboot the device.

CFG – configuration button. Button is used to start device configuration mode.

Debug port

IoTaaP Modules use unified debug port. Debug port is 6pin RJ11 connector that can be used directly with IoTaaP Debug Dongle. Debug port can be used for device configuration, reading system logs or troubleshooting. In special cases debug port can be used for direct firmware upgrade, although OTA upgrades are prefered.
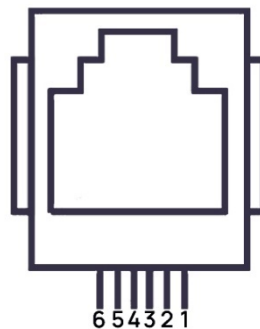

Figure 6 - Debug port pinout

Debug port pinout is provided below:

Pin	Function	Note
1	ENABLE	Reset/Enable SoC
2	BOOT Mode	Select boot mode
3	RX	UART data receive
4	TX	UART data transmit
5	OK	Debug port operational
6	GND	-

Table 3 - Debug port pinout

All debug port pins are 3.3V tolerant, any higher voltage level will damage the device. Some special functions are available on this port, as described below:

ENABLE – putting this pin low for short amount of time will reset the device, if pin is floating device is operational.

BOOT Mode – putting this pin low or high during boot can put device in bootloader mode which is used during manual firmware upgrade.

OK – this pin provides 3.3V if device is succesfully powered by the external power supply. It is used with IoTaaP Debug Dongle to indicate successfull connection between devices.

Status indicator

Status indicator (STAT LED) is directly controlled an operated by IoTaaP OS. Depending on the current device state, indicator will blink differently, so you can easily determine what is happening with your device.

FAST blinking – indicates that device is trying to connect to the access point or MQTT server, this usually happens after powering on, and it lasts about 3-5 seconds. Fast blinking can occure if connection is broken or unavailable at the particular moment.

Really FAST blinking – indicates configuration mode if CFG button is pressed for a longer period, and web configurator is active. This mode is automatically activated when device is powered on for the first time. Fast blinking also occures if OTA update is in progress.

PERIODIC blinking – indicates normal operation, LED will flash every 10 seconds

Hardware installation

IoTaaP GTW modules come in aluminum enclosure with flanged fixtures. Devices should be mounted on a flat surface with four M4 screws. IoTaaP modules also support mounting od DIN rail by using adapters.

Please note that you have to ensure at least 10mm of empty space on the left and right side of the device. If standard WiFi antenna is used (provided in the box) then you have to ensure enough space for the antenna. External connector wires hould not be bended or pressed against any surface.

microSD card can be installed by plugging in (there is no push/pull mechanism), and only while device is powered off. If microSD card is installed or removed while device is oprational, data can be corrupted and microSD card can be damaged.

Device can be mounted in both vertical or horizontal position, user only has to make sure that the antenna is positioned stright up to ensure the best WiFi performance.

D-SUB 9 pin cable should be plugged in gently and secured with two bolts to prevent unplugging. Four pin power connector should be plugged in gently until it produces „click" sound which means that it is securely connected.
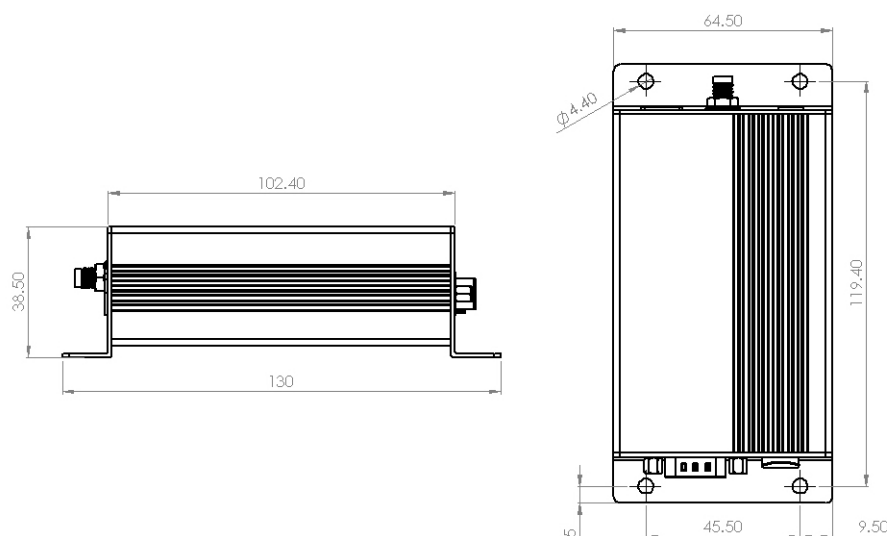

Figure 7 - Module dimensions

Device configuration

Device can be configured by using IoTaaP Debug dongle or by using IoTaaP Web Configurator. Both features are native IoTaaP OS functionalities and detailed procedure is described in IoTaaP OS manual.

Product codes

One standardized module depending on internal configuration can support different features, please refer to the table below for specific product codes.

GTW	XXX	XX	Description
GTW	485	50	Gateway with RS485 and I^{2}C with 5.0V 1A and 3.3V 300mA PSU output
GTW	485	33	Gateway with RS485 and I^{2}C with only 3.3V 300mA PSU output
GTW	CAN	50	Gateway with CAN and I^{2}C with 5.0V 1A and 3.3V 300mA PSU output
GTW	CAN	33	Gateway with CAN and I^{2}C with only 3.3V 300mA PSU output
GTW	I2C	50	Gateway with I^{2}C with 5.0V 1A and 3.3V 300mA PSU output
GTW	I2C	33	Gateway with I^{2}C with only 3.3V 300mA PSU output

Table 4 - Product codes

Please note that I^{2}C pins on all modules are only 3.3V tolerant (internally pulled up to 3.3V). Strapping pins externally to higher voltages will damage the device.

IoTaaP OS

All IoTaaP modules are powered by unique system built for ESP32 SoC which provides all features to successfully connect any system to the internet. Together with IoTaaP Cloud it makes and unseen solution for IoT management, OTA upgrades, data excange, development and automation.

IoTaaP OS is fully open sourced and community supported software distributed under *Apache License 2.0.*

Integrated features such as microSD card support, logging, remote log access, web and serial configurators and other IoT related functionalities are giving the endless connectivity possibilities to the end user. IoTaaP OS documentation is available online: docs.iotaap.io.

Specific IoTaaP modules firmware can be built on top of IoTaaP OS to ensure modularity and compatibility with API and cloud features.

Device customization

All IoTaaP modules support customization. If hardware customization is required you can reach our support team at this address: contact@iotaap.io. Hardware can be customized per your needs, or special solution can be developed for your particular case.

Firmware customization is possible for specific uscases, and you can reach our support team to discuss your needs. Special firmwares are available online and can be flashed to enable different features. Only official firmware is recommended, as 3rd party firmware can damage the device. If 3rd party firmware caused an issue with your device, it is not covered by warranty, only devices that are running official firmware are covered by warranty.

In case that device is used for development or educational purposes, hardware warranty is not applied, although you can reach us to describe your specific usecase.

Documentation changelog

V1.0

- Initial version of the document

V1.0
Aug 2021

Maintenance

- Take care with the handling of this device, do not drop it, bang it or move it sharply.
- Avoid putting the devices in areas of high temperatures since the electronic components may be damaged.
- The antennas are lightly threaded to the connector; do not force them as this could damage the connectors.
- Do not use any type of paint for the device, which may damage the functioning of the connections and enclosure.

Disposal and recycling

- When this device reaches its end of life at some point, it must be taken to a recycling point for electronic equipment.
- The equipment has to be disposed on a selective waste collection system, different form urban solid waste. Please, dispose it properly.
- Procedure is usually defined for specific country, so your local authorites should inform you about the most appropriate and environmentally friendly waste process for the used product and its packaging.