



WUM LORAWAN GATEWAY

WUM LoRa gateway is an optimal product for commercial deployment of LoRaWAN networks and implementation of IIoT solutions. This device is designed for use in residential, office, or industrial premises, while IP67 protection makes it suitable for outdoor installations as well. The gateway is equipped with LoRa, Wi-Fi, and LTE communication modules and has a built-in packet forwarder to the LoRaWAN server.

The gateway incorporates SX1302 - a new generation LoRa chip for LoRaWAN gateways, as well as two SX1250 chips that provide high sensitivity and data transmission efficiency in long-range communications. They ensure a reliable communication over long distances in various conditions, including high housing density or poorly covered areas, thus being able to connect to standard LoRa nodes within LoRaWAN networks and enable bidirectional communication between devices. This functionality is sufficient for construction of small or medium-sized radio networks. The gateway can be connected to a remote network application server via LTE wireless connection or Ethernet wired connection. Thanks to its wide visibility range of up to 15 km in open areas and up to 2 km in areas with high housing density, this gateway is an optimal solution for any LoRaWAN protocol scenario with Class A and Class C nodes.

CHARACTERISTICS

APPLICATION

Connecting nodes and devices that use LoRa, to Internet or LoRaWAN application servers.

It is used in various domains, such as Smart City, Smart Metering, Smart Waste Management, Environmental Monitoring, Smart Parking, Industrial IoT, or wherever long-range, low-power data transmission and extended coverage are required.

MAIN FEATURES

- LoRa gateways provide extended coverage and the ability to transmit data over long distances, covering large areas.
- Gateways can be configured and scaled according to the specific needs of the network.
- Interaction with a wide range of devices, including sensors, smart devices, industrial equipment, and more.
- Reliable data transmission and support for encryption and authentication mechanisms to ensure data transmission security.
- Integration with cloud platforms and LoRa application servers for data processing and analysis, providing scalability and easy network management.

COMMUNICATIONS

- Wireless LoRa technology applied for communication with LoRa using nodes, providing for long-range data transmission with low power consumption. It connects to the internet via LTE or PoE 18-57V and 802.3af, enabling gateway communication with cloud services and application servers.
- Data exchange with the LoRaWAN network ensuring node control and data transmission into Cloud or LoRa application servers.

MODIFICATIONS

The WUM LoRaWAN Gateway is available in two versions:

- The 220V power supply version, which uses only 4G/LTE for data transmission to the cloud or LoRa application servers.
- The PoE In version, which provides power supply to the device through twisted pair cables using PoE 5V and 802.3af standards. It also enables data transmission into Cloud or LoRa application servers.

FUNCTIONALITY

A LoRa gateway is a device used for communication between LoRa or LoRaWAN devices and the Internet. It intermediates data exchange between the nodes and the Cloud or other network systems, by receiving data from the nodes and ensuring data flows from the Cloud back to the nodes.

The functionality of a LoRa gateway includes:

- Receiving data packets from nodes using LoRa or LoRaWAN technology and sending them to the LoRa application server. It can also receive data and transmit it to the nodes through a wireless LoRa connection.
- Processing data using the LoRa or LoRaWAN protocol. It decodes and encrypts data packs, provides node identification and authentication, and controls frequencies and time parameters of the transmission.
- Performing data routing between nodes and application servers. It identifies the optimal rout for data transmission, based on signal strength and availability of network resources.
- Providing control and monitoring capabilities. It can be configured and controlled remotely, as well as provide information on network status, signal quality, and other operational parameters.
- Integrating with cloud services for data processing, storage, and analysis. This allows to create various applications and use the node data for other extended purposes.

DIMENSIONS

IP67 enclosure with brackets	
Dimensions	150 x 52 x 220 mm
Weight (incl. enclosure)	306 g

OPERATION CONDITIONS

Operational temperature	-30 .. +80 °C
Humidity	up to 92% with no condensation

POWER SUPPLY

Voltage	220V AC
Power consumption	3 W

ARCHITECTURE

MAIN MICROCHIP

The IIoT WUM controllers are based on the ESP32-WROOM-32UE microchips.



- 2.4 GHz Wi-Fi + Bluetooth ® + Bluetooth LE module
- Dualcore, 32-bit Xtensa® LX6. processor based on ESP32 SoC series
- 4/8/16 MB memory
- 26 GPIOs, wide range of peripherals

MAIN PROCESSOR AND MEMORY

- ESP32-D0WD-V3 or incorporated ESP32-D0WDR2-V3, Xtensa dualcore 32-bit LX6 processor, up to 240 MHz
- 448 KB ROM
- 520 KB SRAM
- 16 KB SRAM in RTC
- ESP32-D0WDR2-V3 ensuring 2 MB PSRAM

WI-FI

- WI-FI 802.11b/g/n
- Bitrate: 802.11n up to 150 Mbps
- A-MPDU and A-MSDU aggregation
- 0.4 μ s guard time
- Frequency range of the operating channel: 2412 ~ 2484 MHz

BLUETOOTH

- Bluetooth V4.2 BR/EDR and Bluetooth LE, Class-1, class-2 and class-3 transmitter
- AFH
- CVSD и SBC

PERIPHERALS

- SD card, UART, SPI, SDIO, I2C, LED PWM, Motor PWM, I2S, IR, pulse counter, GPIO, capacitive sensor, ADC, DAC, TWAI® (compatible with ISO 11898-1 standard, i.e., with the specification CAN 2.0)

INTEGRATED COMPONENTS

- 40 MHz quartz oscillator
- 4/8/16 MB SPI flash

ANTENNA OPTIONS

- ESP32-WROOM-32UE: external antenna via connector

OPERATING RANGE

- Supply voltage: 3.0 ~ 3.6 V
- Operating temperature
 - 85°C version: -40 ~ 85 °C
 - 105°C version: -40 ~ 105 °C

This version is supported only by modules with built-in 4/8MB flash memory.

CERTIFICATION

- Bluetooth certification: BQB
- CE certification: Certificate B22030317
- Chemical safety: REACH/RoHS

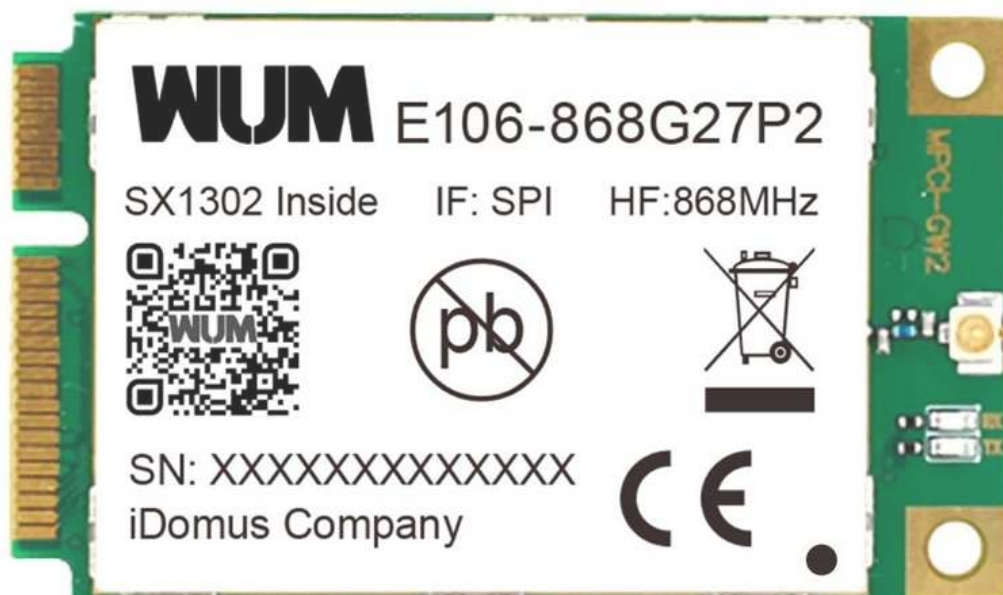
RELIABILITY TESTING

- HTOL/HTSL/uHAST/TCT/ESD

LORA COMMUNICATION

WUM E106-868G27P2 module is a LoRa gateway RF module designed based on the SX1302 chip. It adopts the standard Mini PCI-e package, SPI interface, the module has built-in PA and LNA, and the half-duplex design is convenient for users to quickly develop LoRa gateway equipment. SX1302 is a new generation LoRa gateway baseband chip launched by Semtech. It is equipped with front-end SX1250 and can support spreading factors SF5~SF12.

Compared with the previous generation SX1301 gateway solution, it can support higher-speed data communication, while the power consumption is greatly reduced, the design is simplified, and the performance is significantly improved.

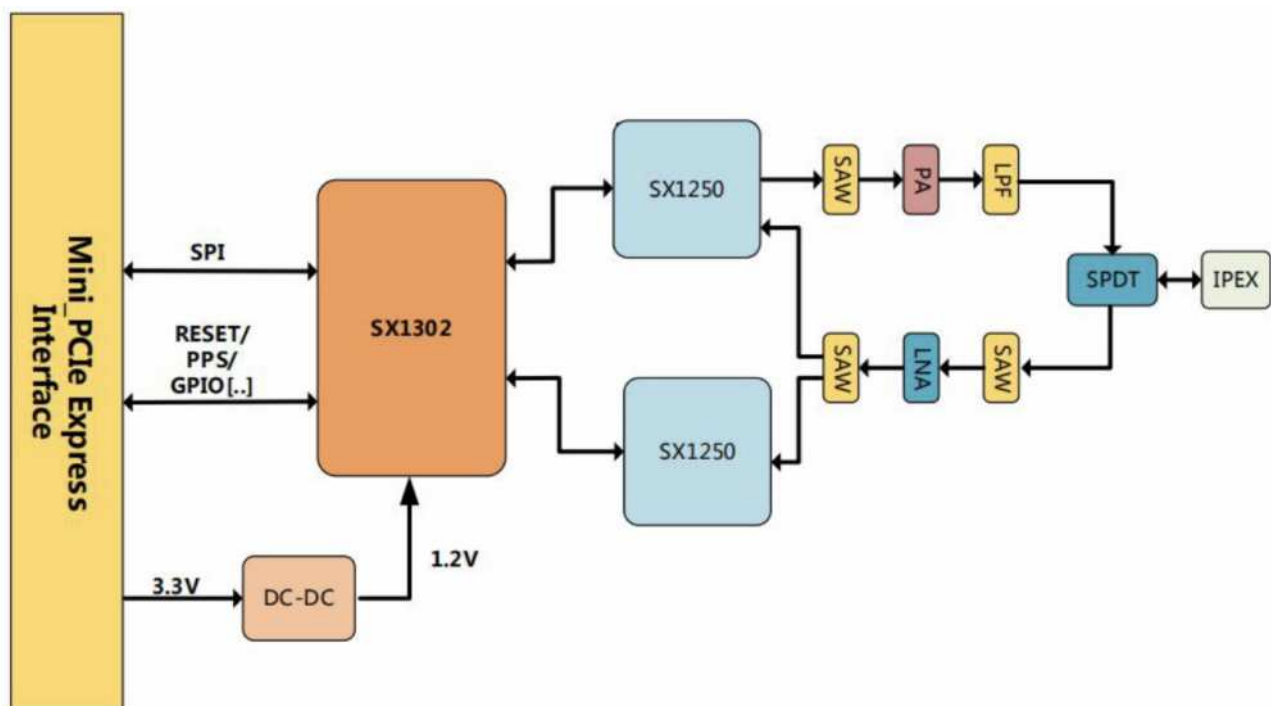


MAIN FEATURES

- PCI Express Mini Card 1.2 standard interface;
- Sending current max 360mA, receiving current 60mA;
- I-PEX antenna interface, half-duplex communication;
- Standard SPI digital interface;
- Support 8 receiving channels, SF5~SF12 full solution, receiving sensitivity as low as -141dBm;

- Support 1 transmission channel, the maximum transmission power is 27dBm (typical value 26dBm);
- ISM band EU868.

BLOCK DIAGRAM



INTERFACE DEFINITION

The signal interface of WUM E106-868G27P2 is a standard Mini PCI Express interface. The following table gives the function definition and description of the 52 pin corresponding to the module.

IO PARAMETER DEFINITION

Attribute	Description
DI	Digital input
DO	Digital output
IO	Bidirectional input and output
PI	Power input

DEFINITION OF MAIN FUNCTION PINS

Pin	Pin No.
GND	4,9,15,18,21,26,27,29,34,35,37,40,43,50
3.3V	2,24,39,41,52
PPS	19
NRESET	22
RX_ON	42
TX_ON	44
CFG_ON	46
SX_SCK	45
SX_MISO	47
SX_MOSI	49
SX_CSN	51

DETAILED PIN DEFINITION

No.	Mini PCIe definition	M-GW1302S definition	I/O attribute	Function description
1	WAKE#	RESERVED	DO	Use in transparent version, suspended
2	3.3Vaux	VCC_3V3	PI	3.3V DC Main power input
3	COEX1	NC	—	Internal use, suspended
4	GND	GND	—	Ground
5	COEX2	NC	—	Internal use, suspended
6	1.5V	NC	—	Not used
7	CLKREQ#	NC	—	Internal use, suspended
8	UIM_PWR	NC	—	Not used
9	GND	GND	—	Ground
10	UIM_DATA	RESERVED	IO	Use in transparent version, suspended
11	REFCLK-	RESERVED	DI	Use in transparent version, suspended

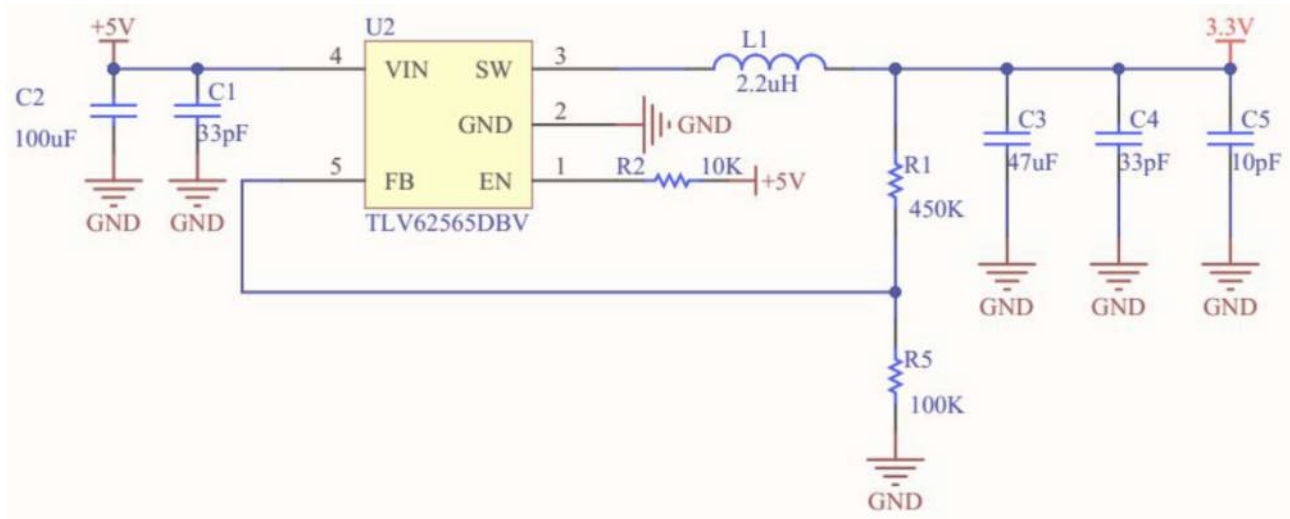
12	UIM_CLK	RESERVED	IO	Use in transparent version, suspended
13	REFCLK+	RESERVED	DO	Use in transparent version, suspended
14	UIM_RESET	NC	—	Not used
15	GND	GND	—	Ground
16	UIM_VPP	NC	—	Internal use, suspended
17	RESERVED	NC	—	Internal use, suspended
18	GND	GND	—	Ground
19	RESERVED	PPS	DI	GPS time input, can be suspended
20	W_DISABLE#	NC	—	Internal use, suspended
21	GND	GND	—	Ground
22	PERST#	NRESET	DI	Reset control pin, valid in high level
23	PERn0	RESERVED	DI	Reserved, externally suspended
24	3.3Vaux	VCC_3V3	PI	3.3V DC Main power input
25	PERp0	NC	—	Not used
26	GND	GND	—	Ground
27	GND	GND	—	Ground
28	1.5V	NC	—	Not used
29	GND	GND	—	Ground
30	SMB_CLK	NC	—	Internal use, suspended
31	PETn0	RESERVED	DO	Reserved, externally suspended
32	SMB_DATA	NC	—	Internal use, suspended
33	PETp0	NC	—	Not used
34	GND	GND	—	Ground
35	GND	GND	—	Ground
36	USB_D-	RESERVED	IO	Use in transparent version, suspended
37	GND	GND	—	Ground
38	USB_D+	RESERVED	IO	Use in transparent version, suspended
39	3.3Vaux	VCC_3V3	PI	3.3V DC Main power input

40	GND	GND	—	Ground
41	3.3Vaux	VCC_3V3	PI	3.3V DC Main power input
42	LED_WWAN#	RX_ON	DO	RX indication, connect to on board LED
43	GND	GND	—	Ground
44	LED_WLAN#	TX_ON	DO	TX indication, connect to onboard LE
45	RESERVED	SX_SCK	DI	SPI clock signal input
46	LED_WPAN#	CFG_ON	DO	CFG indication, connect to onboard LE
47	RESERVED	SX_MISO	DO	SPI data output
48	1.5V	NC	—	Not used
49	RESERVED	SX_MOSI	DI	SPI data input
50	GND	GND	—	Ground
51	RESERVED	SX_CSN	DI	SPI chip select signal input
52	3.3Vaux	VCC_3V3	PI	3.3V DC Main power input

POWER INTERFACE DEFINITION

Item	Pin No	IO Attribute	Function description
GND	4,9,15,18,21,26,27,29,34,35,37,40,43,50	—	—
3.3V	2,24,39,41,52	PI	3.3V power input

WUM E106-868G27P2 module uses 3.3V power supply. In TX mode, the maximum instantaneous peak current may reach 400mA. In order to prevent voltage drop, the switch power supply or LDO used shall be able to provide enough current, and a tantalum capacitor or electrolytic capacitor with large capacitance value shall be added at the power supply port of the module. If switching power supply is used to supply power to the module, the circuit wiring shall avoid the antenna part as much as possible to prevent EMC interference.



SPI INTERFACE

The SPI interface signal definition of E106-868G27P2 module is shown in the following table.

Item	Pin No.	I/O attribute	Description	Voltage
SX_SCK	45	DI	SPI clock signal input	3.3V
SX_MISO	47	DO	SPI data output	3.3V
SX_MOSI	49	DI	SPI data input	3.3V
SX_CSN	51	DI	SPI chip select signal input	3.3V

The master SPI needs to support full duplex. Please refer to the data sheet of SX1302 for the specific timing.

CONTROL SIGNAL

Item	Pin No.	I/O attribute	Description	Voltage
PPS	11	DI	GPS time input	3.3V
NRESET	13	DI	Reset control pin	3.3V
RX_ON	42	DO	RX signal indication	3.3V
TX_ON	44	DO	TX signal indication	3.3V
CFG_ON	46	DO	CFG signal indication	3.3V

- PPS signal. Support GPS-PPS input for receiving data packets with time stamp.
- NRESET signal. The external control circuit can realize the reset of the module. The module can be reset by pulling up the NRESET level by 0.05~0.2s then releasing it. The NRESET signal is relatively sensitive to interference, and the wiring on the module interface board should be as short as possible, and should be processed by certain ground.
- RX_ON signal. When the receiving state of the module is turned on, this pin outputs a high level, and the on-board LED lights up at the same time, and connects to the GPIO of the SX1302.
- TX_ON signal. When the module is transmitting data, this pin outputs a high level, and the on-board LED lights up, and connects to the GPIO of the SX1302.
- CFG_ON signal. When the module successfully configures the parameters, this pin outputs a high level and the on-board LED light up, and connects to the GPIO of the SX1302.

ANTENNA INTERFACE

The antenna connection base of the module adopts I-PEX 1 generation interface. Figure 3 shows the dimensions of the RF connector, in mm.

POWER CHARACTERISTICS

The E106-868G27P2 module is powered by 3.3V, the input voltage is $3.3V \pm 9\%$, and the power input must meet the current supply capacity of at least 500mA. The module input current requirements are shown in the following table:

Item	Description	Min. Value	Typical value	Max. Value	Unit
VCC	Power supply voltage	3.0	3.3	3.6	V

IO INTERFACE CHARACTERISTICS

The digital IO electrical characteristics of E106-868G27P2 module are shown in the table below.

Item	Description	Min. Value	Max. Value	Unit
VIH	Input high voltage	$0.7 \cdot V_{CC}$	$V_{CC} + 0.3$	V
VIL	Input low voltage	-0.3	$0.3 \cdot V_{CC}$	V
VOH	Output high voltage	$V_{CC} - 0.5$	V_{CC}	V
VOL	Output low voltage	0	0.4	V

WORKING CURRENT

Item	Working condition	Working condition	Unit
RX	Turn on RX, disable TX	54	mA
TX/RX	Turn on Rx, turn on TX@25dBm	360	mA
IDLE	Idle mode	27	mA

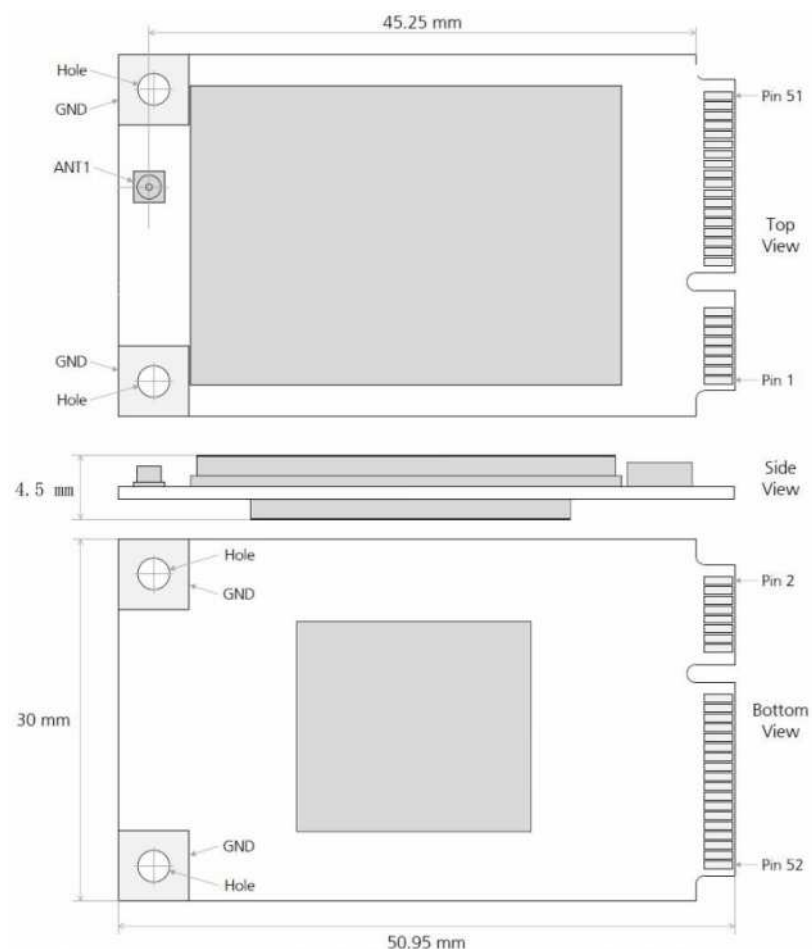
RF MODULE TRANSMIT POWER

Working frequency	Maximum power value	Unit
505.5MHz	26	dBm
868.5MHz	26	dBm
915.5MHz	26	dBm

RF RECEIVING SENSITIVITY

Working frequency	Spreading factor BW=125KHZ	Receiving sensitivity (typical value dBm)
475.5MHz	SF=5	-121
	SF=7	-127
	SF=12	-141
868.5MHz	SF=5	-121
	SF=7	-127
	SF=12	-141
915.5MHz	SF=05	-121
	SF=07	-127
	SF=12	-141

DIMENSIONS



LTE COMMUNICATION

For LTE connections a A7670E module is used.



The A7670E is the LTE Cat 1 module which supports wireless communication modes of LTE-TDD/LTE-FDD/ GSM/GPRS/EDGE. It supports maximum 10Mbps downlink rate and 5Mbps uplink rate.

The A7670E adopts LGA form factor and is compatible with SIM7000/SIM7070 series(NB/Cat M modules), and SIM800A/SIM800F(2G modules), which enables smooth migration from 2G/NB/Cat M products to LTE Cat 1 products, and greatly facilitates more compatible product design for the customer needs.

The A7670E supports multiple built-in network protocols and software function, AT commands are compatible with SIM7500/SIM7600 series modules. Meanwhile the A7670 series integrates main industrial standard interfaces, with powerful expansibility, including abundant interfaces such as UART, USB, I2C, GPIO, which is suitable for main IOT applications such as telematics, surveillance devices, POS, industrial routers, and remote diagnostics etc.

HARDWARE INTERFACE OVERVIEW

Product		A7670E
Form Factor		LGA
Frequency Bands	LTE-FDD	B1/B3/B5/B7/B8/B20
	GSM	900/1800MHz
Temperature		-40°C ~ +85°C
Electrical Features		
Supply Voltage(V)		3.4~ 4.2
Consumption (mA)	LTE	3.8
	GSM,BS_PA_MFRMS=2	3.5
Data Transfer		
LTE(Mbps)		10(DL)/5(UL)
GPRS/EDGE(Kbps)		236.8(DL)/236.8(UL)
Software Features		
Protocol		TCP/IP/IPV4/IPV6/Multi-PDP/FTP/FTPS /HTTP/HTTPS/DNS
TLS		•
File System		•
LBS		•
FOTA		•
WWAN (RNDIS)		•
ECM		•
Interfaces		
SIM Card		1.8V/3.0V
UART		•
USB		•
ADC		•
GPIO		•
I2C		•
Certification		
Certification		CE-RED*/RoHS*/ REACH*



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