AP322A-EC-LR Datasheet

Aiming to create better and safer working environments and life experiences through the products we deliver.

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Programmable LoRaWAN Cellular / Ethernet Gateway

AP322A-EC-LR

Industrial LoRaWAN LTE / Ethernet Gateway

The AP322A-EC-LR is a programmable cellular or Ethernet gateway for LoRaWAN communication. The Semtech S1301 supports LoRAWAN protocol for long range wireless connection to multiple LoRaWAN nodes. The AP322A-EC-LR Gateway provides for a solid out of the box experience for quick deployment. Additionally, since its software and UI sits on top of OpenWRT it is perfect for the development of custom applications (via the open SDK). The gateway comes with two software selectable RS-232/422/485 full-signal serial ports and two 10/100/1000 Mbps Ethernet ports. The built in Node-RED flow-based programming in the gateway provides reliable and secure gateway for data acquisition and processing at field sites as well as a user-friendly communication platform for many other large-scale deployments.

Programmable Edge Computer and Gateway

- QCA9558 MIPS-based processor 720MHz processor
- 2 auto-sensing 10/100/1000 Mbps Ethernet ports
- SD socket for storage expansion
- Rich programmable LEDs and a programmable button for easy installation and maintenance
- Node-RED flow-based programming

High speed 4G LTE

- LTE Cat.4, 2x2 MIMO, 150M downlink and 50M uplink
- LTE Cat.6 with 2CA, 2T2R MIMO provides 300M downlink and 50M uplink
- 4G/3G/2G full cellular network compatibility
- Support GPS for location services

Serial Communication & High Throughput Data Switching

- Dual serial ports with RS232/422/485 full functions for serial over LTE/Wi-Fi/Ethernet data switching
- 2-port Gigabit Ethernet supports routing and bridging mode
- Hardware NAT for CPU utilization saving*

Cloud Management Service

- Support Amazon AWS & Microsoft Azure cloud service*
- Support proprietary ATMS cloud service*
- Interactive monitoring dashboard and map shows the status, signal strength, location etc.*

LoRaWAN Gateway

- Built-in LoRaWAN™ Server
- LoRaWAN™ 1.0.2 protocol
- LoRaWAN™ Frame filtering (node whitelisting)
- MQTT v3.1 Bridging with TLS encryption
- Software and UI sit on top of OpenWRT
- Buffering of LoRa frames in case of Network Server outage (no data loss) *
- Max. 1000 nodes

Programming Environment

- GCC C/C++ cross development tool chain
- Ash, bash* System Shell
- vim, nano* text editor
- Lua, Perl*, Python* programming language

Internet Security Suite and Cryptographic

- Netfilter suite for firewall
- Iptables suite for NAT/NAPT and port forwarding
- OpenVPN, IPsec for secure remote connection
- HTTPs/SSH for secure login
- AES, SHA, OpenSSL, random generator

Rugged Design for Wayside Surveillance, ITS Application

- EN50121-4 railway trackside EMC certificate design for Industrial IoT, ITS applications
- Effective heat dissipation design for operating in -40~75℃
- CE Marking
- IEC61000-6-2/IEC61000-6-4 heavy industrial EMC compliance

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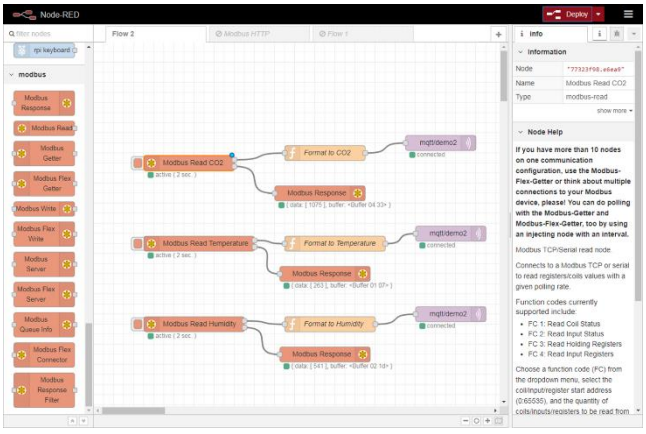
Product Features

✓ Transparent LoRa Communication for Programmable Node-RED Controller for 0-10V or PWM LED Light Control

AP322A-EC-LR supports open system OpenWRT to embed customer own software as well as NodeRED for easy to use Modbus controlling program. The Modbus control program can be extended wirelessly through LoRa Controller AP144-LC with PWM and 0-10V Dimmer Control.



Library With Building Blocks | Light Control | Information Panel

✓ Environment sensor or Smart Meter reading by LoRaWAN™

AP322A-EC-LR supports LTE cellular network and MQTT protocol to forward data to LoRaWAN application server from Sensors or Smart Meters connected to LoRaWAN™ End nodes AP140-LR.

Ordering Information

Model Name	Description
AP322A-EC-LTE-LR-EU868	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A, LoRaWAN EU868: 863-870MHz (with LTE and LoRa antennas)(Must work with AP140-LR)
AP322A-EC-LTE-LR-EU433	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A, LoRaWAN EU433: 433.05~434.79MHz (with LTE and LoRa antennas)(Must work with AP140-LR)
AP322A-EC-LTE-LR-US915	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A LoRAWAN US915: 902-928MHz (with LTE and LoRa antennas)(Must work with AP140-LR)
AP322A-EC-LTE-LR-AS923	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A LoRaWAN AS923: 923-923.5MHz (with LTE and LoRa antennas)(Must work with AP140-LR)
AP322A-EC-LR-EU868	Industrial LoRaWAN Gateway, 2GbE+2COM LoRaWAN EU868: 863-870MHz (Must work with AP140-LR)
AP322A-EC-LR-EU433	Industrial LoRaWAN Gateway, 2GbE+2COM LoRAWAN EU433: 433.05~434.79MHz (Must work with AP140-LR)
AP322A-EC-LR-US915	Industrial LoRaWAN Gateway, 2GbE+2COM LoRAWAN US915: 902-928MHz (Must work with AP140-LR)
AP322A-EC-LR-US923	Industrial LoRaWAN Gateway, 2GbE+2COM LoRaWAN AS923: 923-923.5MHz (Must work with AP140-LR)

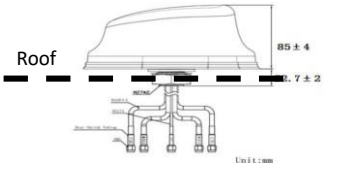
Optional Accessory

Ordering Information	
A-LTE_WLAN_G-4_4-RSM-2M	Combo IP67 Antenna, LTE WW 4dBi, Wi-Fi 2.4/5GHz dual band Omni-directional 4/4dBi, GPS 1561- 1670MHz 28dBi, RP-SMA male, 2M
A-LTE_WLAN_G-3_2-RSM-2M	Combo IP67 Antenna, LTE WW 3dBi, Wi-Fi 2.4/5GHz dual band Omni-directional 2/2dBi, GPS 1575- 1610MHz 28dBi, RP-SMA male, 2M
A-LTE-3-NM	LTE Antenna, LTE WW 3dBi, N-type male
A-WLAN-6-NM	Wi-Fi Antenna, Wi-Fi 2.4/5GHz dual band Omni-directional 4/6dBi, N-type male
A-GPS-27-RSM-3M	GPS Antenna, GPS 1575MHz 27dBi, RP-SMA male, 3M
C-RF-R-RSF_RSM-1M	RF cable, RP-SMA female to RP-SMA male, 1M
C-RF-C2-NF_RSM-2M	RF cable, N-type female to RP-SMA male, CFD200, 2M

Outdoor Vehicle Combo Antenna

A-LTE_WLAN_G-4_4-RSM-2M

- 5 RF cables, LTE MIMO, Wi-Fi MIMO, GPS/GLONASS/GALILEO/BEIDOU
- 4dBi gain for LTE and 4dBi gain for 2.4G/5G WIFI RF
- High WLAN gain is perfect for train to ground vehicle application
- 5 x 2-meter cables in RP SMA male connector
- Outdoor high gain, IP67 waterproof and -40˚~85˚C wide temperature design
- 189x182x107mm



A-LTE_WLAN_G-4_4-RSM-2M

189x182x107mm

A-LTE_WLAN_G-3_2-RSM-2M

- RF cables, LTE MIMO, Wi-Fi MIMO, GPS&GLONASS
- 3dBi gain for LTE and 2dBi gain for 2.4G/5G WIFI
- Suitable for in-vehicle, roadside box and short-range coverage WLAN to LTE communication environment
- 5 x 2-meter cables in RP SMA male connector
- Outdoor IP67 waterproof and -40˚~85˚C wide temperature
- 110x110x80mm slim size

110x110x80mm

A-LTE_WLAN_G-3_2-RSM-2M

	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-LTE_WLAN_G-4_4-RSM-2M	Omni	LTE: 698~960/1710~2690/2900~3600 WLAN: 2400~2483.5/4900~5825 GNSS: 1561.1~1610 (GPS/GLONASS/GALILEO/BEIDOU)	4 4 28	5x RP SMA Male	189x182x107	2	-40˚C~85˚C	Outdoor
	A-LTE_WLAN_G-3_2-RSM-2M	Omni	LTE: 698~960/1710~2690 WLAN: 2400~2483.5/4900~5825 GNSS: 1575.42~1610 (GPS/GLONASS)	3 2 28	5x RP SMA Male	110x110x80	2	-40˚C~85˚C	Outdoor

LTE Antenna

	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-LTE-2-RSM	Omni	704~960/1710~2690	2	RP SMA Male	161xΦ13	-	-20˚C~ 65˚C	Indoor
	A-LTE-3-NM (require RF cable)	Omni	704~960 1710~2700	2 3	N-Type Male	187xΦ20	-	-20˚C~ 65˚C	Outdoor

Wi-Fi Antenna

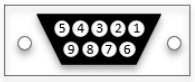
	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-WLAN-3-RSM	Omni	2400~2500 4900~5900	2.5 3	RP SMA Male	196xΦ13	-	-40°C~ 65°C	Indoor
	A-WLAN-6-NM (require RF cable)	Omni	2400~2500 5150~5850	4 6	N-Type Male	187xΦ20	-	-20°C~ 65°C	Outdoor

GPS Antenna (optional)

	Model	Type	Frequency (MHz)	Gain (dBi)	Connector	Dimension (mm)	Cable (M)	Operating Temp.	Application
	A-GPS-27-RSM-3M	Omni	1575.42	27	RP SMA Male	36x36x13.9	3	-20°C~ 65°C	Indoor

Interface	
CPU	QCA9558 MIPS-based processor 720MHz processor
OS (preinstalled)	Linux (OpenWRT LEDE, Kernel 4.4)
USB	USB 2.0 hosts x 1, Type A connector
DRAM	DDR2 SDRAM 256MB
Main Storage	8G Micro SD
Storage Expansion	Micro SD expand to 16G/32G/64G
Ethernet Port	2 x 10/100/1000MBase-T RJ45, Auto Negotiation, Auto-MDI/MDIX
System LED	1 x PWR: Green On 2x Ethernet Ports: Link: Green On, Activity: Green Blinking Programmable: 1x SYS, 2 x Serial Ports (s1, s2), 1 x DO: Red On Programmable: Ra, Rb, Rc, Rd, Re Rf: Base station connected: Green On for 2 sec period, Base station disconnected: Green Off for 2 sec period
Reset	1 x Reset button (Programmable)
SMA Socket	Up to 4 x RP-SMA Female LTE 2T2R: ANT1 for LTE Main, ANT2 for LTE AUX LoRa: ANT3 GPS: ANT4
SIM Socket	2 x Nano SIM with redundancy
Serial	Up to 2 x RS232/422/485, DB9
Power Input, Digital Output	6-Pin Removable Terminal Block Connector 4 Pin for Redundant Power 2 Pin for DO (Relay Alarm) DO: Dry Relay Output with 1A/24V DC

DB9 Female



Pin	RS232	RS485-4w/422	RS485-2w
1	DCD	TX-	Data-
2	TXD	RX+	-
3	RXD	TX+	Data+
4	DSR	-	-
5	GND	GND	GND
6	DTR	RX-	-
7	CTS	-	-
8	RTS	-	-
9	RI	-	-

Software	
OS	Linux OpenWRT LEDE
Web Server	uHttpd, luCI Web Interface, Apache*
Terminal Server (SSH)	Secure encrypted communications between two untrusted hosts over an insecure network
Kernel	GNU/Linux kernel v4.4
System Shell	ASH (default), BASH*
Text Editor	vim, nano*
File System	JFFS2, NFS, Ext3, Ext4, VFAT, OverlayFS, NTFS
Internet Protocol Suite	TCP, UDP, IPv4, IPv6, SNMPv2, v3, ICMP, ARP, HTTP, CHAP,PAP,DHCP, NTP, NFS, SSH, PPP, SFTP, RSYNC, SSL, SCP
Programming Language Support	Lua, Perl*, Python*
Flow-based programming	Node-RED (Modbus TCP and Serial contribution package included)
Internet Security Suite	OpenVPN, IPSec, Netfilter/iptables

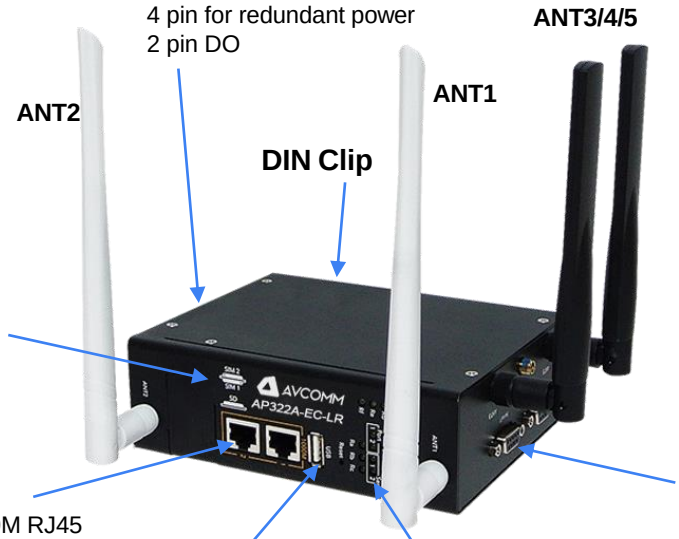
Cryptographic	AES, SHA, OpenSSL, random generator
Linux Board Support Packages (BSP)	GCC C/C++ cross development tool chain Kernel/ filesystem
Cellular Networking	QMI (Qualcomm MSM Interface): Glib-based library for talking to WWAN modems and devices that speak the Qualcomm MSM Interface (QMI) protocol
LoRaWAN™	LoRaWAN™ Gateway, LoRaWAN™ Server
Cellular Properties	**(LTE Cat. 6)**
Standard	UMTS/HSPA 3GPP Release 8 LTE 3GPP Release 12 (LTE Cat.6)
Data Rate	TD-SCDMA: DL Max 4.2Mbps, UL: Max 2.2Mbps HSPA: DL: Max. 42 Mbps, UL: Max. 5.76 Mbps WCDMA: DL: Max 384Kbps, UL: Max 384Kbps LTE-FDD: DL: Max. 300 Mbps, UL: Max. 50 Mbps, 2x2 DL MIMO LTE-TDD: DL: Max. 226 Mbps, UL: Max. 28 Mbps, 2x2 DL MIMO
Band Information: LTE-E	LTE-FDD: B1/B3/B5/B7/B8/B20/B28/B32 (2100/1800/850/2600/900/800/700/1500MHz) LTE-TDD: B38/B40/B41 (2600/2300/2500MHz) WCDMA: B1/B3/B5/B8 (2100/1800/850/900MHz)
Band Information: LTE-U	LTE-FDD: B2/B4/B5/B7/B12/B13/B17/B25/B26/B29/B30/B66 (1900/1700/700/2600/700/700/700/1900/850/700/2300/1700MHz) LTE-TDD: B41 (2500MHz) WCDMA: B2/B4/B5 (1900/1700/850MHz)
Band Information: LTE-AP	LTE-FDD: B1/B3/B5/B7/B8/B18/B19/B21/B26 (2100/1800/850/2600/900/850/850/1500/850MHz) LTE-TDD: B38/B39/B40/B41 (2600/1900/2300/2500MHz) WCDMA: B1/B5/B6/B8/B9/B19 (2100/850/UMTS only/900/1800/850MHz) TD-SCDMA: B39 (1900MHz)
Cellular Properties	**(LTE Cat. 4)**
Standard	GSM/GPRS/EDGE 3GPP Release 6 UMTS/HSPA 3GPP Release 8 LTE 3GPP Release 11
Data Rate	GPRS: DL: max. 85.6 kbps, UL: max. 85.6 kbps EDGE: DL: max. 236.8 kbps, UL: max. 236.8 kbps HSPA: DL: max. 42 Mbps, UL: max. 5.76 Mbps LTE-FDD Cat.4: DL: max. 150 Mbps, UL: max. 50 Mbps, 2x2 DL MIMO LTE-TDD Cat.4: DL: max. 130 Mbps, UL: max. 35 Mbps, 2x2 DL MIMO
Band Information: LTE-E	LTE: FDD B1/B3/B7/B8/B20/B28A (2100/1800/2600/900/800/700MHz) WCDMA: FDD B1/B8 (2100/900MHz) GSM: B3/B8 (1800/900MHz)
Band Information: LTE-U	LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/ B19/B20/B25/B26/B28 LTE TDD: B38/B39/B40/B41 UMTS: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8
GPS Properties	**(Optional)**
GNSS	GPS/GLONASS/BeiDou/Galileo
Performance	Cold start: 18s, Warm start: 2.2s, Hot start: 1.8s
Sensitivity	Cold start: -146dBm, Reacquisition: -157dBm, Tracking: -157dBm
Accuracy	<1.5M
GNSS Frequency	GPS/Galileo: 1575.42±1.023 MHz GLONASS: 1597.5~1605.8 MHz BeiDou: 1561.098±2.046 MHz
Antenna (Optional Accessory-A-GPS-27-RSM-3M)	Frequency range: 1561~1615MHz Polarization: RHCP or linear VSWR: <2 (Typ.) Passive antenna gain: >0dBi

LoRaWAN	
Semtech Radio	SX1301(LoRaWAN Gateway), 8 uplink channels and 1 downlink channel
Version	LoRaWAN 1.0.2
RF Band	EU 868MHz(865 to 872MHz), US 915MHz(902 to 928MHz), EU 433MHz (Other countries channel by request*)
Max. TX Output	+25dBm, average +23dBm
RX Sensitivity	SF7: -124dBm, BW 125KHz, SF12: -136.5dBm, BW 125KHz
Range	Urban: 2-4KM, Suburb/Open Area: 5~10KM (By environment & signal lost rate)
Antenna	
LTE Default Antenna	Frequency: 704~960/1710~2690 MHz
	Gain: 2 dBi
	Dimension: 161xΦ13 mm
Power Requirement	
Input Voltage	24V (12~48VDC)
Reverse Polarity Protect	Yes
Input Current	0.36A@24V
Power Consumption	Max 8W@24VDC full traffic, suggest to reserve 15% tolerance
Mechanical	
Installation	DIN Rail
Enclosure Material	Steel Metal with Aluminum
Dimension	50 x 151 x 120 mm(W x H x D) / without DIN Rail Clip
Ingress Protection	IP30
Weight	~660g without package
Environmental	
Operating Temperature & Humidity	-40°C~75°C , 5%~95% Non- Condensing
Storage Temperature	-40°C~85°C
MTBF	>200,000 hours at 40º full cycle
Warranty	5 years
Approval	
Safety	EN 60950-1 Compliance EN 62368-1:2014/AC:2017 Compliance IEC 60255-27:2013 Compliance
EMC	EN61000-6-2/EN61000-6-4 Compliance
EMI	CISPR 22, FCC part 15B Class A Compliance
EMS	EN61000-4-2 ESD, EN61000-4-3 RS, EN61000-4-4 EFT, EN61000-4-5, EN61000-4-6 CS, EN61000-4-8 Magnetic Field EN61000-4-12/16/17/18/29
Radio	RED Compliance Safety: EN 62368-1 EN 50385/EN62311 MPE assessment EN 301 489-1/17/19/52, EN 55032/55024 EN 300 328/EN 301 893 EN 301 908-1 FCC Part 15B
Railway	EN50121-4
Environmental	EN 60870-2-2:1998 Compliance IEC 60068-2-21:2006 Compliance

Function interface

	AP322A-EC-LTE-LR	AP322A-EC-LR
Ant 1	LoRa	LoRa
Ant 2	--	--
Ant 3	LTE-Main	--
Ant 4	--	--
Ant 5	LTE-Diversity	--

Integrated Power Connector
- 1 x 6-pin terminal block
  4 pin for redundant power
  2 pin DO



SIM Card
- AP322A-EC-LR
  1*SD
- AP322A-EC-LTE-LR
  1*SIM + 1*SD

Gigabit Ethernet
- 2-port 10/100/1000M RJ45
- WAN + LAN configurable

Serial Communication
- RS232/422/485 Full functions
- DB9 female

USB Extension Port
- External Storage

System LED
- 1 x Power
- 1 x System Status
- 1 x DO
- 2 x Ethernet Port
- 2 x Serial Port
- 6 x Radio LED (Ra~Rf)

Installation dimensions

Unit: inch ±0.040 / [mm] ±1.00