

## Programmable LoRaWAN Cellular / Ethernet Gateway

**WR322GR-EC-LTE-LORAWAN**

**WR312GR-EC-LORAWAN**

**Industrial LoRaWAN LTE / Ethernet Gateway**

The WR322GR-EC-LoRaWAN is a programmable cellular or Ethernet gateway for LoRaWAN communication. The Semtech S1301 supports the LoRaWAN protocol for long-range wireless connection to multiple LoRaWAN nodes. The WR322GR-EC-LTE-LoRaWAN gateway converts LoRaWAN™ data to MQTT and transmits to the cloud through the LTE network. The gateway comes with two software-selectable RS-232/422/485 Modbus full-signal serial ports and two 10/100/1000 Mbps Ethernet ports. The built-in Node-RED flow-based programming in the gateway provides a 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. Combining with the new LoRaWAN controller LR140, Cloud platform ThingsMaster, and various environmental sensors, WoMaster presents complete IoT Environment Monitoring applications.



### Features & Benefits

#### 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 ThingsMaster 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
- Support up to 1000 LoRaWAN™ nodes
- Support ThingsMaster OTA cloud service
- Support LoRaWAN™ Node batch register\*

#### 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

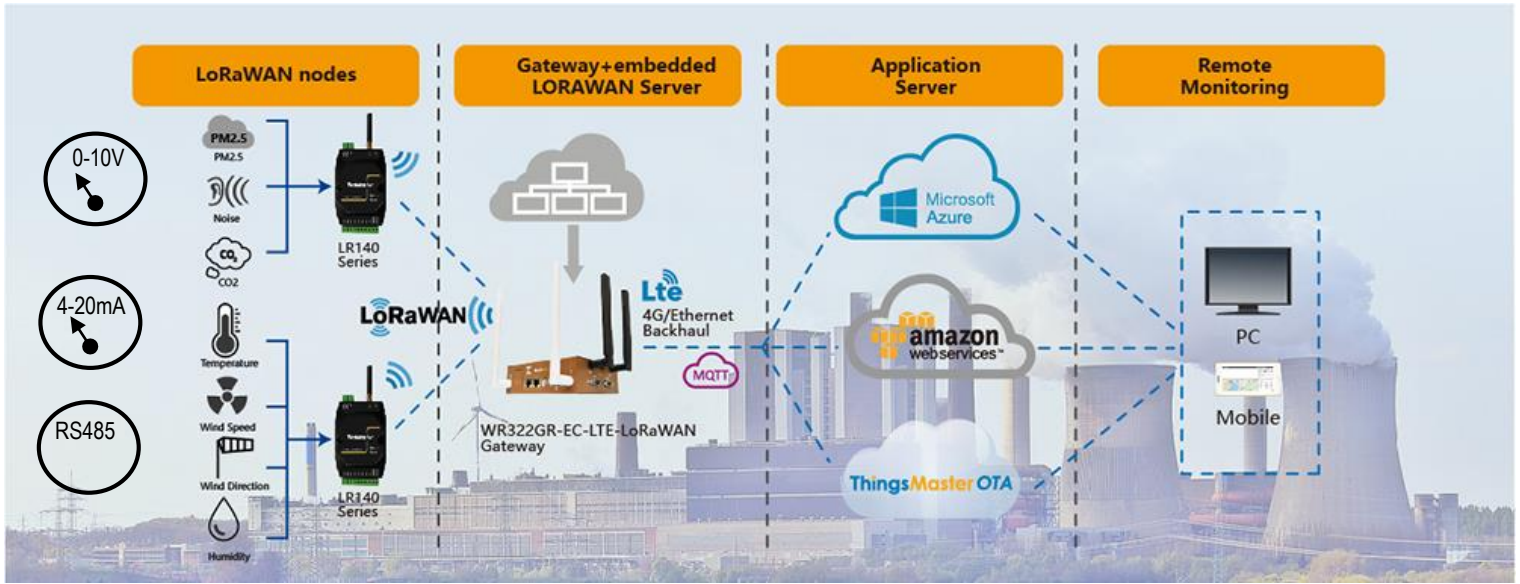
#### Rugged Design for Wayside Surveillance, ITS Application

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



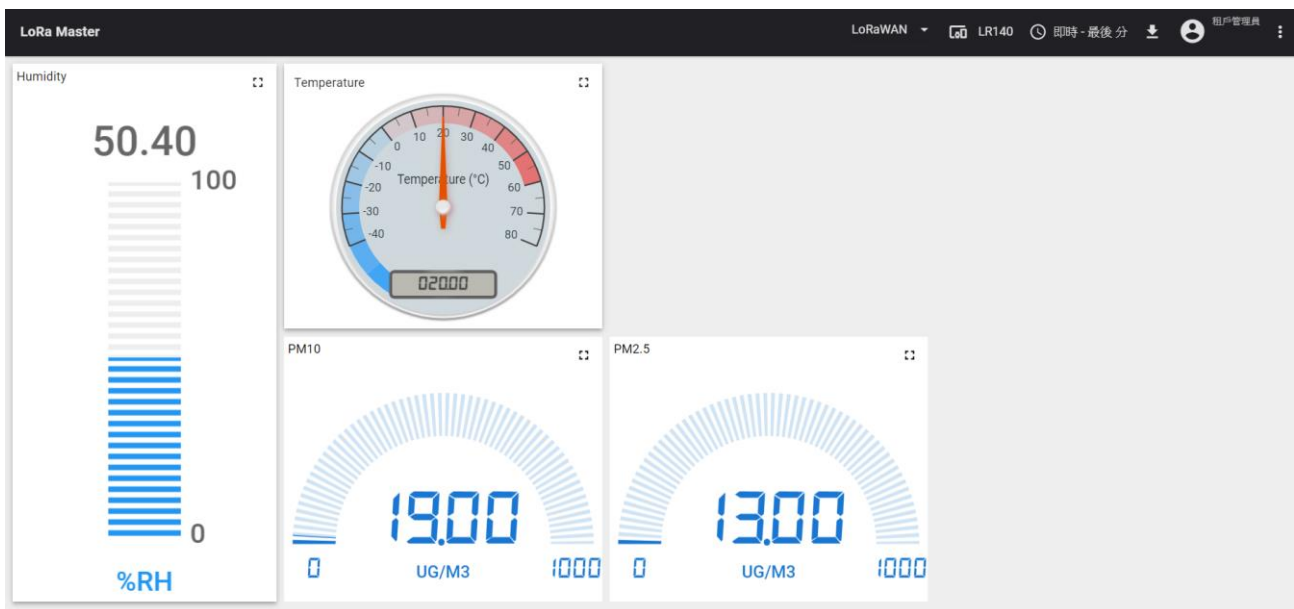
### ✓ LR140 Read Analog and RS485 Data to LoRaWAN Gateway

The analog inputs such as 0~10V, 4~20mA and RS485 Modbus data can be forwarded by LR140 LoRaWAN converter to WR322GR-LoRaWAN gateway via LoRaWAN wireless network. The LoRaWAN gateway sends the data to cloud server such as AWS, Azure or ThingsMaster OTA via WAN or LTE cellular network.



### ✓ LoRaWAN Cloud Server on ThingsMaster OTA

The LoRaWAN data can be sent to the ThingsMaster OTA server, located in the public domain or your corporate server. The device can be easily added and monitored on ThingsMasterOTA through the LoRaWAN gateway. WoMaster provides a free demo account on ThingsMaster OTA for WR322GR-EC-LoRaWAN gateway. A license for more nodes can be requested and supported.





## Interfaces

### 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)

	WR322GR-EC-LTE-LORAWAN	WR312GR-EC-LORAWAN
Ant 1	LoRa	LoRa
Ant 2	--	--
Ant 3	LTE-Main	--
Ant 4	--	--
Ant 5	LTE-Diversity	--



### USB Extension Port

- External Storage

### Gigabit Ethernet

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

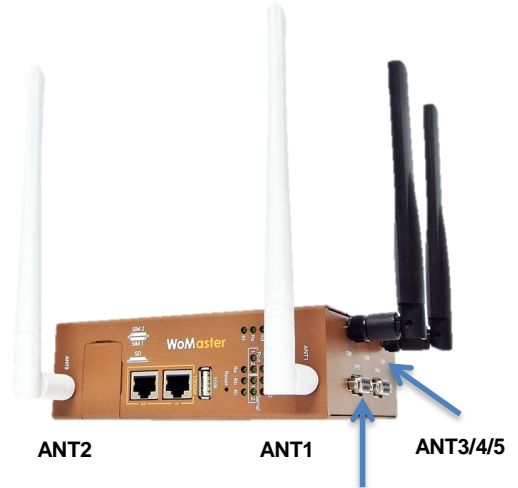
### SIM Card

- WR312GR-EC-LORAWAN  
1x MicroSD
- WR322GR-EC-LTE-LORAWAN  
2x SIM + 1x MicroSD

### DIN Clip

### Integrated Power Connector

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



ANT2

ANT1

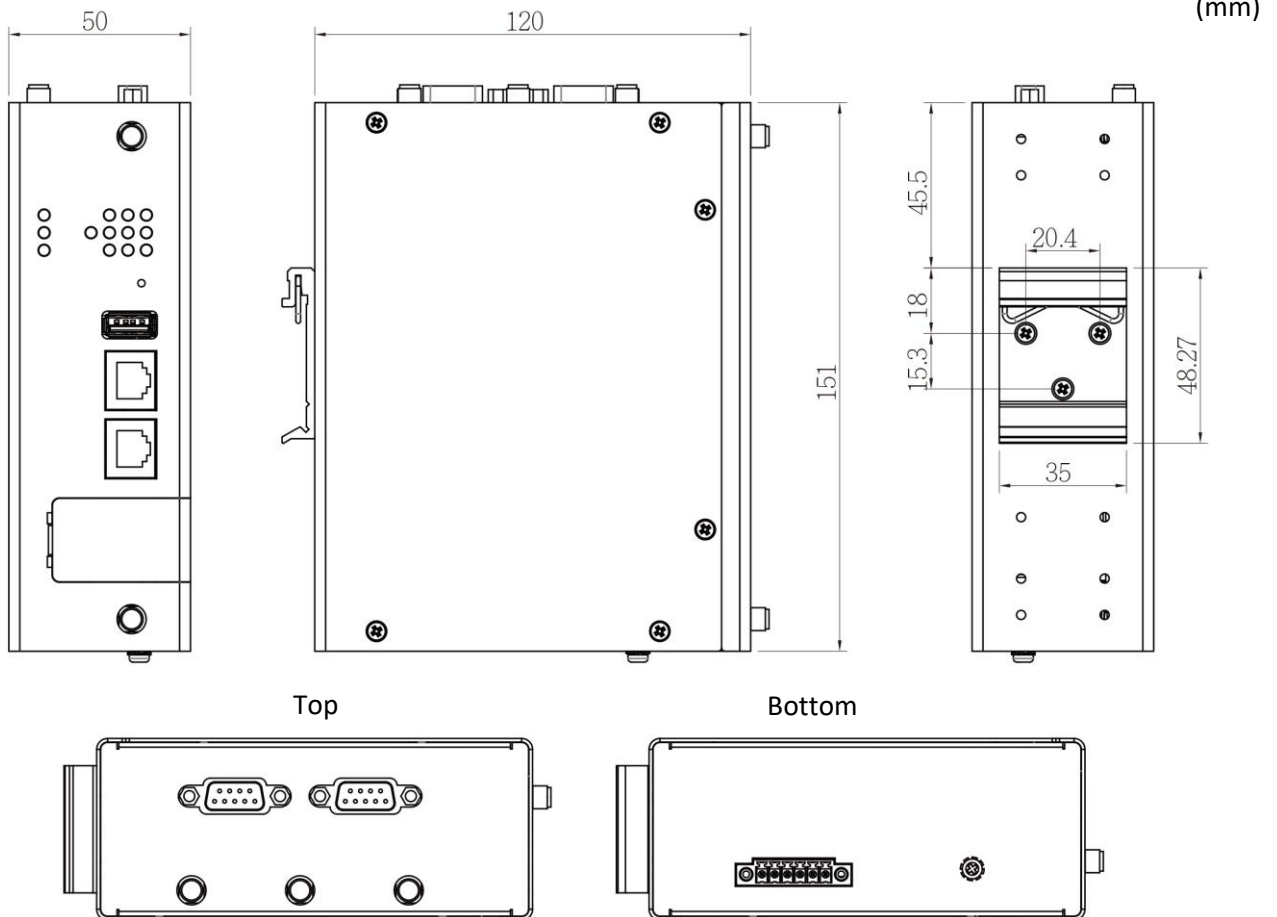
ANT3/4/5

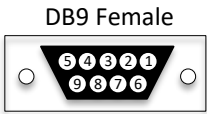
### Serial Communication

- RS232/422/485 Full functions
- DB9 female



## Dimensions



Interface																																									
<b>CPU</b>	QCA9558 MIPS-based processor 720MHz processor																																								
<b>OS (preinstalled)</b>	Linux (OpenWRT LEDE, Kernel 4.4)																																								
<b>USB</b>	USB 2.0 hosts x 1, Type A connector																																								
<b>DRAM</b>	DDR2 SDRAM 256MB																																								
<b>Main Storage</b>	8G Micro SD																																								
<b>Storage Expansion</b>	Micro SD expand to 16G/32G/64G																																								
<b>Ethernet Port</b>	2 x 10/100/1000MBase-T RJ45, Auto Negotiation, Auto-MDI/MDIX																																								
<b>System LED</b>	1 x PWR: Green On 2 x 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																																								
<b>Reset</b>	1 x Reset button (Programmable)																																								
<b>SMA Socket</b>	Up to 4 x RP-SMA Female LTE 2T2R: ANT1 for LTE Main, ANT2 for LTE AUX LoRa: ANT3 GPS: ANT4																																								
<b>SIM Socket</b>	2 x Nano SIM with redundancy																																								
<b>Serial</b>	Up to 2 x RS232/422/485, DB9 <table border="1" data-bbox="922 846 1401 1160" style="float: right; margin-top: 10px;"> <thead> <tr> <th>Pin</th> <th>RS232</th> <th>RS485-4w/422</th> <th>RS485-2w</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>DCD</td> <td>TX-</td> <td>Data-</td> </tr> <tr> <td>2</td> <td>TXD</td> <td>RX+</td> <td>-</td> </tr> <tr> <td>3</td> <td>RXD</td> <td>TX+</td> <td>Data+</td> </tr> <tr> <td>4</td> <td>DSR</td> <td>-</td> <td>-</td> </tr> <tr> <td>5</td> <td>GND</td> <td>GND</td> <td>GND</td> </tr> <tr> <td>6</td> <td>DTR</td> <td>RX-</td> <td>-</td> </tr> <tr> <td>7</td> <td>CTS</td> <td>-</td> <td>-</td> </tr> <tr> <td>8</td> <td>RTS</td> <td>-</td> <td>-</td> </tr> <tr> <td>9</td> <td>RI</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <div style="text-align: center; margin-top: 10px;">  <p>DB9 Female</p> </div>	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	-	-
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	-	-																																						
<b>Power Input, Digital Output</b>	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																																								
Software																																									
<b>OS</b>	Linux OpenWRT LEDE																																								
<b>Web Server</b>	uHttpd, luCI Web Interface, Apache*																																								
<b>Terminal Server (SSH)</b>	Secure encrypted communications between two untrusted hosts over an insecure network																																								
<b>Kernel</b>	GNU/Linux kernel v4.4																																								
<b>System Shell</b>	ASH (default), BASH*																																								
<b>Text Editor</b>	vim, nano*																																								
<b>File System</b>	JFFS2, NFS, Ext3, Ext4, VFAT, OverlayFS, NTFS																																								
<b>Internet Protocol Suite</b>	TCP, UDP, IPv4, IPv6, SNMPv2, v3, ICMP, ARP, HTTP, CHAP,PAP,DHCP, NTP, NFS, SSH, PPP, SFTP, RSYNC, SSL, SCP																																								
<b>Programming Language Support</b>	Lua, Perl*, Python*																																								
<b>Flow-based programming</b>	Node-RED (Modbus TCP and Serial contribution package included)																																								
<b>Internet Security Suite</b>	OpenVPN, IPSec, Netfilter/iptables																																								
<b>Cryptographic</b>	AES, SHA, OpenSSL, random generator																																								
<b>Linux Board Support Packages (BSP)</b>	GCC C/C++ cross development tool chain Kernel/ filesystem																																								
<b>Cellular Networking</b>	QMI (Qualcomm MSM Interface): Glib-based library for talking to WWAN modems and devices that speak the Qualcomm MSM Interface (QMI) protocol																																								
<b>LoRaWAN™</b>	LoRaWAN™ Gateway, LoRaWAN™ Server																																								
<b>Private LoRa</b>	LoRa private protocol for system applications																																								

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
Band Information: LTE-CN	LTE FDD: B1/B3/B5/B8 (2100/1800/850/900MHz) LTE TDD: B38/B39/B40/B41 (2600/1900/2300/2500MHz) TD-SCDMA: B34/B39 (2000/1900MHz) WCDMA: B1/B8 (2100/900MHz) CDMA: BC0 GSM: 900/1800MHz

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, CN 470MHz (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	<b>Frequency:</b> 704~960/1710~2690 MHz
	<b>Gain:</b> 2 dBi
	<b>Dimension:</b> 161xΦ13 mm
Power Requirement	
<b>Input Voltage</b>	24V (12~48VDC)
<b>Reverse Polarity Protect</b>	Yes
<b>Input Current</b>	0.36A@24V
<b>Power Consumption</b>	Max 8W@24VDC full traffic, suggest to reserve 15% tolerance
Mechanical	
<b>Installation</b>	DIN Rail
<b>Enclosure Material</b>	Steel Metal with Aluminum
<b>Dimension</b>	50 x 151 x 120 mm(W x H x D) / without DIN Rail Clip
<b>Ingress Protection</b>	IP30
<b>Weight</b>	~660g without package
Environmental	
<b>Operating Temperature &amp; Humidity</b>	-40°C~75°C , 5%~95% Non- Condensing
<b>Storage Temperature</b>	-40°C~85°C
<b>MTBF</b>	>200,000 hours at 40° full cycle
<b>Warranty</b>	5 years
Approval	
<b>Safety</b>	EN 60950-1 Compliance EN 62368-1:2014/AC:2017 Compliance IEC 60255-27:2013 Compliance
<b>EMC</b>	EN61000-6-2/EN61000-6-4 Compliance
<b>EMI</b>	CISPR 22, FCC part 15B Class A Compliance
<b>EMS</b>	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
<b>Radio</b>	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
<b>Railway</b>	EN50121-4
<b>Environmental</b>	EN 60870-2-2:1998 Compliance IEC 60068-2-21:2006 Compliance



Model Name	Description
WR322GR-EC-LTE-LORAWAN-EU868	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A, LoRaWAN 868MHz
WR322GR-EC-LTE-LORAWAN-EU433	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A, LoRaWAN 433MHz
WR322GR-EC-LTE-LORAWAN-US915	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, B1-5/7/8/12/13/18-20/25/26/28, TDD B38/39/40/41, LoRaWAN 915MHz
WR322GR-EC-LTE-LORAWAN-AS923	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, B1-5/7/8/12/13/18-20/25/26/28, TDD B38/39/40/41, LoRaWAN 923MHz
WR322GR-EC-LTE-LORAWAN-CN470	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/B3/B5/B8, TDD B38/39/40/41, LoRaWAN 470MHz
WR312GR-EC-LORAWAN-EU868	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 868MHz
WR312GR-EC-LORAWAN-EU433	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 433MHz
WR312GR-EC-LORAWAN-US915	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 915MHz
WR312GR-EC-LORAWAN-AS923	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 923MHz
WR312GR-EC-LORAWAN-CN470	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 470MHz
	*Other Regions by request *GPS by request
	<b>Package List</b>
	1 x Product Unit
	1 x 6-pin Removable Terminal Connector
	1 x Quick Installation Guide
	1 x Attached Din Clip
	<b>Default Enclosed Antennas:</b> 2x LTE Antennas, Black (WR322GR-EC-LTE-LORAWAN only) 1x LoRa Antenna

Optional Order	
MDR-40-24	Din Rail Power Supply, INPUT:85-264VAC, 120-370VDC, OUTPUT: 24VDC/1.7A, -20 ~ +70°C
ThingsMaster OTA-Annual Fee-100	ThingsMaster OTA Online OTA annual fee for 100 nodes
LR140-EU433 LR140-EU868 LR140-AS923 LR140-KR920 LR140-US915	LoRa WAN End-Node, 4CH AI, 1 Modbus RTU 485 Host 1 x RS485 Host, 2-wire 1 x SMA /LoRa Antenna Connector EU433: 433Mhz, EU868:868Mhz, AS923:923Mhz, KR920:920Mhz,US915:915Mhz