TLM Series LoRa Radio Modems

**with 2 × 10/100Base-T(x) Ports,
1 × RS232 and 1 × RS485 Serial Ports
and option for BPL (Broadband Power Line Link)**

REDZ
SMART COMMUNICATION
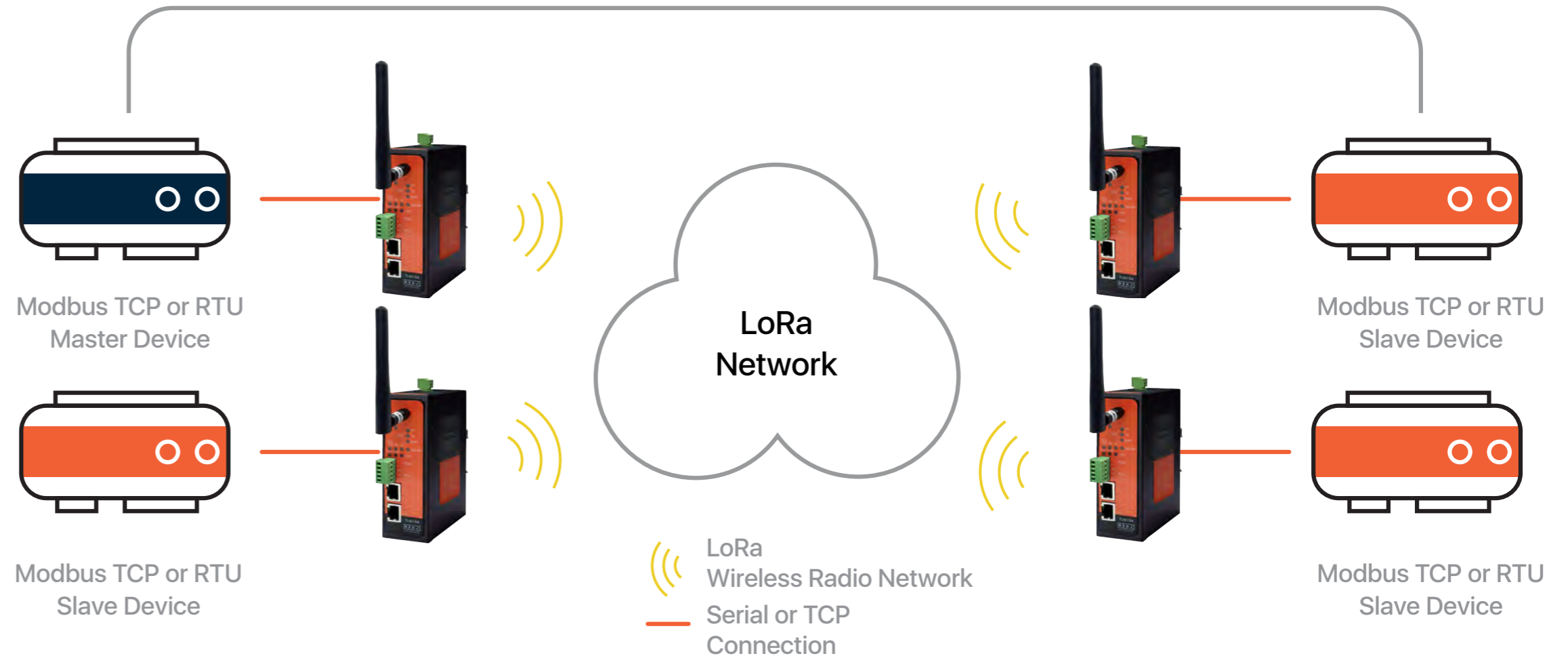
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TLM Series
LoRa Radio Modems
are designed for
industrial-grade
Radio Frequency (RF)
communication and
particularly for facilities
of rugged industry
and infrastructure.

Modbus Master Slave Link over Wireless LoRa Radio Network

Modbus TCP or RTU
Master Device

Modbus TCP or RTU
Slave Device

LoRa
Network

Modbus TCP or RTU
Slave Device

Modbus TCP or RTU
Slave Device

LoRa
Wireless Radio Network

Serial or TCP
Connection

TLM Series LoRa Radio Modems are
tailored to perform various features such as wide
temperature range, wide power input range and
several connectivity ports. Thus, TLM Series
LoRa Radio Modems are the best choice for
facility management, sewage treatment, power
utility, telecommunication, transportation and all
other applications that require industrial Radio
Frequency (RF) connectivity.

TLM Series Radio Modems can create a LoRa Based
RF network and connect Serial and/or ETH based
devices with each other. All communication can
be done over Radio Frequency network, based
on LoRa standard. TLM Series LoRa Based RF
Gateways can act as TCP to Lora Gateway as

TCP Server, TCP to Lora Gateway as TCP Client
or Serial to LoRa Gateway all in one device.
Typical applications: Automated Meter reading,
Wireless networks, Home – Building – Industrial
Automation, Remote Control, Wireless Sensors,
Telemetry, Wireless Alarm and Security Systems...

Main Features

- Supports 2 x 10/100Base-T(X) ports
- Supports Full/Half-Duplex, auto MDI/MDI-X on each port
- DHCP Server Capability
- Supports 1 x RS232 and 1 x RS485 Serial Connection up to 460800 Baud
- Embedded web interface for ease of use
- Up to 10 client connection in Server Mode
- 2 different Gateway Operating Modes:

Transparent Communication - TCP to TCP, TCP to Serial, Serial to Serial

Modbus TCP to RTU Conversion

- Creates Radio Network:

Point to point

Point to multi point - Broadcast

Point to multi point - TCP Socket to target address mapping based data transfer

- **868MHz or 2.4GHz LoRa based Radio Frequency (RF) Communication**
- **128 bit AES Encryption and Decryption on over the air communication**
- **868MHz Version:**

LoRa Signal Bandwidth Configurable: 125, 250, 500 kHz

LoRa Radio Power Configurable between 5dBm (~3mW) to 20dBm (100mW)

LoRa or FSK Selectable Modulation Options

- **2.4GHz Version:**

LoRa Signal Bandwidth Configurable: 200, 400, 800, 1600 kHz

LoRa Radio Power Configurable between -18dBm (~0,02mW) to 13dBm (~20mW)

LoRa or FLRC Selectable Modulation Options

- LoRa Rx Group Address and Device Address Configurable
- LoRa Tx Group Address and Device Address Configurable
- Easy to follow LoRa data packages on web interface
- Easy to follow Device Status on web interface
- Black List and White List based LoRa package filter
- Firmware Upgrade over Web
- 2 firmware storage capability on same device (1 active only)
- AC or DC wide range power options
- Wide operating temperature range from
  -25 to 70 °C AC and -40 to 85 °C DC power input versions
- Rugged Metal IP-40 housing design
- DIN-Rail mounting

Extra Features for Models with BPL (Broadband Powerline)
- Supports 2 x 10/100Base-T(X) ports + 1 x BPL link
- Wide range 3 phase AC input
- Supports up to 30Mbps PHY rate on BPL with
  Up to 10 hops and 1000 nodes
- Up to 432 sub-carriers from 2 to 28MHz analog bandwidth
- Support LDPC-C FEC with 128-bit AES core
- Plug and play with Master/Slave selection via web interface

Technical Specifications

Connectors and Ports

SMA Antenna Connector for LoRa	1 Standard SMA female interface, 50 ohm
Console Port	Micro USB or USB Type-C connection for LOG in 115200 baud
10/100T(X) RJ45 Ports	Ethernet Connection on 2 ports
Serial Ports	5 pin wired Terminal Connection Tx, Rx, GND for RS232 A and B for RS485
Reset Buttons	Reset to Client and Reset to Server Operating modes buttons

Ethernet Switch Technology

Ethernet Standards	IEEE 802.3 for 10Base-T IEEE 802.3u for 100Base-T(X) IEEE 802.3x Flow Control
Mac Table	1K MAC address entry
Processing	Store-and-Forward
Memory	448K bits packet buffer memory

BPL (Broadband Powerline) Technology for BPL Models

PHY Data Rate	Up to 240 MHz
MAC Layer Protocol	CSMA/CA
Modulation Technology	OFDM-432
VLAN	IEEE802.1q/ IEEE802.1p/ IEEE802.3d

LoRa Technology – 2.4GHz Version

Based on	Powerful Cortex M3 Pre-Certified according to EN 300 328
Sensitivity	Down to -130 dBm
Output Power level	Up to 13dBm
Link Budget	Up to 142 dB
Communication Distance	Up to 12km (Line of Sight)
Typical Communication Distance Indoor/Urban	>2km
Frequency Range	Min 2 402 000 137 Hz Max 2 479 999 939 Hz
LoRa Bandwidth Options	200 kHz 400 kHz 800 kHz 1600 kHz
Tx Power Level	-18dBm (~0,02mW) to 13dBm (~20mW) Configurable
LoRa Spreading Factor	SF5 SF6 SF7 SF8 SF9 SF10 SF11 SF12

LoRa Technology - 868MHz Version

Based on	STM32L151CxU6Axx Pre-Certified according to EN 300 220
Sensitivity	Down to -138 dBm
Output Power level	Up to 20 dBm
Link Budget	Up to 156 dB
Communication Distance	Up to 12 km (Line of Sight)
Typical Communication Distance Indoor/Urban	> 2 km
Frequency Range	Min 863Mhz, Max 870MHz

Led Indicators

Power indicator	Power LED
10/100T(X) Indicators	Activity LEDs: ETH1, ETH2 and TLM (Activity of device itself)
LoRa Indicators	Alive (Blinks during normal operation), Tx and Rx of data LEDs
System Indicators	Status LED, Tx and Rx of data LEDs and Server LED (LED ON: Server Operating Mode, LED OFF: Client Operating Mode)
Console Indicators	Tx and Rx of data LEDs

Power - DC Models

Input Range	5-48V DC wide range Power Input (Allows up to 60 V DC)
Reverse Polarity Protection	Available
Thermal Shutdown and Current Limit Protection	Available

Physical & Environmental Characteristics DC Models

Enclosure	Metal, IP 40
Dimensions	43 × 95 × 124 (w × d × h) mm
Weight	~ 380 gr
Storage Temperature	– 65 to 150 °C
Operating Temperature	– 40 to 85 °C
Operating Humidity	5% to 95% Non-condensing

Power – AC Models

Input Range	100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC input
Isolation	Fully Isolated >4200Vrms, 5mA 1 Min
Insulation	Class II

Physical And Environmental Characteristics AC Models

Enclosure	Metal, IP 40
Dimensions	43 x 95 x 124 (w x d x h) mm
Weight	~400gr
Storage Temperature	-40 to 85 °C
Operating Temperature	-30 to 70 °C
Operating Humidity	10% to 95% Non-condensing

Power – BPL Models

Input Range	3 Phase Input, 110V–240V 50Hz to 60Hz AC input
Power and Data	AC Power supply use L1-N only. Phase 2-3 connections are used for BPL signal transmission.

Physical And Environmental Characteristics BPL Models

Enclosure	Metal, IP 40
Dimensions	43 x 95 x 124 (w x d x h) mm
Weight	~400gr
Storage Temperature	-65 to 150 °C
Operating Temperature	-40 to 85 °C
Operating Humidity	5% to 95% Non-condensing

N

L1

L2

L3

POWER INPUT

RESET TO SERVER

RESET TO SERVER

RESET TO CLIENT

RESET TO CLIENT

Ordering Information

TLM154: 868MHz LoRa RF Modem, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-48V (max. 60V) DC Power Input

TLM254: 868MHz LoRa RF Modem, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

TLM655: 868MHz LoRa RF Modem, 2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

TLM194: 2.4GHz LoRa RF Modem, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-48V (max. 60V) DC Power Input

TLM294: 2.4GHz LoRa RF Modem, 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

TLM695: 2.4GHz LoRa RF Modem, 2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

Product Comparison

Model	868MHz LoRa	2.4GHz LoRa	5-48V (max. 60V) DC Power input	100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input	3 Phase AC Power input, 110V240V/ 50-60Hz AC Power Input	2 x 10/100 T(x) ETH ports	1 x RS232 and 1 x RS485 Serial Ports	BPL (Broadband Power Line) Link
TLM154	●		●			●	●	
TLM194		●	●			●	●	
TLM254	●			●		●	●	
TLM294		●		●		●	●	
TLM655	●				●	●	●	●
TLM695		●			●	●	●	●