

SQC485lv2-LW

LoRa® RS485 Industrial Node — LoRaWAN®



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Document	Rev	Date	Notice
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SQC485lv2-LW Datasheet	Rev 1.0	Jun 2026	Siliqs © Limited standard files
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Document Version

Version	Time	Description	Remark
Rev. 1.0	2026-06-13	Preliminary version	Living

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CONTENTS

- 1. Description — 1.1 Overview / 1.2 Application Example / 1.3 Product Features
- 2. Specifications — 2.1 General / 2.2 Operating conditions
- 3. Hardware resource — 3.1 Block diagram / 3.2 Physical dimensions
- 4. Resource — 4.1 Relevant resource / 4.2 Contact Information

1. Description

1.1 Overview



SQC485Iv2 — LoRa RS485 Industrial Node

The SQC485Iv2 is a ruggedized industrial wireless node that converts industrial RS485 / Modbus bus data into LoRa wireless data. It integrates a 32-bit CPU core and a Semtech SX1262 LoRa transceiver.

It accepts a wide 8–30 V industrial supply — or 5 V from the USB Type-C port — and combines high-power LoRa, robust industrial RS485, USB Type-C and BLE 5 in a single compact node. USB Type-C provides power, programming and console access, while BLE 5 enables convenient wireless provisioning in the field.

This is a highly reliable device for industrial IoT scenarios, providing a method to bring legacy RS485 instruments onto a LoRaWAN® network. It runs LoRaWAN Class A/C firmware, integrating easily into standard LoRaWAN infrastructure (ChirpStack, TTN, etc.) via any compliant gateway.

This is the LoRaWAN variant; the Meshtastic variant is documented in the separate SQC485Iv2-MH datasheet.

1.2 Application Example

The SQC485Iv2-LW bridges field-side RS485 equipment to a LoRaWAN network for cloud delivery.

1.2.1 RS485 / Modbus backhaul (point-to-many)

Multiple Modbus meters each connect to an SQC485Iv2-LW over RS485; the nodes transmit over LoRaWAN to a shared gateway, which forwards to the cloud via LTE / Ethernet.

Modbus meter → RS485 → SQC485lv2-LW → LoRaWAN → Gateway → LTE / Ethernet → Cloud

For detailed networking modes and configuration, refer to the Siliqs documentation (see section 4.1).

1.3 Product Features

- DC 8–30 V wide-voltage industrial input, or 5 V via USB Type-C (≥ 500 mA) — automatic source selection between the two.
- LoRaWAN Class A/C firmware — AS923-1 (RP002-1.0.5), selectable AS1 / AS2 channel plan, 8-channel plans matching standard SX1302 / SX1303 gateways. Listen-Before-Talk (LBT) supported where required by the regional plan.
- Operating frequency configurable to the destination region's sub-GHz LoRaWAN band; comply with the local regulatory limits of the country of deployment.
- Industrial-grade RS485 transceiver — ± 70 V bus-fault protection, ± 12 kV HBM ESD on bus pins, true fail-safe receiver and thermal shutdown.
- Miswiring- and surge-protected RS485 front-end (field-tested): multi-stage industrial protection validated to survive up to 25 V accidentally applied across the A / B terminals.
- USB Type-C for programming and console, ESD-protected.
- Internal 2.4 GHz antenna for BLE provisioning (enclosed, no external connector).
- Operating temperature range: $-40 \sim 85^{\circ}\text{C}$.

2. Specifications

2.1 General specifications

Table 2.1: General specifications

Parameters	Description
MCU	32-bit CPU core
LoRa chipset	Semtech SX1262
LoRaWAN	Class A/C, AS923-1 — selectable channel plan AS1 / AS2 (RP002-1.0.5), note 1
Operating frequency	Sub-GHz LoRaWAN band per destination region (e.g. AS923 920–925 MHz); configurable, note 1
RS485 transceiver	Industrial-grade, half-duplex — ± 70 V bus-fault protection, ± 12 kV HBM ESD, true fail-safe receiver, thermal shutdown
RS485 protection	Multi-stage industrial fault & surge protection; survives up to 25 V miswiring across A/B (tested)
2.4 GHz wireless	BLE 5.0 (internal antenna)
Max. TX power	+22 dBm (firmware-configurable; subject to the regional LoRaWAN / regulatory limit of the country of deployment), note 2
Max. receiving sensitivity	-148 dBm (SF12)
Supply voltage	8 ~ 30 V DC (POW_IN), or 5 V DC via USB Type-C (≥ 500 mA); automatic source selection
Operating temperature	$-40 \sim 85^{\circ}\text{C}$
Operating humidity	10% ~ 90%, non-condensing
Antenna impedance	50 Ω
RS485 baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200

Note 1: SQC485lv2-LW runs LoRaWAN Class A/C. The default channel plan is AS923-1 (RP002-1.0.5, AS1 / AS2 selectable); the operating frequency band is configured to the destination region's sub-GHz LoRaWAN allocation. The Meshtastic variant is documented separately (SQC485lv2-MH).

Note 2: The +22 dBm hardware output is firmware-configurable and must be set within the regional LoRaWAN Max EIRP and the radio regulations of the country of deployment (e.g. LoRaWAN AS923 software default Max EIRP is +16 dBm per RP002-1.0.5; the network server may further limit it). It is the integrator's responsibility to obtain the applicable regional type approval.

2.2 Operating conditions

2.2.1 Power supply range

Table 2.2.1: Power supply range

Parameter	Min.	Typical	Max.	Unit
Device operating input voltage (POW_IN)	8	12 / 24	30	V
USB Type-C input voltage	4.75	5.0	5.25	V
USB Type-C input current	—	—	500	mA
Regulated system rail	—	3.3	—	V

The device may be powered from the 8–30 V industrial input (POW_IN) or from the 5 V USB Type-C port; an automatic power-path selects whichever source is present. A USB host or charger supplying at least 500 mA at 5 V is sufficient for full operation, including LoRa TX peaks.

2.2.2 Power consumption

Typical operating currents at the 3.3 V rail (RS485 idle). RX/TX figures are SX1262 datasheet-derived references.

Table 2.2.2: Working current

Mode	Board Rev.	Current	Notes
RX Listening (ref.)	—	~27 mA	MCU active + SX1262 RX
TX @ +22 dBm (peak, ref.)	—	~140 mA	SX1262 PA peak

2.2.3 Air data rate

LoRa (CSS) modulation. Data rate depends on spreading factor / bandwidth.

Table 2.2.3: Air data rate

LoRaWAN AS923. Data rate depends on the data rate (DR) index / spreading factor.

Unit	Levels	Air rate
bps	8 (DR0–DR7)	250 / 440 / 980 / 1760 / 3125 / 5470 (SF12–SF7 @125 kHz); 11000 (SF7 @250 kHz); 50000 (FSK)

2.2.4 TX Power levels

Table 2.2.4: TX Power levels

Unit	Levels	TX Power
dBm	4	22 / 17 / 14 / 10

TX power must be set within the regional LoRaWAN Max EIRP and the radio regulations of the country of deployment.

2.2.5 Interface (connectors and pinout)

Table 2.2.5: Interface

Symbol / Name	Type	Function
POW_IN	Socket	8–30 V DC industrial supply
485A	Socket	RS485 interface A
485B	Socket	RS485 interface B
USB-C	Connector	Programming / power / console
LoRa ANT	On-board SMA connector	External LoRa antenna (sub-GHz)
2.4G ANT	Internal	BLE antenna

2.2.6 RS485 bus length vs data rate

The A/B pair carries an on-board 340 Ω termination (2 × 680 Ω in parallel) — a "soft" termination above the 120 Ω nominal line impedance, best suited to lower-to-moderate-speed Modbus over short-to-medium cable (the typical industrial metering case). Recommended maximum bus length by baud rate:

Table 2.2.6: Recommended bus length (on-board 340 Ω soft termination)

Baud rate	Recommended max bus length
9600 bps	~1000 m
19200 bps	~500 m
38400 bps	~250 m
57600 bps	~170 m
115200 bps	~100 m

The table lengths are limited by reflections off the soft 340 Ω termination, not by RS485 itself. The 340 Ω sits only at this node's A/B point; a bus is properly terminated at its two physical cable ends with ~120 Ω. If this node is at one end of the bus, add a 120 Ω at the opposite end; if it is mid-bus, fit 120 Ω at both ends (the 340 Ω then only lightly loads the bus — by design). The transceiver's maximum data rate is 115200 bps; with proper end-termination the bus reaches ~1000–1200 m. Estimates assume good twisted-pair cable (≈ 5 ns/m), are intentionally conservative, and vary with cable quality, node count and EMI environment.

2.2.7 RF / radio parameters

Table 2.2.7: RF / radio parameters (LoRaWAN)

Parameter	Value
Modulation	LoRa (CSS) / (G)FSK
Network	LoRaWAN Class A/C (RP002-1.0.5)
Default channel plan	AS923-1 — selectable AS1 / AS920-923 (921.8–923.4 MHz) · AS2 / AS923-925 (923.2–924.8 MHz)
Operating band	Configurable to destination region's sub-GHz LoRaWAN allocation
Default channels	923.2 / 923.4 MHz (AS923, LoRa, BW125)
Channels per plan	8 × 125 kHz (multi-SF) + DR6 (250 kHz) + DR7 (FSK) — matches SX1302 / SX1303 8-channel gateways
Data rate	DR0–DR5 (SF12–SF7 @125 kHz), DR6 (SF7 @250 kHz), DR7 (FSK 50 kbps)
Channel bandwidth	125 / 250 kHz
Listen Before Talk (LBT)	Supported (where required by the regional plan)
Max conducted TX power	Up to +22 dBm (158 mW), firmware-configurable (within regional limit)
LoRa antenna	KYOCERA AVX X9003088-3GDSMB (SMA-M stubby, ~2 dBi)
Regulatory	Comply with the radio regulations and LoRaWAN Max EIRP of the country of deployment; regional type approval is the integrator's responsibility.

2.2.8 BLE / 2.4 GHz RF parameters

Table 2.2.8: BLE / 2.4 GHz RF parameters

Parameter	Value
Standard	Bluetooth Low Energy 5.0
Frequency range	2402–2480 MHz (40 channels, 2 MHz spacing) within the 2400–2483.5 MHz ISM band
Modulation	GFSK, adaptive frequency hopping (AFH)
Use	Wireless provisioning / commissioning (low power)
Antenna	Internal PCB antenna (not user-accessible)
Antenna gain	≤ 6 dBi
Max conducted TX power	+3 dBm (2 mW), configurable
Regulatory	2.4 GHz ISM band; comply with the regulations of the country of deployment (BLE AFH qualifies as a frequency-hopping system).

3. Hardware resource

3.1 Block diagram

The functional signal chain is summarized below (graphical block diagram to be added).

Table 3.1: Functional blocks

Stage	Components	Function
Power input	Protected input + buck converter + LDO	8–30 V DC down to regulated 3.3 V rail
Power path	Automatic source ORing	Selects between USB-5V and the 8–30 V main supply
Core	32-bit MCU + SX1262 module	MCU, LoRa radio, internal 2.4 GHz antenna
RS485	Industrial RS485 transceiver + multi-stage protection	±70 V fault-protected, surge- and miswiring-protected RS485 to 485A / 485B
USB	USB Type-C + ESD protection	Programming / console

3.2 Physical dimensions

The enclosure is a compact rectangular body with a Ø70 raised circular label face on the front. Two mounting holes on the front face allow direct surface mounting. The LoRa SMA connector and USB Type-C port are on the top edge; the pluggable RS485 / power terminal block is on the bottom edge.

Table 3.2: Enclosure dimensions

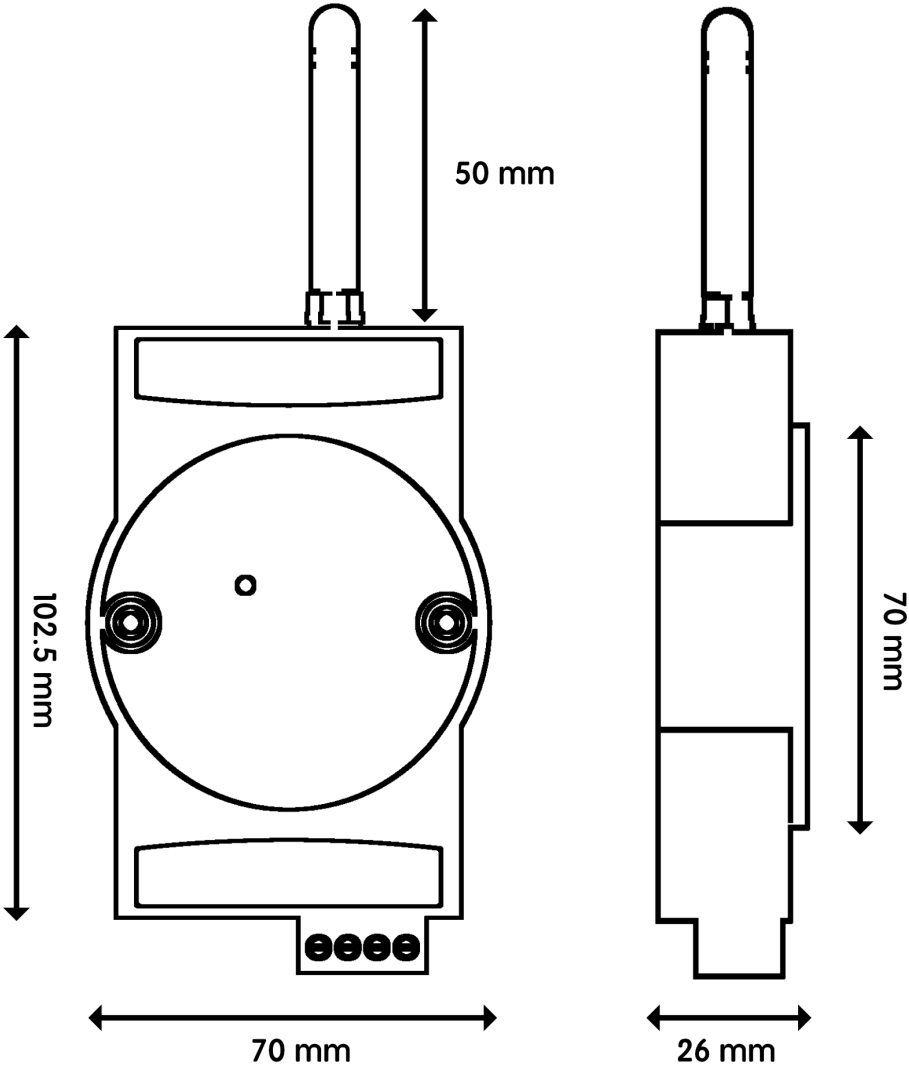
Parameter	Value	Notes
Body (W × L × D)	60 × 102.5 × 23 mm	Rectangular main body
Front label-face diameter	Ø70 mm	Raised ~3 mm above body face
Overall height (incl. label face)	26 mm	Body 23 mm + label face 3 mm
Label keep-out (recess)	Ø65 mm	Ø65 sunk area on the front label face
Mounting holes	2 × Ø3.5 mm (through)	Ø8 counterbore
Mounting hole pitch	55 mm	Horizontal, centred on label face
RS485 / power terminal	4-pin pluggable, 5.08 mm pitch	Bottom edge (V / G / A / B)
LoRa antenna connector	SMA (female)	Top edge
USB Type-C	On top edge	Programming / power / console

Overall depth (incl. front bulge)	26 mm
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See dimension drawing below

Dimensions exclude the external antenna and the mating terminal-block plug. All values ± 0.5 mm (preliminary, from the mechanical model).

Figure 3.2: Dimension drawing (front and side views, mm)



SQC485lv2 — front and side dimension drawing

4. Resource

4.1 Relevant resource

- Siliqs product store: <https://siliqs.net>

4.2 Contact Information

Siliqs

- Web: <https://siliqs.net>
- Email: support@siliqs.net

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