

LoRa Concentrator Card

GL5712-UX Datasheet

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1. Description

1.1 Overview

GL5712-UX is a LoRa concentrator card with industrial standard mini PCIe express form factor based on SX1301 chipset. This mPCIe module can be used in any embedded platform offering a free mPCIe slot with USB/SPI connectivity and capable of providing enough power for the module. which enables low-power wide area communication capabilities to your new gateway design or existing industrial routers/computer.

Each module support eight(8) programmable parallel demodulation channels, allowing it to receive up to eight LoRa® modulated packets simultaneously. -142.5dBm high sensitivity combine with amplifier yields industry leading link budget making it optimal for applications requiring extended range and robustness.

Typical applications

- ✓ Automated Meter Reading
- ✓ Home and Building Automation
- ✓ Wireless Alarm and Security Systems
- ✓ Industrial Monitoring and Control
- ✓ Machine to Machine (M2M)
- ✓ Internet of Things (IoT)



GL5712-UX LoRa concentrator cards are available in four product variants

N O.	Model	Description	Rema rk
1	GL5712-U X	902~928MHz IPEX connector, is mainly designed for operation in America south-east Asia.	

Table1.1 Product variants

1.2 Product features

- ✓ **Multichannel**, 10 programmable parallel demodulation paths, up to 8 RX channel and 1 TX channel for 125K LoRa.
- ✓ **SPI Interface**, The SPI interface gives access to the configuration register of SX1301 via a synchronous full-duplex protocol.
- ✓ **USB2.0 Interface**, Module build in FT232H to convert SPI interface of SX1301 to USB2.0, which compatible with 3G/LTE card of mini-PCIe type.
- ✓ Compact mini PCIe express form factor TYP. 50.9*30.1*13.9mm (W*L*H)
- ✓ Environmentally friendly RoHS compliant
- ✓ Compliance:
 - US Version (GL5712-UX): Certified to FCC Modular Transmitter Standards

2. Specifications

2.1 General specifications

Table3.1 General specification

2.2 Electric specifications

ESD Notice: GL5712-UX is a high performance radio frequency device. It satisfies:

- ✓ Class 2 of the JEDEC standard JESD22-A114 (Human Body Model) on all pins.
- ✓ Class III of the JEDEC standard JESD22-C101 (Charged Device Model) on all pins

It should thus be handled with all the necessary ESD precautions to avoid any permanent damage.

 The limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only, and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to these limits for extended periods may affect device reliability.

2.3 Absolute maximum rating

Symbol	Description	Condition	Min	Max.	Unit
3.3Vaux	Module supply voltage	Input DC voltage at 3.3Vaux pins	-0.3	3.6	V
USB	USB D+/D- pins	Input DC voltage at USB interface pins	3.6	3.6	V
SPDT_SEL	Port select	Input DC voltage at SPDT_SEL input pins	-0.3	3.6	V
RESET	MPCI reset input	Input DC voltage at RESET input pin	-0.3	3.6	V
SPI	SPI interface	Input DC voltage at SPI interface pin	-0.3	3.6	V
GPS_PPS	GPS 1 pps input	Input DC voltage at GPS_PPS input pin	-0.3	3.6	V
Rho_ANT	Antenna ruggedness	Output RF load mismatch ruggedness at ANT1	10:1		VSWR
Tstg	Storage Temperature		-40	85	°C

Table2.3 absolute maximum rating

 Stressing the device beyond the “Absolute Maximum Ratings” may cause permanent damage. The product is not protected against over-voltage or reversed voltages. If necessary, voltage spikes exceeding the power supply voltage specification, given in table above, must be limited to values within the specified boundaries by using appropriate protection diodes.

2.4 Operating conditions

 All specifications are at an ambient temperature of 25° C. Extreme operating temperatures can significantly impact specification values. Applications operating near the temperature limits should be tested to ensure the specification.

Parameter	Min.	Typ	Max.	Unit	Remarks
Normal operating temperature	-20	+25	+65	°C	fully functional and meet 3GPP specifications
Extended operating temperature	-40		+80	°C	RF performance may be affected by outside normal operating range
Storage Temperature	-40		+125	°C	

Table2.4.1 operating temperature range

 Operating beyond the specified operating conditions can affect device reliability.

Symbol	Parameter	Min.	Typical	Max.	Unit
3.3Vaux	Module supply operating input voltage	3.00	3.30	3.60	V

Table2.4.2 Operating power supply range

 Operating beyond the specified operating conditions can affect device reliability.

Item	Parameter	SPEC			Unit	Condition
		MIN	TYP	MAX		
TX	Transmit Frequency	923.3		927.5	MHz	ISM Band
	Frequency Deviation		12.5		KHz	25 °C
RX	Receiving Sensitivity		-142.5		dBm	

Table2.4.3 RF receiver characteristics

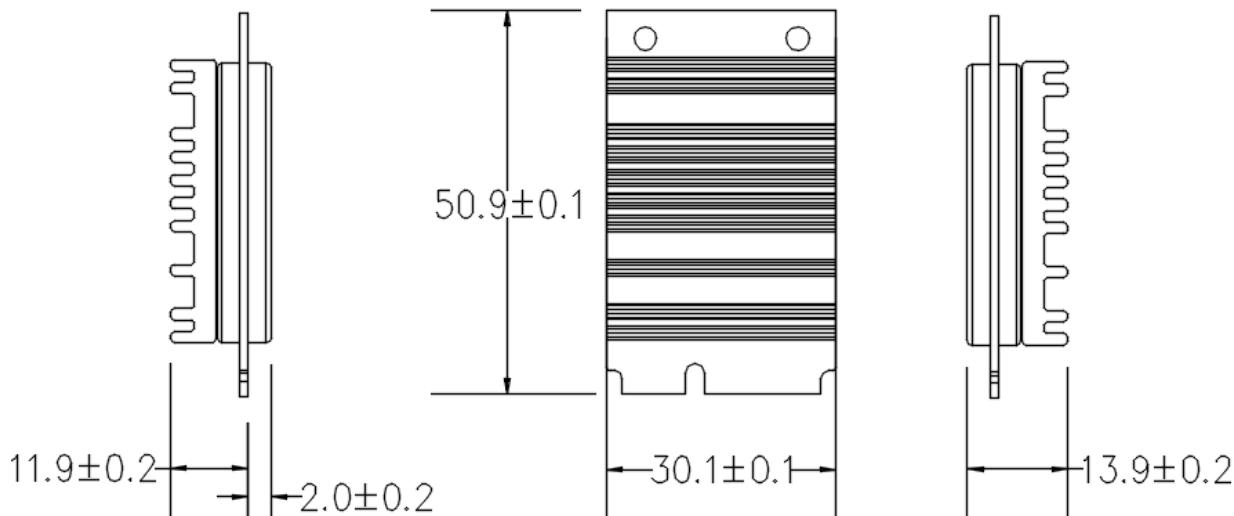
 GL5712-UX series LoRa RF characteristics are specified in the SX1257series Data Sheet .

Mode	Condition	Min	Typ	Max	Unit
RF Idle	All of the chip on the board enter idle mode or shutdown.				uA
Rx active	TX disabled and shutdown PA.	120	185		mA
Tx active	The power of TX channel is 14.9dBm and 3.3V supply.	520	700		mA

Table2.4.4 Current consumption

3. Typical hardware connections

3.1 Physical dimensions



Item	Length	Width	Thickness	Unit	Remark
Dimensions	50.9	30.1	13.9	mm	

Table3.1 dimensions

3.2 Interfaces

Reference circuit design shows the typical hardware connections for the module. Interfacing to the module requires connecting to the signals provided on the GL5712-UX mPCIe connector as listed in pin description. Specific interface connections are discussed in this chapter.

3.2.1 Interface to host MCU

✓ SPI interface

A SPI interface is provided on the PCIe_SCK, PCIe_MISO, PCIe_MOSI, PCIe_CS_N pins of the system connector. The SPI interface gives access to the configuration register of SX1301 via a synchronous full-duplex protocol. Only the slave side is implemented.

✓ USB interface

GL5712-UX series modules can support high speed USB to SPI by FT232H, it include a high-speed USB 2.0 compliant interface with maximum 480 Mb/s data rate, representing the interface for any communication with an external host application processor. The module itself acts as a USB device and can be connected to any USB host equipped with compatible drivers. For more information please refer to the data sheet of FT232H.

3.2.2 Power pins

GL5712-UX series modules must be supplied through the 3.3Vaux pins by a DC power supply. The voltage must be stable, because during this operation the current drawn from 3.3Vaux can vary significantly, based on the power consumption profile of the SX1301 chip(see SX1301 DS).

3.2.3 RF connection

The modules have one RF interfaces over a standard U.FL connectors (Hirose U.FL-R-SMT) with a characteristic impedance of 50. The RF port (ANT1) supports both Tx and Rx, providing the antenna interface.

3.2.4 RESET pin

GL5712-UX series includes the RESET active-high input signal to reset the radio operations as specified by the SX1301 Specification.

3.2.5 GPS_PPS

GL5712-UX series includes the GPS_PPS input for received packets time-stamped.

3.2.6 RF enable

The GL5712-UX mPCIe Smart concentrator card has an input signal used to enable the RF radio on the module. A low level on the RF_ENABLE pin will disable all RF transmission and reception

4. Reliability test and approves

Tests for product family qualifications are according to ISO 16750 "Road vehicles – Environmental conditions and testing for electrical and electronic equipment", and appropriate standards.



Products marked with this lead-free symbol on the product label comply with the "Directive 2002/95/EC and Directive 2011/65/EU of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS). All Maxiiot GL5712-UX modules are RoHS compliant.

Compliance(Pending):

- US Version (GL5712-UX): Certified to FCC Modular Transmitter Standards

FCC Caution:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful

interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

OEM/Integrators Installation Manual

List of applicable FCC rules This module has been tested and found to comply with part 15.247 requirements for Modular Approval.

Summarize the specific operational use conditions This module can be applied in household electrical appliances as well as TV and IP camera. The input voltage to the module should be nominally 3.0 - 3.6 VDC, typical value 3.3VDC and the ambient temperature of the module should not exceed 85 °C.

Limited module procedures

N/A

Trace antenna designs

N/A

Antennas

The module of GL5712-UX has one Antenna port and the antenna gain is 1.0dBi.

Label and compliance information When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed

on the outside of the final device that contains the following text: Contains Transmitter Module

FCC ID: 2A3A5-GL5712, the FCC ID can be used only when all FCC ID compliance requirements are met.

Information on test modes and additional testing requirements

- a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re - test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).
- b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand - alone configuration. It is important to note that host product

manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected .

Additional testing, Part 15 Subpart B disclaimer

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part15 digital device. The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation. When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publiclyavailable drivers and turned on, so the transmitters are active. In certain conditions it might beappropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

5. Package

Module	Package			Article number
	Form	QTY	Size	
GL5712-UX	Trays	As required	As required	Undetermined

Table5.1 package

6. Contact Us

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