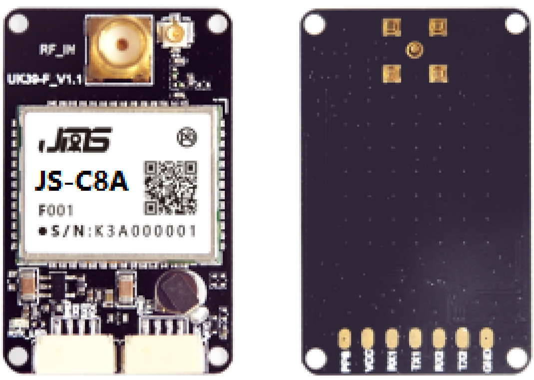
JS-CK39-A

PRODUCT SPECIFICATION

Data Sheet



Contents

Change History of Revision

Revision	Date	Contents of Revision Change	Remark
V1.0	2024-04-22	First release	Wang Wei

1 Functional description

1.1 Overview

The JS-CK39-A is a concurrent GNSS receiver that can receive and track multiple GNSS systems. Thanks to the multi-band RF front-end architecture, it can be configured to receive BDS-2, BDS-3, GPS, GLONASS, Galileo, SBAS and QZSS simultaneously, providing high-performance position reporting and navigation solutions, and when using correction data, all satellites can be processed to provide RTK navigation solutions. In addition, the module onboard inertial navigation device is very suitable for the scale application of Beidou products, supports integrated navigation algorithms, and is suitable for intelligent driving, drones, intelligent robots and other fields.

1.2 Product features

- Build on high performance GNSS C8A
- Support integrated navigation algorithm
- Multiple GNSS system multi-frequency points, support Beidou-3
- Built-in antenna short circuit protection, open circuit detection
- Supports GPS,BDS, GLONASS, Galileo and QZSS,SBAS
- Provides suppression of potential narrowband and monophonic radio interference signals in the GNSS signal band
- Compact size (25.0*39.4*11.6mm±0.3mm) suitable for space-sensitive application

1.3 Performance

Parameter	Specification
Receiver Signals	■GPS: L1C/A, L2P, L2C ■BDS-2:B1I,B2I ■BDS-3:B1C,B2b ■GLONASS:G1,G2 ■Galileo:E1,E5b ■QZSS:L1C/A,L2C ■SBAS:L1C/A
Sensitivity	Tracking -155dBm Reacquisition -138dBm
Time-To-First-Fix[1]	Cold Start < 20 s(Adding Acceleration Capture Module) Hot Start <10 s(Typical) RTK convergence time < 5 s(Typical) Lost lock recapture <1s
Position accuracy	GNSS H ≤ 1.5m, V ≤ 3m (1σ, PDOP≤4) RTK H ± $(8 + 10^{-6} \times D)$ mm V± $(15 + 10^{-6} \times D)$ mm D - Baseline length (Unit: km)
Measurement Precision	Pseudorange Precision ≤10cm Carrier Phase Precision ≤1mm
Speed Accuracy	≤0.02m/s
Time Accuracy	20ns
Gyroscope	Range 250°/s Total zero deviation 0.5°/s

Acceleration of speed	Range	4g
	Total zero deviation	20mg
Inertial Navigation	While the GNSS antenna signal is losing lock for 3 seconds, the accuracy maintains at centimeter level. While the GNSS antenna signal is losing lock for 10 seconds, the accuracy maintains at meter level.	
Data Rates	Measurements & Position	100Hz（Optional)
	RTK: Positioning	20Hz（Optional)

※1 All satellites at -130dBm, 12 SVs

1.4 Protocol

Protocol	Type
NMEA 0183	GPGGA,GPGSV,GPGLL,GPGSA,GPGST,GPHDT,GPRMC,GPVTG,GPZDA
（CNB）Binary format	Custom binary
CMR(GPS)	CMROBS, SMRREF
RTCM2.X	RTCM1,RTCM3,RTCM9,RTCM1819,RTCM31,RTCM41,RTCM42
RTCM3.X	1004~1008,1012,1019,1020,1033,1042,1045/1046,1230,4078 MSM3~MSM7:1073~1077,1083~1087,1123~1127,1093~1097

1.5 Antenna

Parameter	Specification	
Antenna Interface	Impedance Matching	Wiring 50 Ohm impedance matching
	LNA Power	External :+3.3V~+5V±5%VDC @0-100mA
	LNA Gain	20~35dB（Suggested)

1.6 Product Application

- Intelligent driving
- Maritime navigation, fleet management
- Intelligent robot
- Car navigation and tracking
- Automotive applications
- Emergency rescue
- UAV

1.7 RTK operation

1.7.1 Rover navigation modes

In its default configuration the CK39-A Rover will attempt to provide the best positioning accuracy dependant on the received correction data. It will enter RTK Float mode as soon as it receives an input stream of RTCM messages. Once the Rover has resolved the carrier phase ambiguities it will enter RTK Fixed mode. It is when the Rover is in RTK Fixed mode that the relative accuracies can be expected to be correct to the cm-level. The reference frame of the reference receiver (or base) must be transformed by the user into the required system being used by their application and mapping system. If comparing the rover position with a reference system the same RTCM stream should be used to ensure the reference and rover are outputting the same position. If doing post processing of a reference system its output must be transformed to same ITRF and datum being used by the rover.

RTK is a differential system where the rover uses the reference datum of the reference station. The International Terrestrial Reference Frame (ITRF) must be obtained from the reference network and then used to transform the rover position output to match the required reference frame. The rover will not output the position in the local receiver WGS84 (based on ITRF2008) datum, it will match the reference receiver (or base) reference frame. The user application will need to do the transformation for use in a mapping application if it does not use the same reference frame. An offset can occur if this is not done.

If RTCM corrections become unavailable, the cover will run as a standalone precision receiver.

The current mode of operation is indicated by the relevant NMEA and related instruction information.

Note：The module includes two UART interfaces, UART1 and UART2. If you need to use differential, set one of the interfaces as a differential port (UART2 is recommended). For example, if you set UART2 as a differential port, you need to send

1. To set com2 as differential port, send Interfacemode com2 auto auto on.

2. To configure the location information, send log com2 gpgga ontime 1.

3. To save the configuration, send saveconfig.

Once set as a differential port, the port can only receive instructions, not send instructions. COM1 can send "Interfacemode com2 compass compass on" so that com2 can resume command mode, but at this point it will not be able to perform differential.

1.7.2 Base station mode

The RTK rover needs RTCM corrections in order to achieve high precision results. These corrections come from a local receiver (the base), or via a reference receiver. If the two receivers are local to each other they are called the base and rover. If the rover is provided its corrections from a system such as VRS/CORS it is provided its corrections from a service or reference receiver.

The corrections can be supplied to the CK39-A using several interfaces: UART

The link between the rover and the source of the corrections can be any form of wireless link: Cellular, WIFI, Bluetooth, proprietary radio, ISM etc. The user only needs to ensure the RTCM messages arriveat the I/O port selected on the CK39-A. This link will be bi-directional for a VRS services as the rover has to provide its position usually every 30 seconds at least.

Instead of using two local receivers in a base and rover configuration you can use a correction service that can be accessed over the internet. The rover receives corrections in RTCM format that are provided over the internet via a NTRIP service. This requires that an NTRIP client processes the corrections from an NTRIP server on the internet. This client will be implemented on a host application connected to the rover. There are many open source variants of NTRIP clients available that can be implemented on embedded or Windows, Linux, Android systems.

The configuration of the RTCM 3x correction stream must be done according to the following rules:

- All observation messages must be broadcast at the same rate.
- The reference station ID field in the GPS, GLONASS, Galileo, BDS observation messages must be consistent with the reference station ID field in the reference station message otherwise the rover will not be able to compute its position.
- The RTCM 3x stream must contain the "GLONASS code-phase biases" message (type 1230) or the " Receiver and Antenna Description" message (type 1033) otherwise the GLONASS ambiguities can only be estimated as float, even in RTK fixed mode. If using a CK39-F as a base, "GLONASS code-phase bi ases" message (type 1230) must be enabled to be output. For a CK39-F being used as a rover if no R

TCM 1230 message is received, or if the reference receiver type reported in RTCM 1033 message is un known to the CK39-A receiver, the CK39-A rover will only be able to estimate GLONASS ambiguities as float, even in RTK fixed mode. This will result in degraded performance, especially in challenging envir onments.

- The static reference station message (type 1005 or type 1006) does not need to be broadcast at the same rate as the observation messages however the rover will not be able to compute its position until it has received a valid reference station message.
- The RTCM 3x stream should only contain one type of observation messages per constellation. When using a multi-constellation configuration, all constellations should use the same type of observation messages. Mixing RTK and MSM messages will result in undefined rover behavior.
- If the receiver is configured to output RTCM messages on several ports, they must all have the same RTCM configuration otherwise the MSM multiple message bit might not be set properly.

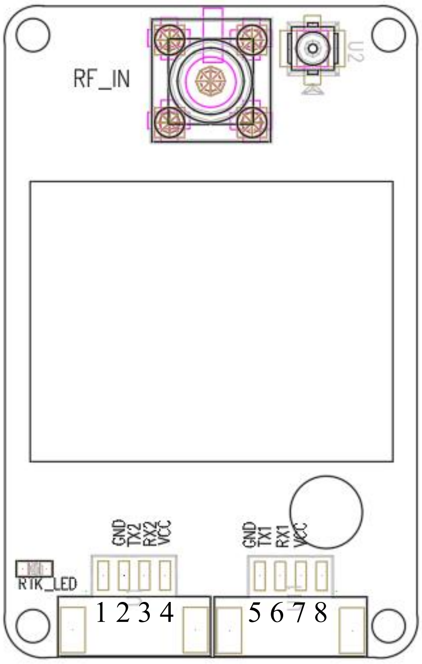
✌ If you want to use base station mode, please contact us.

1.8 Product Application

- UAV
- Automotive application
- Precision agriculture
- AVL and Location-Based Services
- Marine Navigation, Fleet Management
- Handheld GPS receiver application
- Intelligent logistics scheduling
- Measurement of surveying and mapping
- Personnel protective
- Driving test
- Car navigation and tracking
- Geographic Surveying
- Intelligent robot

2 Pin definition

2.1 Pin assignment



No.	Name	I/O	Description
1	GND	G	Ground
2	TX2	O	UART2 Data output
3	RX2	I	UART2 Data input
4	VCC	P	Main Supply
5	GND	G	Ground
6	TX1	O	UART1 Data output
7	RX1	I	UART1 Data input
8	VCC	P	Main Supply

3 Electrical specifications

Parameter	Symbol	Min	Typ	Max	Units
Power supply voltage	VCC	3.3	5.0	5.5	V
Power Consumption	Anti-interference off		0.8 @3.3V±5%DC		W
	Set anti-interference on		0.9 @3.3V±5%DC		W
Backup battery			0.07		F
Digital IO voltage	Div	3.3		3.3	V
Storage temperature	Tstg	-45		85	℃
Operating temperature[1]	Topr	-40		85	℃
Farah capacitance[2]	Tstg	-25		60	℃
Humidity				95	%

1 The temperature range is the operating temperature range without the Farad capacitor

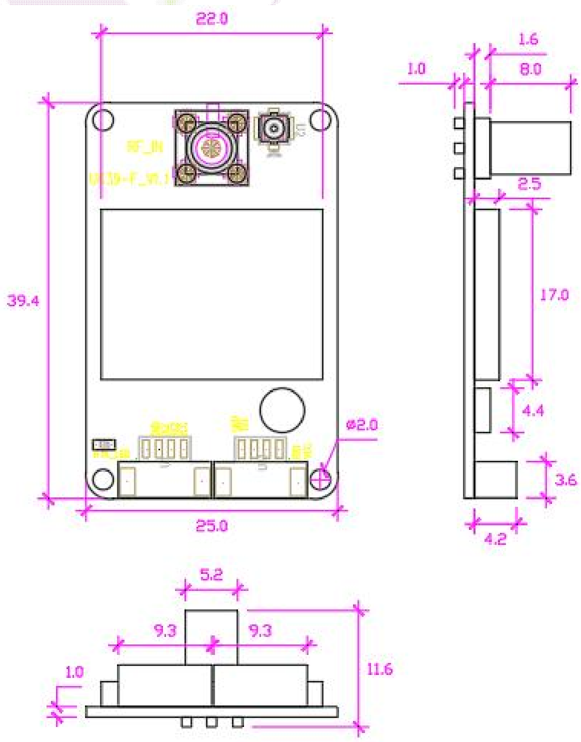
2 Hot start cannot be carried out when the temperature is below -20℃ or above 60℃

Note: VCC main power supply, voltage range: 3.3V (DC). Voltage ripple and spike pulse requirements are less than 50mV.

VCC_RF antenna feed, voltage range: 3.3V ~ 5.5V (DC). Voltage ripple and spike pulse requirements are less than 50mV.

V_BCKP, voltage 1.8V~3.6V, voltage ripple and spike pulse requirements less than 30mV.

4 Mechanical specifica



Unit: mm　　Error: ±0.3mm

5 Interface configuration selection

5.1 Interfaces description

The CK39-A module include two UART interface, which can be used for communication to a host. You can choose any one of the output interface output data, It supports configurable baud rates.

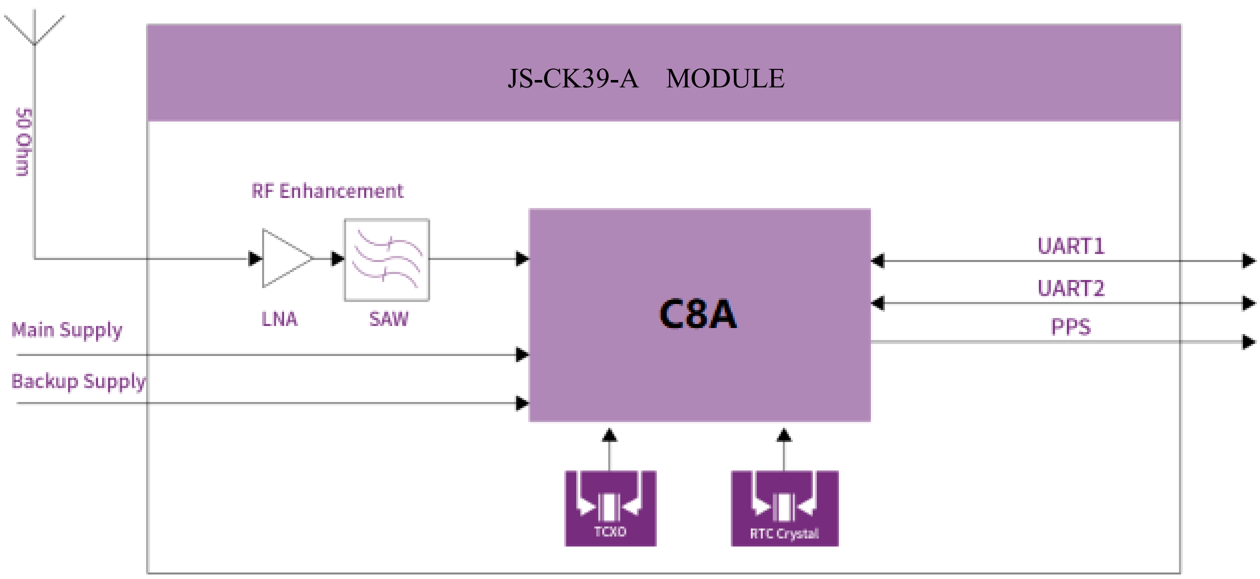
5.2 Interface configuration selection

The CK39-A series GNSS module can be selected based on the corresponding interface output. There are mainly the following options. The relevant sensor is an optional part that can be selected according to actual needs.

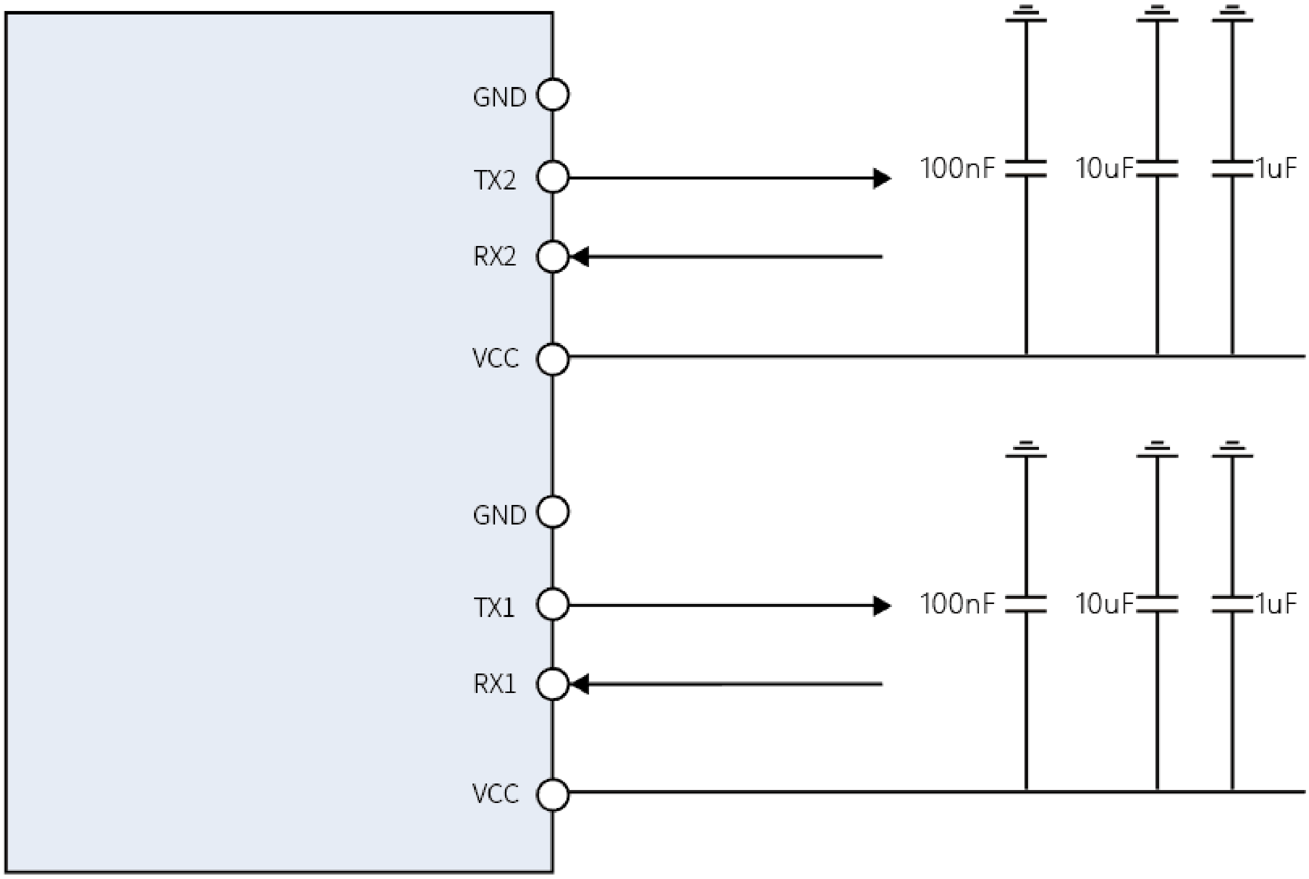
NAME	UART	SPI	IIC	QMC5883L
CK39-A	√	--	--	--

6 System description

6.1 Block Diagram



6.2 Application Circuit



7 ROHS

7.1 RoHS Compliance

This product is RoHS compliance