Datasheet of UB10F-2525e

Version 1.0
2025/9/9

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1. Introduction

LOCOSYS proudly announces the launch of its latest GNSS module, the UB10F-2525e, powered by state-of-the-art 10th-generation GNSS chipsets. This new product line integrates multi-constellation reception with support for GPS, GLONASS, Galileo, and BeiDou, delivering advanced high-precision positioning with optimized power management. Even in complex environments such as urban canyons or highly obstructed areas, the UB10F-2525e ensures stable and reliable availability. Backed by LOCOSYS's extensive experience in high-precision positioning and system integration, the company has successfully helped numerous overseas clients achieve unmanned and autonomous positioning projects, making LOCOSYS the trusted partner of choice. Designed to meet the rapidly growing demand for accuracy, it provides robust solutions for UAVs, AGVs/UGVs, robotics, unmanned vessels, e-bikes, and automotive applications.

With LOCOSYS's expertise in design and system integration, the UB10F-2525e offers meter-level accuracy while maintaining outstanding resilience in dynamic environments. The chipset delivers enhanced RF sensitivity under 25×25 mm patch antenna and weak signal conditions, supported by advanced interference and spoofing detection mechanisms that further strengthen system reliability.

This product launch once again underscores LOCOSYS's long-standing commitment to enabling autonomous and unmanned applications, driving industries toward smarter, more connected, and future-ready mobility and positioning ecosystems. By combining cutting-edge GNSS/RTK technology with proven integration know-how, LOCOSYS continues to empower global partners in building reliable, scalable, and innovative solutions for the next generation of intelligent mobility.

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2. Features

- Multi-constellation GNSS reception: GPS, GLONASS, Galileo, BeiDou.
- Supports SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN.
- Powered by 10th-generation high-performance GNSS chipset.
- Optimized power consumption for energy-sensitive applications.
- Horizontal position accuracy: ≤ 1.5 m CEP.
- Update rate: Up to 25 Hz (one constellation), up to 10 Hz (four constellations).
- Ensures reliable performance in urban canyon and partially obstructed sky conditions.
- Protocols supported: NMEA 4.11, UBX binary.
- Advanced anti-jamming and anti-spoofing technologies.
- Enhanced RF sensitivity for 25×25 mm ceramic antennas.
- Equipped with an IST8310 3-axis magnetic sensor (optional QMC5883P).
- High sensitivity: up to 1320 LSB/Gauss (typical ~330 LSB/Gauss).
- Resolution: approx. 0.3 µT per LSB, enabling fine magnetic field detection.
- Measurement range: X/Y axes ±1600 µT; Z axis ±2500 µT.
- Output data rate (ODR): configurable, up to 200 Hz for fast system updates.
- Temperature stability: sensitivity drift ±0.016 %/°C; offset drift 0.024 µT/°C.
- Accuracy & linearity: X-axis linearity error ≤1.5 %FS; Y/Z axes linearity error ≤0.5 %FS.
- Low-noise performance: delivers mGauss-level noise floor, enabling heading accuracy better than 0.5° when integrated with GNSS/IMU.
- I²C interface supports both standard mode and fast mode.
- Operating temperature: −40 °C to +85 °C.
- Compact design, easy integration for system developers.
- Lead-free packaging structure, compliant with RoHS standards.
- LOCOSYS design, production, and manufacturing

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3. Applications

- Unmanned systems: UAVs, AGVs, UGVs, robotics
- Smart mobility: e-bikes, shared scooters, automotive navigation
- Maritime: unmanned surface vessels, autonomous boats
- Surveying and mapping: precision agriculture, field monitoring
- IoT solutions: asset tracking, logistics, smart city deployments

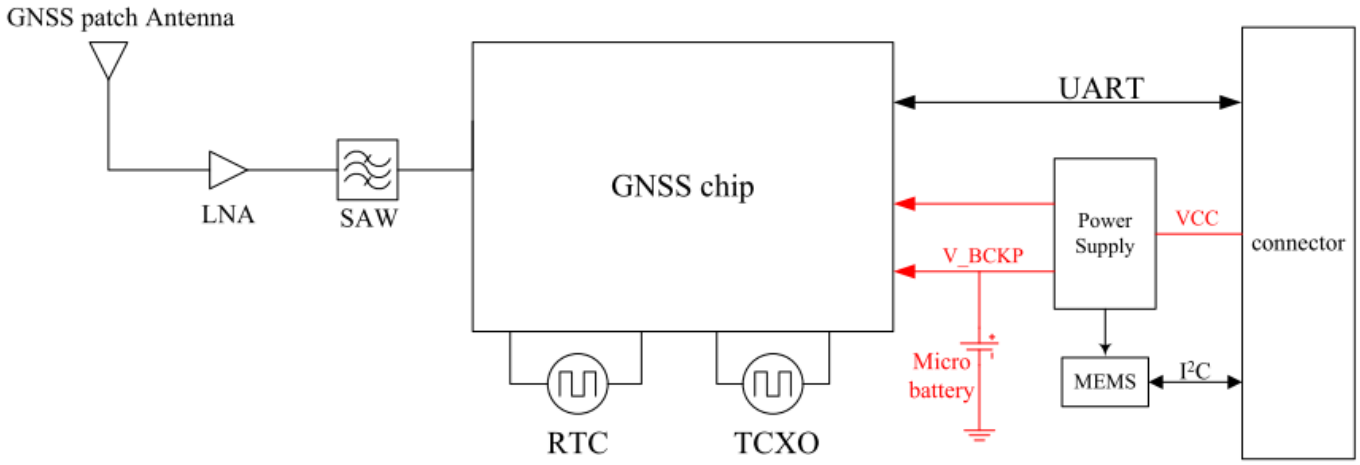

Figure 1: System block diagram

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4. Functional Description

4.1 Key Features

Table 1: Key Features

Parameter	Specification
GNSS reception	• GPS/QZSS: L1 C/A. L1C/A/S • BeiDou: B1I . B1C • GLONASS: L1OF • Galileo: E1-B/C • SBAS: WAAS, EGNOS, MSAS, GAGAN
Update rate	• 1Hz default , up to 10Hz
Position accuracy	• GNSS：1.5m CEP
Velocity & Time accuracy	• GNSS：0.1m/s CEP • SBAS：0.05 m/s • 1PPS：20 ns
Time to First Fix (TTFF)	• Hot start：1 s • Cold start：28 s • AGPS：1.0 s
Sensitivity	• Cold start：-148dBm • Hot start ：-159dBm • Reacquisition：-160dBm • Tracking & navigation：-167dBm
UART Port	• UART Port: TXD&RXD • Supports baud rate from 9600bps to 961200bps, 38400bps by default. • NMEA 0183 Protocol Ver.4.11, UBX binary Protocol. • Supports batch data report mode
Temperature Range	• Normal operation：-40°C ~ +80°C • Storage temperature：-40°C ~ +85°C • Humidity：5% ~ 95%

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5. Pin Assignment and Definition

The UB10F-2525e module is equipped with a 6-pin connector that connects to your application platform.

Figure 2: Pin Assignment

Table 2: Pin Definition

Pin No.	Name	I/O	Description	Remark
1	GND	P	Ground	
2	VCC	P	Power input	Voltage range: 3.0V~5.5V
3	RX	I	UART Serial input	
4	TX	O	UART Serial output	
5	SCL	O	I^2C Serial clock line	
6	SDA	I/O	I^2C Serial data line	

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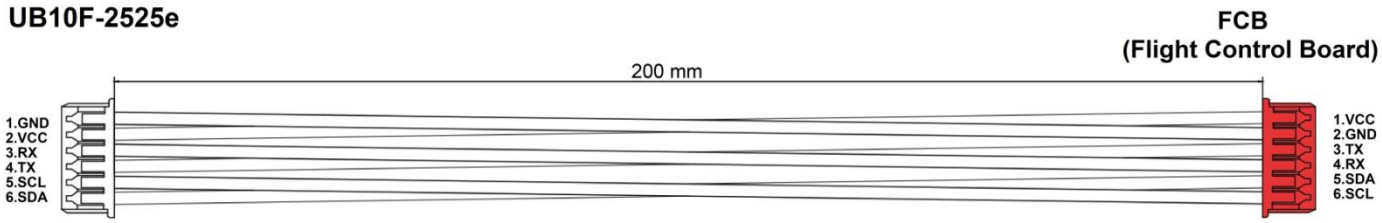

Figure 3: Cable Pin Assignment

Table 3: Cable Pin Definition

UB10F-2525e Side				**FCB Side (Flight Control Board)**	
Pin No.	**Name**	**I/O**	**Description**	**Pin No.**	**Name**
1	GND	P	Ground	2	GND
2	VCC	P	Power input	1	VCC
3	RX	I	UART Serial input	4	RX
4	TX	O	UART Serial output	3	TX
5	SCL	O	I^2C Serial clock line	6	SCL
6	SDA	I/O	I^2C Serial data line	5	SDA

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6. DC Electrical Specification

Table 4: DC Electrical characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input voltage	VCC		3.0	3.3	5.5	V
Input current	I_{CC}			33		mA
High Level Input Voltage	VI H		2.3		3.6	V
Low Level Input Voltage	VI L				0.63	V
High Level Output Voltage	VOH		2.9			V
Low Level Output Voltage	VOL				0.4	V
High Level Output Current	IOH			2		mA
Low Level Output Current	IOL			2		mA

Table 5: Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	T_{OPR}	-40	-	80	℃
Storage Temperature	T_{STG}	-40	25	85	℃

7. Power Supply Requirement

Regulated power for the UB10F-2525e is required. The VCC Pin Need a stable DC voltage supply. Power supply ripple must be less than 30mV. The input voltage VCC should be 3.0V~5.5V, Recommended power supply voltage is 3.3V, maximum current is 33mA. Suitable decoupling must be provided by external decoupling circuitry.

8. UART Ports

The module supports two full duplex serial channels UART. All serial connections are at 3.0V CMOS logic levels, if need different voltage levels, use appropriate level shifters. The baud rate of both serial ports are fully programmable, the data format is however fixed: X, N, 8, 1, i.e. X baud rate, no parity, eight data bits and one stop bit, no other data formats are supported, LSB is sent first. The modules default baud rate is set up 38400bps, UART port can be used for NMEA output.

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9. Mechanical Dimensions

This chapter describes the mechanical dimensions of the UB10F-2525e module. Size unit（mm）.

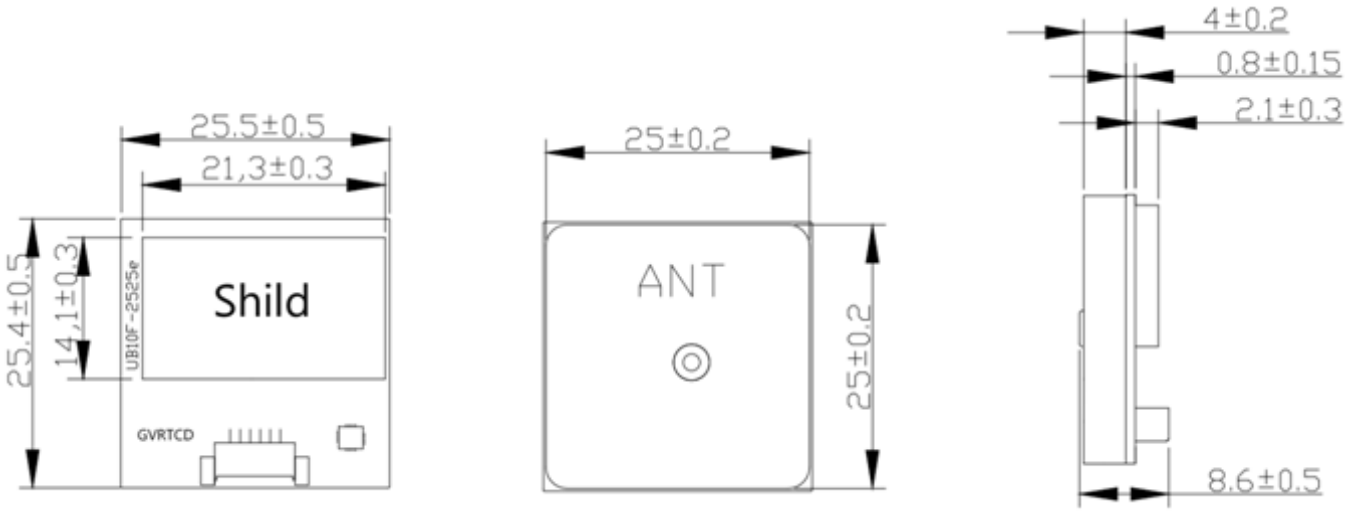

Figure 4: Dimensions

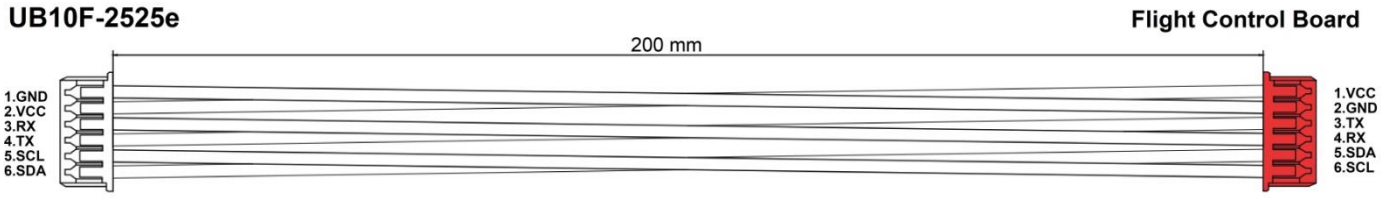

Figure 5: Cable Dimensions

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10. Software Interface

10.1 NMEA output message

Table 6: NMEA output message

NMEA record	Description
GGA	Global Positioning System Fix Data
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
VTG	Course Over Ground and Ground Speed
RMC	Recommended Minimum Specific GNSS Data
GLL	Geographic position – Latitude / Longitude

- GGA – Global Positioning System Fix Data

Contains the values for the following example:

$GNGGA,022245.00,2503.71358,N,12138.74521,E,2,12,0.52,119.3,M,17.2,M,,*48

Table 6-1: GGA Data Format

Name	Example	Units	Description
Message ID	$GNGGA		GGA protocol header
UTC Time	022245.00		hhmmss.sss
Latitude	2503.71358		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12138.74521		dddmm.mmmmm
E/W Indicator	E		E=east or W=west
Quality Indicator	2		See Table 6-1-1
Satellites Used	12		Number of satellites in use
HDOP	0.52		Horizontal Dilution of Precision (meters)
MSL Altitude	119.3	meters	Antenna Altitude above/below mean-sea-level (geoid) (in meters)
Units	M	meters	Units of antenna altitude, meters
Geoidal Separation	17.2	meters	
Units	M	meters	Units of geoidal separation, meters
Age of diff. GNSS data		second	Null fields when DGPS is not used
Diff. Ref. Station ID			Differential reference station ID, 0000-1023
Checksum	*48		Checksum
<CR> <LF>			End of message termination

Table 6-1-1: Position Fix Indicators

Value	Description
0	No position fix

1	Autonomous GNSS fix
2	Differential GNSS fix
6	Estimated/Dead reckoning fix

● GSA –GNSS DOP and Active Satellites

Contains the values for the following example:

$GNGSA,A,3,13,15,24,29,21,05,18,23,11,,,,0.95,0.52,0.80,1*07

$GNGSA,A,3,36,12,05,09,04,06,10,11,,,,,0.95,0.52,0.80,3*09

$GNGSA,A,3,34,42,39,26,24,28,33,43,13,08,38,,0.95,0.52,0.80,4*02

$GNGSA,A,3,07,03,02,,,,,,,,,,0.95,0.52,0.80,5*00

Table 6-2: GSA Data Format

Name	Example	Units	Description
Message ID	$GNGSA		GSA protocol header
Mode 1	A		See Table 6-2-1
Mode 2	3		See Table 6-2-2
ID of satellite used	13		SV on Channel 1
ID of satellite used	15		SV on Channel 2
….			….
ID of satellite used			SV on Channel 12
PDOP	0.95		Position Dilution of Precision
HDOP	0.50		Horizontal Dilution of Precision
VDOP	0.80		Vertical Dilution of Precision
GNSS System ID	1		See Table 6-2-3
Checksum	*07		
<CR> <LF>			End of message termination

Table 6-2-1: Mode 1

Value	Description
M	Manually set to operate in 2D or 3D mode
A	Automatically switching between 2D or 3D mode

Table 6-2-2: Mode 2

Value	Description
1	No position fix
2	2D fix
3	3D fix

Table 6-2-3 GNSS system ID

Value	Description

1	GPS
2	GLONASS
3	GALILEO
4	BEIDOU

- GSV – GNSS Satellites in View

Contains the values for the following example:

$GPGSV,4,1,14,05,45,055,41,11,18,142,34,13,50,027,42,15,64,325,42,1*6C
$GPGSV,4,2,14,18,32,321,38,21,20,082,32,23,15,303,36,24,41,181,39,1*6F
$GPGSV,4,3,14,25,,,17,29,32,241,41,30,05,040,29,41,38,242,38,1*57
$GPGSV,4,4,14,42,60,168,39,50,60,168,39,1*62
$GPGSV,1,1,01,40,13,259,,0*5C
$GAGSV,2,1,08,04,58,021,40,05,10,233,32,06,75,317,40,09,59,255,41,7*76
$GAGSV,2,2,08,10,69,126,40,11,78,348,38,12,44,135,34,36,27,324,36,7*7C
$GBGSV,5,1,19,03,,,39,08,45,345,35,11,,,40,13,42,332,37,1*78
$GBGSV,5,2,19,14,52,328,40,21,14,057,36,24,22,149,36,26,26,096,37,1*73
$GBGSV,5,3,19,28,20,314,37,33,38,293,41,34,31,178,37,38,53,008,41,1*7B
$GBGSV,5,4,19,39,41,176,38,42,49,014,41,43,56,248,43,50,,,38,1*43
$GBGSV,5,5,19,59,,,39,60,,,39,62,,,39,1*7A
$GQGSV,1,1,04,02,13,160,34,03,66,144,40,07,60,168,36,08,45,235,20,1*63

Table 6-3: GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header GP=GPS/QZSS, GL=GLONSS, GA=GALILEO, GB=BEIDOU, GQ=QZSS.
Total number of messages	4		Range 1 to 9
Message number	1		Range 1 to 9
Satellites in view	14		
Satellite ID	05		Channel 1
Elevation	45	degrees	Channel 1 (Range 00 to 90)
Azimuth	055	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	41	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
….			….
Satellite ID	15		Channel 4
Elevation	64	degrees	Channel 4 (Range 00 to 90)
Azimuth	325	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	42	dB-Hz	Channel 4 (Range 00 to 99, null when not tracking)

Signal ID	1		GPS/QZSS: L1 C/A=1 GLONASS: L1 C/A=1 GALILEO: E1=7 BEIDOU: B1=1, B1C=3
Checksum	*6C		
<CR> <LF>			End of message termination

● VTG – Course Over Ground and Ground Speed

Contains the values for the following example:

$GNVTG,,T,,M,0.008,N,0.016,K,D*37

Table 6-4: VTG Data Frmat

Name	Example	Unit	Description
Message ID	$GPVTG		VTG protocol header
Course over ground		degrees	Measured heading
Reference	T		True
Course over ground		degrees	Measured heading
Reference	M		Magnetic
Speed over ground	0.008	knots	Measured speed
Units	N		Knots
Speed over ground	0.016	km/hr	Measured speed
Units	K		Kilometer per hour
Mode	D		N = No position fix A = Autonomous GNSS fix D = Differential GNSS fix E = Estimated/Dead reckoning fix
Checksum	*37		
<CR> <LF>			End of message termination

● RMC – Recommended Minimum Specific GNSS Data

Contains the values for the following example:

$GNRMC,022246.00,A,2503.71359,N,12138.74513,E,0.008,,090925,,,D,V*38

Table 6-5: RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header
UTC time	022246.00		hhmmss.ss
Status	A		A=data valid or V=data not valid
Latitude	2503.71359		ddmm.mmmmm

N/S indicator	N		N=north or S=south
Longitude	12138.74513		dddmm.mmmmm
E/W Indicator	E		E=east or W=west
Speed over ground	0.008	knots	True
Course over ground		degrees	
Date	090925		ddmmyy
Magnetic variation		degrees	
Variation sense			E=east or W=west
Mode	D		N = No position fix A = Autonomous GNSS fix D = Differential GNSS fix E = Estimated/Dead reckoning fix
Navigational status indicator	V		S = Safe C = Caution U = Unsafe V = Void
Checksum	*38		
Checksum			End of message termination

- GLL –Geographic position – Latitude / Longitude

Contains the values for the following example:

$GNGLL,2503.71352,N,12138.74543,E,022244.00,A,D*7E

Table 6-6: GLL Data Format

Name	Example	Units	Description
Message ID	$GNGLL		GLL protocol header
Latitude	2503.71352		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	12138.74543		dddmm.mmmmm
E/W indicator	E		E=east or W=west
UTC Time	022244.00		hhmmss.ss
Status	A		A=data valid or V=data not valid
Mode	D		N = No position fix A = Autonomous GNSS fix D = Differential GNSS fix E = Estimated/Dead reckoning fix
Checksum	*7E		
<CR> <LF>			

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11. Document change list

Revision 1.0

- First release on September 9, 2025.