

Ultra High Precision GNSS for professional drones and robots in smart agriculture

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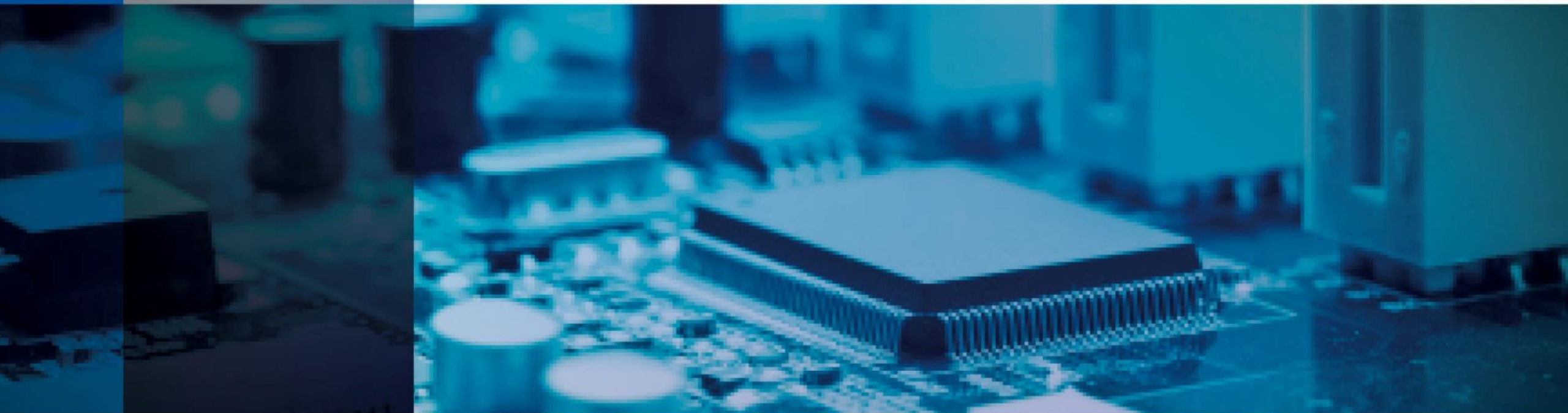


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01

Technology



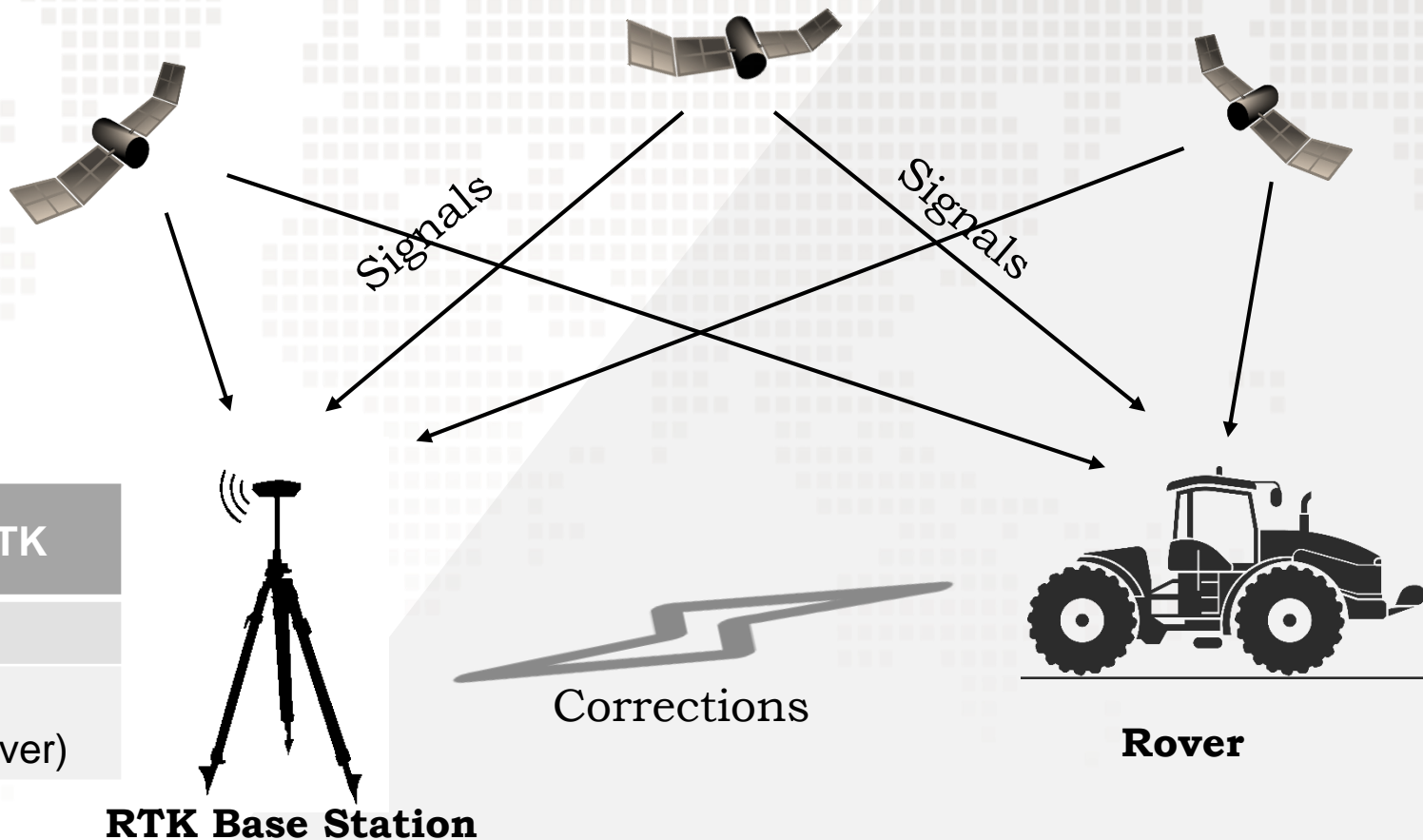
What is RTK(real-time kinematic)? What are the advantages of it?

RTK—Real-time Kinematic

RTK is a real-time dynamic relative positioning technology using GPS carrier phase observations.

Advantages compared with Standalone positioning

Standard Precision-Standalone	High Precision-RTK
Around 2.5 meters	1 centimeter
1 Receiver	2 Receivers (Base Station + Rover)



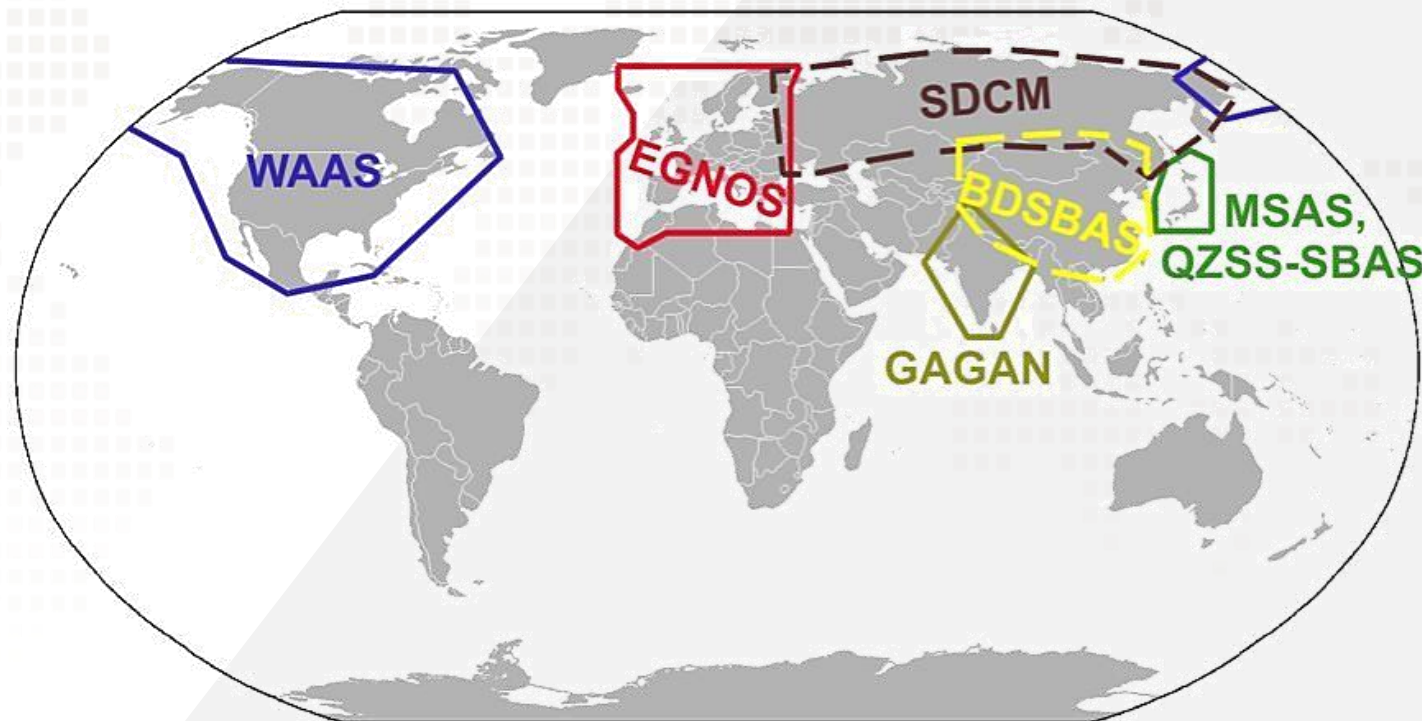
What is SBAS? Why are the advantages?

SBAS—Satellite-Based Augmentation System

SBAS system is mainly composed of four parts: ground reference base station, master control station, upload station and geosynchronous satellite.

Advantages

- ✓ High precision
- ✓ High efficiency
- ✓ Low cost
- ✓ Wide area coverage



What kind of positioning technology is required?

- professional drones and robots in smart agriculture

RTK Positioning & Dual-antenna Heading

Ugypsophila RTK

Make full use of all the constellations and all frequencies, enhancing the RTK usability.



RTK Keep

Centimeter-level positioning accuracy can be maintained for more than 10 minutes after the interruption of base station data.



Dual-RTK

When the master antenna signal is blocked, the slave antenna can still receive signal and do RTK calculation.



Instant Heading

More reliable real-time heading can be realized by utilizing the synchronized, symmetric, and multi-path mitigated observation data.



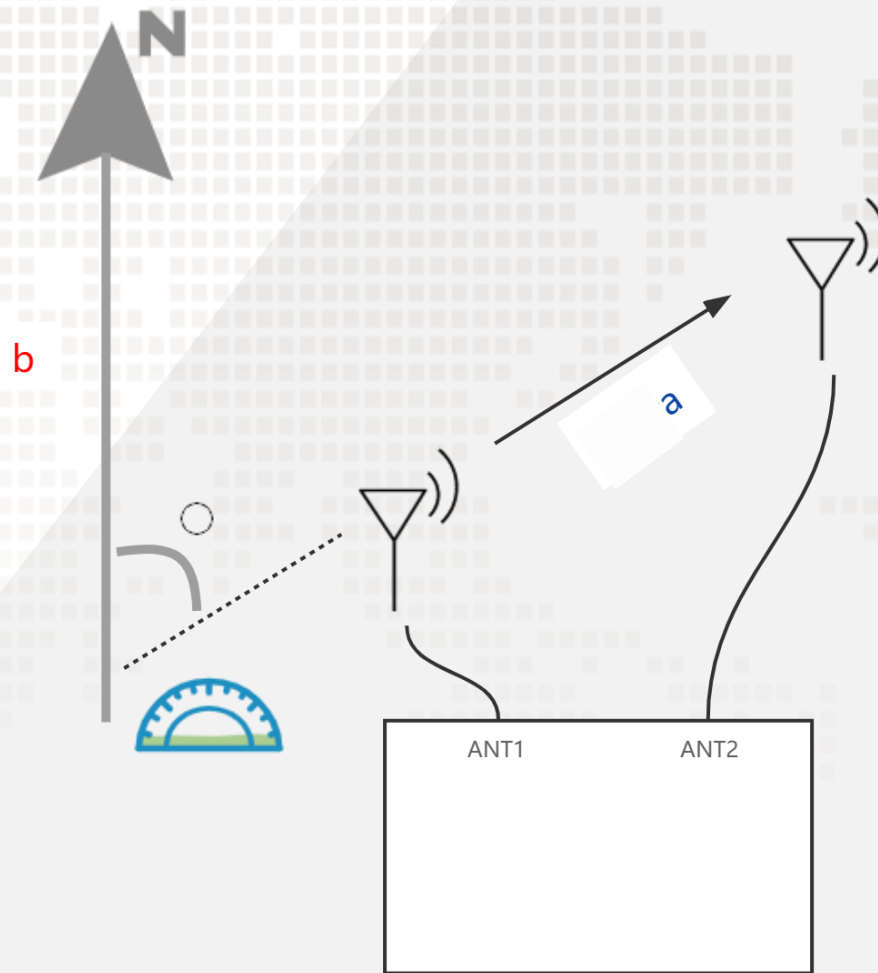
What is Unicore heading function?

Heading

The heading result is the angle from True North to the baseline of the antenna1 to antenna2 in a clockwise direction.

Advantages

- ✓ The attitude info of the equipment for the next action can be provided in In high automation applications;
- ✓ Heading and positioning function can be realized at the same time on one module;
- ✓ Heading function can output heading angle and pitch angle in both dynamic and static scenes.

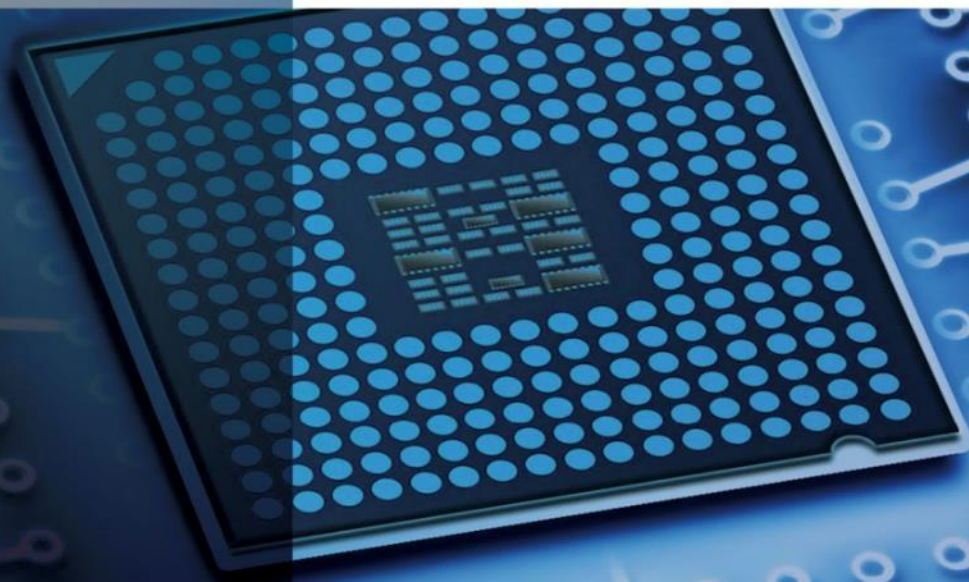


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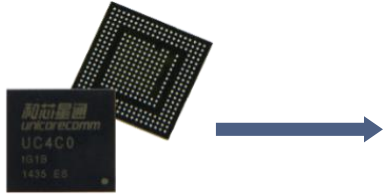
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02

Portfolio



High Precision



UB4B0

GPS/BDS/GLONASS/Galileo
ALL-constellation ALL-frequency High Precision Board(100x60mm)



UB4B0M

GPS/BDS/GLONASS/Galileo
ALL-constellation ALL-frequency Compact High Precision Board (46x71mm)



UB482

GPS/BDS/GLONASS/Galileo
ALL-constellation Multi-frequency High Precision and Heading Board(46x71mm)

NebulasII-UC4C0

Multi-System Multi-Core High Precision GNSS SoC (55nm, 11x11mm)



UM4B0

GPS/BDS/GLONASS/Galileo
ALL-constellation ALL-frequency RTK Positioning Module(30x40mm)



UM482

GPS/BDS/GLONASS/Galileo
ALL-constellation ALL-frequency High Precision and Heading Module(30x40mm)

High Precision Positioning Board

UB4B0M

GPS/ BDS/GLONASS/Galileo
All-constellation All-frequency
Compact High Precision Board



CE FC IC



- » Based on high performance SoC - NebulasII, 432 super channels and dedicated fast capture engine
- » Support BDS, GPS, GLONASS, Galileo and QZSS, including Beidou-3 signal
- » Centimeter-level high-precision RTK positioning, better than 1mm carrier phase observation
- » Support any single system standalone positioning and multi-system joint positioning
- » Support multi-path suppression technology
- » Support 3 x UART and 1 x PPS
- » Compatible with main stream boards

Point Positioning (RMS)	Horizontal: 1.5m	Cold Start	<25s	Dimension	46 × 71 × 10 mm
	Vertical: 2.5m	Hot Start	<10s	Interface	3x UART(LV-TTL)
DGPS (RMS)	Horizontal: 0.4m	RTK Initialization Time	<5s (Typical)		1x1PPS (LV-TTL)
	Vertical: 0.8m	Reacquisition Time	<1s		1xEvent
RTK (RMS)	Horizontal: 0.8cm+1ppm	Velocity Accuracy	0.03m/s	Power Consumption	1.8W (Typical)
	Vertical: 1.5cm+1ppm	Data Update	20Hz*	Operating Temperature	-40°C ~ +85°C

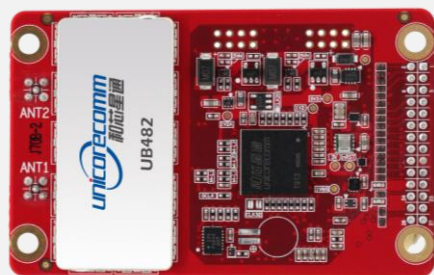
High Precision Positioning Board

UB482

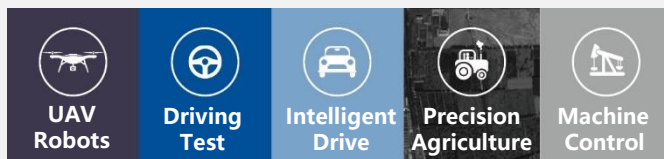
GPS/BDS/GLONASS/Galileo

All-constellation Multi-frequency

High Precision and Heading Board



CE FC IC



- » Based on high performance SoC - NebulasII, 432 super channels and dedicated fast capture engine
- » Support BDS, GPS, GLONASS, Galileo and QZSS, including Beidou-3 signal
- » Support dual-antenna signal input, capable of positioning and heading by using one single board
- » Positioning and orientation output concurrently, more than 20 HZ data output rate
- » Re-acquisition time of RTK within 1s
- » Support serial port, Ethernet port, 1PPS, event and other physical interface, support hot start
- » 46x71mm compact board, compatible with mainstream board

Point Positioning (RMS)	Horizontal: 1.5m	Cold Start	<25s	Dimension	46 × 71 × 10 mm
	Vertical: 2.5m	Hot Start	<10s	Interface	3 x UART (LV-TTL)
DGPS (RMS)	Horizontal: 0.4m	RTK Initialization Time	<5s (Typical)		1 x 1PPS (LV-TTL)
	Vertical: 0.8m	Reacquisition Time	<1s		1 x Event, 1x LAN
RTK (RMS)	Horizontal: 0.8cm+1ppm	Velocity Accuracy	0.03m/s	Power Consumption	2.4W (Typical)
	Vertical: 1.5cm+1ppm	Data Update	20Hz*	Operating Temperature	-40°C ~ +85°C
Heading Accuracy	0.2 degree/1m baseline				

High Precision Positioning Module

UM4B0

GPS/BDS/GLONASS/Galileo
All-constellation All-frequency
RTK Positioning Module



CE FCC IC



- » Based on high performance SoC - NebulasII, 432 super channels and dedicated fast capture engine
- » Support BDS, GPS, GLONASS, Galileo and QZSS, including Beidou-3 signal
- » 30 x 40 mm SMD module supporting all constellations and all frequencies
- » Instant RTK initialization, support long baseline RTK solution
- » Adaptive recognition of differential data RTCM format, support antenna signal detection
- » 60dB suppressing narrow-band interference, support multi-path suppression technology
- » Support serial port, Ethernet port, 1PPS and other physical interface

Point Positioning (RMS)	Horizontal: 1.5m	Cold Start	<25s	Dimension	30 × 40 × 4 mm
	Vertical: 2.5m	Hot Start	<10s	Interface	3x UART(LV-TTL)
DGPS (RMS)	Horizontal: 0.4m	RTK Initialization Time	<5s (Typical)		1x1PPS (LV-TTL)
	Vertical: 0.8m	Reacquisition Time	<1s		1xEvent
RTK (RMS)	Horizontal: 0.8cm+1ppm	Velocity Accuracy	0.03m/s	Power Consumption	1.8W (Typical)
	Vertical: 1.5cm+1ppm	Data Update	20Hz*	Operating Temperature	-40°C ~ +85°C

High Precision Positioning Module

UM482

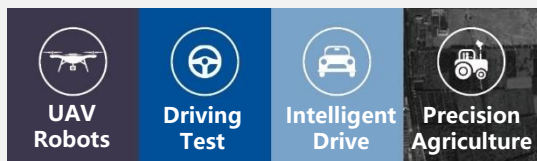
GPS/BDS/GLONASS/Galileo

All-constellation All-frequency

High Precision and Heading Module



CE FC IC



- » Based on high performance SoC - NebulasII, 432 super channels and dedicated fast capture engine
- » Minimum size all-constellation multi-frequency and high-precision positioning and heading SMD module in the industry
- » Support BDS, GPS, GLONASS, Galileo and QZSS, including Beidou-3 signal
- » Support dual-antenna signal input, positioning and orientation output concurrently, more than 20 Hz data output rate
- » Dual-RTK positioning technique and 0.2 °/1m baseline positioning accuracy
- » Support antenna signal detection, adaptive recognition of differential data RTCM format
- » Support serial port, SPI, 1PPS, event and other physical interface

Point Positioning (RMS)	Horizontal: 1.5m	Cold Start	<25s	Dimension	30 × 40 × 4 mm
	Vertical: 2.5m	Hot Start	<10s	Interface	3x UART(LV-TTL)
DGPS (RMS)	Horizontal: 0.4m	RTK Initialization Time	<5s (Typical)		1x1PPS (LV-TTL)
	Vertical: 0.8m	Reacquisition Time	<1s		1xEvent
RTK (RMS)	Horizontal: 0.8cm+1ppm	Velocity Accuracy	0.03m/s	Power Consumption	2.4W (Typical)
	Vertical: 1.5cm+1ppm	Data Update	20Hz*	Operating Temperature	-40°C ~ +85°C
Heading Accuracy	0.2 degree/1m baseline				

New Generation—Performance Enhanced

Standard Precision

- Dual frequencies
- Single point positioning accuracy: **1m CEP**
- Higher anti-jamming capability
- More advanced Multi-path effect mitigation

High Precision

- Smaller size
- Lower Power Consumption
- More frequencies
- Optimized sensitivity



Future High Precision Positioning Module

UM980/UM960/UM980i

BDS/GPS/GLONASS/Galileo/QZSS

All-constellation All-frequency High
Precision RTK/RTK+INS Module



17 x 22 x 2.6 mm

17 x 22 x 2.6 mm

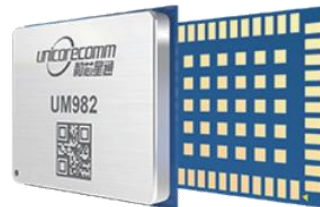
12 x 16 x 2.6 mm

RTK+INS

UM982

BDS/GPS/GLONASS/Galileo/QZSS

All-constellation All-frequency High
Precision and Heading Module



16 x 21 x 2.6 mm

UT986

BDS/GPS/GLONASS/Galileo

All-constellation All-frequency High
Precision Timing Module



17 x 22 x 2.4 mm

Future High Precision Positioning Module

UM980

GPS/BDS/GLONASS/Galileo/QZSS

All-constellation All-frequency

High-Precision RTK Positioning Module



Physical Characteristics

Packaging	54 pin LGA
Dimension	22 × 17 × 2.6 mm
Environmental Specifications	
Working Temperature	-40°C~+85°C
Storage Temperature	-55°C~+95°C
Vibration	GJB150.16-2009, MIL-STD-810
Shock	GJB150.18-2009, MIL-STD-810
Humidity	95% No condensation

Basic Information

Channel	1408 channels, based on NebulasIV
Frequency	BDS: B1I, B2I, B3I, B1C, B2a, B2b GPS: L1C/A, L2P (Y), L2C, L5 GLONASS: L1, L2 Galileo: E1, E5a, E5b, E6* QZSS: L1, L2, L5, L6*

Performance Specifications

Single Point Positioning (RMS)	Horizontal: 1.5m Vertical: 2.5m	Time Accuracy (RMS)	20 ns	
DGPS (RMS)	Horizontal: 0.4m Vertical: 0.8m	Velocity Accuracy (RMS)	0.2 m/s	
RTK (RMS)	Horizontal: 0.8cm+1ppm Vertical: 1.5cm+1ppm	TTFB	Cold start <20s	
Observation Accuracy (RMS)	BDS	GPS	GLONASS	Galileo
B1I/B1C/L1C/A/E1/G1 Code	10cm	10cm	10cm	10cm
B1I/B1C/L1C/A/E1/G1 Carrier Phase	1mm	1mm	1mm	1mm
B2I/B2a/B2b/L5/E5a/E5b Code	10cm	10cm	10cm	10cm
B2I/B2a/B2b/L5/E5a/E5b Carrier Phase	1mm	1mm	1mm	1mm
B3I/L2P(Y)/L2C/G2 Code	10cm	10cm	10cm	10cm
B3I/L2P(Y)/L2C/G2 Carrier Phase	1mm	1mm	1mm	1mm
Differential Data	RTCM 3.3/3.2/3.1/3.0			
Data Format	NMEA-0183, Unicore*			
		Data Update Rate	50Hz* Positioning	
		Initialization Time	<5s (typical)	
		Initialization Reliability	>99.9%	

Future High Precision Positioning Module

UM980i

GPS/BDS/GLONASS/Galileo/QZSS

All-constellation All-frequency RTK/INS

Integrated Navigation Module



Physical Characteristics

Packaging	54 pin LGA
Dimension	22 × 17 × 2.6 mm

Environmental Specifications

Working temperature	-40°C~+85°C
Storage Temperature	-55°C~+95°C
Humidity	95% No condensation
Vibration	GJB150.16-2009, MIL-STD-810
Shock	GJB150.18-2009, MIL-STD-810

Basic Information

Channel	1408 channels, based on NebulasIV
Frequency	BDS: B1I, B2I, B3I, B1C, B2a, B2b* GPS: L1C/A, L2P (Y), L2C, L5 GLONASS: L1, L2 Galileo: E1, E5a, E5b, E6* QZSS: L1, L2, L5, L6*

Performance Specifications

Single Point Positioning(RMS)	Horizontal: 1.5m Vertical: 2.5m	Time Accuracy(RMS)	20 ns
DGPS (RMS)	Horizontal: 0.4m Vertical: 0.8m	Velocity Accuracy (RMS)	0.2 m/s
RTK (RMS)	Horizontal: 0.8cm+1ppm Vertical: 1.5cm+1ppm	TTFB	Cold start <20s
Inertial Navigation Accuracy		Initialization Time	<5s (typical)
Observation Accuracy (RMS)		Initialization Reliability	>99.9%
		Data Update Rate	100 Hz
		Inertial Navigation Accuracy	<5% × Travel Distance (No GNSS Signals)

Observation Accuracy (RMS)	BDS	GPS	GLONASS	Galileo
B1I/B1C/L1 C/A/E1/G1 code	10cm	10cm	10cm	10cm
B1I/B1C/L1C/A/E1/G1 carrier phase	1mm	1mm	1mm	1mm
B2I/B2a/B2b/L5/E5a/E5b code	10cm	10cm	10cm	10cm
B2I/L2P(Y)/L2C/G2/E5b carrier phase	1mm	1mm	1mm	1mm
B3I/B2a/E5a/L5 code	10cm	10cm	10cm	10cm
B3I/B2a/E5a/L5 carrier phase	1mm	1mm	1mm	1mm
Differential Data	RTCM 3.3/3.2/3.1/3.0			
Data Format	NMEA-0183, Unicore*			

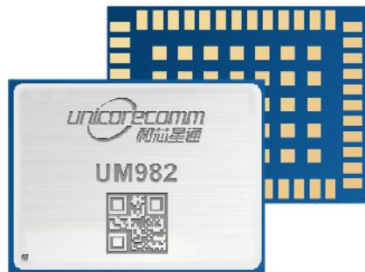
Future High Precision Positioning Module

UM982

GPS/BDS/GLONASS/Galileo/QZSS

All-constellation All-frequency

High-Precision RTK Positioning and Heading Module



Physical Characteristics

Packaging	48 pin LGA
Dimension	21 × 16 × 2.6 mm
Working temperature	-40°C~+85°C
Storage temperature	-55°C~+95°C
Vibration	GJB150.16-2009, MIL-STD-810
Shock	GJB150.18-2009, MIL-STD-810
Humidity	95% No condensation

Basic Information

Channel	1408 channels, based on NebulasIV
Frequency	BDS: B1I, B2I, B3I, B1C, B2a GPS: L1C/A, L2P (Y), L2C GLONASS: L1, L2 Galileo: E1, E5a, E5b QZSS: L1, L2, L5

Performance Specifications

Single point positioning(RMS)	Horizontal: 1.5m Vertical: 2.5m	Heading accuracy (RMS)	0.2°(1m baseline)
DGPS (RMS)	Horizontal: 0.4m Vertical: 0.8m	Time accuracy (RMS)	20 ns
RTK (RMS)	Horizontal: 0.8cm+1ppm Vertical: 1.5cm+1ppm	Velocity accuracy (RMS)	0.2 m/s
		TTFB	Cold start <20s
		Initialization time	<5s (typical)
		Initialization reliability	>99.9%

Observation accuracy (RMS)	BDS	GPS	GLONAS	Galileo
B1I/B1C/L1 C/A/E1/B1I/B1C code	10cm	10cm	10cm	10cm
B1I/B1C/L1C/A/E1/G1 carrier phase	1mm	1mm	1mm	1mm
B2I/G2/L2P(Y)/L2C/E5b code	10cm	10cm	10cm	10cm
B2/L2P(Y)/L2C/E5b carrier phase	1mm	1mm	1mm	1mm
B3I/L5/E5a/B2a code	10cm	10cm	10cm	10cm
B3I/L5/E5a/B2a carrier phase	1mm	1mm	1mm	1mm

Data update rate	Dual antenna 20 Hz 20 Hz raw data output
Differential data	RTCM 3.3/3.2/3.1/3.0
Data format	NMEA-0183, Unicore*

Future High Precision Positioning Module

UM960

GPS/BDS/GLONASS/Galileo/QZSS

All-constellation Multi-frequency

High-Precision RTK Positioning Module



Physical Characteristics

Packaging	24 pin LGA
Dimension	16 × 12 × 2.4 mm

Environmental Specifications

Working Temperature	-40°C~+85°C
Storage Temperature	-55°C~+95°C
Vibration	GJB150.16-2009, MIL-STD-810
Shock	GJB150.18-2009, MIL-STD-810
Humidity	95% No condensation

Basic Information

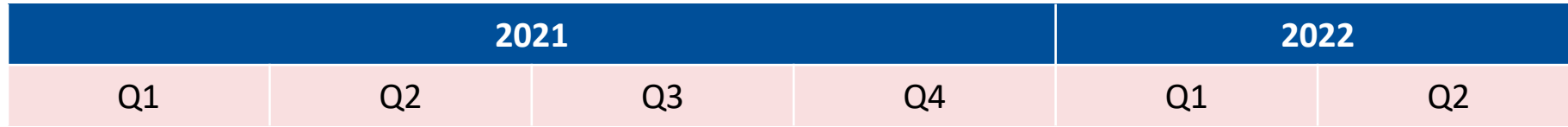
Channel	1408 channels, based on NebulasIV
Frequency	BDS: B1I, B2I, B3I GPS: L1C/A, L2P (W), L2C, L5 GLONASS: L1, L2 Galileo: E1, E5b, E5a QZSS: L1, L2, L5

Performance Specifications

Single Point Positioning(RMS)	Horizontal: 1.5m Vertical: 2.5m	Time Accuracy (RMS)	10 ns
DGPS (RMS)	Horizontal: 0.4m Vertical: 0.8m	Velocity Accuracy (RMS)	0.2 m/s
RTK (RMS)	Horizontal: 0.8cm+1ppm Vertical: 1.5cm+1ppm	TTFB	Cold start 20s
		Initialization Time	<5s (typical)
		Initialization Reliability	>99.9%

Observation Accuracy (RMS)	BDS	GPS	GLONASS	Galileo
B1I/L1 C/A/E1G1 Code	10cm	10cm	10cm	10cm
B1I/L1C/A/E1/G1 Carrier Phase	1mm	1mm	1mm	1mm
B2I/L2P(Y)/L2C/G2/E5b Code	10cm	10cm	10cm	10cm
B2I/L2P(Y)/L2C/G2/E5b Carrier Phase	1mm	1mm	1mm	1mm
Differential Data	RTCM 3.3/3.2			
Data Format	NMEA-0183, Unicore*			

Roadmap--Chip



UC6580I 22nm
Four-constellation **dual-
frequency** GNSS chipset

Sample for business

Beta Release

Production

○ Announce

UC6580A 22nm
Four-constellation **dual-
frequency** GNSS chipset
Automotive grade

Sample for business

Beta Release

Production

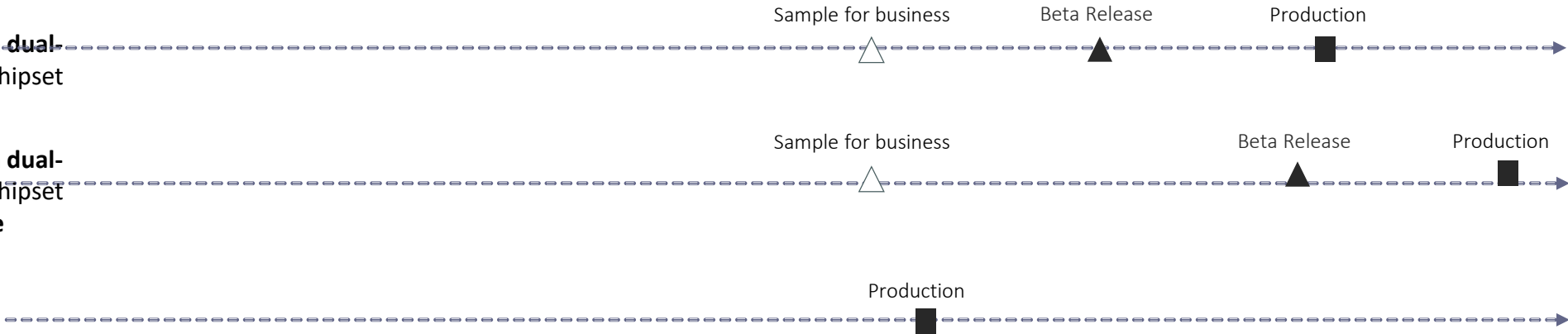
△ ES (sample)

▲ Beta Release

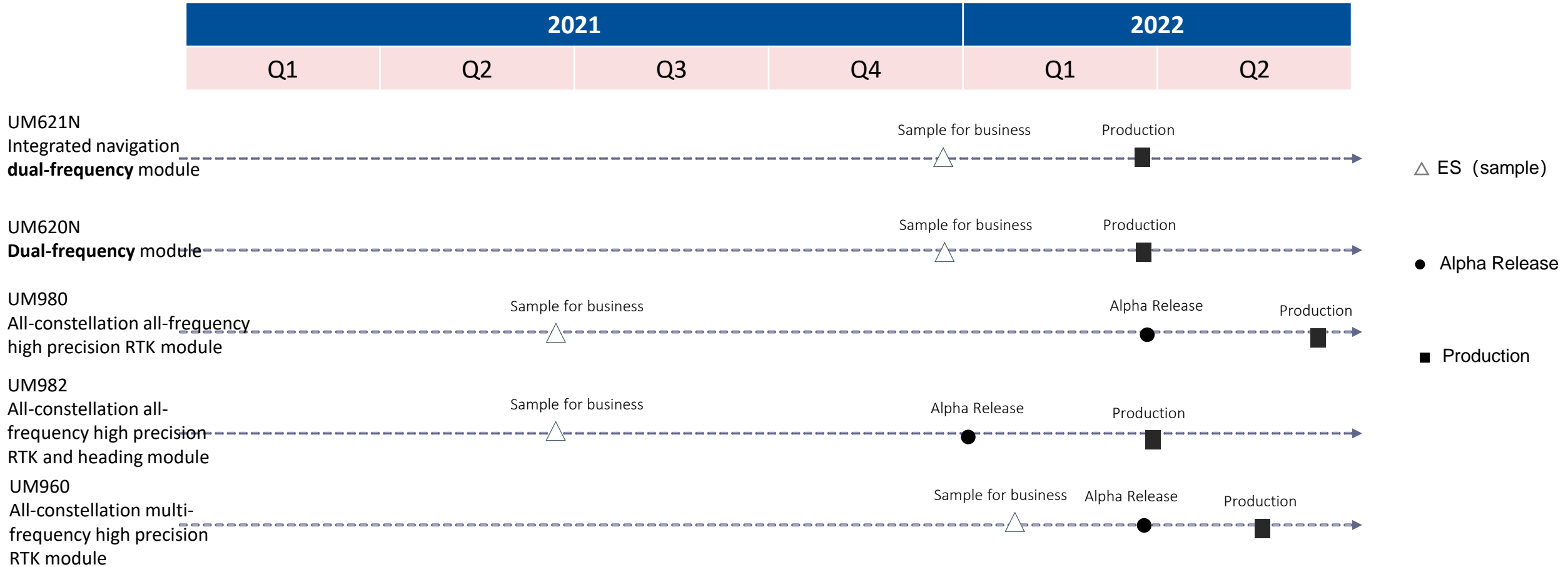
UC9810 22nm
All-constellation
all-frequency high
precision GNSS
chipset

Production

■ Production



Roadmap--Module



03

Applications



Drone

Recommended Products

Current products: UM482, UM4B0, UB482, UB4B0M

New generation: UM982, UM980, UM960

Large-Sized Professional Drones:

- Agricultural Drone
- Delivery Drone
- ...

Small Sized Professional Drones:

- Performing Drones/Drone Formation
- Photographing Drones
- ...



Delivery Drone



Agricultural Drone



Performing Drones

Robot

Recommended Products

Current products: UM482, UM4B0, UB482, UB4B0M

New generation: UM982, UM980, UM960

Applications

Lawn mower, AGV, line-marking robot, self-balancing transporter

Regarding **lawn mower**,

Push→boarder wire→RTK positioning



Automatic lawn mower



Line-marking robot



Self-balancing transporter

Agricultural Machinery

Recommended Products

Current products: UM482, UM4B0, UB482, UB4B0M

New generation: UM982, UM980, UM960

Applications

Agricultural Auto-steering system; excavator, harvester



Auto-steering system



Autonomous harvester

THANKS



Website



LinkedIn



WeChat