bynav北云

Make Mobility More Intelligent

Deep coupling
Functional safety
SoC·Module

Centimeter-level high-precision positioning in all scenarios*

SELF-DEVELOPED SoC — GNSS + IMU + VISION

ABOUT US

Enterprise Introduction

ABOUT US

Bynav specializes in developing high-precision positioning technology, including positioning chips, GNSS signal processing algorithms, RTK algorithms, combined navigation algorithms and visual fusion algorithms. With these technologies, Bynav has created a range of products, including high-precision positioning modules, GNSS receivers and combined navigation systems, which are used in a variety of fields such as **automotive, surveying and mapping, GIS data acquisition, driver training, IoT and transportation**. These products have been exported to more than 40 countries and regions.

The Bynav R&D team, which originates from the technological force of the Beidou Satellite Navigation System, consists of six PhDs who have won four top prizes in scientific and technological progress. The team has extensive technical expertise and innovation capabilities in high precision satellite positioning, multi-source fusion positioning and related fields, they have obtained **3 IC layout design registration certificates** and more than **40 national invention patents**. Bynav Technology is also involved in the national Beidou special project "R&D and Industrialization of Multi-Source Fusion High-Precision Positioning Chips," which aims to promote the use of high-precision positioning technology in the automotive field.

Bynav has obtained various certifications, including **TÜV ISO26262 functional safety certification, ISO21434 automotive network security management system certification, IATF16949 quality system certification** and **ASPICE certification**. Relevant products have also passed **AEC-Q series certification**, CE, FCC, RoHS certification and SGS comprehensive testing and certification. At present, **Bynav's products have been successfully installed in multiple intelligent automotive production models of various Chinese automotive manufacturers**, with a fully automated production line and a production capacity of 1 million sets per year for whole machines and 5 million sets per year for modules.

Years of devotion to development and large- scale applications in the automotive field, Bynav now has multiple mass-produced high-precision positioning chips, making it **one of the few companies in the world to have self-developed high-precision satellite positioning chips that have been produced and applied on a large scale**.

**Vehicle lateral direction 0.3m CEP95

Alice

High-precision GNSS SoC

BDS	B1I/B2I/**B3I**/**B1C**/B2a/**B2b(PPP)**
GLO	G1/G2
QZSS	L1CA /L2/L5/**L6(CLAS)**
SBAS	L1CA
GPS	L1CA/L1C/L2/L5
GAL	E1/**E5a**/E5b/**E6**
IRNSS	L5
L-band	

① Deeply Coupled Combined Navigation Algorithm Performance improvement by 2 to 5 times

Built-in DIST* deeply-coupled combined navigation engine delivers 2-5 times performance improvement in scenarios with satellite signal obstruction, such as tree-lined areas and elevated roads. This is achieved using the same IMU and relatively loose coupling.

② Functional Safety Essential for intelligent driving

One of the world's few high-precision positioning chips with functional safety at the ISO26262 ASIL B level. Newly added navigation engine, hardware and software ensure full-process functional safety.

③ Anti-interference Adapting to urban areas and interference environments

Built-in SAIF* high-performance multiple interference suppression algorithm engine with a signal-to-noise ratio of 65dBc, capable of resisting various interference such as sweeping jamming, narrowband, single frequency, pulse and multi-tone.

④ Satellite-based Augmentation Signal Reception

Single-chip integration of L-band and CLAS satellite-based augmentation provides high-precision positioning without network connection, making it suitable for networkless environments while meeting privacy protection requirements in different countries worldwide.

⑤ Advanced 22nm Process Technology

Automotive-grade 22nm process technology, with a small size of 6x8mm BGA package, full-system and full-frequency, 1507 channels (including 750 FuSa channels) and a built-in REAL* RTK positioning engine.

⑥ Single-chip Solution to Computing Power

Built-in multi-core MCU provides combined navigation computing power and single-chip + IMU can achieve PBOX functionality.

DIST: Deeply Coupling Integrity Signal Tracking
SAIF: Smart Advanced Interference deFense
REAL: Ransac Enhanced Advanced Location

High-precision GNSS P-Module

M20/M20D

Technical advantages

Equipped with Bynav self-developed chip Alice, the GNSS high-precision positioning/orientation module has a high-precision measurement engine, navigation engine and functional safety processor. It complies with ASIL B functional safety requirements and supports high-performance RTK/PPP solutions. It also has anti-interference and anti-deception capabilities and supports L-BAND and CLAS.

Main Parameters

Signal Frequency	Full system and frequency¹
Channels	1507(with 750 FuSaChannels)
Signal tracking	L-Band¹、CLAS¹
Anti-interference	Interference-to-signal ratio 65dBc Anti-single frequency, multi-tone, narrowband, sweep frequency, pulse interference
GNSS Raw data Rate	50 Hz
GNSS Positioning Data Rate	20Hz
Single point positioning accuracy (RMS)	Horizontal 1.5 m Vertical2.5 m
RTK positioning accuracy (RMS)	Horizontal 0.8cm+1ppm Vertical 1.5cm+1ppm
Timing accuracy (RMS)	20 ns
Velocity accuracy	0.03m/s
Orientation accuracy²(RMS)	0.2°/1m Baseline
Functional safety	ASIL-B
Size (mm)	M20: 17.0×22.0×2.75 M20D: 16.0×21.0×2.6

Note 1: M20D Not supported
Note 2: M20 Not supported

Support built-in RTK correction service account

High-precision GNSS/INS P-Module

M21/M22

Technical advantages

The GNSS/INS combined navigation module is based on Bynav self-developed chip Alice, which includes a high-precision measurement engine, navigation engine, inertial navigation unit and functional safety processor. The entire system meets ASIL B functional safety level and supports high-performance RTK/PPP solutions, deeply-coupled combined navigation, anti-interference, anti-deception, L-BAND and CLAS.

Main Parameters

Model	M21	M22
DR accuracy (2σ)	0.80%	0.20%
Power(mW)	510	540

External interfaces	UART*4 RMII*1 SPI*1 CANFD*2 PPS*1

Other Parameters

Size(mm)	17.0×22.0×2.75
INS positioning frequency	100 Hz
IMU raw data rate	100 Hz
INS solution latency	≤ 5 ms
Functional safety	ASIL B

Support built-in RTK correction service account

High-precision GNSS/INS P-BOX

Technical advantages

The PBOX combined navigation machine is based on Bynav self-developed chip, which includes a high-precision GNSS measurement engine, navigation engine, high-precision IMU, REAL positioning engine and deep-coupling combined navigation algorithm. It can effectively cope with satellite signal interference and loss in harsh environments, providing stable, continuous and reliable high-precision position and attitude information.

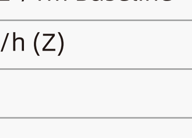
Support built-in RTK correction service account

Main Parameters

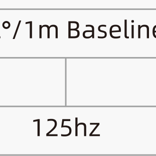
Signal tracking	GPS	L1C/A, L1C, L2, L5
	GLO	G1, G2
	BDS	B1I, B2I, B3I
	BDS-3	B1I, B1C, B2a, B2b, B3I
	GAL	E1, E5b, E5a
	QZSS	L1C/A, L1C, L2, L5
	IRNSS	L5

Single point positioning accuracy (RMS)	Horizontal 1.5 m Vertical2.5 m
RTK positioning accuracy (RMS)	Horizontal 0.8cm+1ppm Vertical 1.5cm+1ppm
Timing accuracy (RMS)	20 ns
Velocity accuracy	0.03m/s

Automotive Grade

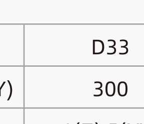
Model	X26	X36D
Appearance		
Size(mm)	118.0x71.0x29.0	153.0x100.0x30.0
Interfaces	Automotive Ethernet*1 CANFD*2 PPS*1 RS232*1	
Heading accuracy (RMS)	/	0.2°/1m Baseline
IMU gyro bias stability	1.8 ° /h (XY) 1.4 ° /h (Z)	
INS positioning/attitude	100hz	
IMU raw data rate	100hz	

Industrial Grade

Model	X1-5	X1-6
Appearance		
Size(mm)	116.0x114.2x38.6	
Interfaces	Industrial Ethernet*1 CAN*1 PPS*1 RS232*2	
Heading accuracy (RMS)	0.2°/1m Baseline	
IMU gyro bias stability	3°/h	1.2°/h
INS positioning/attitude	125hz	
IMU raw data rate	125hz	

IMU Module/BOX

IMU module D2 series

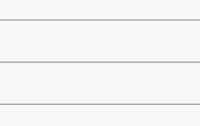


Technical advantages

The high-precision inertial measurement unit includes MEMS three-axis gyroscope and three-axis accelerometer. The inertial sensor is fully tempera-ture calibrated and can provide stable and reliable acceleration and angular rate information for the carrier under different conditions.

IMU-BOX D3 Series

Size (mm): 57.4 x 46.8 x 18.5



Model		D21/D31	D22/D32	D33
Gyroscope	Range(°/s)	300	460(Z) 300(XY)	300
	Bias stability(°/h)	5	1(Z) 5(XY)	1(Z) 5(XY)
	Bias over temperature(°/s)	0.1	0.07(Z) 0.1(XY)	0.05(Z) 0.1(XY)
	Scale factor(‰)	3	2(Z) 3(XY)	2(Z) 3(XY)
	Cross-coupling(°)	0.05		
Accelero meter	Range(°/s)	16		
	Bias stability(°/h)	50		
	Bias over temperature(°/s)	3		
	Scale factor(‰)	2		
	Cross-coupling(°)	0.05		

Visual Fusion Solution

GNSS+IMU alone is insufficient to solve the positioning problem of autonomous driving. In scenarios of long GNSS signal interruption, the positioning accuracy does not meet the requirements of autonomous driving.

GNSS+IMU+VISION full-scenario high-precision positioning solution

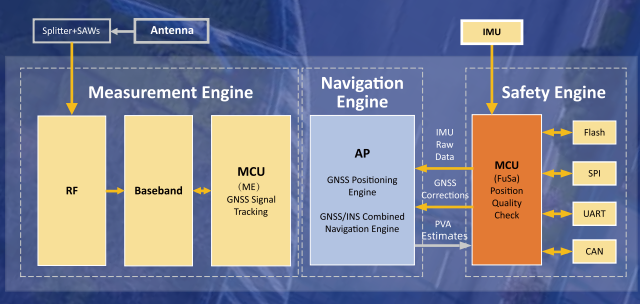
The visual fusion SDK running in the processor of domain controller platform captures semantic features such as lane lines, ground landmarks and road signs from the camera.
When it works with the GNSS/INS combined navigation module, high-precision positioning for the full scenario can be provided. The combination of high-precision positioning for the full scenario, environmental perception, path planning and motion control will eventually enable users to experience advanced assisted driving functions that do not rely on high-precision maps, such as memory driving and memory parking.

*Fusion positioning accuracy	0.3m lateral (perpendicular to the direction of the lane) 0.8m longitudinal (along the direction of the lane) Note: CEP95, typical performance in urban environment	
Resource requirements	CPU	~8K DMIPS
	GPU	~2TOPS
	RAM	~1GB
	KP Data*	~16KB/km
Input interface	Raw camera image data (front view + surround view (optional)) Lane detection results (optional)	
Output interface	Visual fusion positioning results, accuracy indication, integrity Output frequency: 100Hz	

Key Point information is generated by self-learning after the user's driving route and used for subsequent visual fusion repositioning.

FUNCTIONAL SAFETY

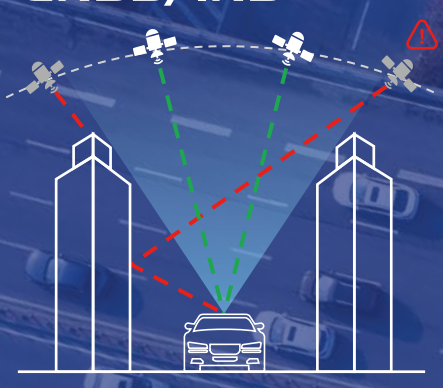
ASIL B: Measurement Engine, Navigation Engine, Safety Engine



Systematically Satisfying Functional Safety

0.1% RMS

DEEPLY COUPLED GNSS/INS



Number of satellites required for positioning:

High-precision positioning (RTK fixed solution): around 8 satellites
Deep-coupling positioning: 2 satellites

Usability in typical urban canyon scenarios*:

High-precision positioning (RTK fixed solution): 15.18%
Deep-coupling positioning: 76.34%

*Horizontal error <0.29m
*vertical error <1.5m

Anti-interference

SAIF composite interference suppression algorithm

RTK Algorithm

REAL high-performance RTK positioning algorithm

Combined Navigation

DIST deep-coupling Combined navigation algorithm

SBAS signal reception

L-BAND and CLAS on one single chip

Full Temperature IMU Calibration

Scalable, chip-level full temperature IMU calibration

Visual Fusion Positioning Solution

High-precision positioning in all scenarios

AUTOMOTIVE

- IATF16949
- ISO26262
- ISO21434
- ASPICE
- AEC-Q

*Vehicle lateral direction 0.3m CEP95

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GLOBAL BUSINESS

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