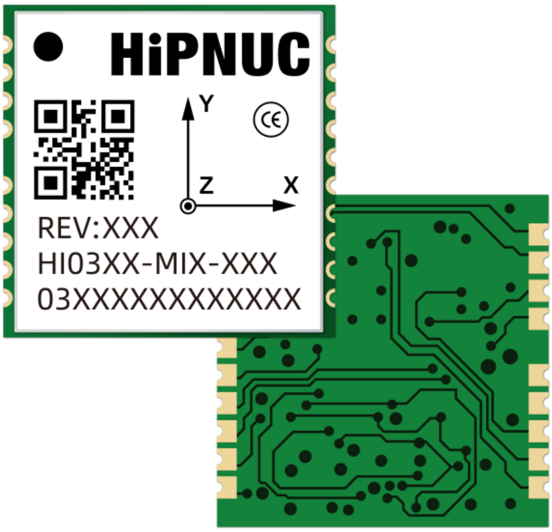
1 Features

1.1 Hardware



- High-performance, low-noise MEMS IMU
- Integrated low-noise, high-reliability LDO
- Factory calibrated and temperature compensated over -40 °C to 85 °C, including bias, scale factor, and cross-axis calibration
- Supports PPS + NMEA GPRMC time synchronization
- Comprehensive peripheral interfaces, including 3 × UART, CAN, and I2C/SPI (not supported in the current firmware version)
- Multi-function IOs (synchronization, LED, alarm, etc.)
- Vibration-resistant design for applications in vibration environments
- Integrated temperature sensor
- Compact SMT package, 15 × 15 × 2.6 mm, easy to integrate
- Product design complies with relevant RoHS requirements, and materials meet halogen-free requirements; certification status shall be subject to the latest official information
- Customization supported

1.2 Software

- Adaptive EKF fusion algorithm
- UART output rate up to 1000 Hz depending on output data type and configuration, with low output latency
- Optimized attitude tracking and vibration suppression for dynamic motion scenarios
- Reduced impact of linear acceleration on attitude estimation under typical operating conditions
- Supports binary, CAN, Modbus, and other protocols
- Comprehensive user configuration commands
- Multi-function GUI for convenient operation
- Supports ROS1, ROS2, C, MATLAB, Python, Arduino, and other example projects

2 Applications

The HI03 series is designed for high-performance attitude sensing and complex operating conditions. It is suitable for attitude measurement and control applications under temperature variation, vibration, and dynamic motion conditions. Typical applications include:

- Platform stabilization control
- Construction machinery
- Humanoid robots
- Unmanned aerial vehicles (UAVs)
- Low-speed autonomous robots
- Smart agricultural machinery

3 Description

3.1 System Block Diagram

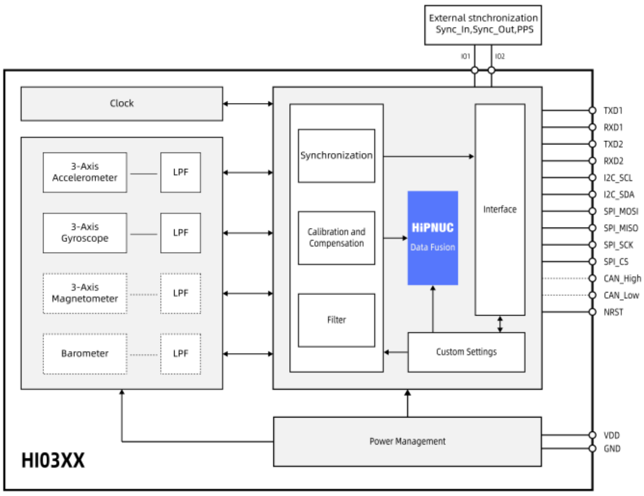


Figure 1: HI03 System Block Diagram

Note 1: Dashed lines indicate functions not supported by some models. See Table 1 for details.

3.2 Description

The HI03 series is a MEMS IMU-based IMU/VRU/AHRS sensor module featuring self-developed adaptive extended Kalman filtering, IMU noise dynamic analysis, and carrier motion state analysis algorithms. It provides raw inertial data (acceleration, angular rate, magnetic field) as well as computed attitude data (Euler angles, quaternions, etc.).

Depending on the model, the HI03 series supports IMU, VRU, or AHRS functions. Not all models integrate a magnetometer or support AHRS output. See Table 1 and Table 2 for detailed configurations.

Each module is factory calibrated for temperature, bias, scale factor, and cross-axis compensation before shipment. The module currently supports UART/CAN data interfaces. I2C/SPI hardware pins are reserved, but are not supported in the current standard firmware version. Future support plans are subject to official release information.

The module supports PPS + GPRMC time synchronization and synchronization trigger functions, and is accompanied by a GUI tool for configuration, data display, firmware upgrade, and data logging during evaluation.

Figure 2: GUI Tool

Contents

4 Product Selection

Table 1: Selection Information

HI03a-b-c							
Identifier	Series	a-Sensor		b-Data Interface		c-Additional Information	
HI	03	R2	IMU/VRU	MI0	UART (I2C/SPI pins reserved, not supported in the current firmware version)	000	Default
		R3	IMU/VRU/AHRS	MI1	UART + CAN (I2C/SPI pins reserved, not supported in the current firmware version)	Others	Custom

Note 1: The current standard models are covered in the Product Ordering section; other models are available for customization.

Table 2: HI03 Series Module Configuration

Model	3-axis Accelerometer	3-axis Gyroscope	3-axis Magnetometer	Barometer	INS
HI03R2-MI0	√	√	×	×	×
HI03R2-MI1	√	√	×	×	×
HI03R3-MI1	√	√	√	×	×

Table 3: HI03 Interface Configuration

Model	3 UARTs	I2C	SPI	CAN	2 Synchronization Pins (Multi-function IO)
HI03R2-MI0	√	Not supported in current firmware	Not supported in current firmware	×	√
HI03R2-MI1	√	Not supported in current firmware	Not supported in current firmware	√	√
HI03R3-MI1	√	Not supported in current firmware	Not supported in current firmware	√	√

Note 2: Multi-function IOs are not limited to synchronization functions, and also support LED, alarm, and other functions. Refer to the Command and Programming Manual for details.

5 Ordering

5.1 Ordering Code

Table 4: Ordering Code

Part Number	Name	Description
HI03R2-MI0-000	IMU/VRU Module	IMU/VRU module
HI03R2-MI1-000	IMU/VRU Module	IMU/VRU module with integrated CAN transceiver
HI03R3-MI1-000	IMU/VRU/AHRS Module	IMU/VRU/AHRS module with integrated CAN transceiver

5.2 Contact Information

1. Email: overseas1@hipnuc.com
2. Website: www.hipnuc.com

6 Documents

6.1 Revision History

Table 5: Revision History

Revision	Date	Author	Description
1.0	2/26/2026	Hipnuc	Initial release

6.2 Related Documents and Development Kits

1. Command and Programming Manual
2. STEP model / package files
3. EVAL HI03 evaluation board datasheet and design files
4. RoHS and other certification documents
5. GUI and reference examples

7 System Architecture

The HI03 series is a class of sensor modules supporting IMU, VRU, and AHRS functional configurations. Depending on the specific model, the product can provide acceleration, angular rate, magnetic field, Euler angles, quaternions, and other outputs.

Depending on the model configuration, the HI03 module can integrate a 3-axis accelerometer, 3-axis gyroscope, 3-axis magnetometer, and a high-performance processor. The processor is mainly used for sensor synchronization, calibration, algorithm fusion, and user configuration. In addition, based on application scenarios and sensor characteristics, the module supports multiple modes such as 6-DoF, AHRS, and humanoid robot mode. Refer to the Command and Programming Manual for details.

7.1 IMU

The HI03 can be used as an inertial measurement unit (IMU), providing precise 3-axis acceleration and 3-axis angular rate data. These data are acquired by the internally integrated high-precision accelerometer and gyroscope and can reflect the motion state and dynamic changes of the object in three-dimensional space in real time.

Compared with uncompensated and uncalibrated raw inertial devices, the HI03 provides better output consistency and stability due to system-level factory calibration and compensation, including cross-axis, scale factor, bias, and temperature calibration.

7.2 VRU

The HI03 can output attitude information referenced to gravity through the fusion algorithm, mainly including pitch and roll. In 6-DoF mode, it can also output an estimated yaw angle, but this value accumulates drift over time.

7.3 AHRS

Based on IMU and VRU functions, the HI03 can further implement AHRS by introducing a high-precision, wide-range TMR (Tunnel Magnetoresistance) geomagnetic sensor. This enhances attitude sensing capability and enables long-term stable pitch, roll, and yaw outputs referenced to magnetic north.

8 Pin Definitions

8.1 MI0 Pin Definition

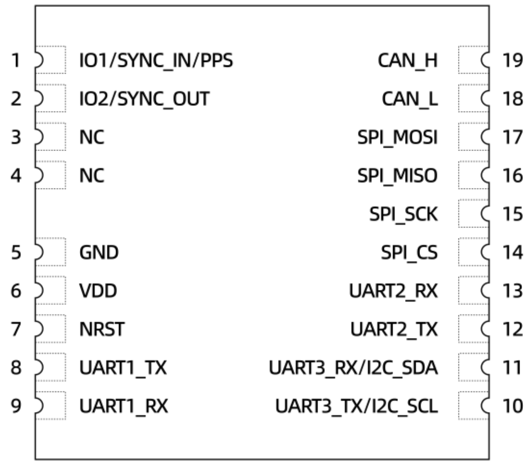


Figure 3: HI03XX-MI0 Pin Definitions

Table 6: HI03XX-MI0 Pin Description

No.	Pin Name	Type	Function	Remark
1	IO1 (SYNC_IN/PPS)	I/O	Synchronization input, can accept external trigger signals such as GNSS PPS	
2	IO2 (SYNC_OUT)	I/O	Synchronization output, can be used as Data Ready signal	
3	NC	N/A	Reserved, leave floating	
4	NC	N/A	Reserved, leave floating	
5	GND	Power	Power ground	
6	VDD	Power	Power input	
7	NRST	I	Reset pin, active low. Connection to host GPIO is recommended. Leave floating if unused	
8	UART1_TX	I/O	UART1 transmit	
9	UART1_RX	I/O	UART1 receive	
10	UART3_TX / I2C_SCL	I/O	UART3 transmit/I2C clock	
11	UART3_RX / I2C_SDA	I/O	UART3 receive/I2C data	
12	UART2_TX	I/O	UART2 transmit	
13	UART2_RX	I/O	UART2 receive	
14	SPI_CS	I/O	SPI chip select	
15	SPI_SCK	I/O	SPI clock	
16	SPI_MISO	I/O	SPI data output (slave)	
17	SPI_MOSI	I/O	SPI data input (slave)	
18	NC	N/A	Reserved, leave floating	
19	NC	N/A	Reserved, leave floating	

8.2 MI1 Pin Definition

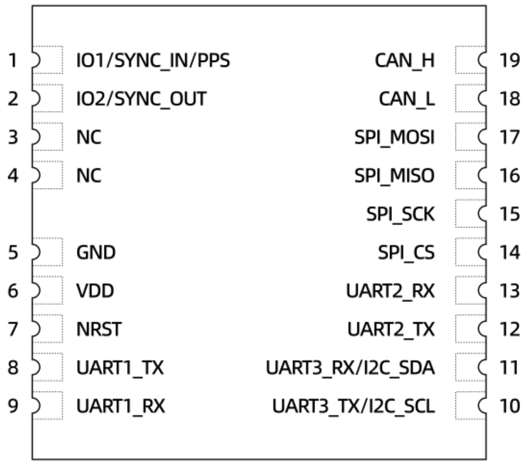


Figure 4: HI03XX-MI1 Pin Definitions

Table 7: HI03XX-MI1 Pin Description

No.	Pin Name	Type	Function	Remark
1	IO1 (SYNC_IN/PPS)	I/O	Synchronization input, can accept external trigger signals such as GNSS PPS	
2	IO2 (SYNC_OUT)	I/O	Synchronization output, can be used as Data Ready signal	
3	NC	N/A	Reserved, leave floating	
4	NC	N/A	Reserved, leave floating	
5	GND	Power	Power ground	
6	VDD	Power	Power input	
7	NRST	I	Reset pin, active low. Connection to host GPIO is recommended. Leave floating if unused	
8	UART1_TX	I/O	UART1 transmit	
9	UART1_RX	I/O	UART1 receive	
10	UART3_TX / I2C_SCL	I/O	UART3 transmit/I2C clock	
11	UART3_RX / I2C_SDA	I/O	UART3 receive/I2C data	
12	UART2_TX	I/O	UART2 transmit	
13	UART2_RX	I/O	UART2 receive	
14	SPI_CS	I/O	SPI chip select	
15	SPI_SCK	I/O	SPI clock	
16	SPI_MISO	I/O	SPI data output (slave)	
17	SPI_MOSI	I/O	SPI data input (slave)	
18	CAN_L	AIO	CAN Low	
19	CAN_H	AIO	CAN High	

Table 8: UART Function Description

Port	Data Transmission	Command Configuration	GPRMC Input	Firmware Upgrade
UART1	√	√	√	√
UART2	√	√	√	×
UART3	×	×	√	×

9 Interface and Reference Design

9.1 Power Supply

The module integrates an LDO to suppress the impact of input power noise on internal analog and digital circuits. The recommended input voltage range is 3.2 V to 5.0 V. See Table 15 for the operating voltage range. External power can be supplied by LDO or DC/DC.

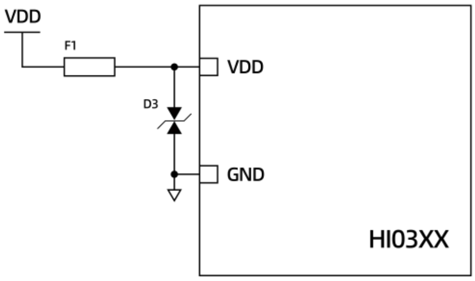


Figure 5: HI03 Power Supply Reference Circuit

9.2 UART

The HI03 series supports flexible communication through UART1/UART2 in full-duplex mode. The default serial configuration is standard 8N1, as follows:

- Baud rate: 115200 bps (configurable)
- Data bits: 8
- Parity: None
- Stop bits: 1

This configuration is widely used in industrial applications and is compatible with most embedded systems, industrial controllers, robot controllers, and similar devices. In addition, the HI03 can be extended to RS-485 or RS-422 communication by adding an external RS-485 or RS-422 transceiver, improving system flexibility and expandability.

Note 1: Baud rate and output frame rate can both be changed by commands. Refer to the Command and Programming Manual for details.

When using UART communication with the HI03 series, a 3.3 V logic level on the host processor is recommended. If communication with 5 V or 1.8 V logic devices is required, an external level shifter shall be added by the user to ensure communication reliability and device safety.

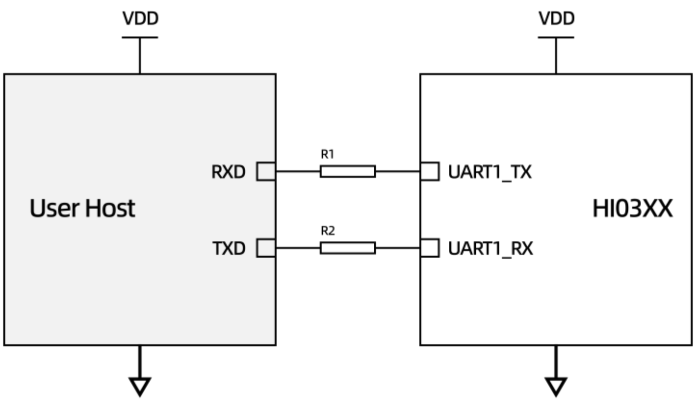


Figure 6: Minimum System for HI03 UART Communication

9.3 I2C

Hardware pins are reserved, but I2C is not supported in the current firmware version.

9.4 SPI

Hardware pins are reserved, but SPI is not supported in the current firmware version.

9.5 CAN

The HI03 module supports standard CAN 2.0B communication. The default baud rate is 500 kbps, which can meet the requirements of most industrial and embedded applications. The baud rate is user-configurable to adapt to different communication scenarios. Refer to the Command and Programming Manual for details.

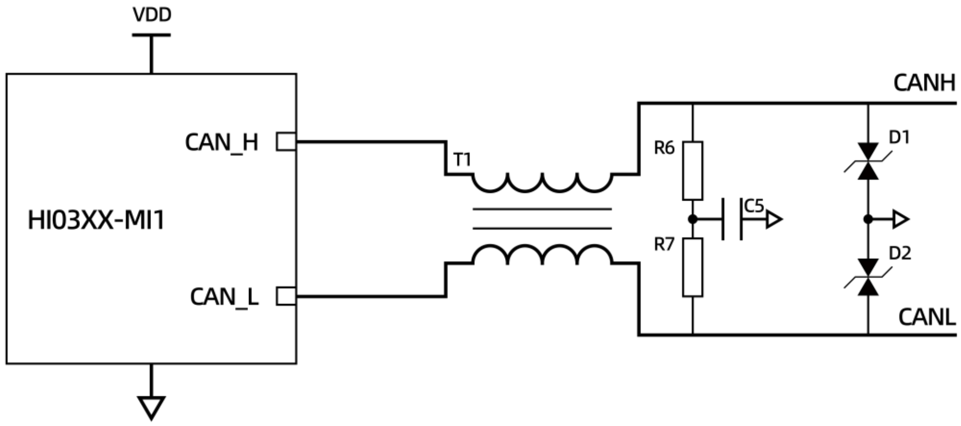


Figure 7: HI03XX-MI1 CAN Reference Circuit

Note 1: Terminal resistor configuration depends on the system bus topology. R6/R7 in the reference circuit are for design reference only.

9.6 Synchronization System

The HI03 supports pulse-trigger synchronization and PPS + GPRMC time synchronization, enabling time alignment with a host or external devices such as GNSS, cameras, radar, etc.

9.6.1 Host Trigger Synchronization (UART)

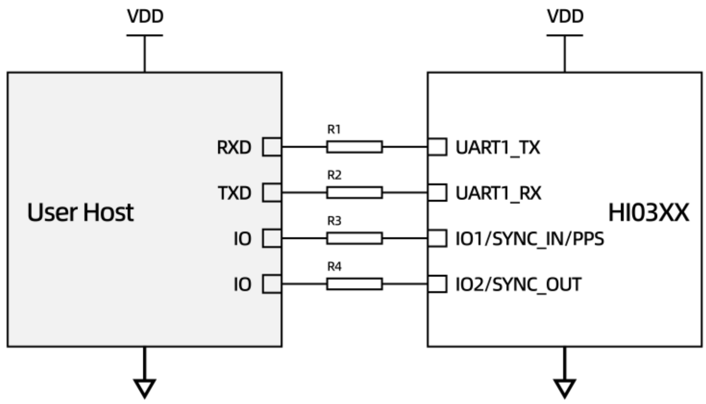


Figure 8: HI03 Host-Triggered Synchronization (UART)

In this connection method, IO1/IO2 are directly connected to the host system for inter-system trigger synchronization. If IO1 is used as synchronization input, IO1 shall be configured as synchronization input mode and the host shall provide pulses with the same frequency as the output data rate to the HI03. If IO2 is used, IO2 shall be configured as synchronization output mode, and the output pulse frequency will match the output data rate and can be used as a Data Ready signal. IO1 and IO2 do not need to be used simultaneously. Users can select the appropriate synchronization method according to their system architecture.

9.6.2 Host PPS + GPRMC Time Synchronization (UART)

In this connection method, IO1/IO2 are directly connected to the host system for inter-system time synchronization. IO1 shall be configured as PPS synchronization input mode, and the host shall provide PPS pulses to the HI03. If IO2 is used, IO2 shall be configured as synchronization output mode, and the output pulse frequency will match the output data rate and can be used as a Data Ready signal. UART1_RX shall receive the GPRMC data generated by the host.

9.6.3 External Device PPS + GPRMC Synchronization (UART)

The HI03 can perform PPS + GPRMC time synchronization with an external device that can provide PPS and GPRMC information. In this case, the HI03, host, and GNSS shall share a common ground. IO1 receives the PPS pulse signal from the external device, and UART2_RX/UART3_RX receive the GPRMC information.

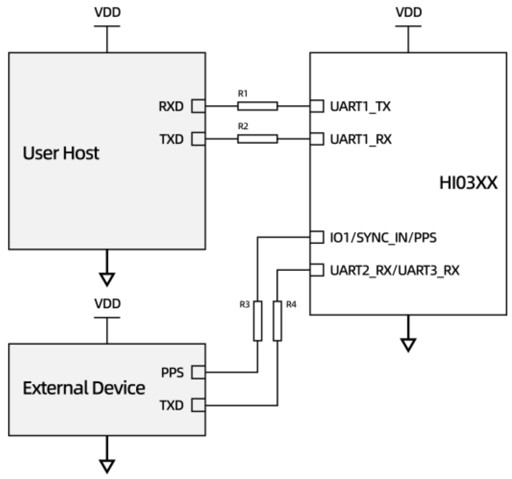


Figure 9: HI03 and External Device PPS + GPRMC Synchronization

9.6.4 CAN (Synchronization)

Synchronization is also supported in CAN communication scenarios. In this case, the HI03 communicates with the host through the CAN interface, while synchronization IOs can still be used for external triggering or time alignment. Refer to the UART synchronization section for detailed timing and configuration methods.

9.7 Reference Design BOM

Table 9: Reference Design BOM

Item	Reference	Part	P/N	Vendor
Fuse	F1	300 mA	JK-SMD0603-030-6	JK
TVS	D3	SMF5.0CA	SMF5.0CA	Littelfuse
Resistor	R1,R2,R3,R4,R5	1 K	RC0402JR-071KL	YAGEO
Resistor	R6,R7	60.4 Ω	RC1206FR-0760R4L	YAGEO
Capacitor	C1,C2	0.1 uF	CC0402KRX5R7BB104	YAGEO
Capacitor	C5	1 nF	CC0402KRX7R9BB102	YAGEO
Common Choke	T1	5.8 kΩ@10MHz, 100 uH@100kHz, 150 mA	ACT45B-101-2P-TL003	TDK
TVS	D1,D2	SMBJXXCA	SMBJXXCA	Littelfuse

Note 1: Series resistors can be selected according to communication distance, rate, and system EMC requirements. Typical values are 33 Ω, 100 Ω, or 1 kΩ.

Note 2: The voltage rating of TVS devices shall be selected according to the system supply platform. In multi-node cascaded applications, SMAJ series devices may also be used.

10 Specifications

10.1 Gyroscope

Table 10: Gyroscope Specifications

Parameters	Condition	Min	Typ	Max	Unit	Remark
Range			±250 ±500 ±1000 ±2000		°/s	Default: 2000
Resolution			16		bit	
Scale Factor Error	Before SMT, 100 °/s rotation		600	850	ppm	Typical: RMS
	After SMT, 100 °/s rotation		1200	2000		
Nonlinearity			±0.05		%FS	1
Noise Density	Bandwidth 47 Hz		0.008		°/s/√Hz	
3 dB Bandwidth			80	200	Hz	2
Bias Output				±0.2	°/s	3
Sampling Rate			1000		Hz	
Bias Instability	Allan Variance X		1.5	2.5	°/h	Typical: 1σ Maximum: 3σ
	Y		1.9	3.2		
	Z		1.7	3.2		
Bias Stability	10 s Average X		5.5	7	°/h	Typical: 1σ Maximum: 3σ
	Y		7.5	9		
	Z		5.5	7		
Bias Repeatability	X		11.5	21	°/h	
	Y		15	30		
	Z		9.5	15		
Angle Random Walk	Allan Variance X		0.3	0.6	°/√h	Typical: 1σ Maximum: 3σ
	Y		0.4	0.7		
	Z		0.2	0.4		
Bias Temperature Drift	-40 °C ~ 85 °C		0.07	0.15	°/s	4
Accelerometer Sensitivity	XYZ		0.05		°/s/g	

Note 1: Maximum deviation from the best-fit straight line within the specified range.

Note 2: Different modes have different bandwidths. The default bandwidth in 6-DoF mode is 80 Hz.

Note 3: After initial bias calibration, bias can be estimated in real time by the algorithm engine.

Note 4: Measured in Hipnuc laboratory thermal chamber and rate table, with temperature ramp rate less than 3 °C/min.

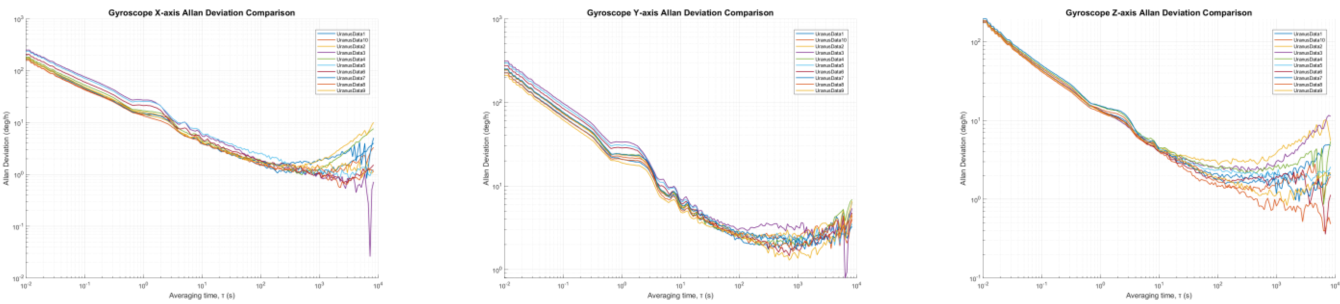


Figure 10: HI03XX Gyroscope Allan Variance

10.2 Accelerometer

Table 11: Accelerometer Specifications

Parameters	Condition	Min	Typ	Max	Unit	Remark
Range			±3 ±6 ±12 ±24		g	Default: 12
Resolution			16		bit	
Initial Bias	Before SMT, Horizontal Static		1	2	mg	Typical: RMS
	After SMT, Horizontal Static		10	20		
Nonlinearity			0.01		%FS	1
3 dB Bandwidth			90	200	Hz	2
Noise Density	Bandwidth 47 Hz		0.1	0.12	mg/√Hz	
Sampling Rate			1000		Hz	
Bias Instability	Allan Variance X		0.015	0.02	mg	Typical: 1σ Maximum: 3σ
	Y		0.02	0.045		
	Z		0.015	0.02		
Bias Stability	10 s Average X		0.06	0.1	mg	Typical: 1σ Maximum: 3σ
	Y		0.055	0.15		
	Z		0.05	0.06		
Bias Repeatability	X		0.127	0.25	mg	Typical: 1σ Maximum: 3σ
	Y		0.09	0.15		
	Z		0.07	0.15		
Velocity Random Walk	Allan Variance		0.055	0.065	m/s/√h	Typical: 1σ Maximum: 3σ
Bias Temperature Drift	-40 °C ~ 85 °C		2	5	mg	3

Note 1: Maximum deviation from the best-fit straight line within the specified range.

Note 2: Different modes have different bandwidths. The default bandwidth in 6-DoF mode is 90 Hz.

Note 3: Measured in Hipnuc laboratory thermal chamber and rate table, with temperature ramp rate less than 3 °C/min.

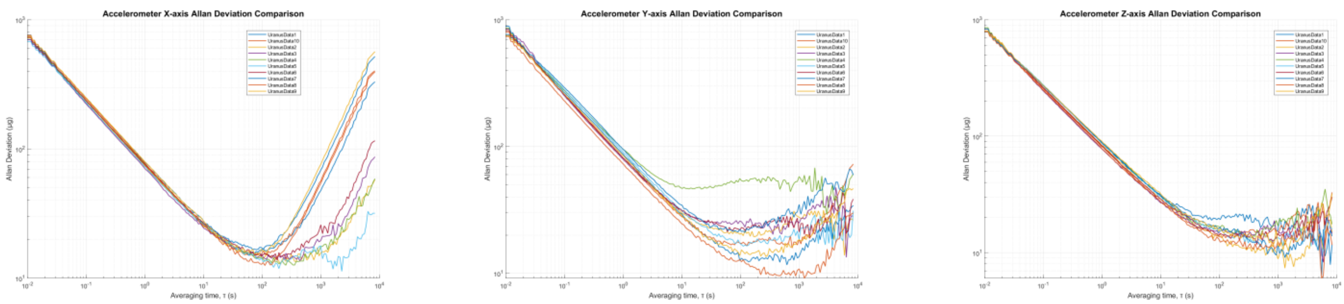


Figure 11: HI03XX Accelerometer Allan Variance

10.3 Magnetometer

Table 12: Magnetometer Specifications

Parameters	Min	Typ	Max	Unit	Remark
Range		±2000		uT	
Noise	0.19	0.45		uT	
Nonlinearity	±10	±20		uT	

10.4 Temperature Sensor

Table 13: Temperature Sensor Specifications

Parameters	Min	Typ	Max	Unit	Remark
Range	-40	-	85	℃	
Offset Error		±5		℃	

10.5 Fusion Accuracy

Unless otherwise specified, the following fusion accuracy data are obtained after factory calibration under typical installation conditions. Attitude accuracy is affected by installation flatness, mechanical stress, vibration environment, linear acceleration, magnetic environment, and user calibration status. Actual application results may vary.

Table 14: Attitude Accuracy

Parameters	Condition	Min	Typ	Max	Unit	Remark
Pitch/Roll (Static)	Before SMT		0.1	0.2	°	1
	After SMT		0.3	0.4		
Pitch/Roll (Dynamic)	Before SMT		0.2	0.3	°	
	After SMT		0.4	0.6		
Heading (AHRS)			2	3	°	2
Static Heading Drift (6-DoF)	Static for 2 h		0.15	0.2	°	
Dynamic Heading Drift (6-DoF)			5	10	°	3
Heading Rotation Error (6-DoF)	100 °/s rotation, Before SMT		0.2	0.3	°	4
	100 °/s rotation, After SMT		0.4	0.7		

Note 1: Data are referenced to the calibration plane and obtained from 20 test samples.

Note 2: Measured after magnetic calibration and under conditions without surrounding magnetic interference. The product shall be configured in AHRS mode.

Note 3: Measured on an indoor cleaning robot moving for 1 hour, result shown as 1σ. In 6-DoF mode, the heading angle is an estimate without magnetic reference, and its long-term stability is affected by initial alignment, motion condition, environmental condition, and time.

Note 4: Average per-turn error over 10 rotations on a rate table.

11 System and Electrical Parameters

11.1 Electrical Specifications

Parameters	Min	Typ	Max	Unit	Remark
Operating Voltage Range VDD	3.2	-	5.5	V	
Power Consumption			240	mW	
V_{OL}		-	0.4	V	
V_{OH}	2.6			V	
V_{IL}	-0.3		1	V	
V_{IH}	1.9		3.6	V	

11.2 Interface Parameters

Port	Parameters	Min	Typ	Max	Unit	Remark
UART1	Baud rate	9600	115200	921600	bps	
UART2	Output Data Rate	0	100	1000	Hz	
UART3	Baud Rate		115200		bps	Currently mainly used for GPRMC input
CAN	Baud Rate	125	500	1000	kbps	
	Output Data Rate	0	100	200	Hz	
	Differential Voltage		1.5	3	V	
	Internal Terminal Resistor		None		Ω	
I2C						Not supported in current firmware
SPI						Not supported in current firmware

11.3 System Parameters

Parameters	Value	Remark
Dimensions	15 × 15 × 2.6 mm	
Weight	<1.5 g	
System Startup Time	2 s	1
Operating Temperature	-40 °C ~ 85 °C	
Shield Material	Nickel silver	
Vibration Resistance	1.0 mm (10 Hz to 58 Hz), ≤20 g (58 Hz to 600 Hz)	
Environmental Compliance	Complies with relevant RoHS requirements	
Compliance Information	Refer to the latest official information for related certification and conformity documents	
Drop Test	3 free drops from a 75 cm laboratory bench	
Temperature Shock Test	Temperature ramp from -40 °C to 85 °C within 1 hour, total 5 cycles	
Moisture Sensitivity Level (MSL)	MSL2	

Note 1: Time from power-on to valid data output.

11.4 Absolute Maximum Ratings

Table 15: Absolute Maximum Ratings

Parameters	Limit	Comment
Mechanical Shock	10,000 g	Duration < 0.2 ms
Storage Temperature	-40 °C ~ 125 °C	
ESD (HBM)	2 kV	JEDEC/ESDA JS-001
Input Voltage	9 V	
I/O to GND Voltage	-0.3 V ~ 5 V	
CAN H or CAN L to GND	±36V	

Note 2: Stresses above the absolute maximum ratings may cause permanent damage to the device. Functional operation at these conditions is not guaranteed.

12 Mechanical

All dimensions are in mm.

12.1 Product Dimensions

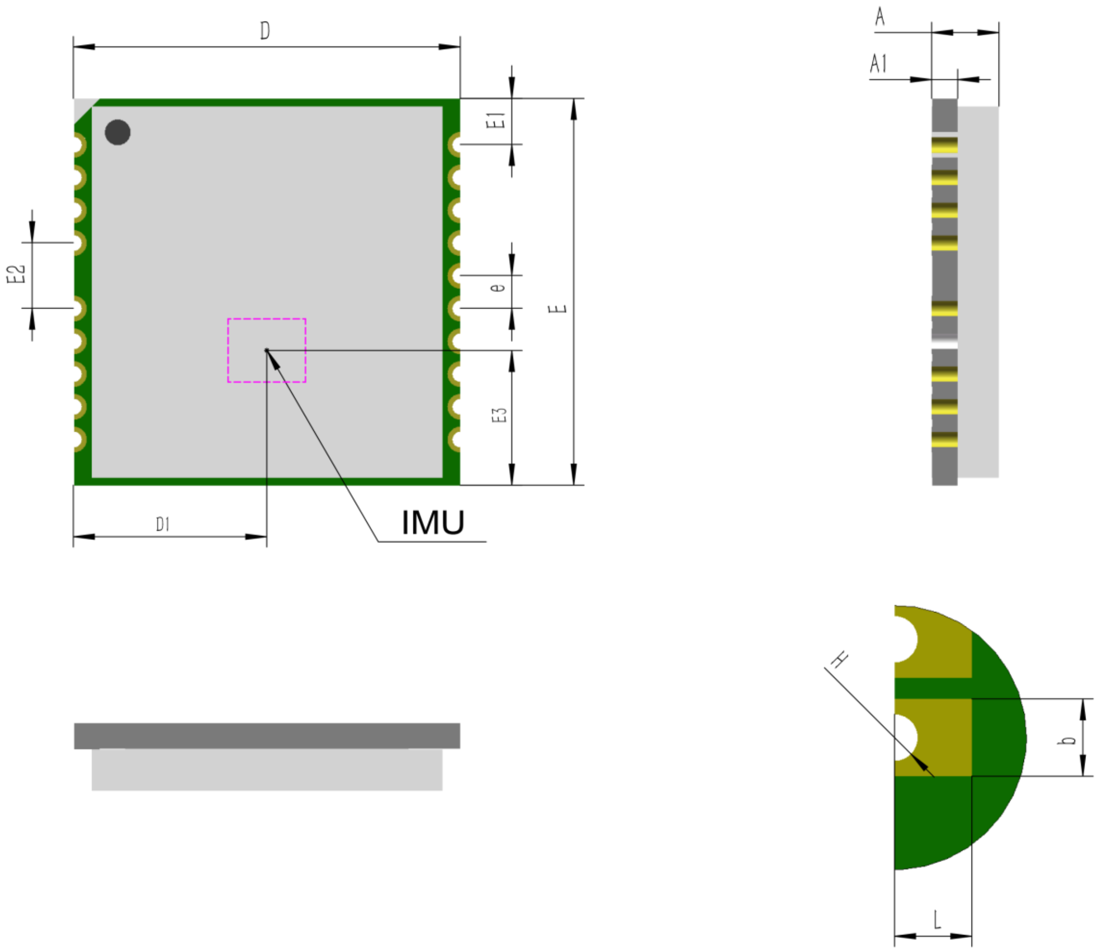


Figure 12: HI03 Mechanical Dimensions and IMU Position

Table 16: HI03 Dimensions

Symbol	Min (mm)	Typ (mm)	Max (mm)
A	2.5	2.6	2.7
A1	0.95	1	1.05
D	14.8	15	15.2
D1	7.45	7.5	7.55
E	14.8	15	15.2
E1	1.69	1.79	1.89
E2	2.5	2.54	2.55
E3	4.9	5	5.1
e	1.25	1.27	1.28
L	0.95	1	1.05
b	0.87	0.9	0.92
H	R0.26	R0.27	R0.28

12.2 HI03 Recommended Land Pattern

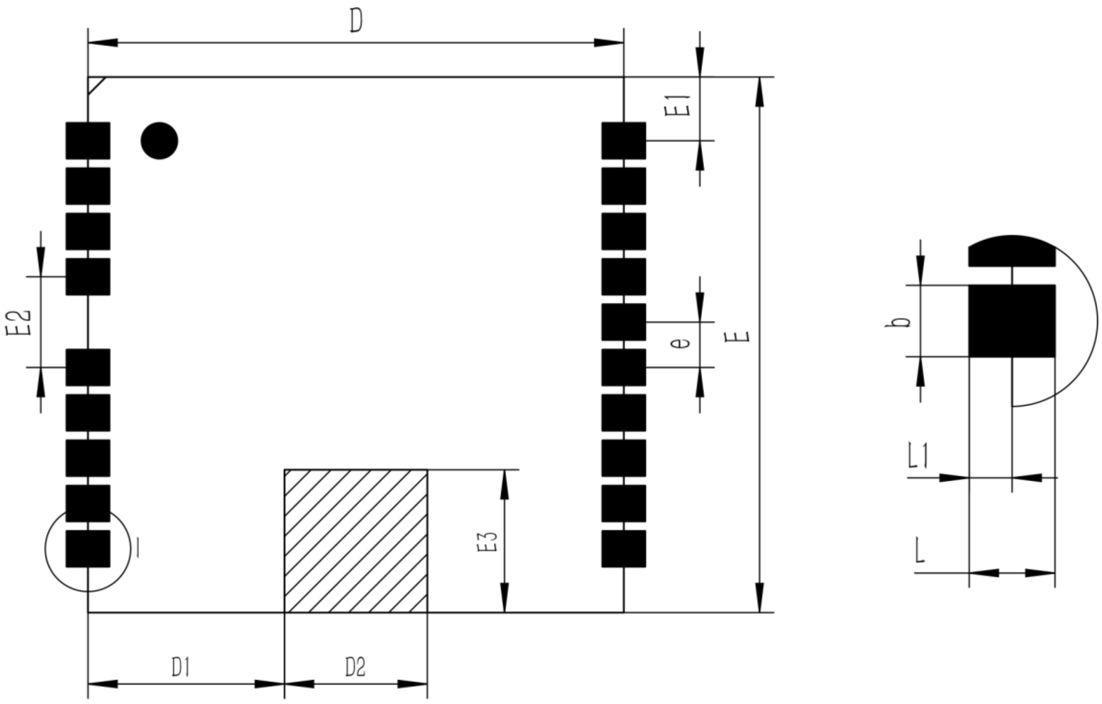


Figure 13: HI03 HI03 Recommended Land Pattern

Note 1: Exposed copper is not allowed on the backside of the device. For HI03 variants with magnetometer function, copper pouring and routing are prohibited in the shaded area.

Table 17: HI03 Recommended Package Dimension

Symbol	Min (mm)	Typ (mm)	Max (mm)
D		15	
D1		5	
D2		5	
E		15	
E1		1.79	
E2		2.54	
E3		5	
e		1.27	
b		0.9	
L		2	
L1		1	

13 Coordinate System

13.1 ENU (Default)

The body frame uses a right-forward-up (RFU) coordinate system, and the geographic frame uses an east-north-up (ENU) coordinate system. The accelerometer and gyroscope axes are shown in the figure below:

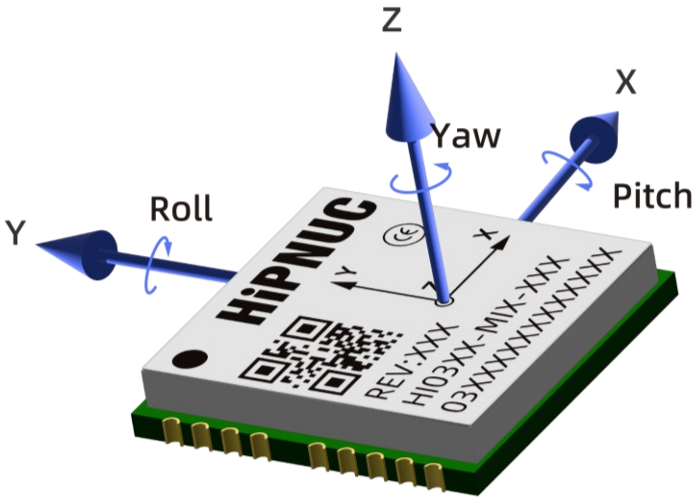


Figure 14: HI03 Coordinate System

The positive direction of angular velocity follows the right-hand rule. Quaternion output order is defined in the Command and Programming Manual. Euler angles are output using the Z-X-Y (312) rotation sequence. For conventions involving intrinsic/extrinsic rotations and coordinate transformation definitions, refer to the definitions in the Command and Programming Manual. The detailed definitions are as follows:

- Rotation about Z-axis: Yaw (ψ), range: -180° ~ 180°
- Rotation about X-axis: Pitch (θ), range: -90° ~ 90°
- Rotation about Y-axis: Roll (ϕ), range: -180° ~ 180°

When the module coordinate frame coincides with the reference coordinate frame, the ideal Euler angle output is Pitch = 0°, Roll = 0°, Yaw = 0°.

For coordinate frame rotation, refer to the Command and Programming Manual.

13.2 NWU and NED

The body frame can also be configured as NWU or NED. User configuration is required. Refer to the Command and Programming Manual for details.

14 Evaluation Board

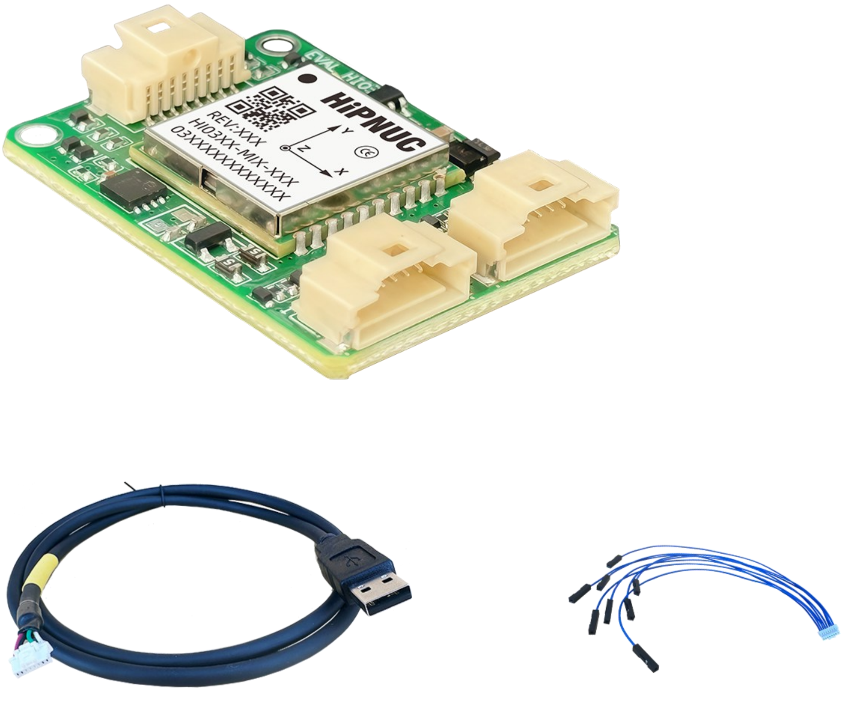


Figure 15: HI03 Series Evaluation Board and Cable Harness

Note 1: For details, please refer to the specification of the EVAL HI03 evaluation board.

15 Protocols

15.1 Serial Binary Protocol

The product supports a serial binary communication protocol. For detailed packet format, output configuration, and command definitions, refer to the Command and Programming Manual.

15.2 Modbus

By adding an external RS-485 transceiver, communication based on Modbus RTU is supported. Refer to the Command and Programming Manual for detailed protocol definitions.

15.3 CAN

CAN communication supports CANopen and SAE J1939. Refer to the Command and Programming Manual for detailed protocol definitions.

16 Soldering and Installation

16.1 Reflow Profile

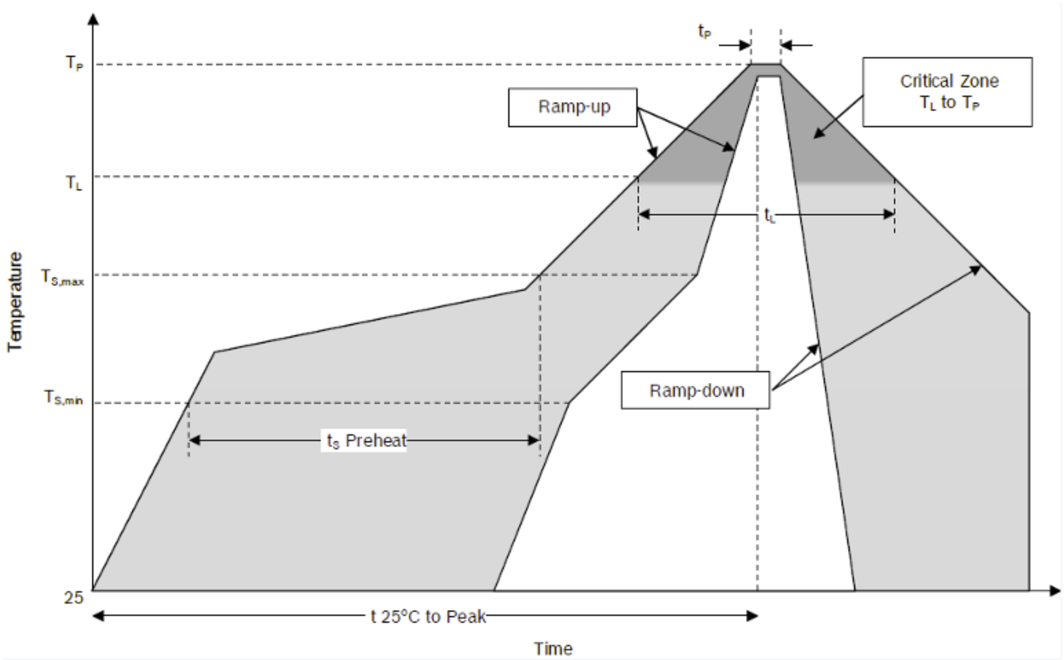


Figure 16: SMT Reflow Profile

Table 18: SMT Reflow Profile

Parameters	Descriptions
Average ramp-up rate (TSmax to Tp)	3 °C/s max
Temperature min (TSmin)	150 °C
Temperature max (TSmax)	200 °C
Time (TSmin to TSmax)	60-180 s
Temperature (T_L)	170 °C
Time (tL)	60-150s
Peak classification temperature (T_P)	250 °C
Time within 5 °C of actual peak temperature (tp)	20-40 s
Ramp-down rate	6 °C /min max
Time 25 °C to peak temperature	8 min max

16.2 Installation Recommendations

MEMS sensors are high-precision measurement devices that combine electronic structures and mechanically sensitive structures. To obtain better measurement accuracy, assembly consistency, and mechanical reliability, users are advised to pay attention to the following points during PCB design and system integration:

● For models with a magnetometer, keep the module away from motors, inductors, high-current loops, ferromagnetic materials, and magnetic fasteners to reduce magnetic interference on heading accuracy

● It is recommended to mount the module horizontally on the target carrier

● It is not recommended to place the sensor near buttons, connectors, or other locations that may introduce local mechanical stress

● It is not recommended to place the sensor near high-heat sources such as main controllers, power devices, or graphics processors, to avoid local rapid heating that may affect measurement results

● It is not recommended to place the sensor in areas of concentrated PCB mechanical stress, such as the center of diagonal crossing lines or near screw holes

- Avoid placing the sensor in areas where PCB resonance or strong vibration response may occur

If the above recommendations cannot be fully satisfied due to system structural constraints, application-specific online offset or installation error compensation calibration after final assembly is recommended to reduce potential impact.

17 Packaging

17.1 Tape

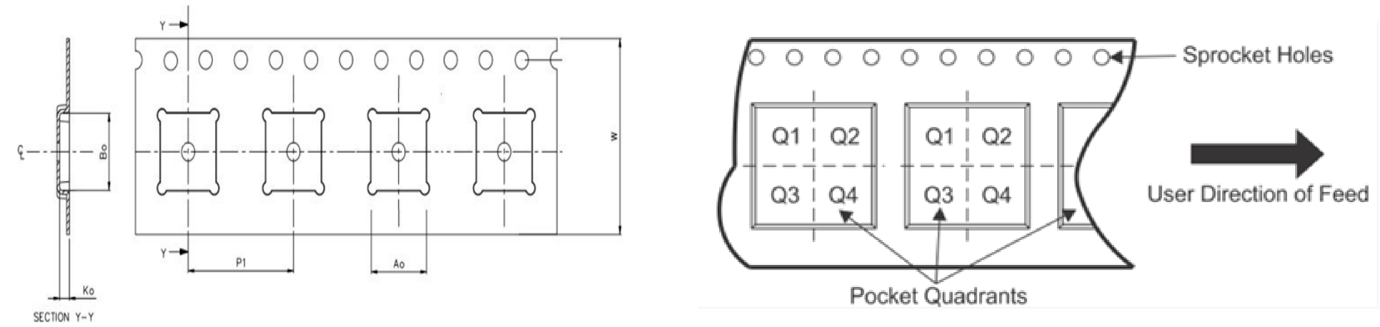


Figure 17: Tape Dimensions and Pin 1 Orientation

Table 19: Tape Dimensions

Device	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
HI03	15.4	15.4	2.9	20	24

17.2 Reel

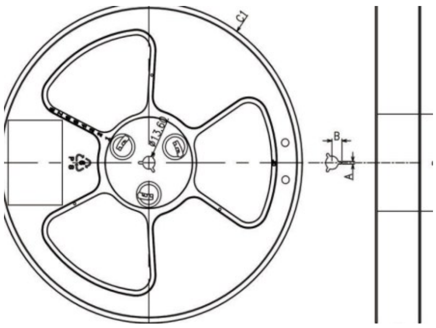


Figure 18: Reel Dimensions

Table 20: Reel Dimensions

Product	SPQ (pcs)	Reel Diameter C1 (mm)	Reel Width H (mm)	A (mm)	B (mm)	T (mm)	D (mm)
HI03	1000	330	16.8	2.5	11	2.0	100

17.3 Packaging Method

The HI03 series is packaged using reel, vacuum sealing, and carton packaging. Standard package quantity and carton dimensions are shown below:

Table 21: Packing

HI03 | Reel | Vacuum Sealed | Boxed

Table 22: Carton Dimensions

Product	SPQ (pcs)	L (mm)	W (mm)	H (mm)
HI03	1000	360	360	40

18 Disclaimer

The parameters listed in this document are typical values, maximum values, or measured values obtained under specified test conditions and do not constitute final delivery commitments. Hipnuc reserves the right to modify the product, document, and related information without prior notice.