



WTS3X Single-Axis Tilt Module

Product Manual

V1.8-2026-9-28

✓ Technical Highlights

- ❖ Resolution: 0.1°;
- ❖ Output format: TTL;
- ❖ Operating voltage: DC 3.3–7V;
- ❖ Excellent performance across the full temperature range;
- ❖ High vibration resistance: >100g.



✓ Product Introduction

The WTS3X single-axis Tilt module is a new-generation, low-cost MEMS inclination sensing module developed independently by Ruicom Technology. Built on an advanced, interference-resistant hardware platform and featuring a high-performance micro-electromechanical sensing unit, the module offers excellent performance across a wide temperature range and robust vibration resistance. It ensures stable, reliable long-term operation, with a design service life of up to 10 years.

Each WTS3X module undergoes systematic, high-precision calibration before leaving the factory. This process effectively compensates for zero-bias, cross-axis, and linearity errors, ensuring consistent measurement performance across batches and reducing the need for additional calibration by the customer. Optimized for mass production, the module is designed for automated SMT (Surface Mount Technology) assembly—eliminating the need for manual soldering—thereby significantly boosting production line efficiency and lowering overall system integration costs.

With its compact design, the module is easily integrated onto PCBs, making it ideal for space-constrained inclination-sensing applications. Thanks to its stable measurement accuracy and exceptional environmental adaptability, the WTS3X is well-suited for a variety of uses, including small-scale industrial equipment, attitude monitoring, platform leveling, and intelligent machinery—providing customers with a highly reliable, cost-effective single-axis inclination sensing solution.

✓ Application Scope

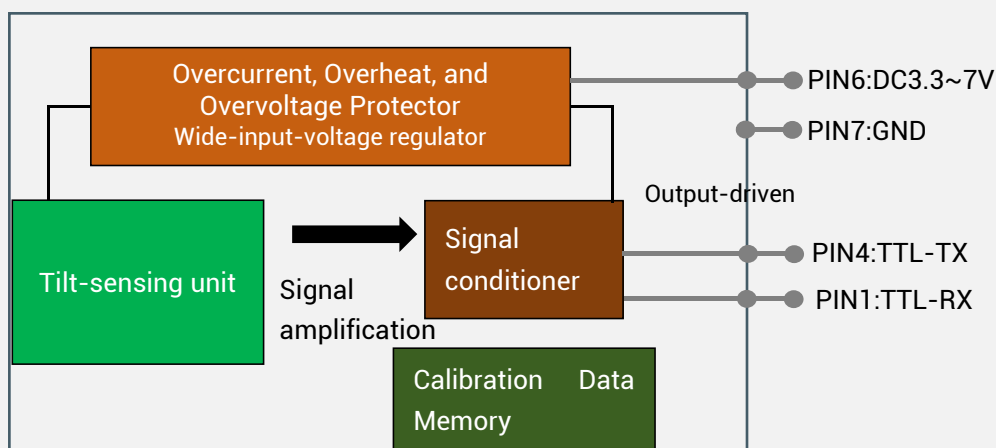
Typical application scenarios for this product series include: leveling of industrial automation platforms, small-scale construction machinery, single-axis solar tracking systems, structural deformation monitoring, medical rehabilitation equipment, as well as attitude detection for measuring instruments and intelligent equipment.



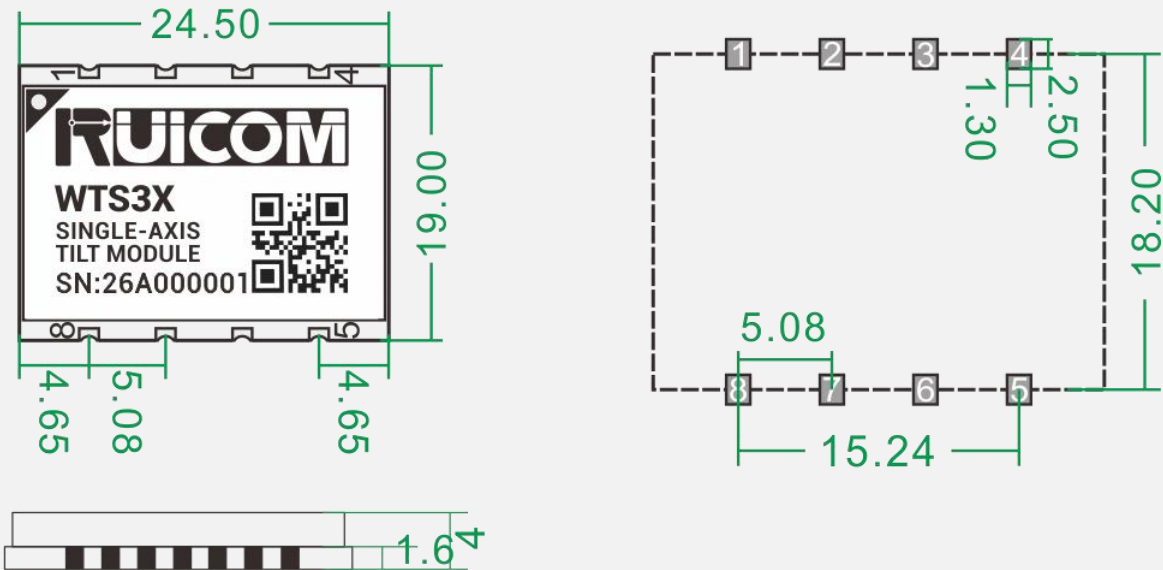
Performance Parameters

WTS3X Single Axis	Condition	Parameter	Unit
Measurement Range	Single Axis	0 ~ 360°	°
Resolution	-	0.1	°
Accuracy	25℃	±0.2	°
Temperature Drift	-40 ~ +85℃	±0.02	°/℃
Response Time	No filtering	0.1	s
Zero Offset	-	±0.1	°
Quiescent Current	DC 5V	10	mA
Power-on Startup Time	1s		
Operating Voltage	DC 5V(Recommendation Score)		
Operating Temperature	-40℃~85℃		
Output Interface	3.3V TTL		
Output Load	>500 Ω		
Operating Duration	50,000 hours/cycles (mean time between failures)		
Vibration Resistance	10 grms, 10–1000 Hz		
Shock Resistance	100 g @ 11 ms, three axes (half-sine wave)		
Weight	≤5g		
Available in horizontal (WTS3X) or vertical (WTS3X-V) mounting configurations			

System Block Diagram



✔ Product Dimensions



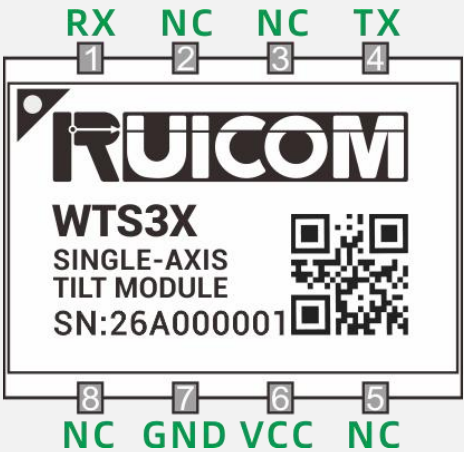
PCBA board dimensions:
L24.5×W19×H4mm

PCBA Pin Position and Dimension Drawing:
297*210*6mm

✔ Interface Definition

PIN	Definition
PIN1	RX
PIN2	NC
PIN3	NC
PIN4	TX
PIN5	NC
PIN6	VCC
PIN7	GND
PIN8	NC

NC: No-connect pin; serves a structural/fixing purpose.



 Packaging Specifications



Packaging:	Dimensions:	Number of trays:
72-Cavity Anti-Static PET Blister Tray	297*210*6mm	72 pieces per tray

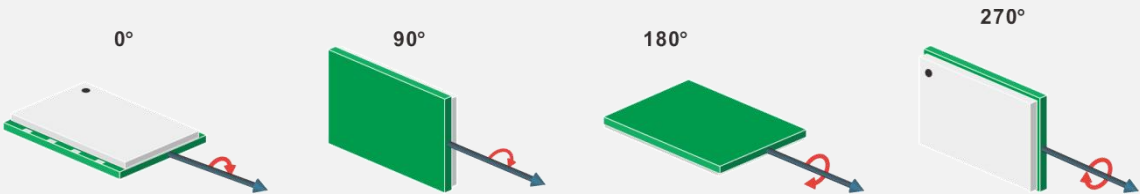
Packaging purpose: Blister tray packaging allows for direct loading onto SMT (surface-mount technology) placement machines, reducing production steps and minimizing damage during transport.

 Product usage, installation and measurement instructions

1. During installation, the axis of the sensor must be parallel to the tilt axis of the object being measured. The sensor must be mounted firmly, flush, and stably against the measurement surface. Failure to ensure a flat mounting surface may result in angular measurement errors.
2. When wiring, ensure that the signal line and the positive terminal of the power supply do not short-circuit, as this could damage the output circuitry. The signal negative terminal and the power supply negative terminal are internally connected; therefore, please ensure that the signal negative terminal at the data acquisition end is connected to the power supply negative terminal of this device.

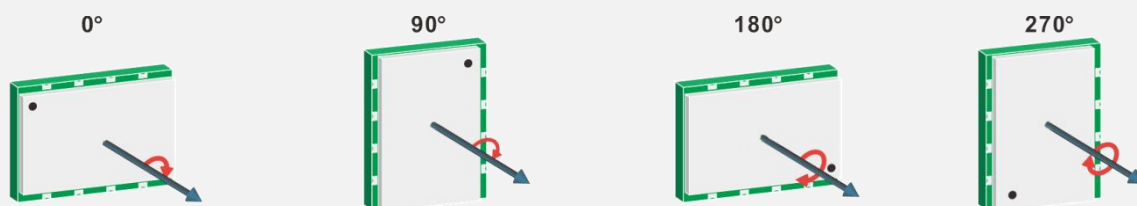
Horizontal installation measurement: WTS3X:

standard horizontal installation mode, MODBUS protocol.



Vertical installation measurement: WTS3X-V:

Vertical installation mode, MODBUS protocol.



Serial Communication Protocol

1. The communication protocol is compatible with Modbus RTU; default settings: baud rate 9600 bps, parity: none, data bits: 8, stop bit: 1.

Register Address	Data Value Name	Data Type	Value Range	Read/Wr ite Type	Default Value
0000H	X-axis Angle Value – High Byte	Custom	Measuring range	R	\
0001H	X-axis Angle Value – Low Byte	Custom	Measuring range	R	\
0006H	Set Relative Zero Point Cancel Relative Zero Point	Int16U	5A5AH 0000H	W	0000H
0007H	Device Address	Int16U	0101H 0202H 0303H(excluding 6868H) FEFEH FFFFH	R/W	0202H (Default address is 02H)
0008H	Baud Rate	Int16U	A0A0H(2400bps) A1A1H(4800bps) A2A2H(9600bps) A3A3H(19200bps)	W	A2A2H (9600bps)

R denotes read-only, W denotes write-only, and R/W denotes a read/write register. Use 03H to read registers, 06H to write to registers, and 42H to read the device address.

Note: The addresses used in the command examples below are arbitrary values; please refer to the actual product for the correct address. The factory default address is 02H.

2. Command to read sensor address:

Broadcast Address	Function Code	Starting Address High Byte	Starting Address Low Byte	Quantity High Byte	Quantity Low Byte	CRC Check
0x00	0x42	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Response:

Device Address	Function Code	Number of Data Bytes Returned	Local Station Address	Local Station Address	CRC Check
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1 Byte	0x42	1 Byte	1 Byte	1 Byte	2 Bytes
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For example: Send command: 00 42 00 07 00 01 CRC_Low CRC_High

Return data: 02 42 02 02 02 CRC_Low CRC_High

This command will return the sensor's address, 0x02.

3. Command to set sensor address:

Device Address	Function Code	Register Address (High Byte)	Register Address (Low Byte)	Target Value (High Byte)	Target Value (Low Byte)	CRC Check
1 Byte	0x06	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Response:

Device Address	Function Code	Register Address (High Byte)	Register Address (Low Byte)	Target Value (High Byte)	Target Value (Low Byte)	CRC Check
1 Byte	0x06	1 Byte	1 Byte	1 Byte	2 Bytes	2 Bytes

Example: Send command: 02 06 00 07 05 05 CRC_Low CRC_High

Return data: 02 06 00 07 05 05 CRC_Low CRC_High

This command sets the sensor's address to 0x05; the change takes effect after a restart.

4. Command for reading angle data:

Device Address	Function Code	Read Angle Data Starting Address (High Byte)	Read Angle Data Starting Address (Low Byte)	Read Angle Number of Data Points to Read (High Byte)	Read Angle Number of Data Points to Read (Low Byte)	CRC Check
0x02	0x03	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Response:

Device Address	Function Code	Number of bytes for angle data	Hundreds digit of angle data	Tens digit of angle data	Decimal (tenths and hundredths) digits of angle data	Reserved decimal place for angle data	CRC check
0x02	0x03	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

For example: Send command: 02 03 00 00 00 02 C4 38

Return data: 02 03 04 01 23 3C 00 CRC_Low CRC_High

The returned angle is 135.60° (angle value = $[(1 * 100) + (2 * 16 + 3) + (3 * 16 + 12) / 100]$).

5. Command for setting the sensor baud rate:

Device Address	Function Code	Baud rate start address (high byte)	Baud rate start address (low byte)	Baud rate code (high byte)	Baud rate code (low byte)	CRC check
0x02	0x06	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Response:

Device Address	Function Code	Baud rate start address (high byte)	Baud rate start address (low byte)	Baud rate code (high byte)	Baud rate code (low byte)	CRC check
0x02	0x06	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Example: Send command: 02 06 00 08 A0 A0 [CRC Low] [CRC High]

Return data: 02 06 00 08 A0 A0 [CRC Low] [CRC High]

This command sets the sensor's baud rate to 2400 bps; the setting will take effect after a

restart.

Note: a. The baud rate setting response is successful and will take effect after restarting.

b. Support baud rate: A0-2400, A1-4800, A2-9600, A3-19200.

6. Command to set or cancel the sensor's relative zero point:

Device Address	Function Code	Set/Cancel Relative Zero Point Starting Address (High Byte)	Set/Cancel Relative Zero Point Starting Address (Low Byte)	Set/Cancel Relative Zero Point Command Value (High Byte)	Set/Cancel Relative Zero Point Command Value (Low Byte)	CRC Check
0x02	0x06	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Response:

Device Address	Function Code	Set/Clear Relative Zero Register Start Address (High Byte)	Set/Clear Relative Zero Register Start Address (Low Byte)	Set/Clear Relative Zero Command Value (High Byte)	Set/Clear Relative Zero Command Value (Low Byte)	CRC Check
0x02	0x06	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Example: Set relative zero point

Send command: 02 06 00 06 5A 5A D3 63

Return data: 02 06 00 06 5A 5A D3 63

Cancel relative zero point

Send command: 02 06 00 06 00 00 69 F8

Return data: 02 06 00 06 00 00 69 F8