熙讯科技
SYSOLUTION



Gyro sensor RT901

specification

Version: Ver. 1.1

Update

NO.	version	Update content	Date of revision
1	Ver.1.0	initial issue	2026.07.06
2	Ver.1.1	Added: Shipping list and product weight	2026.08.04

Note: If the content of the document is modified, we will not give further notice.

Product Introduction

The RT901 gyroscope sensor is a high-performance nine-axis MEMS attitude measurement module specially designed for vehicle-mounted LED advertising displays. It integrates a three-axis gyroscope, a three-axis accelerometer and a three-axis electronic compass, and is equipped with vehicle-scenario-exclusive attitude dynamics algorithms and a high-dynamic Kalman filter fusion engine. Developed specifically for mobile advertising screens installed on buses, freight vehicles and taxis, it delivers three core essential functions for vehicle applications:

- Vehicle motion state recognition and linked LED screen picture switching

Distinguish between the stationary and moving states of a vehicle by real-time detection of vehicle body acceleration, vibration and angular velocity: output control signals to drive the LED display to switch to static safety images when the vehicle is in motion; automatically resume full-screen dynamic advertisement playback when the vehicle is completely stationary, so as to avoid compliance risks caused by dynamic advertisements played while driving that distract passers-by and drivers.

The gyroscope collects the vehicle's pitch and roll angles in real time. When the screen physically tilts due to the vehicle going uphill or downhill, taking turns, or driving on sloped road surfaces, the background algorithm compensates the picture coordinates instantly to keep the LED display content level and upright at all times. This prevents distorted text and images and resolves poor visual display effects caused by bumpiness and tilting of trucks, engineering vehicles and RVs.

- Alarm output for abnormally tilted screen installation

Supports customizable tilt threshold. When the vehicle-mounted screen tilts beyond the set standard angle due to bumps or loose brackets, the module outputs an abnormal alarm signal to be uploaded to the VehHub platform, with fault alerts pushed simultaneously to facilitate timely maintenance and reinforcement by operation and maintenance personnel.

The module supports high-speed data output up to 200Hz. Adopting an automotive-grade design with wide temperature range, vibration resistance and wide voltage compatibility, it adapts to complex vehicle operating conditions including intense sunlight exposure, low temperatures, bumpy roads and electromagnetic interference from engines. Its self-developed nine-axis fusion algorithm with geomagnetic compensation eliminates long-term integral drift of gyroscopes, enabling stable output of attitude data even during prolonged vehicle travel.

Core Application Fields

LED advertising displays on buses/taxis/freight vehicles; mobile promotional screens on vehicles; safety display screens on construction vehicles; monitoring screens on logistics vehicles

Product Features

- **Intelligent Recognition Logic for Vehicle Driving Status**

Built-in vehicle motion judgment algorithm comprehensively filters high-frequency engine vibration via triaxial acceleration and angular velocity, accurately distinguishing idling stationary state, low-speed driving and high-speed driving. It outputs status commands through TTL serial ports and can be directly connected to Y09/Y19//Y59 series vehicle-mounted LED control cards, enabling automatic screen switching without an extra controller.

Vehicle moving (acceleration/angular velocity exceeding static threshold) → Output stop signal, LED displays static images

Vehicle stationary (sustained stable gravity posture, no motion vibration) → Output play signal, LED resumes dynamic advertisements

- **High-precision Detection of Installation Inclination Angle for Vehicle-mounted Screens**

ntegrated with dynamic Kalman filtering, it achieves an attitude measurement accuracy of 0.2 and a horizontal installation reference resolution of 0.0055. During installation and calibration, real-time feedback is provided for the screen's pitch and roll offsets, enabling rapid bracket adjustment to ensure the screen remains perfectly level.

- **Alarm function for loose installation / excessive tilt**

The tilt alarm threshold can be customized via serial port (adjustable from ±1° to ±10°); when the vehicle-mounted screen suffers bracket deformation, loose screws or excessive tilt

due to long-term bumpy driving, the module will continuously send fault alarm messages to the VehHub cloud platform, where the background records abnormalities and pushes operation and maintenance early warnings.

- **Nine-axis geomagnetic fusion for long-term, stable vehicle pose estimation**

The Z-axis heading integrates geomagnetic sensors to address gyroscope drift of 6-axis modules during long-duration driving. It supports all-day continuous operation for buses and long-haul trucks without accumulated errors in attitude data. Only simple geomagnetic calibration for vehicle environments is required prior to use, and the device shall be placed at least 20 centimeters away from in-vehicle magnetic interference sources such as magnets, audio equipment and wiring harnesses.

- **Vibration-resistant and wide-temperature range automotive hardware design**

The operating temperature ranges from -40℃ to +85℃, suitable for vehicles exposed to intense sunlight in summer and low outdoor temperatures in winter. It features ultra-high shock resistance of 20000g to withstand bumpy road surfaces and impacts from speed bumps. Built-in digital noise reduction filtering eliminates high-frequency vibration noise from engines and road surfaces without interfering with status judgment and inclination measurement.

- **Flexibly adjustable serial port output, perfectly compatible with vehicle control cards**

The serial port defaults to a baud rate of 9600, with data output rates customizable between 0.2 and 200 Hz. You can individually enable outputs for acceleration, tilt angle, device status, and alarm signals. With a TTL transmission range of 1 m, it meets the wiring requirements of in-car displays.

- **Low-Power Vehicle Operation Solution**

It operates at a working current of only 5.7mA under standard 12V vehicle power supply, with a sleep current of 0.5mA. It consumes less battery power when the vehicle is off and enters sleep mode, preventing the vehicle battery from being drained.

product appearance



essential parameter

Accelerometer Parameters

parameter	condition	Typical Value
range		±16g
Resolution		0.0005(g/LSB)
sampling rate		1KHz
RMS noise	Bandwidth = 100 Hz	0.75~1mg-rms
Static Zero Drift	Placed horizontally	±20~40mg
Thermophilic	-40°C ~ +85°C	±0.15mg/℃
Bandwidth		5~256Hz
Zero-shift stability	10S smoothing	XY:15ug；Z:35ug
Zero-pitch instability	allan variance	XY:10ug；Z:30ug

Gyro Parameters

parameter	condition	Typical Value
range		±2000°/s
Resolution	±2000°/s	0.061(°/s)/(LSB)
sampling rate		1KHz
RMS noise	Bandwidth = 100 Hz	0.028~0.07(°/s)-rms

Static Zero Drift	Placed horizontally	±0.5~1°/s
Thermophilic	-40°C ~ +85°C	±0.005~0.015 (°/s)/℃
Bandwidth		5~256Hz
Zero-shift stability	10S smoothing	8°/h
Zero-pitch instability	allan variance	5°/h

Magnetometer parameters

parameter	condition	Typical Value
Range		±2Gauss
Resolution	±2Gauss	0.0667mGauss/LSB

Pitch and roll angle parameters

parameter	condition	Typical Value
Range		X:±180°
		Y:±90°
Inclination accuracy		0.2°
Resolution	Placed horizontally	0.0055°

Heading Angle Parameter

parameter	condition	Typical Value
Range		Z:±180°
Heading accuracy	9-axis algorithm,magnetic field calibration,dynamic/static	1° (without interference from magnetic field)
	6-axis algorithm, static	0.5° (Dynamic integral cumulative error exists)
Resolution	Placed horizontally	0.0055°

notes:

- Perform magnetic field calibration in the test environment before use to allow the sensor to adapt to the magnetic field of this environment. Keep away from magnetic interference during calibration.
- Cumulative errors may occur in certain vibration environments, the magnitude of which cannot be estimated and shall be subject to actual test results.

Modem Parameters

Parameter	Condition	Minimum value	Default	Maximum value
interface	UART	4800bps	9600bps	230400bps
Output Content		3-axis acceleration, 3-axis angular velocity, 3-axis magnetic field, 3-axis angle, magnetic field, quaternion		
output speed		0.2Hz	10Hz	200Hz
transmission distance	TTL			1m
start time				1000ms
weight			13.7g	
Operating temperature		-40℃		85℃
Storage temperature		-40℃		100℃
Shock proof				20000g

Electrical parameters

parameter	condition	Min	Default	Max
supply voltage	TTL Interface	3.3V	5V	
working current	Work (5V)		1.3mA	
	Sleep（5V）		1.3mA	
功耗			TTL：28.5mW	

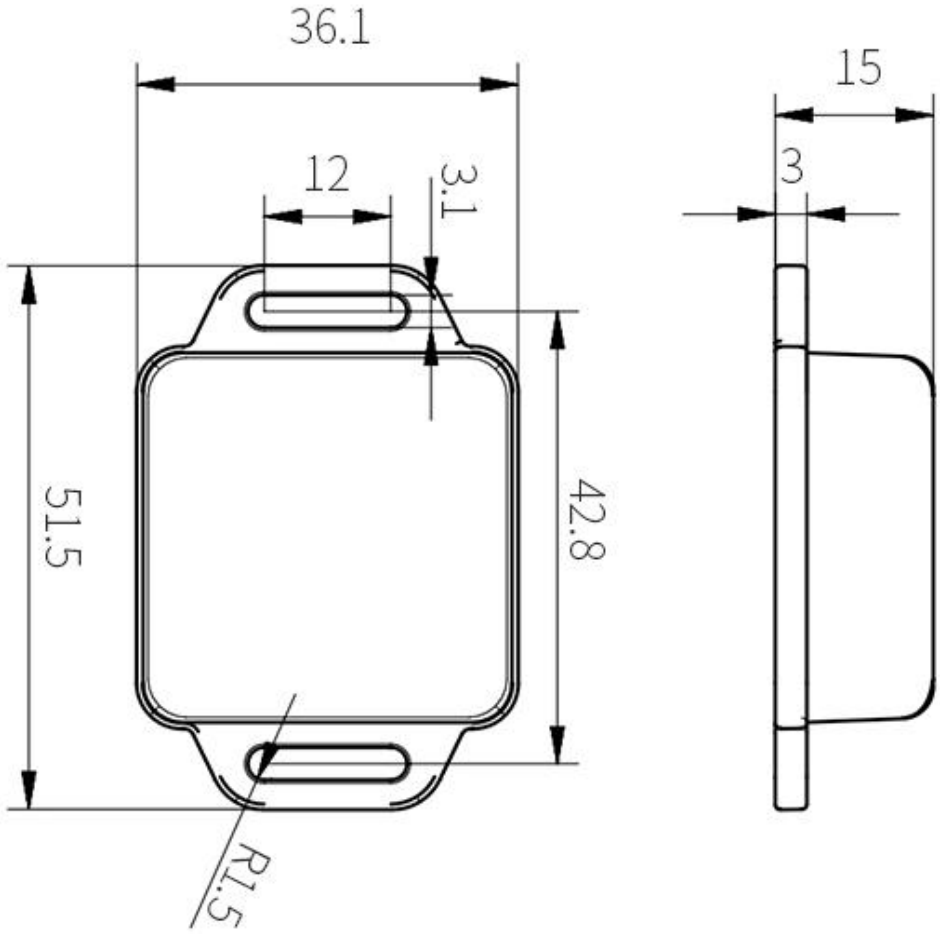
Product Basic Information

designation	information	
size（mm）	51.5*36.1*15	
weight	net weight（g）	14g
	With packaging（g）	31g

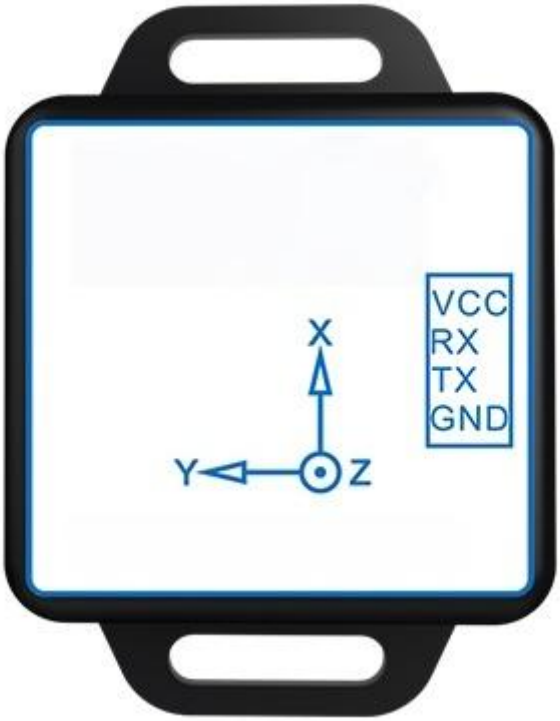
Shipping List

name	length	quantity
Gyro sensor RT901	-	1
Pin line	20CM	1

Product Size Diagram



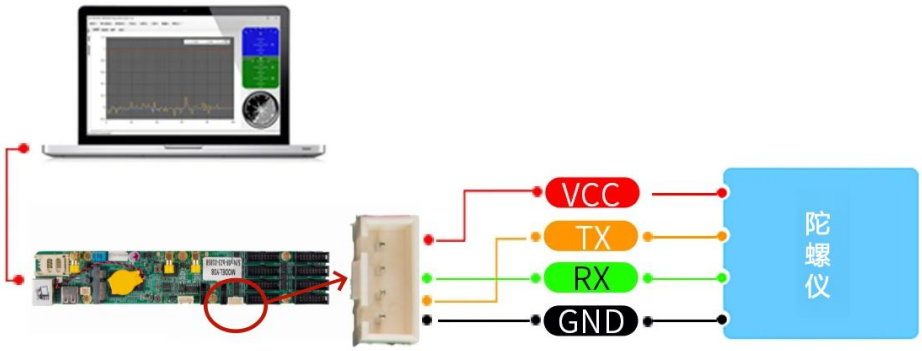
Pin Definition



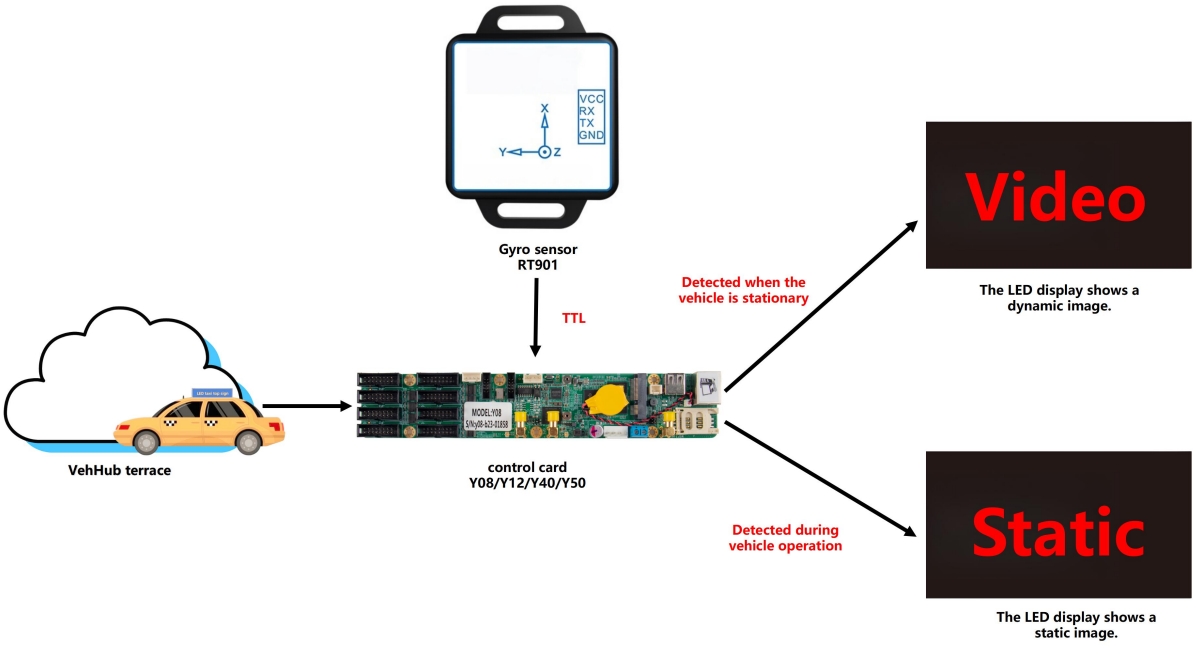
name	function
VCC	TTL：5V input
RX	Serial data input, TTL level
TX	Serial data output, TTL level

01 TTL接线方式

线色功能	红色 RED	黄色 YELLOW	绿色 GREEN	黑色 BLACK
	VCC 9~36V 供电电源正极	TX	RX	GND 电源负极



Diagram


VCC
RX
TX
GND
X
Y
Z
Gyro sensor
RT901
TTL
Detected when the
vehicle is stationary
Video
The LED display shows a
dynamic image.
VehHub terrace
control card
Y08/Y12/Y40/Y50
Detected during
vehicle operation
Static
The LED display shows a
static image.