
# Gyro100-300

## MEMS Gyroscope

## Technical Manual

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## Introduction

Gyro100-300 gyroscope is a silicon based MEMS gyroscope independently developed by BEWIS, which has completely independent intellectual property rights.Small size ceramic package, with high precision, wide range, large impact resistance, wide temperature range, full digital output and other characteristics.

## Features

- Small Size：10mm×10mm×3.5mm
- 24bits digital output
- I²C or SPIbus output
- Operating temperature: -40°C~ +85°C
- low power consumption <70mW
- Shock-resistance：20000g
- interrupt mode or sleep mode
- Measuring Range：300°/s

## Application

- Inertial navigation
- AHRS
- UAV flight control
- Integrated navigation
- Angular velocity measurement
- Dynamic Inclination Sensor

# Specification

## Electrical Specifications

| Parameter | Minimum value | Typical values | Maximum value | Unit |
|---|---|---|---|---|
| Power supply | +4.95 | +5 | +5.05 | V |
| Operating temperature | -40 | | +85 | ℃ |
| Storage temperature | -55 | | +125 | ℃ |

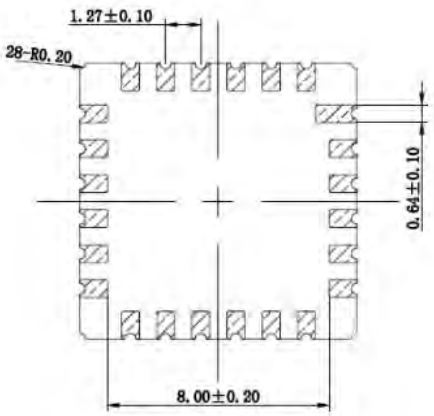
## Performance Specifications

| Parameter | Typical values | Unit |
|---|---|---|
| Measuring range | +300 | °/s |
| Bias stability | 5 | °/h |
| Bias repeatability | 5 | °/h |
| Full temperature bias stability | 20 | °/h |
| Startup time | 0.3 | S |
| Random walk coefficient | 10 | °/h/√Hz |
| Scale factor nonlinearity | < 100 | ppm |
| Scale factor repeatability | 100 | ppm |
| Scale factor temperature coefficient | 50 | ppm/℃ |
| Threshold value | 0.005 | °/s |
| Resolution | 0.005 | °/s |
| Acceleration sensitivity | 20 | °/h /g |
| Random vibration performance | 20 | °/h |
| Anti-overload | 20000 | g |
| Bandwidth | 110 | Hz |
| Data refresh rate | <2000 | Hz |
| Power consumption | < : 0 | mW |
| Data output format | IIC or SPI | digital output |
| Input voltage | 5 | VDC |
| Weight | 1 | g |
| Size | 10x10x3.5 | mm |

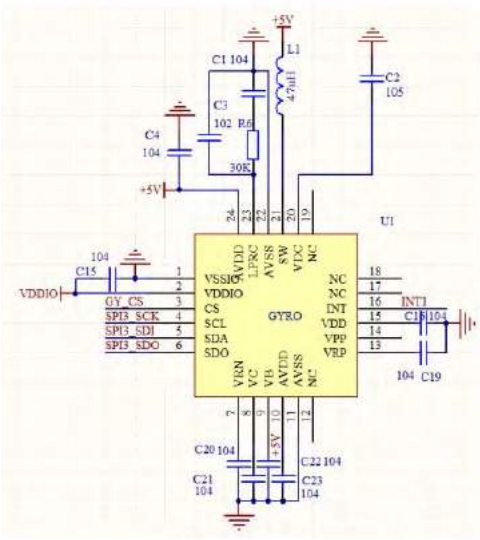
## Pin Definition

| Number | Name | Type | Function |
|---|---|---|---|
| 1 | VSSIO | Input | Digital GND |
| 2 | VDDIO | Output | I/O power supply,+3.3V or +5V |
| 3 | CS | Input | I²C/SPI Operating mode |
| 4 | SCL | Input | I²C or SPI clock |
| 5 | SDA | Bidirectional | I²C DATA or SDI of SPI |
| 6 | SDO | Output | Address selection for I²C, connect +5V or SDO of SPI |
| 7 | VRN | Output | Connect to GND with a 0.1uF ceramic capacitor |
| 8 | VC | Output | Connect to GND with a 0.1uF ceramic capacitor |
| 9 | VB | Output | Connect to GND with a 0.1uF ceramic capacitor |
| 10 | AVDD | Input | Voltage +5V |
| 11 | AVSS | Input | Power supply GND |
| 12 | NC | | Hanging |
| 13 | VRP | Output | Connect to GND with a 0.1uF ceramic capacitor |
| 14 | VPP | Input | Used at factory settings |
| 15 | VDD | Output | Connect 0.1u capacitor |
| 16 | INT | Output | Interrupt pin output |
| 17 | NC | | Hanging |
| 18 | NC | | Hanging |
| 19 | NC | | Hanging |
| 20 | VDC | Output | High voltage on chip ,connect to GND with a 0.1uF ceramic capacitor, withstand voltage 50V |
| 21 | SW | Output | Connect a 47uH inductor to +5V |
| 22 | AVSS | Input | Power supply GND |
| 23 | LPRC | Output | Connect resistor circuit |
| 24 | AVDD | Input | Voltage +5V |


Chip pin arrangement




Chip size




Typical circuit

[Note] Recommended inductor model：XPL2010-473MLB

Internal register description:

| Address | Bit[7] | Bit[6] | Bit[5] | Bit[4] | Bit[3] | Bit[2] | Bit[1] | Bit[0] |
|---|---|---|---|---|---|---|---|---|
| 0x12 | — | ADCFlag | — | — | — | — | — | — |
| 0x1D | OUT_X_L[7:0] | | | | | | | |
| 0x1E | OUT_X_M[15:8] | | | | | | | |
| 0x1F | OUT_X_H[23:16] | | | | | | | |
| 0x1A | OUT_TEMPL[7:0] | | | | | | | |
| 0x1B | OUT_TEMPM[15:8] | | | | | | | |
| 0x1C | OUT_TEMPH[23:16] | | | | | | | |

| Name | Definition | Length | Type |
|---|---|---|---|
| ADCFlag | Internal data output ADC interrupt flag bit, when it is "1", indicating that there is new data output. Automatically clear after reading the data in OUT_X_H | 1 | R |
| OUT_X_L | Gyro output lower 8 bits | 8 | R |
| OUT_X_M | Gyro output intermediate 8 bits | 8 | R |
| OUT_X_H | Gyro output high 8 bits | 8 | R |
| OUT_TEMPL | Gyro output lower 8 bits | 8 | R |
| OUT_TEMPM | Gyro output intermediate 8 bits | 8 | R |
| OUT_TEMPH | Gyro output high 8 bits | 8 | R |

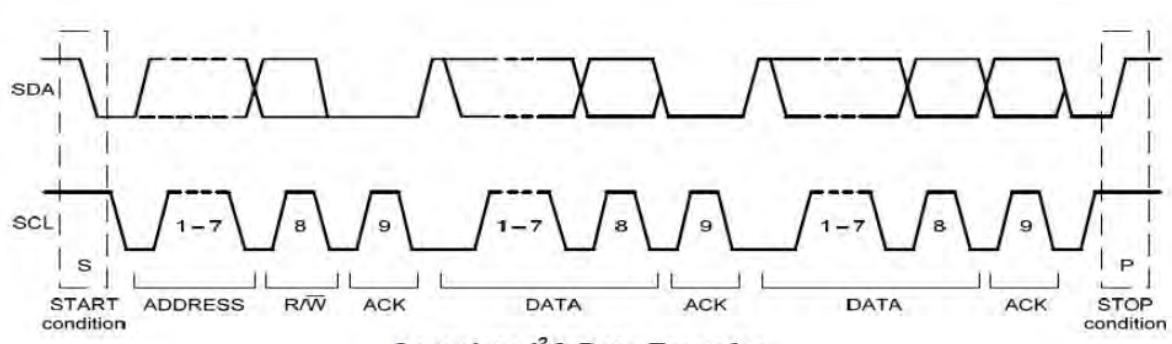
## Protocol

(1) I2C interface

The SDO pin configuration can set the device address of the chip to 1101001 (SDO is tied to high level) or 1101000 (SDO is connected to low level). The reading and writing is determined by the lowest bit of the device address. "1" stands for reading, "0" The representative writes. The serial 8-bit bidirectional data transmission bit rate is up to 100kb/s in standard mode and up to 400kb/s in fast mode.

| Command | SAD[6:1] | SAD[0]=SDO | R/W | SAD+R/W |
|---|---|---|---|---|
| Read | 110100 | 0 | 1 | 11010001(D1h) |
| Write | 110100 | 0 | 0 | 11010000(D0h) |
| Read | 110100 | 1 | 1 | 11010011(D3h) |
| Write | 110100 | 1 | 0 | 11010010(D2h) |

When using the I2C protocol, the received data is first used as the address of the internal register, and then the data is read and written. For different situations, it is divided into the following four types: where ST is START and SAD is the slave device address. SAK indicates the response signal from the slave, SUB indicates the internal address of the device to be accessed by I2C, DATA indicates the transmitted data, MAK indicates the host response signal, NMAK indicates that the host does not respond, and SP indicates the end of STOP.



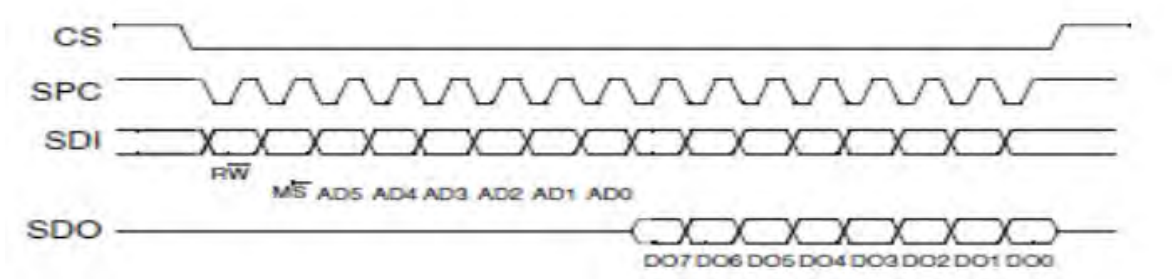

**Complete I²C Data Transfer**

2) SPI interface

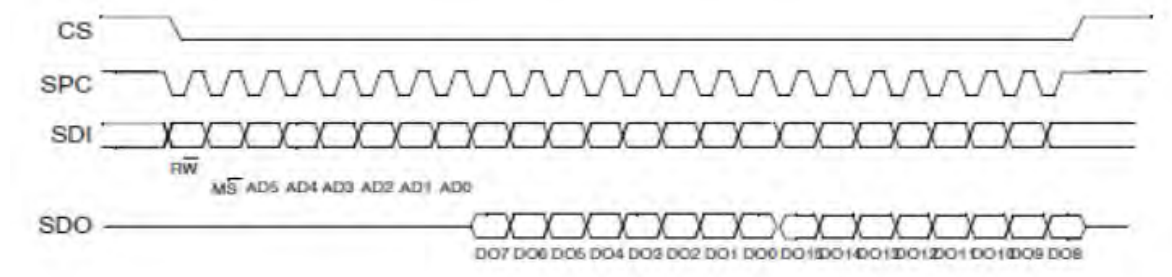
The chip supports the standard 4-wire slave mode, using mode 3, ie CPOL=1, CPHA=1, and data length 8 bits.

The highest bit is transmitted first when SPI transfers serial data, and the baud rate can be as high as 5 Mbps. The join address is automatically incremented by 1 to complete multi-byte read and write. The read and write control is determined by the first bit of the transmission. "0" indicates the write operation, "1" indicates the read operation, the second bit determines whether the byte operation is a single byte operation, and "0" indicates the single byte read and write. "1" indicates multi-byte read and write operations.

Single byte reading: RW is "1", MS is "0";




Multi-byte reading: RW is "1", MS is "1".Sent the first address (AD5~AD0), Then the address is automatically increased by 1.



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