



Gyro100-4000

MEMS Gyroscope Technical Manual



Introduction

Gyro100-4000 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: 4000°/s

Application

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

Specification

Electrical Specifications

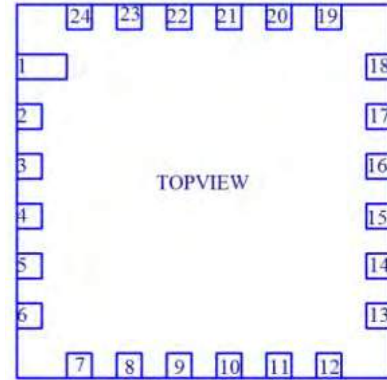
Parameter	Minimum value	Typical values	Maximum value	Unit
Power supply	+4.95	+5	+5.05	V
Operating temperature	-40		+85	°C
Storage temperature	-55		+125	°C

Performance Specifications

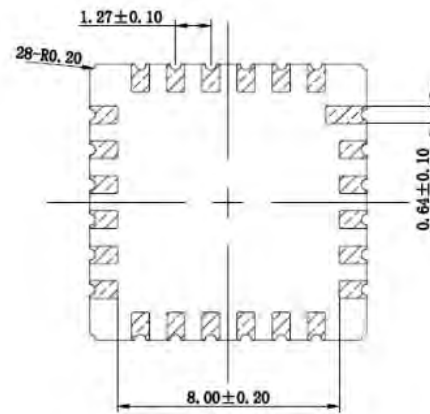
Parameter	Typical values	Unit
Measuring range	+4000	°/s
Bias stability	15	°/h
Bias repeatability	15	°/h
Full temperature bias stability	40	°/h
Startup time	0.3	S
Random walk coefficient	30	°/h/√Hz
Scale factor nonlinearity	200	ppm
Scale factor repeatability	100	ppm
Scale factor temperature coefficient	50	ppm/°C
Threshold value	0.01	°/s
Resolution	0.01	°/s
Acceleration sensitivity	30	°/h /g
Random vibration performance	<50	°/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

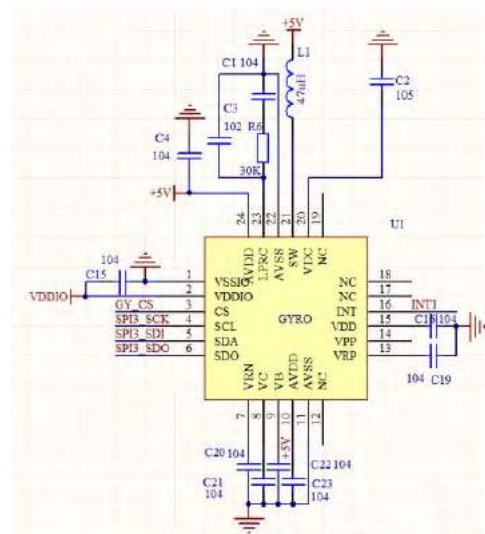
Number	Name	Type	Function
1	VSSIO	Input	Digital GND
2	VDDIO	Output	I/O power supply, +3.3V or +5V
3	CS	Input	I ² C/SPI Operating mode
4	SCL	Input	I ² C or SPI clock
5	SDA	Bidirectional	I ² C DATA or SDI of SPI
6	SDO	Output	Address selection for I ² C, connect +5V or SDO of SPI
7	VRN	Output	Connect to 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	—	<u>ADCFlag</u>	—	—	—	—	—	—
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_TEMP_H[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_TEMP_H	Gyro output high 8 bits	8	R

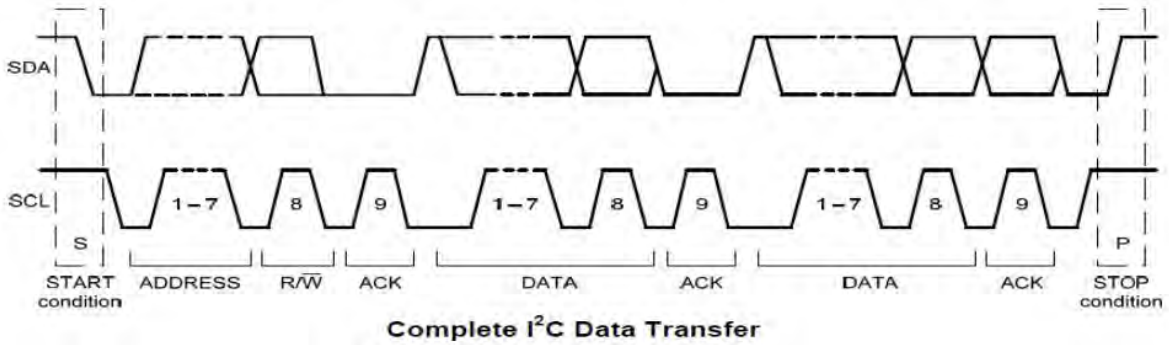
Protocol

(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.

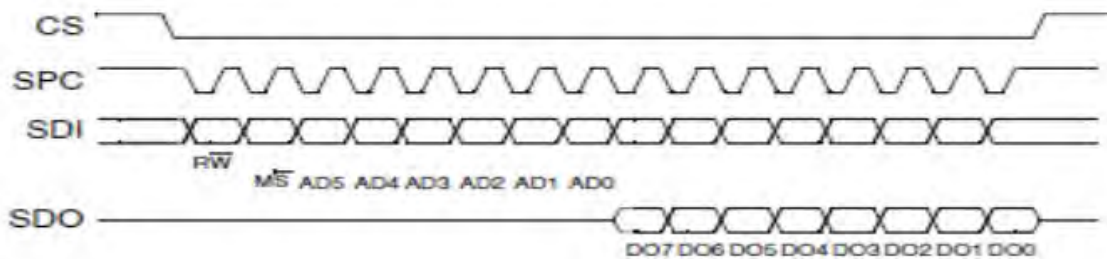


2) SPI interface

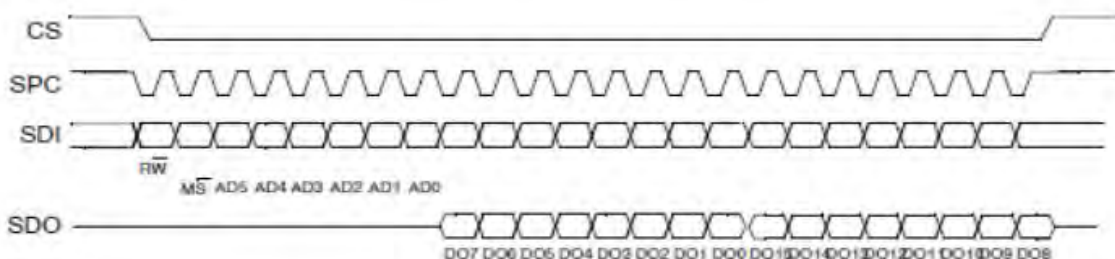
The chip supports the standard 4-wire slave mode, using mode 3, ie CPOL=1, CPHA=1, and data length 8 bits.

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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Technical Manual

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