QS02 Gyroscope Algorithm Module

Datasheet

Revision: V2.0 Date: July 17, 2023

Shuohong Technology (铄泓科技)

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1. Product Overview

QS02 is an algorithm module for riding posture recognition. The module is based on a high-performance 32-bit RISC CPU and a 6D gyroscope, and adopts a multi-modal composite algorithm built on Kalman filtering combined with other algorithms. Developed and verified over a long period with a large volume of real test data, it forms a riding posture recognition module capable of identifying left lean, right lean, braking, and stationary states.

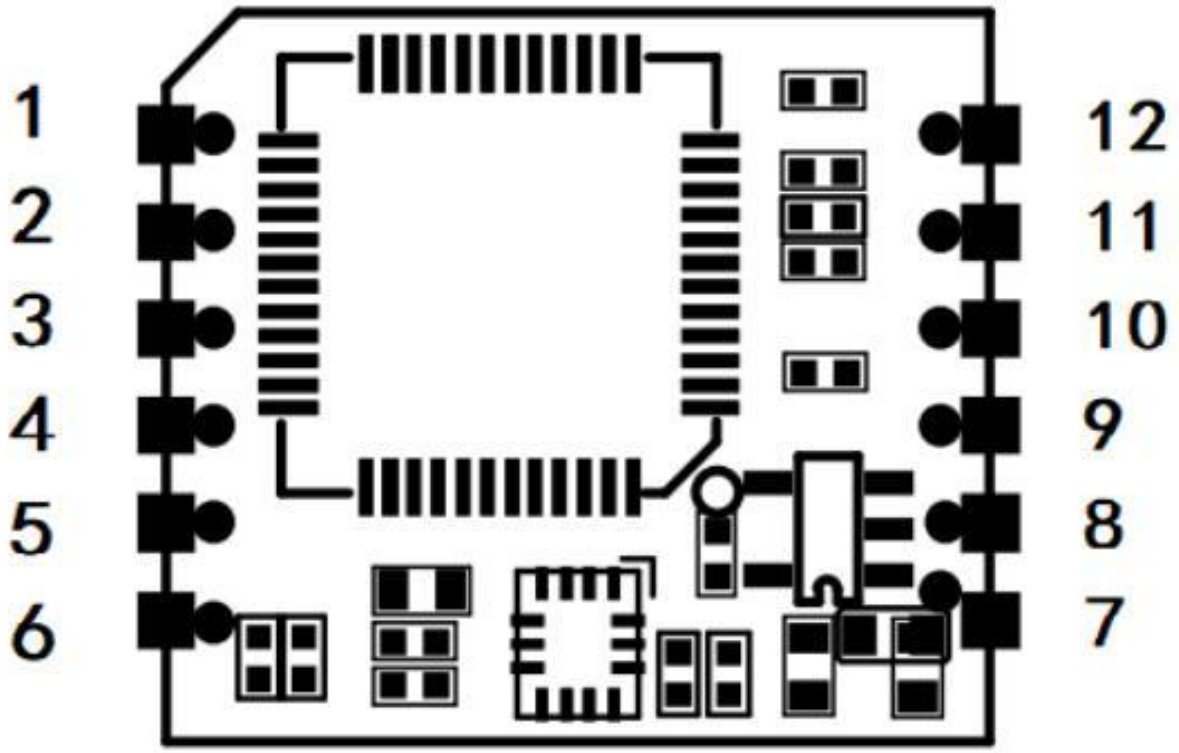
It is applicable to bicycles, electric bikes, scooters and related products such as smart helmets, brake lights, and helmet controls.

Module highlights:

- Core: ARM® 32-bit Cortex™-M0 CPU
- Frequency up to 48 MHz
- 16 to 64 Kbytes of Flash memory
- 4 to 8 Kbytes of SRAM with HW parity checking
- 16-bit digital, triaxial accelerometer
- 16-bit digital, triaxial gyroscope

2. Product Outline Drawing

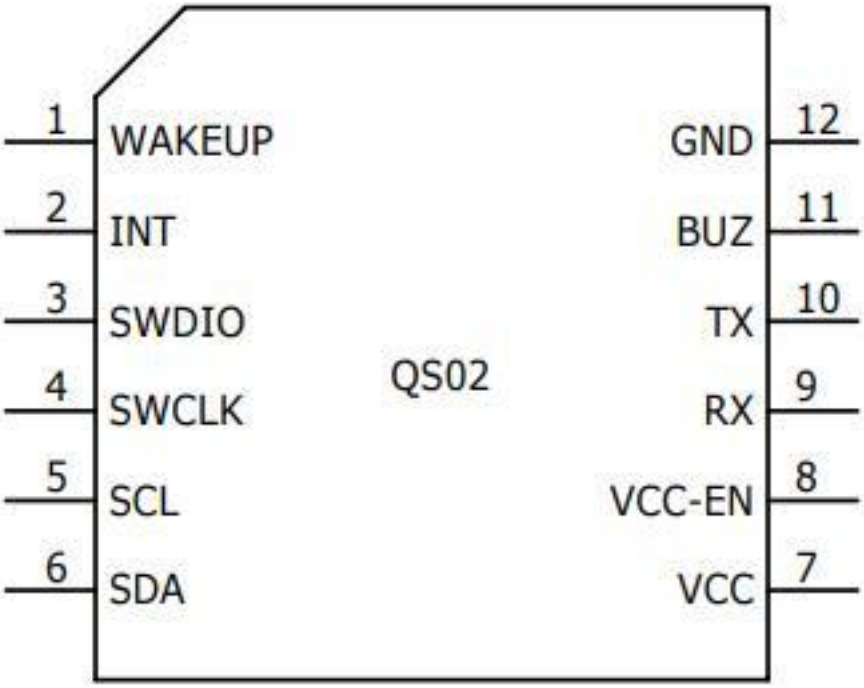
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3. Pin Definition

The module uses a castellated-hole (half-hole) design with 12 pins in total.

Pin diagram

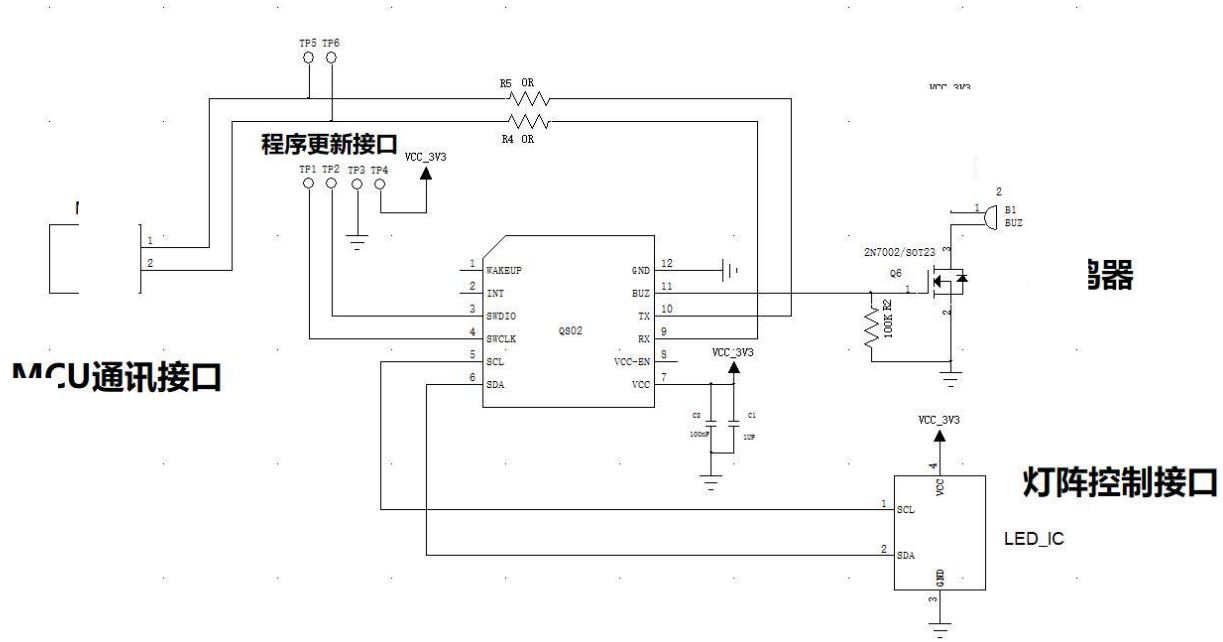


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Pin description

No.	I/O	Pin Name	Function Description
1	I	WAKEUP	Reserved, NC
2	O	INT	Reserved, NC
3	I	SWDIO	Program download data line
4	I	SWCLK	Program download clock line
5	I	SCL	I2C SCL pin, connected to LED-array control IC
6	I	SDA	I2C SDA pin, connected to LED-array control IC
7	P	VCC	Power positive, default 3.3 V
8	I	VCC-EN	Default NC
9	I	RX	UART data input
10	O	TX	UART data output
11	O	BUZ	Buzzer output signal, 1.2 kHz square wave, 50% duty cycle
12	P	GND	Ground

4. Reference Circuit



Notes:

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1. The figure shows a simple wiring diagram of the QS02 module and an external MCU, including the MCU interface, LED-matrix interface, buzzer interface, and program download port.
2. R4, R5 and the test points TP1–TP6 are reserved for debugging and module firmware upgrades.
3. The buzzer (BUZ) circuit is reserved and can be removed if unused.
4. The I2C lines are pulled up inside the module; external pull-up resistors may also be used.
5. VCC voltage: 3.3 V, ±0.1 V.
6. All I/O pins use a standard voltage of 3.3 V; other I/O voltage levels require level-shifting circuitry.
7. For the LED interface, the module supports I2C-interface LED-matrix control chips by default; other LED patterns must be handled by the user.

5. Electrical Characteristics

5.1 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VCC	Supply voltage	-0.3	+3.6	V

5.2 Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VCC	Supply voltage	-	3.3	-	V	-
VIO	I/O voltage	-	3.3	-	V	Input/Output
Iwork	Operating current	-	-	50	mA	VCC = 3.3 V

5.3 Power Consumption Test

Test State	Current
Working average current (connection state)	TBD
Standby average current	TBD
Shutdown current	< 5 μA

5.4 I/O Input/Output Electrical Logical Characteristics

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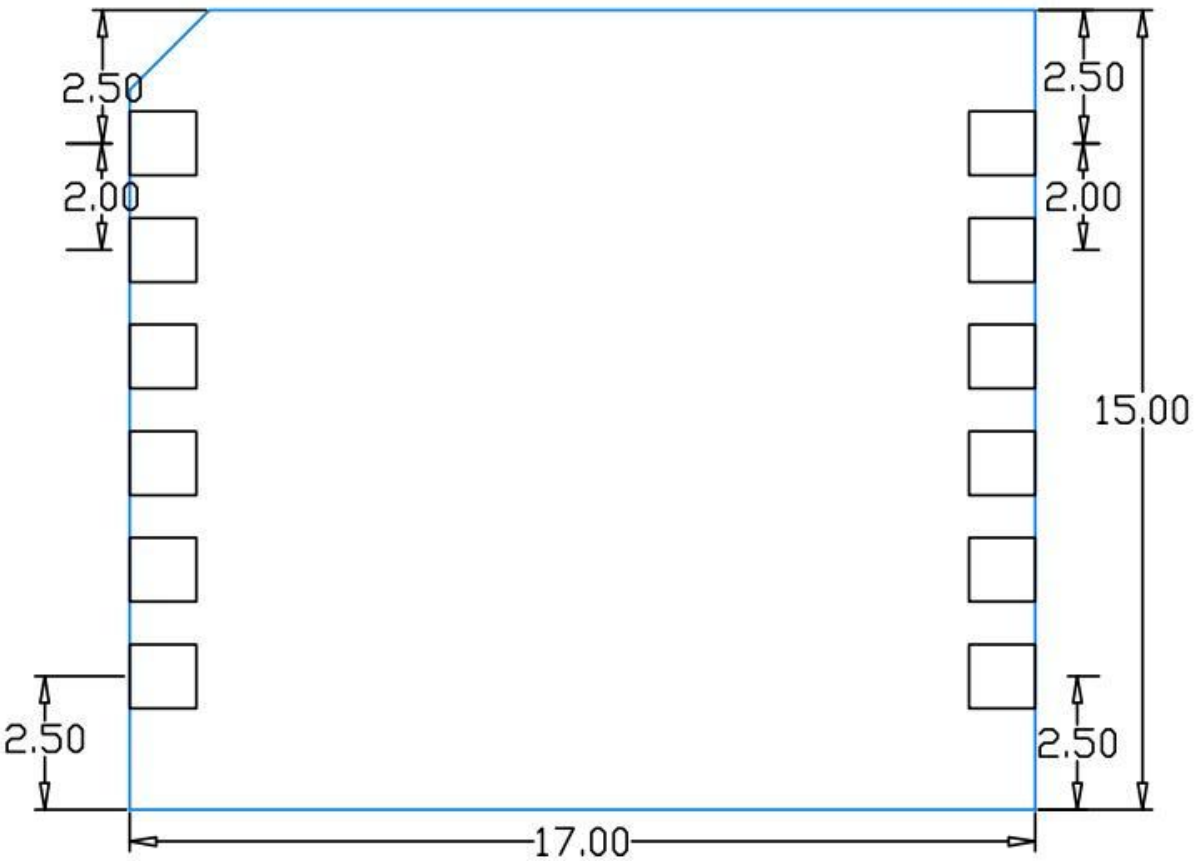
I/O input characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VIL	Low-level input voltage	-0.3	-	0.3×VDDIO	V	VDDIO = 3.3 V
VIH	High-level input voltage	0.7×VDDIO	-	VDDIO+0.3	V	VDDIO = 3.3 V

I/O output characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VOL	Low-level output voltage	-	-	0.33	V	VDDIO = 3.3 V
VOH	High-level output voltage	-	-	2.7	V	VDDIO = 3.3 V

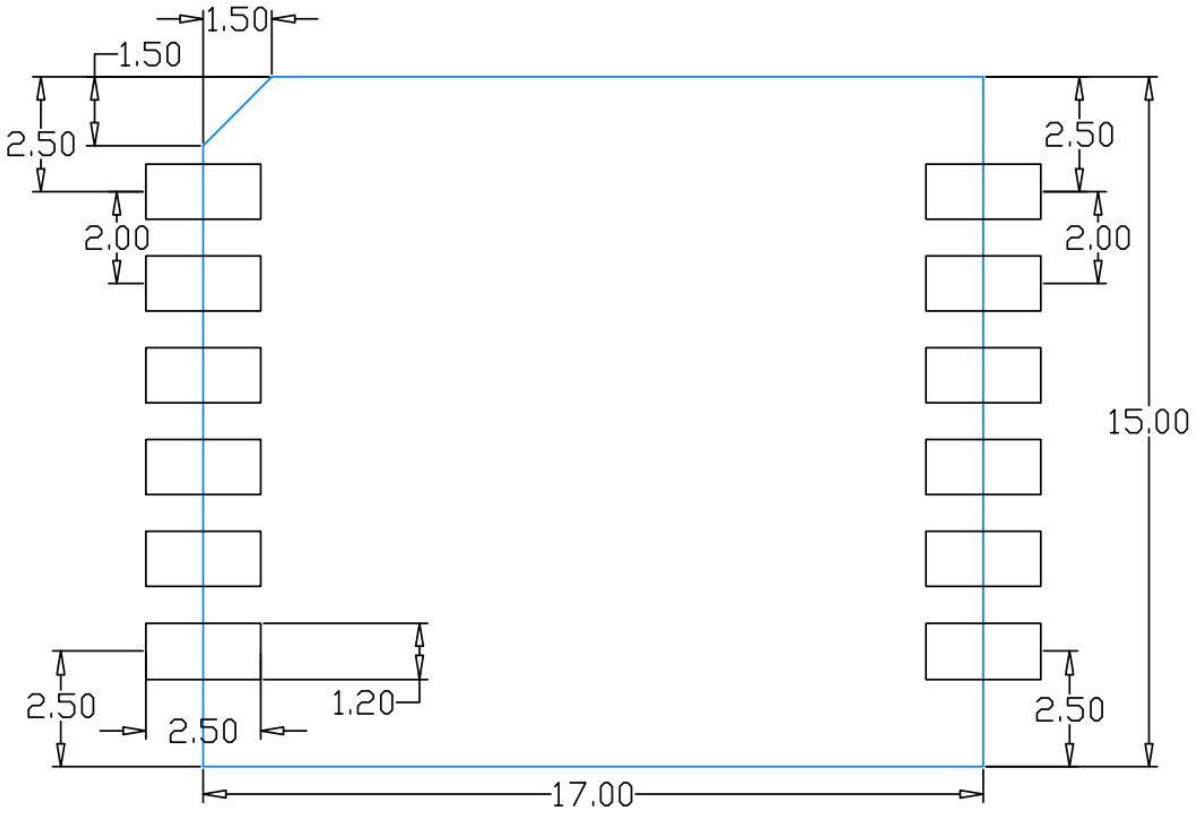
6. Package Dimensions (Unit: mm)



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Model	Length (mm)	Width (mm)	Height (mm)	Pad (mm)	Pitch (mm)	PCB Thickness (mm)
QS02	17.0	15.0	2.5	1.2×1.3	2.0	1.0

Recommended PCB layout package:



7. Revision History

Date	Revision	Description
2023-5-29	V1.0	Initial Release
2023-7-17	V2.0	Default supply voltage changed to 3.3 V

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