

US500 Underwater Ultrasonic Sensor

500mm Range / IP67 / Cost-effective / Split design / High Accuracy Distance output

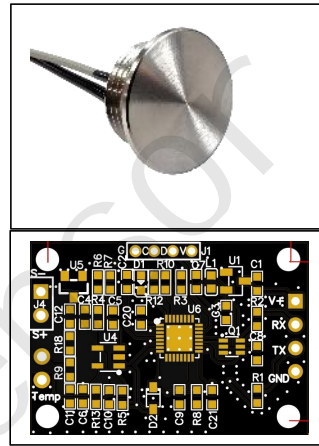
Product Overview

The US500 series Ultrasonic sensor can output Liquid level in real time. This sensor can be applied to Water dispensers, Coffee machines, Washing machines, Underwater robot and so on.

The sensor probe is made of stainless steel and is not sensitive to water quality. It is equipped with NTC and has excellent weather resistance, enabling it to operate in various water environments.

Features

- Ultrasonic sensor: Distance output
- Maximum Measuring Range: 500mm
- Measuring Blind Zone: 50 mm
- Accuracy: $\pm 2\text{mm}$
- Operating Temperature: $0^{\circ}\text{C}\sim 100^{\circ}\text{C}$
- Supply Voltage: 5-12VDC
- Compact Size: $\Phi 14$



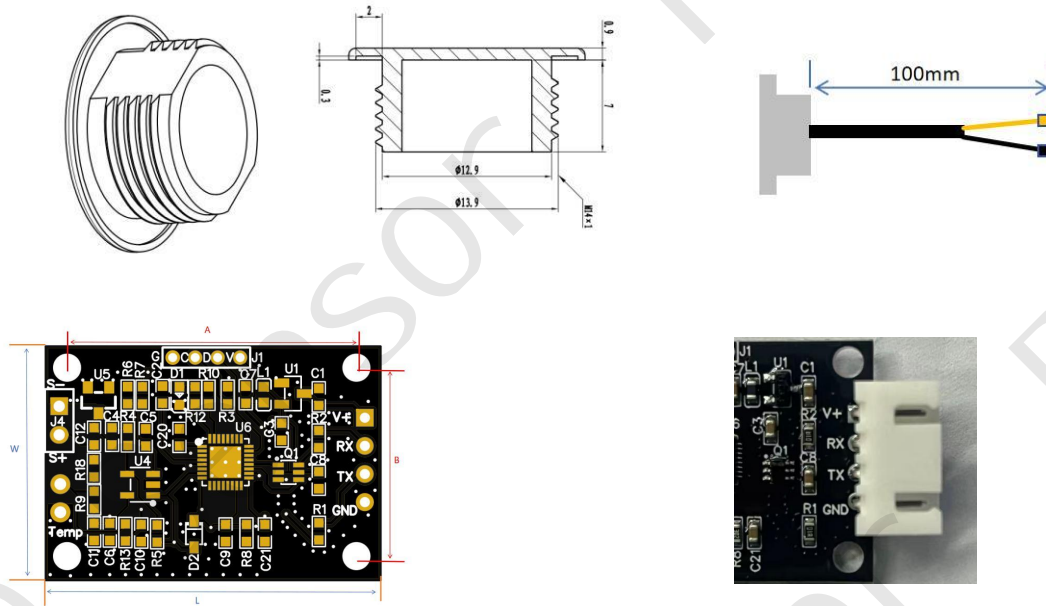
Applications

- Water heater
- Coffee Machine
- Washer
- Underwater Robot

Specifications

#	Model	Probe Unite-US500
1	Range	50-500mm
2	Transducer frequency	3.3M
3	Response	500ms
4	Accuracy	±2mm
5	Repeatability	±1mm
6	Protection Level	IP67
7	Output Rate	25Hz
8	FOV	±5°
9	Operating Temperature	0 ~ 100℃
10	Dimension	Φ14
11	Materials	304 stainless steel
#	Model	Controller
1	Supply Voltage	5-12VDC(3.3Vpp to Probe Unite)
2	Consumption	75mW@5V
3	Communication Interface	TTL (UART Baud rate:9600)
4	Protection Level	N/A
5	Operating Temperature	-10~70℃
6	Dimension	30*20mm

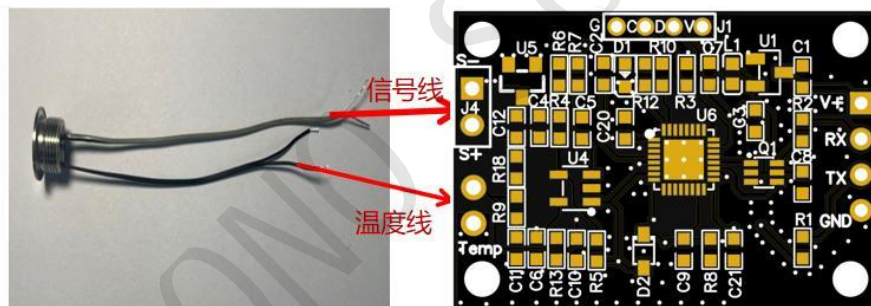
Dimensions



PCBA Dimensions:W=21mm; L=30mm; Mounting Hole Location:A=25.75mm,B=16.75mm

Terminal Block Specifications:XH2.54-4P,2.54mm

Diagram showing the connection between the probe and the board:



The gray cable in the probe are signal lines, while the black cable are temperature signal. The signal lines have positive and negative poles, but the temperature lines do not. The connection relationship with the controller board is as shown in the following table:

Probe	Signal Cable		Temperature Cable	
controller board	Positive Signal	Negative Signal	Black	Black
	S+	S-	/	/



Communication Protocol:TTL

1. Communication Interface

UART	
Baud Rate	9600
Data Bit	8
Stop Bit	1
Parity Bit	None

2. Receive Structure

SN	Data content	Explain
1	Head Code	Frame header, fixed value: 0x5A
2	Device Addr	Device address, two bytes, with the lower byte first, fixed value: 0x0005
3	CMD	Commands(As described in CMD definition)
4	Data Length Size=[byte#1(LSB) : Byte#4(MSB)]	Data length: 4 bytes, with the lower bits first
5	Date 0	Data
6	Date 1	
7	
8	Date N	
9	Checksum	Checksum (Device Addr ^ CMD ^ Data Length ^ Data0... ^ Data N)

3. CMD definition

Command rule: Use single-byte encoding

- HOST->SLAVE:The command field sent by the host is 0x08、0x09、0x0A、0x7A、0x7B、
- SLAVE-> HOST:The data received by the Slave is CMD+0x80: 0x88、0x89、0x8A

SN	Definition	CMD	Description
1	Distance query	0x08	Distance query command
2	Measurement distance setting	0x09	Set the maximum measurement distance. The range that can be set is from 15 to 50 cm
3	Temperature query	0x0A	Temperature query command
4	Start measurement	0x7B	Start ultrasonic distance measurement
5	Stop measurement	0x7A	Stop ultrasonic distance measurement

4. Protocol Usage Instructions:

(1) Powering on, return to the initial distance detection(The default returned data is:5A 05 00 88 02 00 00 00 XX YY ZZ)

(2) Example of sending distance query command

Send 5A 05 00 08 00 00 00 00 ZZ, and the returned data is 5A 05 00 88 02 00 00 00 XX YY ZZ. Among them,XX YY represent the distance information D1, data type: uint16_t, the lower bit comes first, the resolution is 0.1 millimeters, that is: $D1 = YY * 256 + XX$. For example, $D = 1190$, it represents 11.9 centimeters, and ZZ is the check value.

(3) Measurement distance setting

Send 5A 05 00 09 02 00 00 00 XX YY ZZ. The returned data is 5A 05 00 89 01 00 00 00 KK ZZ. Where XX YY represent the distance information D2. Data type: uint16_t. The lower byte comes first, with a resolution of 0.1 millimeters. That is: $D2 = YY * 256 + XX$. For example, $D = 2000$, indicating the distance is 20 centimeters. ZZ is the check value. The product will automatically measure the current distance. After that, when the target is greater than this distance, it will output that the target is at 20 centimeters. KK is the flag indicating whether the setting is successful. 0x01 indicates successful setting, and 0x00 indicates failed setting.

(4) Example of sending temperature query command

Send 5A 05 00 0A 00 00 00 00 ZZ, and the returned data is 5A 05 00 8A 04 00 00 00 AA BB CC DD.ZZ, where AA BB CC DD represent temperature information D1. Data type: int32_t, the least significant bit comes first, with a resolution of 0.1℃, that is: $D1 = (DD \ll 24) + (CC \ll 16) + (BB \ll 8) + AA$. For example, $D = 223$, indicating 22.3℃. ZZ is the check value.

(5) Example of Start measurement command

Send 5A 05 00 7B 00 00 00 00 ZZ. No response. The sensor defaults to enabling distance measurement upon power-on. After receiving the command to turn off, it stops sending sound waves and stops calculating distance. After power-on restart or sending the command to enable ultrasonic distance measurement, distance measurement begins. ZZ is the check value.

(6) Example of Stop measurement command

Send 5A 05 00 7A 00 00 00 00 ZZ. No reply. The sensor defaults to enabling distance measurement upon power-on. After receiving the command to turn off, it stops sending sound waves and stops calculating distance. After power-on restart or sending the command to enable ultrasonic distance measurement, it starts measuring distance. ZZ is the check value.

Attention

1. Please make sure the Ultrasonic sensor probe unite perpendicular to the object(around $90^{\circ} \pm 5^{\circ}$)
When the ultrasonic sensor measure the object. If the angle bigger than $90^{\circ} \pm 5^{\circ}$, the signal will lose.
2. Please keep the sensor probe fixed for the test and do not hold it with your hand. That would affect the signal.
3. The controller is not waterproof. Please do not submerge the controller in water.
4. This sensor is calibrated based on underwater measurement scenarios. Cannot be use in air measurement scenarios.