



RED LOTUS TECHNOLOGIES INC.

## RLT-USR-01 ULTRASONIC RANGING SENSOR



Highly accurate, rugged, and low power ultrasonic ranging module that is ideal for accurate distance measurement in challenging environments.

- IP 65 Water and Dust Rating (transducer face and body)
- Detection range of 150mm to 1500mm
- 0.1mm resolution in distance measurements
- Built-in or external temperature compensation
- Ranges to object with the strongest ultrasound reflection

### Industrial Automation



### Automotive



### Robotics



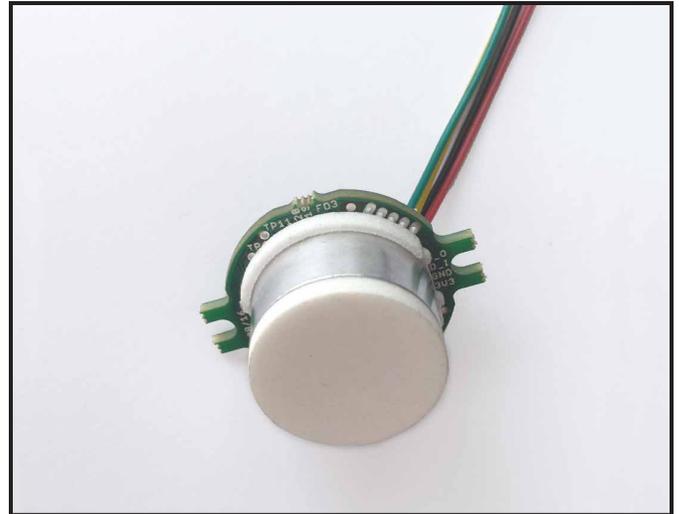
# RLT-USR-01 Ultrasonic Ranging Sensor

## INTRODUCTION

The RLT-USR-01 Ultrasonic Ranging Sensor measures the distance to the object with the strongest ultrasound reflection using a frequency of 200kHz. Objects can be detected when they are within the range of 150mm to 1500mm.

The sensor outputs the measurement result in plain text over a UART output. The value is the distance in millimeters with a resolution of 0.1mm. Compensation for the variation of the speed of sound over temperature is done automatically using an integrated temperature sensor. The sensor also outputs a raw value proportional to the round trip time that can be used for manual temperature compensation.

The sensor can run in autonomous mode making 10 measurements per second. Alternatively, ranging operations can be triggered using a digital control input. In triggered mode, the sensor can make up to 30 measurements per second.



## INTERFACE

The sensor has a 4-pin Molex PicoBlade connector (Molex 0530470310) with 1.25mm pitch. It ships with a 100mm long cable with matching connector on one end and wires on the other end.

Pin	Wire Color	Description
1	Red	Vdd (3.1 to 5.5V)
2	Black	Ground
3	Yellow	Digital control input with internal pull-up resistor (connection is optional)
4	Green	UART output; 38.40kbps, 8 data bits, 1 stop bit, no parity

The digital control input can optionally be used to trigger the ranging operation. When the input is not in use the sensor automatically performs a measurement every 100ms. Ranging can be inhibited by pulling the control input low. As soon as the control input is released or pulled high the ranging operation begins.

Note that the control input is ignored during an ongoing ranging operation and cannot be used to interrupt the operation. In a typical application the user will pull down the control input after receiving a measurement result and then release the input (or pull it high) at the moment the next ranging operation should begin. Using the control input it is also possible to synchronize multiple sensors to prevent them from disturbing each other by triggering them sequentially, allowing enough time for the ultrasound ping to die down.

After each ranging operation the sensor transmits the results over the UART output, formatted as one line of plain text that is terminated with the line feed character 0x0A. The results comprise the measured distance (compensated for temperature), the measured temperature, and a raw value that relates to the round trip time of the ultrasonic echo (see section on temperature compensation for how to use it).

Format: D<distance>,T<temperature>,R<raw>

Examples:

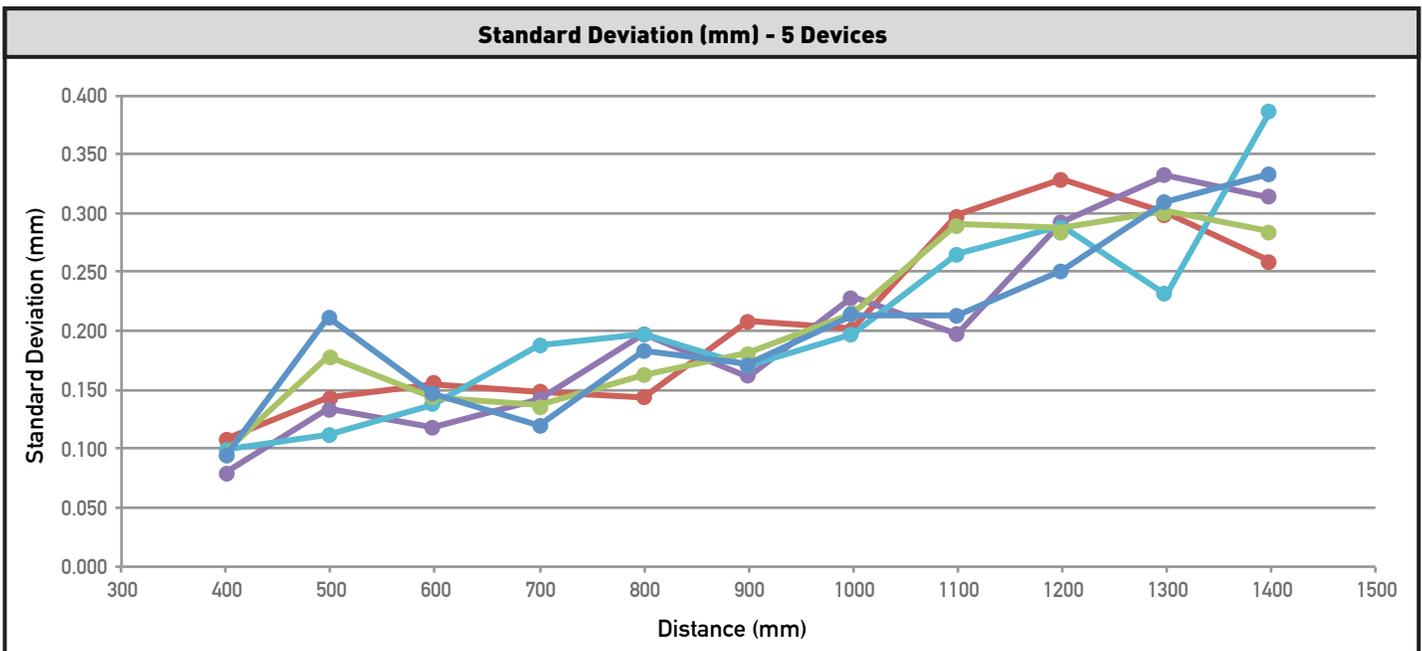
- D0710.8,T025,R13130 The distance is 710.8mm, the temperature is 25 degrees C, the raw value is 13130
- D0481.0,T-10,R09465 The distance is 481mm, the temperature is -10 degrees C, the raw value is 9465
- D0000.0,T024,R00000 No object was detected within the measurement range.

## ACCURACY

Many environmental factors have an impact on accuracy, such as air flow, vibration, temperature fluctuations, electrical and acoustic noise, surface texture and material of the target object. For this reason it is highly recommended to test the sensor in the actual application environment. Note that the sensor may report wrong or undefined results if there is an object closer than 150mm from the face of the transducer.



Note: These results were generated at room temperature in controlled conditions.



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## ELECTRICAL CHARACTERISTICS

The sensor operates from an internal 3.0V regulator; therefore, the performance parameters are not dependent on the supply voltage.

Parameter	Notes	Min	Typ	Max	Unit	
<b>Supply</b>						
Vdd	Supply voltage	3.1	3.3	5.5	V	
Icc_idle	Supply current while the sensor is idle		2.5		mA	
Icc_active	Average supply current during ranging operation		8		mA	
Icc_peak	Maximum instantaneous supply current during ranging operation		30	50	mA	
<b>Digital Input and Output</b>						
V_IH	High level input voltage	2.2		3.3	V	
V_IL	Low level input voltage	0.0		0.8	V	
R_PU	Pull-up resistance of digital input	Pull - up to 3.0V		40	k $\Omega$	
V_OH	High level output voltage	Load: Up to 0.3 mA		3.0	3.1	V
V_OL	Low level output voltage	Load: Up to 0.3mA		0.0	0.5	V
R_out	Output resistance of digital output		1.0		k $\Omega$	
UART	Data rate		38.4		kbps	
<b>Timing</b>						
t_RR	Default ranging interval when ranging is not triggered by digital input		100		ms	
t_R	Time from the beginning of a ranging operation until the UART is finished outputting the result		30		ms	
<b>Environment and Performance</b>						
T_op	Operating temperature	- 20		85	$^{\circ}$ C	
f_US	Ultrasound frequency		200		kHz	
Weight			8.5		g	
Resolution			0.1		mm	
Ranging Distance		0.15		1.5	m	
Beamwidth			7		Degrees	

## DIMENSIONS

Note 1: The sensor reports the distance with respect to this surface.

