RCWL-9600 ultrasonic ranging chip

ÿProduct **overview**

RCWL-9600 is a

Co., Ltd. (WWW.WX-RCWL.COM) designed specifically for

Chip for open ultrasonic ranging applications. single chip

Complete ultrasonic transmission, reception, demodulation, processing, calculation,

output.

RCWL-9600 has a built-in high-performance processing unit, which can

Realize multiple output modes including **GPIO, UART, IIC,** etc.;

The **GPIO** mode is compatible with our **HC-SR04.**

The driving part adopts a unique sweep mode, which makes it

Probes are more adaptable. For the temperature characteristics of the probe,

Abandoning the crystal oscillator mode without temperature characteristics, the driving part has done

The temperature is compensated year-on-year to minimize the influence of probe temperature drift.

Use ÿÿ to compare the fitting curve to make it

The measurement effect from irregular objects is obviously better than HC-SR04.

For the different characteristics of **16, 12, 10MM** probes, the chip

Set 3 comparison fitting curves; the chip does not need additional external

range, you can achieve free matching.

There are only 8 resistive capacitors around the chip, the farthest distance measurement

Can be set by resistors; built-in high-precision oscillator, no

An external crystal oscillator is required, which is extremely cost-effective.

Cooperate with our **16, 12, 10MM** ultrasonic probe, 16MM

Full-color, colorful ultrasonic probe; can easily complete different measurements

Distance program design. Our company also provides chip parameters and LOGO,

Probes, modules and other customized services.

ÿMain **features**

ÿ Working voltage: 2.8-3.6V

ÿ Working current: 1.8mA

ÿ Support **GPIO, UART** and **IIC** multiple output modes

The default output mode is compatible with **HC-SR04**

ÿ 2CM blind zone, can be customized

ÿ 7M farthest range, can be adjusted peripherally

ÿ Built-in high-precision oscillator, no crystal oscillator required

ÿ 50MS measurement cycle, other time can be customized

ÿ Provide a complete design reference solution

ÿ IO port can withstand 5.5V

ÿ Working temperature: -40ÿ-90ÿ

ÿ Provide 3 comparison fitting curve chips

16mm probe: RCWL-9600

12mm probe: RCWL-9601

10mm probe: RCWL-9602

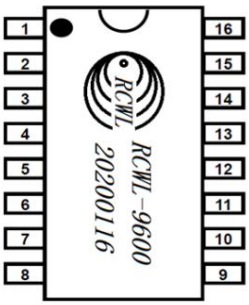
ÿTypical **application**

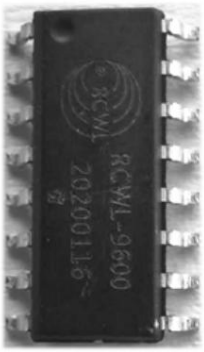
ÿ Toys, robot obstacle avoidance

ÿ Liquid level, water level measurement

ÿ Other ranging applications

ÿPin **definition**

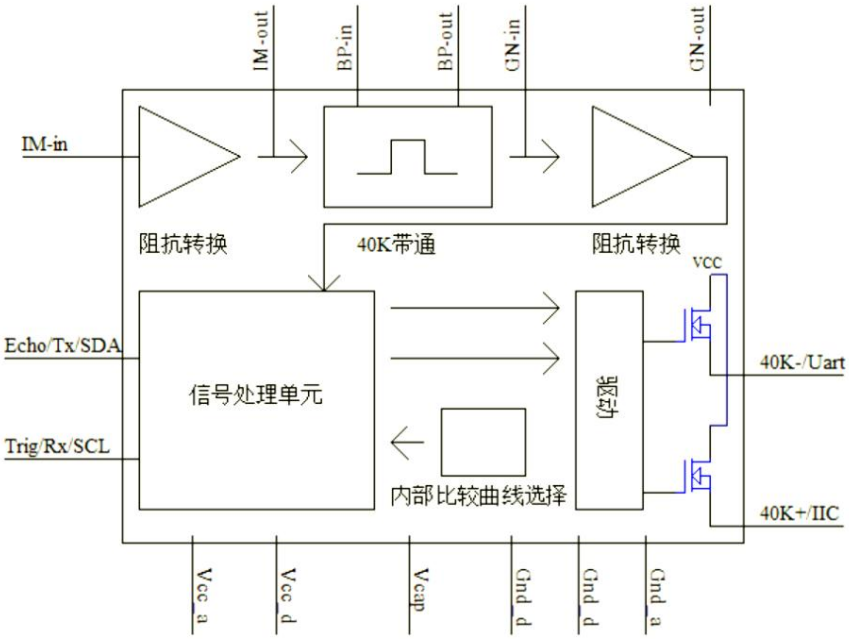




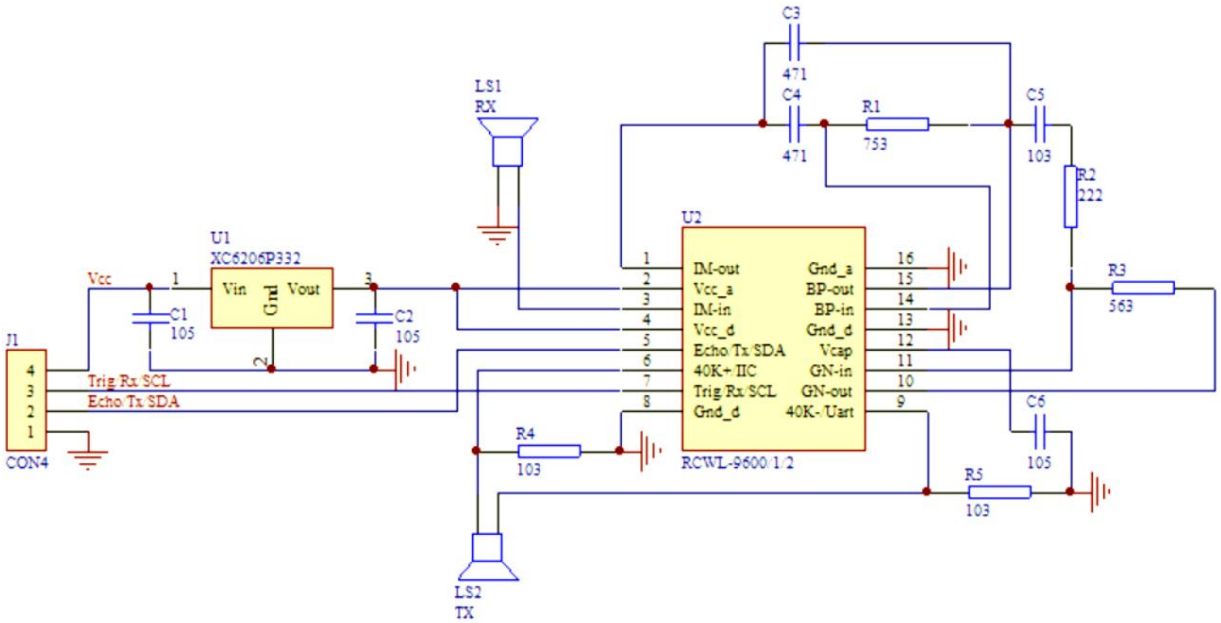
ÿPin **definition**

serial number	symbol	Functional description
1		IM-out probe impedance matching output
2		Vcc_a Analog power supply
3		IM-in probe impedance matching input
4		Vcc_d digital power supply
5		Echo/Tx/SDA GPIO mode: Echo; serial port mode: Tx; IIC mode: SDA
6		40K+/IIC is connected to the + pole of the probe (positive and negative poles can be used regardless of distance measurement); connect 10K to ground, and select IIC mode
7		Trig/Rx/SCL GPIO mode: Trig; Serial port mode: Rx; IIC mode: SCL
8		Gnd_d digital ground
9		40K-/Uart is connected to the probe-pole (the distance measurement application can be regardless of the positive and negative poles); connect 10K to the ground, and select the serial port mode
10		GN-out amplified output, the farthest distance can be adjusted
11		GN-in amplified input, adjustable maximum range
12		Vcap built-in bias voltage, external 1uF
13		Gnd_d digital ground
14		BP-in band pass input
15		BP-out band pass output
16		Gnd_a analog ground

ÿFunctional **block diagram**



ÿApplication **circuit diagram**



Note: 3-5V application circuit diagram, LDO can choose 3.3V or 3V, XC series LDO input and output voltage difference is very small; such as 3.3V application, LDO It can be omitted; if only 5V works, connect a 1K resistor in series to 5V, and divide the chip to 3.3V.

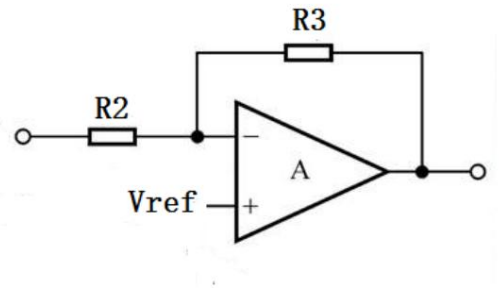
ÿPerformance **parameters**

Parameter Name	Remark	Min Typ Max Unit			
Operating Voltage		2.8		4.2	V
Operating Current			1.8	2	mA
Maximum Detection Distance	flat wall		450	600	CM
Operating			40		KHz
Frequency	The theoretical maximum direction		2	3	CM
Blind Area	angle of random value		±2		%
Detection	at the		1		mm
Accuracy	same temperature in the blind zone		±15	±20 degrees	
Resolution Detection Angle			50		M
Measurement Cycle Time		GPIO/UART/IIC			
Output Interface		-50		100°C	
Mode Storage		-40		90	ÿ
Temperature		Environmental protection material			
Operating Temperature Packaging Material Package Size		SOP16			

ÿ **GPIO, Uart, IIC selection**

serial number	mode	R4/R5 Resistor Setting
1	GPIOs	R4 (40K+/IIC) = NC R5 (40K-Uart/IIC) = NC default
2	IIC	R4 (40K+/IIC)=10K R5 (40K-Uart/IIC)=NC
3	UART	R4 (40K+/IIC) = NC R5 (40K-Uart/IIC) = 10K

ÿFarthest **distance adjustment**



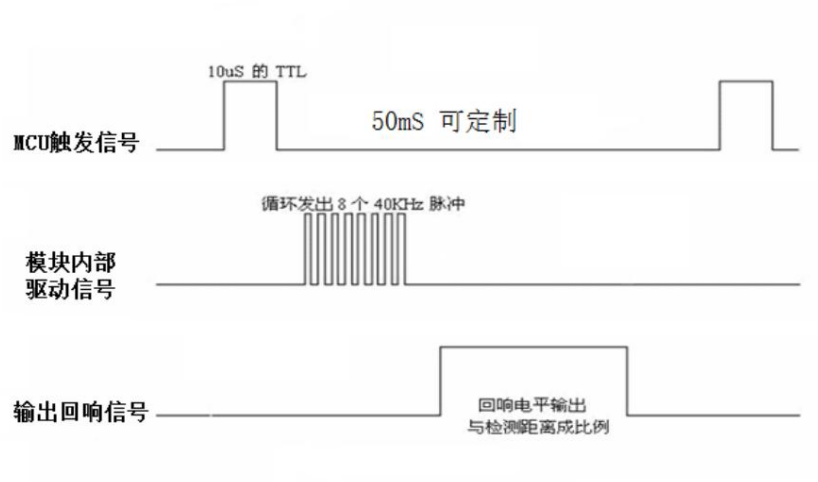
The last stage of the feedback signal can be amplified and adjusted, and the farthest distance value can be changed by adjusting the gain of this stage. In practical applications, generally adjust the resistance of R3, the voltage of R3

The larger the resistance value, the larger the gain, and the larger the farthest distance. In the recommended line, R3=563, and the farthest distance is generally about 4M. R3=753, the farthest is average

4.5M-5M. Customers can adjust the resistance value according to their needs.

ÿMeasurement **operation**

One: GPIO mode



超声波时序图

The working mode is the same as HC-SR04. The external MCU gives a high-level pulse greater than 10uS to the Trig pin of the module; the module will give a

The high-level pulse signal proportional to the distance can be calculated according to the pulse width time "T":

Distance=T*C/2 (C is the speed of sound)

Sound velocity temperature formula: c=(331.45+0.61t/ÿ)m•s-1 (where 330.45 is at 0ÿ)

Speed of sound at 0°C: 330.45M/S

Sound velocity at 20°C: 342.62M/S

Sound velocity at 40°C: 354.85M/S

0ÿ-40ÿ sound velocity error is about 7%. In practical applications, if accurate distance values are required, temperature effects must be considered and temperature compensation must be done. like

If necessary, please pay attention to our company's single chip RCWL-9700 with temperature compensation.

Two: UART mode

UART mode baud rate setting: 9600 N 1

Command return	value description	
0XA0	BYTE_H BYTE_M BYTE_L	The output distance is: ((BYTE_H<<16)+(BYTE_M<<8)+ BYTE_L)/1000 unit mm
0XF1		Company and version information

Connect the serial port. The external MCU or PC sends the command 0XA0, and the module sends 3 returned distance data after the distance measurement is completed:

BYTE_H, BYTE_M and BYTE_L.

The distance is calculated as follows (in mm):

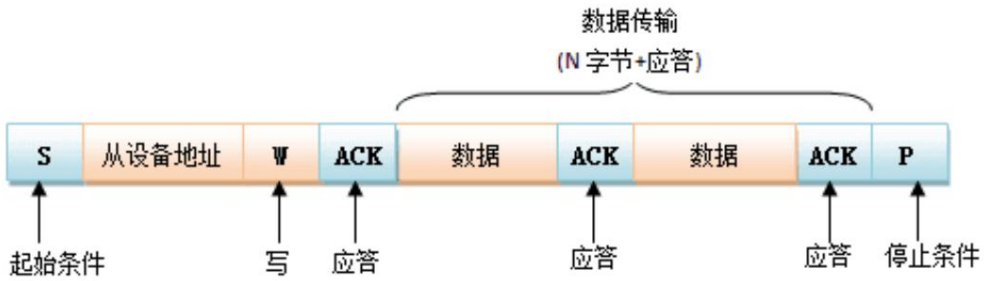
Distance=((BYTE_H<<16)+(BYTE_M<<8)+ BYTE_L)/1000

Three: IIC mode

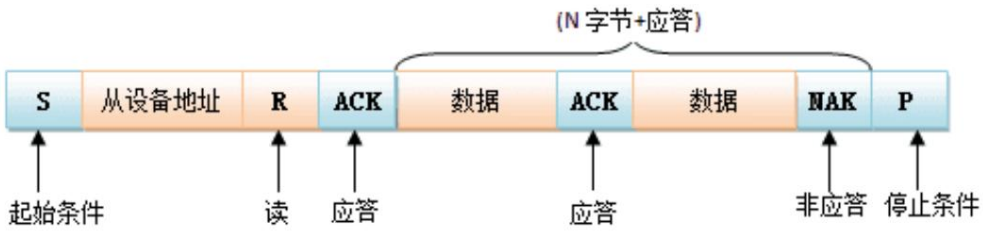
IIC address: 0X57

IIC transmission format:

Write data:



Read data:



Command format:

Address command return value description Write			
address and start ranging command 0XAE	0X01		
read address 0XAF		BYTE_H BYTE_M BYTE_L	The output distance is: ((BYTE_H<<16)+(BYTE_M<<8)+ BYTE_L)/1000 unit mm

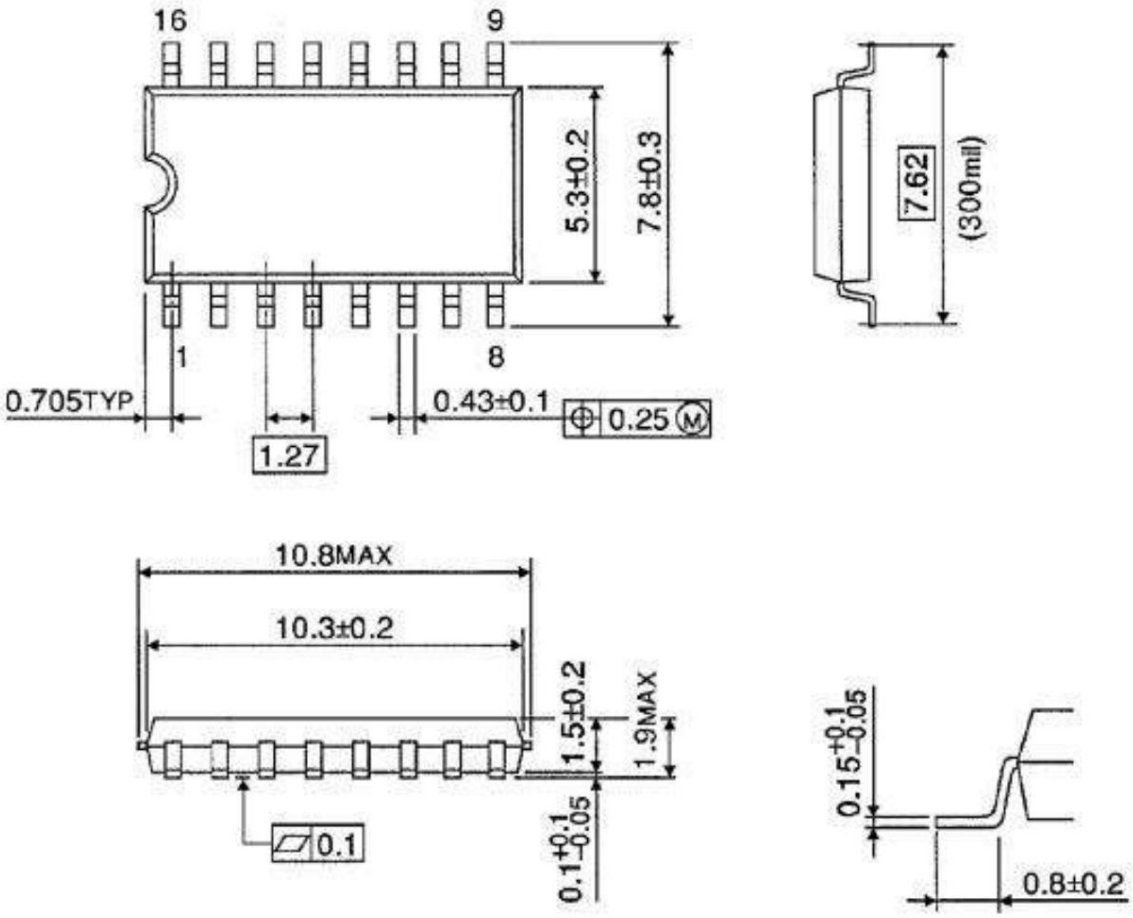
Write 0X01 to the module, and the module starts ranging; wait for 100mS (the maximum ranging time of the module)

above. Directly read out 3 **distance data. BYTE_H, BYTE_M and BYTE_L.**

The distance is calculated as follows (in mm):

Distance=((BYTE_H<<16)+(BYTE_M<<8)+ BYTE_L)/1000

ÿPackage **Outline Drawing**



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