HB100 Microwave Module Manual

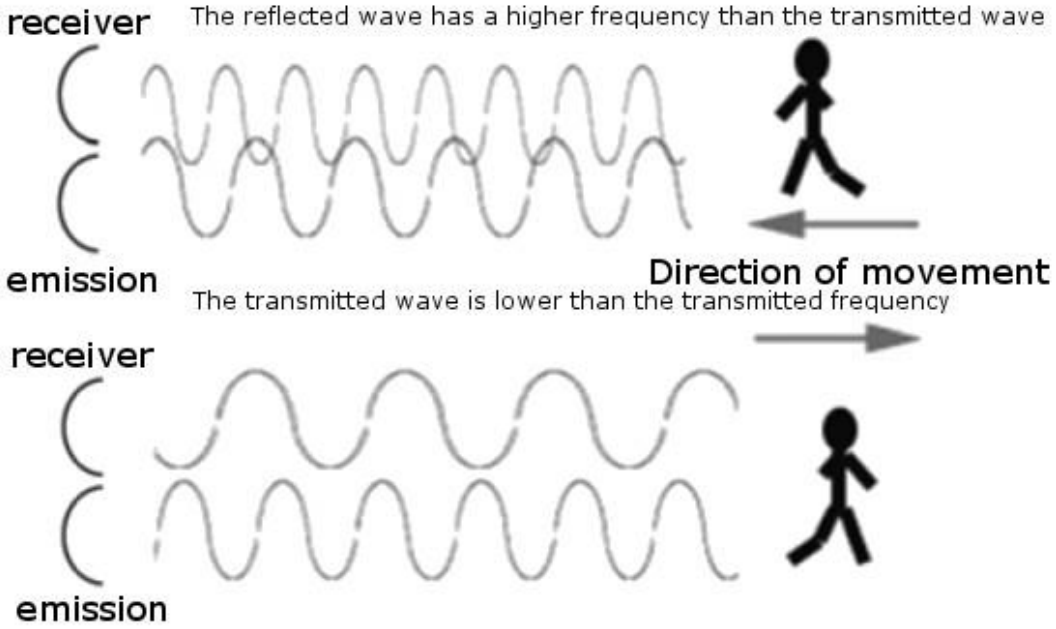
Welding Note: Please use a low-voltage soldering iron to solder and reliably ground the soldering iron. When soldering the DIP PAD, you need to solder the side with circuit wiring or copper plating! !

The HB100 microwave module is a microwave moving object detector designed using the principle of Doppler Radar. It is mainly used in automatic door control switches, security protection systems, automatic video recording control systems for ATM cash dispensers, automatic train signal machines, etc. place. HB100 is a standard 10.525GHz microwave Doppler radar detector. Compared with other detection methods, this detection method has the following advantages: 1. Non-contact detection; 2. Not subject to temperature, humidity, noise, airflow, dust, light Such as impact, suitable for harsh environments; 3. Strong resistance to radio frequency interference; 4. Low output power, no harm to the human body; 5. Long distance: detection range exceeds 20 meters.

Introduction to the Doppler principle:

Doppler theory is based on time. When a radio wave hits an object while traveling, the radio wave will be reflected, and the frequency of the reflected wave will change with the moving state of the object. If the position of the object hit by the radio wave is fixed, the frequency of the reflected wave and the frequency of the transmitted wave should be equal. If the object moves in the direction of emission, the reflected wave will be compressed, that is, the frequency of the reflected wave will increase; otherwise, the frequency of the reflected wave will decrease accordingly.

The microwave detector designed according to the Doppler principle is composed of FET medium DRO microwave oscillation source (10.525GHz), power divider, transmitting antenna, receiving antenna, mixer, detector and other circuits (Figure 2). The transmitting antenna radiates the microwave outward, and is reflected when it encounters the object. The reflected wave is received by the receiving antenna, and then mixed with the oscillating wave to the mixer. The low frequency signal after mixing and detection reflects the speed of the object moving.



The use of 10.525GHz microwave has the following advantages compared to the use of lower frequency band waves:

1. The microwave antenna has good directivity when transmitting, so it is easy to control the range of the microwave probe.
2. Microwaves are more likely to be attenuated, absorbed and reflected during transmission, and will be blocked when they encounter walls and other obstructions, so objects outside the walls and other obstructions have little interference.

Power supply: There are two kinds of power supply for HB100: continuous DC power supply (CW) mode and pulsating power supply (PW) mode: HB100 adapts the voltage range to 5V ± 5% The typical current when working in continuous DC power supply (CW) mode is 35mA (typical value). When working in low duty cycle pulsed power (PW) mode, it is recommended to provide 5V to HB100, pulse width between 5 μ s ~ 30 μ s (typical value is 20 μ s), frequency 2 ~ 4kHz (typical value is 2.0kHz) Pulse power supply. 3 ~ 10% duty cycle pulse power supply average current is 1.2mA ~ 4mA.

The pulse power supply voltage must be between 4.75V and 5.25V, and the flatness at the top of the pulse will affect the detection capability of HB100. When the power supply voltage exceeds 5.25V, its reliability will be reduced, and may cause permanent damage to the RF output beyond the nominal frequency and the circuit.

RF output: In all recommended operating modes, the HB100's RF power output is very low, and all work within a safe range that does not pose any harm to the human body. When working in continuous DC power supply (CW) mode, the total output power is less than 15mW. The output power density is 1mW / cm^2 at 5mm and 0.72 μ W / cm^2 at 1m. When operating in the 5% duty

cycle pulsed power mode, the power density is reduced to 50 μ W / cm^2 and 0.036 μ W / cm^2, respectively.

IF output: When the object moves radially with respect to the antenna surface of HB100 (the side of the non-aluminum shield is the antenna surface) at a speed of 1m / s within the effective detection range of HB100, the IF output of HB100 is 72Hz / s, IF's pulsating output frequency has an approximately linear relationship with the relative radial movement speed of the object. The output amplitude of the IF is related to the size and distance of the object. When a tester with a weight of 70 kg and a height of 170 cm moves at a distance of 1 m / s from the HB100 at a speed of 1 m / s relative to the HB100, the output of the IF is 5 mV, 72 Hz / s For pulsating signals, the output amplitude of IF is approximately inversely proportional to the square of the distance.

Note:
1. The detection range depends on the reflectivity and size of the target and the signal-to-noise ratio.
The Doppler velocity at 2.10.525GHz is 31Hz / m.p.h
3. The module must be installed so that its antenna surface (the side of the non-aluminum shield is the antenna surface) faces the detected area, and the user can also adjust the direction by himself to achieve the best coverage area.

Simple fault judgment: The IF output of HB100 is easy to be broken down during welding. Use the diode file of a multimeter to measure the voltage drop between IF and GND and GND and IF. Normally (V_{IF-GND} V_{GND-IF}) are around 0.25V .

Electrical Characteristics

Transmitter		
Frequency	:	see table
Frequency Setting Accuracy	:	3MHz
Power Output (Min.)	:	13dBm EIRP
Operating Voltage	:	+5V ±0.25V
Operating Current (CW)	:	60mA max.
	:	45mA typ.
Harmonic Emissions	:	< -7.3dBm
Pulse Mode Operation		
Average Current (5% DC)	:	2mA typ.
Pulse Width (Min.)	:	5μSec
Duty Cycle (Min.)	:	1%
Receiver		
Sensitivity (10dB S/N ratio)	:	-86dBm
Noise	:	10μV
(Both in 3Hz to 80Hz bandwidth)		
Antenna		
Gain	:	8dBi
-3dB Beamwidth		
E Plane	:	36°
H Plane	:	72°

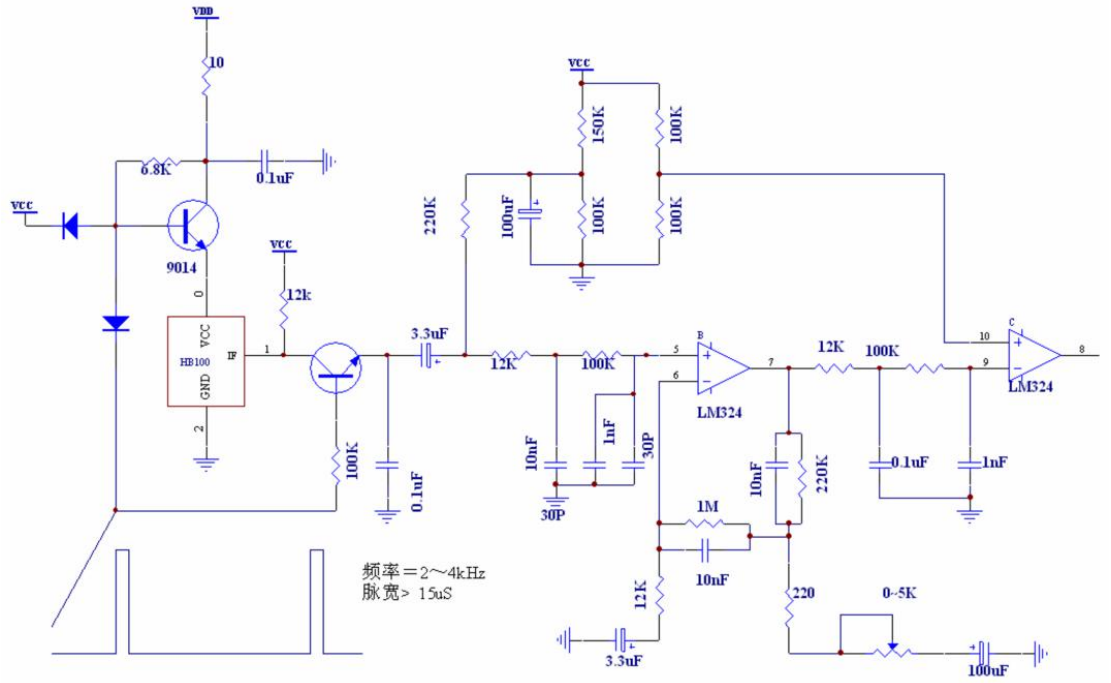
Mechanical Characteristics

Weight	:	9 grams
Tab Connections	:	0.1" spacing

Environmental Characteristics

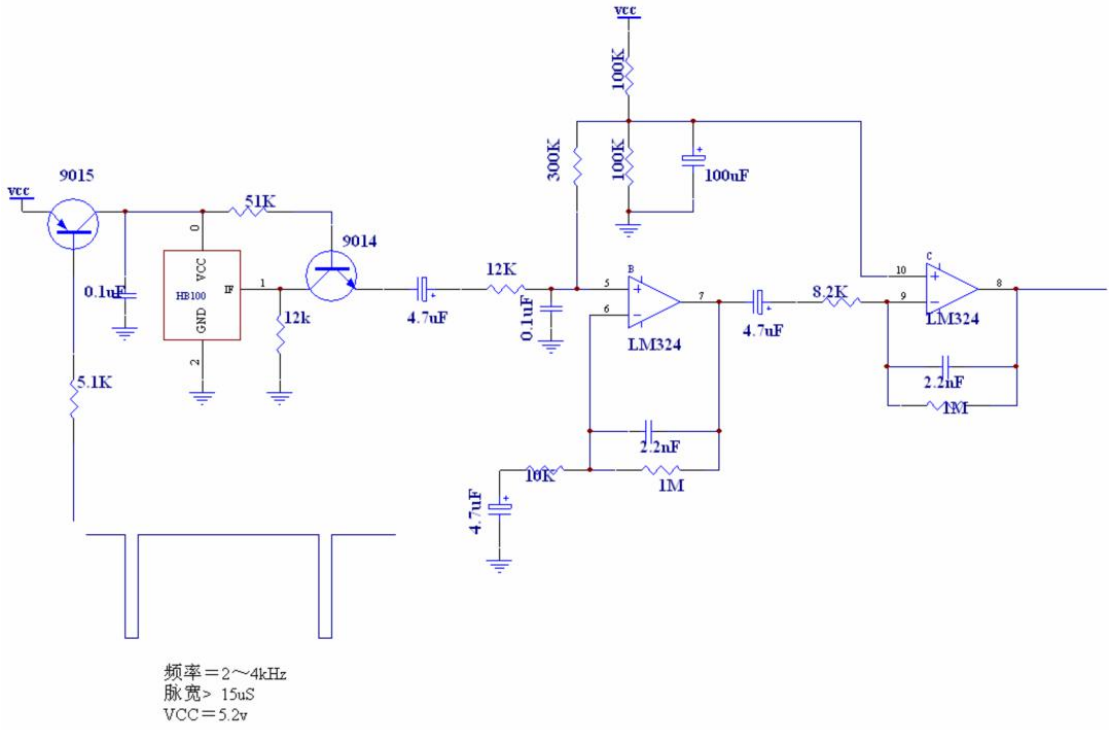
Power/Temp. Coefficient (over operating temp. range)	:	3dB
Frequency/Temp. Coefficient (over operating temp. range)	:	6.5MHz
Operating Temperature	:	-10°C to +55°C
Storage Temperature	:	-30°C to +70°C

HB100 parameter table

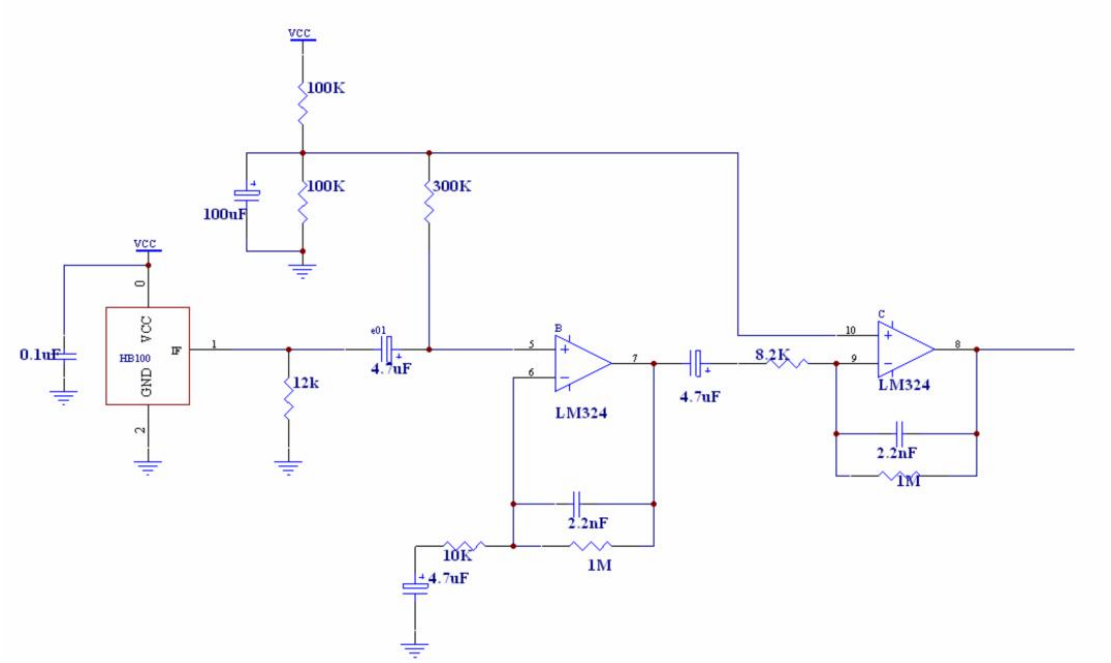


Schematic diagram 1 PW power supply method 1

(In the picture, V_{DD}=10~18V_{DC},V_{CC}=5V_{DC}, adjust the potentiometer to adjust the detection distance from 3m to 25m)



Schematic diagram 2 PW power supply method 2



Schematic diagram 3 CW power supply