

Manual for HB100 Microwave Module

note: please use low voltage soldering iron and sure connect it to reliable grounding, weld PAD of DIP, you need to weld it on electrical wiring or copper imprinted side

HB100 microwave module is a moving object detector designed by Doppler Radar theory, mainly used in automatic control switch, safety and prevention system, automatic video control system in ATMs, train automatic annunciator and other places. HB100 is standard 10.525 GHz microwave doppler radar detector. This detector enjoys many advantages over other similar devices as follows:

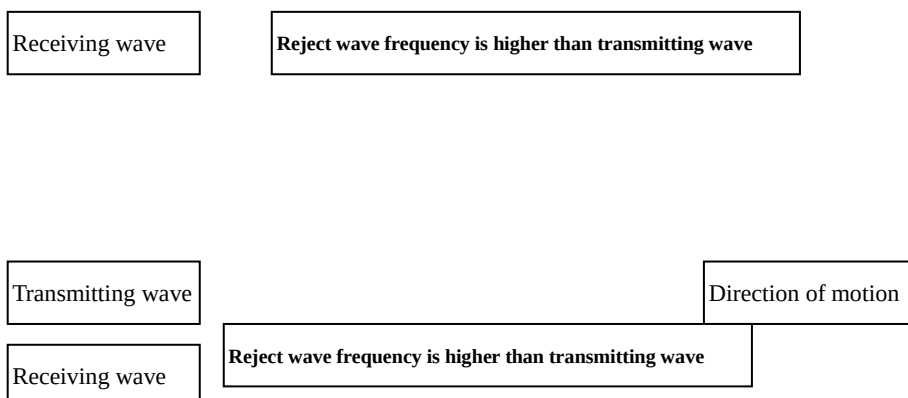
1, non-contact detection; 2, not affected by temperature, humidity, noise, air, dust, light, etc, can withstand adverse environment; 3, high performance of resistance to radio frequency interference; 4, low output power, un-harmful to human body; 5 long distance: detection range is over 20 meters.

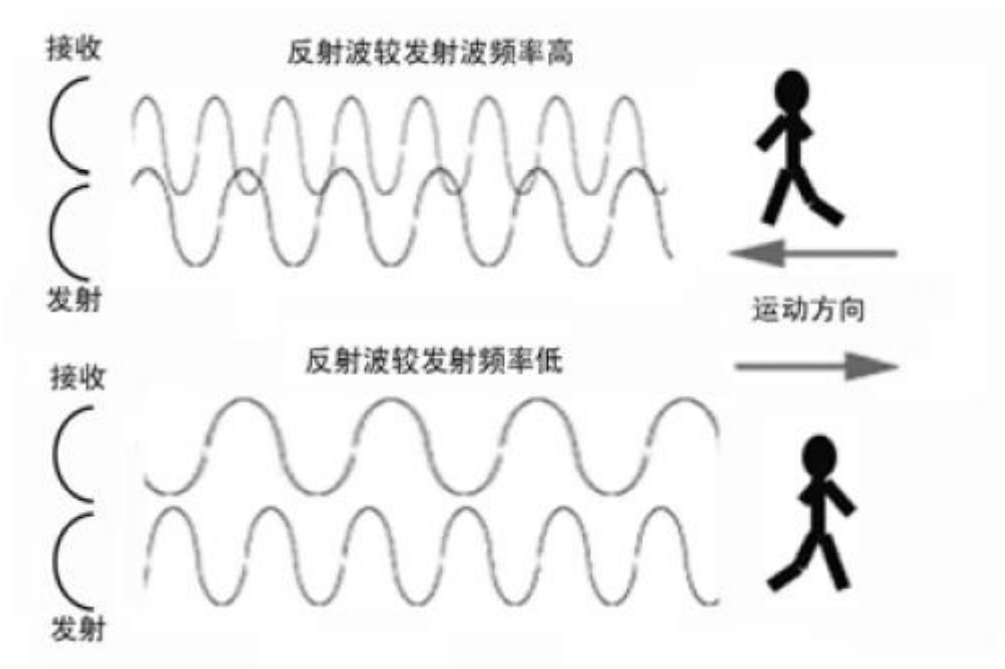
Doppler principle profile:

Doppler theory is on the basis of time, when radio waves march forward and hit the object, they will be reflected, and reflected wave frequency will change according to the state of a moving object.

If the radio waves hit a stationary object, so reflected wave frequency and transmitting wave frequency ought to be equal. If the object moving in the direction of transmitting wave, the reflected wave will be compressed, that is reflected wave frequency will increase; conversely, reflected wave frequency will decrease.

Designed according to Doppler principle , microwave detector is comprised of FET, DRO (10.525 GHz), power distributors, antenna, receiving antenna, mixers, detectors, etc (figure 2). The transmitting antenna launch directional microwave and is reflected when it meets object. reflected wave is received by receiving antenna, and then sent to the mixer and oscillating, and mixed and detected low frequency signal reflects the speed of a moving object.





Compare with using low frequency wave, 10.525 GHz microwave has following advantages: 1, microwave transmitting antennas has good directionality for transmitting, it is easy to control the scope of microwave probe. 2, during transmission microwave is more easily attenuated, absorbed and reflected, it will be kept out of things like walls, so it is less interfered by other small objects.

Power supply: HB100 powered by two modes: continuous DC power supply (CW) mode and pulse power supply (PW), voltage range for HB100 is 5 V + 5%. Under the mode of continuous DC power supply (CW), typical operating current is 35 mA. Under the mode of low duty cycle pulse power supply (PW), recommended pulse power supply for HB100 are voltage 5 V, pulse width 5 μ s ~ 30 μ s (typical values 20 μ s), frequency 2 ~ 4 kHz (typical values 2.0kHz). when duty cycle is 3 to 10%, pulse power supply current is 1.2 mA ~ 4 mA.

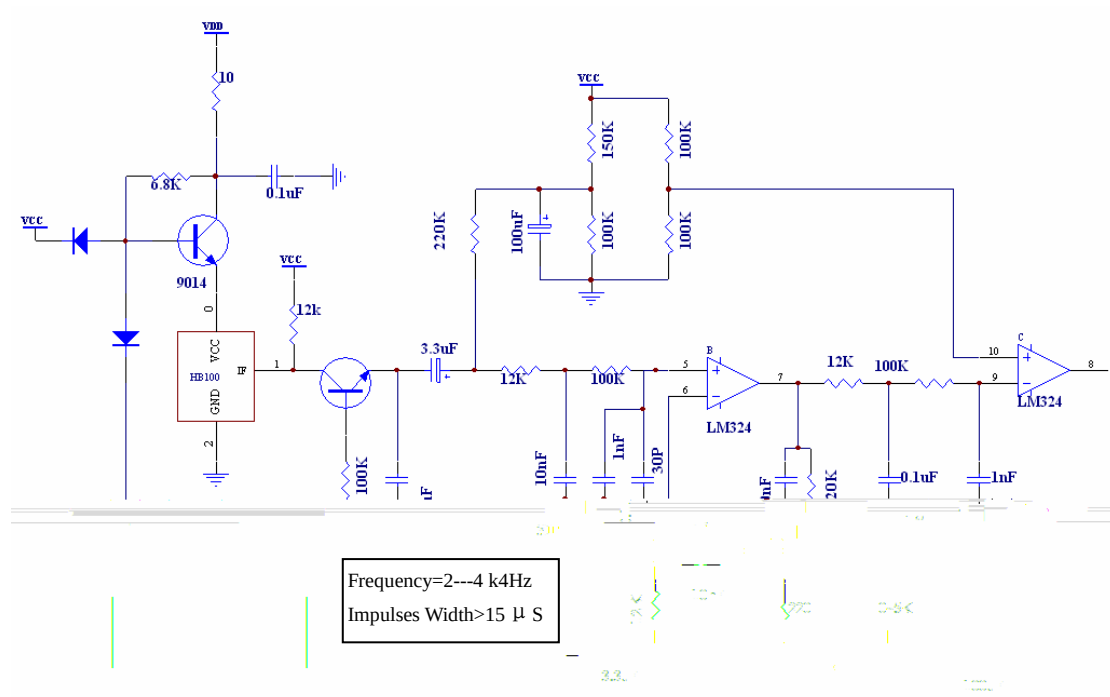
Pulse power supply voltage must be 4.75 V to 5.25 V, the flatness on the top of the pulse will affect HB100's detecting ability. when power supply voltage is 5.25 V, its reliability will be reduced, and could lead to permanent damage to nominal frequency's radio frequency output and the circuit.

Radio frequency output: under recommended working mode, HB100 Radio frequency output power is very low, it is all within the safety range, that is unharmed to human body. In the mode of continuous DC power supply (CW), the total output power is under 15 mW. Output power density: 1 mW/cm² in 5 mm distance, 0.72 μ W/cm² in 1m distance. When in the mode of 5% duty cycle impuse power supply, power density were reduced to 50 μ W/cm² and 0.036 μ W/cm².

IF output amplitude is related to the size, distance of an object, when a testing man weighed 70 kg, 170 cm in height moves in radial direction at the speed of 1 m/s speed relative to HB100 radial move, IF output is 5 mV, 72 Hz ac/s pulse signal, IF output amplitude and the square of distance are in an approximation inverse correlation.

Easy Troubleshooting: HB100 IF output is easily punctured in soldering, use a multimeter adjusted to diode measurement gear, normal values (V_{IF-GND} V_{GND-IF}) are about 0.25 V respectively.

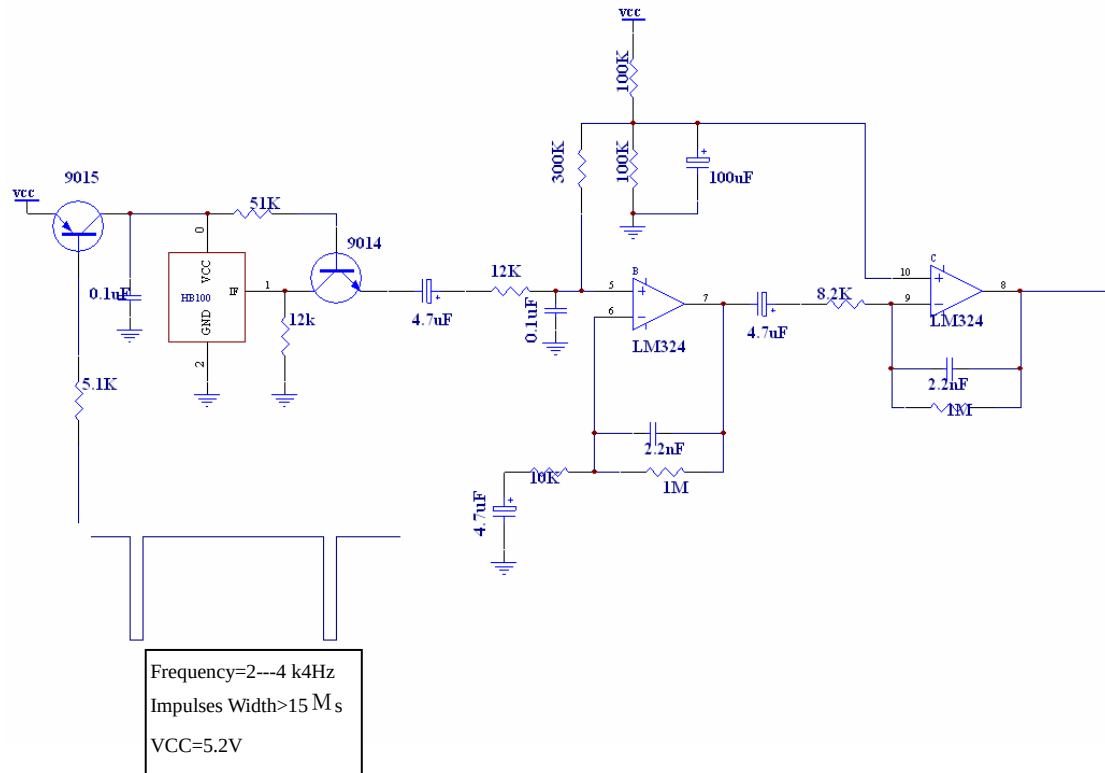
HB100 参数表



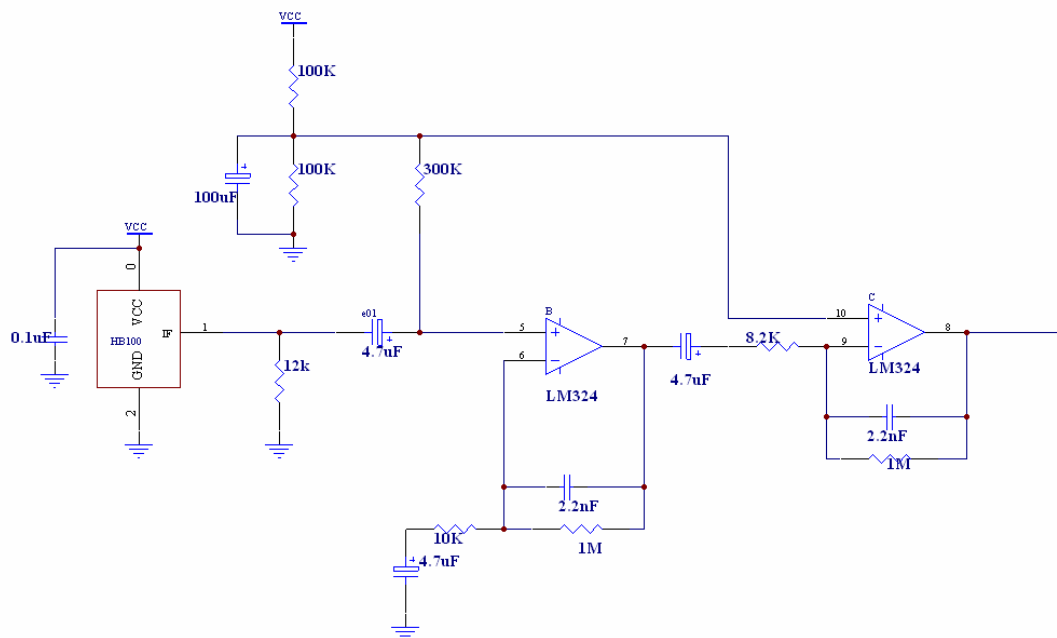
原理图一 PW供电方式一

Schematic diagram 1, PW Power supply mode 1

(Figure: $V_{DD}=10\sim18V_{DC}$, $V_{CC}=5V_{DC}$ detection range can be adjusted from 3m-25m by adjusting potentiometer)



Schematic diagram 2, PW Power supply mode 2



Schematic diagram 3, CW Power supply mode