Shenzhen Hi-Link Electronic Co., Ltd.

Radar Sensor Module
HLK-LD1040
Datasheet

Product Introduction

HLK-LD1040 is a motion sensing module designed based on X-band radar chip with a center frequency of 10.525GHz. The module is designed with fixed frequency, directional transmitting and receiving antennas (1T1R), integrated with intermediate frequency demodulation, signal amplification and digital processing, and has the ability to set delay, adjustable sensing range and light intensity detection. This product has the advantages of not penetrating walls, anti-interference, small size, good suppression of clutter and high-order harmonics, high stability and consistency. The module has a short initialization time and a quick test mode. It is easy to install in the lamp and the test operation is simple, which can effectively accelerate production testing. This module is mainly aimed at low-cost applications.

This product is suitable for embedded concealed installation, is not affected by temperature/humidity, oil smoke, water mist, etc., and can be widely used in various lamps, such as bulbs, down-lights, ceiling lamps, etc.;

Features

- Based on the principle of Doppler radar
- Ceiling installation, 3dB beam width: 110°±10°
- This product is positioned for motion sensing scene applications
- With quick detection mode
- Sensing distance: hanging height 3-4m (sensing radius), wall hanging 8-10 meters (radial)
- With the ability of light detection (this function is not included by default)

Application

Smart lighting: home, office, lighting, pet supplies, etc.

Specification

TA=25℃

Table 1 Input parameters

No	Parameters	Testing condition	Min	Typ	Max	Unit
VCC	Working voltage	Dc power supply	5		12	V
I	Working current	VCC=5~12V	48	50	53	uA

Table 2 Output parameters

No	Parameter	Test condition	Min	Typ	Max	Unit
fOSC	Microwave frequency	VCC=5~12V		10.525		GHz
Vout	Output voltage		3.2	3.3	3.4	V
Tw	Power-on stabilization time			7	9	s

Table 3 Temperature and humidity range

No	Parameter	Testing condition	Min	Typ	Max	Unit
TA	Operating temperature		-20		+70	℃
TB	Storage temperature		-40		+85	℃
HA	Operating humidity		10		95	%
HB	Storage humidity		0		95	%

Table 4 Perception range

No	Parameter	Testing condition	Min	Typ	Max	Unit
	Distance	Height 3m	2	3	4	m
Td	Delay time			5		s
Ts	Block time			2		s

Table 5 ESD feature

No	Parameter	Testing condition	Min	Typ	Max	Unit
	接触放电			2		kV
	空气放电			2		kV

The delay time is the time to maintain the state after triggering, and the default value is 5s;

• The blocking time refers to the time without response after the output state is flipped and triggered again, and the default value is 2s;

• There are two kinds of startup initialization with different software configurations:

1. No quick detection mode initialization state description: After the module is turned on, the O port output is high for 1s, and then it is low all the time, and the normal detection mode starts after 7s

2. Description of the initialization status of the quick detection mode: When the module is turned on, the O port outputs high (1s) and low (0.5s) levels for 3 times, and then enters the sensing mode after 5s. The first sensing is the quick detection mode test (the sensing delay is fixed at 3s), and then enters the normal detection mode.

Sensing range area

Figure 2 Perception diagram

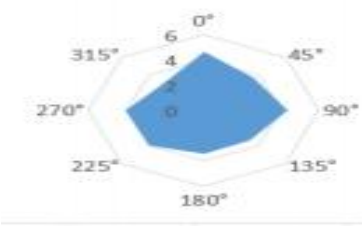


Figure 3 Sensing range diagram

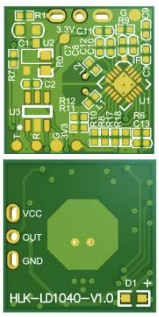
• Test results may vary in different test environments or moving targets;

• Metal casings can shield radar electromagnetic waves, affecting the sensing distance;

• The above test results are obtained in a standard test site. For specific test environments and conditions, please consult relevant technicians.

Pin Configuration and Function Description

Table 6 Pin Configuration and Function Description

Part	Port	Description	Picture
P1	V	DC 5-12V	
	O	TTL high and low level output	
	G	Power Ground	
P2		Program download port	

Considerations for Designing the Matching Drive Power Supply

• Be sure to use a drive power supply that meets the standards for output voltage, current and ripple coefficient. An unstable drive power supply and strong electromagnetic radiation will cause false alarms, no perception, and self-starting of the radar module;

• The matching drive power supply should be 5~12V, the drive current should not be less than

5mA, the power supply ripple amplitude should be controlled within 100mV, and the power frequency fluctuation amplitude should be small;

• When assembling the drive power supply and radar module, avoid the bottom of the radar module or the antenna surface facing the drive power module, and try to stay away from the rectifier bridge, switch transformer and other devices with large power frequency interference in the drive power module to prevent interference with microwave signals;

Radar Module Testing and Usage Precautions

• When there are walls or obstacles around to reflect microwaves, the sensing distance and sensing angle will be increased; when there is a relatively open space around, the sensing distance and angle will be attenuated;

• Since the microwave antenna can change detection even with a small change, please protect the antenna and avoid metal objects (such as solder wire) on the surface to avoid affecting the sensing distance;

• Handle with care to avoid violent vibrations, and keep the radar module flat and not deformed; the photosensitive device is not blocked or covered, especially around the photosensitive element D1 on the radar module, opaque shielding should be avoided;

• The radar module maintains an independent use space, and the surrounding space maintains a free space interval of more than 2mm;

• After power-on, there is about 7s initialization noise analysis time, during which it is considered abnormal sensing work;

• If the photosensitive device of the radar module is blocked (such as the outer shell, etc.), it is necessary to retest to determine the light threshold value;

• During production line testing and aging operations, if a large number of radar modules are stacked together when powered on, self-excitation may occur. Please ensure that the powered radar modules are kept 50cm apart Above safe distance.

Precautions for Installing and Using Built-in Radar Module

• Devices equipped with radar modules should be installed away from ventilation ducts, fire ducts, drainage ducts, mechanical vibrations or places with strong vibration objects such as large metal equipment, because they will affect the radar reflection wave and detection perception effect;

• Live work is strictly prohibited to avoid misoperation, wrong connection, circuit burnout or electric shock;

• Avoid installing in places exposed to the sun and rain to prevent damage and shorten service life;

• The device must be installed away from electromagnetic fields to avoid false operation caused by electromagnetic interference; it should also be installed away from places where objects are fixed, rotating or swinging (such as electric fans, swaying leaves, clothes drying in the wind, etc.) to avoid false operation;

• When several devices with built-in radar modules are fixedly installed, the distance between each device should be ≥0.5m;

• The antenna surface of the radar microwave module is recommended to be 3~5mm away from the product casing, otherwise it will affect the sensing distance;

Figure 4 Distance between antenna surface and product housing

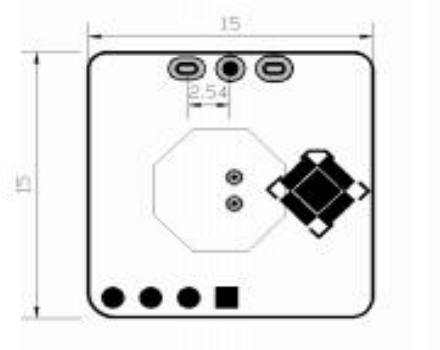
• After the device has a built-in radar module, it is recommended to place it horizontally or vertically. Within the effective sensing range, try to avoid installing two or more devices with built-in radar modules face to face;

• Avoid other lighting objects (such as emergency lights, guide lights and other interfering light sources) near the device (such as lamps) with built-in radar modules, so as to avoid the built-in light-sensing judgment of the device (lamp) failing to work properly (often off, misjudged as daytime);

• If a device (such as a lamp) with a built-in radar module is always working (always on) and cannot be turned on or off according to the moving target detection, it may be that the radar module is interfered by the intermediate frequency, causing the module to always judge that there is a moving target in the sensing range. At this time, the power supply should be turned off, and the power supply status of the power board should be checked to see if it is normal and whether the module space distance has changed;

• If the above problems cannot be solved, please turn off the power and observe the surrounding conditions of the installation location to eliminate the influence of the surrounding environmental interference factors; if there is still a problem after restarting the power supply, consider replacing the device's driver power board or re-verifying the radar module.

Dimension



The dimension unit is mm. The P1 part has V, O, G interface sequence. The hole spacing is compatible with 2mm and 2.54mm. The hole diameter is 0.85mm.

Figure 6 Dimension(15mm*15mm*3mm)

Shenzhen Hi-Link Electronics Co., Ltd.

Address: 17F, Building E, Xinghe WORLD, Minzhi Street, Longhua district, Shenzhen 518131

Telephone: 0755-23152658

Email: sales@hlktech.com

Website: www.hlktech.net