



**AT58L4MD-2020 low power 5.8GHz
radar sensor**

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Version: 1.3

Contents

AT58L4MD-2020 5.8GHz Radar sensor User Guide.....	3
Description.....	3
Radar Sensor illustration.....	3
Input and Output Interface.....	3
Module size and pin position.....	5
Electrical characteristics.....	5
The hold time and detection area.....	6
Photosensitive Detection.....	6
Power on Sequence.....	7
Detection Pattern.....	8
Precautions.....	8
Revision history.....	9

AT58L4MD-2020 5.8GHz Radar sensor User Guide

Description

AT58L4MD-2020 is an low power 5.8G radar sensor launched by AirTouch. The overall power consumption is 9mA. The module size is 20mm*20mm, which is equivalent to a 5coin. , The sensor uses a self-developed radar sensor chip AT58MP1T1RD, which integrates a 5.8G microwave circuit, an intermediate frequency amplifier circuit and a signal processor, The chip has a high degree of integration and good production consistency. The peripheral is equipped with a miniaturized planar antenna, which greatly reduces the overall size while ensuring the performance of the sensor.The sensor can be used to detect various scenes of human being or moving target sensing, including intelligent home, Internet of things, intelligent lighting and other fields.

Radar Sensor illustration

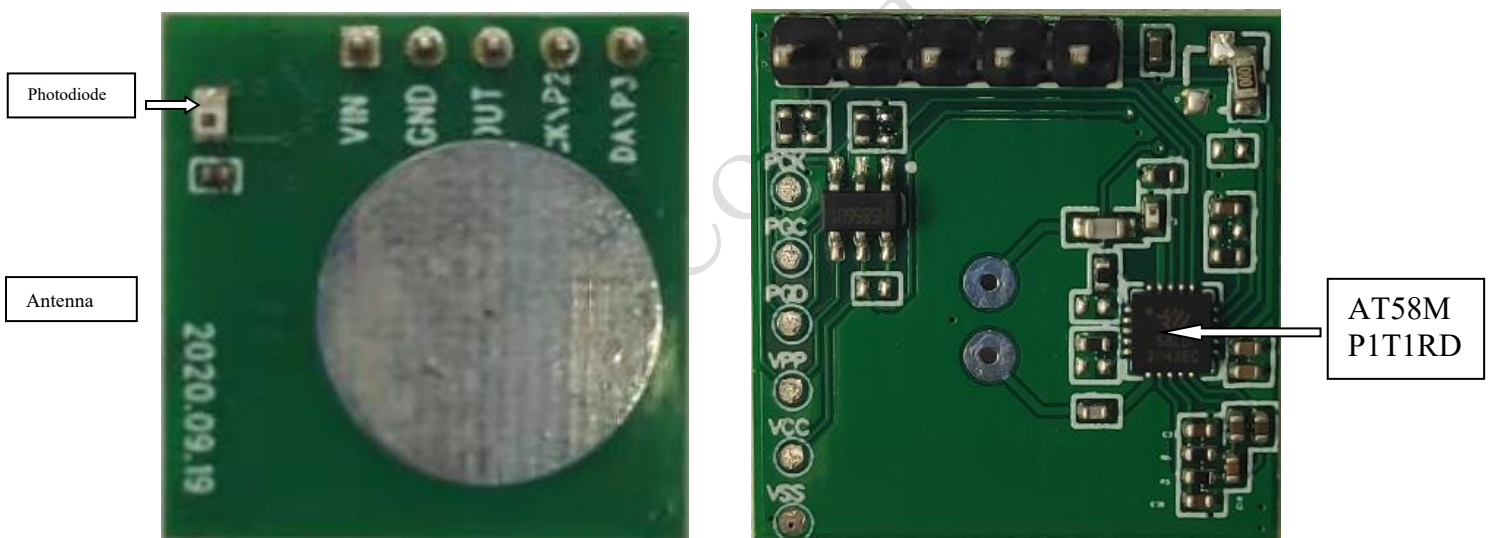


Figure 1 AT58L4MD-2020 5.8GHz Radar sensor

Radar Sensor illustration

Five pin holes are reserved in the module, including VCC, GND, OUT, SCL and SDA, with pin distance of 2.54mm, If you need to adjust parameters such as distance and delay time, you can adjust the specific resistance on the module to select the corresponding gear or use the external MCU reserved on the module to rewrite the internal parameters, The following table describes the definition of each pin:

Pin Name	Function	Note
VCC	Power supply	LDO is not attached by default, it can be directly powered by 2.8~4.8V. If the power supply voltage exceeds 5V, an LDO needs to be added. At this time, the power supply VCC is 5~12V.
GND	Ground PIN	
OUT	Output control	The output signal is high and low level (0V/3.3V).
SCL	IIC CLK	
SDA	IIC DATA	

Module size and pin position

Figure 2 below is the schematic diagram of module size and pin position. The length and width of the module is 20 mm * 20 mm. By default, there is no pin, and the overall thickness is 2.5 mm. If a pin is required, the default pin height is 12 mm.

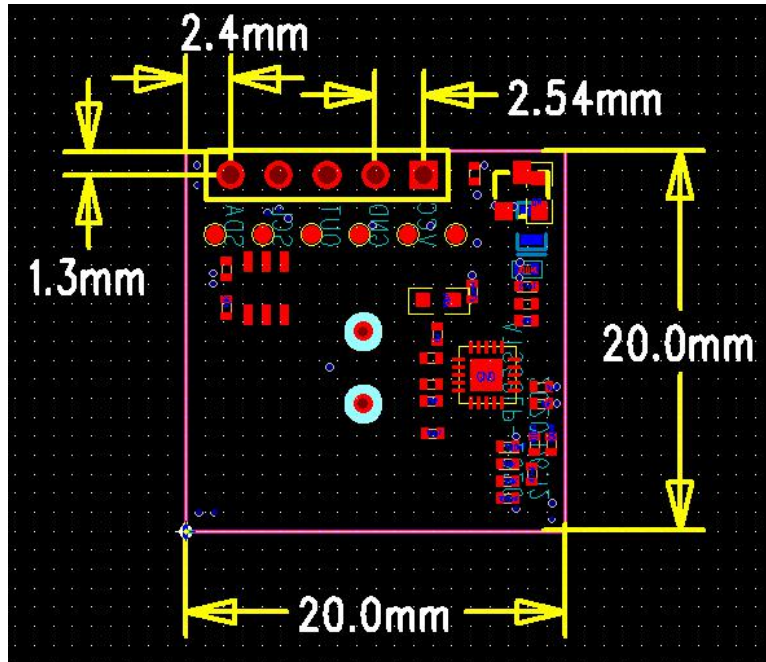


Figure 2 Module size and pin position of AT58L4MD-2020

Electrical characteristics

Parameters	Min.	Typical	Max.	Unit	Note
Frequency	5725		5875	MHz	
TX Power		0.2	0.5	mW	
Input VCC	2.8	3.3	4.8	V	Without external LDO
Output High		3.3		V	
Output Low		0		V	
Current	8	9	10	mA	Average working current
Detection		4	6	M	Adjustable according to specific needs
Hold time		15		S	Adjustable according to specific needs
Daylight		10		Lux	Adjustable according to specific needs
Operating	-30		85	°C	

The hold time and detection area

The AT58L4MD-2020 pin has an IIC signal pin. When debugging, the host computer can be used to adjust the delay, sensitivity and other parameters through the IIC; there is also a reserved MCU position on the module, and the sensing distance, Delay and other parameters of the radar can also be initialized through the MCU on the module. In addition, 3 sensitivity condition resistors are reserved on the module, which can be adjusted by adjusting the resistance shown in Figure 3 on the right.

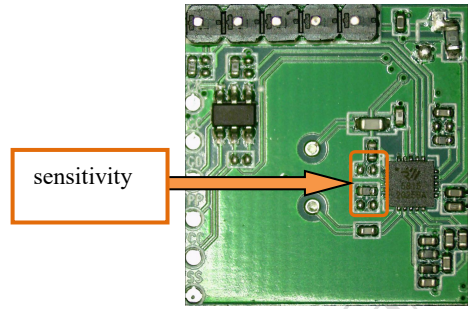


Figure 3 sensitivity condition resistors

In the state without any configuration, the induction delay is 15S, and the OUT output is high during the induction time. If the induction is triggered again within the delay time, the timing will restart.

The sensing distance adjustment resistor is shown in Figure 4. The three resistors correspond to three threshold parameters. The resistor positions are th0, th1 and th2 from top to bottom. The three resistors correspond to 8 logic combinations. When there is no resistor, the logic is 1. Figure 4 lists the thresholds corresponding to various combinational logics. When the threshold is smaller, the sensing distance is farther, when the threshold is larger, the sensing distance is closer. The sensing distance is the farthest when the three resistors are not attached. When the resistors are all pasted, the sensing distance is the shortest, and the intermediate state can be deduced by analogy.

th0	th1	th2	閾值
0	0	0	64
1	0	0	49
0	1	0	38
1	1	0	29
0	0	1	22
1	0	1	17
0	1	1	13
1	1	1	10

Figure 4 sensing threshold

Photosensitive Detection

Module supports photosensitive detection, but photosensitive function is optional. If photosensitive function is required, photodiode and tuning resistance can be added at the position shown in Figure 4. Photosensitive detection function shall also be enabled synchronously in software, and photosensitive threshold can be adjusted by tuning resistance. Turn on the version of photosensitive function, only when the ambient light is lower than the set illuminance, the radar sensing will be started. If the light is too bright, the module will not



Figure 5 photodiode and tuning resistance

start the sensing function. When testing the radar performance alone, the photodiode can be covered with black tape to avoid the photosensitive effect affecting the radar sensing function.

Power on Sequence

The module has a power-on self-check function, that is, after the module is powered on, the OUT pin first outputs a high level, and then outputs a low level after a delay of 3S, and enters the normal induction mode after a low level delay of 0.5S. The following is the sequence diagram of the control signal after the module is powered on:

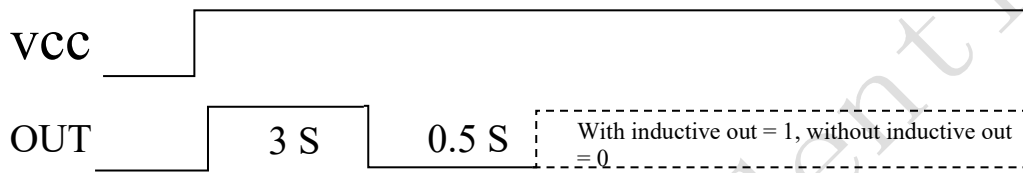


Figure 6 Power on Sequence

Detection Pattern

The sensing sensitivity of the radar sensor can be configured by adjusting the resistance, and its limit sensing distance is 6~8 meters, and the actual sensing distance can be adjusted appropriately according to needs. The following is the schematic diagram of radar detection range in case of high hanging. If the sensitivity is set higher, the detection range will be correspondingly larger. In the figure, the dark area is the high sensitivity area, which can be fully detected, while the light area is the low sensitivity detection area, which can basically detect objects.

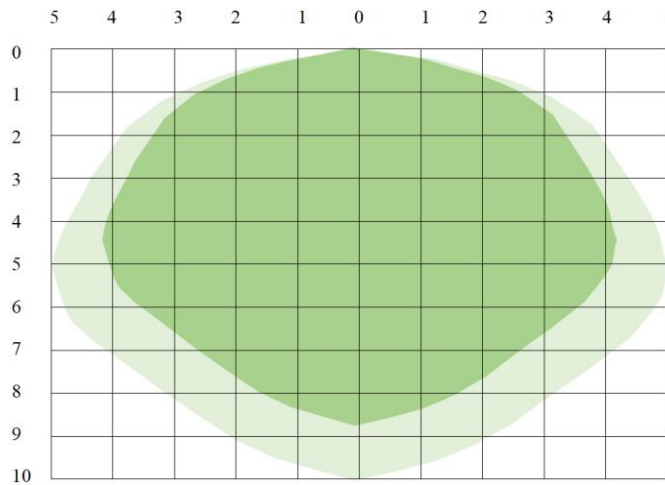


Figure7 AT58L4MD-2020 Detection Pattern

Precautions

- During installation, the front of the antenna shall be free of metal shell or parts to avoid signal shielding. Plastic or glass and other materials are allowed, but these materials shall not be close to the front of the antenna.
- Try to avoid pointing the radar antenna at the large metal equipment or pipeline, etc;
- When multiple radar modules are installed, the antennas of each radar module shall be parallel to each other as much as possible to avoid direct radiation between the antennas, and the distance between the modules shall be more than 1m;
- The radar sensor should avoid facing the AC driving power supply and keep away from the rectifier bridge of the driving power supply as far as possible to avoid the interference of the power frequency.

Revision History

Revision	Release Date	Description
1.0	2020/07/08	Initial version
1.1	2021/02/22	Update Vout
1.2	2021/03/16	Update picture

Requirement of FCC KDB 996369 D03 for module certification:

1. List of applicable FCC rules:

The module complies with FCC Part 15.249

2. Summarize the specific operational use conditions:

The module has been certified for Fix, Mobile, Portable applications. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

3. Limited module procedures:

The module has not its own RF shielding, which belong to Limited module Standard requires:

Clear and specific instructions describing the conditions, limitations and procedures for third-parties to use and/or integrate the module into a host device (see Comprehensive integration instructions below).

Resolve: Supply example as follows:

Installation Notes:

1) AT58L4MD-2020 module Power supply range is DC 2.8-4.8V, when you use AT58L4MD-2020 module design product, the power supply cannot exceed this range.

2) When connect AT58L4MD-2020 module to the host device, the host device must be power off.

3) Make sure the module pins correctly installed.

4) Make sure that the module does not allow users to replace or demolition.

4 .Trace antenna designs:

Not applicable.

5. RF exposure considerations:

This equipment complies with FCC’s RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Note: the host product manuals must include a statement in order to alert the users of FCC RF exposure compliance.

6. Antennas:

Type	Gain	Impedance	Application
PCB type	2.3dBi	50Ω	Fixed, Mobile, Portable

7. Label and compliance information

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The system integrator must place an exterior label on the outside of the final product housing the AT58L4MD-2020 Modules. Below is the content that must be included on this label.

The host product Labeling Requirements:

NOTICE: The host product must make sure that FCC labeling requirements are met. This includes clearly visible exterior label on the outside of the final product housing that displays the contents shown in below:

Contains FCC ID: 2AVK2-AT58L4MD-2020

8 .Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

9. Additional testing, Part 15 Subpart B disclaimer:

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.249) list on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host product shall work normally, all the transmitters installed must be operating, investigate the fundamental and unwanted/spurious emissions with the modular transmitter(s) operating in a normal mode. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode if possible, if receive mode only is not possible, test laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s).