



MS24-2020D58M4-LDO-B-5D-NLS-CW

24GHz Millimeter Wave Radar Module

Data Sheet

MS24-2020D58M4-LDO-B-5D-NLS-CW is a miniaturized 24GHz millimeter radar sensor module launched by MoreSense, which is suitable for many industry such as lighting sensing, security camera linkage and smart home appliance sensing.

Revision History

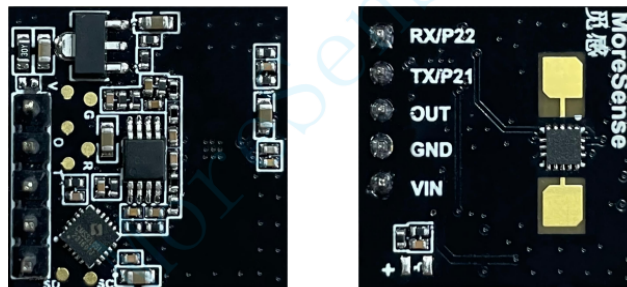
Version	Description	Release Date
V1.0	Initial Version	2023-9-21

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1 Product Description

The MS24-2020D58M4-LDO-B-5D-NLS-CW is a miniaturized, low-cost 24GHz millimeter-wave radar sensor for lighting sensing, security camera linkage, and smart home sensing. This system utilizes the frequency difference between electromagnetic wave transceiver signals to detect the distance of moving targets. A 24GHz electromagnetic signal is emitted through the transmitting antenna, which is reflected back to a moving object with a certain delay when it encounters a objects in a certain distance. The reflected signal is received by the receiving antenna, and the IF signal with the target distance signal is obtained by mixing the received and transmitted signals, which can be calculated and analyzed to get the information of the target.



2 Product Feature

- ★Working Frequency: 24G frequency band;
- ★Can penetrate thin non-metallic materials such as acrylic and glass;
- ★Unaffected by environmental humidity, airflow, dust, noise, brightness and darkness.

3 Application

This module can be used for smart door locks, low-power IPCs, night lights and other products and scenarios that require automatic sensing such as smart lighting, smart home, energy saving, courtyards, and security monitoring.



Indoor Light



Cabinet Light



Intelligent Toilet



Office Lighting



Parking Space Detection



Smart Home

4 Module Parameter

Type	Parameter	Value
RF Parameter	Frequency Range	24.00GHz~24.25GHz
	Transmit Power	3dBm
	Antenna	Built-in;Flat Antenna
Hardware Parameter	Data Interface	GPIO/UART
	Operating Voltage	DC5- 12V(LDO version as default); Optional DC3.3V.
	Operating Current	62-72mA
	Operating Temperature	-40°C- 85°C
	Storage Temperature	-40°C- 85°C
	Humidity	<85%
	Dimension	20mmx20mm
Default Parameter	Power-On Self-Test Time	2s
	Sensing Output Level	3.3V
	Silent Output Level	0V
	Sensing Output Time	2s
	Customizing the Largest Sensing Distance FOR Motion/Movement	About 8m
	Customizing the Largest Sensing Distance FOR Assembly Height 3m	3.5m
	Setting Parameter Method	UART

5 Pin Definition

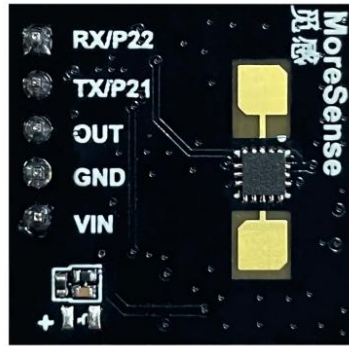
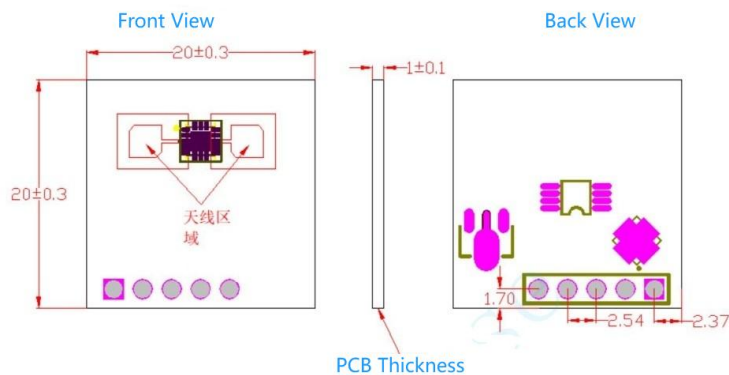


Table 1. MS24-2020D58M4-LDO-B-5D-NLS-CW Pin Function Definition

Pin	Name	Type	Description
1	RX/P22	I	UART RX
2	TX/P21	O	UART TX
3	OUT	O	Signal Signal Output
4	GND		Ground
5	VIN		Power Supply

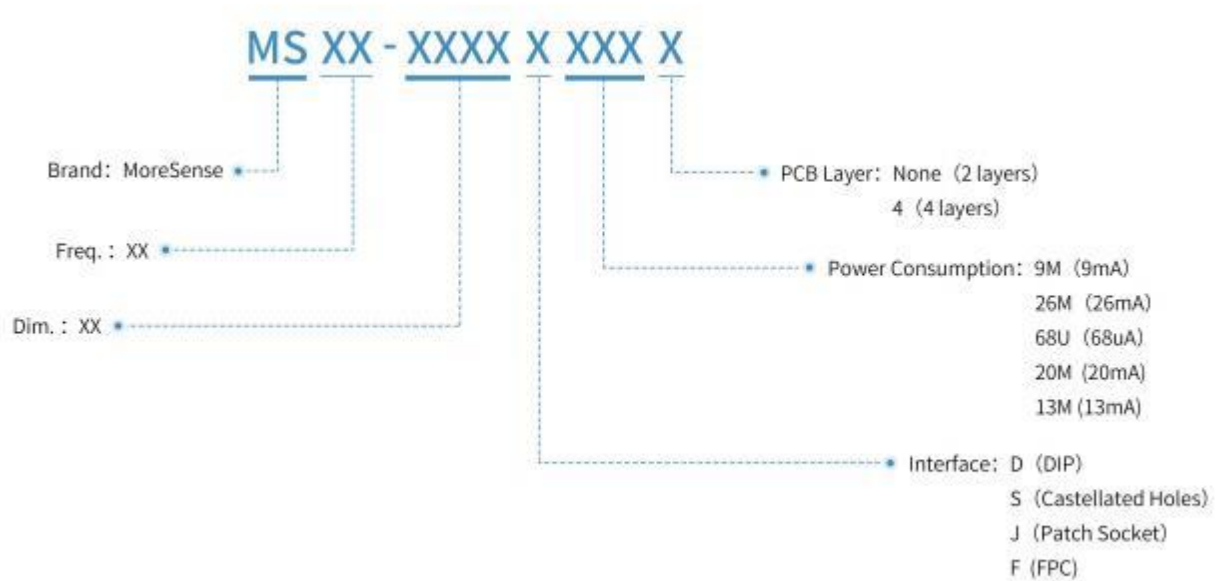
Note: I:Input O:Out T:High impedance state

6 Module Dimension

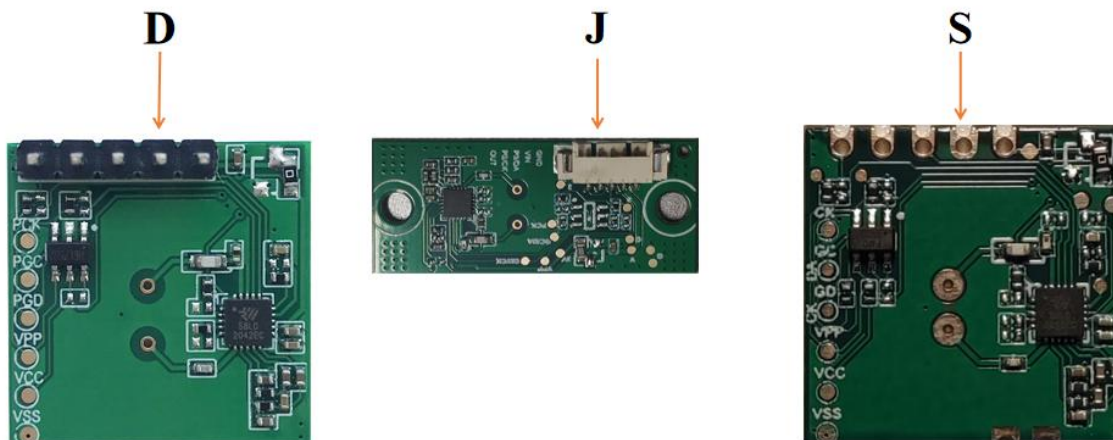


Unit: Millimeter (mm)

7 Name Rule



④ Interface



8 Precautions

※The radar should be operated without metal or other media obstructing the transmission of electromagnetic waves in front of the antenna.

※By different housing materials and distances of the module from the inner surface of the housing, the returned spectral energy and parameter settings will be different. The parameter need to be fine-tuned according to actual conditions. Generally, it is recommended that the module should be 5-6mm away from the housing, which can be adjusted according to the actual conditions.

※We recommend users to test the module according to the default settings of MoreSense firstly. If the result is still not as expected after doing parameter by customers, customer can send the structural parts of the housing to MoreSense who will test and adjust a reference setting.

※When multiple modules are installed at the same time, the distance between modules should be more than 0.5 meters, and avoid the antennas of different modules facing each other.

※The sensitivity can be adjusted according to the user's scenario. Users can adjust the sensitivity according to their actual application scenarios.

※It is recommended to use plastic as the housing, because radar is a very sensitive module. If it is made of high attenuation material, it may affect the detection.

※Avoid air conditioning vents, fans and other objects.

9 Power Supply Requirement

※Isolated power supply must be used. At the same time, the AC rectifier bridge and transformer should avoid direct contact with the module and try not to make the transformer and rectifier face the module, and try not to place the transformer and rectifier directly in front of the module. They can be placed in a staggered position or increase the shielding.

※The ripple of the power supply should be less than 100mV as far as possible to avoid spikes and burrs in the power supply.

※Do not add anti-reverse diodes or other devices in the DC supply link. Adding any device to the DC supply link will increase the power supply noise and lead to the possibility of false alarms.

※The power supply drive current should not be less than the normal operating current of the module.

10 UART Protocol

Module supports AT command to set module parameters, serial port default parameters: 115200,8,1,NONE,NFC.

Setup Instruction:

Function	Command	Return Data	Clarification
Setting the detection speed	AT+SPEED=speed_min,speed_max\r\n	Succeed: OK\r\n Failed: ERROR\r\n	Unit:km/h, default is 0,10, max is not more than 10km/h speed max must be bigger than speed min, the module will only process the signals within the speed range, and won't process the signals beyond that.
Set detection threshold	AT+DELTA=delta_first,delta_normal\r\n	Succeed: OK\r\n Failed: ERROR\r\n	delta first: the threshold for the first trigger delta normal: the threshold for the re-trigger is interpreted as the ability to set the sensing range for the in-triggered and triggered states separately.
Setting the total number of windows	AT+WIN_CNT=win_cnt\r\n	Succeed: OK\r\n Failed: ERROR\r\n	Total number of windows in the algorithm cycle, max 30 - not recommended to change.
Set the number of trigger windows	AT+WIN_TH=win_first,win_normal\r\n	Succeed: OK\r\n Failed: ERROR\r\n	Algorithm cycle trigger window number, minimum is 1, can not be greater than the total window number. win first: the number of first trigger window win normal: the number of re-trigger window, generally not recommended to change.
Set light sensor threshold	AT+LS_TH=ls_th_mv\r\n	Succeed: OK\r\n Failed: ERROR\r\n	Unit: mv. The range of value is 0-3300, otherwise return ERROR. The larger the value, the smaller the

			lux, set to 0 to turn off the light sensor function.
Set self-test output time	AT+SELFCHECK_TIME=se lfche ck_time_ms\r\n	Succeed: OK\r\n Failed: ERROR\r\n	Unit: ms. The configured value must be an integer multiple of 100, otherwise it returns ERROR.
Setting the light-on output time/delay time	AT+ON_TIME=light_on_tim e_ms \r\n	Succeed: OK\r\n Failed: ERROR\r\n	Unit: ms. The configured value must be an integer multiple of 100, otherwise it returns ERROR.
Setting the light-off protection time	AT+OFF_TIME=light_off_ti me_m s\r\n	Succeed: OK\r\n Failed: ERROR\r\n	Unit: ms. The configured value must be an integer multiple of 100, otherwise it returns ERROR.
Set OUT invert output	AT+OUT_REVERSE=x\r\n	Succeed: OK\r\n Failed: ERROR\r\n	x: out output mode 0: Positive phase output, output high level when sensing. 1: Inverted phase output, output low level when sensing.
Set OUT sensing non-parallel mode	AT+OUT_ONESHOT=mode\r\n	Succeed: OK\r\n Failed: ERROR\r\n	mode: Sense delay mode 0: Delay mode (it means if it is during light-on delay time,when some objects still do movement in the sensing distance range, the set delay time will be re-counted until there is no objects in the set sensing distance range)

			1: Non-delay (single) mode
Set UART Active Report Function	AT+AUTO_REPORT=interval_ms \r\n	Succeed: OK\r\n Failed: ERROR\r\n	interval_ms: interval of active reporting, unit: ms. If the value is 0, the active reporting function is disabled; if the value is other than 0, the reporting interval is timed. The configured value must be an integer multiple of 100, otherwise ERROR is returned.
Set UART baud rate	AT+UART=baud\r\n	Succeed: OK\r\n Failed: ERROR\r\n	baud: baud rate. Can be configured as: 9600, 19200, 38400, 57600, 115200. The new baud rate takes effect immediately after configuration, and is restored after reset or reboot. If you need to reset or re-start to take effect, you need to save the parameters.
Save parameter configuration	AT+SAVE\r\n	Succeed: OK\r\n Failed: ERROR\r\n	
Restore factory configuration	AT+RESTORE\r\n	Succeed: OK Failed: ERROR\r\n	
Reset Module	AT+RST\r\n	Succeed: OK Failed: ERROR\r\n	After returning OK, the module will restart after 1s.
Note: Commands end in \r\n, return data end in \r\n			

Query Instructions:

Function	Command	Return Data	Clarification
Query firmware information	AT+FW_INFO\r\n	OK:MoreSense_x xxx\r\n	Different items can be set up for different project information, which can be used for incoming material inspection
Query software version	AT+VER\r\n	OK:xxx\r\n	Version#
Query chip UUID	AT+UUID\r\n	OK:xxxx\r\n	16 bytes UUID
Query Detection Speed	AT+SPEED\r\n	OK:speed min, speed max\r\n	Detectable speed range, unit: km/h. Default is 0,10.
Query Detection Threshold	AT+DELTA\r\n	OK:delta_first,delta_normal\r\n	delta first:threshold for first trigger. delta_normal: threshold for re-triggering
Query the total number of windows	AT+WIN CNT\r\n	OK:win cnt\r\n	Total number of windows in the algorithm cycle
Query the number of triggered windows	AT+WIN TH\r\n	OK:win first,winnormal\r\n	window first:first trigger window window normal:number of re-triggered windows
Query the light sensor threshold value	AT+LS_TH\r\n	OK:ls_th_mv\r\n	Unit: mv
Query self-test output time	AT+SELFCHECK_TIME\r\n	OK:selfcheck_time_ms\r\n	Unit: ms
Query light-on output time/delay time	AT+ON_TIME\r\n	OK:light_on_time_ms\r\n	Unit: ms

Query light-off protection time	AT+OFF_TIME\r\n	OK:light_off_time ms\r\n	Unit: ms。
Query OUT invert output	AT+OUT_REVERSE\r\n	OK:0\r\n or OK:1\r\n 0:Positive phase output 1: Inverted phase output	
Query OUT sensing non-parallel mode	AT+OUT_ONESHOT\r\n	OK:0\r\n 或 OK:1\r\n 0: Delay mode 1: Non-delay (single) mode	
Query UART active report function	AT+AUTO_REPORT\r\n	OK:xx\r\n 0: No reporting Other: active reporting interval	
Query UART baud rate	AT+UART\r\n	OK:baud\r\n	baud: baud rate. 9600 、 19200 、 38400、 57600 、 115200
Query radar sensing status	AT+SENSE_STATE\r\n	OK\r\n sense_state= move ,distance=x x,mag=xx\r\n or sense_state= brth,distance=xx, mag=xx\r\n or	Move means movement; Brth means presence; Nobody means nobody. Distance denotes distance in cm; Mag denotes signal strength.

		sense_state= no body\r\n	
Remarks: The instruction ends with \r\n and the return data ends with \r\n. If the instruction returns ERROR, it means that the instruction is wrong.			