

TRFK345S0066

24GHz radar module

2024 1 25



Toplight Sensor Technology (Xiamen) Co., Ltd

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1. Product Overview

The TRMK345S0066 module operates in the 24 GHz frequency band. It emits millimeter waves through the onboard microstrip antenna and receives the echo signals reflected from the target. When it detects relative motion of objects within its signal coverage area, the module processes the received echo signals through internal high-gain intermediate frequency amplification. After further signal acquisition and processing within the microcontroller, it outputs serial protocol signals via the UART interface.

2. Application

- **Smart Toilets**
- **Smart Appliances**

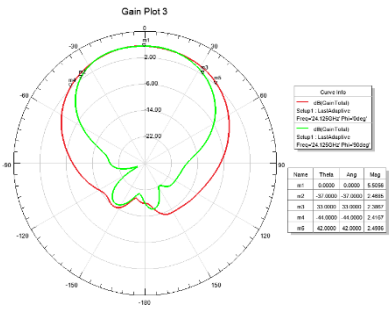

3. Key Features

- Operates in the 24GHz frequency band.
- High-performance MMIC transceiver.
- Penetrates certain thicknesses of materials such as ceramics, glass, and plastics without the need for perforations.
- Resilient to environmental factors like temperature, humidity, noise, airflow, dust, and light, making it suitable for harsh conditions.

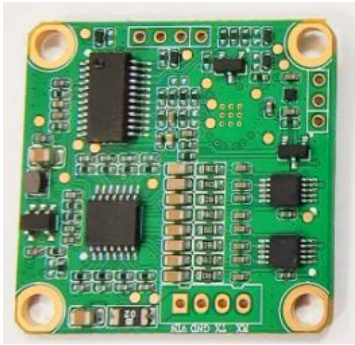
4. Module specification

Model	Transmit Frequency (GHz)	Voltage (V)	Current (mA)	Peak Current (mA)	Power Consumption (W)	Range (m)	Weight (g)	Dimensions (mm)	working Temperature (°C)
TRMK345S0066	24-24.250	5	50	59	0.25	0.4~2.5	3	30*30	-15~65

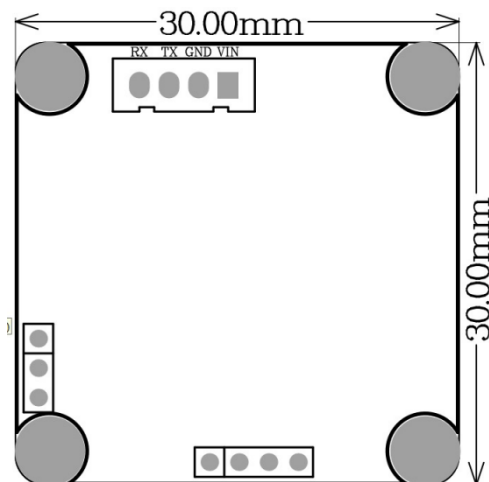
5. Antenna specification

Product	FOV	direction	Antenna																								
TRMK345S0066	 <p>Gain Plot 3</p> <p>Legend:</p> <ul style="list-style-type: none"> Curve 1 (dB): 24.0000 ~ 24.2500 Curve 2 (dB): 24.0000 ~ 24.2500 Curve 3 (dB): 24.0000 ~ 24.2500 Curve 4 (dB): 24.0000 ~ 24.2500 <table border="1"> <thead> <tr> <th>Name</th> <th>Theta</th> <th>Phi</th> <th>Mag</th> </tr> </thead> <tbody> <tr> <td>w1</td> <td>0.0000</td> <td>0.0000</td> <td>5.6985</td> </tr> <tr> <td>w2</td> <td>31.0000</td> <td>31.0000</td> <td>5.4685</td> </tr> <tr> <td>w3</td> <td>31.0000</td> <td>31.0000</td> <td>5.3887</td> </tr> <tr> <td>w4</td> <td>42.0000</td> <td>42.0000</td> <td>5.1187</td> </tr> <tr> <td>w5</td> <td>42.0000</td> <td>42.0000</td> <td>5.4685</td> </tr> </tbody> </table>	Name	Theta	Phi	Mag	w1	0.0000	0.0000	5.6985	w2	31.0000	31.0000	5.4685	w3	31.0000	31.0000	5.3887	w4	42.0000	42.0000	5.1187	w5	42.0000	42.0000	5.4685		<p>Horizontal FOV: -44° ~ +42°</p> <p>Vertical FOV: -37° ~ +33°</p>
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6. Connection Description

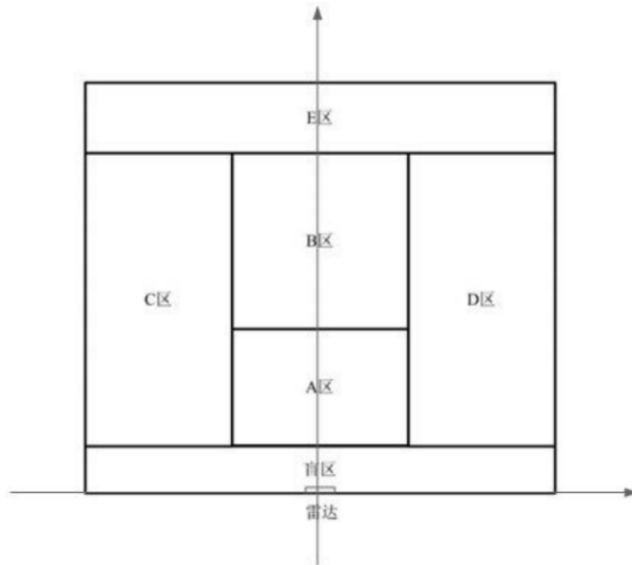
 ①②③④	No.	Port	Definition	Description
	1	VCC	Power	5V
	2	GND		
	3	TX	UART RX	LVTTTL
4	RX	UART TX	LVTTTL	

7. Dimensions



8. Functions

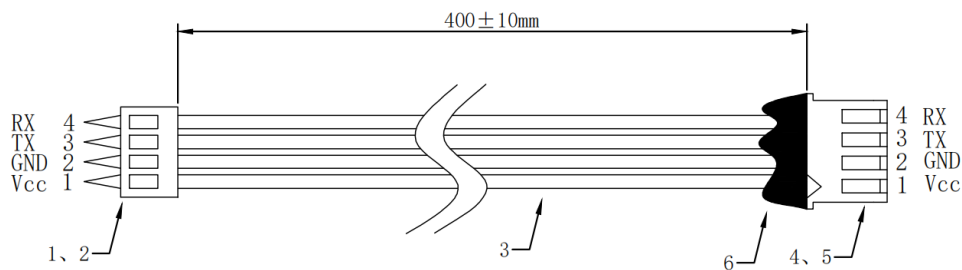
- **Motion Target Detection:** Detects targets within a range of 2.5 meters, identifying their distance and reflected energy.
 - **Flexible Trigger Area Enable/Disable:** Supports flexible activation or deactivation of trigger areas.
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- **UART Serial Communication Support:**

Provides compatibility for communication via UART serial ports.

9. Connector:



10. Installation instructions


- The radar module should not have metal materials covering or obstructing the antenna in front.
- The radar radiation range is affected by the material and thickness of the cover. For 24GHz millimeter-wave radar, based on experience, it is recommended to use plastic materials for the casing (such as ABS, PE, PVC, etc.). When the shell thickness exceeds 3mm, consider an increase in signal loss.
- The actual sensing distance is related to the casing and installation method; the material and shape of the casing will affect the sensing distance.
- If you need to design your own casing, it is advisable to maintain a distance of approximately 6mm between the casing and the antenna face.

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11. Caution:

The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Antenna used

Antenna Type	Brand/ manufacturer	Model No.	Max. Antenna Gain
PCB Antenna		TRMK345	5.8dBi

Notice to Host Product Manufacturer

Any deviation(s) from the defined parameters of the antenna trace, as described by this instruction, host product manufacturer must notify us that you wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application. Every new host configuration requires FCC Class II Permissive Change filing by the grantee.

Notice to Host manufacturer when installing our Limited Module and intend to use Contains FCC ID: 2BF56-TRFK345S0066

Limited module procedure

The module doesn't have its own RF shielding, The host should provide the RF shielding to the modular, 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).

Supply example as follows: Installation Notes:

- (1). Power supply for the limited module with FCC ID: 2BF56-TRFK345S0066 is DC 5V, when you use product with this module design, the power supply cannot exceed this value.
- (2). When connect the module to the host device, the host device must be powered off.
- (3). Make sure the module pins correctly installed.
- (4). Make sure that the module does not allow users to replace or demolish.

Information on test modes and additional testing requirements

Host manufacturer which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.249 and 15.209 requirement, only if the test result comply with FCC part 15.249 requirement, then the host can be sold legally.

Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15B.

Additional Testing and Grantee Evaluation for Host Product.

The module is limited module and complies with the requirement of FCC Part 15.249.

According to FCC Part Subpart C section 15.212, the radio elements must have the radio frequency circuitry shielded.

However, Due to there is no shield for this module, this module is granted as a Limited Modular Approval.

A C2PC is required for new host application. Only Grantees are permitted to make permissive changes. Please contact us for further process with Toplight Sensor Technology (Xiamen) Co., Ltd. The OEM integrators should follow the following C2PC test plan, Base on Module RF report "KSCR240300038701under FCC ID: 2BF56-TRFK345S0066.

For the host product installed this module exactly according to this guide, and did not make any hardware or software modifications to this module or modified the software but does not affect the radio characteristics,

The host product will need to evaluate according to FCC Part 15 Subpart C 15.249 for 24GHz radar:

- (1). Maximum EIRP of channel 24000MHz-24250 MHz.
- (2). Radiated spurious emissions and band edge on channel 24000 and 24250MHz with the other co-located transmitters.

RF Exposure evaluation for the simultaneous transmission of the co-located transmitters. The host product shall be evaluation for ensuring the continuous compliance for the FCC rules that apply to the host product. Additional guidance for testing host products is provided in KDB Publication 996369 D02 and D04. This module was tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to final host. The host will still need to be reassessed for compliance to this portion of rule requirements. For the host product is not installed according to tis guide, the module certification will be invalid, and a new grant certification will be required for the host product.

Contact Information:

Company Name: Toplight Sensor Technology (Xiamen) Co., Ltd.

Address: Unit 301, No. 52, Huli Industrial Park, Meixi Road, Tongan District, Xiamen, Fujian, China

Contact Name: Gino Huang

Contact Email: gino@ttcsensor.com

Contact Phone: +865927256288

FCC regulatory compliance statement

§15.19

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.

§15.21 Information to user

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

RF Exposure compliance statement

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Labelling Instruction for Host Product Integrator

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. For FCC, this exterior label should follow "Contains FCC ID: 2BF56-TRFK345S0066". In accordance with FCC KDB guidance 784748 Labeling Guidelines.

§ 15.19 Labelling requirements shall be complied on end user device.

Labelling rules for special device, please refer to §2.925, § 15.19 (a)(5) and relevant KDB publications. For E-label, please refer to §2.935.

Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, 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.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 *Information to the user* or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

For Class B

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.*

For Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
