

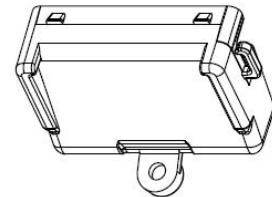
**microwave radar sensor module specification  
(with gesture recognition)**

Type: KMGR-1T1R02

Version: V1.1

## 1. Characteristic

- 24 GHz frequency band design.
- Accurate gesture recognition.
- Super disturbance suppression.
- Low power consumption, low cost, and small size.



## 2. application

Used in intelligent toilet with the recognition function: approximation, departure, and gesture.

## 3. Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Supply voltage	25°C	4	5	6	V
Current consumption	25°C, DC5V	60	67	75	mA
Power consumption (standby)	25°C, DC5V, in standby mode		<60		mW
Temperature (in operation)		-10		+70	°C
Temperature (in storage)		-25		+70	°C
ESD	25°C, contact discharge ①		8		kV
	25°C, discharge in air ②		15		kV
Humidity	40°C ⑬			95%	RH
Transmitting power	25°C ⑮		<20		mW
Transmitting frequency	25°C	24		24.25	GHz
Vertical beam (-3d)	simulation		±17.5		°
Horizontal beam (-3dB)	simulation		±34		°
Logic level	TTL	0		5	V
Velocity	25°C ⑬	0.4		1.2	m/s
Gesture detection: height	25°C ⑭	60		90	cm
Gesture detection: plane	25°C ⑮	40		65	cm
Gesture detection time: cover	25°C, ⑯ single period	0.6		1.5	s
Gesture detection time: ring	25°C, ⑰ one and half period	1		2.5	s
Approximation trigger: distance	25°C, ⑱ 30° mounted		50±10		cm
Departure trigger distance	25°C ⑲	40		80	cm
Approximation trigger: fov	25°C ⑳		±70		°
Departure trigger: fov	25°C ㉑		±60		°
Piss detection: height	25°C ㉒	60		90	cm

## Notes

①②"Antistatic ability" is only for antistatic design of products. Antistatic ability test is verified by Kemu and passed the test.

③"Walking speed range" is the theoretical value data of software design, this parameter is the research and development design of Yixing, and the validation of Kemu test is passed.

④ "Hand swing trigger open loop height range" takes the ground as the zero point, the seat ring center reference point, and the radar installation angle is 40 degrees, which is determined by the structure of Kemu toilet. The software design of this parameter is "Yixing", and the actual test verification is Kemu, which is verified by Kemu test. This parameter is related to the installation angle of the radar, the material and thickness of the radar surface of the toilet, the size and processing accuracy of the shell, and the actual use environment of the module. The current test verifies that the shell is the 3D manual mold provided by Kemu combined with the test data of the toilet prototype. The final radar output shell combined with the final mass production toilet effect may change, and the final effect is subject to the actual product and the actual scene effect.

⑤ "The radar installation angle is 40 degrees, which is determined by the structure of Kemu toilet. The software of this parameter is designed to be "Yixing". The actual test shows that Kemu has passed the test. This parameter is related to the installation angle of the radar, the material and thickness of the radar surface of the toilet, the size and processing accuracy of the shell, and the actual use environment of the module. The current test verifies that the shell is the 3D manual mold provided by Kemu combined with the test data of the toilet prototype. The final radar output shell combined with the final mass production toilet effect may change, and the final effect is subject to the actual product and the actual scene effect.

⑥⑦ This time is defined by the software, and the final test parameters of radar products combined with the actual test parameters of Kemu's output toilet shall prevail. This part of the test is verified and passed by Kemu.

⑧ The front end of the toilet is taken as the zero point, and the radar installation angle is 30 degrees. This angle is determined by the structure of Kemu toilet. The software design of this parameter is Yixing, and the actual test is verified to be Kemu, which is verified by Kemu test. This parameter is related to the installation angle of the radar, the material and thickness of the radar surface of the toilet, the size and processing accuracy of the shell, and the actual use environment of the module. The current test verifies that the shell is the 3D manual mold provided by Kemu combined with the test data of the toilet prototype. The final radar output shell combined with the final mass production toilet effect may change, and the final effect is subject to the actual product and the actual scene effect.

⑨⑩⑪ The front end of the toilet is taken as the zero point, and the radar installation angle is 40 degrees. This angle is determined by the structure of Kemu toilet. The software design of this parameter is Yixing, and the actual test is verified to be Kemu, which is verified by Kemu test. This parameter is related to the installation angle of the radar, the material and thickness of the radar surface of the toilet, the size and processing accuracy of the shell, and the actual use environment of the module. The current test verifies that the shell is the 3D manual mold provided by Kemu combined with the test data of the toilet prototype. The final radar output shell combined with the final mass production toilet effect may change, and the final effect is subject to the actual product and the actual scene effect.

⑫ With the ground zero point, the radar is installed at 30 degrees. This angle is determined by the structure of Kemu toilet. The software design of this parameter is Yixing, and the actual test verification is Kemu, which is verified by Kemu test. This parameter is related to the installation angle of the radar, the material and thickness of the radar surface of the toilet, the size and processing accuracy of the shell, and the actual use environment of the module. The current test verifies that the shell is the 3D manual mold provided by Kemu combined with the test data of the toilet prototype. The final radar output shell combined with the final mass production toilet effect may change, and the final effect is subject to the actual product and the actual scene effect.

⑬ The parameter of "constant temperature and humidity" is related to the sealing design of the shell. The shell of the product is provided by Kemu Design Co., Ltd., which is not verified by Yixing, but verified and passed by Kemu.

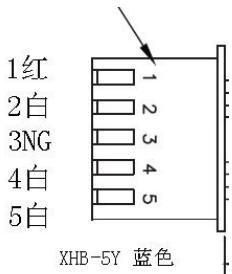
⑯ ISM : Radar operating frequency: 24~24.25GHz, transmitting power<20mW, meet ism requirements.

\*The notes on SRRC, EN55014 and FCC are as follows:

1. SRRC:Meet SRRC standard.
2. EN55014:conform to en55014 standard, verification test from kemu.

3. FCC:The design is FCC compliant.

## 4. Interface



Num.	Name	Description	Comment
1	VDD	DC+5V	Input
2	Data-Down	Host → Radar	TTL 0~5V
3	NC	NC	NC
4	Data-Up	Radar → Host	TTL 0~5V
5	GND	Ground	Input

## 5. Uplink communication protocol

### 1) Microwave uplink signal :

- Normal: high level;
- Human body induction detection:
- When the automatic flip function is on, it detects that a person enters the sensing range and outputs 200ms low level, and detects the movement of objects in the range in real time, and outputs 200ms low level in real time;
- When other people are not close to the cover automatically, the function will be closed automatically.

### 2) Gesture sensing detection :

- When the automatic flip function is turned off, if the cover is in the fully closed state, the gesture signal is detected and the low level of 300ms is output;
- When the automatic flip function and gesture sensing function are turned off, the human activity signal and gesture signal are not detected;
- When the upper cover of the microwave module is opened, a gesture signal is detected and a 50 Hz square wave (duty ratio of 1:1) is output for 300 ms. the uplink signal returns to normal for human body induction detection and departure signal detection;

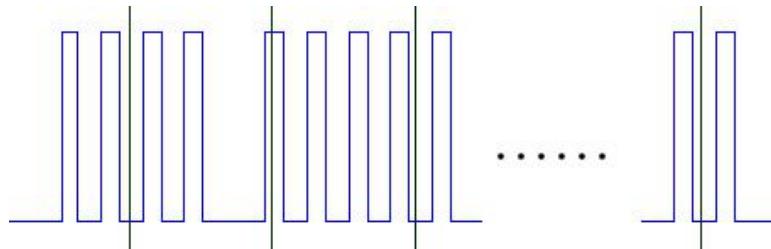
### 3) Departure signal detection :

- Whether the automatic flip function and gesture sensing function are on or not, the exit signal needs to be detected;
- When the human body is detected to be out of range, a 100Hz square wave (duty ratio of 1:1) is output, and the duration is 300ms. The uplink signal returns to normal for human body induction detection;

## 6. Downlink communication protocol

## 1) Content of communication protocol

- Data format:



- Content description:

- Data head: 4ms for high level and 8ms for low level;
- Interval code (high level): 480us;
- Data (low level): 0 -> 480us, 1 -> 1.44ms; 32 bit data in total;
- Data transmission sequence: first send data header, then interval code, and then send data code, each bit of data is followed by an interval code, and the data is sent in sequence from high to low;

- Frame format: start code + data + check sum, 4 bytes of data in total

- See data protocol for function and format;
- Check sum: 1 byte, starting code + function + cumulative sum of data. Only 8 bits are reserved if more than 8 bits;

- Data packet :

- Byte0: 0x4C
- Byte1: bit7->The sitting indication , ‘1’ is the sitting state and ‘0’ is the off seat state  
bit6->Automatic flip , ‘1’ is on, ‘0’ is off; it is on by default and restored by default after power failure  
bit5->air gesture1 is on, ‘0’ is off; it is on by default and restored by default after power failure  
bit4-2->reserved  
Bit1->Seat ring status, ‘1’ means that the seat ring is open, and the ‘0’ position seat ring is closed  
Bit0->Cover plate status, ‘1’ is the cover plate open, ‘0’ is the cover plate closed
- Byte2: Duty cycle, used to adjust the sensing range (5, 10, 14, 20, 28, 38, 50, 65, 80, 100)
- Byte3: Check sum (The cumulative sum of byte0-byte2, with 8 bits reserved)

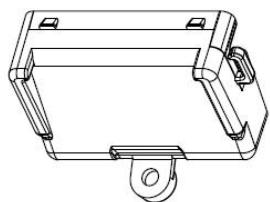
- Special command word:

After receiving this data packet, turn off the microwave induction, do not output the induction signal, and receive any other signal to resume work.

- Byte0 : 0x4C
- Byte1 : 0xB0
- Byte2 : 0xBF
- Byte3 : Check sum

## **7. PCBA structure size:**

Unit:: mm



## **8. Change record:**

1. V1.0 changes---initial Version
2. V1.1 changes---Name changes

## **OEM/Integrators Installation Manual**

Important Notice to OEM integrators 1. This module is limited to OEM installation ONLY. 2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b). 3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations 4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting, and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are compliant with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

### **Important Note**

notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to KOMOO that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

### **End Product Labeling**

When the module is installed in the host device, the FCC/IC label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: 2AYYZKMGR1T1R02" "Contains IC: 26995-KMGR1T1R02". The FCC ID/IC Certification Number can be used only when all FCC/IC compliance requirements are met.

## **Antenna**

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
- (2) The transmitter module may not be co-located with any other transmitter or antenna.

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC/IC authorization.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed.

## **Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

## **Federal Communication Commission Interference Statement**

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.

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 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## **List of applicable FCC rules**

This module has been tested and found to comply with part 15 requirements for Modular Approval.

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

**This device is intended only for OEM integrators under the following conditions: (For module device use)**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Radiation Exposure Statement**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

## **Industry Canada Statement**

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

## **Radiation Exposure Statement**

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

## **This device is intended only for OEM integrators under the following conditions: (For module device use)**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

## **Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

- 1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

### **IMPORTANT NOTE:**

In the event that these conditions cannot be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

### **NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

### **End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 26995-KMGR1T1R02".

### **Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 26995-KMGR1T1R02".

## **Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

## **Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

1. List of applicable FCC rules. KDB 996369 D03, Section 2.2

*Complies with FCC Part 15.245*

2. Summarize the specific operational use conditions. KDB 996369 D03, Section 2.3

*Integrated antenna*

3. Limited Module Procedures. KDB 996369 D03, Section 2.4

*Integrated antenna*

4. Trace antenna designs. KDB 996369 D03, Section 2.5

*Integrated antenna*

5. RF exposure considerations. KDB 996369 D03, Section 2.6

*It will be installed in their own products only, host model name: ZD74A2-SA-ASL305, SLi4000.*

6. Antennas. KDB 996369 D03, Section 2.7

*Integrated antenna*

7. Label and compliance information. KDB 996369 D03, Section 2.8

*Refer label file.*