User Manual

1 Brief introduction

New microwave sensor is used as human body detector for automatic control of closestool. The sensor adopts frequency modulated continuous wave (FMCW) technique, so has higher ranging accuracy and stronger adaptability compared with doppler sensor. The sensor can detect distance and motion state of ambient human body in real time, and send corresponding signal to master controller of closestool to control automatic opening/closing of cover & seat and auto-flushing.

2 Datasheet

2.1 Pin function definition

No.	Label	Color	Description	IN/OUT	Voltage
1	VCC	Red	Positive pole of power supply	IN	5V
2	D-OUT	Orange	Digital output	OUT	5V
3	GND	Black (Thick)	Negative pole of power supply	IN	GND
4	SDA	Brown	Data line of I2C communication	OUT/IN	3.3V
5	SCL	Yellow	Clock line of I2C	IN	3.3V

			communication		
6	A-OUT	Black (Thin)	Analog output	OUT	3.3V

2.2 Electrical parameters

Parameters	Min.	Typ.	Max.	Unit	Comments
Transmitting frequency	24.00	24.125	24.25	GHz	FMCW
Field strength		80		dBuV/m	measurement distance：1m
FM period	1.66	1.67	1.68	ms	Time of a scanning cycle
Working voltage	4.5	5	5.5	V	Long-time voltage
Limiting voltage	-12		12	V	Short-time voltage
Working current		80		mA	
Starting time	2	2.5	3	s	Time from powering-on to outputting stably
Detection angle		40		°	Horizontal direction
		90		°	Vertical derection
Detection range	0		250	cm	
Detection accuracy		10		cm	
Detection range of slight motion	0		70	cm	
Working temperature	-10		+65	℃	
Storage temperature	-40		+80	℃	

3 I2C communication protocol

Microwave sensor is always working as slave at any time.

3.1 Setting detection range

Master sends: 0x5C, 0x00, 0xXX

Comment:

0x5C--- Slave address, write operation

0x00--- Device address

0xXX--- Gear value

- <0x6C: near gear

- =0x6C: middle gear

- >0x6C: far gear

3.2 Querying preset gear value saved in sensor

Step1: Master sends 0x5C, 0x00

Comment:

0x5C--- Slave address, write operation

0x00--- Data address in device

Step2: Master sends 0x5D

Slave responds 0xXX

Comment:

0x5D--- Slave address, read operation

0xXX--- Depending on actual condition, e.g. 0x6C if middle gear

3.3 Querying distance values of series of gears saved in sensor

Step1: Master sends 0x5C, 0x0X

Comment:

0x5C--- Slave address, write operation

0x0X--- Device address for saving far/middle/near gears distance

values (as per the list in 3.8)

Step2: Master sends 0x5D

Slave responds 0xXX

Comment:

0x5D--- Slave address, read operation

0xXX--- Depending on actual condition

3.4 Querying software version of sensor

Step1: Master sends 0x5C, 0x05

Comment:

0x5C--- Slave address, write operation

0x05--- Data address in device

Step2: Master sends 0x5D

Slave responds 0xXX, 0xXX

Comment:

0x5D--- Slave address, read operation

0xXX, 0xXX --- Depending on actual condition

3.5 Setting distance value of far gear triggering

Master sends 0x5C, 0x01,0xXX

Comment:

0x5C--- Slave address, write operation

0x01--- Device address for saving far gear distance value

0xXX--- Distance value of far gear triggering

3.6 Setting distance value of middle gear triggering

Master sends 0x5C, 0x02,0xXX

Comment:

0x5C--- Slave address, write operation

0x02--- Device address for saving middle gear distance value

0xXX--- Distance value of middle gear triggering

3.7 Setting distance value of near gear triggering

Master sends 0x5C, 0x03,0xXX

Comment:

0x5C--- Slave address, write operation

0x03--- Device address for saving near gear distance value

0xXX--- Distance value of near gear triggering

3.8 Comparison table of device addresses and data contents

Slave address	Device address	Data content	Comment
0101 110 W/R	0x00	Gear value (far, middle or	One of the three: <0x6C, =0x6C or >0x6C

		near gear)	
0101 110 W/R	0x01	Distance value of far gear	In hexadecimal format
0101 110 W/R	0x02	Distance value of middle gear	Ditto
0101 110 W/R	0x03	Distance value of near gear	Ditto
0101 110 W/R	0x05	Software version	Requiring 2 bytes

4 Signal definition of digital output pin

Digital output pin remains low electric level. Once target object moves in the distance of the preset gear, the sensor output pulse signal with special frequency, which would keep till the object moves out of the distance range. The period of the pulse signal is 50 ± 1ms, and the duty ratio of high/low electric level is 50% with high electric level of 5V.

5 Certification information

5.1 FCC/IC certification

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.

Note: This product 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 product 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 product 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.

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

5.2 RSS certification

This device complies with Industry Canada licence-exempt RSS standard(s). 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 radioexempts 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.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

The module is limited to OEM installation ONLY

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

When the FCC identification number or ISED certification 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. This exterior label can use wording such as the following: "Contains FCC ID: N82-KOHLER036" and the information should be also contained in the devices' user manual.

This device complies with Industry Canada's RSS-310. Operation is subject to the condition that this device must not cause harmful interference and must accept

any interference, including interference that may cause undesired operation of the device.