Motion Detection Sensor

User Manual

Product Name	**Motion Detection Sensor**
Version	**0.1**
Date	**July 23, 2024**

Revision History

Version	Date	Description
0.1	July 23, 2024	Draft Version

Contents

1. Overview

This product is a module developed for effective human or object recognition using the built-in RADAR sensor. Built-in detectors that allow full autonomous operation of the device. Detector Designed to operate as a Doppler motion sensor from 61 to 61.5 GHz (60.5 to 61 GHz for the Japanese ISM band). The integrated detector in fully autonomous mode provides a digital output indicating movement and direction.
An integrated frequency divider with a kinetic Phase Locked Loop (PLL) provides a Voltage Controlled Oscillator. (VCO) frequency stabilization and Continuous Wave (CW) operation and Distance measurement is possible. This product can be selected in fully autonomous mode, semi-autonomous mode, and various modes through hardware preset pins.

Features

- 60GHz Radar IC with one transmitter and one receiver unit
- Antennas in Package (AiP) Radar IC
- Integrated controller for full autonomous mode
- Integrated motion detectors and direction of movement detectors
- CW and pulsed-CW mode of operation
- D-MIC
- 38.4MHz X-Tal

Applications

- Smart TV appliances

The Motion Detection Sensor Module specified is a product that is installed in the application after being mounted on the frame in actual use.

2. System Specification

2.1 Physical feature

Item	Specification
Product Name	Motion Detection Sensor
Communication method	61.25GHz(ISM BAND) RADAR(DOPPLER)
Dimension	35mm x 33mm x 1.1mm(T)
Weight	5.68g
Mounting Type	FFC Connector(24Pin Header), Screw(1Hole)
Function	Acceleration Sensor, MIC, Color Sensor, IR Receiver
Mutual of the person being certified	Samsung Electronics Co., Ltd.
Date of manufacture	Marked separately
Certification Number	-

2.2 Pin Description

Pin No.	Pin Name	Type	Function	Pin No.	Pin Name	Type	Function
1	IR_RX	I	IR Signal Receive	2	HOST_SPI_INT	I/O	MCU_SPI_INTERRUPT
3	RADAR_I2C_SCL	I/O	RADAR_I2C_SCL	4	RADAR_I2C_SDA	I/O	RADAR_I2C_SDA
5	HOST_WAKEUP	I/O	MCU_WAKEUP	6	HOST_NRESET	I/O	MCU _RESET
7	GND1	P	Digital Ground	8	N/A	-	-
9	N/A	-	-	10	N/A	-	-
11	N/A	-	-	12	GND2	P	Digital Ground
13	SENSOR_I2C_SDA	I/O	SENSOR_I2C_SDA	14	SENSOR_I2C_SCL	I/O	SENSOR_I2C_SCL
15	GND3	P	Digital Ground	16	LED_IND	P	RED LED Control
17	KEY_INPUT_1	I	TACT KEY INPUT	18	MIC_SWITCH	I/O	MIC_ Power Control
19	GND4	P	Digital Ground	20	MIC_DATA	I/O	MIC_I2C_SDA
21	MIC_CLK	I/O	MIC_I2C_CLK	22	GND5	P	Digital Ground
23	N/A	-	-	24	D_3.3_PW	P	INPUT 3.3V

2.3 Module Specification

2.3.1 Product Summary

Item	P/N	Description
Radar IC	BGT60LTR11AiP	- Low Power 60GHz Doppler Radar Sensor
MCU	XMC1302-Q024X006	- 8 kbytes on-chip ROM - 16 kbytes on-chip high-speed SRAM - up to 200 kbytes on-chip Flash program and data memory
LDO	TPS7A2015PDBVR	- 300-mA - Ultra-Low-Noise, Low-IQ LDO
X-TAL	X.ME. 112HJVF0038400000	- XME-SMD2520 - 38.400000MHz - 12 PF/60ohms
MIC	DOS3527B-R26-NXF1	- High SNR - High Sensitivity - Low output Impedance
LEVEL SHIFTER	AW39204AQNR	- 4-Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing
ACCELERATION SENSOR	BMA422	- Very low noise: down to 1.3 mg RMS in low power Mode - supply voltage, 1.62 V to 3.6 V - High-speed I2C interface
Color Sensor	VEML33293TA3OZ	-i2c interface -Detect R,G,B,W,IR colors
IR RECEIVER	ROM-SA138MFH-R	- Internal Pull-Up output. - Lead(Pb)-free component
SLIDE S/W	JS6901EM	- This specification is applied to low current circuit slide switch for electronic equipment.
TACT S/W	DHT-1187AC	-
RED-LED	LTST-C191KRKT	- lightweight makes them ideal for miniature applications.

2.3.2 Electrical Specification

Parameter	Description	Min.	Typ.	Max.	Units
Supply Voltage(3.3V)		2.97	-	3.63	V
Operating Current(3.3V)	RMS			60	mA

2.3.3 Environment Specification

Item	Specification
Storage Temperature	-25℃ to + 85℃
Operating Temperature	-10℃ to + 80℃
Humidity (Operational)	85%(50℃) relative humidity
Vibration (Operational)	5 Hz to 500 Hz sinusoidal, 1.0G
Drop	No damages after 75cm drop over concrete floor
ESD [Electrostatic discharge]	+/- 0.8 kV Human Body Model (JESD22-A114-B)

2.4 RF Specification

2.4.1 RF FE Characteristics

Parameter	Condition	Min.	Typ.	Max.	Units
Transmitted Frequency	Vtune = VCPOUTPLL	61	61.25	61.5	GHz
Spurious Emission < 40GHz				-42	dBm
Spurious Emission > 40GHz and < 57GHz				-20	dBm
Spurious Emission > 68GHz and < 78GHz				-20	dBm
Spurious Emission > 78GHz				-30	dBm

2.4.2 Antenna Characteristics

Parameter	Test Condition	Min.	Typ.	Max.	Units
Operating Frequency Range		60.5	61.25	61.5	GHz
Transmitter Antenna Gain	@ Freq = 61.25GHz		6		dBi
Receiver Antenna Gain	@ Freq = 61.25GHz		6		dBi
Horizontal -3Db Beamwidth	@ Freq = 61.25GHz		80		Deg
Vertical -3dB Beamwidth	@ Freq = 61.25GHz		80		Deg
Horizontal sidelobe suppression	@ Freq = 61.25GHz		12		dB
Vertical sidelobe suppression	@ Freq = 61.25GHz		12		dB
TX-RX Isolation	@ Freq = 61.25GHz		35		dB

3. Module Assembly

Be careful not to damage the module when you assemble or disassemble. If you press heavily RADAR IC, it may affect the overall performance.

※ Screw: CA+ B D:2.5 H:0.5 C:0.15; 1.7*2.5*3 CR+3 WH

4. FCC Information

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

(1) This Device may not cause harmful interface, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for CLASS B digital device, pursuant to Part 15 of 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 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 correct the interference by one or more of the following measures:

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

5. WARNING

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

"CAUTION : Exposure to Radio Frequency Radiation.
Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.

6. IC Information

This device complies with Industry Canada license-exempt RSS standard(s). Operation in 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.

Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence(s), Son utilisation est

soumise à Les deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

" CAUTION: Exposure to Radio Frequency Radiation.
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body. 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."

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