| | |
|---|---|
| Product Name. | USRR05MA |
| Product Type | 24GHz RADAR |
| Model Name | PX-USR-05MA |
| Project | TSWIN_MA_CAR_DVR |
| Customer Name | TSWIN_MA |

| Part No. | Customer Approved Signature |
|---|---|
| | |

## CONTENTS

## 1. DESCRIPTION

K-Band based motion detector. It is suitable for integration into small devices as sensing motion and distance measurement functions, and is applied to smart IoT devices and recording devices, such as smart control, automatic sensor lights, DVR, automatic door control switches and security systems.

- Movement
- Presence
- Velocity
- Distance

## 2. FEATURES

- Radar-based motion detector working in the 24GHz - ISM - Band
- Detection of direction and velocity of moving objects
- Integrated Low Noise Amplifier
- Extended temperature range from -40°C up to +85°C
- Very small outline dimensions
- Customized firmware to apply in different application

## 3. CERTIFICATES

- ISO9001
- ISO14001

## 4. RoHS-INFO

This product is compliant to the restriction of hazardous substances (RoHS - Directive (EU) 2015/863).

## 5. ELECTRICAL CHARTACTERISTICS

Typical values are measured at $T_A$ = 25 °C

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note/Condition |
|---|---|---|---|---|---|---|
| Operating Frequency | $f_{standard}$ | 24.150 | | 24.250 | GHz | ( *1) |
| Detection Frame rate | | | 250 | | ms | 4Hz, Idle for 230ms |
| Supply voltage | $V_{CC}$ | 3.0 | 3.3 | 3.6 | V | DCIN |
| Run mode current | $I_{CC}$ | 240 | 250 | 270 | mA | DCIN=3.3V |
| Average current | $I_{OP}$ | | 17 | 20 | mA | @3.3V,duty cycle: 4Hz |
| Antenna type | | 1*4 planar antenna | | | | 1T1R |
| Antenna FOV ( -10 dB ) | AZ | | 145 | | ° | Horizontal ( *design value ) |
| | EL | | 47 | | ° | Vertical ( *design value ) |
| Detection range | | 1 | | 20 | m | ( *2) |
| Detection Resolution | | | 50 | | cm | |
| Ambient temperature range | $T_A$ | -40 | — | +85 | °C | |
| Storage temperature range | $T_{STG}$ | -40 | — | +85 | °C | |

Remark *1: There are options in FW that can be set to US or UK Frequency band
( US - Frequency band : 24.125GHz ~ 24.250GHz, UK-Frequency band : 24.150GHz ~ 24.250GHz )

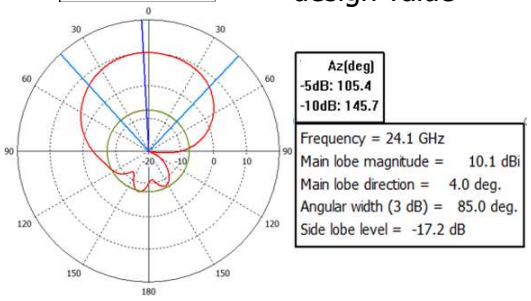
Remark *2: According to the radar test report, when the radar angle (AZ) is 0 degrees and the sensitivity is level 2, detect the distance of moving target, Human:1m ~ 6m, and cars (sedan): 1m ~ 10m.

| Parameter | Min. | Typical | Max. | Unit | Note/Condition |
|---|---|---|---|---|---|
| Tx power output | | 10 | 13 | dBm | |
| Bandwidth | | 100 | | MHz | |

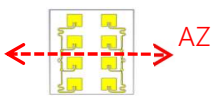
## 6. ANTENNA PATTERN

AZ

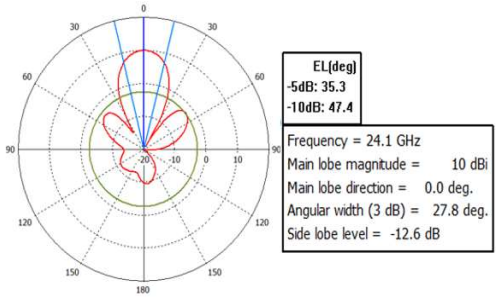
* design value



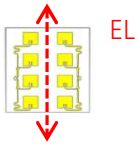

Theta / Degree vs. dB




EL




Theta / Degree vs. dB



## 7. INTERFACE

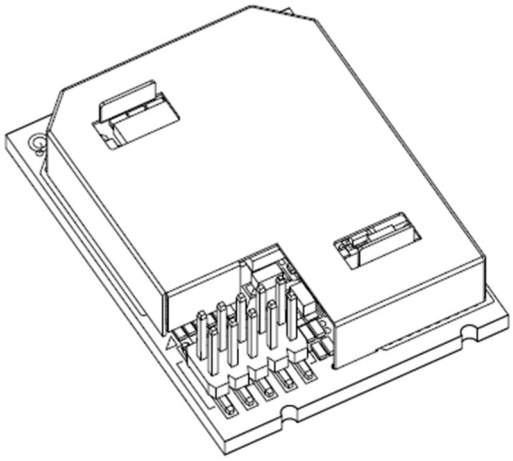
### 7.1 PIN DEFINITON

| PIN NO. | I/O | Front Radar | | Rear Radar | |
|---|---|---|---|---|---|
| | | In/Out | PIN definition | In/Out | PIN definition |
| 1 | I2C SDA (*2) | IN/OUT | I2C SDA | | N/C |
| 2 | I2C SCL (*2) | IN | I2C SCL | | N/C |
| 3 | GPIO_3 (*1) | IN | Radar Interrupt | OUT | RCAM_ON |
| 4 | GPIO_2 (*1) | IN | Parking Status | OUT | LED_ON |
| 5 | GPIO_0 (*1) | IN | ID(Low) | IN | ID(High) |
| 6 | GPIO_1 (*1) | OUT | DVR Interrupt | OUT | CAM_SEL |
| 7 | VCC | IN | 3.3V | IN | 3.3V |
| 8 | TX(LIN) | OUT | TX(LIN) | OUT | TX(LIN) |
| 9 | GND | IN | GND | IN | GND |
| 10 | RX(LIN) | IN | RX(LIN) | IN | RX(LIN) |

Remark *1 : GPIO supports High(2.6V tolerate 5V) / Low signal, Max fan out current 6mA.

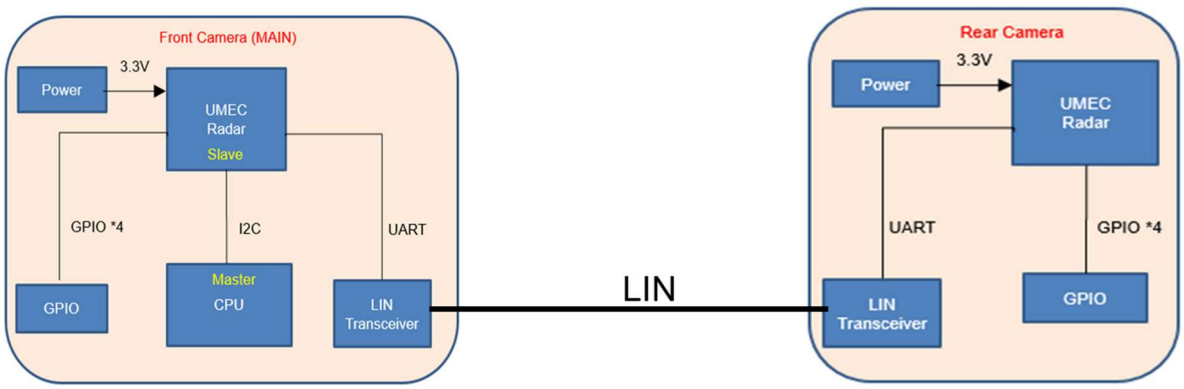
Remark *2 : The I2C master device needs to add a 2K ohm pull-up resistor.( I2C Voltage: 3.3V typical, Voltage range 1.8 ~ 5V)

### 7.2 MODULE CONNECTOR 3D OUTLINES



## 8. BLOCK DIAGRAM

MA Black Diagram +UMEC Radar Module Block Diagram




*I2C[SDA/SCL] *GPIO *UART[TX/RX]

1) DVR Interrupt
2) ID
3) Parking Status
4) Radar Interrupt

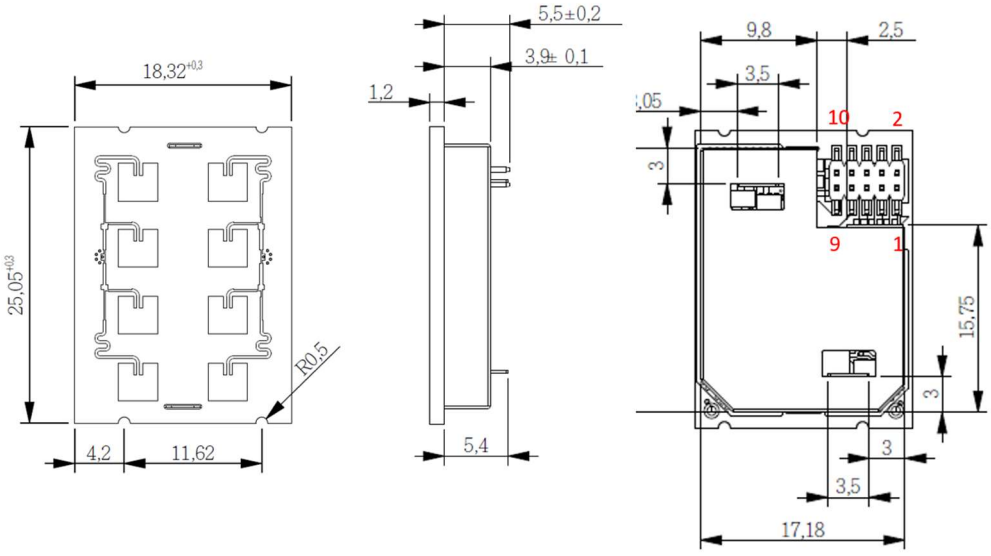
*Power[Vin/GND]

*UART[TX/RX] *GPIO

1) CAM_SEL
2) ID
3) LED_ON
4) RCAM_ON

*Power[Vin/GND]

## 9. OUTLINE DIMENSION



## 10. APPENDIXES

### 10.1 PACKING SPEC

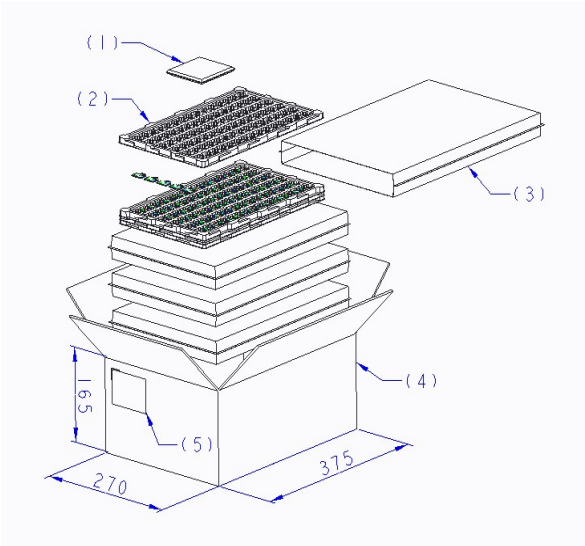



**Figure2. Schematic view of the box**

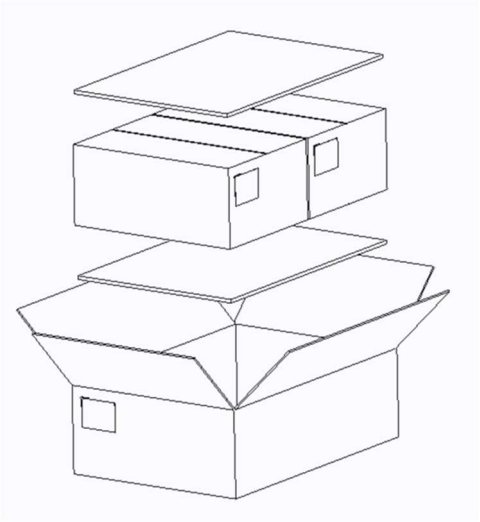


**Figure1. Schematic view of the carton**

- Packaging list:

| No | Packaged | Box | Bag | Tray | Module total Qty | Remarks |
|---|---|---|---|---|---|---|
| 1 | Carton | | | | | Figure 1 |
| 2 | Box | | | | | Figure 2 |
| 3 | Bag | | | | | Figure 3 |

- Packaging contains:

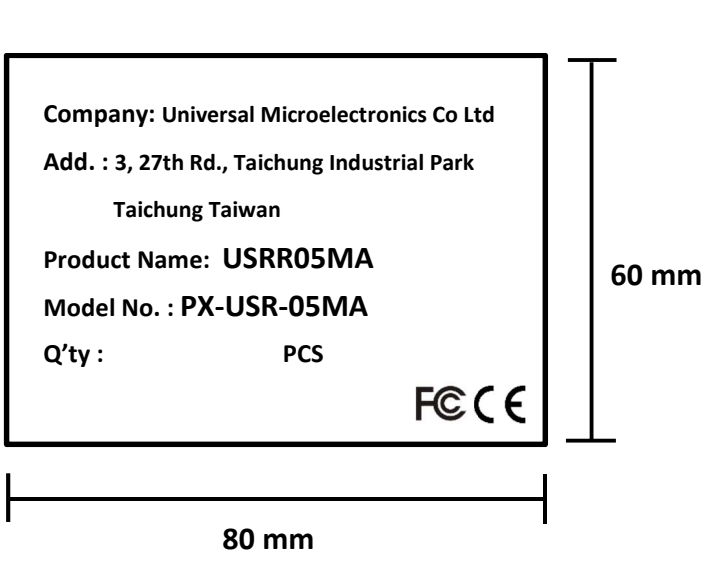



**Figure 2. Box Label Diagram**

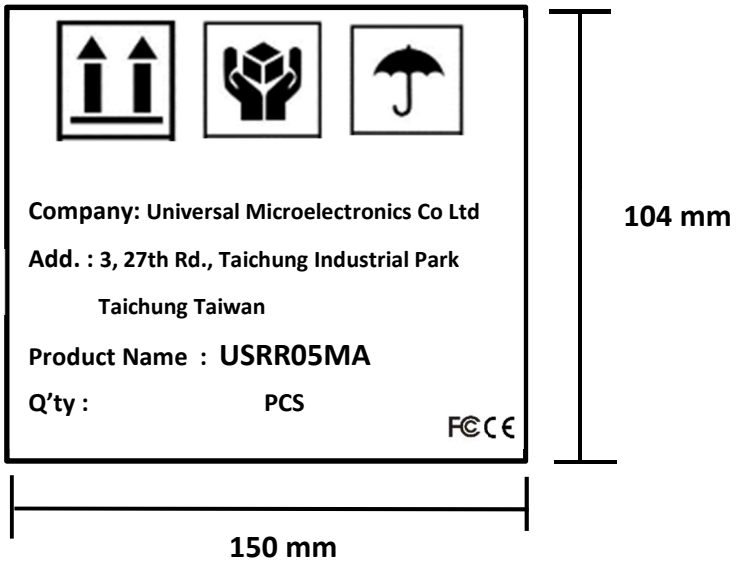



**Figure 1. Carton Label Diagram**

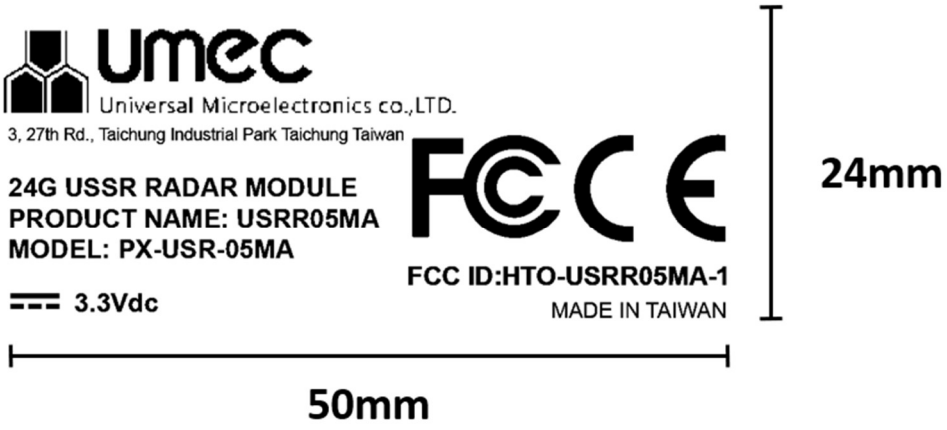



**Figure 3. Bag Label Diagram**

**Universal Microelectronics Co., Ltd.**
3,27TH RD.,Taichung Industrial Park. Taichung, Taiwan
TEL: +886-4-23590096
EMAIL: sales@umec.com.tw

FCC ID: HTO-USRR05MA-1

**EU DECLARATION OF CONFORMITY**

Hereby, UMEC(Universal Microelectronics Co., Ltd.)/ 3,27TH RD.,Taichung Industrial Park. Taichung, Taiwan declares that the PX-USR-05MA is in compliance with Directive 2014/53/EU.
The full text of the EU declaration of conformity is available at the following internet address:
www.umec.com.tw

**RF Exposure Warning – FCC**

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

**RF Exposure Warning – CE**

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

**Frequency Band & Max. Output Power**

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note/Condition |
|---|---|---|---|---|---|---|
| Operating Frequency | $f_{standard}$ | 24.150 | | 24.250 | GHz | ( *1) |
| Detection Frame rate | | | 250 | | ms | 4Hz, Idle for 230ms |
| Supply voltage | $V_{CC}$ | 3.0 | 3.3 | 3.6 | V | DCIN |
| Run mode current | $I_{CC}$ | 240 | 250 | 270 | mA | DCIN=3.3V |
| Average current | $I_{OP}$ | | 17 | 20 | mA | @3.3V,duty cycle: 4Hz |

Remark *1: There are options in FW that can be set to US or UK Frequency band
( US - Frequency band : 24.125GHz ~ 24.250GHz, UK-Frequency band : 24.150GHz ~ 24.250GHz )

**OEM Guide**

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated. such as 15B, emission in 15C, and RF exposure should re-examed in accordance with permissive change policy. Additional testing and certification may be necessary when multiple modules are used. Host vendors are required to use identical antenna listed in this given guide. Any modification should involve re-measurement on the pertinent rules, such as 15C emission, and RF exposure, in accordance with permissive change policy by FCC.

**USERS MANUAL OF THE END PRODUCT:**

OEM shall be noticed that Installation to the product should contain the warning complying with § 15.105. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

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.

In the user's manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated.

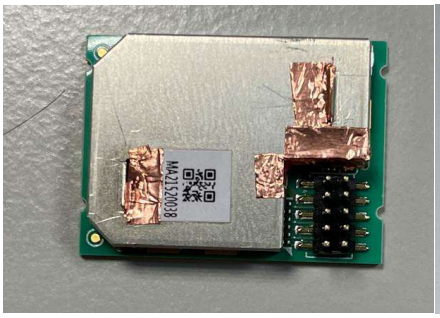
The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

**LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: HTO-USRR05MA-1 ".

**Cautions on Assembling**

This 05MA module is well shielded and with reinforcement of 0.1mm copper foil sticker at the positioning dowel and other potential leakage. Please do not **remove**, **drill hole** or **peel off** the copper foil when assembling module to product.



This 05MA module is designed and made by UMEC(Universal Microelectronics Co., Ltd.).

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