



## ***ARI UNI42 60GHz Radar Module***

### ***1. Introduction***

The UNI42 radar module from Augmented Radar Imaging is an easy-to-use board that contains 60-GHz mmWave Radar transceiver with patch antennas etched on PCB and acts as a Radar front-end module. It can be used in various applications where object detection, distance measurement, or speed measurement are required. The radar module is equipped with 12-pin and 32-pin connectors to interface external peripherals and host boards so that the users can customize for their specific applications.

### ***2. Hardware Features***

#### ***2.1. Features***

- Radar tuning frequency: 60-64GHz
- Number of Receivers: 4
- Number of Transmitter: 3
- Processing: MCU, FFT accelerator, DSP
- Memory: 1.75 MB
- Antenna: microstrip patch antenna
- Onboard temperature sensor

#### ***2.2. Interface Connectors***

There are two connectors on the UNI42 Radar module. They are used as interface to the host system and/or peripherals. The pins include power rails, SPI interface, I2C bus, and other miscellaneous signals.

| Pin Number | Description | Pin Number | Description |
|------------|-------------|------------|-------------|
| 1          | 3V3         | 2          | DRV_INT_L   |
| 3          | GND         | 4          | I2C_SCL     |
| 5          | I2C_SDA     | 6          | RESET_L     |
| 7          | SPI_CS_L    | 8          | SPI_CLK     |
| 9          | SPI_MISO    | 10         | SPI_MOSI    |
| 11         | 5V          | 12         | GND         |

Table 1: J1 12-pin Connector Pinout

| Pin Number | Description | Pin Number | Description  |
|------------|-------------|------------|--------------|
| 1          | 3V3         | 2          | 5V           |
| 3          | I2C_SDA     | 4          | 5V           |
| 5          | I2C_SCL     | 6          | GND          |
| 7          | SPI_CS_L    | 8          | TXD0         |
| 9          | GND         | 10         | RXD0         |
| 11         | RESET_L     | 12         | FAN_CTRL     |
| 13         | PWR_DWN_L   | 14         | GND          |
| 15         | DRV_INT_L   | 16         | SOP2         |
| 17         | 3V3         | 18         | EN_3V        |
| 19         | RADAR_NRST  | 20         | GND          |
| 21         | RXD4        | 22         | RADAR_GPIO_0 |
| 23         | NC          | 24         | NC           |
| 25         | NC          | 26         | SPI_CLK      |
| 27         | NC          | 28         | NC           |
| 29         | SPI_MISO    | 30         | NC           |
| 31         | SPI_MOSI    | 32         | NC           |

Table 2: J2 32-pin Connector Pinout

### 2.3. Onboard Antenna

The UNI42 Radar module has built-in microstrip patch antennas for both transmitters and receivers. The antennas are connected directly to the Radar transceiver chip via microstrip transmission lines, and the connections are permanent. **Per FCC regulation, the end user is prohibited from modifying any part of the antennas and the feed traces.**

## 3. System Integration Considerations

### 3.1. Hardware

Brief/general discussion on how end user could integrate this module with a host system, from HW perspective.

### 3.2. Software

The module is configured by the host through commands sent over the UART port. Please consult with the module manufacturer for details.

### 3.3. Test Modes

When the UNI42 Radar module is installed in a host, the host manufacturer may need to disable the module in order to perform certain tests such as FCC Part 15 Subpart B.

In order to disable the transmitter, the following command should be issued to the module over the UART port:

sensorStop

To return the transmitter to its normal operating state, the following command should be issued to the module over the UART port:

sensorStart

## **4. Regulatory Compliance**

### **4.1. Operational Considerations**

The UNI42 Radar module is designed to transmit at power level that meets the FCC EIRP peak power requirement. The host manufacturer does not have the ability to adjust the output power.

### **4.2. RF Exposure Considerations**

In accordance to the EN 62311 RF exposure test on the Radar transceiver, a minimum separation distance of 20 centimeters should be maintained between the user and the UNI42 Radar module during operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must be at least 20 cm from the user and must not be co-located or operating in conjunction with any other antenna or transmitter. The information in this guide may change without notice. The manufacturer assumes no responsibility for any errors that may appear in this guide

This equipment complies with the IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

Énoncé d'exposition aux rayonnements: Cet équipement est conforme aux limites d'exposition aux rayonnements ioniques RSS-102 Pour un environnement incontrôlé. Cet équipement doit être installé et utilisé avec un Distance minimale de 20 cm entre le radiateur et votre corps.

### **4.3. Label and Compliance Information**

The UNI42 Radar module is shipped with FCC/IC ID label permanently affixed to its RF shield. The label is shown below:

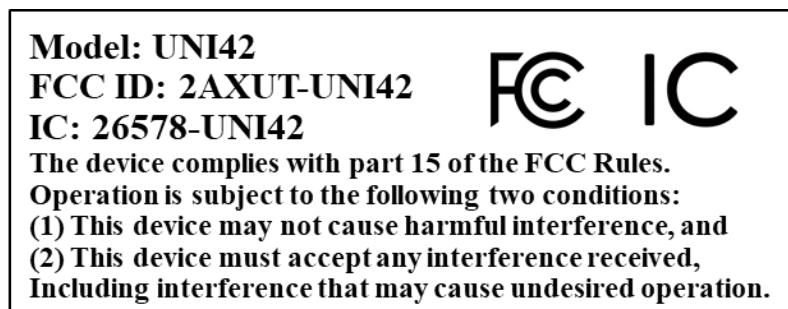


Figure 3: FCC/IC Label

### **4.4. Part 15 Subpart B Disclaimer**

The UNI42 Radar module is **only** authorized for FCC Part 15.255 and IC RSS-210 rules (intentional transmitter). While this module is also FCC Part 15b and/or IC ES-003 compliant (unintentional radiator), the end user must ensure the final host product still meets Part 15b and/or

IC ES-003 compliance through testing with the UNI42 module installed.

#### **4.5. FCC Statements**

per 47 CFR §15.105 Class B Device

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 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.

per 47 CFR §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.

per 47 CFR §15.21

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

#### **4.6. ISED Statements**

This device complies with Innovation, Science and Economic Development Canada's license-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.

Cet appareil est conforme aux flux RSS exemptés de licence d'Innovation, Science et Développement économique Canada. L'opération est soumise aux deux conditions suivantes:

- (1) Cet appareil ne doit pas provoquer d'interférence; et
- (2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

## ***OEM Warnings***

The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its FCC/ISED identification number:

(A) If using a permanently affixed label, the modular transmitter must be labeled with its own FCC/ISED identification number, and, 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. This exterior label can use wording such as the following: “Contains Transmitter Module **FCC ID: 2AXUT-UNI42; IC: 26578-UNI42.**” Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

L'émetteur modulaire doit être équipé d'une étiquette apposée en permanence ou doit être capable d'afficher électroniquement son numéro d'identification FCC / ISED:

(A) Si vous utilisez une étiquette fixée en permanence, le transmetteur modulaire doit être étiqueté avec son propre numéro d'identification FCC / ISED, et, si le numéro d'identification FCC n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut utiliser un libellé tel que le suivant: «Contient un module émetteur **FCC ID: 2AXUT-UNI42; IC: 26578-UNI42.** » Toute formulation similaire qui exprime le même sens peut être utilisée. Le bénéficiaire peut soit fournir une telle étiquette, dont un exemple doit être inclus dans la demande d'autorisation d'équipement, soit fournir des instructions adéquates avec le module expliquant cette exigence. Dans ce dernier cas, une copie de ces instructions doit être jointe à la demande d'autorisation d'équipement.