

FusionAir-MRT

User Manual and Operation Guide

Product Name: FusionAir-MRT

Model Name: FURM99

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1. Specification 功能規格

FusionAir-MRT supports WLAN 2.4G/5G (802.11 a / b / g / n), Bluetooth 5.0 and BLE, designed with PCB antenna in SMD form factor, ready to be placed onto a host PCB. The the overall design is compact, low power consumption, transmission distance, anti-interference ability, and low cost, designed specifically for IoT Device, embedded applications, can be widely applied in the field of short-range wireless communications for all occasions. Customers in the use of RF hardware design eliminates the difficulty, and product structure more flexible secondary development of space.

Specification	Description
Product Name	FusionAir-MRT
Model No.	FURM99
Package	SMD module
Size	50*40*2 mm
Antenna	PCB Antenna
CPU	ARM M33 @ 200MHz
Modem	WLAN 2.4G/5G (802.11 a / b / g / n) BT5.0 / BLE (Support Bluetooth Low Energy only , not support BR 、 EDR)
Frequency Range	BLE: 2402~2480MHz, WIFI 2.4G: 2412~2472MHz (CH1~CH13) WIFI 5G: 5180~5320MHz (CH36~CH64) 5500~5825MHz (CH100~CH165)
RAM	Embedded 512KB
Flash	Embedded 4MB
SPI Flash Default	128Mbit
Interface	UART/ SPI/I2C/GPIO/ADC/PWM
IO Port	48
Power (Typical Values)	Continuous Transmission: Average~71mA Peak~ 500mA
Security	WEP/WPA-PSK/WPA2-PSK

Power Supply

Voltage 3.0V ~ 3.6V (Typical 3.3V), Current >50mA

2. Application Guide 應用指引

FusionAir-MRT module comes with pre-program firmware, allowing easy setup and deployment on Fusion wireless network. Communication interface is via standard UART, SPI or I2C interfaces, with a well-defined and simple API.

When powered on, the module will automatically establish a secure connection to Fusion network. No commissioning procedure is needed, and security is hardware-base for robustness.

It offers BLE solution and conforms to the Bluetooth 5 core specification to enhance the throughput and security for various application fields.

- Internet of Things (IoT)
- Secure Payment
- Wearable Devices
- Home and Security
- Health and Fitness
- Beacons
- Industrial and Data Logger

3. Device Photo 裝置照片



Size : 54.0mm x 34.0mm x 4.95mm

4. Install Guide 安裝指引

4-1 Antenna Placement 天線擺放

For a Bluetooth wireless product, the antenna placement affects the whole system performance. The antenna requires free space to radiate the RF signals and it cannot be surrounded by the ground plane. Figure 4-1 illustrates a typical example of good and poor antenna placement of the FusionAir-MRT module on the main application board with the ground plane.

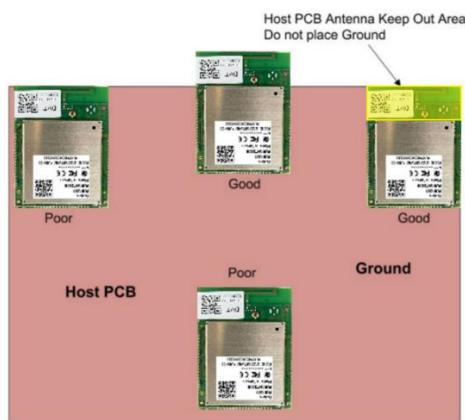
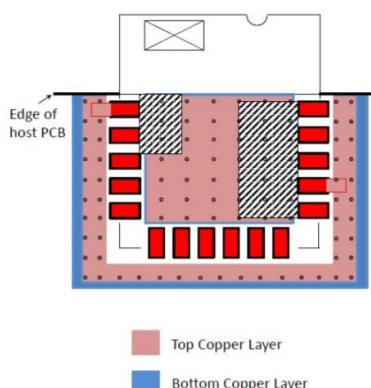


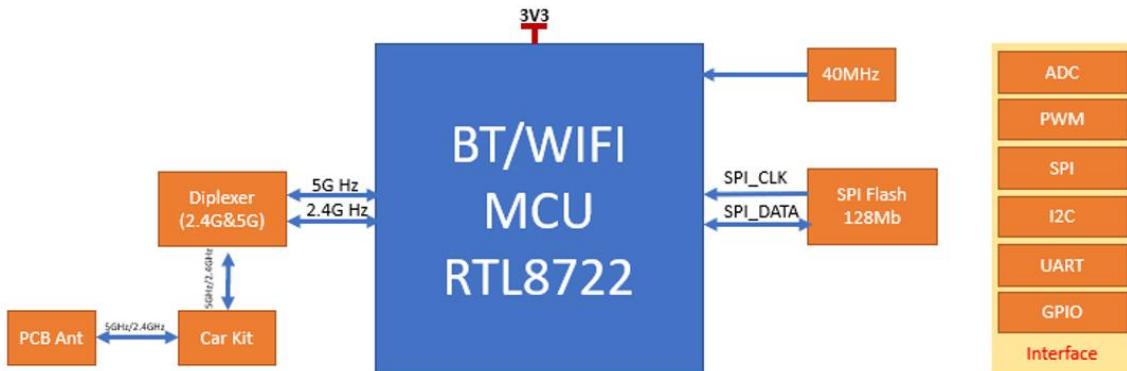
Figure 4-1

4-2 Host PCB Mounting Suggestion 主機 PCB 安裝建議

The area under the antenna must not contain any top, inner, or bottom copper layer while designing the host PCB. A low-impedance ground plane ensures the best radio performance (best range, low noise). The ground plane can be extended beyond the minimum recommended as required for the host PCB EMC noise reduction. For best range performance, keep all external metal away from the ceramic chip antenna by a minimum of 30 mm.



5. Block Diagram 方塊圖



6. Absolute Maximum Ratings 絕對最大額定值

Caution : The specifications in Table 1 define levels at which permanent damage to the device can occur. Function operation is not guaranteed under these conditions.

Operating at absolute maximum conditions for extended periods can adversely affect the long-term reliability of the device.

Parameter	Min	Max	Unit
Storage Temperature	-10	+40	°C
Storage Humidity (40°C)	20	60	%

6-1 Other conditions

- (1) Do not use or store modules in the corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are contained. Also, avoid exposure to moisture.
- (2) Store the modules where the temperature and relative humidity do not exceed -10 to 40 °C and 20 to 60%.
- (3) Assemble the modules within 6 months. Check the soldering ability in case of 6 months over.

7. Operating Conditions 運行條件

Parameter	Min	Typ	Max	Unit
Operating Temperature	-20	-	+55	°C
Operating Humidity (40°C)	-	-	85	%
Supply Voltage	3.0	3.3	3.6	Vdc

8. Standard Test Conditions 標準測試條件

The test for electrical specification shall be performed under following conditions. Otherwise this following conditions, not guaranteed this performance.

8-1 Ambient condition

Temperature	25 ± 5°C
Humidity	65 ± 5%

8-2 Power supply voltage

Input Power	Supply Voltage
VDD_3.3V	+3.3V ± 0.3V

9. Frequency and Antenna Gain 天線增益

BLE frequency and gain table

Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480
Gain (dBi)	1.23	1.47	1.69	2.21	2.50	2.74	2.57	2.57	2.56

Wifi 2.4GHz frequency and gain table

Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2482
Gain (dBi)	1.23	1.47	1.69	2.21	2.50	2.74	2.57	2.57	2.56

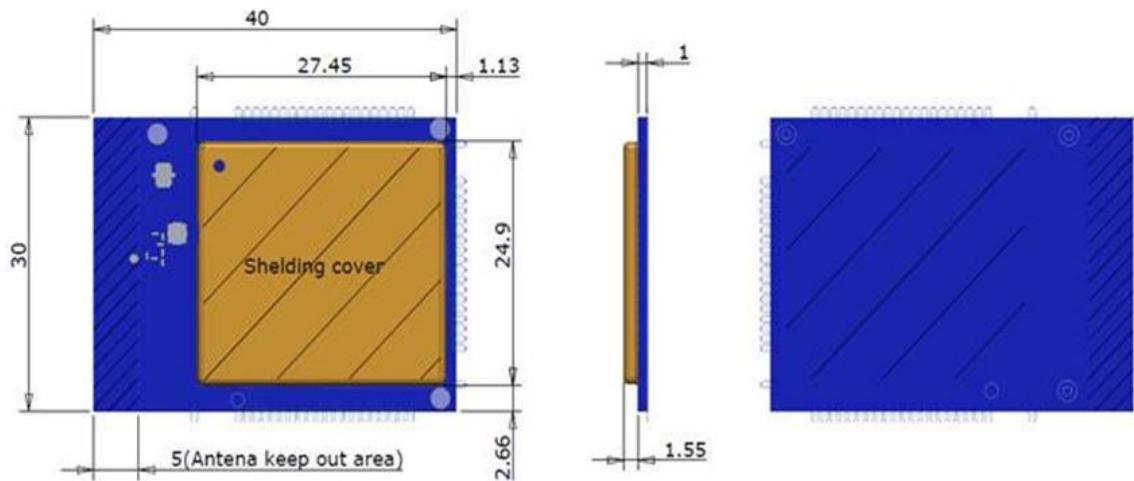
Wifi 5GHz frequency and gain table

Frequency (MHz)	5150	5160	5170	5180	5190	5200	5210	5220	5230	5240	5250	5260
Gain (dBi)	1.0436	1.2212	1.3473	1.3473	1.4732	0.8723	1.6918	1.6733	1.8427	2.1454	2.4853	2.5418
Frequency (MHz)	5270	5280	5290	5300	5310	5320	5330	5340	5350	5360	5370	5380
Gain (dBi)	2.2331	2.0122	1.7492	1.5123	1.1153	0.3098	0.8726	0.9197	1.0236	1.621	2.0915	2.5657
Frequency (MHz)	5390	5400	5410	5420	5430	5440	5450	5460	5470	5480	5490	5500
Gain (dBi)	2.6225	2.6148	2.7287	2.7172	1.97	1.8831	1.7363	2.0831	1.5965	1.1671	2.5396	2.1387
Frequency (MHz)	5510	5520	5530	5540	5550	5560	5570	5580	5590	5600	5610	5620
Gain (dBi)	2.425	2.4035	3.0289	2.9099	2.9193	2.8215	2.8567	2.7722	2.9674	2.1827	2.8483	2.8485
Frequency (MHz)	5630	5640	5650	5660	5670	5680	5690	5700	5710	5720	5730	5740
Gain (dBi)	2.4988	2.4926	2.1765	2.1592	1.6529	1.7645	1.1168	1.1114	0.8609	1.2621	0.673	0.9443
Frequency (MHz)	5750	5760	5770	5780	5790	5800	5810	5820	5830	5840	5850	
Gain (dBi)	1.3859	1.4287	1.8127	1.7551	2.1022	1.9271	1.8923	1.8612	1.8369	1.7862	1.7356	

10. Pin Description 引腳說明



11. Outline Drawing 外觀圖



12. Packing Information 包裝資訊



13. Regulatory Notices 認證與安全許可

13-1. FCC

FCC Statements:

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 of the device.

15.105(b)

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 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.

15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement:

- (1) This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- (2) This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

13-2 Taiwan

NCC 警語

根據 NCC LP0002 低功率射頻器材技術規範_章節 3.8.2：

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前述合法通信，指依電信管理法規定作業之無線電通信。

低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。使用本產品應避免影響附近雷達系統之操作。

FCC 符合性聲明

本裝置符合 FCC 規範 15 部分的要求，本裝置的操作符合下列二項條件：

- (1) 本裝置不會造成有害的干擾，並且
- (2) 本裝置必須承受外來的干擾，包括可能導致設備意外運行的干擾。

FCC 15.105(b)聲明

本設備已經通過測試並符合 FCC 規範第 15 部分所訂 B 類數位裝置的限制。這些限制標準用於確認電氣設備 不會對住屋內安裝的設備產生有害的干擾。本設備會產生、使用和輻射射頻能量，若未按照使用手冊中的指示安裝和使用，可能對無線電通訊造成不良干擾。但是不能保證不會在特定的安裝情況下產生干擾。如果本設備對無線電或電視收訊造成有害干擾(可經由關閉和打開設備來確定)，建議使用者嘗試通過以下一種或多種措施來消除干擾：

- 重新調整或擺放接收天線。
- 增加設備和接收器之間的距離。
- 將設備連接到與接收器連接的電路不同的電路上的插座。
- 向經銷商或有經驗的無線電/電視技術人員尋求幫助。

FCC 15.21 警示

請注意，未經負責製造商明確允許而對本裝置進行的任何變更或修改，可能會導致使用者操作設備的權限無效。

FCC 射頻輻射暴露聲明

本設備符合 FCC 為未受控制環境所提出的輻射曝露限制，使用者必須遵循下列操作指示

以達到 RF 曝露符合性的要求。

- (1) 該發射器不得與任何其他天線或發射器位於同一地點或與任何其他天線或發射器一起使用。
- (2) 對於身體佩戴操作，此設備已經過測試並符合 FCC 射頻暴露指南。與包含金屬的配件一起使用時，可能無法確保符合 FCC 射頻暴露指南。

13-3 IMPORTANT NOTE 重要提示

End Product Labeling 最終產品標籤

The device is labeled with its own FCC ID and NCC Certification Number. If the FCC ID and NCC Certification Number are not visible when this device is installed inside another device, then the outside of the device into which this device is installed must also display a label referring to the enclosed device.

該設備標有自己的 FCC ID 和 NCC 認證編號。如果將此設備安裝在另一台設備內部時看不到 FCC ID 和 NCC 認證編號，則安裝此設備的設備外部也必須貼有與所附設備相關的標籤。

OEM Responsibilities to comply with FCC and NCC Regulations

OEM 遵守 FCC 和 NCC 法規的責任

The device has been certified for integration into products.

The transmitter device must not be co-located or operating in conjunction with any other antenna or transmitter. As long as the condition above is met, further transmitter testing will not be required. However,

the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this device installed (for example, digital device emissions, PC peripheral requirements, etc.).

該設備已經過認證，可以集成到產品中。

發射器設備不得與任何其他天線或發射器位於同一地點或與任何其他天線或發射器一起使用。只要滿足上述條件，就不需要進一步的發射機測試。但是，

OEM 集成商仍負責測試其最終產品是否滿足安裝此設備所需的任何其他合規性要求（例如，數字設備輻射、PC 周邊設備要求等）。