

SR-MU921B Function Description

1. RFID fundamentals

Radio Frequency Identification (RFID) is a wireless communication technology. It can identify the object under test through radio signals, and the system does not need to contact with the object under test.

By inductively coupled electromagnetic fields, radio signals transmit information from electronic tags placed on the object under test, thereby automatically identifying it. The tag, which can be identified within a few meters, contains electronically stored information. Unlike bar codes, RFID tags do not have to be seen from the human eye, but can be identified from the object being identified.

2. SR-MU921B Overview

General Description :

SR-MU921B is a high performance UHF RFID Reader Module, which is designed with lower dissipation, high integrated RFID chip design, cost effective and small size. It can be widely applied in many RFID application systems such as logistics, access control, attendance system, anti-counterfeit and industrial production process control system etc.

Features :

- *Designed based on low dissipation (single +5V power supply) and high integration RF transceiver chip

- * Support EU 866~868MHz, US 902~928MHz working frequency (or Customized).

- *Support EPC global UHF class 1 gen2 / ISO18000-6C protocol RFID tags.

- *Support temperature sensor RFID tag, moisture Sensor RFID tag and some other sensor RFID tags.

- *Optimized multiple tags inventory algorithm, inventory tags speed is more than 100 per second

- *Support 4 external antennas with MCX or IPX socket

- *Support 4 GPIO ports GPIO, I/O Control for RS-485 port and indication I/O for Read Tag.

- *Support UART (3.3V TTL level) interface.

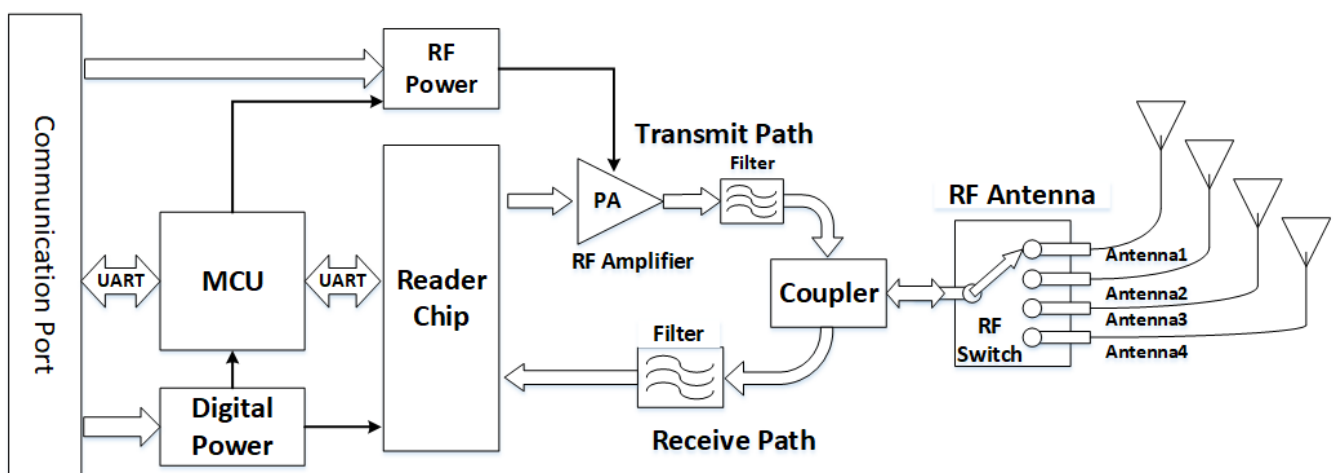
- *Support IAP firmware upgrading.

- *Provide free DEMO software and SDK for testing and further development.

3. SR-MU921B principle description

SR-MU921B is a high performance UHF RFID Reader Module, which is designed base on a high integrated RFID Reader chip, with low cost effective and small size. It meets EPC Gen2/ISO18000-6C tag protocol which is an international RFID standard.

The follow diagram shows the principle of the SR-MU921B.



There are several circuit unit, including Communication Port, Power unit, MCU unit, Reader Chip unit, Transmit Path unit, Receive Path unit, Coupler and RF Antenna unit.

- **Communication Port**

Communication Port provide the communication function between the reader module and the host from outside the reader module. There are two kind of communication port. One is a UART

serial port, the other is General Purpose Input/Output port (GPIO).

For the UART serial port, the reader module receives control commands from the host through the UART serial port; at the same time, it return back the data of the electronic tag that read by the reader module to host and so on.

For the GPIO port, the host control the reader module power up or power down, also reset the reader module by the GPIO port. The reader module can be triggered to start some operation or task through the GPIO port when it is in the status of input, and can also control the peripheral outside of reader module through the GPIO port when it is in the status of output.

● **Power unit**

The Power Unit have two part of power. One of the power provide the work energy for the digital circuit, including the Microcontroller Unit (MCU) and the Reader Chip Unit; the other of the power provide the work energy for the RF transmit circuit, including the RF Amplifier and RF Switch circuit and so on.

The host outside can power up or shut down the Digital Power through the GPIO port from the Communication Port.

The RF Power is control on or shut down by the MCU depend on the RF signal need to be transmitted or not.

- **MCU unit**

MCU unit base on a High-performant Cortex-M3 microcontroller, which run some software module to support the function of Reader Module, including Communication process, Tag protocol flow process, Tag receive data process, RF power control and Antenna control and so on.

Communication process are communication with two side unit, one is communication with Host outside of Reader Module, and the other is communication with the Reader Chip unit.

Tag protocol flow process the flow of tag operation which base on ISO-18000-6C protocol.

Tag receive data process get the tag data received from the tags during the flow of tag operation.

RF power control is used to control the RF power when host needs.

Antenna control send the GPIO signal to switch the antenna channel according the Host command.

- **Reader Chip unit**

Reader Chip unit base on a High-performant and low cost RFID Reader Chip. There are modulation circuit, demodulation circuit,

LNA, PLL circuit, embedded MCU circuit and UART port.

The RFID Reader Chip is in charge of generating the based Tag instruction that was modulated into a Transmit Path unit and demodulate the tag response data from these electronic tags.

MCU unit send a tag operation command to the embedded MCU of Reader Chip, then the modulation circuit and PLL of Reader Chip generate the RF Tag instruction for the Transmit Path unit to send a RF modulate wave to an electronic tag.

Reader Chip unit receive the tag response data from the electronic tag through the Receive Path. LNA amplifies the tag signal; the demodulation circuit demodulated the RF tag signal into a digital signal and decode it into tag data; the embedded MCU package the tag data, then return it back to the MCU unit for further process.

● **Transmit Path unit**

Transmit Path unit is a transmitted channel to amplify and transmit the RF signal which was modulated by a tag command from Reader Chip unit, including a power amplifier and a filter circuit.

- **Receive Path unit**

Receive Path unit receive the response RF signal from electronic tag. There are receive filter, impedance transformer circuit and so on.

- **Coupler unit**

The main function of couplers unit is to separate RF signals between transmit and receive signal. On the one hand, it pass the transmit RF signal to RF Antenna unit, on the other hand, it pass the receive RF signal to Receive Path unit.

- **RF Antenna unit**

The main function of RF Antenna unit is transmit the RF signal from the PA of Transmit Path unit and receive the tag response RF signal to Receive Path unit.

FCC Statement

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 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 important announcement

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following" Contains FCC ID:

2AW6BSR-MU921B "

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

Not applicable

2.7 Antennas

This radio transmitter **2AW6BSR-MU921B** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Model	Type	Connector	Peak gain (dBi)				
			902 - 928 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz
902 -928 MHz	External antenna	/	0dBi	/	/	/	/

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AW6BSR-MU921B".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.