

RFID MODULE

Mifare Read/Write Module

RFM015B

User Manual

Version 2.3

Apr 2007

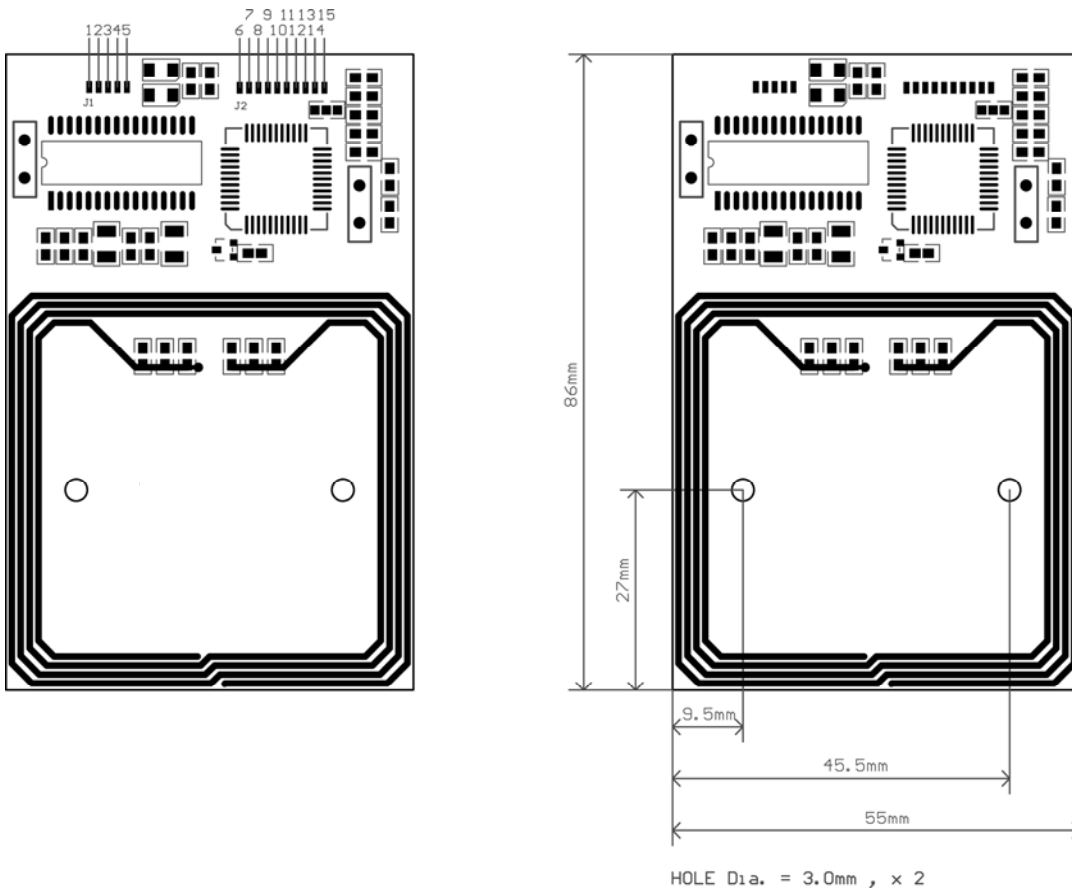
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1. MAIN FEATURES

- Tag supported: Mifare 1K, Mifare 4K, Mifare UltraLight
- Auto detecting tag
- Built-in antenna
- RS232 interface, baud rate 9,600 ~ 115,200 bps
- DC4.5V to DC5.5V VDD operating
- Operating distance: Up to 80mm, depending on tag
- Storage temperature: -40 °C ~ +85 °C
- Operating temperature: -20 °C ~ +70 °C
- Dimension: 85 × 55 × 7 mm
- Two LEDs, green led is auto light when tag in detection range, red led is controlled by host
- The PA1 pin is low level indicating tag in detection range, and high level indicating tag out

2. PINNING INFORMATION



PIN	SYMBOL	TYPE	DESCRIPTION
1	TXD	Output	Serial output port
2	RXD	Input	Serial input port
3	VCC	PWR	Power Supply
4	GND	PWR	Ground
5	GND	PWR	Ground
6	VCC	PWR	Power Supply
7	PA0	Output	
8	PA1	Output	Tag detect signal:low level indicating tag in detection range, high level indicating tag out
9	PA2	Output	
10	PA3	Output	
11	PA4	Output	
12	PA5	Output	
13	PA6	Output	
14	PA7	Output	
15	GND	PWR	Ground

3. BAUD RATE SETTING

R6 & R7 are two 0 ohm resistances assembled on the bottom layer of module, are used for config baud rate as follows sheet

	R6	R7	Baud rate bps
Assembled	no	no	9,600
	yes	no	19,200
	no	yes	57,600
	yes	yes	115,200

4. COMMUNICATION PROTOCOL

4-1. Communication Setting

The communication protocol is byte oriented. Both sending and receiving bytes are in hexadecimal format. The communication parameters are as follows,

Baud rate: 9,600 ~ 115,200 bps
Data: 8 bits
Stop: 1 bit
Parity: None
Flow control: None

4-2. Communication Format

Host to Reader:

Header	Len	Command	Data	Checksum
--------	-----	---------	------	----------

Header: Communication header, 1 byte.
From host to module: 0xBA.
Len: Byte length counting from Command to Checksum inclusively, 1 byte.
Command: Command, 1 byte.
Data: Data, variable length depends on the command type.
Checksum: XOR result from Header to Data inclusively, 1 byte.

Reader to Host:

Header	Len	Command	Status	Data	Checksum
--------	-----	---------	--------	------	----------

Header: Communication header, 1 byte.
From module to host: 0xBD.
Len: Byte length counting from Command to Checksum inclusively, 1 byte.
Command: Command, 1 byte.
Status: Command status, 1 byte
Data: Data, variable length depends on the command type.
Checksum: XOR result from Header to Data inclusively, 1 byte.

4-3. Command Overview

Command	Description
0x01	Select Mifare card
0x02	Login to a sector
0x03	Read a data block
0x04	Write a data block
0x05	Read a value block
0x06	Write a value block
0x07	Write master key (key A)
0x08	Increment value
0x09	Decrement value
0x0A	Copy value
0x10	Read a data page (UltraLight)
0x11	Write a data page (UltraLight)
0x40	Control PA status
0xFF	Reset

Status Overview

Status	Description
0x00	Operation success
0x01	No tag
0x02	Login success
0x03	Login fail
0x04	Read fail
0x05	Write fail
0x06	Unable to read after write
0x0A	Collision occur
0x0D	Not authenticate
0x0E	Not a value block
0xF0	Checksum error
0xF1	Command code error

4-4. Command List

4-4-1. Select Mifare card

0xBA	Len	0x01	Checksum
------	-----	------	----------

Return:

0xBD	Len	0x01	Status	Serial num	Type	Checksum
------	-----	------	--------	------------	------	----------

Status: 0x00: Operation success
0x01: No tag
0x0A: Collision occur
0xF0: Checksum error

Serial num: Serial number of the card detected if the operation is success, 4 bytes for Mifare Standard & Mifare Pro(X), 7 bytes for Mifare UltraLight & Mifare DesFire

Type: 0x01: Mifare Standard 1K card
0x02: Mifare Pro card
0x03: Mifare UltraLight card
0x04: Mifare Standard 4K card
0x05: Mifare ProX card
0x06: Mifare DesFire card

4-4-2. Login to a sector

0xBA	Len	0x02	Sector	Type	Key	Checksum
------	-----	------	--------	------	-----	----------

Sector: Sector need to login

Type: Key type (0xAA: authenticate with KeyA, 0xBB: authenticate with KeyB)

Key: Password, 6 bytes

Return:

0xBD	Len	0x02	Status	Checksum
------	-----	------	--------	----------

Status: 0x02: Login success
0x01: No tag
0x03: Login fail
0xF0: Checksum error

4-4-3. Read a data block

0xBA	Len	0x03	Block	Checksum
------	-----	------	-------	----------

Block: The block number to be read, 1 byte

Return:

0xBD	Len	0x03	Status	Data	Checksum
------	-----	------	--------	------	----------

Status: 0x00: Operation success
0x01: No tag
0x04: Read fail
0x0D: Not authenticate
0xF0: Checksum error

Data: Block data returned if operation is success, 16 bytes.

4-4-4. Write a data block

0xBA	Len	0x04	Block	Data	Checksum
------	-----	------	-------	------	----------

Block: The block number to be written, 1 byte.

Data: The data to write, 16 bytes.

Return:

0xBD	Len	0x04	Status	Data	Checksum
------	-----	------	--------	------	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x06: Unable to read after write

0x0D: Not authenticate

0xF0: Checksum error

Data: Block data written if operation is success, 16 bytes.

4-4-5. Read a value block

0xBA	Len	0x05	Block	Checksum
------	-----	------	-------	----------

Block: The block number to be read, 1 byte.

Return:

0xBD	Len	0x05	Status	Value	Checksum
------	-----	------	--------	-------	----------

Status: 0x00: Operation success

0x01: No tag

0x04: Read fail

0x0D: Not authenticate

0x0E: Not a value block

0xF0: Checksum error

Value: Value returned if the operation is success, 4 bytes.

4-4-6. Write a value block

0xBA	Len	0x06	Block	Value	Checksum
------	-----	------	-------	-------	----------

Block: The block number to be written, 1 byte.

Value: The value to write, 4 bytes.

Return:

0xBD	Len	0x06	Status	Value	Checksum
------	-----	------	--------	-------	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x06: Unable to read after write

0x0D: Not authenticate

0xF0: Checksum error

Value: Value written if the operation is success, 4 bytes.

4-4-7. Write master key (key A)

0xBA	Len	0x07	Sector	Key	Checksum
------	-----	------	--------	-----	----------

Sector: The sector number to be written, 1 byte.

Key: Authentication key, 6 bytes

Return:

0xBD	Len	0x07	Status	Key	Checksum
------	-----	------	--------	-----	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x0D: Not authenticate

0xF0: Checksum error

Key: Authentication key written if the operation is success, 6 bytes.

4-4-8. Increment value

0xBA	Len	0x08	Block	Value	Checksum
------	-----	------	-------	-------	----------

Block: The block number to be increased, 1 byte.

Value: The value to be increased by, 4 bytes.

Return:

0xBD	Len	0x08	Status	Value	Checksum
------	-----	------	--------	-------	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x06: Unable to read after write

0x0D: Not authenticate

0x0E: Not a value block

0xF0: Checksum error

Value: The value after increment if the operation is success, 4 bytes

4-4-9. Decrement value

0xBA	Len	0x09	Block	Value	Checksum
------	-----	------	-------	-------	----------

Block: The block number to be decreased, 1 byte

Value: The value to be decreased by, 4 bytes

Return:

0xBD	Len	0x09	Status	Value	Checksum
------	-----	------	--------	-------	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x06: Unable to read after write

0x0D: Not authenticate

0x0E: Not a value block

0xF0: Checksum error

Value: The value after decrement if the operation is success, 4 bytes

4-4-10. Copy value

0xBA	Len	0x0A	Source	Destination	Checksum
------	-----	------	--------	-------------	----------

Source: The source block copy from, 1 byte

Destination: The destination copy to, 1 byte

The source and destination must in the same sector

Return:

0xBD	Len	0x0A	Status	Value	Checksum
------	-----	------	--------	-------	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x06: Unable to read after write

0x0D: Not authenticate

0x0E: Not a value block (Source)

0xF0: Checksum error

Value: The value after copy if the operation is success, 4 bytes

4-4-11. Read a data page (UltraLight)

0xBA	Len	0x10	Page	Checksum
------	-----	------	------	----------

Page: The page number to be read, 1 byte

Return:

0xBD	Len	0x10	Status	Data	Checksum
------	-----	------	--------	------	----------

Status: 0x00: Operation success

0x01: No tag

0x04: Read fail

0xF0: Checksum error

Data: Block data returned if operation is success, 4 bytes.

4-4-12. Write a data Page (UltraLight)

0xBA	Len	0x11	Page	Data	Checksum
------	-----	------	------	------	----------

Page: The page number to be written, 1 byte.

Data: The data to write, 4 bytes.

Return:

0xBD	Len	0x11	Status	Data	Checksum
------	-----	------	--------	------	----------

Status: 0x00: Operation success

0x01: No tag

0x05: Write fail

0x06: Unable to read after write

0xF0: Checksum error

Data: page data written if operation is success, 4 bytes.

4-4-13. Control PA status

0xBA	Len	0x40	Mask	Value	Checksum
------	-----	------	------	-------	----------

Mask: PAx which to change, bit to bit

Value: The status level

Return:

0xBD	Len	0x40	Status	Checksum
------	-----	------	--------	----------

Status: 0x00: Operation success
0xF0: Checksum error

Example: If you want PA3 to go low, you can send
0xBA, 0x04, 0x40, 0x08, 0x00, 0xF6

4-4-14. Reset

0xBA	Len	0xFF	Checksum
------	-----	------	----------

No return