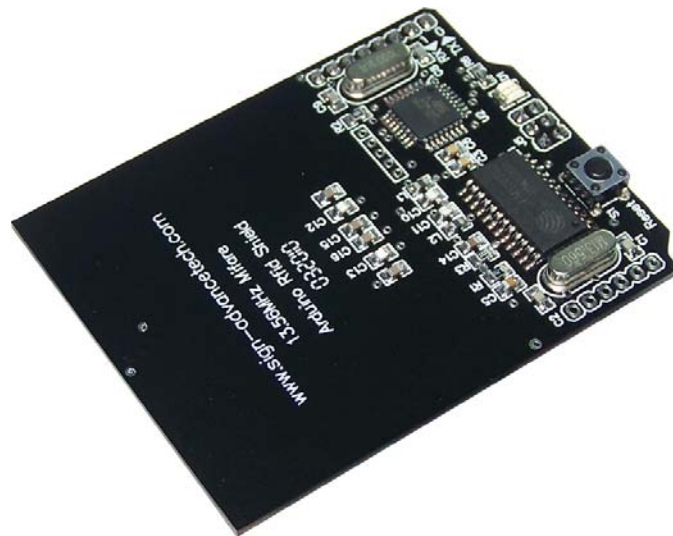


Arduino 13.56MHz Rfid Shields
User's Manual

UART Interface



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HARDWARE SELECT INTERFACE:

- The communication protocol is byte oriented. Both sending and receiving bytes are in hexadecimal format. The communication parameters are as follows,
 - Baud rate: 9600 bps Fix
 - Data: 8 bits
 - Stop: 1 bit
 - Parity: None
 - Flow control: None

DC CHARACTERISTIC:

Parameter	Min	Type	Max	Units
Power supply	4.5	5.0	5.5	V
Current consumption	12	50	70	mA
Module start up time	250	500	550	ms
Card response			200	ms
Operating temperature	-25		+72	°C
Storage temperature	-40		+125	°C

UART COMMUNICATION FORMAT: (Protocols of Host to Reader)

- Data package format Host to Reader:

Start header	length	Command	Data	Checksum
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- Start header: Communication header From host to module: 0xBA (1 byte)
Follow to distinguish start header. But Command length will NOT increase.
- Length: Number of bytes from Command length to the last byte of data (1 byte.)
- Command: Command code of this package (1 byte.)
- Data: Parameters and the other data, maybe empty. Variable length depends on the command type.
- Checksum: XOR results from Command length byte to the last byte of data (1 byte.)

UART COMMUNICATION FORMAT: (Protocols of Reader to Host)

- Data package format Reader to Host:

Start header	length	Command	Status	Data	Checksum
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- Start header: Communication header From host to module: 0xBD (1 byte)
Follow to distinguish start header. But Command length will NOT increase.
- Length: Number of bytes from Command length to the last byte of data (1 byte.)
- Command: Command code of this package (1 byte.)
- Status: Command code status (1 byte.)
- Data: Parameters and the other data, maybe empty. Variable length depends on the command type.
- Checksum: XOR results from Command length byte to the last byte of data (1 byte.)

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LIST OF COMMAND OVERVIEW:

Command Name	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 Card)
0x11	Write a data page (UltraLight Card)
0xA0	Control the led
0xFF	Reset

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UART COMMAND LIST PROTOCOLS:

COMMAND SELECT A Mifare CARD:

Data package format Host to Reader:

0xBA	length	0x01	Checksum
------	--------	------	----------

Data package format Host to Reader:

0xBD	length	0x01	Status	Serial No.	Card Type	Checksum
------	--------	------	--------	------------	-----------	----------

Status	0x00:	Operations successfully
	0x01:	No Tag
	0xF0:	Checksum Error (UART only)
Serial Number		Serial number of the card detected if the operation is success, 4 bytes for Mifare Standard, 7 bytes for Mifare UltraLight.
Card Type	0x01:	Standard Mifare 1K Card
	0x02:	Not supported
	0x03:	Mifare UltraLight Card
	0x04:	Standard Mifare 4K Card
	0x05:	Not supported
	0x06:	Not supported
	0x07:	Standard Mifare Mini 320Byte Card

COMMAND LOGIN TO A SECTER:

Data package format Host to Reader:

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

Sector:	Sector need to login
Type:	Key type (0xAA: authenticate with KeyA, 0xBB: authenticate with KeyB)
Key:	Authenticate key, 6 bytes

Data package format Reader to Host:

0xBD	length	0x02	Status	Checksum
------	--------	------	--------	----------

Status	0x00:	Operations successfully
	0x01:	No Tag
	0x02:	Login to a sector fails
	0xF0:	Checksum Error (UART only)

COMMAND READ A DATA BLOCK:

Data package format Host to Reader:

0xBA	length	0x03	Block	Checksum
------	--------	------	-------	----------

Block:	Block number to read, 1 byte
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Data package format Reader to Host:

0xBD	length	0x03	Status	Data	Checksum
------	--------	------	--------	------	----------

Status:	0x00:	Operations successfully
	0x01:	No Tag
	0x04:	Read a data block fail
	0xF0:	Checksum Error (UART only)
Data:		Data return if operation is success, 16 bytes.

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COMMAND WRITE A DATA BLOCK:

Data package format Host to Reader:

0xBA	length	0x04	Block	Data	Checksum
------	--------	------	-------	------	----------

Block: Block number to write, 1 byte
Data: Data to write, 16 byte

Data package format Reader to Host:

0xBD	length	0x04	Status	Data	Checksum
------	--------	------	--------	------	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x05: Write a data block fail
0xF0: Checksum Error (UART only)
Data: Data return if operation is success, 16 bytes.

COMMAND READ A VALUE BLOCK:

Data package format Host to Reader:

0xBA	length	0x05	Block	Checksum
------	--------	------	-------	----------

Block: Block number to read, 1 byte

Data package format Reader to Host:

0xBD	length	0x05	Status	Value	Checksum
------	--------	------	--------	-------	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x04: Read a value block fail (write fail)
0x07: Not a value block
0xF0: Checksum Error (UART only)
Value: Value return if operation is success, 4 bytes.

COMMAND WRITE A VALUE BLOCK:

Data package format Host to Reader:

0xBA	length	0x06	Block	Value	Checksum
------	--------	------	-------	-------	----------

Block: Block number to write, 1 byte
Value: Value to write, 4 byte

Data package format Reader to Host:

0xBD	length	0x06	Status	Value	Checksum
------	--------	------	--------	-------	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x05: Write a value block fail (write fail)
0x07: Not a value block
0xF0: Checksum Error (UART only)
Value: Value return if operation is success, 4 bytes.

COMMANDS WRITE A MASTER KEY (KEY A TYPE):

Data package format Host to Reader:

0xBA	length	0x37	Sector	Key	Checksum
------	--------	------	--------	-----	----------

Block: Sector number to write, 1 byte
Key: Authentication key, 6 byte

Data package format Reader to Host:

0xBD	length	0x07	Status	Key	Checksum
------	--------	------	--------	-----	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x05: Authentication key fail (write fail)
0xF0: Checksum Error (UART only)
Key: Authentication key return if operation is success, 6 bytes.

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COMMAND INCREMENT A VALUE BLOCK:

Data package format Host to Reader:

0xBA	length	0x08	Block	Value	Checksum
------	--------	------	-------	-------	----------

Block: Block number to increase, 1 byte
Data: Value to increase, 4 byte

Data package format Reader to Host:

0xBD	length	0x08	Status	Value	Checksum
------	--------	------	--------	-------	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x05: Increase a value block fail (write fail)
0x07: Not a value block
0xF0: Checksum Error (UART only)
Value: Value return if operation is success, 4 bytes.

COMMAND DECREMENT A VALUE BLOCK:

Data package format Host to Reader:

0xBA	length	0x09	Block	Value	Checksum
------	--------	------	-------	-------	----------

Block: Block number to decrease, 1 byte
Data: Value to decrease, 4 byte

Data package format Reader to Host:

0xBD	length	0x09	Status	Value	Checksum
------	--------	------	--------	-------	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x05: decrease a value block fail (write fail)
0x07: Not a value block
0xF0: Checksum Error (UART only)
Value: Value return if operation is success, 4 bytes.

COMMAND COPY A VALUE BLOCK:

Data package format Host to Reader:

0xBA	length	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

Data package format Reader to Host:

0xBD	length	0x0A	Status	Value	Checksum
------	--------	------	--------	-------	----------

Status: 0x00: Operations successfully
0x01: No Tag
0x05: Copy a value block fail (write fail)
0x07: Not a value block (source)
0xF0: Checksum Error (UART only)
Value: The value after copy returns if operation is success, 4 bytes.

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COMMAND READ A DATA PAGE (Mifare UltraLight):

Data package format Host to Reader:

0xBA	length	0x10	Page	Checksum
------	--------	------	------	----------

Block: Page number to read, 1 byte

Data package format Reader to Host:

0xBD	length	0x10	Status	Data	Checksum
------	--------	------	--------	------	----------

Status: 0x00: Operations successfully
 0x01: No Tag
 0x04: Read a data page fail (Read fail)
 0xF0: Checksum Error (UART only)

Data: Data page return if operation is success, 4 bytes.

COMMAND WRITE A DATA PAGE (Mifare UltraLight):

Data package format Host to Reader:

0xBA	length	0x11	Page	Data	Checksum
------	--------	------	------	------	----------

Block: Page number to write, 1 byte
Data: Data to write, 4 byte

Data package format Reader to Host:

0xBD	length	0x11	Status	Data	Checksum
------	--------	------	--------	------	----------

Status: 0x00: Operations successfully
 0x01: No Tag
 0x05: Write a data page fail (write fail)
 0xF0: Checksum Error (UART only)

Data: Data page return if operation is success, 4 bytes.

COMMAND CONTROL THE LED:

Data package format Host to Reader:

0xBA	length	0x40	ON/OFF	Checksum
------	--------	------	--------	----------

ON/OFF 0x00 command led turn off
 0x01 or Other Command led turn on

Data package format Reader to Host:

0xBD	length	0x40	Status	Checksum
------	--------	------	--------	----------

Status: 0x00: Operations successfully
 0xF0: Checksum Error (UART only)

COMMAND RESET READER:

Data package format Host to Reader:

0xBA	length	0xFF	Checksum
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No return data package

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NOTES: