

**RFID MODULE**

**NFC MIFARE MODULE**

**SL060**

**User Manual**

**Version 1.2**

**July 2018**

**StrongLink**

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## 1. FEATURES



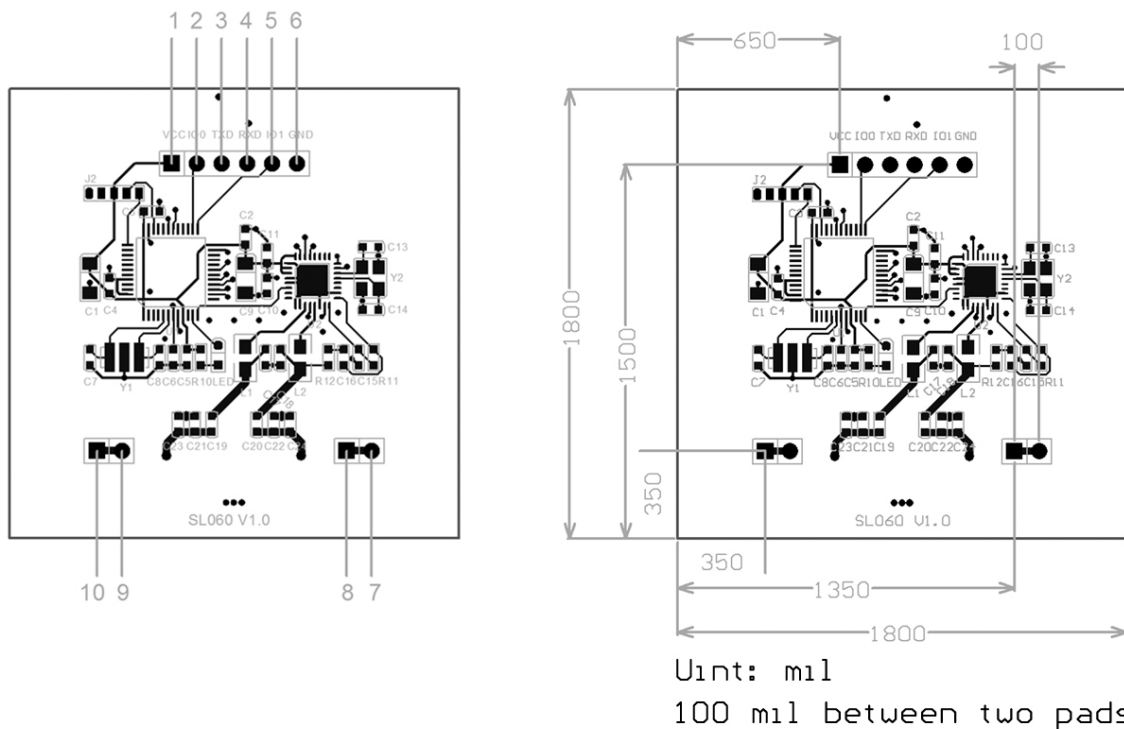
- Tags supported: Mifare 1k, Mifare 4k, Mifare UltraLight, Mifare UltraLight C, NTAG203, NTAG213, and NTAG216.
- Built-in antenna
- UART Interface, baud rate 9,600 ~ 115,200 bps(Default:9600bps)
- 13.56MHz RF Operating Frequency
- Protocol supported: ISO14443, ISO18092 NFCIP-1 mode(text&url)
- 2.5 ~3.6 VDC Operating, I/O supports 5.0 VDC
- Work current less than 50mA@3.3V
- Operating distance: Up to 50mm, depending on tag
- Storage Temperature Range: -40°C ~ +85°C
- Operating Temperature Range: -25°C ~ +70°C
- Dimension: 46 × 46 × 3 mm

## 2. DESCRIPTION

Being developed based on NXP’s NFC transponder IC, NFC Module SL060 is a mini NFC reader/writer. This RFID module supports MIFARE™ Classic 1K, MIFARE™ Classic 4K, MIFARE Ultralight™, MIFARE DESFire™ and NFC NFCIP-1 mode. The maximum working current is less than 50mA. It integrates all necessary components and antenna in the PCB.

SL060 can offer NFCIP-1 functions. Users can send NFC message to NFC device to open a web URL or display text words in the window.

## 3. PINNING INFORMATION



| PIN | SYMBOL | TYPE   | DESCRIPTION                 |
|-----|--------|--------|-----------------------------|
| 1   | VCC    | PWR    | Power supply, 2.5 to 3.6VDC |
| 2   | IO0    | NA     | Reserved for future use     |
| 3   | TXD    | Output | UART TX                     |
| 4   | RXD    | Input  | UART RX                     |
| 5   | IO1    | NA     | Reserved for future use     |
| 6   | GND    | PWR    | GND                         |

## 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: 9600bps(default)  
 Data: 8 bits  
 Stop: 1 bit  
 Parity: None  
 Flow control: None

### 4.2 Communication Format

#### Host to Reader:

| Preamble | Len | DeviceID | Command | Data | Checksum |
|----------|-----|----------|---------|------|----------|
|----------|-----|----------|---------|------|----------|

Preamble: 2 bytes equal to 0xAABB

Len: 2 bytes, indicating the number of bytes from DeviceID to Checksum

In this reader, the first byte is effective, the second byte keep 0

DeviceID: 2 bytes

Command: 2 bytes, Command code, see Table 3

Data: Variable length depends on the command code

Checksum: 1 byte, XOR of all the bytes from DeviceID to Data

#### Attention

If there is any byte equaling to AA occurs between Len and Checksum, one byte 00 will be added after this byte to differentiate preamble. However, the Len keeps unchanged.

Example, writing data (0x00112233445566778899AABBCCDDEEFF) to block 1

Host->SL060:AABB1600000009020100112233445566778899AA00BCCDDEEFF0A

#### Reader to Host:

| Preamble | Len | DeviceID | Command | Status | Data | Checksum |
|----------|-----|----------|---------|--------|------|----------|
|----------|-----|----------|---------|--------|------|----------|

Preamble: 2 bytes equal to 0xAABB

Len: 2 bytes, indicating the number of bytes from DeviceID to Checksum

In this reader, the first byte is effective, the second byte keep 0

DeviceID: 2 bytes

Command: 2 bytes

Status: 1 byte, 00 = success, Not 0 = fail

Data Range: Response data, may blank

Checksum: 1 byte, XOR of all the bytes from DeviceID to the last of the Command  
 Sending data

## Attention

If there is any byte equaling to AA occurs between Len and Checksum, one byte 00 will be added after this byte to differentiate preamble. However, the Len keeps unchanged.

Example, reading data (0x00112233445566778899AABBCCDDEEFF) from block 1  
SL060 -> Host: ABB1600000009020000112233445566778899AA00BBCCDDEEFF0B

### 4.3 Command Overview

**Table 1**

| Command | Description   |
|---------|---|
| 0x0101  | Set baud rate   |
| 0x0201  | Initialize the Device ID  |
| 0x0303  | Get device ID   |
| 0x0401  | Get hardware vision   |
| 0x0701  | Set the LED   |
| 0x0C01  | Set the RF field  |
| 0x0102  | Request(Card A)   |
| 0x0202  | Anticollision (Card A)  |
| 0x0302  | Select card(Card A)   |
| 0x0402  | Halt(Card A)  |
| 0x0702  | Authenticate  |
| 0x0802  | Read block  |
| 0x0902  | Write block   |
| 0x0A02  | Initialize electronic purse                                       |
| 0x0B02  | Read purse value  |
| 0x0C02  | Decrease purse value (including Transfer)                         |
| 0x0D02  | Increase purse value (including Transfer)                         |
| 0x0E02  | Restore purse value   |
| 0x0F02  | Transfer  |
| 0x1002  | Get ATS of CPU A  |
| 0x1102  | Exchange data between PICC and PCD according with T = CL protocol |
| 0x1202  | Ultralight card Anticoll and Select                               |
| 0x1302  | Write a page of data into ultralight and Ntag card                |
| 0x4002  | Authenticate password of Ultralight_C                             |
| 0x4102  |   |
| 0x4202  | Change password of Ultralight_C                                   |
| 0x2002  | SHC1102 card check password                                       |
| 0x2102  | Read data block of SHC1102 card                                   |
| 0x2202  | Write data block of SHC1102 card                                  |
| 0x3002  | Request DESFire and reset   |
| 0x5002  | Get version of Ntag213/216  |
| 0x5102  | Read page of data of Ntag213/216                                  |
| 0x5202  | Fast read page of data of Ntag213/216                             |
| 0x5302  | Get NFC counter of Ntag213/216                                    |

|        |                                      |
|--------|--------------------------------------|
| 0x5402 | Authenticate password of Ntag213/216 |
| 0x5502 | Get ECC signature of Ntag213/216     |
| 0x0D01 | Set the NFC field                    |
| 0x0E01 | Send the NFC command                 |

## Status Overview

**Table 2**

| Status | Description                |
|--------|----------------------------|
| 0x00   | Operation successes        |
| 0x01   | NFC connect fails          |
| 0x0A   | Operation fails            |
| 0x0B   | Command is not supported   |
| 0x0C   | Parameter is error         |
| 0x0D   | No cards                   |
| 0x0E   | RF base station is damaged |
| 0x14   | Searching card fails       |
| 0x15   | Reset card fails           |
| 0x16   | Verifying key fails        |
| 0x17   | Reading fails              |
| 0x18   | Writing fails              |

## 4-4. Command List

### 4-4-1 System Function Command

#### 4-4-1-1. Set baud rate

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x01 | 0x01 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data:

- 0x00: BaudRate = 4800
- 0x01: BaudRate = 9600(default)
- 0x02: BaudRate = 14400
- 0x03: BaudRate = 19200
- 0x04: BaudRate = 28800
- 0x05: BaudRate = 38400
- 0x06: BaudRate = 57600
- 0x07: BaudRate = 115200

After changing the BaudRate, further communication must be set as the new BaudRate.

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x01 | 0x01 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status:

- 0x00: Operation succeed
- 0x0C: Parameter error

#### 4-4-1-2. Initialize the Device ID

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x02 | 0x01 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 2 bytes device ID

#### Response:



|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x02 | 0x01 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

Remark: SL060 only response to the command that Device ID is in accord with itself, and broadcast command that DeviceID equals to 0x0000

#### 4-4-1-3. Get device ID

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x03 | 0x01 | Checksum |
|------|------|-----|----------|------|------|----------|

##### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x03 | 0x01 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 2 bytes device ID

Status: 0x00: Operation succeed

#### 4-4-1-4. Get hardware vision

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x04 | 0x01 | Checksum |
|------|------|-----|----------|------|------|----------|

##### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x04 | 0x01 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: Hardware vision

Status: 0x00: Operation succeed

#### 4-4-1-5. Set the LED

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x07 | 0x01 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 0: turn off the led

1-3: turn on the led

##### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x07 | 0x01 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x0C: Parameter is error

#### 4-4-1-6. Set the RF field

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0C | 0x01 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 0: turn off the RF field

1: turn on the RF field

##### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0C | 0x01 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x0A: Operation fails

### 4-4-2 ISO14443A - Mifare Function Command

#### 4-4-2-1. Request(Card A)

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x01 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 0x26 or 0x52

##### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x01 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: ATQA

Status: 0x00: Operation succeed

0x14: Searching card fails

#### 4-4-2-2. Anticollision(Card A)

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x02 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

Data: None

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x02 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: UID

Status: 0x00: Operation succeed

0x0A: Operation fails

**4-4-2-3. Select card (Card A)**

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x03 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: UID

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x03 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: SAK

Status: 0x00: Operation succeed

0x0A: Operation fails

**4-4-2-4. Halt (Card A)**

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x04 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

**Response:**

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x04 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Data: None

Status: 0x00: Operation succeed

0x0A: Operation fails

**4-4-2-5. Authenticate**

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x07 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte authenticate mode + 1 byte absolute block number + 6bytes key  
 authenticate mode: 0x60—KeyA 0x61—KeyB

**Response:**

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x07 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x16: Verifying key fails

**4-4-2-6. Read block**

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x08 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x08 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 16 bytes data

Status: 0x00: Operation succeed

0x17: Reading fails

**4-4-2-7. Write block**

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x09 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number+16 bytes data

**Response:**

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x09 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
 0x18: Writing fails

#### 4-4-2-8. Initialize electronic purse

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0A | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number+4 bytes data

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0A | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
 0x18: Writing fails

#### 4-4-2-9. Read purse value

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0B | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0B | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 4 bytes data (low bytes in the former)

Status: 0x00: Operation succeed  
 0x17: Reading fails

#### 4-4-2-10. Decrease purse value (including Transfer)

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0C | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number+ 4 bytes decrement value

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0C | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
 0x18: Writing fails

#### 4-4-2-11. Increase purse value (including Transfer)

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0D | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number+ 4 bytes decrement value

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0D | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
 0x18: Writing fails

#### 4-4-2-12. Restore purse value

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0E | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0E | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
 0x17: Reading fails

#### 4-4-2-13. Transfer

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0F | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte absolute block number

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0F | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
0x18: Writing fails

**4-4-2-14. Get ATS of CPU A**

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x10 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x10 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: ATS

Status: 0x00: Operation succeed  
0x18: Writing fails

**4-4-2-15. Exchange data between PICC and PCD according with T = CL protocol**

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x11 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: COS command

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x11 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: COS response

Status: 0x00: Operation succeed  
0x0A: Operation fails

**4-4-2-16. Ultralight card Anticoll and Select**

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x12 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x12 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 7 bytes ultralight UID

Status: 0x00: Operation succeed  
0x0A: Operation fails

**4-4-2-17. Write a page of data into ultralight card**

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x13 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte page address + 4 bytes written date

**Response:**

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x13 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed  
0x18: Writing fails

**4-4-2-18. Authenticate password of Ultralight\_C**

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x40 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

**Response:**

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x40 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: ek(RndB)

Status: 0x00: Operation succeed  
0x16: Verifying key fails

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x41 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: ek(RndB)

**Response:**

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x41 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x16: Verifying key fails

#### 4-4-2-19. Change password of Ultralight\_C

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x42 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 16 byte new password

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x42 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x18: Writing fails

#### 4-4-2-20. SHC1102 card check password

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x20 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 4 bytes password

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x20 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x16: Verifying key fails

#### 4-4-2-21. Read data block of SHC1102 card

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x21 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 bytes block address

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x21 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 4 bytes data

Status: 0x00: Operation succeed

0x17: Reading fails

#### 4-4-2-22. Write data block of SHC1102 card

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x22 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 bytes block address +4 bytes written data

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x22 | 0x02 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status: 0x00: Operation succeed

0x18: Writing fails

#### 4-4-2-23. Request DESFire and reset

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x30 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 0x26 = REQ\_STD

0x52 = REQ\_ALL

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x30 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 7 bytes CSN + ATS information

Status: 0x00: Operation succeed

0x18: Writing fails

#### 4-4-2-24. Get version of Ntag213/216

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x50 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x50 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 8 bytes Product version information

Status: 0x00: Operation succeed

0x17: Reading fails

#### 4-4-2-25. Read page of data of Ntag213/216

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x51 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 1 byte start page address

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x51 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 16 bytes Data content of the addressed pages

Status: 0x00: Operation succeed

0x17: Reading fails

#### 4-4-2-26. Fast read page of data of Ntag213/216

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x52 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 2 bytes start page address + end page address

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x52 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: n\*4 bytes max 200 bytes

Status: 0x00: Operation succeed

0x17: Reading fails

#### 4-4-2-27. Get NFC counter of Ntag213/216

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x53 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x53 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 3 bytes counter value

Status: 0x00: Operation succeed

0x17: Reading fails

#### 4-4-2-28. Authenticate password of Ntag213/216

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x54 | 0x02 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data: 4 bytes password

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x54 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 2 bytes password authentication acknowledge

Status: 0x00: Operation succeed

0x16: Verifying key fails

#### 4-4-2-29. Get ECC signature of Ntag213/216

|      |      |     |          |      |      |          |
|------|------|-----|----------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x55 | 0x02 | Checksum |
|------|------|-----|----------|------|------|----------|

#### Response:

|      |      |     |          |      |      |        |      |          |
|------|------|-----|----------|------|------|--------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x55 | 0x02 | Status | Data | Checksum |
|------|------|-----|----------|------|------|--------|------|----------|

Data: 32bytes ECC signature

Status: 0x00: Operation succeed

0x17: Reading fails

### 4-4-3 NFC Function Command

#### 4-4-3-1. Set the NFC field

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0D | 0x01 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data:       0: turn off the NFC field  
           1: turn on the NFC field

#### Response:

|      |      |     |          |      |      |        |          |
|------|------|-----|----------|------|------|--------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0D | 0x01 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|

Status:       0x00: Operation succeed

#### 4-4-3-2. Send the NFC command

|      |      |     |          |      |      |      |          |
|------|------|-----|----------|------|------|------|----------|
| 0xAA | 0xBB | Len | DeviceID | 0x0E | 0x01 | Data | Checksum |
|------|------|-----|----------|------|------|------|----------|

Data:       NFC command, see Table 3

**Table 3**

|        |          |   |        |
|--------|----------|---|--------|
| Text : | 0x54—‘T’ | Language:<br>0: N/A<br>1:English<br>2:German<br>3:French  | String |
| Uri:   | 0x55—‘U’ | Protocol:<br>0:N/A<br>1:http://www.<br>2:https://www<br>3:http://<br>4:https://<br>5:tel:<br>6:mailto:<br>7:ftp:anonymous:anonymous@<br>8:ftp://ftp<br>9:ftps://<br>10:sftp://<br>11:smb://<br>12:nfs://<br>13:ftp://<br>14:dav://<br>15:news:<br>16:telnet://<br>17:imap:<br>18:rtsp://<br>19:urn:<br>20:pop:<br>21:sip:<br>22:sips: | String |

|  |  |   |  |
|--|--|---|--|
|  |  | 23:ftp:<br>24:btspp://<br>25:btl2cap://<br>26:btgoep://<br>27:tcpobex://<br>28:irdaobex://<br>29:file://<br>30:urn:epc:id:<br>31:urn:epc:tag:<br>32:urn:epc:pat:<br>33:urn:epc:raw:<br>34:urn:epc:<br>35:urn:nfc:<br>36-255:RFU |  |
|--|--|---|--|

Example:

aabb1f0000000e015401534e4550207465737420737472696e6720504e2d3531320074  
 means sending the text ' SNEP test string PN-512'.

**Response:**

| 0xAA | 0xBB | Len | DeviceID | 0x0E | 0x01 | Status | Checksum |
|------|------|-----|----------|------|------|--------|----------|
|------|------|-----|----------|------|------|--------|----------|

Status:        0x00:    Operation succeed  
                   0x01:    NFC connect fails

Remark: Uri must be lowercase letters.



## Federal Communications Commission (FCC) Interference 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 UNDESIRE OPERATION.

NOTE: THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module. The host must meet the necessary requirements to satisfy the module limiting conditions: shield and power supply regulation.

The module is limited to OEM installation ONLY. The OEM integrator is responsible for ensuring the end-user has no manual instructions to remove or install module

# Regulatory Module Integration Instructions

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

- The host product with the module installed must be evaluated for simultaneous transmission requirements.
- The users manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.
- To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation.
- A label must be affixed to the outside of the host product with the following statements:

This device contains FCC ID: [2AD18-SL060](#)

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

If the final host / module combination is intended for use as a portable device (see classifications below) the host manufacturer is responsible for separate approvals for the SAR requirements from FCC Part 2.1093.

# Device Classifications

Since host devices vary widely with design features and configurations module integrators shall follow the guidelines below regarding device classification and simultaneous transmission, and seek guidance from their preferred regulatory test lab to determine how regulatory guidelines will impact the device compliance. Proactive management of the regulatory process will minimize unexpected schedule delays and costs due to unplanned testing activities.

The module integrator must determine the minimum distance required between their host device and the user's body. The FCC provides device classification definitions to assist in making the correct determination. Note that these classifications are guidelines only; strict adherence to a device classification may not satisfy the regulatory requirement as near-body device design details may vary widely. Your preferred test lab will be able to assist in determining the appropriate device category for your host product and if a KDB or PBA must be submitted to the FCC.

Note, the module you are using has been granted modular approval for mobile applications. Portable applications may require further RF exposure (SAR) evaluations. It is also likely that the host / module combination will need to undergo testing for FCC Part 15 regardless of the device classification. Your preferred test lab will be able to assist in determining the exact tests which are required on the host / module combination.

## FCC Definitions

**Portable:** (§2.1093) — A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is / are within 20 centimeters of the body of the user.

**Mobile:** (§2.1091) (b) — A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Per §2.1091d(d)(4) In some cases (for example, modular or desktop transmitters), the potential conditions of use of a device may not allow easy classification of that device as either Mobile or Portable. In these cases, applicants are responsible for determining minimum distances for compliance for the intended use and installation of the device based on evaluation of either specific absorption rate (SAR), field strength, or power density, whichever is most appropriate.

# Simultaneous Transmission Evaluation

This module has **not** been evaluated or approved for simultaneous transmission as it is impossible to determine the exact multi-transmission scenario that a host manufacturer may choose. Any simultaneous transmission condition established through module integration into a host product **must** be evaluated per the requirements in KDB447498D01(8) and KDB616217D01,D03 (for laptop, notebook, netbook, and tablet applications).

These requirements include, but are not limited to:

- Transmitters and modules certified for mobile or portable exposure conditions can be incorporated in mobile host devices without further testing or certification when:
- The closest separation among all simultaneous transmitting antennas is  $\geq 20$  cm,

Or

- Antenna separation distance and MPE compliance requirements for **ALL** simultaneous transmitting antennas have been specified in the application filing of at least one of the certified transmitters within the host device. In addition, when transmitters certified for portable use are incorporated in a mobile host device, the antenna(s) must be  $\geq 5$  cm from all other simultaneous transmitting antennas.
- All antennas in the final product must be at least 20 cm from users and nearby persons.