JMY600 Series IC Card Module

MIFARE Ultralight EV1 Card Operation Guide

（Revision 1.02）

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Please read this manual carefully before using. If any problem, please feel free to contact us, we will offer a satisfied answer ASAP.

Contents

1 Overview

This file describes how to operate MIFARE Ultralight EV1 card and the sequence via using JMY600 Series RFID module. It is suitable for the programmers who are using it to do the development.

Any questions during the programming, please feel free to contact our technical support via jinmuyu@vip.sina.com.

2 Features

2.1 MIFARE RF Interface (ISO/IEC 14443 A)

- Contactless transmission of data and supply energy
- Operating distance: Up to 100mm (depending on antenna geometry)
- Operating frequency: 13.56 MHz
- Fast data transfer: 106kbit/s
- High data integrity: 16 Bit CRC, parity, bit coding, bit counting
- True anticollision
- 7 byte serial number (cascade level 2 according to ISO/IEC14443-3)
- Typical ticketing transaction: < 35 ms
- Fast counter transaction: < 10 ms

2.2 EEPROM

- 640-bit or 1312-bit, organized in 20 or 41 pages with 4 bytes per page
- Field programmable read-only locking function per page for the first 512 bits
- 32-bit user definable One-Time Programmable (OTP) area
- 3 independent, true one-way 24-bit counters on top of the user area
- Configurable password protection with optional limit of unsuccessful attempts
- Data retention of 10 years
- Write endurance for one-way counters 1.000.000 cycles
- First 512 bits compatible to MF0ICU1
- Field programmable read-only locking function per 2 pages above page 15
- 384-bit or 1024-bit freely available user Read/Write area (12 or 32 pages)
- Anti-tearing support for counters, OTP area and lock bits
- ECC based originality signature
- Write endurance 100.000 cycles

3 General Description

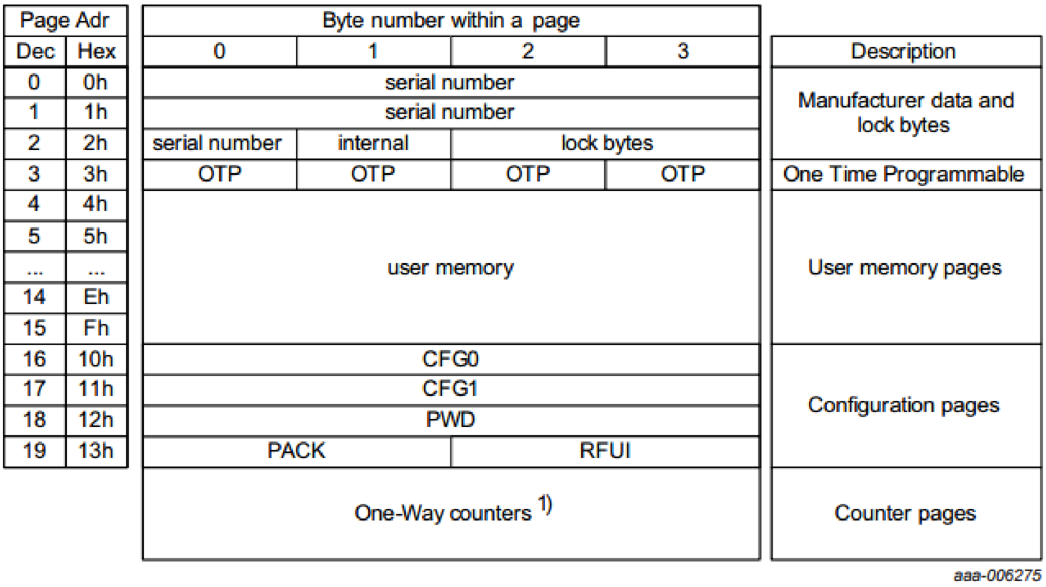
NXP Semiconductors developed the MIFARE Ultralight EV1 MF0ULx1 for use in a contactless smart ticket, smart card or token in combination with a Proximity Coupling Device (PCD). The MF0ULx1 is designed to work in an ISO/IEC 14443 Type A compliant environment (see Ref. 1). The target applications include single trip or limited use tickets in public transportation networks, loyalty cards or day passes for events. The MF0ULx1 serves as a replacement for conventional ticketing solutions such as paper tickets, magnetic stripe tickets or coins. It is also a perfect ticketing counterpart to contactless card families such as MIFARE DESFire or MIFARE Plus.

The MIFARE Ultralight EV1 is succeeding the MIFARE Ultralight ticketing IC and is fully functional backwards compatible. Its enhanced feature and command set enable more efficient implementations and offer more flexibility in system designs.

The mechanical and electrical specifications of MIFARE Ultralight EV1 are tailored to meet the requirements of inlay and paper ticket manufacturers.

4 Memory Organization

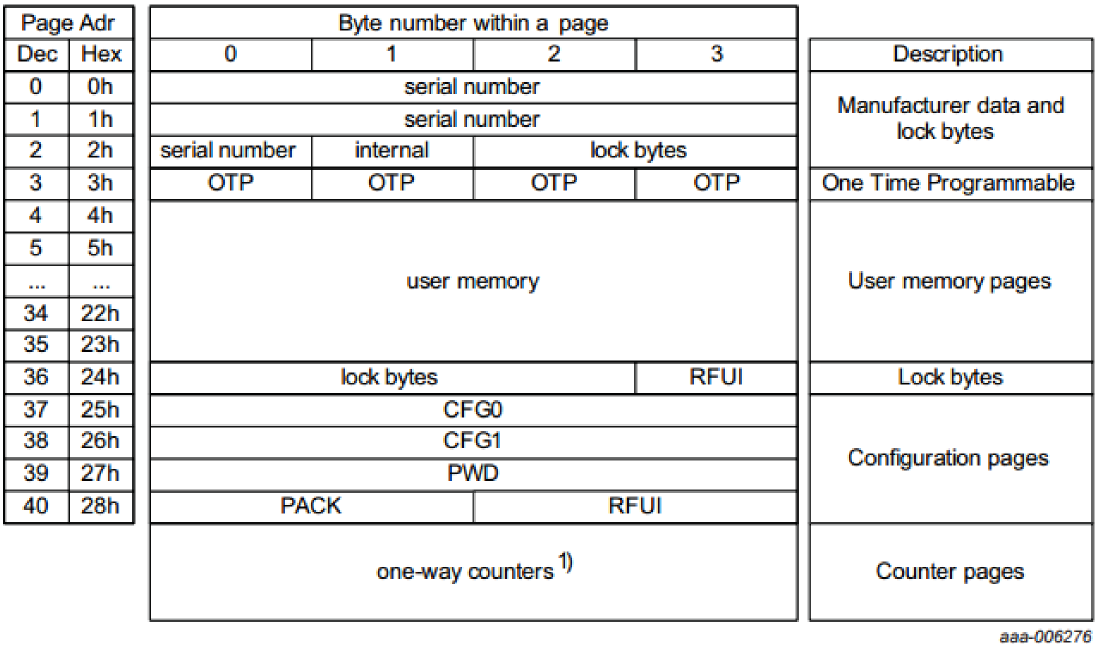
The EEPROM memory is organized in pages with 4 bytes per page. The MF0UL11 variant has 20d pages and the MF0UL21 variant has 41d pages in total. The memory organization can be seen in Figure 5 and Figure 6, the functionality of the different memory sections is described in the following sections



Page Adr		Byte number within a page				
Dec	Hex	0	1	2	3	Description
0	0h	serial number				Manufacturer data and lock bytes
1	1h	serial number				
2	2h	serial number	internal	lock bytes		
3	3h	OTP	OTP	OTP	OTP	One Time Programmable
4	4h	user memory				User memory pages
5	5h					
...	...					
14	Eh					
15	Fh					
16	10h	CFG0				Configuration pages
17	11h	CFG1				
18	12h	PWD				
19	13h	PACK		RFUI		
		One-Way counters $^{1)}$				Counter pages

(1) counter pages are only accessible with READ_CNT and INCR_CNT commands

Fig 5. Memory organization MF0UL11



Page Adr		Byte number within a page				
Dec	Hex	0	1	2	3	Description
0	0h	serial number				Manufacturer data and lock bytes
1	1h	serial number				
2	2h	serial number	internal	lock bytes		
3	3h	OTP	OTP	OTP	OTP	One Time Programmable
4	4h	user memory				User memory pages
5	5h					
...	...					
34	22h					
35	23h					
36	24h	lock bytes			RFUI	Lock bytes
37	25h	CFG0				Configuration pages
38	26h	CFG1				
39	27h	PWD				
40	28h	PACK		RFUI		
		one-way counters [1]				Counter pages

aaa-006276

(1) counter pages are only accessible with READ_CNT and INCR_CNT commands

Fig 6. Memory organization MF0UL21

5 Card Operation

5.1 Active Mode

"Automatic detection card" only can be used via UART or RS232C interface. Under this function, the reader module output card Serial Number.

Under this working mode, the following information, you can refer to:

Continuous or discontinuous output card SNR

HEX or ASCII format output:

As an example: "Continuous output card Serial Number" + "HEX format output". We need choose "JCP04 communication protocol" to send the comfigration commands via TransPort.

- ■ TransPort input: 1E 03
- ■ Host sends: 03 1E 03 1E
- ■ Success: 02 1E 1C

SNR output:

- ■ TransPort Close
- ■ SSCOM Open, Choose the suitablt Port, Baudrate 19200bps, and HEX display

Then put the MIFARE Ultralight EV1 Card within the Antenna field, if the Module with Buzzer, the Buzeer will beep. And the SNR will output continuously on the SSCOM displayer. The output data: "0C 20 04 23 74 E1 ED 25 80 44 00 00 92" This is JCP04 protocol data packet. We choose JCP04 as an example, because of the data packet is less. (0C is Length; 20 is Command; "04 23 74 E1 ED 25

80" is card Serial Number; "44 00" is ATQA; 00 is SAK; 92 is Checksum).

Each MIFARE Ultralight EV1 Card Serial Number is unique, that can be used as identification.

Module reset to factory default:

■ TransPort input: 0F 52 45 53 45 54

■ Host sends: 07 0F 52 45 53 45 54 5D

■ Success: 02 0F 0D

After the power on, the Tested Module will be in factory default.

5.2 Passive Mode

Put a new MIFARE Ultralight EV1 Card into the antenna field, then to do the test via TransPort test tool. Please send the commands like the following sequence.

- MIFARE Ultralight EV1 Request:
  TransPort input: 20 00
  Host sends: 00 05 00 20 00 25
  Success: 00 0E 01 20 04 42 6A 72 9F 35 80 44 00 00 1F
- MIFARE Ultralight EV1 Data Block Read:
  TransPort input: 41 04
  Host sends: 00 05 00 41 04 40
  Success: 00 14 01 41 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 54
- MIFARE Ultralight EV1 Data Block Write:
  TransPort input: 42 04 44 44 44 44
  Host sends: 00 09 00 42 04 44 44 44 44 4F
  Success: 00 04 01 42 47
- MIFARE Ultralight EV1 Data Block Reread:
  TransPort input: 41 04
  Host sends: 00 05 00 41 04 40
  Success: 00 14 01 41 44 44 44 44 00 00 00 00 00 00 00 00 00 00 00 00 54
- MIFARE Ultralight EV1 FAST_READ:
  TransPort input: 47 04 10
  Host sends: 00 06 00 47 04 10 55
  Success: 00 38 01 47 44 44 44 44 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF 81
- MIFARE Ultralight EV1 READ_CNT:
  TransPort input: 48 00
  Host sends: 00 05 00 48 00 4D
  Success: 00 07 01 48 00 00 00 4E
- MIFARE Ultralight EV1 INCR_CNT:
  TransPort input: 49 00 01 00 00
  Host sends: 00 08 00 49 00 01 00 00 40
  Success: 00 07 01 48 00 00 00 4E
- MIFARE Ultralight EV1 REREAD_CNT:
  TransPort input: 48 00

Host sends: 00 05 00 48 00 4D
Success: 00 07 01 48 01 00 00 4F

- MIFARE Ultralight EV1 CHECK_TEARING_EVENT:
  TransPort input: 8C 00
  Host sends: 00 05 00 8C 00 89
  Success: 00 05 01 8C BD 35
- MIFARE Ultralight EV1 PWD_AUTH:
  TransPort input: 4A FF FF FF FF
  Host sends: 00 08 00 4A FF FF FF FF 42
  Success: 00 06 01 4A 00 00 4D
- MIFARE Ultralight EV1 GET_VERSION:
  TransPort input: 46
  Host sends: 00 04 00 46 42
  Success: 00 0C 01 46 00 04 03 01 01 00 0B 03 44
- MIFARE Ultralight EV1 READ_SIG:
  TransPort input: 4B
  Host sends: 00 04 00 4B 4F
  Success: 00 24 01 4B E2 7A E8 10 83 D2 AE 81 A1 8A 9C D1 D6 F9 9F DD 22 CB 5C 31 06 AC DB A8 8E 1D 14 FE D8 2C D0 18 63