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MFRX852 Evaluation Board- Quick start up Guide

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Application note
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Document information

Info	Content
Keywords	MIFARE SAM AV1, RC523, MFRX852, miSAM-X, MFRX623.
Abstract	This application note provides the guidance of using MFRX852 evaluation board.

Revision history

Rev	Date	Description
1.1	06-May-10	TestWinSCard document number added
1.0	26-Mar-10	Initial version.

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1. Introduction

MFRX852 which is a single package of MIFARE SAM AV1 and MF RC523 is optimum, secure and simple solution for secure contactless applications. NXP provides a design-in package (see in §1.2 MFRX852 Support Package) to support the developers. This package includes an evaluation board.

1.1 Scope

This application note addresses the developers of contactless reader using MIFARE MFRX852 module or MIFARE SAM AV1. This document describe all the necessary steps to install and use the SW and HW simulation and evaluation environment

1.2 MFRX852 Support Package

Table 1. Product Support Package MFRX852

Nr.	Item name	Type	Short description	Ordering Information
1	MFRX 852 sample (MFRX623)	Hardware	HLQFN48R	12NC = 935285663551
2	MFRX852 Eval board	Hardware	Two PCBs: contact interface and RX852 board	12NC = 822264090093
3	Application note - Quick Start Up Guide for MFRX 852 boards.	Document	Describing the way of using the eval board.	Document nr. 1896xx[1], this document.
4	Product specification CLRX852	Document	Functional specification of CLRX852	Document nr. 1263xx
5	Product specification RC523	Document	Functional specification of RC523	Document nr. 1152xx
6	Product specification MIFARE SAM AV1	Document	Functional specification of MIFARE SAM AV1.	Document nr. 1297xx.
7	Application note - Feature and Hints X functionalities	Document	Features and hints for X functionalities	Document nr. 1585xx
8	Application note - MIFARE SAM AV1 Feature and hints	Document	Feature and hints for MIFARE SAM AV1	Document nr. 1654xx.
9	Application note - Antenna Design Notes for MFRX852	Document	Directly matched antenna design for MFRX852	Document nr. 1739xx
10	MIFARE SAM AV2 Library	Lib	A C API/library, with source code in ANSI C	Document nr. 1868xx
11	MIFARE discover	Executable	A SW tool to evaluate MIFARE SAM AV2	Document nr. 1866xx
12	MIFARE discover user Manual	Document	Describing the usages of MIFARE discover	Document nr. 1867xx
13	TestWinSCard	Application	A demo application to demonstrate PC/SC and example pre-personalization and validation scripts for MIFARE DESFire EV1	Document nr. 1923xx
14	Standard Customer training	Training	A full day training and hands-on workshop for the developers	Can be requested through NXP local contact

In addition, the functional specification of the chip (e.g. MIFARE DESFire, MIFARE Classic) your application is targeting can be collected.

1. xx – the document version number.

1.3 Not Included in the Package

The NXP evaluation package doesn't include

- Contact smart card reader, any contact PC/SC smart card reader can be used.
- 5 volt power supply.

2. Installation

2.1 Preparing HW tool

The Hardware tool provided by NXP consists in one evaluation board [H_EVB6] HW tool: Evaluation board: MFRX623DEV), one Smart Card ISO 7816 contact adapter [H_CASC], and in one or more DESFIRE EV1 Smartcard in ID-1 format, [H_MDSC]. The three objects are shown in the following figure 4.

Fig 1. From top to bottom: Evaluation board [H_EVB6], Smartcard contact adapter [H_CASC] and Mifare DESFIRE EV1 card

Please note that the jumpers' set of the [H_CASC] should be as indicated in the following picture

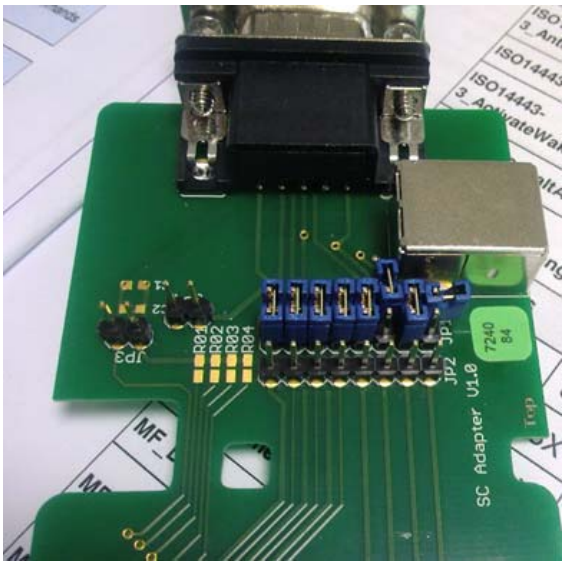


Fig 2. Figure title here

Connect the evaluation board to the card adapter via the serial interface. The DESFIRE Card should be put on the Contactless reader Interface of the Evaluation board. The Contact Card adapter must be put in the contact interface of the Omnikey reader.

At the end the final set up should be as indicated in the figure 6.

Note that when inserting the [H_CASC] in the Omnikey Reader the led blinks for some seconds.

A power supply with 3-5 DC volt output should be connected to the Power input of the Evaluation board [H_EVB6]

The polarity from the Power Supply is indicated in figure 7.

Fig 3. Organization of all hardware

The correct polarity is indicated by the Red Led of the [H_EVB6] turning on when the power supply is connected (see following picture).

Fig 4. Power supply interface connector polarity

2.2 Installing the SW tool

2.2.1 TestWinScard

TestWinScard [S_TWNC] Tool is provided as ZIP file. Unzip the content in one directory and then run the TestWinsCard.exe

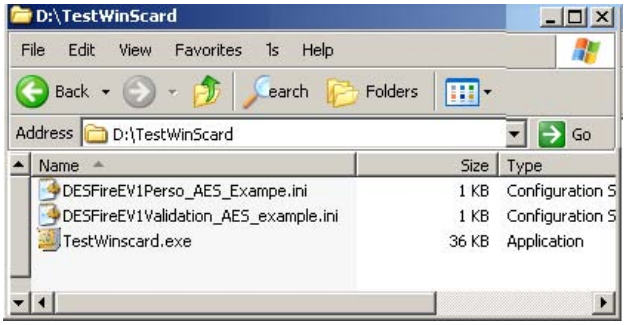


Fig 5. TestWinScard

The user interface is shown in the following figure:

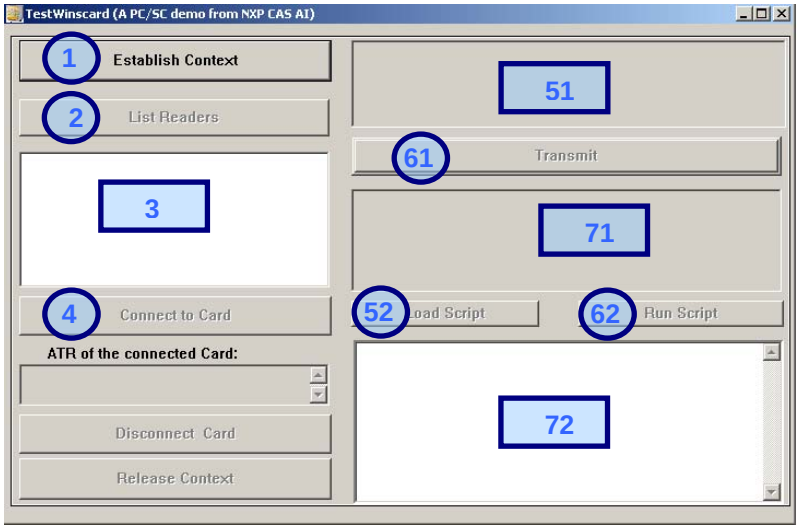


Fig 6. TestWinscard Graphical User Interface

This tool is showing the steps you need to implement using winscard api.

1. Establish context – will establish the context.
2. List Readers – will show the connected PC/SC readers in the field 3.
3. Click on the reader you want to use.
4. Connect to the card, if the contact [H_CASC] is inserted in the contact reader selected in 3, the ATR will be shown.

Now there are two options usages of single APDU and/or script file.

Usages of single APDU:

51. Enter the C-APDU in this field.
61. Press Transmit.
71. The response of the card is shown in the field 71.

Usages of script file:

52. Load the ini file. Example ini files are included in the SW package.
62. Run script.
72. The APDU exchange is shown in field 72.

In order to use the evaluation board you will use only the contact slot of the Card Man Reader where you will plug in the Contact Adapter (refer to the next chapter)

2.2.2 MIFAREdiscover

The **MIFAREdiscover [S_MDSC]** tool is provided as Auto Running SETUP file.

Simply click on the EXE file and follow the instructions.

At the end on your program bar you will find the link to the Mifare Discover tool.

Fig 7. Setup File MIFARE discover and link in the Program bar after installation

After the installation Click on MIFAREdiscover icon and the following window will open (Fig. 4) . Select OMNIKEY CardMan 5x21 0 (the contact interface). Naturally the Omnikey reader should be connected on your PC and SW driver installed as explained in chapter 2.3.

Note: be sure there are no other program running and using the Contact IF of your Omnikey reader.

After selecting the correct reader you will enter in the MIFARE Discover Graphic User Interface that will be explained in detail in the following chapter with a practical example. Hardware Tool.

Read the user manual of MIFAREdiscover Document nr. 1867xx for detail of using it.

3. Examples

3.1 Communication flow

The communication flow with examples is explained in [D_MSC8] Document number: 1585xx, MIFARE SAM AV1 and CLRX852: features and Hints for X Functionalities.

3.2 Example using APDUs

This low level example shows the APDUs exchanges. The APDUs are defined in [D_SAMAV1]: Document number 1297xx, MIFARE SAM AV1 functional specification. This example will demonstrate different steps of the application.

3.2.1 Personalizing MIFARE DESFire EV1

Use the “TestWinScard” tool. Load script “DESFireEV1Perso_AES_Exampe.ini” and run the script. The content of the script file is shown in the following figure:

The changing of the MIFARE DESFire EV1 keys is not supported by the MIFARE SAM AV1. The changing keys have to be done using SW at personalization. For evaluation purpose, the “DESFire FortyTwo” (a SW tool from NXP) can be used.

Fig 8. Example personalization script

The keys of the application are by default 16-byte 00s and crypto option is AES as set in step 5 of the script file. Figure 9 shows the TestWinScard GUI after running the script.

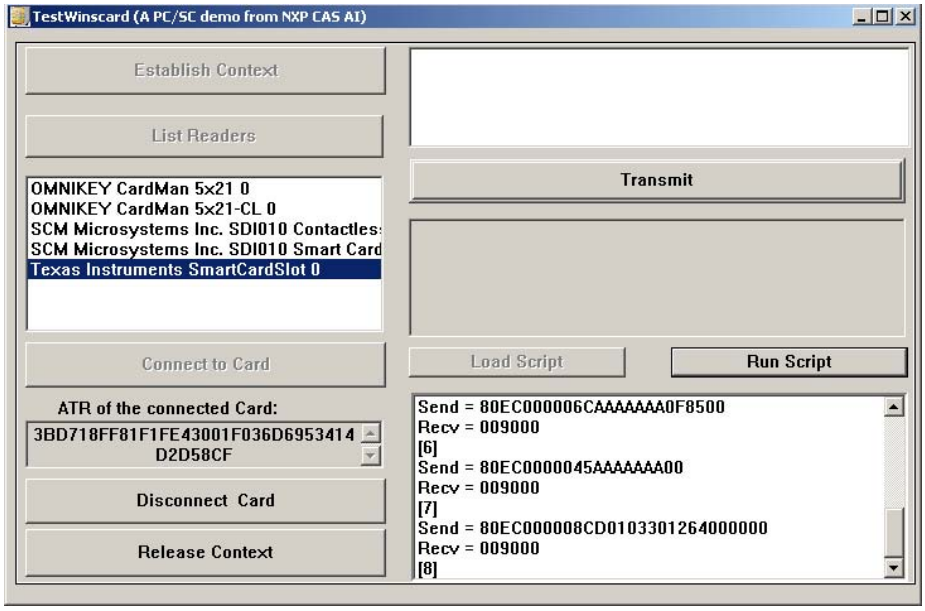


Fig 9. After running the script

3.2.2 Downloading the Personalizing MIFARE DESFire EV1

The keys what we have in the MIFARE DESFire EV1 application, have to be downloaded to the MIFARE SAM AV1 (MFRX852). For this purpose let's use MIFAREdiscover. According to default setting of MFRX852, host authentication is required for downloading the keys to MFRX852. "AuthenticateHost" command is shown in the following figure.

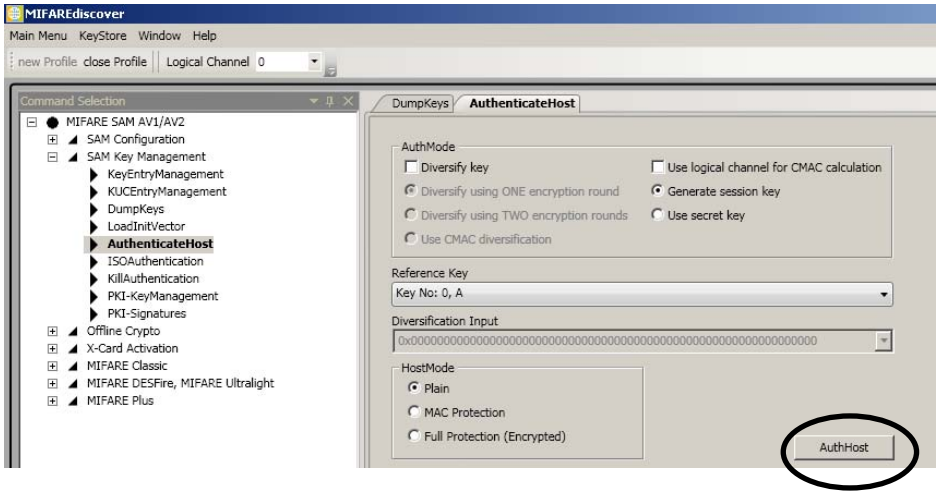


Fig 10. AuthenticateHost command

After authentication the DESFire application keys will be downloaded.

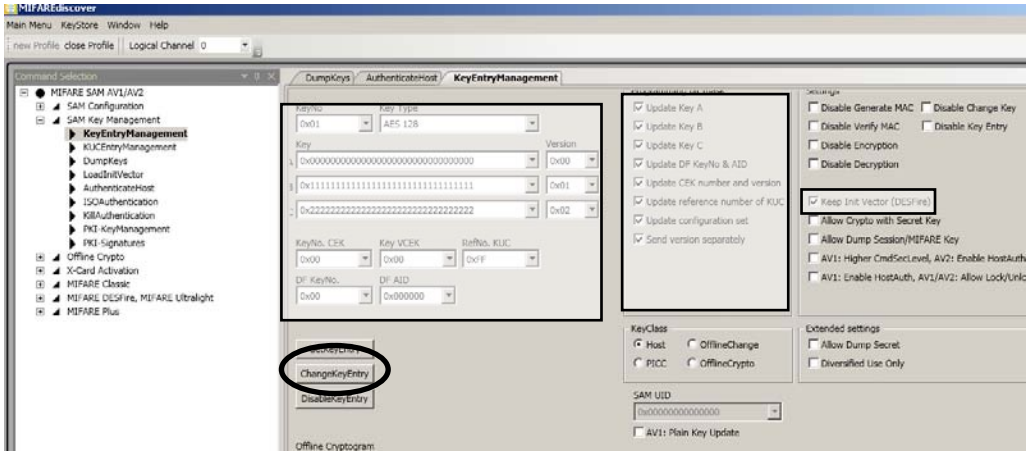


Fig 11. SAM_ChangeKeyEntry command

The keys are taken

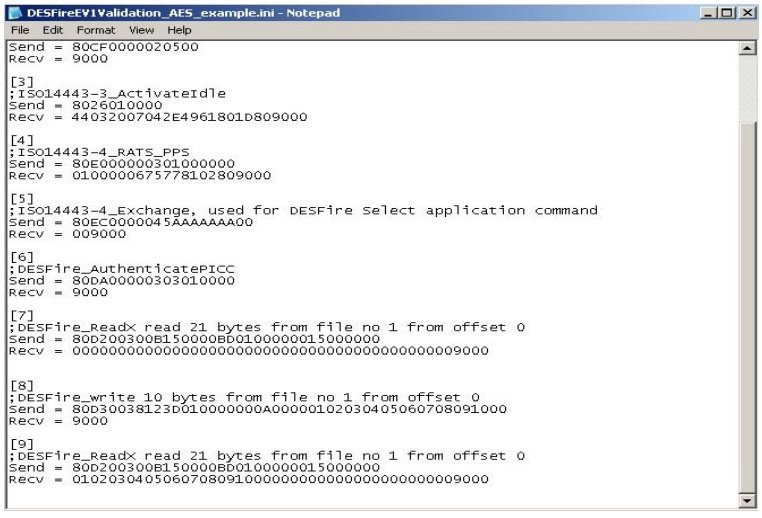
A: 00000000000000000000000000000000, version 0x00 (is the key right now we have DESFire application)

B: 11111111111111111111111111111111, version 0x01

C: 22222222222222222222222222222222, version 0x02

3.2.3 Validation of the DESFire EV1 Application

Use the “TestWinScard” tool. Load script “DESFireEV1Validation_AES_example.ini” and run the script. The content of the script file is shown in the following figure:



In the real life use key diversification.

Fig 12. Example validation script

3.3 Example using MIFAREdiscover

MIFAREdiscover can be used to perform every command supported by MIFARE SAM AV1 in X interface. The X functions commands (for DESFire) in the MIFAREdiscover are shown in the following figure.

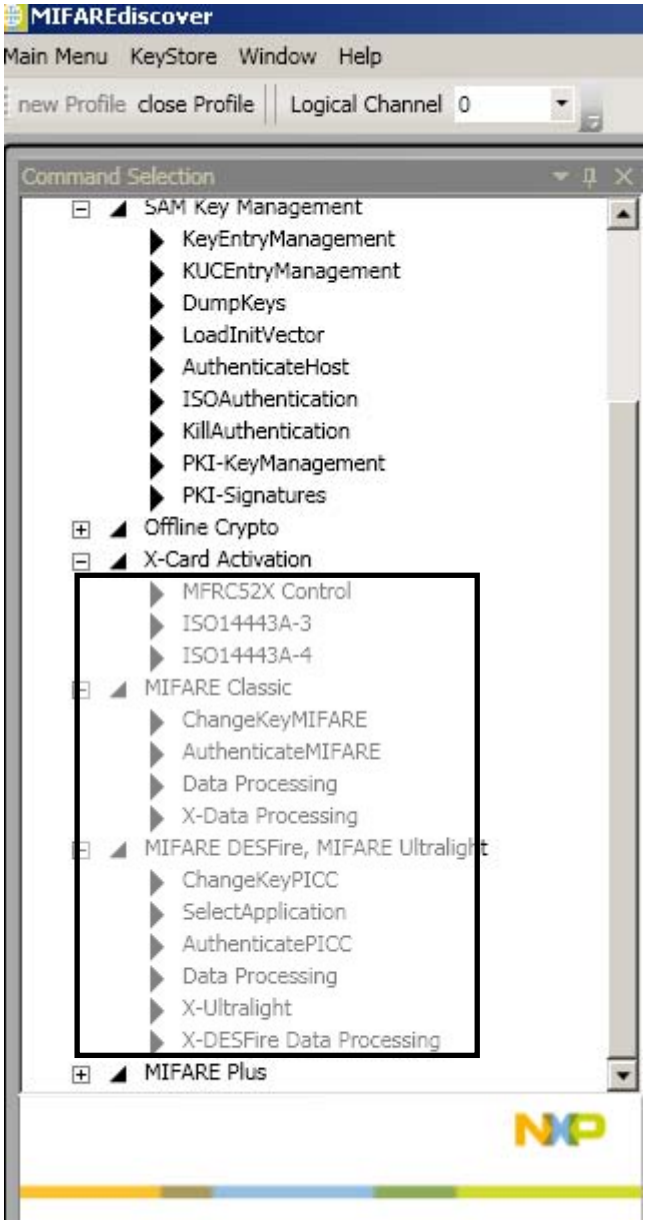


Fig 13. X-functions for MIFARE DESFire

Follow the MIFAREdiscover user manual and MIFARE SAM AV1 data sheet to perform the commands one by one.

4. References

[D_MDFS] Document number: 1340xx[2], MF3ICD81 MIFARE DESFire Functional Specification.

[D_MSC8] Document number: 1585xx, MIFARE SAM AV1 and CLRX852: features and Hints for X Functionalities.

[D_MFRX6] Document number: 1263xx, MFRX623 Module Next generation SAM Reader module Datasheet.

[D_SAMAV1] Document number 1297xx, MIFARE SAM AV1 functional specification.

[S_MDSC] Mifare Discover: Document number: 1866xx

[S_TWNC] TestWinscard.exe, a SW tool to demonstrate the winscard api, document number 1923xx.

[H_EVB6] HW tool: Evaluation board: MFRX623DEV

[H_CASC] Smart Card Contact Adapter

[H_MDSC] MIFARE DESFIRE EV1 card

2. xx – is the version number.

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6. Contents

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