Federal Office
for Information Security

Certification Report

BSI-DSZ-CC-0487-2009

for

NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software

from

NXP Semiconductors Germany GmbH

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Bundesamt
für Sicherheit in der
Informationstechnik

Deutsches IT-Sicherheitszertifikat

erteilt vom Bundesamt für Sicherheit in der Informationstechnik

BSI-DSZ-CC-0487-2009

NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software

from	NXP Semiconductors Germany GmbH
PP Conformance:	Smartcard IC Platform Protection Profile, Version 1.0, BSI-PP-0002-2001, July 2001
Functionality:	PP conformant plus product specific extensions Common Criteria Part 2 extended
Assurance:	Common Criteria Part 3 conformant EAL 4 augmented by ADV_IMP.2, ALC_DVS.2, AVA_MSU.3 and AVA_VLA.4

Common Criteria Recognition Arrangement for components up to EAL 4

Common Criteria

The IT product identified in this certificate has been evaluated at an accredited and licensed / approved evaluation facility using the Common Methodology for IT Security Evaluation, Version 2.3 extended by advice of the Certification Body for components beyond EAL 4 and guidance specific for the technology of the product for conformance to the Common Criteria for IT Security Evaluation (CC), Version 2.3 (ISO/IEC 15408:2005).

This certificate applies only to the specific version and release of the product in its evaluated configuration and in conjunction with the complete Certification Report.

The evaluation has been conducted in accordance with the provisions of the certification scheme of the German Federal Office for Information Security (BSI) and the conclusions of the evaluation facility in the evaluation technical report are consistent with the evidence adduced.

This certificate is not an endorsement of the IT product by the Federal Office for Information Security or any other organisation that recognises or gives effect to this certificate, and no warranty of the IT product by the Federal Office for Information Security or any other organisation that recognises or gives effect to this certificate, is either expressed or implied.

Bonn, 1 April 2009
For the Federal Office for Information Security

IT Security Certified

SOGIS - MRA

Bernd Kowalski L.S.
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Preliminary Remarks

Under the BSIG[1] Act, the Federal Office for Information Security (BSI) has the task of issuing certificates for information technology products.

Certification of a product is carried out on the instigation of the vendor or a distributor, hereinafter called the sponsor.

A part of the procedure is the technical examination (evaluation) of the product according to the security criteria published by the BSI or generally recognised security criteria.

The evaluation is normally carried out by an evaluation facility recognised by the BSI or by BSI itself.

The result of the certification procedure is the present Certification Report. This report contains among others the certificate (summarised assessment) and the detailed Certification Results.

The Certification Results contain the technical description of the security functionality of the certified product, the details of the evaluation (strength and weaknesses) and instructions for the user.

[1] Act setting up the Federal Office for Information Security (BSI-Errichtungsgesetz, BSIG) of 17 December 1990, Bundesgesetzblatt I p. 2834

Contents

A Certification

1 Specifications of the Certification Procedure

The certification body conducts the procedure according to the criteria laid down in the following:

a) BSIG[2]

b) BSI Certification Ordinance[3]

c) BSI Schedule of Costs[4]

d) Special decrees issued by the Bundesministerium des Innern (Federal Ministry of the Interior)

e) DIN EN 45011 standard

f) BSI certification: Procedural Description (BSI 7125) [3]

g) Common Criteria for IT Security Evaluation (CC), Version 2.3 (ISO/IEC 15408:2005)[5] [1]

h) Common Methodology for IT Security Evaluation, Version 2.3 [2]

i) BSI certification: Application Notes and Interpretation of the Scheme (AIS) [4]

j) Advice from the Certification Body on methodology for assurance components above EAL4 (AIS 34)

2 Recognition Agreements

In order to avoid multiple certification of the same product in different countries a mutual recognition of IT security certificates - as far as such certificates are based on ITSEC or CC - under certain conditions was agreed.

2.1 European Recognition of ITSEC/CC - Certificates

The SOGIS-Mutual Recognition Agreement (MRA) for certificates based on ITSEC became initially effective in March 1998.

This agreement on the mutual recognition of IT security certificates was extended in April 1999 to include certificates based on the Common Criteria for the Evaluation Assurance Levels (EAL 1 – EAL 7). This agreement was signed by the national bodies of Finland, France, Germany, Greece, Italy, The Netherlands, Norway, Spain, Sweden and the United Kingdom. The German Federal Office for Information Security (BSI) recognises certificates issued by the national certification bodies of France and United Kingdom, and from The Netherlands since January 2009 within the terms of this agreement.

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2 Act setting up the Federal Office for Information Security (BSI-Errichtungsgesetz, BSIG) of 17 December 1990, Bundesgesetzblatt I p. 2834

3 Ordinance on the Procedure for Issuance of a Certificate by the Federal Office for Information Security (BSI-Zertifizierungsverordnung, BSIZertV) of 07 July 1992, Bundesgesetzblatt I p. 1230

4 Schedule of Cost for Official Procedures of the Bundesamt für Sicherheit in der Informationstechnik (BSI-Kostenverordnung, BSI-KostV) of 03 March 2005, Bundesgesetzblatt I p. 519

5 Proclamation of the Bundesministerium des Innern of 10 May 2006 in the Bundesanzeiger dated 19 May 2006, p. 3730

The SOGIS-MRA logo printed on the certificate indicates that it is recognised under the terms of this agreement.

2.2 International Recognition of CC - Certificates

An arrangement (Common Criteria Recognition Arrangement) on the mutual recognition of certificates based on the CC Evaluation Assurance Levels up to and including EAL 4 has been signed in May 2000 (CCRA). It includes also the recognition of Protection Profiles based on the CC.

As of January 2009 the arrangement has been signed by the national bodies of: Australia, Austria, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Israel, Italy, Japan, Republic of Korea, Malaysia, The Netherlands, New Zealand, Norway, Pakistan, Republic of Singapore, Spain, Sweden, Turkey, United Kingdom, United States of America. The current list of signatory nations and approved certification schemes can be seen on the web site: http://www.commoncriteriaportal.org

The Common Criteria Recognition Arrangement logo printed on the certificate indicates that this certification is recognised under the terms of this agreement.

This evaluation contains the components ADV_IMP.2, ALC_DVS.2, AVA_MSU.3, and AVA_VLA.4 that are not mutually recognised in accordance with the provisions of the CCRA. For mutual recognition the EAL4 components of these assurance families are relevant.

3 Performance of Evaluation and Certification

The certification body monitors each individual evaluation to ensure a uniform procedure, a uniform interpretation of the criteria and uniform ratings.

The product NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software has undergone the certification procedure at BSI.

The evaluation of the product NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software was conducted by T-Systems GEI GmbH. The evaluation was completed on 16 March 2009. T-Systems GEI GmbH is an evaluation facility (ITSEF)[6] recognised by the certification body of BSI.

For this certification procedure the sponsor and applicant is: NXP Semiconductors Germany GmbH

The product was developed by: NXP Semiconductors Germany GmbH.

The certification is concluded with the comparability check and the production of this Certification Report. This work was completed by the BSI.

4 Validity of the certification result

This Certification Report only applies to the version of the product as indicated. The confirmed assurance package is only valid on the condition that

a) all stipulations regarding generation, configuration and operation, as given in the following report, are observed,

[6] Information Technology Security Evaluation Facility

b) the product is operated in the environment described, where specified in the following report and in the Security Target.

For the meaning of the assurance levels and the confirmed strength of functions, please refer to the excerpts from the criteria at the end of the Certification Report.

The Certificate issued confirms the assurance of the product claimed in the Security Target at the date of certification. As attack methods may evolve over time, the resistance of the certified version of the product against new attack methods can be re-assessed if required and the sponsor applies for the certified product being monitored within the assurance continuity program of the BSI Certification Scheme. It is recommended to perform a re-assessment on a regular basis.

In case of changes to the certified version of the product, the validity can be extended to the new versions and releases, provided the sponsor applies for assurance continuity (i.e. re-certification or maintenance) of the modified product, in accordance with the procedural requirements, and the evaluation does not reveal any security deficiencies.

5 Publication

The product NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software has been included in the BSI list of the certified products, which is published regularly (see also Internet: http://www.bsi.bund.de) and [5]. Further information can be obtained from BSI-Infoline +49 228 9582-111.

Further copies of this Certification Report can be requested from the developer[7] of the product. The Certification Report may also be obtained in electronic form at the internet address stated above.

[7] NXP Semiconductors Germany GmbH
Business Line Identification
Stresemannallee 101
22529 Hamburg

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B Certification Results

The following results represent a summary of

a) the Security Target of the sponsor for the Target of Evaluation,

b) the relevant evaluation results from the evaluation facility, and

c) complementary notes and stipulations of the certification body.

1 Executive Summary

The Target of Evaluation (TOE) is called NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software which is to be used with Proximity Coupling Devices (PCDs) according to ISO14443 Type A. The communication protocol complies to part ISO 14443-4. The MF3ICD81 is designed for secure contact-less transport applications and related loyalty programs as well as access control systems.

The TOE is a Smartcard comprising a hardware platform and a fixed software package (Smartcard Embedded Software). The software package provides an operating system with a set of functions used to manage the various kinds of data files stored in the non-volatile EEPROM memory. The operating system supports a separation between the data of different applications and provides access control if required by the configuration. The TOE includes also IC Dedicated Software to support its start-up and for test purposes after production. The Smart Card Controller hardware comprises an 8-bit processing unit, volatile and non-volatile memories, cryptographic co-processors, security components and one communication interface. The security measures of the TOE comprise both the hardware platform as the software package. The TOE includes a functional specification and a guidance document. This documentation contains a description of the hardware and software interface, and the usage of the product by the terminal designer.

Chapter 2 of the Security Target [6] and [9] gives a detailed TOE description, including its hardware and software description, documentation, interfaces of the TOE, life cycle and delivery of the TOE, the TOE intended usage and user environment, and features of the TOE.

Note that since the TOE comprises the complete the IC Dedicated Software and the Smart Card Embedded Software stored in the ROM, there is no possibility to download further Smart Card Embedded Software.

A number of package types are supported for the TOE. Each package type has a different commercial type name. The TOE will be available in two different packages and three different memory configurations. For details please read the Security Target [6] and [9] chapter 2.2 and this report, chapter 2.

The Security Target [6] and [9] is the basis for this certification. It is based on the certified Protection Profile Smartcard IC Platform Protection Profile, Version 1.0, BSI-PP-0002-2001, July 2001 [10].

The TOE Security Assurance Requirements (SAR) are based entirely on the assurance components defined in Part 3 of the Common Criteria (see part C or [1], Part 3 for details). The TOE meets the Assurance Requirements of the Evaluation Assurance Level EAL 4 augmented by ADV_IMP.2, ALC_DVS.2, AVA_MSU.3 and AVA_VLA.4.

The TOE Security Functional Requirements (SFR) relevant for the TOE are outlined in the Security Target [6] and [9], chapter 5.1. They are selected from Common Criteria Part 2 and some of them are newly defined. Thus the TOE is CC Part 2 extended.

The Security Functional Requirements (SFR) relevant for the IT-Environment of the TOE are outlined in the Security Target [6] and [9], chapter 5.2.

The TOE Security Functional Requirements are implemented by the following TOE Security Functions:

TOE Security Function	Addressed issue
F.AUTH	Authentication
F.ACC_CTRL	Access Control
F.CONFID	Confidentiality and Integrity
F.TRANS	Transaction Control
F.NO_TRACE	Preventing traceability
F.OPC	Control of Operating Conditions
F.PHY	Protection against Physical Manipulation
F.LOG	Logical Protection
F.COMP	Protection of Mode Control

Table 1: TOE Security Functions

For more details please refer to the Security Target [6] and [9], chapter 6.1.

The claimed TOE's Strength of Functions 'high' (SOF-high) for specific functions as indicated in the Security Target [6] and [9], chapter 1.3 is confirmed. The rating of the Strength of Functions does not include the crypto algorithms suitable for encryption and decryption (see BSIG Section 4, Para. 3, Clause 2). For details see chapter 9 of this report.

The assets to be protected by the TOE are defined in the Security Target [6] and [9], chapter 3.1. Based on these assets the TOE Security Environment is defined in terms of Assumptions, Threats and Organisational Security Policies. This is outlined in the Security Target [6] and [9], chapter 3.2, 3.3 and 3.4.

This certification covers three different configurations of the EEPROM (8 kBytes EEPROM, 4 kBytes EEPROM, 2 kBytes EEPROM) and two different package formats (120µm sawn wafer, MOA4 modules on a reel) of the TOE as listed in chapter 2 of this report. See also the Security Target [6] and [9], chapter 2.2.

The certification results only apply to the version of the product indicated in the certificate and on the condition that all the stipulations are kept as detailed in this Certification Report. This certificate is not an endorsement of the IT product by the Federal Office for Information Security (BSI) or any other organisation that recognises or gives effect to this certificate, and no warranty of the IT product by BSI or any other organisation that recognises or gives effect to this certificate, is either expressed or implied.

2 Identification of the TOE

The Target of Evaluation (TOE) is called:

NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software

The following table outlines the TOE deliverables:

No	Type	Identifier	Release	Form of Delivery
1	HW	Hardware platform NXP Mifare DESFire8 MF3ICD81 Master	T504V0C, i.e. Release V0C, t504C.gds2 (26.11.2007)	Wafer or Module (dice include reference t504C)

No	Type	Identifier	Release	Form of Delivery
2	HW / SW	Mask NXP Mifare DESFire8 MF3ICD81 Via1 It comprises the following three items (Test ROM, Boot ROM, and DESFire8 Embedded SW)	Release 004, romt0cdf004.eco (22.04.2008)	As part of wafer resp. modules (dice include reference 004 on via)
2a	SW	Test ROM Software	Version 1.1, April 16th, 2008, Test ROM (DF8_TestOS.hex)	on the chip as part of item 2
2b	SW	Boot ROM Software	Version 1.1, April 16th, 2008, included in (DF8_TestOS.hex)	on the chip as part of item 2
2c	SW	DESFire8 Embedded Software	Version 1.3, April, 11th, 2008. ROM (DesFire8.hex)	on the chip as part of item 2
3	DOC	MF3ICD81 Mifare DESFire Functional Specification, NXP Semiconductors [11]	Doc.No. 134035, Rev. 3.5, 28 November 2008	electronic document
4	DOC	Guidance, Delivery and Operation Manual, MF3ICD81, Doc.No. 146935, NXP Semiconductors [12]	Rev. 3.5, 28 November 2008	electronic document
5	DOC	MF3ICD8101 Sawn bumped 120µm wafer addendum [13]	Doc. No. 131832, Rev. 3.2, 12 February 2009	electronic document

Table 2: Deliverables of the TOE

The TOE hardware platform is labelled with the name plate “t504C” on the surface of the die. The name plate “t504C” is the short form but is still unambiguously related to the label MF3ICD81. The full release name is t504V0C as referred in the developer documents. The name-plate is visible with a microscope on the surface of the chip. The ROM code number is “004” for the evaluated version.

The TOE is delivered in six different configurations, i.e. three EEPROM variations (8 kBytes EEPROM, 4 kBytes EEPROM, 2 kBytes EEPROM) and two different package formats (120µm sawn wafer, MOA4 modules on a reel).

The device coding is stored in the EEPROM and can be read using the command "GetVersion". While the name plate is the same for all configurations because it is part of the hardware platform, the device coding is different for each EEPROM configuration and is listed hereinafter:

8 kBytes EEPROM

120µm sawn wafer (MF3ICD8101DUD/04) and

MOA4 modules on a reel (MF3MOD8101DA4/04):

0x04 0x01 0x01 0x01 0x00 0x1A 0x05

0x04 0x01 0x01 0x01 0x03 0x1A 0x05

4 kBytes EEPROM

120µm sawn wafer (MF3ICD4101DUD/04) and

MOA4 modules on a reel (MF3MOD4101DA4/04):

0x04 0x01 0x01 0x01 0x00 0x18 0x05

0x04 0x01 0x01 0x01 0x03 0x18 0x05

2 kBytes EEPROM

120µm sawn wafer (MF3ICD2101DUD/04) and

MOA4 modules on a reel (MF3MOD2101DA4/04):

0x04 0x01 0x01 0x01 0x00 0x16 0x05

0x04 0x01 0x01 0x01 0x03 0x16 0x05

Note:

Only the first two frames are listed here because the third frame is not relevant for the TOE identification.

For a description of the values and for details please read the Functional Specification [11] chapter 9.4.7. and the Configuration List [8] chapter 3.1.2 (confidential document).

3 Security Policy

The Security Policy is expressed by the set of Security Functional Requirements and implemented by the TOE. It covers the following issues:

The security policy of the TOE is to provide basic Security Functions to be used to ensure an overall smart card system security. Therefore, the TOE implements an algorithm to ensure the confidentiality of plain text data by encryption and to support secure authentication protocols using an internal physical random number generator.

The security policy of the TOE is also to provide protection against leakage of information (e.g. to ensure the confidentiality of cryptographic keys during cryptographic functions performed by the TOE), against physical probing, against malfunctions, against physical manipulations and against abuse of functionality. Hence the TOE shall

- maintain the integrity and the confidentiality of data stored in the memory of the TOE and
- maintain the integrity, the correct operation and the confidentiality of Security Functions (security mechanisms and associated functions) provided by the TOE.

4 Assumptions and Clarification of Scope

The Assumptions defined in the Security Target and some aspects of Threats and Organisational Security Policies are not covered by the TOE itself. These aspects lead to specific Security Objectives to be fulfilled by the TOE Environment. The following topics are of relevance: Protection during TOE Development and Production; Protection during Packaging, Finishing and Personalisation; Generation of secure values; Terminal support to ensure integrity and confidentiality. Details can be found in the Security Target [6] and [9] chapter 4.2.

5 Architectural Information

The TOE is an integrated circuit (smart card controller) with Smartcard Embedded Software. There is no possibility to download further Smartcard Embedded Software.

The integrated circuit (hardware platform) includes the components 8-bit CPU, Triple-DES and AES co-processors, Random Number Generator (RNG), Contact-less Interface, Power Module, Security Sensors and Filters as well as memory blocks. The IC Dedicated Software as well as the Smartcard Embedded Software are stored in the ROM. The EEPROM is used for data only.

The Smartcard Embedded Software includes the complete operating system and the application. The supported command set comprises proprietary and standardised commands. The Smartcard Embedded Software allows to set up 28 applications. Each application can store up to 32 files. The possibility to access applications and files depends on the configuration of the Administrator and the Application Manager.

Before the TOE can be used in the field it must be personalised according to the security concept and the access control policy of the service provider. The personalisation is a sensitive process that is determining the access control policy to the files stored on the TOE.

For more information about the architectural information about the TOE see also the Security Target [6] and [9] chapter 2.1.

6 Documentation

The evaluated documentation as outlined in table 2 is being provided with the product to the customer. This documentation contains the required information for secure usage of the TOE in accordance with the Security Target.

Additional obligations and notes for secure usage of the TOE as outlined in chapter 10 of this report have to be followed.

7 IT Product Testing

The tests performed by the developer can be divided into the following categories:

1. Tests of the hardware platform comprising:
   - tests which are performed in a simulation environment with different tools for the analogue circuitries and for the digital parts of the TOE;
   - functional tests which are performed with special software
   - characterisation and verification tests to release the hardware platform for production including tests with different operating conditions as well as special verification tests for Security Functions of the hardware
   - functional tests at the end of the production process using IC Dedicated Test Software.
2. Test of the smart card product comprising:
   - tests of the Smartcard Embedded Software in a simulation environment to check the security measures and integrity checks that cannot be tested by external stimulation.

- regression tests including checks of error conditions
- functional tests, of the Smartcard Embedded Software including all commands supported.

The developer tests cover all Security Functions and all security mechanisms as identified in the functional specification as well as in the high and low level designs.

The ITSEF repeated the tests of the developer using the protocol of the tests provided by the developer. The tests of the developer were repeated by sampling. In addition the ITSEF performed additional independent tests to supplement, augment and to verify the tests performed by the developer. The tests of the ITSEF include special tests and examination of the hardware platform using special samples as well as tests of the smart card product using all authentication methods and command sequences supported by the evaluated configuration.

The evaluation provides evidence that the TOE provides the Security Functions as specified by the developer. The test results confirm the correct implementation of the TOE Security Functions.

For penetration testing the ITSEF took all Security Functions into consideration. Penetration testing was performed to test the security mechanisms used to provide the Security Functions and considered both physical tampering of the hardware platform and attacks which do not modify the hardware platform physically. The test of the smart card product included attacks that must be averted by the combination of the hardware platform and the software as well as attacks against the software. In addition logical attacks that were based on the command interface were performed.

8 Evaluated Configuration

This certification covers the following configurations of the TOE:

MF3ICD8101DUD/04

MF3ICD4101DUD/04

MF3ICD2101DUD/04

MF3MOD8101DA4/04

MF3MOD4101DA4/04

MF3MOD2101DA4/04

For information about EEPROM variations and different package formats please read chapter 2 of this report which also gives details about the identification of the TOE.

9 Results of the Evaluation

9.1 CC specific results

The Evaluation Technical Report (ETR) [7] was provided by the ITSEF according to the Common Criteria [1], the Methodology [2], the requirements of the Scheme [3] and all interpretations and guidelines of the Scheme (AIS) [4] as relevant for the TOE.

The Evaluation Methodology CEM [2] was used for those components up to EAL4 extended by advice of the Certification Body for components beyond EAL 4 and guidance specific for the technology of the product [4] (AIS 34).

The following guidance specific for the technology was used:

- The Application of CC to Integrated Circuits
- Application of Attack Potential to Smart Cards
- Functionality classes and evaluation methodology of physical random number generators

(see [9], AIS 25, AIS 26, AIS 31, AIS 34, AIS 35, AIS 37 were used.)

The assurance refinements outlined in the Security Target were followed in the course of the evaluation of the TOE.

As a result of the evaluation the verdict PASS is confirmed for the following assurance components:

- All components of the class ASE
- All components of the EAL 4 package as defined in the CC (see also part C of this report)
- The components ADV_IMP.2, ALC_DVS.2, AVA_MSU.3 and AVA_VLA.4 augmented for this TOE evaluation.

The evaluation has confirmed:

- PP Conformance: Smartcard IC Platform Protection Profile, Version 1.0, BSI-PP-0002-2001, July 2001 [10]
- for the Functionality: PP conformant plus product specific extensions, Common Criteria Part 2 extended
- for the Assurance: Common Criteria Part 3 conformant, EAL 4 augmented by ADV_IMP.2, ALC_DVS.2, AVA_MSU.3 and AVA_VLA.4
- The following TOE Security Functions fulfil the claimed Strength of Function: high
  F.AUTH (output of Random Number Generator that is part of F.AUTH can be analysed with probabilistic methods; authentication is implemented with probabilistic mechanisms)
  F.LOG (leakage attacks against either 2-key, 3-key Triple-DES, and 128 bit AES as used by F.AUTH can be analysed with probabilistic methods)

  In order to assess the Strength of Function the scheme interpretations AIS 25, AIS 26 and AIS 31(see [9]) were used.

For specific evaluation results regarding the development and production environment see annex B in part D of this report.

The results of the evaluation are only applicable to the TOE as defined in chapter 2 and the configuration as outlined in chapter 8 above.

9.2 Results of cryptographic assessment

The rating of the Strength of Functions does not include the crypto algorithms suitable for encryption and decryption (see BSIG Section 4, Para. 3, Clause 2). This holds for:

- the TOE Security Function F.AUTH (two-key and three-key Triple-DES and AES 128 bit key) and F.CONFID (supporting the AES algorithm)

The following cryptographic algorithms are used by the TOE to enforce its security policy:

- hash functions:
  - none
- algorithms for the encryption and decryption:
  - 2-key Triple-DES, 3-key Triple-DES, 112 or 168 bit, according to FIPS PUB 46-3
  - 128-bit AES according to FIPS PUB 197

This holds for the following security functions:

- F.AUTH, authentication of subjects is performed by a cryptographic challenge-response
- F.CONFID supporting the AES algorithm

The strength of the cryptographic algorithms was not rated in the course of this evaluation (see BSIG Section 4, Para. 3, Clause 2). But Cryptographic functions with a security level of 80 bits or lower can no longer be regarded as secure against attacks with high attack potential without considering the application context. Therefore for these functions it shall be checked whether the related crypto operations are appropriate for the intended system. Some further hints and guidelines can be derived from the 'Technische Richtlinie BSI TR-02102' (www.bsi.bund.de).

The cryptographic function 2-key Triple DES (2TDES) provided by the TOE has got a security level of maximum 80 Bits (in general context).

10 Obligations and notes for the usage of the TOE

The operational documents as outlined in table 2 and the Security Target [6] and [9] contain necessary information about the usage of the TOE and all security hints therein have to be considered.

Since the TOE comprises the complete the IC Dedicated Software and the Smart Card Embedded Software stored in the ROM, there is no possibility to download further Smart Card Embedded Software.

Principally, the user has to follow the instructions in the user guidance documents and has to ensure the fulfilment of the assumptions about the environment in the Security Target [6] and [9].

11 Security Target

For the purpose of publishing, the Security Target [9] of the Target of Evaluation (TOE) is provided within a separate document as Annex A of this report. It is a sanitised version of the complete Security Target [6] used for the evaluation performed. Sanitisation was performed according to the rules as outlined in the relevant CCRA policy (see AIS 35 [4])

12 Definitions

12.1 Acronyms

AES Advanced Encryption Standard

BSI Bundesamt für Sicherheit in der Informationstechnik / Federal Office for Information Security, Bonn, Germany

BSIG	BSI-Errichtungsgesetz
CCRA	Common Criteria Recognition Arrangement
CC	Common Criteria for IT Security Evaluation
DES	Data Encryption Standard
EAL	Evaluation Assurance Level
IT	Information Technology
ITSEF	Information Technology Security Evaluation Facility
OS	Operating System
PP	Protection Profile
RSA	Rivest Shamir Adleman Algorithmus
SF	Security Function
SFP	Security Function Policy
SOF	Strength of Function
ST	Security Target
TOE	Target of Evaluation
TSC	TSF Scope of Control
TSF	TOE Security Functions
TSP	TOE Security Policy

12.2 Glossary

Augmentation - The addition of one or more assurance component(s) from CC Part 3 to an EAL or assurance package.

Extension - The addition to an ST or PP of functional requirements not contained in part 2 and/or assurance requirements not contained in part 3 of the CC.

Formal - Expressed in a restricted syntax language with defined semantics based on well-established mathematical concepts.

Informal - Expressed in natural language.

Object - An entity within the TSC that contains or receives information and upon which subjects perform operations.

Protection Profile - An implementation-independent set of security requirements for a category of TOEs that meet specific consumer needs.

Security Function - A part or parts of the TOE that have to be relied upon for enforcing a closely related subset of the rules from the TSP.

Security Target - A set of security requirements and specifications to be used as the basis for evaluation of an identified TOE.

Semiformal - Expressed in a restricted syntax language with defined semantics.

Strength of Function - A qualification of a TOE security function expressing the minimum efforts assumed necessary to defeat its expected security behaviour by directly attacking its underlying security mechanisms.

SOF-basic - A level of the TOE strength of function where analysis shows that the function provides adequate protection against casual breach of TOE security by attackers possessing a low attack potential.

SOF-medium - A level of the TOE strength of function where analysis shows that the function provides adequate protection against straightforward or intentional breach of TOE security by attackers possessing a moderate attack potential.

SOF-high - A level of the TOE strength of function where analysis shows that the function provides adequate protection against deliberately planned or organised breach of TOE security by attackers possessing a high attack potential.

Subject - An entity within the TSC that causes operations to be performed.

Target of Evaluation - An IT product or system and its associated administrator and user guidance documentation that is the subject of an evaluation.

TOE Security Functions - A set consisting of all hardware, software, and firmware of the TOE that must be relied upon for the correct enforcement of the TSP.

TOE Security Policy - A set of rules that regulate how assets are managed, protected and distributed within a TOE.

TSF Scope of Control - The set of interactions that can occur with or within a TOE and are subject to the rules of the TSP.

13 Bibliography

[1] Common Criteria for Information Technology Security Evaluation, Version 2.3, August 2005

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[3] BSI certification: Procedural Description (BSI 7125)

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[8] specifically

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- AIS 26, Version 3, 6 August 2007, Evaluationsmethodologie für in Hardware integrierte Schaltungen including JIL Document and CC Supporting Document
- AIS 31, Version 1, 25 Sept. 2001 Funktionalitätsklassen und Evaluationsmethodologie für physikalische Zufallszahlengeneratoren
- AIS 32, Version 1, 2 July 2001, Übernahme international abgestimmter CC-Interpretationen ins deutsche Zertifizierungsschema.
- AIS 34, Version 1.00, 1 June 2004, Evaluation Methodology for CC Assurance Classes for EAL5+
- AIS 35, Version 2.0, 12 November 2007, Öffentliche Fassung des Security Targets (ST-Lite) including JIL Document and CC Supporting Document and CCRA policies
- AIS 36, Version 2, 12 November 2007, Kompositionsevaluierung including JIL Document and CC Supporting Document

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C Excerpts from the Criteria

CC Part1:

Conformance results (chapter 7.4)

„The conformance result indicates the source of the collection of requirements that is met by a TOE or PP that passes its evaluation. This conformance result is presented with respect to CC Part 2 (functional requirements), CC Part 3 (assurance requirements) and, if applicable, to a pre-defined set of requirements (e.g., EAL, Protection Profile).

The conformance result consists of one of the following:

- **CC Part 2 conformant** - A PP or TOE is CC Part 2 conformant if the functional requirements are based only upon functional components in CC Part 2.
- **CC Part 2 extended** - A PP or TOE is CC Part 2 extended if the functional requirements include functional components not in CC Part 2.

plus one of the following:

- **CC Part 3 conformant** - A PP or TOE is CC Part 3 conformant if the assurance requirements are based only upon assurance components in CC Part 3.
- **CC Part 3 extended** - A PP or TOE is CC Part 3 extended if the assurance requirements include assurance requirements not in CC Part 3.

Additionally, the conformance result may include a statement made with respect to sets of defined requirements, in which case it consists of one of the following:

- **Package name Conformant** - A PP or TOE is conformant to a pre-defined named functional and/or assurance package (e.g. EAL) if the requirements (functions or assurance) include all components in the packages listed as part of the conformance result.
- **Package name Augmented** - A PP or TOE is an augmentation of a pre-defined named functional and/or assurance package (e.g. EAL) if the requirements (functions or assurance) are a proper superset of all components in the packages listed as part of the conformance result.

Finally, the conformance result may also include a statement made with respect to Protection Profiles, in which case it includes the following:

- **PP Conformant** - A TOE meets specific PP(s), which are listed as part of the conformance result.“

CC Part 3:

Protection Profile criteria overview (chapter 8.2)

“The goal of a PP evaluation is to demonstrate that the PP is complete, consistent, technically sound, and hence suitable for use as a statement of requirements for one or more evaluatable TOEs. Such a PP may be eligible for inclusion within a PP registry.

Assurance Class	Assurance Family
Class APE: Protection Profile evaluation	TOE description (APE_DES)
	Security environment (APE_ENV)
	PP introduction (APE_INT)
	Security objectives (APE_OBJ)
	IT security requirements (APE_REQ)
	Explicitly stated IT security requirements (APE_SRE)

Table 3 - Protection Profile families - CC extended requirements”

Security Target criteria overview (Chapter 8.3)

“The goal of an ST evaluation is to demonstrate that the ST is complete, consistent, technically sound, and hence suitable for use as the basis for the corresponding TOE evaluation.

Assurance Class	Assurance Family
Class ASE: Security Target evaluation	TOE description (ASE_DES)
	Security environment (ASE_ENV)
	ST introduction (ASE_INT)
	Security objectives (ASE_OBJ)
	PP claims (ASE_PPC)
	IT security requirements (ASE_REQ)
	Explicitly stated IT security requirements (ASE_SRE)
	TOE summary specification (ASE_TSS)

Table 5 - Security Target families - CC extended requirements ”

Assurance categorisation (chapter 7.5)

“The assurance classes, families, and the abbreviation for each family are shown in Table 1.

Assurance Class	Assurance Family
ACM: Configuration management	CM automation (ACM_AUT)
	CM capabilities (ACM_CAP)
	CM scope (ACM_SCP)
ADO: Delivery and operation	Delivery (ADO_DEL)
	Installation, generation and start-up (ADO_IGS)
ADV: Development	Functional specification (ADV_FSP)
	High-level design (ADV_HLD)
	Implementation representation (ADV_IMP)
	TSF internals (ADV_INT)
	Low-level design (ADV_LLD)
	Representation correspondence (ADV_RCR)
	Security policy modeling (ADV_SPM)
AGD: Guidance documents	Administrator guidance (AGD_ADM)
	User guidance (AGD_USR)
ALC: Life cycle support	Development security (ALC_DVS)
	Flaw remediation (ALC_FLR)
	Life cycle definition (ALC_LCD)
	Tools and techniques (ALC_TAT)
ATE: Tests	Coverage (ATE_COV)
	Depth (ATE_DPT)
	Functional tests (ATE_FUN)
	Independent testing (ATE_IND)
AVA: Vulnerability assessment	Covert channel analysis (AVA_CCA)
	Misuse (AVA_MSU)
	Strength of TOE security functions (AVA_SOF)
	Vulnerability analysis (AVA_VLA)

Table 1: Assurance family breakdown and mapping”

Evaluation assurance levels (chapter 11)

“The Evaluation Assurance Levels (EALs) provide an increasing scale that balances the level of assurance obtained with the cost and feasibility of acquiring that degree of assurance. The CC approach identifies the separate concepts of assurance in a TOE at the end of the evaluation, and of maintenance of that assurance during the operational use of the TOE.

It is important to note that not all families and components from CC Part 3 are included in the EALs. This is not to say that these do not provide meaningful and desirable assurances. Instead, it is expected that these families and components will be considered for augmentation of an EAL in those PPs and STs for which they provide utility.”

Evaluation assurance level (EAL) overview (chapter 11.1)

“Table 6 represents a summary of the EALs. The columns represent a hierarchically ordered set of EALs, while the rows represent assurance families. Each number in the resulting matrix identifies a specific assurance component where applicable.

As outlined in the next section, seven hierarchically ordered evaluation assurance levels are defined in the CC for the rating of a TOE's assurance. They are hierarchically ordered inasmuch as each EAL represents more assurance than all lower EALs. The increase in assurance from EAL to EAL is accomplished by substitution of a hierarchically higher assurance component from the same assurance family (i.e. increasing rigour, scope, and/or depth) and from the addition of assurance components from other assurance families (i.e. adding new requirements).

These EALs consist of an appropriate combination of assurance components as described in chapter 7 of this Part 3. More precisely, each EAL includes no more than one component of each assurance family and all assurance dependencies of every component are addressed.

While the EALs are defined in the CC, it is possible to represent other combinations of assurance. Specifically, the notion of “augmentation” allows the addition of assurance components (from assurance families not already included in the EAL) or the substitution of assurance components (with another hierarchically higher assurance component in the same assurance family) to an EAL. Of the assurance constructs defined in the CC, only EALs may be augmented. The notion of an “EAL minus a constituent assurance component” is not recognised by the standard as a valid claim. Augmentation carries with it the obligation on the part of the claimant to justify the utility and added value of the added assurance component to the EAL. An EAL may also be extended with explicitly stated assurance requirements.

Assurance Class	Assurance Family	Assurance Components by Evaluation Assurance Level						
		EAL1	EAL2	EAL3	EAL4	EAL5	EAL6	EAL7
Configuration management	ACM_AUT				1	1	2	2
	ACM_CAP	1	2	3	4	4	5	5
	ACM_SCP			1	2	3	3	3
Delivery and operation	ADO_DEL		1	1	2	2	2	3
	ADO_IGS	1	1	1	1	1	1	1
Development	ADV_FSP	1	1	1	2	3	3	4
	ADV_HLD		1	2	2	3	4	5
	ADV_IMP				1	2	3	3
	ADV_INT					1	2	3
	ADV_LLD				1	1	2	2
	ADV_RCR	1	1	1	1	2	2	3
	ADV_SPM				1	3	3	3
Guidance documents	AGD_ADM	1	1	1	1	1	1	1
	AGD_USR	1	1	1	1	1	1	1
Life cycle support	ALC_DVS			1	1	1	2	2
	ALC_FLR							
	ALC_LCD				1	2	2	3
	ALC_TAT				1	2	3	3
Tests	ATE_COV		1	2	2	2	3	3
	ATE_DPT			1	1	2	2	3
	ATE_FUN		1	1	1	1	2	2
	ATE_IND	1	2	2	2	2	2	3
Vulnerability assessment	AVA_CCA					1	2	2
	AVA_MSU			1	2	2	3	3
	AVA_SOF		1	1	1	1	1	1
	AVA_VLA		1	1	2	3	4	4

Table 6: Evaluation assurance level summary”

Evaluation assurance level 1 (EAL1) - functionally tested (chapter 11.3)

“Objectives

EAL1 is applicable where some confidence in correct operation is required, but the threats to security are not viewed as serious. It will be of value where independent assurance is required to support the contention that due care has been exercised with respect to the protection of personal or similar information.

EAL1 provides an evaluation of the TOE as made available to the customer, including independent testing against a specification, and an examination of the guidance documentation provided. It is intended that an EAL1 evaluation could be successfully conducted without assistance from the developer of the TOE, and for minimal outlay.

An evaluation at this level should provide evidence that the TOE functions in a manner consistent with its documentation, and that it provides useful protection against identified threats.”

Evaluation assurance level 2 (EAL2) - structurally tested (chapter 11.4)

“Objectives

EAL2 requires the co-operation of the developer in terms of the delivery of design information and test results, but should not demand more effort on the part of the developer than is consistent with good commercial practice. As such it should not require a substantially increased investment of cost or time.

EAL2 is therefore applicable in those circumstances where developers or users require a low to moderate level of independently assured security in the absence of ready availability of the complete development record. Such a situation may arise when securing legacy systems, or where access to the developer may be limited.”

Evaluation assurance level 3 (EAL3) - methodically tested and checked (chapter 11.5)

“Objectives

EAL3 permits a conscientious developer to gain maximum assurance from positive security engineering at the design stage without substantial alteration of existing sound development practices.

EAL3 is applicable in those circumstances where developers or users require a moderate level of independently assured security, and require a thorough investigation of the TOE and its development without substantial re-engineering.”

Evaluation assurance level 4 (EAL4) - methodically designed, tested, and reviewed (chapter 11.6)

“Objectives

EAL4 permits a developer to gain maximum assurance from positive security engineering based on good commercial development practices which, though rigorous, do not require substantial specialist knowledge, skills, and other resources. EAL4 is the highest level at which it is likely to be economically feasible to retrofit to an existing product line.

EAL4 is therefore applicable in those circumstances where developers or users require a moderate to high level of independently assured security in conventional commodity TOEs and are prepared to incur additional security-specific engineering costs.”

Evaluation assurance level 5 (EAL5) - semiformally designed and tested (chapter 11.7)

“Objectives

EAL5 permits a developer to gain maximum assurance from security engineering based upon rigorous commercial development practices supported by moderate application of specialist security engineering techniques. Such a TOE will probably be designed and developed with the intent of achieving EAL5 assurance. It is likely that the additional costs attributable to the EAL5 requirements, relative to rigorous development without the application of specialised techniques, will not be large.

EAL5 is therefore applicable in those circumstances where developers or users require a high level of independently assured security in a planned development and require a rigorous development approach without incurring unreasonable costs attributable to specialist security engineering techniques.”

Evaluation assurance level 6 (EAL6) - semiformally verified design and tested (chapter 11.8)

“Objectives

EAL6 permits developers to gain high assurance from application of security engineering techniques to a rigorous development environment in order to produce a premium TOE for protecting high value assets against significant risks.

EAL6 is therefore applicable to the development of security TOEs for application in high risk situations where the value of the protected assets justifies the additional costs.”

Evaluation assurance level 7 (EAL7) - formally verified design and tested (chapter 11.9)

“Objectives

EAL7 is applicable to the development of security TOEs for application in extremely high risk situations and/or where the high value of the assets justifies the higher costs. Practical application of EAL7 is currently limited to TOEs with tightly focused security functionality that is amenable to extensive formal analysis.“

Strength of TOE security functions (AVA_SOF) (chapter 19.3)

“Objectives

Even if a TOE security function cannot be bypassed, deactivated, or corrupted, it may still be possible to defeat it because there is a vulnerability in the concept of its underlying security mechanisms. For those functions a qualification of their security behaviour can be made using the results of a quantitative or statistical analysis of the security behaviour of these mechanisms and the effort required to overcome them. The qualification is made in the form of a strength of TOE security function claim.”

Vulnerability analysis (AVA_VLA) (chapter 19.4)

"Objectives

Vulnerability analysis is an assessment to determine whether vulnerabilities identified, during the evaluation of the construction and anticipated operation of the TOE or by other methods (e.g. by flaw hypotheses), could allow users to violate the TSP.

Vulnerability analysis deals with the threats that a user will be able to discover flaws that will allow unauthorised access to resources (e.g. data), allow the ability to interfere with or alter the TSF, or interfere with the authorised capabilities of other users.”

"Application notes

A vulnerability analysis is performed by the developer in order to ascertain the presence of security vulnerabilities, and should consider at least the contents of all the TOE deliverables including the ST for the targeted evaluation assurance level. The developer is required to document the disposition of identified vulnerabilities to allow the evaluator to make use of that information if it is found useful as a support for the evaluator's independent vulnerability analysis.”

“Independent vulnerability analysis goes beyond the vulnerabilities identified by the developer. The main intent of the evaluator analysis is to determine that the TOE is resistant to penetration attacks performed by an attacker possessing a low (for AVA_VLA.2 Independent vulnerability analysis), moderate (for AVA_VLA.3 Moderately resistant) or high (for AVA_VLA.4 Highly resistant) attack potential.”

D Annexes

List of annexes of this certification report

Annex A: Security Target provided within a separate document.

Annex B: Evaluation results regarding development and production environment

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Annex B of Certification Report BSI-DSZ-CC-0487-2009

Evaluation results regarding development and production environment

The IT product NXP Mifare DESFire8 MF3ICD81 V0C/004 Secure SmartCard Controller with Embedded Software (Target of Evaluation, TOE) has been evaluated at an accredited and licensed / approved evaluation facility using the Common Methodology for IT Security Evaluation, Version 2.3 extended by advice of the Certification Body for components beyond EAL 4 and guidance specific for the technology of the product for conformance to the Common Criteria for IT Security Evaluation (CC), Version 2.3 (ISO/IEC 15408:2005).

As a result of the TOE certification, dated 1 April 2009, the following results regarding the development and production environment apply. The Common Criteria Security Assurance Requirements

- ACM – Configuration management (i.e. ACM_AUT.1, ACM_CAP.4, ACM_SCP.2),
- ADO – Delivery and operation (i.e. ADO_DEL.2, ADO_IGS.1) and
- ALC – Life cycle support (i.e. ALC_DVS.2, ALC_LCD.1, ALC_TAT.1),

are fulfilled for the development and production sites of the TOE listed below:

a) Development, Documentation: NXP Semiconductors GmbH; Business Line Identification; Document Control Office; Mikron-Weg 1; A-8101 Gratkorn

b) Semiconductor Factory: Systems on Silicon Manufacturing Co. Pte. Ltd. (SSMC); 70 Pasir Ris Drive 1; Singapore 519527; Singapore

c) Mask Shop: Photronics Singapore Pte. Ltd.; 6 Loyang Way 2; Loyang Industrial Park; Singapore 507099; Singapore

d) Mask Shop: Photronics Semiconductors Mask Corp. (PSMC); 1F, No.2, Li-Hsin Rd.; Science-Based Industrial Park; Hsin-Chu City Taiwan R.O.C.

e) Wafer Bumping: Chipbond Technology Corporation; No. 3, Li-Hsin Rd. V; Science Based Industrial Park; Hsin-Chu City; Taiwan R.O.C.

f) Test Center: NXP Semiconductors GmbH; IC Manufacturing Operations - Test Center; Hamburg (IMO TeCH); Stresemannallee 101; D-22529 Hamburg

g) Module Assembly: NXP Semiconductors (Thailand); Assembly Plant Bangkok, Thailand (APB); 303 Moo 3 Chaengwattana Rd.; Laksi, Bangkok 10210 Thailand

The TOE is manufactured in the IC fabrication SSMC in Singapore indicated by the nameplate (on-chip identifier) t504V0C.

For the sites listed above, the requirements have been specifically applied in accordance with the Security Target [6]). The evaluators verified, that the Threats, Security Objectives and Requirements for the TOE life cycle phases up to delivery (as stated in the Security Target [6] and [9]) are fulfilled by the procedures of these sites.

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