Certification Report

Bundesamt für Sicherheit in der Informationstechnik

BSI-DSZ-CC-0353-2006

for

**Renesas AE57C1 (HD65257C1)
smartcard integrated circuit version 01**

from

Renesas Technology Corp.

Deutsches IT-Sicherheitszertifikat

erteilt vom
Bundesamt für Sicherheit in der Informationstechnik

**Bundesamt für Sicherheit
in der Informationstechnik**

BSI-DSZ-CC-0353-2006

Renesas AE57C1 (HD65257C1)
smartcard integrated circuit version 01

from

Renesas Technology Corp.

Common Criteria Arrangement
for components up to EAL4

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 (ISO/IEC 15408:2005)* extended by advice of the Certification Body for components beyond EAL4 and smart card specific guidance for conformance to the *Common Criteria for IT Security Evaluation, Version 2.3 (ISO/IEC 15408:2005).*

Evaluation Results:

PP Conformance: **Protection Profile BSI-PP-0002-2001**

Functionality: **BSI-PP-0002-2001 conformant plus product specific extensions
Common Criteria Part 2 extended**

Assurance Package: **Common Criteria Part 3 conformant
EAL 4 augmented by:**
ADV_IMP.2 (Implementation of the TSF),
ALC_DVS.2 (Sufficieny of security measures),
AVA_MSU.3 (Analysis and testing for insecure states) and
AVA_VLA.4 (Highly resistant)

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.

The notes mentioned on the reverse side are part of this certificate.

Bonn, 13. September 2006

The President of the Federal Office
for Information Security

Dr. Helmbrecht   L.S.   SOGIS - MRA

The rating of the strength of functions does not include the cryptoalgorithms suitable for encryption and decryption (see BSIG Section 4, Para. 3, Clause 2).

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.

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[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:

- BSIG[2]

- BSI Certification Ordinance[3]

- BSI Schedule of Costs[4]

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

- DIN EN 45011 standard

- BSI certification: Procedural Description (BSI 7125)

- Common Criteria for IT Security Evaluation (CC), version 2.3[5]

- Common Methodology for IT Security Evaluation (CEM), version 2.3

- BSI certification: Application Notes and Interpretation of the Scheme (AIS)

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

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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 7 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

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   ITSEC/CC - Certificates

The SOGIS-Agreement on the mutual recognition of certificates based on ITSEC became effective on 3 March 1998. This agreement was signed by the national bodies of Finland, France, Germany, Greece, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. This agreement on the mutual recognition of IT security certificates was extended to include certificates based on the CC for all evaluation levels (EAL 1 – EAL 7).

2.2   CC - Certificates

An arrangement (Common Criteria Arrangement) on the mutual recognition of certificates based on the CC evaluation assurance levels up to and including EAL 4 was signed in May 2000. It includes also the recognition of Protection Profiles based on the CC. The arrangement was signed by the national bodies of Australia, Canada, Finland, France, Germany, Greece, Italy, The Netherlands, New Zealand, Norway, Spain, United Kingdom and the United States. Israel joined the arrangement in November 2000, Sweden in February 2002, Austria in November 2002, Hungary and Turkey in September 2003, Japan in November 2003, the Czech Republic in September 2004, the Republic of Singapore in March 2005, India in April 2005.

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 Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01 has undergone the certification procedure at BSI. This is a re-certification based on BSI-DSZ-CC-0329-2006. For this evaluation specific results from the evaluation process based on BSI-DSZ-CC-0329-2006 were re-used.

The evaluation of the product Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01 was conducted by T-Systems GEI GmbH. The T-Systems GEI GmbH is an evaluation facility (ITSEF)[6] recognised by BSI.

The vendor and distributor is Renesas Technology Corp.. The sponsor is

> Renesas Technology Europe Ltd.
> Dukes Meadow Millboard Road
> Bourne End
> Buckinghamshire
> SL8 5FH
> UK

The certification is concluded with

- the comparability check and

- the production of this Certification Report.

This work was completed by the BSI on 13. September 2006.

The confirmed assurance package is only valid on the condition that

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

- the product is operated in the environment described, where specified in the following report.

This Certification Report only applies to the version of the product indicated here. The validity can be extended to new versions and releases of the product, provided the sponsor applies for re-certification of the modified product, in accordance with the procedural requirements, and the evaluation does not reveal any security deficiencies.

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.

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[6]   Information Technology Security Evaluation Facility

4   Publication

The following Certification Results contain pages B-1 to B-18 and D1 to D-4.

The product Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01 has been included in the BSI list of the certified products, which is published regularly (see also Internet: http:// www.bsi.bund.de). Further information can be obtained from BSI-Infoline +49 228 9582-111.

Further copies of this Certification Report can be requested from the vendor[7] of the product. The Certification Report can also be downloaded from the above-mentioned website.

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[7]   Renesas Technology Corp.
Secure MCU Design Dept. 1
5-20-1 Jousuihon-cho, Kodaira-shi
Tokyo 187-8588
Japan

B   Certification Results

The following results represent a summary of

- the security target of the sponsor for the target of evaluation,

- the relevant evaluation results from the evaluation facility, and

- complementary notes and stipulations of the certification body.

Contents of the certification results

1   Executive Summary

The Target of Evaluation (TOE) is the "Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01" with IC manufacturer's ID number 4870 for Naka (Japan). The AE57C1 is an integrated circuit (IC) and an AES Library providing a hardware platform and cryptographic functions implemented in software to a smart card operating system and smart card application software.

The TOE is intended for use in a range of high security applications, including high speed security authentication, data encryption or electronic signature. Several security features independently implemented in hardware or controlled by software will be provided to ensure proper operation and integrity and confidentiality of stored data. This includes for example measures for memory protection, leakage protection and sensors to allow operations only under specified conditions.

The TOE is composed of a processing unit, system control logic, security logic, watchdog timer, firewall management unit, UART, two I/O lines, volatile or non-volatile memories (480 kbytes + 16 kbytes ROM, 12 kbytes RAM + 2 kbytes of coprocessor RAM, 128 kbytes + 16 kbytes EEPROM), a AES co-processor, a DES co-processor, a random number generator (RNG), modular multiplication coprocessor and two interval timer. The TOE also includes Renesas proprietary IC Dedicated Software stored on the chip and used for testing purposes during production only. It does not provide additional services in the operational phase of the TOE. The listing of a RNG Online Test Software is delivered as part of the TOE and should be included in the users embedded software as outlined in the guidance [11]. Additionally an AES library is integrated into the TOE hardware. The smart card operating system and the application stored in the User ROM and in the EEPROM are not part of the TOE.

The IT product Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01 was evaluated by T-Systems GEI GmbH. The evaluation was completed on 11. August 2006. The T-Systems GEI GmbH is an evaluation facility (ITSEF)[8] recognised by BSI.

The vendor and distributor is

> Renesas Technology Corp.
> 5-20-1 Jousuihon-cho
> Kodaira-shi
> Tokyo 187-8588
> Japan

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[8]   Information Technology Security Evaluation Facility

The sponsor is

> Renesas Technology Europe Ltd.
> Dukes Meadow Millboard Road
> Bourne End
> Buckinghamshire
> SL8 5FH
> UK

1.1   Assurance package

The TOE security assurance requirements are based entirely on the assurance components defined in part 3 of the Common Criteria (see Annex C or [1], part 3 for details). The TOE meets the assurance requirements of assurance level EAL 4+ (Evaluation Assurance Level 4 augmented). The following table shows the augmented assurance components:

Requirement	Identifier
EAL4	TOE evaluation: methodically designed, tested, and reviewed
+ ADV_IMP.2	Development – Implementation of the TSF
+ ALC_DVS.2	Life cycle support – Sufficiency of security measures
+ AVA_MSU.3	Vulnerability assessment - Analysis and testing for insecure states
+ AVA_VLA.4	Vulnerability assessment - Highly resistant

Table 1: Assurance components and EAL-augmentation

1.2   Functionality

The TOE Security Functional Requirements (SFR) selected in the Security Target are Common Criteria Part 2 extended as shown in the following tables.

The following SFRs are taken from CC part 2:

Security Functional Requirement	Addressed issue
FCS	**Cryptographic support**
FCS_COP.1 [DES]	Cryptographic operation
FCS_COP.1 [AES]	Cryptographic operation
FDP	**User data protection**
FDP_IFC.1	Subset information overflow control
FDP_ITT.1	Basic internal transfer protection
FDP_ACC.1 [CRP]	Subset access control [Controlled-Register Policy]
FDP_ACC.1 [WPP]	Subset access control [Write-Protect Policy]
FDP_ACF.1 [CRP]	Security attribute based access control [Controlled-Register Policy]

Security Functional Requirement	Addressed issue
FDP_ACF.1 [WPP]	Security attribute based access control [Write-Protect Policy]
FPT	**Protection of the TOE Security Functions**
FPT_FLS.1	Failure with preservation of secure state
FPT_ITT.1	Basic internal TSF data transfer protection
FPT_PHP.3	Resistance to physical attack
FPT_SEP.1	TSF domain separation
FRU	**Resource utilisation**
FRU_FLT.2	Limited fault tolerance

Table 2: SFRs for the TOE taken from CC Part 2

The following CC part 2 extended SFRs are defined:

Security Functional Requirement	Addressed issue
FAU	**Security Audit**
FAU_SAS.1	Audit storage
FCS	**Cryptographic support**
FCS_RND.1	Quality metric for random numbers
FMT	**Security management**
FMT_LIM.1	Limited capabilities
FMT_LIM.2	Limited availability

Table 3: SFRs for the TOE, CC part 2 extended

Note: Only the titles of the Security Functional Requirements are provided. For more details and application notes please refer to the ST chapter 5.

These Security Functional Requirements are implemented by the TOE Security Functions:

TOE Security Function	Addressed issue
SF.HWProtect	Protection from attacks on the operation of the hardware
SF.LeakProtect	Protection against leakage of information from the IC
SF.RNG	Random Number Generator
SF.AES	AES Coprocessor
SF.DES	DES Coprocessor
SF.FMU	Firewall Management Unit
SF.ESFunction	Embedded Software Functions

TOE Security Function	Addressed issue
SF.TestModeControl	Test Mode Control
SF.EEPAccess	Erase/write protection of EEPROM
SF.Inject	Data injection

Table 4: Security Functions

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

1.3 Strength of Function

The TOE's strength of functions is claimed 'high' (SOF-high) for specific functions as indicated in the Security Target [6], chapter 6.

The rating of the strength of functions does not include the cryptoalgorithms suitable for encryption and decryption (see BSIG Section 4, Para. 3, Clause 2). For details see chapter 9 of this report.

1.4 Summary of threats and Organisational Security Policies (OSPs) addressed by the evaluated IT product

The threats which were assumed for the evaluation and averted by the TOE and the organisational security policies defined for the TOE are specified in the Security Target [7] and can be summarized as follows.

It is assumed that the attacker is a human being or a process acting on behalf of him.

With reference to the Protection Profile [9], the Security Target [7] defines so called standard high-level security concerns derived from considering the end-usage phase (Phase 7 of the life cycle as described in the Security Target) as follows:

- manipulation of User Data and of the Smartcard Embedded software (while being executed/processed and while being stored in the TOE's memories),

- disclosure of User Data and of the Smartcard Embedded Soft-ware (while being processed and while being stored in the TOE's memories) and

- deficiency of random numbers.

These high-level security concerns are refined by defining threats on a more technical level for

- Inherent Information Leakage,

- Physical Probing,

- Physical Manipulation,

- Malfunction due to Environmental Stress,

- Forced Information Leakage,

- Abuse of Functionality and

- Deficiency of Random Numbers.

Phase 1 and the Phases from TOE Delivery up to the end of Phase 6 are covered by assumptions (see below).

The development and production environment starting with Phase 2 up to TOE Delivery are covered by an organisational security policy outlining that the IC Developer / Manufacturer must apply the policy "Protection during TOE Development and Production (P.Process-TOE)" so that no information is unintentionally made available for the operational phase of the TOE. The Policy ensures confidentiality and integrity of the TOE and its related design information and data. Access to samples, tools and material must be restricted.

Additionally, the Security Target defines a security concern about specific attacks on the Smartcard Embedded Software the TOE is not being able to detect or to respond to. This concern is detailled in terms of the threats

- Inability of the TOE to detect an attack,

- Inability of the Smartcard Embedded Software to respond to an attack.

A specific additional security functionality for DES encryption and decryption must be provided by the TOE according to an additional security policy defined in the Security Target.

Objectives are taken from the Protection Profile plus additional ones related to the additional threats and policy.

1.5   Special configuration requirements

The TOE has two different operating modes from security aspect, user mode and test mode. The application software being executed on the TOE can not use the test mode. The TOE is delivered as a hardware unit at the end of the IC manufacturing process (Phase 3) or at the end of IC Packaging (Phase 4). At this point in time the operating system software is already stored in the non-volatile memories of the chip and the test mode is disabled. Thus, there are no special procedures for generation or installation that are important for a secure use of the TOE. The further production and delivery processes, like the Smart Card Finishing Process, Personalisation and the delivery of the smart card to an end user, have to be organized in a way that excludes all possibilities of physical manipulation of the TOE. There are no special security measures for the startup of the TOE besides the requirement that the controller has to be used under the well-defined operating conditions and that the requirements on the software have to be applied as described in the user documentation.

1.6   Assumptions about the operating environment

With respect to the life cycle defined in the Security Target, Phase 1 and the Phases from TOE Delivery up to the end of Phase 6 are covered by these assumptions:

The developer of the Smartcard Embedded Software (Phase 1) must ensure:

- the appropriate "Usage of Hardware Platform (A.Plat-Appl)" while developing this software in Phase 1. Therefore, it has to be ensured, that the software fulfils the assumptions for a secure use of the TOE. In particular the assumptions imply that developers are trusted to develop software that fulfils the assumptions.

- the appropriate "Treatment of User Data (A.Resp-Appl)" while developing this software in Phase 1. The smart card operating system and the smart card application software have to use security relevant user data (especially keys and plain text data) in a secure way. It is assumed that the Security Policy as defined for the specific application context of the environment does not contradict the Security Objectives of the TOE. Only appropriate secret keys as input for the cryptographic function of the TOE have to be used to ensure the strength of cryptographic operation.

Protection during Packaging, Finishing and Personalisation (A.Process-Card) is assumed after TOE Delivery up to the end of Phase 6, as well as during the delivery to Phase 7.

Following additional assumptions are assumed in the Security Target:

- Key-dependent functions (if any) shall be implemented in the Smartcard Embedded Software in a way that they are not susceptible to leakage attacks (A.Key-Function).

- Data for injection/pre-personalisation will be supplied from the various bodies controlling the operations of the system in which the TOE is functioning. It is assumed that the generation, distribution, maintenance, and destruction of these data is adequately secure (A.InjDatSupp).

1.7   Disclaimers

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:

Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01

The following table outlines the TOE deliverables:

No	Type	Identifier	Release	Form of Delivery

No	Type	Identifier	Release	Form of Delivery
1	HW	AE57C1 (HD65257C1) single-chip microcomputer	version 01 with IC manufacturer's ID number 4870 for Naka	Wafer or packaged module
2	SW	AES Library	version 1.30	Stored in AE57C1 ROM on the chip
3	SW	Self-Test ROM Software (the IC dedicated software)	Rev. 1.2 ae57c1_selfrom_a 01_1st_keyX"_NP _merge.src	Stored in AE57C1 Test ROM on the chip
3	SW	RNG online test software	Defined by the version of [11]	Hardcopy
4	DOC	AE57C1 Hardware Manual	Rev. 1.00	Hardcopy
6	DOC	AE-5 series User Guidance Manual	Rev. 5.3	Hardcopy
7	DOC	Option List for Smart Card Microcomputer (for HD65257C1 [AE57C1])	V. 1.3	Hardcopy

Table 5: Deliverables of the TOE

The TOE is identified by HD65257C1 (short form AE57C1) Version 01 (stored as version number in the EEPROM), produced in Naka (indicated by IC manufacturer's ID number 4870 for Naka). The pre-personalisation data are injected into the EEPROM as specified by the customer using the option list [12].

To ensure that the customer receives this evaluated version, the delivery procedures described in [11] have to be followed.

3   Security Policy

The security policy of the TOE is to provide basic security functions to be used by the smart card operating system and the smart card application thus providing an overall smart card system security. Therefore, the TOE will implement symmetric cryptographic block cipher algorithms to ensure the confidentiality of plain text data by encryption and to support secure authentication protocols and it will provide a random number generation of appropriate quality.

As the TOE is a hardware security platform, 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 smart card operating system and the application software stored in the User ROM and in the EEPROM are not part of the TOE. The code in the Test ROM of the TOE (IC dedicated software) is used by the TOE manufacturer to check the chip function before TOE delivery. This was considered as part of the evaluation under the CC assurance aspects ALC for relevant procedures and under ATE for testing.

The TOE is delivered as a hardware unit at the end of the chip manufacturing process (phase 3 of the life cycle defined) or at the end of the IC packaging into modules (phase 4 of the life cycle defined). At these specific points in time the operating system software is already stored in the non-volatile memories of the chip and the test mode is completely disabled.

The smart card applications need the security functions of the smart card operating system based on the security features of the TOE. With respect to security the composition of this TOE, the operating system, and the smart card application is important. Within this composition the security functionality is only partly provided by the TOE and causes dependencies between the TOE security functions and the functions provided by the operating system or the smart card application on top. These dependencies are expressed by environmental and secure usage assumptions as outlined in the user documentation.

Within this evaluation of the TOE several aspects were specifically considered to support a composite evaluation of the TOE together with an embedded smart card application software (i.e. smart card operating system and application). This was necessary as Renesas Technology Corp. is the TOE developer and manufacturer and responsible for specific aspects of handling the embedded smart card application software in its development and production environment. For those aspects refer to chapter 9 of this report.

5 Architectural Information

The Renesas AE57C1 (HD65257C1) smartcard integrated circuit version 01 is an integrated circuit (IC) providing a hardware platform and an AES library to a smart card operating system and smart card application software. The top level block diagram and a list of subsystems can be found within the TOE description of the Security Target. The complete hardware description and the complete instruction set of the Renesas AE57C1 (HD65257C1) smartcard integrated circuit version 01 is to be found in the Hardware Manual [10].

For the implementation of the TOE Security Functions basically the components AE-5 Series CPU, EEPROM, Watchdog Timer, System Control Registers, AES coprocessor, DES coprocessor, Firewall Management Unit, a Random Number

Generator, the analog block with security sensors and the random logic module for security logic are used. Security measures for physical protection are realized within the layout of the whole circuitry.

The TOE IC Dedicated Software, stored on the chip, is used for testing purposes during production only and is completely separated from the use of the embedded software by disabling before TOE delivery.

6 Documentation

The following documentation is provided with the product by the developer to the customer for secure usage of the TOE in accordance with the Security Target:

- The Hardware Manual [10],
- Guidelines for using the TOE [11],
- The Option List [12].

Note that the customer who buys the TOE is normally the developer of the operating system and/or application software which will use the TOE as hardware computing platform. The documents [10] - [12] will be used by the customer to implement the software (operating system / application software) which will use the TOE.

7 IT Product Testing

The tests performed by the developer were divided into four categories:

- tests which are performed in a simulation environment,
- functional production tests, which are done as a last step of the production process (phase 3) and, in case TOE delivery is at the end of phase 4, additionally done as a last step of IC Packaging. These tests are done for every chip to check its correct functionality,
- characterization tests, which were used to determine the behaviour of the chip with respect to different operating conditions and
- special verification tests for security functions which were done with samples of the TOE.

The developer tests cover all security functions and all security mechanisms as identified in the functional specification and the high level design. Chips from the production site in Naka (see annex A of this report) were used for tests.

The evaluators repeated the tests of the developer either using the library of programs and tools delivered to the evaluator or at the developers site. They performed independent tests to supplement, augment and to verify the tests performed by the developer by sampling. Besides repeating exactly the developers tests, test parameters were varied and additional analysis was

done. Security features of the TOE realised by specific design and layout measures were checked by the evaluators during layout inspections.

The evaluators gave evidence that the actual version of the TOE (Version 01 with IC manufacturer's ID number 4870 for Naka) provides the security functions as specified. The test results confirm the correct implementation of the TOE security functions.

For penetration testing the evaluators took all security functions into consideration. Intensive penetration testing was performed to consider the physical tampering of the TOE using highly sophisticated equipment and expert know how.

8   Evaluated Configuration

The TOE is identified by AE57C1 (HD65257C1) version 01 IC manufacturer's ID number 4870 for Naka. There is only one evaluated configuration of the TOE. This configuration (all TSF are active and usable) has to be selected by the customer in the option list at order. All information of how to use the TOE and its security functions by the software is provided within the user documentation.

The TOE has two different operating modes, user mode and test mode. The application software being executed on the TOE can not use the test mode. Thus, the evaluation was mainly performed in the user mode. For all evaluation activities performed in test mode, there was a rationale why the results are valid for the user mode, too.

9   Results of the Evaluation

The Evaluation Technical Report (ETR), [8] 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 identical with EAL4.

For smart card IC specific methodology the guidance documents (i) *Joint Interpretation Library - The application of CC to Integrated Circuits,* (ii) *Joint Interpretation Library - Integrated Circuit Hardware Evaluation Methodology* and (iii*) Functionality classes and evaluation methodology for physical random number generators* (see [4]: AIS 25, AIS 26 and AIS 31) were used.

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

The verdicts for the CC, Part 3 assurance components (according to EAL4 and the class ASE for the Security Target evaluation) are summarised in the following table:

Assurance classes and components		Verdict
Security Target evaluation	CC Class ASE	PASS
TOE description	ASE_DES.1	PASS
Security environment	ASE_ENV.1	PASS
ST introduction	ASE_INT.1	PASS
Security objectives	ASE_OBJ.1	PASS
PP claims	ASE_PPC.1	PASS
IT security requirements	ASE_REQ.1	PASS
Explicitly stated IT security requirements	ASE_SRE.1	PASS
TOE summary specification	ASE_TSS.1	PASS
Configuration management	CC Class ACM	PASS
Partial CM automation	ACM_AUT.1	PASS
Generation support and acceptance procedures	ACM_CAP.4	PASS
Problem tracking CM coverage	ACM_SCP.2	PASS
Delivery and operation	CC Class ADO	PASS
Detection of modification	ADO_DEL.2	PASS
Installation, generation, and start-up procedures	ADO_IGS.1	PASS
Development	CC Class ADV	PASS
Fully defined external interfaces	ADV_FSP.2	PASS
Security enforcing high-level design	ADV_HLD.2	PASS
Implementation of the TSF	ADV_IMP.2	PASS
Descriptive low-level design	ADV_LLD.1	PASS
Informal correspondence demonstration	ADV_RCR.1	PASS
Informal TOE security policy model	ADV_SPM.1	PASS
Guidance documents	CC Class AGD	PASS
Administrator guidance	AGD_ADM.1	PASS
User guidance	AGD_USR.1	PASS
Life cycle support	CC Class ALC	PASS
Sufficiency of security measures	ALC_DVS.2	PASS
Developer defined life-cycle model	ALC_LCD.1	PASS
Well-defined developement tools	ALC_TAT.1	PASS
Tests	CC Class ATE	PASS
Analysis of coverage	ATE_COV.2	PASS
Testing: high-level design	ATE_DPT.1	PASS
Functional testing	ATE_FUN.1	PASS
Independent testing – sample	ATE_IND.2	PASS

Assurance classes and components		Verdict
Vulnerability assessment	CC Class AVA	PASS
Analysis and testing for insecure states	AVA_MSU.3	PASS
Strength of TOE security function evaluation	AVA_SOF.1	PASS
Highly resistant	AVA_VLA.4	PASS

Table 1: Verdicts for the assurance components

The evaluation has shown that:

▪ the TOE ist conformant to the Protection Profile BSI-PP-0002-2001,

▪ Security Functional Requirements specified for the TOE are Common are Criteria Part 2 extended,

▪ the assurance of the TOE is Common Criteria Part 3 conformant, EAL4 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:

> SF.LeakProtect
>
> SF.RNG
>
> SF.TestModeControl

The rating of the strength of functions does not include the cryptoalgorithms suitable for encryption and decryption (see BSIG Section 4, Para. 3, Clause 2). This holds for

▪ the TOE Security Function SF.DES used for encryption and decryption.

▪ the TOE Security Function SF.AES used for encryption and decryption.

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

10   Comments/Recommendations

▪ The operational documentation [10] - [12] contains necessary information about the usage of the TOE. For secure usage of the TOE the fulfilment of the assumptions about the environment in the Security Target has to be taken into account. These requirements are stated in the guidance document [11].

▪ For evaluations of products or systems including the TOE as a part or using the TOE as a platform (for example smart card operating systems or complete smart cards), specific information resulting from this evaluation is of importance and shall be given to the succeeding evaluation.

▪ The TOE software for random number postprocessing shall be implemented by the embedded software developer as outlined in the guidance [11].

11   Annexes

Annex A: Evaluation results regarding the development and production environment (see part D of this report).

12   Security Target

For the purpose of publishing, the Security Target [7] of the Target of Evaluation (TOE) is provided within a separate document. It is a sanitized version of the complete Security Target [6] used for the evaluation performed.

13   Definitions

13.1 Acronyms

AES	Advanced Encryption Standard; symmetric block cipher algorithm
BSI	Bundesamt für Sicherheit in der Informationstechnik / Federal Office for Information Security, Bonn, Germany
CC	Common Criteria for IT Security Evaluation
CEM	Common Evaluation Methodology
DES	Data Encryption Standard; symmetric block cipher algorithm
EAL	Evaluation Assurance Level
EEPROM	Electrically Erasable Programmable Read Only Memory
IT	Information Technology
PP	Protection Profile
RAM	Random Access Memory
RNG	Random Number Generator
ROM	Read Only Memory
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
UART	Universal Asynchronous Receiver Transmitter

13.2 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.

14 Bibliography

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

[2] Common Methodology for Information Technology Security Evaluation (CEM), Evaluation Methodology, Version 2.3, August 2005

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

[4] Application Notes and Interpretations of the Scheme (AIS) as relevant for the TOE.

[5] German IT Security Certificates (BSI 7148, BSI 7149), periodically updated list published also on the BSI Web-site

[6] Security Target BSI-DSZ-CC-0353, Version 5.2, 26 June 2006, AE57C1 (HD65257C1) Version 01, Renesas Technology Corp. (confidential document)

[7] Security Target BSI-DSZ-CC-0353, Version 3.0, 18 July, 2006, AE57C1 (HD65257C1) Version 01, Renesas Technology Corp. (sanitized public document)

[8] Evaluation Technical Report, 1.0, 10 August, 2006, AE57C1 (HD65257C1) Version 01 (confidential document)

[9] Smartcard IC Platform Protection Profile, Version 1.0, July, 2001, BSI registration ID: BSI-PP-0002-2001, developed by Atmel Smart Card ICs, Hitachi Europe Ltd., Infineon Technologies AG, Philips Semiconductors

[10] AE57C1 Hardware Manual Rev. 1.0, Renesas 32-bit Smart Card Microcomputer AE-5 Series AE57C1 (HD65257C1, Renesas Technology Corp., 21 April, 2006, (confidential document)

[11] AE-5 Series User Guidance Manual Rev. 5.30, Renesas Technology Corp., 13 July, 2006, (confidential document)

[12] Option List for Smart Card Microcomputer (for HD65257C1 [AE57C1]), Version 1.3, Renesas Technology Corp, 31 January, 2006, (confidential document)

[13] Federal Information Processing Standards Publication, Security Requirements for Cryptographic Modules, FIPS PUB 140-2, 25th May 2001

[14] U.S. Department of Commerce/ National Bureau of Standards Data Encryption Standard, FIPS PUB 46-3, 25th October 1999

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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:

a) **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.

b) **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:

a) **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.

b) **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:

a) **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.

b) **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:

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

CC Part 3:

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

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Annex A of Certification Report BSI-DSZ-CC-0353-2006

Evaluation results regarding development and production environment

The IT product Renesas AE57C1 (HD65257C1) smartcard integrated circuit Version 01 (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 (ISO/IEC 15408:2005), for conformance to the Common Criteria for IT Security Evaluation, Version 2.3 (ISO/IEC15408: 2005).

As a result of the TOE certification, dated 13. September 2006, the following results regarding the development and production environment apply. The Common Criteria assurance requirements

- ACM – Configuration management (ACM_AUT.1, ACM_CAP.4, ACM_SCP.2),

- ADO – Delivery and operation (ADO_DEL.2, ADO_IGS.1) and

- ALC – Life cycle support (ALC_DVS.2, ALC_LCD.1, ALC_TAT.1),

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

(a) Renesas Technology Corp. – Musashi site, 5-20-1 Jousuihon-cho, Kodaira-shi, Tokyo 187-8588, Japan

(b) Renesas Technology Corp. – Naka site, 571 Horiguchi, Hitachinaka-shi, Ibaraki 312-0034, Japan (production site "Naka")

(c) Subcontractors supporting the production of the AE57C1 (HD65257C1) with i.e. photomask fabrication and IC packaging into modules

The hardware part of the TOE produced at site (b) "Naka" indicated by IC manufacturer's ID number 4870 for Naka .

For the sites listed above, the requirements have been specifically applied in accordance with the Security Target BSI-DSZ-CC-0353, Version 5.2, 26 June 2006, AE57C1 (HD65257C1) Version 01, Renesas Technology Corp.).

The evaluators verified, that the threats and the security objective for the life cycle phases 2, 3 and 4 up to delivery at the end of phases 3 or 4 as stated in the TOE Security Target [6] are fulfilled by the procedures of these sites.

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