



Federal Office  
for Information Security

# Certification Report

**BSI-DSZ-CC-1059-2018**

for

**NXP Secure Smart Card Controller P6022y VB\*  
including IC Dedicated Software**

from

**NXP Semiconductors Germany GmbH**

BSI - Bundesamt für Sicherheit in der Informationstechnik, Postfach 20 03 63, D-53133 Bonn  
Phone +49 (0)228 99 9582-0, Fax +49 (0)228 9582-5477, Infoline +49 (0)228 99 9582-111



Bundesamt  
für Sicherheit in der  
Informationstechnik

# Deutsches IT-Sicherheitszertifikat

erteilt vom Bundesamt für Sicherheit in der Informationstechnik

**BSI-DSZ-CC-1059-2018 (\*)**

Smartcard Controller

**NXP Secure Smart Card Controller P6022y VB\* including IC Dedicated Software**

from NXP Semiconductors Germany GmbH

PP Conformance: Security IC Platform Protection Profile with  
Augmentation Packages Version 1.0, 13 January  
2014, BSI-CC-PP-0084-2014

Functionality: PP conformant plus product specific extensions  
Common Criteria Part 2 extended

Assurance: Common Criteria Part 3 conformant  
EAL 6 augmented by ALC\_FLR.1, ASE\_TSS.2



SOGIS  
Recognition Agreement



The IT Product identified in this certificate has been evaluated at an approved evaluation facility using the Common Methodology for IT Security Evaluation (CEM), Version 3.1 extended by Scheme Interpretations, by advice of the Certification Body for components beyond EAL 5 and CC Supporting Documents as listed in the Certification Report for conformance to the Common Criteria for IT Security Evaluation (CC), Version 3.1. CC and CEM are also published as ISO/IEC 15408 and ISO/IEC 18045.

(\*) 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 and Notification. For details on the validity see Certification Report part A chapter 4

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, 18 May 2018

For the Federal Office for Information Security

Joachim Weber  
Head of Branch

L.S.



**Bundesamt für Sicherheit in der Informationstechnik**

Godesberger Allee 185-189 - D-53175 Bonn - Postfach 20 03 63 - D-53133 Bonn  
Phone +49 (0)228 99 9582-0 - Fax +49 (0)228 9582-5477 - Infoline +49 (0)228 99 9582-111

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## A. Certification

### 1. Preliminary Remarks

Under the BSIG1 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.

### 2. Specifications of the Certification Procedure

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

- Act on the Federal Office for Information Security<sup>1</sup>
- BSI Certification and Approval Ordinance<sup>2</sup>
- BSI Schedule of Costs<sup>3</sup>
- Special decrees issued by the Bundesministerium des Innern (Federal Ministry of the Interior)
- DIN EN ISO/IEC 17065 standard
- BSI certification: Scheme documentation describing the certification process (CC-Produkte) [3]
- BSI certification: Scheme documentation on requirements for the Evaluation Facility, its approval and licencing process (CC-Stellen) [3]
- Common Criteria for IT Security Evaluation (CC), Version 3.1<sup>4</sup> [1] also published as ISO/IEC 15408.

<sup>1</sup> Act on the Federal Office for Information Security (BSI-Gesetz - BSIG) of 14 August 2009, Bundesgesetzblatt I p. 2821

<sup>2</sup> Ordinance on the Procedure for Issuance of Security Certificates and approval by the Federal Office for Information Security (BSI-Zertifizierungs- und -Anerkennungsverordnung - BSIZertV) of 17 December 2014, Bundesgesetzblatt 2014, part I, no. 61, p. 2231

<sup>3</sup> 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

- Common Methodology for IT Security Evaluation (CEM), Version 3.1 [2] also published as ISO/IEC 18045.
- BSI certification: Application Notes and Interpretation of the Scheme (AIS) [4]

### 3. 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.

#### 3.1. European Recognition of CC – Certificates (SOGIS-MRA)

The SOGIS-Mutual Recognition Agreement (SOGIS-MRA) Version 3 became effective in April 2010. It defines the recognition of certificates for IT-Products at a basic recognition level and, in addition, at higher recognition levels for IT-Products related to certain SOGIS Technical Domains only.

The basic recognition level includes Common Criteria (CC) Evaluation Assurance Levels EAL 1 to EAL 4. For "Smartcards and similar devices" a SOGIS Technical Domain is in place. For "HW Devices with Security Boxes" a SOGIS Technical Domains is in place, too. In addition, certificates issued for Protection Profiles based on Common Criteria are part of the recognition agreement.

The current list of signatory nations and approved certification schemes, details on recognition, and the history of the agreement can be seen on the website at <https://www.sogisportal.eu>.

The SOGIS-MRA logo printed on the certificate indicates that it is recognised under the terms of this agreement by the related bodies of the signatory nations. A disclaimer beneath the logo indicates the specific scope of recognition.

This certificate is recognized under SOGIS-MRA for all assurance components selected.

#### 3.2. International Recognition of CC – Certificates (CCRA)

The international arrangement on the mutual recognition of certificates based on the CC (Common Criteria Recognition Arrangement, CCRA-2014) has been ratified on 08 September 2014. It covers CC certificates based on collaborative Protection Profiles (cPP) (exact use), CC certificates based on assurance components up to and including EAL 2 or the assurance family Flaw Remediation (ALC\_FLR) and CC certificates for Protection Profiles and for collaborative Protection Profiles (cPP).

The current list of signatory nations and approved certification schemes can be seen on the website: <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 by the related bodies of the signatory nations. A disclaimer beneath the logo indicates the specific scope of recognition.

This certificate is recognized according to the rules of CCRA-2014, i. e. up to and including CC part 3 EAL 2+ ALC\_FLR components.

<sup>4</sup> Proclamation of the Bundesministerium des Innern of 12 February 2007 in the Bundesanzeiger dated 23 February 2007, p. 3730

## 4. 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 Secure Smart Card Controller P6022y VB\* including IC Dedicated Software has undergone the certification procedure at BSI. This is a re-certification based on BSI-DSZ-CC-0973-V2-2016. Specific results from the evaluation process BSI-DSZ-CC-0973-V2-2016 were re-used.

The evaluation of the product NXP Secure Smart Card Controller P6022y VB\* including IC Dedicated Software was conducted by TÜV Informationstechnik GmbH. The evaluation was completed on 4 May 2018. TÜV Informationstechnik GmbH is an evaluation facility (ITSEF)<sup>5</sup> 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.

## 5. Validity of the Certification Result

This Certification Report applies only to the version of the product as indicated. The confirmed assurance package is 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, as specified in the following report and in the Security Target.

For the meaning of the assurance components and assurance levels please refer to CC itself. Detailed references are listed in part C of this report.

The Certificate issued confirms the assurance of the product claimed in the Security Target at the date of certification. As attack methods evolve over time, the resistance of the certified version of the product against new attack methods needs to be re-assessed. Therefore, the sponsor should apply for the certified product being monitored within the assurance continuity program of the BSI Certification Scheme (e.g. by a re-assessment or re-certification). Specifically, if results of the certification are used in subsequent evaluation and certification procedures, in a system integration process or if a user's risk management needs regularly updated results, it is recommended to perform a re-assessment on a regular e.g. annual basis.

In order to avoid an indefinite usage of the certificate when evolved attack methods would require a re-assessment of the products resistance to state of the art attack methods, the maximum validity of the certificate has been limited. The certificate issued on 18 May 2018 is valid until 17 May 2023. Validity can be re-newed by re-certification.

The owner of the certificate is obliged:

1. when advertising the certificate or the fact of the product's certification, to refer to the Certification Report as well as to provide the Certification Report, the Security

<sup>5</sup> Information Technology Security Evaluation Facility



Target and user guidance documentation mentioned herein to any customer of the product for the application and usage of the certified product,

2. to inform the Certification Body at BSI immediately about vulnerabilities of the product that have been identified by the developer or any third party after issuance of the certificate,
3. to inform the Certification Body at BSI immediately in the case that security relevant changes in the evaluated life cycle, e.g. related to development and production sites or processes, occur, or the confidentiality of documentation and information related to the Target of Evaluation (TOE) or resulting from the evaluation and certification procedure where the certification of the product has assumed this confidentiality being maintained, is not given any longer. In particular, prior to the dissemination of confidential documentation and information related to the TOE or resulting from the evaluation and certification procedure that do not belong to the deliverables according to the Certification Report part B, or for those where no dissemination rules have been agreed on, to third parties, the Certification Body at BSI has to be informed.

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.

## 6. Publication

The product NXP Secure Smart Card Controller P6022y VB\* including IC Dedicated Software has been included in the BSI list of certified products, which is published regularly (see also Internet: <https://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<sup>6</sup> of the product. The Certification Report may also be obtained in electronic form at the internet address stated above.

<sup>6</sup> NXP Semiconductors Germany GmbH  
Troplowitzstrasse 20  
22529 Hamburg

## **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.

## 1. Executive Summary

The Target of Evaluation (TOE) is the IC hardware platform NXP Secure Smart Card Controller P6022y VB\* with IC Dedicated Software and documentation describing the Instruction Set and the usage. The short name P6022y VB will be used in the following sections. The \* in the TOE name indicates the distinction between the TOE - not including the MIFARE emulations - and the P6022y VB product.

The P6022y VB is a microcontroller incorporating a central processing unit, memories accessible via a Memory Management Unit, cryptographic co-processors, other security components and two communication interfaces. The central processing unit supports a 32-/24-/16-/8-bit instruction set optimized for smart card applications, which is a super set of the 80C51 family instruction set. On-chip memories are ROM, RAM and EEPROM. The non-volatile EEPROM can be used as data or program memory.

The IC Dedicated Software comprises IC Dedicated Test Software for test purposes and IC Dedicated Support Software. The IC Dedicated Support Software consists of Boot-ROM Software controlling the boot process of the hardware platform and Firmware Operating System which can be called by the Security IC Embedded Software.

Except for the y=P and y=X configurations the P6022y VB includes Emulation Software MIFARE Plus MF1PLUSx0 and/or MIFARE DESFire EV1. MIFARE emulations are not part of the TSF and do not implement any Security Functional Requirement. The evaluation scope of the MIFARE emulations are limited to not interfere with the functionality provided by the IC hardware platform. In case of y=X, the TOE provides extended ROM memory (optimized memory to free-up additional ROM for application OS).

The P6022y VB can be used to assure authorized conditional access in a wide range of applications. Examples are identity cards, Banking Cards, Pay-TV, Portable communication SIM cards, Health cards and Transportation cards.

The Security Target [6] is the basis for this certification. It is based on the certified Protection Profile Security IC Platform Protection Profile with Augmentation Packages Version 1.0, 13 January 2014, BSI-CC-PP-0084-2014 [8].

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 6 augmented by ALC\_FLR.1, ASE\_TSS.2.

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

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

TOE Security Functionality	Addressed issue
SS.RNG	Random Number Generator
SS.TDES	Triple-DES co-processor
SS.AES	AES co-processor
SS.RECONFIG	Post Delivery Configuration
SF.OPC	Control of Operating Conditions

TOE Security Functionality	Addressed issue
SF.PHY	Protection against Physical Manipulation
SF.LOG	Logical Protection
SF.COMP	Protection of Mode Control
SF.MEM_ACC	Memory Access Control
SF.SFR_ACC	Special Function Register Access Control
SF.FFW	Firmware Firewall
SF.FIRMWARE	Firmware Support
SF.PUF	Physically Unclonable Function

Table 1: TOE Security Functionalities

For more details please refer to the Security Target [6] and [9], chapter 7.

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 Problem 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 the configurations of the TOE as outlined in chapter 8.

The vulnerability assessment results as stated within this certificate do not include a rating for those cryptographic algorithms and their implementation suitable for encryption and decryption (see BSIG Section 9, Para. 4, Clause 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 Secure Smart Card Controller P6022y VB\* including IC Dedicated Software**

The following table outlines the TOE deliverables:

No	Type	Identifier	Release	Date	Form of Delivery
Developer documents for all configurations of the P6022y VB					
1	DOC	Product Data Sheet - SmartMX2 family P6022y VB, Secure high-performance smart card controller, NXP Semiconductors, Document Number 292533 [11]	3.3	2018-02-07	Electronic Document
2	DOC	Instruction Set for the SmartMX2 family, Secure smart card controller, NXP Semiconductors, Document Number 147831 [12]	3.1	2012-02-02	Electronic Document

No	Type	Identifier	Release	Date	Form of Delivery
3	DOC	Information on Guidance and Operation, NXP Secure Smart Card Controller P6022y VB, NXP Semiconductors, Document Number 323913 [13]	1.3	2017-10-27	Electronic Document
4	DOC	Product data sheet addendum - SmartMX2 P6022y VB, Wafer and delivery specification, NXP Semiconductors, Document Number 295932 [14]	3.2	2018-01-31	Electronic Document
5	DOC	Product data sheet addendum - SmartMX2 P602xy VB family, Firmware Interface Specification, NXP Semiconductors, Document Number 299737 [15]	3.7	2017-05-15	Electronic Document
6	DOC	Firmware Interface Specification Addendum - SmartMX2P602xy VB family, Firmware Interface Specification Addendum, NXP Semiconductors, Document Number 374111 [16]	1.1	2016-05-23	Electronic Document
Developer documents for all configurations of the P6022y VB except P6022X VB					
7	DOC	Product data sheet addendum - SmartMX2 P6022y VB ATMC Wafer and delivery specification, NXP Semiconductors, Document Number 430914 [17]	1.4	2018-01-31	wafer, module, inlay, package (dice have nameplate 9072B)
TOE components for P6022P VB, P6022M VB, P6022D VB, P6022J VB					
8	HW	NXP Secure Smart Card Controller P6022P VB/P6022X VB	VB	2016-01-18	wafer, module, inlay, package (dice have nameplate 9072B or F072A).
9	SW	Test-ROM Software	10.1D	2015-04-25	Test-ROM, Boot-ROM and Firmware Operating System on the chip acc. to 9072A_LK097_TESTROM_v1_btos_10v1D_fos_Cv21rc5.hex (0C.22) / 9072B_LR009_TESTROM_v1_btos_10v1D_fos_Cv6.hex (0C.60) / F072A_ZK015_TESTROM_v1_btos_10v1D_fos_Cv6.hex (0C.60)
10	SW	Boot-ROM Software	10.1D	2015-04-25	
11	SW	Plain Firmware Operating System (FOS-Plain)	0C.22 / 0C.60	2016-01 / 2016-04	
TOE components for the P6022X VB					
12	HW	NXP Secure Smart Card Controller P6022P VB/P6022X VB	VB	2016-01-18	wafer, module, inlay, package (dice have nameplate 9072B)

No	Type	Identifier	Release	Date	Form of Delivery
13	SW	Test-ROM Software	10.1D	2015-04-25	Test-ROM, Boot-ROM and Firmware Operating System on the chip acc. to 9072A_LV041_TESTROM_v1_btos_101D_fos_Cv31.hex (0C.32) / 9072A_LW094_TESTROM_v1_btos_10v1D_fos_Cv70.hex (0C.70)
14	SW	Boot-ROM Software	10.1D	2015-04-25	
15	SW	Plain Firmware Operating System (FOS-Plain)	0C.32 / 0C.70	2016-01 / 2016-04	
Additional TOE deliverables for P6022M VB / P6022J VB					
16	SW	Emulation Firmware Operating System (FOS- Emu) with MIFARE Plus MF1PLUSx0 configuration	0C.22 / 0C.60	2016-01 / 2016-04	Firmware Operating System on the chip acc. to 9072A_LK097_TESTROM_v1_btos_10v1D_fos_Cv21rc5.hex (0C.22) / 9072B_LR009_TESTROM_v1_btos_10v1D_fos_Cv6.hex (0C.60) / F072A_ZK015_TESTROM_v1_btos_10v1D_fos_Cv6.hex (0C.60).
Additional TOE deliverables for P6022D VB / P6022J VB					
17	SW	Emulation Firmware Operating System (FOS-Emu) with MIFARE DESFire EV1 configuration	0C.22 / 0C.60	2016-01 / 2016-04	Firmware Operating System on the chip acc. to 9072A_LK097_TESTROM_v1_btos_10v1D_fos_Cv21rc5.hex (0C.22) / 9072B_LR009_TESTROM_v1_btos_10v1D_fos_Cv6.hex (0C.60) / F072A_ZK015_TESTROM_v1_btos_10v1D_fos_Cv6.hex (0C.60).

Table 2: Deliverables of the TOE

For the configurations containing MIFARE Plus MF1PLUSx0 and/or MIFARE DESFire EV1, additional documentation will be provided by NXP.

Document delivery to the customer is realised via a web tool, the DocStore. Customers and developer only have access to the documentation that is necessary according their status. Only registered and identified customers are provided with the necessary information. Furthermore all documents are protected and personalised based on certificates.

For the TSMC samples, delivery of the TOE is addressed in [14] chapter 4. Here, identification of a certified product as well as the different forms and ways of delivery are described as follows:

- If the TOE is provided as wafer, it can be either collected from the NXP site in Hamburg, Germany, or it is shipped by one of the specified distribution centers (cf. [14] chapter 4.3).

- If the TOE is provided as module, it can be either collected from the NXP site in Hamburg, or from the NXP site ATBK in Bangkok, Thailand, or it is shipped by one of the specified distribution centers (cf. [14] chapter 4.4).
- If the TOE is provided as inlay, it can be either collected from the NXP site in Hamburg, Germany, or it is shipped by one of the specified distribution centers (cf. [14] chapter 4.5).

For the ATMC samples, delivery of the TOE is addressed in [17] chapter 4. Here, identification of a certified product as well as the different forms and ways of delivery are described as follows:

- If the TOE is provided as wafer, it can be either collected from the NXP site in Hamburg, Germany, or it is shipped by one of the specified distribution centers (cf. [17] chapter 4.3).
- If the TOE is provided as module, it can be either collected from NXP Chandler (cf. [17] chapter 4.4).
- If the TOE is provided as inlay, it can be either collected from the NXP site in Hamburg, Germany, or it is shipped by one of the specified distribution centers (cf. [17] chapter 4.5).

The hardware version can be identified by the encrypted nameplates on the surface of the hardware platform as described in chapters 4.2 and 3.10 of the Wafer and delivery specification [14] and [17]. There are no special nameplates for the different configurations, but for the two hardware incarnations.

Identification is also possible using the Chip Health Mode. The identification string provided by the command 00h of the Chip Health Mode comprises also the device coding and the firmware version. Each major configuration has a dedicated device coding. The device coding and type coding are described in [11] section 31.2.3.

### 3. Security Policy

The security policy enforced is defined by the selected 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 functionalities 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 the symmetric cryptographic block cipher algorithm to ensure the confidentiality of plain text data by encryption and to support secure authentication protocols and it will provide a True Random Number Generator (TRNG).

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 functionalities (security mechanisms and associated functions) provided by the TOE.

Specific details concerning the above mentioned security policies can be found in chapter 7 of the Security Target [6] and [9].

#### 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:

- OE.Resp-Appl states that the IC Embedded Software Developer shall treat user data (especially keys) appropriately. The IC Embedded Software Developer gets sufficient information on how to protect user data adequate in the security guidelines [13].
- OE.Process-Sec-IC states that security procedures are used after delivery of the TOE by the TOE Manufacturer up to delivery to the end-consumer. This is necessary to maintain confidentiality and integrity of the TOE, and of its manufacturing and test data (to prevent any possible copy, modification, retention, theft or unauthorised use). The IC Embedded Software Developer is informed in the security guidelines [13].
- OE.Check-Init states that the TOE provides specific functionality that allows the unique identification of the TOE in form of FabKey-Data. The IC Embedded Software Developer gets sufficient information in the security guidelines [13].

Details can be found in the Security Target [6] and [9], chapter 4.2 and 4.3.

#### 5. Architectural Information

The TOE consists of the following hardware:

- CPU / coprocessors:
  - a CPU implementation supporting a 32-/24-/16-/8 bit instruction set which is a superset of the 80C51 family instruction set and distinguishes five CPU modes,
  - a Triple-DES coprocessor, supporting single DES and Triple-DES operations (in 2-key or 3-key operation, with two/three 56 bit keys (112-/168 bit)), where only Triple-DES operations are evaluated and considered as security functionality,
  - an AES coprocessor (key sizes 128, 192 or 256 bit), whose availability is subject to specific choice of Customer Reconfiguration Options supporting AES operations with three different key lengths,
  - an arithmetic coprocessor, called Fame2 coprocessor, whose availability is subject to specific choice of Customer Reconfiguration Options. It supplies basic arithmetic functions to support implementation of asymmetric cryptographic algorithms by the Security IC Embedded Software; the Security IC Embedded Software is not part of the TOE,
  - a CRC coprocessor, providing the CRC generation polynomials CRC-16 and CRC-32 for hardware cyclic redundancy check calculations,
- Memory / Memory Controller:
  - Read-Only Memory (ROM): depending on its major configuration, the TOE provides different ROM sizes. In any case, 128 kByte (1 KByte = 1024 Byte) is reserved for the



Test-ROM. The remaining ROM memory is available as Application ROM for the IC Embedded Software:

- P6022P VB: 512 kByte,
- P6022X VB: 586 kByte,
- P6022M VB / P6022D VB / P6022J VB: 384 kByte.
- Random Access Memory (RAM): 11968 Bytes of RAM, which is partitioned into RAM available to the Firmware Operating System only (576 Bytes), Application-RAM which is available to the Security IC Embedded Software and is split into 2.688 Bytes for the Fame2 coprocessor, called FXRAM, and 7488 Bytes general purpose RAM, called CXRAM,
- Electrically Erasable Programmable Read Only Memory (EEPROM): Provides 144 KBytes of EEPROM, where 1024 Bytes are always reserved for IC Dedicated Support Software for FOS control data, 512 Bytes for the manufacturer area, 768 Bytes for the PUF Block and the remaining part is reserved for MIFARE software part of the IC Dedicated Support Software.
- Memory Controller: A Memory Management Unit (MMU) controls access to all of the three above mentioned memory types, and
- Copy Machine: a device providing direct memory access for the Security IC Embedded Software without CPU interactions.
- Internal Peripherals:
  - a True Random Number generator,
  - A PUF (Physically Unclonable Function) block,
  - a Watchdog timer, configurable by the Security IC Embedded Software to protect program execution,
  - timers,
  - reset generator.
- Physical protection:
  - Secure shielding,
  - Security sensors (light, voltage, temperature, and frequency sensors with reset generator,
- Electrical interfaces:
  - ISO/IEC 14443 A contactless interface with pads LA and LB, whose availability is subject to a minor configuration option,
  - ISO/IEC 7816 contact interface with serial communication pads I/O1,
  - Single external power supply of 1.8V, 3V or 5V nominal by the lines VDD and VSS, or supply by inductive coupling via the ISO/IEC 14443 A contactless interface,
  - Clock input CLK with a clock filter and clock generator,
  - Reset input RST\_N.

For the TOE firmware, as given in [6] and [9] section 1.4.1.3 or Table 5, one has:

- Security IC Dedicated Test Software, which is stored in the Test-ROM and used by the manufacturer of the Security IC during production test; It includes the test operating system, test routines for the various blocks of the circuitry, control flags for the status of the EEPROM's manufacturer area and shutdown functions,
- Security IC Dedicated Support Software including:
  - Boot-ROM Software, executed during start-up or reset, and
  - Firmware Operating System used as interface for firmware provided by the manufacturer.

In case of the major configurations P6022M VB, P6022D VB, and P6022J VB, the TOE comes with MIFARE software. MIFARE emulations are not part of the TSF and do not implement any Security Functional Requirement. The evaluation scope of the MIFARE emulations are limited to not interfere with the functionality provided by the IC hardware platform.

The smartcard embedded software is not part of the evaluation.

## 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 were divided into five categories:

- Simulation tests (design verification),
- Qualification tests,
- Verification Tests,
- Security Evaluation Tests,
- Production Tests.

The developer tests cover all security functionalities and all security mechanisms as identified in the functional specification.

The evaluators were able to repeat the tests of the developer either using the library of programs, tools and prepared chip samples delivered to the evaluator or at the developer's site. They performed independent tests to supplement, augment and to verify the tests performed by the developer. For the developer tests repeated by the evaluators other test parameters were used and the test equipment was varied. Security features of the TOE realised by specific design and layout measures were checked by the evaluators during layout inspections both in design data and on the final product.

The evaluation has shown that the actual version of the TOE provides the security functionalities as specified by the developer. The test results confirm the correct implementation of the TOE security functionalities.

For penetration testing the evaluators took all security functionalities into consideration. Intensive penetration testing was planned based on the analysis results and performed for the underlying mechanisms of security functionalities. The penetration tests considered both the physical tampering of the TOE and attacks which do not modify the TOE physically. The penetration tests results confirm that the TOE is resistant to attackers with high attack potential in the intended environment for the TOE.

## 8. Evaluated Configuration

The P6022y hardware platform was tested including all major configurations as well as all minor configuration options that can be selected based on [6] and [9] section 1.4.2.2. The major and all minor configurations are available to the evaluator. The major configuration does not have varying dependencies to security features. All minor configuration options that are part of the evaluation were tested. The minor configuration options behave as specified and described in [11] and [13].

The major and minor configurations cannot be influenced by the customer. They are selected by the customer according to the Order Entry Form [18]. This configuration cannot be changed in the Application Mode after delivery of the TOE.

Please note that the MIFARE emulations are not part of the TSF and do not implement any Security Functional Requirement. The evaluation scope of the MIFARE emulations are limited to not interfere with the functionality provided by the IC hardware platform.

## 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 EAL 5 extended by advice of the Certification Body for components beyond EAL 5 and guidance specific for the technology of the product [4] (AIS 34).

The following guidance specific for the technology was used:

- (i) *The Application of CC to Integrated Circuits*
- (ii) *Application of Attack Potential to Smartcards*
- (iii) *Guidance, Smartcard Evaluation*

(see [4], AIS 25, AIS 37).

For RNG assessment the scheme interpretations AIS 31 was used (see [4]).

To support composite evaluations according to AIS 36 the document ETR for composite evaluation [10] was provided and approved. This document provides details of this platform evaluation that have to be considered in the course of a composite evaluation on top.

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

- All components of the EAL 6 package including the class ASE as defined in the CC (see also part C of this report)
- The components ALC\_FLR.1, ASE\_TSS.2 augmented for this TOE evaluation.

As the evaluation work performed for this certification procedure was carried out as a re-evaluation based on the certificate BSI-DSZ-CC-0973-V2-2016, re-use of specific evaluation tasks was possible. The changes compared to the previous certification can be summarized as follows:

- Mifare emulations are removed from the scope of the evaluation. Therefore, only EAL6 evaluation is done instead of a combined EAL5/EAL6 evaluation. This implies the removal of Mifare-related sites and guidance documentation.
- A new product is introduced, USEPP. For this reason new production sites are to be considered in the certification. This product has its own commercial type identifier and packages.
- The set of sites used for production and development was updated.
- The new package (HX2QFN14) has been added.
- During the product lifecycle, it was observed that the MMU does not behave as intentionally specified in previous certifications. This led to a correction of the access control policy in the ST and updates of guidance documents.

The evaluation has confirmed:

- PP Conformance: Security IC Platform Protection Profile with Augmentation Packages Version 1.0, 13 January 2014, BSI-CC-PP-0084-2014 [8]
- for the Functionality: PP conformant plus product specific extensions  
Common Criteria Part 2 extended
- for the Assurance: Common Criteria Part 3 conformant  
EAL 6 augmented by ALC\_FLR.1, ASE\_TSS.2

For specific evaluation results regarding the development and production environment see annex B in part D of this report. For some sites a so called STAR-report for reuse has been provided and approved (see [21] to [24]).

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 strength of the cryptographic algorithms was not rated in the course of this certification procedure (see BSIG Section 9, Para. 4, Clause 2). But Cryptographic Functionalities with a security level of lower than 100 bits can no longer be regarded as secure without considering the application context. Therefore, for these functionalities 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' (<https://www.bsi.bund.de>).

Any Cryptographic Functionality that is marked in column '*Security Level above 100 Bits*' of the following table with '*no*' achieves a security level of lower than 100 Bits (in general context).

No.	Purpose	Cryptographic Mechanism	Standard of Implementation	Key Size in Bits	Security Level above 100 Bits
1.	Cryptographic Primitives	2-key Triple DES (ECB)	NIST SP 800-67	$ k  = 112$	No
		3-key Triple DES (ECB)	NIST SP 800-67	$ k  = 168$	No
		AES (ECB)	FIPS-197	$ k  = 128 / 192 / 256$	No
		Physical RNG PTG.2	AIS31	N/A	N/A

Table 3: TOE cryptographic functionality

## 10. Obligations and Notes for the Usage of the TOE

The documents as outlined in table 2 contain necessary information about the usage of the TOE and all security hints therein have to be considered. In addition all aspects of Assumptions, Threats and OSPs as outlined in the Security Target not covered by the TOE itself need to be fulfilled by the operational environment of the TOE.

The customer or user of the product shall consider the results of the certification within his system risk management process. In order for the evolution of attack methods and techniques to be covered, he should define the period of time until a re-assessment of the TOE is required and thus requested from the sponsor of the certificate.

The limited validity for the usage of cryptographic algorithms as outlined in chapter 9 has to be considered by the user and his system risk management process, too.

Some security measures are partly implemented in this certified TOE, but require additional configuration or control or measures to be implemented by a product layer on top, e.g. the Embedded Software using the TOE. For this reason the TOE includes guidance documentation (see table 2) which contains obligations and guidelines for the developer of the product layer on top on how to securely use this certified TOE and which measures have to be implemented in order to fulfil the security requirements of the Security Target of the TOE. In the course of the evaluation of the composite product or system it must be examined if the required measures have been correctly and effectively implemented by the product layer on top. Additionally, the evaluation of the composite product or system must also consider the evaluation results as outlined in the document "ETR for composite evaluation" [10].

At the point in time when evaluation and certification results are reused there might be an update of the document "ETR for composite evaluation" available. Therefore, the certified products list on the BSI website has to be checked for latest information on reassessments, recertifications or maintenance result available for the product.

## 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

<b>AES</b>	Advanced Encryption Standard
<b>AIS</b>	Application Notes and Interpretations of the Scheme
<b>BSI</b>	Bundesamt für Sicherheit in der Informationstechnik / Federal Office for Information Security, Bonn, Germany
<b>BSIG</b>	BSI-Gesetz / Act on the Federal Office for Information Security
<b>CCRA</b>	Common Criteria Recognition Arrangement
<b>CC</b>	Common Criteria for IT Security Evaluation
<b>CEM</b>	Common Methodology for Information Technology Security Evaluation
<b>CRC</b>	Cyclic redundancy check
<b>cPP</b>	Collaborative Protection Profile
<b>DES</b>	Data Encryption Standard
<b>EAL</b>	Evaluation Assurance Level
<b>ECB</b>	Electronic Code Book
<b>EEPROM</b>	Electrically Erasable and Programmable Read Only Memory
<b>ETR</b>	Evaluation Technical Report
<b>ISO</b>	International Organization for Standardization
<b>IT</b>	Information Technology
<b>ITSEF</b>	Information Technology Security Evaluation Facility
<b>MMU</b>	Memory Management Unit
<b>NIST</b>	National Institute of Standards and Technology
<b>OS</b>	Operating system
<b>PP</b>	Protection Profile
<b>RAM</b>	Random Access Memory
<b>ROM</b>	Read Only Memory
<b>RNG</b>	Random number generator
<b>SAR</b>	Security Assurance Requirement
<b>SFP</b>	Security Function Policy
<b>SFR</b>	Security Functional Requirement
<b>ST</b>	Security Target
<b>TOE</b>	Target of Evaluation
<b>TRNG</b>	True Random number generator
<b>TSF</b>	TOE Security Functionality

## 12.2. Glossary

**Augmentation** - The addition of one or more requirement(s) to a package.

**Collaborative Protection Profile** - A Protection Profile collaboratively developed by an International Technical Community endorsed by the Management Committee.

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

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

**Informal** - Expressed in natural language.

**Object** - A passive entity in the TOE, that contains or receives information, and upon which subjects perform operations.

**Package** - named set of either security functional or security assurance requirements

**Protection Profile** - A formal document defined in CC, expressing an implementation independent set of security requirements for a category of IT Products that meet specific consumer needs.

**Security Target** - An implementation-dependent statement of security needs for a specific identified TOE.

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

**Subject** - An active entity in the TOE that performs operations on objects.

**Target of Evaluation** - An IT Product and its associated administrator and user guidance documentation that is the subject of an Evaluation.

**TOE Security Functionality** - Combined functionality of all hardware, software, and firmware of a TOE that must be relied upon for the correct enforcement of the SFRs.

## 13. Bibliography

- [1] Common Criteria for Information Technology Security Evaluation, Version 3.1, Part 1: Introduction and general model, Revision 5, April 2017  
Part 2: Security functional components, Revision 5, April 2017  
Part 3: Security assurance components, Revision 5, April 2017  
<http://www.commoncriteriaportal.org>
- [2] Common Methodology for Information Technology Security Evaluation (CEM), Evaluation Methodology, Version 3.1, Rev. 5, April 2017,  
<http://www.commoncriteriaportal.org>
- [3] BSI certification: Scheme documentation describing the certification process (CC-Produkte) and Scheme documentation on requirements for the Evaluation Facility, approval and licencing (CC-Stellen), <https://www.bsi.bund.de/zertifizierung>

- [4] Application Notes and Interpretations of the Scheme (AIS) as relevant for the TOE<sup>7</sup>  
<https://www.bsi.bund.de/AIS>
- [5] German IT Security Certificates (BSI 7148), periodically updated list published also on the BSI Website, <https://www.bsi.bund.de/zertifizierungsreporte>
- [6] Security Target BSI-DSZ-CC-1059-2018, NXP Secure Smart Card Controller P6022y VB – Security Target, Version 2.1, 2018-04-06, NXP Semiconductors (confidential document)
- [7] Evaluation Technical Report BSI-DSZ-CC-1059-2018, Version 3, 2018-05-03, TÜV Informationstechnik GmbH , (confidential document)
- [8] Security IC Platform Protection Profile with Augmentation Packages Version 1.0, 13 January 2014, BSI-CC-PP-0084-2014
- [9] Security Target BSI-DSZ-CC-1059-2018, NXP Secure Smart Card Controller P6022y VB – Security Target Lite, Version 2.1, 2018-04-06, NXP Semiconductors (sanitised public document)
- [10] Evaluation Technical for Composite Evaluation (ETR COMP) for the P6022y VB VB, version 3, 2018-05-03, TÜV Informationstechnik GmbH (confidential document)
- [11] Product Data Sheet - SmartMX2 family P6022y VB, Secure high-performance smart card controller, Version 3.3, 2018-02-07, NXP Semiconductors (confidential document)
- [12] Instruction Set for the SmartMX2 family, Secure smart card controller, Version 3.1, 2012-02-02, NXP Semiconductors (confidential document)

<sup>7</sup>Specifically

- AIS 1, Version 14, Durchführung der Ortsbesichtigung in der Entwicklungsumgebung des Herstellers
- AIS 20, Version 3, Funktionalitätsklassen und Evaluationsmethodologie für deterministische Zufallszahlengeneratoren
- AIS 25, Version 9, Anwendung der CC auf Integrierte Schaltungen including JIL Document and CC Supporting Document
- AIS 26, Version 9, Evaluationsmethodologie für in Hardware integrierte Schaltungen including JIL Document and CC Supporting Document
- AIS 31, Version 3, Funktionalitätsklassen und Evaluationsmethodologie für physikalische Zufallszahlengeneratoren
- AIS 32, Version 7, CC-Interpretationen im deutschen Zertifizierungsschema
- AIS 34, Version 3, Evaluation Methodology for CC Assurance Classes for EAL 5+ (CCv2.3 & CCv3.1) and EAL 6 (CCv3.1)
- AIS 35, Version 2, Öffentliche Fassung des Security Targets (ST-Lite) including JIL Document and CC Supporting Document and CCRA policies
- AIS 36, Version 5, Kompositionsevaluierung including JIL Document and CC Supporting Document
- AIS 38, Version 2, Reuse of evaluation results
- AIS39, Formal Method, Version 3.0, 24.10.2008
- AIS46, Informationen zur Evaluierung von kryptographischen Algorithmen und ergänzende Hinweise für die Evaluierung von Zufallszahlengeneratoren, Version 3, 04.12.2013.
- AIS 47, Version 1.1, Regelungen zu Site Certification



- [13] Information on Guidance and Operation, NXP Secure Smart Card Controller P6022y VB, Version 1.3, 2017-10-27, NXP Semiconductors (confidential document)
- [14] Product data sheet addendum - SmartMX2 P6022y VB, Wafer and delivery specification, Version 3.2, 2018-01-31, NXP Semiconductors (confidential document)
- [15] Product data sheet addendum - SmartMX2 P602xy VB family, Firmware Interface Specification, Version 3.7, 2017-05-15, NXP Semiconductors (confidential document)
- [16] Objective Data Sheet Addendum - SmartMX2 P602xy VB Family Firmware Interface Specification Addendum, Version 1.1, 2016-05-23, NXP Semiconductors (confidential document)
- [17] Product data sheet addendum - SmartMX2 P6022y VB ATMC Wafer and delivery specification, Version 1.4, 2018-01-31, NXP Semiconductors (confidential document)
- [18] Order Entry Form Delivery Data, Version 1.10, 2016-05-31, NXP Semiconductors
- [19] NXP Secure Smart Card Controller P6022y VB Configuration List - Hardware IC, Version 1.5, 2018-04-12, NXP Semiconductors (confidential document)
- [20] NXP Secure Smart Card Controller P6022y VB Evaluation Reference List, Version 2.0, 2018-04-12, NXP Semiconductors (confidential document)
- [21] SITE TECHNICAL AUDIT REPORT (STAR), Production (Data Prep, Mask Temp Storage), Photronics, Singapore, Version 1, 2018-04-16, TÜV Informationstechnik GmbH (confidential document)
- [22] SITE TECHNICAL AUDIT REPORT (STAR), Production Environment (Wafer Production), Systems on Silicon Manufacturing Co. Pte. Ltd., Version 1, 2018-04-16, TÜV Informationstechnik GmbH (confidential document)
- [23] SITE TECHNICAL AUDIT REPORT (STAR), Production Environment (Mask Production) Photronics DNP Mask Corp, Hsinchu, Version 1, 2018-04-16, TÜV Informationstechnik GmbH (confidential document)
- [24] SITE TECHNICAL AUDIT REPORT (STAR), Production Environment (Wafer Bumping, Gold), Chipbond Technology Corporation, Hsinchu Version 1, 2018-04-16, TÜV Informationstechnik GmbH (confidential document)

## C. Excerpts from the Criteria

For the meaning of the assurance components and levels the following references to the Common Criteria can be followed:

- On conformance claim definitions and descriptions refer to CC part 1 chapter 10.5
- On the concept of assurance classes, families and components refer to CC Part 3 chapter 7.1
- On the concept and definition of pre-defined assurance packages (EAL) refer to CC Part 3 chapters 7.2 and 8
- On the assurance class ASE for Security Target evaluation refer to CC Part 3 chapter 12
- On the detailed definitions of the assurance components for the TOE evaluation refer to CC Part 3 chapters 13 to 17
- The table in CC part 3 , Annex E summarizes the relationship between the evaluation assurance levels (EAL) and the assurance classes, families and components.

The CC are published at <http://www.commoncriteriaportal.org/cc/>

## **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

## Annex B of Certification Report BSI-DSZ-CC-1059-2018

### Evaluation results regarding development and production environment



The IT product NXP Secure Smart Card Controller P6022y VB\* including IC Dedicated Software (Target of Evaluation, TOE) has been evaluated at an approved evaluation facility using the Common Methodology for IT Security Evaluation (CEM), Version 3.1 extended by Scheme Interpretations, by advice of the Certification Body for components beyond EAL 5 and CC Supporting Documents for conformance to the Common Criteria for IT Security Evaluation (CC), Version 3.1.

As a result of the TOE certification, dated 18 May 2018, the following results regarding the development and production environment apply. The Common Criteria assurance requirements ALC – Life cycle support ((i.e. ALC\_CMC.5, ALC\_CMS.5, ALC\_DEL.1, ALC\_DVS.2, ALC\_LCD.1, ALC\_TAT.3) are fulfilled for the development and production sites of the TOE listed below:

Name of site / Company name	Address	Function
<b>Development Sites</b>		
NXP Semiconductors Hamburg	Business Unit Identification Tropowitzstraße 29 22569 Hamburg, Germany	Development, Delivery and customer support
NXP Semiconductors Development Center Eindhoven HTC- 46.3 West	Building 46, High Tech Campus 5656AE, Eindhoven, The Netherlands	Development center
NXP Semiconductors RQC & NPIT & MM	NXP Semiconductors Netherlands B.V. Gerstweg 2 6534AE Nijmegen, The Netherlands	Development and Manufacturing, Regional Quality Center - Europe
NXP Semiconductors Austria GmbH Styria Gratkorn	Business Unit Identification Mikron-Weg 1 8108 Gratkorn, Austria	Document control
NXP High Tech Campus	Building 60, High Tech Campus Secure Room 131 5656AE, Eindhoven, The Netherlands	IT Engineering and Generic Support
SII Gdansk	Olivia Gate, al. Grunwaldzka 472A,	Development related to MIFARE components

Name of site / Company name	Address	Function
	80-309 Gdansk, Poland Biznes Park ul. Kraszewskiego 1 85-240 Bydgoszcz, Poland	
Digital Realty	120 East Van Buren St, Phoenix, AZ 85004 United States	TOE database
<b>Production Sites</b>		
TSMC	Fab 14A: 1-1, Nan-Ke North Rd., Tainan Science Park, Tainan 741-44, Taiwan, R.O.C., Fab 2 and 5: 121, Park Ave. 3, Hsinchu Science Park, Hsinchu 300-77, Taiwan, R.O.C., Fab 7: 6, Creation Rd. 2, Hsinchu Science Park, Hsinchu 300-77, Taiwan, R.O.C.	Mask data preparation, Mask and wafer production
Chipbond Technology Corporation	No. 3, Li-Hsin Rd. V Science Based Industrial Park Hsin-Chu City Taiwan, R.O.C.	Bumping (refer to STAR [24])
NXP Semiconductors GmbH Hamburg Test Center Europe - Hamburg (TCE-H)	Tropelwitzstraße 29 22569 Hamburg, Germany	Test Center, configuration of the Fabkey, and delivery
Assembly & Test Bangkok (ATBK) (former APB)	303 Moo 3 Chaengwattana Rd. Laksi, Bangkok 10210, Thailand	Test centre, wafer treatment, module assembly and delivery
Assembly & Test Kaohsiung (APKH) (former APK)	#10, Jing 5th Road, N.E.P.Z, Kaohsiung 81170 Taiwan, R.O.C	Test centre, wafer treatment, module assembly and delivery
NXP Austin (ATMC)	NXP Semiconductors 3501 Ed Bluestein Blvd, Austin, TX 78721, USA	Wafer production
Toppan Round Rock Maskshop	400 Texas Ave, Round Rock, TX 78664, United States	Mask Production
NXP Chandler Arizona	1300 N. Alma School Rd., Chandler, AZ 85224, USA	Wafer testing, wafer treatment and delivery
HID Global Teoranta	Paic Tionscail na Tulaigh Balle na hAbhann Co. Galway, Ireland	Inlay assembly

Name of site / Company name	Address	Function
SMARTRAC Technology Ltd. Bangkok	Street: 142 Moo, Hi- Tech Industrial Estate Tambon Ban Laean, Amphor Bang-Pa-In 13160 Ayutthaya, Thailand	Inlay assembly

Table 4: Relevant development/production sites for the respective TOE configurations

The following sites were evaluated within the course of the evaluation, but are not part of the life-cycle of the TOE:

Name of site / Company name	Address	Function
SSMC Singapore	Systems on Silicon Manufacturing Co. Pte. Ltd., Singapore 70 Pasir Ris Drive 1 Singapore 519527	Wafer fab (refer to STAR [22])
Photronics Singapore (PGSP)	Photronics, Singapore No 33 Ubi Avenue 3 # 03 – 09, Vertex Building Singapore 408868	Mask data processing and interim storage of masks (refer to STAR [21])
Photronics Hsinchu (PDMC)	Photronics DNP Mask Corp, Hsinchu (short: PT_Hsinchu) Hsinchu 1A (Head Office) 1F, No.2, Li-Hsin Rd., Science Based Industrial Park, Hsin-Chu City, 30078, Taiwan R.O.C. Hsinchu 1D No.6, Li-Hsin 7th Rd., Science Based Industrial Park, Hsin-Chu City, 30078, Taiwan R.O.C.	Mask house (refer to STAR [23])
Toppan Icheon	Toppan Photomasks Korea Ltd. 91, Wonjeok-ro 290 beon-gil, Sindun-myeon Icheon-Si, Gyeonggi-do 467-842 South Korea	Mask house

Table 5: Sites audited in the course of the evaluation, but not part of the life-cycle