

Infineon OPTIGATM

# Infineon's OPTIGA™ embedded security solutions



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## **Embedded Security**

The advancements within semiconductor technologies and the increasing amount of connected objects create the necessity for embedded security.

## Markets

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Security affects every market and application that uses connectivity to send and receive data. Main differences regarding the level of protection and measures are based on the risk resulting from hacks as well as the legal framework and requirements.



- device or system in order to reproduce or copy it. Can also be used to access data on similar devices based on the knowledge gained during the reverse engineering process.
- HW counterfeit Copy of a device, system or consumable; often difficult to distinguish from original and low quality.
- Eavesdropping/Man-in-the-middle Breach of communication or data exchange in order to obtain information.

## **Attack Points**



- Ransom
- Legal consequences
- Failure of functional safety systems
- Physical impact, injuries



- Exploit communication protocol errors
- Flaws in software design / implementation

With the case opened / removed

- Test / debug port access
- Inter device bus and IO probing
- Reset, clock attacks
- Temperature / electrical attacks (glitch, overvoltage)

Circuit analysis and probing

## EBV is a trusted partner for security design and supports you throughout every phase of the development process of the best suited security solution for your individual requirements.



EBV Personalization services for secure devices IoT – Connections for everything

EBV – Security for everything

## Service Offering

- Definition of security requirements
- Device selection
- Customer specific configuration support
- Personalization of secure elements
- Logistics

## Benefits

- The personalization takes place in a highly secure and separated area
- A HSM (High Security Module) ensures highest level of security for generating keys and certificates
- No investment needed on customer side
- Flexible solution for any quantities
- Fast and secure
- Fits into standard logistics flow
- Minimized risk of security breaches

## Personalization Flow

- The defined chip configuration is encrypted and exported to a file
- The encrypted file is sent to EBV and exclusively linked to the customer
- For personalization, the encrypted file is loaded in the HSM where it's being decrypted (it will never be visible to anybody)
- · Before programming, devices are checked for originality
- Device data and secret configuration data are combined and injected into the device
- A log file is generated for each single device and is available for download for the customer

SLS 32AIA; and OPTIGA™ TPM SLB 9670 VQ2.0; OPTIGA™ TPM SLB 9670 XQ2.0; OPTIGA™ TPM SLM 9670; OPTIGA™ TPM SLI 9670



## Time to change the game

Cheer up those times are over! EBV is changing the game with an **industry first custom** programming service for security devices. Now you car integrate embedded custom security

#### How does it work?

- We take "blank" devices
- We define the OEM certificate and parameters with you
- We program the devices using a Data I/O machine



### How does this integrate into your supply chain?

- We box and ship them using our Avnet Logistics Backbone
- You receive the security chips ready to drop them into your application
- That's it! You're ready to market your devices equipped with reliable custom security hardware



## The implementation and investment in effective security enables you to:

- Build reliable products
- Comply with data protection and safety requirements (e.g. IEC62443, OCF, OPC-UA)
- Protect IP, products, quality and revenue
- Prevent legal issues

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• Stay in control of products, add-ons, extensions and consumables



### **Principles**

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The key to successful security implementations: Finding the balanced solution in your window of acceptable security



r i	O				
Authenticity	Integrity	Confidentiality			
Do I talk to a valid partner or device?	Is the data or code correct or modified?	Is the message encrypted and			
• ECC based asymmetric authentication (ECDSA)	System characteristic measurement	decrypted securely?			
Symmetric authentication (HMAC, CMAC)	(Measured boot)	<ul> <li>Session key agreement (ECDH)</li> </ul>			
	<ul> <li>Conditional key access</li> </ul>	Data encryption (AES 128, AES 256)			
	Message signing (MAC)				

#### Use Cases

- Secure cloud connection
- Login token (e.g. to cloud application)
- Prevent hardware copy
- Detect fake firmware
- Identify connected device
- Lifecycle management
- Enforce original hardware in safety applications
- Privacy protection
- Data protection
- Remote device configuration / maintenance
- Secure data channel

printer cartridge

There is no "absolute" level of security – however there is a window of opportunity which makes hacking the device economically uninteresting. The maximum cost and the minimum expenses to achieve this level of protection define this window.

Note: Security cannot be implemented into applications retrospectively, but has to be included in the design from the very beginning. A security flaw is never an isolated mistake but a system solution shortcoming.

## Applications

- Router / switch
- PLC
- Industrial computer
- Medical / healthcare
- Accessories
- Spare parts / option boards
- Batteries
- Consumables
- IoT device
- Smart home & building
- Lighting
- Cash register / POS
- Commercial vehicle
- Infotainment
- Smart grid / metering

## Security should be implemented in all layers of a design



## Authentication

	Turnkey solutions							
Product name	OPTIGA™ TRUST E SLS 32AIA	OPTIGA™ Trust X SLS 32AIA	OPTIGA™ TRUST M SLS 32AIA					
Product description	Enhanced authentication solution for high-value goods	Enhanced device security solution	Enhanced device security solution					
Interfaces	I2C	I2C	I2C (shielded connection)					
EEPROM	-	-	-					
NVM	3 kByte	10 kByte	10 kByte					
RAM	-	-	-					
CPU	16-bit	16-bit	16-bit					
Symmetrical cryptography	-	_	-					
Asymmetrical cryptography	ECC 256-bit	ECC 256-bit	ECC 256-bit, ECC 384-bit, RSA 1024-bit, RSA 2048-bit					
Ambient temperature	-40°C to +85°C	"SLS32AIA020X4 standard: -25 to +85°C SLS32AIA020X2 extended: -40 to +105°C"	"SLS32AIA010MS standard: -25 to +85°C ; SLS32AIA010MH extended: -40 to +105°C"					
Delivery forms	USON-10-2	USON-10-2	USON-10					
Typical applications	PKI networks, consumer electronics, smart home, industrial automation, Internet of Things (IoT), authentication of system services and accessories, original replacement parts, smart metering, system configuration management, IP/software protection	Internet of Things (IoT), smart home, industrial automation, consumer electronics, smart metering, authentication of system services and accessories, original replacement parts, secure communication, IP/software protection	Mutual authentication, secured communication, secured updates, key provisioning, life- cycle management, data store protection, power management, platform integrity protection					
Certifications	-	EAL6+ (high) for the HW	CC EAL6+ (high) for HW					
EBV personalization services	available	available						

## **Trusted Computing**

	OPTIGA™ TPM (Trusted Platform Module)								
Product name	OPTIGA™ TPM SLB 9645TT1.2	A™ TPM SLB         OPTIGA™ TPM SLB         OPTIGA™ TPM SLB         OPTIGA™ TPM SLB           45TT1.2         9645XT1.2         9645VQ1.2         9645XQ1.2		OPTIGA™ TPM SLB         OPTIGA™ TPM SLB           9660TT1.2         9660XT1.2		OPTIGA™ TPM SLB 9660VQ1.2	OPTIGA™ TPM SLB 9660XQ1.2	OPTIGA™ TPM SLB 9665TT2.0	
Product description	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.	a Infineon OPTIGA™ TPMThe Infineon OPTIGA™ TPMThe Infineon OPTIGA™ TPMThe Infineon OPTIGA™ TPMated Platform Module) is a standardized security(Trusted		The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded systems.
Interfaces	I2C	I2C	I2C	I2C	LPC	LPC	LPC	LPC	LPC
Symmetrical cryptography	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1, SHA-256
Asymmetrical cryptography	RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048
Ambient temperature	-20°C to +85°C	-40°C to +85°C	-20°C to +85°C	-40°C to +85°C	-20°C to +85°C	-40°C to +85°C	-20°C to +85°C	-40°C to +85°C	-20°C to +85°C
Package	TSSOP-28	TSSOP-28	VQFN-32	VQFN-32	TSSOP-28	TSSOP-28	VQFN-32	VQFN-32	TSSOP-28
Typical applications	PC and mobile computing on non-x86 platforms; embedded	PC and mobile computing on non-x86 platforms; embedded	PC and mobile computing on non-x86 platforms; embedded	PC and mobile computing on non-x86 platforms; embedded	PC and mobile computing with Intel x86, ARM platforms and	PC and mobile computing with Intel x86, ARM platforms and	PC and mobile computing with Intel x86, ARM platforms and	PC and mobile computing with Intel x86, ARM platforms and	PC and mobile computing with Intel x86, ARM platforms and
	devices e.g.communication, gateways, printer,PoS systems, networking, ATMs	devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	Devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs
Certifications	based on CC EAL4+ certified HW	based on CC EAL4+ certified HW	based on CC EAL4+ certified HW	based on CC EAL4+ certified HW	"CC EAL4+, FIPS 140-2 level 2 (with FW update)"				
Standard	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 2.0 Rev. 01.16

			OPTIGA™ TPM Industrial	OPTIGA™ TPM Automotive					
Product name	OPTIGA™ TPM SLB 9665XT2.0	OPTIGA™ TPM SLB 9665VQ2.0	OPTIGA™ TPM SLB 9665XQ2.0	OPTIGA™ TPM SLB 9670VQ1.2	OPTIGA™ TPM SLB 9670XQ1.2	OPTIGA™ TPM SLB 9670VQ2.0	OPTIGA™ TPM SLB 9670XQ2.0	OPTIGA™ TPM SLM 9670	OPTIGA™ TPM SLI 9670
Product description	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) is a standardized security controller which provides a wide range of security functions for computing platforms and embedded	The Infineon OPTIGA™ TPM (Trusted Platform Module) SLM 9670 is a special model of OPTIGA™ TPM that meets the requirements of industrial and other demanding applications, where key requirements include an extended temperature range (-40 to +105°C), extended lifetime, long-lasting supply availability in combination with industrial	Security cryptocontroller for automotive use cases
Interfaces	systems.	quality grade.	וספ						
Symmetrical cryptography	AES, HMAC, SHA-1, SHA-256	AES, HMAC, SHA-1, SHA-256	AES, HMAC, SHA-1, SHA-256	AES, HMAC, SHA-1	AES, HMAC, SHA-1	AES, HMAC, SHA-1, SHA-256	AES, HMAC, SHA-1, SHA-256	HMAC, SHA-1, SHA-256	HMAC, SHA-1, SHA-256
Asymmetrical cryptography	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048	RSA1024, RSA2048	RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048	ECC, ECC BN-256, ECC NIST P-256, ECC256, ECDH, RSA1024, RSA2048
Ambient temperature	-40°C to +85°C	-20°C to +85°C	-40°C to +85°C	-20°C to +85°C	-40°C to +85°C	-20°C to +85°C	-40°C to +85°C	-40°C to +105°C	-40°C to +105°C
Package	TSSOP-28	VQFN-32	VQFN-32						
Typical applications	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	PC and mobile computing with Intel x86, ARM platforms and others; embedded devices e.g. communication, gateways, printer, PoS systems, networking, ATMs	Industrial computing, industrial PCs, servers, tablets, single-board computers, programmable logic controllers (PLCs), industrial networking infrastructure & equipment, industrial servers, gateways, routers, switches	Automotive security
Certifications	"CC EAL4+, FIPS 140-2 level 2 (with FW update)"	*CC EAL4+ & FIPS 140-2 level 2 combined certification*	*CC EAL4+ & FIPS 140-2 level 2 combined certification*	CC EAL4+, FIPS 140-2	CC EAL4+, FIPS 140-2				
Standard	Version 2.0 Rev. 01.16	Version 2.0 Rev. 01.16	Version 2.0 Rev. 01.16	Version 1.2 Rev. 116	Version 1.2 Rev. 116	Version 2.0 Rev. 01.38	Version 2.0 Rev. 01.38	Version 2.0 Rev. 1.38	Version 2.0 Rev. 1.38
Qualification	-	-	-	-	-	-	-	-	AEC-Q100
EBV personalization services						available	available	available	available

## **Evaluation Boards**

		OPTIGA™ TPM (Trust	ted Platform Module)		OPTIGA™ Trust Evaluation Kits	OPTIGA™ Trust valuation Kits				OPTIGA™ TPM Xenonboards		
Product name	S2Go Security OPTIGA™ Trust E	S2Go Security OPTIGA™ Trust X	S2Go Security OPTIGA™ Trust M	MY IOT ADAPTER	OPTIGATM Trust E EVAL KIT	TPM SLB 9645 IRIDIUMBOARD	IRIDIUM9670 TPM1.2 LINUX	IRIDIUM9670 TPM2.0 LINUX	IRIDIUM SLI9670 TPM2.0 LINUX	IRIDIUM SLM9670 TPM2.0 LINUX	TPM 70 1.2 XENONBOARD	TPM 70 2.0 XENONBOARD
Picture						R.O.S.	-999 			900 19. j. j. j.		
Product description	This Shield2Go board is equipped with one OPTIGA™ Trust E security chip and comes with a ready-to- use Arduino library. By combining Shield2Go boards with Infineon MyIoT adapters, customized system solutions can be developed.	This Shield2Go board is equipped with one OPTIGA™ Trust X security chip and comes with a ready-to- use Arduino library. By combining Shield2Go boards with Infineon MyIoT adapters, customized system solutions can be developed.	This Shield2Go board is equipped with one OPTIGATM Trust M security chip and comes with a ready-to- use Arduino library. By combining Shield2Go boards with Infineon MyIoT adapters, customized system solutions can be developed.	By combining Shield2Go boards with the Infineon My IoT adapter, customized system solutions can be developed and evaluated.	With the XMC4800 controller as the host on the evaluation kit allows users to connect to the OPTIGATM Trust M (SLS 32AIA) through the I2C interface. Customers can use this evaluation kit to either debug the host lib code or demonstrate major features of the OPTIGATM Trust M.	"Infineon TPM SLB 9645 Iridium add-on board for Raspberry Pi and BeagleBoard xM. For integration into the corresponding platform OS (Linux, Win 10 IoT, etc.)."	"Infineon TPM SLB 9670 Iridium add-on board for Raspberry Pi. For integration into the corresponding platform OS (Linux, Win 10 IoT, etc.)."	"Infineon TPM SLB 9670 Iridium add-on board for Raspberry Pi. For integration into the corresponding platform OS (Linux, Win 10 IoT, etc.)."	"Infineon TPM SLI 9670 Iridium add-on board for Raspberry Pi. For integration into the corresponding platform OS (Linux etc.)."	Infineon TPM SLM 9670 Iridium add-on board for Raspberry Pi. For integration into the corresponding platform OS (Linux, Win 10 IoT, etc.).	"Infineon TPM SLB 9670 Xenon is an add-on board for the PC platform. For integration into the corresponding platform OS (Windows, Linux, Win 10 loT, etc.)."	"Infineon TPM SLB 9670 Xenon is an add-on board for the PC platform. For integration into the corresponding platform OS (Windows, Linux, Win 10 IoT, etc.)."
Configuration	-	-	-	Infineon Shield2Go boards	_	SLB 9645 TPM 1.2 for Raspberry Pi	SLB 9670 TPM 1.2 for Raspberry Pi	SLB 9670 TPM 2.0 for Raspberry Pi	SLI 9670 TPM 2.0 for Raspberry Pi	SLM 9670 TPM 2.0 for Raspberry Pi	SLB 9670 TPM 1.2 for a PC platform	SLB 9670 TPM 2.0 for a PC platform
Typical applications	Device authentication, embedded systems networked over the IoT, industrial control and automation, medical devices, consumer electronics, smart home, PKI networks	"Embedded systems networked over the IoT, industrial control and automation, medical devices, consumer electronics, smart home, PKI networks"	Embedded systems networked over the IoT, industrial control and automation, medical devices, consumer electronics, smart home, PKI networks	Device authentication, embedded systems networked over the IoT, industrial control and automation, medical devices, consumer electronics, smart home, PKI networks	Device authentication, embedded systems networked over the IoT, industrial control and automation, medical devices, consumer electronics, smart home	Embedded computing, trusted computing	Embedded computing, trusted computing	Embedded computing, trusted computing	Automotive security	Industrial computing, industrial PCs, servers, tablets, single-board computers, Programmable Logic Controllers (PLCs), industrial networking infrastructure & equipment, industrial servers, gateways, routers, switches	Embedded computing, trusted computing	Embedded computing, trusted computing
Qualification	Consumer, industrial	Consumer, industrial	Consumer, industrial	Consumer, industrial	Consumer, industrial	Consumer, industrial	Consumer, industrial	Consumer, industrial	Consumer, industrial	-	-	-
Input type	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC
Supply voltage min	3.13 V	3.13 V	3.13 V	3.15 V	3.13 V	1.65 V	1.65 V	1.65 V	1.65 V	1.65 V	1.65 V	1.65 V
Supply voltage max	3.63 V	3.63 V	3.63 V	5 V	3.63 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V
Supply voltage	-	-	-	-	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V

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