

# OPTIGA™ Trust Charge Automotive
# Qi authentication for in-cabin wireless charging

Infineon Technologies

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public

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# Imagine…
# a world without wires



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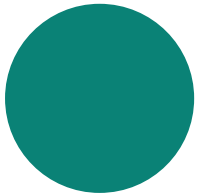
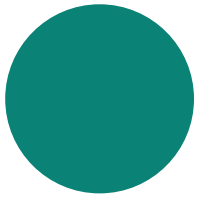
# Qi is the leading standard for wireless charging and offers a growing market potential

## In 2025



**1.15 billion Qi-certified wireless charging handhelds** (power receivers) will be shipped*



**435 million Qi-certified wireless chargers** (power transmitters) will be shipped*, with **50 million being in-cabin chargers****



**48% of all shipped mobile phones** will support wireless charging*

Sources: * Strategy Analytics, Global Wireless Charging Tracker, June 2021 / ** Wireless Power Market Tracker - T2 2021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# Qi was developed by the Wireless Power Consortium (WPC) with clear targets

- **Worldwide compatibility and interoperability** of wireless power sources and power receivers
- **Safety** of devices and consumers
- Increased **customer satisfaction** due to interoperability and fast charging
- **Quality seal** and **brand protection**

https://www.wirelesspowerconsortium.com


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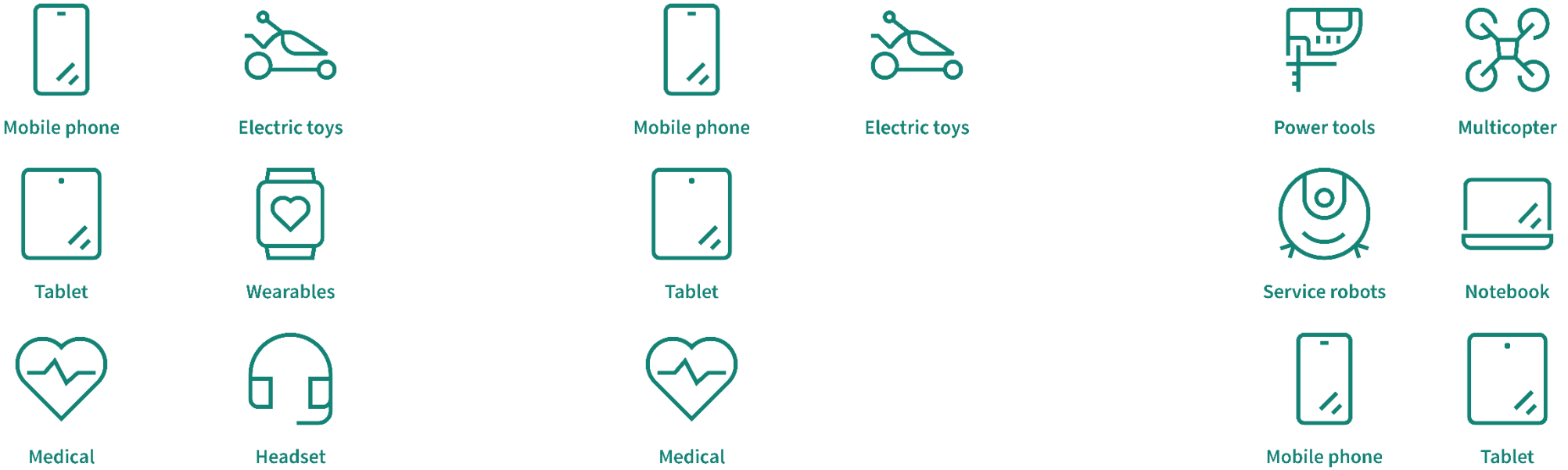
# The Qi standard includes different power profiles for different applications

| **Qi BBP Baseline Power Profile**<br>Charging up to 5 W<br><br>**No authentication** needed | **Qi EPP Extended Power Profile**<br>Charging 5 -15 W<br><br>**Mandatory authentication** | **Expected 2023**<br>– Extension to 60 W (or higher)<br>– Integration of **MPP** (Magnetic power profile)<br>**Mandatory authentication** |
|---|---|---|

Application examples




**Qi wireless charging > 5 W requires authentication based on security certified hardware**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# The Qi 1.3 & Q 2 standard addresses challenges of wireless charging




- Growing use of **"fast charging"** > 5 W leads to increasing **risks of product damage or safety hazards**
- **Qi 1.3 standard reduces risks**:
  - Mandatory **authentication** of the charger to the charged device to verify that the charger is Qi certified and therefore trustworthy (for charging > 5 W up to 15 W), using a "Secure Storage Subsystem" which has to be security assured or certified (e.g. CC EAL4+ or higher)
- **Qi 2:** Integration of **MPP** (Magnetic Power Profile) and extension to **60 W**
  - Improved **Foreign Object Detection** reduces risks for & from surrounding objects
- Authentication is able to check Qi certified chargers to support product and consumer safety
  - **Better consumer experience**
  - **Better brand image** for manufacturers
- Qi certification of new charging platforms **only with Qi 1.3** starting **2023** (consumer: January, automotive: June)


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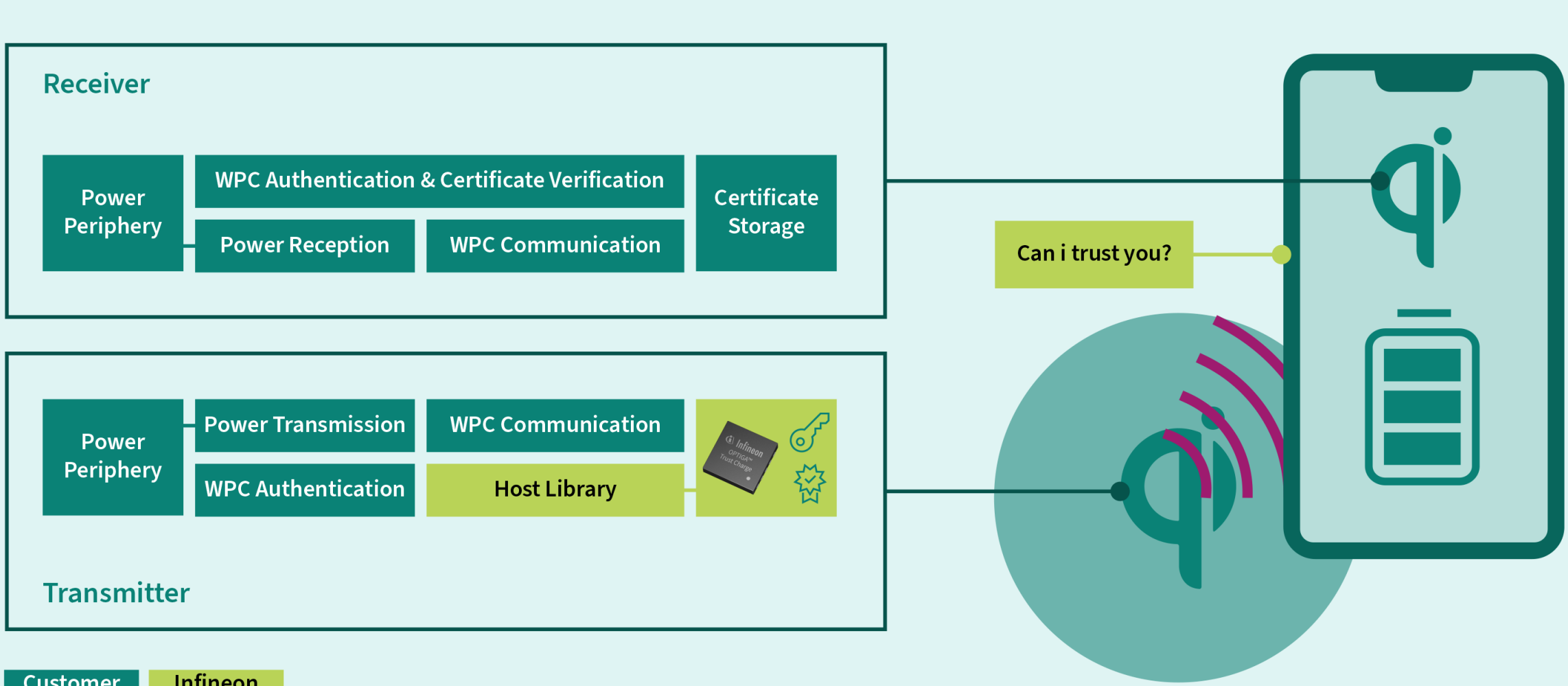
# OPTIGA™ Trust Charge Automotive
# Authentication for in cabin Qi 1.3 compliant wireless charging





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# OPTIGA™ Trust Charge is the authentication solution supporting Qi 1.3 & Qi 2 wireless charging - for Automotive

## OPTIGA™ Trust Charge Automotive

### Easy integration

- Full turnkey solution for authentication for wireless charging **(Qi 1.3 & Qi 2)**
- Full system integration support
- Host code and **application notes** available for different MCUs




### Security features

- Based on CC EAL 6+ (high) certified HW
- X.509 / WPC certificate format supported
- Authentication based on ECDSA NIST-P256; Cryptography support:
- ECC256, SHA-2
- CC EAL5+ **certified and audited production sites**

### Key features

- SPI
- VQFN32 (SPI)
- AEC Q100 qualification available
- PPAP available


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# OPTIGA™ Trust Charge is the authentication solution supporting Qi 1.3 & Qi 2 wireless charging - for Automotive

## Deliverables

- Full turnkey solution  = hardware / firmware / drivers / host library
- Full WPC compliant provisioning
  - Generation and injection of keys and certificate chains
  - IFX acts as WPC Manufacturer CA




## Differentiating features (exceeding Qi 1.3 requirements)

- In-Field update function
- Transport protection & Binding of MCU and Secure Storage Subsystem with unique key pairs
- Secured channel (SCP03) between MCU Secure Storage Subsystem
- Up to four slots for keys and certificates

## Schedule:

- Samples available
  - Including product unit certificates based on WPC Test Root CA and IFX Manufacturer CA
- Evaluation kit available
- Mass production available for SPI
- Sales codes:
  - SLS37CSAE20TC (SPI) with VQFN32 package


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# Getting your own personalized OPTIGA™ Trust Charge Automotive is easy



Manufacturer (as WPC member) provides his WPC manufacturer code (PTMC) and platform code (Qi-ID) to Infineon



Infineon sets up customer specific part number and customer specific manufacturer certificate authority, signed by WPC root CA



Infineon uses manufacturer certificate authority to create and sign unit certificates for each OPTIGA™ Trust Charge chip



Standard order process for samples and mass production


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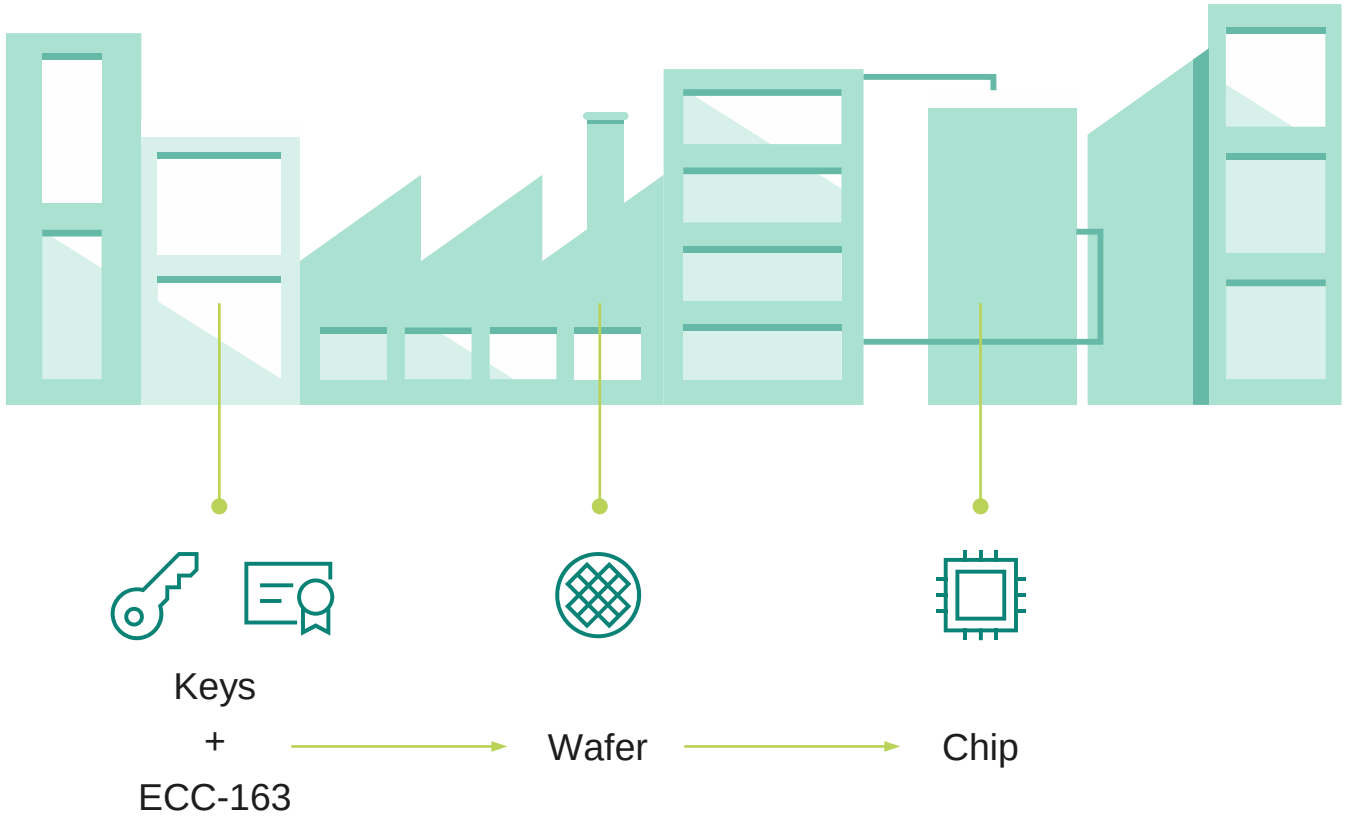
# Keys and certificates provisioned at Infineon's secured fab




**Infineon's secured fab:**

- Common criteria certified site / factory
- Site audit and inspection by CC on yearly basis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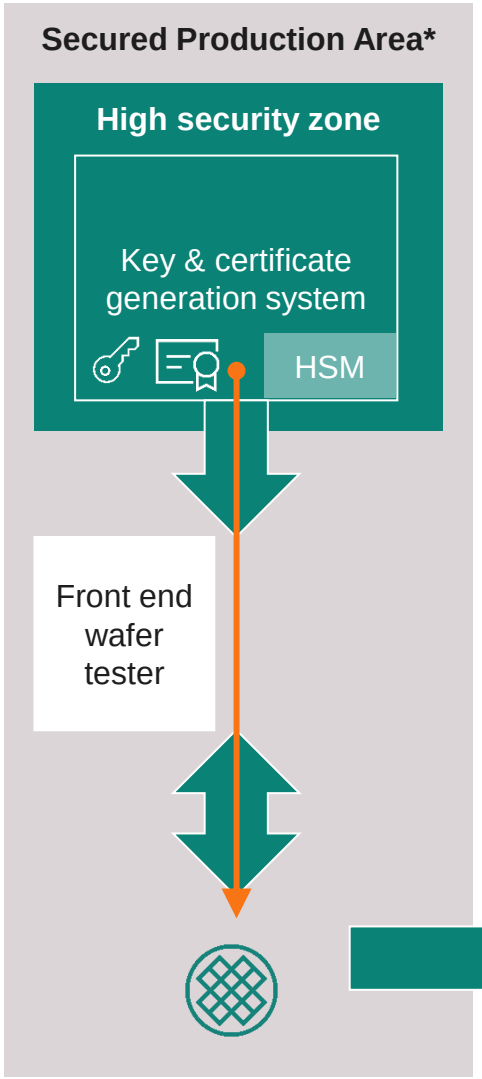
# OPTIGA™ Trust Charge Automotive
# Provisioning of keys and certificates for the Secure Storage Subsystem




**IFX Production and Provisioning sites**
- Sites are security **evaluated & certified ***

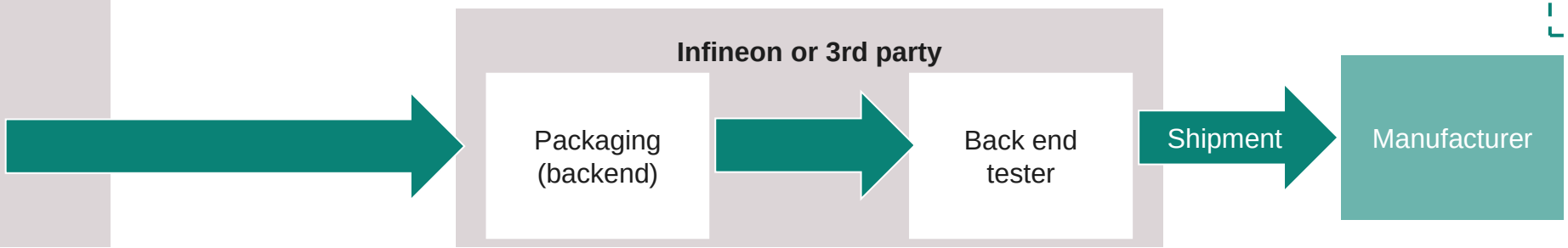
**Specific PKI for every customer**
- Infineon acts in the role of a WPC Manufacturer CA. Product certificates will be signed by the WPC root CA and this Manufacturer CA

**Process**
- Obtain unique Manufacturer CA Certificate signed by WPC Root CA
- Creation of unique manufacturer key pair
- Creation of chip-unique public-private key pairs
- Issue product unit certificates
- Install the private key associated with the Product Unit Certificate (incl. Manufacturer CA Cert, # of root CA) in the chip
- Packaging and Backend Testing
- Supply chips to Authorized Manufacturer for use in Qi certified product
- Traceability in line with WPC requirements

**Certification***

**Site Security** on services and sites evaluated & Based on CC EAL 6+ (high) certified HW
(augmented with ALC_DVS.2, AVA_VAN.5: attackers with high attack potential)

In the field:
**Revocation** Management if necessary





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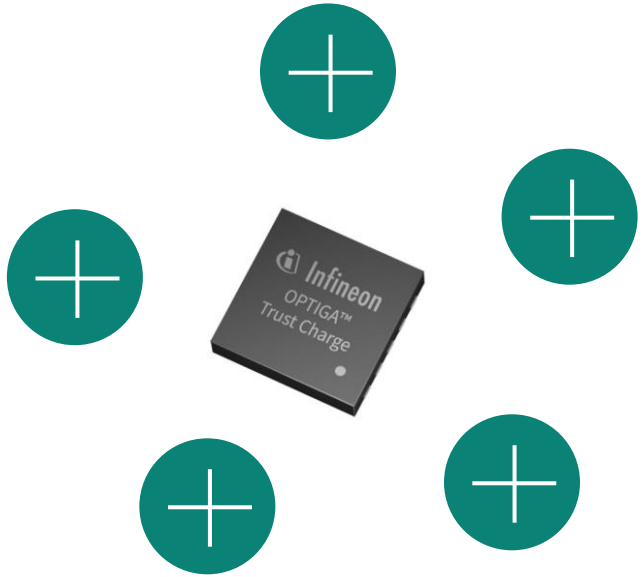
# OPTIGA™ Trust Charge Automotive is the easy way to authenticate wireless charging in cars

**Easy authentication for 15 W Qi charging**
Supports authentication according to WPC's Qi 1.3. & Qi 2 security requirements (and higher)

**Easy integration of security & Easy logistics for key material**
WPC specific personalized keys and certificates preloaded in secured Infineon fabs > no customer investment in infrastructure




**Easy integration of full turnkey design reduces effort and time at customer**
Integration support including embedded software, host software, development board, reference design and documentation

**Reduced risk of platform revocation**
Common Criteria EAL6+ (high) certified security controller exceeds WPC's security requirements

**Automotive Quality for in-cabin usage**
AEC Q-100 available
PPAP available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# OPTIGA™ Trust Charge Automotive
# Fulfilling market needs and Qi security requirements

| Market needs | Qi 1.3 & Qi 2 specification | Trust Charge features |
|---|---|---|
| Trustworthy wireless charger | ECDSA[1] authentication using ECC[2] 256 encryption and X.509 variant certificates | Supports cryptographic Qi authentication protocol |
| Secured key Storage | Protection of minimum two secret keys in a Secure Storage Subsystem | Secured on-chip storage of up to 4 key pairs and full X.509 certificate chains |
| Confirmed, certified protection against theft of keys and cloning | 7 security certification options for the Secure Storage Subsystem; most security levels at AVA_VAN[3].4-5, one at AVA_VAN.1 (cPP DSC) | CC[4] EAL6+ (high) certified hardware (AVA_VAN 5) |
| Turnkey solution – small invest in development – no invest in provisioning | Site security certification on services and sites related to the provisioning of a Secure Storage Subsystem | Provision Site Security on services and sites **evaluated &** based on CC EAL 6+ (high) certified HW |

[1] ECDSA – Elliptic Curve Digital Signature Algorithm
[2] ECC – Eliptic curve cryptocraphy
[3] AVA_VAN – AVA Vulnerability analysis
[4] CC – Common Criteria


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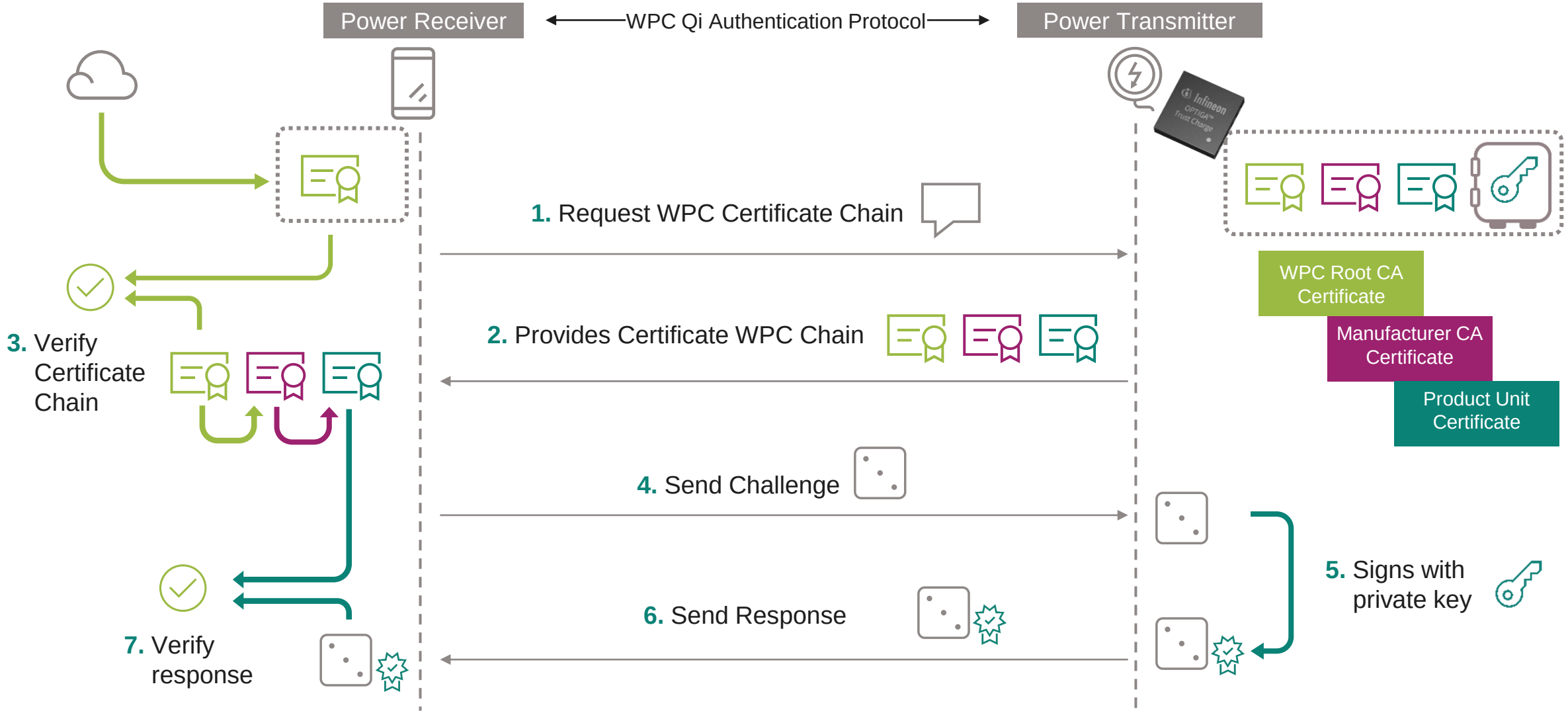
# Qi Authentication Flow





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# Infineon's OPTIGA™ family: flexibility, robust security, ease of use and a commitment to quality, supply and support



- Scaling from basic authentication chips to sophisticated implementations
- Designed for easy integration into embedded systems
- Robust protection of the confidentiality, integrity and authenticity of information and devices
- A trusted advisor with 30+ years of expertise in hardware security, helping you to reduce complexity and implementation costs


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# Our solution comes with service and support



## We support you by…

- Providing Design-In Application Notes for our products
- Host side integration support
- Evaluation kits

- Providing a secured Public Key Infrastructure
- Custom certificate loading in secured production environment

- Answering questions immediately
- Two-level customer service

- Providing trainings for our security products
- Showing Demo Applications as a starting point for custom designs


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# You can count on us

Extensive track record
and reliable logistics

**> 3 billion**

**Security ICs shipped every year**

Best partner network

**50 partners**

**for security**

Most trustworthy and innovative network of partners
in the security space

Shaping tomorrow’s standards

**> 100**

**standardization bodies**

Driving standardization bodies like GSMA, ETSI,
Global Platform, 3GPP, and NFC Forum

Strong innovation power

**> 25,000**

**patents**

7,161 R&D employees; 11 % of Infineon’s revenue
goes into R&D


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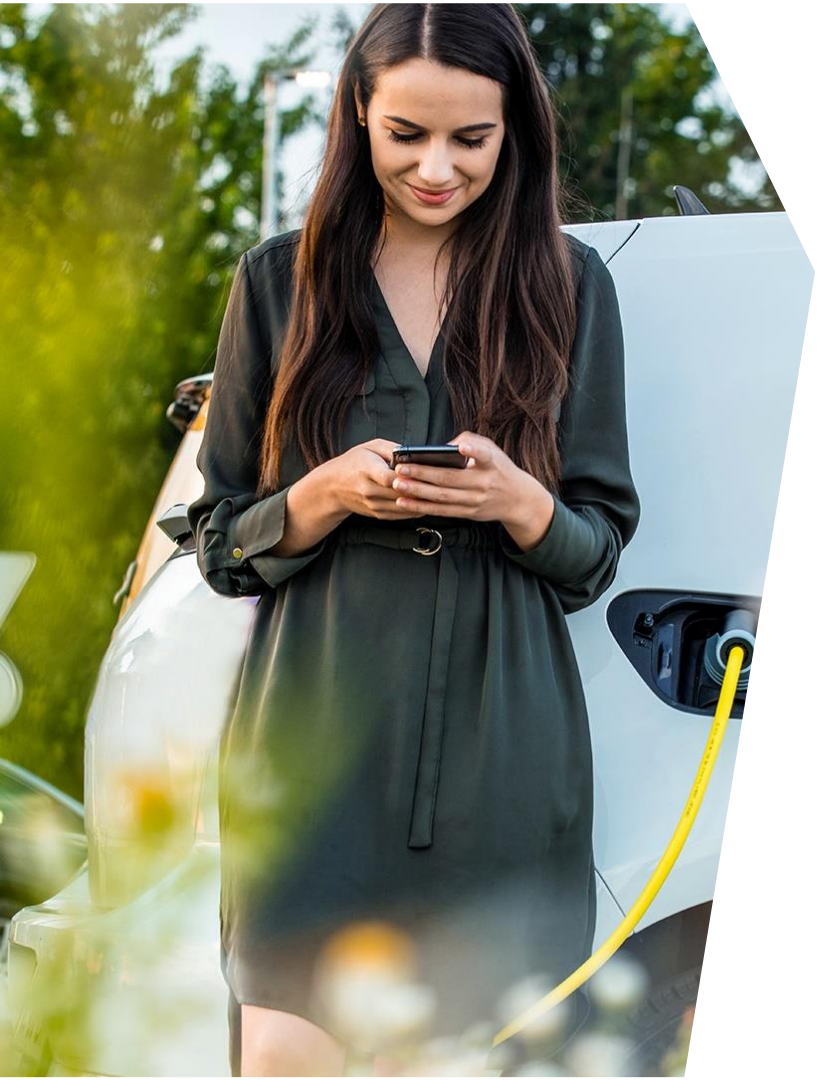
# For more information about wireless charging and the OPTIGA™ Trust Charge Automotive:



- **OPTIGA™ Trust Charge Automotive product webpage:** https://www.infineon.com/cms/en/product/security-smart-card-solutions/optiga-embedded-security-solutions/optiga-trust/optiga-trust-charge-auto/

- **In-cabin wireless charging application:** https://www.infineon.com/cms/en/applications/automotive/body-electronics-and-lighting/in-cabin-wireless-charging/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# Key takeaways



OPTIGA™ Trust Charge Automotive enables fulfillment of latest Qi security requirements

System compliant to international regulations

No customer investments for own security infrastructure

Full-service provisioning: Infineon operates as Manufacturer CA on behalf of WPC

Secured authentication with OPTIGA™ Trust Charge Automotive

- supports safety of devices & consumers by protecting against fake chargers
- protects manufacturers against reputation loss & supports brand image


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