SMART NFC SINGLE-CHIP SOLUTIONS

Offering security, sensing and tamper protection, while enabling the next level of trusted applications at scale

NEAR FIELD
COMMUNICATION

Near Field Communication (NFC) is an enabling technology in consumer and industrial segments of the Internet of Things (IoT). It provides a unique digital identity for every product, and can ensure the authenticity and integrity of products throughout their lifecycle.

With the new NTAG 223 DNA and NTAG 224 DNA line, NXP establishes a new level of connectivity – enabling an 'Internet of Everything' where businesses and their consumers can use NFC technology in fully passive mode to authenticate, protect, sense, and monitor in powerful new ways. The NTAG 22x DNA line of tag ICs is targeted at customers who need high-volume tagging solutions at an affordable cost, without sacrificing advanced security and functionality. The NTAG 22x DNA line is powered by SUN (Secure Unique NFC) message authentication with AES cryptography and status awareness using conductance or capacitance. The product's application space is virtually unlimited, since it can be used as an authentication tag, an anti-tampering tag, or a simple battery-free sensing tag, expanding the reach of smart, trusted IoT objects.

KEY FEATURES

- Full NFC interoperability – ISO/IEC 14443-A communication, NFC Forum Type 2 Tag
- Standard AES-128 cryptography and CC EAL3+ certification
- SUN (Secure Unique NFC) message authentication for advanced data protection within NFC (NDEF) read operation
- User memory of 144 bytes (NTAG 223 DNA) or 208 bytes (NTAG 224 DNA)
- User memory protected by password (NTAG 223 DNA) or 3-pass mutual authentication (NTAG 224 DNA)
- Customizable Originality Signature (48-byte based on ECC) to validate tag origin

- Conductive or capacitive tamper-protection mechanisms (NTAG 22x DNA StatusDetect)
- Capacitive sensing interface to external capacitor to measure changes in environmental conditions, e.g. humidity, pressure (StatusDetect)
- 7-byte Unique ID
- Automatic NFC tap counter
- On-chip assembly of item URLs with ASCII mirrors (UID, counter, tamper status, CMAC)
- 50 pF input capacitance for compact antenna design

KEY BENEFITS

- Cryptographically secure message authentication accessible with any standard NFC phone
- Authentication in near real time, for intuitive, convenient user experiences
- Cost-efficient, easy to implement, sustainable

- Advanced tamper detection, using conductance or capacitance (NTAG 22x DNA StatusDetect)
- Ability to capacitively sense specific conditions without a battery (NTAG 22x DNA StatusDetect)

KEY APPLICATIONS

SECURE AUTHENTICATION

- Advanced anti-counterfeiting and brand protection
- Supply-chain visibility and control

NEXT-GEN USER INTERACTIONS

- Hyper-personalized marketing campaigns
- Status-aware messaging
- Pre-/post-retail messaging

In addition, our NTAG 22x DNA StatusDetect enables advanced product integrity protection:

PRODUCT INTEGRITY PROTECTION

- Anti-tampering and refill-fraud protection
- Security sealing
- Leak detection
- Sensing of specific conditions, e.g. humidity, fill level

COMMON INDUSTRIES

Manufacturing, Retail, Healthcare, Industrial

MULTI-LAYERED PROTECTION

The NTAG 22x DNA architecture supports Secure Unique NFC (SUN) message authentication with AES-128 based encryption. In addition, to protect sensitive data against unauthorized access or to establish 'proof of presence', the NTAG 224 DNA offers a 3-pass mutual authentication with an additional AES key. AES-128 cryptography is used by governments worldwide for authentication of sensitive documentation. The NTAG 22x DNA StatusDetect products also come with a dual tamper protection mechanism and a simple passive sensing capability.

SUN MESSAGE AUTHENTICATION

SUN message authentication gives everyday objects unique, trusted identities that can be read by a standard NFC-enabled mobile device. NDEF data (NFC Data Exchange Format) that is read from DNA tags has added security attributes that change on every tap, making the taps unclonable. Each time an NTAG DNA tag IC is tapped, it generates a Secure Unique NFC (SUN) authentication message using an AES-128 cryptogram, to maintain data authenticity and integrity.
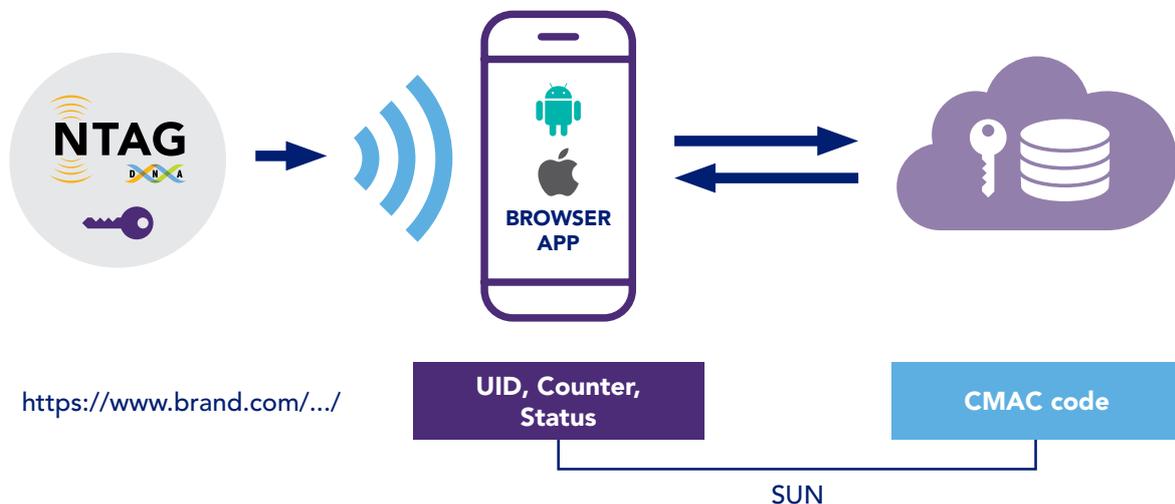
TAMPER PROTECTION

The NTAG 22x DNA StatusDetect performs advanced tamper detection, using conductance or capacitance, so customers can choose the approach that works best for their application.


Tamper Pads
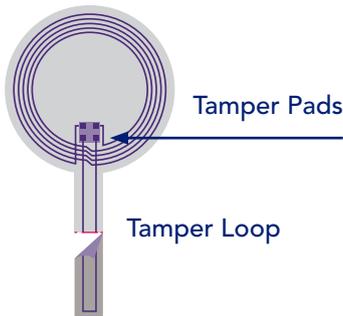
Tamper Loop

CONDUCTIVE

The NTAG 22x DNA StatusDetect IC works with a conductive tamper loop, to detect if a tagged product has been opened or mishandled before the sale or usage. A quick read of the opening status with a mobile device verifies that the loop is intact, to confirm product integrity. In case of a broken loop, the once-opened status is permanently and irreversibly stored in the chip memory, and, is reported to the cloud as part of the SUN authentication message – all with a simple tap of an NFC phone. Conductive solutions are well suited for the tamper-evident labels and seals which are affixed to product packaging.

CAPACITIVE

The NTAG 22x DNA StatusDetect tag IC can also be connected to a sensing capacitor. When read with an NFC reader, the tag IC will generate a tamper-sensing value of the capacitance, and when pre-configured limits are exceeded, it provides the open status information. The precise position of the capacitor electrodes can hardly be duplicated if the tag is manipulated or removed and affixed to a surrogate object, as even a very small displacement will result in a different, detectable capacitance value when interrogated. This can enable easier integration into physical products or packaging (as no connection is required), and makes reconstruction by a fraudster more difficult.

Tamper Pads

Closed

Open

Open
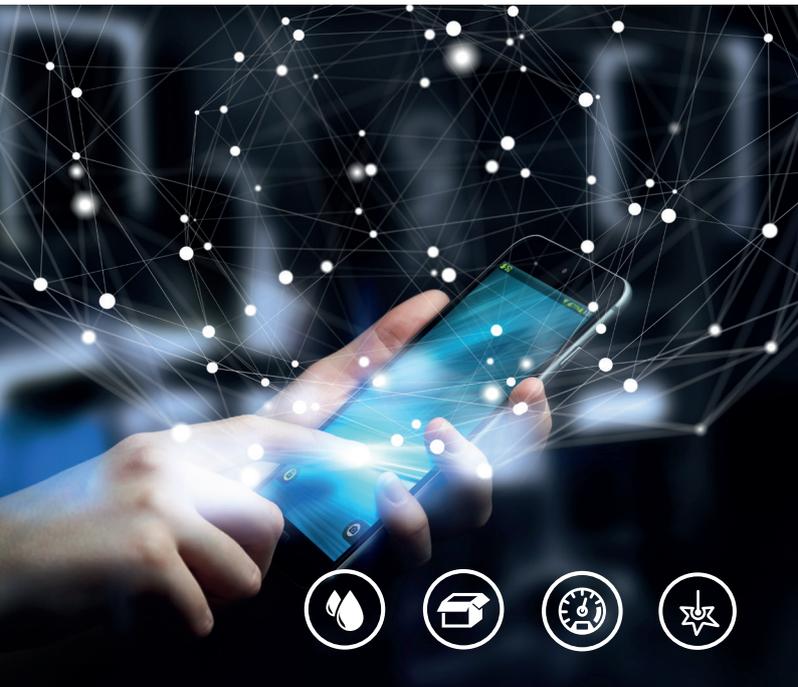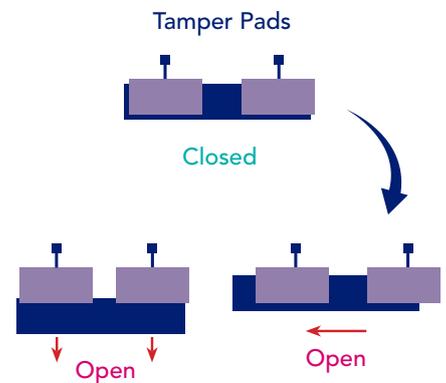
SIMPLE PASSIVE SENSING

NTAG 22x DNA StatusDetect can also be used as a passive NFC sensing solution, to detect a change in an item's condition or surrounding environment. Implementation is simple, inexpensive and sustainable. The change in the connected capacitance, caused for example by a change in humidity or pressure, is captured with an NFC-compliant reader and then interpreted by a mobile or cloud based application. Capacitive measurement range is up to 11pF with up to 64 granular steps. Because the NTAG 22x DNA StatusDetect doesn't use a battery, it can be deployed where battery-powered sensors are not practical, and there are none of the issues relating to battery maintenance, product lifetime, or recycling.

What is a capacitor? It consists of two parallel conductive plates are separated by air or by some good insulating material such as ceramic, glass, paper, or plastic. The size of the plates and their distance from each other, plus the permittivity of the insulating material being used affect the overall capacitance of the device. Calibration with determination of dissipation factors is carried out during the customer's production process.

THE NEXT LEVEL OF TRUSTED APPLICATIONS AT SCALE

NTAG 22x DNA tag ICs use multi-layered protection to support a broad range of NFC-based applications that can be trusted to protect products, services, and IoT-driven user experiences. With the advent of secure and status-aware NFC technology, the collection and processing of data is becoming easier, more secured, and more affordable:

ADVANCED ANTI-COUNTERFEITING

Protect against losses by allowing brand protection staff and consumers to instantly and securely verify a product's authenticity, globally, using a mobile NFC-enabled device. Improve accountability for provenance and increase consumer confidence while meeting industry and regulatory requirements. Beyond mobile authentication, also consider automated authentication for embedded appliances, enabled by a built-in reader and a tagged consumable or part.

SUPPLY-CHAIN TRACEABILITY

Authenticate products at any time, during sourcing, manufacturing, distribution or the sale itself. Products can be assigned to specific locations, and cloud-based data management and visibility help track products along the supply chain, reducing grey-market diversions and other types of fraud.

ENHANCED TAMPER DETECTION

Designed for products that will be physically consumed, such as pharmaceuticals, foods, and drinks, enhanced tamper detection securely detects whether a product has been interfered with in the supply chain or opened prior to sale, when interrogated with an NFC-compliant reader. Consider tamper evident labels also for transport packaging to safeguard the integrity of the delivery channel. Or, use 'intelligent' sealing to protect devices that benefit from trusted maintenance, such as fire extinguishers or electricity meters.

QUALITY ASSURANCE THROUGH SIMPLE SENSING

Battery-less, maintenance-free and sustainable tags that can measure environmental capacitance changes, such as humidity and pressure, enable new interpretation of quality-related data. Decisions that protect products can thus be made pro-actively and with confidence, opening up a number of valuable opportunities, including checking the quality of products, leak detection, predictive maintenance, and more.

INTELLIGENT FILL LEVEL DETECTION

NTAG 22x DNA StatusDetect can be used to monitor fill levels and at the same time report a digitized status to an NFC mobile device or cloud server. Consumer Package Goods (CPGs) with the NTAG 22x DNA StatusDetect technology can sense if the fill level of a liquid in an opaque package is below a threshold, so consumers know when a refill is needed. Or, injectable drug delivery devices with a sensing capability can measure the fill level (full vs. empty), to help patients take medication properly and clinical studies achieve compliance.

NEXT-LEVEL CONSUMER EXPERIENCES

Evolve the customer experience by engaging more dynamically and with greater personalization – with tap-unique messaging. For example, reward customers for purchases and make product ownership more valuable with tailored services, loyalty programs, or special buying privileges. Or, use product-opening status to prompt targeted messages. For example, pre-sale messages can include product provenance, helpful information, and reviews, while post-sale messages can include services, such as loyalty rewards, access to social communities, e-commerce, and more.

VALUE-ADD
SERVICES

A comprehensive set of value-add services enhance system security and support customer implementations.

- NTAG Configure & Trust creates and provisions chip-individual AES keys, derived from master keys in tamper-resistant hardware security modules (HSMs), and injects customer keys and data into individual tag ICs at the source of production.

Hardware Security Module

Chip individual derived keys

Customer specific memory content
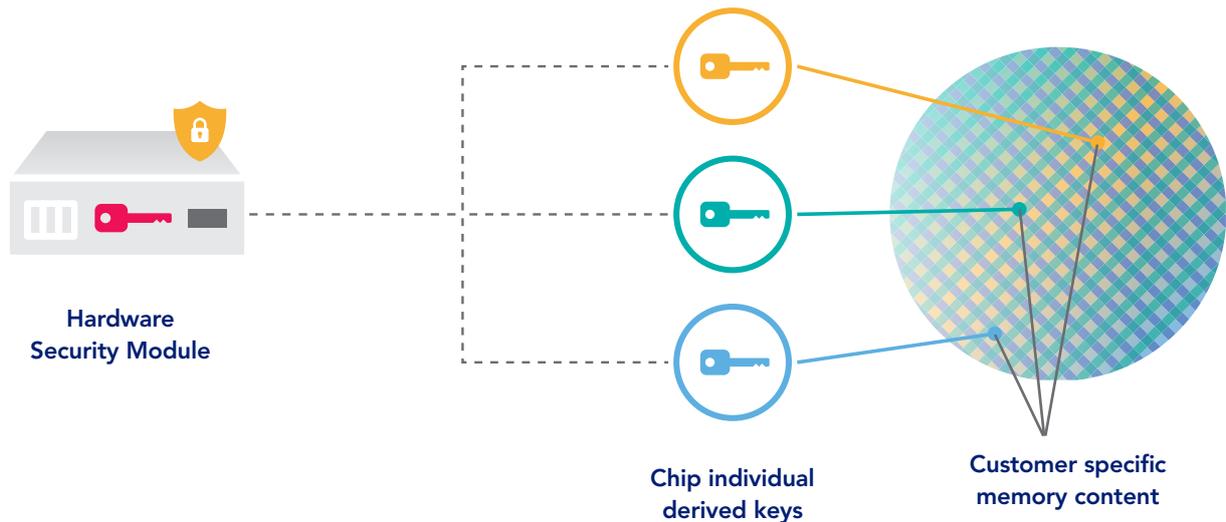
- NTAG Secure Services is an IoT SaaS platform to manage unique digital product identities in the cloud. NTAG Authenticator is a robust authentication engine to support advanced cryptographic operations and key management, while NTAG Redirector offers a tag management service with dynamic content links. With this secure authentication environment, businesses can easily verify authenticity of tags and their reported status, so they can take action in case of any irregularities, fraud, or changing conditions.
- A free set of purpose-built software tools simplify system integration, while two plug-and-play solutions, the TapLinx SDK for Android, iOS, and Java, and the NFC Reader Library make application development fast and easy.

ORDERING INFORMATION

	ORDERABLE PART NUMBER	12NC	WAFER	TAMPER & SENSING	MEMORY SIZE	MEMORY PROTECTION	INPUT CAP.
NTAG 223 DNA	NT2H2331G0DUDZ	9354 322 75003	120μm		144 bytes	Password	50 pF
NTAG 224 DNA	NT2H2421G0DUDZ	9354 322 77003	120μm		208 bytes	Mutual	50 pF
NTAG 223 DNA	NT2H2331G0DUFZ	9354 322 76003	75μm		144 bytes	Password	50 pF
NTAG 224 DNA	NT2H2421G0DUFZ	9354 322 78003	75μm		208 bytes	Mutual	50 pF
NTAG 223 DNA StatusDetect	NT2H2331S0DUDZ	9354 238 99003	120μm	Y	144 bytes	Password	50 pF
NTAG 224 DNA StatusDetect	NT2H2421S0DUDZ	9354 322 79003	120μm	Y	208 bytes	Mutual	50 pF