

Next-Gen High-Frequency (HF) Tags for a Performance Edge and Enhanced User Experiences



ICODE 3 tags deliver new levels of RF performance and speed while in manufacturing and the supply chain, then, extended NFC features augment user experience (UX) and expand privacy when in the end user's world.

Target Applications

- Product Tracking and Tracing
- Inventory Management
- Brand and Product Protection
- Smart Device-Consumable Systems
- Personalized Consumer Engagement

Wherever RFID tags need to work at both vicinity and close range, ICODE 3 delivers boosted RF performance and secure operation. In the vicinity range, improved tag readability and wide compatibility across materials and applications, together with fast data transfer, simplify design-in, speed up industrialization, and increase operational efficiency. For near-range applications, better tag readability and options like opening status and NFC tap counter create opportunities for more meaningful consumer interactions.

Key Features

- SELFAdjust mechanism for optimal RF performance over a range of materials and conditions.
- Read range up to 20% longer than existing HF tags.
- Faster read rate of up to 212 kbit/second (ISO/IEC 15693 compliant) versus existing HF tags.
- Large 2400-bit user-configurable memory with password protection.
- Customizable originality signature (based on ECC) to validate tag origin.
- Extended NFC features for serialized, dynamic and contextual messages, with native support in Android and iOS.
- Optional tamper detection with first-open and current status.
- Configurable 24-bit NFC tap- or command-based counter.
- Robust protections to safeguard tag data and user privacy.
- Increased junction temperature range from -40 to +105 °C.



Key Benefits

- Higher productivity, with tags working at peak efficiency, even in challenging operating environments and over tight tolerances.
- Design flexibility, with easier RFID integration into diverse form factors and materials, and design reusability.
- Improved operational efficiencies, with 2× faster in-line programming (when used in combination with a one-lock memory command) and up to 8× faster memory-data readouts versus existing HF tags.
- More meaningful engagements with consumers, using contextual interactions for personalized content, status-aware messages, usage counting, and more.

ICODE 3 uses HF functionality, according to ISO/IEC 15693, for applications that work in the vicinity range at up to 1.5 meters, and uses NFC functionality, according to the NFC Forum Type 5 Tag specification, for data exchange within a few centimeters. As a result, ICODE 3 accelerates broad-scale adoption across a wide range of applications in multiple industries, such as healthcare, fashion, consumables, toys, home appliances, and industrial assets.

A Step Up in Technology

As the next generation within NXP’s popular ICODE family, ICODE 3 breaks new ground in several ways:

- The benchmark SELFAdjust mechanism yields a read range that is up to 20% longer, as it widens the tag’s RF range, making it more tolerant of material and environmental variations than traditional narrowband tags.
- The tags deliver very fast reads (up to 212 kbit/second according to ISO/IEC 15693), for faster in-line programming during production (when used in combination with a one-lock memory command), and faster readouts in operations that make the end application more efficient.
- In NFC applications that involve mobile devices, the extended NFC feature set enables an enhanced UX. Serialized, dynamic and contextual NFC Data Exchange Format (NDEF) messages with auto-mirroring are natively supported in Android and iOS. The tags support an optional first-opening indication, too.
- To ensure tag authenticity, ICODE 3 tags offer a customizable ECC-based originality signature and, to prevent tag traceability and protect consumer privacy, one of two password-protected privacy modes can be used.

Maximum Tag Efficiency with SELFAdjust Function

The innovative and fully automatic SELFAdjust mechanism compensates for variations in RF performance over different materials, processes, and environments, allowing for enhanced readability across operations. This is because SELFAdjust widens a tag's RF range, or bandwidth, making its resonance frequency $\pm 3\%$ more tolerant of material and environmental variations than traditional narrowband tags.

Such robust RF performance makes ICODE 3 tags easier to use (and reuse) across a broader range of applications. Better performance on tight production specs increases yield and, since there are fewer design iterations and less time spent on fine-tuning performance, the overall cost goes down, too. Having a higher safety margin to meet RF performance requirements ensures the best tag readability across manufacturing, the supply chain, and in the end-user environment.

Higher Speed with Faster Read Rates in HF Range

ICODE 3 delivers read rates up to 212 kbit/second in the vicinity range, based on ISO/IEC 15693 standard compliance. When combined with a special memory feature that locks all memory blocks at once, the faster read rate enables in-line programming that's twice as fast as for existing tags for higher production throughput. The ICODE 3 data readout rate is also up to eight times faster, supporting such tasks as efficient inventory inspections, even in-box, device configurations, and end applications with high-speed, low-latency requirements.

New, Contextual Interactions with Extended NFC Features

Building on an extended set of NFC features, ICODE 3 makes it easier to attract, engage, and interact with end users. Flexible NDEF messaging makes it possible to tailor the content experience in compelling ways. NFC ASCII mirrors, available with the tag ID (UID), counter value, and first-opening



status, support serialized, dynamic messaging with contextual content. That means end users can experience personalized content, each time they tap their phone to the product. All this happens with native support in Android and iOS, so developers can quickly add compelling, user-oriented features.

ICODE 3 comes with a configurable 24-bit counter function. The tap counter can be used with cloud-based tag validations using a mobile phone, while the command counter can be used to record consumption within a closed-loop piece of equipment or device.

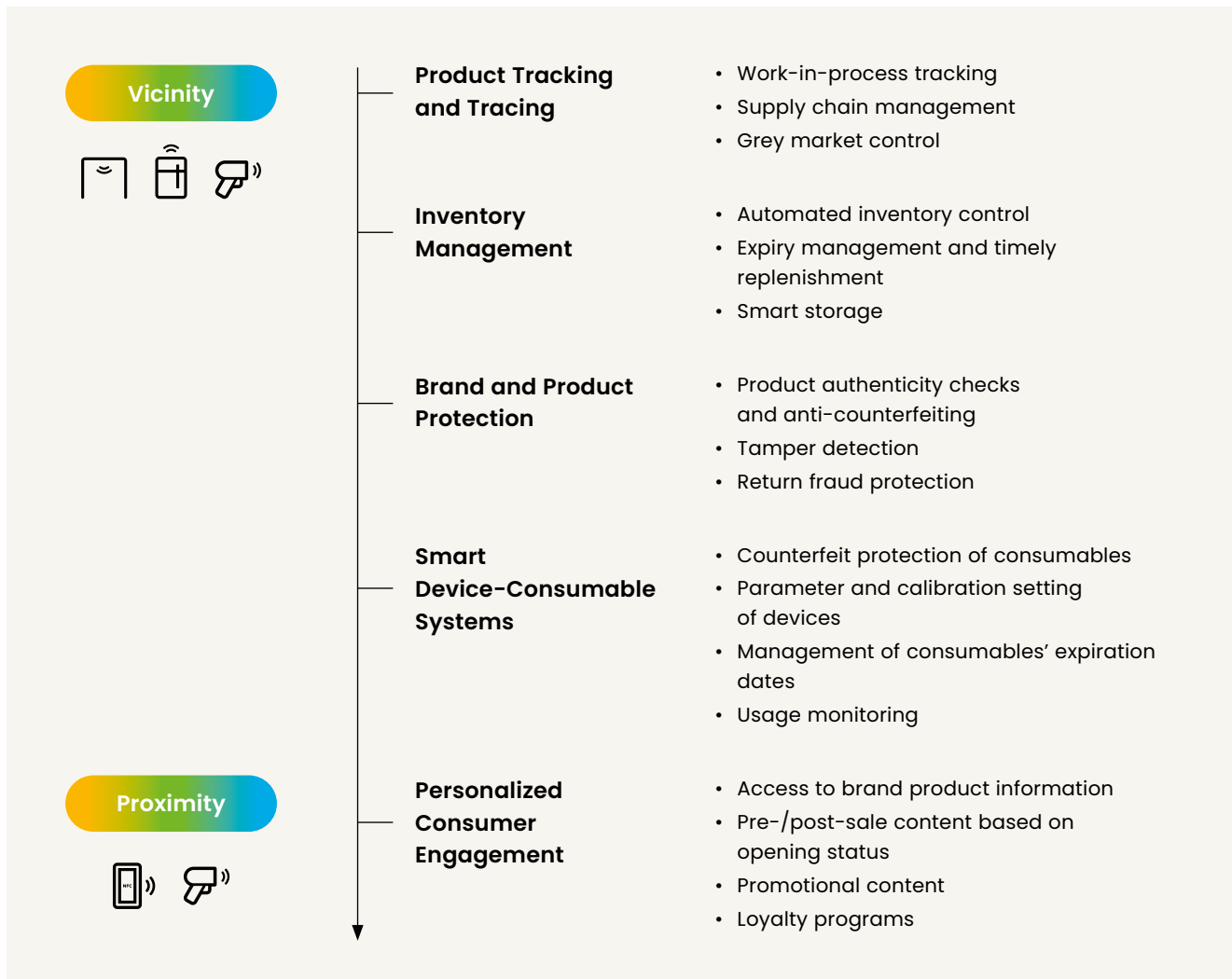


Product Tampering and First-Opening Indication

An optional tamper-detection feature uses a conductive tamper loop to sense unauthorized opening. A quick readout of the first-opened status, using an NFC reader on a mobile device, verifies that the loop is intact and the product has not been modified from its original state. Product integrity is protected by a programmable, die diversifiable and non-predictive 32-bit status message. Upon tag readout, if the loop is broken, the first-opened status is permanently and irreversibly stored in the chip memory and is reported to the cloud as part of the NFC message.

Protections for Tag Data and User Privacy

Several features – digital originality signature, flexible counters, and password-protected memory and modes – protect the tag and the information it stores. The customizable originality signature (32 or 48-byte based on ECC) validates tag origin. There are two alternative privacy modes that ensure that the tag is untraceable based on its unique identifier (UID), allowing users to also disable a tag's privacy with a mobile phone app. As a result, the end product is better protected against counterfeits, the supply chain becomes smarter, with accurate item tracking, and unintended tag traceability is prevented.



Crossover Applications for HF and NFC Ranges

Working at up to 1.5 meters with dedicated HF readers, and at close range with NFC enabled devices, including smartphones, ICODE 3 solutions deliver the best of both worlds. They increase efficiency and productivity in manufacturing and the supply chain, and create an enhanced user experience when they reach the end user.

Valuable Integration Support – Free of Charge

A free set of purpose-built software tools for PC and mobile simplify system integration. RFIDDiscover, a PC based tool, enables easy configuration and evaluation of the ICODE 3 tags. Two plug-and-play solutions, the NXP and NFC Reader libraries for Windows and embedded platforms, as well as the TapLinx SDK/Library for Android, iOS, and Java, make application development fast and easy.

Ordering Information

Product	Description	12NC
SL2S3003FUD	ICODE 3, 23.5pF, 12" wafer, 120µm thickness, with SELFAdjust	935437719046
SL2S3003TTFUD	ICODE 3, 23.5pF, TagTamper, 12" wafer, 120µm, thickness, with SELFAdjust	935437721046
SL2S3103FUD (available June 2024)	ICODE 3, 97pF, 12" wafer, 120µm thickness	935444643046

Visit nxp.com/ICODE3

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