Fact Sheet

UCODE® X

Ultra-low power consumption and standards-based features boost system performance

NXP's RAIN RFID tag chip, UCODE X, features exceptionally low power consumption and industry-leading encoding speeds. Fully compliant with global standards and offering multiple/extended memory options, UCODE X can be easily adapted to serve diverse use cases across fashion, cosmetics, food, logistics, healthcare and automotive—accelerating market adoption in emerging segments.

Target applications

Retail

- Inventory management
- Continuous location tracking in store
- Consumer self-checkout
- Loss prevention
- Expiration date management
- Product recall/warranty/returns management

Supply chain logistics

- Goods shipping and receiving
- Inventory management across entire supply chains

Third-party shipment services

- Improved truck loading speed
- Enhanced last-mile delivery precision

Pharma and healthcare

- Process automation
- Supply chain management
- Inventory management
- Asset tracking
- Expiration date management
- Production mix-up prevention

UCODE X expands the possibilities of RAIN RFID. Its industry-leading performance enables smaller, more-sustainable labels, allowing tagging of even more challenging and smaller items. Flexible configuration options support the needs of diverse applications, paving the way to new product categories and market expansion. It is a major step forward for retailers, brands and logistics providers looking to increase RAIN RFID use fast.

Key benefits

- Improved inventory accuracy
- High-throughput and efficiency for demanding applications
- Ability to tag challenging items like cosmetics, food and pharmaceuticals
- Supports new product categories and market expansion
- Enables smaller, more eco-friendly label design with reduced antenna material

UCODE X sets new standards in RAIN RFID performance, particularly for EPC reading. This makes it the perfect choice for extremely high-volume and high-throughput applications, especially for difficult-to-read items in retail, warehouse, supply chain and logistics environments. It also offers greater flexibility in implementation:

- Reduce antenna dimension while maintaining reading range
- Extend reading range with same antenna dimensions
- Helps comply with more ARC (Auburn RFID Lab Compliance) categories with the same antenna dimensions
- Supports tagging of challenging items (cosmetics, food, pharmaceuticals)
- Increase speed for handheld inventory counts
- Increase speed and accuracy for location updates in overhead reader applications

Key features

- Standard GS1 EPC Gen2v2
- Market-leading EPC read sensitivity, write sensitivity and write speed
  - Read sensitivity: -26.2 dBm
  - Write sensitivity: -23 dBm
  - Write speed: 32 bits in 1.9 ms
- Flexible memory configuration supports diverse application needs
- Reduced chip size
- Industry-leading low power consumption
- Customer configurable EPC/user memory allocation
- Self-adjust feature automatically optimizes tag performance to the surrounding environment
- GS1 EPC Gen2 standardized untraceable command: reduces read range and hides memory
- Memory Safeguard automatically protects memory integrity
- Pre-serialization of 96-bit EPC
- Compatible with single-slit antenna

Flexible memory configuration

Multiple memory options enable tag functionality to be tailored for specific use cases and applications. These options help users strike the right balance between EPC size and available user memory for their needs. More EPC memory allows additional product attributes to be stored on-chip and supports compliance with regulations such as the USA FDA's FSMA 204. User memory offers an independent storage area for any kind of user data.

Configuration	EPC memory	User memory	Access password	Kill password	Permalock	Lock	Untraceable
Default	128	0	Yes	Yes	Yes	Yes	Yes
Config 2	160	0	Yes	No	Yes	Yes	Yes
Config 3	208	0	No	No	Yes	No	No
Config 4	96	32	Yes	Yes	Yes	Yes	Yes
Config 5	128	32	Yes	No	Yes	Yes	Yes
Config 6	176	32	No	No	Yes	No	No

Kill and access passwords

By default, UCODE X offers separate access and kill passwords. For even greater security, both EPC and user memory can be write protected, either temporarily or permanently using the LOCK and PERMALOCK commands, respectively. If desired, the password memory can be easily reallocated to provide greater EPC or user memory capacity, allowing for maximum flexibility in use.

Consumer privacy

To ensure maximum consumer confidence, UCODE X offers full standardized GS1 EPC Gen2 untraceable command. NXP's implementation supports full and partial hiding of the EPC, tag ID and user memory. This feature allows unique item-identifiable data stored in memory to remain hidden, ensuring, for example, that no unique product information is revealed by the tag. In addition, tag reading range can be reduced to a fraction of the full reading distance. Users are free to choose either or both privacy features, depending on their particular use case.

Sustainability and smaller inlays

Sustainability is a key concern for consumers and companies alike. Thanks to its excellent RAIN RFID read performance, UCODE X can be used with smaller antennas, resulting in smaller inlays and reduced material waste. What's more, the advanced process technology used to produce UCODE X allows more individual chips on a wafer, further reducing material usage and emissions in the chip and tag supply chain.

An extensive ecosystem and infrastructure

As a board member of the RAIN Alliance, we actively collaborate to expand adoption of this technology with a standards-based approach that ensures interoperability across RAIN RFID infrastructures. UCODE chips are widely used by major label converters, tags and reader manufacturers, solution providers and system integrators around the world. In addition, a range of NXP Partners offer interoperable designs based on UCODE X, simplifying the design-in process.

Explore the NXP Partner Program and our global network of partners that can help enable your next design.

UCODE X product overview

UCODE X	
Performance	
Read sensitivity	- 26.2 dBm
Write sensitivity	-23 dBm
Memory	
EPC memory	Configurable: 96-208 bits
User memory	Configurable: 0-32 bits
Access password	Yes
Kill password	Yes
Features	
Untraceable	Yes
Pre-serialization 96-bit EPC	Yes
Memory safeguard	Yes
Self-adjust	Yes

Ordering information

Product	Delivery Form	Type	12NC
UCODE X	Wafer	SL3S1208FUD2/HBPZ	9354 639 55035

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Document Number: UCODEXFSA4 REV 0