

## RI-I02-114x-S1 Tag-it™ HF-I Pro Transponder Inlays Large Rectangle

### 1 Features

- ISO/IEC 15693-2, -3; ISO/IEC 18000-3 Compliant
- 13.56-MHz Operating Frequency
- 256-Bit User Memory in 8 blocks x 32-Bit
- User and Factory Lock Per Block
- Application Family Identifier (AFI)
- Fast Simultaneous Identification (Anti-Collision)
- Password Protected Write Command
- Command to Disable IC Functionality

### 2 Applications

- Product Authentication
- Ticketing
- Stored Value

### 3 Description

Texas Instruments Tag-it™ HF-I pro transponder inlays consist of 13.56-MHz high-frequency (HF) transponders that are compliant with the ISO/IEC 15693 and ISO/IEC 18000-3 global open standards. These products offer a user-accessible memory of 256 bits, organized in eight blocks, and an extended command set including password protect write available in five different antenna shapes, with frequency offset for integration into paper, PVC, or other substrates.

The Tag-it HF-I pro transponder inlays are manufactured with TI's patented laser tuning process to provide consistent read performance. Prior to delivery, the transponders undergo complete functional and parametric testing, in order to provide the high quality that customers have come to expect from TI.

The Tag-it HF-I pro transponder inlays are well suited for a variety of applications including, but not limited to, product authentication, library, supply-chain management, asset management, and ticketing/stored value applications.

#### Device Information<sup>(1)</sup>

| PART NUMBER    | PACKAGE | BODY SIZE (NOM)     |
|----------------|---------|---------------------|
| RI-I02-114A-S1 | TFF     | 45.00 mm x 76.00 mm |
| RI-I02-114B-S1 | TFF     | 45.00 mm x 76.00 mm |

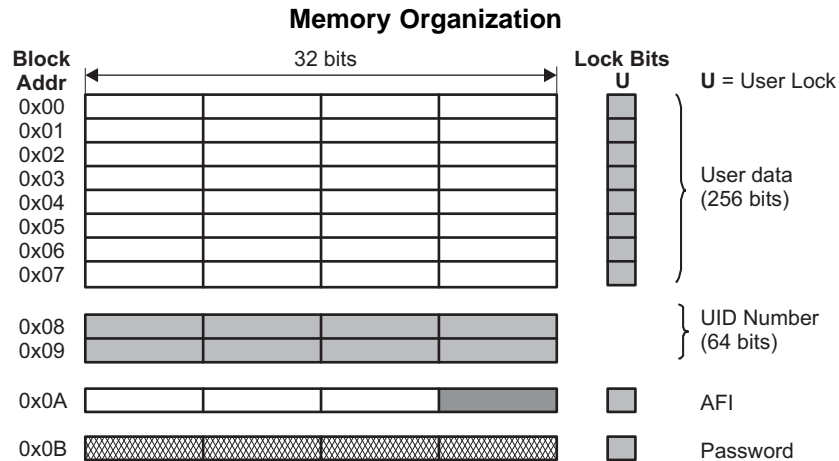
(1) For all available packages, see the orderable addendum at the end of the datasheet.



## 4 Revision History

| Changes from Revision B (Sept 2011) to Revision C                        | Page |
|--|------|
| • Changed feature from 8 bits x 32-bit blocks to 8 blocks x 32-Bit ..... | 1    |
| • Changed spec from 8 bits x 32-bit blocks to 8 blocks x 32-Bit .....    | 3    |

## 5 Pin Configuration and Functions



## 6 Specifications

**Table 1. Specifications<sup>(1)</sup>**

|   | PART NUMBER  |   |
|---|--|---|
|   | RI-I02-114A-S1   | RI-I02-114B-S1  |
| Supported standard  | ISO/IEC 15693-2, -3; ISO/IEC 18000-3   |   |
| Recommended operating frequency                               | 13.56 MHz  |   |
| Passive resonance frequency (at 25°C)                         | 13.86 MHz ±200 kHz<br>(includes frequency offset to compensate further integration into paper)   | 14.4 MHz ±200 kHz<br>(includes frequency offset to compensate PVC lamination) |
| Typical required activation field strength to read (at 25°C)  | 94 dBµA/m <sup>(2)</sup>   | 94 dBµA/m <sup>(3)</sup>  |
| Typical required activation field strength to write (at 25°C) | 97 dBµA/m <sup>(2)</sup>   | 97 dBµA/m <sup>(3)</sup>  |
| Factory-programmed read-only number                           | 64 bits  |   |
| Memory (user programmable)                                    | 256 bits organized in 8 blocks × 32-Bit  |   |
| Typical programming cycles (at 25°C)                          | 100,000  |   |
| Data retention time (at 55°C)                                 | >10 years  |   |
| Simultaneous identification of tags                           | Up to 50 tags per second (reader/antenna dependent)  |   |
| Antenna size  | 45 mm × 76 mm (~1.77 in × ~2.99 in)  |   |
| Foil width  | 48 mm ± 0.5 mm (1.89 in ± 0.02 in)   |   |
| Foil pitch  | 96 mm +0.1 mm/-0.4 mm (~3.78 in)   |   |
| Thickness   | Chip area: 0.34 mm ±0.02<br>Antenna area (AI both sides): 0.085 mm ±0.01<br>Antenna area (AI one side): 0.075 mm ±0.008  |   |
| Base material   | Substrate: PET (polyethylenetherephtalate); Antenna: aluminum  |   |
| Operating temperature   | -25°C to 70°C  |   |
| Storage temperature (single inlay)                            | -40°C to 85°C (warpage may occur at upper temperature range)   |   |
| Storage temperature (on reel)                                 | -40°C to 40°C  |   |
| Delivery  | Single-row tape wound on cardboard reel with 500-mm diameter<br>Reel outer width: approximately 60 mm (about 2.36 inches)<br>Reel inner width: approximately 50 mm (about 1.97 inches)<br>Hub diameter: 76.2 mm (3 in) |   |
| Typical quantity of good units per reel                       | 5000   |   |

(1) For highest possible read-out coverage, operate readers at a modulation depth of 20% or higher.

(2) After integration into paper

(3) After PVC lamination

**Table 2. Supported Command Set**

| REQUEST  | REQUEST MODE <sup>(1)</sup> |           |           |               |     |           |
|--|-----------------------------|-----------|-----------|---------------|-----|-----------|
|  | REQUEST CODE                | INVENTORY | ADDRESSED | NON-ADDRESSED | AFI | OPT. FLAG |
| <b>ISO 15693 Mandatory and Optional Commands</b> |                             |           |           |               |     |           |
| Inventory  | 0x01                        | ✓         | –         | –             | ✓   | 0         |
| Stay Quiet                                       | 0x02                        | –         | ✓         | –             | –   | 0         |
| Read_Single_Block                                | 0x20                        | –         | ✓         | ✓             | –   | 1         |
| Write_Single_Block                               | 0x21                        | –         | ✓         | ✓             | –   | 1         |
| Lock_Block                                       | 0x22                        | –         | ✓         | ✓             | –   | 1         |
| <b>TI Custom Commands</b>                        |                             |           |           |               |     |           |
| Kill   | 0xA4                        | –         | ✓         | –             | –   | 1         |
| WriteSingleBlockPwd                              | 0xA5                        | –         | ✓         | –             | –   | 1         |

(1) ✓ = Implemented, – = Not applicable

## 7 Device and Documentation Support

### 7.1 Documentation Support

#### 7.1.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

**Table 3. Related Links**

| PARTS          | PRODUCT FOLDER             | SAMPLE & BUY               | TECHNICAL DOCUMENTS        | TOOLS & SOFTWARE           | SUPPORT & COMMUNITY        |
|----------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| RI-I02-114A-S1 | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> |
| RI-I02-114B-S1 | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> |

### 7.2 Trademarks

Tag-it is a trademark of Texas Instruments.

### 7.3 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 7.4 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 8 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2) | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|-------------------------|----------------------|--------------|-------------------------|---------|
| RI-I02-114A-S1   | NRND          | RFIDN        | TFF             | 0    |             | TBD             | Call TI                 | Call TI              | -25 to 70    |                         |         |

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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### Products

|                              |  |
|------------------------------|--|
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| Amplifiers                   | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters              | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products                | <a href="http://www.dlp.com">www.dlp.com</a>   |
| DSP                          | <a href="http://dsp.ti.com">dsp.ti.com</a>   |
| Clocks and Timers            | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface                    | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                        | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt                   | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers             | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                         | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Applications Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity        | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |  |
|-------------------------------|--|
| Automotive and Transportation | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
| Space, Avionics and Defense   | <a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a> |
| Video and Imaging             | <a href="http://www.ti.com/video">www.ti.com/video</a>                                   |

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