

## Tag-it™ HF-I PLUS TRANSPONDER INLAYS MINIATURE RECTANGLE

Check for Samples: [RI-I03-112A-03](#)

### FEATURES

- ISO/IEC 15693-2, -3; ISO/IEC 18000-3 Compliant
- 13.56-MHz Operating Frequency
- 2048-Bit User Memory in 64-Bit x 32-Bit Blocks
- User and Factory Lock Per Block
- Application Family Identifier (AFI)
- Data Storage Format Identifier (DSFID)
- Combined Inventory Read Block

### APPLICATIONS

- Product Authentication
- Library
- Supply-Chain Management
- Asset Management
- Ticketing/Stored Value



### DESCRIPTION

Texas Instruments Tag-it™ HF-I plus 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 2048 bits, organized in 64 blocks, and an extensive command set available in six different antenna shapes, with frequency offset for integration into paper, PVC, or other substrates.

The Tag-it HF-I plus 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 plus 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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

Tag-it is a trademark of Texas Instruments.

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

|   | PART NUMBER  |
|---|--|
|   | RI-I03-112A-03   |
| 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 (includes frequency offset to compensate further integration into paper or PVC lamination)   |
| Typical required activation field strength to read (at 25°C)  | 107 dB $\mu$ A/m <sup>(2)</sup>  |
| Typical required activation field strength to write (at 25°C) | 111 dB $\mu$ A/m <sup>(2)</sup>  |
| Factory programmed read-only number                           | 64 bits  |
| Memory (user programmable)                                    | 2k bits organized in 64-bit × 32-bit blocks  |
| 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  | 22.5 mm × 38 mm (~0.89 in × ~1.5 in)   |
| Foil width  | 48 mm ± 0.5 mm (1.89 in ± 0.02 in)   |
| Foil pitch  | 48 mm +0.1 mm/–0.4 mm (~1.89 in)   |
| Thickness   | Chip area: 0.34 mm ±0.02<br>Antenna area (Al both sides): 0.085 mm ±0.01<br>Antenna area (Al one side): 0.075 mm ±0.008  |
| Base material   | Substrate: PET (polyethylenetherephtalate)<br>Antenna: aluminum  |
| Smallest bending radius allowed                               | 18 mm (~0.71 in)   |
| 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 (~2.36 in)<br>Reel inner width: approximately 50 mm (~1.97 in)<br>Hub diameter: 76.2 mm (3 in) |
| Typical quantity of good units per reel                       | 5,000  |

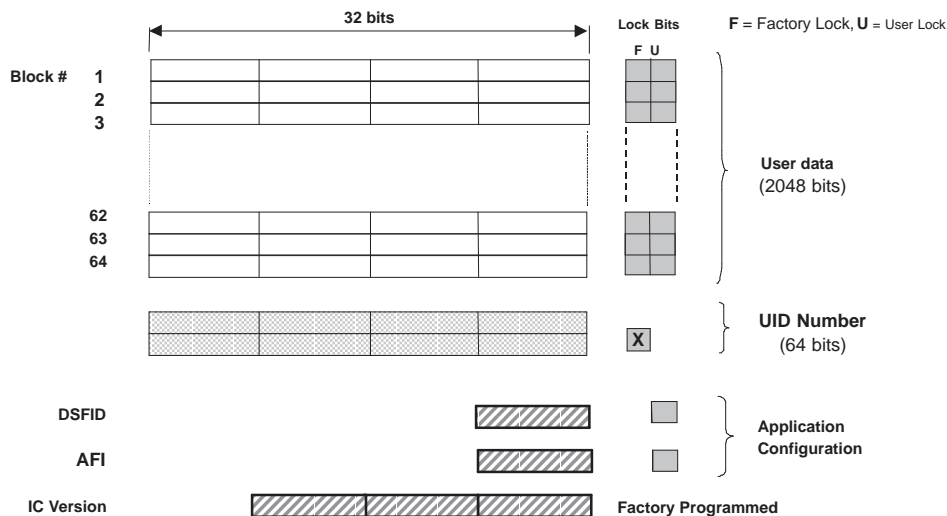
(1) For highest possible read-out coverage, operate readers at a modulation depth of 20% or higher.

(2) After integration into paper

**Table 2. SUPPORTED COMMAND SET**

| REQUEST  | REQUEST MODE <sup>(1)</sup> |           |           |               |        |     |           |
|--|-----------------------------|-----------|-----------|---------------|--------|-----|-----------|
|  | REQUEST CODE                | INVENTORY | ADDRESSED | NON-ADDRESSED | SELECT | AFI | OPT. FLAG |
| <b>ISO 15693 Mandatory and Optional Commands</b> |                             |           |           |               |        |     |           |
| Inventory  | 0x01                        | ✓         | –         | –             | –      | ✓   | 0         |
| Stay Quiet                                       | 0x02                        | –         | ✓         | –             | –      | –   | 0         |
| Read_Single_Block                                | 0x20                        | ✓         | ✓         | ✓             | ✓      | ✓   | 0/1       |
| Write_Single_Block                               | 0x21                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Lock_Block                                       | 0x22                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Read_Multi_Blocks                                | 0x23                        | ✓         | ✓         | ✓             | ✓      | ✓   | 0/1       |
| Select Tag                                       | 0x25                        | –         | ✓         | –             | –      | –   | 0         |
| Reset to Ready                                   | 0x26                        | –         | ✓         | ✓             | ✓      | –   | 0         |
| Write_AFI  | 0x27                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Lock_AFI   | 0x28                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Write DSFID                                      | 0x29                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Lock DSFID                                       | 0x2A                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Get_System_info                                  | 0x2B                        | ✓         | ✓         | ✓             | ✓      | ✓   | 0         |
| Get_M_BLK_Sec_St                                 | 0x2C                        | ✓         | ✓         | ✓             | ✓      | ✓   | 0         |
| <b>TI Custom Commands</b>                        |                             |           |           |               |        |     |           |
| Write_2_Blocks                                   | 0xA2                        | –         | ✓         | ✓             | ✓      | –   | 1         |
| Lock_2_Blocks                                    | 0xA3                        | –         | ✓         | ✓             | ✓      | –   | 1         |

(1) ✓ = Implemented, – = Not applicable

**MEMORY ORGANIZATION**


**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2) | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|------------------|----------------------|--------------|--------------------------|---------|
| RI-I03-112A-03   | ACTIVE        | RFIDN        | TFE             | 0    | 5000        | Pb-Free (RoHS)  | Call TI          | N / A for Pkg Type   | -25 to 70    |                          | Samples |

(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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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|                              |  |
|------------------------------|--|
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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

|                               |  |
|-------------------------------|--|
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| 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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