Digital Signature Transponder With Integrated DST80 Authentication, EEPROM, and LF Immobilizer

1 Features

- Low-frequency (LF) immobilizer interface
  - 75-byte EEPROM
  - 80-bit DST80 security authentication coprocessor
  - Integrated batteryless immobilizer interface
  - Half duplex (HDX) immobilizer communication achieves up to 4-in (10-cm) read range
  - Special selective addressing mode allows reliable learn-in sequence
  - 80-bit authentication key length
  - Up to 8-kbit/s uplink data rate
  - 5- or 3-byte challenge/response algorithm
  - Fast authentication within 42 ms
  - Fast mutual authentication within 65 ms
  - 75-byte EEPROM
    - 48-bytes of available EEPROM user memory
    - 32-bit unique serial number
    - High EEPROM security and flexibility
    - Write-only authentication keys
    - Pages are irreversibly lockable and protectable
    - Protected pages programmable only through mutual authentication
  - Each user page is lockable
  - Resonant frequency: 134.2 kHz

2 Applications

- Immobilizer

3 Description

This security RFID transponder provides an 80-bit encryption algorithm. The 5-byte challenge and 3-byte response algorithm is backward compatible with existing TI products and provides, together with the burst length coding, short encryption telegram times.

The DST80 offers 65 bytes of free programmable user data stored in nine pages, each of them lockable for programming. Each of the two 80-bit encryption keys with can be programmed with a single telegram.

The DST80 comes in two versions, preprogrammed with either PWM or PPM communication formats, eliminating the need for the user to change this field.

For a higher security level, the DSTAES transponder with AES-128 encryption is recommended.

Device Information

PART NUMBER(1)	PACKAGE(2)	COMMUNICATION FORMAT	BODY SIZE
TMS37145TEAIE	Wedge	PWM	12 mm × 6 mm
TMS37145TEAIEG	Wedge	PPM	12 mm × 6 mm

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

Wedge Package

Table of Contents

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from May 25, 2012 to January 29, 2020	**Page**
• Added Applications	1
• Changed the first paragraph and added the last paragraph in Description	1
• Removed former *Ordering Information* table and added *Device Information* table	1
• Added Device and Documentation Support, *Device and Documentation Support*	4

5 Specifications

5.1 Operating Characteristics

<table>
<tr><th>Part Number</th><th colspan="2">TMS37145TEAIE, TMS37145TEAIEG</th></tr>
<tr><td>Features</td><td colspan="2">Immobilizer plus microcontroller with integrated power management</td></tr>
<tr><td>DST80 authentication logic</td><td colspan="2">80-bit key length, 4-byte or 5-byte challenge, 3-byte signature</td></tr>
<tr><td>DST80 encryption time</td><td colspan="2">Mutual authentication: 65 ms
Fast authentication: 42 ms</td></tr>
<tr><td colspan="3">Transponder</td></tr>
<tr><td>Transmission principle</td><td colspan="2">HDX (half duplex telegram protocol)</td></tr>
<tr><td>Operating frequency</td><td colspan="2">134.2 kHz
Integrated resonant frequency trimming capability via LF or test interface</td></tr>
<tr><td>Security</td><td colspan="2">Challenge/response, mutual authentication</td></tr>
<tr><td>Downlink</td><td colspan="2">100% AM, PPM bit coding with 2 kbit/s (typ)</td></tr>
<tr><td>Uplink</td><td colspan="2">FSK modulation with 7.9 kbit/s (typ)</td></tr>
<tr><td>Read time for an encryption</td><td colspan="2">PPM: 60 ms (typ) (including 20-ms charge time)</td></tr>
<tr><td>Read time for mutual authentication</td><td colspan="2">PPM: 85 ms (typ) (including 20-ms charge time)</td></tr>
<tr><td>Protocol transmission security</td><td colspan="2">16-bit block check character</td></tr>
<tr><td>Activation field strength</td><td colspan="2">141.5 dBµA/m</td></tr>
<tr><td>Minimum required operation Q-factor</td><td colspan="2">30</td></tr>
<tr><td rowspan="3">EEPROM memory</td><td rowspan="3">75 bytes</td><td>48-byte free available EEPROM user memory</td></tr>
<tr><td>32-bit unique serial number</td></tr>
<tr><td>Two 80-bit security keys</td></tr>
<tr><td>EEPROM endurance</td><td colspan="2">200 000 (min) write-erase cycles (T_A = 25°C)</td></tr>
<tr><td>Key learn-in</td><td colspan="2">Special selective addressing to provide secure learn-in procedure</td></tr>
<tr><td>Storage temperature</td><td colspan="2">-40°C to 100°C (175°C for 5 minutes)</td></tr>
<tr><td>Operating temperature</td><td colspan="2">-40°C to 85°C</td></tr>
<tr><td>Case material</td><td colspan="2">Plastic</td></tr>
<tr><td>Protection class</td><td colspan="2">IP 68</td></tr>
<tr><td>EMC</td><td colspan="2">Programmed code is not affected by natural electromagnetic interference or X-rays</td></tr>
<tr><td>Mechanical shock</td><td colspan="2">IEC 68-2-27, Test Ea; 200 g, half sine, 3 ms, 6 shocks per axis</td></tr>
<tr><td>Vibration</td><td colspan="2">IEC 68-2-6, Test Fc; 10 to 500 Hz, 1.65 mm peak to peak, 10 g, 4 hours per axis</td></tr>
<tr><td>Dimensions</td><td colspan="2">12.0 mm ± 0.2 mm x 6.0 mm ± 0.2 mm x 3.0 mm ± 0.05 mm</td></tr>
<tr><td>Weight</td><td colspan="2">0.4 g</td></tr>
<tr><td>Packaging</td><td colspan="2">Bulk (2000 units per box)</td></tr>
</table>

6 Device and Documentation Support

6.1 Getting Started

RFID products from TI provide the ultimate solution for a wide range of applications. With its patented HDX technology, TI RFID offers unmatched performance in read range, read rate and robustness. For more information, see Overview for NFC / RFID.

6.2 Device Nomenclature

To designate the stages in the product development cycle, TI assigns prefixes to the part numbers of devices. Each device has one of three prefixes: X, P, or null (no prefix) (for example, TMS37145).

Device development evolutionary flow:

X – Experimental device that is not necessarily representative of the final device's electrical specifications and may not use production assembly flow.

P – Prototype device that is not necessarily the final silicon die and may not necessarily meet final electrical specifications.

null – Production version of the silicon die that is fully qualified.

X and P devices are shipped against the following disclaimer:

"Developmental product is intended for internal evaluation purposes."

Production devices have been characterized fully, and the quality and reliability of the device have been demonstrated fully. TI's standard warranty applies.

Predictions show that prototype devices (X or P) have a greater failure rate than the standard production devices. TI recommends that these devices not be used in any production system because their expected end-use failure rate still is undefined. Only qualified production devices are to be used.

6.3 Documentation Support

The following documentation describes the transponder, related peripherals, and other technical collateral.

Receiving Notification of Document Updates

To receive notification of documentation updates—including silicon errata—go to the TMS37145 product folder. In the upper right corner, click the "Alert me" button. This registers you to receive a weekly digest of product information that has changed (if any). For change details, check the revision history of any revised document.

TMS3705 Range Extender Power Solution Using UCC27424-Q1

This application report provides supplementary information about the Texas Instruments 134.2-kHz RFID base station IC TMS3705x in combination with an external driver IC. In particular, the document shows a low cost and easy-to-implement solution to improve the communication distance between the transaction processor (TRP) and the reader unit.

6.4 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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6.5 Trademarks

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6.6 Glossary

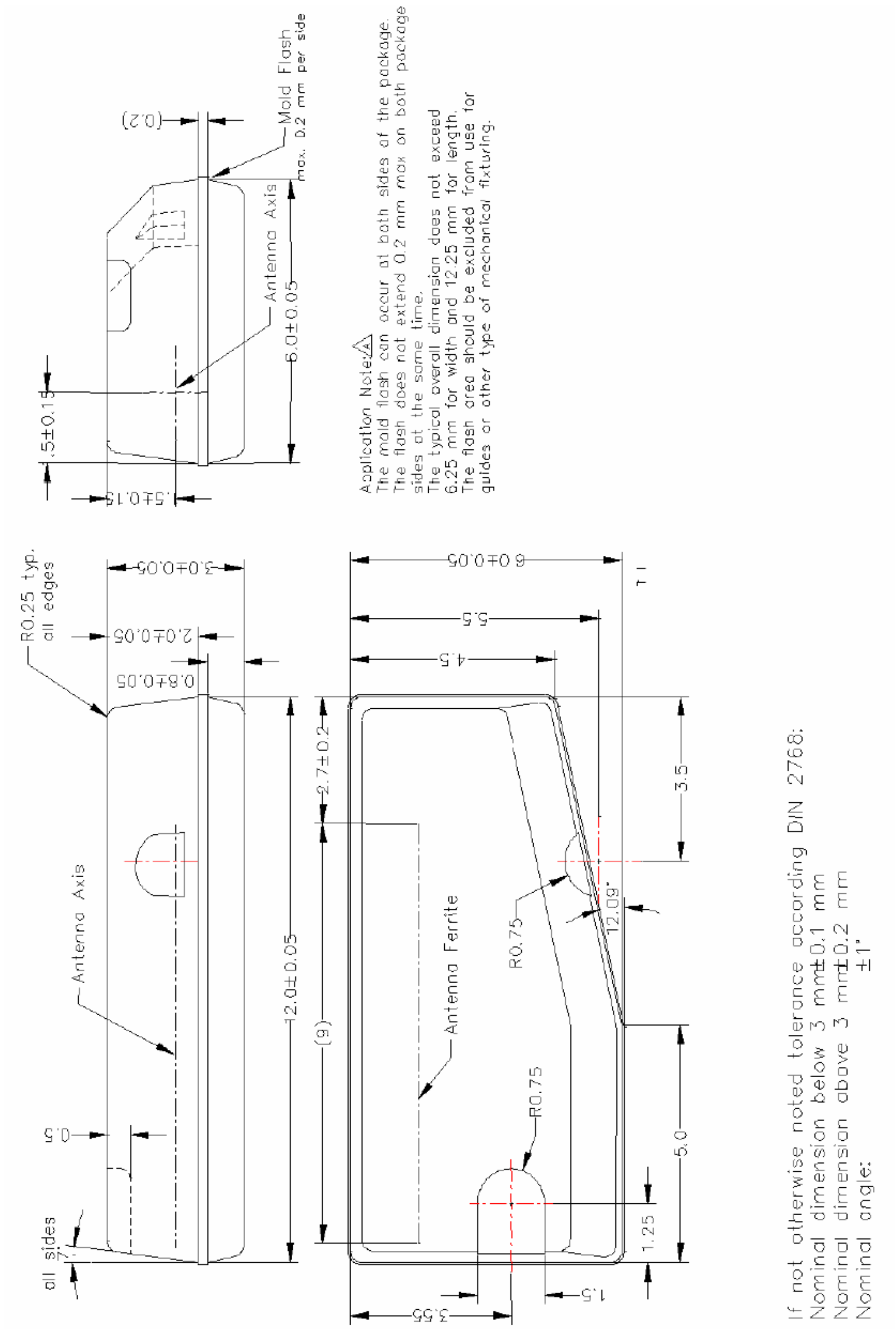
SLYZ022 — *TI Glossary*.

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

7 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.

7.1 Mechanical Data



Application Note: ⚠
The mold flash can occur at both sides of the package.
The flash does not extend 0.2 mm max on both sides at the same time.
The typical overall dimension does not exceed 6.25 mm for width and 12.25 mm for length.
The flash area should be excluded from use for guides or other type of mechanical fixturing.

If not otherwise noted tolerance according DIN 2768:
Nominal dimension below 3 mm±0.1 mm
Nominal dimension above 3 mm±0.2 mm
Nominal angle: ±1°

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TMS37145TEAIE	Active	Production	RFIDP (TEA) | 0	2000 | BULK	Yes	Call TI	Level-1-260C-UNLIM	-40 to 85	

[1] **Status:** For more details on status, see our product life cycle.

[2] **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

[3] **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

[4] **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

[5] **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

[6] **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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