

# Hitag 2 Transponder Card

**Part Number: CARD-H2**



Dimensions: 85mm x 54mm

Plastic laminated card with 125 kHz NXP Hitag transponder IC and antenna coil inside. Please see the following pages for the NXP Hitag transponder IC.

# HT2x

## HITAG 2 transponder IC

Rev. 3.1 — 3 November 2014  
210431

Product short data sheet  
COMPANY PUBLIC

## 1. General description

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HITAG 2 based transponders are highly integrated and do not need any additional components beside the HITAG 2 transponder IC and the external coil. Data are transmitted bidirectionally, in half duplex mode, between Read Write Device (RWD) and HITAG transponder IC. To achieve a main stream security, data may be transmitted enciphered. HITAG 2 transponder IC offer a memory of 256 bit.

Custom specific configuration of the transponder IC is possible by using the configuration page. The configuration page allows the selection of different modes and access possibilities and also the configuration of the memory. The pages of the memory can be protected against read or write access by setting corresponding memory flags.

The HITAG 2 transponder IC provides - besides password and crypto mode - the following three standard read only modes, that can be configured using the configuration byte:

- public-mode A
- public-mode B (animal identification, according to ISO 11784 and ISO 11785)
- public-mode C (PIT compatible mode PCF793x)

## 2. Features and benefits

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- Identification transponder for use in contactless applications
- Operating frequency 125 kHz
- Data transmission and energy supply via RF link, no internal battery
- Reading distance same as writing distance
- Non-volatile memory of 256 bits (128-bit user data and 128-bit control data/secret memory) organized in 8 pages, 4 bytes each
- 10 years non-volatile data retention
- 100000 erase/write cycles
- Selective read/write protection of memory content
- Two coding schemes for read operation: Biphase and Manchester coding
- Effective communication protocol with outstanding data integrity check
- Mutual authentication function
- Read/write mode allows:
  - ◆ Plain data transmission (password mode)
  - ◆ Encrypted data transmission (crypto mode)
- In read/write mode multi-tag operation possible because of special HALT-function
- Emulation of standard industrial read-only transponders:



- ◆ public-mode A (MIRO and transponders from  $\mu$ EM (H400x))
- ◆ public-mode B (according to ISO 11784 and ISO 11785 for animal identification)
- ◆ public-mode C (PIT compatible mode)

### 3. Applications

- Logistics
- Livestock tracking
- Asset tracking
- Gas cylinder ID
- Casino - gambling
- Industrial automation

### 4. Quick reference data

Table 1. Quick reference data

| Symbol                              | Parameter         | Conditions                                | Min    | Typ | Max | Unit  |
|-------------------------------------|-------------------|-------------------------------------------|--------|-----|-----|-------|
| <b>Wafer EEPROM characteristics</b> |                   |                                           |        |     |     |       |
| $t_{ret}$                           | retention time    | $T_{amb} \leq 55\text{ }^{\circ}\text{C}$ | 10     | -   | -   | year  |
| $N_{endu(W)}$                       | write endurance   |                                           | 100000 | -   | -   | cycle |
| <b>Interface characteristics</b>    |                   |                                           |        |     |     |       |
| $C_i$                               | input capacitance | between LA and LB<br>HT2ICS2002W/V6F/R    | 189    | 210 | 231 | pF    |

### 5. Ordering information

Table 2. Ordering information

| Type number       | Package |                                                          |                         |
|-------------------|---------|----------------------------------------------------------|-------------------------|
|                   | Name    | Description                                              | Version                 |
| HT2ICS2002W/V6F/R | Wafer   | sawn wafer on FFC, 150 $\mu$ m, 8 inch, UV, inkless      | -                       |
| HT2MOA4S20/E/3/R  | PLLMC   | plastic leadless module carrier package; 35 mm wide tape | SOT500-2 <sup>[1]</sup> |
| HT2DC20S20/F/R    | PLLMC   | plastic leadless module carrier package                  | SOT385-1                |

[1] This package is also known as MOA4.

## 6. Block diagram

The HITAG 2 transponder IC requires no external power supply. The contactless interface generates the power supply and the system clock via the resonant circuitry by inductive coupling to the RWD. The interface also demodulates data transmitted from the RWD to the HITAG 2 transponder IC, and modulates the magnetic field for data transmission from the HITAG 2 transponder IC to the RWD.

Data are stored in a non-volatile memory (EEPROM). The memory has a capacity of 256 bit and is organized in pages.

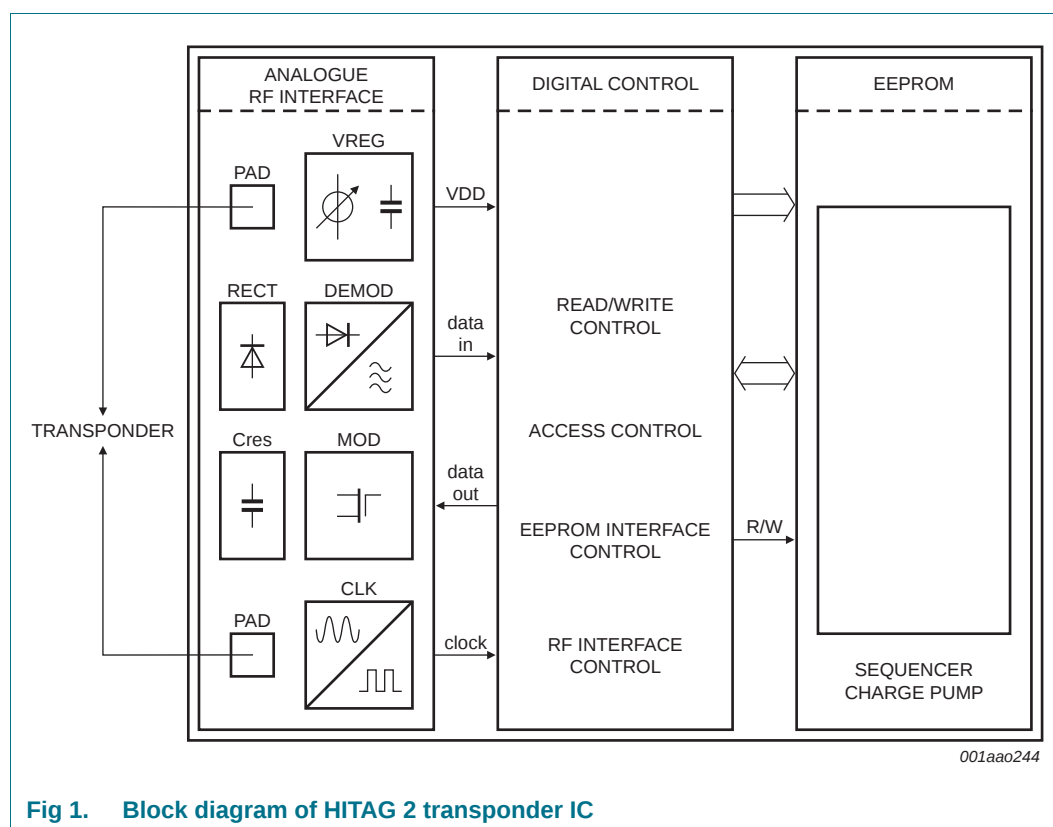


Fig 1. Block diagram of HITAG 2 transponder IC

## 7. Functional description

### 7.1 Overview of transponder

Table 3. Overview of transponders

| Parameter               | Description                                      | Unit |
|-------------------------|--------------------------------------------------|------|
| carrier frequency       | 125                                              | kHz  |
| coding read             | Manchester/Biphase                               | -    |
| coding write            | Pulse duration                                   | -    |
| modulation              | ASK (amplitude shift keying)                     | -    |
| total memory size       | 256                                              | bit  |
| user memory read/write  | 128                                              | bit  |
| read only serial number | 32                                               | bit  |
| data retention          | 10                                               | year |
| data security           | encryption, authentication, passwords            | -    |
| data integrity          | half-duplex handshake, reverse data transmission | -    |

### 7.2 Memory map

The 256 bit memory area of the HITAG 2 transponder IC is divided into 8 pages. Each page has a size of 32 bits.

Depending on the operation mode (crypto mode/password mode) the memory is organized as described in the following:

Table 4. Memory map in Crypto Mode

| Page | Content                                           | Access    |
|------|---------------------------------------------------|-----------|
| 0    | serial number                                     | ro        |
| 1    | secret key low (32 bit)                           | r/w or 0  |
| 2    | secret key high (16 bit)<br>reserved bit (14 bit) | r/w or ro |
| 3    | configuration (8 bit)<br>password tag (24 bit)    | r/w or ro |
| 4    | usable memory page                                | r/w or ro |
| 5    | usable memory page                                | r/w or ro |
| 6    | usable memory page                                | r/w or ro |
| 7    | usable memory page                                | r/w or ro |

Table 5. Memory map in Password Mode

| Page | Content                                        | Access    |
|------|------------------------------------------------|-----------|
| 0    | serial number                                  | ro        |
| 1    | password RWD                                   | r/w or 0  |
| 2    | reserved for future use                        | r/w or 0  |
| 3    | configuration (8 bit)<br>password tag (24 bit) | r/w or ro |
| 4    | usable memory page                             | r/w or ro |
| 5    | usable memory page                             | r/w or ro |
| 6    | usable memory page                             | r/w or ro |
| 7    | usable memory page                             | r/w or ro |

## 8. Limiting values

Table 6. Limiting values - HT2ICS2002W/V6F/R<sup>[1]</sup>

| Symbol              | Parameter                       | Conditions                              | Min  | Max  | Unit |
|---------------------|---------------------------------|-----------------------------------------|------|------|------|
| V <sub>DD</sub>     | supply voltage                  |                                         | -0.5 | +6.5 | V    |
| V <sub>ESD</sub>    | electrostatic discharge voltage | MIL-STD 883D, Method 3015.7, Human Body | 2    | -    | kV   |
| I <sub>IU</sub>     | latch-up current                | MIL-STD 883D, Method 3023               | 100  | -    | mA   |
| I <sub>I(max)</sub> | maximum input current           | IN1-IN2                                 | -    | 30   | mA   |
| T <sub>j</sub>      | junction temperature            |                                         | -55  | +140 | °C   |

- [1] Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any conditions other than those described in the Operating Conditions and Electrical Characteristics section of this specification is not implied.

Table 7. Limiting values - HT2DC20S20/F/R (SOT385-1)/ HT2MOA4S20/E/3/R (SOT500-2)<sup>[1]</sup>

| Symbol           | Parameter           | Conditions | Min | Max  | Unit |
|------------------|---------------------|------------|-----|------|------|
| T <sub>stg</sub> | storage temperature |            | -55 | +125 | °C   |

- [1] Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any conditions other than those described in the Operating Conditions and Electrical Characteristics section of this specification is not implied.

## 9. Abbreviations

Table 8. Abbreviations

| Acronym | Description                                         |
|---------|-----------------------------------------------------|
| EEPROM  | Electrically Erasable Programmable Read-Only Memory |
| IC      | Integrated Circuit                                  |
| RF      | Radio Frequency                                     |
| RWD     | Read Write Device                                   |

## 10. Revision history

Table 9. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                    | Data sheet status        | Change notice | Supersedes     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------|----------------|
| HT2X_SDS v.3.1 | 20141103                                                                                                                                                                                                                                                                        | Product short data sheet | -             | HT2X_SDS v.3.0 |
| Modifications: | <ul style="list-style-type: none"><li>• <a href="#">Section 11 “Legal information”</a>: License statement “ICs with HITAG functionality” removed</li><li>• <a href="#">Section 5 “Ordering information”</a>: updated</li><li>• <a href="#">Table 7</a>: Title updated</li></ul> |                          |               |                |
| HT2X_SDS v.3.0 | 20110916                                                                                                                                                                                                                                                                        | Product short data sheet | -             | -              |

## 11. Legal information

### 11.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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