# HTCICC64

## HITAG µ RO64 transponder IC

Rev. 3.1 — 24 July 2009
176431

Product data sheet
PUBLIC

## 1. General description

The HITAG product line is well known and established in the contactless identification market.

Due to the open marketing strategy of NXP Semiconductors there are various manufacturers well established for both the transponder / cards as well as the Read/Write Devices. All of them supporting HITAG transponder IC's.

With the new HITAG µ RO64, NXP is addressing the low end LF market, by offering a preprogrammed, read only IC variant.

The advantages of this transponder IC are:

- proven HITAG performance
- easy to assemble because of mega-bumps
- low cost manufacturing because of preprogrammed TTF code

The HITAG µ RO64 operates in a continuous TTF mode where it modulates the reader field with it's preprogrammed 64-bit memory content.

## 2. Features

### 2.1 Features

- Integrated circuit for contactless identification transponders and cards
- Integrated resonance capacitor of 210 pF with ± 3% tolerance or 280 pF with ± 5% tolerance over full production
- Frequency range 100 kHz to 150 kHz
- 64-bit preprogrammed TTF response
- 10 years data retention

### 2.2 Delivery types

- Sawn, megabumped wafer, 150 µm, 8 inch, UV

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | **Name** | **Description** | **Type** | **Version** |
| HTCICC6402FUG/AM | Wafer | sawn, megabumped wafer, 150 µm, 8 inch, UV | HITAG µ RO64, 210 pF | <tbd> |
| HTCICC6403FUG/AM | Wafer | sawn, megabumped wafer, 150 µm, 8 inch, UV | HITAG µ RO64, 280 pF | <tbd> |

## 4. Block diagram

The HITAG μ RO64 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 read/write device (RWD). The interface also demodulates data transmitted from the RWD to the HITAG μ RO64 transponder IC, and modulates the magnetic field for data transmission from the HITAG μ RO64 transponder IC to the RWD.

Data are stored in a non-volatile memory (EEPROM).

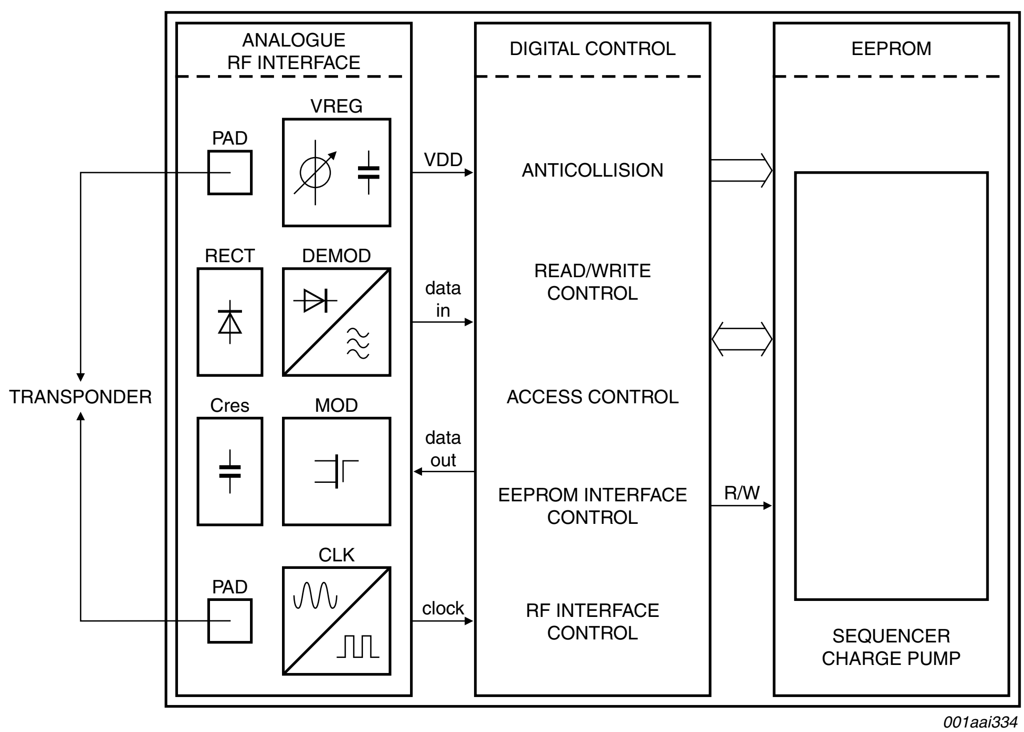


**Fig 1. Block diagram of HITAG μ RO64 transponder IC**

# 5. Pinning information

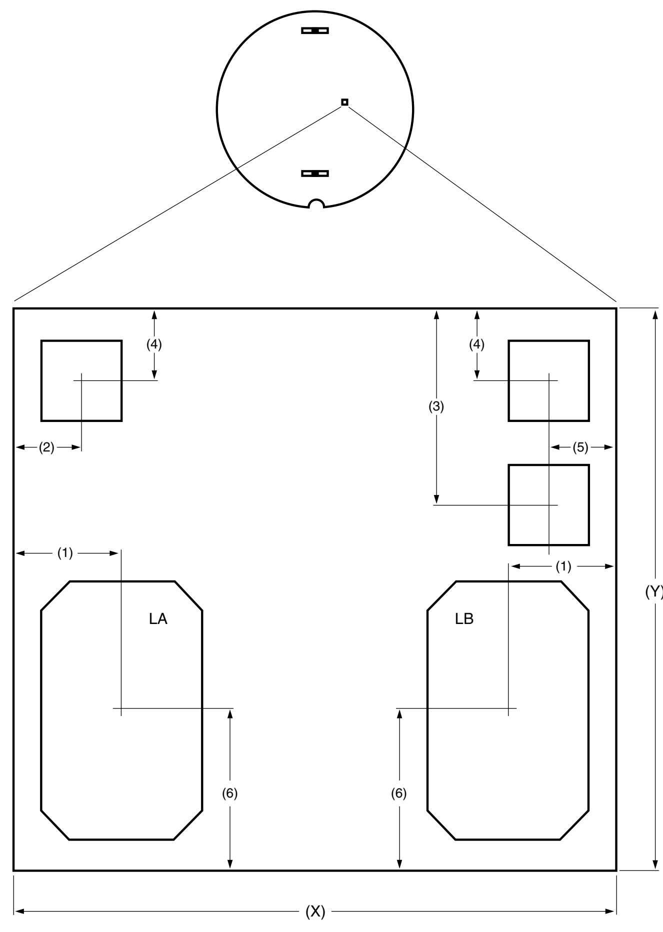


**Fig 2. HITAG µ RO64 - Mega bumps bondpad locations**

**Table 2. HITAG µ RO64 - Mega bumps dimensions**

| Description | Dimension |
|---|---|
| (X) chip size | 550 µm |
| (Y) chip size | 550 µm |
| (1) pad center to chip edge | 100.5 µm |
| (2) pad center to chip edge | 48.708 µm |
| (3) pad center to chip edge | 180.5 µm |
| (4) pad center to chip edge | 55.5 µm |
| (5) pad center to chip edge | 48.508 µm |
| (6) pad center to chip edge | 165.5 µm |
| **Bump Size:** | |
| LA, LB | 294 × 164 µm |
| Remaining pads | 60 × 60 µm |

**Note**: All pads except LA and LB are electrically disconnected after dicing.

# 6. Functional description

## 6.1 Memory organization

The memory is preprogrammed as shown in Table 3. This data gets continuously sent back as soon as the transponder receives sufficient energy.

**Table 3. Memory organization HITAG µ RO64**

| TTF ID7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| MSB | | | | | | | LSB |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | | |
| **TTF ID6** | | | | | | | |
| MSB | | | | | | | LSB |
| 1 | VBit7 | VBit6 | VBit5 | VBit4 | P VBit7-4 | VBit3 | VBit2 |
| | | | | | | | |
| **TTF ID5** | | | | | | | |
| MSB | | | | | | | LSB |
| VBit 1 | VBit0 | P VBit3-0 | DBit31 | DBit30 | DBit29 | DBit28 | P DBit31-28 |
| | | | | | | | |
| **TTF ID4** | | | | | | | |
| MSB | | | | | | | LSB |
| DBit27 | DBit26 | DBit25 | DBit24 | P DBit27-24 | DBit23 | DBit22 | DBit21 |
| | | | | | | | |
| **TTF ID3** | | | | | | | |
| MSB | | | | | | | LSB |
| DBit20 | P DBit23-20 | DBit19 | DBit18 | DBit17 | DBit16 | P DBit19-16 | DBit15 |
| | | | | | | | |
| **TTF ID2** | | | | | | | |
| MSB | | | | | | | LSB |
| DBit14 | DBit13 | DBit12 | P DBit15-12 | DBit11 | DBit10 | DBit9 | DBit8 |
| | | | | | | | |
| **TTF ID1** | | | | | | | |
| MSB | | | | | | | LSB |
| P DBit11-8 | DBit7 | DBit6 | DBit5 | DBit4 | P DBit7-4 | DBit3 | DBit2 |
| | | | | | | | |
| **TTF ID0** | | | | | | | |
| MSB | | | | | | | LSB |
| DBit1 | DBit0 | PDBit3-0 | PColumn0 | PColumn1 | PColumn2 | PColumn3 | Stopbit |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P Column 0: | DBit31 | DBit27 | DBit23 | DBit19 | DBit15 | DBit11 | DBit7 | DBit3 |
| P Column 1: | DBit30 | DBit26 | DBit22 | DBit18 | DBit14 | DBit10 | DBit6 | DBit2 |
| P Column 2: | DBit29 | DBit25 | DBit21 | DBit17 | DBit13 | DBit9 | DBit5 | DBit1 |
| P Column 3: | DBit28 | DBit24 | DBit20 | DBit16 | DBit12 | DBit8 | DBit4 | DBit0 |

# 7. Protocol timing

## 7.1 HITAG µ RO64 transponder waiting time before transmitting data in TTF mode

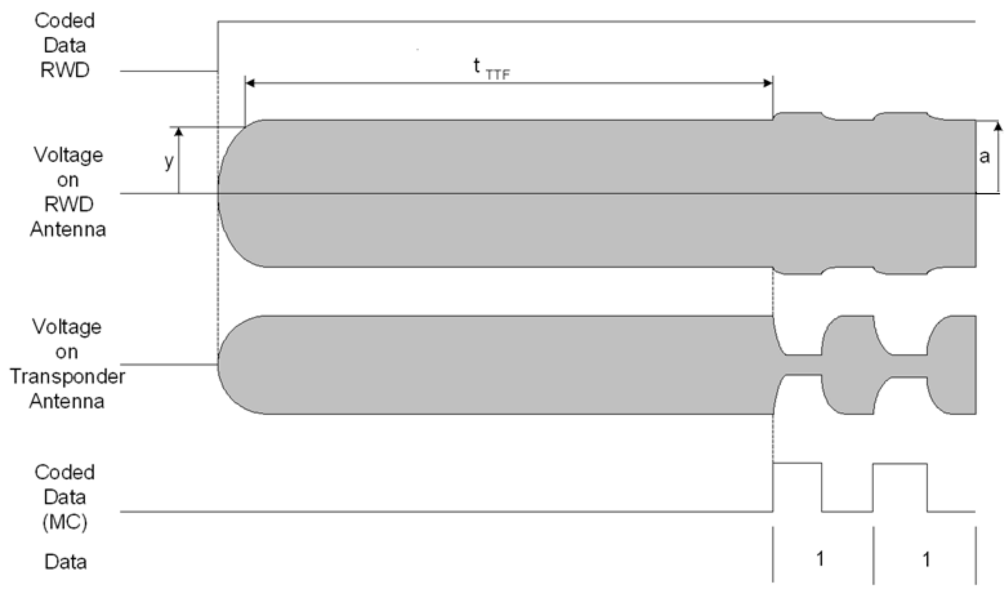


Fig 3. HITAG µ RO64 transponder waiting time before transmitting data in TTF mode

After switching on the powering field, the HITAG µ RO64 transponder waits a time $t_{TTF}$ before transmitting data.

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $t_{TTF}$ | $T_0$ = 1/125 kHz = 8 µs | 250 | 304 | 400 | $T_0$ |

## 8. Limiting values

**Table 4. Limiting values[1][2]**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $T_{stg}$ | storage temperature | | –55 | +125 | °C |
| $V_{ESD}$ | electrostatic discharge voltage | JEDEC JESD 22-A114-AB Human Body Model | ± 2 | - | kV |
| $I_{I(max)}$ | maximum input current | IN1-IN2 | – | ± 20 | $mA_{peak}$ |
| Tj | junction temperature | | –40 | +85 | °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.

[2] This product includes circuitry specifically designed for the protection of its internal devices from the damaging effects of excessive static charge. Nonetheless, it is suggested that conventional precautions should be taken to avoid applying values greater than the rated maxima

## 9. Characteristics

**Table 5. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $f_{oper}$ | operating frequency | | | 100 | 125 | 150 | kHz |
| $I_I$ | input current | IN1-IN2 | | - | - | ± 10 | $mA_{peak}$ |
| $V_{IN1\text{-}IN2}$ | input voltage | | | 4 | 5 | 6 | $V_{peak}$ |
| $C_i$ | input capacitance between IN1-IN2 | $V_{IN1\text{-}IN2} = 0.5\ V_{rms}$ | [2][3] | 203.7 | 210 | 216.3 | pF |
| $C_i$ | input capacitance between IN1-IN2 | $V_{IN1\text{-}IN2} = 0.5\ V_{rms}$ | [2][4] | 266 | 280 | 294 | pF |

[1] Typical ratings are not guaranteed. Values are at 25°C.

[2] Measured with an HP4285A LCR meter at 125 kHz/room temperature (25 °C)

[3] Integrated Resonance Capacitor: 210 pF ± 3 %

[4] Integrated Resonance Capacitor: 280 pF ± 5%

# 10. Abbreviations

**Table 6. Abbreviations**

| Abbreviation | Definition |
|---|---|
| AC | Anticollision Code |
| ASK | Amplitude Shift Keying |
| BC | Bi-phase Code |
| BPLC | Binary Pulse Length Coding |
| CRC | Cyclic Redundancy Check |
| DSFID | Data Storage Format Identifier |
| EEPROM | Electrically Erasable Programmable Memory |
| EOF | End Of Frame |
| ICR | Integrated Circuit Reference number |
| LSB | Least Significant Bit |
| LSByte | Least Significant Byte |
| m | Modulation Index |
| MC | Manchester Code |
| MFC | integrated circuit Manufacturer Code |
| MSB | Most Significant Bit |
| MSByte | Most Significant Byte |
| MSN | Manufacturer Serial Number |
| NA | No Access |
| NOB | Number Of Block |
| NOP | Number Of Pages |
| NOS | Number Of Slots |
| NSS | Number Of Sensors |
| OTP | One Time Programmable |
| PID | Product Identifier |
| PWD | Password |
| RFU | Reserved for Future Use |
| RND | Random Number |
| RO | Read Only |
| RTF | Reader Talks First |
| R/W | Read/Write |
| RWD | Read/Write Device |
| SOF | Start of Frame |
| TTF | Transponder Talks First |
| UID | Unique Identifier |

## 11. References

[1] **Application note —** AN10214, HITAG Coil Design Guide, Transponder IC BL-ID Doc.No.: 0814**

## 12. Revision history

**Table 7: Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 176431 | 20090724 | Product data sheet | - | 176430 |
| Modifications: | • Section 6.1 “Memory organization”: update Table 3 | | | |
| 176430 | 20090716 | Product data sheet | - | - |

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## 13.1 Data sheet status

| Document status[1][2] | Product status[3] | 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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## 15. Tables



## 16. Figures



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