HT2x

HITAG 2 transponder IC

Rev. 3.0 — 16 September 2011
210430

Product short data sheet
COMPANY PUBLIC

1. General description

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

- 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 μEM (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
Wafer EEPROM characteristics						
t_{ret}	retention time	$T_{amb} \leq 55$ °C	10	-	-	year
$N_{endu(W)}$	write endurance		100000	-	-	cycle
Interface characteristics						
C_i	input capacitance	between LA and LB				
		HT2ICS2002W/V6F	189	210	231	pF

5. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
HT2ICS2002W/V6F	Wafer	sawn wafer on FFC, 150 μm, 8 inch, UV, inkless	-
HT2MOA2S20/E/3	PLLMC	plastic leadless module carrier package; 35 mm wide tape	SOT500-2[1]
HT2DC20S20/F	PLLMC	plastic leadless module carrier package	SOT385-1

[1] This package is also known as MOA2.

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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.

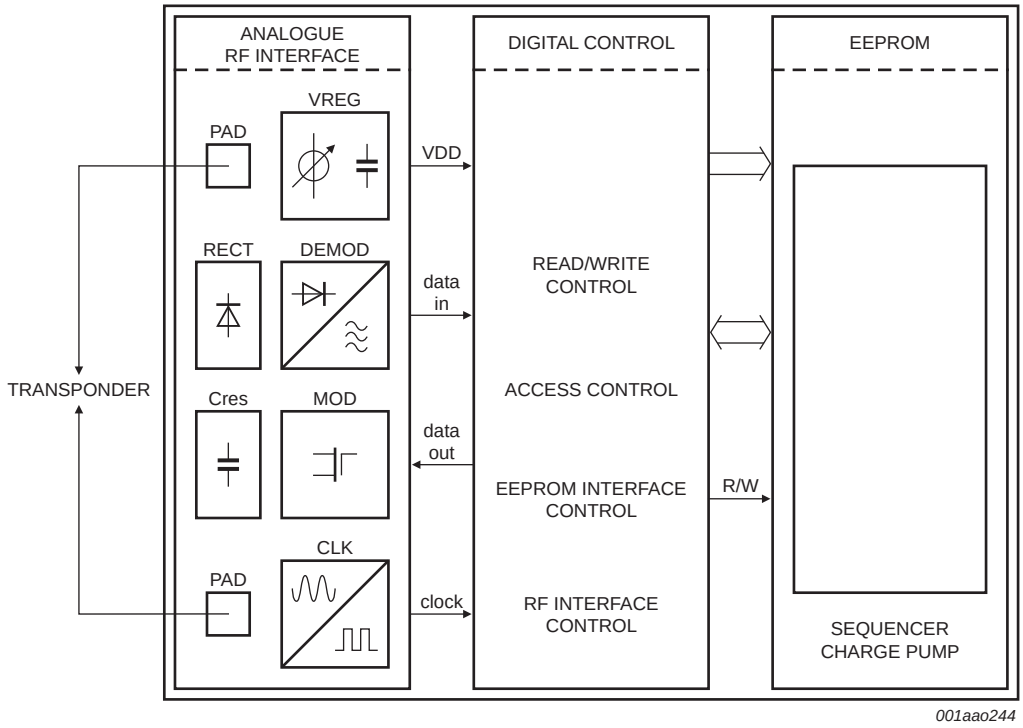

Fig 1. Block diagram of HITAG 2 transponder IC

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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) reserved bit (14 bit)	r/w or ro
3	configuration (8 bit) 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

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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) 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[1]

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DD}	supply voltage		–0.5	+6.5	V
V_{ESD}	electrostatic discharge voltage	MIL-STD 883D, Method 3015.7, Human Body	2	-	kV
I_{lu}	latch-up current	MIL-STD 883D, Method 3023	100	-	mA
$I_{i(max)}$	maximum input current	IN1-IN2	-	30	mA
T_j	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 (SOT385-1)/ HT2MOA2S20/E/3 (SOT500-2)[1]

Symbol	Parameter	Conditions	Min	Max	Unit
T_{stg}	storage temperature		–55	+125	°C

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9. Abbreviations

Table 8. Abbreviations

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

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10. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
HT2X_SDS v.3.0	20110916	Product short data sheet	-	-

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Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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Product [short] data sheet	Production	This document contains the product specification.

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

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