DATA SHEET

hitag

HT1DC20S30
HITAG 1 stick transponder

Product specification
Supersedes data of 2000 Apr 19
File under Integrated Circuits, IC11

2001 Sep 24

Philips
Semiconductors

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HITAG 1 stick transponder HT1DC20S30

FEATURES

- Complete identification transponder for use in contactless applications
- Operating frequency 125 kHz
- Data transmission and supply energy via RF link, no internal battery
- Low power EEPROM technology for writing distance that equals reading distance
- Total memory size 2048 bits
- Parts of memory can be write protected by the user
- Effective communication protocol with outstanding data integrity check
- Secure mutual authentication function
- Encrypted data transmission
- Anticollision protocol for handling of multiple transponders inside the field of the reader antenna
- Special features:
  - User defined write protection
  - Unique 32-bit serial number for each transponder
  - Encrypted data transmission possible.

GENERAL DESCRIPTION

The HITAG(1) stick transponder HT1DC20S30, based on the HITAG tag IC, is a high performance transponder for bi-directional data transmission in full-duplex mode. Data is stored in the transponder in a non-volatile memory (EEPROM).

(1) HITAG - is a trademark of Philips Semiconductors Gratkorn GmbH.

The transponder acts as a passive device, thus not having the need for any internal power supply (battery).

It derives power from the magnetic component of the RF resonant frequency generated by the reader. Data is transmitted by modulating this resonant frequency.

The HT1DC20S30 is dedicated for use in secure access systems where the transponder and the reader have to identify each other.

The EEPROM has a capacity of 2048 bits and is organised in 64 pages. Access is provided either in page mode or in block mode, where 1 block includes 4 pages.

Data transmission from the HT1DC20S30 to the reader uses Manchester or biphase coding and Amplitude Shift Keying (ASK) modulation. Absorption modulation is used to transmit data from the transponder to the reader. The transponder absorbs the magnetic field which hence modulates the current in the reader antenna.

Data transmission from the reader to the HT1DC20S30 uses Binary Pulse Length Modulation (BPLM).

The anticollision feature of the transponder allows to operate several transponders simultaneously in the field of the reader antenna. To use that feature, the reader needs to have implemented the anticollision protocol and must be able to detect bit-collisions (e.g. the Philips HTRM800 long range reader module includes the anticollision protocol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
f_0	resonant frequency	120	125	130	kHz
f_{trans}	data transfer rate				
	transponder to reader	–	4.0	–	kbits/s
	reader to transponder	–	5.2	–	kbits/s
M	memory				
	size	–	2048	–	bits
	organization	–	64	–	pages
N	encrypted mutual authentication bits				
	serial number	–	32	–	bits
	secret key	–	32	–	bits

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
HT1DC20S30	PLLMC	plastic leadless module carrier	SOT385-1

BLOCK DIAGRAM

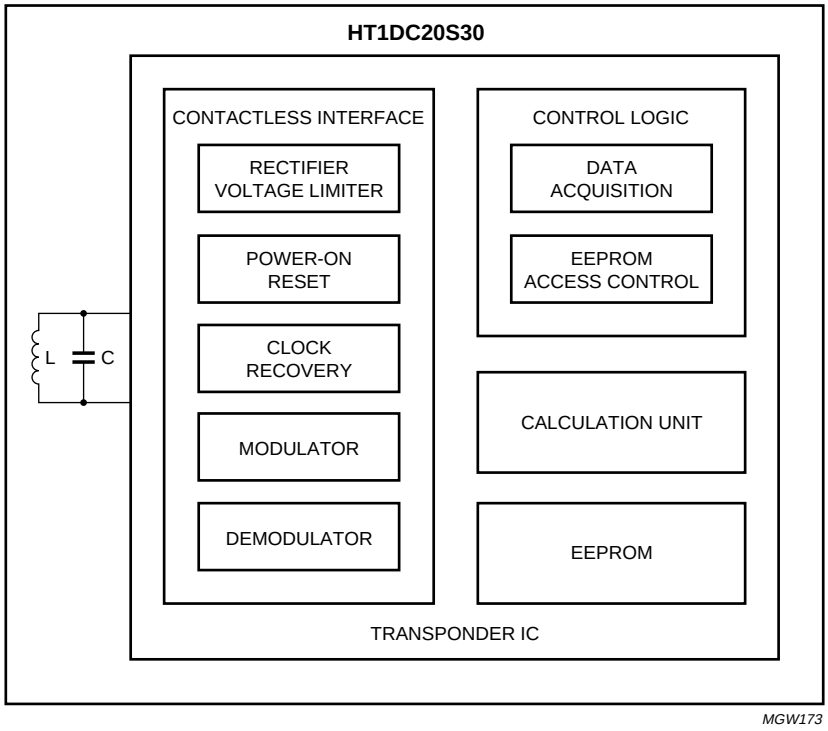


Fig.1 Block diagram.

FUNCTIONAL DESCRIPTION

Related documents

For additional information on the functional description of the HT1DC20S30, in particular the protocol between reader and transponder please refer to the document *"HT1 Transponder Family Communication Protocol Reader - HITAG 1 Transponder"* (document number HT038522).

Write command - safety instructions

When writing to page 1 (configuration page) we strongly recommend to carefully follow the instructions in the document *"HT1 Transponder Family Communication Protocol Reader - HITAG 1 Transponder"*. In particular, overwriting the reserved bits in configuration page 1 may lead to reduced reading range of the HT1DC20S30.

LIMITING VALUES

All values are in accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
N	number of erase/write cycles of EEPROM	T_{amb} = 22 °C	100000	–	
$t_{D(ret)}$	data retention time of EEPROM	T_{amb} = 55 °C	10	–	years
T_{oper}	operating temperature		–40	+85	°C
T_{stg}	storage temperature		–55	+125	°C
B	magnetic flux density	note 1	–	0.2	T
a_v	vibration acceleration	10 to 2000 Hz; 3 axis; IEC 68-2-6; Test Fc	–	10	g
a_s	shock acceleration	3 axis; IEC 68-2-27; Test Ea	–	1500	g

Note

1. Resistivity against magnetic pulses.

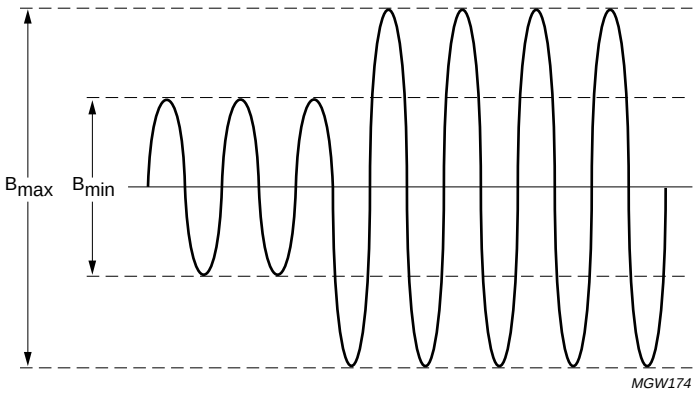
ELECTRICAL CHARACTERISTICS

Period time T_0 = 8 µs (f_0 = 125 kHz); note 1.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
f_0	resonant frequency		120	125	130	kHz
B	bandwidth		2.3	–	–	kHz
$B_{THR(p-p)}$	magnetic flux density for data transmission from transponder (peak-to-peak value)	f_0 = 125 kHz	50	–	400(2)	µT
$B_{PRG(p-p)}$	magnetic flux density for programming the EEPROM (peak-to-peak value)	f_0 = 125 kHz; m = 0.95; $t_{LOW} = 8T_0$	50	–	400(2)	µT
$B_{AUTH(p-p)}$	magnetic flux density for mutual authentication (peak-to-peak value)	f_0 = 125 kHz; m = 0.95; $t_{LOW} = 8T_0$	50	–	400(2)	µT
$B_{READ(p-p)}$	field absorption due to the modulation of the transponder (peak-to-peak value)	f_0 = 125 kHz; B_{field} = 50 µT (p-p)	8	–	–	µT
MI_{PRG}	modulation index (m) of the base station for programming and authentication	f_0 = 125 kHz; B_{field} = 50 µT (p-p); $t_{LOW} = 8\ T_0$; see Fig.2	95	–	100	%

Notes

1. All parameters are characterized with the SCEMTEC test equipment (STM-1) available from SCEMTEC, Reichshof-Wenrath, Germany. All parameters are guaranteed within the temperature range of T_{amb} = –40 to +85 °C.
2. Maximum available field strength of the test equipment. Transponder limit has not been characterized.



Definitions:

$$m = \frac{B_{max} - B_{min}}{B_{max} + B_{min}}$$

$$m_{read} = |B_{max} - B_{min}|$$

Fig.2 Definition of modulation index.

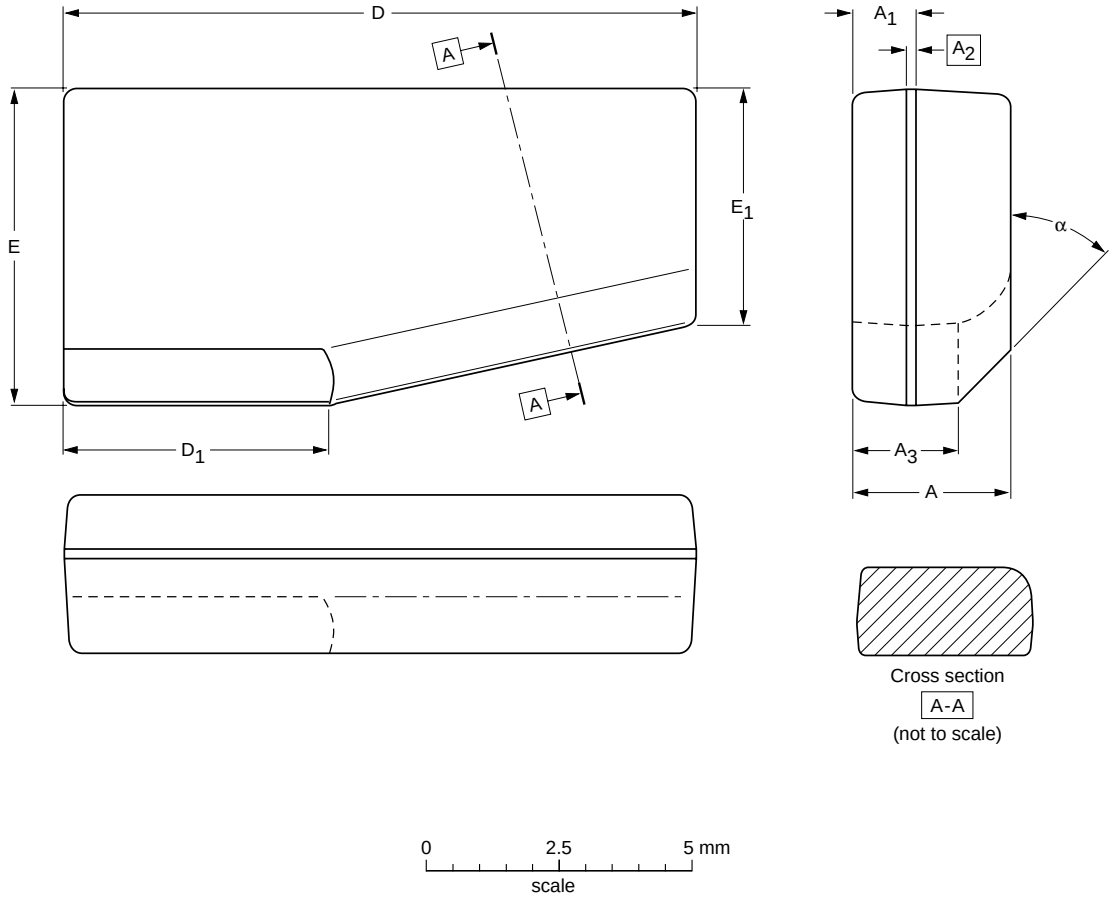
MECHANICAL CHARACTERISTICS

The transponder is sealed in epoxy resin moulding compound. The designation of the package is SOT385-1 (see Chapter “Package outline”).

PARAMETER	VALUE
Mechanical dimensions	$12 \times 6 \times 3$ mm
Protection class	IP67
Casting material	epoxy resin
Transponder IC type	HT1ICS30

PACKAGE OUTLINE

PLLMC: plastic leadless module carrier **SOT385-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	A_2	A_3	$D^{(1)}$	$D_1{}^{(1)}$	$E^{(1)}$	$E_1{}^{(1)}$	α
mm	3.05 2.90	1.2 1.1	0.165	2.1 1.9	12.1 11.9	5.1 4.9	6.1 5.9	4.6 4.4	46^o 44^o

Note

1. Plastic protrusions of 0.2 mm per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT385-1						01-06-27

DATA SHEET STATUS

DATA SHEET STATUS[1]	PRODUCT STATUS[2]	DEFINITIONS
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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Notes

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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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