

13.56MHz RFID Transponder

Features

- Very low operating current (4 μ A @ $V_{DD}=3V$)
- Wide range operating voltage
- Batteryless RF transponder
- Data transmission in read-only operation
- Max. of 64-bits customer programmable data
- 16-bits CRC error detection code
- OTP data memory
- 13.56MHz carrier frequency
- Output data baud rate: 4kbps (Typ.) @ $V_{DD}=3V$
- PWM/ASK modulation
- Built-in voltage limiter

Applications

- Interactive leisure products
- Security system
- Access control
- Anti-counterfeit devices
- Material management
- Animal management
- Personnel working time record
- Car park monitoring system

General Description

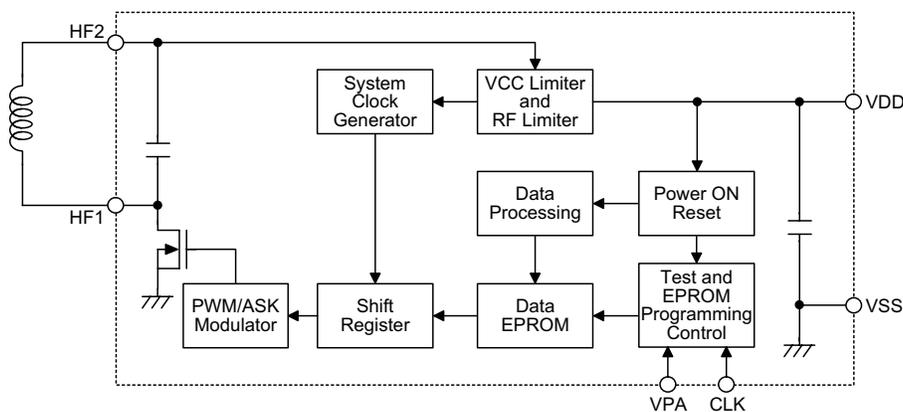
The HT6720 is an RF transponder IC with 13.56MHz RF carrier, which provides a low cost batteryless transponder solution when combined with an external inductor. The inductor and internal capacitor form an LC tank which induce voltage from the radiated 13.56MHz carrier signal generated from the reader antenna. HT6720 has a built-in low power RC oscillator which is activated if the induced carrier field strength is high enough to supply the operating current and the response signal (pre-programmed in the OTP memory) is serially transmitted out. The response data is transmitted using PWM/ASK modulation. Modulation of 13.56MHz is accomplished by damping the LC tank with a fixed baud rate.

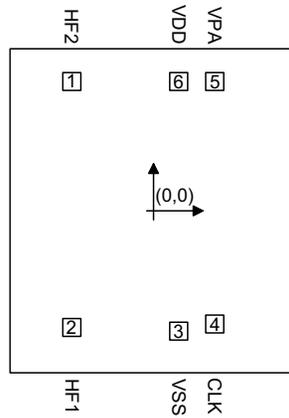
The transmission information is stored in a 96 bits one time programmable memory OTP, with a 16-bit CRC code (up to 64 bits reserved for customer). The effective detection range for a small sized antenna is 2cm~10cm which is dependent on antenna format & reader design. The larger the antenna loop used the longer the detection range. It is advisable to use larger antenna to attain a 15 cm detection range.

Implementing Holtek's advanced OTP and low power technology, HT6720 offers a very cost effective solution for RF contactless detection system.

A code area of 64-bits (max.) wide is provided so customers can program the device using the specified programmer supplied by Holtek. The pre-programmed ICs are also available upon customer's request.

Block Diagram



Pad Assignment

 Chip size: 925×1040 (μm)²

* The IC substrate should be connected to VSS in the PCB layout artwork.

Pad Coordinates

Unit: μm

| Pad No. | X | Y | Pad No. | X | Y |
|---------|---------|---------|---------|--------|---------|
| 1 | -256.65 | 357.34 | 4 | 228.70 | -361.37 |
| 2 | -256.65 | -361.99 | 5 | 219.80 | 338.59 |
| 3 | 96.10 | -378.15 | 6 | 88.89 | 332.15 |

Pad Description

| Pad No. | Pad Name | I/O | Internal Connection | Description |
|---------|----------|-----|---------------------|---|
| 1 | HF2 | I/O | CMOS | Connect to an antenna coil for normal operation. Open for data programming. |
| 2 | HF1 | I/O | CMOS | Connect to an antenna coil for normal operation. Data I/O for programming. |
| 3 | VSS | — | — | Negative power supply, ground |
| 4 | CLK | I | CMOS | Open for normal operation. Clock input for programming. |
| 5 | VPA | I | — | Open for normal operation. High voltage supplies input for programming. |
| 6 | VDD | — | — | Open for normal operation, +5V supply input for programming. |

Absolute Maximum Ratings

| | | | |
|----------------------------|--|-----------------------------|----------------|
| Supply Voltage (VDD) | 6V | Storage Temperature | -50°C to 125°C |
| Supply Voltage (VPA) | 13.5V | Operating Temperature | 0°C to 70°C |
| Input Voltage | V _{SS} -0.3V to V _{DD} +0.3V | | |

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------|------------------------------------|------|------|------|------|
| | | V _{DD} | Conditions | | | | |
| V _{DD} | Operating Voltage | — | V _{DD} pad voltage | 2.4 | — | 5 | V |
| I _{dd} | Operating Current | 3V | — | — | 4 | — | μA |
| | | 5V | Voltage limiter not started | — | 10 | — | μA |
| R _m | Modulation Resistance | 5V | — | — | 320 | — | Ω |
| V _{LCL} | LC Input Limiter Voltage | — | — | — | 6.5 | — | V |
| B _R | Output Data Baud Rate | 3V | V _{DD} vs V _{SS} | — | 4 | — | Kbps |
| | | 5V | V _{DD} vs V _{SS} | — | 5.5 | — | Kbps |

Functional Description

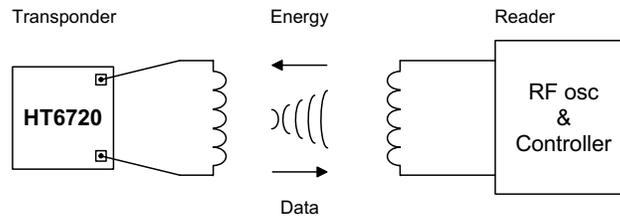
Operation Concept

The reader transmits a 13.56MHz carrier signal from its antenna, the LC tank on the transponder side converts the carrier energy to voltage form and supply to the transponder chip with an internal pump circuit. If the induced energy is high enough, the pumped voltage reaches the break-in voltage of the internal RC-oscillator, the transponder is actuated to transmit its internal data serially by means of damping the LC tank.

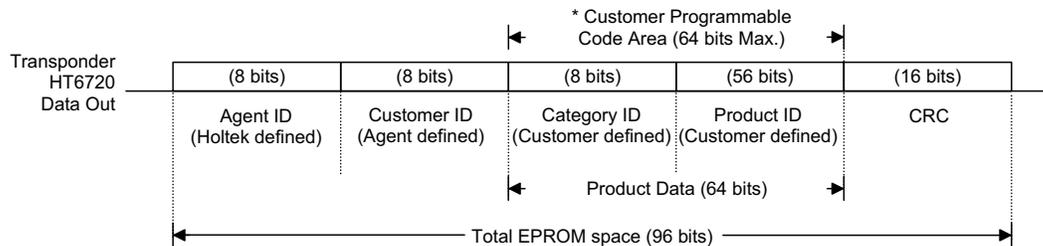
The reader receives the transponder's data by means of detecting the energy variation on its own antenna, and recognize the information with a microcontroller.

The HT6720 has a built-in internal Voltage Limiter to prevent excess power supply and RF levels induced by the LC tank from damaging the device or causing the device to function abnormally.

A total of 96 bits of OTP memory space is provided, from which 64 bits wide are customer programmable, which can be programmed using the specified programmer supplied by Holtek. The pre-programmed ICs are also available upon customer's request.



Timing & Code Package



Code Package

A total of 96 bits information can be stored in the HT6720, from which 64 bits are customer programmable.

Agent ID: This 8-bit wide code is not customer programmable and is supplied together with the data writer after registering to Holtek. The writer generates the code automatically.

Customer ID: This area is for the Agent, for example used to store current number of customer.

Category ID: Can be used to store the application field information code.

Product ID: Storing the contents of the user ID number or data.

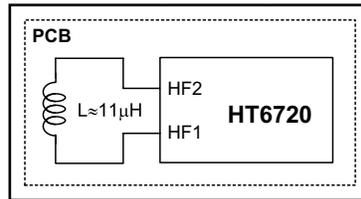
Data CRC: A 16 bits of CRC code is generated automatically by the writer.

Application Circuits

Tag

A tag consists of a PCB (or Mylar film) with printed coil, HT6720 and a housing. The housing can be of various shapes.

Tag Housing

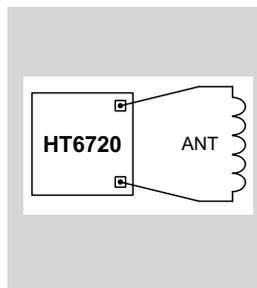


Note: The value of the antenna inductance is $11 \mu H$, however the optimum value will be changed slightly due to the variation of the internal resonance capacitor ($10 pF$ typically) during process.

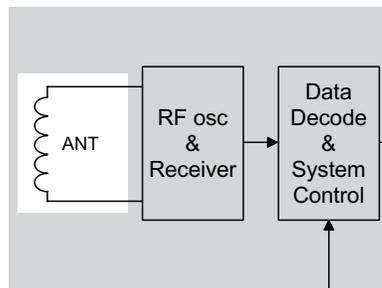
For more application information about the reader, refer to Holtek's 13.56MHz RF ID reader data.

2-chip solution

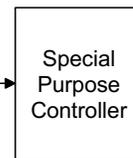
Holtek Transponder Solution



Holtek Reader Solution



Other Controller

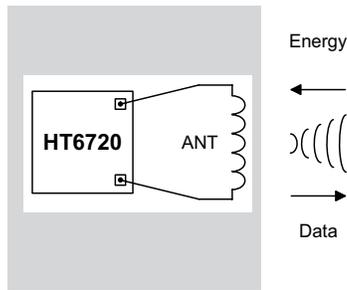


Energy
←
Data

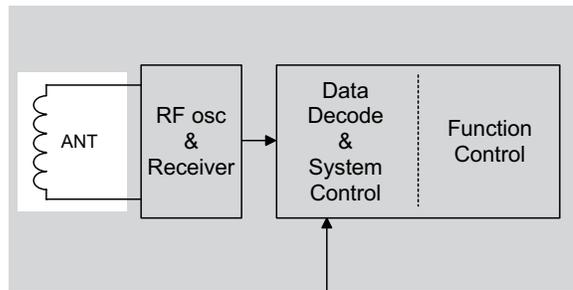
Holtek low cost MCU:
HT48R05A/HT48R06A

1-chip solution (I)

Holtek Transponder Solution



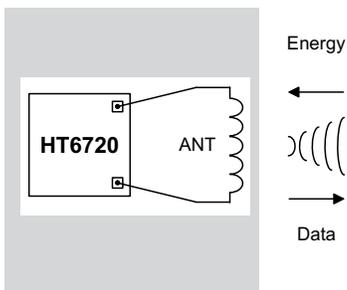
Holtek Reader Solution



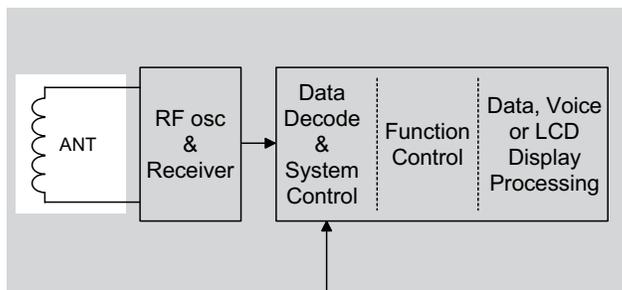
Holtek Standard MCU:
HT48XXX/HT49XXX

1-chip solution (II)

Holtek Transponder Solution



Holtek Reader Solution



Holtek Embedded MCU:
HT21XXX/HT84XXX/HT86XXX

Holtek Semiconductor Inc. (Headquarters)

No.3, Creation Rd. II, Science Park, Hsinchu, Taiwan
Tel: 886-3-563-1999
Fax: 886-3-563-1189
<http://www.holtek.com.tw>

Holtek Semiconductor Inc. (Taipei Sales Office)

4F-2, No. 3-2, YuanQu St., Nankang Software Park, Taipei 115, Taiwan
Tel: 886-2-2655-7070
Fax: 886-2-2655-7373
Fax: 886-2-2655-7383 (International sales hotline)

Holtek Semiconductor Inc. (Shanghai Sales Office)

7th Floor, Building 2, No.889, Yi Shan Rd., Shanghai, China 200233
Tel: 021-6485-5560
Fax: 021-6485-0313
<http://www.holtek.com.cn>

Holtek Semiconductor Inc. (Shenzhen Sales Office)

43F, SEG Plaza, Shen Nan Zhong Road, Shenzhen, China 518031
Tel: 0755-8346-5589
Fax: 0755-8346-5590
ISDN: 0755-8346-5591

Holtek Semiconductor Inc. (Beijing Sales Office)

Suite 1721, Jinyu Tower, A129 West Xuan Wu Men Street, Xicheng District, Beijing, China 100031
Tel: 010-6641-0030, 6641-7751, 6641-7752
Fax: 010-6641-0125

Holmate Semiconductor, Inc. (North America Sales Office)

46712 Fremont Blvd., Fremont, CA 94538
Tel: 510-252-9880
Fax: 510-252-9885
<http://www.holmate.com>

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