HOLTEK

HT6P60
Rolling Encoder

Features

- Operating voltage: 6V~12V
- Low stand-by current
- Rolling code transmission
- Work with HT6P60M (encoded HT93LC46)
- 2 frames of word minimum can be transmitted at a time.
- A built-in regulator for EEPROM power supply
- 8 data inputs
    - 4 direct data input pins (D0~D7)
    - A 4-level data input pin (D0~D3)

- Internal oscillation resistor for 8/16 pins package
- External oscillation resistor for 16 pins package
- 56ms or 28ms of key debounce time selectable for DATA0~DATA4 pins
- 8 DIP or 16 DIP/SOP

Applications

- Burglar alarm system
- Smoke and fire alarm system
- Garage door controllers
- Car door controllers

- Car alarm system
- Security system
- Cordless telephones
- Other remote control systems

General Description

The HT6P60 is an encoder CMOS LSI for remote control system applications. It pairs with the rolling decoder of the HT6P50.
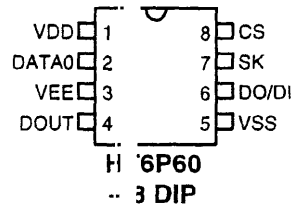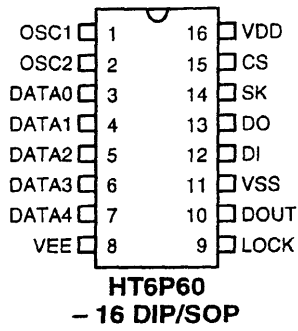
The encoded information words, each consist of a set of customer codes, data codes, synchronize bit and rolling addresses are transmitted on the DOUT pin via an RF or Infra-Red transmission medium after a trigger signal is received. The trigger signal include DATA1~DATA4 pins, which are all active high

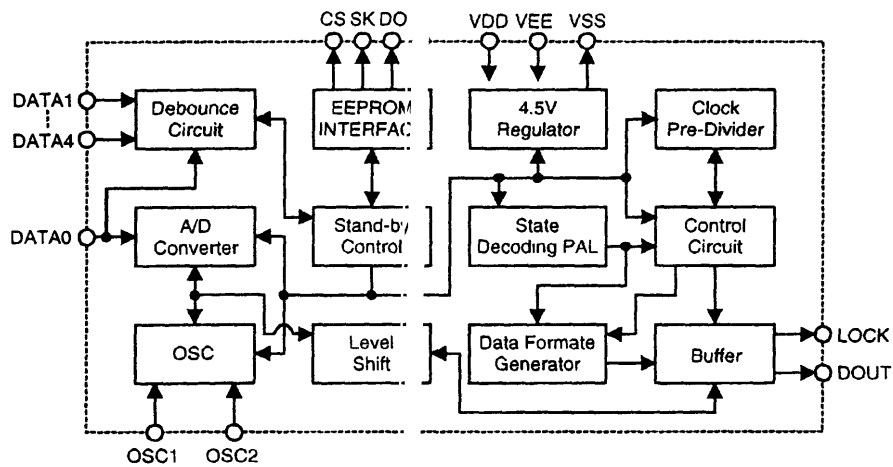or the DATA0 pin alone has a voltage level input.

When the chip in active, at least an odd and a even frame which compose a word will be transmited, depend on the active duration of the trigger signal.

The customer codes of the HT6P60 are stored in the EEPROM (HT6P60M). The HT6P60 also provides a regulator as a power supply for the EEPROM.
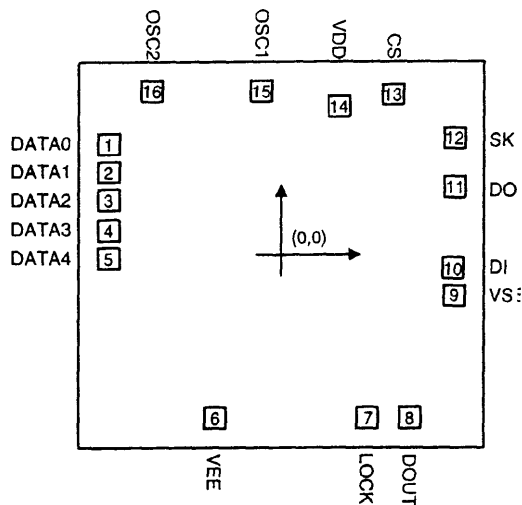
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Pin Assignment

```
       OSC1 ▢ 1    16 ▢ VDD
       OSC2 ▢ 2    15 ▢ CS
      DATA0 ▢ 3    14 ▢ SK
      DATA1 ▢ 4    13 ▢ DO
      DATA2 ▢ 5    12 ▢ DI
      DATA3 ▢ 6    11 ▢ VSS
      DATA4 ▢ 7    10 ▢ DOUT
       VEE  ▢ 8     9 ▢ LOCK
```

HT6P60
– 16 DIP/SOP

```
       VDD ▢ 1     8 ▢ CS
      DATA0 ▢ 2     7 ▢ SK
       VEE ▢ 3     6 ▢ DO/DI
      DOUT ▢ 4     5 ▢ VSS
```

H ʹ6P60
·· 3 DIP

Block Diagram

Pad Coordinates

Unit: mil

| Pad No.	X	Y	Pad No.	X	Y
1	-50.00	32.13	9	50.36	-11.97
2	-50.00	23.94	10	50.09	-3.87
3	-50.00	15.84	11	50.54	19.67
4	-50.00	7.02	12	50.54	33.93
5	-50.00	-1.08	13	32.49	46.67
6	-19.17	-47.25	14	16.74	43.16
7	25.02	-47.25	15	-5.94	47.70
8	37.40	-47.25	16	-37.62	47.70

Chip size: 113×106 mil^2

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

Pin Description

Pin Name	I/O	Internal Connection	Description
OSC1	—	Oscillator Resistor	With an internal oscillation resistor for internal oscillator circuit For the 8 DIP version, the internal oscillator resistor is selected as default
OSC2	I	—	Oscillator input pin This pin connects an external resistor to VDD as an oscillator.
DATA0	I	Voltage Comparator	4-level analog data input pin The level of input voltage is decided by D0~D3 (the external data switches, see the Application Circuits)
DATA1~ DATA4	I	CMOS IN Pull-Low	Input pins for data D4~D7 setting and transmission enable, active high
VEE	I	—	Negative power supply (GND)
LOCK	O	Tri-State	To control power supply and reduce power dissipation, active high
DOUT	O	Tri-State	Encoder data serial transmission output
VSS	O	—	Regulator voltage output, (VDD-VSS)=4.5V
DI	I	CMOS IN	Data input from EEPROM (connected to DO pin of EEPROM)
DO	O	Tri-State	Data output to EEPROM (connected to DI pin of EEPROM)

Pin Name	I/O	Internal Connection	Description
SK	O	CMOS OUT	Serial clock output for EEPROM (connected to SK pin of EEPROM)
CS	O	CMOS OUT	EEPROM chip selection signal output
VDD	I	—	Positive power supply

Approximate internal connection circuits
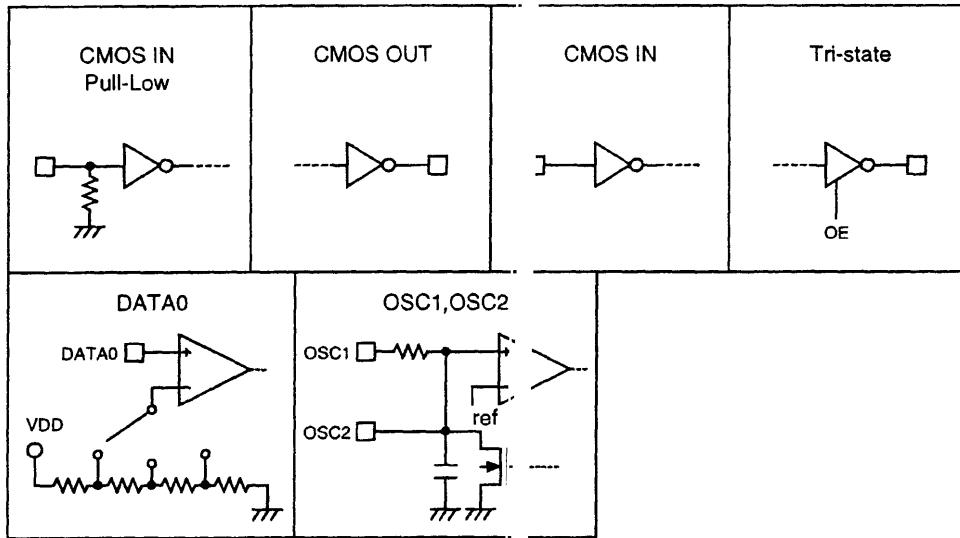
Absolute Maximum Ratings

Supply Voltage .... −0.3V to 12V

Storage Temperature .... −50°C to 125°C

Input Voltage .... V_{SS}−0.3 to V_{DD}+0.3

Operating Temperature .... −20°C to 75°C

Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_D	Condition				
V_{DD}	Operating Voltage	—	—	6	—	12	V
V_{REG}	Regulator Voltage (VDD-VSS)	—	—	3.5	4.5	5.5	V
I_{STB}	Stand-by Current	6	Oscillator stops.	—	3	5	μA
		12		—	6	10	μA
I_{DD}	Operating Current	6	No load F_{OSC}=48KHz R_{OSC}=430KΩ	—	200	400	μA
		12		—	400	1000	μA
I_{OH1}	DOUT Source Current	6	V_{OH}=0.9V_{DD}	-0.8	-2	—	mA
I_{OL1}	DOUT Sink Current	6	V_{OL}=0.1V_{DD}	1	3	—	mA
V_{IH}	"H" Input Voltage	6	—	4.5	—	V_{DD}	V
V_{IL}	"L" Input Voltage	6	—	0	—	1.5	V
R_{DATA}	DATA1~DATA4 Pull-Low Resistance	6	V_{IL}=0V	30	70	150	KΩ
		12		20	43	90	KΩ
V_{IN1}	DATA0 Level1 Input Voltage	·	—	$\frac{15}{20}$	$\frac{16}{20}$	$\frac{20}{20}$	V_{DD}
V_{IN2}	DATA0 Level2 Input Voltage	·	—	$\frac{11}{20}$	$\frac{12}{20}$	$\frac{13}{20}$	V_{DD}
V_{IN3}	DATA0 Level3 Input Voltage	·	—	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{9}{20}$	V_{DD}
V_{IN4}	DATA0 Level4 Input Voltage	·	—	$\frac{4}{20}$	$\frac{5}{20}$	$\frac{6}{20}$	V_{DD}
I_{OH2}	LOCK Source Current	6	V_{OH2}=0.9V_{DD}	-0.8	-2	—	mA
I_{OL2}	LOCK Sink Current	6	V_{OL2}=0.1V_{DD}	1	2	—	mA
I_{OH3}	SK Source Current	6	V_{OH3}=0.9V_{DD}	-0.5	-1	—	mA
I_{OL3}	SK Sink Current	6	V_{OL3}=0.1V_{DD}	0.5	1	—	mA
I_{OH4}	CS Source Current	6	V_{OH4}=0.9V_{DD}	-1	-1.5	—	mA
I_{OL4}	CS Sink Current	6	V_{OL4}=0.1V_{DD}	0.5	1	—	mA
F_{OSC}	Oscillator Frequency	6V	External R_{OSC}=430KΩ	36	48	60	KHz
			Internal R_{OSC}	31	48	65	KHz

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Functional Description

The HT6P60 is a series of rolling encoders designed for use in remote control systems. It pairs with HOLTEK's rolling decoders of the HT6P50 series. The HT6P60 can interface with an EEPROM (HT6P60M) which stores the rolling address and customer codes of the HT6P60. A maximum of 8 sets of data can be provided to the HT6P50 for output control.

HT6P60M

The HT6P60M is an EEPROM that stores the rolling address and customer codes of the HT6P60. After the rolling address and customer codes are written in the HT93LC46 through HOLTEK's tooling, the HT93LC46 is named the HT6P60M.

Operation

The HT6P60 begins a 2-frame transmission cycle upon receipt of a transmission trigger (DATA1~DATA4 are active high or DATA0 has a voltage input). This cycle will repeat itself as long as a transmission trigger signal exists. After the transmission trigger signal is released, the encoder output completes its final cycle and then ceases (as shown in Fig.1). The LOCK pin is activated to reserve LSI power only if there is transmission data output.
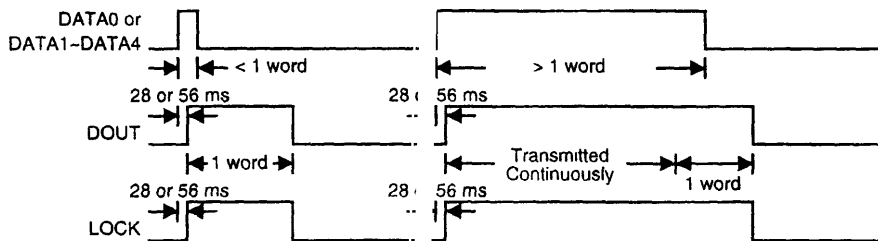
Fig.1 Transmission timing for the HT6P60

Information word

A complete information word is made up of frames (an odd frame and an even frame) of information. It consists of period bits, a synchronize bit, a data code, an address code, and a customer code.

## Address/Data programming

After a set of customer codes has been received. the customer code of the HT6P60 can be ex panded by HOLTEK's tools. The expanded cus tomer codes are stored in the externa EEPROM. If a transmission enable signal i: applied, the encoder scans and transmits th(expanded customer codes, rolling address, an(an external data code serially.

The data code is set by a push button or elec- tronic switches, which are made up of 4 digital keys (only for the 16 pins package) and with 4 analog keys. The DATA0 pin connects with an internal comparator to detect which analog key has been pressed.

The following demonstrates an application of the HT6P60 and the ratio of R0:R1:R2:R3 (8:8:6:9).
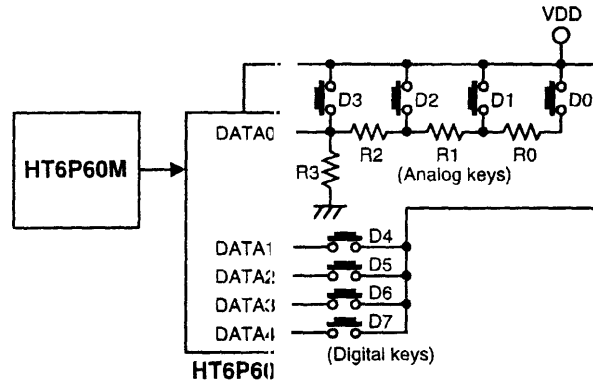

Power control

The HT6P60 provides a LOCK pin to reser\ LSI power. To reduce system power dissipatic the LOCK pin can function as an electron : switch to control the external transistor. ./ : soon as one of D0~D7 keys is triggered (tran · mission is enabled) the LOCK pin turns hi{ , the LSI power switches on, and the signal is :; : high until the LSI transmission is complete . Once the transmission is terminated, the LOC : pin turns low, and the LSI power switches o :. The figure below illustrates the application f LOCK pin as system power control. As for th{ 3 pin package of the HT6P60, the LOCK pin is r t bonded out, so the CS pin can replace the LO({ pin and control the LSI power.


Transmission enable

The HT6P60 transmission is enabled by apply- ing a high signal to one of the data pins DATA1~DATA4 or applying a level voltage that is greater than $1/10V_{DD}$ to the DATA0 pin.
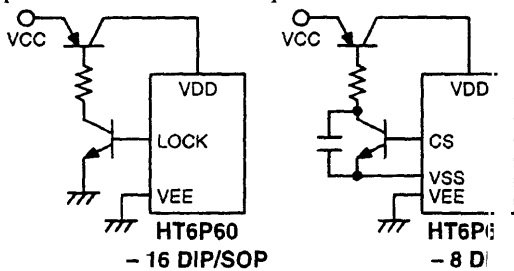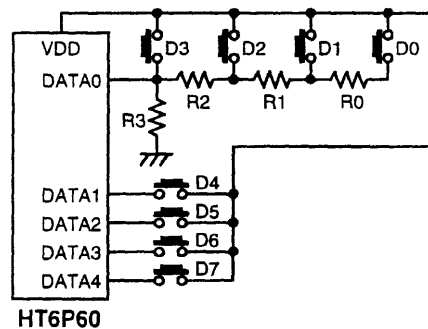
KEY	Input Level
D0	$\dfrac{4}{20}$ VDD ~ $\dfrac{6}{20}$ VDD
D1	$\dfrac{7}{20}$ VDD ~ $\dfrac{9}{20}$ VDD
D2	$\dfrac{11}{20}$ VDD ~ $\dfrac{13}{20}$ VDD
D3	$\dfrac{15}{20}$ VDD ~ VDD

Flowchart

System oscillator

The HT6P60 is built in with an RC oscillato with an internal oscillation resistor to minimiz external components, however the internal re sistor may present high tolerance due to vari ation of VDD, temperature and process. If : more stable oscillator frequency is required, th application with an external reistor is recom mended. For the internal oscillation resisto application, the OSC1 pin is connected wit VDD whereas the OSC2 pin is left open. For th 8 DIP version, the internal oscillator resistor i selected as default.
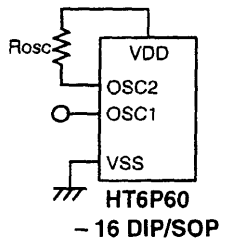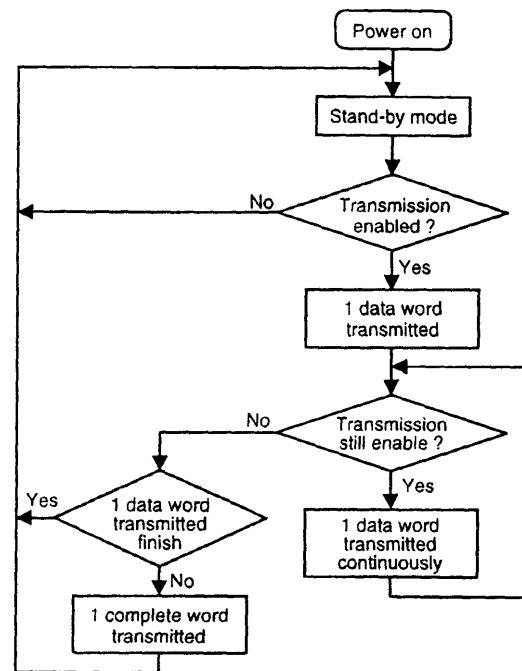

HT6P60
– 16 DIP/SOP
External oscillation resistor
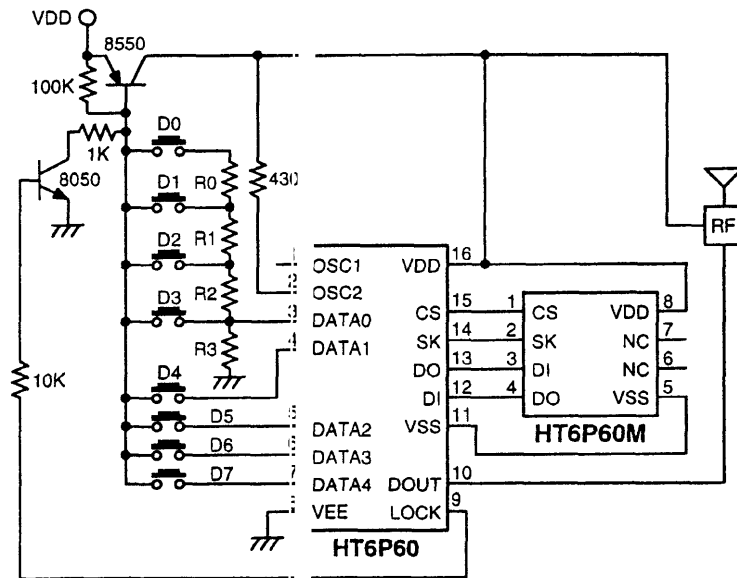
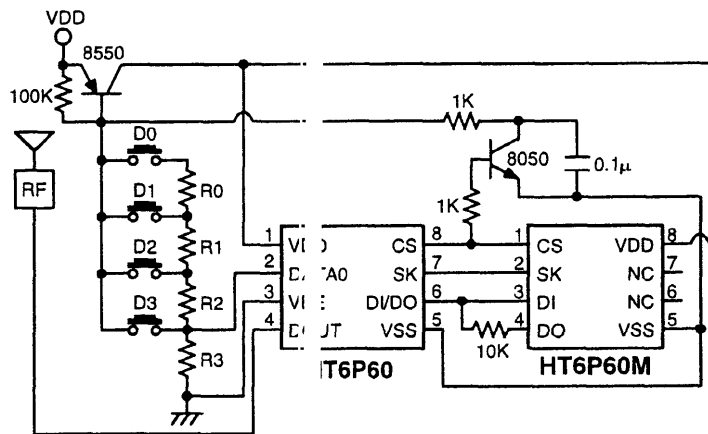HT6P60
– 16 DIP/SOP
Internal oscillation resistor
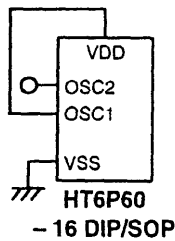
Application Circuits

– 16 DIP/SOP

– 8 DIP

Note: Typical infrared diode: EL- L2 (KODENSHI CORP.)
Typical RF transmitter: JR 220 (JUWA CORP.)
The ratio of R0:R1:R2:R3= 8:6:9.
A reference value of R0, R1 R2 and R3: 33KΩ, 33KΩ, 24KΩ, 36KΩ.

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