

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.

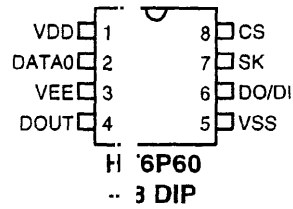
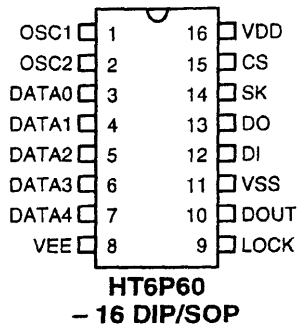
The encoded information words, each consist of a set of customer codes, data codes, synchronize bit and rolling addresses are transmitted on the DOUT pin via an RF or Infra-Red transmission medium after a trigger signal is received. The trigger signal include DATA1-DATA4 pins, which are all active high

or the DATA0 pin alone has a voltage level input.

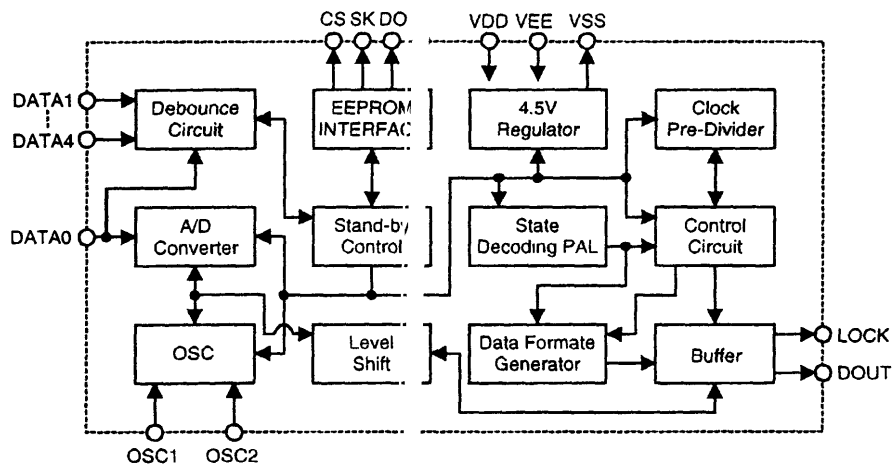
When the chip is active, at least an odd and an even frame which compose a word will be transmitted, depend on the active duration of the trigger signal.

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.

Pin Assignment

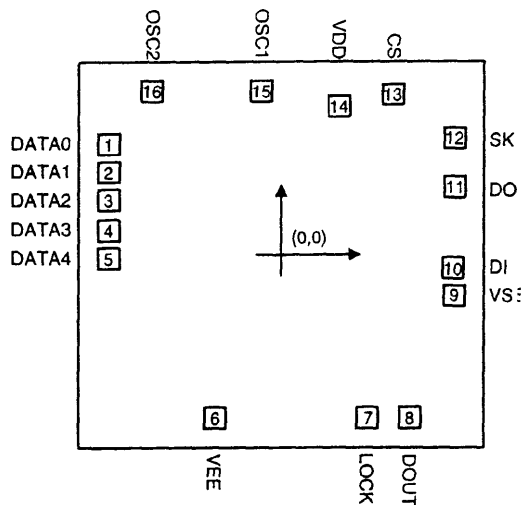


Block Diagram



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 mil²

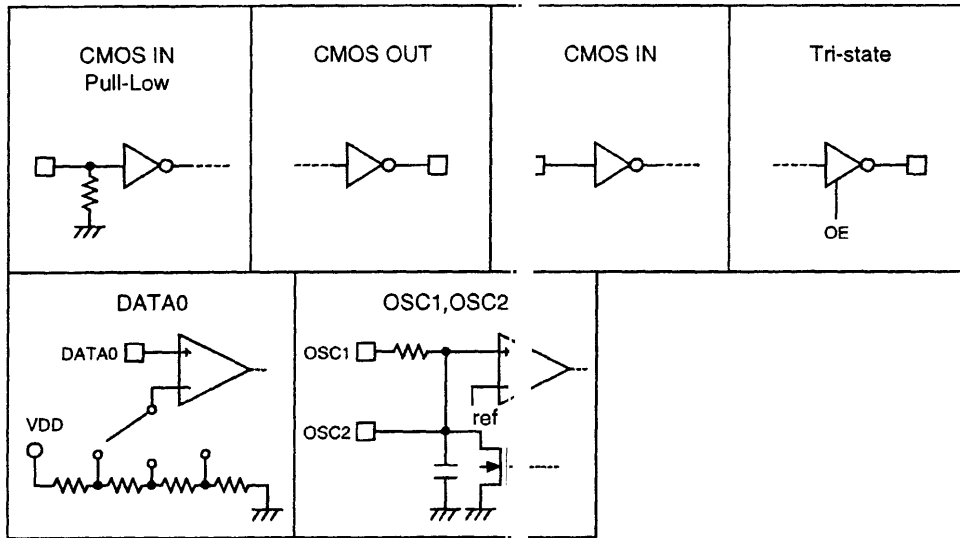
* The IC substrate should be connected to VDD in the PCB layout artwork.

Pin Description

Pin Name	I/O	Internal Connection	Description
OSC1	—	Oscillator Resistor	With an internal oscillation resistor for internal oscillator circuit. For the 8 DI 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	Input Voltage.....	$V_{SS}-0.3$ to $V_{DD}+0.3$
Storage Temperature.....	-50°C to 125°C	Operating Temperature.....	-20°C to 75°C

Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	V _D	Test Condition	Min.	Typ.	Max.	Unit
			Condition				
V _{DD}	Operating Voltage	—	—	6	—	12	V
V _{REG}	Regulator Voltage (V _{DD} -V _{SS})	—	—	3.5	4.5	5.5	V
I _{STB}	Stand-by Current	6V	Oscillator stops.	—	3	5	μA
		12V		—	6	10	μA
I _{DD}	Operating Current	6V	No load	—	200	400	μA
		12V	F _{OSC} =48KHz R _{OSC} =430KΩ	—	400	1000	μA
I _{OH1}	DOUT Source Current	6V	V _{OH} =0.9V _{DD}	-0.8	-2	—	mA
I _{OL1}	DOUT Sink Current	6V	V _{OL} =0.1V _{DD}	1	3	—	mA
V _{IH}	"H" Input Voltage	6V	—	4.5	—	V _{DD}	V
V _{IL}	"L" Input Voltage	6V	—	0	—	1.5	V
R _{DATA}	DATA1~DATA4 Pull-Low Resistance	6V	V _{IL} =0V	30	70	150	KΩ
		12V		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	6V	V _{OH2} =0.9V _{DD}	-0.8	-2	—	mA
I _{OL2}	LOCK Sink Current	6V	V _{OL2} =0.1V _{DD}	1	2	—	mA
I _{OH3}	SK Source Current	6V	V _{OH3} =0.9V _{DD}	-0.5	-1	—	mA
I _{OL3}	SK Sink Current	6V	V _{OL3} =0.1V _{DD}	0.5	1	—	mA
I _{OH4}	CS Source Current	6V	V _{OH4} =0.9V _{DD}	-1	-1.5	—	mA
I _{OL4}	CS Sink Current	6V	V _{OL4} =0.1V _{DD}	0.5	1	—	mA
F _{OSC}	Oscillator Frequency	12V	External R _{OSC} =430KΩ	36	48	60	KHz
			Internal R _{osc}	31	48	65	KHz

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.

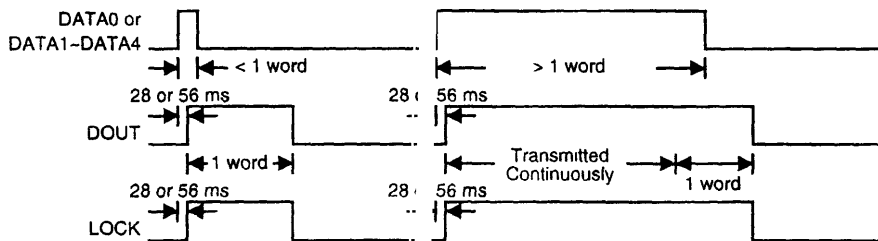


Fig.1 Transmission timing for the HT6P60

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 synchron

nize bit, a data code, an address code, and a customer code.

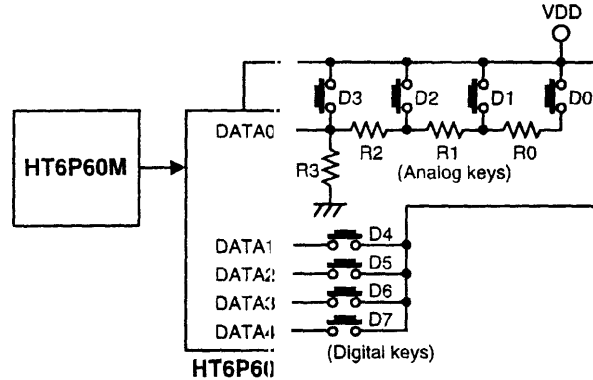


Address/Data programming

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

The data code is set by a push button or electronic 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).

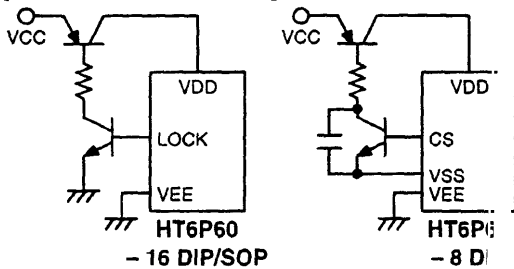
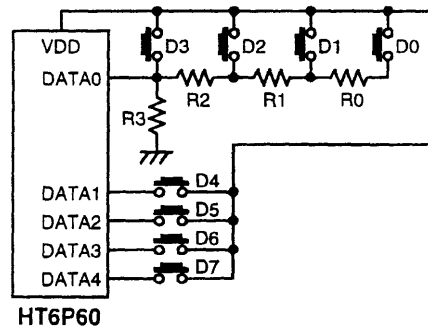


Power control

The HT6P60 provides a LOCK pin to reserve LSI power. To reduce system power dissipation, the LOCK pin can function as an electronic switch to control the external transistor. As soon as one of D0~D7 keys is triggered (transmission is enabled) the LOCK pin turns high, the LSI power switches on, and the signal is sent high until the LSI transmission is complete. Once the transmission is terminated, the LOCK pin turns low, and the LSI power switches off. The figure below illustrates the application of the LOCK pin as system power control. As for the 8 pin package of the HT6P60, the LOCK pin is not bonded out, so the CS pin can replace the LOCK pin and control the LSI power.

Transmission enable

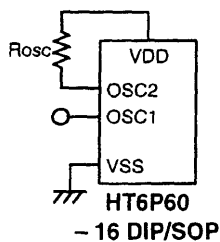
The HT6P60 transmission is enabled by applying a high signal to one of the data pins DATA1~DATA4 or applying a level voltage that is greater than $1/10V_{DD}$ to the DATA0 pin.



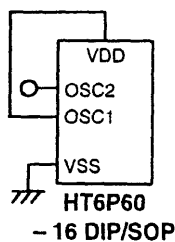
KEY	Input Level
D0	$\frac{4}{20} VDD \sim \frac{6}{20} VDD$
D1	$\frac{7}{20} VDD \sim \frac{9}{20} VDD$
D2	$\frac{11}{20} VDD \sim \frac{13}{20} VDD$
D3	$\frac{15}{20} VDD \sim VDD$

System oscillator

The HT6P60 is built in with an RC oscillator with an internal oscillation resistor to minimize external components, however the internal resistor may present high tolerance due to variation of VDD, temperature and process. If a more stable oscillator frequency is required, the application with an external resistor is recommended. For the internal oscillation resistor application, the OSC1 pin is connected with VDD whereas the OSC2 pin is left open. For the 8 DIP version, the internal oscillator resistor is selected as default.

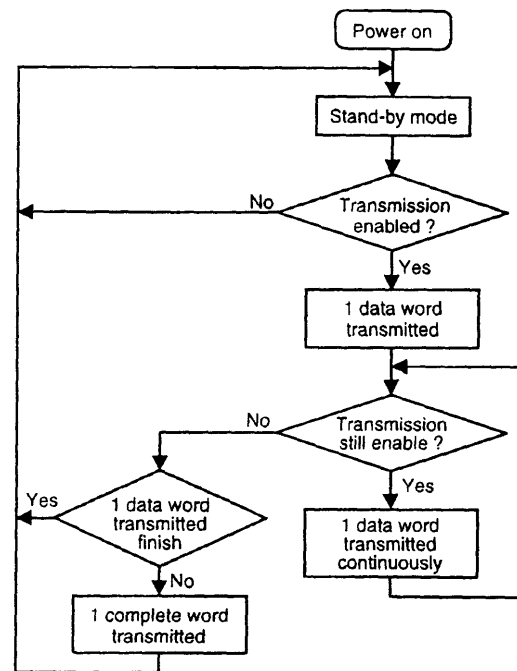


External oscillation resistor



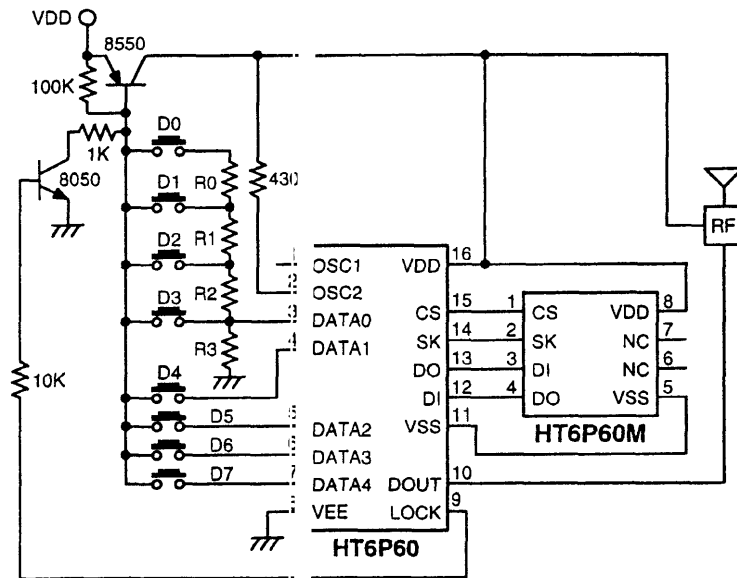
Internal oscillation resistor

Flowchart

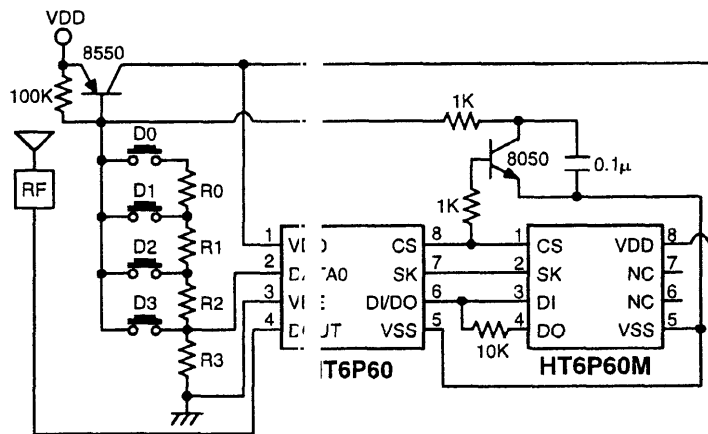


Application Circuits

- 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=1 8:6:9.
 A reference value of R0, R1, R2 and R3: 33KΩ, 33KΩ, 24KΩ, 36KΩ.