

Features

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- Low standby current
- Minimum transmission word:
 - Four words for TE trigger
- Built-in oscillator needs only 5% resistor
- Easy interface with an RF or an infrared transmission medium
- Minimal external components

Applications

- Burglar alarm system
- Smoke and fire alarm system
- Garage door controllers
- Car alarm system
- Security system
- Cordless telephones
- Other remote control systems

General Description

The 3^{12} encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding 12 bits of information which consists of N address bits and 12-N data bits. Each address/data input is externally trinary programmable if bonded out. They are otherwise set floating internally. Various packages of

the 3^{12} encoders offer flexible combinations of programmable address/data to meet various applications. The programmable address/data is transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal.

The block diagram illustrates the control logic for the 68000 microprocessor. It shows the following components and their interconnections:

- External Inputs:** OSC1, OSC2, TE, A0, A11, and DOUT.
- Internal Blocks:**
 - Oscillator:** Receives OSC1 and OSC2. It provides a clock signal to Counter 1 and a feedback signal to OSC2.
 - Counter 1 ($\div 16$):** Receives the clock from the Oscillator and outputs to Counter 2.
 - Counter 2 ($\div 4$):** Receives the clock from Counter 1 and outputs to the "0", "1" Encoder and the Address Counter.
 - "0", "1" Encoder:** Receives signals from Counter 2 and outputs to the Mixer.
 - Control Logic:** Receives the TE signal and outputs to the Address Counter.
 - 4 times Detector:** Receives signals from the Address Counter and outputs to the Control Logic.
 - Address Counter:** Receives signals from Counter 2 and the Control Logic. It outputs to the Address Decoder and the 4 times Detector.
 - Address Decoder:** Receives signals from the Address Counter and outputs to the Address Input.
 - Mixer:** Receives signals from the "0", "1" Encoder and outputs to the Output Driver DOUT.
 - Output Driver DOUT:** Receives signals from the Mixer and outputs to DOUT.
- Internal 68000 Components:**
 - Address Input:** Receives signals from the Address Decoder and A0. It is connected to the internal Address Bus.
 - DOUT:** Receives signals from the Output Driver DOUT and A11. It is connected to the internal Data Bus.

The image shows two pin diagrams for the HT6062 component. The left diagram is for the 18-DIP package, and the right diagram is for the 20-DIP/SOP package. Both diagrams show the pin numbers and their corresponding functions.

HT6062 – 18 DIP

Pin	Function
1	VDD
2	DOUT
3	OSC2
4	OSC1
5	TE
6	AD11
7	AD10
8	AD9
9	AD8
10	AD8
11	AD9
12	AD10
13	AD11
14	TE
15	OSC1
16	OSC2
17	DOUT
18	VDD

HT6062 – 20 DIP/SOP

Pin	Function
1	VDD
2	DOUT
3	OSC2
4	OSC1
5	TE
6	AD11
7	AD10
8	AD9
9	AD8
10	NC
11	NC
12	AD8
13	AD9
14	AD10
15	AD11
16	TE
17	OSC1
18	OSC2
19	DOUT
20	VDD

Pin Description

Pin Name	I/O	Internal Connection	Description
A0~A11	I		Code address Pin Nos. 0~11. These twelve tristate pins are detected by HT6062 to determine the encoded waveform bit 0 ~ bit 11. Each pin can be set to "1", "0" or "I" (floating).
VSS	—		Negative power supply
NC	—		No Connection
$\overline{\text{TE}}$	I		Transmission Enable. Active Low Signal. HT6062 outputs the encoded waveform to DOUT when this pin is pulled to low.
OSC1	I		A resistor connected between these two pins determine the fundamental frequency of the HT6062.
OSC2	O		
DOUT	O		Data output pin. The encoded waveform is serially generated to this pin. When HT6062 is not transmitting, DOUT outputs low (VSS) voltage.
VCC	—		Positive power supply

Absolute Maximum Ratings*

Supply Voltage -0.3V to 13V Storage Temperature -50°C to 125°C

Input Voltage VSS-0.3 to VDD+0.3V Operating Temperature -20°C to 75°C

*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

Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDD	Operating Voltage	—	—	2.4	5	12	V
ISTB	Standby Current	5V	Oscillator Stops	—	0.03	—	μA
IDD	Operating Current	5V	No load	—	190	—	μA
IDOUT	Output Drive/Sink Current	5V	V _{IH} = 4.5V, V _{IL} = 0.5V	—	-3/2	—	mA
		5V	V _{IH} = 3V, V _{IL} = 3V	—	-10/7	—	mA
		8V	V _{IH} = 7.2V, V _{IL} = 0.8V	—	-7/4	—	mA
		8V	V _{IH} = 4V, V _{IL} = 4V	—	-16/14	—	mA
		12V	V _{IH} = 10.8V, V _{IL} = -1.2V	—	-13/6.5	—	mA
		12V	V _{IH} = 6V, V _{IL} = 6V	—	-52/26	—	mA

Oscillator Frequency vs. Supply Voltage

HT6062

Ω	V_{DD}						Oscillator Frequency
Rosc	2V	3V	4V	5V	6V	7V	fosc
150k Ω	98.5	112.6	122	128.1	131.5	131.6	kHz
180k Ω	82.2	92.5	100.2	104.3	106.4	108.7	kHz
200k Ω	75.5	84.7	92.5	96.1	98	99.6	kHz
220k Ω	69.5	78.1	84.7	87.7	90.6	90.9	kHz
240k Ω	64.6	72.4	78.2	81.9	84.3	84.7	kHz
270k Ω	57.6	64.4	69.4	72.5	74.6	75	kHz
300k Ω	51.5	57.2	61.7	64.9	65.8	66.6	kHz
330k Ω	48.4	53.9	58.1	60.6	62	62.5	kHz
360k Ω	44.3	49.1	53.1	55.5	56.5	57.1	kHz
390k Ω	40.7	45	49	50.7	52	52.1	kHz
430k Ω	37.3	41	44.3	46.3	47.1	47.6	kHz
470k Ω	34.5	38	41.3	42.9	43.8	44.3	kHz
510k Ω	31.2	34.41	37.5	39	39.3	39.9	kHz
560k Ω	29	31.8	34.4	35.7	36.5	36.7	kHz
620k Ω	26.2	28.9	31.2	32.4	33.1	33.3	kHz

Ω	V_{DD}						Oscillator Frequency
Rosc	8V	9V	10V	11V	12V	13V	fosc
150k Ω	132	134	134	134	134	134	kHz
180k Ω	108.7	109.4	111.1	111.1	111.1	111.1	kHz
200k Ω	100	100	101	101	100	100	kHz
220k Ω	92.4	92.5	92.5	92.5	92.5	92.5	kHz
240k Ω	85.4	85.5	85.6	86.1	85.8	85.7	kHz
270k Ω	75.7	75.7	75.7	75.7	75.7	75.7	kHz
300k Ω	67.1	67.1	67.1	67.1	67.1	67.1	kHz
330k Ω	63.2	63.2	63.2	63.2	63.2	63.1	kHz

Ω	V_{DD}						Oscillator Frequency
R_{osc}	8V	9V	10V	11V	12V	13V	f_{osc}
360k Ω	57.4	57.4	57.5	57.5	57.5	57.5	kHz
390k Ω	52.6	52.6	52.6	52.6	52.6	52.6	kHz
430k Ω	48	48.1	48.1	48.1	48.1	48.1	kHz
470k Ω	44.5	44.6	44.6	44.6	44.6	44.6	kHz
510k Ω	40	40.2	40.3	40.3	40.3	40.3	kHz
560k Ω	37	37.3	37.3	37.3	37.3	37.3	kHz
620k Ω	33.5	33.5	33.5	33.5	33.5	33.5	kHz

HT6072

Ω	V_{DD}						Oscillator Frequency
R_{osc}	2V	3V	4V	5V	6V	7V	f_{osc}
27k Ω	375.6	480.8	537.5	575.9	599.2	615.6	kHz
30k Ω	349.7	445.2	495.7	528.1	552.2	565.8	kHz
33k Ω	320.6	409.8	454.8	483.6	502.6	516.9	kHz
36k Ω	304.4	380.1	422.3	450.1	467.6	480.6	kHz
39k Ω	286.3	366.3	404.8	429.7	447.8	458.7	kHz
43k Ω	264	330.6	362.9	386.8	400.4	411.6	kHz
47k Ω	243.5	304.8	337.5	357.4	370.8	378.2	kHz
51k Ω	230.1	284.4	313.6	332.8	345.2	354.1	kHz
56k Ω	216.2	261.8	287.5	304.6	317.2	324.5	kHz
62k Ω	194.2	239.3	261.3	277.4	286.7	294.6	kHz
68k Ω	178	218	238.2	255.6	263.6	270.2	kHz
75k Ω	168.5	201.5	219.4	232.5	241.1	246.8	kHz
82k Ω	154.8	186.5	202.5	215.7	223.5	227.8	kHz
91k Ω	140.5	168.1	181.7	192.5	199.3	203.7	kHz
100k Ω	134.5	157.5	172.2	182.5	188.6	192.6	kHz

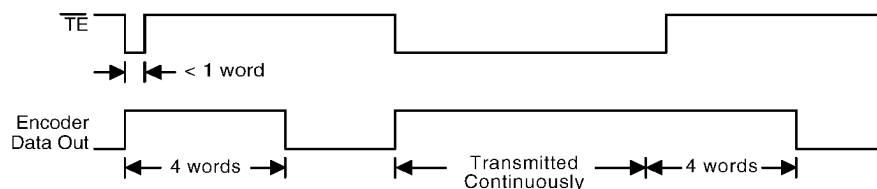
Ω	V_{DD}						Oscillator Frequency
R_{osc}	8V	9V	10V	11V	12V	13V	fosc
27k Ω	628.4	636.6	643.2	649.1	653.7	658.5	kHz
30k Ω	575.9	584.2	590.1	594.9	597.6	602.9	kHz
33k Ω	526.3	532.1	537.4	541.9	544.7	548.2	kHz
36k Ω	489.2	495.4	499.9	503.3	506.3	509.1	kHz
39k Ω	467.5	471.9	476.4	479.6	482.5	458.4	kHz
43k Ω	417.1	422.4	425.6	428.7	431.5	433.5	kHz
47k Ω	385.1	391.2	393.8	396.1	398.7	400.1	kHz
51k Ω	359.4	363.5	366.3	368.2	370	371.5	kHz
56k Ω	328.7	333.1	335.6	337.6	339.4	340.6	kHz
62k Ω	298.8	301.3	304.2	306.4	307.5	308.9	kHz
68k Ω	273.5	275.6	278.4	280.5	281.5	282.7	kHz
75k Ω	250.1	253.1	254.5	256.2	257.2	258.5	kHz
82k Ω	231.8	233.5	235.5	237.3	238.1	238.8	kHz
91k Ω	207.3	208.5	210.4	210.8	212.6	212.8	kHz
100k Ω	195.5	197.8	198.4	199.5	200.5	201.7	kHz

Functional Description

Operation

The 3¹² series of encoders begin a 4-word transmission cycle upon receipt of a transmission enable (TE). This cycle will repeat itself as long as the transmission enable is held low. Once the transmission enable returns high, the encoder output completes its final cycle and then stops as shown below.

Information word



Transmission timing

Single resistor oscillator

HT6062 encodes the code address and data set at A0~A11 into a special waveform and outputs it to the DOUT when $\overline{TE}$ is pulled to low state. This waveform is fed to RF modulator for transmission. The transmitted radio frequency is received by the RF demodulator and reshaped to the special waveform. HT6072 is then used to decode the waveform and set the corresponding output pins. Thus completing a remote control encoding and decoding function.

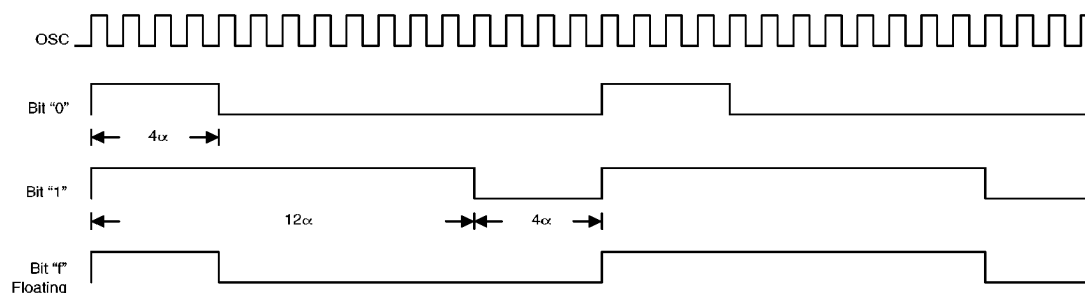
The built-in oscillator circuitry of HT6062 allows a precision oscillator to be constructed by connecting an external resistor between OSC1 and OSC2 pins. For HT6072 to decode correctly the received waveform, the oscillator frequency of HT6072 must be 2.8~7.8 times that of transmitting HT6062. The typical oscillator frequency with various resistor values for both HT6062 and HT6072 are shown below:

Recommended oscillator resistor values are shown below.

HT6062 (Encoder)		HT6072 (Decoder)	
Resistor Values	Frequency	Resistor Values	Frequency
300k Ω	64.9 kHz	47k Ω	357.4 kHz
330k Ω	60.6 kHz	51k Ω	332.8 kHz
360k Ω	55.5 kHz	56k Ω	304.6 kHz
390k Ω	50.7 kHz	62k Ω	277.4 kHz
430k Ω	46.3 kHz	68k Ω	255.6 kHz

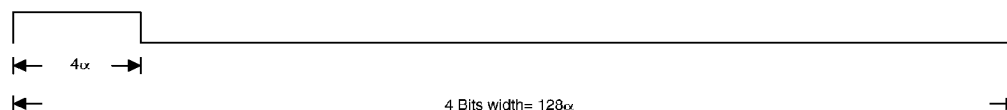
Address/data waveform

Each programmable address/data pin can be externally set to one of the following three logic states:



Where: α = Oscillating Clock Period

Synchronous bit:



Note: 1 bit= 32α

Address/data programming (preset)

The status of each address/data pin can be individually preset to a logic “high”, “low”, or “floating”. If a transmission enable signal is applied, the encoder scans and transmits the status of the 12 bits of address/data serially in the order A0 to AD11 for the HT6062.

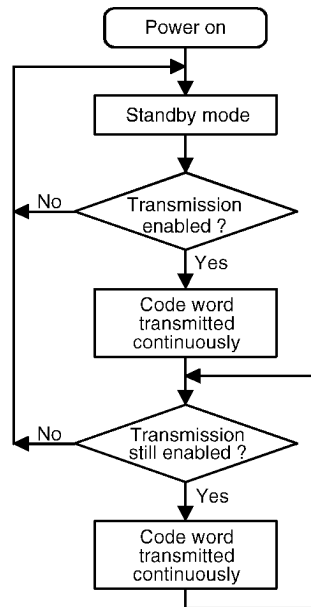
The transmitted data is as shown below:

Sync. Bit	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
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Transmission enable

For the $\overline{\text{TE}}$ trigger type of encoders, transmission is enabled by applying a low signal to the $\overline{\text{TE}}$ pin.

Flowchart



Application Circuits

