HT6072
3^{12} Decoder

Features

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- Low standby current
- Capable of decoding 12 bits of information
- Pairs with Holtek's 3^{12} series of encoders
- 6~12 address pins
- 0~6 data pins
- Trinary address setting
- Received codes are checked twice
- Built-in oscillator needs only 5% resistor
- VT goes high during valid transmission
- Easy interface with an RF or an infrared transmission medium
- Minimal external components
- Package information: refer to Selection Table

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 3^{12} decoders are a series of CMOS LSIs for remote control system applications. They are paired with the 3^{12} series of encoders. For proper operation, a pair of encoder/decoder with the same number of address and data format should be selected (refer to the encoder/decoder cross reference tables).

The 3^{12} series of decoders receive serial address and data from a particular series of encoders that are transmitted by a carrier using an RF. It then compares the serial input information twice continuously with its local address. If no errors or unmatched codes are encountered, the input data codes are decoded and transferred to the output pins. The VT pin also goes high to indicate a valid transmission.

The 3^{12} series of decoders are capable of decoding 12 bits of information that consists of N bits of address and 12–N bits of data. To meet various applications they are arranged to provide a number of data pins ranging from 0 to 6 and an address pin ranging from 6 to 12. Thus, various combinations of address/data number are available in different packages.

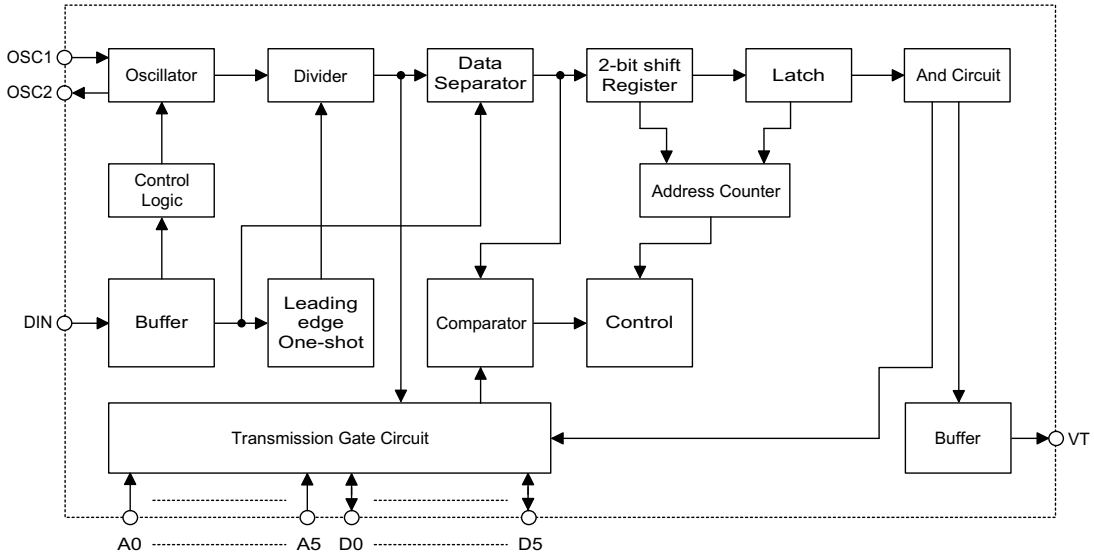
Selection Table

Function / Part No.	Address No.	Data		VT	Oscillator	Trigger	Package
		No.	Type				
HT6072-XX-0	12	0	—	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-2M	10	2	M	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-2L	10	2	L	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-3M	9	3	M	√	RC	DIN active "Hi"	18 DIP/20 SOP
HT6072-XX-3L	9	3	L	√	RC	DIN active "Hi"	18 DIP/20 SOP
HT6072-XX-4M	8	4	M	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-4L	8	4	L	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-5M	7	5	M	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-5L	7	5	L	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-6M	6	6	M	√	RC	DIN active "Hi"	18 DIP/20 DIP
HT6072-XX-6L	6	6	L	√	RC	DIN active "Hi"	18 DIP/20 DIP

Note: Data type: M represents the momentary type data output
L represents the latch type data output

VT can be used as a momentary data output

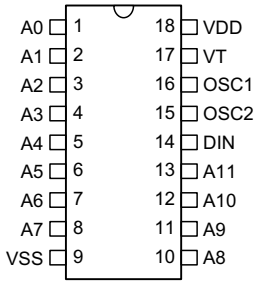
Block Diagram



Pin Assignment

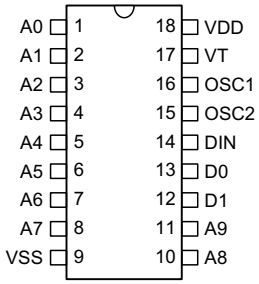
Latch series

12-Address 0-Data



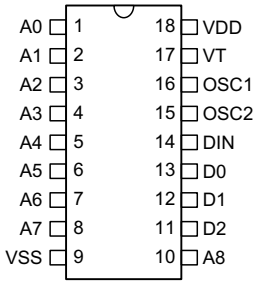
HT6072 – 18 DIP-0

10-Address 2-Data



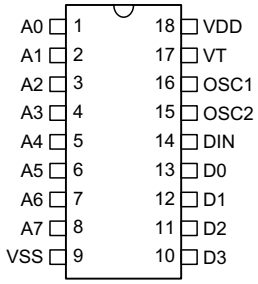
HT6072 – 18 DIP-2L

9-Address 3-Data



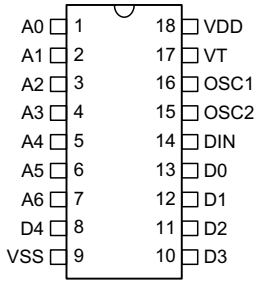
HT6072 – 18 DIP/SOP-3L

8-Address 4-Data



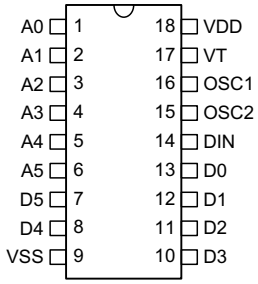
HT6072 – 18 DIP-4L

7-Address 5-Data



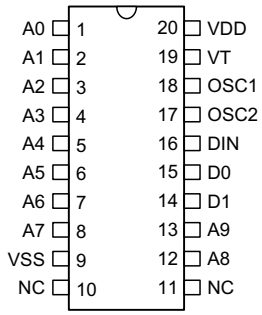
HT6072 – 18 DIP-5L

6-Address 6-Data



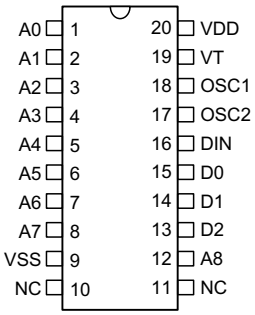
HT6072 – 18 DIP-6L

10-Address
2-Data



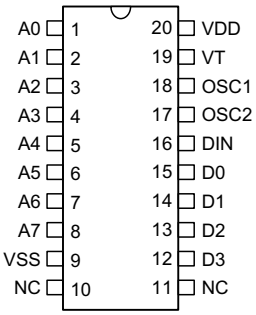
HT6072
– 20 DIP-2L

9-Address
3-Data



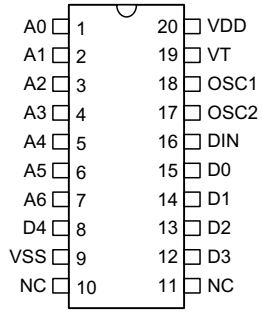
HT6072
– 20 DIP/SOP-3L

8-Address
4-Data



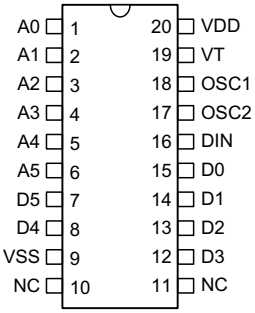
HT6072
– 20 DIP-4L

7-Address
5-Data



HT6072
– 20 DIP-5L

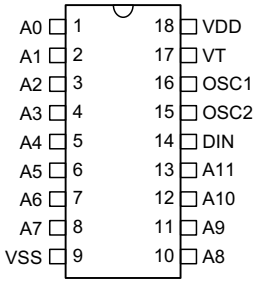
6-Address
6-Data



HT6072
– 20 DIP-6L

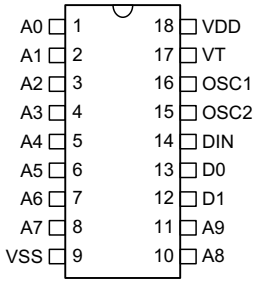
Momentary series

12-Address 0-Data



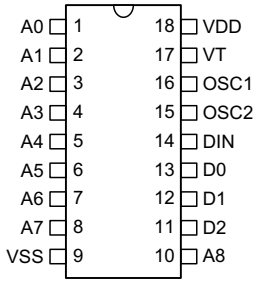
HT6072 – 18 DIP-0

10-Address 2-Data



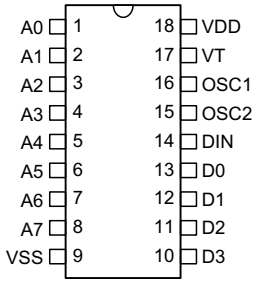
HT6072 – 18 DIP-2M

9-Address 3-Data



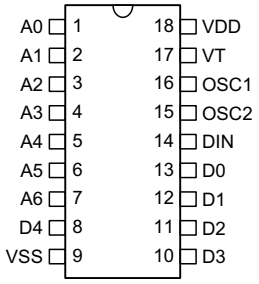
HT6072 – 18 DIP/SOP-3M

8-Address 4-Data



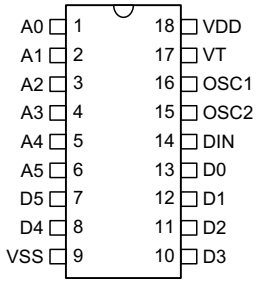
HT6072 – 18 DIP-4M

7-Address 5-Data



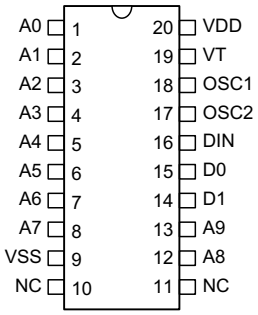
HT6072 – 18 DIP-5M

6-Address 6-Data



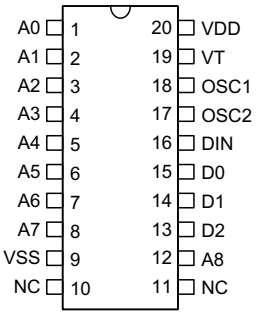
HT6072 – 18 DIP-6M

10-Address 2-Data



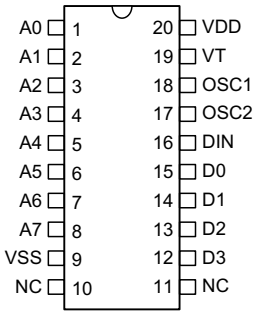
HT6072 – 20 DIP-2M

9-Address 3-Data



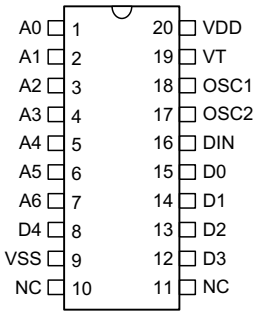
HT6072 – 20 DIP/SOP-3M

8-Address 4-Data



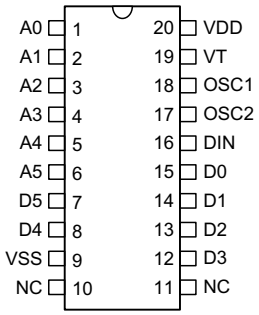
HT6072 – 20 DIP-4M

7-Address 5-Data



HT6072 – 20 DIP-5M

6-Address 6-Data



HT6072 – 20 DIP-6M

Pin Description

Pin Name	I/O	Internal Connection	Description
A0~A5	I		Code address Pin Nos. 0~5. These six tristate pins are detected by HT6072 to determine the encoded waveform bit 0 ~ bit 5. Each pin can be set to "1", "0" or "f" (floating).
A6~A11 (D5~D0)	I/O		Code address Pin Nos. 6~11. Data Pin Nos. 5~0. These six pins are used as higher address input bits or data output pins depending on the version (type) of HT6072 used. When used as address inputs, these pins are tristate input pins and each pin can be set to "1" "0" or "f" (floating). When used as output pins, these pins are driven to V_{CC} if (1) the address decoded from the waveform that was received matches the address setting at the address input pins , and (2) the corresponding data bits received is a "1" bit. Otherwise, they are driven to V_{SS}.
VSS	—		Negative power supply
NC	I		No connection
DIN	I		Data input pin. The encoded waveform received is serially fed to HT6072 at this pin.
OSC2 OSC1	O I		A resistor connected between these two pins determine the fundamental frequency of the HT6072.
VT	O		Valid transmission. Active high signal. VT in high state signifies that HT6072 receives valid transmission waveform.
VCC	—		Positive power supply

Absolute Maximum Ratings

Supply Voltage.....–0.3V to 13V

Input Voltage.....V_{SS}–0.3 to V_{DD}+0.3V

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

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. (3 Data Pin; Latch Mode)	Max.	Unit
		V_{DD}	Conditions				
V_{DD}	Operating Voltage	—	—	2.4	5	12	V
I_{STB}	Standby Current	5V	Oscillator stops	—	5.68	—	μA
I_{DD}	Operating Current	5V	No load	—	190μ	—	μA
I_{VT}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–3.1/2.7	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–9.7/8.4	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–6.56/5.88	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–24.8/19.6	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–12.1/10.9	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–46.2/37	—	mA
I_{A11D0}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–0.82/0.76	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–2.6/2.4	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–1.8/1.65	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–6.8/5.5	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–3.4/3.0	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–12.8/10.4	—	mA
I_{A10D1}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–0.83/0.76	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–2.6/2.4	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–1.8/1.7	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–6.8/5.5	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–3.5/3	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–13/10.5	—	mA
I_{A9D2}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–0.85/0.75	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–2.7/2.34	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–1.88/1.66	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–7.0/5.5	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–3.6/3.04	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–13.4/10.4	—	mA

Symbol	Parameter	Test Conditions		Min.	Typ. (3 Data Pin; Latch Mode)	Max.	Unit
		V_{DD}	Conditions				
I_{A8D3}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–0.85/0.76	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–2.66/2.37	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–1.86/1.67	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–6.89/5.52	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–3.53/3.1	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–13.1/10.48	—	mA
I_{A7D4}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–0.88/0.47	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–2.78/1.67	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–1.95/0.92	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–7.2/3.52	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–3.7/1.53	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–13.7/6.24	—	mA
I_{A6D5}	Output Drive/Sink Current	5V	V_{IH}=4.5V, V_{IL}=0.5V	—	–0.86/0.71	—	mA
		5V	V_{IH}=3V, V_{IL}=3V	—	–2.69/2.22	—	mA
		8V	V_{IH}=7.2V, V_{IL}=0.8V	—	–1.89/1.54	—	mA
		8V	V_{IH}=4V, V_{IL}=4V	—	–6.98/5.10	—	mA
		12V	V_{IH}=10.8V, V_{IL}=–1.2V	—	–3.58/2.79	—	mA
		12V	V_{IH}=6V, V_{IL}=6V	—	–13.26/9.66	—	mA

Oscillator Frequency vs. Supply Voltage

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Unit	V_{DD}						Oscillator Frequency
R_{OSC}	2V	3V	4V	5V	6V	7V	f_{OSC}
150kΩ	85.5	102.7	109.2	110.5	111.1	110.9	kHz
180kΩ	73.2	865	91.2	925	92.6	92	kHz
200kΩ	68	79.7	84	85.4	85.4	84.6	kHz
220kΩ	63.2	73.7	77.6	78.7	78.6	78.1	kHz
240kΩ	57.4	66.3	69.5	70.4	70.4	69.8	kHz
270kΩ	52.6	60.5	63.3	64	64	63.3	kHz
300kΩ	48.1	55	57.5	58.1	58.1	57.4	kHz
330kΩ	44.8	50.8	53	53.6	53.4	52.7	kHz
360kΩ	41.3	46.5	48.5	49.2	49	48.5	kHz
390kΩ	39	43.8	45.4	45.8	45.8	45.4	kHz
430kΩ	34.3	38.2	39.6	40	40	39.5	kHz
470kΩ	31.8	35.4	36.7	37	36.7	36.5	kHz
510kΩ	30.5	33.7	34.9	35.2	35.1	34.7	kHz
560kΩ	27.7	30.5	31.6	31.8	31.7	31.3	kHz
620kΩ	25.1	27.5	28.5	28.7	28.4	28.2	kHz

Unit	V_{DD}						Oscillator Frequency
R_{OSC}	8V	9V	10V	11V	12V	13V	f_{OSC}
150kΩ	109.8	109	108.5	107.5	106.8	106.4	kHz
180kΩ	91.7	90.8	90	89.2	88.5	87.7	kHz
200kΩ	84	83.3	82.5	81.8	81.1	80.5	kHz
220kΩ	77.4	76.8	76.2	75.2	74.6	74.3	kHz
240kΩ	69.2	68.5	68.1	67.3	67.1	66.2	kHz
270kΩ	62.8	62.2	61.6	61	60.4	60	kHz
300kΩ	56.8	56.5	55.8	55.2	54.8	54.5	kHz
330kΩ	52.5	51.5	51.3	50.7	50.4	50	kHz

Unit	V_{DD}						Oscillator Frequency
R_{OSC}	8V	9V	10V	11V	12V	13V	f_{OSC}
360kΩ	48	47.6	46.7	46.2	45.8	45.8	kHz
390kΩ	45.4	44.6	43.8	43.4	43.1	42.7	kHz
430kΩ	39	38.7	38.1	38.1	37.6	37.4	kHz
470kΩ	35.9	35.7	35.2	34.9	34.7	34.2	kHz
510kΩ	34.3	34	33.5	33.3	32.8	32.4	kHz
560kΩ	31	30.6	30.3	30	29.7	29.4	kHz
620kΩ	27.8	27.5	27.1	26.8	26.6	26.3	kHz

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Unit	V_{DD}						Oscillator Frequency
R_{OSC}	2V	3V	4V	5V	6V	7V	f_{OSC}
27kΩ	134.7	321.7	381.8	408.2	420.8	427.6	kHz
30kΩ	125	295	347.1	368.3	379.1	384.5	kHz
33kΩ	121.7	278.1	324.3	343.1	352.5	357.2	kHz
36kΩ	117.2	261.6	303.4	320.1	328	331.8	kHz
39kΩ	115.4	249.5	287.1	302	308.5	312.5	kHz
43kΩ	111.6	229	261.2	273.6	279	282.2	kHz
47kΩ	111.5	220	248.5	260.5	265.5	267.5	kHz
51kΩ	104.3	203.5	229.3	239.1	243.1	245.1	kHz
56kΩ	99.6	190.1	212.7	221.3	225.1	226.5	kHz
62kΩ	98.8	176.2	196	203	206.1	207.3	kHz
68kΩ	93.4	167.5	185.5	191.8	194.3	195.5	kHz
75kΩ	89.5	153.5	169.2	174.2	176.5	177	kHz
82kΩ	84	140.3	153.5	157.8	159.6	160.1	kHz
91kΩ	79.6	130.4	142.3	146.3	147.5	147.7	kHz
100kΩ	76.1	120.2	130.1	133.6	134.8	135.2	kHz

Unit	V_{DD}						Oscillator Frequency
R_{OSC}	8V	9V	10V	11V	12V	13V	f_{OSC}
27kΩ	431.5	433.8	435.2	436.2	436.5	437.2	kHz
30kΩ	387.5	389.1	390.2	390.5	390.7	390.5	kHz
33kΩ	359.5	361.1	361.5	362.1	362.2	362.1	kHz
36kΩ	334.3	335.1	335.3	335.4	335.5	335.5	kHz
39kΩ	314.1	314.8	315.2	315.5	315.4	315	kHz
43kΩ	283.2	284	284	283.9	283.6	283.4	kHz
47kΩ	268.6	269.1	269.5	269.8	268.8	268.1	kHz
51kΩ	245.5	246.2	246.2	246.2	245.2	245.1	kHz
56kΩ	227.1	227.1	227.2	226.5	226.1	226.2	kHz
62kΩ	208.1	207.8	207.5	206.9	206.5	206.1	kHz
68kΩ	196	195.5	195.1	194.8	194.1	193.8	kHz
75kΩ	177	177	176.8	176.1	175.5	175.4	kHz
82kΩ	160.2	159.6	159.6	159.1	158.5	158.0	kHz
91kΩ	147.2	147	146.5	146.2	145.5	145.2	kHz
100kΩ	135	134.6	134.1	133.6	132.8	132.6	kHz

Functional Description

Operation

The 3^{12} series of decoders provides various combinations of address and data pins in different packages. It is paired with 3^{12} series of encoders. The decoders receive data transmitted by the encoders and interpret the first N bits of the code period as addresses and the last 12–N bits as data (where N is the address code number). A signal on the DIN pin then activates the oscillator which in turns decodes the incoming address and data. The decoders will check the received address twice continuously. If all the received address codes match the contents of the decoder's local address, the 12–N bits of data are decoded to activate the output pins and the VT pin is set high indicating a valid transmission. That will last until the address code is incorrect or no signal is received.

The output of the VT pin is high only when the transmission is valid. Otherwise it is always low.

Output type

There are two types of output to select from:

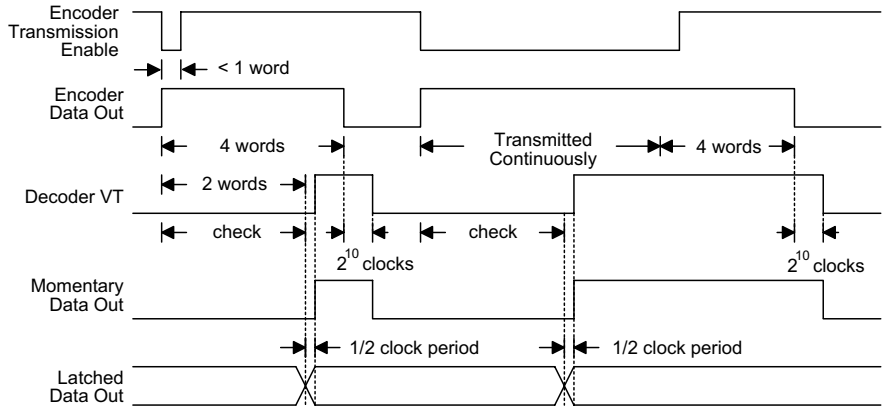
- Momentary type
  The data outputs follow the encoders during a valid transmission and then reset.
- Latch type
  The data outputs follow the encoders during a valid transmission and are then latched in this state until the next valid transmission occurs.

Address/data sequence

The following table describes the position of the address/data sequence for various models of the 3^{12} series of decoders. A correct device should be selected according to the requirements of the individual address and data.

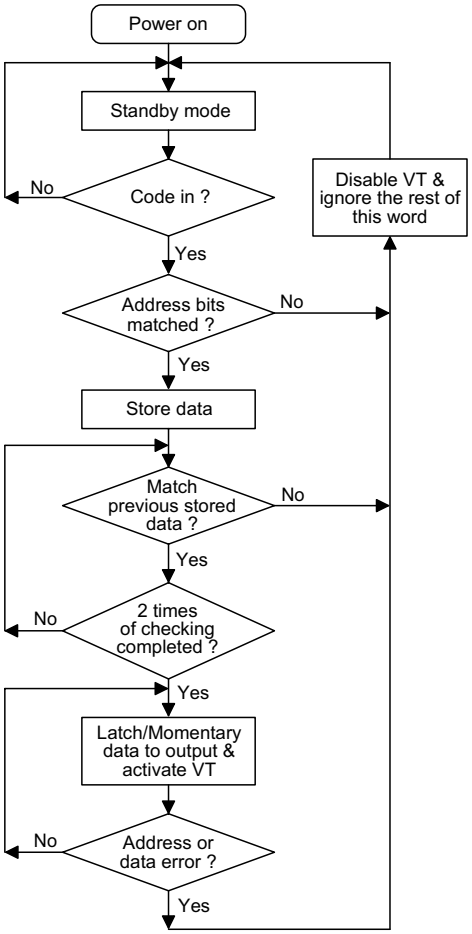
Part No.	Address/Data Bits											
	0	1	2	3	4	5	6	7	8	9	10	11
HT6072-XX-0	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
HT6072-XX-2X	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	D1	D0
HT6072-XX-3X	A0	A1	A2	A3	A4	A5	A6	A7	A8	D2	D1	D0
HT6072-XX-4X	A0	A1	A2	A3	A4	A5	A6	A7	D3	D2	D1	D0
HT6072-XX-5X	A0	A1	A2	A3	A4	A5	A6	D4	D3	D2	D1	D0
HT6072-XX-6X	A0	A1	A2	A3	A4	A5	D5	D4	D3	D2	D1	D0

Decoder timing

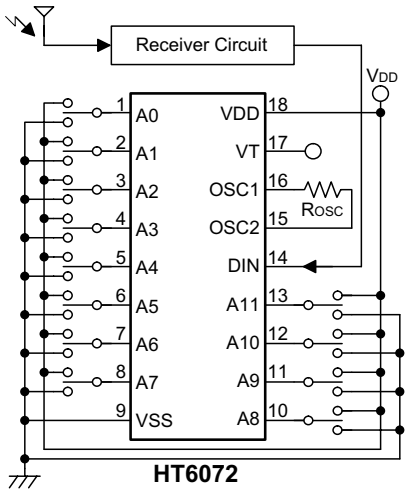


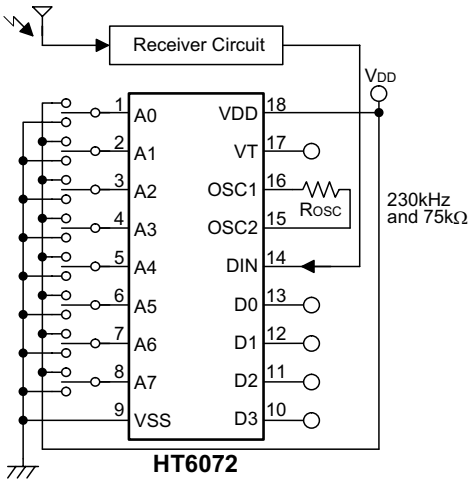
Flowchart

The oscillator is disabled in the standby state and activated as long as a logic″ high″ signal is applied to the DIN pin. i.e., the DIN pin should be kept″ low″ if there is no signal input.



Application Circuits





Holtek Semiconductor Inc. (Headquarters)
No.3 Creation Rd. II, Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
Tel: 886-3-563-1999
Fax: 886-3-563-1189

Holtek Semiconductor Inc. (Taipei Office)
5F, No.576, Sec.7 Chung Hsiao E. Rd., Taipei, Taiwan, R.O.C.
Tel: 886-2-2782-9635
Fax: 886-2-2782-9636
Fax: 886-2-2782-7128 (International sales hotline)

Holtek Microelectronics Enterprises Ltd.
RM.711, Tower 2, Cheung Sha Wan Plaza, 833 Cheung Sha Wan Rd., Kowloon, Hong Kong
Tel: 852-2-745-8288
Fax: 852-2-742-8657