

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 3¹² series of encoders
- 8~12 address pins
- 0~4 data pins
- Trinary address setting
- Two times of receiving check
- Built-in oscillator needs only a 5% resistor
- VT goes high during a valid transmission
- Easily 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 door controllers
- Car alarm system
- Security system
- Cordless telephones
- Other remote control systems

General Description

The 3¹² decoders are a series of CMOS LSIs for remote control system applications. They are paired with the 3¹² 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 3¹² series of decoders receives serial address and data from that series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. 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 3¹² 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 whose range is from 0 to 4 and an address pin whose range is from 8 to 12. Thus, various combinations of address/data number are available in different packages.

Selection Table

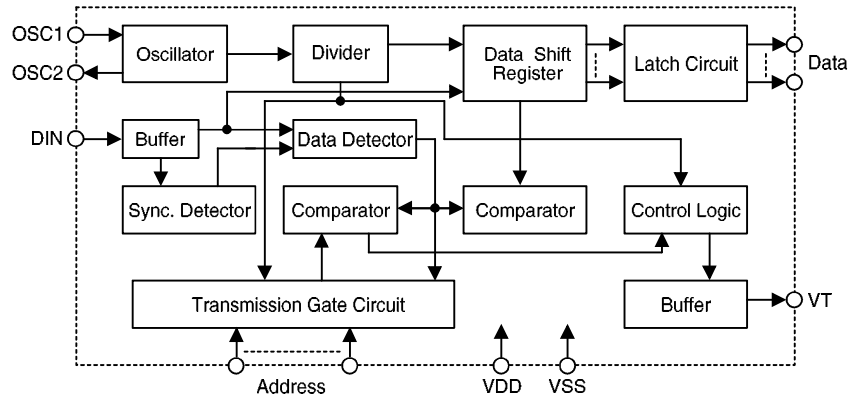
Item	Function	Address No.	Data		VT	Oscillator	Trigger	Package
			No.	Type				
HT6030		12	0	—	√	RC oscillator	DIN active "Hi"	18 DIP/20 SOP
HT6032		10	2	L	√	RC oscillator	DIN active "Hi"	18 DIP/20 SOP
HT6033		10	0	—	√	RC oscillator	DIN active "Hi"	16 DIP/16 SOP
HT6034		8	4	L	√	RC oscillator	DIN active "Hi"	18 DIP/ 20 SOP
HT6035		8	2	L	√	RC oscillator	DIN active "Hi"	16 DIP/16 SOP

Item	Function	Address No.	Data		VT	Oscillator	Trigger	Package
			No.	Type				
HT6042		10	2	M	√	RC oscillator	DIN active "Hi"	18 DIP/20 SOP
HT6044		8	4	M	√	RC oscillator	DIN active "Hi"	18 DIP/20 SOP
HT6045		8	2	M	√	RC oscillator	DIN active "Hi"	16 DIP/16 SOP

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

VT can be used as a momentary data output.

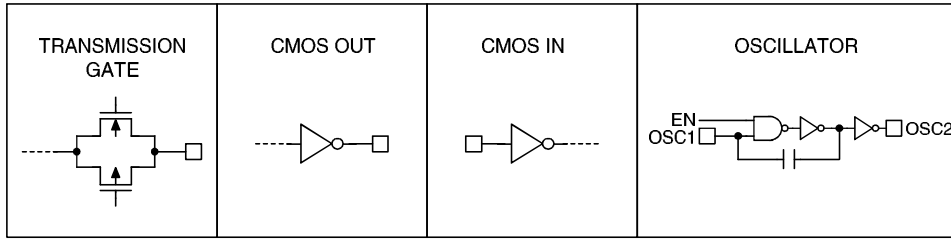
Block Diagram



Note: The address/data pins are available in various combinations (refer to the address/data table).

Pin Description

Pin Name	I/O	Internal Connection	Description
A0~A11	I	TRANSMISSION GATE	Input pins for address A0~A11 setting They can be externally set to VDD, VSS, or left open.
D8~D11	O	CMOS OUT	Output data pins
DIN	I	CMOS IN	Serial data input pin
VT	O	CMOS OUT	Valid transmission, active high
OSC1	I	OSCILLATOR	Oscillator input pin
OSC2	O	OSCILLATOR	Oscillator output pin
VSS	I	—	Negative power supply (GND)
VDD	I	—	Positive power supply

Approximate internal connection circuits

Absolute Maximum Ratings*

Supply Voltage	-0.3V to 13V	Storage Temperature.....	-50°C to 125°C
Input Voltage.....	V _{SS} -0.3 to V _{DD} +0.3V	Operating Temperature.....	-20°C to 75°C

*Note: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

 (T_a=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{DD}	Operating Voltage	—	—	2.4	5	12	V
I _{STB}	Standby Current	5V	Oscillator stops	—	0.1	1	μA
		12V		—	2	4	μA
I _{DD}	Operating Current	5V	No load F _{OSC} =100kHz	—	250	500	μA
I _O	Data Output Source Current (D8~D11)	5V	V _{OH} =4.5V	-0.5	-1	—	mA
	Data Output Sink Current (D8~D11)	5V	V _{OL} =0.5V	0.5	1	—	mA
I _{VT}	VT Output Source Current	5V	V _{OH} =4.5V	-2	-4	—	mA
	VT Output Source Current Only For HT6033/35/45			-0.35	-0.6	—	
	VT Output Sink Current		V _{OL} =0.5V	1	2	—	
	VT Output Sink Current Only For HT6033/35/45			0.35	0.6	—	
V _{IH}	“H” Input Voltage	5V	—	3.5	—	5	V

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
V _{IL}	"L" Input Voltage	5V	—	0	—	1	V
F _{OSC}	Oscillator Frequency	5V	R _{OSC} =91kΩ	—	100	—	kHz

Functional Description

Operation

The 3¹² series of decoders provides various combinations of address and data pins in different packages. It is paired with the 3¹² 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.

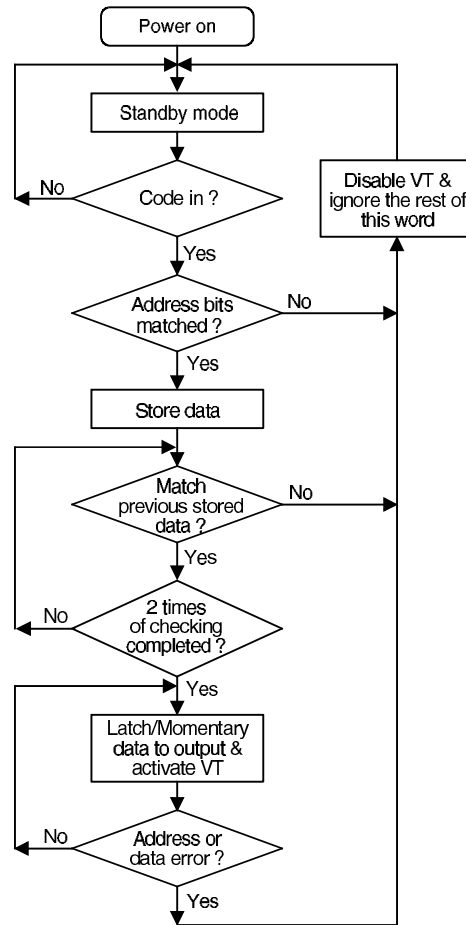
The output of the VT pin is high only when the transmission is valid. Otherwise it is always low.

Output type

There are 2 types of output to select from:

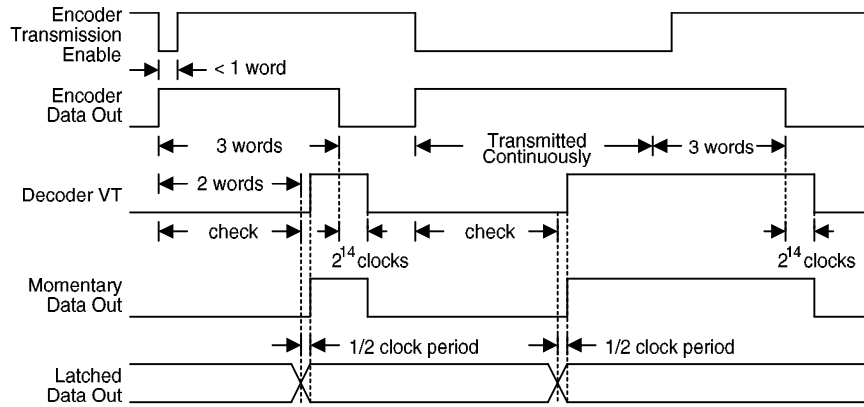
- **Momentary type**
The data outputs follow the encoders during a valid transmission and then reset.
- **Latch type**
The data outputs follow the encoders during a valid transmission and are then latched in this state until the next valid transmission occurs.

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.

Decoder timing



Encoder/Decoder cross reference tables

• Latch type of data output

Part No.	Data Pins	Address Pins	VT	Pair Encoder	Package			
					Encoder		Decoder	
					DIP	SOP	DIP	SOP
HT6032	2	10	√	HT6010	18, 20	20	18	20
				HT6012	18	20	18	20
HT6034	4	8	√	HT6010	18, 20	20	18	20
				HT6014	18	20		
HT6035	2	8	√	HT6013	16	16	16	16
				HT6015	16	16		

• Momentary type of data output

Part No.	Data Pins	Address Pins	VT	Pair Encoder	Package			
					Encoder		Decoder	
					DIP	SOP	DIP	SOP
HT6030	0	12	√	HT6010	18, 20	20	18	20
HT6033	0	10	√	HT6013	16	16	16	16
HT6042	2	10	√	HT6010	18, 20	20	18	20
				HT6012	18	20		
HT6044	4	8	√	HT6010	18, 20	20	18	20
				HT6014	18	20		
HT6045	2	8	√	HT6013	16	16	16	16
				HT6015	16	16		

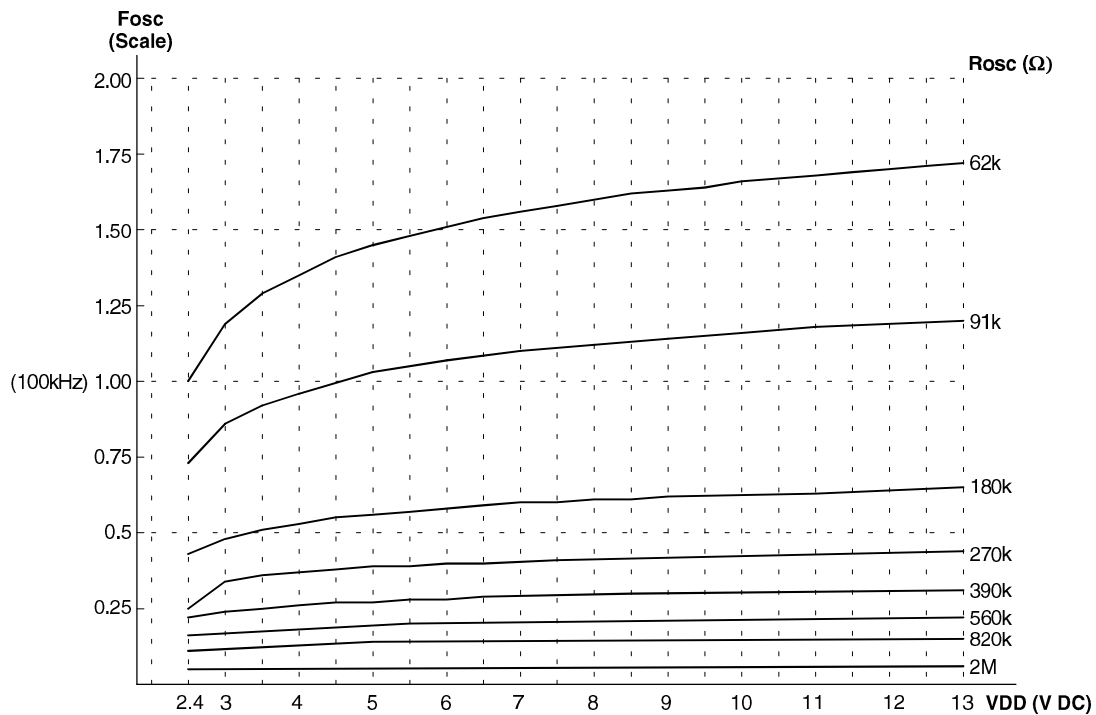
Address/Data sequence

The following table describes the position of the address/data sequence for various models of the 3¹² series decoders. A correct device should be selected according to the requirements of individual address and data.

Part No.	Address/Data Bits											
	0	1	2	3	4	5	6	7	8	9	10	11
HT6030	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
HT6032	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	D10	D11
HT6033	—	—	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
HT6034	A0	A1	A2	A3	A4	A5	A6	A7	D8	D9	D10	D11
HT6035	—	—	A2	A3	A4	A5	A6	A7	A8	A9	D10	D11
HT6042	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	D10	D11
HT6044	A0	A1	A2	A3	A4	A5	A6	A7	D8	D9	D10	D11
HT6045	—	—	A2	A3	A4	A5	A6	A7	A8	A9	D10	D11

Note: “—” is a dummy code which is left “open” and not bonded out.

Oscillator frequency vs supply voltage

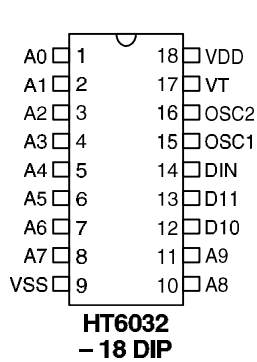


The recommended oscillator frequency is F_{OSCD} (decoder) ≈ 33 F_{OSCE} (encoder).

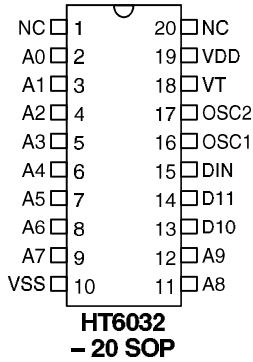
Package Information

Latch series

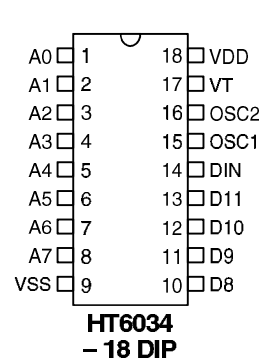
**10-Address
2-Data**



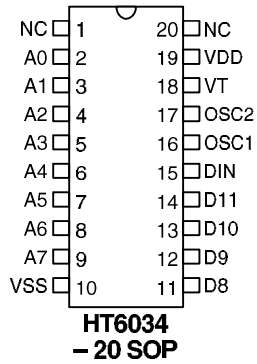
**10-Address
2-Data**



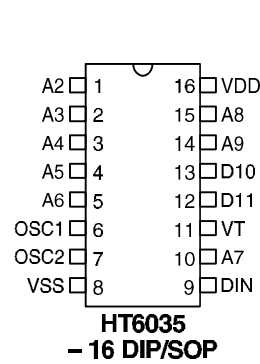
**8-Address
4-Data**



**8-Address
4-Data**

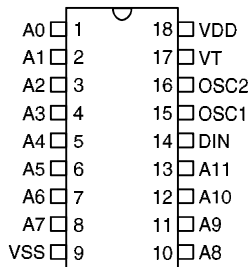


**8-Address
2-Data**



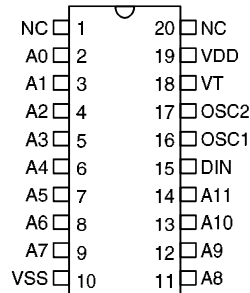
Momentary series

**12-Address
0-Data**



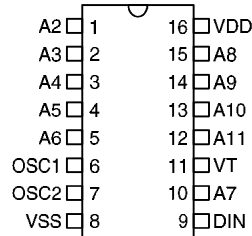
HT6030
- 18 DIP

**12-Address
0-Data**



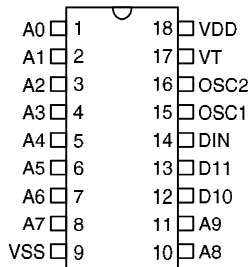
HT6030
- 20 SOP

**10-Address
0-Data**



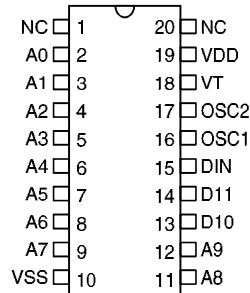
HT6033
- 16 DIP/SOP

**10-Address
2-Data**



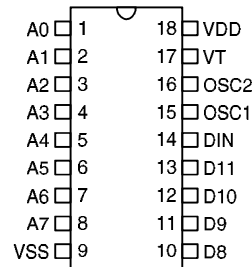
HT6042
- 18 DIP

**10-Address
2-Data**



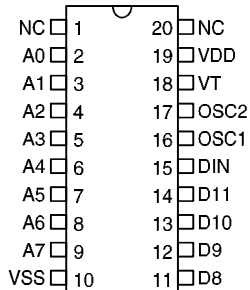
HT6042
- 20 SOP

**8-Address
4-Data**



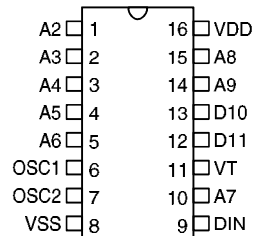
HT6044
- 18 DIP

**8-Address
4-Data**



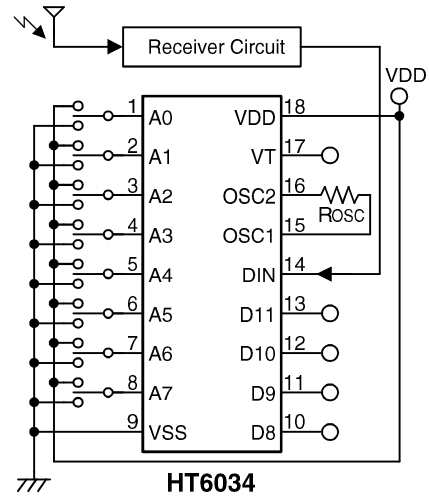
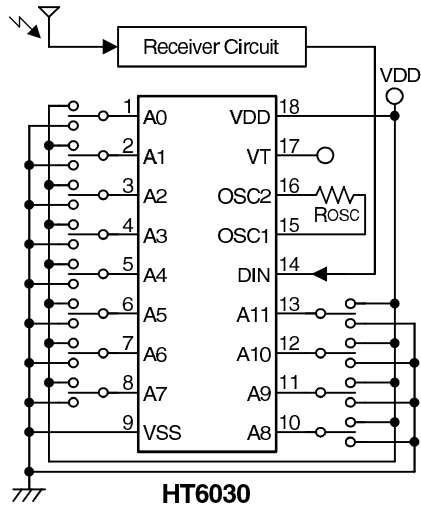
HT6044
- 20 SOP

**8-Address
2-Data**



HT6045
- 16 DIP/SOP

Application Circuits



Note: Typical infrared receiver: PIC-12043T/PIC-12043S (KODESHI CORP.)
or LTM9052 (LITEON CORP.)

Typical RF receiver: JR-200 (JUWA CORP.)
RE-99 (MING MICROSYSTEM, U.S.A.)