HT6160
3^{18} Programmable Decoder

Features

- Operating voltage: 2.4V~5.0V
- Low power consumption
- Built-in oscillator needs only 5% resistor
- Valid transmission indicator
- Pairs with 3^{18} series of encoders
- Latch/Momentary/Delay selection data output
- 3^{18} address and data codes
- Decoder learning function for 12 address bits
- Check 7 times for program mode
- Check twice for normal mode
- Easy interface with RF or IR medium
- Programmable address

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

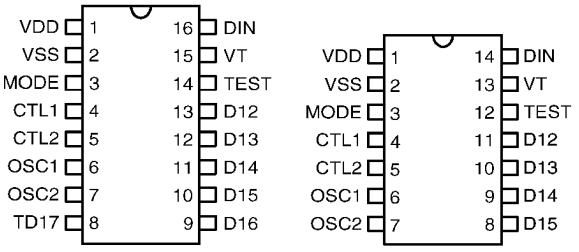
General Description

The HT6160 is a CMOS LSI address programmable decoder. It is paired with the 3^{18} series of encoders to form a programmable address remote control system.

The HT6160 has two operation modes, namely program mode and normal mode. With MODE=0 the device is in the program mode and encodes the data on the DIN pin as local address. The initial 12 bits of an 18 bit code are interpreted as the device address. On the other hand, with MODE=1 or floating, the device is in the normal mode and decodes the address and data on the DIN pin from the 3^{18} series of encoders. The data is transmitted along with a carrier wave using an RF or an IR medium. If the received address code matches the local programmed address code, VT goes high and the data codes are placed on the output pins.

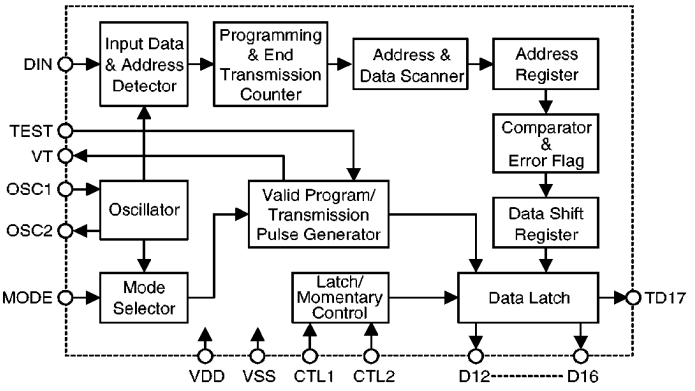
Combination of the data output type and functions of the HT6160 are both controlled by the control signals CTL1 and CTL2.

Package Information



HT6160 – 16 DIP **HT6160A – 14 DIP**

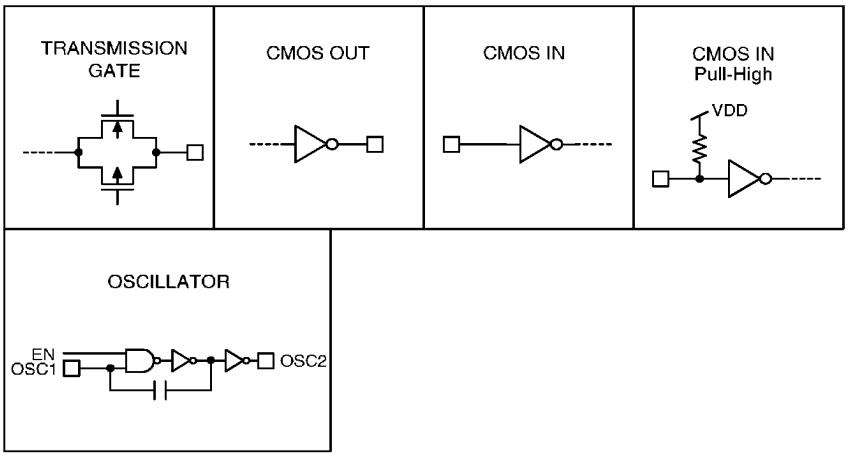
Block Diagram



Pin Description

Pin Name	I/O	Internal Connection	Description
VDD	I	—	Positive power supply
VSS	I	—	Negative power supply (GND)
MODE	I	CMOS IN Pull-High	Programming mode control pin: VSS: Program mode VDD or Open: Normal mode
CTL1	I	CMOS IN Pull-High	D12, D13 output function control
CTL2	I	CMOS IN Pull-High	D14~D16 output function control
OSC1	I	OSCILLATOR	Oscillator input pin
OSC2	O	OSCILLATOR	Oscillator output pin
TD17	O	CMOS OUT	Toggle output controlled by a “Hi" transmission on D17 of the encoder
D12~D16	O	CMOS OUT	Data output pins
TEST	I	CMOS IN Pull-High	For IC testing only
VT	O	CMOS OUT	Valid transmission indicator output pin
DIN	I	CMOS IN	Serial data input pin

Approximate internal connection circuits



Absolute Maximum Ratings*

Supply Voltage ..... –0.3V to 6V
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 extened periods may affect device reliability.

Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DD}	Operating Voltage	—	—	2.4	3	5.0	V
I_{STB}	Standby Current	5V	Oscillator stops	—	5	10	μA
I_{DD}	Operating Current	5V	DIN pin=VDD No load F_{OSC}=100kHz	—	250	600	μA
I_O	Data Output Source Current (D12~TD17)	5V	V_{OH}=4.5V	–0.5	–1	—	mA
	Data Output Sink Current (D12~TD17)		V_{OL}=0.5V	0.5	1	—	mA
I_{VT}	VT Output Source Current	5V	V_{OH}=4.5V	–1	–2	—	mA
	VT Output Sink Current		V_{OL}=0.5V	1	2	—	mA

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
R_{UP}	Pull-High Resistance (CTL1, CTL2, MODE)	5V	V_{IN}=0V	—	1	2	MΩ
V_{IH}	"H" Input Voltage	—	—	$0.8V_{DD}$	—	V_{DD}	V
V_{IL}	"L" Input Voltage	—	—	0	—	$0.2V_{DD}$	V
F_{OSC}	Oscillator Frequency	5V	R_{OSC}=180kΩ	—	100	—	kHz

Functional Description

Address programming

Before using the HT6160, first program its internal address memory to match the address of the corresponding 3^{18} series of encoders. Then to program the address, connect the MODE pin to VSS, allowing the DIN pin to receive address code from the continuously transmitting encoder. During this programming operation the LED of the VT pin flashes at a 2Hz rate. It then stops at the end of the programming operation. The HT6160 will then check the input address code 7 times continuously. If no error has been detected, the input address code is written into the internal memory of the device. The contents of the internal memory will be lost if power is removed. In this case, an uninterruptable power supply is recommended for reliable operation.

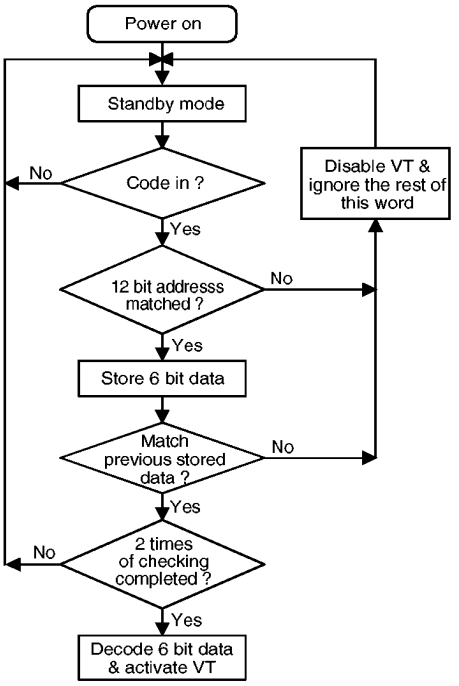
Normal operation

The HT6160 should be set to the Operation Mode (the MODE pin is left open or connected to VDD) for normal operation after the address programming process. In the operation mode, the decoder receives a data word transmitted by the encoder and interprets the initial 12 bits of the code period as address and the last 6 bits as data. The decoder then checks the received address code twice continuously. If all the received address codes correspond to the contents of the internal memory of the HT6160, the VT pin goes high and the 6 bits of data (D12~D16, TD17) are decoded so as to activate the 6 output pins. The function of the 6 output pins are listed in the following table:

Output	CTL1 Connection			CTL2 Connection	
	VDD	VSS	RC	VDD	VSS
D12	Momentary	Latched	Delayed	—	—
D13	Momentary	Latched	Delayed	—	—
D14	—			Momentary	Latched
D15	—			Momentary	Latched
D16	—			Momentary	Latched
TD17	Toggled by a "HIGH" input of the encoder D17				

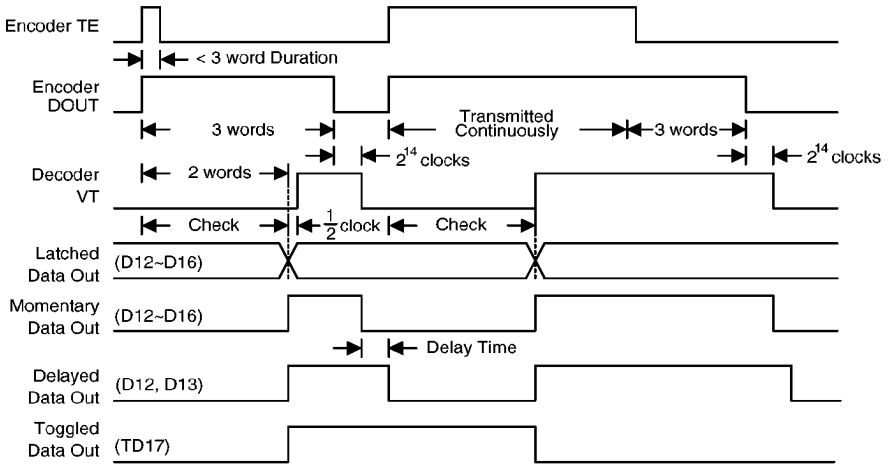
Note: "—" denotes no effect.

Flowchart



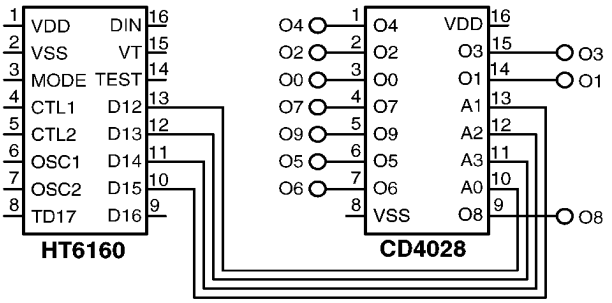
Note: The oscillator is disabled in the standby state and activated as long as a logic "high" signal is applied to the DIN pin. i.e., the DIN pin should be kept low if there is no signal input.

Decoder timing



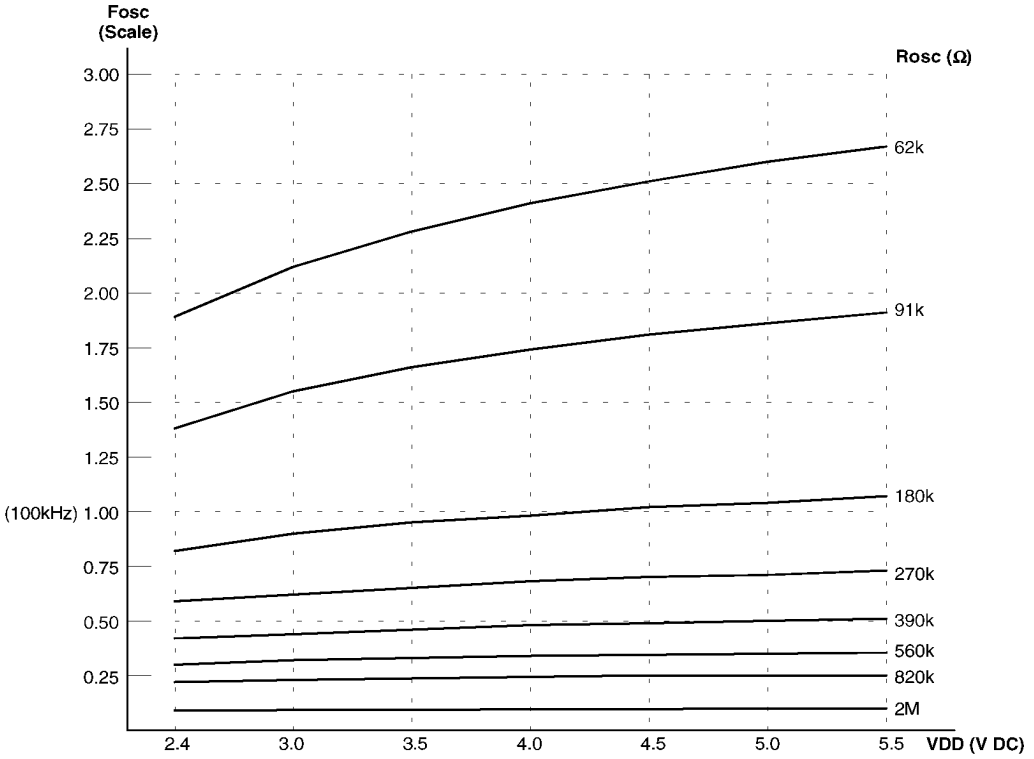
Output expansion

If the external circuit requires control pins in excess of the pins offered by the HT6160, a CD4028 can be utilized to expand the number of outputs.



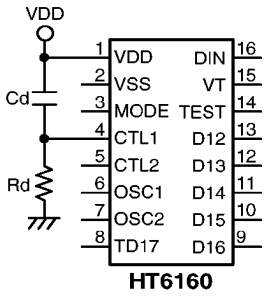
Output expansion using a CD4028

Oscillator frequency vs supply voltage



The recommended oscillator frequency is F_{OSCD} (HT6160 decoder) ≅ F_{OSCE} (encoder).

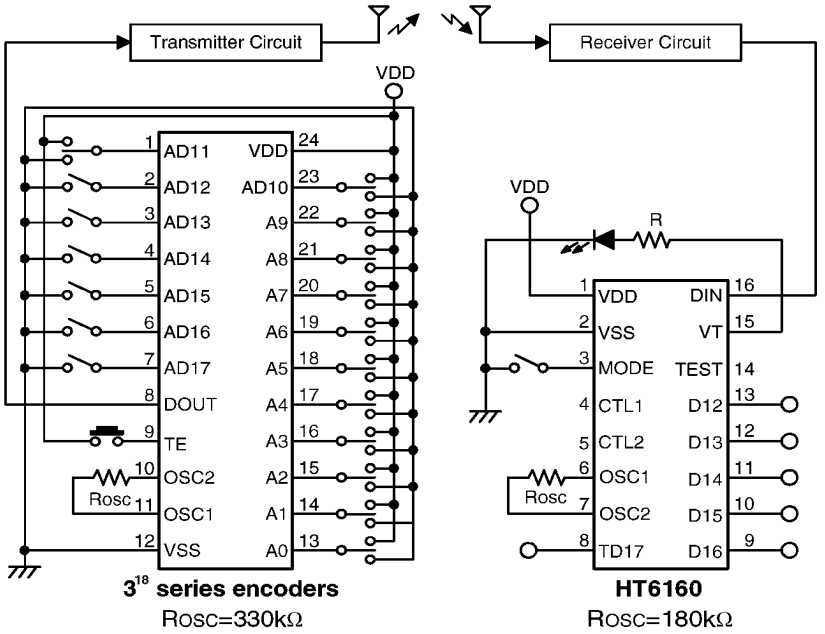
Delayed output control for D12, D13



Delayed time ≅ Rd × Cd

Note: For Cd=1μf and Rd=2MΩ the delay time is about 2 seconds.

Application Circuits



Note: Typical infrared diode: EL-1L2 (KODENSHI CORP.)
Typical RF transmitter: JR-220 (JUWA CORP.)
Typical infrared receiver: PIC-12043T/PIC-12043S (KODESHI CORP.)
or LTM9052 (LITEON CORP.)
Typical RF receiver: JR-200 (JUWA CORP.)