

HT12D/HT12F 2¹² Series of Decoders

Features

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- · Low standby current
- · Capable of decoding 12 bits of information
- · Binary address setting
- · Received codes are checked 3 times
- · Address/Data number combination
 - HT12D: 8 address bits and 4 data bits
 - HT12F: 12 address bits only

- · Built-in oscillator needs only 5% resistor
- · Valid transmission indicator
- Easy interface with an RF or an infrared transmission medium
- Minimal external components
- Pair with Holtek's 2¹² series of encoders
- 18-pin DIP, 20-pin SOP package

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 2¹² decoders are a series of CMOS LSIs for remote control system applications. They are paired with Holtek's 2¹² series of encoders (refer to the encoder/decoder cross reference table). For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen.

The decoders receive serial addresses and data from a programmed 2^{12} series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continu-

ously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission.

The 2¹² series of decoders are capable of decoding informations that consist of N bits of address and 12–N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

Selection Table

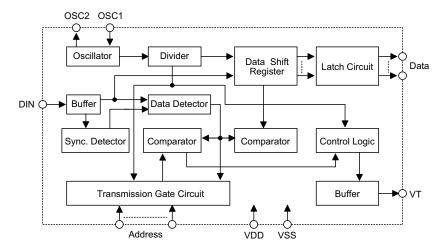
Function	Address	Da	ıta	VT	Oscillator	Triagor	Dookogo	
Part No.	No.	No.	Туре	VI	Oscillator	Trigger	Package	
HT12D	8	4	L	√	RC oscillator	DIN active "Hi"	18DIP, 20SOP	
HT12F	12	0	_	√	RC oscillator	DIN active "Hi"	18DIP, 20SOP	

Notes: Data type: L stands for latch type data output.

VT can be used as a momentary data output.

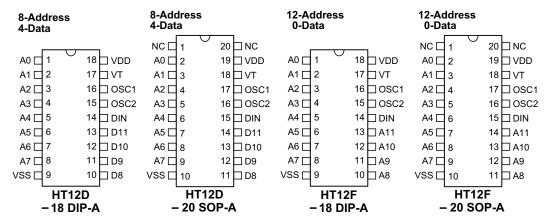


Block Diagram



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

Pin Assignment



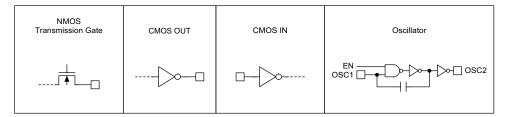
Pin Description

Pin Name	I/O	Internal Connection	Description
A0~A11 (HT12F)		NMOS	Input pins for address A0~A11 setting These pins can be externally set to VSS or left open.
A0~A7 (HT12D)	I	Transmission Gate	Input pins for address A0~A7 setting These pins can be externally set to VSS or left open.
D8~D11 (HT12D)	0	CMOS OUT	Output data pins, power-on state is low.
DIN	I	CMOS IN	Serial data input pin
VT	0	CMOS OUT	Valid transmission, active high
OSC1	I	Oscillator	Oscillator input pin
OSC2	0	Oscillator	Oscillator output pin
VSS		_	Negative power supply, ground
VDD	_	_	Positive power supply

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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: 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

Cumb al	Parameter		Test Conditions	Min	T	Max	Unit		
Symbol	Parameter	V_{DD}	Conditions	Min.	Тур.	Max.	Unit		
V _{DD}	Operating Voltage	_	_	2.4	5	12	V		
		5V	0	_	0.1	1	μА		
I _{STB}	Standby Current	12V	Oscillator stops	_	2	4	μА		
I _{DD}	Operating Current		No load, f _{OSC} =150kHz	_	200	400	μА		
	Data Output Source Current (D8~D11)	5V	V _{OH} =4.5V	-1	-1.6	_	mA		
l _o	Data Output Sink Current (D8~D11)		V _{OL} =0.5V	1	1.6	_	mA		
	VT Output Source Current	5) /	V _{OH} =4.5V	-1	-1.6	_	mA		
I _{VT}	VT Output Sink Current		VT Output Sink Current 5V	50	V _{OL} =0.5V	1	1.6	_	mA
V _{IH}	"H" Input Voltage		_	3.5	_	5	V		
V _{IL}	"L" Input Voltage	5V	_	0	_	1	V		
fosc	Oscillator Frequency	5V	R _{OSC} =51kΩ	_	150	_	kHz		



Functional Description

Operation

The 2^{12} series of decoders provides various combinations of addresses and data pins in different packages so as to pair with the 2^{12} series of encoders.

The decoders receive data that are transmitted by an encoder and interpret the first N bits of 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 activates the oscillator which in turn decodes the incoming address and data. The decoders will then check the received address three times continuously. If the received address codes all 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 to indicate a valid transmission. This will last unless 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.

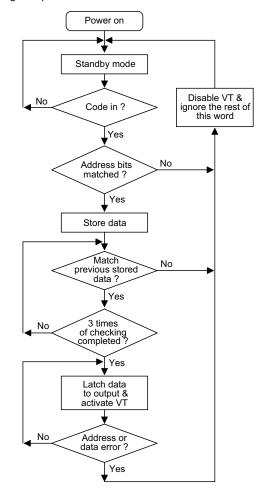
Output type

Of the 2¹² series of decoders, the HT12F has no data output pin but its VT pin can be used as a momentary data output. The HT12D, on the other hand, provides 4 latch type data pins whose data remain unchanged until new data are received.

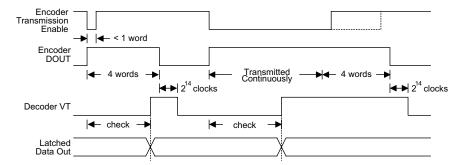
Part No.	Data Pins	Address Pins	Output Type	Operating Voltage
HT12D	4	8	Latch	2.4V~12V
HT12F	0	12	_	2.4V~12V

Flowchart

The oscillator is disabled in the standby state and activated when a logic "high" signal applies to the DIN pin. That is to say, the DIN should be kept low if there is no signal input.



Decoder timing



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Encoder/Decoder cross reference table

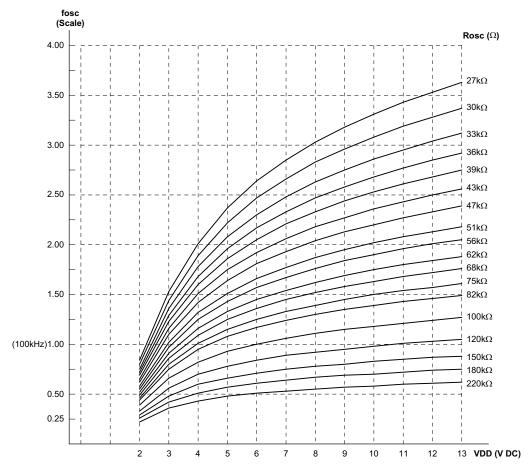
					Package		cage		
Decoders Part No.	Data Pins	Address Pins	VT	Pair Encoder	Enc	oder	Dec	oder	
					DIP	SOP	DIP	SOP	
HT12D	4	8	\checkmark	HT12A HT12E	18	20	18	20	
HT12F	0	12	V	HT12A HT12E	18	20	18	20	

Address/Data sequence

The following table provides address/data sequence for various models of the 2¹² series of decoders.

Part No.					Α	ddress	Data Bit	s				
Part No.	0	1	2	3	4	5	6	7	8	9	10	11
HT12D	A0	A1	A2	А3	A4	A5	A6	A7	D8	D9	D10	D11
HT12F	A0	A1	A2	А3	A4	A5	A6	A7	A8	A9	A10	A11

Oscillator frequency vs supply voltage

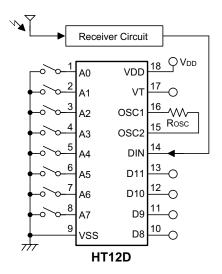


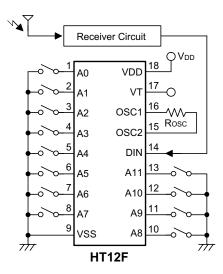
Note: The recommended oscillator frequency is f_{OSCD} (decoder) $\cong 50 \; f_{OSCE}$ (HT12E encoder) $\cong \frac{1}{3} \; f_{OSCE}$ (HT12A encoder).

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Application Circuits

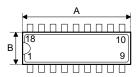


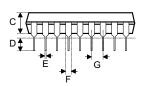




Package Information

18-pin DIP (300mil) outline dimensions



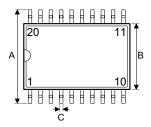


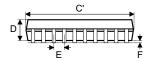


Cumhal	Dimensions in mil					
Symbol	Min.	Nom.	Max.			
Α	895	_	915			
В	240	_	260			
С	125	_	135			
D	125	_	145			
E	16	_	20			
F	50	_	70			
G	_	100	_			
Н	295	_	315			
1	335	_	375			
α	0°	_	15°			



20-pin SOP (300mil) outline dimensions





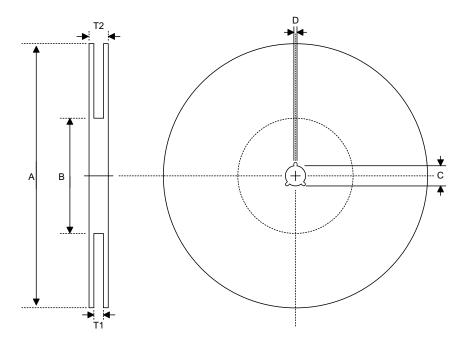


Symbol	Dimensions in mil					
Symbol	Min.	Nom.	Max.			
А	394	_	419			
В	290	_	300			
С	14	_	20			
C'	490	_	510			
D	92	_	104			
Е	_	50	_			
F	4	_	_			
G	32	_	38			
Н	4	_	12			
α	0°	_	10°			



Product Tape and Reel Specifications

Reel dimensions

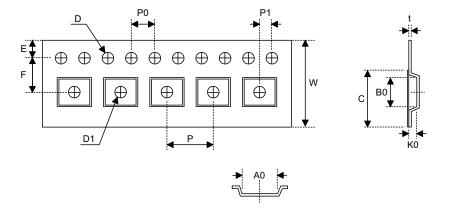


SOP 20W

Symbol	Description	Dimensions in mm
Α	Reel Outer Diameter	330±1.0
В	Reel Inner Diameter	62±1.5
С	Spindle Hole Diameter	13.0+0.5 -0.2
D	Key Slit Width	2.0±0.5
T1	Space Between Flange	24.8+0.3 -0.2
T2	Reel Thickness	30.2±0.2



Carrier tape dimensions



SOP 20W

Symbol	Description	Dimensions in mm
w	Carrier Tape Width	24.0+0.3 -0.1
Р	Cavity Pitch	12.0±0.1
E	Perforation Position	1.75±0.1
F	Cavity to Perforation (Width Direction)	11.5±0.1
D	Perforation Diameter	1.5+0.1
D1	Cavity Hole Diameter	1.5+0.25
P0	Perforation Pitch	4.0±0.1
P1	Cavity to Perforation (Length Direction)	2.0±0.1
A0	Cavity Length	10.8±0.1
В0	Cavity Width	13.3±0.1
K0	Cavity Depth	3.2±0.1
t	Carrier Tape Thickness	0.3±0.05
С	Cover Tape Width	21.3



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