# HT12A/HT12E
# $2^{12}$ Series of Encoders

## Features

- Operating voltage
  - 2.4V~5V for the HT12A
  - 2.4V~12V for the HT12E
- Low power and high noise immunity CMOS technology
- Low standby current: 0.1μA (typ.) at $V_{DD}$=5V
- HT12A with a 38kHz carrier for infrared transmission medium
- Minimum transmission word
  - Four words for the HT12E
  - One word for the HT12A
- Built-in oscillator needs only 5% resistor
- Data code has positive polarity
- Minimal external components
- HT12A/E: 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

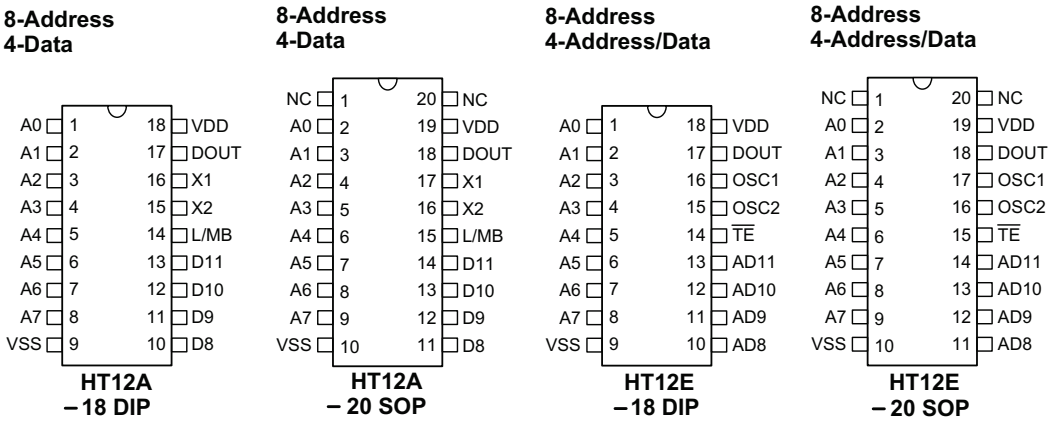
The $2^{12}$ encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12–N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a $\overline{TE}$ trigger on the HT12E or a DATA trigger on the HT12A further enhances the application flexibility of the $2^{12}$ series of encoders. The HT12A additionally provides a 38kHz carrier for infrared systems.

## Selection Table

| Function / Part No. | Address No. | Address/ Data No. | Data No. | Oscillator | Trigger | Package | Carrier Output | Negative Polarity |
|---|---|---|---|---|---|---|---|---|
| HT12A | 8 | 0 | 4 | 455kHz resonator | D8~D11 | 18 DIP<br>20 SOP | 38kHz | No |
| HT12E | 8 | 4 | 0 | RC oscillator | $\overline{TE}$ | 18 DIP<br>20 SOP | No | No |

Note: Address/Data represents pins that can be address or data according to the decoder requirement.

## Pin Assignment



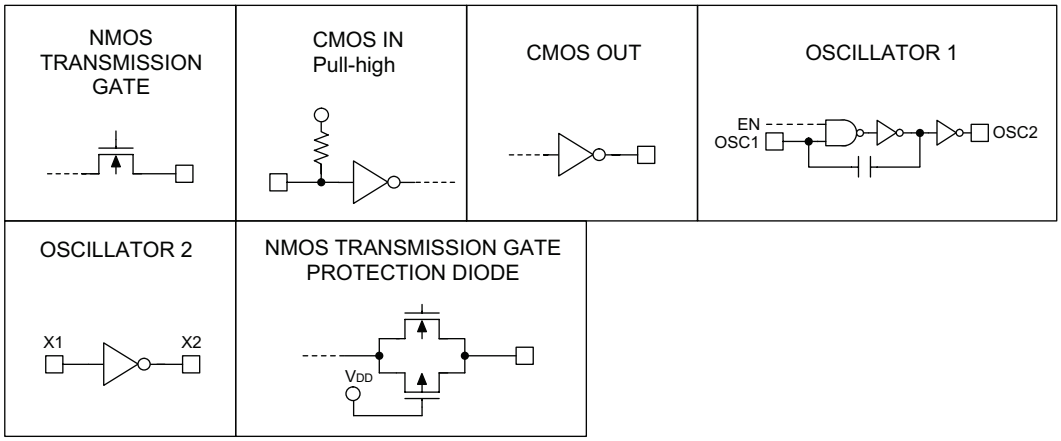

## Pin Description

| Pin Name | I/O | Internal Connection | Description |
|---|---|---|---|
| A0~A7 | I | CMOS IN<br>Pull-high<br>(HT12A)<br>NMOS<br>TRANSMISSION<br>GATE<br>PROTECTION<br>DIODE<br>(HT12E) | Input pins for address A0~A7 setting<br>These pins can be externally set to VSS or left open |
| AD8~AD11 | I | NMOS<br>TRANSMISSION<br>GATE<br>PROTECTION<br>DIODE<br>(HT12E) | Input pins for address/data AD8~AD11 setting<br>These pins can be externally set to VSS or left open |
| D8~D11 | I | CMOS IN<br>Pull-high | Input pins for data D8~D11 setting and transmission enable, active low<br>These pins should be externally set to VSS or left open (see Note) |
| DOUT | O | CMOS OUT | Encoder data serial transmission output |
| L/MB | I | CMOS IN<br>Pull-high | Latch/Momentary transmission format selection pin:<br>Latch: Floating or VDD<br>Momentary: VSS |

| Pin Name | I/O | Internal Connection | Description |
|---|---|---|---|
| $\overline{TE}$ | I | CMOS IN Pull-high | Transmission enable, active low (see Note) |
| OSC1 | I | OSCILLATOR 1 | Oscillator input pin |
| OSC2 | O | OSCILLATOR 1 | Oscillator output pin |
| X1 | I | OSCILLATOR 2 | 455kHz resonator oscillator input |
| X2 | O | OSCILLATOR 2 | 455kHz resonator oscillator output |
| VSS | I | — | Negative power supply, grounds |
| VDD | I | — | Positive power supply |

Note: D8~D11 are all data input and transmission enable pins of the HT12A.
$\overline{TE}$ is a transmission enable pin of the HT12E.

**Approximate internal connections**




## Absolute Maximum Ratings

Supply Voltage (HT12A) .....–0.3V to 5.5V
Input Voltage.....$V_{SS}$–0.3 to $V_{DD}$+0.3V
Operating Temperature.....–20°C to 75°C
Supply Voltage (HT12E) .....–0.3V to 13V
Storage Temperature.....–50°C to 125°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

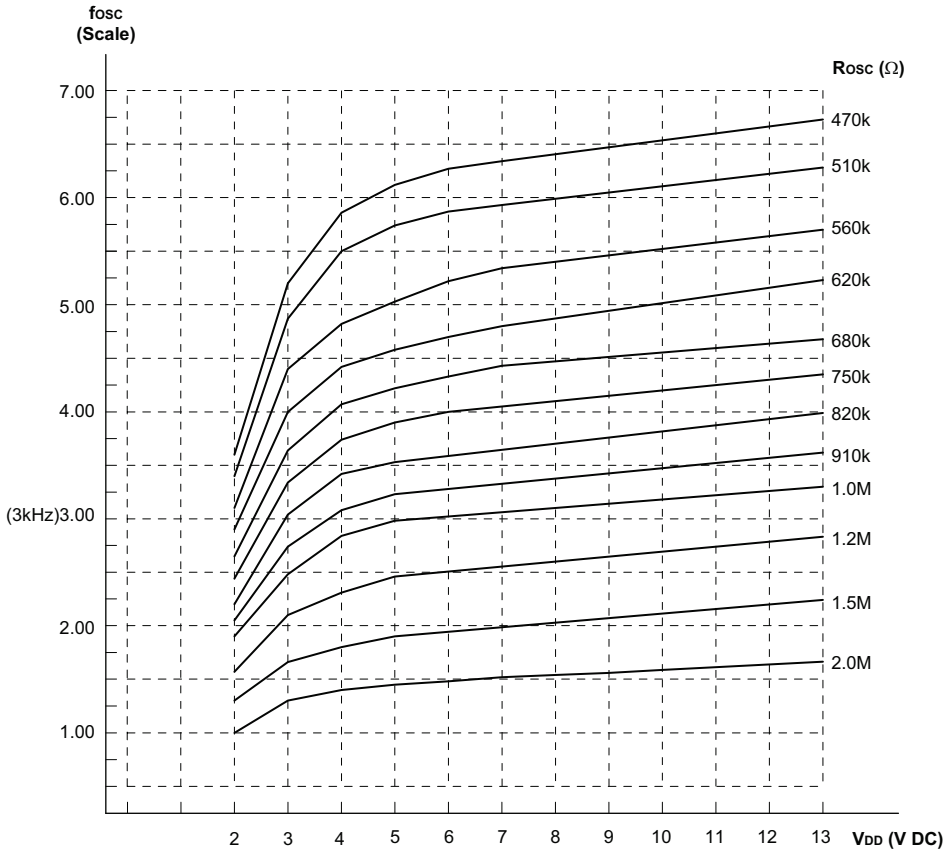
**HT12A** Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{DD}$ | Conditions | | | | |
| $V_{DD}$ | Operating Voltage | — | — | 2.4 | 3 | 5 | V |
| $I_{STB}$ | Standby Current | 3V | Oscillator stops | — | 0.1 | 1 | μA |
| | | 5V | | — | 0.1 | 1 | μA |
| $I_{DD}$ | Operating Current | 3V | No load $f_{OSC}$=455kHz | — | 200 | 400 | μA |
| | | 5V | | — | 400 | 800 | μA |
| $I_{DOUT}$ | Output Drive Current | 5V | $V_{OH}$=0.9$V_{DD}$ (Source) | –1 | –1.6 | — | mA |
| | | | $V_{OL}$=0.1$V_{DD}$ (Sink) | 2 | 3.2 | — | mA |
| $V_{IH}$ | "H" Input Voltage | — | — | 0.8$V_{DD}$ | — | $V_{DD}$ | V |
| $V_{IL}$ | "L" Input Voltage | — | — | 0 | — | 0.2$V_{DD}$ | V |
| $R_{DATA}$ | D8~D11 Pull-high Resistance | 5V | $V_{DATA}$=0V | — | 150 | 300 | kΩ |

**HT12E** Ta=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 | 3V | Oscillator stops | — | 0.1 | 1 | μA |
| | | 12V | | — | 2 | 4 | μA |
| $I_{DD}$ | Operating Current | 3V | No load $f_{OSC}$=3kHz | — | 40 | 80 | μA |
| | | 12V | | — | 150 | 300 | μA |
| $I_{DOUT}$ | Output Drive Current | 5V | $V_{OH}$=0.9$V_{DD}$ (Source) | –1 | –1.6 | — | mA |
| | | | $V_{OL}$=0.1$V_{DD}$ (Sink) | 1 | 1.6 | — | mA |
| $V_{IH}$ | "H" Input Voltage | — | — | 0.8$V_{DD}$ | — | $V_{DD}$ | V |
| $V_{IL}$ | "L" Input Voltage | — | — | 0 | — | 0.2$V_{DD}$ | V |
| $f_{OSC}$ | Oscillator Frequency | 5V | $R_{OSC}$=1.1MΩ | — | 3 | — | kHz |
| $R_{\overline{TE}}$ | $\overline{TE}$ Pull-high Resistance | 5V | $V_{\overline{TE}}$=0V | — | 1.5 | 3 | MΩ |

**Oscillator frequency vs supply voltage**




The recommended oscillator frequency is $f_{OSCD}$ (decoder) $\cong 50\ f_{OSCE}$ (HT12E encoder)

$\cong \frac{1}{3} f_{OSCE}$ (HT12A encoder)