

## 3-Key 3D USB+PS/2 Mouse Controller

### Features

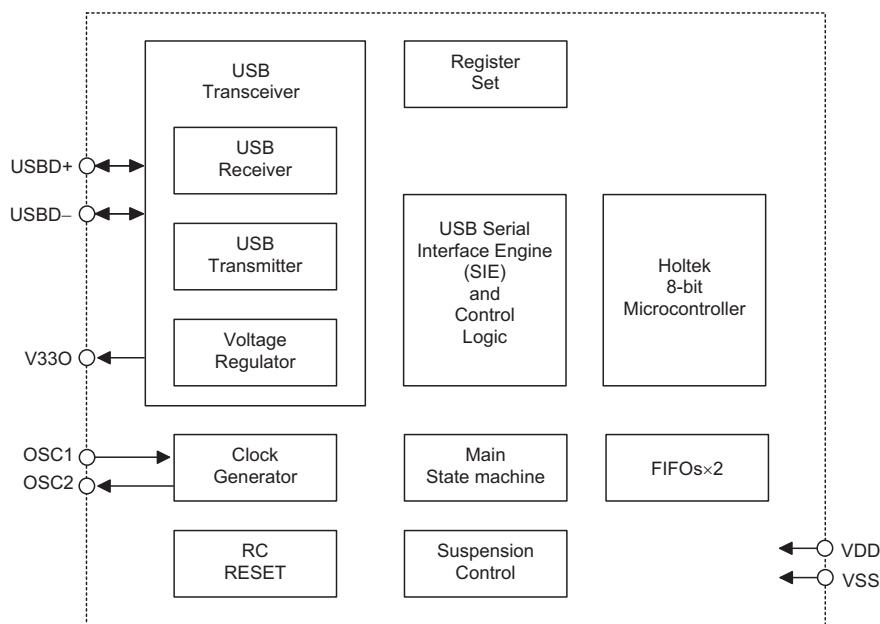
- Operating voltage: 4.4V~5.25V
- Complete Universal Serial Bus specs V1.1 compatibility
- Serial Bus Interface Engine (SIE)
- USB transceiver
- Microsoft 3D Intelli mouse and IBM PS/2 mouse compatible
- Supports three buttons (R, M, L) and three axes (X, Y, Z) input
- Z axis can only support encoder which divided by 2
- Single chip solution especially for USB mouse function
- HALT function and wake-up feature reduce power consumption
- Plug and Play functions
- Minimal external components
- 6MHz crystal oscillator for system clock
- 18/20-pin DIP package

### General Description

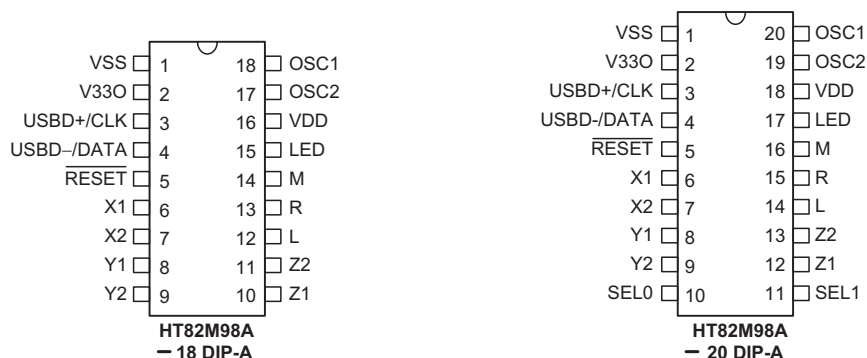
HT82M98A is a 3D mouse controller especially designed for USB and PS/2 applications. The HT82M98A can support the USB Standard Request as well as HID Class Request version 1.1. It is compatible with Microsoft Intelli 3D PS/2 mouse. The X/Y axis photo input with built-in Holtek's special dynamic photo-input resistor and Z axis can support two kinds of scroller input,

namely; optomechanical and mechanical. It requires minimal external components to implement 3D USB plus PS/2 mouse. It can be briefly described as a Holtek 8-bit MCU with an on-chip USB interface logic. The USB is specified by the *Universal Serial Bus Specification V1.1*.

### Block Diagram



## Pin Assignment



## Pin Description

| Pin Name                      | I/O | Description                                                                                                |
|-------------------------------|-----|------------------------------------------------------------------------------------------------------------|
| USB Interface (2 pins)        |     |                                                                                                            |
| USB+/CLK                      | I/O | USB data plus or PS2 Clock, F/W auto-detect USB+ for USB, CLK for PS2                                      |
| USB-/DATA                     | I/O | USB data minus or PS2 Data, F/W auto-detect USB- for USB, DATA for PS2                                     |
| General purpose I/O (11 pins) |     |                                                                                                            |
| X1, X2                        | I   | X-axis photo input with built-in Holtek's special dynamic photo input resistor                             |
| Y1, Y2                        | I   | Y-axis photo input with built-in Holtek's special dynamic photo input resistor                             |
| Z1, Z2                        | I   | Z-axis input supports two kinds of scroller input; optomechanical and mechanical                           |
| L, R, M                       | I   | Input ports with pull-high resistor. These pads can function as Left, Right and Middle button input lines. |
| SEL0*                         | I   | SEL0=1: 400DPI (default)                                                                                   |
| SEL1*                         | I   | SEL0=0: 800DIP                                                                                             |
|                               |     | SEL1=1: USB and PS2 combo (default)                                                                        |
|                               |     | SEL1=0: USB only                                                                                           |
| Miscellaneous (7 pins)        |     |                                                                                                            |
| VSS                           | —   | Negative power supply, ground                                                                              |
| V33O                          | O   | 3.3V voltage output                                                                                        |
| RESET                         | I   | Chip reset input, low active                                                                               |
| LED                           | I/O | Drives LED output                                                                                          |
| VDD                           | —   | 5V positive power supply                                                                                   |
| OSC2                          | O   | 6MHz OSC output                                                                                            |
| OSC1                          | I   | 6MHz OSC input                                                                                             |

Note: "\*" These functions are only available on date code '-4' version

## Absolute Maximum Ratings

|                         |                                 |                            |                                  |
|-------------------------|---------------------------------|----------------------------|----------------------------------|
| Supply Voltage .....    | $V_{SS}-0.3V$ to $V_{SS}+6V$    | Storage Temperature .....  | $-50^{\circ}C$ to $125^{\circ}C$ |
| MCU Input Voltage.....  | $V_{SS}-0.3V$ to $V_{DD}+0.3V$  | Operating Temperature..... | $-25^{\circ}C$ to $70^{\circ}C$  |
| USB Input Voltage ..... | $V_{SS}-0.3V$ to $V_{33O}+0.3V$ |                            |                                  |

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.

**D.C. Characteristics**

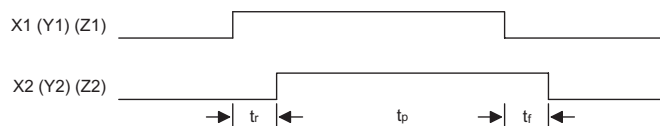
Ta=25°C

| Symbol           | Parameter                                        | Test Conditions |                                 | Min. | Typ. | Max. | Unit |
|------------------|--------------------------------------------------|-----------------|---------------------------------|------|------|------|------|
|                  |                                                  | V <sub>DD</sub> | Conditions                      |      |      |      |      |
| V <sub>DD</sub>  | Operating Voltage                                | —               | —                               | 4.4  | —    | 5.25 | V    |
| I <sub>DD</sub>  | Operating Current (Crystal OSC)                  | 5V              | No load, f <sub>sys</sub> =6MHz | —    | 10   | —    | mA   |
|                  |                                                  |                 | USB mode                        | —    | 3    | —    | mA   |
|                  |                                                  |                 | PS/2 mode                       | —    | 3    | —    | mA   |
| I <sub>STB</sub> | Standby Current                                  | 5V              | No load, system HALT            | —    | —    | 250  | μA   |
| V <sub>IL1</sub> | Input Low Voltage for I/O Ports                  | 5V              | —                               | 0    | —    | 1.0  | V    |
| V <sub>IH1</sub> | Input High Voltage for MCU I/O Ports             | 5V              | —                               | 3.5  | —    | 5    | V    |
| V <sub>IL2</sub> | Input Low Voltage (RESET)                        | 5V              | —                               | 0    | —    | 1.5  | V    |
| V <sub>IH2</sub> | Input High Voltage (RESET)                       | 5V              | —                               | 3.5  | —    | 5    | V    |
| V <sub>IH3</sub> | Input High Voltage for USB I/O Ports             | 3.3V            | —                               | 2.8  | —    | 3.6  | V    |
| V <sub>POR</sub> | Power on Reset V <sub>DD</sub> Detection Voltage | 5V              | —                               | 3.5  | —    | 3.9  | V    |
| I <sub>OL1</sub> | Output Port Sink Current                         | 5V              | V <sub>OL</sub> =0.5V           | —    | 4    | —    | mA   |
| I <sub>OH1</sub> | Output Port Source Current                       | 5V              | V <sub>OL</sub> =4.5V           | —    | -4   | —    | mA   |
| I <sub>OL2</sub> | Output Port Sink Current (LED)                   | 5V              | V <sub>OL</sub> =4.5V           | —    | 50   | —    | mA   |
| R <sub>PH</sub>  | Pull-high Resistance for RESET                   | 5V              | —                               | 50   | 100  | 150  | kΩ   |

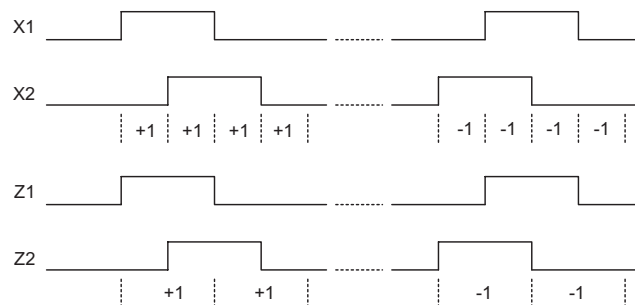
**A.C. Characteristics**

Ta=25°C

| Symbol           | Parameter                         | Test Conditions |                               | Min. | Typ. | Max. | Unit             |
|------------------|-----------------------------------|-----------------|-------------------------------|------|------|------|------------------|
|                  |                                   | V <sub>DD</sub> | Conditions                    |      |      |      |                  |
| f <sub>sys</sub> | System Clock (Crystal OSC)        | 5V              | —                             | 0    | 6000 | —    | kHz              |
| t <sub>OST</sub> | Oscillation Start-up Timer Period | —               | Power-up or wake-up form HALT | —    | 1024 | —    | t <sub>sys</sub> |

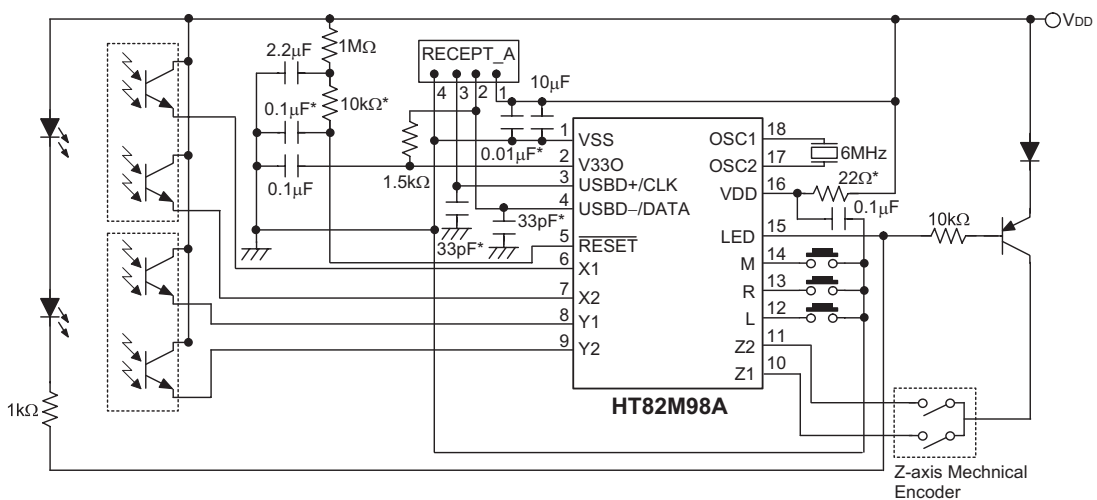
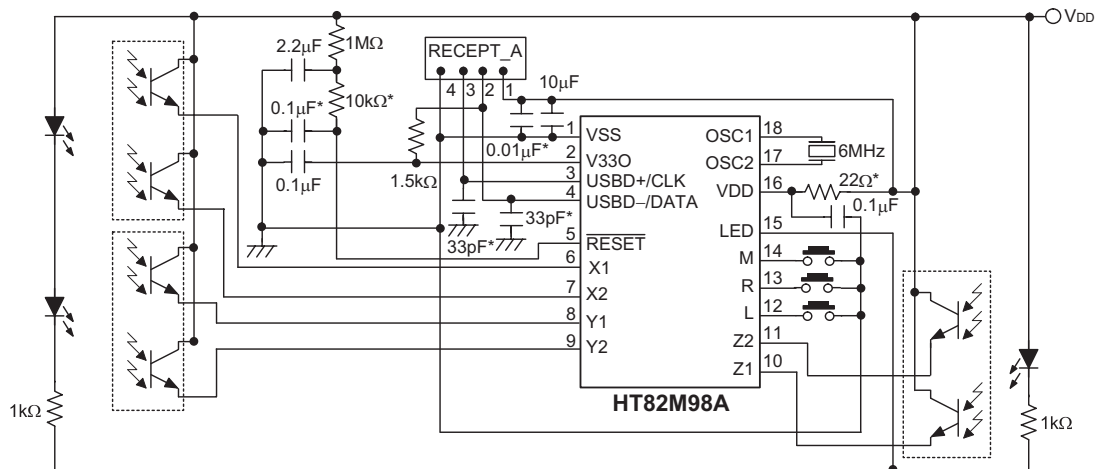
Note: t<sub>sys</sub>=1/f<sub>sys</sub>
**Timing Diagram**
**X, Y Axis Photo-Coupler Crossed Width**


Note: For X, Y-axis tr, tp, tr > 30μs  
For Z-axis tr, tp, tr > 2.5ms

**X, Y, Z Axis Counting**


## Application Circuits

This Application Circuit is for Reference Only



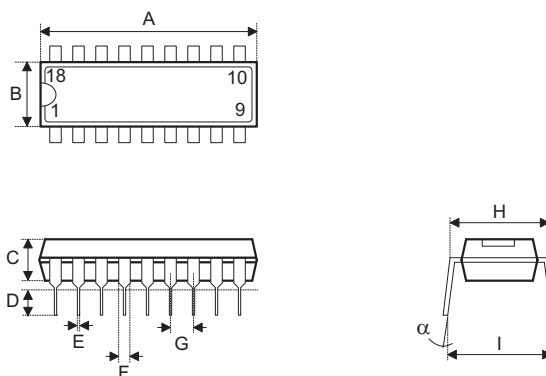
Note: Layout 0.1μF capacitor, 22Ω resistor and 0.01μF capacitor as close to VDD pin as possible.

Layout power plane and ground plane as large as possible.

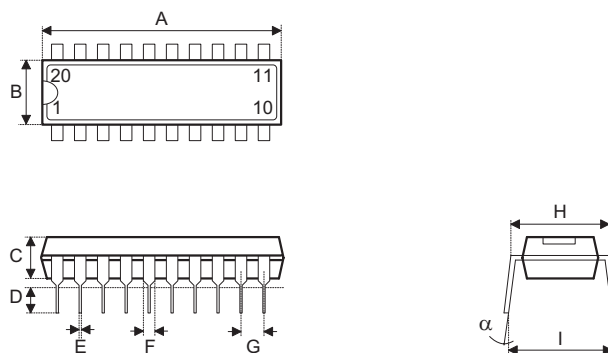
Place 0.1μF capacitor as close to RESET pin as possible.

Place 6MHz crystal as close to OSC1 and OSC2 pins as possible.

Components with \* are used for EMC issue.

**Package Information**
**18-pin DIP (300mil) Outline Dimensions**


| Symbol   | Dimensions in mil |      |      |
|----------|-------------------|------|------|
|          | Min.              | Nom. | Max. |
| A        | 895               | —    | 915  |
| B        | 240               | —    | 260  |
| C        | 125               | —    | 135  |
| D        | 125               | —    | 145  |
| E        | 16                | —    | 20   |
| F        | 50                | —    | 70   |
| G        | —                 | 100  | —    |
| H        | 295               | —    | 315  |
| I        | 335               | —    | 375  |
| $\alpha$ | 0°                | —    | 15°  |

**20-pin DIP (300mil) Outline Dimensions**


| Symbol   | Dimensions in mil |      |      |
|----------|-------------------|------|------|
|          | Min.              | Nom. | Max. |
| A        | 1020              | —    | 1045 |
| B        | 240               | —    | 260  |
| C        | 125               | —    | 135  |
| D        | 125               | —    | 145  |
| E        | 16                | —    | 20   |
| F        | 50                | —    | 70   |
| G        | —                 | 100  | —    |
| H        | 295               | —    | 315  |
| I        | 335               | —    | 375  |
| $\alpha$ | 0°                | —    | 15°  |

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