

3/5-Key 3D PS/2 Optical Mouse Controller

Feature

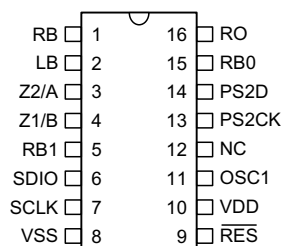
- Operating voltage: 4.0V~5.5V
- Microsoft Intelli 3D PS/2 and IBM PS/2 mouse compatible
- Microsoft Windows 2000 and 5-button Wheel mouse compatible
- Z-axis can support three kinds of scroller input divided by 2 or 4 (only for H2610 and H2620)
- Supports 400 or 800 DPI for H2051
- Serial interface with H2051, H2610, H2620
- Auto detect as to which photo sensor is used
- 2MHz RC oscillator for system frequency with external pull-high resistor (140kΩ)
- 16/18-pin DIP package

General Description

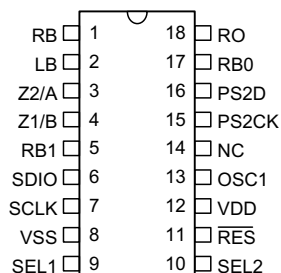
The HT82M30A is designed as 2D, 3D 3/5-key PS/2 optical mouse controller. These have serial interface to access the Agilent sensor H2051, H2610, H2620 or the

same compatible series sensor. Refer to the datasheets for detailed register descriptions of the Agilent sensors.

Pin Assignment



**HT82M30A
- 16 DIP-A**



**HT82M30A
- 18 DIP-A**

Pin Description

Pin Name	I/O	Description
RB, RO, LB	I	Right Button: Normal pull-high resistor (30k Ω) Rolling Button: Normal pull-high resistor (30k Ω) Left Button: Normal pull-high resistor (30k Ω)
Z2/A, Z1/B	I	"Z" axis input supports three kinds of scroller input Normal pull-high resistor (30k Ω)
RB1, RB0	I	Input ports with 30k Ω pull-high resistor
SDIO	I/O	Serial data for Agilent sensor IC SDIO
SCLK	O	Serial data for Agilent sensor IC SCLK
VSS	—	Negative power supply, ground
SEL1, SEL2	I	For configuring the H2051 400 or 800 DPI, and the Z-axis type (divided by 2 or 4) For H2051 SEL1=1 800 DPI (default) SEL1=0 400 DPI SEL2=1 Z-axis is divided by 2 (default) SEL2=0 Z-axis is divided by 4 For H2610 or H2620 [SEL1, SEL2]={0,0} Z-axis divided by 4 [SEL1, SEL2]={0,1} Z-axis divided by 4 [SEL1, SEL2]={1,1} Z-axis divided by 2 (default)
$\overline{\text{RES}}$	I	Chip reset input, Low active
VDD	—	5V positive power supply
OSCI	I	2MHz RC oscillator for system frequency with external pull-high resistor (140k Ω)
NC	—	No connection
PS2CK	I/O	PS/2 mouse CLK line
PS2D	I/O	PS/2 mouse data line

Absolute Maximum Ratings

Supply Voltage	$V_{SS}-0.3V$ to $V_{SS}+6.0V$	Storage Temperature	-50°C to 125°C
Input Voltage	$V_{SS}-0.3V$ to $V_{SS}+6.0V$	Operating Temperature	-40°C to 85°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.

D.C. Characteristics

Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{DD}	Operating Voltage	—	f _{SYS} =2MHz	4.0	5.0	5.5	V
I _{DD}	Operating Current	5V	No load, f _{SYS} =2MHz	—	2.5	4	mA
V _{IL1}	Input Low Voltage for RB, LB, RO, Z1, Z2, RB1, RB0, SDIO, SEL1, SEL2, PS2CK and PS2D	—	—	0	—	0.3V _{DD}	V
V _{IH1}	Input High Voltage for RB, LB, RO, Z1, Z2, RB1, RB0, SDIO, SEL1, SEL2, PS2CK and PS2D	—	—	0.7V _{DD}	—	V _{DD}	V
V _{IL2}	Input Low Voltage for $\overline{\text{RES}}$	—	—	0	—	0.4V _{DD}	V
V _{IH2}	Input High Voltage for $\overline{\text{RES}}$	—	—	0.9V _{DD}	—	V _{DD}	V
I _{OL}	I/O Port Sink Current	5V	V _{OL} =0.1V _{DD}	10	20	—	mA
I _{OH}	I/O Port Source Current	5V	V _{OL} =0.9V _{DD}	–2	–4	—	mA
R _{PH}	Pull-high Resistance for RB, LB, RO, Z1, Z2, RB1, RB0, SDIO, SEL1, SEL2, PS2CK and PS2D	5V	—	10	30	50	kΩ

A.C. Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
t _{WDTOSC}	Watchdog Oscillator Period	5V	—	32	65	130	μs
t _{WDT1}	Watchdog Time-out Period	5V	Without WDT prescaler	8	17	33	ms
t _{RES}	External Reset Low Pulse Width	—	—	1	—	—	μs

Functional Description

PS/2 Mouse

- PS/2 status byte

Byte 1
bit

7: Reserved

6: 0=Stream Mode, 1=Remote Mode

5: 0=Disabled, 1=Enabled

4: 0=Scaling 1:1, 1=Scaling 2:1

3: 1=Wrap Mode, 0=Stream or Remote
(different from IBM specs.)

2: 1=Left Button Pressed

1: 1=Middle Button Pressed

0: 1=Right Button Pressed

Byte 2

Bit 0~7 current resolution setting
(Bit 0=LSB)

Byte 3

Bit 0~7 current sampling rate (Bit 0=LSB)

- Standard PS/2 data format

Variable rps, 0, 8, 1, bidirectional, synchronous

Bit No.	7	6	5	4	3	2	1	0
1st word	YV	XV	YS	XS	1	MB	RO	LB
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

- Data format for 3D PS/2

Variable rps, 0, 8, 1, bidirectional, synchronous

Bit No.	7	6	5	4	3	2	1	0
1st word	YV	XV	YS	XS	1	MB	RO	LB
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0

The x/y data report is 9-bit 2's complement

The z data report is 8-bit 2's complement

- Data format for 5-button Wheel Mouse

Bit No.	7	6	5	4	3	2	1	0
1st word	0	0	YS	XS	1	MB	RO	LB
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	0	0	RB1	RB0	Z3	Z2	Z1	Z0

X- movement towards the right is positive, moving towards the left is negative

Y- upward movement is positive, moving down is negative

Z- rolling towards the user is positive, else negative

Button status: 1=pressed, 0=released

- Mouse mode changes between Standard and 3D PS/2 mode

Sending the commands in the following sequence will set the mouse to 3D PS/2 mode.

Command Response From Mouse

F3h FAh

C8h FAh

F3h FAh

64h FAh

F3h FAh

50h FAh

F2h FAh, 03h

- Mouse mode changes between Standard and Win2K PS/2 mode.

Sending the commands in the following sequence will set the mouse to Win2K PS/2 mode.

Command Response From Mouse

F3h FAh

C8h FAh

F3h FAh

C8h FAh

F3h FAh

50h FAh

F2h FAh, 04h

- Any time the PC sends a reset "FFh" command to the mouse, it will reset the mouse to Standard PS/2 mode.

- After power-on reset is initiated, the mouse is set to Standard PS/2 mode.

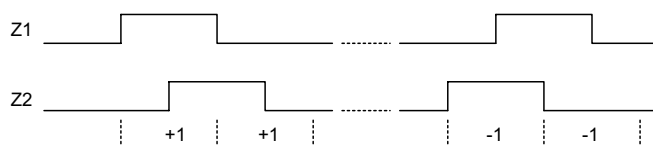
Timing Diagrams

Z-Axis Photo-coupler Cross Width



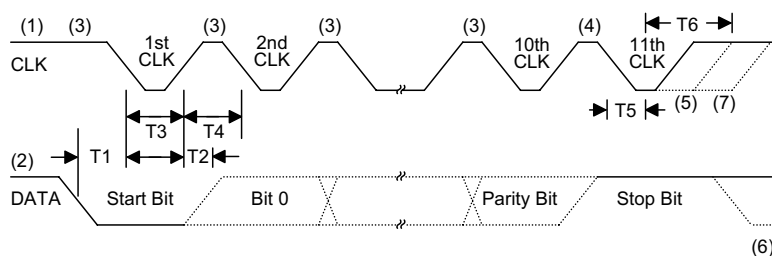
Note: For Z-axis $t_r, t_p, t_f > 1\text{ms}$

Z-Axis Counting



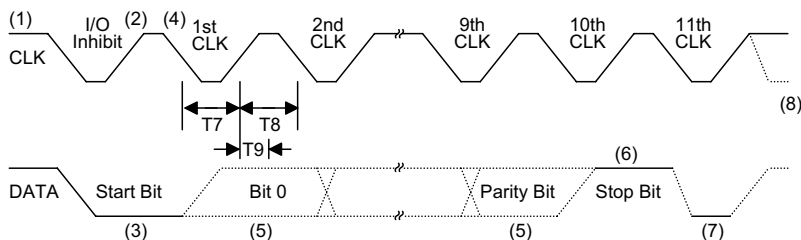
PS/2 Mouse

• Data output



Timing Parameter	Min./Max.
T1 DATA transition to the falling edge of CLK	5/25 μsec
T2 Rising edge of CLK to DATA transition	5/T4-5 μsec
T3 Inactive CLK Duration	30/50 μsec
T4 Active CLK Duration	30/50 μsec
T5 Minimum time to inhibit MOUSE after clock 11	>0 μsec
T6 Maximum time to inhibit MOUSE after clock 11 to ensure that the MOUSE does not start another transmission	<50 μsec

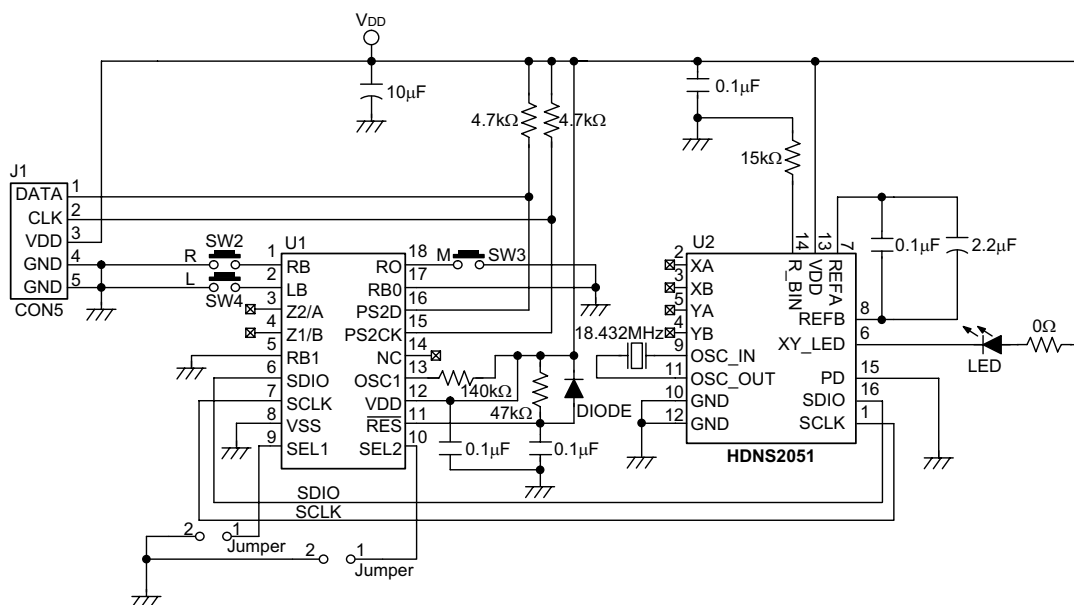
• Data input



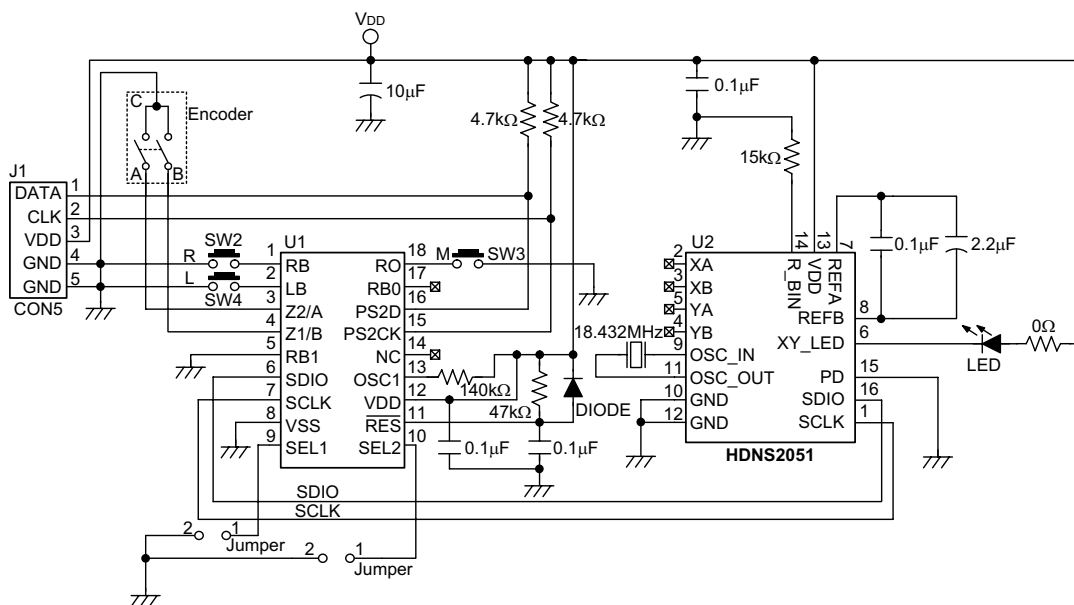
Timing Parameter	Min./Max.
T7 CLK Duration, low	30/50 μsec
T8 CLK Duration, high	30/50 μsec
T9 Time from low to high CLK transition to time when MOUSE samples DATA line	5/25 μsec

Application Circuits

2D PS/2 Optical Mouse Controller (H2051)

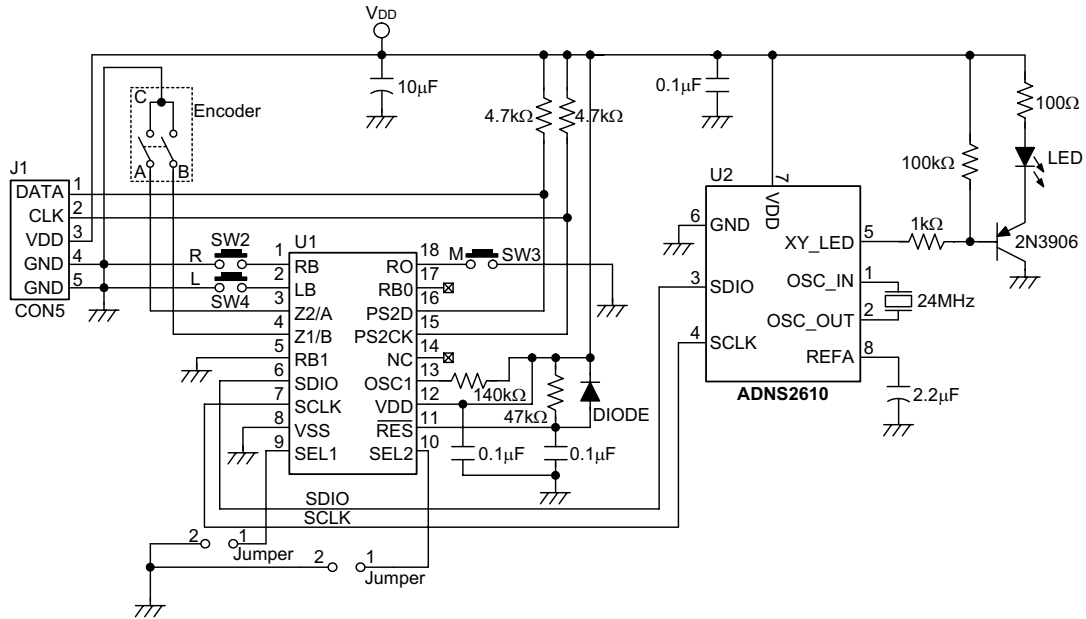


3D PS/2 Optical Mouse Controller (H2051)

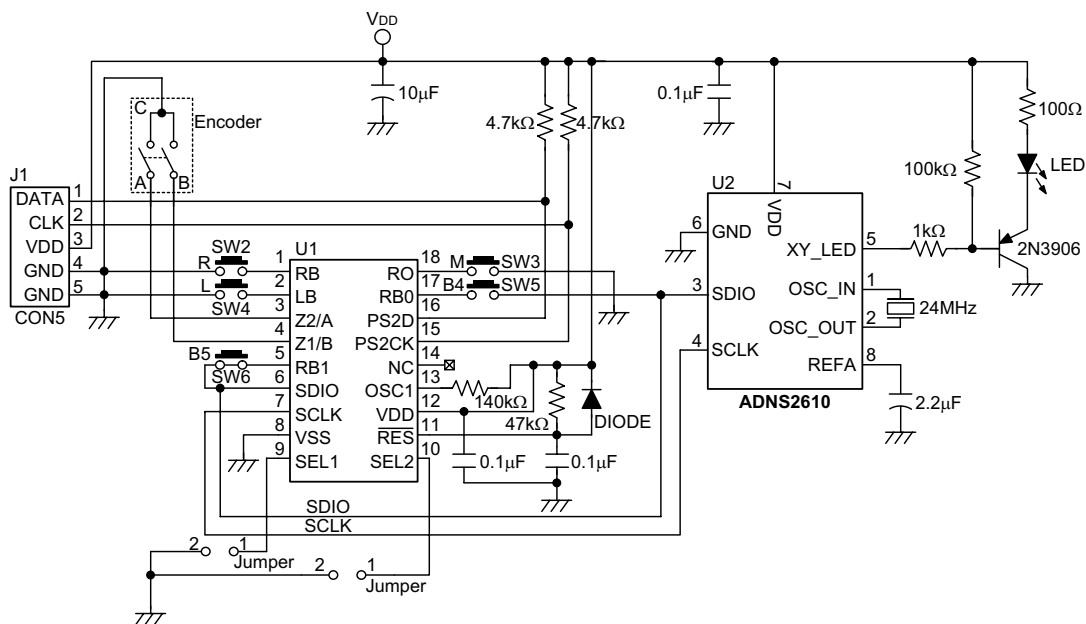


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3D PS/2 Optical Mouse Controller (H2610)



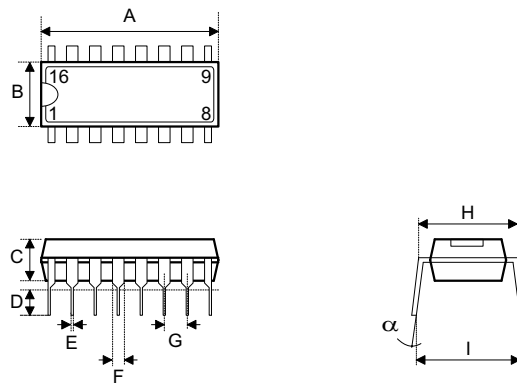
Win2K PS/2 Optical Mouse Controller (H2610)



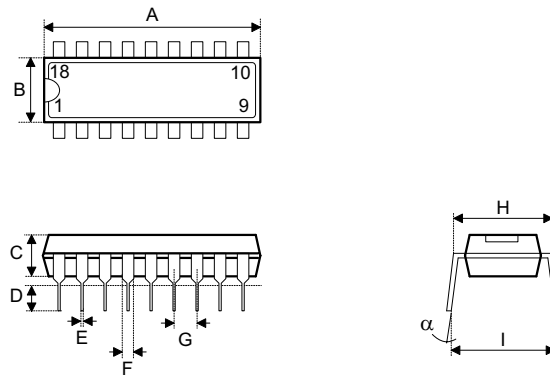
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August 4, 2004

Package Information
16-pin DIP (300mil) Outline Dimensions


Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	745	—	775
B	240	—	260
C	125	—	135
D	125	—	145
E	16	—	20
F	50	—	70
G	—	100	—
H	295	—	315
I	335	—	375
α	0°	—	15°

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
α	0°	—	15°

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