

1. General Description

The MDT80C04 is a Low Cost Scrolling Mouse Controller for PS/2 (3D,2D) only.

The auto resistance matching circuits are built in to prevent the adjustment in the resistance of photo-sensors during manufacture.

2. Features

- Compatible with IBM PS/2 mouse.
- Compatible with Microsoft PS/2 scrolling mouse.
- Internal Power-On reset (POR).
- Auto resistance matching circuit for X1 X2 Y1 Y2.
- Internal RC oscillation about 6.5MHz ~7.5MHz .
external resistor to adjust internal RC frequency
- Motion Detector Sample Rate 25KHZ.
- Three key-switches and six photo-couples inputs,
or three key-switches and one rotate switch inputs,
four photo-couples inputs.
- Low power dissipation.
- 2 type Z direction input.
 1. Photo couples input Z/2
 2. Mechanical input Z/2
- Cost Saving : 16 PIN DIP, 16 PIN SOP Package

3. Applications

2D/3D PS/2 scrolling mouse

4. Pin Assignment

MDT80C04A1P / MDT80C04A1S

X1	1	16	Z2
X2	2	15	Z1
Y1	3	14	CLK
Y2	4	13	DATA
Vdd	5	12	Vss
NC	6	11	L
OSCRH	7	10	M
OPT	8	9	R

MDT80C04A2P/MDT80C04A2S

Vdd	1	16	OSCRL
OPT	2	15	Y2
Z1	3	14	Y1
Z2	4	13	X2
CLK	5	12	X1
DATA	6	11	L
NC	7	10	M
Vss	8	9	R

5. Pin Function Description

Symbol	I/O	Function Description
X1 X2 Y1 Y2	I I I I	Connect to photo sensors for X,Y Motion detect.
V _{dd}		+5V
N/C		No connect
OSCRH	I	Connect a resistor to V _{dd} to adjust internal RC freq. for A1.
OSCRL	I	Connect a resistor to V _{ss} to adjust internal RC freq. for A2.
OPT	I	Input pin with 100K ohm pull-high. =1 3D mouse =0 2D mouse
R M L	I I I	Three Key-switches inputs. Internal 50K ohm pull-high for A1 and 50K pull-low. for A2
V _{ss}		Ground
DATA	I/O	Connect to 8042 auxiliary port DATA line in PS/2 mode. Internal 10K ohm pull high.
CLK	I/O	Connect to 8042 auxiliary port CLK line in PS/2 mode. Internal 10K ohm pull high.
Z1 Z2	I I	Z-axis input for Photo Sensor or Mechanical resistors.

6.Data Reporting

2D :

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit1	Bit0
Byte 1	Y ovfl	X ovfl	Y sign	X sign	1	Middle	Right	Left
Byte 2	X data							
Byte 3	Y data							

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3D :

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit1	Bit0
Byte 1	0	0	Y7	X7	1	Middle	Right	Left
Byte 2	X data							
Byte 3	Y data							
Byte 4	Z data							

7. PS/2 Mouse Commands:

The following table list the commands :

8042 send	Command	MDT80C04 echo
FF	Reset	FA, AA, 00
FE	Resend	XX, (XX, XX)
F6	Set Default	FA
F5	Disable	FA
F4	Enable	FA
F3, XX	Set Sampling Rate	FA, FA
F2	Read Device Type	FA, 00 or FA,03(Scrolling Mode)
F0	Set Remote Mode	FA
EE	Set Wrap Mode	FA
EC	Reset Wrap Mode	FA
EB	Read Data	FA, XX, XX, XX
EA	Set Stream Mode	FA
E9	Status Request	FA, XX, XX,XX
E8, XX	Set Resolution	FA,FA
E7	Set Auto-speed	FA
E6	Reset Auto-speed	FA

IN DETAIL:**(a). Reset (FF)**

The MDT80C04 reset to initial mode as power on and transmit FA, AA, 00 to system 8042. Then set default states as below :

sampling rate : 100 reports/s
 2 dots/count
 non-autospeed
 stream mode
 disable

(b). Resend (FE)

a. When MDT80C04 receives an invalid command, it returns a Resend code to the system.

b. If MDT80C04 receives a Resend command, it's last packet of data will send again to the system.

(c). Set Default (F6)

Initializes mouse conditions to the power-on default states.

(d). Disable(F5)

To disable mouse transmissions to system.

(e). Enable (F4)

To enable mouse transmissions to system if in stream mode.

(f). Set Sampling Rate (F3, XX)

Sets the sampling rate as described below

Second byte XX	Sample Rate
C8	200/sec
64	100/sec
50	80/sec
3C	60/sec
28	40/sec
14	20/sec
0A	10/sec

(g). Read Device Type (F2)

MDT80C04 send ' ' FA, 00' ' for standard mouse.

(h). Set Remote Mode (F0)

Set reports only in response to system Read Data(EB) command.

(i) . Set Wrap Mode (EE)

The mouse resend the data sent by system

IF Reset (FF) or Reset Wrap Mode (EC) is received wrap mode will be terminated.

(j). Reset Wrap Mode (EC)

Set mouse to the previous mode

(k). Read Data (EB)

Send mouse data in any mode.

(l). Set Stream Mode (EA)

Set mouse in stream mode .

The report rate is set by F3 command.

(m). Status Request (E9)

The mouse return the status to system with 3-byte status report

Byte1:

Bit	Description
0	1=Right button pressed
1	1=Middle button pressed
2	1=Left button pressed
3	Reserved
4	0=Normal speed, 1=Autospeed
5	0=Disabled, 1=Enabled
6	0=Stream mode, 1=Remote mode
7	Reserved

Byte2: Current resolution setting (D0-D7)

Byte3: Current sampling rate (D0-D7)

(n) Set Resolution (E8, XX)

Resolution is set as follows :

Second Byte XX	Resolution
00	8 dots/count
01	4 dots/count
02	2 dots/count
03	1 dots/count

(o) Set Auto speed (E7)

Not supported. The MDT80C04 just responses FA

(p). Reset Autospeed (E6)

Not supported. The MDT80C04 just responses FA

() . Microsoft PS/2 scrolling mouse mode :

(a) When MDT80C04 received the following consecutive command.

- i. F3 C8 ----set report rate 200/sec
- ii. F3 64 ----set report rate 100/sec
- iii. F3 50 ----set report rate 80/sec

Then it will enter the INTEL I Scrolling mode

(b) The mouse will return FA 03 to read device type command (F2).

(c) Data report will be four bytes format.

(d) The mouse will exit the Microsoft PS/2 scrolling mode only if power off or a reset command(FF) is received.

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().Z-axis Input Function :

- (a). Photo couples input
- (b). Mechanical switches

8. Electrical Characteristics ($T_A=0$ to 70)

Absolute Maximum Ratings

Parameter	Ratings		Unit
	Min.	Max.	
Temperature under bias	-40	85	
Storage temperature range	-65	150	
Supply voltage	-0.6	6.5	Volt

DC Electrical Characteristics

Parameters	Sym.	Min.	Typ.	Max.	Unit
X1,X2,Y1,Y2 pull low resistor	Rlo	10K		55K	ohm
L,M,R,Z1,Z2 (key mode) input voltage	Vai		1.27		V
Z1,Z2 (voltage mode) Sensitivity	Vs	-0.4		+0.4	V
L,M,R,Z1,Z2 input leakage current ($V_{in}=0V$)	Iil			-1.0	μA
L,M,R,Z1,Z2 input leakage current ($V_{in}=5V$)	Iih			1.0	μA

PS/2 mouse mode

Parameters	Sym.	Min.	Typ.	Max.	Unit
Operating voltage	V_{DD}	4.5	5.0	5.5	V
Operating current (no load)	I_{OP}	0.8	0.9	1.0	mA
CLK, DATA Threshold voltage	V_t	0.9	1.25	1.6	V
DATA, CLK Input low current (Pull Hi)	V_t	0.9	1.2	1.5	mA
DATA, CLK ($I_{L1}=4mA$) Low output voltage	V_{L1}	-	0.1	-	V
DATA, CLK ($I_{L2}=8mA$) Low output voltage	V_{L2}	-	0.2	-	V

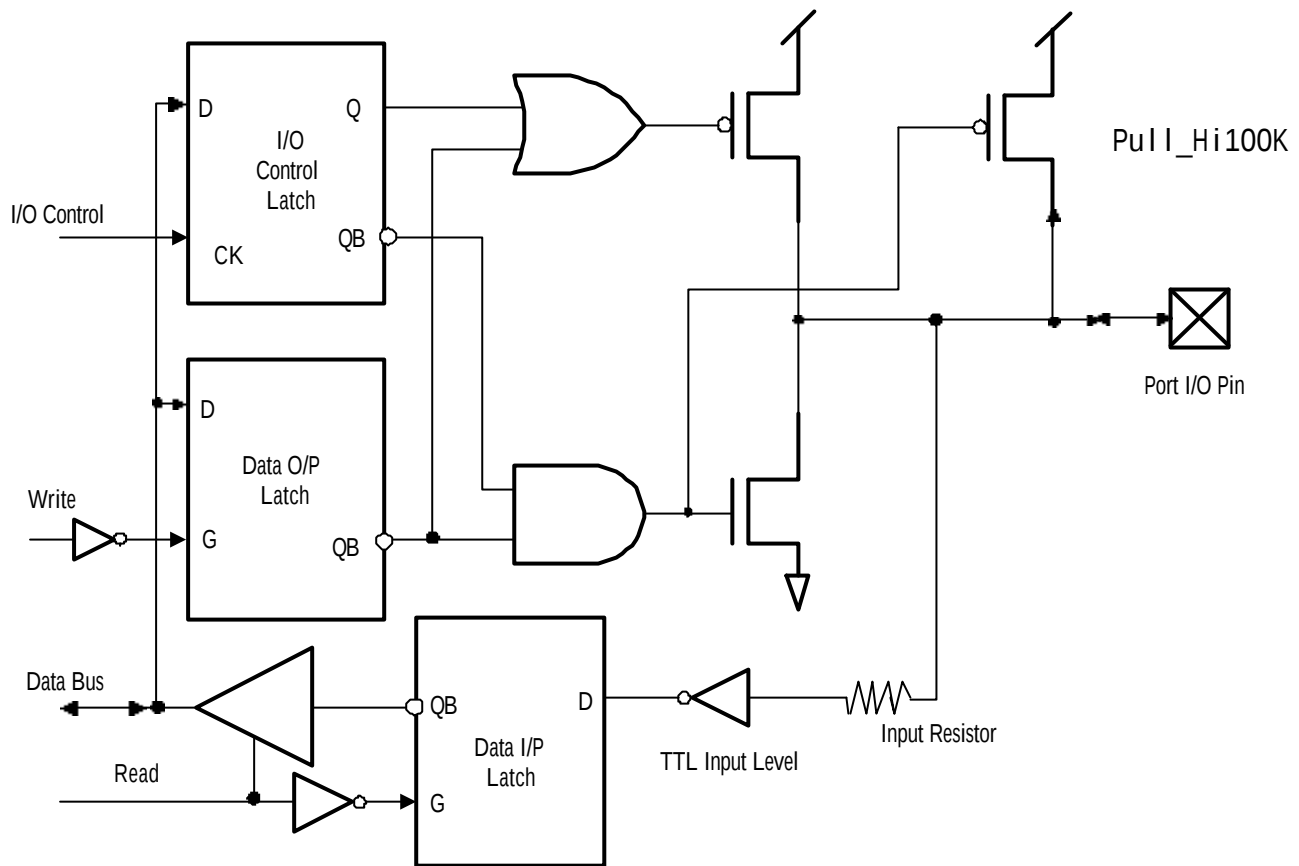
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AC Electrical Characteristics

Parameters	Sym.	Min.	Typ.	Max.	Unit
Oscillating Frequency	Fosc	6.5	7	7.5	MHz
Rising Edge Crossed Width	Tr	-	15	-	ns
Falling Edge Crossed Width	Tf	-	10	-	ns
Mouse CLK high period Time	Tmh	-	45	-	ns
Mouse CLK low period Time	Tml	-	45	-	ns
System CLK high period Time	Tsh	-	45	-	ns
System CLK low period Time	Tsl	-	45	-	ns
Time that Mouse Sample DATA from CLK rising Edge	Tmdc	-	20	-	ns
Time from DATA Transition to Falling Edge of CLK	Tsdc	-	22	-	ns
Time from rising Edge of CLK to DATA Transition	Tscd	-	26	-	ns
Time to mouse Inhibit after the 11 th CLK to ensure mouse does not start another Transmission	Tpi	0	-	72	ns

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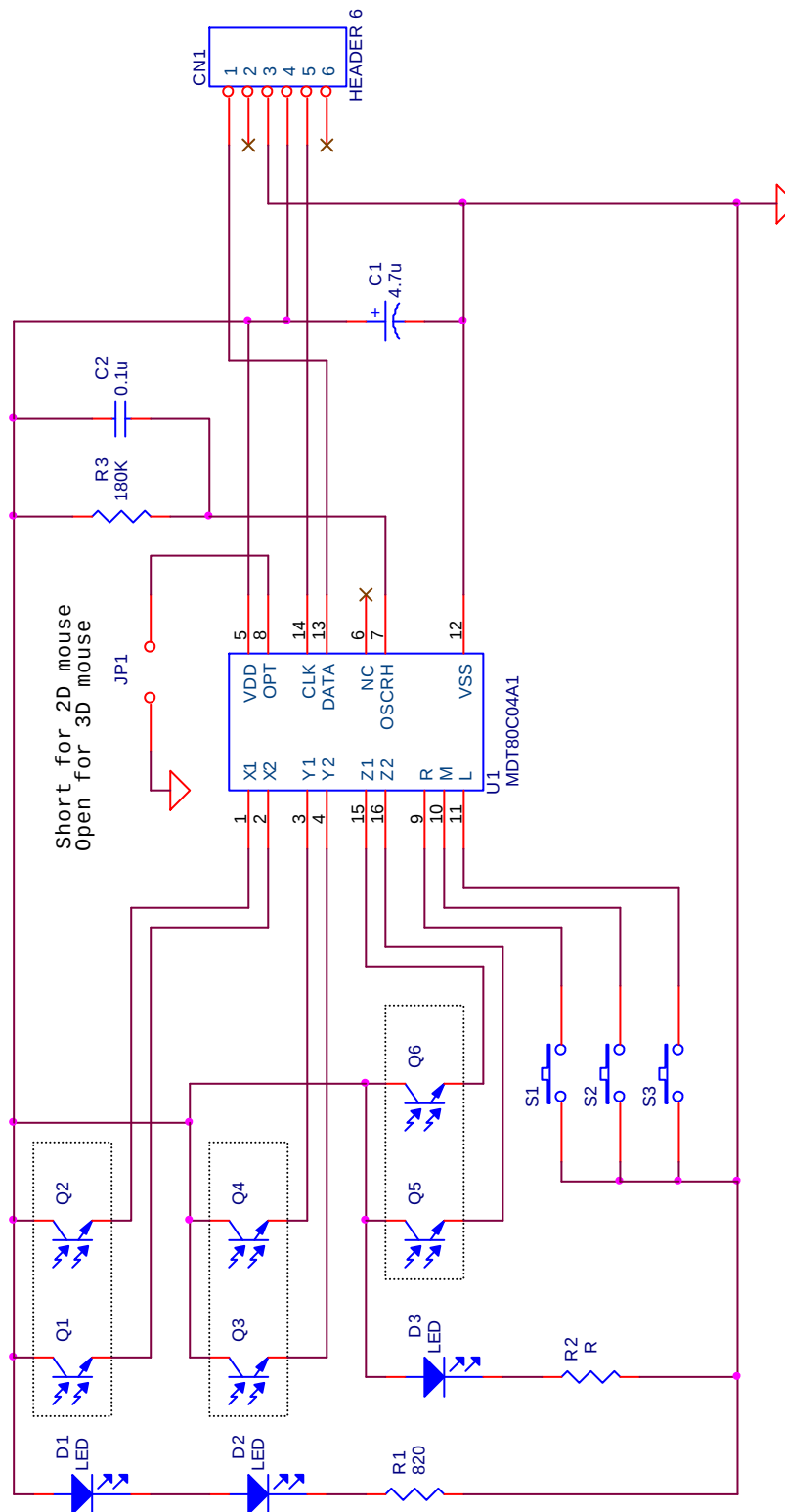
9. OPT Equivalent Circuit



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10. Application circuit

10.1 MDT80C04A1:

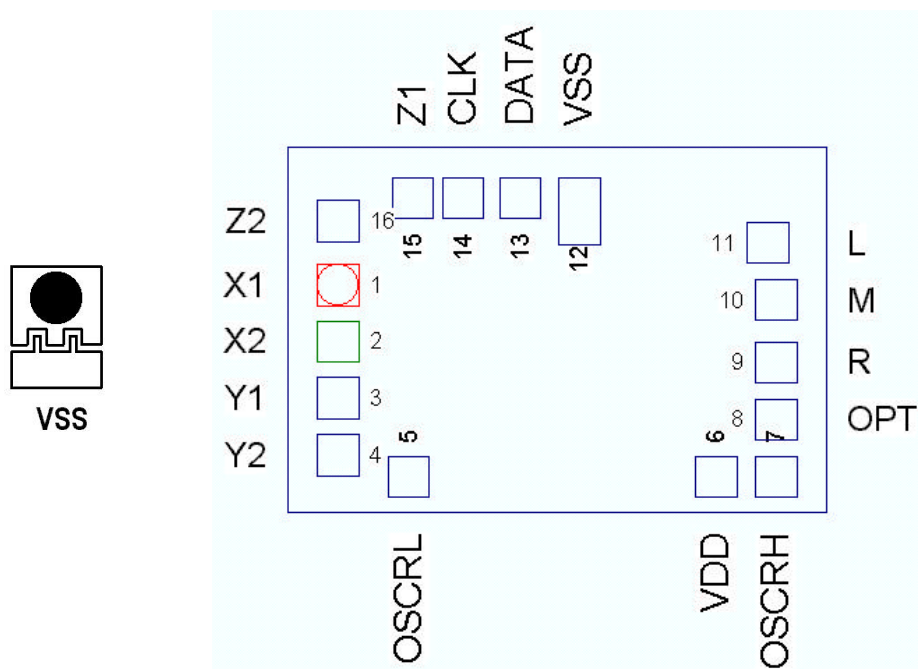


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11. Pad Diagram

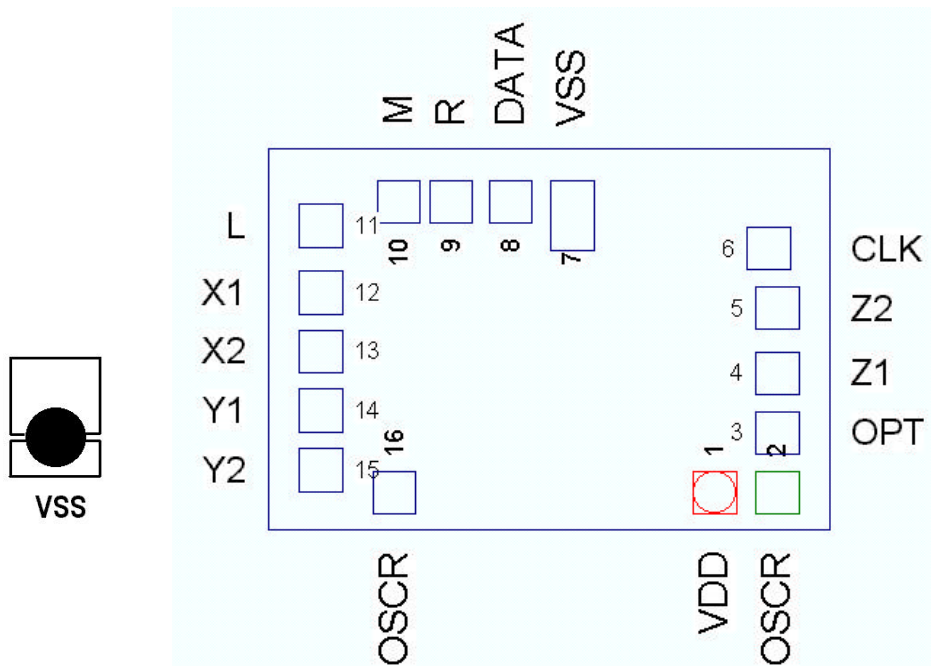
11.1 MDT80C04A1:



MAIN PATTERN SIZE : 1180.000 × 800.000

PAD-No	PAD-Name	X	Y	Remark
1	X1	110.00	498.50	
2	X2	110.00	373.50	
3	Y1	110.00	248.50	
4	Y2	110.00	123.50	
5	OSCRL	264.40	76.50	No use
6	VDD	938.50	76.50	
7	OSCRH	1070.00	76.50	
8	OPT	1070.00	201.50	
9	R	1070.00	326.50	
10	M	1070.00	466.50	
11	L	1052.00	591.50	
12	VSS	640.00	660.50	
13	Data	507.50	690.00	
14	CLK	382.50	690.00	
15	Z1	272.50	690.00	
16	Z2	110.00	638.50	

11.2 MDT80C04A2:



MAIN PATTERN SIZE : 1180.000 × 800.000

PAD-No	PAD-Name	X	Y	
1	VDD	938.50	76.50	
2	OSCRH	1070.00	76.50	No use
3	OPT	1070.00	201.50	
4	Z1	1070.00	326.50	
5	Z2	1070.00	466.50	
6	CLK	1052.00	591.50	
7	VSS	640.00	660.50	
8	Data	507.50	690.00	
9	R	382.50	690.00	
10	M	272.50	690.00	
11	L	110.00	638.50	
12	X1	110.00	498.50	
13	X2	110.00	373.50	
14	Y1	110.00	248.50	
15	Y2	110.00	123.50	
16	OSCRL	264.40	76.50	