

MDT80C06

PS2 optical 2D/3D, 3/5 key mouse controller

1. General Description

The MDT80C06 is a Low Cost Optical Mouse Controller for PS/2 (2D/3D, 3/5 Key) only. Work with low cost Agilent ADNS-2610, ADNS-2620, ADNS-2051 or PixArt PAN101B optical mouse sensor.

2. Features

- Compatible with IBM PS/2 mouse.
- Compatible with Microsoft PS/2 scrolling mouse.
- Compatible with Microsoft Windows 2000 and 5-button mouse.
- Internal Power-On reset (POR).
- Working with Agilent ADNS-2610, ADNS-2620, ADNS-2051 or PixArt PAN101B optical mouse sensor.
- The sensor position can be normal or clockwise rotate 90 degree.
- Internal RC oscillation about 6.5MHz ~7.5MHz .
- Support 400 or 800 DPI for ADNS-2051. Support 400DPI for PAN101BOI-204 and 800DPI for PAN101BOI-208.
- Auto-detect photo sensor type.
- Low power dissipation.
- Z-axis supports 2 kinds of scrolling input : Z/2 or Z/4.
- 16 pin DIP/SOP Package

3. Applications

2D/3D 3-Key/5-Key PS/2 optical mouse

4. Pin Assignment

MDT80C06P / MDT80C06S

K4	1	16	Z2
K5	2	15	Z1
SCK	3	14	CLK
SDIO	4	13	DATA
Vdd	5	12	Vss
NC	6	11	L
OSCRH	7	10	M
PD	8	9	R

5. Pin Function Description

Symbol	I/O	Function Description
V _{dd}		+5V
PD	I/O	Photo-sensor power down control (Open Drain output). Also used as rotation selection. Internal 100K ohm pull-high. =1 for sensor in vertical position =0 for sensor rotating 90 degree clockwise
Z1 Z2	I I	Z-axis input for Photo Sensor or Mechanical resistors. Internal weak pull low.
CLK	I/O	Connect to 8042 auxiliary port CLK line in PS/2 mode. Internal 10K ohm pull high.
DATA	I/O	Connect to 8042 auxiliary port DATA line in PS/2 mode. Internal 10K ohm pull high.
V _{ss}		Ground
R M L	I I I	Three Key-switches inputs. Internal 50K ohm pull high.
K4 K5	I I	The 4 th and 5 th button inputs. Internal 100K ohm pull high. Also used to select 2D/3D and 3/5 key mouse.
SCK	I/O	Serial clock output to optical mouse sensor. Internal 100K ohm pull high. Also used to select Z/2 or Z/4
SDIO	I/O	Serial data input/output to optical mouse sensor. Internal 100K ohm pull high.
OSCRH	I	Connect a resistor to V _{dd} to adjust internal RC freq.

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							

3D, 5-key :

	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	0	0	K5	K4	Z data			

7. PS/2 Mouse Commands:

The following table list the commands :

8042 send	Command	MDT80C06 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 or FA 04
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

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IN DETAIL:

(a). Reset (FF)

The MDT80C06 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 MDT80C06 receives an invalid command, it returns a Resend code to the system.
- b. If MDT80C06 receives a Resend command, its 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)

MDT80C06 send ' FA, 00' for standard mouse or send "FA,03" for Microsoft Inteli 3D mouse or send "FA, 04" for 3D/5key 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 MDT80C06 just responses FA
- (p) Reset Autospeed (E6)
Not supported. The MDT80C06 just responses FA

(). Microsoft PS/2 scrolling mouse mode :

(a) When MDT80C06 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 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.

(III). 3D/5key mouse mode :

(e) When MDT80C06 received the following consecutive command.

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

Then it will enter the 3D/5key mode.

(f) The mouse will return FA 04 to read device type command (F2).

(g) Data report will be four bytes format.

(h) The mouse will exit the 3D/ 5key mode only if power off or a reset command(FF) is received.

().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
L,M,R,K4,K5,Z1,Z2 (key mode) input voltage	V _{ai}		1.27		V
L,M,R,K4,K5,Z1,Z2 input leakage current (V _{in} =0V)	I _{il}			-1.0	uA
L,M,R,K4,K5,Z1,Z2 input leakage current (V _{in} =5V)	I _{ih}			1.0	uA
SCK,SDIO input voltage	V _i		2.0		V

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}		1		mA
DATA, CLK 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 Low output voltage (I _{L1} =4mA)	V _{L1}	-	0.1	-	V
DATA, CLK Low output voltage (I _{L2} =8mA)	V _{L2}	-	0.2	-	V

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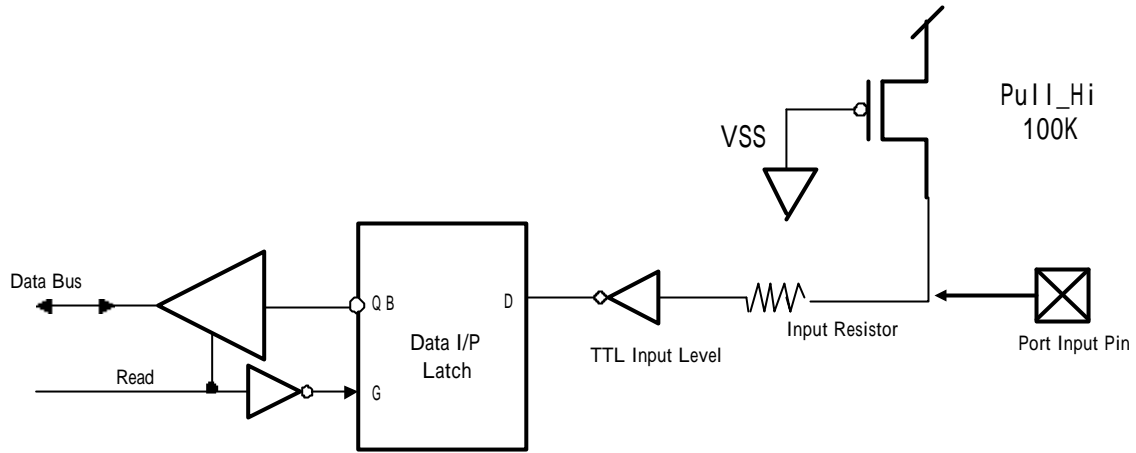
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AC Electrical Characteristics

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	-	40	-	ns
Mouse CLK low period Time	Tml	-	40	-	ns
System CLK high period Time	Tsh	-	40	-	ns
System CLK low period Time	Tsl	-	40	-	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

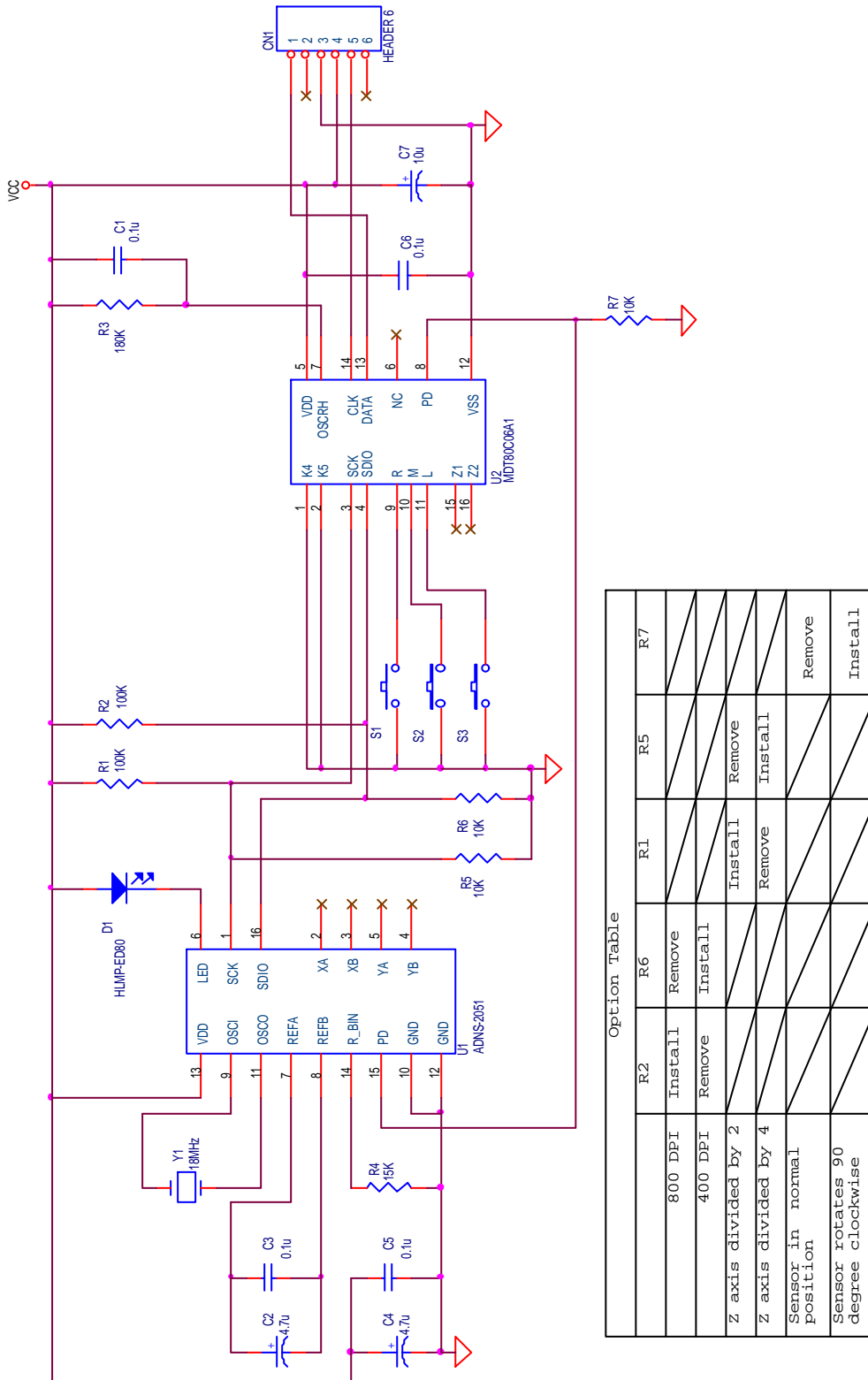
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9. OPT Equivalent Circuit



10. Application circuit

10.1 2D PS2 Optical mouse (ADNS2051) :

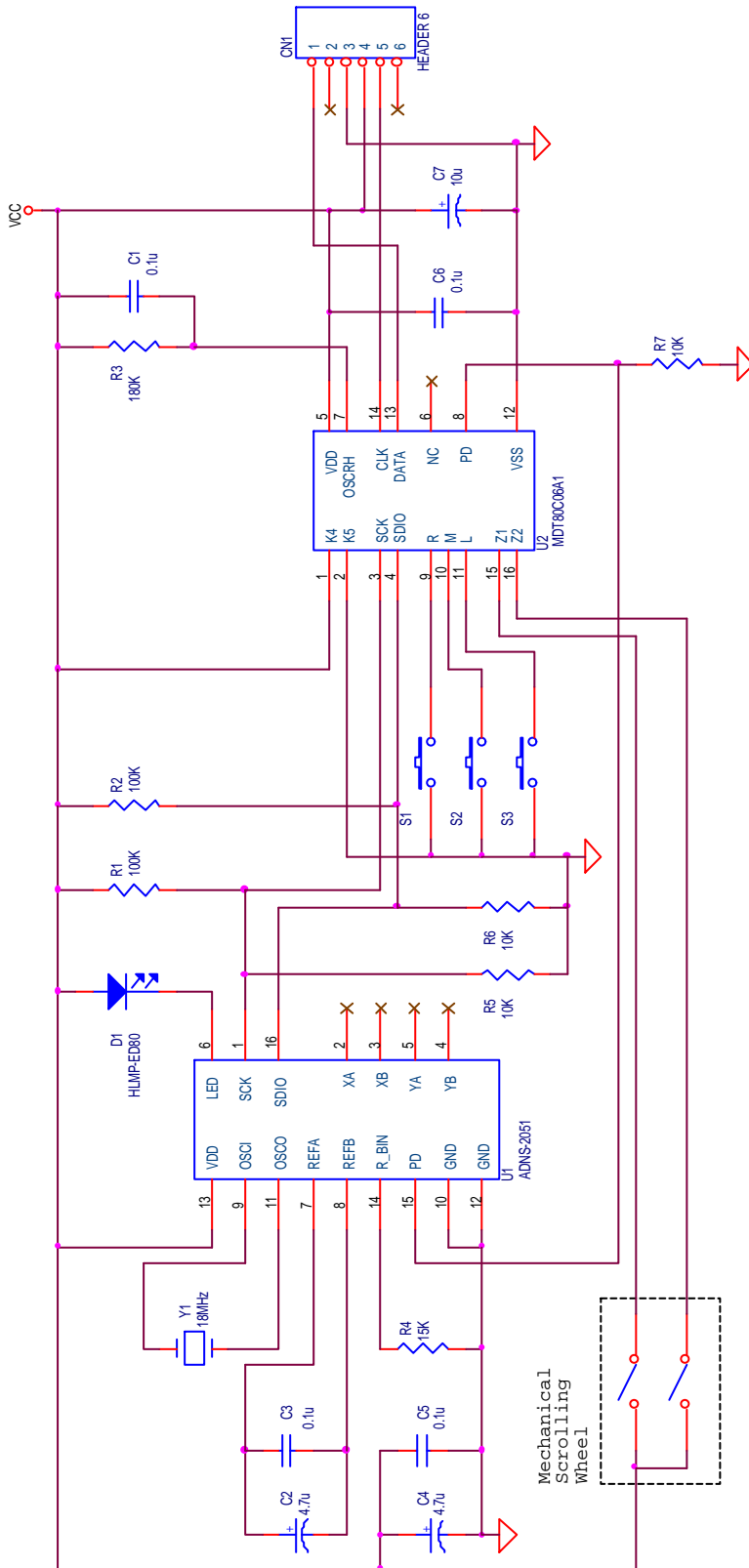


	R2	R6	R1	R5	R7
800 DPI	Install	Remove			
400 DPI	Remove	Install			
Z axis divided by 2			Install	Remove	
Z axis divided by 4			Remove	Install	
Sensor in normal position					Remove
Sensor rotates 90 degree clockwise					Install

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10.2 3D/3Key PS2 Optical Mouse (ADNS2051) :



Option Table

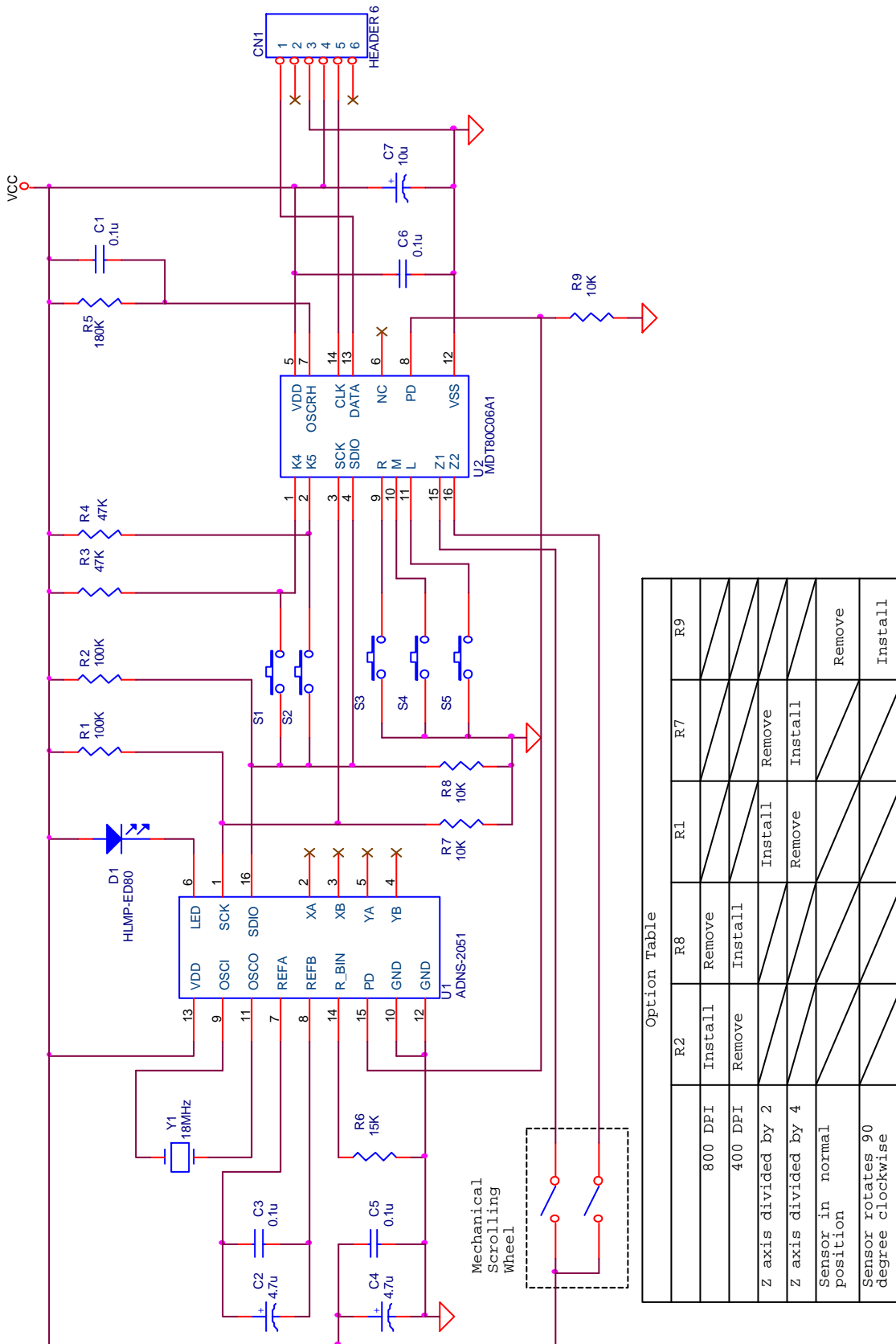
	R2	R6	R1	R5	R7
800 DPI	Install	Remove			
400 DPI	Remove	Install			
Z axis divided by 2			Install	Remove	
Z axis divided by 4			Remove	Install	
Sensor in normal position					Remove
Sensor rotates 90 degree clockwise					Install

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10.3 3D/5key PS2 Optical Mouse (ADNS2051) :

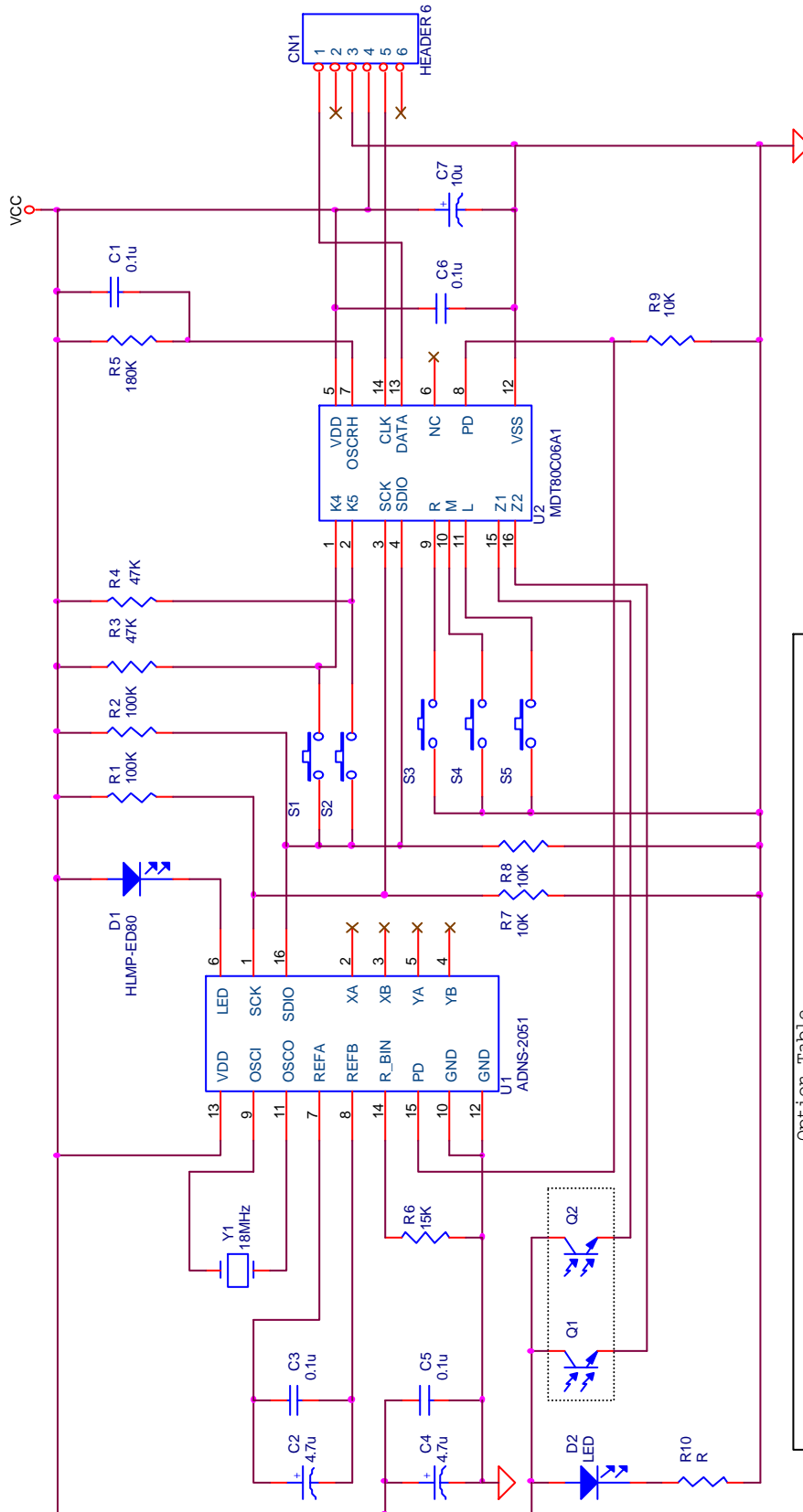


Option Table

	R2	R8	R1	R7	R9
800 DPI	Install	Remove			
400 DPI	Remove	Install			
Z axis divided by 2			Install	Remove	
Z axis divided by 4			Remove	Install	
Sensor in normal position					Remove
Sensor rotates 90 degree clockwise					Install

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10.4 3D/5Key, Photo-coupler Zaxis, PS2 Optical Mouse (ADNS2051) :



Option Table

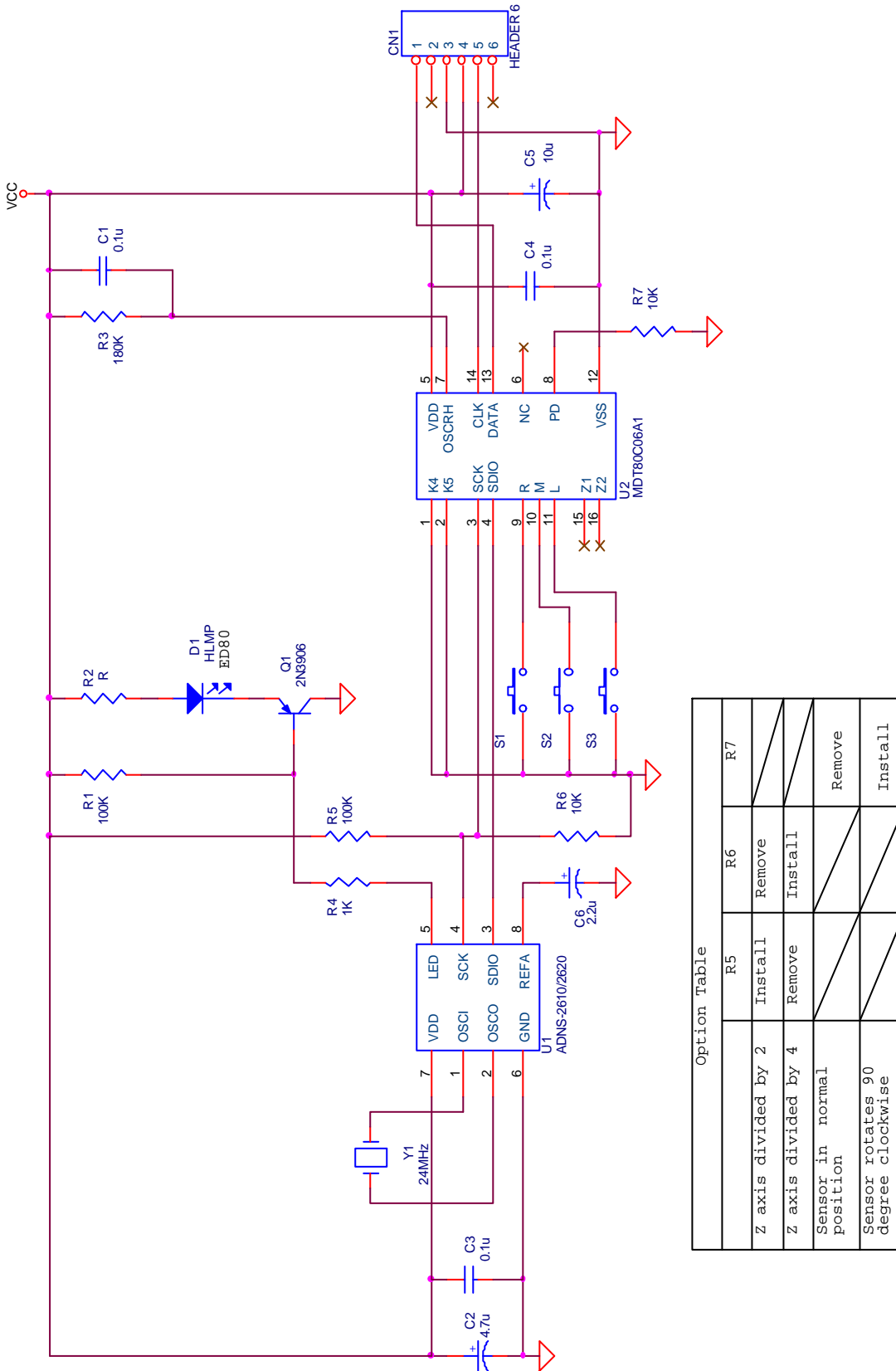
	R2	R8	R1	R7	R9
800 DPI	Install	Remove			
400 DPI	Remove	Install			
Z axis divided by 2			Install	Remove	
Z axis divided by 4			Remove	Install	
Sensor in normal position					Remove
Sensor rotates 90 degree clockwise					Install

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10.5 2D PS2 Optical Mouse (ADNS2610/2620) :



Option Table

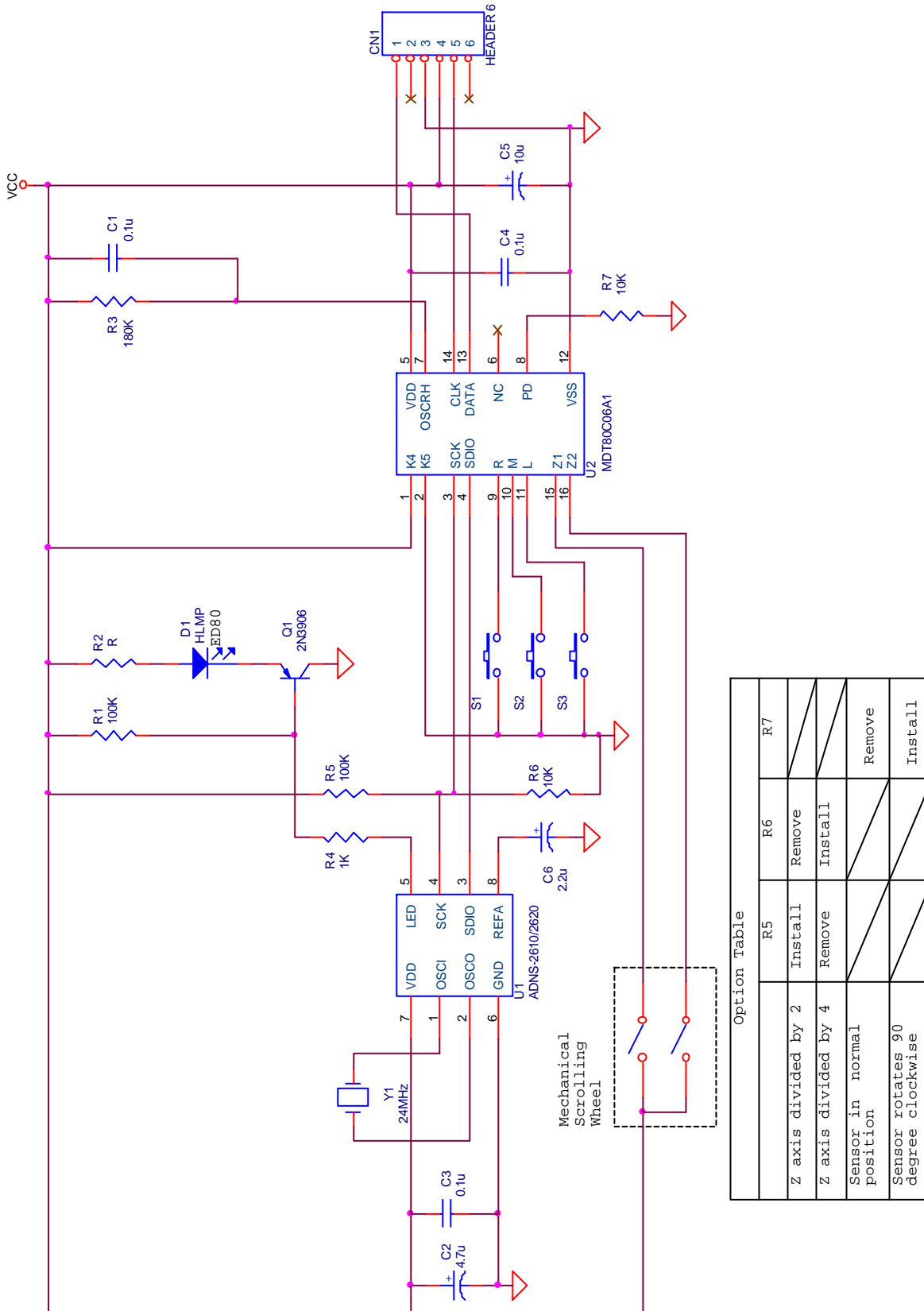
	R5	R6	R7
Z axis divided by 2	Install	Remove	
Z axis divided by 4	Remove	Install	
Sensor in normal position			Remove
Sensor rotates 90 degree clockwise			Install

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10.6 3D/3Key PS2 Optical Mouse (ADNS2610/ADNS2620) :

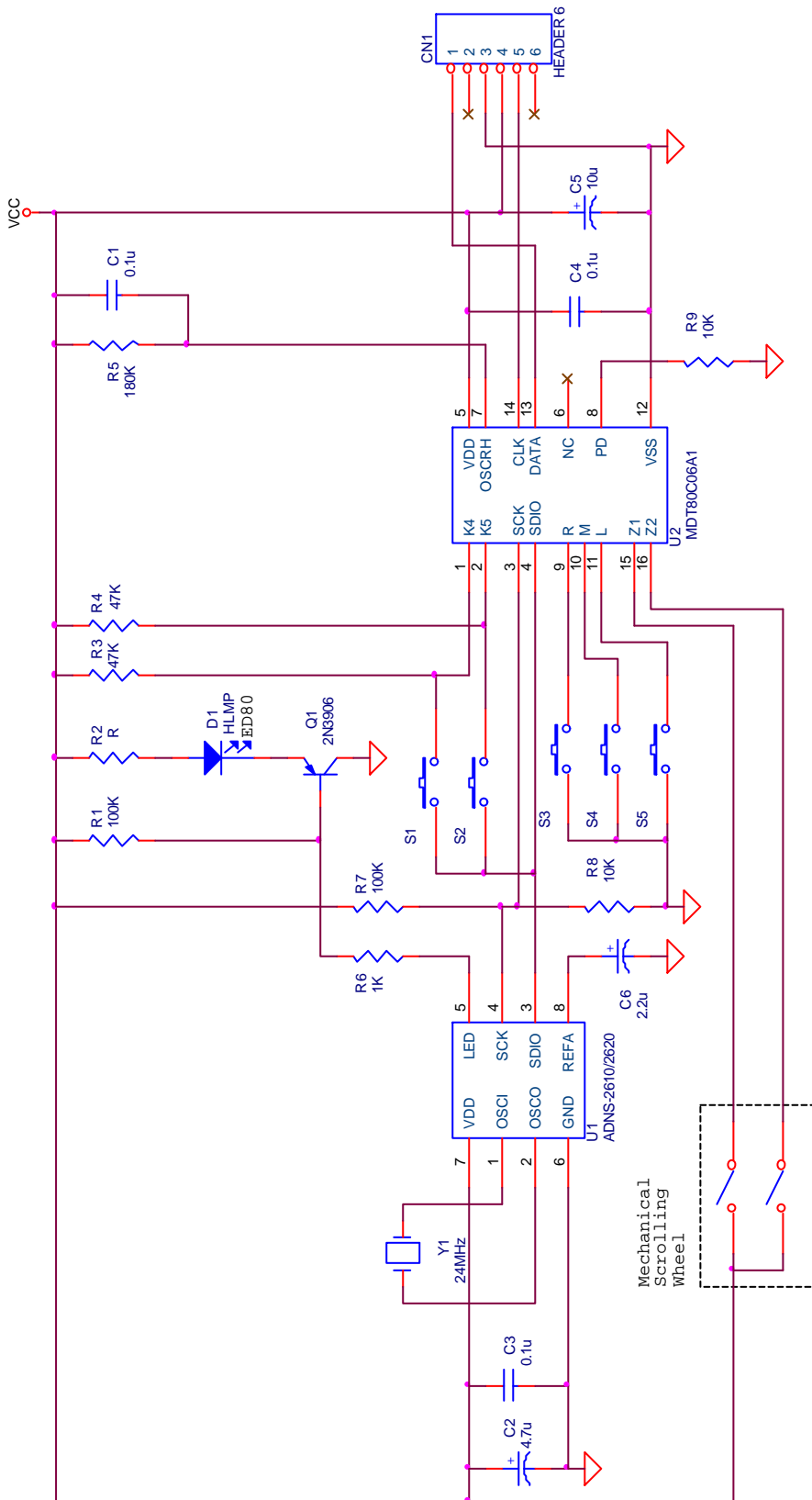


Option Table

	R5	R6	R7
Z axis divided by 2	Install	Remove	/
Z axis divided by 4	Remove	Install	/
Sensor in normal position	/	/	Remove
Sensor rotates 90 degree clockwise	/	/	Install

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10.7 3D/5key PS2 Optical Mouse (ADNS2610/2620) :



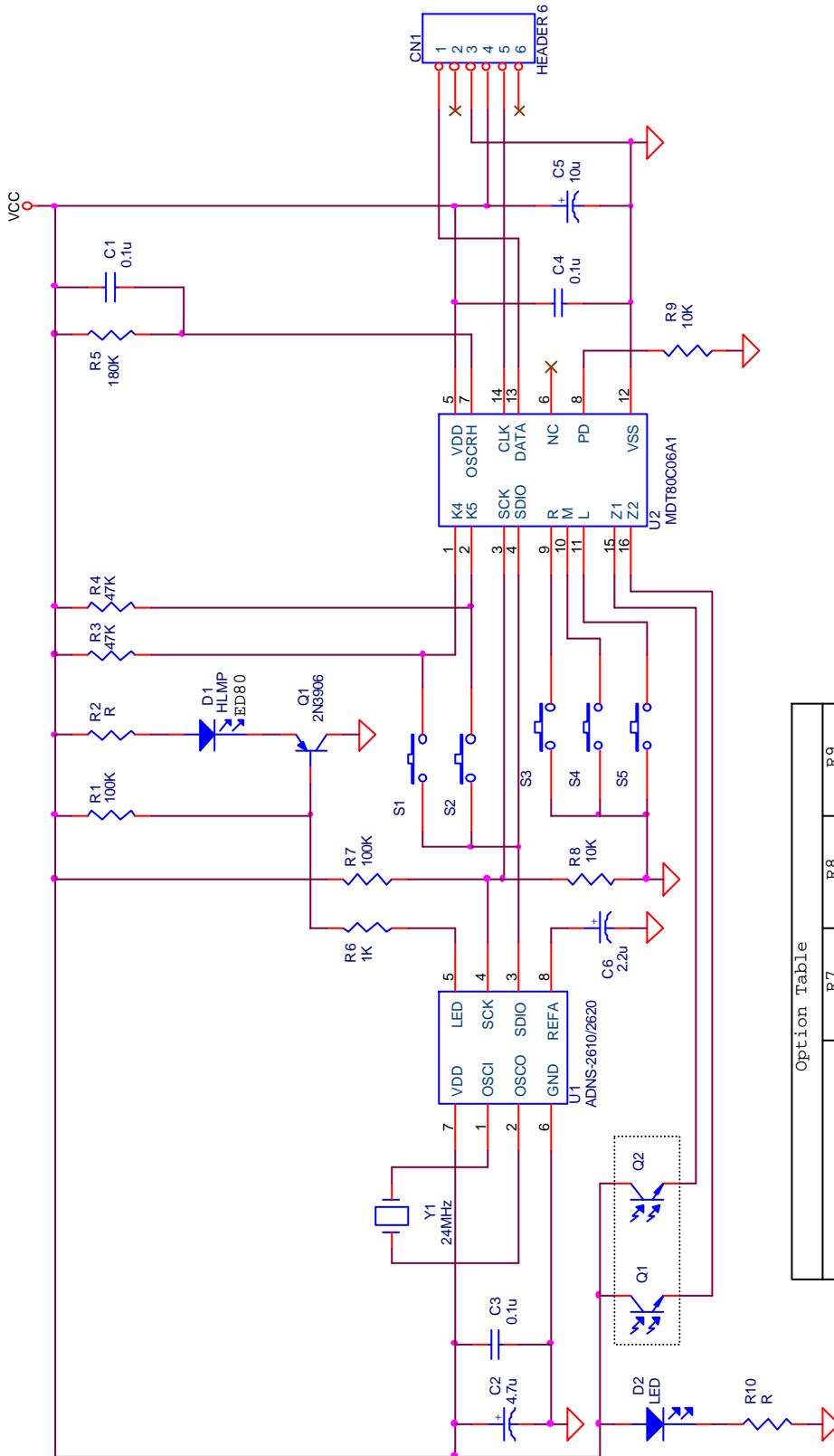
Option Table

	R7	R8	R9
Z axis divided by 2	Install	Remove	
Z axis divided by 4	Remove	Install	
Sensor in normal position			Remove
Sensor rotates 90 degree clockwise			Install

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10.8 3D/5key, Photo-coupler Z-axis, PS2 Optical Mouse (ADNS2610/2620) :



Option Table

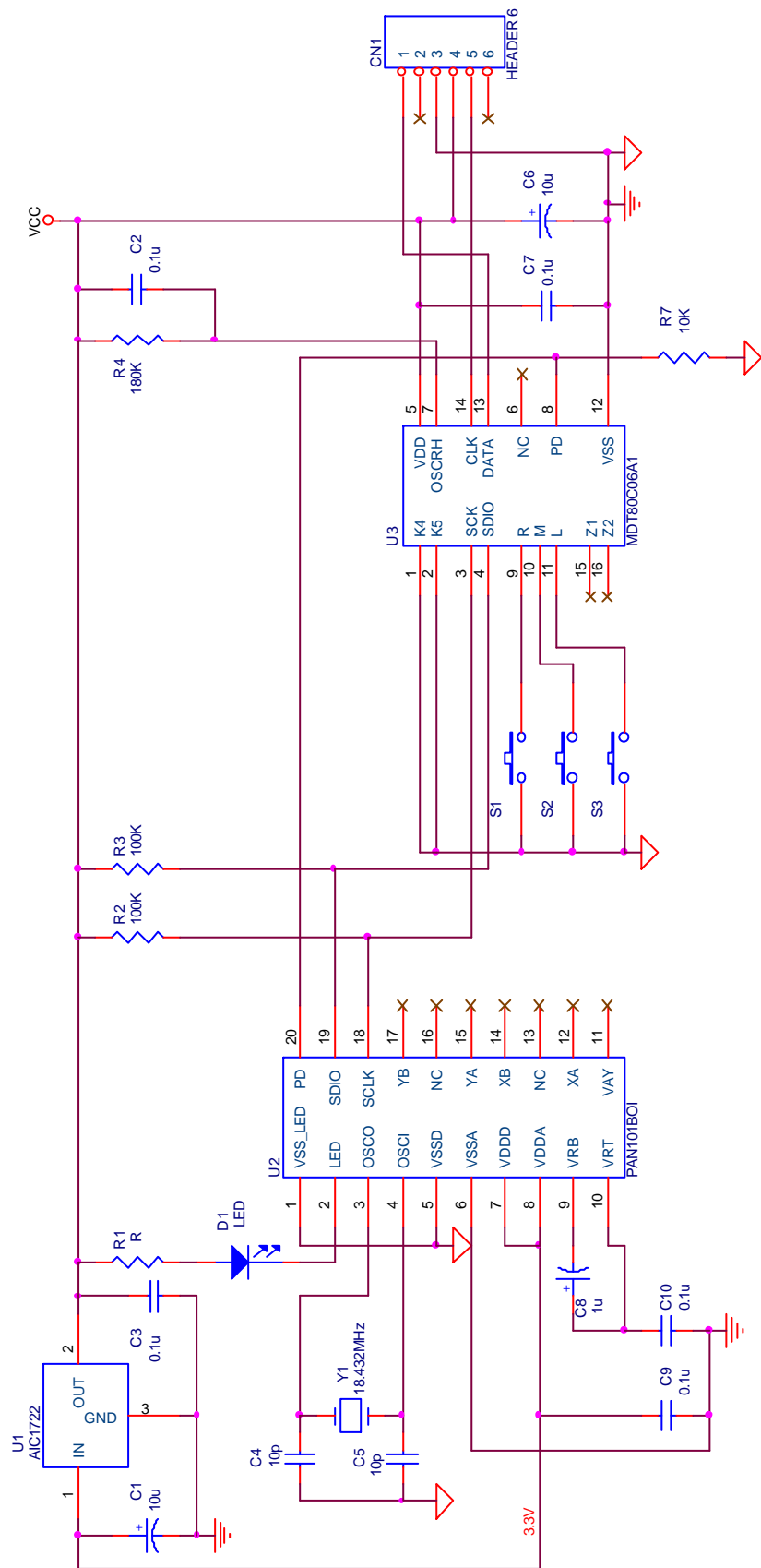
	R7	R8	R9
Z axis divided by 2	Install	Remove	
Z axis divided by 4	Remove	Install	
Sensor in normal position			Remove
Sensor rotates 90 degree clockwise			Install

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10.9 2D PS2 Optical Mouse (PANS101B) :



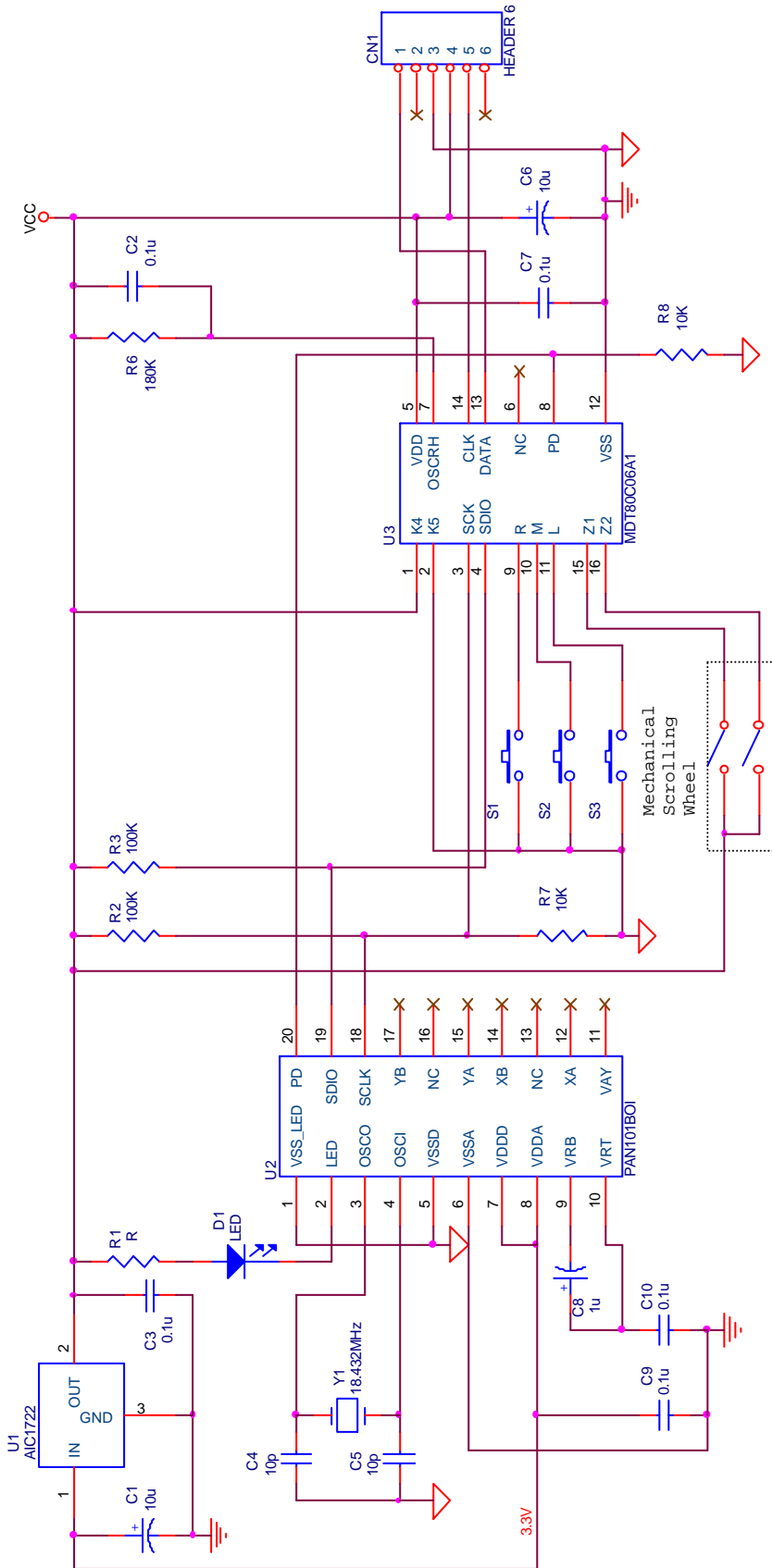
Option Table	
Sensor in normal position	Remove
Sensor rotates 90 degree clockwise	Install

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10.10 3D/3key PS2 Optical Mouse (PANS101B) :



Option Table

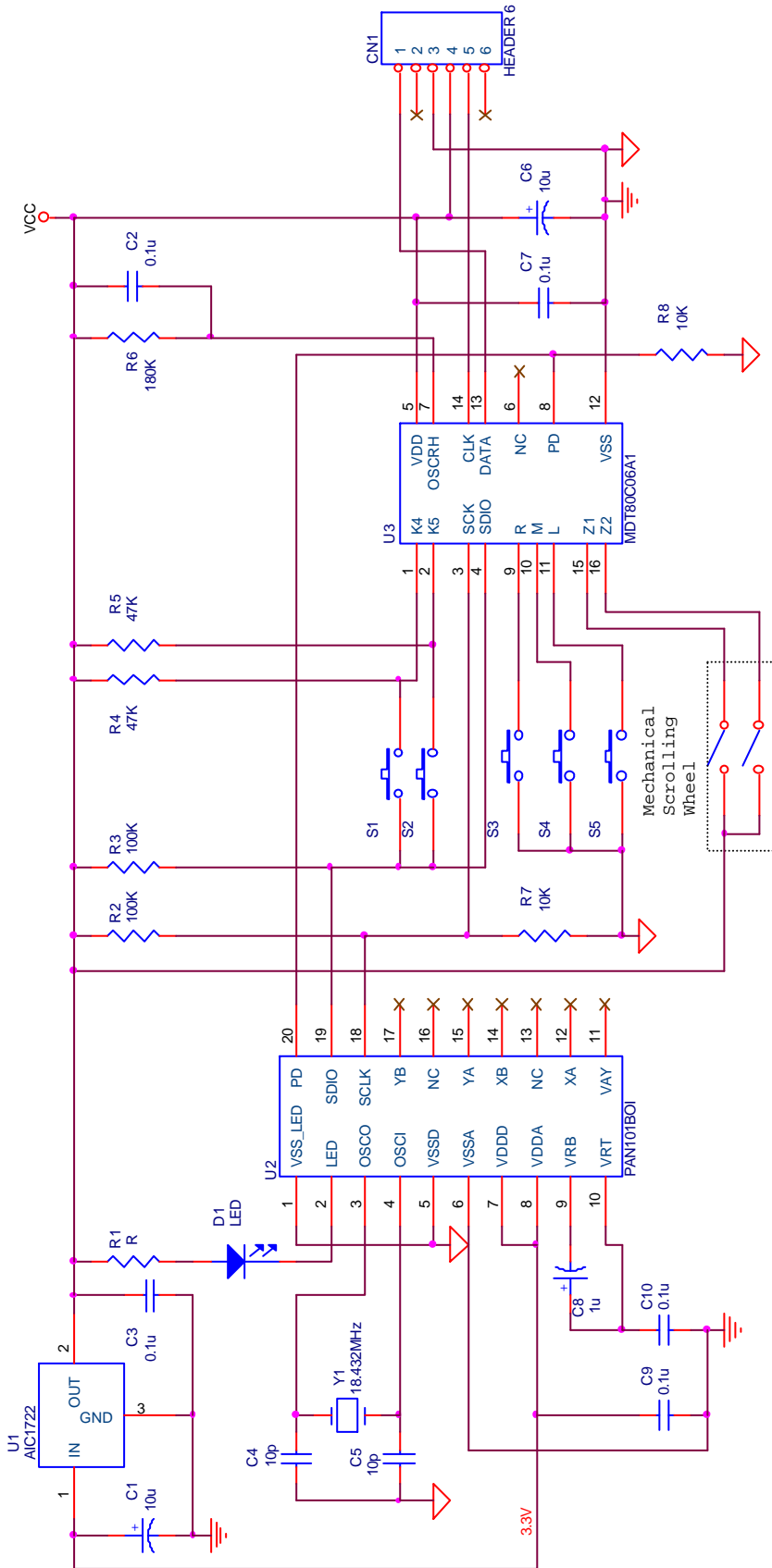
	R2	R7	R8
Z axis divided by 2	Install	Remove	
Z axis divided by 4	Remove	Install	
Sensor in normal position			Remove
Sensor rotates 90 degree clockwise			Install

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10.11 3D/5key PS2 Optical Mouse (PAN101B) :



Option Table

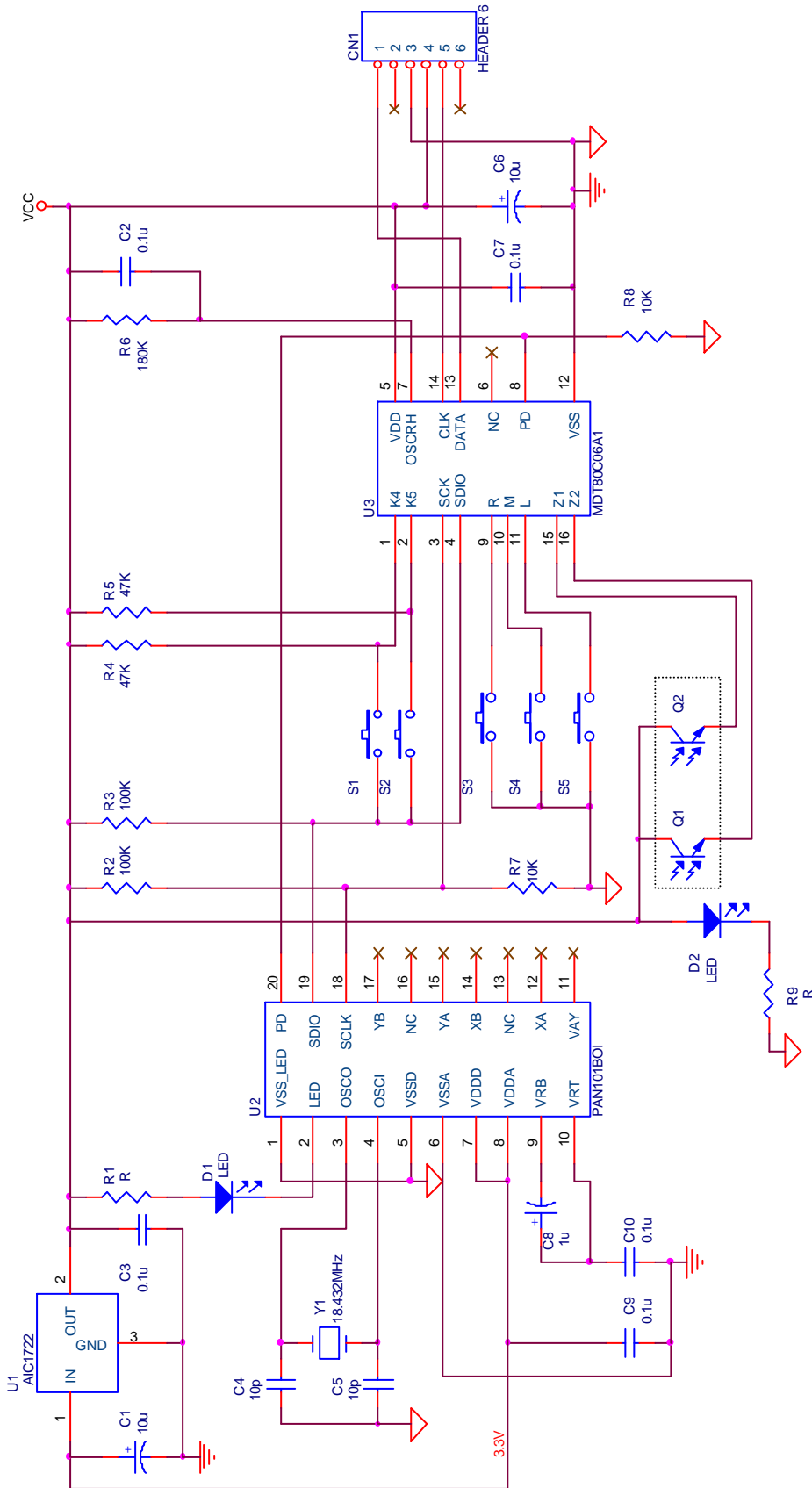
	R2	R7	R8
Z axis divided by 2	Install	Remove	
Z axis divided by 4	Remove	Install	
Sensor in normal position			Remove
Sensor rotates 90 degree clockwise			Install

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PS2 optical 2D/3D, 3/5 key mouse controller

10.12 3D/5Key, Photo-coupler Z-axis, PS2 Optical Mouse (PAN101B) :



Option Table

	R2	R7	R8
Z axis divided by 2	Install	Remove	
Z axis divided by 4	Remove	Install	
Sensor in normal position			Remove
Sensor rotates 90 degree clockwise			Install

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