

# SPECIFICATION

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MX84521

USB+PS/2 Mouse Controller

VERSION 1.0



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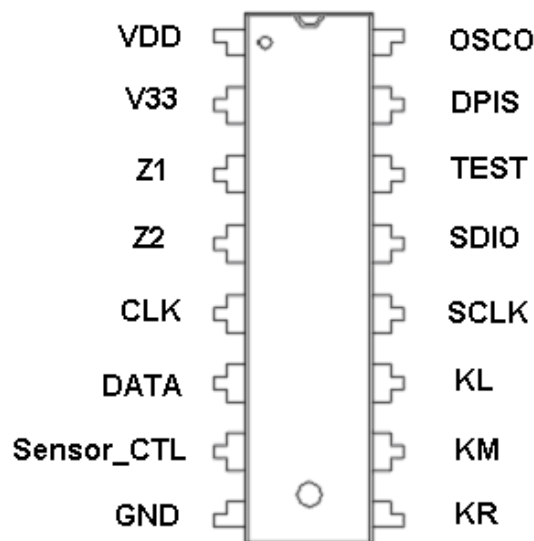
## 1. General Description

The MX84521 is a Mouse Controller designed to control both USB & PS/2 Optical Mouse device. This Mouse Controller can auto detect USB or PS/2 mode, and supports three axes X, Y, Z, and three buttons L, R, M in both USB and PS/2 mode. It is a true crystal-less and ultra low cost BOM solution.

## 2. Features

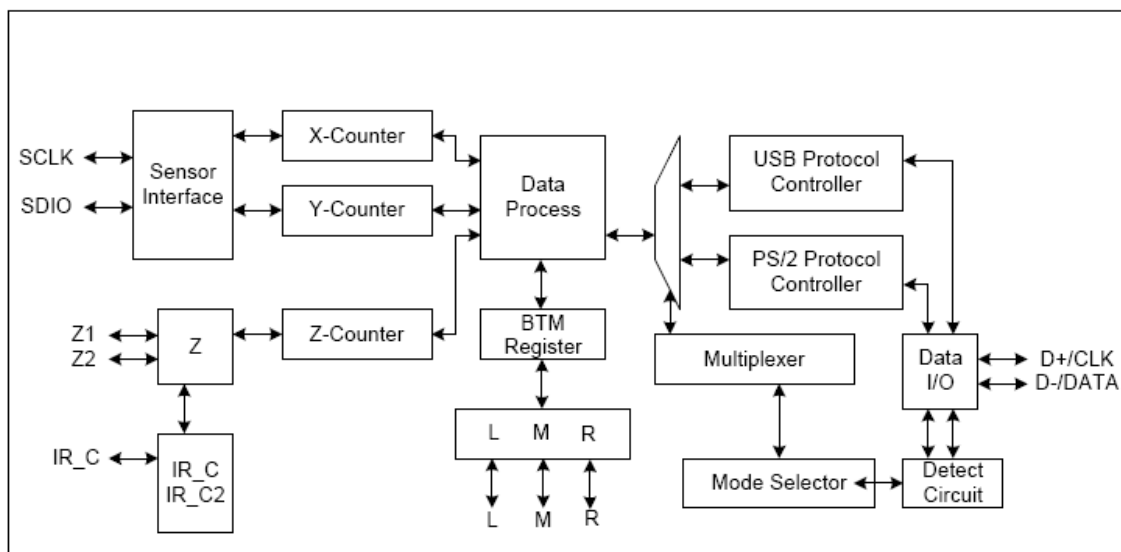
- Universal Serial Bus Specification, version 1.0
- USB HID Specification, version 1.11
- USB-IF certification pending
- WHQL certificated
- Auto-detecting PS/2 port or USB port
- Compatible with Microsoft 3D PS/2 mouse
- Supports 3D (X, Y, Z) 3-Key (L, R, M) input
- Supports Z/2 Z-axis input type
- Supports Agilent HDNS- 2610 & 2620 & 5020 Optical Mouse Sensor
- Supports PXI PAN3101 & PAN3102 Optical Mouse Sensor
- Firmware simulates 800DPI for 2610/2620 Optical Sensor

## 3. Pin Assignment



Pin No.	Symbol	I/O	Function
1	VDD		5V Power Input
2	V33		3.3V DC voltage output from internal regulator. This pin has to be tied to a 104 capacitor
3	Z1	I	Z axis Input 1
4	Z2	I	Z axis Input 1
5	CLK	I/O	USB D+ or PS/2 CLK I/O
6	DATA	I/O	USB D- or PS/2 Data I/O
7	Sensor_CTL	O	Sensor power control
8	GND		GND
9	KR	I	Right key input
10	KM	I	Middle key input
11	KL	I	Left key input
12	SCLK	I/O	Serial Clock to sensor IC SCLK
13	SDIO	I/O	Serial Data from Agilent sensor IC SDIO
14	TEST2	I	Test for chip
15	DPIS	I	CPI select pin
16	OSCO	O	Oscillator for sensor

#### 4. Function Description



## 4.1 PS/2 Function Description PS/2 Mouse Commands Description

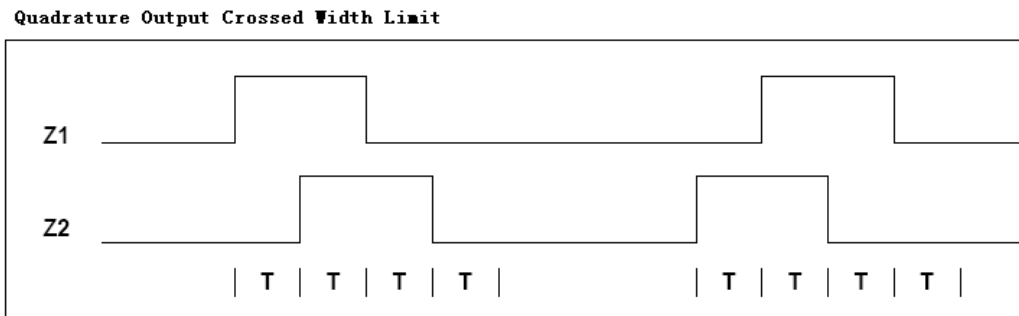
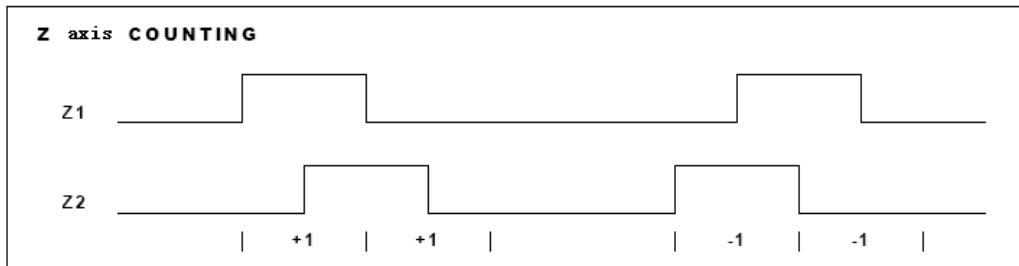
Hex Code	Command	MX84521 Echo Code
FF	Reset	FA,AA,00
FE	Resend	XX,(XX,XX)
F6	Set Default	FA
F5	Disable	FA
F4	Enable	FA
F3,XX	Set Sampling Rate	FA,FA
F2	Read Device Type	FA,00
F0	Set Remote Mode	FA
EE	Set Wrap Mode	FA
EC	Reset Wrap Mode	FA
EB	Read Data	FA,XX,XX,XX
EA	Set Stream Mode	FA
E9	Status Request	FA,XX,XX,XX
E8	Set Resolution	FA,FA
E7	Set Autospeed	FA

Byte	Bit	Description
1	0	Left button status; 1 = pressed
	1	Right button status; 1 = pressed
	2	Middle button status; 1 = pressed
	3	Reserve, set to 1
	4	X data sign; 1 = negative
	5	Y data sign; 1 = negative
	6	X data overflow; 1 = overflow
2	7	Y data overflow; 1 = overflow
	0-7	X data (D0-D7)
	0-7	Y data (D0-D7)
4	0-7	Z data (D0-D7)

(A) The Z0-Z7 limit value is 7

(B) Z-axis counter accumulates the Z1, Z2 phase changed by movement. This mode includes noise immunity.

(C) Z/2: 2 dot per count. The wheel should stay at Z1=0, Z2=0 or Z1=1, Z2=1 Phase



## 4.2 USB Function Description

### 4.2.1 Device Descriptor

Offset	Field	Size	Description	Value
0	bLength	1	The size of this descriptor is 18 bytes	0x12
1	bDescriptorType	1	Device Descriptor Type	0x01
2	bcdUSB	2	Device complies with the USB specification Version 1.10	0x0110
4	bDeviceClass	1	Each interface specifies its own class information	0x00
5	bDeviceSubClass	1	Each interface specifies its own subclass information	0x00
6	bDeviceProtocol	1	No protocols on the device basis	0x00
7	bMaxPacketSize0	1	Maximum packet size for endpoint zero is 8	0x08
8	idVendor	2	The Vendor ID is 0x01c4F	0x1c4F
10	idProduct	2	The Product ID is 0x0003	0x0003
12	bcdDevice	2	The device release number is 0x0110	0x0110
14	iManufacturer	1	The device does not have the string*1 descriptor describing the manufacturer	0x01
15	iProduct	1	The index of the string*1 descriptor describing the product is "2"	0x02
16	iSerialNumber	1	The device does not have the string*1 descriptor that describes the serial number	0x00
17	bNumConfigurations	1	The device uses "1" as possible configurations	0x01

#### 4.2.2 Configuration Descriptor

Offset	Field	Size	Description	Value
0	bLength	1	The size of this descriptor is 9 bytes.	0x09
1	bDescriptorType	1	Configuration Descriptor Type	0x02
2	wTotalLength	2	The total length of data for this configuration is 34. This includes the combined length of all the descriptors returned.	0x0022
4	bNumInterfaces	1	This configuration supports "1" interface.	0x01
5	bConfigurationValue	1	The value "1" should be used to select this configuration.	0x01
6	iConfiguration	1	The device does not have the string descriptor describing this configuration.	0x00
7	bmAttributes	1	Configuration characteristics: • Bit 7: Reserved (set to 1) • Bit 6: Self-powered 0 • Bit 5: Remote Wake-up 1	0xA0
8	MaxPower	1	Maximum power consumption of the device under this configuration is 98mA	0x31

#### 4.2.3 Interface Descriptor

Offset	Field	Size	Description	Value
0	bLength	1	The size of this descriptor is 9 bytes.	0x09
1	bDescriptorType	1	Interface Descriptor Type	0x04
2	bInterfaceNumber	1	The number of this interface is "0".	0x00
3	bAlternateSetting	1	The value used to select alternate setting for this interface is "0".	0x00
4	bNumEndpoints	1	The number of endpoints used by this interface is "1" (excluding Endpoint 0).	0x01
5	bInterfaceClass	1	The interface implements HID class.	0x03
6	bInterfaceSubClass	1	The subclass code is 0x01.	0x01
7	bInterfaceProtocol	1	The protocol code is 0x02.	0x02
8	iInterface	1	The device does not have the string descriptor describing this interface.	0x00

#### 4.2.4 Human Interface Device (HID) Descriptor

Offset	Field	Size	Description	Value
0	bLength	1	The size of this descriptor is 9 bytes.	0x09
1	bDescriptorType	1	HID Descriptor Type	0x21

Offset	Field	Size	Description	Value
2	bcdHID	2	Device compliant to the HID specification version 1.10.	0x0110
4	bCountryCode	1	The country code is 0x00.	0x00
5	bNumDescriptors	1	The number of class descriptors is "1".	0x01
6	bDescriptorType	1	The class descriptor is Report descriptor.	0x22
7	wDescriptorlength	2	The total size of the class descriptor is 34.	0x0032

#### 4.2.5 Endpoint Descriptor

Offset	Field	Size	Description	Value
0	bLength	1	The size of this descriptor is 7 bytes	0x07
1	bDescriptorType	1	Endpoint Descriptor Type	0x05
2	bEndpointAddress	1	This is an IN endpoint with address (endpoint number) 1	0x81
3	bmAttributes	1	Types of attributes: • Transfer: Interrupt • Sync: No Sync • Usage: Data EP	0x03
4	wMaxPackerSize	2	Maximum packet size value for this endpoint is 0x4 (Bits 12-11: Addtl. Transactions/frame)	0x0004
6	bInterval	1	bInterval:10. The polling interval value is bInterval or 2**(bInterval-1)	0x0A

#### 4.2.6 Report Descriptor

0x05	0x01	Usage Page (Generic Desktop Control)
0x09	0x02	Usage (Mouse)
0xA1	0x01	Collection (Application)
0x09	0x01	Usage (Pointer)
0xA1	0x00	Collection (Linked)
0x05	0x09	Usage Page (Button)
0x19	0x01	Usage Minimum (1)
0x29	0x03	Usage Maximum (3)
0x15	0x00	Logical Minimum (0)
0x25	0x01	Logical Maximum (1)
0x95	0x03	Report Count (3)
0x75	0x01	Report Size (1)
0x81	0x02	Input (DATA, VARIABLE, ABSOLUTE)
0x95	0x05	Report Count (5)
0x81	0x03	Input (Constant)
0x05	0x01	Usage Page (Generic Desktop Control)
0x09	0x30	Usage (X)



0x09	0x31	Usage (Y)
0x09	0x38	Usage (Wheel)
0x15	0x81	Logical Minimum (-128)
0x25	0x7F	Logical Maximum (127)
0x75	0x08	Report Size (8)
0x95	0x03	Report Count (3)
0x81	0x06	Input (Data, Variable, Relative)
0xC0		End Collection
0xC0		End Collection

#### 4.2.7 USB Mouse Report Data Type

Byte 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	0	0	0	0	0	M	R	L
Byte 2	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
				X-Movement Data				
Byte 3	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
				Y-Movement Data				
Byte 4	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
				Z-Movement Data				

## 5. Absolute Maximum Rating

Symbol	Min.	Max.	Unit
Temperature under bias	0	70	°C
Storage temperature	-65	150	°C
Input voltage	-0.5	6.0	V
Output voltage	-0.5	6.0	V

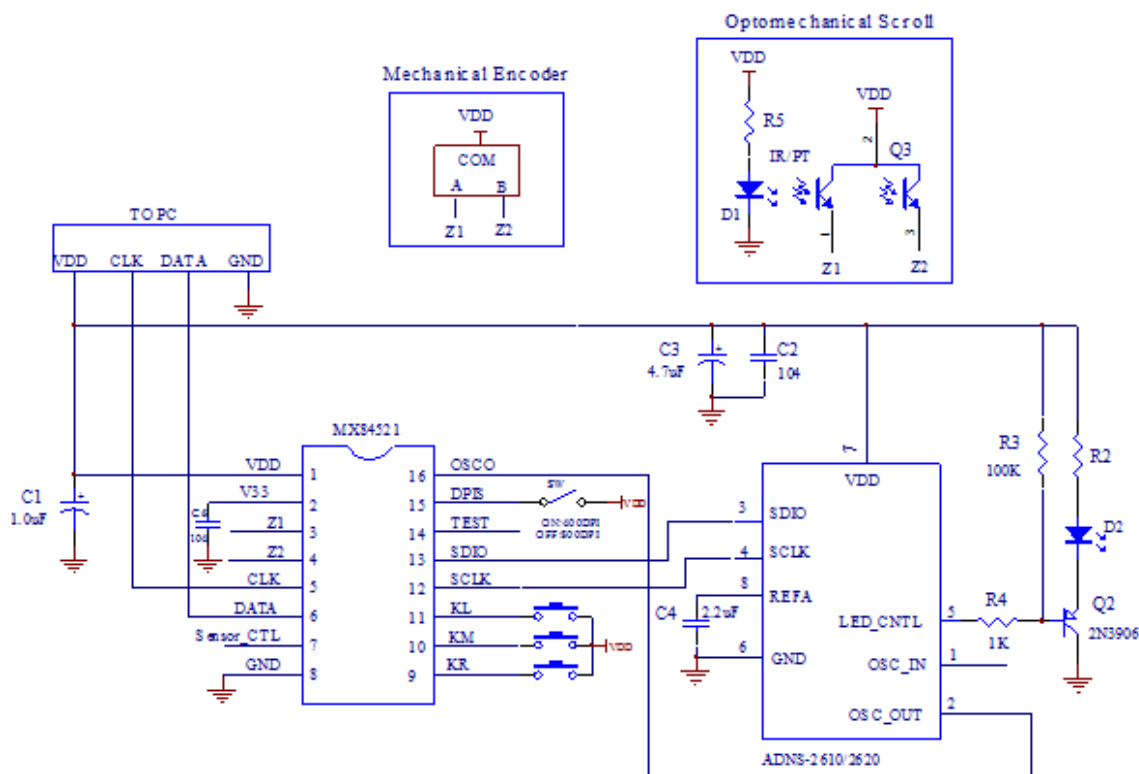
## 6. Electrical Characteristic

Test Condition: T = 25°C, VDD=5.0V, VSS=0V

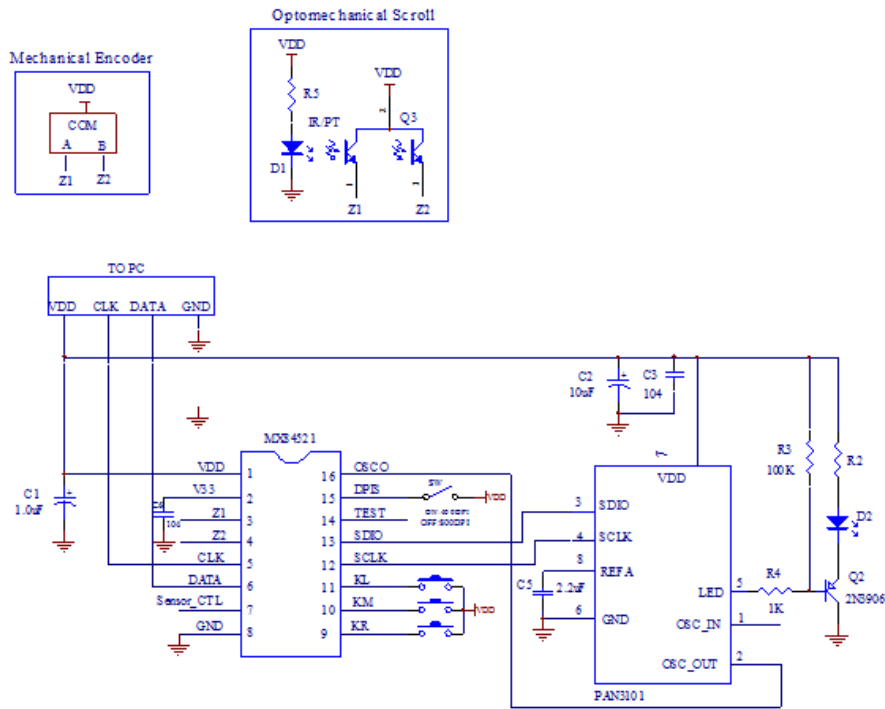
Parameters	Sym.	Min.	Typ.	Max.	Unit
Operating voltage	VDD	4.5	5.0	5.5	V
Operating Current (normal operation)	IOP	-	-	10	mA
Operating Current (Sleep mode)	Isleep	-	-	320	μA
Output voltage of 3.3V regulator	Vreg	3.0	3.3	3.6	V
L, M, R, debounce time	Tb	17	-	-	ms
Z-axis debounce time	Tz	700	-	-	μs

## 7. Application Circuit

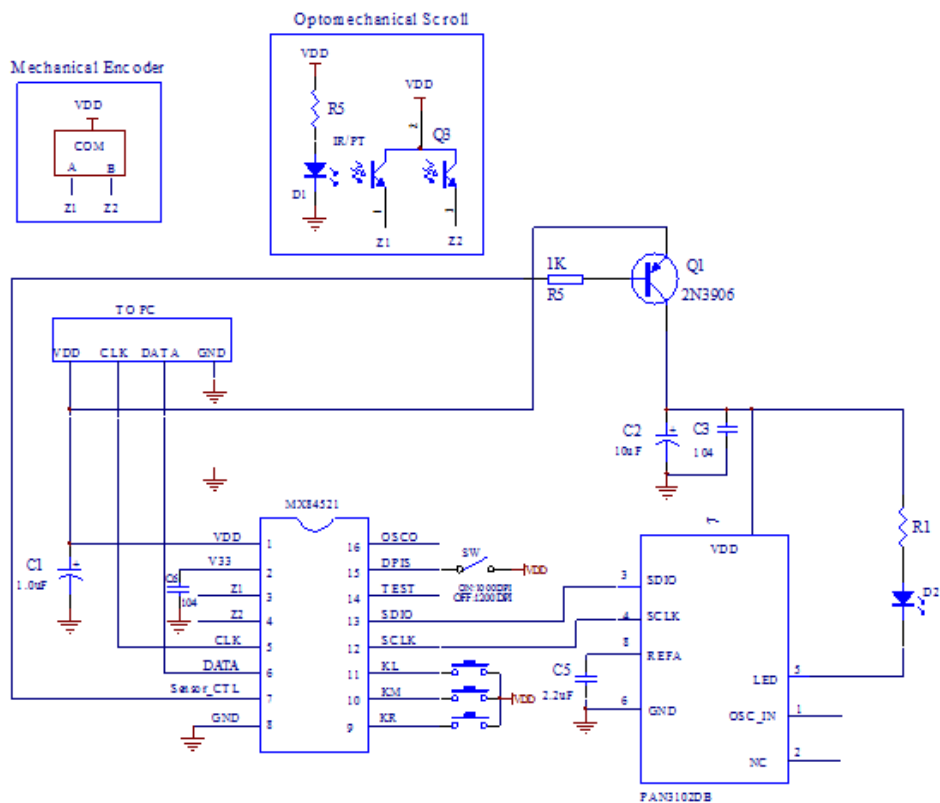
### 7.1 Application for ADNS-2610,ADNS-2620



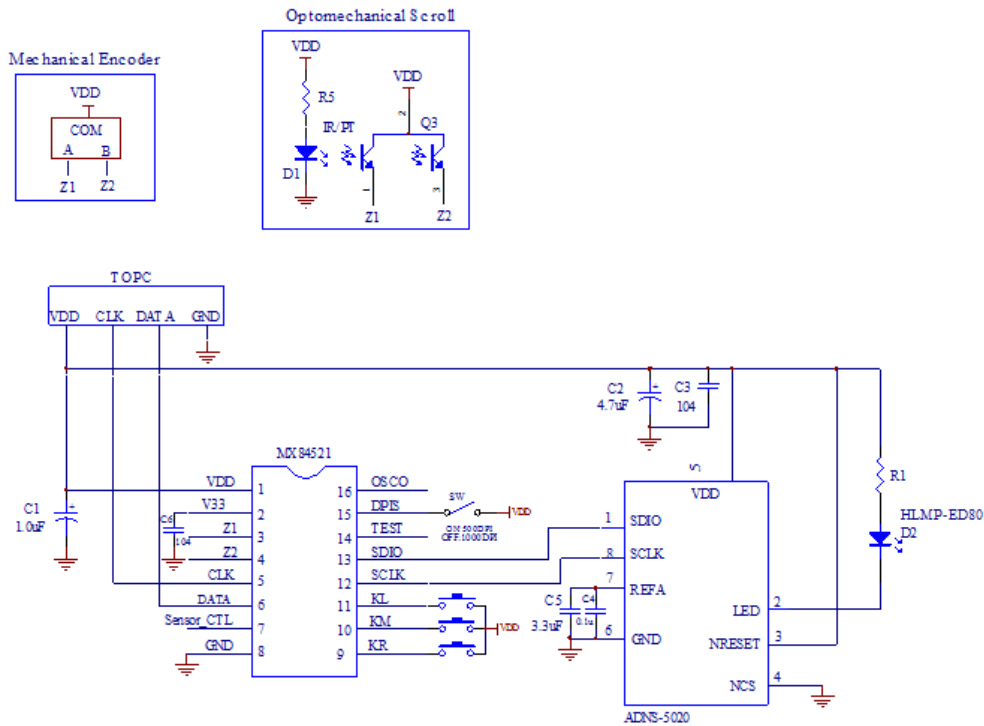
### 7.2 Application for PAN3101



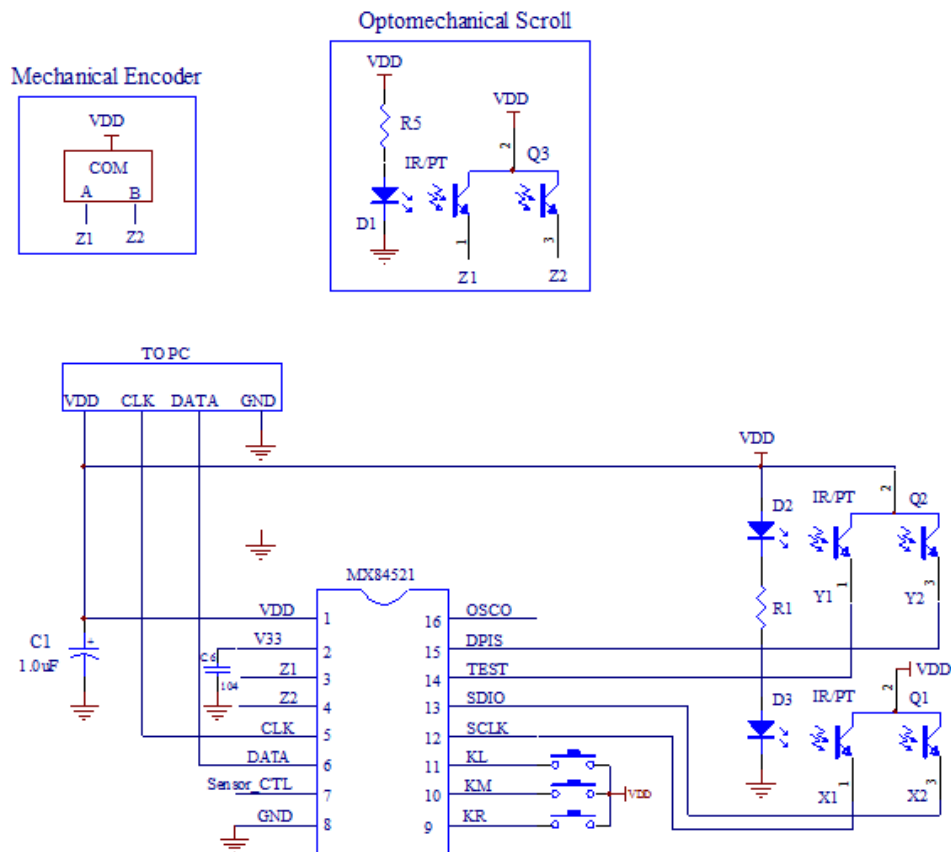
### 7.3 Application for PAN-3102



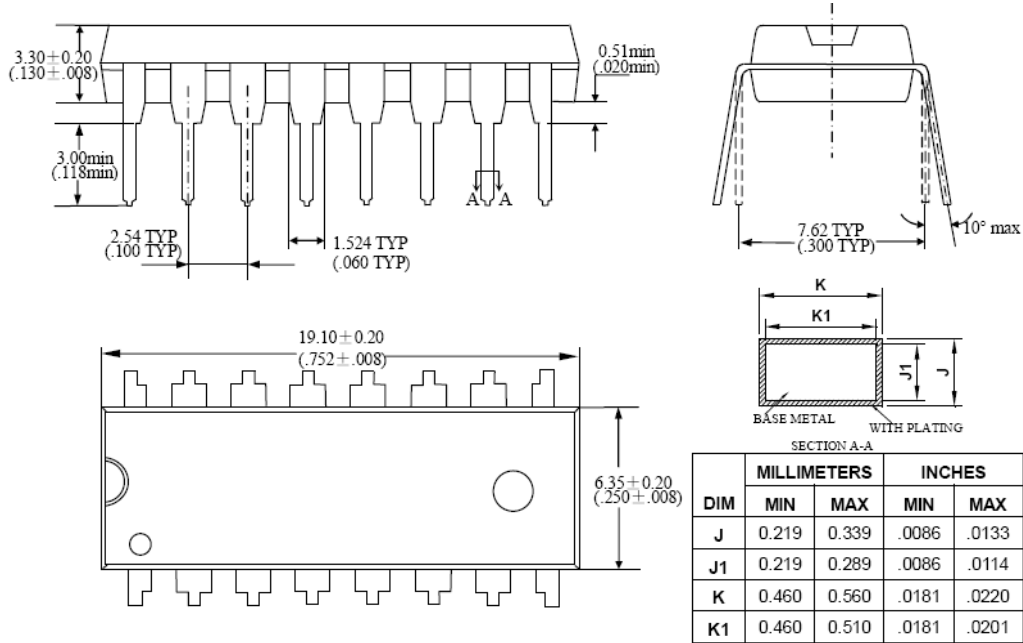
### 7.4 Application for ADNS-5020



### 7.5 Application for machine ball mouse



## 8. Package



## 9. Revision History

Version	Update date	Revised Content	Revised by	Confirmed by
V0.9	2006-9-27	Original	Sky	Alan
V1.0	2007-12-6	Modify Function Description	Apple	Alan