

### 1 General Description

A2611 is a 3D crystal-free optical mouse controller designed for USB or PS/2 applications, minimal external components makes it a competitive low BOM cost of mouse solution. Support the USB standard v1.1 as well as HID class definition v1.1. It is compatible with Microsoft 3D Intellimouse and IBM PS/2 mouse. Support mechanical scrolling.

### 2 Features

- Crystal-free design with internal oscillator directly feeding clock to sensor, implementing completely crystal-free system design;
- SPI interface to control the sensor IC with minimal wire line connection;
- Microsoft 3D Intellimouse and IBM PS/2 mouse compatible;
- Complete USB v1.1 1.5Mbps compatibility;
- Complete USB HID v1.1 compatibility;
- USB plug and play functions;
- Compatible with PS/2 protocol;
- Supports Windows 2000, XP, ME, 98, DOS (with driver);
- USB-IF certified;
- WHQL certified;
- Variable resolution selection for multi-resolution sensor;
- Built-in de-bounce circuits;
- Built-in 3.3V regulator;
- Built-in power-on reset;
- Support Z/2 Z-axis mechanical scroll wheel;
- Suspend function and wake-up feature to reduce power consumption;
- Minimal external components;
- 14-pin DIP green package.

### 3 Ordering Information

Part Number	Description
A2611D	14-pin lead-free DIP package
A2611N	15-pad DIE form

### 4 Block Diagram

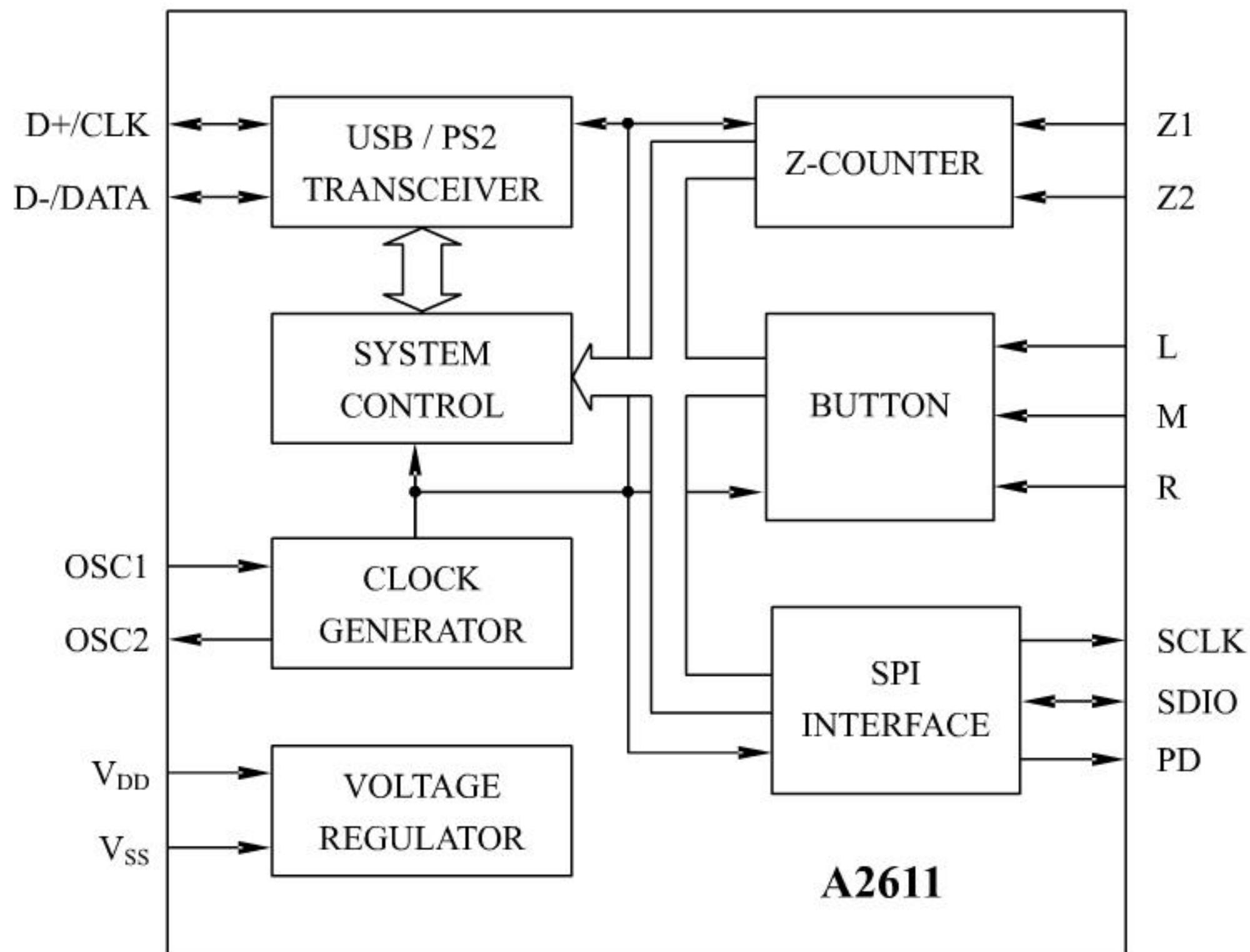


Figure 1: Block diagram

### 5 Pin Assignment

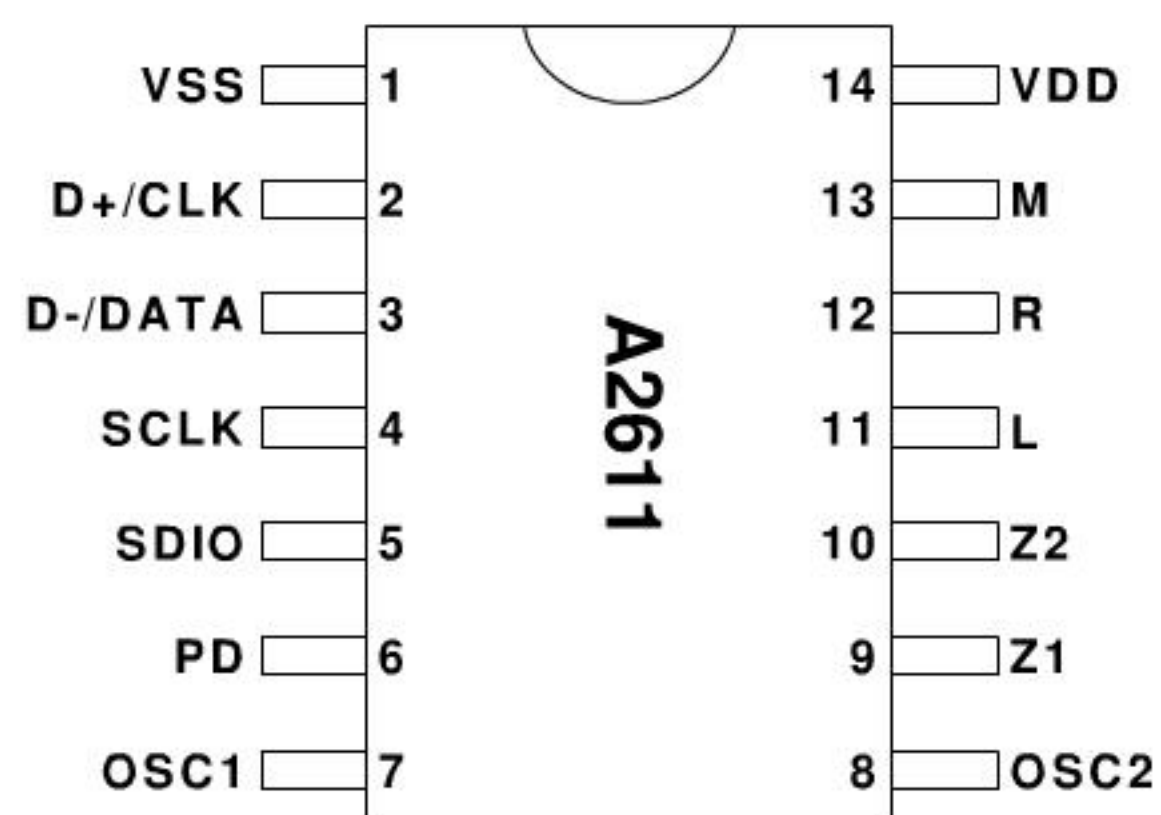


Figure 2: Pin Assignment (Top View)

## 6 Pin Description

**Table 1: Pin Description**

No.	Pin Name	I/O	Description
1	V <sub>SS</sub>	-	Ground
2	D+/CLK	I/O	USB data plus or PS2 Clock
3	D-/DATA	I/O	USB data minus or PS2 Data
4	SCLK	O	Serial interface Clock
5	SDIO	I/O	Serial interface Data
6	PD	O	Power Down control for sensor
7	OSC1	I	External resistor for frequency fine tune
8	OSC2	O	Clock output for Sensor
9	Z1	I	Interface for mechanical or opto-mechanical wheel encoder
10	Z2	I	
11	L	I	Left button input port.
12	R	I	Right button input port.
13	M	I	Middle button input port.
14	V <sub>DD</sub>	-	5V positive power supply

## 7 Function Setting

### 7.1 Strap pin setting on SCLK

In application with sensor A2051, sensor's 800dpi is selected when SCLK is floating; 400 dpi is selected if SCLK is connected to ground by a 10KΩ pull down resistor.

### 7.2 Setting OSC frequency output

Resistor value I at OSC1	Frequency output at OSC2
42KΩ	24MHz±1MHz
58KΩ	18MHz±1MHz

### 8 Absolute Maximum Ratings

**Table 2: Absolute maximum ratings**

Symbol	Characteristic	Value	Unit
V <sub>DD</sub>	Supply Voltage	-0.3 ~ 6.0	V
V <sub>I</sub>	Input Voltage	V <sub>SS</sub> -0.3 ~ V <sub>DD</sub> +0.3 V	V
T <sub>OPR</sub>	Operating Temperature	-15 ~ 55	°C
T <sub>STG</sub>	Storage Temperature	-50 ~ 125	°C
ESD	Electro-Static Discharge	± 8000	V

**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.

### 9 Electrical Characteristics (V<sub>DD</sub>=5V, T<sub>a</sub> =25°C)

**Table 3: Electrical Characteristics**

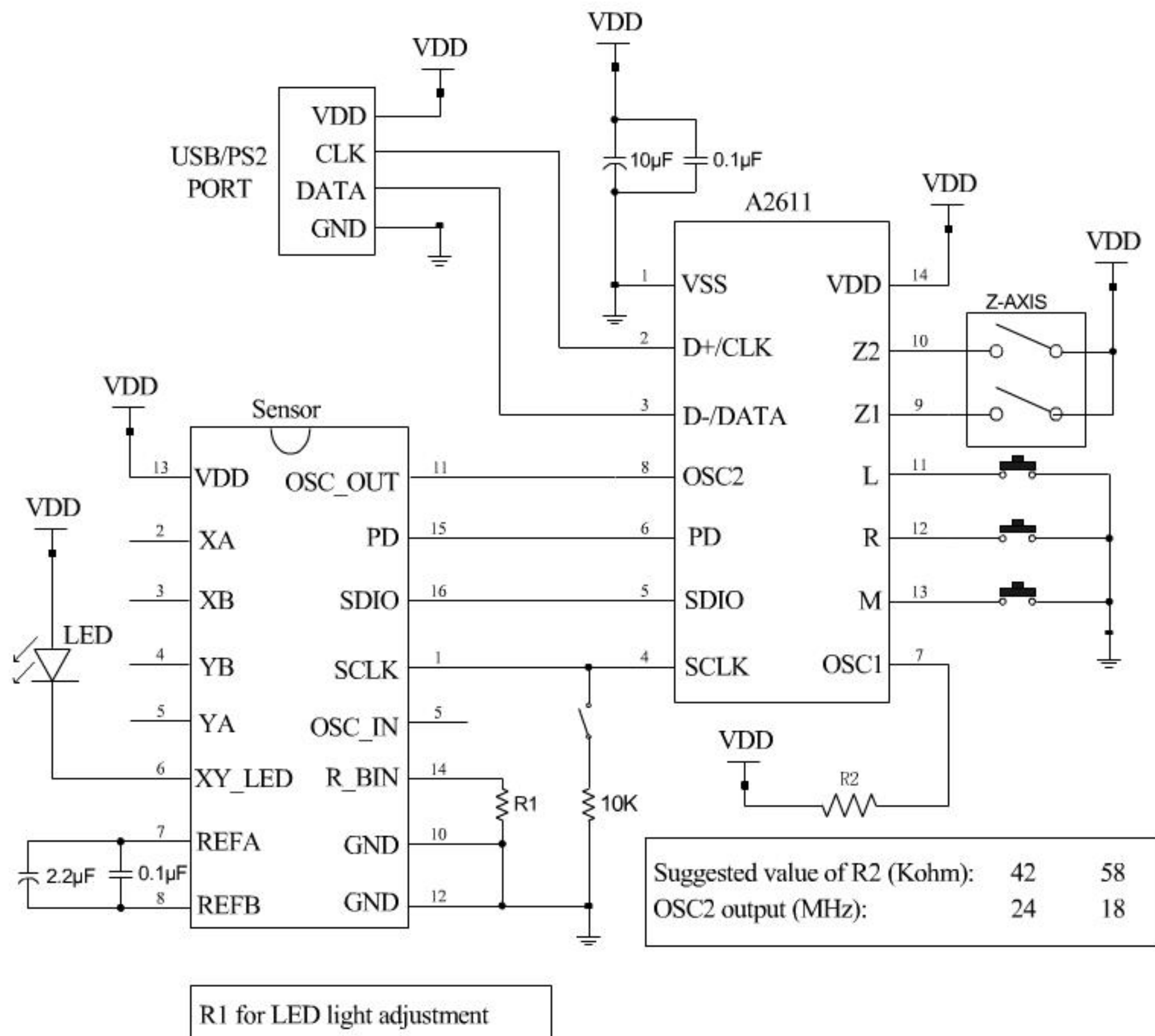
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Operating Voltage	-	4.5	-	5.5	V
I <sub>DD</sub>	Operating Current	No load USB mode	-	8.5	12	mA
		PS/2 mode	-	6.5	10	mA
I <sub>STB</sub>	Standby Current	System suspend	-	330	-	μA
V <sub>IHI</sub>	Input High Voltage for I/O Ports	-	0.7*V <sub>DD</sub>	-	-	V
V <sub>ILI</sub>	Input Low Voltage for I/O Ports	-	0	-	0.8	V
V <sub>IH3</sub>	Input High Voltage for USB/PS2 I/O Ports	-	2.0	-	-	V
V <sub>IL3</sub>	Input Low Voltage for USB/PS2 I/O Ports	-	-	-	0.8	V
V <sub>DI</sub>	Differential Input Sensitivity	(D+) – (D-)	0.15	-	-	V
V <sub>SE</sub>	Single Ended Receiver Threshold	-	0.8	-	-	V
V <sub>CRS</sub>	USB driver output Signal Crossover Voltage	C <sub>LOAD</sub> =50~600pF	1.3	-	2.0	V

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{PD}$	External Bus Pull-down resistance	-	14.25	-	15.75	$K\Omega$
$R_{PS2}$	Internal PS2 Pull-up Resistance	-	4	-	6	$K\Omega$
$T_R$	USB driver transition rise time	$C_{LOAD} = 50pF$	75	-	-	ns
		$C_{LOAD} = 600pF$	-	-	300	ns
$T_F$	USB driver transition fall time	$C_{LOAD} = 50pF$	75	-	-	ns
		$C_{LOAD} = 600pF$	-	-	300	ns
$V_{POR}$	Power on Reset $V_{DD}$ Detection Voltage	-	3.5	-	3.9	V



### 10 Typical Application circuits

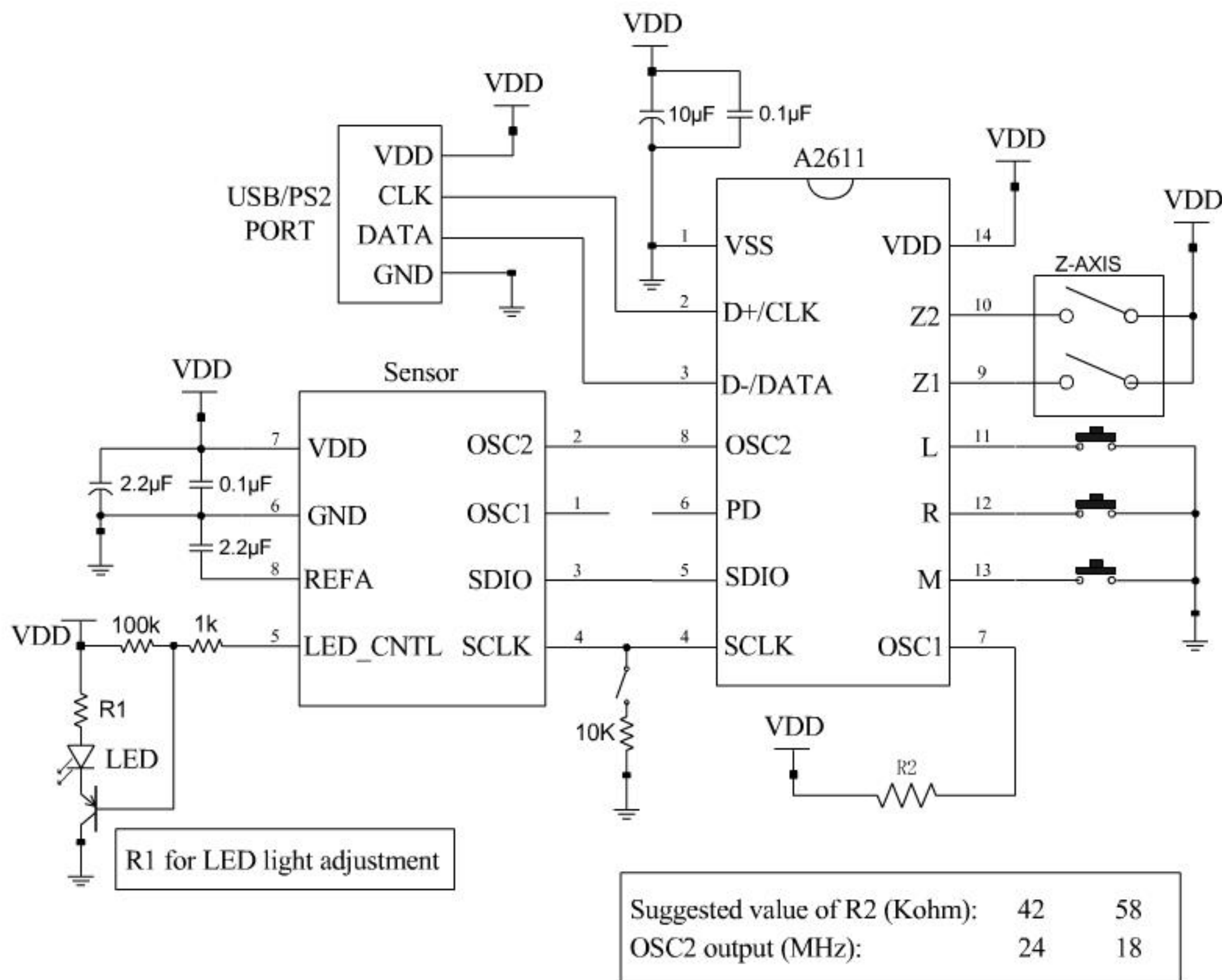
#### 10.1 Application circuit 1



**Figure 3: Typical Application with A2051 sensor**

*Note: At SCLK, pull this pin low with a 10 k $\Omega$  resistor will change the resolution of sensor from 800DPI to 400DPI. This option is only valid for 800DPI multi-resolution sensors.*

### 10.2 Application circuit 2



**Figure 4: Typical Application with A2610/A2620 sensors**

#### Notes:

- (1) The wire length of A2611 OSC2 pin to sensor should be as short as possible to avoid clock jitter and improve EMI performance.
- (2) At SCLK, pull this pin low with a 10 k $\Omega$  resistor will change the resolution of sensor from 800DPI to 400DPI. This option is only valid for 800DPI multi-resolution sensors.
- (3) For more accurate clock frequency of OSC2, adjust R2 value.

### 11 A2611 PAD diagram

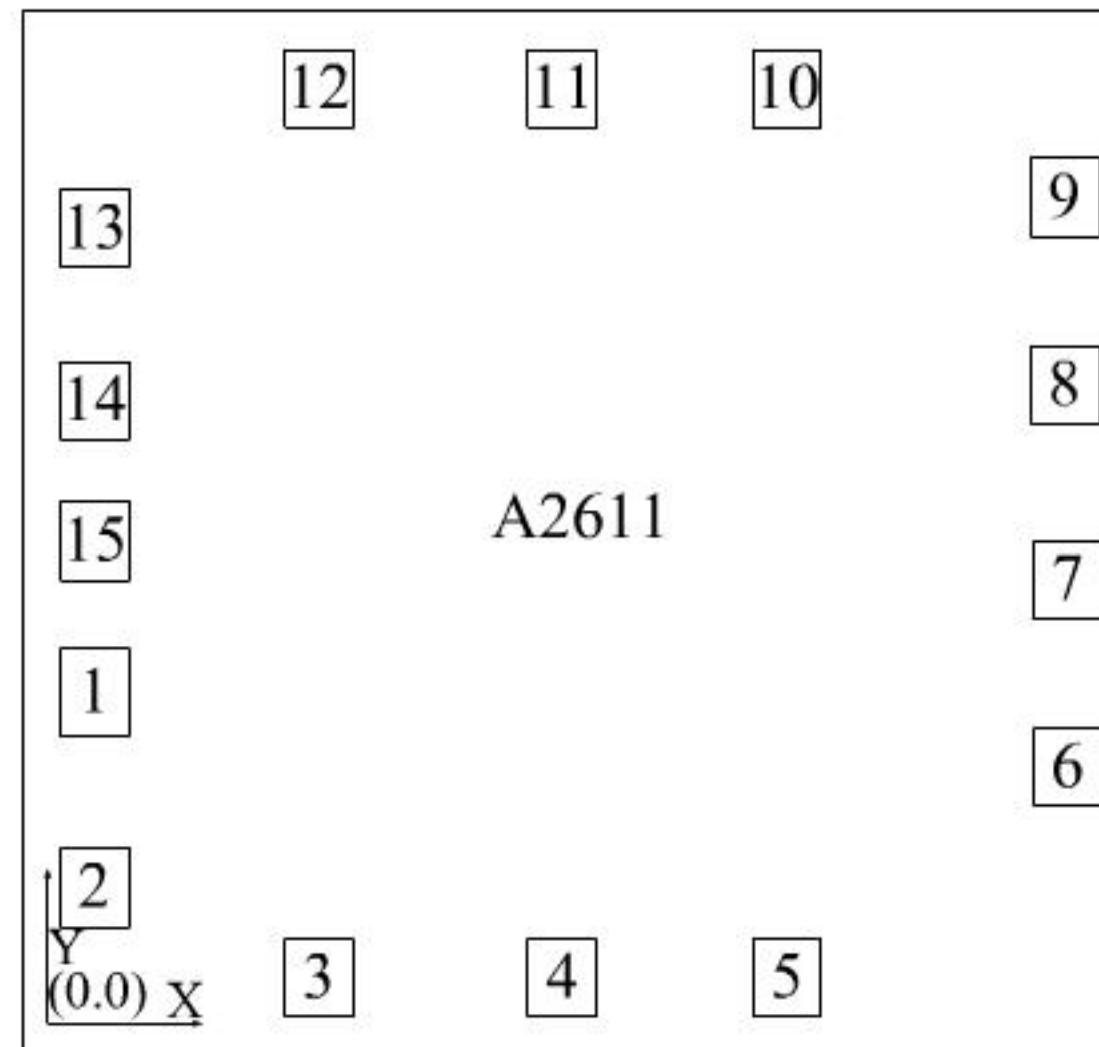


Figure 5: PAD Diagram (Top View)

Substrate= $V_{SS}$

Pad size:  $70\mu\text{m} * 70\mu\text{m}$

Die Size:  $X=1300\mu\text{m} * Y=1370\mu\text{m}$

### 12 PAD description

Table 4: A2611 Die Pad Coordinates

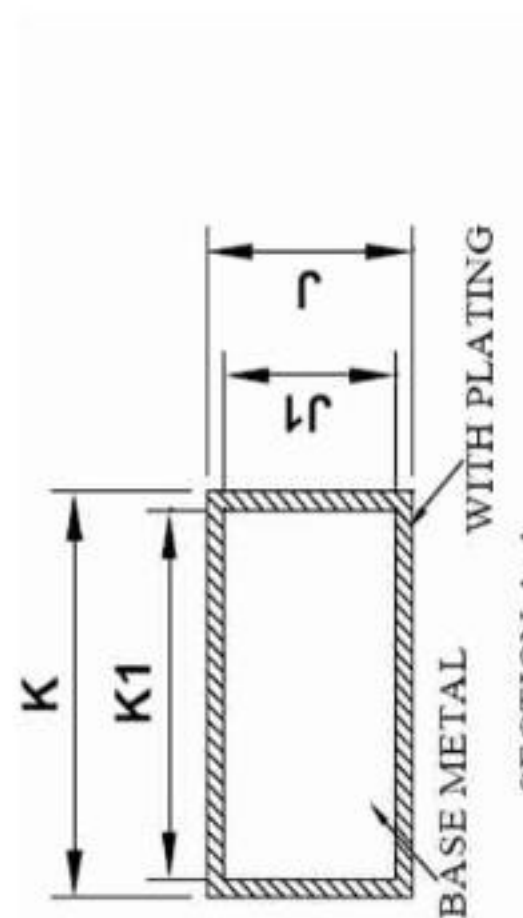
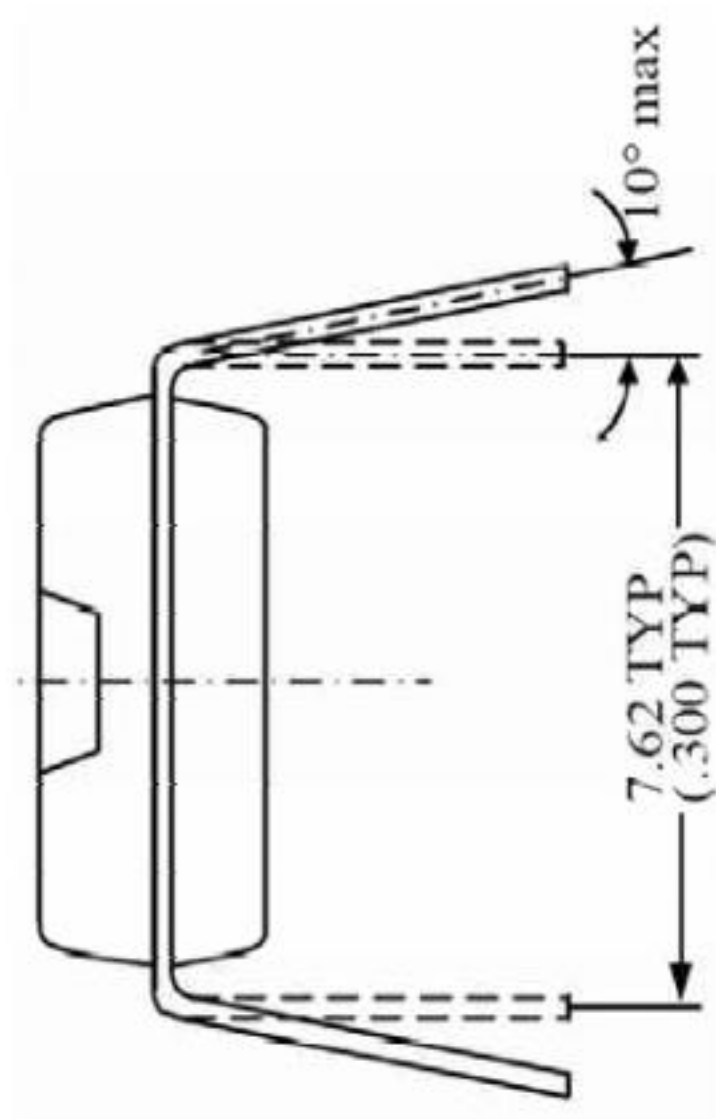
Pad No	Pad Name	Pin No	Pin Name	X ( $\mu\text{m}$ )	Y ( $\mu\text{m}$ )
1	DVSS	1	$V_{SS}$	69.1	404.53
2	AVSS	1	$V_{SS}$	69.1	171.53
3	USBD+CLK	2	D+/CLK	363.95	69.03
4	USBD-DATA	3	D-/DATA	616.85	69.03
5	SCLK	4	SCLK	862.98	69.03
6	SDIO	5	SDIO	1232.78	343.95
7	PD	6	PD	1232.78	583.68
8	OSC1	7	OSC1	1232.78	852.7
9	OSC2	8	OSC2	1232.78	1095.25
10	Z1	9	Z1	802.65	1296.3
11	Z2	10	Z2	558.58	1297.35
12	L	11	L	302.48	1297.35
13	R	12	R	69.1	986.78
14	M	13	M	69.1	746.1
15	AVDD	14	$V_{DD}$	69.1	575.63



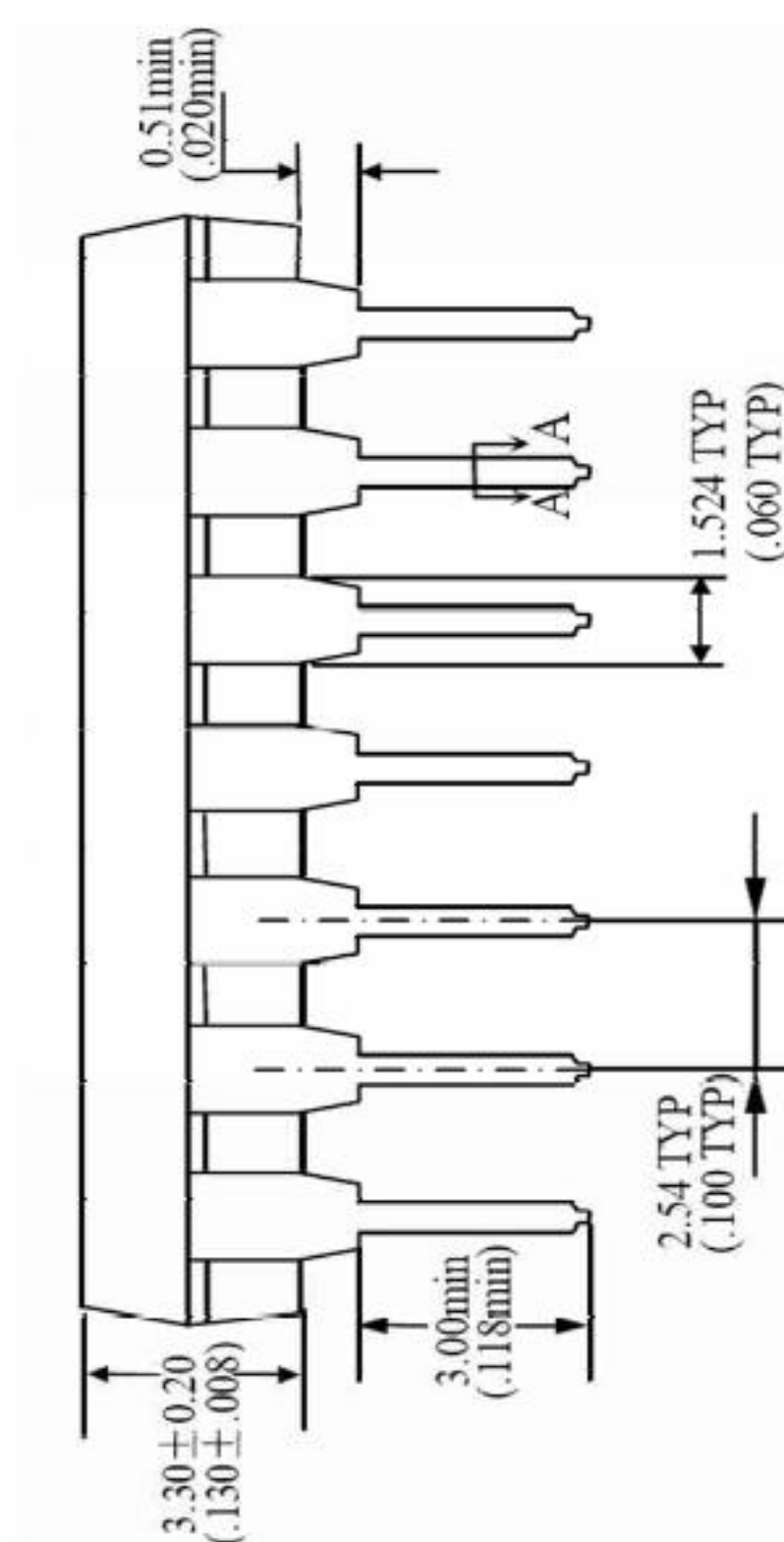
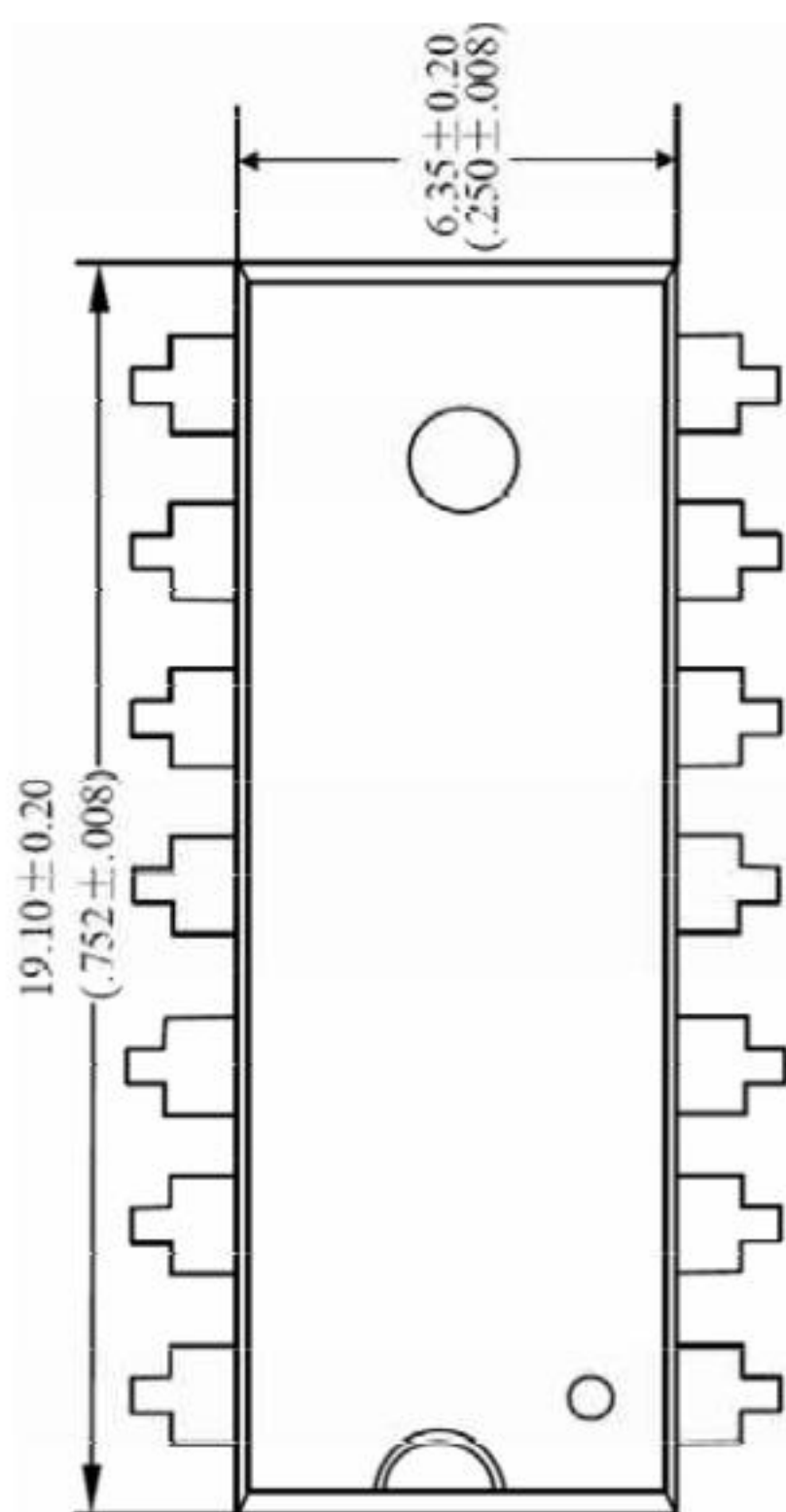
### 13 Package information

#### 13.1 DIP14 Dimensions

Unit: mm (inches)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
J	0.219	0.339	.0086	.0133
J1	0.219	0.289	.0086	.0114
K	0.460	0.560	.0181	.0220
K1	0.460	0.510	.0181	.0201





# A2611

## *3D USB or PS/2 Optical Mouse Controller*

---

### 14 Revision History

Revision	Change Date	Description of Change
1.0	July 12, 2005	Initial release
1.3	Oct. 24, 2005	Revised version
1.54	Feb. 8, 2007	Corrected typo and updated company contact info, added section 6 for SCLK setting and Rosc value selection
1.6	June 12, 2007	Added ordering information



# A2611

## 3D USB or PS/2 Optical Mouse Controller

---

**NOTICE:**

- 1. The information here contained could be changed without notice owing to product and/or technical improvements. Please make sure before using the product that the information you are referring to is up-to-date.*
- 2. No responsibilities are assumed by us for any consequence resulting from any wrong or improper operation, etc. of the product.*

### **Apexone Microelectronics**

#### **Shanghai Headquarters**

Building 18, 115 Lane 572 BiBo Road,  
Zhang-Jiang High-Tech Park  
Shanghai, P. R. China 201203  
Tel: 0086-21-50809600  
Fax: 0086-21-50800992

#### **Shenzhen Office**

Room 801, Cangsong Building (North)  
Tairan Industry Park, Futian District  
Shenzhen, P. R. China 518040  
Tel: 0086-755-82049220  
Fax: 0086-755-82049219

#### **U.S. Office**

7966 Arjons Dr., Suite 109  
San Diego, CA 92126, USA  
Tel: 001-858-5270115  
Fax: 001-858-5270116

**Email: [techsupport@apexonemicro.com](mailto:techsupport@apexonemicro.com)**

#### **Copyright © 2007 by Apexone Microelectronics**

*The information appearing in this Data Sheet is believed to be accurate at the time of publication. However, Apexone assumes no responsibility arising from the using of the specification described. The applications mentioned herein are used solely for the purpose of illustration and Apexone makes no warranty or representation that such application will be suitable without further modification, nor recommends the use of its product for application that may present a risk to human life due to malfunction or otherwise. Apexone reserves the right to alter its product without prior notification. For the most up-to-date information, please visit our web site at <http://www.apexonemicro.com>*