DATA SHEET

凌陽科技
SUNPLUS

SPCP16A-05B

USB/PS2 3D 3/5 Key Mouse Solution

JAN. 16, 2003

Version 1.0

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USB/PS2 3D 3/5 KEY MOUSE SOLUTION

1. FEATURES

1.1. Common Features

- Supports both PS/2 and USB protocols. Auto detection protocol interface (USB or PS/2) at power on.
- Decodes two types of structures for mouse X-Y direction:
  - Traditional opto-sensor for balled mouse (Resolution up to 650dpi).
  - Optical sensor for optical mouse:
    - Agilent® HDNS2000 for 400dpi resolution. (Quadrature output)
    - Agilent® ADNS2051 for 400/800dpi resolution (SPI mode special specific of Agilent®).
- Supports opto-mechanism and mechanical wheel encoding
- Supports button modes (up to 5-button) adjustment according the application setting at power-on and reset.
- 20-pin PDIP and SOP packages available.

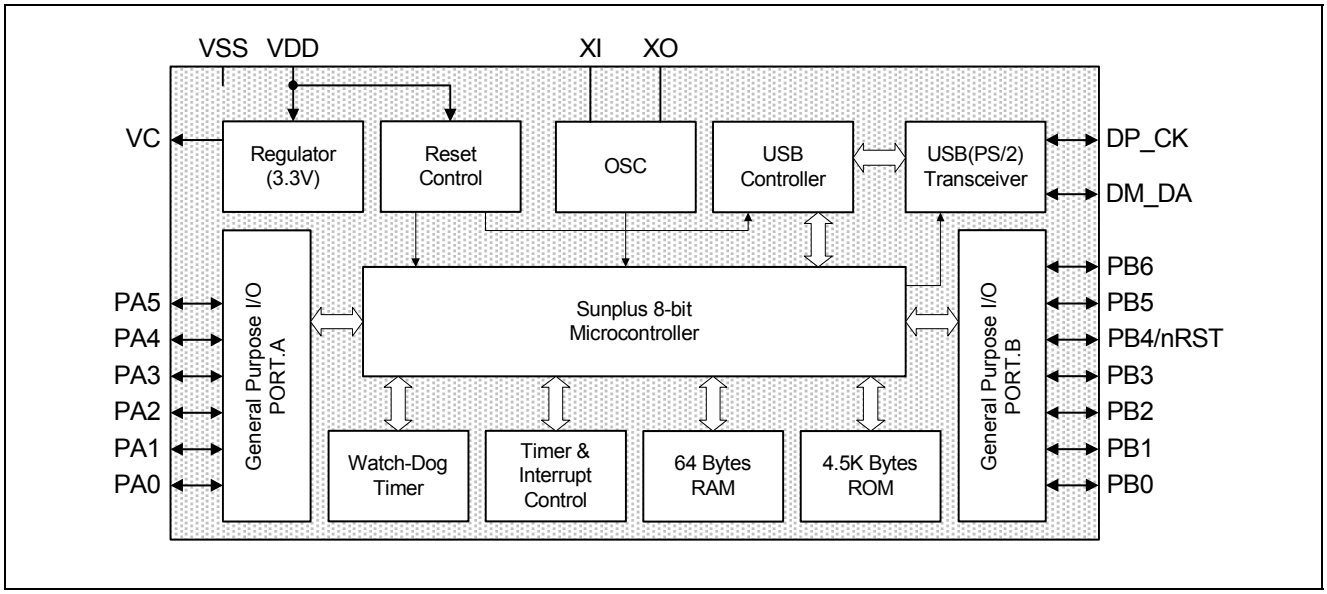
1.2. USB Features

- The Endpoint 0 and Endpoint 1, as specified in the USB specification, are utilized for pipe and interrupt pipe (data transfer) controls respectively.
- Compliant with USB V1.1 and HID V1.1.
- Supports report protocol and boot protocol (mouse is a boot device).

1.3. PS/2 Features

- Compliant with IBM® mouse specification
- Additional keys (4th and 5th buttons) available, based on the IntelliEye® protocol.
- Supports Microsoft® IntelliMouse® mode.
- Supports Microsoft® IntelliEye® mode.

2. BLOCK DIAGRAM

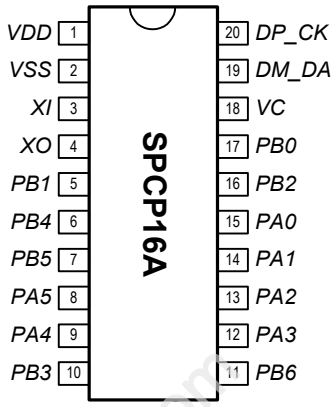


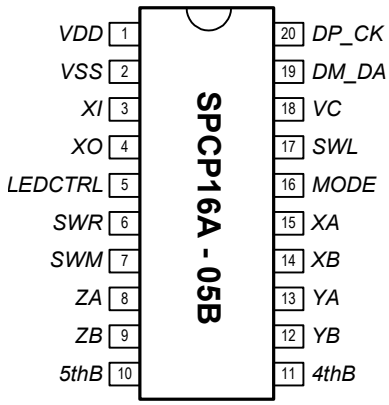
3. SIGNAL DESCRIPTIONS

3.1. PIN Descriptions

Function Name	IC Name	PIN No.	Function Description
VCC	VDD	1	5.0V power
GND	VSS	2	Power ground
XI	XI	3	6.0MHz crystal input
XO	XO	4	6.0MHz crystal output
LEDCTRL	PB1	5	Opto LED control
SWR	PB4	6	Right button input
SWM	PB5	7	Middle or wheel button input
ZA	PA5	8	Z-axis input A
ZB	PA4	9	Z-axis input B
YA	PA3	12	Y-axis input A
YB	PA2	13	Y-axis input B
XA	PA1	14	X-axis input A
XB	PA0	15	X-axis input B
MODE	PB2	16	Extended button strap 1 = 3-button mode 0 = 5-button mode
SWL	PB0	17	Left button input
VC	VC	18	3.3V output from USB transceiver
DM_DA	DM_DA	19	USB D- or PS/2 data
DP_CK	DP_CK	20	USB D+ or PS/2 clock
B5	PB3	10	5th button
B4	PB6	11	4th button

3.2. PIN Assignment





4. FUNCTIONAL DESCRIPTIONS

4.1. USB Function Descriptions

4.1.1. Sunplus 3D USB 5-key mouse mode USB descriptor

4.1.1.1. Device descriptor: (18 bytes)

Offset	Field	Size	Value	Description
0	BLength	1	12h	Size of the descriptor in byte.
1	bDescriptor Type	1	01h	Device descriptor type
(3, 2)	BcdUSB	2	0110h	USB spec. Release Number in BCD
4	bDeviceClass	1	00h	Class Code (assigned by USB).
5	bDeviceSubClass	1	00h	Subclass code (assigned by USB).
6	bDeviceProtocal	1	00h	Protocol code (assigned by USB).
7	bMaxPacketSize0	1	08h	Maximum packet size for endpoint 0.
(9, 8)	idVendor	2	04FCh	Sunplus Vendor ID (assigned by USB).
(11,10)	idProduct	2	0005h	Product ID (assigned by manufacturer).
(13,12)	bcdDevice	2	0101h	Device release number in BCD.
14	iManufacturer	1	01h	Index of string descriptor for manufacturer description.
15	iProduct	1	02h	Index of string descriptor for product description.
16	iSerialNumber	1	00h	Index of string descriptor for the device's serial number description.
17	bNumConfigurations	1	01h	Number of possible configurations.

4.1.1.2. Configuration descriptor: (9 bytes)

Offset	Field	Size	Value	Description
0	Blength	1	09h	Size of the descriptor in byte.
1	bDescriptor Type	1	02h	Configuration descriptor type.
3,2	wTotalLength	2	0022h	Total length of data returned for this configuration by Get_Descriptor command, the data comprises configuration, interface, endpoint, and HID.
4	bNumInterfaces	1	01h	Number of Interface supported by this configuration.
5	bConfigurationValue	1	01h	Value to be used as an argument to Set_Configuration.
6	iConfiguration	1	00h	Index of string descriptor for this configuration description; 00h means none.
7	bmAttributes	1	A0h	Bus Powered; remote wakeup.
8	bMaxPower	1	32h	Maximum power consumption in unit of 100mA.

4.1.1.3. Interface descriptor: (9 bytes)

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of the descriptor in byte.
1	bDescriptor Type	1	04h	Interface descriptor type.
2	bInterfaceNumber	1	00h	Number of interface.
3	bAlternateSetting	1	00h	Value used to select alternated setting for the interface identified in the prior field.
4	bNumEndpoints	1	01h	Number of endpoints used by the interface (excluding endpoint zero).
5	bInterfaceClass	1	03h	Class code (HID code assigned by USB).
6	bInterfaceSubClass	1	01h	0: no subclass; 1:Boot interface subclass
7	bInterfaceProtocol	1	02h	0: none; 1: keyboard; 2: mouse.
8	iInterface	1	00h	Index of string descriptor for this configuration description; 00h means none.

4.1.1.4. HID descriptor: (9 bytes)

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of the descriptor in byte.
1	bDescriptor Type	1	21h	HID descriptor type.
3,2	bcdHID	2	0100h	HID class specification release number in BCD.
4	bCountryCode	1	00h	Hardware target country.
5	bNumDescriptors	1	01h	Number of HID class descriptors to follow.
6	bDescriptorType	1	22h	Report descriptor type.
(8, 7)	wDescriptorLength	2	0048h	Total length of report descriptor.

4.1.1.5. Endpoint descriptor: (7 bytes)

Offset	Field	Size	Value	Description
0	BLength	1	07h	Size of the descriptor in byte.
1	bDescriptor Type	1	05h	Endpoint descriptor type.
2	BendpointAddress	1	81h	IN endpoint, endpoint number = 0001.
3	BmAttribute	1	03h	B(1:0) = 11 means Interrupt endpoint.
(5, 4)	WmaxPacketSize	2	0004h	Maximum packet size. This endpoint is capable of transmitting or receiving data.
6	Binterval	1	0Ah	Interval of polling endpoint for data transfers; this is expressed in millisecond, here = 10 ms.

4.1.1.6. Report descriptor: (72 bytes)

Item	Value (hex)
Usage Page (Generic Desktop),	05 01
Usage (Mouse),	09 02
Collection (Application),	A1 01
Usage (Pointer),	09 01
Collection (Linked),	A1 00
Usage Page (Button),	05 09
Usage Minimum (Button 1),	19 01
Usage Maximum (Button 5),	29 05
Logical Minimum (0),	15 00
Logical Maximum (1),	25 01
Report Size (1),	75 01
Report Count (5),	95 05
Input (Variable)	81 02
Report Size (3),	75 03
Report Count (1),	95 01
Input (Constant),	81 01
Usage Page (Generic Desktop),	05 01
Usage (X),	09 30
Usage (Y),	09 31
Usage (wheel)	09 38
Logical Minimum 81h (-127d)	15 81
Logical Maximum 7Fh (127d)	25 7F
Report Size 8	75 08

Item	Value (hex)
Report Counter 3	95 03
Input (variable, relative)	81 06
End Collection	C0
Usage Page (Generic, Desktop)	05 FF
Usage	09 02
Logical Minimum 0	15 00
Logical Maximum 1	25 01
Report Size 1	75 01
Report Count 1	95 01
Feature (Variable, Relative)	B1 22
Report Size 7	75 07
Report Count 1	95 01
Feature (Constant)	B1 01
End Collection	C0

4.1.1.7. String descriptor

1). String index 0 as for Get_Descriptor (string)

Offset	Field	Size	Value	Description
0	BLength	1	04h	Size of the descriptor in byte.
1	bDescriptor Type	1	03h	String descriptor type.
3,2	BString	2	0409h	Array of LangID code; here is English.

2). String index 1 as for Get_Descriptor (string)

Offset	Field	Size	Value	Description
0	BLength	1	12h	Size of this descriptor in byte.
1	bDescriptor Type	1	03h	String descriptor type.
str_size –1	BString	10h	53h, 00h, 55h, 00h, 4Eh, 00h, 50h, 00h, 4Ch, 00h, 55h, 00h, 53h, 00h, 00h, 00h	String description of manufacturer (SUNPLUS).

3). String index 2 as for Get_Descriptor (string)

Offset	Field	Size	Value	Description
0	bLength	1h	24h	Size of the descriptor in byte
1	bDescriptor Type	1h	03h	String descriptor type
str_size –1	bString	22h	18h, 03h, 57h, 00h, 68h, 00h, 65h, 00h, 65h, 00h, 6ch, 00h, 20h, 00h, 4Dh, 00h, 0Fh, 00h, 75h, 00h, 73h, 00h, 65h, 00h	String description of manufacturer (wheel mouse).

4.1.2. Sunplus 3D USB 3-key mouse mode USB descriptor

4.1.2.1. Device description: (18 bytes)

Offset	Field	Size	Value	Description
0	Blength	1	12h	Size of the descriptor in byte
1	bDescriptor Type	1	01h	Device descriptor type
(3, 2)	BcdUSB	2	0110h	USB specification. Release Number in BCD
4	bDeviceClass	1	00h	Class Code (assigned by USB).
5	bDeviceSubClass	1	00h	Subclass code (assigned by USB).
6	bDeviceProtocol	1	00h	Protocol code (assigned by USB).
7	bMaxPacketSize0	1	08h	Maximum packet size for endpoint 0.
(9, 8)	idVendor	2	04FCh	Sunplus Vendor ID (assigned by USB).
(11, 10)	idProduct	2	0003h	Product ID (assigned by manufacturer).
(13, 12)	bcdDevice	2	0101h	Device release number in BCD.
14	iManufacturer	1	01h	Index of string descriptor for manufacturer description.
15	iProduct	1	02h	Index of string descriptor for product description.
16	iSerialNumber	1	00h	Index of string descriptor for the device's serial number description.
17	bNumConfigurations	1	01h	Number of possible configurations

4.1.2.2. Configuration descriptor: (9 bytes)

Offset	Field	Size	Value	Description
0	BLength	1	09h	Size of the descriptor in byte.
1	bDescriptor Type	1	02h	Configuration descriptor type.
3,2	wTotalLength	2	0022h	Total length of data returned for this configuration by Get_Descriptor command, the data comprises configuration, interface, endpoint, and HID.
4	bNumInterfaces	1	01h	Number of Interface supported by this configuration.
5	bConfigurationValue	1	01h	Value to be used as an argument to Set_Configuration.
6	iConfiguration	1	00h	Index of string descriptor for this configuration description; 00h means none.
7	bmAttributes	1	A0h	Bus powered; remote wakeup.
8	bMaxPower	1	32h	Maximum power consumption, unit in 100mA.

4.1.2.3. Interface descriptor: (9 bytes)

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of the descriptor in byte.
1	bDescriptor Type	1	04h	Interface descriptor type.
2	bInterfaceNumber	1	00h	Number of Interface.
3	bAlternateSetting	1	00h	Value used to select alternated setting for the interface identified in the prior field.
4	bNumEndpoints	1	01h	Number of endpoints used by the interface (excluding endpoint zero).
5	bInterfaceClass	1	03h	Class code (HID code assigned by USB).
6	bInterfaceSubClass	1	01h	0: no subclass; 1: boot interface subclass
7	bInterfaceProtocol	1	02h	0: none; 1: keyboard; 2: mouse
8	iInterface	1	00h	Index of string descriptor for this configuration description; 00h means none.

4.1.2.4. HID descriptor: (9 bytes)

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of the descriptor in byte.
1	bDescriptor Type	1	21h	HID descriptor type.
3,2	bcdHID	2	0100h	HID class specification release number in BCD.
4	bCountryCode	1	00h	Hardware target country.
5	bNumDescriptors	1	01h	Number of HID class descriptors to follow.
6	bDescriptorType	1	22h	Report descriptor type.
(8, 7)	wDescriptorLength	2	004Ah	Total length of report descriptor.

4.1.2.5. Endpoint descriptor: (7 bytes)

Offset	Field	Size	Value	Description
0	BLength	1	07h	Size of the descriptor in byte.
1	bDescriptor Type	1	05h	Endpoint descriptor type
2	BendpointAddress	1	81h	IN endpoint, endpoint number = 0001
3	BmAttribute	1	03h	B (1:0) = 11 means interrupt endpoint.
(5, 4)	WmaxPacketSize	2	0004h	Maximum packet size. This endpoint is capable of transmitting or receiving data.
6	Binterval	1	0Ah	Interval of polling endpoint for data transfers; this is expressed in millisecond, here = 10 ms

4.1.2.6. Report descriptor: (74 bytes)

Item	Value (hex)
Usage Page (Generic Desktop),	05 01
Usage (Mouse),	09 02
Collection (Application),	A1 01
Usage (Pointer),	09 01
Collection (Linked),	A1 00
Usage Page (Button),	05 09
Usage Minimum (Button 1),	19 01
Usage Maximum (Button 3),	29 03
Logical Minimum (0),	15 00
Logical Maximum (1),	25 01
Report Size (1),	75 01
Report Count (5),	95 03
Input (Variable)	81 02
Report Size (3),	75 05
Report Count (1),	95 01
Input (Constant),	81 01
Usage Page (Generic Desktop),	05 01
Usage (X),	09 30
Usage (Y),	09 31
Usage (wheel)	09 38
Logical Minimum 81h (-127d)	15 81
Logical Maximum 7Fh (127d)	25 7F
Report Size 8	75 08
Report Counter 3	95 03

Item	Value (hex)
Input (variable, relative)	81 06
End Collection	C0
Usage	09 3C
Usage Page (Generic, Desktop)	05 FF
Usage	09 01
Logical Minimum 0	15 00
Logical Maximum 1	25 01
Report Size 1	75 01
Report Count 1	95 02
Feature (Variable, Relative)	B1 22
Report Size 7	75 06
Report Count 1	95 01
Feature (Constant)	B1 01
End Collection	C0

4.1.2.7. String descriptor

1). String Index 0 as for Get_Descriptor (String)

Offset	Field	Size	Value	Description
0	BLength	1	04h	Size of the descriptor in byte
1	bDescriptor Type	1	03h	String descriptor type
3,2	BString	2	0409h	Array of LangID code in English language.

2). String Index 1 as for Get_Descriptor (String)

Offset	Field	Size	Value	Description
0	BLength	1	12h	Size of the descriptor in byte
1	bDescriptor Type	1	03h	String descriptor type
str_size –1	BString	10h	53h, 00h, 55h, 00h, 4Eh, 00h, 50h, 00h, 4Ch, 00h, 55h, 00h, 53h, 00h, 00h, 00h	String description of manufacturer (SUNPLUS)

3). String Index 2 as for Get_Descriptor (String)

Offset	Field	Size	Value	Description
0	BLength	1h	24h	Size of the descriptor in byte
1	bDescriptor Type	1h	03h	String descriptor type
str_size –1	bString	22h	18h, 03h, 57h, 00h, 68h, 00h, 65h, 00h, 65h, 00h, 6ch, 00h, 20h, 00h, 4Dh, 00h, 0Fh, 00h, 75h, 00h, 73h, 00h, 65h, 00h	String description of manufacturer (Wheel Mouse)

4.1.2.8. USB data format

1). USB 3D 3-key data format

Byte	D7	D6	D5	D4	D3	D2	D1	D0	Comment
1	0	0	0	0	0	M	R	L	Signs & switches
2	X7	X6	X5	X4	X3	X2	X1	X0	X data byte
3	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Y data byte
4	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0	Z data byte

2). USB 3D 5-key data format

Byte	D7	D6	D5	D4	D3	D2	D1	D0	Comment
1	0	0	0	B5	B4	M	R	L	Signs & switches
2	X7	X6	X5	X4	X3	X2	X1	X0	X data byte
3	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Y data byte
4	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0	Z data byte

4.2. PS2 Mouse Standard Command

Hex	Command	Description
FF	Rest	The system will issue a reset command to initiate a software reset and internal self-test by the mouse.
FE	Resend	The system issues this command when it detects an error in any transmission from mouse. In receiving of resend command, mouse will retransmit the previous data package. It retransmits three bytes package if the previous output is a three-byte data package, two bytes for the two-byte package and one byte if the previous data is one byte, unless the previous output from mouse is a “Resend” command. In this case, the mouse will resend the previous output prior to the Resend command. If a “Resend” command is received by the mouse from the host immediately followed by a three-byte data packet transmission from the mouse to the host while the mouse is in stream mode, the mouse should resend the three-byte data packet prior to clear the count accumulators.
F6	Set default	This command reinitializes all conditions to the power-on default states.
F5	Disable	This command is used in the stream mode to stop transmission initiated from the mouse. It responds to all other commands while disabled. If the mouse is in the stream mode, it must be disabled before sending any command to require a response.
F4	Enable	Begin transmission in stream mode.
F3, XX	Set Sampling Rate	In the stream mode, this command defines the sample rate to the specified value XX where XX is given as follows: hex 0A (10/sec), hex 14 (20/sec), hex 28 (40/sec), hex 3C (60/sec), hex 50 (80/sec), hex 64 (100/sec), hex C8 (200/sec).
F2	Read Device	1. This command always receives a response of hex 00 in the IBM PS/2 mode. 2. This command always receives a response of hex 03 in the IntelliMouse® mode. 3. This command always receives a response of hex 04 in the IntelliEye® mode.
F0	Set Remote Mode	This command sets the remote mode. Data values are reported only in response to a read data command.
EE	Set Wrap Mode	This command sets the wrap mode. This mode remains until hex FF or hex EC is received.
EC	Reset Wrap Mode	This command resets the wrap mode.
EB	Read Data	This command requests all data defined in the data packet format to be transmitted. This command is executed in either remote or stream mode. The data is transmitted even if there has no movement since the last report or the switch status is unchanged. Following a Read Data command, the accumulators are cleared after a data transmission.
EA	Set Stream Mode	This command sets the stream mode.

Hex	Command	Description
E9	Status Request	When this command is issued by the system, the mouse responds with a 3-byte status report as follows: In byte 1: bit means 0 1 = left button depressed 1 1 = middle button depressed 2 1 = right button depressed 3 always = 0 4 0 = scaling 1:1 1 = scaling 2:1 5 0 = disabled 1 = enabled 6 0 = stream mode 1 = remote mode 7 always = 0 In byte 2: bit 0-7 current resolution setting (bit 0 = lsb). In byte 3: bit 0-7 current sampling rate (bit 0 = lsb).
E8, XX	Set Resolution	The mouse provides four resolution selections, configured by the specified XX in this command: hex Count per mm 00 2 01 4 02 8 03 16
E7	Set Scaling 2:1	Scaling is able to provide a course/fine tracking response. At the end of a sample interval in the stream mode, the current X and Y data values are converted to new values. The sign bits are not involved in this conversion. Input output 0 0 1 1 2 1 3 3 4 6 5 9 N (>=6) 2.0 x N 2:1 scaling is only performed in stream mode. In response to a Read Data command, mouse will transmit the present value before conversion.
E6	Reset scaling	This command restores 1:1 scaling.

4.2.1. Data packet format for PS/2-compatible mouse

Byte	D7	D6	D5	D4	D3	D2	D1	D0	Comment
1	Yover	Xover	Ysign	Xsign	1	M	R	L	Signs & switches
2	X7	X6	X5	X4	X3	X2	X1	X0	X data byte
3	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Y data byte

4.2.2. 3D PS2 mouse activation method and data package format

The mouse is set to the 3-button wheel mode by setting the report rate to 200/second, next to 100/second, 80/second, and finally reading the ID from the mouse. The mouse should report an ID of 3 when this sequence is completed.

4.2.3. Data packet format for 3-button wheel mouse

Byte	D7	D6	D5	D4	D3	D2	D1	D0	Comment
1	Yover	Xover	Ysign	Xsign	1	M	R	L	Signs & switches
2	X7	X6	X5	X4	X3	X2	X1	X0	X data byte
3	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Y data byte
4	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0	Z data byte

4.2.4. PS2 mouse 5-button activation (or "Knocking") method and data format

The method used in Windows 2000 to activate a new 5-button wheel mode is an extension of the method used to activate the 3-button and the wheel in IntelliMouse® compatible mice.

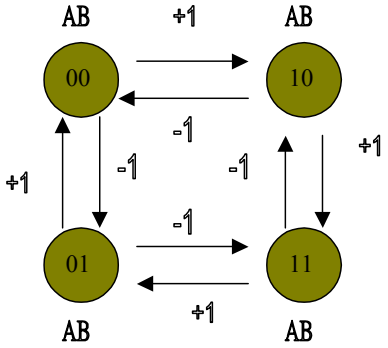
First, the mouse is set to the 3-button wheel mode by setting the report rate to 200/second, next to 100/second, to 80/second consecutively, and ultimately reading the ID from the mouse. The mouse should report an ID of 3 when this sequence is completed.

After that, the mouse is set to the 5-button wheel mode by setting the report rate to 200/second, to 200/second again, to 80/second consecutively, and finally reading the ID from the mouse. Once this sequence is completed, a 5-button wheel mouse should report an ID of 4 (whereas an IntelliMouse® compatible 3-button wheel mouse still reports an ID of 3).

4.2.5. Data packet format for 5-button wheel mouse

Byte	D7	D6	D5	D4	D3	D2	D1	D0	Comment
1	Yover	Xover	Ysign	Xsign	1	M	R	L	Signs & switches
2	X7	X6	X5	X4	X3	X2	X1	X0	X data byte
3	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Y data byte
4	0	0	B5	B4	Z3	Z2	Z1	Z0	Z/wheel data and buttons 4 and 5

4.2.6. X / Y / Z axis counting method



5. ELECTRICAL SPECIFICATIONS

5.1. Absolute Maximum Rating

Characteristics	Item	Min.	Typ.	Max.	Unit	Condition
Storage Temperature	T_{STR}	-40	-	125	ºC	
Operating Ambient Temperature	T_{OPR}	0	-	70	ºC	
Voltage Rating on Input	V_{IN}	-0.3	-	VDD +0.3	V	
Voltage Rating on VDD		-0.3	-	7.0	V	
Output Voltage	V_{OUT}	0	-	VDD	V	

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device. For normal operational conditions see AC/DC Electrical Characteristics.

5.2. Recommended Operating Conditions

Characteristics	Item	Min.	Typ.	Max.	Unit	Condition
Operating Supply Voltage	VDD	4.5	-	5.5	V	PS/2 Mode
		4.4		5.25	V	USB Mode
Power Consumption	I_{DD}	-	-	20	mA	VDD = 5.5V, rms value
Suspend Current	I_{SUSP}	-	-	400	µA	VDD = 5.25V, rms value
LVR Trigger Voltage	V_{LVR}	-	2.2	-	V	

5.3. DC Characteristics

Name	Description	Symbol	Min.	Typ.	Max.	Unit	Test Condition
VC	3.3V regulator output	V_{OH}	3.0	3.3	3.6	V	VDD = 4.4V - 5.25V
DP_CK	Input Voltage High	V_{IH}	2.0	-	-	V	
	Input Voltage Low	V_{IL}	-	-	0.8	V	
	Output Voltage High	V_{OH}	2.8	-	3.6	V	
	Output Voltage Low	V_{OL}	0	-	0.3	V	
	Rise Time	T_{LR}	75	-	300	ns	For C_{LOAD} = 200- 600P
	Falling Time	T_{LF}	75	-	300	ns	For C_{LOAD} = 200-600P
	Input Leakage Current	I_{IZ}	-	-	10	µA	
	PS/2 mode Pull-up	R_{PPU}	3.5	5.0	6.5	KΩ	
DM_DA	Input Voltage High	V_{IH}	2.0	-	-	V	
	Input Voltage Low	V_{IL}	-	-	0.8	V	
	Output Voltage High	V_{OH}	2.8	-	3.6	V	
	Output Voltage Low	V_{OL}	0	-	0.3	V	
	Rise Time	T_{LR}	75	-	300	ns	For C_{LOAD} = 200-600P, and
	Falling Time	T_{LF}	75	-	300	ns	VDD = 4.4V - 5.25V
	Input Leakage Current	I_{IZ}	-	-	10	µA	Internal pull-down disabled
	USB mode Pull-up	R_{PU}	1.20	1.50	1.80	KΩ	
	PS/2 mode Pull-up	R_{MPU}	3.5	5.0	6.5	KΩ	
PA[5:0]	Input Voltage High	V_{IH}	2.0	-	-	V	
	Input Voltage Low	V_{IL}	-	-	0.8	V	
	Input Leakage Current	I_{IZ}	-	-	10	µA	Internal pull-down disabled
	Output Voltage High	V_{OH}	2.4	-	-	V	Source current = 4.0mA
	Output Voltage Low	V_{OL}	-	-	0.5	V	Sink current = 4.0mA
	Pull-down Resistor	R_{PD}	14	20	26	KΩ	Measured at PAD = 1.5V

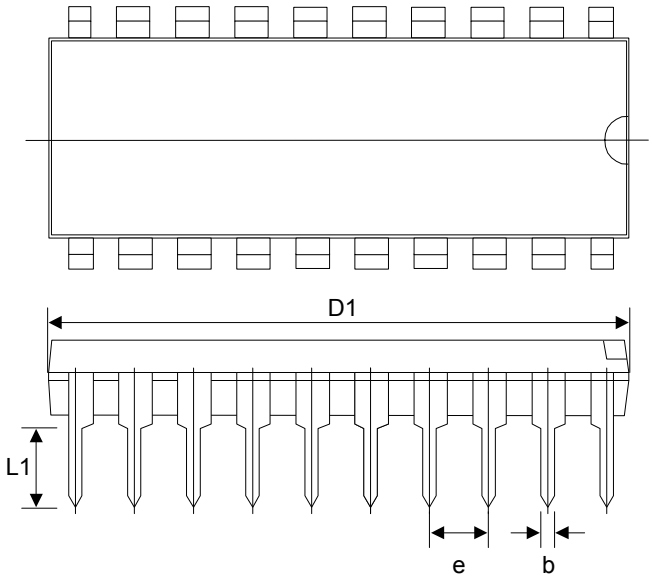
6. APPLICATION CIRCUITS

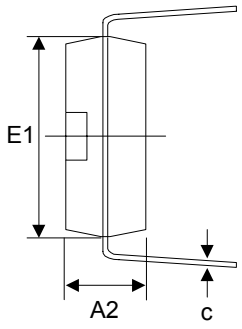
Please contact Sunplus sales representatives or FAE for more information.

7. PACKAGE/PAD LOCATIONS

7.1. Package Information

7.1.1. PDIP 20





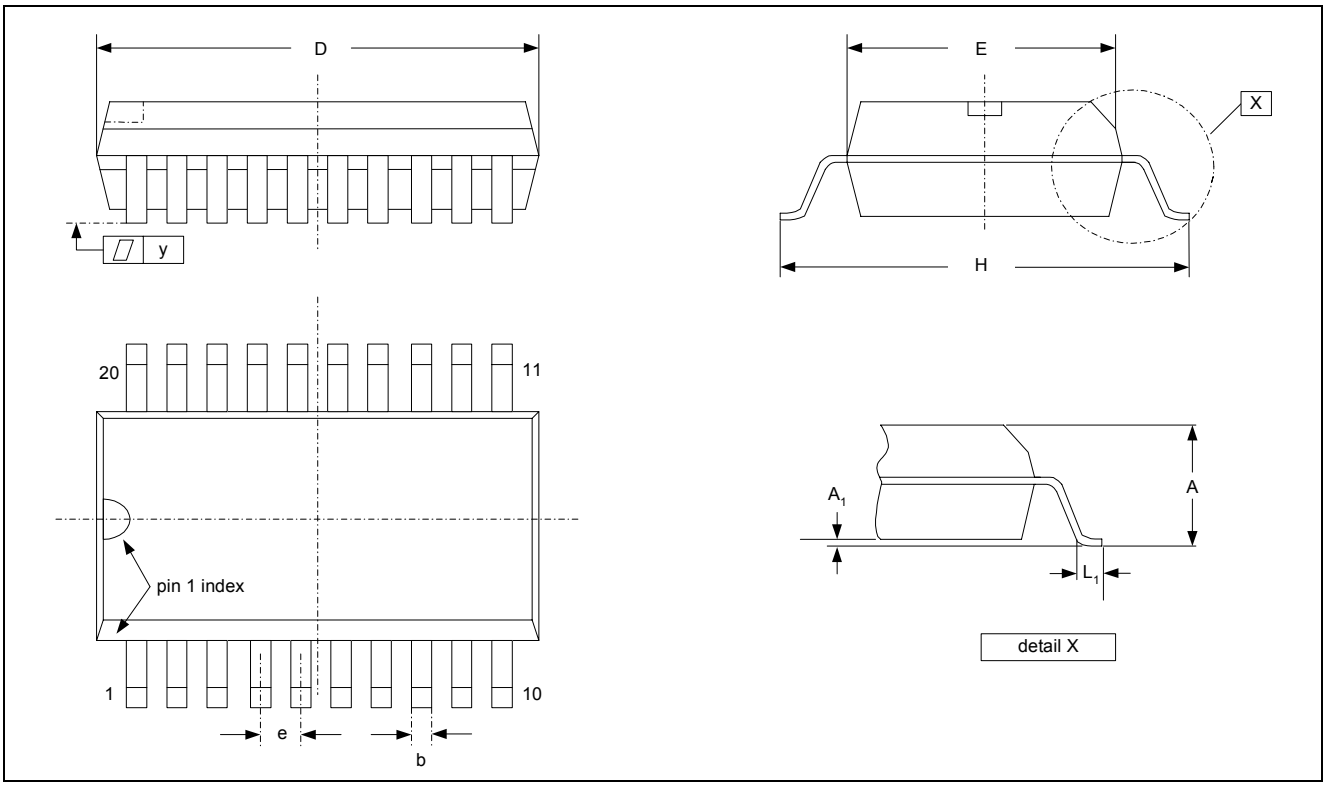
Body Size			Lead Size			
D1	E1	A2	L1	b	c	e
1020±10	250±4	130±5	130±15	18±2	10Typ	100Typ

All units are in mil. 1mil = 25.4μm

D1	Body Length
E1	Body Width
A2	Body Thickness
L1	Lead Length
b	Lead Width
c	Lead Thickness
e	Lead Pitch

PDIP-20-300

7.1.2. SOP 20



Symbol	Dimension in inch		
	Min.	Typ.	Max.
A	0.093	-	0.104
A_1	0.004	-	0.012
b	-	0.016	-
D	0.496	-	0.508
E	0.291	-	0.299
e	-	0.050	-
H	0.394	-	0.419
L_1	0.016	-	0.050
y	-	-	0.004

7.2. Ordering Information

Product Number	Package Type
SPCP16A-05B-PD05	Package form - PDIP 20
SPCP16A-05B-PS07	Package form - SOP 20

8. DISCLAIMER

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9. REVISION HISTORY

Date	Revision #	Description	Page
JAN. 16, 2003	1.0	Original	19