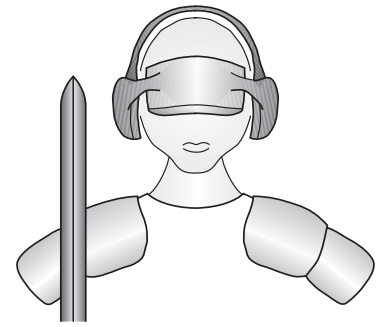


MouseWarrior



MouseWarrior20 O, MouseWarrior20 V
MouseWarrior24 Wheel II, MouseWarrior24 EyeIII
Universal mouse controller chips

Code Mercenaries

1. Features

- USB, ADB™, PS/2 and serial interfaces on MouseWarrior20 O and MouseWarrior20 V
- USB and PS/2 interfaces on MouseWarrior24 EyeIII and MouseWarrior24 Wheel II
- Auto detects active interface
- Up to three buttons on MouseWarrior20 O
- Up to four buttons on MouseWarrior20 V
- Up to six buttons on MouseWarrior24 EyeIII and MouseWarrior24 Wheel II, 5 buttons via PS/2
- Full USB V1.1/2.0 compliance
- Full USB HID 1.1 compliance
- ADB™ Cursor Device Manager compatible
- Uses optical quadrature encoder (MouseWarrior20 O, MouseWarrior24 Wheel II), VersaPoint™ sensor (MouseWarrior20 V), or optical motion sensor ADNS2051 (MouseWarrior24 EyeIII)
- Supports quadrature encoder wheel or two buttons for scrolling (MouseWarrior24 Wheel II and MouseWarrior24 EyeIII)
- Extended serial protocol to support three or four buttons (MouseWarrior20).
- Compatible with standard system drivers, no special drivers necessary
- Low external component count
- Single +5V power supply
- Available in 20 pin DIL or 20 pin SOIC, DIL24 or SOIC24 for MouseWarrior Wheel II and MouseWarrior EyeIII

1.1 Variants

MouseWarrior is available in a number of variants.

MouseWarrior20 O

- USB, ADB™, PS/2 and serial interfaces
- Supports up to three buttons
- Uses any quadrature encoding hardware

MouseWarrior20 V

- USB, ADB™, PS/2 and serial interfaces
- Supports up to four buttons
- Uses Interlink Electronics VersaPoint™ sensor

MouseWarrior24 Wheel II

- USB and PS/2 interfaces
- Supports up to six buttons
- Uses any quadrature encoding hardware
- Scrolling by quadrature encoded wheel or two buttons

MouseWarrior24 EyeIII

- USB and PS/2 interfaces
- Supports up to six buttons
- Uses Agilent ADNS2051 optical motion sensor to track movement with no moving parts.
- Scrolling by quadrature encoded wheel or two buttons

Custom variants

Custom adaptations are available on request.

2. Functional overview

The MouseWarrior family of mouse controllers does combine all mouse interfaces with any market significance into a single chip. Designing pointing devices based on MouseWarrior allows the manufacturer to significantly reduce inventory and production cost.

The manufacturer may choose to equip the device with all interfaces and let the user decide which one to use or produce devices with identical electronics that just differ in the cable attached in the last production step.

MouseWarrior

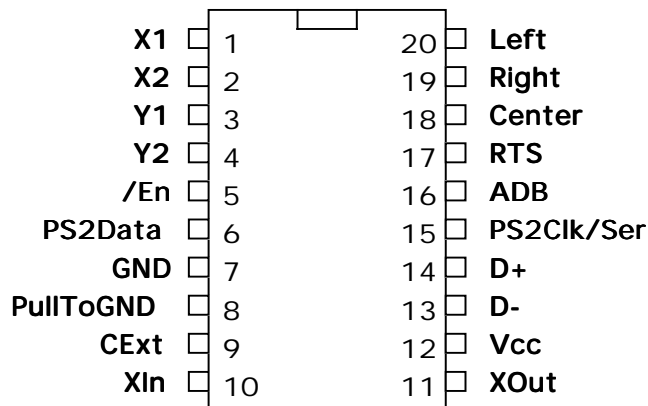
2.1 Product selection matrix

Type	Sensor type	Buttons	Wheel	USB	PS/2	Serial	ADB	DIL20	SOIC20	DIL24	SOIC24
MouseWarrior20O	Quadrature	3	-	√	√	√	√	√	√	-	-
MouseWarrior20V	Force	4	-	√	√	√	√	√	√	-	-
MouseWarrior24Wheel II	Quadrature	6	√	√	√	-	-	-	-	√	√
MouseWarrior24Eye III	ADNS2051	6	√	√	√	-	-	-	-	√	√

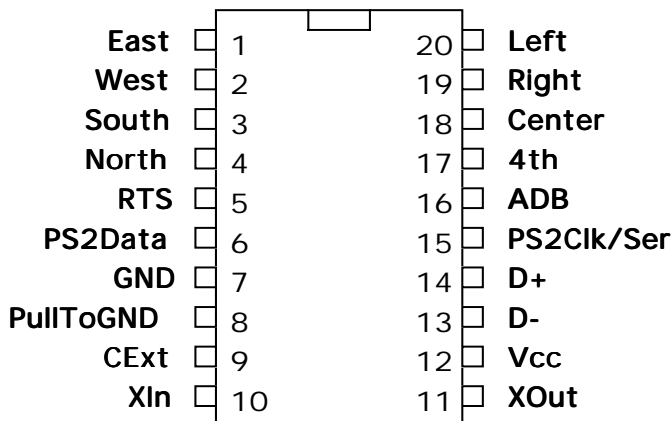
MouseWarrior

3.0 Pin Configurations

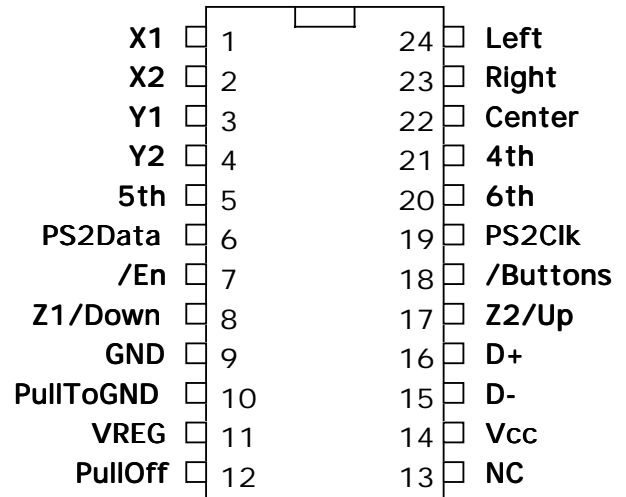
MouseWarrior20 O-P/S 20 Pin PDIP or 20 Pin SOIC



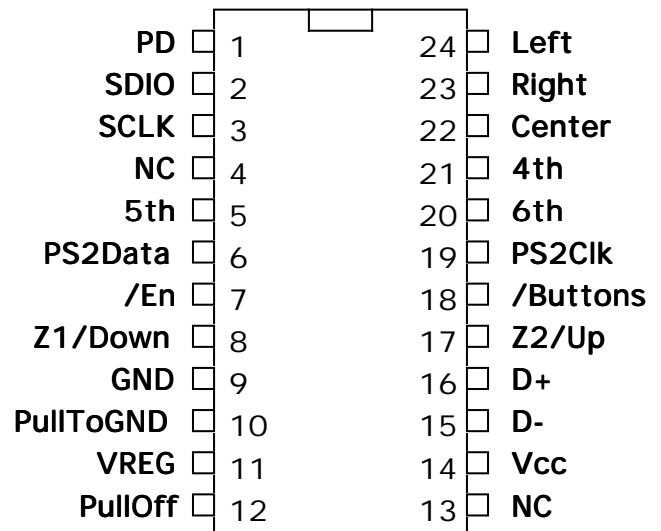
MouseWarrior20 V-P/S 20 Pin PDIP or 20 Pin SOIC



MouseWarrior24 Wheel II-P/S 24 Pin PDIP or 24 Pin SOIC



MouseWarrior24 EyeIII-P/S 24 Pin PDIP or 24 Pin SOIC



All drawings: TOP VIEW!

MouseWarrior

4.0 Pin Descriptions MouseWarrior20 O

Name	I/O	Type	Pins	Description
D+, D-	I/O	special	13,14	USB differential data lines
PS2Clock/Ser	I/O	OD, internal Pull Up	15	PS/2 interface clock line and data out for serial port
PS2Data	I/O	OD, internal Pull Up	6	PS/2 interface data line
ADB	I/O	OD, internal Pull Up	16	ADB™ bus signal
RTS	I	input, high impedance *	17	Serial port RTS, used to detect serial port and reset mouse
X1	I	input, internal Pull Up	1	Encoder X1 input
X2	I	input, internal Pull Up	2	Encoder X2 input
Y1	I	input, internal Pull Up	3	Encoder Y1 input
Y2	I	input, internal Pull Up	4	Encoder Y2 input
Left	I	input, internal Pull Up	20	Input for left mouse button
Right	I	input, internal Pull Up	19	Input for right mouse button
Center	I	input, internal Pull Up	18	Input for center mouse button
/En	O	open drain	5	Output to drive the encoder LEDs
CEExt	I/O	special *	9	Requires external RC for periodic wake
PullToGND	I		8	Used during manufacturing, connect to GND
GND		Power supply	7	Ground
Vcc		Power supply	12	Supply voltage
XOut	O		11	On chip oscillator output
XIn	I		10	On chip oscillator input

4.1 Pin Descriptions MouseWarrior20 V

Name	I/O	Type	Pins	Description
D+, D-	I/O	special	13,14	USB differential data lines
PS2Clock/Ser	I/O	OD, internal Pull Up	15	PS/2 interface clock line and data out for serial port
PS2Data	I/O	OD, internal Pull Up	6	PS/2 interface data line
ADB	I/O	OD, internal Pull Up	16	ADB™ bus signal
RTS	I	input, high impedance *	5	Serial port RTS, used to detect serial port and reset mouse
East	I/O	OD *	1	East signal from VersaPoint™ sensor
West	I/O	OD *	2	West signal from VersaPoint™ sensor
South	I/O	OD *	3	South signal from VersaPoint™ sensor
North	I/O	OD *	4	North signal from VersaPoint™ sensor
Left	I	input, internal Pull Up	20	Input for left mouse button
Right	I	input, internal Pull Up	19	Input for right mouse button
Center	I	input, internal Pull Up	18	Input for center mouse button
4th	I	input, internal Pull Up	17	Input for 4th mouse button
CEExt	I/O	special *	9	Requires external RC for periodic wake
PullToGND	I		8	Used during manufacturing, connect to GND
GND		Power supply	7	Ground
Vcc		Power supply	12	Supply voltage
XOut	O		11	On chip oscillator output
XIn	I		10	On chip oscillator input

* See application circuit for external circuitry.

MouseWarrior

4.2 Pin Descriptions MouseWarrior24 Wheel II

Name	I/O	Type	Pins	Description
D+, D-	I/O	special	15,16	USB differential data lines
PS2Clock	I/O	OD, internal Pull Up	19	PS/2 interface clock line
PS2Data	I/O	OD, internal Pull Up	6	PS/2 interface data line
X1	I	input, internal Pull Up	1	Encoder X1 input
X2	I	input, internal Pull Up	2	Encoder X2 input
Y1	I	input, internal Pull Up	3	Encoder Y1 input
Y2	I	input, internal Pull Up	4	Encoder Y2 input
Z1/Down	I	input, internal Pull Up	8	Encoder Z1 input for wheel or scroll down button
Z2/Up	I	input, internal Pull Up	17	Encoder Z2 input for wheel or scroll up button
Left	I	input, internal Pull Up	24	Input for left mouse button
Right	I	input, internal Pull Up	23	Input for right mouse button
Center	I	input, internal Pull Up	22	Input for center mouse button
4th	I	input, internal Pull Up	21	Input for 4th mouse button
5th	I	input, internal Pull Up	5	Input for 5th mouse button
6th	I	input, internal Pull Up	20	Input for 6th mouse button
/Buttons	I	input, internal Pull Up	18	Selects wheel or buttons for scrolling
/En	O	open drain	7	Output to drive the encoder LEDs
VREG	O	sepcial *	11	Supplies power for USB D- pull up resistor
PullToGND	I		10	Used during manufacturing, connect to GND
PullOff	I	input, internal Pull Down	12	Deactivatex pull up resistors on X1, X2, Y1, Y2, Z1, Z2
GND		Power supply	9	Ground
Vcc		Power supply	14	Supply voltage
NC		unused	13	Unused, leave open

* See application circuit for external circuitry.

MouseWarrior

4.3 Pin Descriptions MouseWarrior24 EyeIII

Name	I/O	Type	Pins	Description
D+, D-	I/O	special	15,16	USB differential data lines
PS2Clock	I/O	OD, internal Pull Up	19	PS/2 interface clock line
PS2Data	I/O	OD, internal Pull Up	6	PS/2 interface data line
PD	O	OD, internal Pull Up	1	PowerDown signal to the ADNS2051 sensor
SDIO	I/O	OD, internal Pull Up	2	Serial data to/from ADNS2051
SCLK	O	OD, internal Pull Up	3	Serial clock to ADNS2051
Z1/Down	I	input, internal Pull Up	8	Encoder Z1 input for wheel or scroll down button
Z2/Up	I	input, internal Pull Up	17	Encoder Z2 input for wheel or scroll up button
Left	I	input, internal Pull Up	24	Input for left mouse button
Right	I	input, internal Pull Up	23	Input for right mouse button
Center	I	input, internal Pull Up	22	Input for center mouse button
4th	I	input, internal Pull Up	21	Input for 4th mouse button
5th	I	input, internal Pull Up	5	Input for 5th mouse button
6th	I	input, internal Pull Up	20	Input for 6th mouse button
/Buttons	I	input, internal Pull Up	18	Selects wheel or buttons for scrolling
/En	O	OD, internal Pull Up*	7	Output to supply wheel encoder LED
VREG	O	special *	11	Supplies power for USB D- pull up resistor
PullToGND	I		10	Used during manufacturing, connect to GND
PullOff	I	input, internal Pull Down	12	Deactivates pull up resistors on X1, X2, Y1, Y2, Z1, Z2
GND		Power supply	9	Ground
Vcc		Power supply	14	Supply voltage
NC		unused	4, 13	Unused, leave open

* See application circuit for external circuitry.

MouseWarrior

4.4 Pin descriptions

D+, D-

Differential data lines of USB. Connect these signals direct to a USB cable or a type B connector. On MouseWarrior20 if USB is unused D+ must be pulled high and D- pulled low.

PS2Clk/Ser, PS2Data (MouseWarrior20)

These two lines are the PS/2 mouse interface. Connect these lines to the mouse interface of the host computer.

PS2Clk doubles as the serial data output, connect this line to a RS232 driver that drives the TXD line of the serial mouse interface.

These two pins must be left floating if PS/2 is not used.

Internal pull up resistors.

PS2Clk, PS2Data (MouseWarrior24)

These two lines are the PS/2 mouse interface. Connect these lines to the mouse interface of the host computer.

These two pins must be left floating if PS/2 is not used.

Internal pull up resistors.

RTS (MouseWarrior20)

Serial port RTS signal line input. This pin requires external circuitry as outlined in the application circuit.

Pulling this line low does halt the serial mouse data transmission and resets the mouse when it returns to high.

This pin must be pulled to ground if the serial port is not used.

ADB (MouseWarrior20)

Data signal of the ADB™. Connect to the ADB™ data line of the computer.

This pin must be left floating if ADB is not used.

Internal pull up resistor.

North, South, East, West (MouseWarrior20 V)

An Interlink Electronics VersaPoint™ sensor may be connected here. See application circuit for external circuitry.

Series resistors are necessary to allow MouseWarrior to properly discharge the dual slope conversion capacitors when maximum force (i.e. minimal resistance) is applied to the sensor.

X1, X2, Y1, Y2 (MouseWarrior20 O, MouseWarrior24 Wheel II)

Inputs for optical quadrature encoded trackball or mouse mechanism. X1 falling edge leads X2 falling edge for right movement. Y1 falling edge leads Y2 falling edge for up movement.

Internal pull up resistors, photo transistors must pull to ground, or schmitt trigger type photo detectors may be used. Pull up resistors can be disabled via PullOff pin (MouseWarrior24 only).

PD, SDIO, SCLK (MouseWarrior24 EyeIII)

These signals connect direct to the corresponding pins on the ADNS2051 sensor.

Internal pull up resistors.

Z1/Down, Z2/Up (MouseWarrior24)

Inputs for quadrature encoded scroll wheel or scroll buttons. The function of these pins is selected by /Buttons pin.

Z1 falling edge leads Z2 falling edge for upward scrolling.

Internal pull up resistors, photo transistors or buttons must pull to ground. Pull up resistors can be disabled via PullOff pin.

/Buttons (MouseWarrior24)

This pin is left unconnected when a scroll wheel is used. To use buttons for scrolling pull this pin to ground and connect the scroll buttons to the Z1/Down, Z2/Up pins.

Internal pull up resistor.

/En (MouseWarrior20 O, MouseWarrior24)

Enable signal for the LEDs of the optical quadrature encoder. Open drain output, capable of sinking up to 24mA on MouseWarrior20 and 50mA on MouseWarrior24.

External series resistor may be needed.

Left, Right, Center

Inputs for three mouse buttons. Internal pull up resistors, contacts must close to GND.

4th (MouseWarrior20 V, MouseWarrior24)

Input for 4th mouse button. Internal pull up resistor, contact must close to GND.

5th, 6th (MouseWarrior24)

Input for 5th and 6th mouse button. Internal pull up resistor, contact must close to GND.

MouseWarrior

CExt (MouseWarrior20)

This input is used to periodically wake the processor during USB suspend to check for a wakeup condition. An external RC combination is required. See application circuit for details.

/Pull to GND

This pin is used during production of the MouseWarrior chips, connect to GND.

PullOff (MouseWarrior24)

The status of this pin at power up determines if the internal pull up resistors on the inputs X1, X2, Y1, Y2 (MW24Wheel II only) and Z1, Z2 are enabled. Pulling this pin high at power up does disable the internal pull up resistors.

XOut, XIn (MouseWarrior20)

Connection for external oscillator. A 6MHz two pin ceramic resonator may be connected here, no additional components required.

Using a crystal will result in unstable operation as the oscillator is optimized for use with ceramic resonators. Using a three pin ceramic resonator will also result in unstable operation.

An external 6MHz clock may be connected to XIn, XOut has to be left floating in this case. Though this may not be compliant with the USB suspend mode current limits.

VREG (MouseWarrior24)

Supplies 3.3V for the USB D- pull up resistor. Don't use this pin to supply power to external circuitry, it does only supply sufficient current for the pull up resistor.

GND

Power supply ground.

Vcc

Supply voltage.

MouseWarrior

5. Device Operation

MouseWarrior does work with very few external components. No jumpers or circuit changes are necessary to use MouseWarrior with either of the interfaces.

MouseWarrior monitors the interface lines to detect which of the interfaces is active. Only one of the interfaces may be connected at any given time, connecting two or more interfaces at the same time will produce unpredictable results.

Once MouseWarrior has been powered up and has detected its active interface it does start checking the mouse sensor and buttons.

5.1 Power Up

Every time the supply voltage is applied MouseWarrior executes an internal reset sequence. All internal pull up resistors are disabled upon power up and will be activated during the internal reset sequence.

After initialisation MouseWarrior waits for any of the interfaces to show activity. If no interface goes active within 5 seconds of power on MouseWarrior will assume it has been hot plugged to a PS/2 port and start working as a PS/2 mouse.

5.2 Protocol details: USB

MouseWarrior works as a HID compliant pointing device using boot protocol. The country code is 0 for not localized hardware. MouseWarrior20 O defines three buttons, MouseWarrior20 V defines four buttons. MouseWarrior24Wheel II and MouseWarrior24EyeIII define six buttons and a scroll wheel.

5.3 Protocol Details: ADB™

When running on ADB™ MouseWarrior identifies as a standard mouse with HandlerID=1. The Left button is reported as the normal mouse button. The Right button is reported as the second button according to CDM (Cursor Device Manager) specs.

MouseWarrior does also accept HandlerID=4 which puts it into the CDM compliant mode which returns an extra byte of data containing the third and fourth button as well as three more bits for each of the axes.

For detailed information on the ADB mouse protocol refer to the Apple Developer Technote "HW01-ADB The Untold Story: Space Aliens Ate My Mouse".

5.4 Protocol Details: PS/2

MouseWarrior by default identifies as a PS/2 device type 0. It does report the buttons Left, Right and Center via the standard protocol which is compatible with normal system drivers (i.e. Logitech method).

MouseWarrior24Wheel II and MouseWarrior24EyeIII are compatible with the Microsoft Intellimouse Explorer™ protocol on the PS/2 interface. They can be set to work as type 3 devices reporting the scroll wheel and three buttons or to type 4 reporting the 4th and 5th button as well. There is no way to utilize the 6th button via PS/2.

MouseWarrior20 V does not report the 4th button via PS/2. A special version of MouseWarrior20 V supporting type 3 and 4 protocol is available on request.

5.5 Protocol Details: Serial

On the serial port MouseWarrior20 O and MouseWarrior20 V use an extended protocol which is compatible with Logitech Mouseman™.

This protocol allows the use of standard drivers which either require standard MS two button protocol or four button extended protocol.

All four buttons (three buttons for MW200) are reported separately in serial mode.

Other protocols are available on request.

MouseWarrior

6. Absolute Maximum Ratings

Storage Temperature	-65°C to +150°C
Ambient Temperature with power applied.....	-0°C to +70°C
Supply voltage on Vcc relative to Gnd	-0.5V to +7V
DC input voltage.....	-0.5V to Vcc+0.5V
Power Dissipation.....	300mW
Static discharge voltage.....	>2000V
Latch-up current.....	>200mA

6.1 DC Characteristics MouseWarrior20

	Parameter	Min	Max	Units	Remarks
V _{cc}	Operating Voltage	4.35	5.25	V	
I _{cc}	Operating Supply Current		25	mA	
I _{sb}	Suspend mode current		20	μA	Oscillator off
I _{ol}	Sink current on interface and /En pins	8	24	mA	V _{out} = 2.0V
R _{up}	Pull-up Resistance	8	24	kΩ	
V _{ith}	Input Threshold Voltage	45%	65%	V _{cc}	
	USB Interface				
V _{oh}	Static output high	2.8	3.6	V	15kΩ±5% to GND
V _{ol}	Static output low		0.3	V	
V _{di}	Differential Input sensitivity	0.2		V	(D+) - (D-)
V _{cm}	Differential Input common Mode Range	0.8	2.5	V	
V _{se}	Single Ended Transceiver Threshold	0.8	2.0	V	
C _{in}	Transceiver capacitance		20	pF	
I _{io}	Hi-Z State Data Line Leakage	-10	10	μA	0V < V _{in} < 3.3V, Hi-Z State
R _{pu}	Bus Pull-up resistance	7.35	7.65	kΩ	7.5kΩ±2% to V _{cc}
R _{pd}	Bus Pull-down resistance	14.25	15.75	kΩ	15kΩ±5% to Gnd

6.1.1 DC Characteristics MouseWarrior24

	Parameter	Min	Max	Units	Remarks
V _{cc}	Operating Voltage	4.35	5.25	V	
I _{cc}	Operating Supply Current		20	mA	
I _{sb}	Suspend mode current		25	μA	Oscillator off
I _{ol}	Sink current on interface pins		2	mA	V _{out} = 0.4V
I _{olen}	Sink current on /En pin		50	mA	V _{out} = 0.8V
R _{up}	Pull-up Resistance	8	24	kΩ	
V _{ith}	Input Threshold Voltage	40%	60%	V _{cc}	
	USB Interface				
V _{oh}	Static output high	2.8	3.6	V	15kΩ±5% to GND
V _{ol}	Static output low		0.3	V	
V _{di}	Differential Input sensitivity	0.2		V	(D+) - (D-)
V _{cm}	Differential Input common Mode Range	0.8	2.5	V	
V _{se}	Single Ended Transceiver Threshold	0.8	2.0	V	
C _{in}	Transceiver capacitance		20	pF	
I _{io}	Hi-Z State Data Line Leakage	-10	10	μA	0V < V _{in} < 3.3V, Hi-Z State
R _{pu}	Bus Pull-up resistance	1.274	1.326	kΩ	1.3kΩ±2% to V _{cc}
R _{pd}	Bus Pull-down resistance	14.25	15.75	kΩ	15kΩ±5% to Gnd

MouseWarrior

6.2 AC Characteristics

	Parameter	Min	Max	Units	Remarks
t _{cy}	input clock cycle time	165.0	168.3	ns	
t _{ch}	Clock high time	0.45t _{cy}		ns	
t _{cl}	Clock low time	0.45t _{cy}		ns	
USB Driver Characteristics					
t _r	Transition rise time	75		ns	C _{Load} = 50pF
t _r	Transition rise time		300	ns	C _{Load} = 350pF
t _f	Transition fall time	75		ns	C _{Load} = 50pF
t _f	Transition fall time		300	ns	C _{Load} = 350pF
t _{rfm}	Rise/Fall Time matching	80	120	%	
V _{crs}	Output signal crossover voltage	1.3	2.0	V	
USB Data Timing					
t _{drate}	Low Speed Data Rate	1.4777	1.5225	MBit/s	
t _{djr1}	Receiver data jitter tolerance	-75	75	ns	To next transition
t _{djr2}	Receiver data jitter tolerance	-45	45	ns	For paired transitions
t _{deop}	Differential to EOP transition skew	-40	100	ns	
t _{eoпр1}	EOP width at receiver	165		ns	Rejects as EOP
t _{eoпр2}	EOP width at receiver	675		ns	Accepts as EOP
t _{eoпрt}	Source EOP width	1.25	1.50	μs	
t _{udj1}	Differential driver jitter	-95	95	ns	To next transition
t _{udj2}	Differential driver jitter	-150	150	ns	To paired transition

MouseWarrior

7. Ordering information

Partname	Order Code	Description	Package
MouseWarrior20 O	MW20O-P	Mouse controller for optical encoders, supports 3 buttons	PDIP20
MouseWarrior20 O	MW20O-S	Mouse controller for optical encoders, supports 3 buttons	SOIC20
MouseWarrior20 V	MW20V-P	Mouse controller for VersaPoint™ sensor, supports 4 buttons	PDIP20
MouseWarrior20 V	MW20V-S	Mouse controller for VersaPoint™ sensor, supports 4 buttons	SOIC20
MouseWarrior24Wheel II	MW24Wheel II-P	Mouse controller for optical encoders with scroll support, 6 buttons	PDIP24
MouseWarrior24Wheel II	MW24Wheel II-S	Mouse controller for optical encoders with scroll support, 6 buttons	SOIC24
MouseWarrior24EyeIII	MW24EyeIII-P	Mouse controller for optical motion sensor and scrolling, 6 buttons	PDIP24
MouseWarrior24EyeIII	MW24EyeIII-S	Mouse controller for optical motion sensor and scrolling, 6 buttons	SOIC24

The chips listed here are standard products. Customized chips are available on request.

7.1 Packaging info

PDIP20 chips come in tubes with 20 chips each.
 SOIC20 chips come in tubes with 37 chips each.
 PDIP24 chips come in tubes of 16 each.
 SOIC24 chips come in tubes with 31 chips each.
 To assure best handling and shipping safety please order the chips in full tubes if possible.

7.2 USB VendorID and ProductID

By default all MouseWarrior chips are shipped with the USB VendorID of Code Mercenaries (\$7C0 or decimal 1984) and a fixed ProductID. On request chips can be equipped with the customers VendorID and ProductID. VendorIDs can be obtained from the USB Implementers Forum <www.usb.org> Customized chips may be subject to minimum order quantities, contact <sales@codemerccs.com> for details.

Following are the ProductIDs for the MouseWarrior controllers:

MouseWarrior20 O	\$0001
MouseWarrior20 V	\$0002
MouseWarrior24 Wheel II	\$000A
MouseWarrior24 EyeIII	\$0009

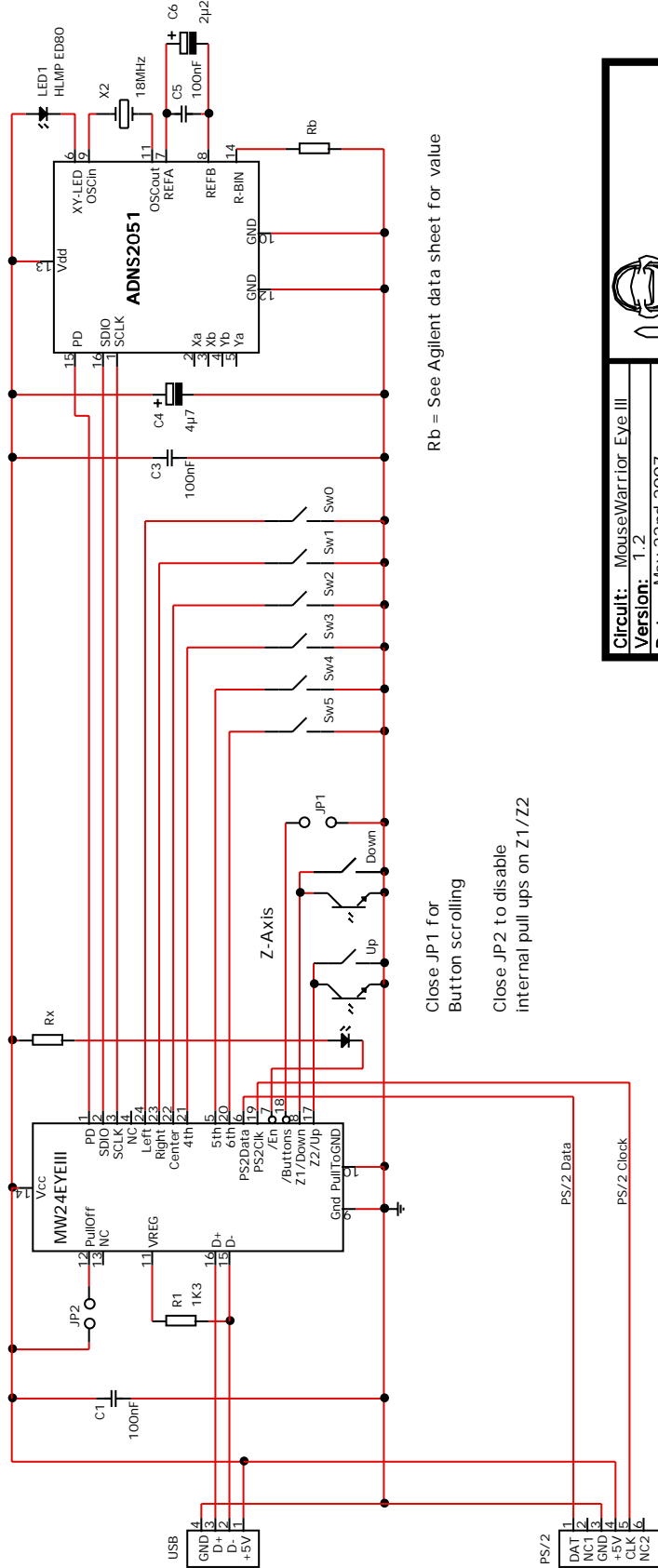
ProductIDs are independent of the package type.

7.3 Using ADB

The utilisation of ADB requires a license from Apple Computer Inc. Contact <sw.license@apple.com> for details.

MouseWarrior

8.3 Typical application for MouseWarrior24EyeIII



Rb = See Agilent data sheet for value

Close JP1 for Button scrolling

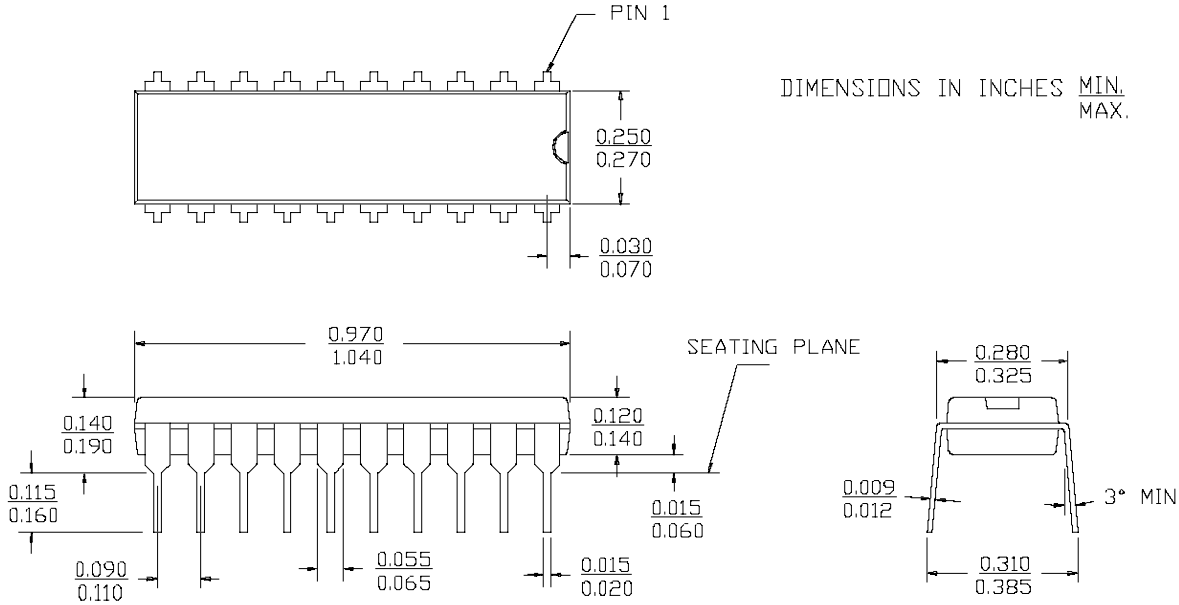
Close JP2 to disable internal pull ups on Z1/Z2

Circuit:	MouseWarrior Eye III
Version:	1.2
Date:	May 22nd 2007
Drawn by:	
Function:	
Part:	
Rev.	
Date	
By	
Change	
Sign.	

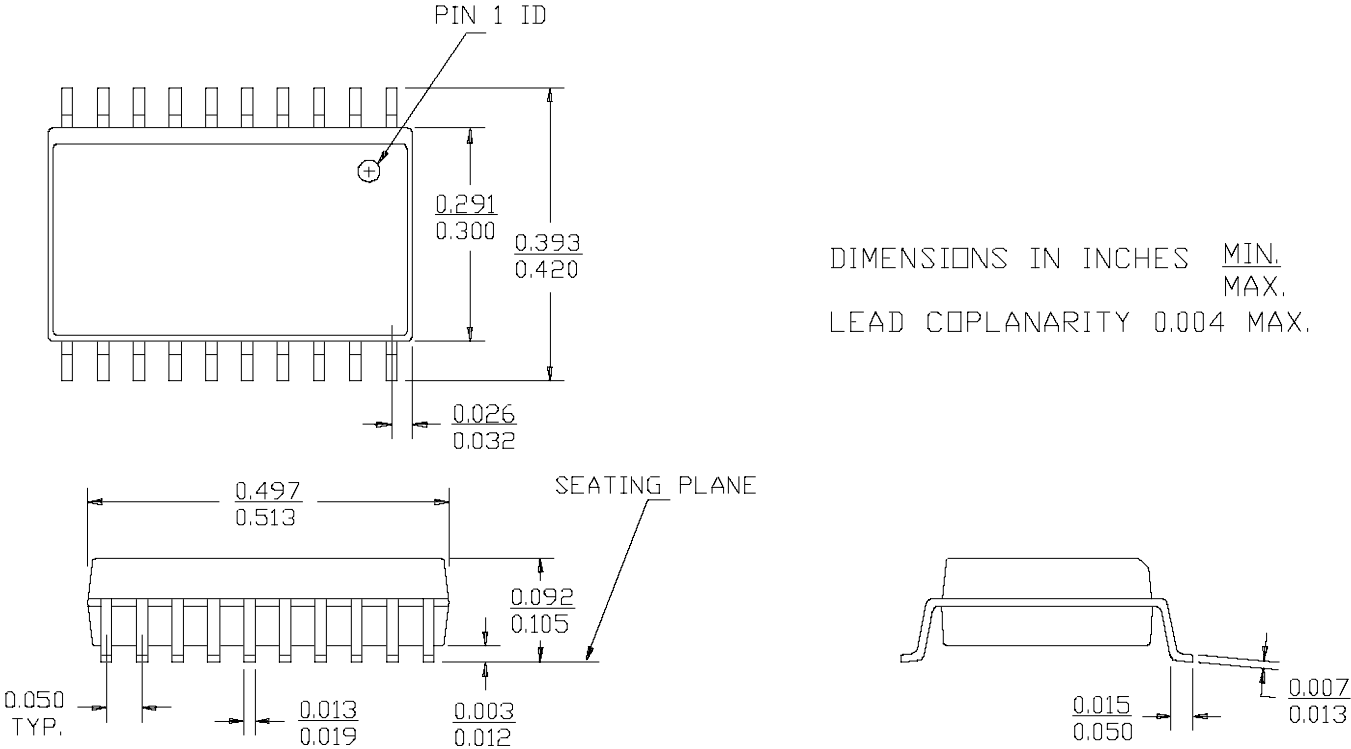
MouseWarrior

9. Package Dimensions

20 Pin DIP



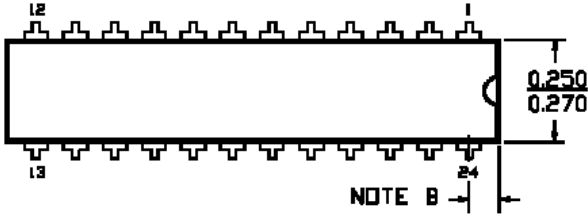
20 Pin SOIC



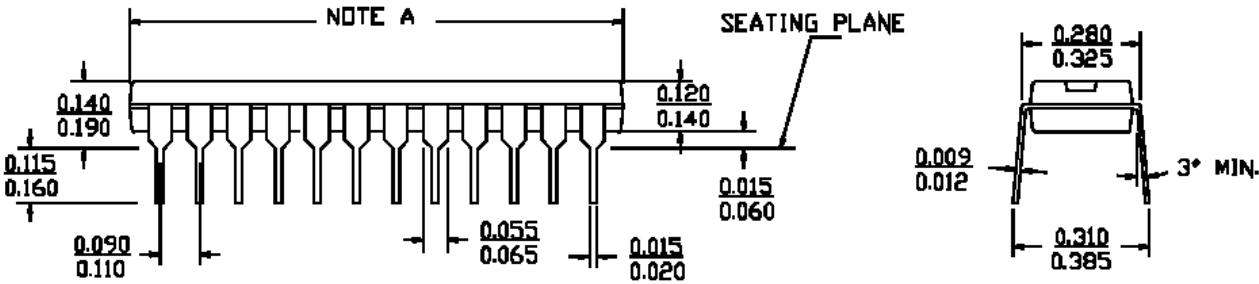
MouseWarrior

24 Pin DIL

DIMENSIONS IN INCHES MIN.
MAX.

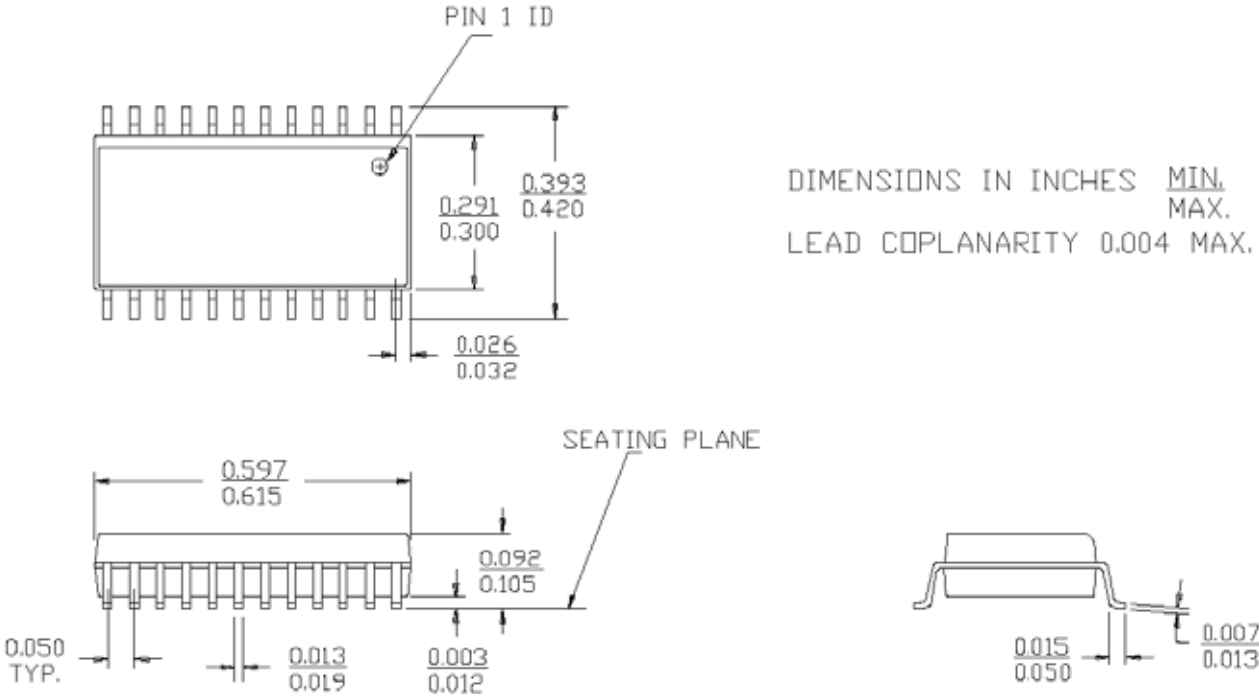


	P 13	P 13A
NOTE A	<u>1.170</u> <u>1.200</u>	<u>1.230</u> <u>1.260</u>
NOTE B	<u>0.030</u> <u>0.050</u>	<u>0.060</u> <u>0.080</u>



24 Pin SOIC

DIMENSIONS IN INCHES MIN.
MAX.
LEAD COPLANARITY 0.004 MAX.



MouseWarrior

10. Revision history

Changes made to the MouseWarrior chips since V1.0.0:

V1.0.6.3

- Discontinued MouseWarrior24EyeII and replaced it by MouseWarrior24EyeIII.
- Discontinued MouseWarrior24Wheel and replaced it by MouseWarrior24Wheel II.

V1.0.6.2 (was not generally released)

- Added various custom versions.
- PS/2 interfaces does now send BAT OK on power up. This assures that the mouse is detected as hot plugged and gets initialized by the host. Newer BIOS versions show better results with this approach.

V1.0.6.1

- Discontinued MouseWarrior24Eye and replaced it by MouseWarrior24EyeII.

V1.0.6.0 (was not generally released)

- Added various custom versions.
- Changed PS/2 timing so clock low and high phase are symmetrical.
- Switched to four part version numbers.

V1.0.5 (was not generally released)

- Optimized USB stack
- Improved encoder scanning speed of MW20O and MW24Wheel by moving send routines to interrupt.
- Made Report Protocol default as specified in HID 1.1 for USB.

V1.0.4

- Added MouseWarrior24Eye variant.
- Modified MouseWarrior24Wheel to also work as a type 4 PS/2 device, enabling it to report the 4th button.
- Added some delay between receiving a PS/2 command and answering on it. This fixes problems with some badly designed host controllers.
- Fixed an interrupt related problem in the PS/2 protocol that could under certain timing conditions cause the return of a wrong reply to a command. The correct data byte to be send was overwritten, returning a random reply. This lead to the mouse not being recognized or not properly configured on some hosts.

V1.0.3

- Finished MouseWarrior24 Wheel.
- SetScaling command on PS/2 of MouseWarrior20 O and MouseWarrior24 Wheel does now activate a ballistic scaling of the mouse movement.

V1.0.2

- Added MouseWarrior24 Wheel variant. Still preliminary, subject to changes.
- Reversed position of USB Class and Endpoint descriptor to be HID Draft 4 compliant.
- Fine tuned axis handling of MouseWarrior20 V to match KeyWarrior Combo V.
- Optimized Wakeup interrupt to minimize on time during USB suspend state when checking for activity.
- Changed MouseWarrior20 O speed on USB, ADB and serial to maximum.

V1.0.1

- Modified MouseWarrior20 V to use the stronger direction of an axis instead of the difference between the directions. This eliminates the Z-axis force from X and Y.
- Fixed a bug in USB suspend that caused the controller to crash when going to suspend with remote wakeup enabled.

MouseWarrior

11. ESD Considerations

MouseWarrior has an internal ESD protection to withstand discharges of more than 2000V without permanent damage. However ESD may disrupt normal operation of the chip and cause it to exhibit erratic behaviour.

For the typical office environment the 2000V protection is normally sufficient. Though for industrial use additional measures may be necessary.

When adding ESD protection to the signals special care must be taken on the USB signal lines. The USB has very low tolerance for additional resistance or capacitance introduced on the USB differential signals.

The PS/2, serial and ADB lines are less critical. Series resistors of 27Ω and signal to ground capacitors of 27pF may be used alone or in addition to some kind of suppressor device.

11.1 EMC Considerations

MouseWarrior uses relatively low power levels and so it causes few EMC problems if a few precautions are taken.

To avoid any EMC problems the following rules should followed:

- Keep the PCB traces from the resonator to the chip pins as short as possible.
- Put a 100nF ceramic capacitor right next to the power supply pins and make sure the PCB traces between the chips power pins and the capacitor are as short as possible.
- Run the power supply lines first to the capacitor, then to the chip.

Adding a ferrite bead to the +5V power supply lines is advisable. Use separate beads for the USB and the ADB+PS/2 power supply lines, i.e. don't place the bead behind the diode in the USB power supply line.

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