Interlink Electronics
FSR® Force Sensing Resistors®

High Precision MicroJoystick Integration Guide

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1.0 Introduction

The High-Precision MicroJoystick is an innovative, intuitive, OEM pointing system that delivers simultaneous 360 degree control of direction and speed at the touch of a fingertip – ideal for integration into notebook computers, remote controls, games, ruggedized products, and other portable products where space is limited. The MicroJoystick is based on Interlink Electronics' patented pressure-sensitive Force Sensing Resistor® (FSR®) technology. The dynamic response of FSR technology enables the lightest of touches to be translated into smooth, intuitive cursor control, while simultaneously enabling dynamic speed control by altering the amount of applied pressure.

2.0 Scope

This Design Guide is intended to provide OEMs with a comprehensive overview of evaluating and integrating Interlink Electronics' MicroJoystick. If questions arise beyond the scope of this design guide, please contact Interlink Electronics. Before using or installing the MicroJoystick, please take a few minutes to carefully review this Integration Guide.

3.0 Theory of Operation

When you place your finger on the top of the MicroJoystick, the pressure exerted by your finger is transmitted to the 4-zone VersaPoint® FSR sensor located in the joystick's base. The 4-zone sensor consists of four overlapping zones designed to produce smooth, light cursor response. The force distribution over the four zones is immediately converted by the microcontroller into cursor movement in the direction of applied force. The micro-controller's dedicated firmware optimizes the cursor's speed response and accuracy; the result is smooth cursor movement in any direction, from a precise crawl to a screen-crossing zip.
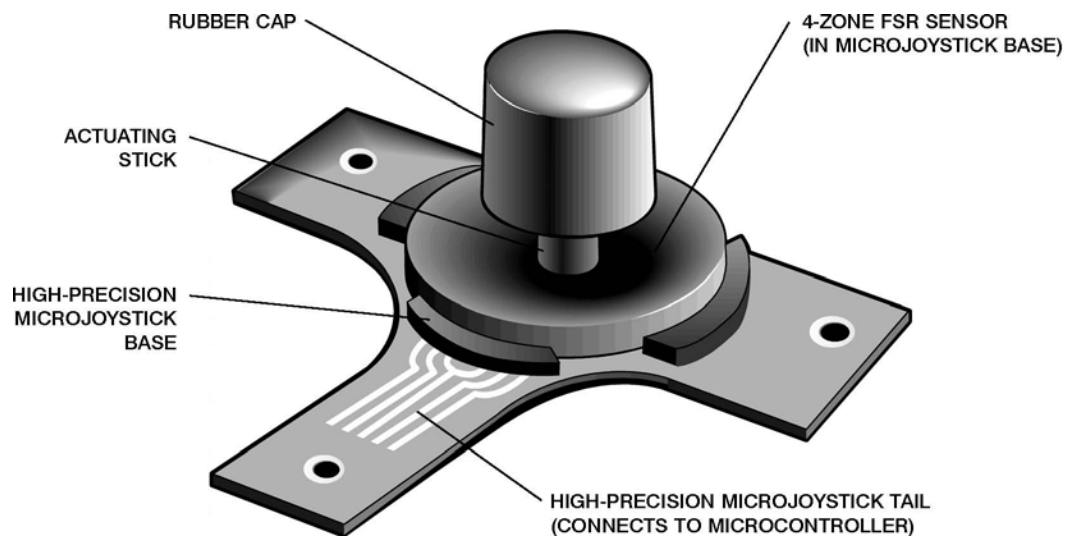
4.0 Features and Operation

4.1 Component Description

The standard MicroJoystick system is a component-level solution consisting of a joystick, a microcontroller, and a rubber cap. The integrator provides the interconnect cable and a few simple electronic components (to support the microcontroller). Customized turnkey modules can be designed that simplify integration and improve time-to-production. Custom interconnect cables, designed to connect the joystick or module to system boards, can also be supplied by Interlink Electronics.

MicroJoystick Caps

The typical cap which Interlink Electronics supplies is made of rubber and is designed to slip over the top of the MicroJoystick's actuating stick. Custom, molded hard-plastic caps can be designed to produce a "control-disk" or "control-sphere" interface. Since the design of the cap can influence the cursor response, fine tuning of the mouse speed may be required. This is accomplished by changing R1 in the recommended schematic.

Standard

Cap Control Disk Cap
(Custom Example)

Control Sphere Cap
(Custom Example)

4.2 Features

The MicroJoystick has many features and benefits that make it a versatile pointing solution for a variety of applications.

Unparalleled Noise and ESD Properties

The MicroJoystick's low-gain electrical circuitry is inherently resistant to electrical noise and electro static discharge (ESD). In addition, the MicroJoystick's simple, no-moving-parts design makes it highly resistant to vibration and mechanical noise.

Unsurpassed Quality and Reliability

The MicroJoystick reliability is a benefit of its no-moving parts design – making it virtually maintenance free and highly resistant to contamination. MicroJoystick pointing solutions are rated to lifetimes in excess of five million cycles.

Compact Design Facilities Integration Flexibility

The compact size of the MicroJoystick allows it to be mounted in-between keys on keyboards – close to the user's hands – below the space bar, into front panels, or virtually anywhere! The compact size – much smaller than trackballs or touchpads – allows it to be easily integrated into tight, cramped spaces and frees up space for other system components. The MicroJoystick is unaffected by mounting orientation, whether horizontal, vertical, or any angle in-between, providing integrators maximum flexibility with product design.

Robust Environmental Properties

The MicroJoystick's robust environmental properties make it the ideal pointing device for use in almost any environment – from climate controlled clean rooms to hot and humid tropical climates.

Hardware Interface Support

Standard MicroJoystick ICs are available with PS/2 and USB hardware interface.

Driver Software

The standard Microsoft windows mouse driver will operate the MicroJoystick.

5.0 Mechanical Integration

Mounting the MicroJoystick

There are a variety of mounting methods available to the integrator. The MicroJoystick may be mounted on the frame of a keyboard, either by mounting it directly on top of the frame or by mounting it from underneath the frame with the stick protruding through the frame. Its compact size easily fits within the constraints of most notebook keyboards. In addition, the MicroJoystick can be mounted on a case or bezel, or directly to a printed-circuit board. Figure 1 on the next page shows the dimensions of the MicroJoystick assembly.

How to Adhere to Printed Circuit Board

Never solder directly to the connecting traces on the printed circuit board of the MicroJoystick; the material used for the conductive pattern is not solderable. Instead use standard or custom flex circuit attached using heat-bonded anisotropic conductive adhesives or pressure-sensitive anisotropic adhesives. However, in order to ensure that the pressure-sensitive adhesive joint is robust and reliable, a compressive force must be applied to the adhesive joint. A molded-in rib or mechanical clamp can be used to supply the compressive force.
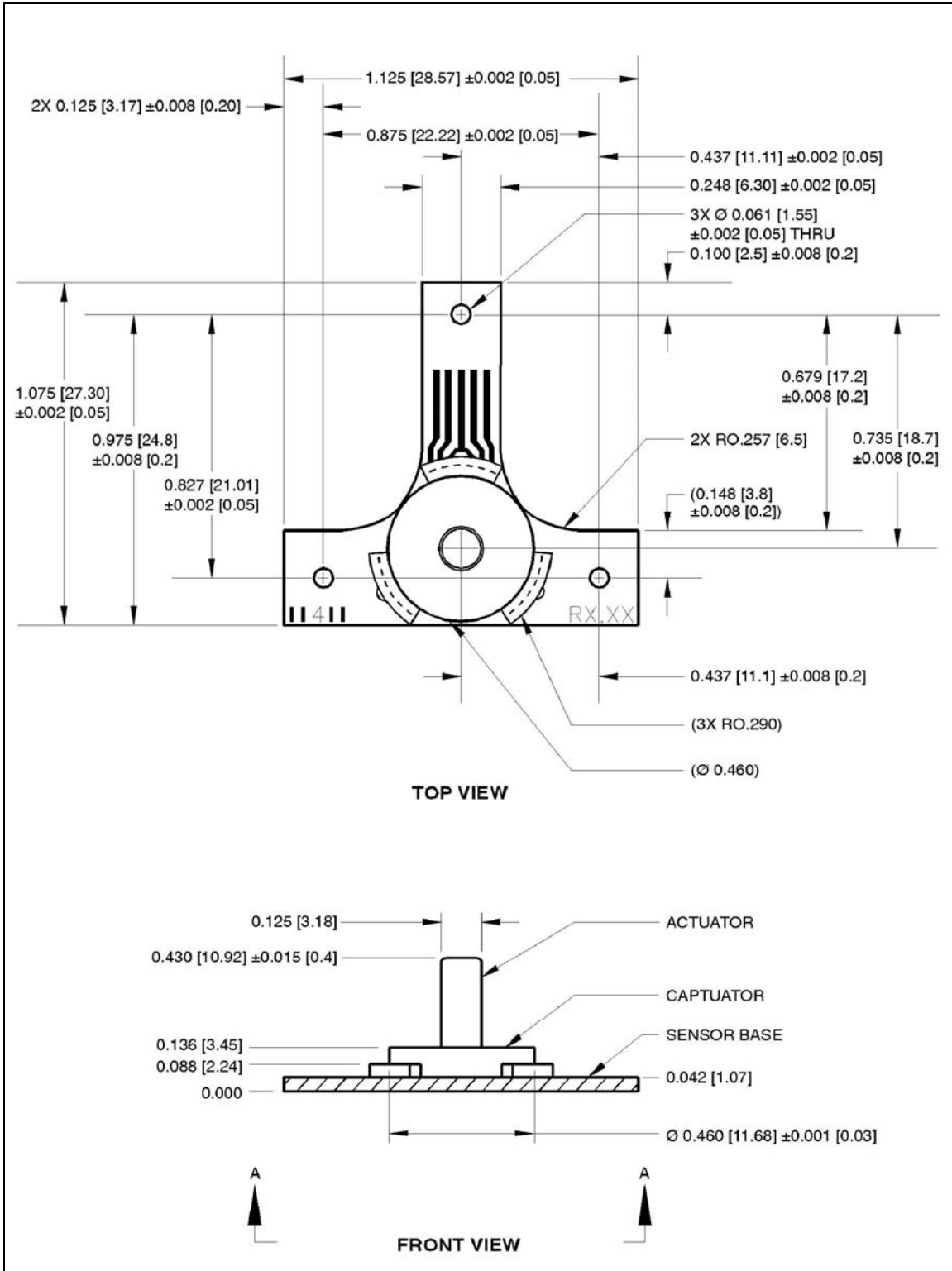
**Figure 1: MicroJoystick, 7.4 mm Assembly**

5.1 Mounting Methods

Several different mounting methods are detailed in the following section. Before designing a mounting method for the MicroJoystick, please carefully review all of the suggested mounting methods and design parameters. This will enable you to design the best mounting method for your system, reduce time to production, and help optimize your installation procedure.

5.1.1 Method 1: A molded-in detail

A simple molded-in detail can be used to mount the MicroJoystick. This method is ideal for integration of the MicroJoystick in-between keyboard key caps (i.e., the detail can be molded directly into the keyboard's base, eliminating or reducing incremental system costs). Either pins or a close-tolerance fit around the MicroJoystick's captuator can be used to register the MicroJoystick in the detail as shown in the illustrations below.

Registering with Pin   **Registering by the Captuator**
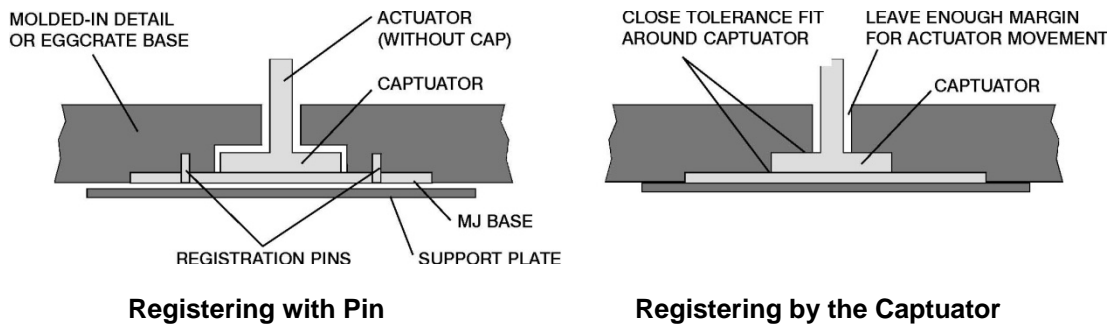
The portion of the molded-in detail that holds the MicroJoystick's base is designed to be slightly thicker than the thickness of the MicroJoystick's base. This helps prevent unwanted forces from being applied to the MicroJoystick. Since the MicroJoystick is designed for maximum sensitivity, forces as small as 20 grams can cause cursor movement or cursor "drift." The term "drift" is used to describe cursor movement caused by unwanted force permanently applied to the FSR in the mounting process.

A support plate is used to keep the MicroJoystick in place. The support plate should be flat and free from surface defects (e.g., bumps). The support plate can be the backplate of a keyboard or can be constructed as a separate metal or plastic unit.

To install the MicroJoystick, simply…
- Drop the MicroJoystick into the detail
- Register the MicroJoystick around the captuator or on the pins
- Check to make sure the MicroJoystick is positioned correctly
- Install the support plate.

Please see Figure 2, "Using Pin in Top Plate for Registration with Support Bosses at Bottom."

NOTES:

1. MOUNTING HOLE CENTER TO CENTER DIMENSIONING TOLERANCE TO BE ±0.002 [0.05]. REF. DWG #50-45289 FOR DETAILS.

2. MOUNTING HOLE (3 PLACES) DIAMETER 0.061 [1.55] ±0.002 [0.05].

3. BOSS END (3 PLACES) COPLANARY TOLERANCE ±0.002 [0.05].

4. BOSS SURFACE FLATNESS 0.002 [0.05] MAX.

5. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].

CAUTION:
1/ IF THE MICROJOYSTICK IS MOUNTED AGAINST A FLAT SOLID SURFACE, THE SURFACE FLATNESS OF THE BASE MUST BE 0.0005 [0.01]. OTHERWISE CURSOR MAY DRIFT.

2/ THE MICROJOYSTICK BASE SHOULD BE FREE OF WARP OR BEND, OTHERWISE CURSOR MAY DRIFT.
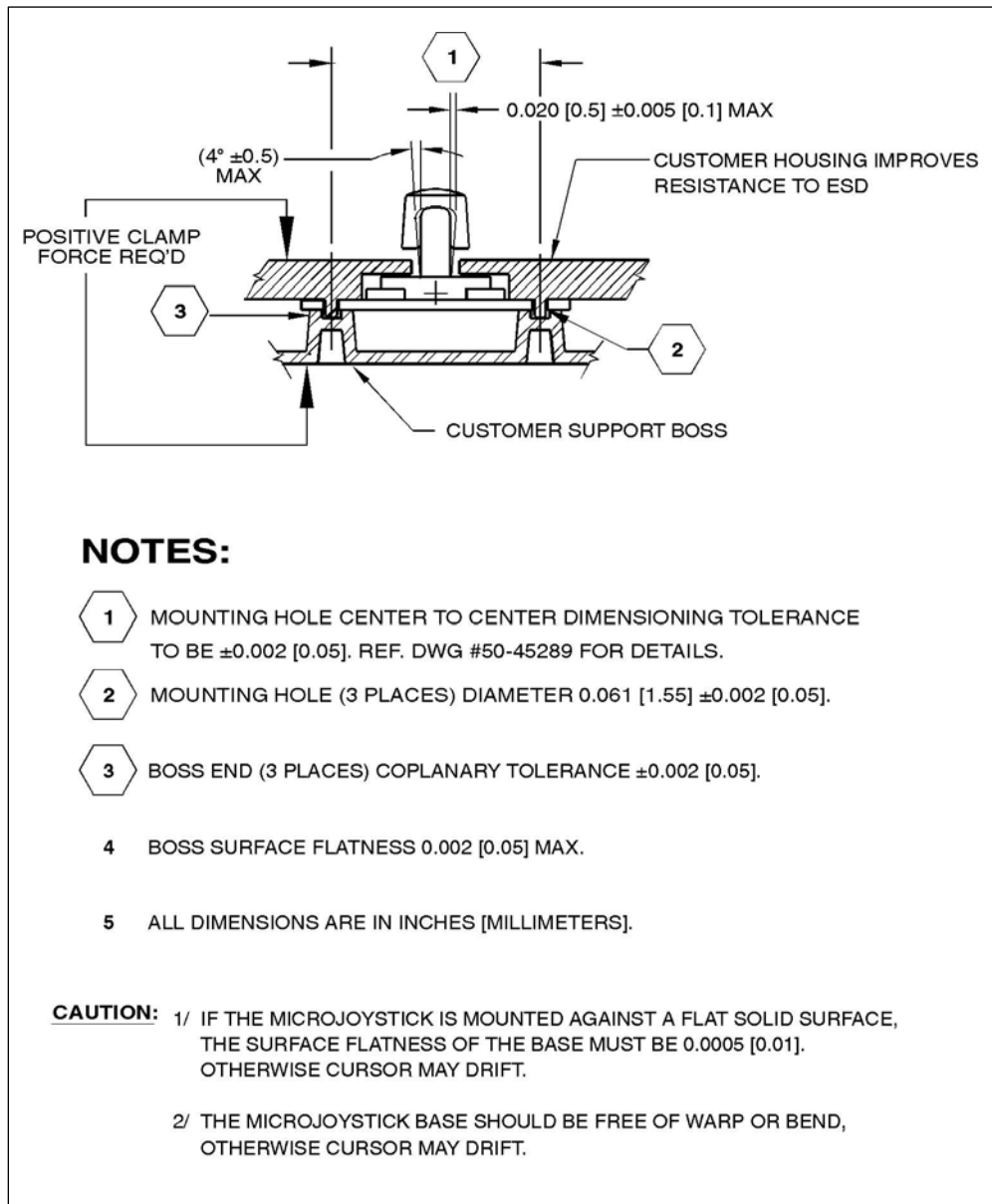
Figure 2: Using Pin in Top Plate for Registration with Support Bosses at Bottom

5.1.2   Method 2: A low profile molded-in detail

If the depth of the detail in section 5.1.1 is too great, a low-profile detail can be used in conjunction with a special support plate to mount the MicroJoystick as shown in the illustration below. As in section 5.1.1, either a close-tolerance fit around the MicroJoysticks captuator or pins can be used to register the MicroJoystick in the detail. The sketch below illustrates pins being used to register the MicroJoystick in the low-profile detail.
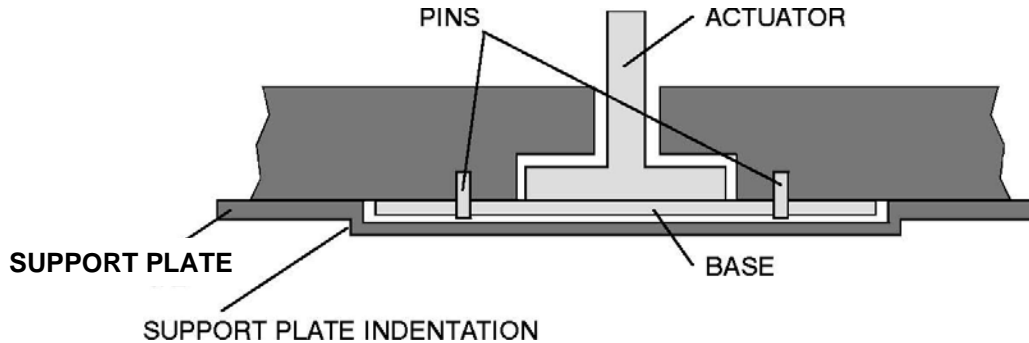
The support plate has an indentation in it to capture the MicroJoystick's base. The thickness of the indentation is slightly thicker than the thickness of the MicroJoystick's base. This prevents unwanted forces from being applied to the MicroJoystick that could cause unwanted cursor drift. The support plate should be flat and free from surface defects (e.g., bumps), and can be integrated into the backplate of a keyboard or can be constructed as a separate metal or plastic unit.

To install the MicroJoystick, simply…
- Drop the MicroJoystick into the detail
- Register the MicroJoystick around the captuator or on the pins
- Check to make sure the MicroJoystick is positioned correctly
- Install the support plate.

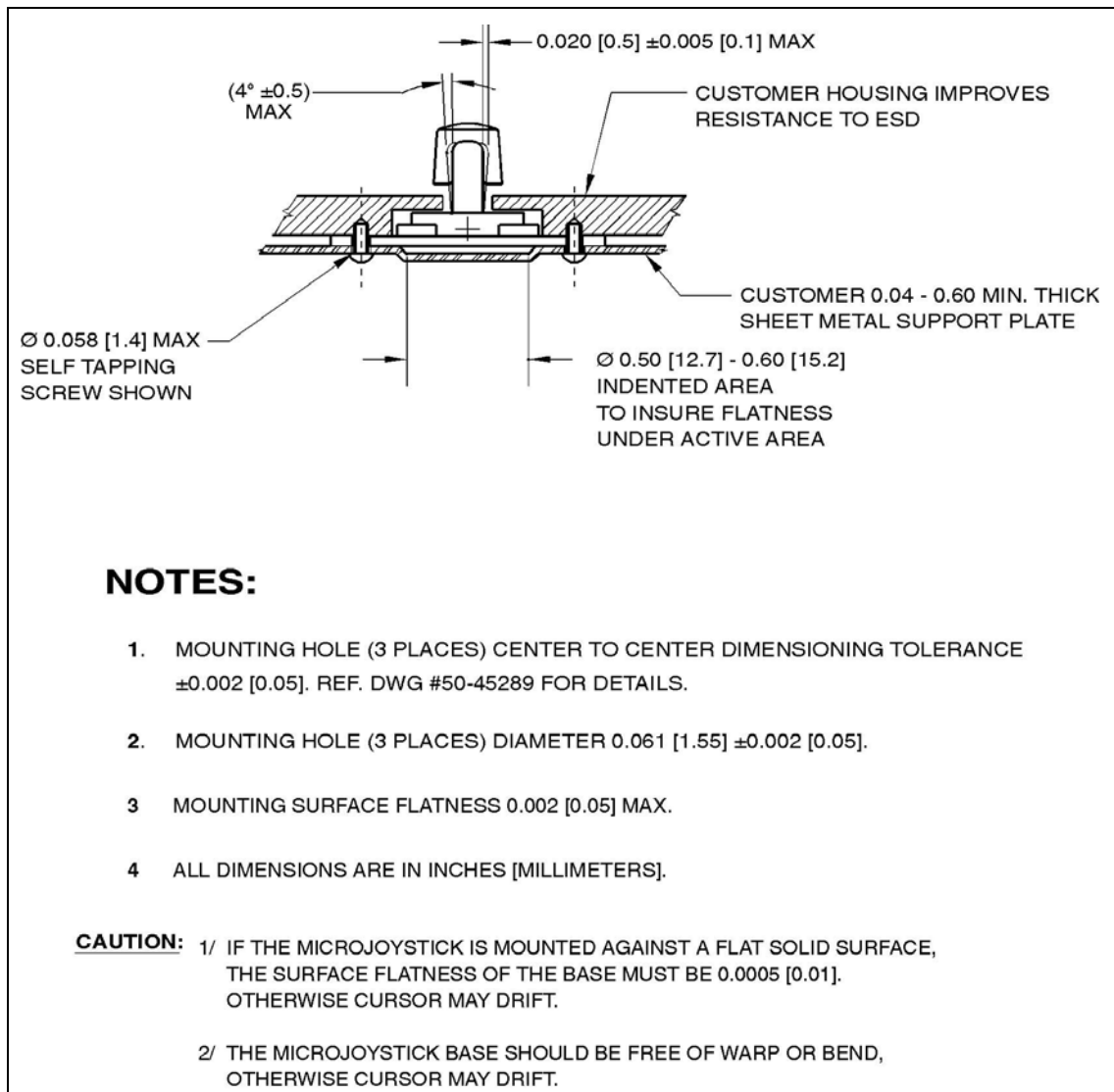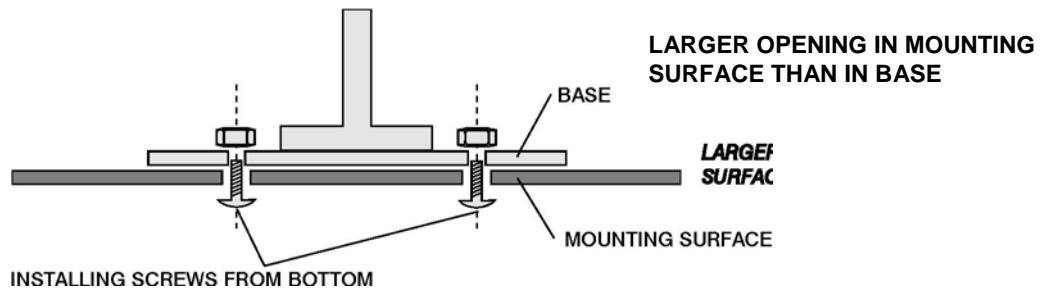Please see Figure 3, "Using Self Tapping Screw with Indented Support Metal Plate."

Figure 3: Using Self Tapping Screw with Indented Support Metal Plate

5.1.3   Method 3: Mounting the MicroJoystick to a flat surface

The illustration below shows how the MicroJoystick can be mounted to a flat surface such as a PCB or molded keyboard housing.
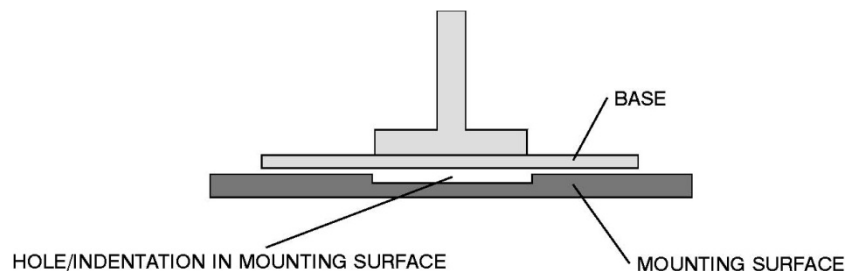

The holes in the mounting surface should be designed as clearance holes (e.g., larger than the thread diameter of the screws). This helps to ensure that the screws only thread into one surface -- the MicroJoystick's base. If the screws thread into both the MicroJoystick's base and the mounting surface, the resultant stress could cause cursor drift.   Alternatively, the screws can be installed from the top of the MicroJoystick as shown in the illustration below.
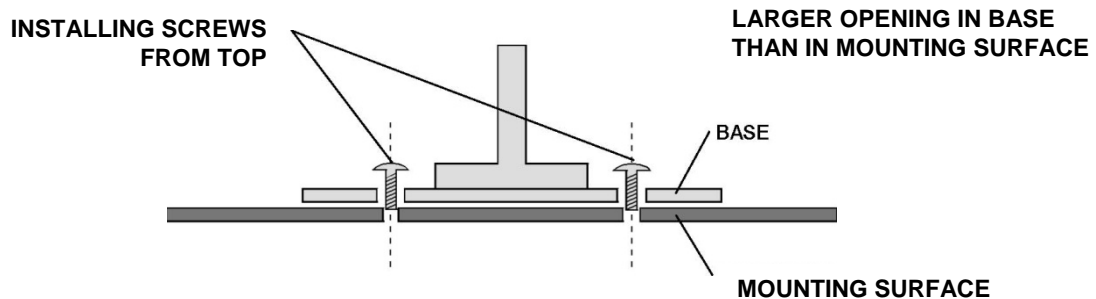
When installing screws from the top of the MicroJoystick, the holes in the MicroJoysticks base are clearance holes. The screws should only thread into the mounting surface. If the holes in the MicroJoystick are too small, they may be drilled out and enlarged.
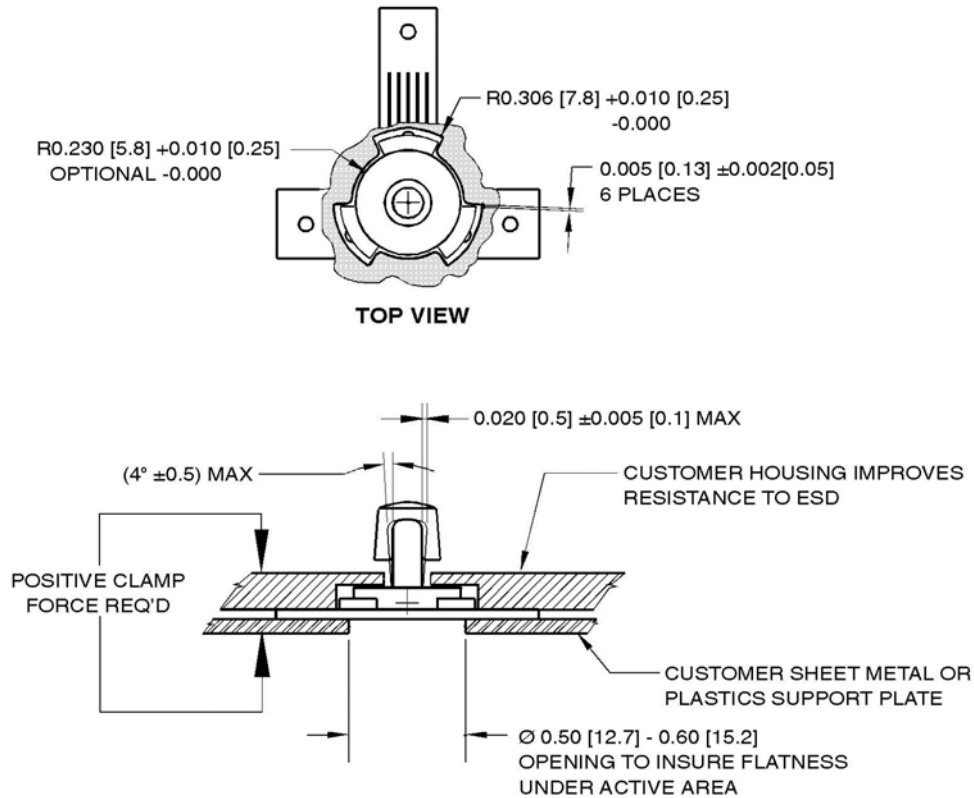
The mounting surface must be flat to within 0.013mm. Bowing of the mounting surface or surface bumps can cause preloads on the MicroJoystick resulting in unwanted cursor movement. To help reduce the effects that any existent bumps or bowing may have a hole or indentation 12.7mm to 15.2mm in diameter can be machined or molded into the mounting surface as shown below.

The hole/indentation should be centered on the MicroJoystick's stick. Alternatively, a spacer can be designed with a hole/indentation and mounted in-between the MicroJoystick and the mounting surface. For more information on this mounting method, please refer to the Figure 4, "Using Captuator for Registration with Opened Support Plate."

To install the MicroJoystick, inspect the mounting surface, MicroJoystick and optional spacer to ensure that they are clean and free of contaminants (e.g., dirt, dust, hair, etc.). Then place the optional spacer on the mounting surface, and place the MicroJoystick on the mounting surface/spacer and install the screws. Use care to torque the screws evenly and ensure that they only thread into one surface (i.e., either the MicroJoystick's base or the mounting surface, depending on whether installing the screws from the bottom or top).

Note: When mounting the MicroJoystick to a flat surface, please carefully review the ESD concerns described in section 5.2.

R0.306 [7.8] +0.010 [0.25]
-0.000

R0.230 [5.8] +0.010 [0.25]
OPTIONAL -0.000

0.005 [0.13] ±0.002[0.05]
6 PLACES

TOP VIEW

0.020 [0.5] ±0.005 [0.1] MAX

(4° ±0.5) MAX

CUSTOMER HOUSING IMPROVES
RESISTANCE TO ESD

POSITIVE CLAMP
FORCE REQ'D

CUSTOMER SHEET METAL OR
PLASTICS SUPPORT PLATE

Ø 0.50 [12.7] - 0.60 [15.2]
OPENING TO INSURE FLATNESS
UNDER ACTIVE AREA

NOTES:

1   MOUNTING HOLE (3 PLACES) CENTER TO CENTER DIMENSIONING TOLERANCE
±0.002 [0.05]. REF. DWG #50-45289 FOR DETAILS.

2   MOUNTING HOLE (3 PLACES) DIAMETER 0.061 [1.55] ±0.002 [0.05].

3   MOUNTING SURFACE FLATNESS 0.002 [0.05] MAX.

4   ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].

CAUTION: 1/ IF THE MICROJOYSTICK IS MOUNTED AGAINST A FLAT SOLID SURFACE,
THE SURFACE FLATNESS OF THE BASE MUST BE 0.0005 [0.01].
OTHERWISE CURSOR MAY DRIFT.

2/ THE MICROJOYSTICK BASE SHOULD BE FREE OF WARP OR BEND,
OTHERWISE CURSOR MAY DRIFT.

Figure 4: Using Captuator for Registration with Opened Support Plate

5.1.4 Method 4: Adhesive

One of the simplest ways of mounting a MicroJoystick to a flat surface is to use a pressure sensitive adhesive. Companies such as 3M Corporation make such adhesives, and can recommend a specific product. Generally, the adhesive bond becomes stronger over time, reaching its maximum in about two days. If you will need to use the holes for screws to register the MicroJoystick (in addition to the adhesive), then you may need to cut out the adhesive strip where it overlays the holes.

5.1.5 Method 5: Heat-stake pins

Heat-stake pins may also be used to mount the MicroJoystick to a flat surface. A horn can be designed to melt plastic into the three holes to secure the base into place.

5.2   Custom Design Parameters

Interlink Electronics strongly recommends using one of the mounting methods described in section 5.1. However, these methods may not be appropriate for all systems. If you do need to design an alternative mounting method, please review the design parameters given below.

Note: These design parameters should be used when designing any mounting method. Before proceeding to production, any mounting method should be carefully reviewed and tested to ensure that it does not impair the performance of the MicroJoystick (e.g., introduce bias, cause preloads on the MicroJoystick, etc.) or introduce other unwanted effects.

Flatness of Mounting Surface
If the MicroJoystick is mounted to a flat surface, the surface should be flat within 0.013mm As detailed in section 5.1.3, a hole or indentation in the mounting surface can help reduce the unwanted effects of the mounting surface on the MicroJoystick.

Screwing into Two Surface
Do NOT screw into two surfaces. If screws are used to mount the MicroJoystick, the screws should only thread into one surface. For example, if the MicroJoystick is mounted to a mounting surface, the mounting screws should only thread into the mounting surface and not the MicroJoystick's base. Threading into two surfaces (i.e., the MicroJoystick's base and the mounting surface) can cause unwanted forces to be applied to the MicroJoystick. These forces could cause cursor movement or cursor drift. Please refer to section 5.1.3.

ESD
When designing a mounting system, care should be taken to consider your electro static discharge (ESD) requirements. The exposed connecting traces should be properly insulated against any direct source of static electricity. Your mounting system should be designed with a large enough dielectric strength (i.e., length of air path from the ESD probe to the conductive traces on the MicroJoystick's base plus any additional dielectric insulation) to prevent unwanted ESD effects. Generally, the further you can bury the MicroJoystick into the mounting surface, the better your protection against ESD.

Whenever possible, the mounting methods in Section 5.1 have been designed with long or lengthened air paths from the ESD probe to the MicroJoystick's conductive traces. Testing is based on IEC 61000-4-2 requirements using only the air discharge method. The MicroJoystick with "captuator hidden" mounting method was subjected to 5, 10 and 15 KV electrostatic discharges. ESD testing should be repeated after the actual integration. Actual ESD tolerance or resistance is subject to the integration design. Please see Figure 5, "MicroJoystick ESD Test Information."
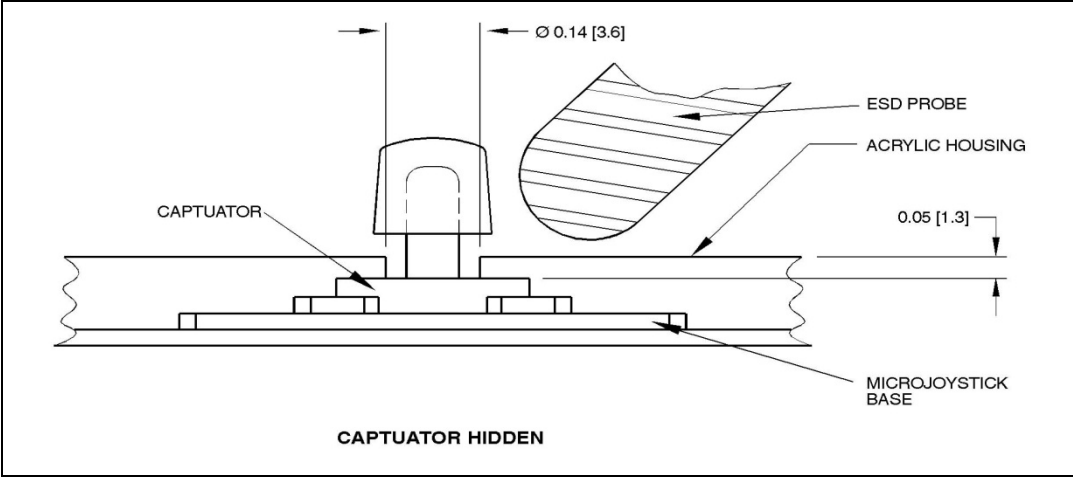
Figure 5: MicroJoystick ESD Test Information

5.3 Tail Attachment

The MicroJoystick is designed for easy attachment of flexible-circuit tails. Interlink Electronics can supply flexible-circuit tails designed for use with the MicroJoysticks or can supply MicroJoysticks with tails attached. Electrical connections between the MicroJoystick and a flexible-circuit tail are typically made using conductive adhesives. Before designing an attachment method for the MicroJoystick's tail, please carefully review this section.

Flexible-Circuit Tail

Interlink Electronics can supply custom-designed flexible-circuit tails in a variety of materials (e.g., polyester, polyimide, etc.). If you wish to fabricate your own tail, Figure 6 below illustrates a standard flexible-circuit tail used by Interlink Electronics.
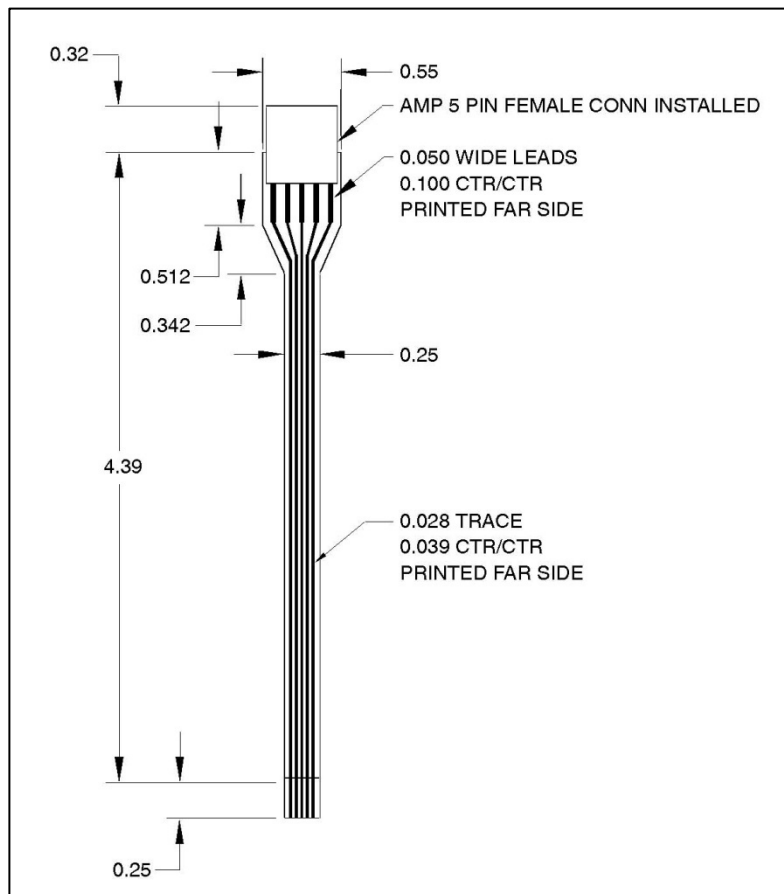

Figure 6: Flex Tail

Anisotropic (Z-axis) Conductive Adhesives

Electrical connections between the MicroJoystick and a flexible tail are typically made with a Z-axis conductive adhesive. These adhesives offer excellent Z-axis conductivity, with little leakage in the X and Y axis. Two common types of Z-axis adhesives are heat-bond adhesives and pressure-sensitive tape adhesives. Please review the following sections that detail design parameters for both styles of Z-axis adhesives, so you can select the best adhesive for your application.

Heat-Bond Z-axis Adhesives

Flexible-circuit tails can be attached to the MicroJoystick with heat-bond Z-axis adhesives. Heat-bond adhesives are activated by heat and pressure. A heated ram applies the heat and pressure to the bond joint allowing the adhesive to attach to the polyester tail and the MicroJoystick. Special care should be taken to ensure that the ram head is parallel to the bond joint. If the ram is not parallel, open circuits or biases (caused by high-resistance connections) could result. For more details on applying heat-bond adhesives, please contact your adhesive or heat-bonding machine vendor.

RAM
ADHESIVE
CONDUCTIVE TRACES
TAIL

PROPERLY ALIGNED RAM

MIS-ALIGNED RAM
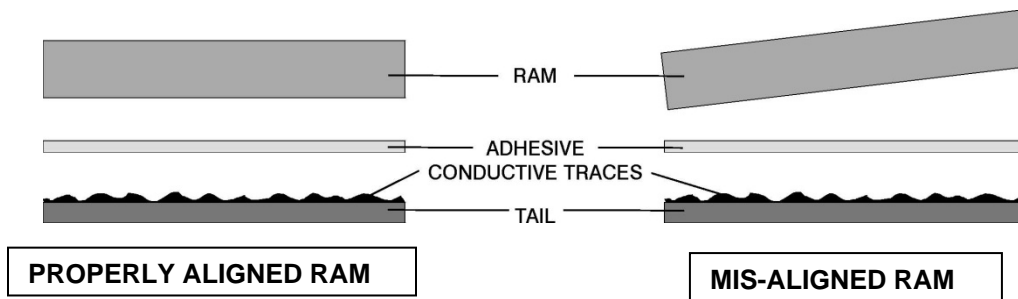
Pressure-Sensitive Z-axis Adhesives

Z-axis conductive adhesive offers an inexpensive and, if used correctly, a reliable means of connecting FSRs to flexible circuit tails. The Z-axis adhesive used by Interlink Electronics is .05mm thick and is manufactured by 3M Corporation (Scotch™ brand number 9703). When handling the sensor, care should be taken to prevent touching and to prevent wrinkling of the adhesive. This can lead to a short, leakage in the X and Y directions, or an open circuit. Since the Z-axis adhesive does not provide a strong mechanical bond, a compressive force to the connection joint should be devised. Applying pressure to the connection joint will prevent delamination of the adhesive which can lead to an open circuit. For example, a rib could be designed into the assembly to apply pressure to the joint. Rubber could be used on the end of the rib to take up tolerances in the design.
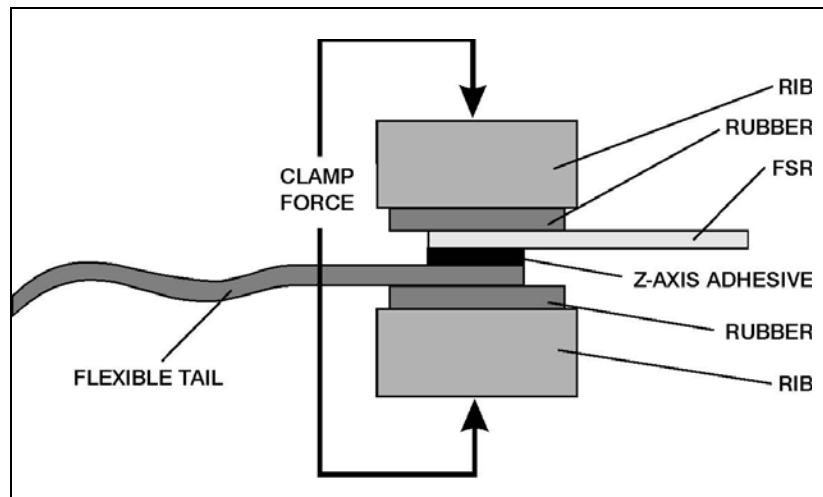
Using a Rib to Compress the Adhesive Joint

The compressive force on the joint should be applied within a few minutes of assembling the FSR to the flexible tail. This will help prevent the Z-axis adhesive from delaminating and being exposed to contaminants. If the Z-axis tape is exposed to contaminants, the electrical conductivity of the tape can be permanently impaired even with the application of pressure to the bond joint.

Attaching a Flexible-Circuit Tail to the MicroJoystick
When attaching the flexible-circuit tail to the MicroJoystick's conductive traces, care should be taken to ensure that the tail is properly aligned to the conductive traces on the MicroJoystick's base. The sketch below illustrates a properly aligned tail and an improperly aligned tail.

PROPERLY ALIGNED TAIL   **MIS-ALIGNED TAIL**
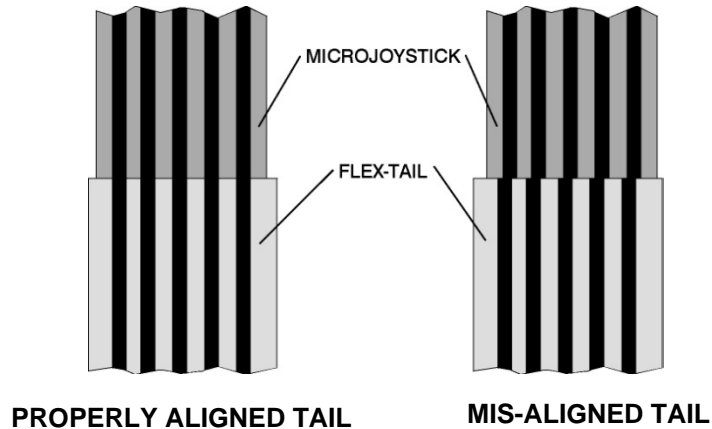
When handling conductive adhesives, use care to avoid wrinkling the tape which could cause leakage in the X or Y directions or open circuits. The adhesives should not be touched with bare fingers, and the conductive traces of the MicroJoystick should be clean (i.e., free from dirt, dust, oil or other contaminates). Contaminants on the adhesive or MicroJoystick can impair electrical conductivity between the MicroJoystick and the flexible circuit. If the conductive traces of the MicroJoystick need to be cleaned, use a soft material (e.g., a cotton swab) moistened with isopropyl alcohol. The cotton swab should only be moistened with alcohol, not dripping. This will help prevent the alcohol from wicking into the captuator base. Use care not to scratch the conductive traces when cleaning the MicroJoystick.

Peel forces applied to the bond joint can cause the adhesive to delaminate. If peel forces are likely to be applied to the joint, a method of mechanically reinforcing the joint should be devised (as recommended in the section above, a mechanical reinforcement should always be used with pressure-sensitive Z-axis adhesives). For example, if a long tail is attached to the MicroJoystick, the alignment of the tail may not be perfect. If a mis-aligned tail is bent when placed into a connector, peel forces could be transferred to the bond joint. To prevent delamination of the adhesive, a mechanical compressive force should be applied to the bond joint. The sketch on the next page details this situation.

PROPERLY ALIGNED TAIL

MIS-ALIGNED TAIL
(REQUIRES TAIL TO BENT
SLIGHTLY TO FIT INTO
CONNECTION HEADER)
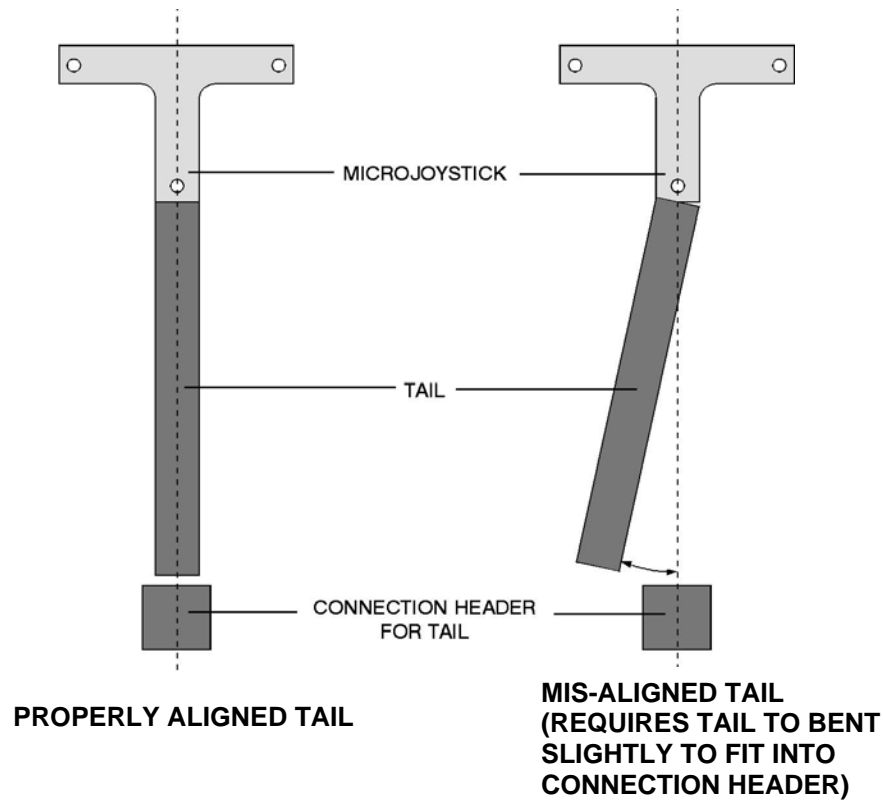
5.4 Handling of MicroJoyStick

MicroJoysticks are typically shipped in plastic trays that are designed with individualized compartments for each MicroJoystick. Since the trays are designed to protect each MicroJoystick from damage (the base of the MicroJoystick is hard enough to scratch the conductive traces), please try to incorporate these trays into your inventory and manufacturing process. When installing tails or handling the MicroJoysticks, keep units separate from each other to help prevent damage to the conductive traces.

6.0 Electronic Integration

Circuit for the MicroJoystick
The interface circuit for the MicroJoystick uses a minimum of commonly available components, and offers a more cost-effective and simpler interface than other types of joysticks (e.g., strain-gauge based joysticks). With its small number of components, the interface circuit for the MicroJoystick can easily be integrated onto a system board, or Interlink Electronics can supply an add-on interface board with the MicroJoystick. Figure 7, "Schematic - MicroJoystick, Application Note" details the board layout for the circuit. See Section 9 for details of the interface circuit components list.

Note: The schematic referenced is not a universal interface solution. Additional circuitry may need to be added or component values may need to be changed to eliminate noise or counteract other electronic issues that could have a detrimental affect on the performance of the MicroJoystick. Use sound engineering practices when laying out and specifying your MicroJoystick interface circuit.

1.125 [28.57] ±0.002 [0.05]

2X 0.125 [3.17] ±0.008 [0.20]

0.875 [22.22] ±0.002 [0.05]

0.437 [11.11] ±0.002 [0.05]

0.248 [6.30] ±0.002 [0.05]

3X Ø 0.061 [1.55]
±0.002 [0.05] THRU
0.100 [2.5] ±0.008 [0.2]

1.075 [27.30]
±0.002 [0.05]

0.975 [24.8]
±0.008 [0.2]

0.827 [21.01]
±0.002 [0.05]

0.679 [17.2]
±0.008 [0.2]

2X RO.257 [6.5]

0.735 [18.7]
±0.008 [0.2]

(0.148 [3.8]
±0.008 [0.2])

RX.XX

0.437 [11.1] ±0.008 [0.2]

(3X RO.290)

(Ø 0.460)

TOP VIEW

0.125 [3.18]

ACTUATOR

0.430 [10.92] ±0.015 [0.4]

CAPTUATOR

SENSOR BASE

0.136 [3.45]

0.088 [2.24]

0.042 [1.07]

0.000

Ø 0.460 [11.68] ±0.001 [0.03]

A   A

FRONT VIEW

Figure-7: Schematic- MicroJoystick, Application Note

7.0 DOs and DON'Ts

DO's

- **Do prototype the VersaPoint system before proceeding into Production.**
  In the prototyping phase, the lifetime, durability, manufacturability, ergonomics and performance of the MicroJoystick should all be thoroughly investigated to ensure they meet your requirements.

- **Do mechanically reinforce the Z-axis pressure-sensitive adhesive joint.**
  If Z-axis pressure sensitive adhesive is used as the connection method, a compressive force should be applied to the joint to prevent adhesive delamination.

- **Do mechanically reinforce the Z-axis pressure-sensitive adhesive joint immediately after assembly.**
  This will prevent the adhesive from delaminating and being exposed to contaminants.

- **Do use an adhesive primer with Z-axis pressure-sensitive adhesive.**
  This will help increase the mechanical strength of the joint.

DON'Ts

- **Do not solder directly to the exposed conductive traces.**
  With flexible substrates, the solder joint will not hold and the substrate can easily melt and distort during soldering.

- **Do not expose the MicroJoystick to Liquids**

- **Do not screw into two surfaces when mounting.**

The self-contained design of the MicroJoystick makes it highly resistant to contamination and failure caused by dust or liquids. In general, the MicroJoystick is better protected than the keyboard or system into which it is integrated. However, the MicroJoystick is NOT sealed against liquids. Exposure to moisture could affect the flex-circuit connection juncture. There is a small vent at the base of the stick, opposite the connection juncture; the joystick's operation may be impaired if moisture enters this vent.

8.0 MicroJoystick Specifications

Physical Size:

Cursor Directional Control:	Continuous, 360° Control
Cursor Speed Control:	Smooth,continuous,and dynamic(a function of applied force)
Hardware Interface:	PS/2 and USB Controllers Available
Data Format:	Emulates Microsoft mouse
Use Force Range:	40 ± 20g min,150 ± 20g max. Applied at extremity of 10mm stick
Stick Deflection at Full Force:	3.7° (0.65mm) approximately for 10mm stick
Stick Strength Capacity:	Typical maximum side load: 20kg (42 lbs.) Typical maximum compression load: 100kg (220 lbs.) Typical maximum tension load: 13 kg (29 lbs.)
Lifetime (Stick):	Greater than 5 million cycles
Temperature:	Operating: 0° to 60° (32°F to +140°F) Test duration: 96 hrs. Storage: -40° to +70° (-40°F to +158°F) Test duration:96hrs
Humidity:	5-95% RH, non condensing. Test duration: 96hrs.
ESD Susceptibility	IEC 61000-4-2 Air discharge method Level 4 (No errors at 15KV)*
EMI:	Passes FCC Rule Part 15, Class B Computing Device Peripheral*
Shock:	80g acceleration in 11ms*
Vibration:	MIL Std.202, Method 204 condition A*
Connection Method:	Standard or custom flex circuits can be attached with anisotropic (Z-axis) adhesive.
Mounting Flatness:	Must be 0.013mm or flatter
UL:	All materials UL grade 94 V-1 or better
CE:	Conforms to 89/336/EEC

When properly integrated.

Microcontroller Specifications

Chip Family: Microchip P1C18F14K50

Configuration: 18-pin SSOP

Clock Speed: 6MHz

Specifications are subject to change without notice

9.0 PC-Interface Circuit Components List

Used	Part Type	Designator	Description
1	0.22uF	C1	CAP,CER,0.22UF,10%,10V,0603
1	0.1uF	C2	CAP,CER,0.1UF,10%,25V,0603
1	0.01uF	C3	CAP,CER,0.01UF,10%,50V,0603
1	4.7uF	C4	CAP,CER,4.7UF,10%,6.3V,0603
1	3.3K	R1	RES,3.3K OHM, Metal Film,0402,1%,100ppm
3	47K	R2,R3,R4	RES,47K,5%,1/10W,0603
2	1.5k	R5,R6	RES,1.5K,5%,1/10W,0603
1	6MHz	X1	Resonator, 6.00MHz, 0.5%, SMT, 2 x 4.5mm
1	8Pin	J2	Header, 8 Pin, 1.25mm L/S Rt. Angle
2	600	L1,L2	Ferrite Chip,600 Ohm,500mA,0805,SMD
1	PIC18F14K50*	U1	uProc,PIC18F14K50T-I/SS,16K Flash,USB,SSOP20

*USE IE P/N 24-00030 4 Zone Controller IC

10.0 Contact Interlink Electronics

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