

## *i*Sensor® IMU Mounting Tips

by Mark Looney

### INTRODUCTION

The *i*Sensor IMU product family integrates multiple MEMS sensors and signal processing components in a three-dimensional structure to provide a fully integrated, inertial measurement system. The MEMS sensors are attached to single aluminum structures that include mounting tabs, which provide tight mechanical coupling to platform motion. The flexible cable and connector provide a convenient user interface. The flexible cable greatly simplifies installation on the manufacturing line. For many users, the design is as simple as installing two screws and pushing the flexible connector into a mate on a PCB. When handled properly, the flexible cables are very reliable and robust. They have survived 2000 *g* shock tests (drop tests), over 1000 temperature cycles, and many other tough environmental tests. However, these devices are subject to damage if handled inappropriately, such as pulling on the body to unplug the connector. If the development process requires device removal, treat the flexible connector with care and follow the instructions in this application note for safe removal.

There are two mechanical considerations for using *i*Sensor IMUs: mechanical attachment and electrical interface.

### MECHANICAL ATTACHMENT

The *i*Sensor IMU package provides two aluminum mounting tabs on each side of its base that enable a number of attachment approaches. The *i*Sensor evaluation boards use a simple approach, by providing two threaded holes in locations that allow M2 × 0.4 mm machine screws to slide in between the mounting tabs, as shown in Figure 1.

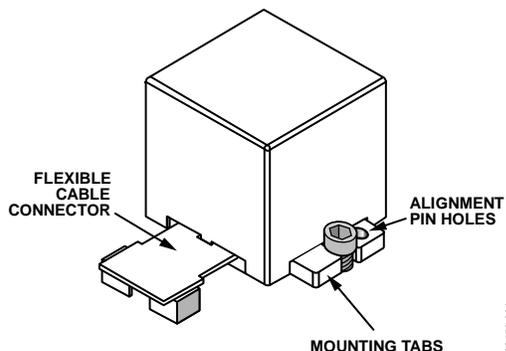


Figure 1. *i*Sensor IMU Package

One of the tabs on each side has a hole for mating to a precision alignment pin. These pins are for system frame alignment, not for machine screws. Do not attempt to enlarge these holes for mounting screws because this can alter the physical structure of the device and introduce errors in its calibration.

Using mounting brackets (see Figure 2) or a cover plate (see Figure 3) with six fasteners reduces the risk of mechanical resonance for systems that may experience higher levels of shock or vibration. The U-shaped plate design can provide protection for the flexible cable in systems that are subject to sharp objects or other potential damaging influences. The U-shaped plate design can also incorporate mechanical features that hold the connector in place. Make sure that the design accounts for any difference in the mounting tab height and the final connector height.

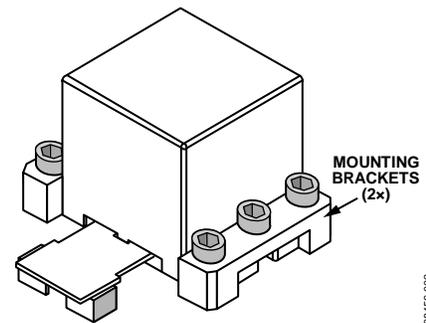


Figure 2. Bracket Mounting Example

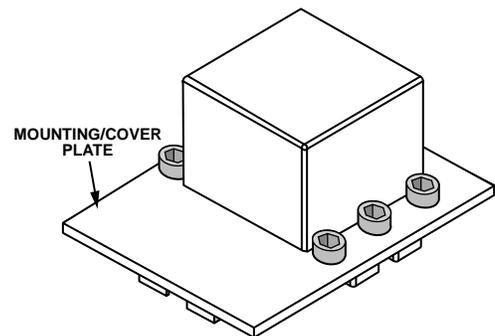


Figure 3. Cover Plate Mounting Example

#### Rev. 0

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

Figure 4 provides an example design for machine screw placement, which applies to all three attachment systems.

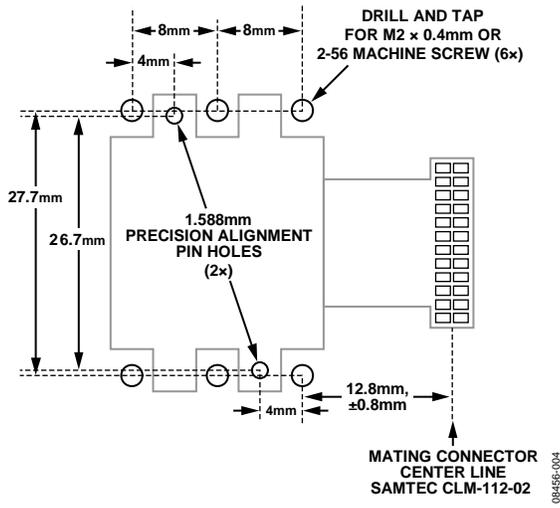


Figure 4. Example Hole Pattern for Machine Screw Placement

One advantage of the *i*Sensor IMU package is that the flexible connector allows the mating connector to be on a different surface than its aluminum baseplate. Exercising this option will likely change the hole locations shown in Figure 4 with respect to the mating connector. Figure 5 illustrates how the screw location can change when the IMU is mounted to a different surface than the mating connector. Figure 6 and Figure 7 provide another example where the mating connector is on a surface that is orthogonal to the body's attachment surface.

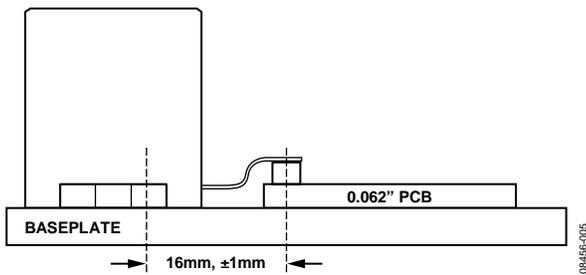


Figure 5. Dissimilar Mounting Surfaces

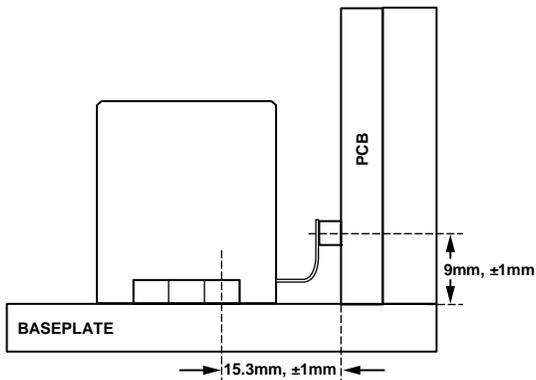


Figure 6. Orthogonal System Design Example

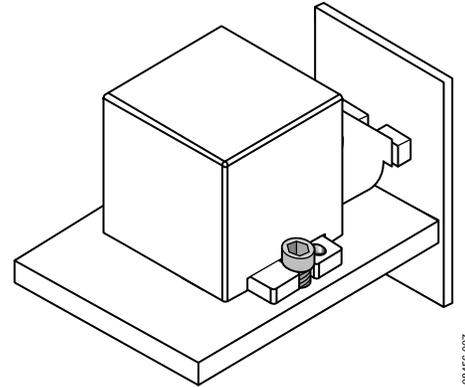


Figure 7. Orthogonal System Orientation

Using an adhesive material between the aluminum baseplate and the attachment surface can add additional strength but can complicate device removal. These materials are available in either paste or double-sided preform tape/appliqué. Limit any processing temperature to 125°C.

**ELECTRICAL CONNECTION**

The electrical interface is a dual-row, 24-pin header that has a 1 mm pitch. The *i*Sensor evaluation boards use the Samtec CLM-112-02-LM-D-A for the mating connector. The bending radius in the flexible cable can influence its reliability. Therefore, when selecting a location for a mating connector, maintain a bending radius of at least 1.5 mm to prevent crimping or other mechanical stress. The mating connector location should allow for some stress relief and not require the flexible cable to be stretched during installation.

**HANDLING/REMOVAL GUIDELINES**

During installation and normal use, the primary handling consideration is to protect the flexible cable connector from sharp objects or other damage threats. In cases where removal is required, protect the flexible connector from unreasonable stress. For example, do not attempt to unplug the flexible connector by pulling on the body; this can break the flexible cable connector and, in effect, destroy the entire sensor.

When removing this device, start by inspecting the flexible cable connector for damage. Look for minor tears or cracks from accidental contact with tools or other sharp objects. The tears can propagate with multiple insertions and removals. After inspecting the flexible connector, carefully break the connection between the flexible connector and its mating connector. Apply removal force to the connector base and not to the flexible cable itself. When the connection is loose, remove the machine screws and lift the part off the mounting surface. Although the flexible connector requires some attention in this process, it provides excellent reliability when properly installed.

**NOTES**

**NOTES**