RAQ's

Rarely Asked Questions

Strange stories from the call logs of Analog Devices

Some Chips Have Moving Parts!

Q. Is it true that over the years electrical devices have evolved to where they have no moving parts at all?

A. While it is true that any machinery becomes more reliable as the number of moving parts where friction can cause wear is reduced, there are actually integrated circuits (ICs) which only work because of moving parts on the surface of the chip.

These are known as Microelectromechanical Systems, or MEMS. They use standard IC process technology to make structures in metal, silicon and silica on the surface of a chip. Such structures may be designed to move and thus perform many useful functions.

Moving parts of such chips flex, but do not usually bear on other surfaces, so friction is not often a problem. They are usually made of silicon, which has very low mechanical hysteresis with deformation, and therefore great resistance to fatigue. Silicon does not change its properties or suffer damage even when flexed many trillions of times.

The first commercial MEMS devices with visibly moving parts were accelerometers. Electronic accelerometers once cost hundreds or thousands of dollars, today the least expensive cost only a dollar or two making it economical to use them in inexpensive gadgetry, air bag deployment (their first major application), joysticks for computer games, shock protection for disk drives and athletes ankles, keystone correction in projectors, orientation detection in hand-held monitors, and a thousand other uses.

Traditional gyroscopes rotate, but it's quite possible to make a gyroscope that vibrates rather than rotating; and this can easily be done in a MEMS structure. MEMS gyroscopes are used wherever rotation is measured; their low cost enables hitherto unaffordable applications such as optical image stabilization, safety controls in motor vehicles and short-range inertial navigation for GPS receivers when no satellite is visible.

MEMS structures allow the manufacture of high quality microphones on an IC chip. These are smaller, more cost-effective and reliable than any other microphone technology and are starting to replace the electret microphone in many applications.

The linked articles describe all these chips with moving parts, and their many uses, in much more detail.

To Learn More About MEMS Technologies
http://designnews.hotims.com/23114-100

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Have a question involving a perplexing or unusual analog problem? Submit your question to: raq@reedbusiness.com

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