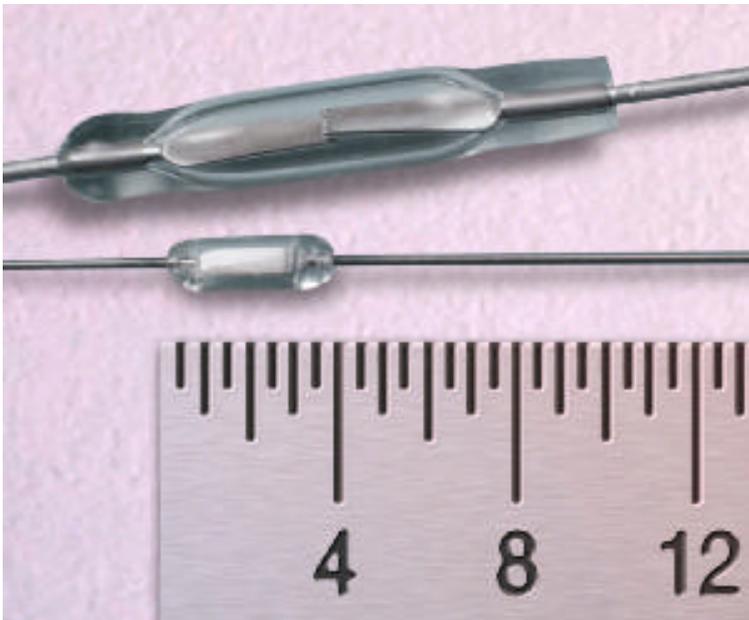


# Getting a Reed on Miniaturizing Magnetic Switches

Paul Linsley

**The reduction in size of medical electronics is a benefit of component suppliers across the board making their products smaller with lower power requirements. This article looks at the benefits achieved from the miniaturization of magnetic reed switches and the specific applications in which they are used.**

The reduction in size of medical electronics can be critical in allowing new medical devices and equipment that advance diagnostic ability while increasing overall patient comfort during the testing process to come to market. Over the past few years, the ability of manufacturers of magnetic reed switches to substantially reduce the size of these switches has allowed widespread use in hearing aids and heart pacemakers, as well as in several additional new applications in diagnostic devices.



**Figure 1: Side-by-side comparison shows reduction in size of magnetic reed switches over the past 10 years.**

Magnetic reed switches are hermetically sealed switches that are normally backfilled with an inert gas, such as nitrogen, to allow reliable operation over many years and millions of operations. They are non-contact devices that do not require

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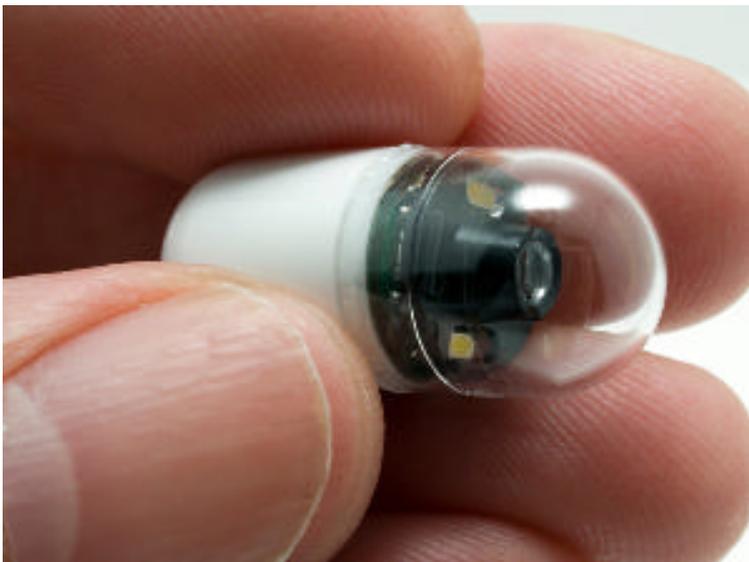
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any power until they are actuated (closed). For these (and other) reasons, they are ideal for use within medical devices.

Within the past 10 years, the glass length of available magnetic reed switches has been reduced from about 12.7 to 3.7 mm (e.g., [Standex](#) [1] GR150 series), which is currently the shortest reed switch available (Figure 1). This represents a component reduction of 70% in length and commensurate width – a significant contribution towards reducing overall size of medical devices that use these components.

### Imaging

One such medical device is a pill-shaped camera that is swallowed by the patient (Figure 2). These devices take digital photographs as the camera moves through the patient's intestinal track. In this instance, the magnetic reed switch is an integral part of the pill-shaped camera. The external camera packaging contains a magnetic source that triggers the magnetic reed switch to activate the battery operated camera as the camera is removed from its packaging for use by a medical professional. Reducing the size of the pill shaped camera is essential for patient comfort in both ingesting the device and as it moves through the intestinal tract. Ingesting a smaller capsule can induce less stress upon the patient than a larger device, which diagnostically may be relevant with normal vital signs, like heart rate and blood pressure. While micro-miniature devices are highly desired, the quality of the device cannot be compromised to accommodate the smaller size.



**Figure 2: Reducing size of electronic components allows overall size of medical devices to shrink, as evidenced by this pill-shaped camera for diagnosing issues in the gastrointestinal track.**

### Monitoring

Other new applications under development include use of similar battery operated

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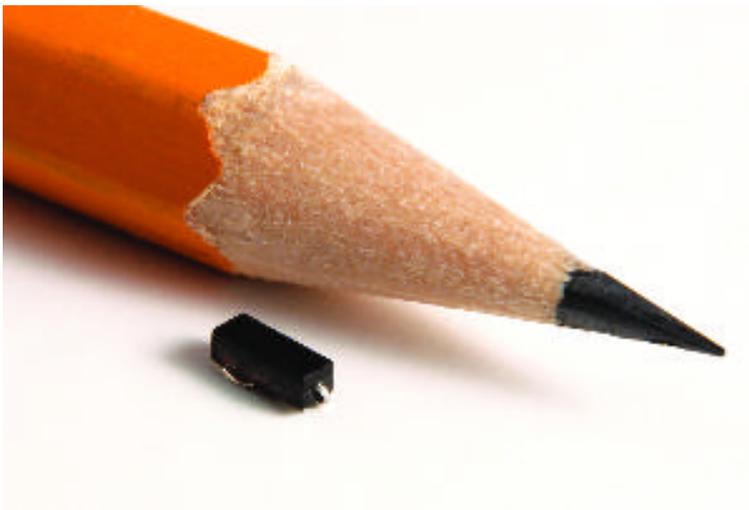
devices to allow remote monitoring of certain conditions within a person's body from microminiaturized instruments placed temporarily within the body. Again, microminiaturization is a key element of success here, as smaller devices are less intrusive when they reside within the body.

### Hearing Aids

In hearing aids, magnetic reed switches are commonly used to automatically detect the patient's use of a telephone (or cell phone) and enables automatic adjustment of the device for optimum sound. Additional hearing aid applications of magnetic reed switches include remote manual stepping of hearing aid amplifier gain. The reduced size of magnetic reed switches has allowed use in in-the-ear as well as behind-the-ear hearing aid applications.

### Surface Mount Technology

While 3.7-mm long switches are a dramatic breakthrough, ultra miniature medical devices can sometimes better use SMT (Surface Mount Technology) based devices. This can increase reliability, reduce production cost, and sometimes, reduce overall size of the medical device. The Standex SR4M series is a surface mount version of the GR150 3.7-mm long magnetic reed switch in a molded SMT configuration with a package length of 5.13 mm (Figure 3).



**Figure 3: In addition to traditional glass-shelled magnetic reed switch designs, ultra-miniature surface mount technology is also available.**

### Conclusion

While medical device manufacturers would like smaller components, reducing the size can be a complicated task. To manufacture the GR150 for high volume production, Standex had to develop a totally new microelectronics based manufacturing system for both the manufacturing and test processes. That investment is yielding benefits, however, not only for the company and the medical device manufacturers, but also for the doctors who perform the procedures and the patients who undergo them.

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