Light
Matters

Designing illumination systems with high-brightness LEDs

Industrial environments present special challenges for switches, buttons, rotary controls and other user input devices. Keeping dust, moisture and contaminants on the outside of any electronic product is always a concern. When that instrument or machine requires frequent human interaction, it's a difficult and expensive challenge as well. These are critical reliability and "ease of use" problems for engineers developing systems ranging from medical instruments and military devices to industrial process controls and washdown food/chemical handing equipment. Yes, there are expensive, ungainly, manually-installed, sealed panel-mounted switches available. They've been around since the turn of the century.

"Ye Olde Rotary Switch" I found at a San Jose surplus store this week

Surely there must be a better solution…

There is. It's an extension of technology designed for mobile phones. The concept is to project a small amount of structured infrared (IR) light through an opaque-looking plastic or glass panel, sense how it is reflected back by the movement or presence of a hand or finger, and interpret the gesture as a control.

Mechanical switch type	Potential equivalent input method using Osram IR proximity sensing
Push button	Fingertip touches designated area on panel
Toggle	Left or right finger swipe across designated area
Rotary	Fingertip touches designated area, then moves in clockwise or counterclockwise circle
Slide	Fingertip touches designated area, then moves linearly in up/down or left/right direction

A few ideas of how intuitive finger movements can replace old switches

Now this is fairly easy to implement using a remarkable integrated IR sensor device from Osram called the SFH 7770. It's a tiny surface-mount IC that measures IR and ambient light, controls several IR emitters, and sends information back to a microcontroller (MCU) over the I2C bus.

It's up to you to write the small bits of code in the MCU that interpret the SFH 7770 data and translate it into the desired controls for your end-product. Several application notes illustrate how to do this with example flowcharts, and Avnet also has small demonstration/evaluation units which run sample code "out of the box". If you're near a browser, check out the device (and especially the video of the demo unit) here: **http://tinyurl.com/Cary-SFH7770**

Osram SFH 7770 Proximity Sensor Demo from Avnet
Watch video at http://tinyurl.com/Cary-SFH7770

Osram IR LEDs on perimeter of sensing area

SFH 7770 in center of area

Touch / gesture sensitive front panel of the Avnet SFH 7770 demo unit - it emulates rotary, push button and slide switches (Note there are no openings)

This is a second demo unit with its black IR-transmissive panel removed to illustrate the sensor and IR LEDs placement

A sealed, touch/gesture operated control system has benefits beyond operating in harsh environments. In some cases it can increase the perceived value of an older product, by adopting a "next-generation" user input technology… similar to smartphones. In other products there are certain aesthetic advantages to eliminating protruding knobs and buttons from an otherwise sleek-looking appearance. Finally, although I haven't done a cost comparison yet, my assumption is that it's far less expensive than traditional switches- even plain unsealed push buttons. The SFH 7770 IC costs less than a dollar. Along with three IR LEDs and an inexpensive MCU, the entire solution might be three to five dollars or less. Just a reminder though, that the SFH 7770 is not a turn-key switch replacement unit—you will need to craft some MCU code and tailor it to your requirements.

Are you planning to attend LIGHTFAIR International 2014 in Las Vegas, June 3rd – 5th? It's the world's largest exhibition for Solid State Lighting (LEDs) and illumination. We'll be there of course, along with a case of free SFH 7770 demo kits for qualified customers. Stop by booth 2910, pick one up and say hello!

If you have questions on infrared light, IR LEDs or other LED-based systems, you're always welcome to send me a note at **LightSpeed@Avnet.com**. Regards, Cary
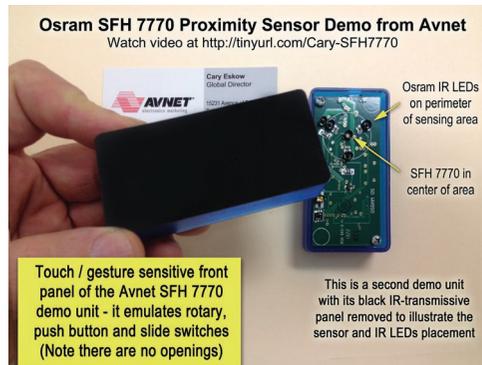

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is Global Director of the Solid State Lighting and Advanced LED business unit of Avnet Electronics Marketing. An ardent advocate of energy efficient LED-based illumination, he has worked closely with LED manufacturers, advanced analog IC and secondary optics vendors since his first patent using LEDs was issued two decades ago. Avnet works with customers through their national team of illumination-focused sales engineers who are experienced in thermal, drive stage and optics design. Prior to his LED lighting focus, Cary was Avnet's technical director and managed Avnet's North American FAE team.

To submit questions or ideas, e-mail Cary at LightSpeed@Avnet.com

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