Keep It Simple: The Role of Switch Selection in Simplifying Electronic Designs

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Albert Einstein said, "Everything should be made as simple as possible, but not simpler." Whether in architectural design, software coding, engineering discipline or even managing people, simplicity is an overriding goal and success is achieved when a product or process is at its maximum simplicity.

Electronic design engineers have the challenging job of making very complex processes simple with their design and most hold true to the Keep It Simple (KISS) principle. However, while there are a number of factors to think about when simplifying your design from power management to sensor solutions, nowhere is simplicity more important than the initial and primary interface with the user: the electromechanical switch.

Switches are where the simplicity of your design will play out, but the simplicity of the interaction will depend on the decisions you make when specifying each switch in the interface of your device. When it comes to streamlining the human-machine interface, designers need to pay attention to a particular set of criteria to ensure the interface will accomplish its intended purpose. When designing your next device consider the following questions.

How will the user interact with the machine?

The needs of the end user must be considered first and foremost. This includes factors such as feedback, illumination and legends to indicate dedicated functions or statuses. Designers should consider if feedback needs to be tactile, audible or visual. Tactile feedback transmits a sensation to the operator to indicate transfer of circuit.

Other switch applications may use illuminated switches at the man-machine interface. Illuminated switches use an internal light, typically a LED or incandescent bulb, to indicate status. There are pros and cons to each. LEDs have a virtually unlimited service life at about 100,000 hours and an unmatched level of brightness. On the other hand, incandescent lamps operate in a self-destructive mode to produce light, resulting in a shorter lifetime of approximately 7,000 hours.

everything starts here.

Another option for indicating switch status is legends. Legends, which include engraving, screen printing, pad printing and Mylar inserts, can be used to identify specific functions. Some LED switches offer alternating legends and colors that display different combinations when the switch is ON or OFF. For example, bicolor LEDs use standard RGB colors that alert users to different options based on pre-programmed functions and add aesthetic appeal to the switches.

What about switch size?

Keep It Simple: The size, location and application of the human-machine interface will have a significant role in determining the switch best-suited for your device. Designers should also consider the ease of use of different switch sizes. Consumers and designers often feel that smaller is better, but it is more important to select a switch that not only fits the size parameters, but is also sufficiently user-friendly. This is especially important in consumer products.

What is the best actuator for the user?

Actuators come in a wide selection of categories, such as pushbutton, toggle, rocker, paddle, rotary, keylock and slide actuated, and within each category a multitude of sub options are available. No matter the actuator type, these switches have one hardwired function. The key to determining the best actuator type for a switch design is to determine what the switch will specifically be used for and by whom it will be used, and then logically consider each actuator option in those terms.

Keylock switches, for instance, are often used to enhance security of a system. A server blade in a data center may use a keylock switch that requires the user to insert a key in order to operate the switch. This helps to reduce human error and to prevent tampering.

Will your user and design benefit from a Smart Switch?

As demand for greater functionality from devices and equipment continues to increase, many designers have found that the use of traditional switches, whether toggle, rocker or pushbutton, in certain scenarios is no longer sufficient. Programmable switches have become a useful option.

Programmable switches combine the easy-to-read, well-illuminated menus and multiple functions of a touchscreen with the tactile feedback of a dedicated function key. These smart switches provide designers with space saving, multifunction alternatives to traditional switches. In large banks of switches, programmable switches can be invaluable to simplifying your design and assist users in completing tasks more efficiently.

For example, the broadcast industry commonly uses programmable switches to help control the various elements of television broadcasts. Complex control panels can quickly become littered with dedicated function keys. However, programmable switches allow for more functionality from a smaller panel size because a single programmable switch is capable of accomplishing the same functions as multiple dedicated function keys.

Equipment used in the food service industry can also use programmable switches to simplify tasks, reduce human error and increase safety. Quick-service restaurants may use a programmable switch to alert workers when a grill is hot, when to flip the burger and when to remove it. The ability to program the switch not only ensures consistent cook times, but also reduces training time, speeds up service and makes food handling safer.
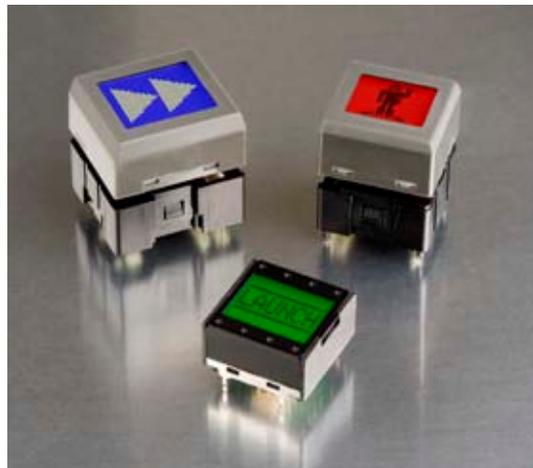
Remember to Keep It Simple

For the design engineer, creating the human-machine interface often feels like a work of art, as this is where your device shows the user the simplicity of your complex design. If the designer does a poor job with the human-machine interface, the device will be difficult to use and ultimately fail. However, if you bear in mind the old acronym KISS and the words of Albert Einstein, your design will clearly indicate what is going to happen next and make the interface intuitive.

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