

Selecting a SWITCH

An essential part of the design process

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While the electromechanical switch is one of the last components designed in a circuit, selecting the right switch is an essential part of designing any control panel or electronic device. It is imperative for designers to understand the options

- often called the "man-machine interface". If the designer does a poor job with the man-machine interface, the machine will be difficult to use and ultimately fail commercially.

The designer should ponder questions

any power rating is required, silver is the best choice. Gold contacts are typically necessary when switching at logic level, generally defined as covering a microamp to 100ma.

Whether a circuit is momentary or maintained will also influence the switch selection process. A maintained circuit remains open (or closed) after the switch is actuated, where a momentary circuit only remains open (or closed) while the switch is held in the appropriate position.

Finally, designers must remember to consider a switch's life expectancy relative to the application. As a general rule, switches using momentary circuits have longer life expectancies than switches on maintained circuits.

Rules and regulations

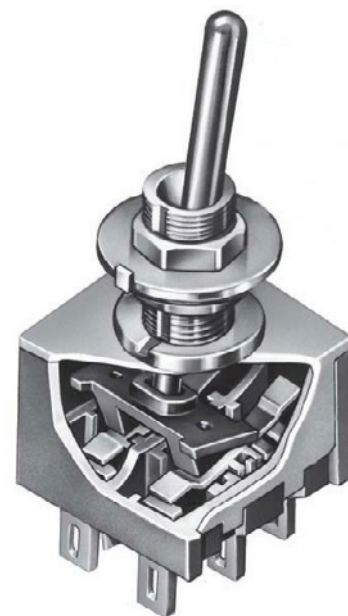
Another important aspect of switch selection is compliance with government regulations and industry ratings. Such regulations include The Resource Conservation and Recovery Act (RCRA), The Clean Air Act (CAA) and The Clean Water Act. European countries have also produced regulations limiting the use of chemicals in manufactured goods and components, such as RoHS and Waste Electrical Electronic Equipment (WEEE).

In addition to government regulations, many switch applications require certification by UL, and CSA. For example, the UL94V rating measures the fire retardant properties of a switch, and TV-5 and TV-8 ratings measure arc-proof properties. These ratings ensure that a given switch will hold up to the demands of a particular application.

Actuator style

In terms of actuator style, switch manufacturers offer a wide array of options to fit any design. Pushbutton switches may be the broadest sub-category of the switch universe. Available in illuminated or non-illuminated, momentary or maintained, and in many shapes and sizes, pushbuttons perform in a countless range of applications.

Toggles, rockers and paddles also come in a wide range of options from physical size to electrical rating, illuminated, momentary or maintained. They also offer a variety of circuit options, usually contained within two or three positions.



Rotary switches, which require a circular motion to select circuit combinations, come in all sizes and types ranging from micro-subminiature dip rotaries to very large and heavy-duty rotaries. Enclosed or open-deck versions are available in many poles with a variety of stop positions.

Keylock switches, a member of the rotary family, are a popular solution in many applications. Keylocks can be high, medium or low security and come in a wide variety of sizes, circuits and key options.

An additional option is slide actuated switches, which are offered in a number of sizes, circuit functions and key options.

Operating environment

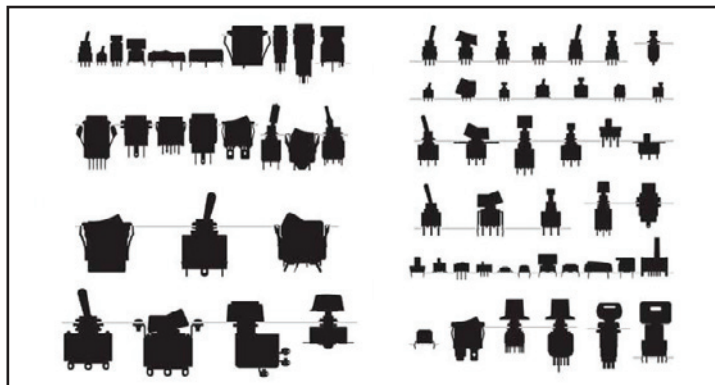
Designers need to keep in mind the operating environment of a given application. Many switches operate in an environment where temperature and humidity are tightly controlled - however, applications such as medical devices, industrial controls, mining/construction machinery and marine equipment require protection from dust, mist and often direct sprays of water.

Designers should choose switches with appropriate IP ratings for the level of protection they need. IP65-rated switches protect against dust and direct high-pressure sprays of water, and IP67-rated switches protect against temporary immersion in up to 1m of water. On the other end of the spectrum, IP60-rated switches only protect against the ingress of larger, solid objects such as dirt.

Conclusion

The switch selection process is important for designers to consider when determining which switch would be best suited for a given application. By following this process, they can identify the right switch for the job more quickly, and avoid many problems down the line such as unhappy users, frequent failures/replacements, and even fire or safety hazards. The most important thing to remember is the goal mentioned by Steve Jobs: design isn't just what the switch looks like, but how it works.

For more information on selecting an electromechanical switch for an OEM electronic design from NKK Switches Inc., go to <http://www.nkkswitches.com>



available when selecting a switch in order to specify the most suitable switch for each application.

The process for selecting a switch can be outlined in five steps. First, the needs of the end user must be considered. Then engineering constraints must be examined: load, voltage and contact materials; circuit type; terminal type and mounting; etc. Care must be taken to comply with certain standards as well, such as RoHS and other government regulations. Once compliance with the applicable regulations is ensured, actuator type should be determined. Finally, the switch selected must be reliable and robust enough for the application. By carefully evaluating and selecting switches based on these six factors, designers can be assured they are selecting the best switch for that particular application.

Meeting the needs of the end user

According to Apple Computer president Steve Jobs, "Design is not just what it looks like and feels like. Design is how it works." The design of every machine includes one fundamental and very important aspect: How the user will interact with the machine

relating to interface and conditions surrounding the switch. What types of feedback does the user require? Is illumination needed to show status? Are legends needed to indicate functions?

Designers should also consider the ease of use of different switch sizes and designs. Engineers should select a switch that not only fits the size parameters, but is also sufficiently user-friendly.

Engineering specs

Several engineering characteristics need to be evaluated when selecting a switch to be sure that it can perform the desired functions. When determining specifications, identifying the load characteristics focuses the designer on the necessary switch type.

Size and mounting constraints also factor into switch selection. Is a standard, miniature, sub-miniature or ultra-subminiature switch required? What mounting configuration is needed - surface mount, PC mount, solder lug or quick connect?

Contact material is another item to think about when choosing switches. Due to excellent conductive qualities and low electrical resistance, silver contact material is most common. In situations where