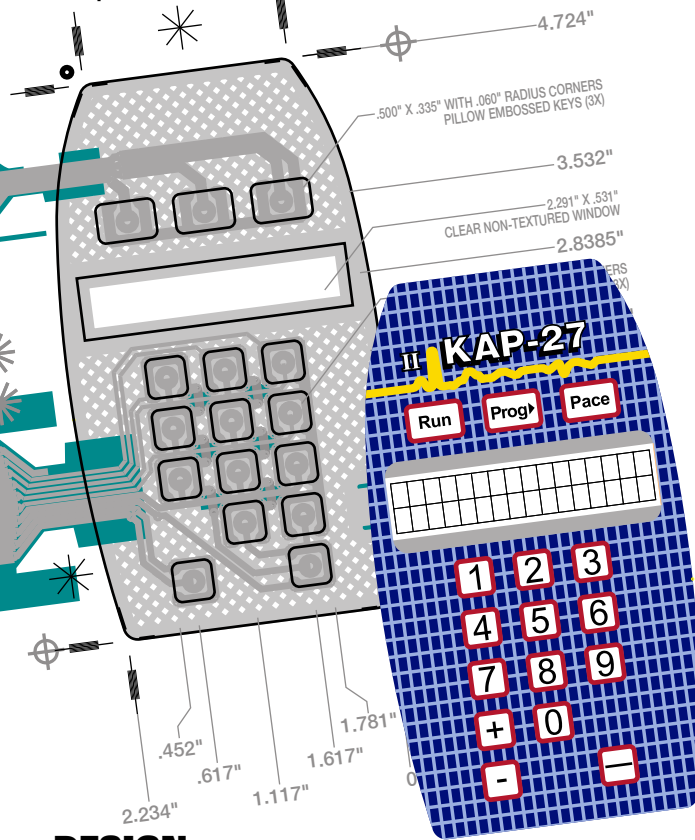


**Dawar Technologies**, a 120 year old company has over 14 years experience in manufacturing membrane switches. Dawar utilizes the latest in material and design technologies. We can manufacture a membrane switch that complies with your specs and within your budget. We offer design consultations to our customers and design options that can reduce costs and comply with your environmental requirements.



## DESIGN:

Dawar provides the customer with a complete set of drawings (graphic and electrical) for the customer to review, approve and retain for their records prior to manufacturing. These drawings also flow through the shop during production.

Dawar supports files created in AutoCAD, CorelDraw, FreeHand, Illustrator, PageMaker and QuarkXPress (Ask for our Computer Graphics Specifications). We have an extensive font library, but it is recommended that you include or embed the fonts with your file, especially if you have edited them in some way.

It can also be helpful to send a hard copy of the artwork. You can email your file to [graphics@dawar.com](mailto:graphics@dawar.com)

## PROTOTYPES:

A prototype is a cost effective way to produce your design with a minimum investment in tooling. Especially if you are not sure about color, size or shape. Dawar has the printing and laser cutting capabilities to better serve your prototype requirements.

## OVERLAY MATERIALS:

The overlay is the top layer of a membrane switch and is the interface between you and the machine. The overlay creates the look and feel for your product. It is the first thing your customer sees and has to be aesthetically pleasing. Dawar has a design team to assist you create the image you want to project.

Dawar offers a complete line of polycarbonate, polyester or acrylic materials in various gloss levels, textures, pencil hardness and gages to meet your needs. If you have special UL or CSA requirements, Dawar can make recommendations to comply with those needs.

Two of the most important issues are durability and environmental concerns. It is essential to choose a material that will out live your application requirements; polycarbonate offers more flexibility with regard to design but polyester is more durable.

If you have an application for < 50000 actuations, polycarbonate is a good choice; otherwise polyester is the material of choice. Life cycle tests show that polyester can be actuated over 1,000,000 times in a tactile switch without showing signs of wear. For good tactile feedback in a membrane switch, choose an overlay thickness between .006 and .010. These thickness ranges will offer the durability to meet your requirements.

Dawar has a computerized color formulation system to achieve consistent results from printing to printing. Dawar can color match to the Pantone Matching System, Federal Standard Guide, a color swatch or to your bezel. The colors on the overlay are screen printed on the second surface. The thickness of the overlays protects the graphics from the environment and operator wear. Selective textures and window clearing agents are printed on the first surface and UV cured to produce a very durable finish.

## **ADHESIVE:**

There are numerous differences in adhesives. Selecting the proper adhesive for a membrane switch application requires consideration of environment, surface, appearance and other performance requirements.

Surface contact is fundamental to adhesive performance. The strength of the bond is determined by the surface energy. Adhesives are manufactured for applications to these three surface categories: metals, high surface energy and low surface energy. Dawar engineers can help you select the correct adhesive for your application.

## **EMBOSSING:**

Embossing can dramatically enhance the look and functionality of the overlay. There are three basic styles of embossing, pillow, rim and dome embossing. Depending on shape and size, logos and multi level shapes can be embossed.

There are two ways to emboss an overlay. The first method is with male and female magnesium dies. This method is fine for most applications but there are height limitations: embossing height is usually 2 to 2-1/2 times the material thickness, the minimum width of a rim emboss is 0.050", the distance between embossed objects should be .100" and the minimum inside radius should be .005". Hydroforming is the second method which has more design flexibility.

## **CIRCUITS:**

Dawar offers screen printed conductive silver ink circuit, copper flex circuit and printed circuit boards. The conductive silver ink is printed on .005 polyester, resistance range is <10 ohms to 100 ohms with a rating of 30 volts DC.

Copper flex circuits base material is .001, .002, .003 and .005 polyimide or polyester. Minimum trace width is .004 with a pitch of .004. Copper can be either .5oz, 1.0oz or 2.0oz RA or ED copper.

Printed circuit board can be single or double sided. The base material is FR4, CEM-1 or CEM-4. Minimum trace width

for gold .003 for hot air leveling .006. Plating thickness dependent on material can either be 1 micron to 25 microns. Plating options include copper, carbon, nickel or gold.

## **SURFACE MOUNT DEVICES:**

Dawar can implant membrane switches with LEDs, and resistors using our pick and place machine. The SMD is adhered to the circuit layer with conductive epoxy and encapsulated with a UV cured polyurethane.

## **SHIELDING:**

Dawar can recommend and design the proper shielding to meet your ESD, EMI, or RFI requirements.

Dawar uses two methods for shielding membrane switches: 1.) Copper or aluminum foil with or without laminated polyester to the second surface and 2.) Screen printed conductive silver ink in a grid or complete coating of the first surface.

The shield can be terminated by three methods:

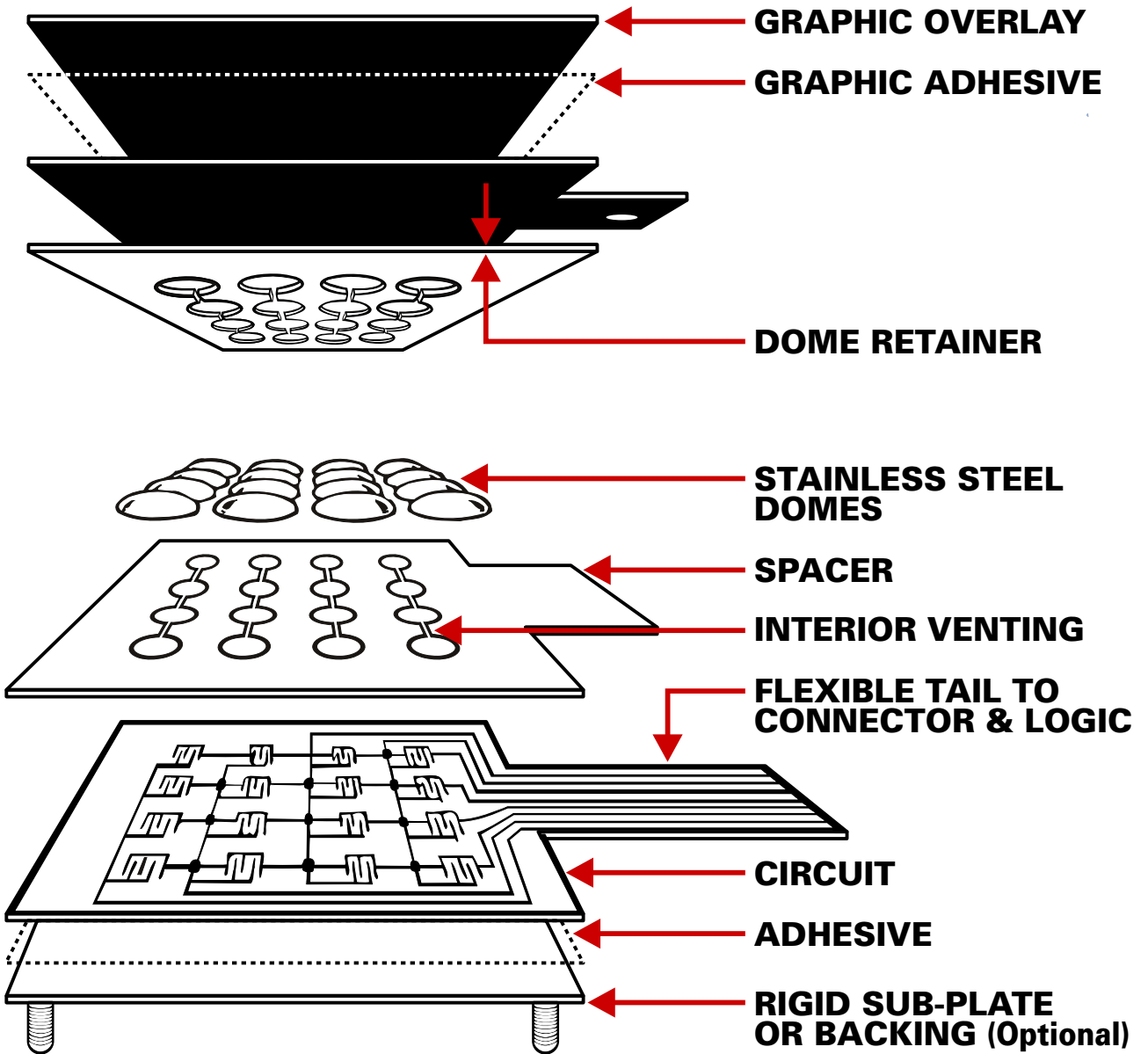
- 1.) **Tab.** The tab can be attached to a stud or standoff on the metal backer or the metal enclosure.
- 2.) **Connector.** The shield can be terminated into the pins of the membrane switch tail.
- 3.) **Wrap Around.** The shield layer will wrap around the membrane switch and ground to the enclosure.

## **TACTILE AND NON-TACTILE:**

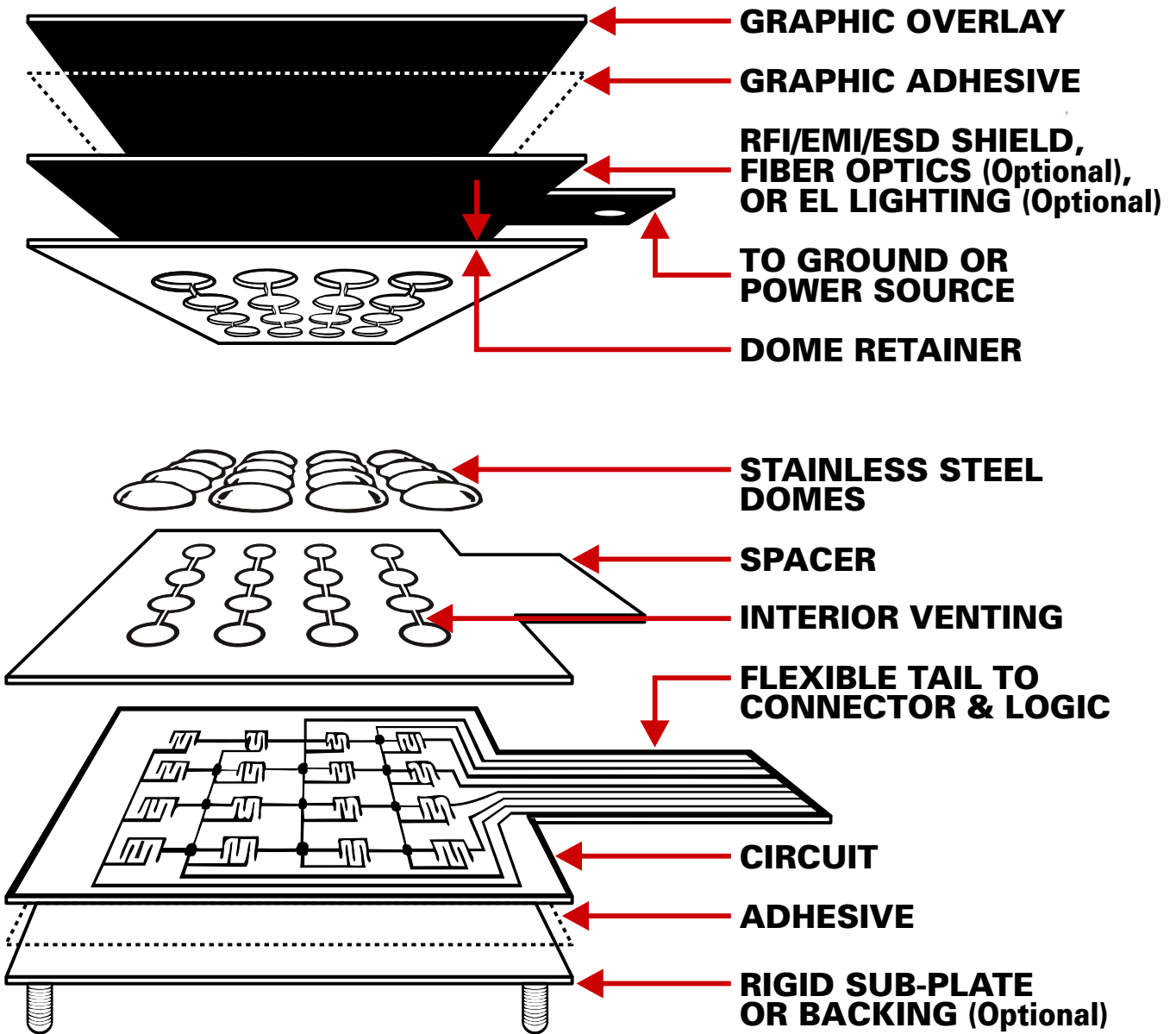
Non-tactile membrane switches can be designed with a wide range of actuation forces. The actuation force is determined by the circuit spacer thickness. If required a non-tactile membrane switch can be designed as thin as .021".

Tactile membrane switches incorporate a metal dome or a polydome to achieve the desired tactile response. Using different sizes of metal domes or polydomes will vary the actuation force. Metal domes come in a large variety of shapes and sizes with actuation forces between 180 to 700 grams; different polydome actuation forces can be achieved by changing the diameter and height of the polydome to meet your requirements.

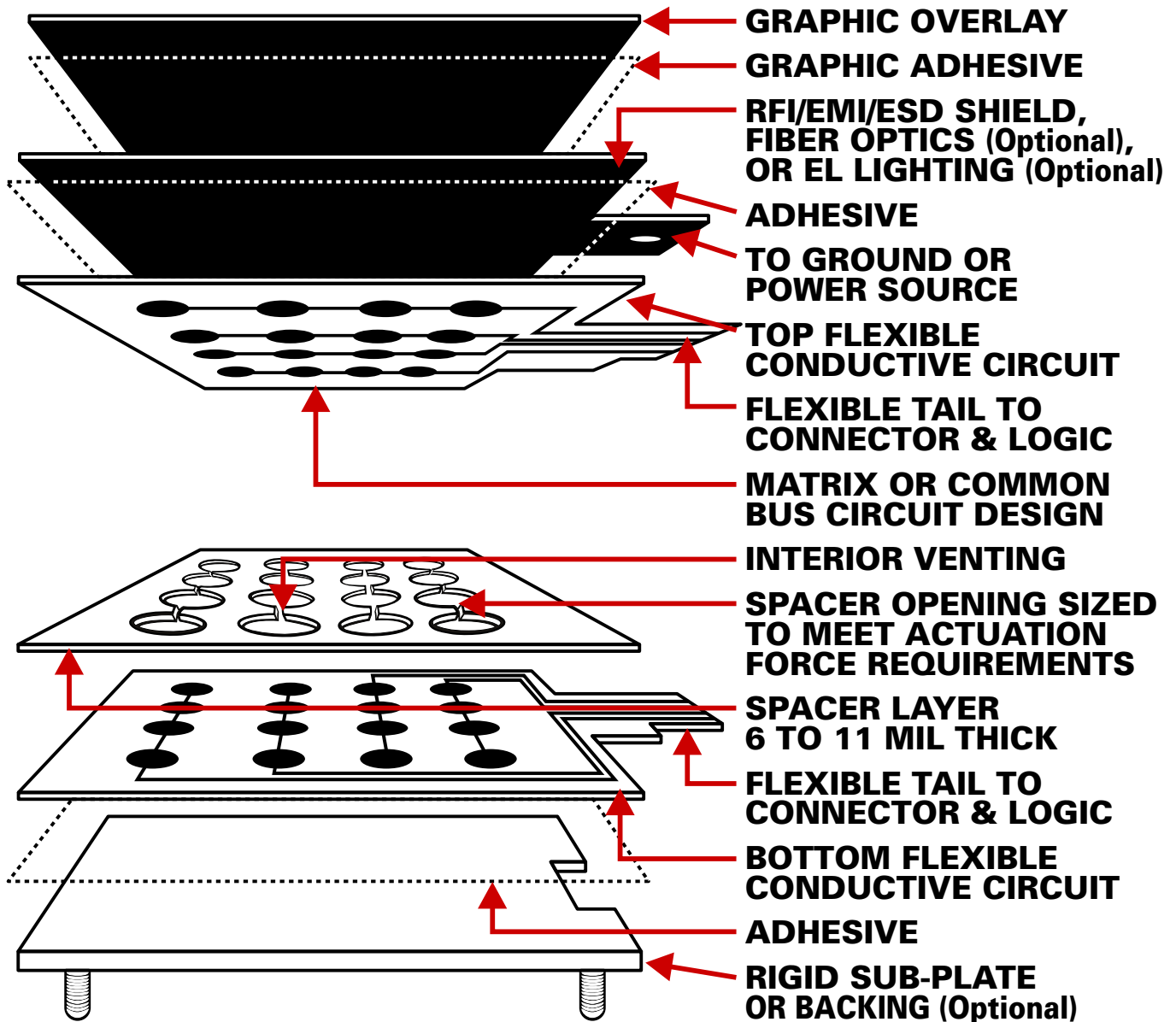
# Custom Tactile Membrane Switch Design Without Shield



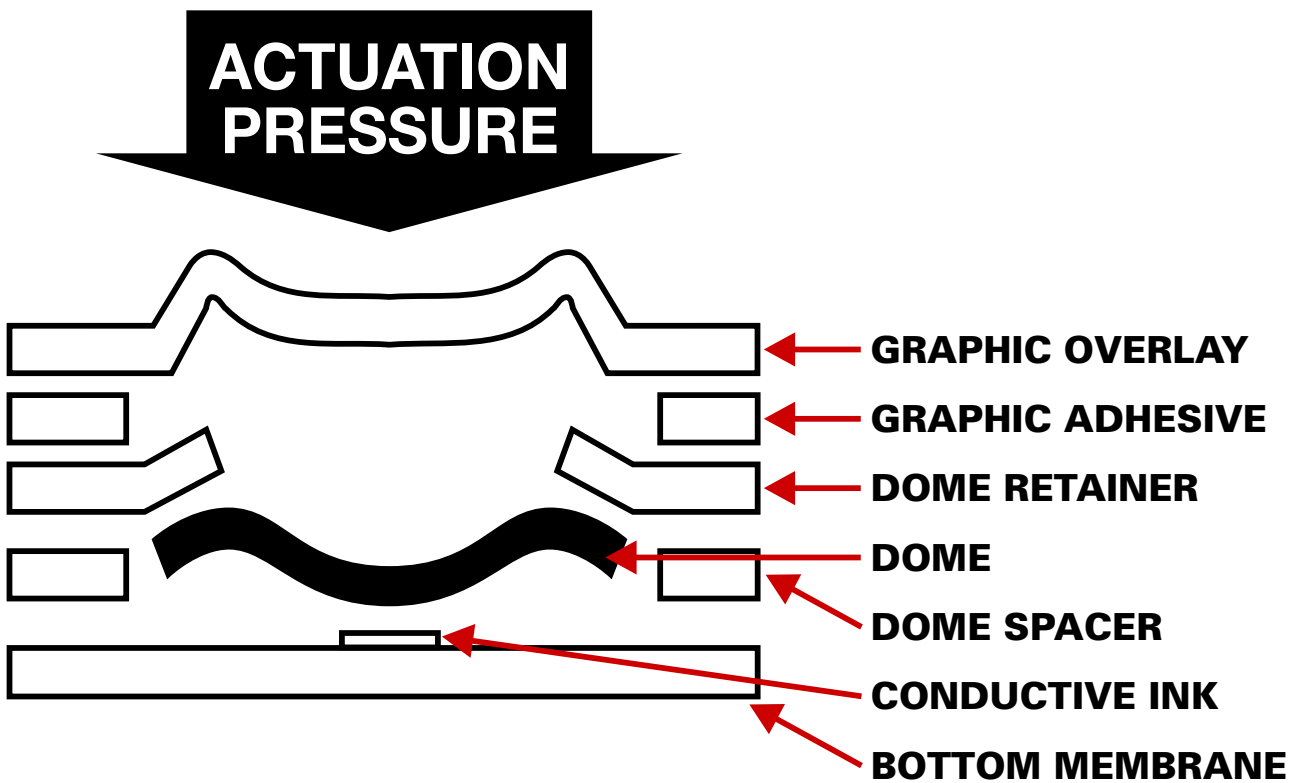
# Custom Tactile Membrane Switch Design With Shield and Backer



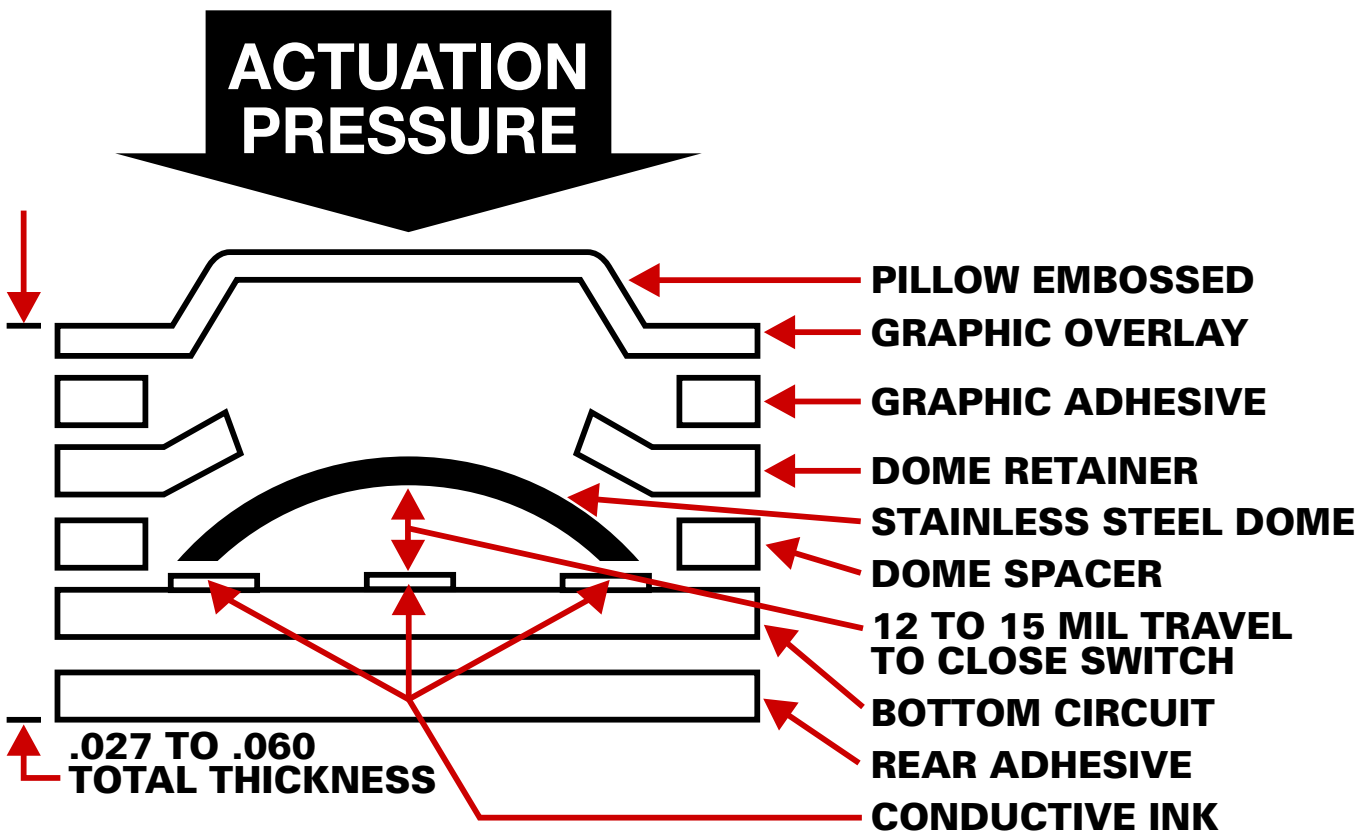
# Custom Standard (Non-Tactile) Membrane Switch Design With Shield and Backer



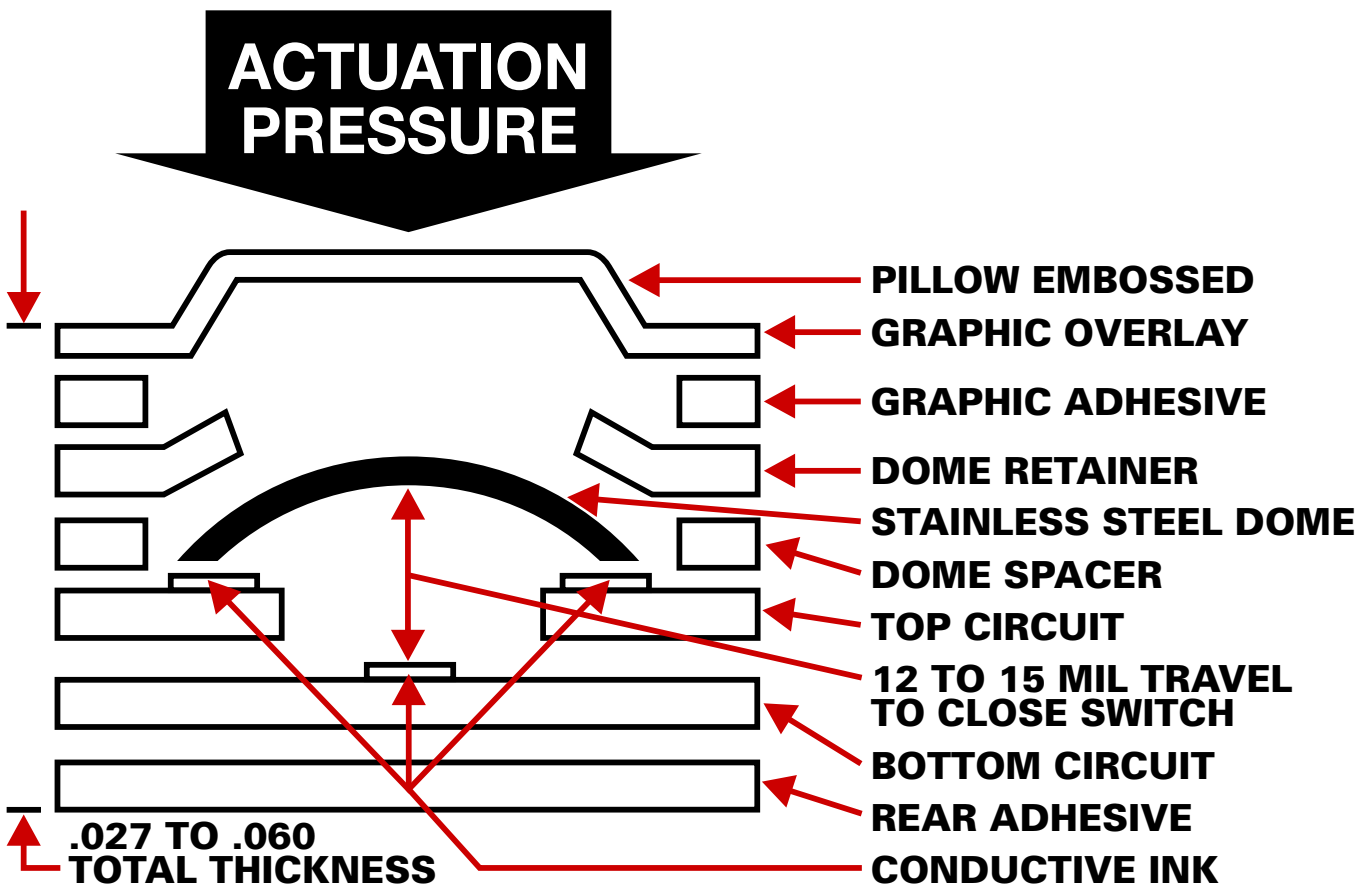
# Tactile Response Technology



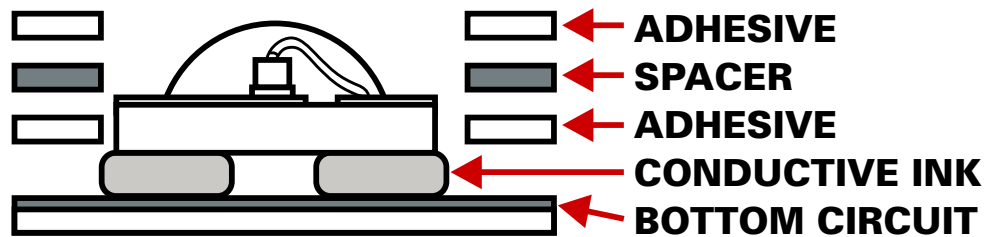
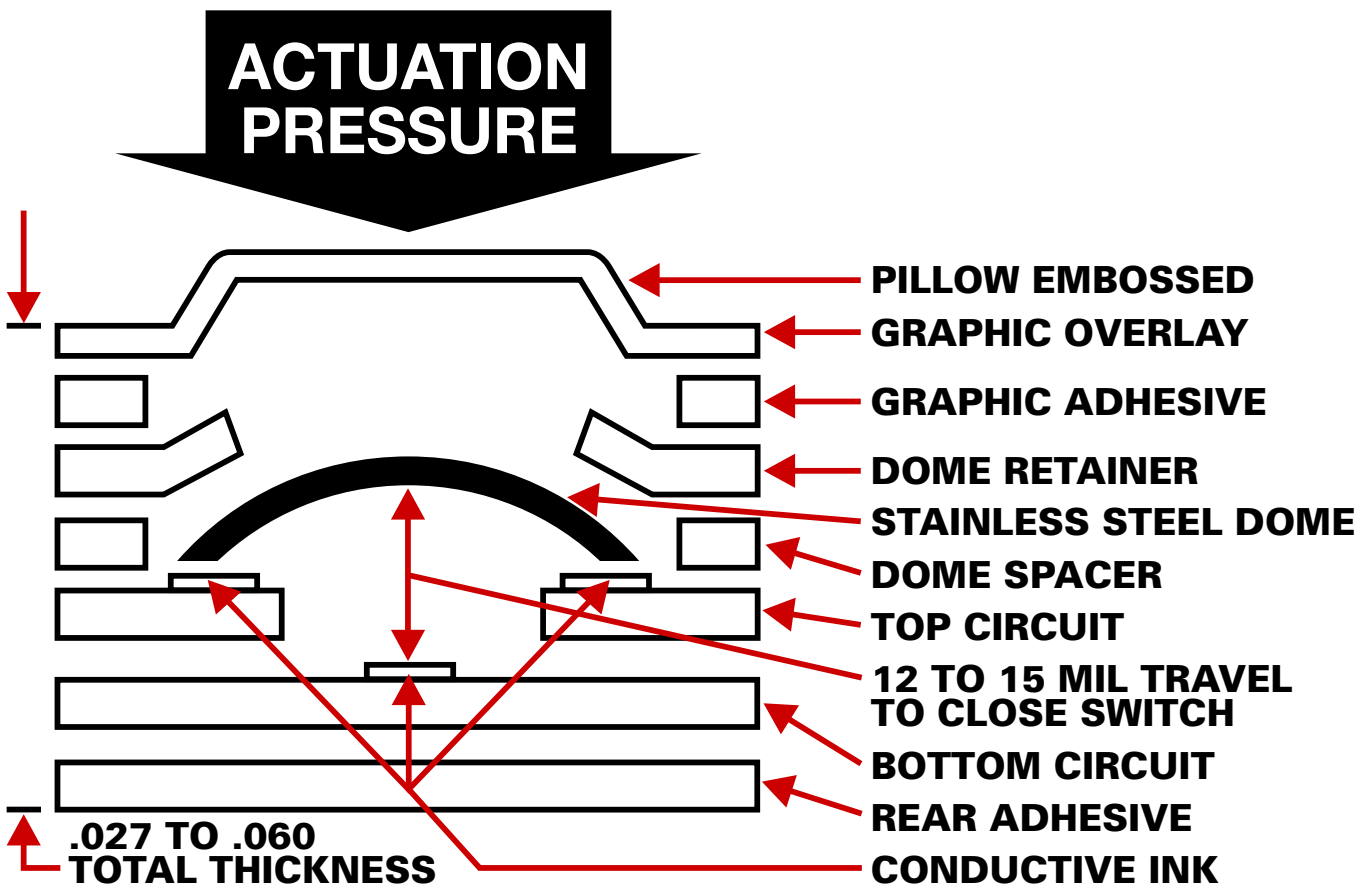
# Custom Tactile Membrane Switch Design (V1)



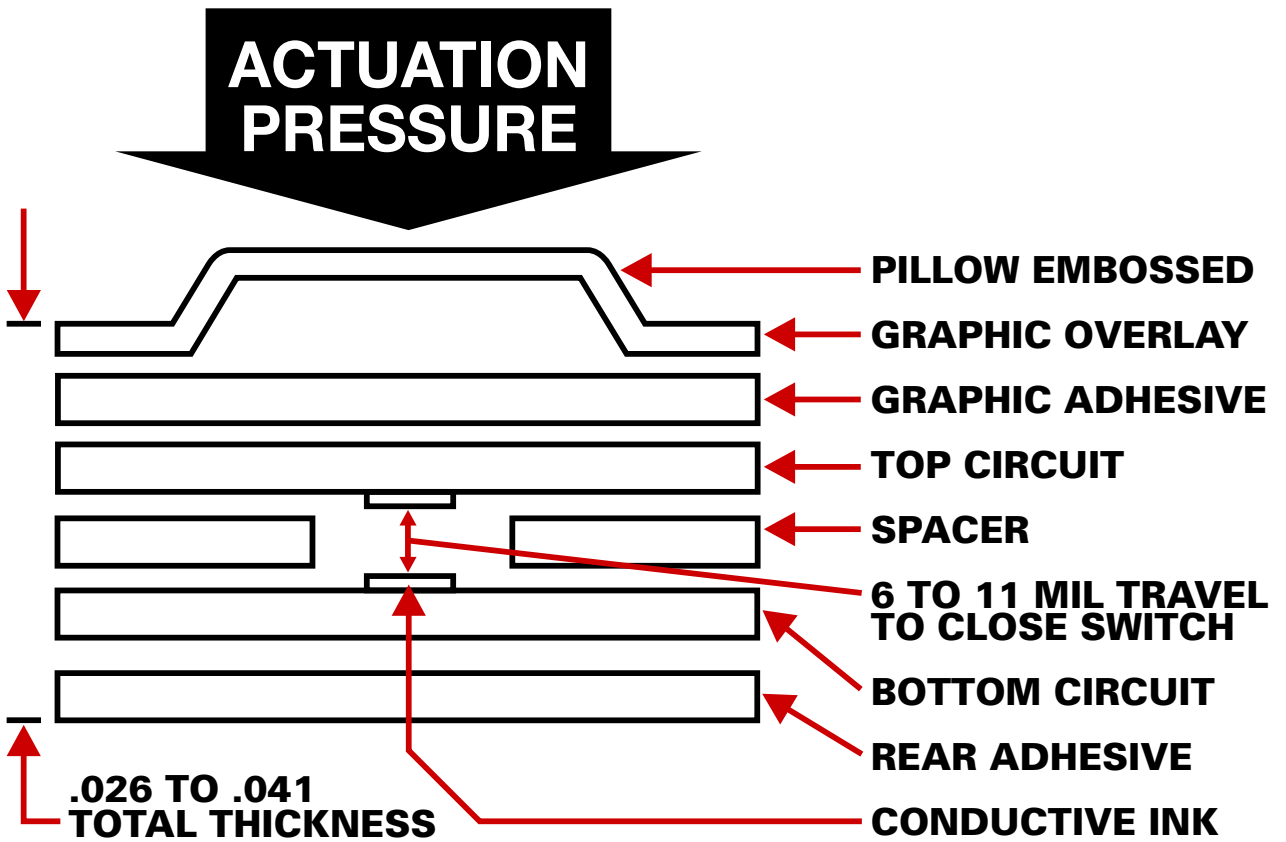
# Custom Tactile Membrane Switch Design (V2)



# Custom Tactile Membrane Switch Design With Surface Mounted L.E.D.S



# Custom Standard (Non-Tactile) Membrane Switch Design



## ABRASION RESISTANCE

Ability to resist surface wear.

## ACCELERATED AGING

A test methodology that simulates long term environmental effects.

## ACTUATION FORCE

Force required to collapse a metal or polyester dome.

## ADHESION

The molecular force of attraction between unlike materials. The strength of attraction is determined by the surface energy of the material. The higher the surface energy the greater the molecular attraction, the lower the surface energy the weaker the attractive force.

## AMPERE [AMP]

A standard unit of current. Defined as the amount of current that flows when one volt of EMF is applied across one ohm of resistance. An ampere of current is produced by one coulomb of charge passing a point in one second.

## AQL

Acceptable quality level.

## ASTM

American Society for Testing and Materials.

## AUTOTEX

Trademark for Autotype Industrial Films polyester graphic overlay film.

## BOND STRENGTH

Amount of adhesion between two surfaces.

## BREAKDOWN VOLTAGE

The voltage at which the insulation between two conductors is destroyed.

## CAD/CAM

Computer aided design/Computer-aided manufacturing.

## CAPACITANCE

The property of conductors and dielectrics which allows the storage of an electrical charge when voltage is applied. ASTM F1663-95

## CARBON/GRAPHITE INKS

Specially prepared suspensions of carbon black; these systems are employed for lower cost when the conductivity of a metal base system is not required. Often printed over silver circuitry to reduce the potential for silver migration, also employed for printed resistors.

## CERTIFICATE OF COMPLIANCE (C OF C)

A certificate generated by a quality control department confirming that the product being shipped meets the manufacturing document.

## CONDUCTIVITY

The ability of a material to allow electrons to flow measured by the current per unit of voltage applied.

## CONTACT BOUNCE

Intermittent contact opening and closure that may occur after switch operation. See ASTM F161-95

## CSA

Canadian Standards Association.

## CURRENT, ALTERNATING (AC)

An electric current that periodically reverses direction of electron flow. The rate at which a full cycle occurs in a given unit of time (usually a second) is called the frequency of the current.

## CURRENT, DIRECT (DC)

Electrical current whose electrons flow in one direction only. It may be constant or pulsating as long as it's movement is in the same direction.

## DEAD FRONT

Cosmetic feature of a graphic overlay allowing for a display feature to be visible only when backlit.

## DIE CUTTING

Process for blanking or cutting sheet or roll materials to predetermined shapes for membrane switch components, graphic overlays and labels.

## DIELECTRIC

An insulating (nonconducting) medium.

### DOME RETAINER

An adhesive layer designed to hold metal domes in keys

### EL LAMPS

A thin (.010"-.025") illuminating device employed to light large areas, commonly used in LCD, control panel, and membrane switch backlighting.

### EMBEDDED LED

The practice of encapsulating a surface mount LED into a membrane switch construction.

### EMBOSS

Mechanical and thermoforming of graphic features, providing a raised feature for accenting key surfaces, logo's, and to allow for embedding of surface mount LED's within the switch.

### EMBOSS, RAIL

Creates a raised ridge around the perimeter of the key area, usually.

### EMBOSS, PILLOW

Creates a raised surface in the graphic overlay over the entire key area.

### EMI/RFI/ESD SHIELD

Printed conductor pattern or separate aluminum or copper film employed in membrane switch designs to reduce the effects of electromagnetic and radio frequency interference.

### FIBER OPTIC BACKLIGHTING

Illuminating device employed to light large areas. Strands of clear fiber are woven and bundled, after polishing the fiber ends are illuminated by an LED or Halogen lamp.

### FLAT FLEX CONNECTOR [FFC]

Connector type commonly used to terminate membrane switch circuitry.

### FONT

A set of characters having a unified design.

### GLOSS LEVEL

The degree of shininess of a substrate, usual specified in percentages for example 75% gloss, 90% gloss, etc.

### HB-94HB

Underwriters Laboratories flame retardant specification (horizontal burn)

### HSE

High surface energy.

### INSERT LEGEND (INSERT GRAPHICS)

A design feature allowing for changes to nomenclature and symbols by the client or end user. The feature is accomplished by creating a pocket in the membrane switch assembly to allow for an insert card.

### INTERNALLY VENTED

Switch openings are connected to each other but not to the outside atmosphere. This design approach is used to seal the switch from moisture and contaminants.

### ISO

International Standards Organization. Known for the development of a series of standards called ISO 9000 for developing Total Quality Management, and creating a continuous Quality Improvement Process.

### ITO

Indium Tin Oxide, a thin film conductive material vacuum deposited on the surface of a film substrate. Material is often the base material for resistive touchscreens.

### KEY HEIGHT

The measured distance from the bottom (base) of the keypad to the top surface of the key.

### KEY TRAVEL

The distance a switch moves to close an electrical contact, expressed in inches or MM.

### LED

Light emitting diode.

### LEXAN®

General Electric (GE) registered trademark for polycarbonate film.

### LSE

Low surface energy.

# MEMBRANE SWITCH BASICS

**G L O S S A R Y**

## MEMBRANE SWITCH

A momentary switching device in which at least one contact is on or made of, a flexible substrate.

## METAL DOME

Stainless Steel Disc or element. One of several approaches used to produce tactile response.

## MOISTURE RESISTANCE

The ability of a material to resist absorbing moisture from the air or when immersed in water.

## MP

Modified performance. An adhesive classification of 3M products.

## MUNSELL

Color matching system which defines color by three attributes; hue, value, chroma. Fifteen hundred color samples are available as opaque pigmented films.

## MYLAR®

Dupont trademark for polyethylene terephthalate (polyester) film.

## NEMA

National Electrical Manufacturers Association.

## NON-TACTILE

Membrane switch constructed without snap action.

## OHM

The electrical unit of resistance. The value of resistance through which a potential difference of one volt will maintain a current of one ampere.

## OVERLAY

Decorative front layer of a membrane switch or control panel.

## OVER-TRAVEL

The additional travel of a rubber keypad or metal dome after making contact with the circuit.

## PANTONE MATCHING SYSTEM (PMS)

Color matching system originally developed for the offset printing industry, commonly used in the membrane switch industry for its broad acceptance, range of colors and ease of use. Over 1000 colors are cataloged.

## PCB

Printed circuit board.

## PINOUT

The schematic describing the circuit output requirements for a membrane switch or other electronic device.

## POLYCARBONATE

Graphic overlay film widely used for control panels

## POLYESTER DOME

A spherically formed element in polyester circuit material to provide tactile response in membrane switches. Usually the domes are formed in arrays or sets to match the key configuration of the keypad. Polydomes.

## POLYESTER

Bi-axially oriented polyethylene terephthalate film. (PET)

## PRESSURE-SENSITIVE

Adhesive materials which bond with the application of pressure alone and do not require activation by heat or solvents.

## RESISTANCE

In DC circuits, the opposition a material offers to current flow, measured in Ohms.  
RFI Radio Frequency Interference.

## SCREEN PRINTING

Printing process using a mesh stretched over a frame allowing ink to selectively pass through by using a stencil. The process most commonly used for producing graphic overlays and membrane switch circuits.

## SECOND SURFACE PRINTED

Inks are applied to the non-exposed side of the film to allow for the film to protect the inks from scratching or damage.

**D A W A R T E C H N O L O G I E S**

# MEMBRANE SWITCH BASICS

**G L O S S A R Y**

## SELECTIVE TEXTURING

The creation of surface effects on matte or gloss films normally applied using the screen printing process.

## SILICONE RUBBER

Rubber made from silicone elastomers and noted for its retention of flexibility, resilience and tensile strength over a wide temperature range.

## SILVER INKS

Specially prepared suspensions of finely milled silver particles in a variety of resin systems are used widely to produce conductive patterns on flexible substrates.

## SPACER

An adhesive layer of a membrane switch used to separate circuit layers and to provide key openings allowing for conductors to contact each other when depressed.

## STATIC SHIELD

Printed conductor pattern or separate aluminum or copper film employed in membrane switch designs to reduce the effects of static discharges.

## STEEL RULE DIE

Consists of a .750-.875 thick die-board (plywood construction) with .937" high knives inserted into laser cut groves.

## TACTILE SWITCH

A switch or switch assembly providing a positive snap-action response. The response can be achieved through the use of stainless steel domes embedded in the membrane switch, or polyester domes formed in either the circuit or graphic overlay layers.

## THIXOTROPY

The property of a coating or ink, which has a low viscosity when agitated, but thickens when agitation ceases.

## VISIBLE LIGHT TRANSMISSION (%)

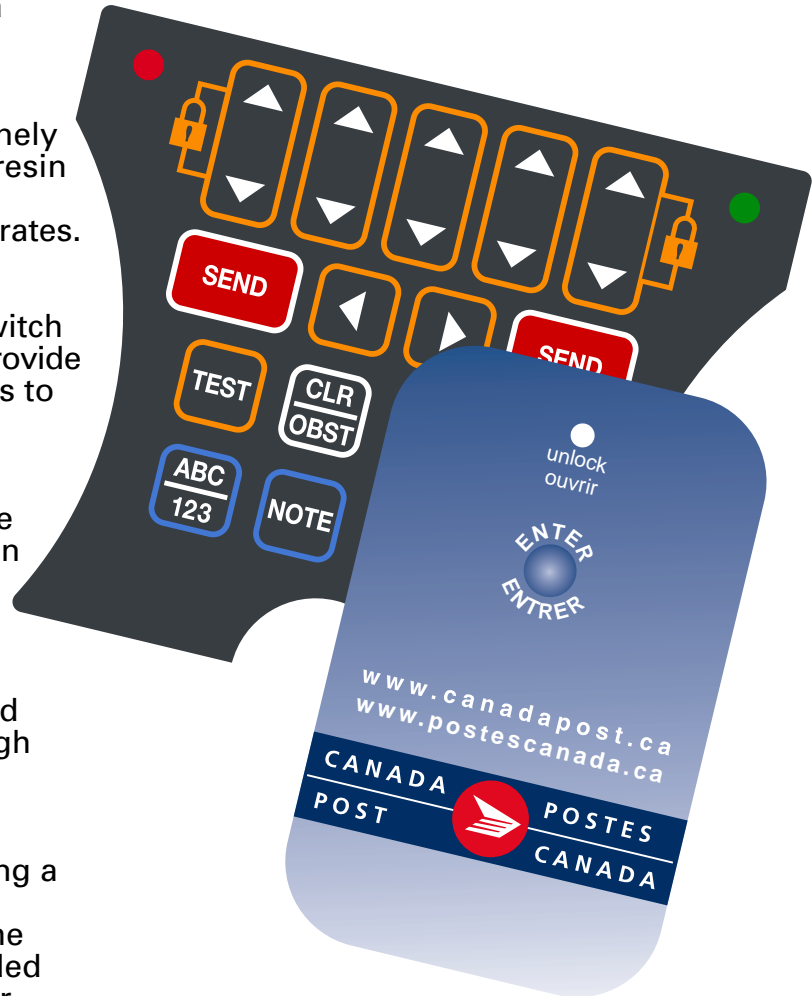
The ratio of the amount of total visible solar energy (370-780 nanometers) that is allowed to pass through a filter, to the amount of total solar energy falling on that filter.

## WATT

A unit of electrical power. One Watt is equivalent to the power represented by one ampere of current with a pressure of one volt in a DC circuit.

## ZIF

Zero Insertion force.



For more details on products and services go to [www.dawar.com](http://www.dawar.com)

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