A membrane switch is a thin, low-profile, micro-motion, front-panel assembly with one or more layers of polyester. Screen-printed conductors are printed on each layer and pressure-sensitive adhesives are used to bond the polyester layers together. The assembly may also include passive electronic components, such as resistors or capacitors that are adhered to the membrane switch substrate using conductive adhesive technology.

Molex’s low-profile membrane switches are light weight and permit integration into smaller and thinner packages. Membrane switches are available as either tactile or non-tactile. The tactile element provides a “snap” or tactile sound when the switch is actuated. LEDs are available upon request to provide a bonded LED assembly.

**FEATURES AND BENEFITS**

- Light weight and low profile to permit integration in to smaller and thinner packages.
- Easy to shield which offers protection against static discharge and EMI/RFI.
- Extremely resistant to shock and vibration for exceptional performance in commercial applications.
- Durable to meet the needs of rugged and high-usage applications.
- Capabilities exist to bond simple electronic components
- Superior tactile response that is consistent from switch to switch and withstands even the most rugged commercial environments
- Well-suited for harsh environments and medical applications
SPECIFICATIONS

Material
Circuit Sheet: Polyester film of a specified thickness with conductive thick film circuitry
Conductive Thick Film: Composition of fine silver particles suspended in resin, exhibiting typical sheet resistance of .025 Ω per square at .02mm (.001") unless otherwise dictated by application
Spacer Sheet: Polyester film of a specified thickness that may have adhesive on both sides. The spacer contains openings that act as through holes for the contact of silver pads on the circuit sheet
Dome Retainer: Polyester film of a specified thickness that has adhesive on both sides. Provides insulation between a silver conductor and the dome in a tight matrix design
Mounting Sheet: Free film or polyester supported adhesive with release backing
Graphic Sheet: Decorative overlay of plastic film, typically polyester or polycarbonate, of a specified thickness. May have pressure sensitive adhesive on the back side
Flex Tail Cover: Polyester of a specified thickness with adhesive on one side or screenable coating with specified dielectric properties

Electrical
Contact Rating: 30ma at 28V DC
Durability: 1 million operations at maximum contact rating
Circuit Resistance: 100 Ω max. typical. Total loop resistance at termination depends on circuit configuration
Contact Bounce: 20 milliseconds max.
Insulation Resistance: 100 M Ω initial between adjacent lines
Silver Migration: 24 hours in 40°C at 90-95% RH with 5 DC applied. Design dependent
Available Circuit Codes: Any combination of normally open momentary contact arrangements
Dielectric Withstanding Voltage: Polyester Circuit Sheet: Short term dielectric strength test per ASTM-D149
Dielectric strength vs. thickness with 50.80mm (2.00") electrode in air at +20°C is 3500V per mil with .13mm (.005") thick film
Dielectric strength vs. temperature with .13mm (.005") thick film is 3500V per mil at +25°C to 3000V per mil at +150°C
Dielectric strength as it relates to various humidities:.13mm (.005") thick film is 3200V per mil at 80% RH and 3800V per mil at 20% RH
Dielectric strength of flex tail covering and contact gap will vary depending on construction

Mechanical
Actuation Force: 8 to 18 oz. typical. Varies with construction of switch, including dome retainer thickness and graphic options, and tactile force of the dome used
Button Travel: .38 to .46mm (.015 to .018") typical depending on dome specified
Switch Thickness: .48 to 1.40mm (.019 to .055") typical depending on graphic and mounting options
Shock: 50g, 3 hits on each axis per MIL-STD 202F, Method 213B, Condition A. Switches are monitored for closures during test
Vibration: Per MIL-STD 202F, Method 201A with 30ma at 28V DC applied. Switches are monitored for closures during test
Conductor Adhesion: Capable of withstanding 6 insertions and extractions of any Molex connector designed for silver conductive ink and then carrying rated load. Capable of withstanding an abrasion taber test with a specified number of cycles and weight. After test, there should be no increase of termination resistance beyond the specified limits.
Flex Tail Strength: Five 180° clockwise and counterclockwise bending cycles flat around a .79mm (.031") radius. No cracking, flaking or delamination should be detected under a 30X microscope. After test there should be no increase of termination resistance beyond specified limits.

Environmental
Storage Temperature: -40 to +70°C typical depending on specific switch configuration and application requirements
Humidity: Per MIL-STD 202F, Method 103B, Condition A*
Thermal Aging: 96 hours at +70°C, then 96 hours at +40°C
Thermal Shock: Per MIL-STD 202F, Method 107D, 5 Cycles of -40°C for 30 minutes, then +70°C for 30 minutes

*After test, parts must meet electrical characteristics as specified above.

APPLICATIONS
• Appliance controls
• Medical front panels
• Point-of-sale terminals
• Industrial controls
• Consumer products
• Cellular communications
• Telecom and datacom

Membrane Switches