MEMBRANE SWITCHES AND CAPACITIVE SOLUTIONS

Versatile, Reliable Membrane Switches and Capacitive Solutions

Beyond interconnects, Molex is a global leader in manufacturing custom user interfaces, membrane switches and flex circuit solutions.

Molex delivers:

• Full staff of experienced electrical, software and mechanical engineers to collaborate with you on designs
• Design centers in the US and Asia
• Regionally located global sales force
• Manufacturing in US, Mexico and Asia
• UL qualified internal reliability lab
• 100% electrical inspection, testing and packaging
• Automated and semi-automated processes

With our history of reliable manufacturing and design, we are the ideal collaborator for professional grade products. Our team of experts will get your program from prototype to high-volume production on schedule.

The Molex Approach

At Molex, we take a multidimensional approach to develop complete, integrated solutions that turn your ideas into reality. With the industry’s broadest line of printed electronics and the expertise to work through your mechanical issues, we can advise you on the best fit for your needs, balancing cost, performance, durability, weight and other requirements.

Learn whether a Molex user interface solution is right for your end application, and start designing your solution today at www.molex.com/product/switch.

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INNOVATIVE TECHNOLOGY WITH A GLOBAL REACH

Membrane Switch and Control Panels
- Unlimited tactile and non-tactile contact configuration
- 3D membrane switches enhanced with rubber keypads
- Multiple backlighting and indication solutions
- Impressive array of decorative pieces for integration (metal, plastic bezel)

Capacitive Systems
- Electronic layout and stack up design services
- Optimize performance between touch sensor and micro controller
- Software and firmware development in-house
- Innovative backlighting techniques

Transparent Capacitive Sensors
- Ideal technology for backlighting capacitive touch keys
- Experts in PEDOT transparent sensor printing
- Experienced in mutual and self-capacitive layouts
- Integration into decorative plastic or glass

Physical
- Substrates:
  - Polyester (PET) Transparent or white, 0.08mm to 0.18mm (.003" to .007") thick
  - Polyimide and FR4 Various thicknesses available, 0.03mm (.001") standard
  - Thermoplastic Polyurethane (TPU) Non-Wovens Materials
  - Glass
- Conductive Ink:
  - Silver and Silver Blends
  - Carbon Ink
  - PEDOT

Component Attachment
- Component Types on PET:
  - SMD
  - LEDS, resistors, capacitors, diodes, phototransistors
  - 7-Segment Displays
  - Microprocessors
  - 0.1mm pitch leads

Component Sizes and Forces
<table>
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<th>Dome Size</th>
<th>Force</th>
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<tbody>
<tr>
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User Interface Applications:
- Appliance
- Automotive interiors
- Medical equipment
- Industrial controls
- Commercial handholds

MOLEX DELIVERS:
- Design engineering support
- Proven Molex reliability
- In-house value-add capabilities

MOLEX INNOVATION WITH A GLOBAL REACH

Printing Capabilities
- Panel Printing Maximum
  - 1016mm (40") by 508mm (20")
- Roll-to-Roll Printing Maximum
  - 48" web, 2" max roll diameter

Environmental
- These parameters may vary depending on specific switch configuration and application requirements
- Operating Temperature
  - 40 to 70°C typical (+85 and +105°C constructions available)
- Storage Temperature
  - -40 to 70°C typical (+85 and +105°C constructions available)
- Humidity
  - 85% RH non-condensing, 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 107C, 5 cycles of +150°C for 30 minutes, then –70°C for 30 minutes
- Silver Migration
  - 2 cycles of 4 hours in an +85°C at 85% RH, then cooled to +25°C for 4 cycles of 4 hours with 35 SC Applied

Backlighting
- Light Guide Films
- Acrylic Light Guides
- Fiber Optics
- Indication LED
- Alternative Lighting Techniques

Electrical
- Circuit Resistance
  - 100 Ohms maximum, may vary depending on circuit configuration
- Durability
  - Tactile - 1 million operations
  - Non-Tactile - 5 million operations
- Contact Bounce
  - 5 milliseconds typical
- Insulation Resistance
  - 1 Mohm nominal between adjacent traces

Capacitive Systems
- Electronic layout and stack up design services
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- Operating Temperature
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- Storage Temperature
  - -40 to 70°C typical (+85 and +105°C constructions available)
- Humidity
  - 85% RH non-condensing, 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 107C, 5 cycles of +150°C for 30 minutes, then –70°C for 30 minutes
- Silver Migration
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- Insulation Resistance
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Physical
- Substrates:
  - Polyester (PET) Transparence or white, 0.08mm to 0.18mm (.003" to .007") thick
  - Polyimide and FR4 Various thicknesses available, 0.03mm (.001") standard
  - Thermoplastic Polyurethane (TPU) Non-Wave Materials
  - PET/Nylon
  - Glass
- Conductive Ink:
  - Silver and Silver Blends
  - Carbon Ink
  - PEDOT

Component Attachment
- Component Types on PET:
  - SMD LEDs, resistors, capacitors, diodes, phototransistors
  - 7-Segment Displays
  - Microprocessors
- Component Types on PCB:
  - QFN, QFP, SU

Component Types on FPC:
- Minimum Package Size
  - SMD 0204 on PET
  - 0102 on PCB / FPC
- Microprocessors
  - 0.5mm pitch leads

Membrane Switch Options
- Various dome sizes and forces from qualified vendors
- Molex In-House Metal Domes
- Molex In-House Metal Domes

Printing Capabilities
- Panel Printing Maximum
  - 12.00mm (.472") 405g
  - 9.00mm (.354") 250g

Environmental
- These parameters may vary depending on specific switch configuration and application requirements
- Operating Temperature
  - +85 and +105°C constructions available
- Storage Temperature
  - +85 and +105°C constructions available
- Humidity
  - Up to 90% RH non-condensing, 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 170, 5 cycles at +40°C for 30 minutes, then –5°C for 30 minutes
- Silver Migration
  - 3 cycles of 4 hours in +45°C at 85% RH, then cooled to +25°C for 4 hours with 3V DC applied

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- Polyimide and FR4 Various thicknesses available, 0.03mm (.001") standard
- Thermoplastic Polyurethane (TPU) Non-Waves Materials
- PMMA
- Glass
- Component: Contact Ink
- Silver and Silver Blends
- Carbon Ink
- PEDOT

Component Attachment
- Component Types on PET:
  - SMD
  - LEDS, resistors, capacitors, diodes, phototransistors
  - 7-Segment Displays
  - Microprocessors
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- Molex In-House Metal Domes
  - Force
  - 12.00mm (.472") 405g
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  - 9.00mm (.354") 250g

Printing Capabilities
- Panel Printing Maximum
  - Width by Height
  - 150" by 200"
- Roll-to-Roll Printing Maximum
  - 21" repeat max

Trace Pitch Capabilities
- Lines 0.5mm (.020")
- Spaces 0.1mm (.004")

Circuit Construction
- Screened Crossbar Circuit
- 2 insulated conductors on same side
- Printed Through Hole
  - Inside-out printed circuits with solder through via
- Print Registration Tolerances
  - 0.150mm (.006")

Die-Cut Capabilities
- Die-Cut to
  - Light Guide Films
  - Acrylic Light Guides
  - Fiber Optics
  - Indication LED
  - Alternative Lighting Techniques

Electrical
- Circuit Resistance
  - 100 Ohms maximum, may vary depending on circuit configuration
- Durability
  - Tactile – 1 million operations
  - Non-Tactile – 5 million operations
- Contact Bounce
  - 5 milliseconds typical
- Insulation Resistance
  - 10 Megohms minimum between adjacent traces

Environmental
- These parameters may vary depending on specific switch configuration and application requirements
- Operating Temperature
  - 40 to 70°C typical (+45 to +110°C constructions available)
- Storage Temperature
  - 40 to 70°C typical (+45 to +110°C constructions available)
- Humidity
  - 10 to 90% RH non-condensing, per MIL-STD-202F, Method 103, Condition A
- Thermal Aging
  - 96 hours at +70°C, then 96 hours at –40°C
- Thermal Shock
  - Per MIL-STD-202F, Method 176, 5 cycles of –40°C for 30 minutes, then +70°C for 30 minutes
- Silver Migration
  - 3 cycles of 4 hours each at +40°C at 85%/RH, then cooled to +25°C for 4 hours with 70°C applied

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- Appliance
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- Medical equipment
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MOLEX INNOVATIONS DEVELOPED:
- Printing Capabilities
  - Panel Printing Maximum
  - Roll-to-Roll Printing Maximum
- Device Registration Tolerances
- Die-Cut to
- Light Guide Films
- Acrylic Light Guides
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- Alternative Lighting Techniques

Circuit Construction:
- Screened Crossbar Circuit
- 2 insulated conductors on same side

Die-Cut Capabilities
- Hard Tool
  - Print Tolerance
  - 0.12mm (.005")
- Steel Rule Dies
  - Print Tolerance
  - 0.38mm (.015")

Steel Rule Die-Cut Tolerances
- Overall Size
  - 0.25mm (.010")
- Hole Diameter
  - 0.25mm (.010")
- Hole Location
  - 0.25mm (.010")
- All Cuts
  - 0.38mm (.015")

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