Membrane Keypad Structure

Overlay/Upper Circuit
- Flat or Embossed Buttons
- Conductive Carbon or Silver Printed Contacts

Spacer

Metal Domes or Polydome Tactile

Lower Circuit and LEDs embedded

Adhesive Tape

Insulation Printing

Termination to suit Application

Reference Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overlay</td>
<td>Polycarbonate Film (PC) – Matt or Glossy surface</td>
</tr>
<tr>
<td></td>
<td>Thickness (mm): 0.075, 0.125, 0.175, 0.250, 0.375, 0.500</td>
</tr>
<tr>
<td></td>
<td>Polyester Film (PET) with UV-cured texture coating – Matt or Glossy surface</td>
</tr>
<tr>
<td></td>
<td>Thickness (mm): 0.15, 0.20, 0.25</td>
</tr>
<tr>
<td>Circuit Layer</td>
<td>Polyester Film (PET) – Thickness (mm): 0.075, 0.100, 0.125</td>
</tr>
<tr>
<td>Conductive</td>
<td>Carbon Ink, Conductive Silver Paste or Metal Domes</td>
</tr>
<tr>
<td>Spacer</td>
<td>Polyester Film (PET)</td>
</tr>
<tr>
<td>Adhesive</td>
<td>Adhesive Double Tape</td>
</tr>
</tbody>
</table>

Standard Specification for Membrane Keypad

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Resistance</td>
<td>10 – 500 Ohms</td>
</tr>
<tr>
<td>Operation Voltage</td>
<td>&lt;35 VDC</td>
</tr>
<tr>
<td>Operation Current</td>
<td>&lt;100 mA</td>
</tr>
<tr>
<td>Open Circuit Resistance</td>
<td>&gt;10 Meg Ohms</td>
</tr>
<tr>
<td>Operation Force</td>
<td>30g – 500g</td>
</tr>
<tr>
<td>Operation Temperature</td>
<td>-20°C – +70°C</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>5 x 10⁶ – 10 x 10⁶ cycles</td>
</tr>
<tr>
<td>Switch Stroke (travel)</td>
<td>0.1mm – 0.6mm</td>
</tr>
<tr>
<td>Contact Bounce</td>
<td>5 – 30 mSec</td>
</tr>
</tbody>
</table>

Membrane & Rubber Keypads

Membrane Keypads
- Graphic overlay only or full switching membrane
- Metal or polydome contacts
- Tactile or non-tactile feel
- Integral SMD LEDs
- LCD windows
- ESD/RFI shielding
- Insertable legend options

Rubber Keypads
- Backlighting options
- Various coatings eg epoxy, polyurethane
- Harder rubber options to give ‘plastic’ feel
- Various travel/operating force options
- Combination with tactile switches
- Wide variation of tactile switches
- Plastic key tops available
## Rubber Keypad Design

### Basic Construction Illustration

- Top Surface
- Optional Colour/Text
- Conductive Part (Contact)
- Side-Wall (Web)

### Life Test

- Operating life depends on:
  - Soft Material – 50 Shore is preferred.
  - Low Stroke – less than 1mm.
  - Angle (as part A illustrated above) - 45-degree is recommended.
  - Length of side-wall (as part B illustrated above) – determined by key structure. The thicker the web, the higher the operating force.

### Tolerance Requirement of Silicone Rubber Key

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Allowable Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 10mm</td>
<td>± 0.5mm</td>
</tr>
<tr>
<td>10 – 20mm</td>
<td>± 0.5mm</td>
</tr>
<tr>
<td>20 – 30mm</td>
<td>± 0.5mm</td>
</tr>
<tr>
<td>30 – 40mm</td>
<td>± 0.5mm</td>
</tr>
<tr>
<td>40 – 50mm</td>
<td>± 0.5mm</td>
</tr>
<tr>
<td>50 – 60mm</td>
<td>± 0.5mm</td>
</tr>
<tr>
<td>60 and above</td>
<td>± 0.5%</td>
</tr>
</tbody>
</table>

### Mechanical and Electrical Properties of Silicone Rubber

- **Non-Conductive Silicone**
  - Temperature for use
    - -50°C – +250°C
  - Specific Gravity: 1.15
  - Tensile Strength: 104000 dyn/cm²
  - Tear Strength: 105 (dyn/cm)
  - Compression Set: 10% (180°C x 22hrs.)
  - Elongation at Break: 350%
  - Volume Resistivity: 10² ohm cm
  - Contact Resistance –
  - Contact Rating (DC) –
  - Contact Bounce –
  - Chalking –
  - Insulation Breakdown: 24 Kicm
  - Colour: Colouring possible
  - Dielectric Constant: 4.3 (50 Hz)
  - Dielectric: Target: 15% (XH)

### Force-Stroke Curve of Rubber Keypad

- Force: Peak Force (Fp)
- Fs: Max. Return Force
- Fc: Contact Force
- Fr: Max. Return Force
- Fl: Max. Return Force
- Fp: Drop Force (Fp = Fr – Fc)
- Fs: Gap Force (Fs = Fr – Fs)
- Stroke: S1: Peak Stroke
- S2: Contact Stroke

### Special Design for Construction Ideas

1. Different shore-hardnesses in the basic keypad and key
2. Push or pull thru to anchor keypad to PCB
3. Back lighting – option 1
4. SMD LED:
   - Round: Ø1.5, Ø2, Ø2.5, Ø3, Ø3.5, Ø4, Ø4.5, Ø5, Ø6, Ø7, Ø8, Ø9, Ø10
   - Square: Ø1.5, Ø2, Ø2.5, Ø3, Ø3.5, Ø4, Ø4.5, Ø5, Ø6, Ø7, Ø8, Ø9, Ø10

### Guideline for Assembly Design

- A & B: dimensions of plastic
- a, b: dimensions rubber

### Colour / Printing

- **Suitable Key Surface for Legend Printing:** The commonly used colour for the undiekey is medium-grey. Customers should provide us with the Pantone code or a colour specimen for both the key button and the legend.

The above information and specifications are for reference only.
Rubber Keypad Design

Basic Construction Illustration

Life Test

Tolerance Requirement of Silicone Rubber Key

Mechanical and Electrical Properties of Silicone Rubber

Force-Stroke Curve of Rubber Keypad

Force Range 30 – 200 grams
Stroke Range 0.5 – 3.0mm
Cycle Life (x106) 500 – 2000

Guideline for Assembly Design

Some Special Design Illustrations

Special Design for Construction Ideas

Guideline for Printing Artwork Design

Patterns of Conductive Designs

Colour / Printing

The above information and specifications are for reference only.