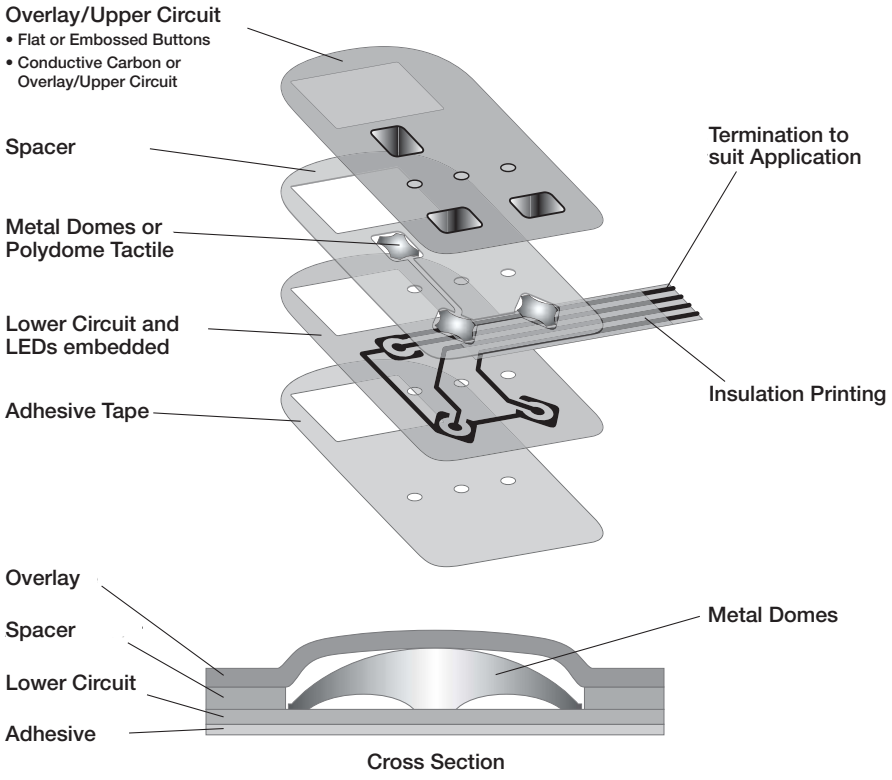
Membrane Keypad Structure

Reference Materials:

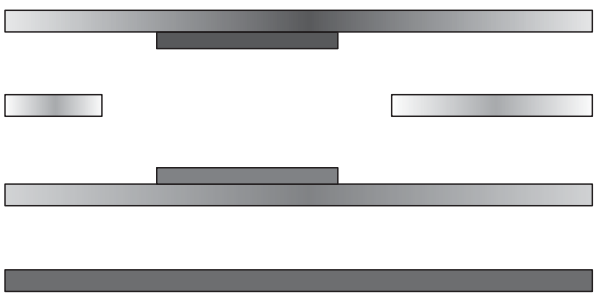
Overlay	Polycarbonate Film (PC) –
	Matt or Glossy surface
	Thickness (mm): 0.075, 0.125, 0.175, 0.250, 0.375, 0.500
	Polyester Film (PET) with UV-cured texture coating –
	Matt or Glossy surface
	Thickness (mm): 0.15, 0.20, 0.25
Circuit Layer:	Polyester Film (PET) –
	Thickness (mm): 0.075, 0.100, 0.125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

Standard Specification for Membrane Keypads:

Contact Resistance:	10 to 500 Ω
Operation Voltage:	< 35 V DC
Operation Current:	< 100 mA
Open Circuit Resistance:	> 10 MΩ
Operation Force:	30 g to 500 g
Operation Temperature:	–20°C to +70°C
Storage Temperature:	–20°C to +70°C
Life Expectancy:	5 x 10^5 to 10 x 10^5 cycles
Switch Stroke (travel):	0.1mm to 0.6mm
Contact Bounce:	5 to 30 mSec



Flat Type (Non-Tactile)



Graphic overlay

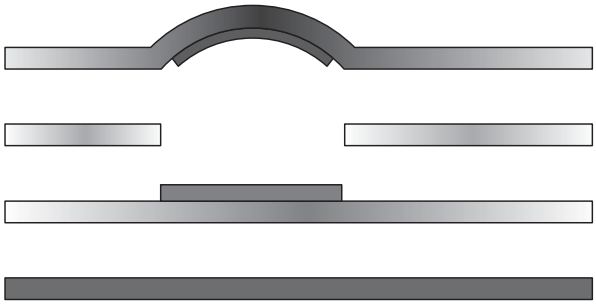
Upper spacer with adhesive

Printed circuit

Back adhesive

Tactile Type

POLYDOME



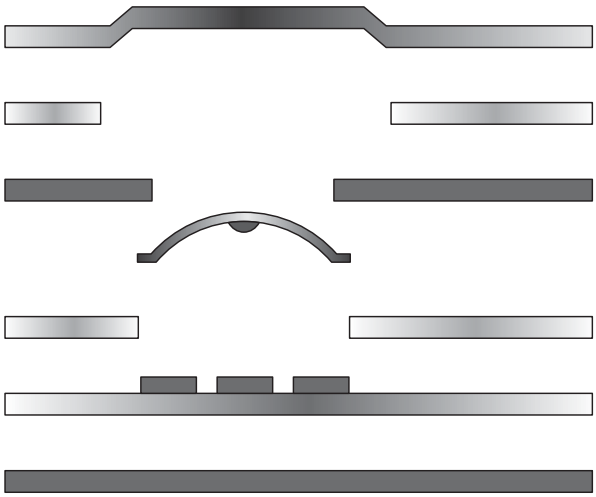
Embossed graphic overlay with upper circuit

Spacer with adhesive

Lower circuit

Back adhesive

METAL DOME



Embossed graphic overlay

Mounting spacer with adhesive

Mounting spacer

Metal dome

Lower spacer with adhesive

Lower circuit

Back adhesive

Rubber Keypad Design

Tolerance Requirement of Silicone Rubber Key:

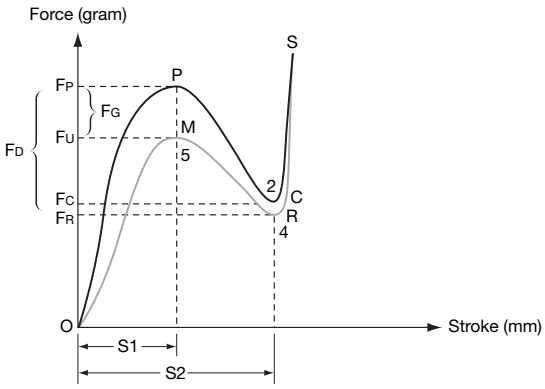
Dimensions:		Actuation Force:	
0 – 9 mm	± 0.10 mm	50 – 60 grams	± 15 grams
10 – 19 mm	± 0.15 mm	61 – 80 grams	± 20 grams
20 – 29 mm	± 0.20 mm	81 – 100 grams	± 25 grams
30 – 39 mm	± 0.25 mm	101 – 120 grams	± 30 grams
40 – 49 mm	± 0.30 mm	121 – 150 grams	± 35 grams
50 – 59 mm	± 0.35 mm	151 – 200 grams	± 40 grams
60 and above	± 0.6 %	201 and above	± 25 %

Mechanical and Electrical Properties of Silicone Rubber:

	Non-Conductive Silicone
Temperature for use:	–55°C to +250°C
Specific Gravity:	1.15
Tensile Strength:	90 Kg/cm^2
Tear Strength:	13 Kgf/cm
Compression Set:	10% (180°C x 22 hrs.)
Elongation at Break:	350%
Volume Resistivity:	8 x 10^{14} Ω cm
Insulation Breakdown:	24 Kv/mm
Colour:	Colouring possible
Dielectric Constant:	4.2 (50 Hz)
Dielectric Tangent:	13% (50 Hz)

Depending on the size of contacts and keyboard layout.

Force-Stroke Curve of Rubber Keypad



Force

FP	Peak Force (Fmax)
FU	Max. Return Force
FC	Contact Force
FR	Min. Return Force (Fmin)
FM	Max. Return Force
FD	Drop Force (FD = FP – FC)
FG	Gap Force (FG = FP – FM)

Stroke

S1	Peak Stroke
S2	Contact Stroke

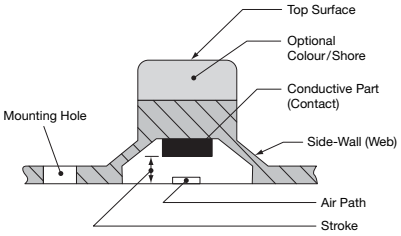
Location:

O	Original Point
P	Peak Point
C	Contact Point
R	Return Point
M	Max. Return Point

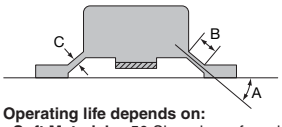
Travel

O–P	Peak Force (FMAX)
P–C	Contact Force
C–S	Min. Return Force (FMIN)
S–R–M–O	Gap Force (FG = FP – FM)

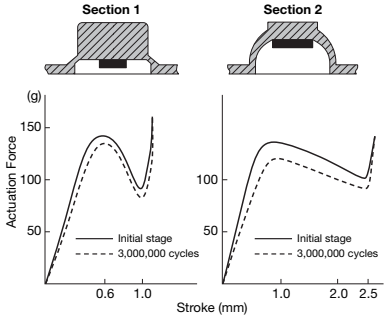
Basic Construction Illustration:



Life Test:



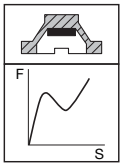
Operating life depends on:
- **Soft Material** ... 50 Shore is preferred.
- **Low Stroke** ... less than 1 mm
- **Angle** (as part A illustrated above) ... 40-degree is recommended.
- **Length of side-wall** ... (as part B illustrated above)
- **Thickness of side-wall** ... (as part C illustrated above) ... determined by key structure. The thicker the web, the higher the operating force.



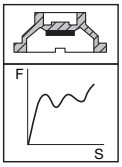
Rubber Keypad Design

Typical Key Sections and Characteristics:

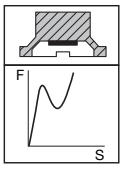
Force Range: 30 ~ 350 grams
Stroke Range: 0.5 ~ 3.0 mm
Cycle Life (x10³): 500 ~ 2000
Typical uses: Telephone, Remote Control, Automotive, Radio, Toys, Calculator, etc.



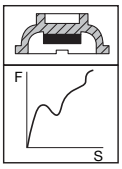
Force Range: 30 ~ 80 grams
Stroke Range: 2.0 ~ 4.0 mm
Cycle Life (x10³): 5000 ~ 20000
Typical uses: Computer, Typewriter etc.



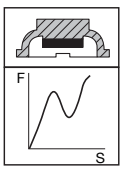
Force Range: 30 ~ 250 grams
Stroke Range: 0.7 ~ 2.5 mm
Cycle Life (x10³): 500 ~ 2000
Typical uses: Telephone, Remote Control, Toys, Games, Calculator, etc.



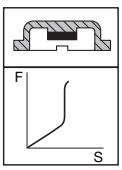
Force Range: 30 ~ 200 grams
Stroke Range: 1.0 ~ 2.5 mm
Cycle Life (x10³): 500 ~ 3000
Typical uses: Telephone, Typrewriter, Test Instruments, etc.



Force Range: 30 ~ 150 grams
Stroke Range: 0.5 ~ 3.0 mm
Cycle Life (x10³): 1000 ~ 3000
Typical uses: Telephone, Remote Control, Toys, Measuring Instruments, Office Machine

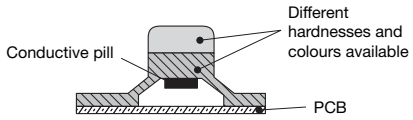


Force Range: 20 ~ 80 grams
Stroke Range: 0.2 ~ 1.0 mm
Cycle Life (x10³): 500 ~ 10000
Typical uses: Typewriter, Household Appliances, Computer, etc.

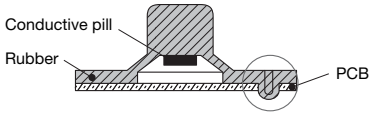


Some Special Design Illustrations:

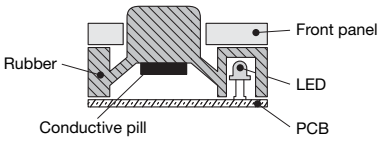
1. Different shorehardnesses in the basic keypad and key



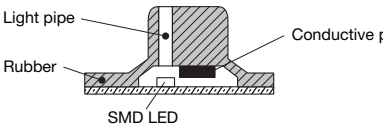
2. Push or pull thru to anchor keypad to PCB



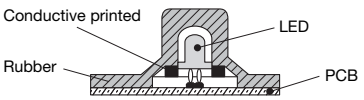
3. Back lighting – option 1



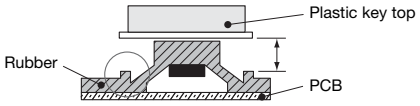
4. Squared key top design with LED light pipe



5. Back lighting – option 2

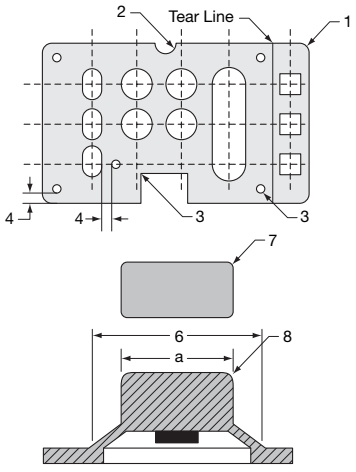


6. Control of travel distance



Special Design for Construction Ideas:

1. Typical outside radius is 1.0 to 1.5 mm.
2. Minimum radius is 0.3 mm.
3. Minimum inside radius is 0.2 mm.
4. Spacing between the edges of a rubber dome and a guide hole is 1.0 mm or more.
5. Guide holes are min. 1.0 mm in diameter.
6. The width of a rubber dome base is typically 2.0 mm more than a.
7. The minimum radius for the side edges of key top is 0.25 mm.
8. The minimum radius for the top edges of key top is 0.2 mm.

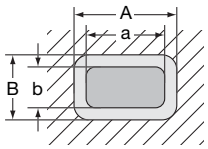


Rubber Keypad Design

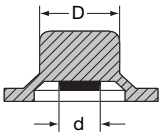
Guideline for Assembly Design:

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

A–a ≥ 0.5 mm, B–b > 0.5 mm

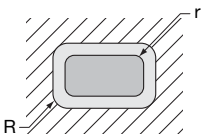


D–d = 1.5 to 2.0 mm

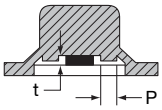


R: the corner radius of plastic
r: the corner radius of rubber

1 mm ≤ R ≤ 1.25 mm, 0.75 mm ≤ r ≤ 1 mm is better

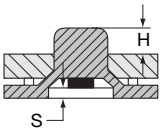


P: diameter of post
t: the gap between post & conductive pill
P = 1.0 mm is better
t = 0.1 ~ 0.15 mm is better

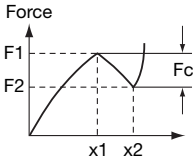


H: the dimension of key tops & plastic
S: the stroke of key pad

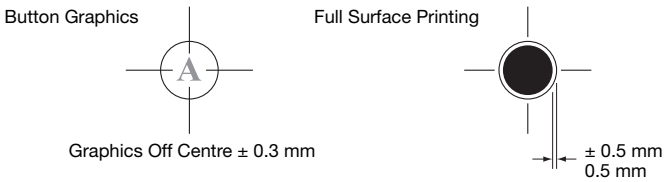
H–S ≤ 1.5 mm



Fc: click force
Fc: F1–F2 > 25 g is better

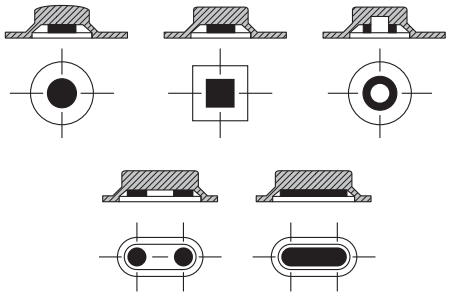


Guideline for Printing Artwork Design:



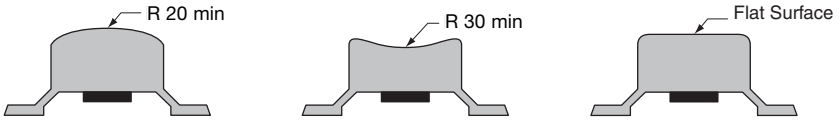
Patterns of Conductive Designs:

Items:	Standard Sizes of Conductive Pill
Circle:	1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6, 7, 8, 9, 10
Square/Ellipse:	Recommended size of conductive ink printing contact is flexible.
Conductive Pill Resistance:	Less than 150 ohms, with 125 grams loading
Mechanical Life:	minimum 10 million operations
Print type Resistance:	Less than 500 ohms, with 125 grams loading
Mechanical Life:	1 x 10^6 max. operations



Colour/Printing:

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



Keypads Inquiry Form

Company

Department

Attention

Address

Postcode

Phone

Fax

Email

Web

Membrane Requirements

Graphic Layer

Overall size

What finish is required (matt, gloss or selective texture)

Are windows required

- Size
- Position
- Do they need to be tinted

Is embossing required

- Pillow or rim

Number of colours

Switches

Number

Tactile or non-tactile

If tactile: polydome or metal dome

Metal means higher unit cost, lower tool cost.
Polydome means lower unit cost, higher tool cost.

Detail of switch matrix

LEDs

Are embedded LEDs required

- Number and colour
- Will a separate tail be required

Tail position and length

Position of tail – exit from side and rear

Type of connector (if required)

If ZIF connector being used, get type for ref.

Any special features required

Insert legends

Luminescent inks

Other

Estimated project volume

Please complete this questionnaire and return to us with your sketch overleaf
(See back page for address details)