Membrane & Rubber Keypads

Membrane Keypads

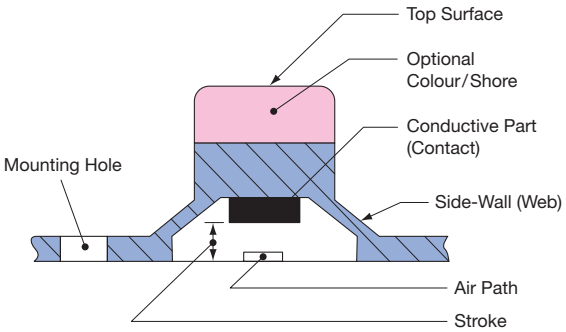
- Graphic overlay only or full switching membrane
- Metal or polydome contacts
- Tactile or non-tactile feel
- Integral SMD LEDS
- LCD windows
- ESD/RFI shielding
- Insertable legend options

Rubber Keypads

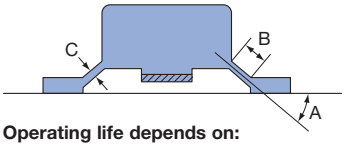
- Backlighting options
- Various coatings eg epoxy, polyurethane
- Harder rubber options to give ‘plastic’ feel
- Various travel/operating force options
- Combination with tactile switches
- Wide variation of colours and designs
- Plastic key tops available

Rubber Keypad Design

Basic Construction Illustration

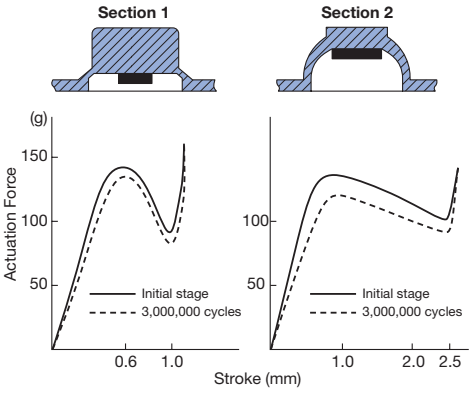


Life Test



Operating life depends on:

- **Soft Material** ... 50 Shore is preferred.
- **Low Stroke** ... less than 1mm.
- **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.



Tolerance Requirement of Silicone Rubber Key

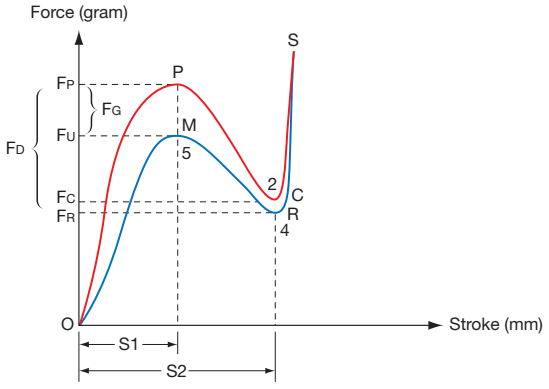
Dimensions:		Actuation Force:	
0 ~ 10mm	± 0.10mm	50 ~ 60 grams	± 15 grams
10 ~ 20mm	± 0.15mm	61 ~ 80 grams	± 20 grams
20 ~ 30mm	± 0.20mm	81 ~ 100 grams	± 25 grams
30 ~ 40mm	± 0.25mm	101 ~ 120 grams	± 30 grams
40 ~ 50mm	± 0.30mm	121 ~ 150 grams	± 35 grams
50 ~ 60mm	± 0.35mm	151 ~ 200 grams	± 40 grams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

Mechanical and Electrical Properties of Silicone Rubber

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

Depending on the size of contacts and keyboard layout.

Force-Stroke Curve of Rubber Keypad



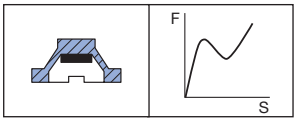
Force	
FP	Peak Force (Fmax)
FU	Max. Return Force
FC	Contact Force
FR	Min. Return Force (Fmin)
FM	Max. Return Force
FD	Drop Force (FD = FP – FC)
FG	Gap Force (FG = FP – FM)

Stroke	
S1	Peak Stroke
S2	Contact Stroke

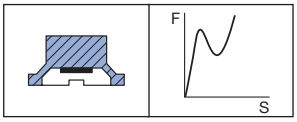
Location	
O	Original Point
P	Peak Point
C	Contact Point
R	Return Point
M	Max. Return Point

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)

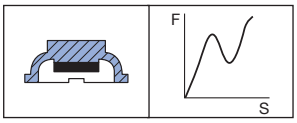
Typical Key Sections and Characteristics



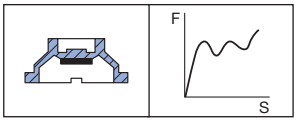
Force Range	30 ~ 350 grams
Stroke Range	0.5 ~ 3.0mm
Cycle Life (x10^3)	500 ~ 2000
Typical uses	Telephone, Remote Control, Automotive, Radio, Toys, Calculator, etc



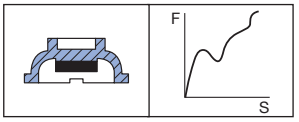
Force Range	30 ~ 250 grams
Stroke Range	0.7 ~ 2.5mm
Cycle Life (x10^3)	500 ~ 2000
Typical uses	Telephone, Remote Control, Toys, Games, Calculator, etc



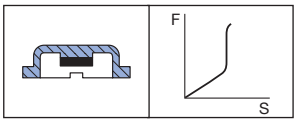
Force Range	30 ~ 150 grams
Stroke Range	0.5 ~ 3.0mm
Cycle Life (x10^3)	1000 ~ 3000
Typical uses	Telephone, Remote Control, Toys, Measuring Instruments, Office Machine



Force Range	30 ~ 80 grams
Stroke Range	2.0 ~ 4.0mm
Cycle Life (x10^3)	5000 ~ 20000
Typical uses	Computer, Typewriter etc.



Force Range	30 ~ 200 grams
Stroke Range	1.0 ~ 2.5mm
Cycle Life (x10^3)	500 ~ 3000
Typical uses	Telephone, Typewriter, Test Instruments, etc.



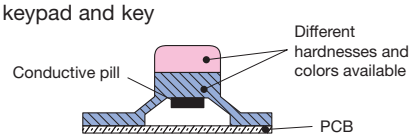
Force Range	20 ~ 80 grams
Stroke Range	0.2 ~ 1.0mm
Cycle Life (x10^3)	500 ~ 10000
Typical uses	Typewriter, Household Appliances, Computer, etc.

The above information and specifications are for reference only.

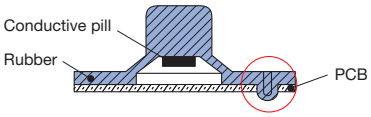
Rubber Keypad Design

Some Special Design Illustrations

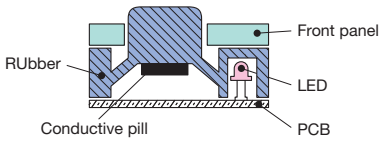
1. Different shorehardnesses in the basic keypad and key



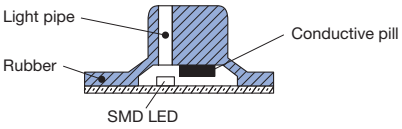
2. Push or pull thru to anchor keypad to PCB



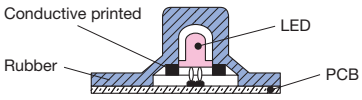
3. Back lighting – option 1



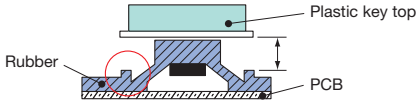
4. Squared key top design with LED light pipe



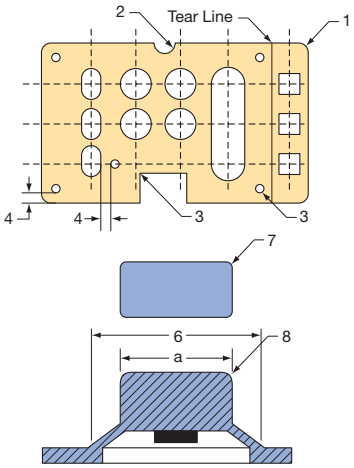
5. Back lighting – option 2



6. Control of travel distance

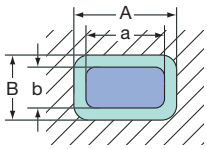


Special Design for Construction Ideas



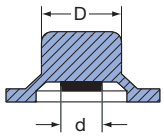
1. Typical outside radius is 1.0 to 1.5mm.
2. Minimum radius is 0.3mm.
3. Minimum inside radius is 0.2mm.
4. Spacing between the edges of a rubber dome and a guide hole is 1.0mm or more.
5. Guide holes are min. 1.0mm in diameter.
6. The width of a rubber dome base is typically 2.0mm more than a.
7. The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

Guideline for Assembly Design

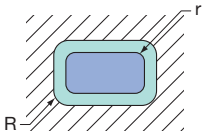


A & B : dimensions of plastic
a & b : dimension rubber

A-a ⩾ 0.5mm, B-b > 0.5mm

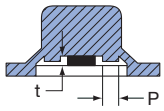


D-d = 1.5 ~ 2.0mm

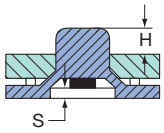


R : the corner radius of plastic
r : the corner radius of rubber

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

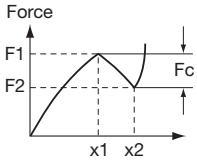


P : diameter of post
t : the gap between post & conductive pill
P = 1.0mm is better
t = 0.1-0.15mm is better



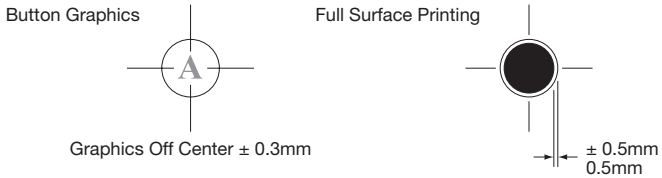
H : the dimension of key tops & plastic
S : the stroke of key pad

H-S ⩾ 1.5mm

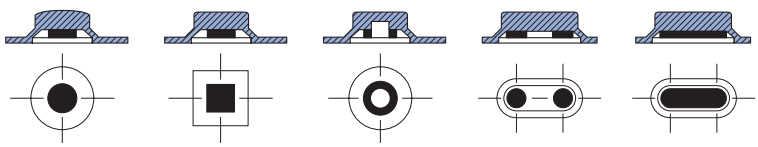


Fc : click force
Fc : F1-F2 > 25g is better

Guideline for Printing Artwork Design



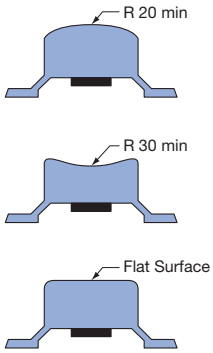
Patterns of Conductive Designs



Items	Standard Sizes of Conductive Pill
Circle	Ø1.5, Ø2, Ø2.5, Ø3, Ø3.5, Ø4, Ø4.5, Ø5, Ø6, Ø7, Ø8, Ø9, Ø10
Square/ Ellipse	Recommended size of conductive ink printing contact is flexible.

Conductive Pill Resistance	Less than 150 ohms, with 125 grams loading
Life	10 million (min.)
Print Type Resistance	Less than 500 ohms, with 125 grams loading
Life	1 x 10^6 max.

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.

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