

# Switch Products Guide

**MITSUMI ELECTRIC CO.,LTD.**



Feb. 2022

## ● Switches

Our switch line-up consists of the three major types:  
**Tactile switch, Slide switch, Switch sheet.**

All of our switches are ultra small size with  
high-performance, high-reliability, high-quality.



## ● Head Quarters, Business Unit, Factory



**Mitsumi Co., Ltd.**  
**Kyushu Business Unit**  
(Iizuka-shi, Fukuoka)  
Product/Facility design,  
QA, Purchasing, Control



**Qingdao Mitsumi**  
**Electronics Co., Ltd.**  
(Qingdao, China)  
Production, Product/Facility  
design, Parts processing,  
Production control, QA



**MinebeaMitsumi Inc.**  
**Headquarters**  
(Minato-ku, Tokyo)



**Mitsumi Co., Ltd.**  
**Headquarters**  
(Tama-shi, Tokyo)

## ● Notice












Any products mentioned in this material are subject to any modification in their appearance and others for improvements without prior notification.

The details listed here are not a guarantee of the individual products at the time of ordering.

**When using the products, please obtain the authoritative specifications.**

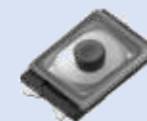
Where there is any divergence between both contents, the authoritative specifications will prevail.

# § Tactile Switches

| Series                               | STI  | STU  | STO  | SOG  | STV   | SOV   | SOF   | SOU   |
|--------------------------------------|--|--|--|--|---|---|---|---|
| Image                                |   |           |           |    |  |  |  |  |
| Size<br>[mm]                         | 2.5x1.6  | 2.8x1.9  | 3.0x2.0  | 3.7x3.6  | 5.9x4.0   | 3.8x3.6   | 3.3x2.9   | 3.3x3.55  |
| Height<br>[mm]                       | 0.55   | 0.57<br>0.60   | 0.6  | 0.4  | 0.72  | 1.5   | 1/1.5/2   | 1.0   |
| Operating Force<br>[N]               | 1.2<br>1.6<br>2.4  | 2.25<br>3.0  | 1.6<br>2.4<br>3.3  | 1.6<br>2.35  | 2.5   | 1.9<br>3.5  | 1.6<br>1.9<br>3.8   | 1.6<br>2.0<br>2.4   |
| Travel<br>[mm]                       | 0.11   | 0.15   | 0.13   | 0.15   | 0.21  | 0.12<br>0.14  | 0.12  | 0.2   |
| Operating Life<br>[k]<br>for each OF | 500<br>500<br>200  | 500<br>300   | 500<br>500<br>300  | 1,000<br>500   | 1,000   | 1,000<br>500  | 100<br>100<br>100   | 100<br>100<br>100   |
| Note                                 | <br>IP68   | <br>IP68 | <br>IP68 | <b>International Protection Code (IEC 60526/JIS C 0920)</b><br><br>Dust: IP6X=Dust tight, No ingress of dust. two to eight hours.<br>Water: IPX8=Immersion in water 1.5m for 30minutes. (Our standard) |   |   |   |   |
|                                      | <b>Cautions on Use of Waterproof tactile switches</b><br><br>IP68 dust and water resistance is guaranteed for the switch alone under our specified conditions.<br>To prevent immersion water completely in a system, coating around the terminals of switch by sealant is required.<br>Please consult us for future information. |  |  |  |   |   |   |   |

## Waterproof Small Type Tactile Switch (25x16 size)

### STI Series

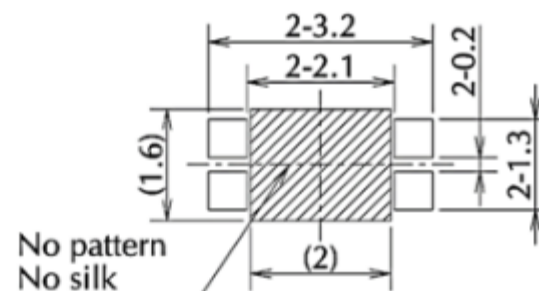
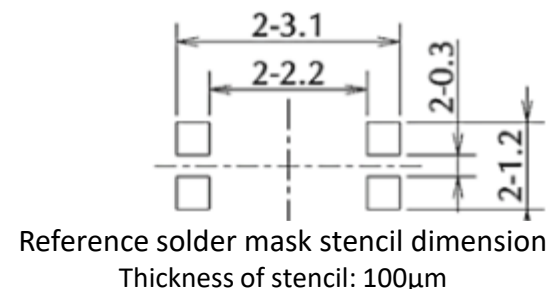
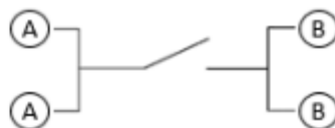
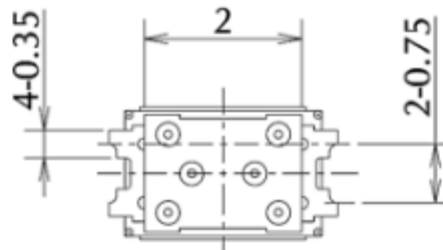
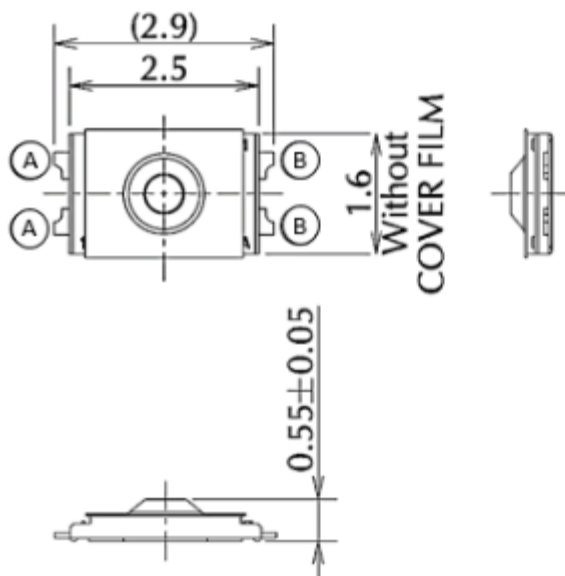


#### The smallest sized tactile switch in our lineup.

Contact part is sealed by welding Cover film and Housing.  
Laser processing on Terminals is applied to prevent ingress of liquid from the gap of terminals.

**<IP68 equivalent>**

|                           |                   |
|---------------------------|-------------------|
| Size [mm]                 | 2.5 x 1.6, H=0.55 |
| Operating Force [N]       | 1.2/1.6/2.4       |
| Travel [mm]               | 0.11              |
| Operating Life [k cycles] | 500 /500/200      |
| Actuator                  | Inside            |
| Cover Film/Housing        | Heat Welding      |



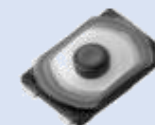
Scale: Free

Circuit diagram

Reference land dimension

## Waterproof Small Type Tactile Switch (28x19 size)

### STU Series

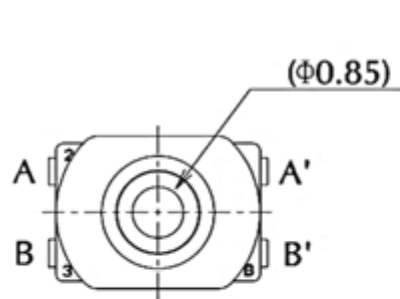


Contact part is sealed by welded Cover film and Housing.  
Laser processing on Terminals is applied to prevent ingress  
of liquid from the gap of terminals.

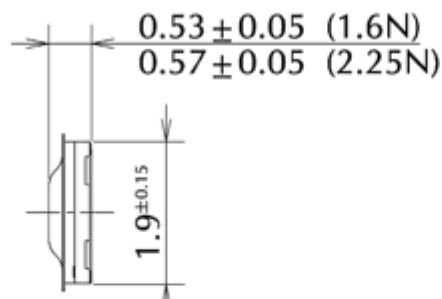
**<IP68 equivalent>**

Height of product and operating life cycles are different  
by specified operating force.

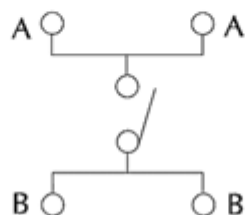
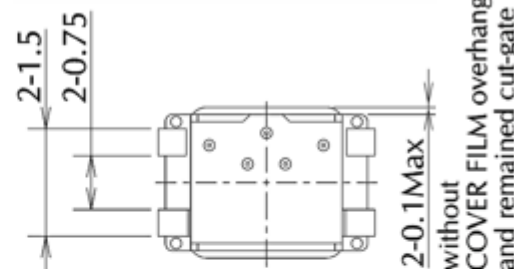
| Size [mm]                 | 2.8 x 1.9, H=0.57/0.60 |
|---------------------------|------------------------|
| Operating Force [N]       | 2.25/3.00              |
| Travel [mm]               | 0.15                   |
| Operating Life [k cycles] | 500/300                |
| Actuator                  | Inside                 |
| Cover Film/Housing        | Heat Welding           |



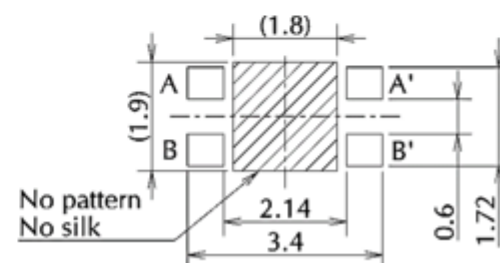
Scale: Free



without  
COVER FILM overhang  
and remained cut-gate



Circuit diagram

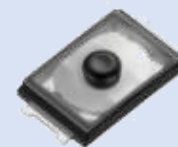


Reference land dimension



## Waterproof Small Type Tactile Switch (30x20 size)

### STO Series

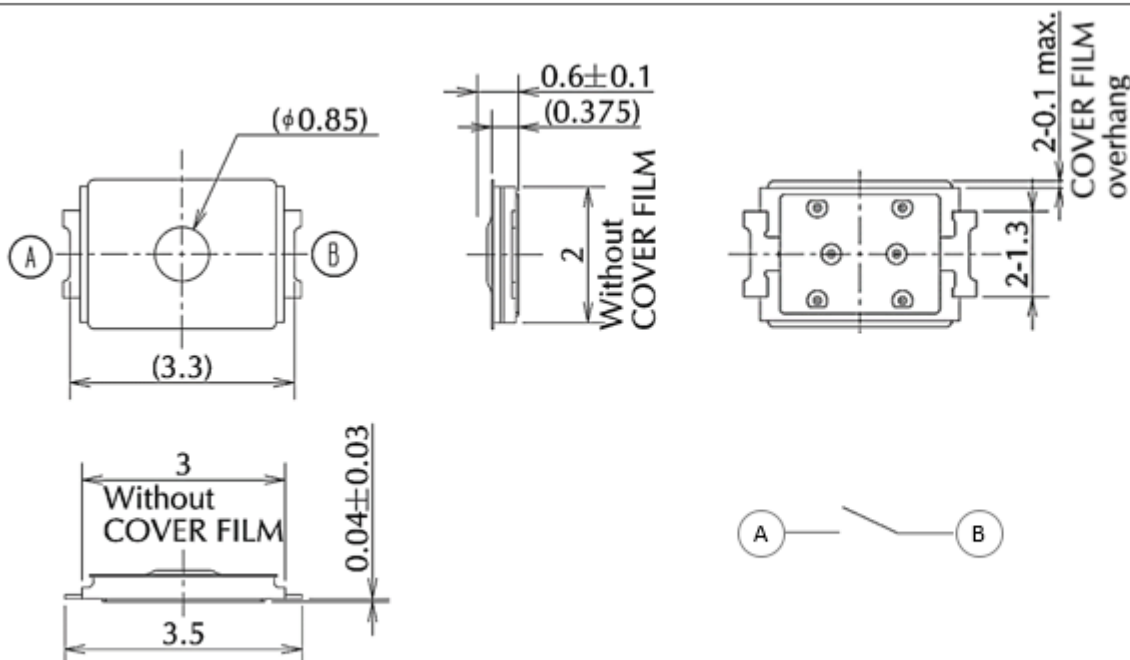


Contact part is sealed by welding Cover film and Housing.  
Laser processing on Terminals is applied to prevent ingress  
of liquid from the gap of terminals.

**<IP68 equivalent>**

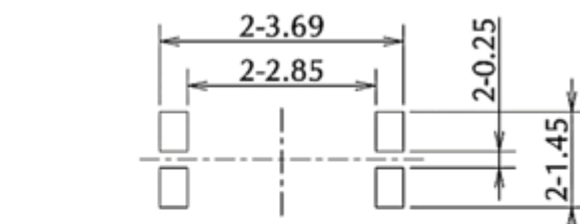
Operating life cycles is different by specified operating force.

|                           |                |
|---------------------------|----------------|
| Size [mm]                 | 3.0x2.0, H=0.6 |
| Operating Force [N]       | 1.6/2.4/3.3    |
| Travel [mm]               | 0.13           |
| Operating Life [k cycles] | 500/500/300    |
| Actuator                  | Inside         |
| Cover Film/Housing        | Heat Welding   |

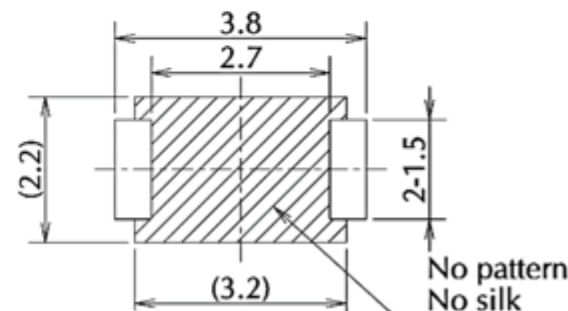


Scale: Free

Circuit diagram

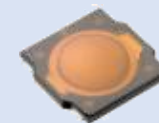


Reference solder mask stencil dimension  
Thickness of stencil: 100μm



Reference land dimension

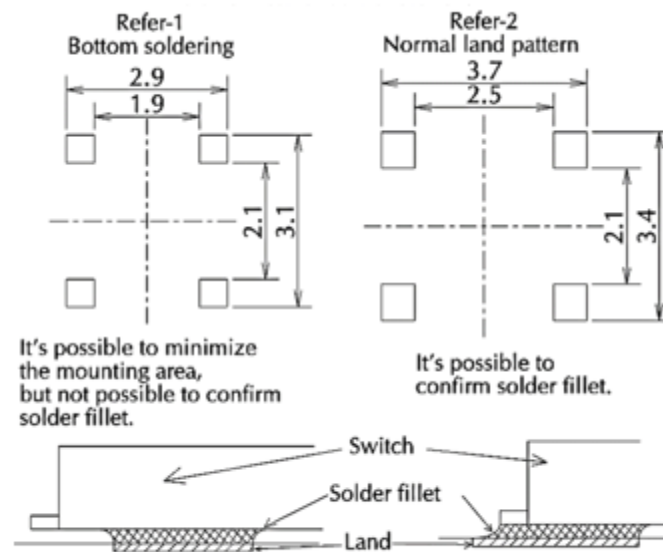
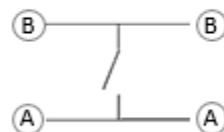
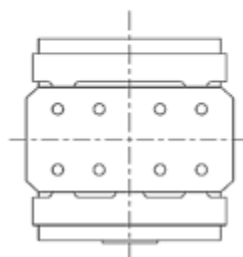
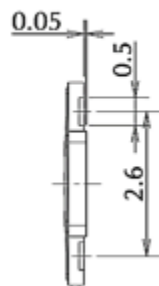
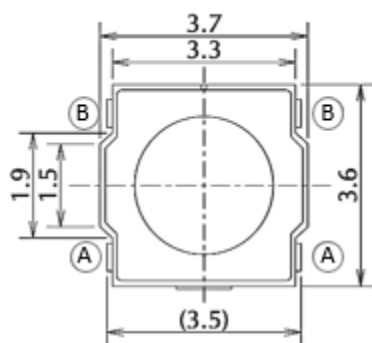
## Small Type Tactile Switch SOG Series



Small and thin Tactile switch.

**The thinnest tactile switch in our lineup.**

|                           |                |
|---------------------------|----------------|
| Size [mm]                 | 3.7x3.6, H=0.4 |
| Operating Force [N]       | 1.6/2.35       |
| Travel [mm]               | 0.15           |
| Operating Life [k cycles] | 1,000/500      |
| Actuator                  | None           |
| Cover Film/Housing        | Adhesion       |



Scale: Free

Circuit diagram

Reference land dimension

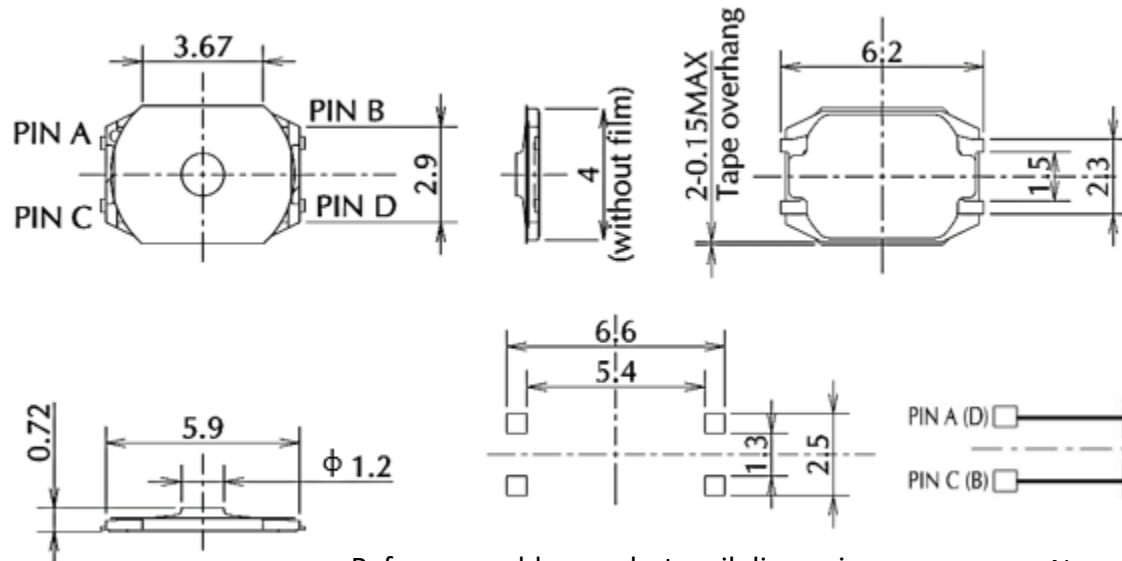
## Long life Tactile Switch STV Series



Small and thin Tactile switch.

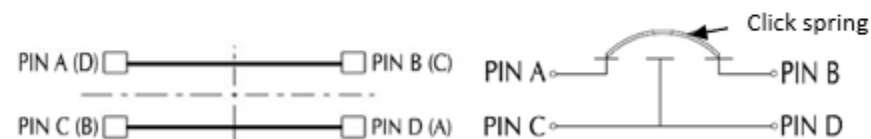
**Long operating life one million cycles with high force (2.5N).**

|                           |                 |
|---------------------------|-----------------|
| Size [mm]                 | 5.9x4.0, H=0.72 |
| Operating Force [N]       | 2.5             |
| Travel [mm]               | 0.21            |
| Operating Life [k cycles] | 1,000           |
| Actuator                  | Inside          |
| Cover Film/Housing        | Adhesion        |



Reference solder mask stencil dimension  
Thickness of stencil: 100μm

| Circuit     | Terminal   |
|-------------|--|
| Open (OFF)  | (A-B): Not specified<br>(A-B)-C: Not connected<br>(A-B)-D: Not connected<br>(C-D): Connected |
| Closed (ON) | (A-B): Connected<br>(A-B)-C: Connected<br>(A-B)-D: Connected<br>(C-D): Connected             |



Not guaranteed always connect PIN A & PIN B.  
Please connect PIN A-PIN B and PIN C-PIN D  
by pattern on board.

Scale: Free



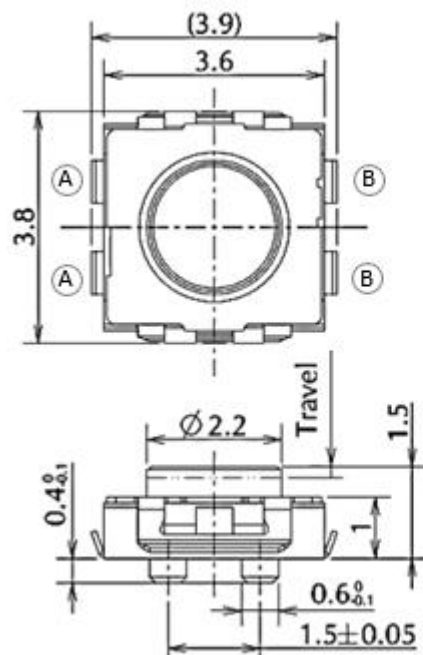
## Long Life Tactile Switch SOV Series



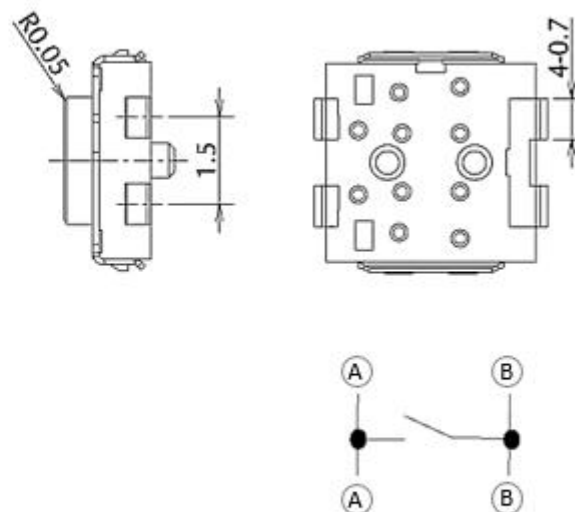
Small Tactile switch with Plastic button.

High Operating Force 3.5N is available.

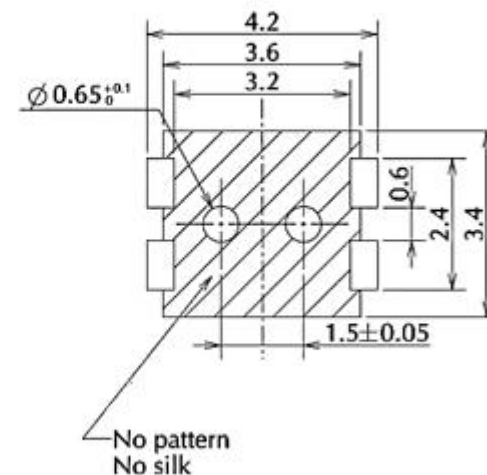
|                           |                 |
|---------------------------|-----------------|
| Size [mm]                 | 3.8x3.6, H=0.35 |
| Operating Force [N]       | 1.9/3.5         |
| Travel [mm]               | 0.12/0.14       |
| Operating Life [k cycles] | 1,000/500       |
| Actuator                  | Plastic         |
| Cover Film/Housing        | None            |



Scale: Free



Circuit diagram



Reference land dimension

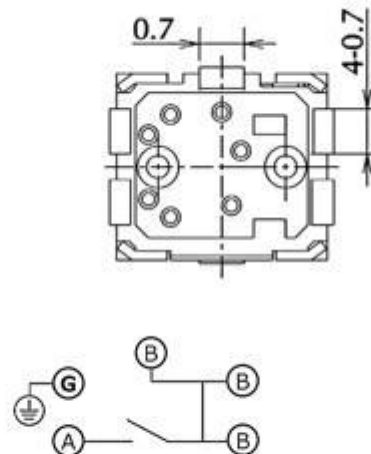
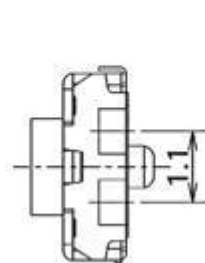
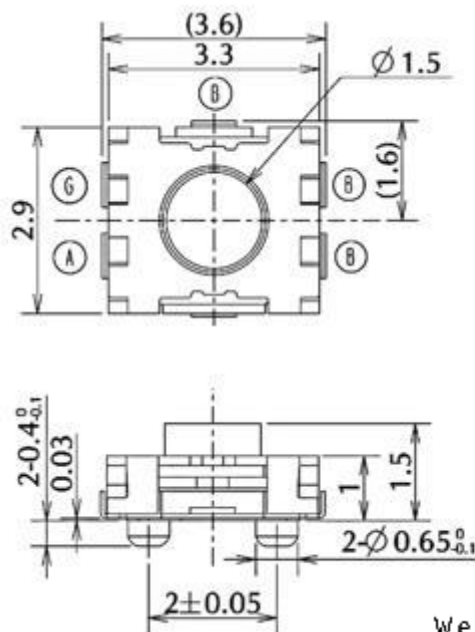
## Tactile Switch With Button SOF Series



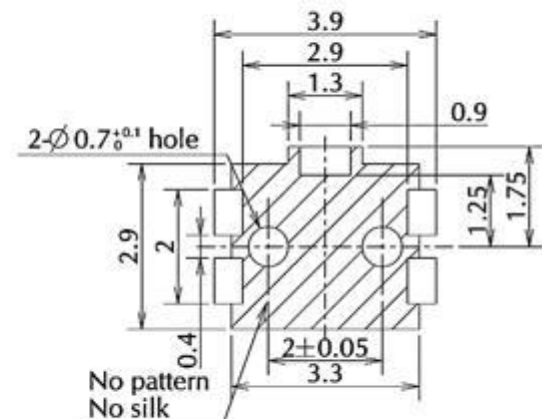
Small Tactile switch with Plastic button.

Height of product is different by button.  
No bosses on under face is available.

|                           |                        |
|---------------------------|------------------------|
| Size [mm]                 | 3.3x2.9, H=1.0/1.5/2.0 |
| Operating Force [N]       | 1.6/1.9/3.8            |
| Travel [mm]               | 0.12                   |
| Operating Life [k cycles] | 100                    |
| Actuator                  | Plastic                |
| Cover Film/Housing        | Adhesion               |



Circuit diagram



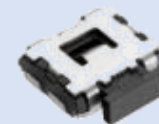
Reference land dimension

We do not guarantee an electrical contact between (G) terminal and cover.  
But an insulation distance between them is designed to be shortest.  
So, (G) terminal can be used as an earth terminal.

Scale: Free

## Side Click Type Tactile Switch

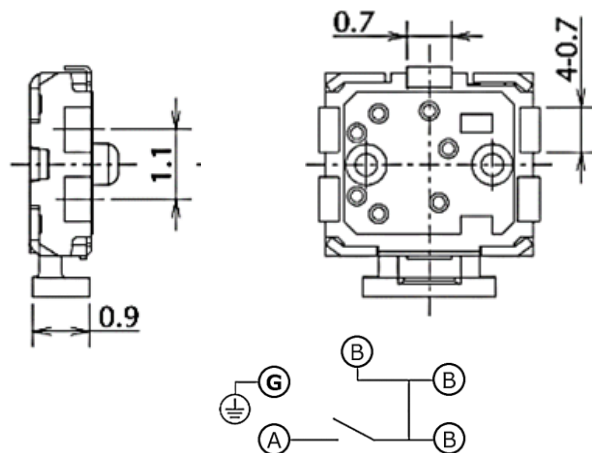
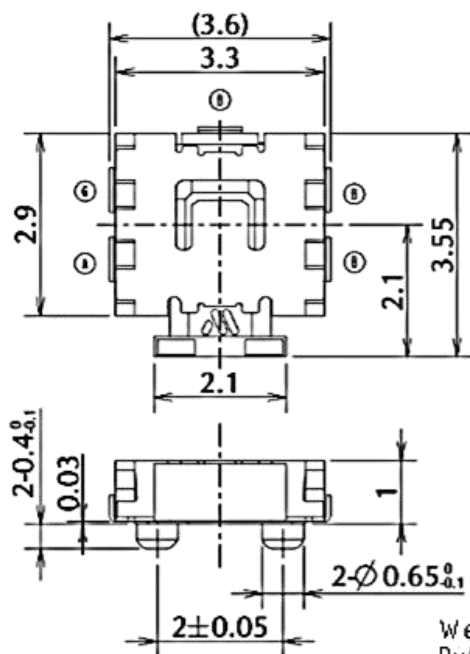
### SOU Series



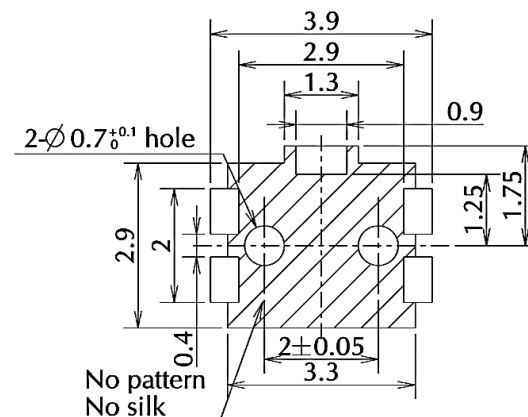
Small Tactile switch with Plastic button.

Side click operation.  
No bosses on under face is available.

|                           |               |
|---------------------------|---------------|
| Size [mm]                 | 3.3x3.55, H=1 |
| Operating Force [N]       | 1.6/2.0/2.4   |
| Travel [mm]               | 0.2           |
| Operating Life [k cycles] | 100           |
| Actuator                  | Plastic       |
| Cover Film/Housing        | Adhesion      |



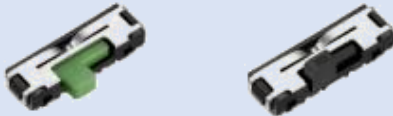

Circuit diagram



Reference land dimension

We do not guarantee an electrical contact between ⑥ terminal and cover.  
But an insulation distance between them is designed to be shortest.  
So, ⑥ terminal can be used as an earth terminal.

# § Slide Switches

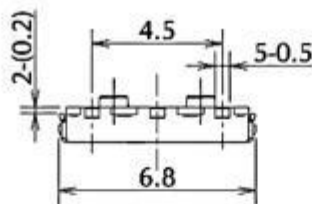
| Series              | SSU   | SSA   |
|---------------------|---|---|
| Image               |    |                                  |
| Poles-Contacts      | 1-2   | 1-3   |
| Knob Direction      | Horizontal/Vertical   | Horizontal/Vertical   |
| Size (mm)           | 2.0 x 6.8   | 3.0 x 9.9   |
| Height (mm)         | 1.2   | 1.35  |
| Travel (mm)         | 1.5   | 1.5   |
| Life Cycle (cycles) | 1.5   | Click 1.5<br>Self return 1.2  |
| Feature             | 10,000  | 50,000  |
| Image               | For SMT, Small Slide switch 1.2mm in height. 1 circuit-2 contact (SPDT) (Horizontal and Vertical knob) and 1 circuit-3 contacts (SP3T) (Horizontal knob) are available. Stable contact condition due to double contact structure. | 1 circuit-3 contacts (SP3T)<br><br>Normally switch operation with detent and self return (momentary) are available. |

# SSU series (SPST)

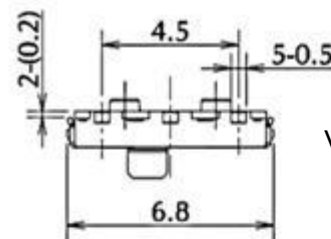
**H=1.2mm**  
**Slide switch**

**SSU Series**

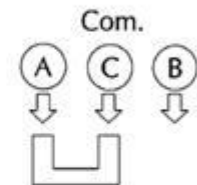
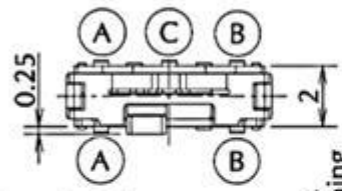
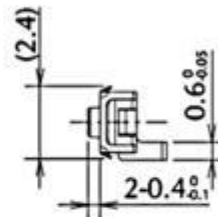
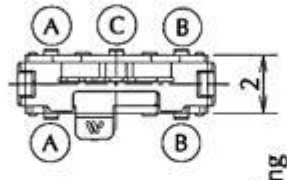
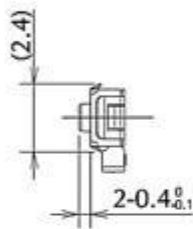
|                         |                     |
|-------------------------|---------------------|
| Poles-Contacts          | 1-2 (SPDT)          |
| Operating Force [N]     | 1.5                 |
| Travel [mm]             | 1.5                 |
| Operating Life [cycles] | 10,000              |
| Knob                    | Vertical/Horizontal |



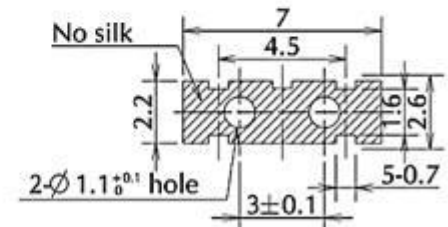
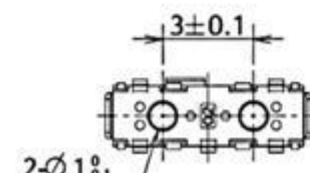
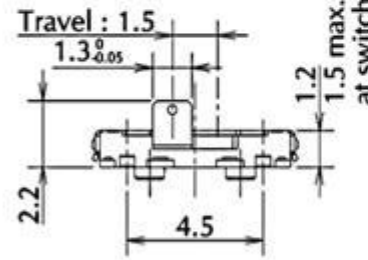
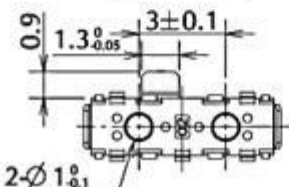
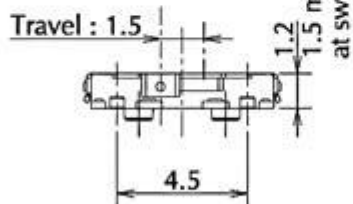
Horizontal knob



Vertical knob



Circuit diagram



Reference land dimension

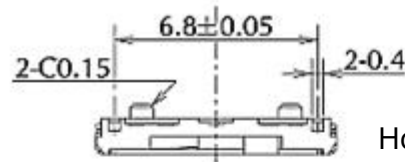
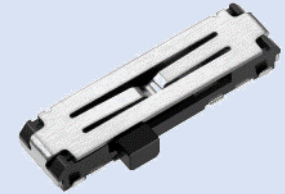
Scale: Free

# SSU series (SP3T)

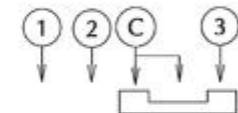
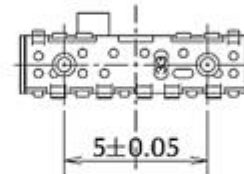
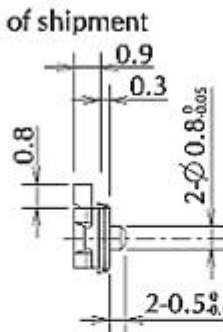
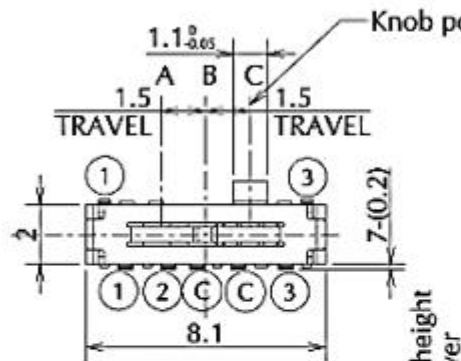
**H=1.2mm**  
**Slide switch**

**SSU Series**

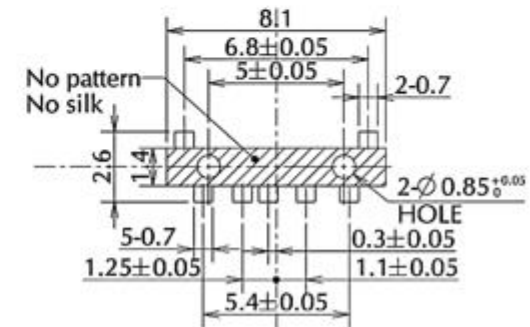
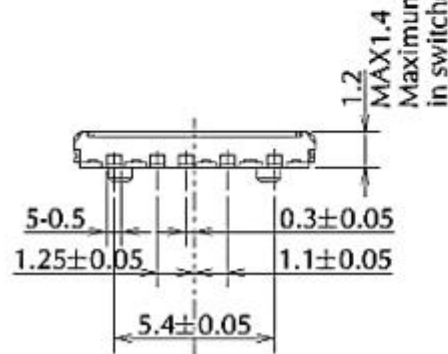
|                         |                              |
|-------------------------|------------------------------|
| Poles-Contacts          | 1-3 (SP3T)                   |
| Operating Force [N]     | A->B/C->B 1.5, B->A/B->C 1.6 |
| Travel [mm]             | 1.5                          |
| Operating Life [cycles] | 10,000                       |
| Knob                    | Horizontal                   |



Horizontal knob



Circuit diagram



Reference land dimension

Scale: Free

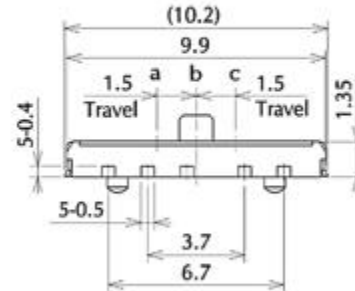
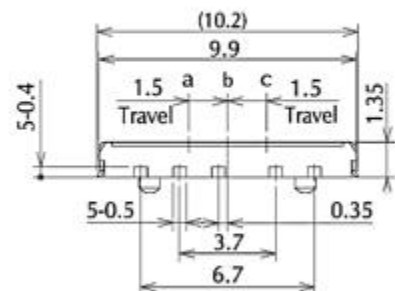
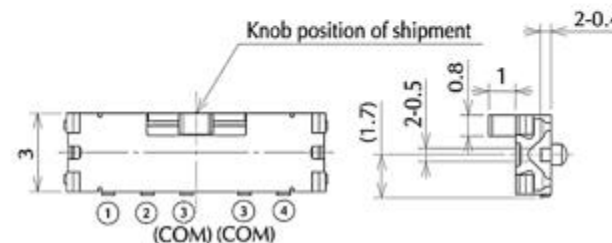
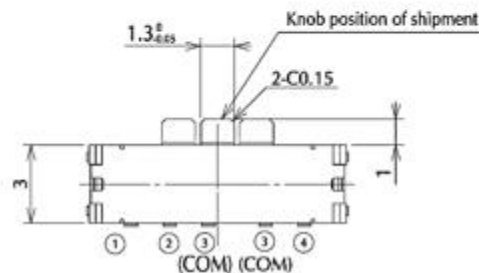
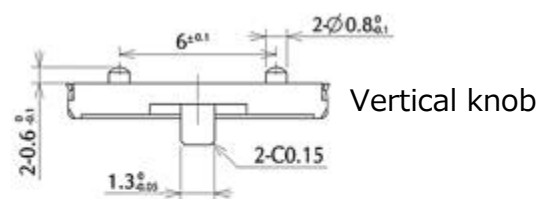
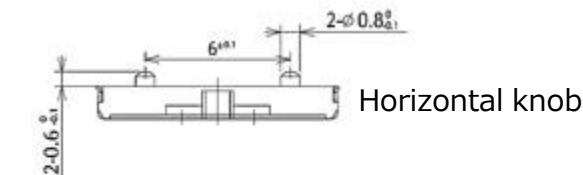
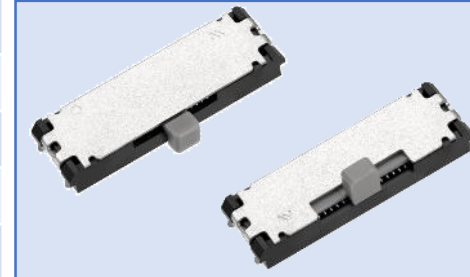


# SSA series (SP3T: Detent and/or Self return)

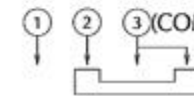
## Self Return Slide switch

## SSA Series

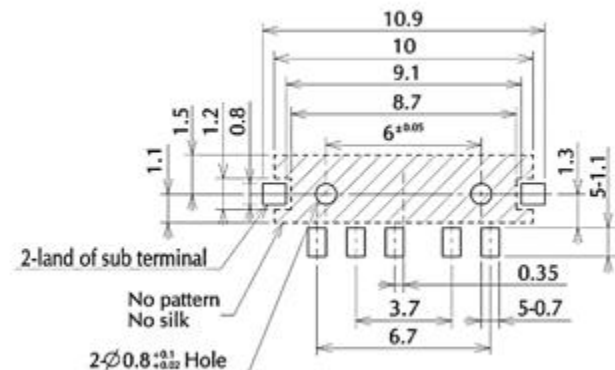
|                         |                              |
|-------------------------|------------------------------|
| Poles-Contacts          | 1-3 (SP3T)                   |
| Operating Force [N]     | A->B/C->B 1.5, B->A/B->C 1.6 |
| Travel [mm]             | 1.5                          |
| Operating Life [cycles] | 10,000                       |
| Knob                    | Horizontal                   |



|   | Combination of switching operation |        |                    |        |
|---|------------------------------------|--------|--------------------|--------|
|   | Slide A<br>a <-> b                 |        | Slide B<br>b <-> c |        |
|   | Self Return                        | Detent | Self Return        | Detent |
| F | Yes                                |        | Yes                |        |
| G | Yes                                |        |                    | Yes    |
| H | Yes                                |        |                    |        |
| K |                                    | Yes    | Yes                |        |
| M |                                    |        | Yes                |        |
| P |                                    | Yes    |                    | Yes    |



Circuit diagram



Reference land dimension

Scale: Free

# § Switch Sheets

## Custom Design

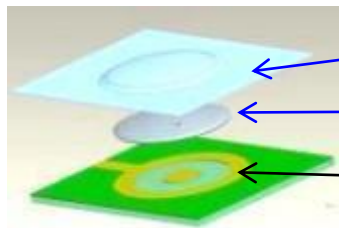
Outline, Click spring size and alignment,  
Structure, and performance etc.



## Waterproof type is available



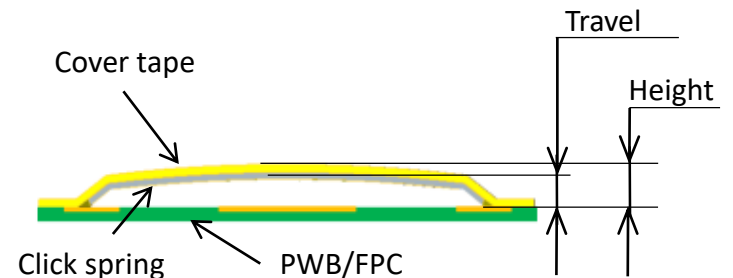
## Switch Sheet Structure (Basic structure)



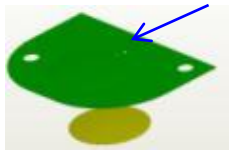
Cover Tape (PET Film with adhesive)

Click Spring (Stainless steel)

Contact pad on substrate (PWB/FPC).



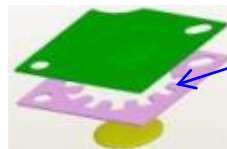
### Cover Tape + Click Spring (Basic structure)



Cover Tape  
(PET Film with adhesive)

Flexible Design, Small Size, Low Profile

### Cover tape + Click Spring + **Spacer**

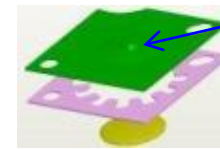


Spacer  
(PET Film with adhesive)



Flexible Design, Small Size,  
Low Profile, **Waterproof**

### Cover tape+Click Spring+Spacer+**Nub**



Nub  
On or under  
the Cover Tape



Flexible Design, Small Size,  
Low Profile, **Waterproof, Stable Feel**

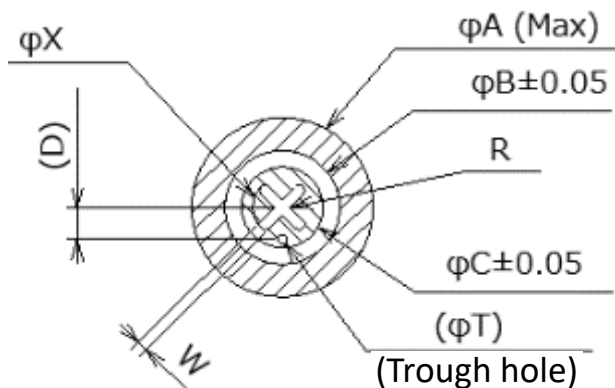
# Line-up of Standard Click springs for Switch Sheet

| Size<br>[mm]           | Operating<br>Force<br>[gf] | Click<br>ratio | Travel<br>[mm] | Height<br>[mm] | Operating<br>life | Size<br>[mm] | Operating<br>Force<br>[gf] | Click<br>ratio | Travel<br>[mm] | Height<br>[mm] | Operating<br>life |
|------------------------|----------------------------|----------------|----------------|----------------|-------------------|--------------|----------------------------|----------------|----------------|----------------|-------------------|
| φ2.4mm                 | 160                        | 55%            | 0.12           | 0.43           | 100,000           | φ4mm         | 110                        | 50%            | 0.16           | 0.25           | 1,000,000         |
|                        | 190                        | 45%            | 0.12           | 0.43           | 100,000           |              | 130                        | 50%            | 0.16           | 0.50           | 1,000,000         |
|                        | 310                        | 55%            | 0.14           | 0.49           | 100,000           |              | 165                        | 55%            | 0.17           | 0.28           | 1,000,000         |
|                        | 380                        | 45%            | 0.14           | 0.49           | 100,000           |              | 180                        | 55%            | 0.17           | 0.55           | 1,000,000         |
| φ3mm                   | 120                        | 55%            | 0.12           | 0.45           | 500,000           |              | 200                        | 55%            | 0.17           | 0.28           | 1,000,000         |
|                        | 160                        | 55%            | 0.14           | 0.47           | 500,000           |              | 220                        | 55%            | 0.17           | 0.52           | 1,000,000         |
|                        | 180                        | 55%            | 0.14           | 0.47           | 500,000           | φ5mm         | 110                        | 55%            | 0.17           | 0.27           | 1,000,000         |
|                        | 230                        | 55%            | 0.16           | 0.52           | 500,000           |              | 135                        | 55%            | 0.17           | 0.52           | 1,000,000         |
|                        | 310                        | 55%            | 0.18           | 0.54           | 500,000           |              | 160                        | 55%            | 0.19           | 0.29           | 1,000,000         |
|                        | 370                        | 55%            | 0.18           | 0.54           | 500,000           |              | 185                        | 55%            | 0.19           | 0.53           | 1,000,000         |
| φ3x2mm<br>(side cut)   | 120                        | 55%            | 0.14           | 0.47           | 500,000           |              | 205                        | 55%            | 0.20           | 0.58           | 1,000,000         |
|                        | 160                        | 55%            | 0.18           | 0.51           | 500,000           |              | 275                        | 45%            | 0.20           | 0.56           | 1,000,000         |
|                        | 220                        | 55%            | 0.16           | 0.53           | 500,000           | φ6mm         | 100                        | 50%            | 0.17           | 0.27           | 1,000,000         |
|                        | 320                        | 55%            | 0.20           | 0.57           | 500,000           |              | 120                        | 50%            | 0.17           | 0.51           | 1,000,000         |
| φ4x2.8mm<br>(side cut) | 160                        | 50%            | 0.18           | 0.29           | 500,000           |              | 200                        | 55%            | 0.23           | 0.34           | 1,000,000         |
|                        | 180                        | 50%            | 0.18           | 0.53           | 500,000           |              | 220                        | 55%            | 0.23           | 0.58           | 1,000,000         |
|                        | 200                        | 60%            | 0.22           | 0.34           | 500,000           |              | 240                        | 42%            | 0.25           | 0.36           | 1,000,000         |
|                        | 220                        | 60%            | 0.22           | 0.61           | 500,000           |              | 250                        | 45%            | 0.25           | 0.61           | 1,000,000         |

Available to provide any other Click spring which is not listed above, please contact us.  
For higher operating force; Double force can be achieved by using stack of two Click springs.  
Nub structure is required for smaller than φ3mm Click spring due to narrow sweet spot.

# Reference Land pattern for Switch Sheet

## Circle shaped Spring

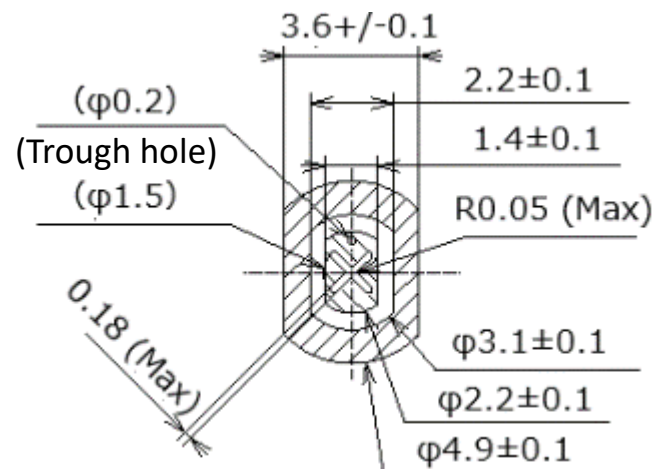


| Circle | φ2.4          | φ3            | φ4            | φ5            | φ6            |
|--------|---------------|---------------|---------------|---------------|---------------|
| φA     | 3             | 3.5           | 4.9           | 5.9           | 6.9           |
| φB     | 1.8           | 2.4           | 3.1           | 4.1           | 5.1           |
| φC     | 1.2           | 1.7           | 2.2           | 3.2           | 3.2           |
| φX     | 0.75          | 1.2           | 1.6           | 1.6           | 1.6           |
| W      | 0.18<br>(Max) | 0.18<br>(Max) | 0.18<br>(Max) | 0.18<br>(Max) | 0.18<br>(Max) |
| R      | 0.05<br>(Max) | 0.05<br>(Max) | 0.05<br>(Max) | 0.05<br>(Max) | 0.05<br>(Max) |
| φT     | 0.1           | 0.1           | 0.2           | 0.2           | 0.2           |

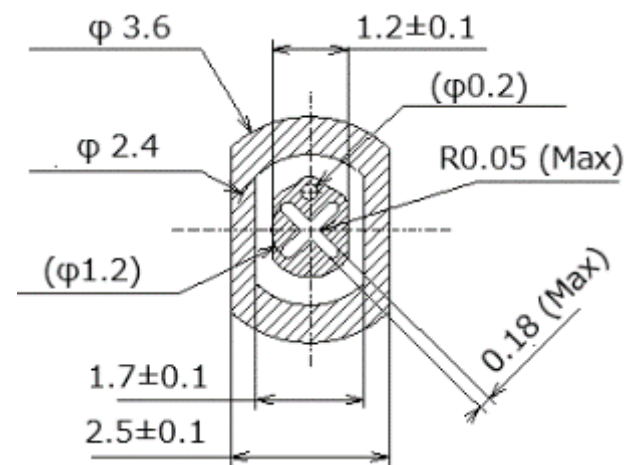
Recommend to use a double sided PWB which has through hole to lead out the center electrode of contact pattern.

When use single side PWB, please contact us about special pattern and instructions.

## Side cut Spring: φ3 x 2



## Side cut Spring: φ4 x 2.8

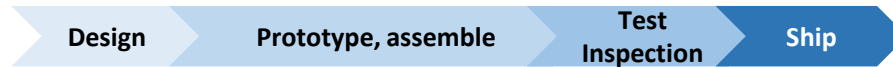


**Because Switch sheet is customized product, lead time of Design and Production is required.**

**Standard lead time of “no Nub” or using “the existing Nub” is shown in below.**

\* In case of newly Nub or other special design/specifications, please consult us.

## Design lead time



- Product design is done by the engineers in Qingdao (China) factory.
- Able to support the engineers in Japan.
- Sample shipment: 3 to 7days for inside of China, 10days plus transportation days for out of China.

## Production lead time



- Product design, Facility design, and Mass production are done in Qingdao (China) factory.
- Standard lead time from design start to shipment is about 8weeks.
- However, it fluctuates by the specifications, materials and facility, etc. (4 to 8weeks)

## Production capability As of the end of 2019.

- 100,000,000 click springs able to be mounted in one month.

|                       |                            |
|-----------------------|----------------------------|
| <b>Corporate Name</b> | <b>MinebeaMitsumi Inc.</b> |
|-----------------------|----------------------------|

|             |               |
|-------------|---------------|
| Established | July 16, 1951 |
|-------------|---------------|

|         |   |
|---------|---|
| Capital | 68,258 million yen (As of March 31, 2019) |
|---------|---|

|                |   |
|----------------|---|
| Representative | Yoshihisa Kainuma, Representative Director, CEO & COO |
|----------------|---|

|                     |   |
|---------------------|---|
| Outline of Business | Machinery Components Business, Electronic Devices and Components Business, Automotive, Industrial Machinery and Home Security Unit Business |
|---------------------|---|

|                        |  |
|------------------------|--|
| Consolidated Net Sales | MinebeaMitsumi Group 884,723 million yen (April 1, 2018 to March 31, 2019) |
|------------------------|--|

|                                  |  |
|----------------------------------|--|
| Consolidated Number of Employees | MinebeaMitsumi Group 77,957<br>(As of March 31, 2019) *Excluding temporary employees |
|----------------------------------|--|

|  |   |
|--|---|
| Number of Consolidated Subsidiaries and Affiliates | MinebeaMitsumi Group 121<br>(As of June 30, 2019) |
|--|---|

