| Classification | REFERENCE SPECIFICATION | Issue No. 20170199 |
|---|---|---|
| Part Name 3.4mm x 1.7mm Side-operational Edge-mount Light Touch Switch | Part No. EVPAT2L1B000 | 1 / 8 |

1. Notification Items

1.1 Law and the regulation which are applied

① Ozone depleting substances specified by Montreal Protocol have not been used in the manufacturing process of the material used in this product.

② This product complies with RoHS Directive (on the restriction of the use of certain hazardous substances in electrical and electronic equipment) (2011/65/EU).

③ The materials used in this product contain only the substances listed in the List of Existing Chemical Substances specified in 'Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc'.

④ Permission must be obtained from the Japanese government if the product that is subject to the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

1.2 Application Limits

The following shall be described for safety precaution:

[Limitation of Application]

(a) This product has been designed and manufactured for general electronic devices, such as home electronics, office equipment, information devices and communication devices.

(1) This product is not intended for use in more sophisticated applications which require a higher safety standard and more reliability, including if a failure or malfunction may cause bodily injury or property damage.

(2) If the product is intended for more sophisticated applications prior approval must be obtained. Such applications shall include, but are not limited to, the following: aircraft equipment, aerospace equipment, disaster prevention equipment, crime prevention equipment, medical equipment, transportation equipment (such as vehicles, trains, ships, etc.), and information processing equipment that are highly publicized, and other equivalent equipment.

(b) Regardless of its applications, in an event that this product is used for equipment with high safety standards, protective circuits or back up circuits must be used and safety tests must be performed.

1.3 Handling of reference specification.

・ Since the contents of this reference specification are subjected to change without prior notifications,please request us a formal specification again for your investigations before using.

1.4 Manufacturing Sites

| | |
|---|---|
| The country of manufacture : Malaysia | Panasonic Industrial Devices Malaysia Sdn. Bhd. |
| The country of manufacture : Japan | Input Devices Business Unit, Electromechanical Control Business Division Panasonic Corporation |

2. Summary

2.1 This specifications applies to the following types of switch.
Push-ON type S.P.S.T

2.2 This specifications is a constituent document of contract for business concluded between your company and Panasonic Corporation.

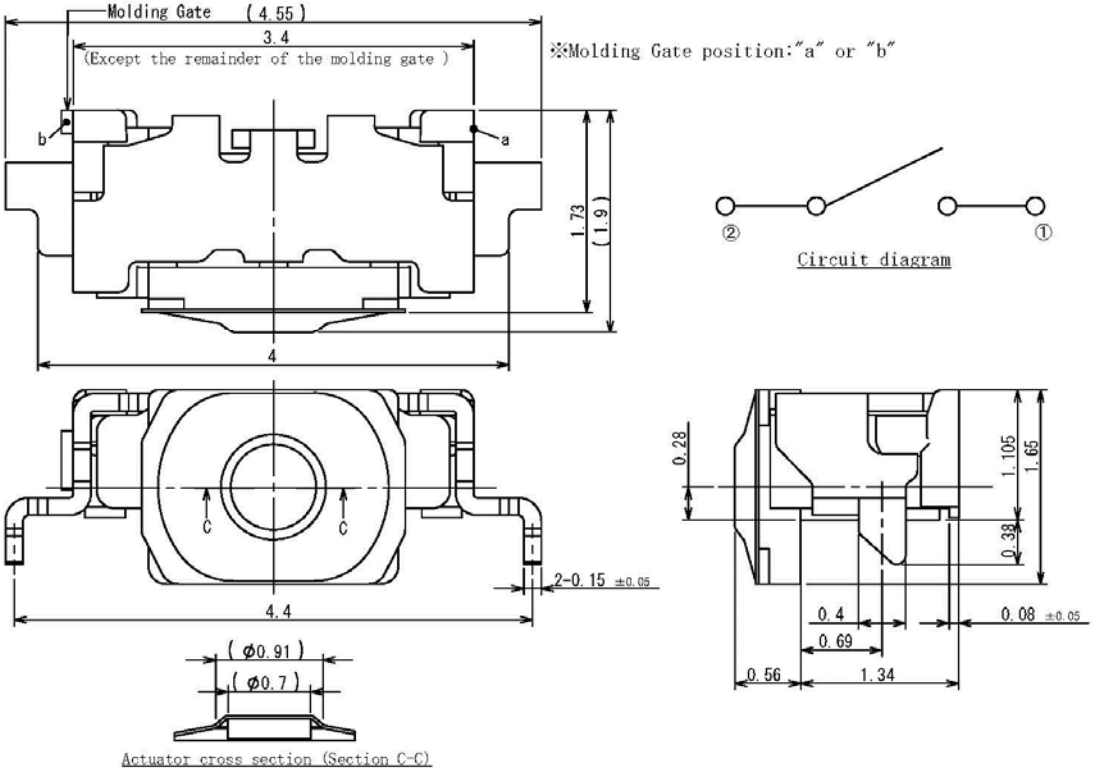
2.3 Items not particularly specified in this specifications shall be in conformance with JIS Standards.

3. Dimension・Marking・Circuit diagram

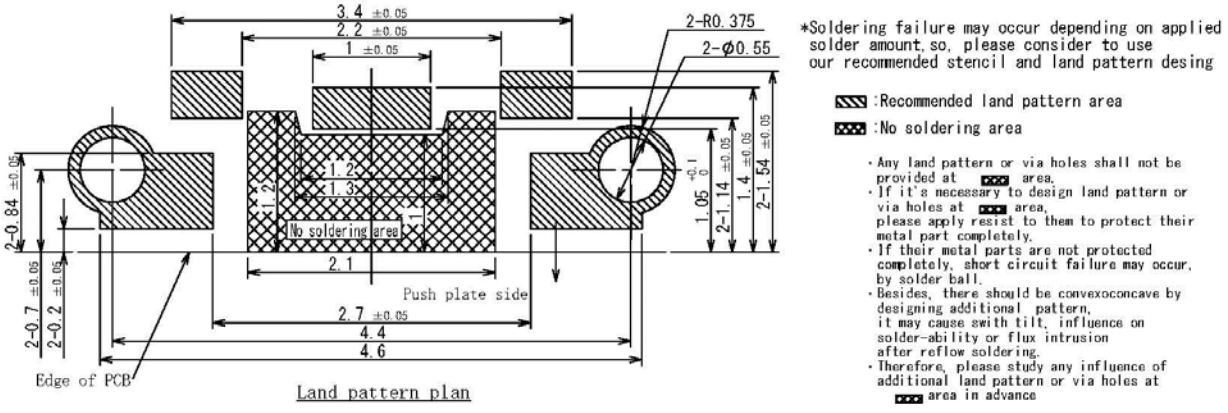
REFERENCE ONLY

Date code are indicated in the product.

General dimension tolerance : ±0.1
()dimensions are reference dimensions.
※This reference specifications are subject to change.




Soldering thickness:t=0.12±0.02




*Soldering failure may occur depending on applied solder amount,so, please consider to use our recommended stencil and land pattern desing

:Recommended land pattern area
:No soldering area

- Any land pattern or via holes shall not be provided at area.
- If it's necessary to design land pattern or via holes at area, please apply resist to them to protect their metal part completely.
- If their metal parts are not protected completely, short circuit failure may occur, by solder ball.
- Besides, there should be convexoconcave by designing additional pattern, it may cause swith tilt, influence on solder-ability or flux intrusion after reflow soldering.
- Therefore, please study any influence of additional land pattern or via holes at area in advance

4. General specification

4.1 Switch rating DC 15 V 20 mA(max.) DC 2 V 10 μA(min.)

4.2 Operation temperature range -40 ～ + 85 ℃

4.3 Preservative temperature range Single condition : - 40 ～ + 85 ℃
Taping conditior : - 20 ～ + 60 ℃

4.4 Standard conditions

Unless otherwise specified, the test and measurements shall be carried out as follows.

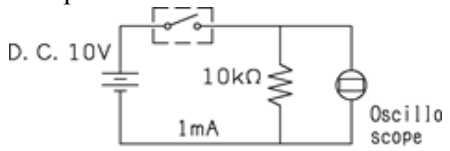
Ambient temperature : 5 ～ 35 ℃
Relative humidity : 45 ～ 85 %
Atmospheric pressure : 86 ～ 106 kPa

However, if doubt arises on the decision based on the measured values under the above-mentioned conditions, the following conditions shall be employed.

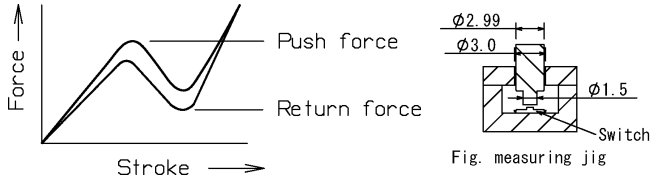
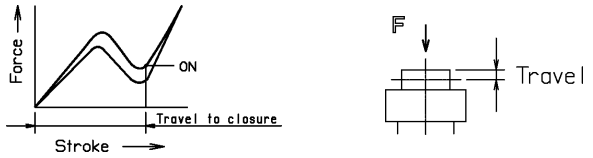
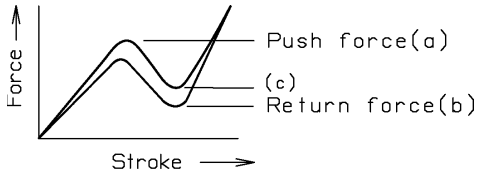
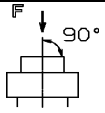
Ambient temperature : 20 ± 2 ℃
Relative humidity : 65 ± 5 %
Atmospheric pressure : 86 ～ 106 kPa

5. Performance

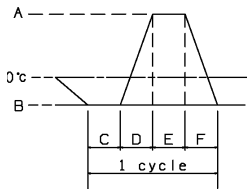
5.1 Electrical characteristics

| No. | ITEM | TEST CONDITION | PERFORMANCE |
|---|---|---|---|
| 5.1.1 | Contact resistance | Push force : {Operation force} × 2<br>Measurement tool : Contact resistance meter (Capable of 10 μA ～ 10 mA) | 500 mΩ max. |
| 5.1.2 | Insulation resistance | DC 100 V (Between terminals) | 50 MΩ min. |
| 5.1.3 | Withstand voltage | AC 250 V for 1 minute. (Between terminals) | No insulation destruction |
| 5.1.4 | Bouncing | Operation speed : 3～4 times/s<br>  <br>Switch Bouncing Test Circuit | ON<br>10 ms max.<br>OFF<br>10 ms max. |

5.2 Mechanical characteristics

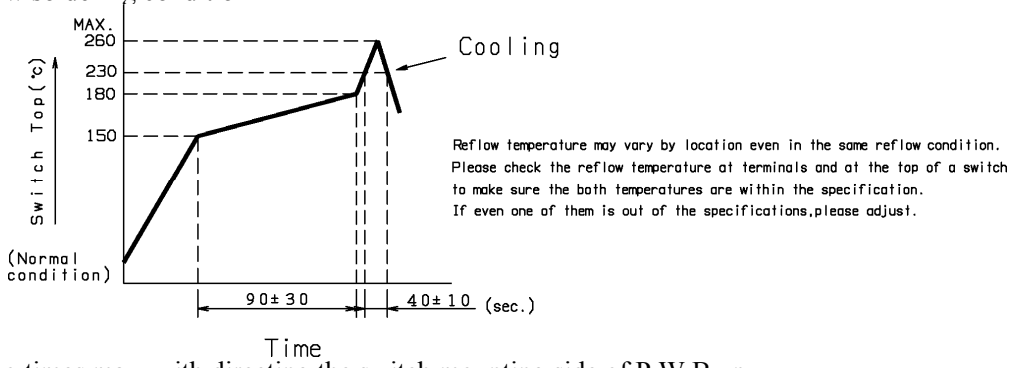
| No. | ITEM | TEST CONDITION | PERFORMANCE |
|---|---|---|---|
| 5.2.1 | Operation force | Operation feeling shall be measured after 3 times pre-operations.<br>Pre-operation condition : 3 times, 1mm/s by 3 N<br>Measurement speed : 0.5 mm/s<br>  <br>Fig. measuring jig | Push force<br>1.6 $^{+0.5}_{-0.5}$ N<br>Return force<br>0.1 N min |
| 5.2.2 | Travel to closure |  | 0.11 $^{+0.05}_{-0.05}$ mm |
| 5.2.3 | Click ratio | Measurement condition:No.5.2.1<br>  <br>Click ratio = (a-c)/a×100% | Click ratio<br>40 % min. |
| 5.2.4 | Push strength | 50 N for 15 sec.<br>  | No damage<br>(Electrical and mechanical) |
| 5.2.5 | Vibration test | 1) Amplitude : 1.5 mm<br>2) Sweep rate : 10-55-10Hz for 1 minute<br>3) Sweep method : Logarithmic frequency sweep rate<br>4) Vibration direction : X,Y,Z(3 directions)<br>5) Time : Each direction 2 hours (Total 6 hours) | No.5.1 and 5.2.1 to 5.2.2 shall be satisfied. |
| 5.2.6 | Soldering heat test | Mount the switch on P.W.B by solder paste.<br>1) Reflow process 2 times. (Refer to section 6.1)<br>2) Standard conditions after test : 1 hours | Contact resistance 500 mΩ max.<br>Click ratio 35% min.<br>No.5.1.2 to 5.1.4 and No.5.2.1 to 5.2.2 shall be satisfied. |
| 5.2.7 | Solderbility | After spreading flux, the terminal is immersed in solder with following condition.<br>Solder bar : M705/Sn-3.0Ag-0.5Cu (Senju Metal Industry Co.,Ltd.)<br>Flux : CF-110VH-2A (tamura kaken)<br>Soldering temperture : 260±5 ℃<br>Soldering time : 2±0.5 sec. | 95% or more of surface area(Excluding ruptured surface)where is immersed in solder shall be covered by new solder. |

5.3 Climatic characteristics

| No. | ITEM | TEST CONDITION | PERFORMANCE |
|---|---|---|---|
| 5.3.1 | Cold test | 1) Temperature : -40±2 ℃<br>2) Duration of test : 500h<br>3) Take off a drop water.<br>4) Standard conditions after test : 1 h | Contact resistance<br>1000 mΩ max.<br>No.5.1.2 to 5.1.4 and<br>No.5.2.1 to 5.2.2<br>shall be satisfied. |
| 5.3.2 | Heat test | 1) Temperature : 85±2 ℃<br>2) Duration of test : 500h<br>3) Standard conditions after test : 1 h | Contact resistance<br>1000 mΩ max.<br>No.5.1.2 to 5.1.4 and<br>No.5.2.1 to 5.2.2<br>shall be satisfied. |
| 5.3.3 | Heat shock test | 1) Test cycles : 20 cycles<br>2) Standard conditions after test : 1 h<br>  <br>A:+85±2 ℃<br>B:-40±2 ℃<br>C:1 hour<br>D:5 minutes max.<br>E:1 hour<br>F:5 minutes max. | Contact resistance<br>1000 mΩ max.<br>No.5.1.2 to 5.1.4 and<br>No.5.2.1 to 5.2.2<br>shall be satisfied. |
| 5.3.4 | Humidity test | 1) Temperature : 60±2 ℃<br>2) Relative humidity : 90～95 %<br>3) Duration of test : 500 h<br>4) Take off a drop water.<br>5) Standard conditions after test : 1 h | Contact resistance<br>1000 mΩ max.<br>No.5.1.2 to 5.1.4 and<br>No.5.2.1 to 5.2.2<br>shall be satisfied. |
| 5.3.5 | Endurance (by spring method) | 1) DC 15 V 20 mA Resistance load<br>2) Operation speed : 2～3 times/s<br>3) Push force : Maximum value of operation force<br>4) Operation number : 500,000 times | Contact resistance<br>20 Ω max.<br>Bouncing : 30 ms max.<br>Variation rate of operation force shall be within ±30 % to the value before testing<br>No.5.1.2 and 5.2.2<br>shall be satisfied. |
| 5.3.6 | Withstand $H_2S$ | 1) Density : 3±1ppm<br>2) Temperature : 40±2 ℃<br>3) Relative humidity : 80～85 %<br>4) Duration of test : 24 h<br>5) Standard conditions after test : 1 h | Contact resistance<br>1000 mΩ max.<br>No.5.1.2 to 5.1.4 and<br>No.5.2.1 to 5.2.2<br>shall be satisfied. |
| 5.3.7 | Water resistance (adhere to IPx7) | 1) liquid : Fresh water<br>2) Temperature : 20±15 ℃ (Ambient temperature)<br>3) Immersion depth : 1m<br>4) Duration of test : 30min.<br>Water around the switch shall be removed by the moisture absorbing material, then expose the switch in the ambient temperature and humidity for 1 h before checking.<br>＊ Temperature difference between switch and liquid shall be 5 deg C max. | Water ingress shall be limited enough to prevent deleterious effect to the switch function. |
| 5.3.8 | Dust resistance (adhere to IP6x) | 1) Dust : Talc (Type 4)<br>2) Density : 2kg/m$^3$<br>3) Temperature : 20±15 ℃ (Ambient temperature)<br>4) Relative humidity : 45～85 %<br>5) Duration of test : 8 h | No dust ingress to the inside of switch. |

6. Prohibitions and precaution for handling

6.1 Reflow soldering condition




1) Two times max. with directing the switch mounting side of P.W.B up.
2) Re-soldering by soldering iron shall be allowed under 350 ℃ max. 3 sec. max. 1 time only and the tip of iron must not touch to terminals.
   Soldering iron for re-soldering have to be 60 W max.

6.2 Design instructions

1) Please refer to the land pattern plan Panasonic recommends on the 2nd page.
2) Design key top as fig-1.(Recommended operation condition)
   As the design of key top may affect operation feeling,please follow the directions stated below.
   - We recommend to use harder material such as resin for key top, and we do not recommend softer material such as rubber may affect operation feeling.
     However in case if you still would like to use softer material, please consult with us beforehand.

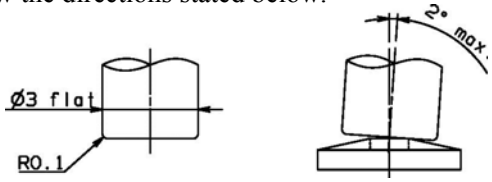



fig-1

   - Considering decentering between switch and key top, the key top shall be always positioned to be able to push the entire top surface of actuator.
     The switch and the decentering shall be 0.3 mm max..
     If you cannot apply our recommended plunger design,please make plungers size bigger than product outline.
   - Please design housing and key top not to produce friction to each other to avoid inhibition of operation feeling.
3) Please design your knob not to hit the switch film or case even when the switch is fully pushed.
4) Please pay attention not to add side force (static or impact) to the push plate of the switch, especially when the switch is being built into the products.(fig-2)

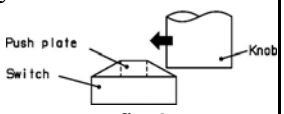


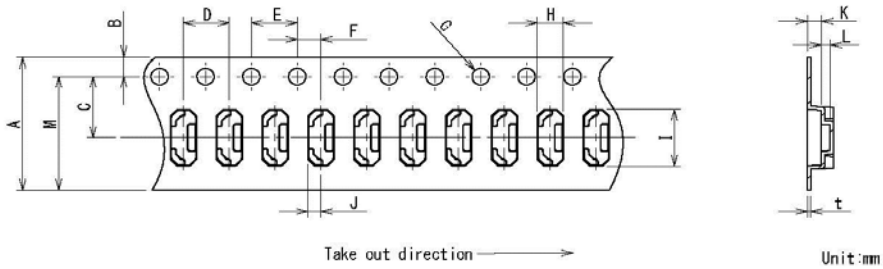

fig-2

6.3 Note

1) Please be cautions not to give excessive static load or shock to switches.
2) Please be careful not to pile up P.W.B. after switches were soldered.
3) Preservation under high temperature and high humidity or corrosive gas should be avoided especially.
   When you need to preserve for a long period, do not open the carton.
4) Avoid pressing the film portion of the product with sharp-edged object.
5) Cleaning
   - If flux or solder is scattered on the surface of P.W.B when soldering, characteristics of this product may be damaged.
   - Cleaning after soldering is not allowed.When cleaning is required this switch should be soldered after the cleaning.
6) Avoid the use of the switch under pushed ON condition is continued for a long time.
7) There is a possibility the flux from solder paste infiltrates into the body if plenty of solder paste was applied by switch on the P.W.B.
   So we recommend to use our proposed land design in order to prevent above problem.
   Also please avoid putting additional land by the switch on the P.W.B.
8) Please don't apply any coating material to the switch after reflow soldering.
9) Please be careful not to apply the load sideways to avoid film bending when the switches are soldered.

7. Packing specification

Carrier tape




Unit:mm

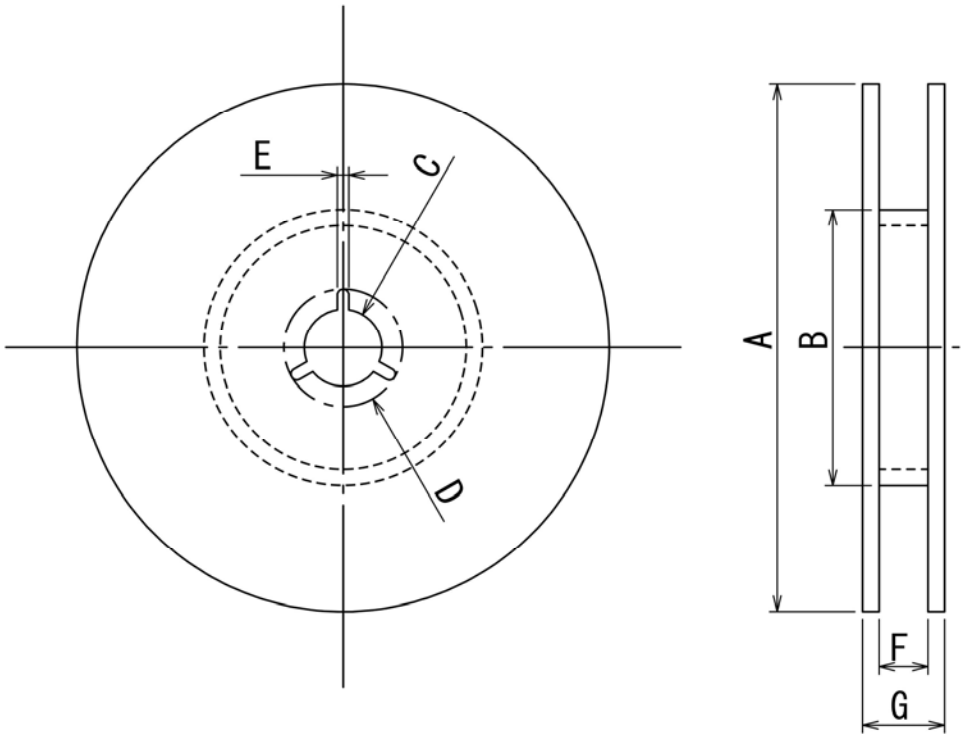
| A | B | C | D | E | F | G | H | I | J | K | L | M | t |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ±0.2 12 | ±0.1 1.75 | ±0.05 5.5 | ±0.1 4 | ±0.1 4 | ±0.05 2 | +0.1 0 1.5 | ±0.2 2.28 | ±0.2 4.8 | (1.065) | ±0.1 1.23 | ±0.1 0.77 | (10.25) | ±0.05 0.3 |

＊ Taping condition : Lack of products in the middle of taping should be one MAX.
but total quantity specified in the specifications should be secured.

＊ Peeling off strength of top tape : It should be within 0.2N to 1.0N at 165 degree in peeling off angle.

＊ Joint of carrier tape : One joint per one reel may exist.

Reel( 10000 pcs./reel)




| A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|
| ±2 Φ380 | ±1 Φ80 | ±0.2 Φ13 | ±0.8 Φ21 | ±0.5 2 | ±1 13.4 | ±1 17.4 |

Unit:mm

<Prohibitions and precaution for handling>

【Prohibited items on fire and smoking】

- Absolutely avoid use of a product beyond its rated range because doing so may cause a fire. If misuse or abnormal use may result under conditions in which the product is used out of its rated range, take proper measures such as current interruption using a protective circuit.
- The grade of nonflammability for resin used in product is "94HB, " which is based on UL94 Standards (flammability test for plastic materials). Prohibit use in a location where a spreading fire may be generated or prepare against a spreading fire.

【For use in equipment for which safety is requested】

- Although care is taken to ensure product quality, inferior characteristics, short circuits, and open circuits are some problems that might be generated. To design an equipment which places maximum emphasis on safety, review the effect of any single fault of a product in advance and perform virtually fail-safe design to ensure maximum safety by:
  - Preparing a protective circuit or a protective device to improve system safety, and equipment.
  - Preparing a redundant circuit to improve system safety so that the single fault of a product does not cause a dangerous situation.

【Attentions required for storage condition】

- When this product is to be stored in the following circumstances and conditions, it may affect on the performance deteriorations and solderability etc., avoid storing in the following conditions.
  (1) A place where the temperature is -10℃ max., +40℃ min. and the humidity is 85% min.
  (2) In the corrosive gas atmosphere.
  (3) Long-term storage for 6 months min.
  (4) A place where the product is exposed to direct sunlight.
- Store in packed condition so that the load stress is not applied.
- Please use this product as soon as possible, our recommendation is within 3 months and the limitation is 6 months.
- If any remainder left after packing is opened, store it with proper moistureproofing and gasproofing, etc.,

Panasonic

# Handling Manual for ;

# 3.4 mm X 1.7 mm Side-op. Edge Mount Light Touch Switch

Version 0.0
Issued: Feb.23.2017

# Panasonic

**Content :**

# Panasonic

1. Instruction for set design

1.1 Proposals for set knob design

The shape of set-knob shall be as shown in figure-1, and off-centering between push knob and switch push plate shall be within 0.3mm max, and inclination shall be 2 degrees max.

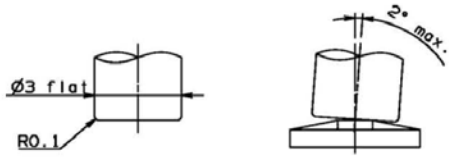


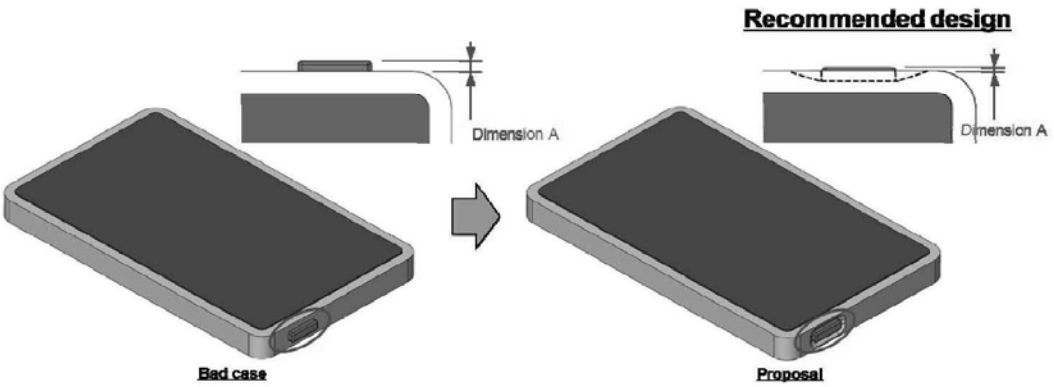

Fig1. Set knob design

1.2 Set design against impact load

Please design set structure to prevent feeling deterioration and impact load.

1.2.1 Set knob design for impact load

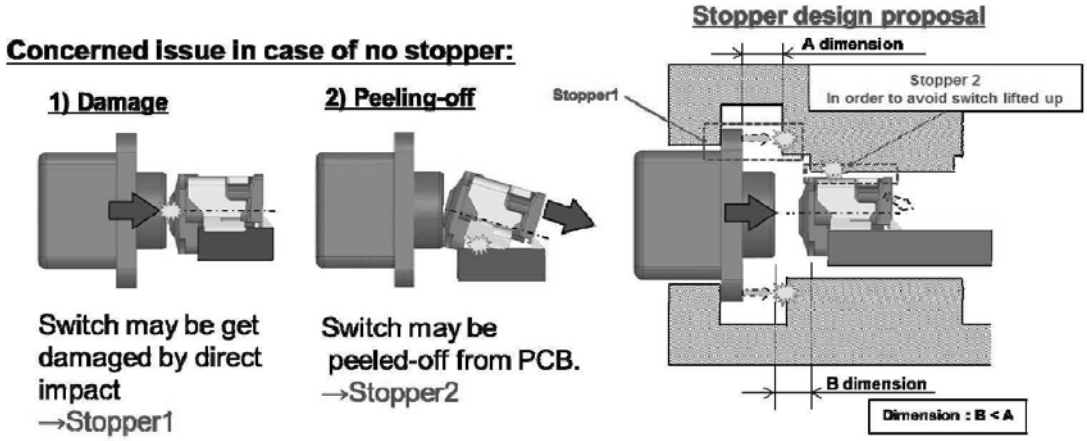
Please confirm set knob design in order to protect the switch from the direct impact.
In case dimension A is bigger than switch travel, the switch can get damaged
by impact loaded direct impact and switch may be broken.



# Panasonic

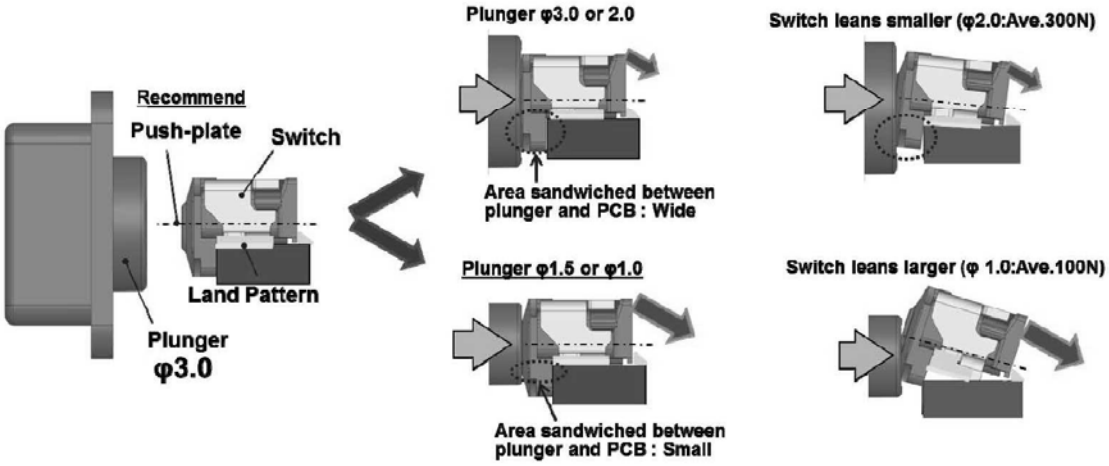
1.2.2. Stopper design for impact load

In order to protect the switch from the direct impact, a stopper should be provided on the set case. Please refer to stopper design below.




1.2.3. Set knob design to prevent deterioration of switch strength

When φ3.0 and φ2.0 plunger is used, area sandwiched between plunger and PCB becomes big. Switch shows high peeling-off strength. By using plunger more than φ2.0, you can keep the high peeling-off strength.



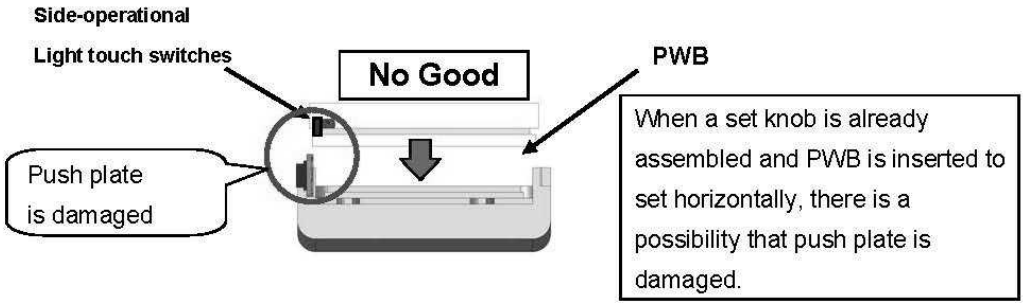

- Peeling-off strength -

| Plunger diameter | φ1.0 | φ1.5 | φ2.0 | φ3.0 |
|---|---|---|---|---|
| Peeling-off strength (Ave.) | 100N | 130N | 220N | 300N |

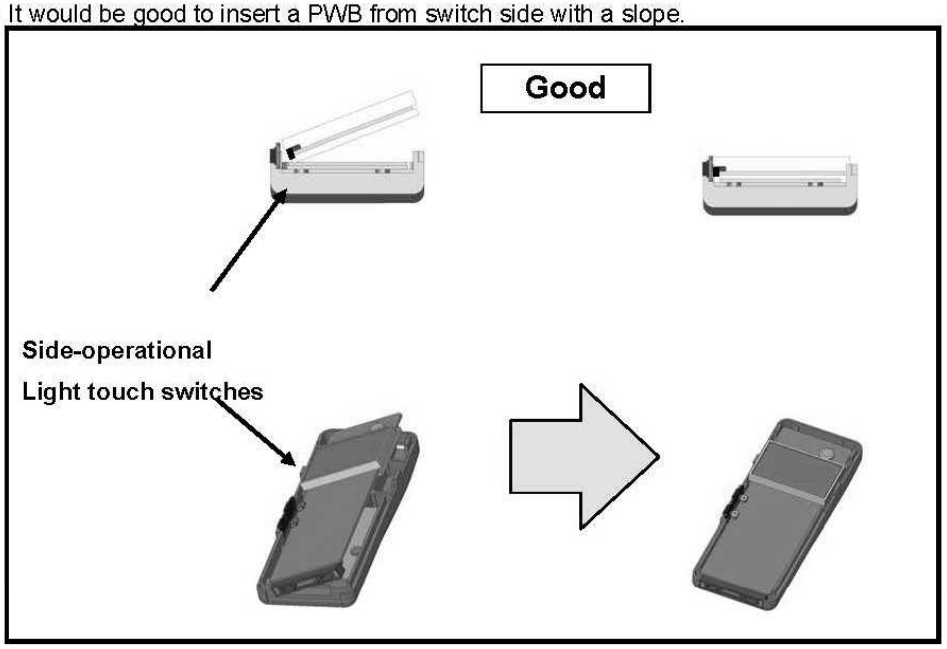
# Panasonic

1.3. Proposals for set design, PWB design and assembly method

・Case 1: Switch is arranged in one side of a set

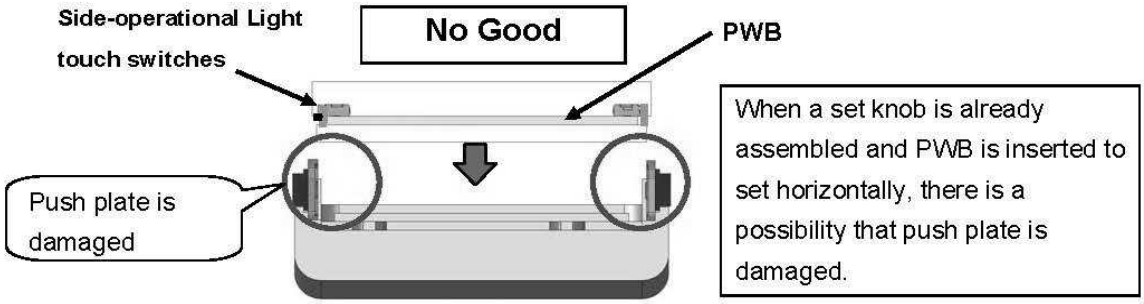



・It would be good to insert a PWB from switch side with a slope.

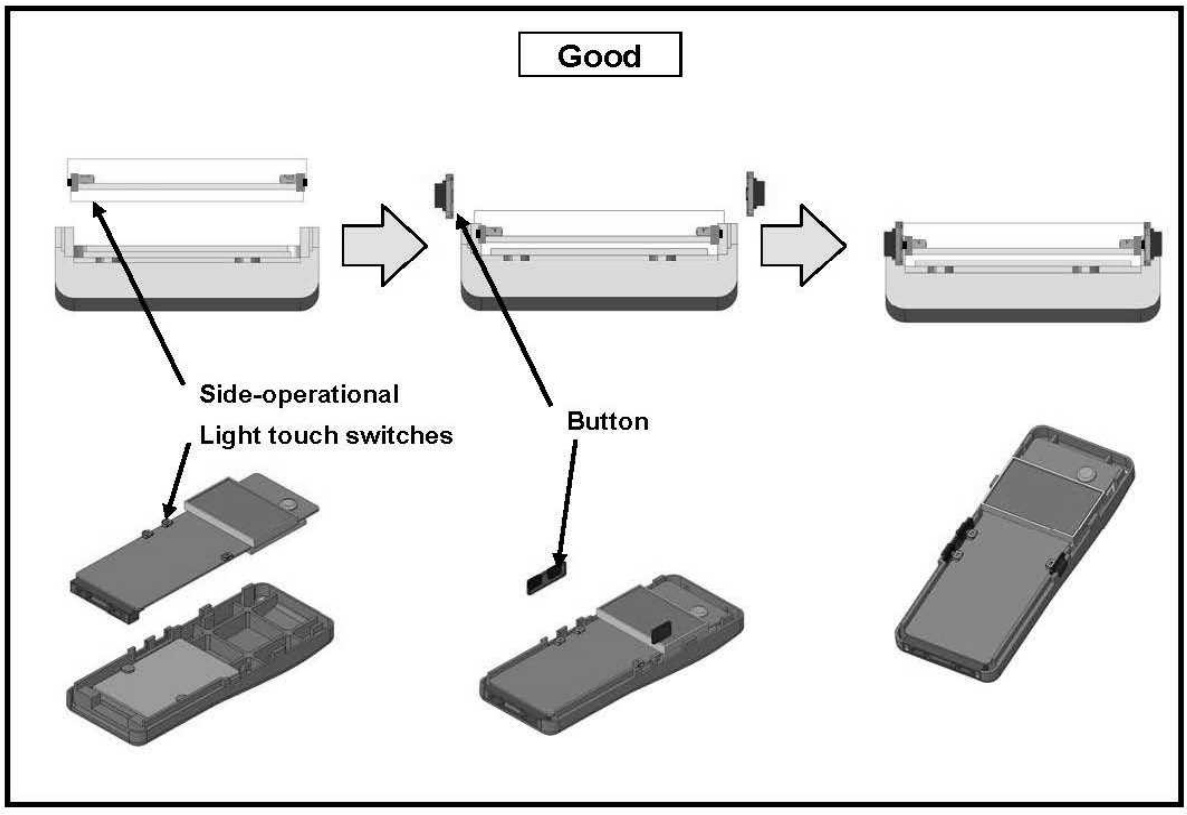


# Panasonic

・Case2:　Switch is arranged in both sides of a set



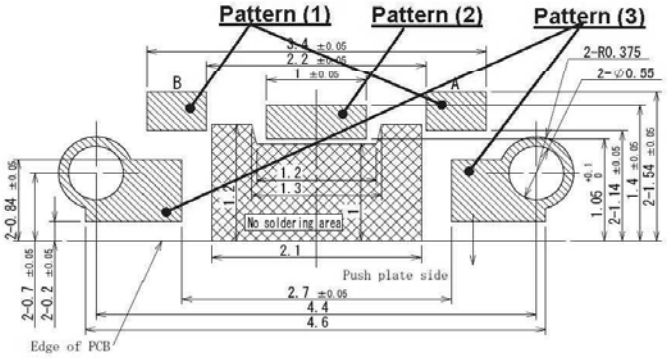

・In order not to load switch at assembly, please design structure to put up set button later.



# Panasonic

## 2. Instruction for Mask pattern design/ Land pattern design

### 2.1. Recommended mask pattern




*Soldering failure may occur depending on applied solder amount,so, please consider to use our recommended stencil and land pattern desing

:Recommended land pattern area

:No soldering area

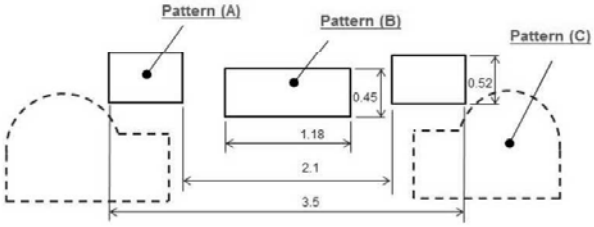
- Any land pattern or via holes shall not be provided at area.
- If it's necessary to design land pattern or via holes at area, please apply resist to them to protect their metal part completely.
- If their metal parts are not protected completely, short circuit failure may occur, by solder ball.
- Besides, there should be convexoconcave by designing additional pattern, it may cause swith tilt, influence on solder-ability or flux intrusion after reflow soldering.
- Therefore, please study any influence of additional land pattern or via holes at

Mask thickness : 0.12 ㎜
Solder volume : 0.30 ㎜ $^3$

| Pattern | Volume[mm$^3$] | Note |
|---|---|---|
| (1) | 0.0576 | Sum of 2 places |
| (2) | 0.0492 | – |
| (3) | 0.2009 | Sum of 2 places |

In case you need to design different mask pattern from Panasonic recommending pattern, please design same the mask pattern with solder volume in order to ensure the solderability, as Panasonic recommending solder volume. And if you need expand mask pattern, please expand mask pattern toward to direction of arrow in below figure.

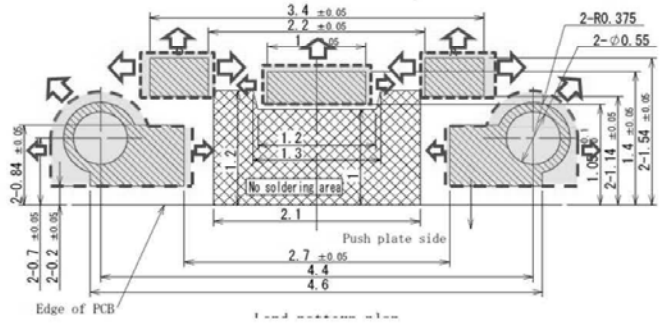
### 2.2 Example mask pattern




*Land pattern is designed following on Panasonic recommending land pattern.

**Mask thickness : 0.08㎜**
**Solder volume : Right table**

| Pattern | Volume[mm$^3$] |
|---|---|
| (A) | 0.0362 |
| (B) | 0.0425 |
| (C) | Remain especially |




Recommended mask pattern

Example mask pattern

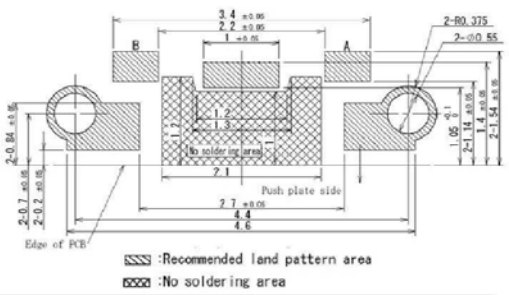
Direction of expansion

# Panasonic

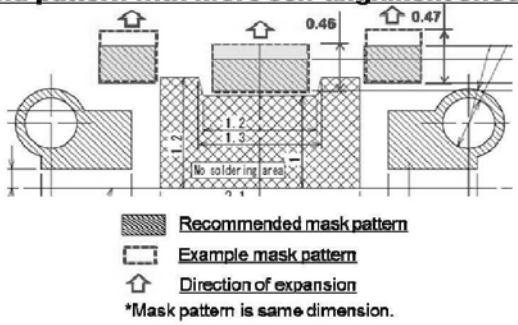
2.3. Recommended Land pattern

In order to ensure the solderability, please keep dimension of recommended land pattern.
If it is requested to increase self-alignment effect, the red area ▭ of land pattern shown in below figure can be expanded. And also if land pattern is expanded, please follow on expanded the direction of arrow shown in figure.

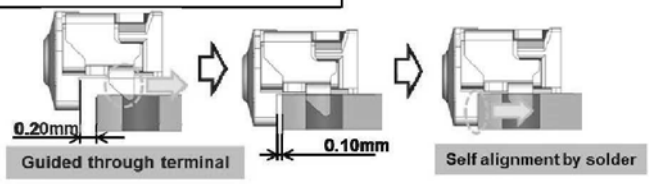
**Recommended land pattern**




**Land pattern with more self-alignment effect**



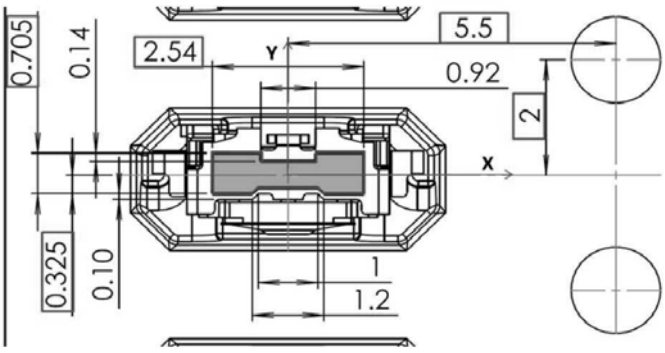

**Mountability and self-alignment effect**

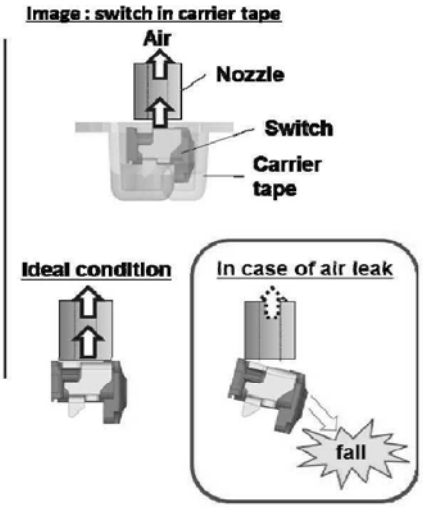


# Panasonic

3. Nozzle Shape/Pick Up Area by Nozzle

We recommend below nozzle aperture shape to pick up a component in component mounting machine.
1. Adsorption area is designed within 2.54 mm x 0.705 mm area shown as red area in below picture.
2. The biggest aperture area as possible. Also, in addition, we would like you to study to increase vacuum pressure in absorption.(More than 0.3 MPa)




4. Warning against washing and coating for waterproof

This switch is not washable.
Please do not use alcohol for cleaning around the switch as Alcohol may dissolve adhesive on film and flux. In results, those insulating material may enter inside the switch and cause insufficient insulation.

This switch cannot be used with coating agent for water proof.
Please do not use such agent as it may cause insufficient insulation.

# Panasonic

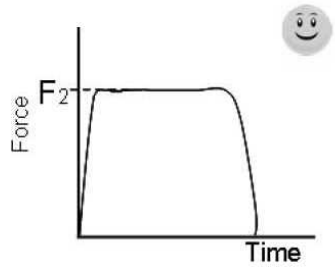
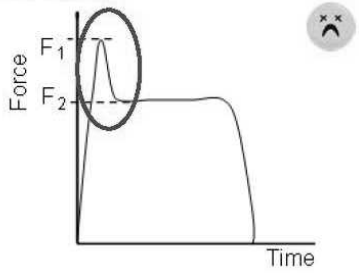
5. Troubleshooting on life cycle test

1) Trouble:
Switch malfunction* occurred before target endurance.
*Switch malfunction: no switch operation feeling.

2) Recommendation & Proposal
LTSW is designed to be used by finger operation. If excessive force is applied to a switch, it may cause switch malfunction such as metal dome breakage. If switch operation feeling is damaged during the evaluation test, please check the following items.

- Alignment of plunger and push plate of switch.
- Is a plunger set to push the designated area of push plate?
- Is a size, shape and material of plunger appropriate?

- Endurance Test Machine (Air pressure/Impact load type)
- Is applied load setting correct?
- Is actual applied load correct to the setting?
- Is there any impact load?
(→If contactor was damaged, suspect impact load.)

| Good Example | Bad Example |
|---|---|
| Force curve   | Force curve   |
| No impact load. | Setting may be F2, but due to the condition of test equipment and machine, imapct load(F1) is caused. →May cause contactor brakage. |

Countermeasure for impact load.
Please check actual force curve before starting the test.
Please use a rubber knob on the air cylinder tip to absorb impact load.