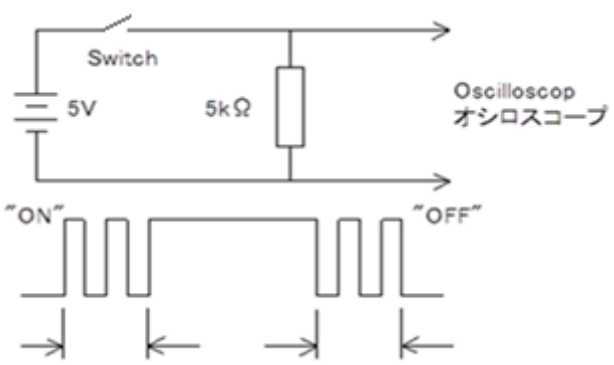
1	General	
1.1	Application	This specification is applied to low current circuit TACT Switch™ used for general electronic equipment.
1.2	Operating temperature range	-40 to 90 ℃ (normal humidity, normal air pressure) Operating temperature range shall refer to the range where this switch keeps electrical makes ”ON”/”OFF” within such temperature.
1.3	Storage temperature range	At switch level: -40 to 90 ℃ (normal humidity, normal air pressure) Switch on Taping: -20 to 50 ℃ (Relative humidity: 20 to 85 %)
1.4	Test Condition	Unless otherwise specified, measurements and tests shall be done under the atmospheric conditions as follows. Normal temperature: (Temperature 5 to 35 ℃) Normal humidity: (Relative humidity 25 to 85 %) Normal air pressure: (Air pressure 86 to 106 kPa) If any doubts arise from judgement, tests shall be conducted under the following conditions. Ambient temperature: 20±2 ℃ Relative humidity: 60 to 70 % Air pressure: 86 to 106 kPa Switch shall be mounted on PWB without any indication of switch floating.
2	Appearance, Design, and dimensions	
2.1	Appearance	There shall be no defects that affect the functionality of the switch.
2.2	Design and dimensions	Refer to the Product Drawing.
3	Type of actuation	Tactile feedback
4	Circuit	Single Pole, Single Throw (Circuit details is given in the assembly Product Drawings)
5	Rating	
5.1	Absolute maximum ratings	12 V DC 50 mA (Resistive load)
5.2	Minimum ratings	1 V DC 10 μA (Resistive load)

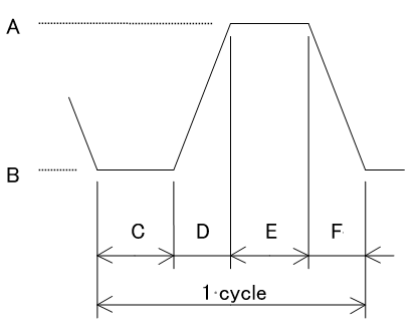
6. Electrical specification

	Items	Test conditions	Criteria
6.1	Contact resistance	Apply the below static load to the center of the switch operation. The measurement shall be done under the below conditions. 3 times push shall be done before the measurement. (1) Test force: 1.57 N (2) Measuring method: 1 kHz small-current contact resistance meter or voltage drop method at 5VDC 10mA.	100 mΩ Max.
6.2	Insulation resistance	The measurement shall be done under the below conditions. (1) Test voltage: 100 V DC for 1 min. (2) Applied position: Between all terminals. And if there is a metal frame, between terminals and ground(frame)	100 MΩ Min.
6.3	Voltage proof	The measurement shall be done under the below conditions. (1) Test voltage : 250 V AC (50 to 60Hz) (2) Duration : 1 min (3) Applied position : Between all terminals. And if there is a metal frame, between terminals and ground(frame)	There shall be no breakdown.
6.4	Bounce	Lightly press the center of the switch operation at the rate of 3 to 4 push per second, the bounce measurements at switch makes “ON” and “OFF” shall be done respectively. 	ON Bounce 10ms Max. OFF Bounce 10ms Max.

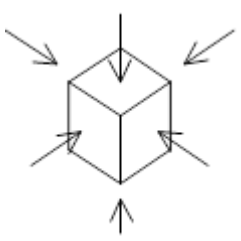
7. Mechanical specification

	Items	Test conditions	Criteria
7.1	Operating force	Place the switch such that the direction of switch operation is vertical. Then, apply the below force to the center of the switch operation. Measure the maximum force that the switch makes "ON". 3 times push shall be done before the measurement. (1) Test force: 1.96 N (2) Measurement speed: 0.5 mm/s	0.98 ± 0.49 N
7.2	Travel	Place the switch such that the direction of switch operation is vertical. Then, apply the below force to the center of the switch operation. Measure the travel distance of the switch operation, when the below test force is applied at the stated measuring speed. 3 times push shall be done before the measurement. (1) Test force: 1.96 N (2) Measurement speed: 0.5 mm/s	0.25 +0.2/-0.1 mm
7.3	Return force	Place the switch such that the direction of switch operation is vertical. Then, apply the below force to the center of the switch operation, Measure the force that the center of the switch operation returns to the initial position. 3 times push shall be done before the measurement. (1) Test force: 1.96 N (2) Measurement speed: 0.5 mm/s	0.2 N Min.
7.4	Stop strength	Place the switch such that the direction of switch operation is vertical. Then, apply the below force to the center of the switch operation. (1) Test force: 29.4 N (2) Time : 60s	There shall be no sign of damage mechanically and electrically.
7.5	Stem strength	Place the switch such that the direction of switch operation is vertical. Then, apply the pull force to the stem in the opposite direction of the switch operation.	4.9N

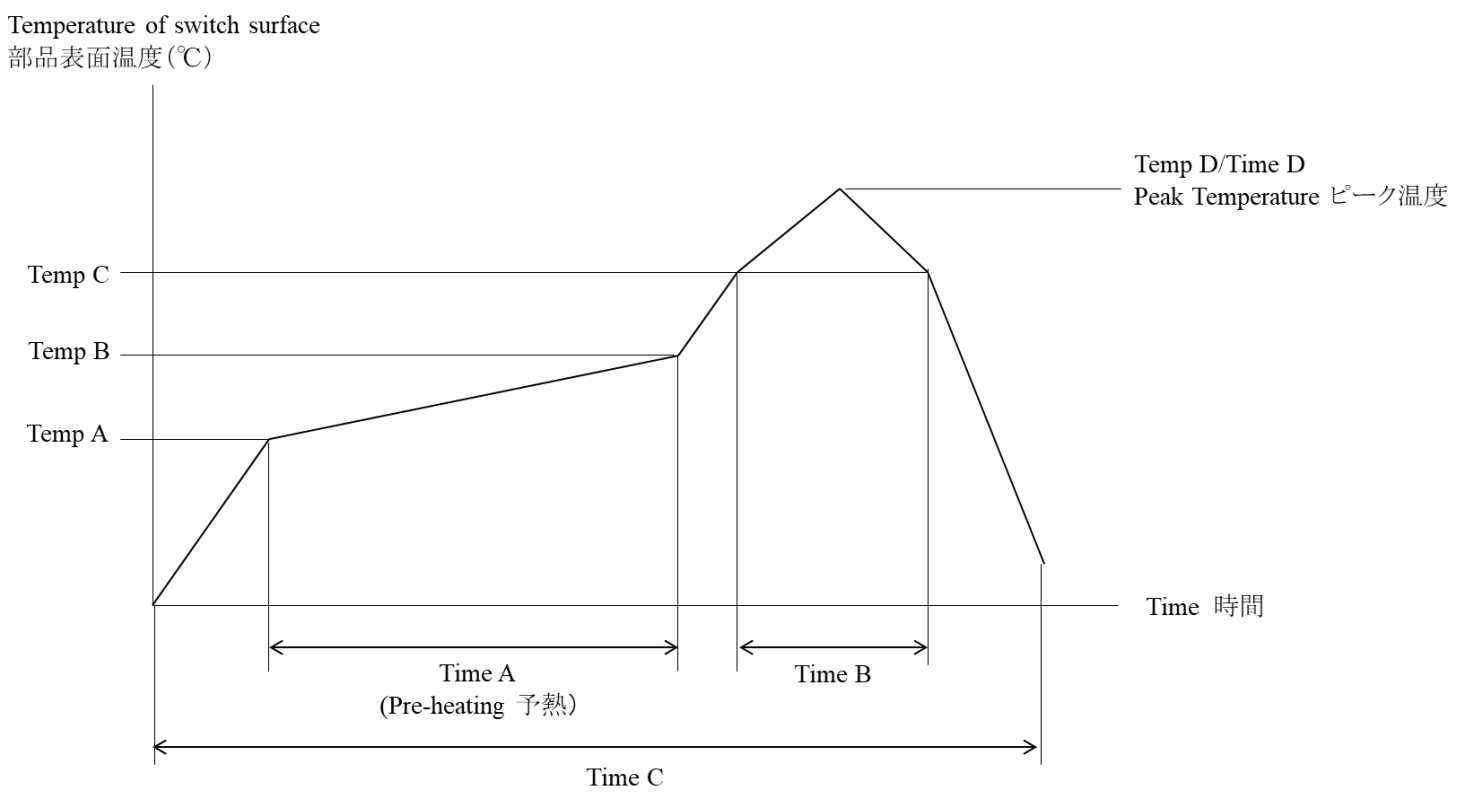
8. Environmental specification

	Items	Test conditions	Criteria
8.1	Cold resistance	After exposed to the below test conditions, the switch is stabilized at normal temperature and humidity conditions for 1 hour. Then, the measurements shall be done. (1) Temperature: -40 ± 2 ℃ (2) Time: 96 h (3) Waterdrops shall be removed.	Item 6. Item 7.1 Item 7.2
8.2	Heat resistance	After exposed to the below test conditions, the switch is stabilized at normal temperature and humidity conditions for 1 hour. Then, the measurements shall be done. (1) Temperature: 90 ± 2 ℃ (2) Time: 96 h	Item 6. Item 7.1 Item 7.2
8.3	Humidity resistance	After exposed to the below test conditions, the switch is stabilized at normal temperature and humidity conditions for 1 hour. Then, the measurements shall be done. (1) Temperature: 60 ± 2 ℃ (2) Time: 96 h (3) Relative humidity: 90 ~ 95 % (4) Waterdrops shall be removed.	Item 6.1 : 500 mΩ Max. Item 6.2 : 10 MΩ Min. Item 6.3 Item 6.4 Item 7.1 Item 7.2
8.4	Thermal cycling resistance	After exposed to the below test conditions, the switch is stabilized at normal temperature and humidity conditions for 1 hour. Then, the measurements shall be done. Waterdrops shall be removed.  A= +90 ℃ B= -40 ℃ C= 2 h D= 1 h E= 2 h F= 1 h (1) Number of cycles: 5 cycles	Item 6. Item 7.1 Item 7.2

9. Endurance specification

	Items	Test conditions	Criteria
9.1	Operation life	After exposed to the below test conditions, the measurements shall be done. (1) 5 V DC 5 mA (Resistive load) (2) Rate of operation: 2 to 3 operations per s (3) Test force: 1.47 N (4) Life cycles: 500,000 cycles	Item 6.1 : 200 mΩ Max. Item 6.2 : 10 MΩ Min. Item 6.3 Item 6.4: ON bounce: 20 ms. Max. OFF bounce : 20 ms. Max. Item 7.1 : -30 ~ +30 % of initial force Item 7.2
9.2	Vibration resistance	After exposed to the below test conditions, the measurements shall be done. (1) Vibration frequency range: 10 ~ 55 Hz (2) Total amplitude: 1.5 mm (3) Sweep ratio: 10-55-10 Hz Approx. 1min (4) Method of changing the sweep vibration frequency: Logarithmic or uniform (5) Direction of vibration: Three mutually perpendicular directions, including the direction of the travel (6) Duration: 2 h each(6 h in total)	Item 6.1 Item 7.1 Item 7.2
9.3	Shock resistance	After exposed to the below test conditions, the measurements shall be done. (1) Acceleration: 784 m/s² (2) Acting time: 11ms (3) Test direction: 6 directions (4) Number of shocks: 3 times per direction (18 times in total) 	Item 6.1 Item 7.1 Item 7.2

10. Soldering conditions

	Items	Recommended conditions
10.1	Hand soldering	Hand soldering shall follow the below conditions. (1) Soldering temperature: 350℃ Max. (2) Continuous soldering time: 3 s Max. (3) Capacity of soldering iron: 60 W Max. (4) Excessive pressure shall not be applied to the terminal.
10.2	Reflow soldering	Reflow soldering shall follow the below conditions. (1) Temperature profile  ・Each parameter Temp A= 150℃ Temp B = 180℃ Temp C= 230℃ Temp D = 260℃ Max. Time A= 120s Max. Time B = 40s Max. Time C = 3~4 min. Max. Time D = 3s Max. (2) Allowable reflow cycles: Max. 2 reflow cycles The temperature shall be stabilized with a normal temperature in prior to exposure to any reflow cycle.
10.3	Other precautions for soldering	(1) Switch terminals and top face of PWB shall be free from flux in prior to soldering. (2) No cleaning with solvent or like shall be made after the soldering process. (3) Recommended solder paste : M705-GRN360-K2-V(SENJU METAL INDUSTRY CO.,LTD) or equivalent (4) No through holes shall be located underneath and/or near the switch. If reflow process of this switch is follow by wave/flow soldering for chip components on the backside of PWB, flux potentially may penetrate into the switch along the side of housing due to flux ejection. (5) The prior verification is needed, as the soldering conditions may vary depending on reflow chambers. (6) Switch may have degradation in click feeling due to repeated reflow heat stress. Reflow soldering should be performed. Under shortest duration and at lowest temperature as possible. (7) Safeguard the switch assembly against flux penetration from its top side of switch. (8) The thickness of solder paste: 0.15 mm

【Precaution in use】

The below pre-caution in use shall be met in using this switch. All details stated in this specification must be well considered for the module design. We are not liable for any damage and/or claims related with the below case: Use this switch outside the absolute max rating and/or precaution in use specified in this product specification. Any specification and/or test conditions outside this product specification must be verified per our full part number. In such case, please contact the sales representative in advance. Please also verified it with the actual samples at your module level.

For export of this switch, respective laws and/or regulations shall be fully met. Necessary approval or permission must be obtained upon need.

This switch must not be used for military and/or antisocial purposes such as terrorism and shall not be supplied to any party intending to use the products for such purposes. Unless provided otherwise, this switch has been designed and manufactured for application to equipment and devices which are sold to end-users in the market, such as AV (audio visual) equipment, home electric equipment, office and commercial electronic equipment, information and communication equipment or amusement equipment. This switch is not intended for use in, and must not be used for, any application of nuclear equipment, driving control equipment for aerospace or any other unauthorized use. With the exception of the above-mentioned banned applications, for applications involving high levels of safety and liability such as medical equipment, burglar alarm equipment, disaster prevention equipment and undersea equipment, please contact an Alps Alpine sales representative and/or evaluate the total system on the applicability. Also, implement a fail-safe design, protection circuit, redundant circuit, malfunction protection and/or fire protection into the complete system for safety and reliability of the total system.

In case of using non-automotive rated switches in automotive applications, please contact an Alps Alpine sales representative in advance.

The specification will be invalid if we do not get an approval or no orders within one year after we issued specification.

Not-specified dimensions and/or other than switch characteristics may be subject to any changes for our convenience.

TACT Switch™ is trademark or registered trademark of Alps Alpine Co., Ltd.

A.【Safety precautions】

A1. This switch must be used within the stated rating and specification. Use outside the absolute maximum rating and specification (higher force, durability life and environmental conditions) may cause the following failure modes:
-Malfunction due to degraded insulation, and/or
-Damaged contact area due to abnormal heat generation
* Absolute Maximum rating: The maximum voltage and current that must not be exceeded at any moment. This includes transient voltage such as surge and transient current such as inrush current.
Also, this switch must be used above the absolute minimum voltage and current.
*Absolute Minimum rating: The minimum voltage and current that switch needs for stable electrical conduction. Use below such rating may cause unstable contact and contact failure.

A2. The circuit diagram specified in the product drawing shall be fully met. If wrongly connected, this switch may have a risk of malfunction and/or damages caused by short circuit.

A3. When mounting, removing and/or wiring this switch, the switch shall not be energized. There is a risk of electrical shock and/or damages from short circuit.

A4. Upon need, please use protective circuit or redundant circuit.

A5. This switch durability and/or performance is largely affected by applied voltage and current, push speed and/or actual usage. Please verify it with the actual samples under the actual usage conditions that there is no risk of electrical shock and/or damages from short circuit. Use this switch within the life cycles verified at the module level under the actual conditions.

A6. The flammability grade of plastic resin used in this switch is UL94HB. There is a risk of catching a fire.

A7. This switch shall not be disassembled or remodeled. Do not drop this switch. There is a risk of causing degraded performance, electrical shock, and/or burn-out.

A8. This switch must not be used in the atmosphere where flammable gas and/or explosive gas exist. There is a risk of sparking, thermal ignition and/or explosion when switch is operated. Under the actual usage conditions, there is a risk that unexpected accidents may occur. So, please confirm safety by the actual usage conditions.

A9. Under the actual usage condition, there is a risk that unexpected accidents may occur. Safety needs to be verified with the samples under the actual usage conditions.

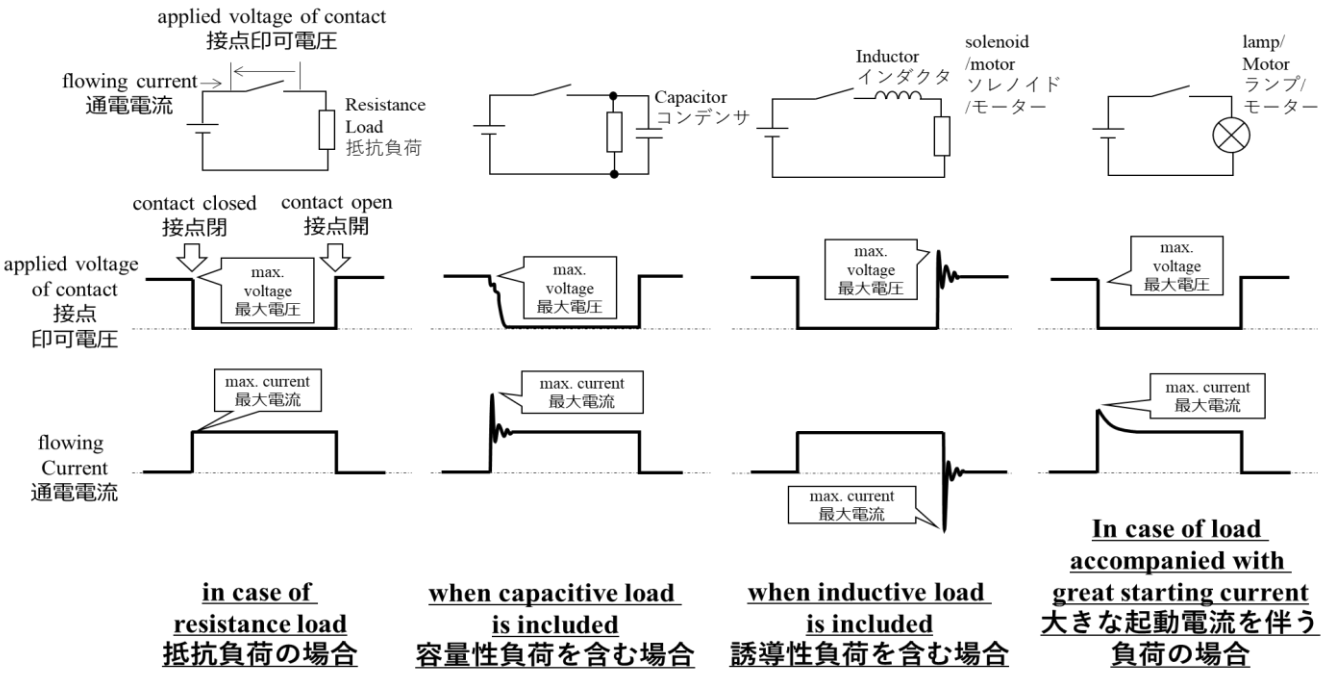
B.【Circuit design】

B1. This switch is designed for limited to DC resistive load. If operated with other than resistive load, surge voltage and/or inrush current may occur. This may potentially exceed the absolute maximum rating. This switch must be used within the specified absolute maximum rating under any situation. When use above the absolute maximum rating, the following mode may potentially occur:

-worn-out on contact area due to arc discharge.

-increased contact resistance due to various oxide (e.g. organic gas, siloxane)

-decreased durability life due to degraded insulator.



B2. In the circuit with bypass capacitor and/or inductor, the switch may be exposed to surge voltage and/or inrush current even for a second. Thereby, arc discharge may occur, possibly causing the mode listed in "B1". If such capacitor and/or indicator is used, a proper measure (e.g. connect resister in series circuit) should be taken. Please verify it under the actual usage condition that any voltage and current applied to the switch is within the absolute maximum rating.

B3. Bounce or chattering may occur, depending on the temperature conditions and/or push speed. Necessary measure (e.g. filtering in the circuit or software) must be taken to avoid malfunction due to signal noise or wrong pulse. Please verify it under the actual usage conditions that no malfunction is found.

C.【Mechanism design】

C1. This switch is designed to be normally opened. This switch shall not be used as normally closed.

C2. This switch is designed only for manual operation. This switch shall not be used for mechanical detection function. For detection function and purpose, please use detector switch.

C3. PWB shall be free from warpage. Such PWB warpage may cause switch breakage.

C4. If you consider using this switch for multiple applications, please use the suitable switch for each application.

C5. Warpage of PWB may cause degraded switch characteristic.

C6. When use a different PWB mounting hole and/or PWB footprints from our recommended dimensions, the prior consultation shall be made with us.

C7. This switch shall not be used in a manner that the stem or the projection will get a side force. If the side of stem or projection is pushed, the switch may be broken.

C8. Do not press-other than the center of stem, projection or metal dome.

C9. This switch shall not be used in a manner that the stem or the projection will get a side force. If the side of stem or projection is pushed, the switch may be broken. This switch shall not be kept “ON” for a long time. (refer to C1.)

C10. This switch shall not be exposed to force outside the product specification (refer to “stop strength”).

C11. Press the center of stem, projection or metal dome. Click feeling of switch may be degraded by off-center push including stem, projection or metal dome edge due to hinge construction and/or tolerance stack-up at module level. Hinge construction may cause slant angle push, causing switch to fail to make “ON”.

D.【Usage environment】

D1. Electrical, mechanical, durability life and environmental characteristics stated in this product specification are guaranteed respectively. These characteristics are not guaranteed in combination of each test conditions. When durability life test is done under temperatures, the switch performance and/or functionality may be affected. The switch performance needs to be verified under such specific conditions under temperatures.

D2. When this switch is used in Sulfur hot-spring area and/or near exhaust gas from vehicle, the switch functionality and performance may be degraded.

D3. This switch is not protected against water nor dust. Dust may come into inside of the switch, depending on the actual usage conditions. This may cause contact failure. The necessary protection or measure shall be taken to avoid dust from coming into inside of the switch.

D4. This switch shall not be used with the material that generate sulfide gas and oxidize gas (e.g. molded parts, rubber, adhesives. Mechanical actuator, or grease). This may cause corroded surface of the switch or increased contact resistance.

D5. This switch shall not be used with the materials that generate gas.

D6. Do not use this switch in high humidity and/or dew condensation conditions. It may cause current leakage between terminals.

D7. Materials such as adhesive. screw lock adhesive, grease/lubricants, coating, and organic solvents may potentially cause contact failure or switch breakage. Please verify it with the actual samples that such materials do not affect the switch function.

E.【Handling for assembly】

E1. When soldering the terminals of this switch, please take the below precaution in handling.

E1-1. Do not apply excessive heat to this switch. Soldering should be performed within the specified conditions. If excessive heat is applied to the switch, it may cause wobble, deformation and degraded electrical characteristic.

E1-2. Do not apply a load to the terminals when soldering. It may cause wobble, deformation and electrical characteristic.

E1-3. Do not use water-soluble flux for soldering. It may cause corrosion to the switch. In addition, please use flux amount proper enough to avoid flux flowing into the switch inside.

E1-4. After soldering, please do not wash this switch with any solvents.

E1-5. When using a through-hole PWB and /or thinner one than our recommendation, heat stress will be increased. So, please verified it with the actual soldering conditions.

E1-6. No clearance between the bottom of switch and PWB surface.

E1-7. Setting of soldering condition shall be verified under the actual production condition.

E1-8. The reflow soldering should be performed within the recommended condition. Otherwise, the click feeling may be degraded when the reflow heat is applied repeatedly.

E1-9. When PWB is split in-process after soldering, do not apply a load to this switch. There is a risk of the switch deformation

E1-10.When flow soldering the backside of PWB after reflow soldering this switch, flux may flow into inside of switch along the switch housing during the wave soldering process. No through-hole on PWB shall be designed underneath or near the switch.

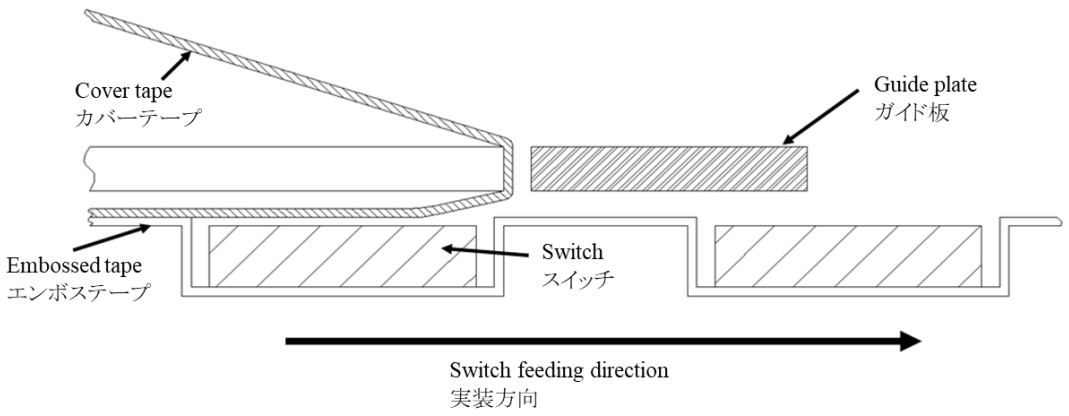
E1-11.Design and thickness of resist on PWB may affect solderability of the switch.

E2. In case ultrasonic welding is needed, such process shall be verified enough not to affect the switch functionality and performance as well as not to cause any damages. In such case, please review and use the suitable welding conditions, welding direction, and layout.

E3. The stem top surface shall not be vacuumed by pick/place machine. In such case, the switch may not be in a proper position for mounting on PWB. Metal frame shall be vacuumed.

E4. During the handling this switch, no force shall be applied to stem or projection of the switch. This may cause breakage. Also, the switch should not be stored in a manner that stem or projection is kept pressed.

E5. As per the below sketch, cover tape shall be set-up free from guide plate in order to prevent switch from being caught by cover tape during the mounting process.



E6. When using other than the recommended solder paste, the prior verification shall be done with the actual samples.

F.【Storage method】

F1. This switch shall be stored in the unopened original packaging and kept at room temperature and humidity, out of direct sunlight, and away from any and all corrosive gas. The switch shall be completely used as soon as possible, but no later than 6 months from the date of delivery. Once the original packaging is opened, repack the switch in the plastic bag to avoid outer air. Then, the switch should be stored in the same way as the above.

F2. This switch should be stored in our original packaging condition without overstocking and avoid deformation of cartoon box.