

Application Notes

When using our Push Switches, please observe the following items ("prohibited items") and be cautious of the following in order to prevent dangerous accidents and deterioration of performance.

1. Prohibited items and notes on mounting

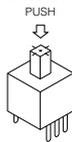
- When soldering (including preheating), do not solder in the locked condition.
- When soldering using a soldering iron, soldering conditions vary with the tip shape of the soldering iron, wattage, and PWB thickness. Thoroughly check the conditions in advance, including the heat resistance rating of the solder.
- Do not apply a load to terminals when soldering. Care should be taken in this regard because a load may deteriorate electric and mechanical characteristics.
- Since the push switches are not sealed, do not wash them.
- When mounting a push switch to a through-hole type PWB, the influence of thermal stress on the switch is greater than that on one-sided PWB. Be sure to check the influence as well as the heat resistance rating of the solder.

2. Notes on circuit conditions

- To ensure reliability, use switches within the rated range, as designated in "Product Specifications for Information."
- To avoid malfunction of a set due to bounce generated by turning the switch ON and OFF, and/or due to chatter generated by external vibrations, etc., take the following into consideration in design.
 - Read contact multiple times.
(In Case of microcomputer Processing)
 - Set a delay time.
(Recommendation: 3 or more times of reading with the cycle of 3 ms or over)
 - Prepare a CR integrating circuit.
(Recommendation: A time constant of 6 ms or over)
- When circuits of a two-circuit type are connected in parallel, switching timing (non-shortening, etc.) described in the specifications is not assured.

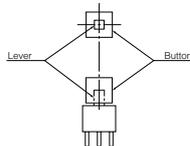
3. Prohibited items and notes on mounting and operating conditions

- In principle, operate the center of the lever.

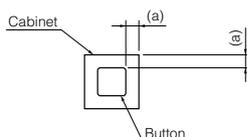


- For mounting an operation button:

- Design so that the button is mounted to the center of the lever.



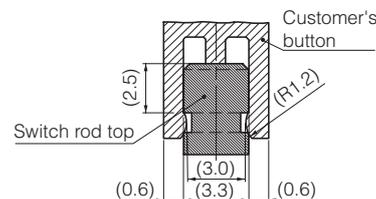
- Design a set so that the gap (a) between the cabinet and the button is as small as possible.
(a)=0.1 to 0.3mm



- Design so that the load in removal and mounting of the button is within the range of the switch's strength rating of the operational part.
- If multiple switches are placed side by side, or a switch is placed near another part, the gap between the switch and the adjacent switch/part must be at least 1mm to prevent affect of flux and to ensure proper insulation distance.

- Design and use so that external stress is not continuously applied to the soldering parts in a set. External stress may cause pattern peeling and solder cracks on a PWB.
- When mounting a switch, check the ON/OFF position.
- Contact lubricant, which is used in push switches, may flow out to the exterior of the switch due to the structure. For design review, sufficiently check the operating conditions.
- Do not pull the switch rod while it is locked. Otherwise, the self-locking function may be broken, resulting in a locking failure or malfunction. Make sure that the switch is released especially when attaching/detaching a button to the rod and assembling/disassembling the target product. (This applies to the self-locking switches) Set the strength for detaching your button (knob) from our switch rod to a maximum of 10 N in order to minimize the possibility of a breakdown of the locking function. When designing your button, refer to the following shape and dimensions.
Before adopting our switches, check the requirements carefully.

Reference of Customer's button design



- Design to avoid operation with continuous lateral pressure (more than 500 mN on the lever).
- Do not mount a switch by bending switch terminals.
- Avoid the following ambient surroundings and other conditions because they may affect performance:
 - Under an atmosphere of corrosive gas such as Cl₂, H₂S, NO_x, or SO₂
 - In atmospheres of residual water drops, dew condensation, or adhesive water drops
 - In liquids such as water, salt solution, oil, chemicals, and organic solvents
 - In direct sunlight
 - In dusty locations
- Do not apply a shock to the switch lever during mounting of the switch on the printed circuit board and installation in the target product.

4. Prohibited items and notes on storage conditions

Since contact characteristics and soldering quality may deteriorate due to sulfuration and oxidation of contacts and terminals, pay heed to the following items.

- For storage and transport of the switches, avoid unpacking them, and store them at room temperature and room humidity. Use them as soon as possible, generally within 3 months, or within a maximum of 6 months after delivery.
- Do not store the switches under conditions of high temperature and/or high humidity, or in a location where corrosive gas may be generated.
- If some units remain after unpacking, store them after applying adequate moisture-proof and gas-proof treatment.

5. For use in equipment for which safety requested

Although care is taken to ensure switch quality, variation of contact resistance (increase), short circuits, open circuits, and temperature rise are some problems that might be generated. To design a set which places maximum emphasis on safety, review the affect of any single fault of a switch 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
- preparing a redundant circuit to improve system safety so that the single fault of a switch does not cause a dangerous situation.

- For actual use, be sure to refer to "Product Specifications for Information."

■ Common Specifications

Mechanical Specifications	Lever Strength	To withstand 30 N push force applied in operating direction for 15 seconds [ESE20: 50 N for 10 seconds, ESB30: 10N for 15 seconds]																		
	Terminal Strength	To withstand 5 N push force applied on the end of terminal in any direction for 1 minute without damage and/or loosening																		
Electrical Specifications	Contact Resistance	ESB64	40 mΩ max.																	
		ESB30, ESE20, ESB32, ESB33	100 mΩ max.																	
	Voltage drop	0.1 V max.																		
	Insulation Resistance	Terminal to Terminal and Terminal to Frame: 100 MΩ min. (at 500 Vdc)																		
Dielectric Withstanding Voltage	Terminal to Terminal and Terminal to Frame: 500 Vac for 1 minute																			
Environmental Specifications	Temperature Range	-10 °C to +70 °C (ESE20/ESB30/ESB33: -30 °C to +80 °C)																		
	Heat Resistance	+70 °C for 96 hours (ESE20/ESB30: +85 °C for 96 hours)																		
	Low Temperature Resistance	-10 °C for 96 hours (ESE20/ESB30: -40 °C for 96 hours)																		
	Humidity Resistance	40 °C, 90 % to 95 % RH for 96 hours (ESE20/ESB30: +60 °C)																		
	Non-loaded Life	Number of operations: 10000 cycles Contact resistance: 50 mΩ max.																		
	Loaded Life	<table border="1"> <thead> <tr> <th>Type</th> <th>No. of operations</th> <th>Contact resistance</th> </tr> </thead> <tbody> <tr> <td>ESB64</td> <td>10000 cycles</td> <td>100 mΩ max.</td> </tr> <tr> <td>ESB33</td> <td>30000 cycles</td> <td>0.5 V max.</td> </tr> <tr> <td>ESB30</td> <td>30000 cycles</td> <td>0.2 V max (By voltage drop at 0.1 A 12 Vdc)</td> </tr> <tr> <td>ESE20</td> <td>30000 cycles</td> <td>200 mΩ max.</td> </tr> <tr> <td>ESB32</td> <td>10000 cycles</td> <td>150 mΩ max.</td> </tr> </tbody> </table>	Type	No. of operations	Contact resistance	ESB64	10000 cycles	100 mΩ max.	ESB33	30000 cycles	0.5 V max.	ESB30	30000 cycles	0.2 V max (By voltage drop at 0.1 A 12 Vdc)	ESE20	30000 cycles	200 mΩ max.	ESB32	10000 cycles	150 mΩ max.
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