

ONLY FOR REFERENCE

Standard Spec Sheet

Mitsumi Model Name	SOV-169HST
Mitsumi Model No.	R 66 7844
Operating Force	3.5N
Pcs/Reel	5,000

This specification is only for reference. If you have any questions for the details, please contact SW engineering division.

For your adopting the products, the formal supply specification will be provided.

MITSUMI ELECTRIC CO.,LTD.

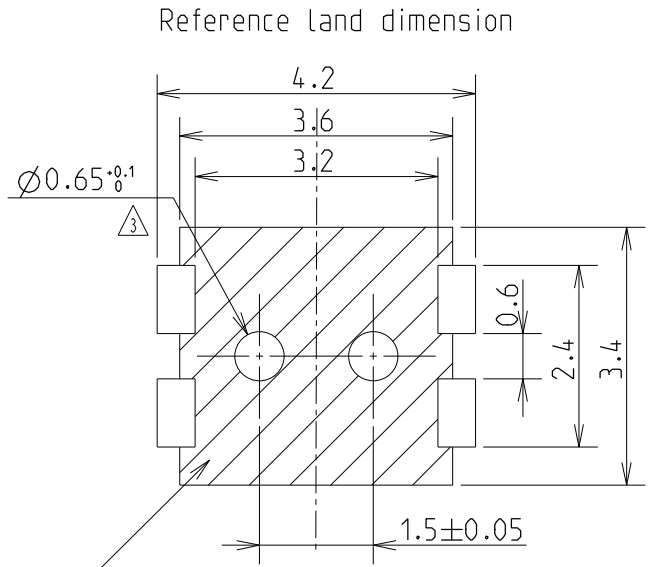
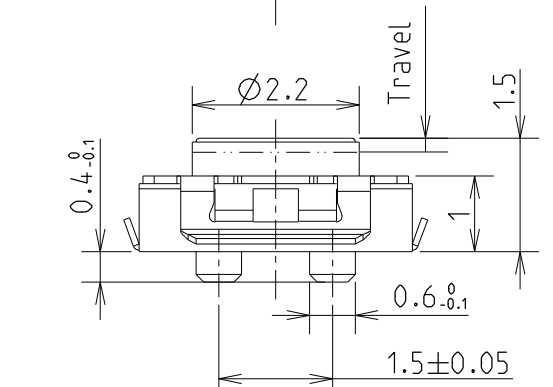
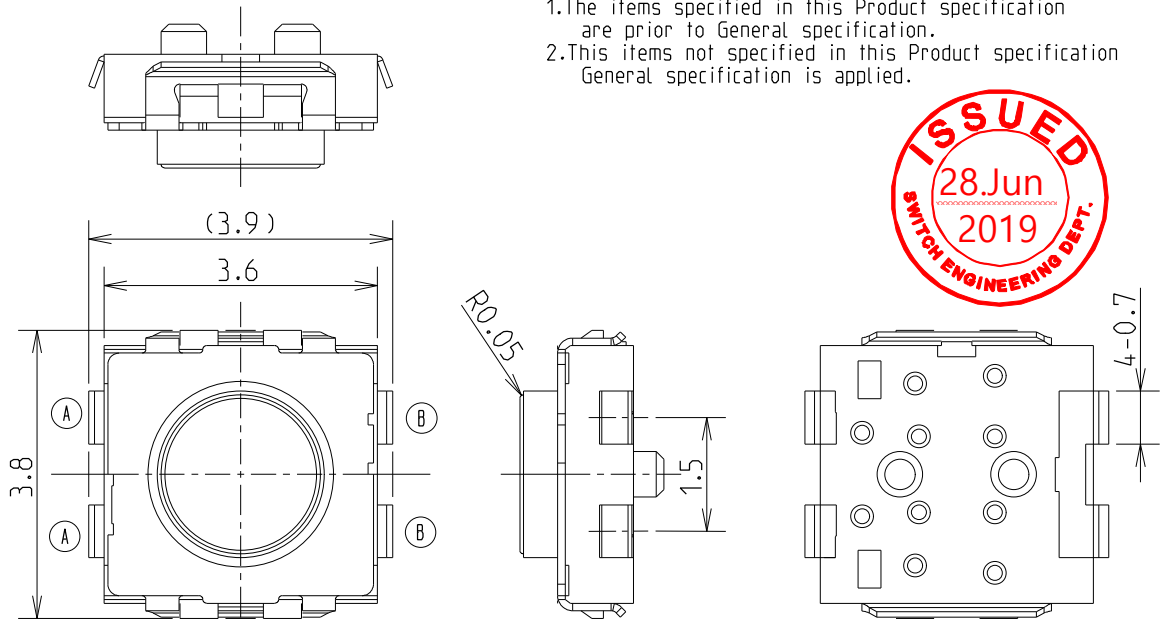
2-11-2, Tsurumaki, Tama-shi. Tokyo 206-8657 Japan.

SWITCH ENGINEERING SECTION

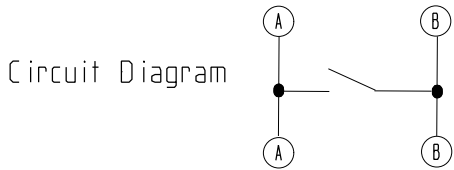
1049, Tateiwa, Iizuka-shi. Fukuoka 820-8533 Japan.

778L File No.	Product Specification With Button Tactile Switches SOV-169HST		Approved May-21-16 SW eng. M.Kumagai	Checked May-21-16 SW eng. L.Liu	Drawn May-21-16 SW eng. XJ.Wang
	Customer's Name	Customer's Parts No.	General Specification	Issued	
-	-	S66-1806	Apr-05-16		

- 1.The items specified in this Product specification are prior to General specification.
- 2.This items not specified in this Product specification General specification is applied.



Operating force	3.5±1.0 [N]
Return Force	0.2 [N] Min
Travel	0.14±0.1 [mm]
Contact Resistance	1.0 [Ω] Max
⚠ Operating life	500,000 cycles
⚠ Max Rating	50mA, 12V DC (Resistive load)



Metal Mask thickness: 100μm
Do not pattern on hatching area

RoHS compliant (2011/65/EU)

Environmental classification	G
Parameter sheet result	N
Development Class	2

Rev. 3	x1 Corrected land dimension. (Added through holes)	Jun-27-19	Inoue
Rev. 2	x1 Added Max Rating	Jun-13-18	Inoue
Rev. 1	x1 Added Cycle operation	May-09-16	XJ.Wang

Third Angle Projection	Scale	Tolerance	Ass'y dwg. no.
	10:1	+/-0.15	66-9993L

QA process flow chart	Product inspection standard	Model code	Code	Indent.No.	File No.
Q66-0759	166-8495	1469	R	66	7844 03

908L

General specification
Tactile switches
SOV series

Approved

Mar. 30.'16
SW eng.
Kumagai

Checked

Mar. 30.'16
SW eng.
Lei.Liu

Drawn

Mar. 30.'16
SW eng.
XinJian.Wang

Released

Mar. 30. '16

1. General

1.1. Application

This specification is applied to Tactile switches named SOV series.

1.2. Operating temperature range: -40 to +60 deg-C

1.3. Storage temperature range: -25 to +85 deg-C (Product level)
-20 to +50 deg-C (Taped condition)

1.4. Test conditions

Normal temperature; 5 to 35 deg-C, normal humidity; 45 to 85% RH.

If any doubt arises from judgement, tests and measurements shall be conducted under the following conditions.

Temperature 20+/- 2deg-C, humidity 65+/-5% RH, and air pressure 86 to 106 kPa.

2. Appearance and Construction

2.1. Dimensions: Specified on Product specifications.

2.2. Materials: Refer to Table-1.

2.3. Appearance: There shall be no defects that affect the performance of the products such as crack, scratch, dirt, discoloration, and contamination.

2.4. Cross section view:

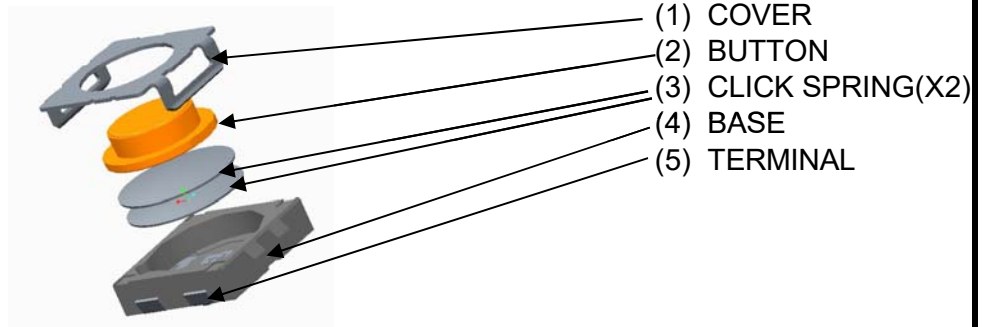


Fig. 1: Cross section of product

Table-1

Components	Material	Note
(1) COVER	Stainless steel	
(2) BUTTUN	6T Nylon	
(3) CLICK SPRING	Stainless steel	Ni+Ag plated
(4) BASE	6T Nylon	
(5) TERMINAL	Phosphor bronze	Ag plated

3. Rating

Specified on Product specification.



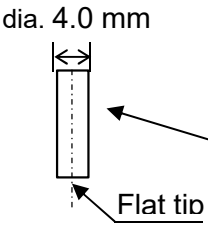
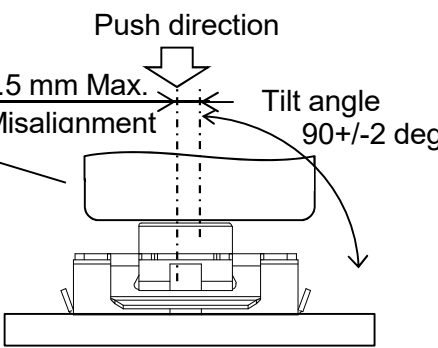
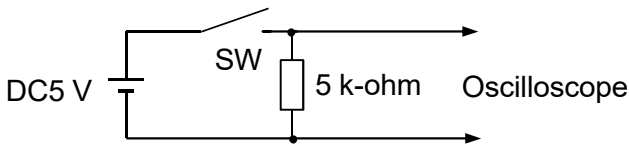

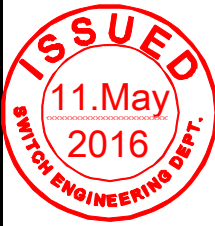
Revision				

Code Division File No.

S 66 1806



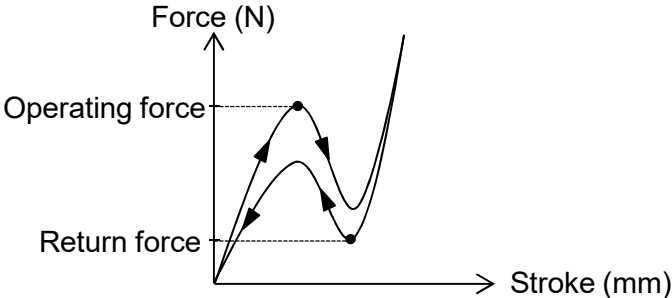
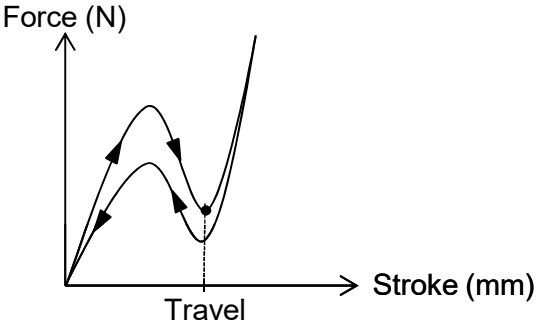
4. Electric Characteristics

Item	Test conditions	Criteria
4.1. Contact resistance	<p>Measurements shall be made under the conditions shown in Fig. 3.</p> <ol style="list-style-type: none"> 1) Load: 2 times of the specified standard operating force. 2) Measurement conditions: Contact resistance meter at 20 mV Max. and 50 mA Max. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>dia. 4.0 mm Flat tip</p> <p>(Material: Stainless steel)</p> <p>Fig. 2: Push rod</p> </div> <div style="text-align: center;">  <p>Push direction 0.5 mm Max. Misalignment Tilt angle 90 +/- 2 deg</p> <p>Fig. 3: Measurement conditions</p> </div> </div>	Specified on Product specifications.
4.2. Insulation resistance	<p>Measurements shall be made under the following conditions.</p> <ol style="list-style-type: none"> 1) Applied voltage: 100 V, DC 2) Duration: 1 min. 3) Applied position: Between terminals. 	10 M-ohm Min.
4.3. Withstanding voltage	<p>Measurements shall be made under the following conditions.</p> <ol style="list-style-type: none"> 1) Applied voltage: 100 V, AC (50/60 Hz) 2) Duration: 1 min. 3) Leak current: 2 mA 4) Applied position: Between terminals. 	There shall be no damage and breakdown.
4.4. Bounce	<p>Measurements shall be made under the conditions shown in Fig. 3.</p> <p>Bounce time at "ON" and "OFF" shall be measured under the following conditions.</p> <ol style="list-style-type: none"> 1) Circuit: Refer to Fig. 4. 2) Load: 1.5 times of the specified standard operating force. 3) Frequency of operation: 3 to 4 times/sec. <div style="display: flex; justify-content: center; align-items: center;"> <div style="text-align: center;">  <p>DC 5 V SW 5 k-ohm Oscilloscope</p> <p>Fig. 4: Circuit</p> </div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p>"ON" "OFF"</p> <p>"ON bounce" "OFF bounce"</p> <p>Fig. 5: Bounce</p> </div> </div>	<p>ON bounce: 10 ms Max.</p> <p>OFF bounce: 10 ms Max.</p> <div style="text-align: right; margin-top: 20px;">  </div>

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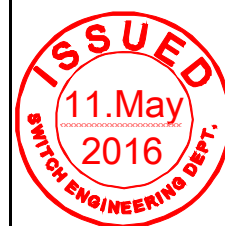
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5. Mechanical Characteristics

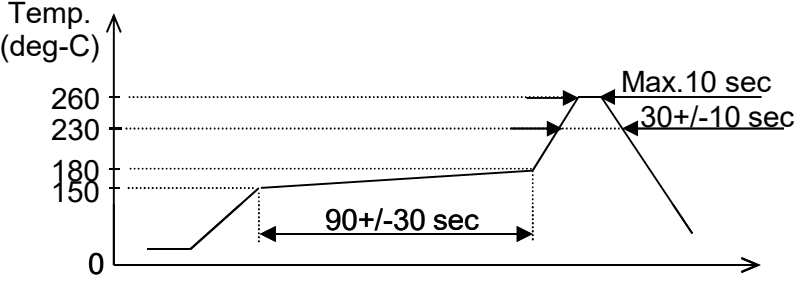
Item	Test conditions	Criteria
5.1. Operating force 5.2. Return force	Measurements shall be made under the conditions shown in Fig. 3 just after striking 10 times lightly. 1) Measurement speed: 0.5 mm/sec. 2) Limit load to apply: 1.5 to 2 times of the specified standard operating force.  Fig. 6: Force-Stroke curve	Specified on Product specifications.
5.3. Click ratio	Refer to 5.1 and 5.2 for the measurement conditions.  Fig. 7 Force-Stroke curve	Specified on Product specifications.
5.4. Stopper strength	Measurements shall be made under the conditions shown in Fig. 3 and at returned condition. Load: 30 N Duration: 15 sec.	There shall be no electrical and mechanical abnormality.
5.5. Impact resistance	Measurements shall be made after testing under the following conditions. 1) Acceleration: 735 m/s ² 2) Duration: 6 msec 3) Test direction: 6 directions 4) Number of test: 3 times per direction (18 times in total)	
5.6. Vibration resistance	Measurements shall be made after testing under the following conditions. 1) Vibration frequency range: 10 to 55 Hz 2) Amplitude: 1.5 mm (peak-to-peak) 3) Sweep ratio: 10-55-10 Hz in approx. 1 min. 4) Frequency sweep mode: Logarithmic or Linear sweep 5) Direction of vibration: 3 orthogonal directions including the direction of operation. 6) Duration: 2 hr each (6 hr in total)	

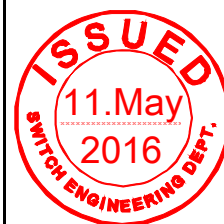
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5. Mechanical Characteristics

Item	Test conditions	Criteria
5.7. Solderability	Measurements shall be made under the following conditions. 1) Solder temperature: 230 +/- 5 deg-C 2) Dipping time: 3 +/- 0.5 sec. 3) Composition of solder: Sn-3.0Ag-0.5Cu 4) Soldering flux: Rosin 25%, Alcohol 75%	More than 75% of dipped part shall be covered with solder.
5.8. Soldering heat resistance	1) Hand soldering 1-1) Temperature of soldering iron tip: 350 +/- 5 degrees C 1-2) Soldering time: 3 +1/-0 seconds 1-3) The soldering iron should be applied to the terminals. 1-4) Excessive load should not be applied. 1-5) Power of the soldering iron should not exceed 15 W. 2) Measurements shall be made after reflow soldering under the following conditions. 2-1) Heating method: Far-infrared radiation heating 2-2) Temperature profile : As shown in below. 2-3) Allowable soldering process: 2 times Max.  <p style="text-align: center;">Fig. 8: Reflow soldering profile Time (sec)</p> <p>The condition mentioned above is a temperature on the PWB surface on which parts are mounted. There are cases where board's temperature greatly differs from switch's surface temperature, depending on board's material, size, thickness, etc. Please care, therefore, should be used not to allow switch's surface temperature to exceed 260°C.</p> <p>The above temperature profile is the conditions for heat resistance test. Therefore, conditions of soldering shall be confirmed under actual production conditions.</p>	There shall be no abnormality such as marked looseness, drop-off, and assured 4. Electrical Characteristics. Operating force: Item 5.1.



5.9. Precautions for soldering

- 1) Do not overheat when you solder with soldering iron.
- 2) Following the soldering process, do not try to clean the switch with a solvent or the like.
- 3) Safeguard the switch assembly against flux penetration from its top side.
- 4) As the conditions vary somehow on the kind of reflow soldering equipment, please make sure you have the right one before use.
- 5) As the click ratio may deteriorate when a high heat load is applied, reflow soldering should be performed in the shortest period and at the lowest temperature possible.
- 6) Please use the proper amount of solder in order to prevent the flux penetration into the switch.
- 7) Switch terminals and PWB upper face shall be free from flux prior to soldering.
- 8) Note that if the load is applied to the terminals during soldering it might cause deformation and defects in electrical performance.

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6. Durability

Item	Test conditions	Criteria
6.1. Operating life	<p>Measurements shall be made after testing under the following conditions.</p> <ol style="list-style-type: none"> 1) Electrical load:DC12V 50mA 2) Rate of operation: 2 cycles/sec. 3) Depression: The maximum value of specified operating force. 4) Cycles of operation: Specified on the product specification. 5) Push rod:Material: Stainless steel Φ 4.0Flat 	<p>Contact resistance: 20 ohm Max.</p> <p>Insulation resistance: 10 M-ohm Min.</p> <p>Withstanding voltage: Item 4.3.</p> <p>Bounce (ON/OFF): 20 msec Max.</p> <p>Operating force: Within +/-30% of specified initial value.</p> <p>Travel: Item 5.3.</p>

7. Environmental

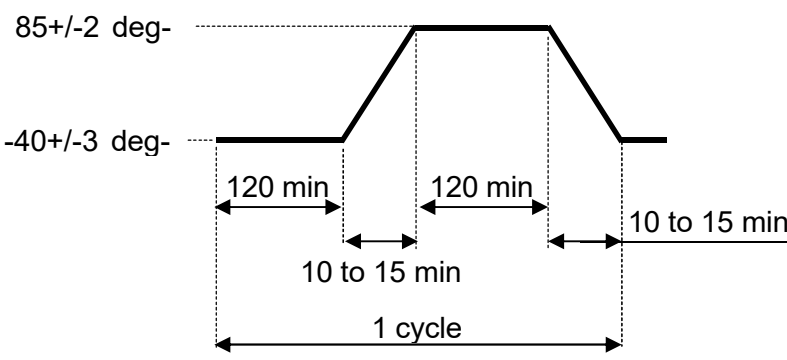
Item	Test conditions	Criteria
7.1. Humidity resistance	<p>Following the test set forth below the sample shall be left in normal temperature and humidity conditions for 1 hr before measurements are made.</p> <p>Water drops shall be removed.</p> <ol style="list-style-type: none"> 1) Temperature: 65+/-2 deg-C, Humidity: 90 to 96% RH 2) Duration: 96+/-5 hr 	<p>Contact resistance: 1 ohm Max.</p> <p>Insulation resistance: 10 M-ohm Min.</p>
7.2. Heat resistance	<p>Following the test set forth below the sample shall be left in normal temperature and humidity conditions for 1 hr before measurements are made.</p> <ol style="list-style-type: none"> 1) Temperature: 85+/-3 deg-C 2) Duration: 96+/-5 hr 	<p>Withstanding voltage: Item 4.3.</p> <p>Bounce (ON/OFF): 20 msec Max.</p>
7.3. Cold resistance	<p>Following the test set forth below the sample shall be left in normal temperature and humidity conditions for 1 hr before measurements are made.</p> <p>Water drops shall be removed.</p> <ol style="list-style-type: none"> 1) Temperature: -40+/-3 deg-C 2) Duration: 96+/-5 hr 	<p>Operating force: Within +/-30% of specified initial value.</p> <p>Travel: Item 5.3.</p>



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7. Environmental

Item	Test conditions	Criteria
7.4. Temperature cycling	<p>Following continuous 5 cycles of the temperature cycling test set forth below, the sample shall be left in normal temperature and humidity conditions for 1hr before measurements are made.</p>  <p>Fig. 9: Temperature cycling test conditions</p>	<p>Contact resistance: 1 ohm Max.</p> <p>Insulation resistance: 10 M-ohm Min.</p> <p>Withstanding voltage: Item 4.3.</p> <p>Bounce (ON/OFF): 20 msec Max.</p> <p>Operating force: Within +/-30% of specified initial value.</p> <p>Travel: Item 5.3.</p>

8. Use Condition

- 8.1. Operating temperature range: Refer to the item 1.2.
(Temperature range which the product is ON and OFF electrically.)
There shall be no freezing and condensation.

8.2. Using environment

- 1) Do not expose the products to corrosive gas such as sulfur gas and salty wind.
- 2) Visible dust must be cleared.
- 3) Please do not apply excessive load to the products to avoid deformation and deterioration.

9. Storage Condition

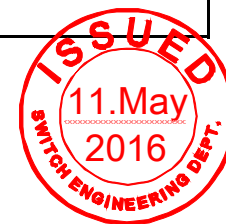
- 9.1. Storage temperature range: Refer to the item 1.3. There shall be no freezing and condensation.

9.2. Environment

- 1) Do not expose the products to corrosive gas such as sulfur gas, and salty wind.
- 2) Visible dust must be cleared.
- 3) Please do not apply excessive load to the products to avoid deformation and deterioration.

9.3. Storage method

- 1) Products shall be packed in an airtight plastic bag and stored in cool place avoiding direct sunshine.
- 2) Do not stack too many switches for strafe. Shall be free from high temperature and high humidity.
- 3) Do not store the products in the state of applying load on it's operation area.
- 4) Products should be used within six months after the date of delivery.



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10. Precautions in Use

- 10.1. Do not clean the products with a solvent or the like.
- 10.2. Do not use the products with beyond the rated current and voltage.
- 10.3. Do not apply excessive load to the terminals and the operating part.
- 10.4. Larger static load than specified and/or shock shall not be applied to the operating part.
- 10.5. After mounting the products on PWB/FPC, please do not stack too many PWB/FPC in order to avoid excessive load to the switch mounted area.
- 10.6. The dimensions of a pattern on PWB/FPC shall refer to the recommended dimensions in Product specifications.
- 10.7. Use of organic acid flux shall be avoided because it may cause corrosion of the switch. Please make sure the type of flux before you use it.
- 10.8. As this switch is designed for reflow soldering, if you place it at the edge of PWB for convenience, then flux may get into the sliding part of the switch during automatic dip soldering after being mounted, so do not apply auto dip after being mounted.
- 10.9. If the switch is given stress from the side, the cover may drop off and it may result in damages to switch functions. Therefore, please handle it with extreme care.
- 10.10. The operating part should be moved to the appointed position in order to ensure proper operation.
- 10.11. If you use this product in one of the following environmental conditions, progress of sulfuration and oxidization on the contact part (silver) will be accelerated, which may cause contact failure. Therefore, be careful about the operation environment.
 - 1) Around a sulfarate hot spring where sulfide gas is generated.
 - 2) In case this product is always used in a place where exhaust gas from automobiles exist.
- 10.12. Unless provided for otherwise, the products have been designed and manufactured for application in equipment and devices which are sold to end users in the market, including audio-visual equipment, electrical home appliances, office machines, information and communication equipment, and amusement equipment. The products are not intended for use in, and must not be used for, any application for nuclear equipment, driving equipment for aerospace or any other unauthorized use. With the exception of the abovementioned prohibited applications, please contact us (MITSUMI) and/or evaluate the total system regarding applicability for applications involving high levels of safety and liability such as medical equipment, burglar alarm equipment, disaster prevention equipment and undersea equipment. Please also incorporate fail-safe design, protection and redundant circuitry, malfunction protection, and/or fire protection into the complete system to ensure safety and reliability of the total system.
- 10.13. If you intend to use the products for automotive, please let us know beforehand.
- 10.14. If you push the edge of stem, the switch might not operate properly. An actuator to push the stem of switch in device case needs to be designed to touch the whole surface of the stem evenly.

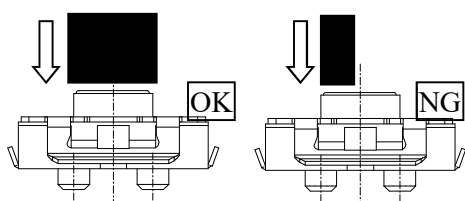
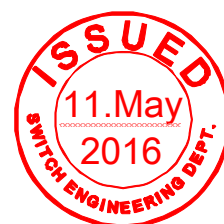


Fig. 10



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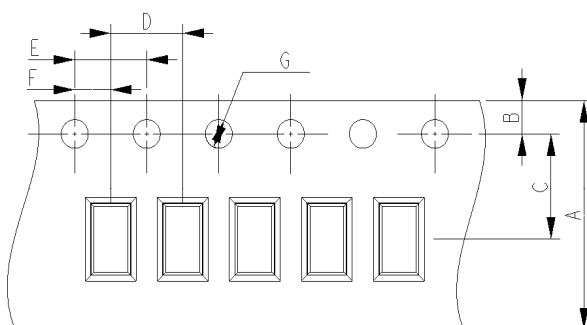
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11. Packing Specification

11.1. Dimensions of carrier tape are as shown below.

11.2. Taping rule

- 1) Tape winding direction is in clockwise.
(When pulling the tape toward, feeding holes should be located on the right side.)
- 2) Feeding holes shall not be covered with the cover tape.
The cover tape shall not be run off the edge of the carrier tape.
- 3) 160 mm or more from the end of trailer tape part shall be empty.
- 4) The leader part shall be 400 mm or more and it should include 100 mm of empty part.
The leader part shall have 20 to 30 mm of un-sealed cover tape.
- 5) The top tape of the leader part shall be stuck on the side of the reel by 30 to 50 mm using adhesive tape.
- 6) Peeling strength of cover tape from carrier tape is 0.1 to 1.3 N at 165 to 180 deg.
- 7) Bar-code label and Mitsumi label shall be stuck on the side of the reel.
- 8) The products shall free drop from the reversed carrier tape without cover tape after pressing at 0.1 to 0.2 N force.
- 9) Continuous two missing switches shall not be allowed.
Total number of missing switches shall be 0.1% or less of the packed quantity per reel.
- 10) Switch shall be packed in single direction.
- 11) 5,000 switches shall be packed in a reel.



A	B	C	D	E	F	G
12	1.75	5.5 +/-0.1	8+/-0.1	4+/-0.1	2+/-0.1	dia.1.5

Fig. 11 Carrier tape dimensions

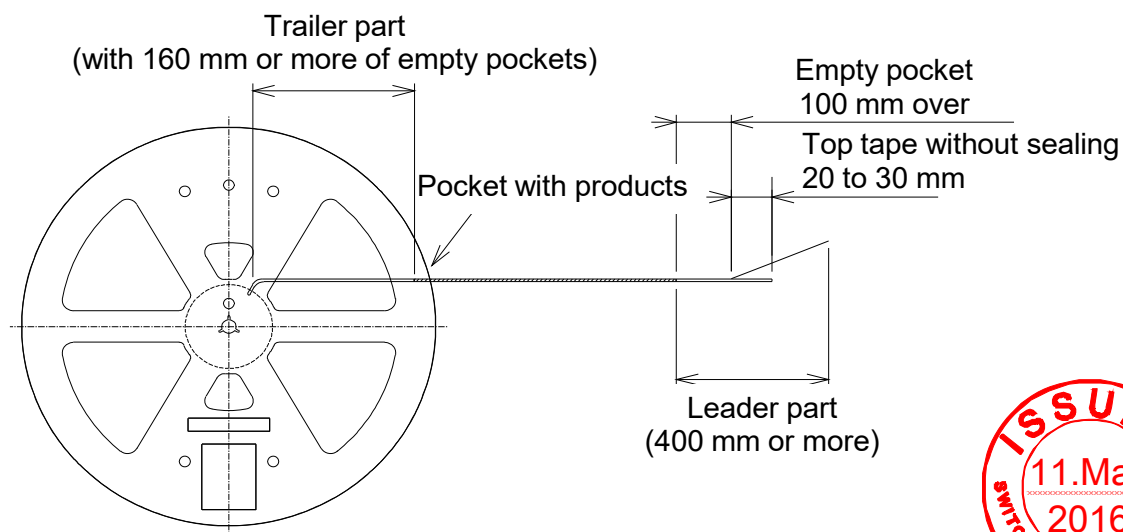
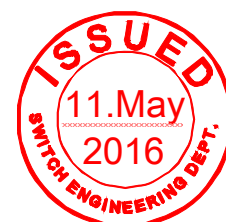


Fig. 12 Taping specification

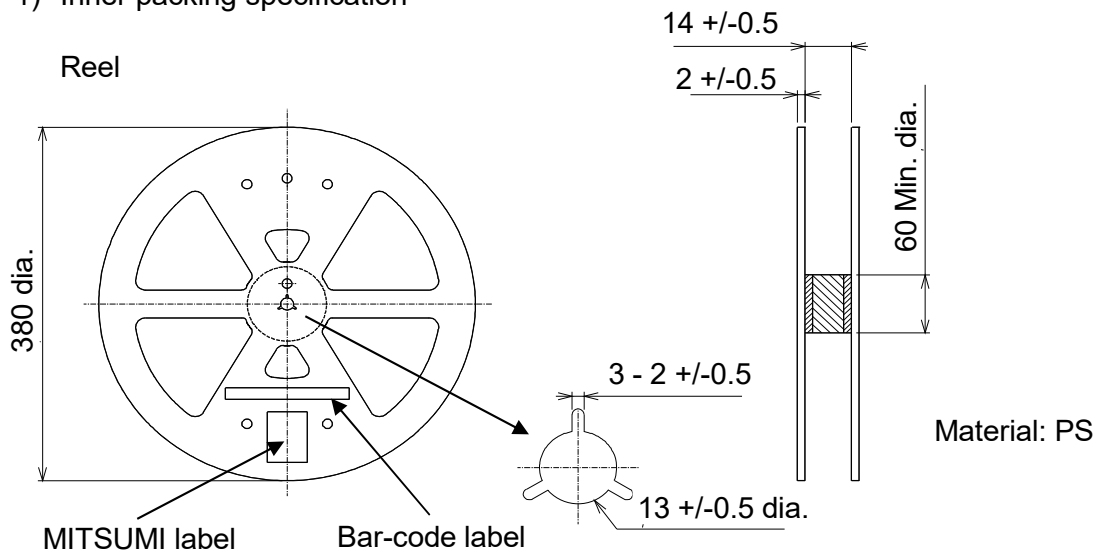


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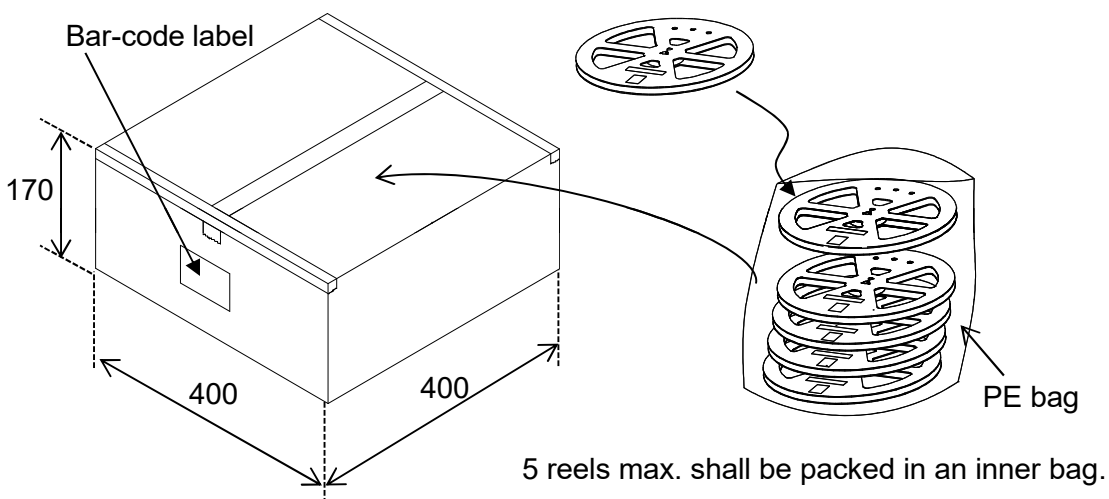
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12. Packing Specification

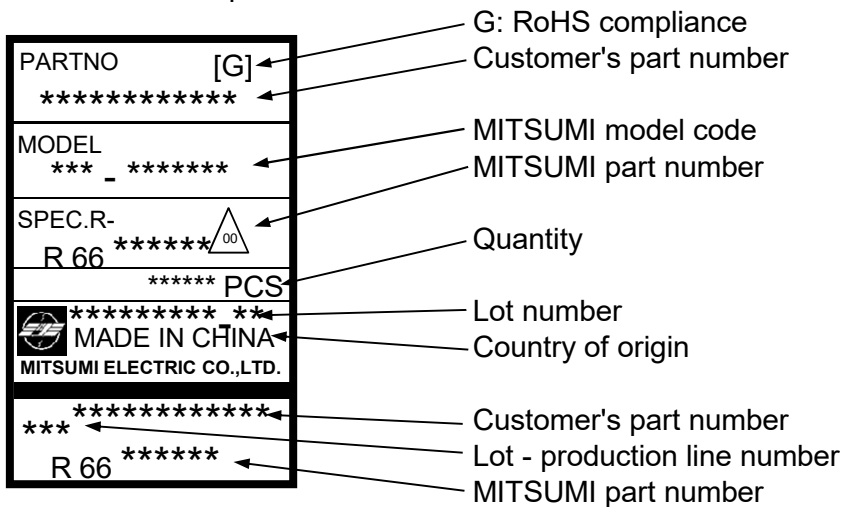
1) Inner packing specification



2) Outer box specification



3) MITSUMI label specification



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