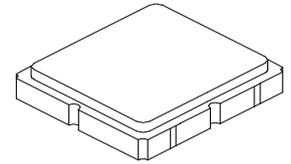


**SAFDC312MSQ0T91R05**

**312.150 MHz  
SAW Filter**



**SM3030-6**

1. Scope

This delivery specification specifies the SAFDC312MSQ0T91R05 surface wave filter for the 300MHz band used for communication equipment. Please contact us in advance if you intend to use the product for other purposes.

- Country of Origin: Taiwan
- AEC-Q200 Qualified

2. Customer Part Number if Applicable

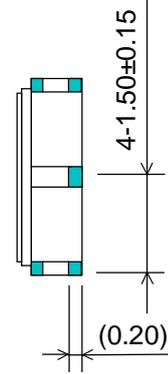
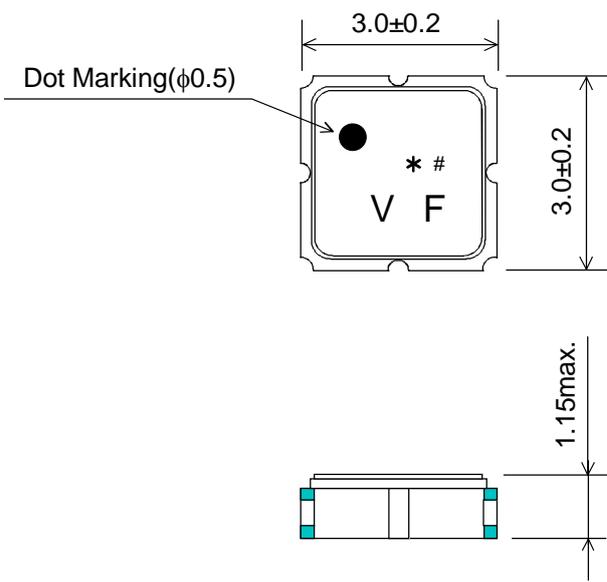
Customer No.		Customer Dwg No.	
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3. RFMi Number

SAFDC312MSQ0T91R05	Tape/Packing (5000 pieces)
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4. Dimensions

4.1 External dimensions



Marking : Laser Printing

\* EIAJ Code

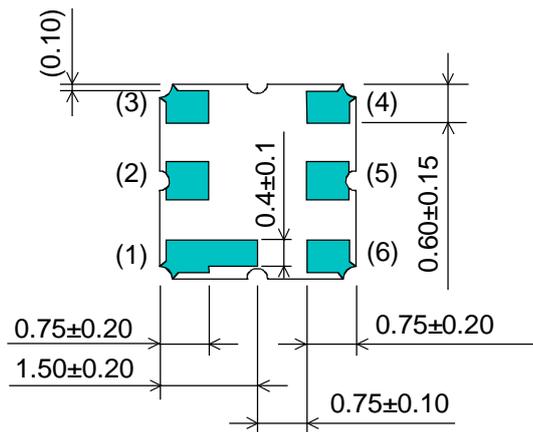
Terminal(Surface) : Au  
 thickness 0.3...1.0μm  
 (Typ. 0.6μm)

Terminal(Base) : Ni  
 thickness 2.0...8.0μm  
 (Typ. 3.5μm)

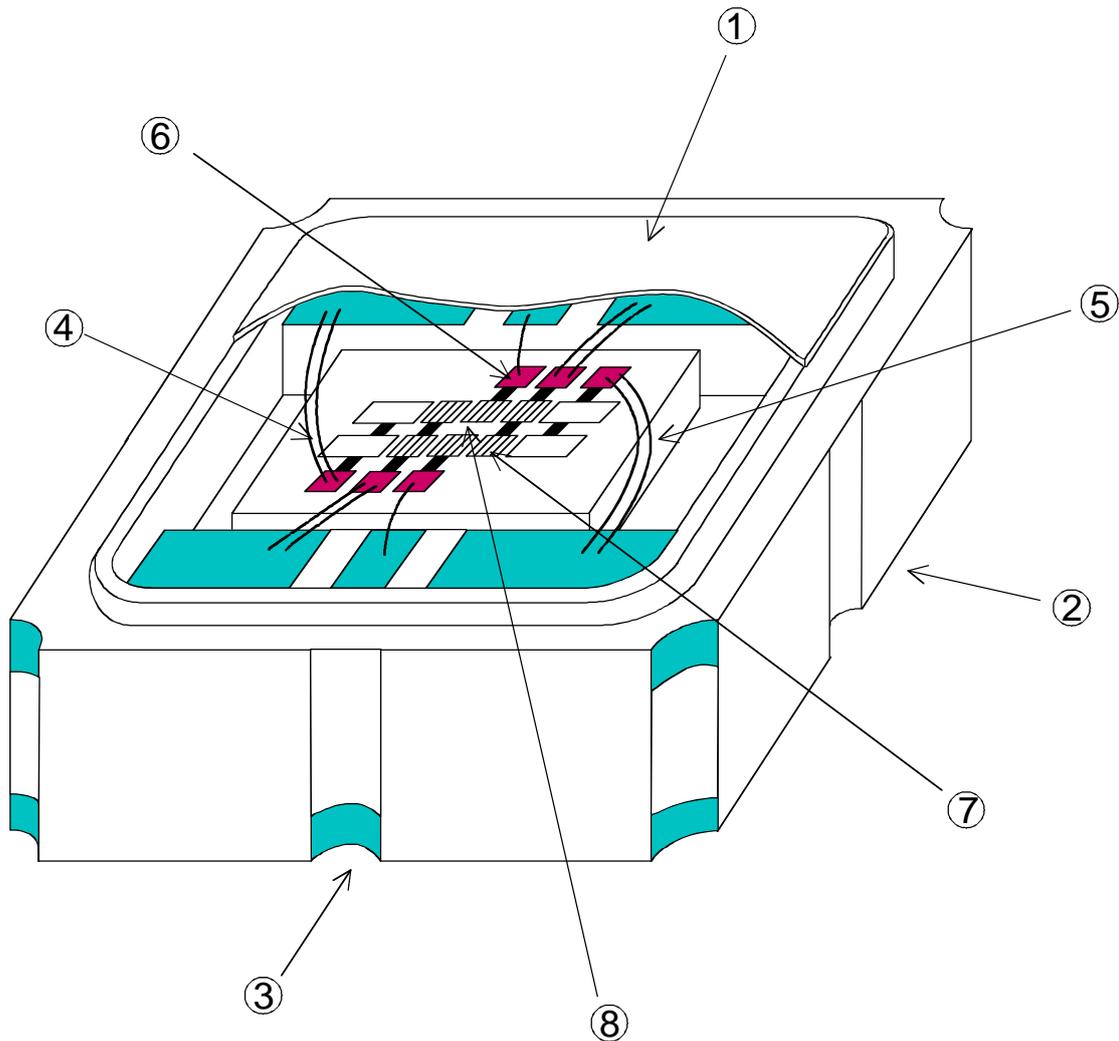
Terminal Assignments  
 (2) : Input  
 (5) : Output  
 Others : Ground

Weight : 32±5mg  
 Coplanarity : 0.1mm max.

Unit : mm



#### 4.2 Internal structure diagram



	Product Name	Material
①	Metal lid	Kovar, Ni plating
②	Multilayer ceramic	Alumina
③	Terminal	Au plating
④	Bonding wire	Al
⑤	Piezoelectric substrate	LiTaO <sub>3</sub>
⑥	Wire bonding pad	Al/Cu
⑦	I D T (Interdigital transducer)	Al/Cu
⑧	Protective film	SiO <sub>2</sub>

## 5. Maximum Ratings

5.1	Withstanding Voltage for short term between the terminals	Maximum allowable voltage 10V (Insulation resistance 10MΩ or more, 25 ± 2 °C)
5.2	D. C. Voltage between the terminals	Maximum allowable capacity 3V (25 ± 2 °C)
5.3	Allowable input level	1) 1 minute at 30mW (+ 14.8dBm) 2) 1000 hours at 20mW (+ 13dBm)
5.4	Operating Temperature	-40~+110°C
5.5	Storage Temperature	-40~+110°C

## 6. Electrical performance

### 6.1 -40~+110°C

	Item	Specifications	Initial room temperature
6.1.1	Nominal center frequency (fc)	312.15 MHz	
6.1.2	Insertion loss		
	1) 311.65 ~ 312.65 MHz (Passband width)	2.5 dB max	1.7 dB
	2) 10 ~ 270 MHz	55 dB min	70 dB
	3) 270 ~ 287 MHz	50 dB min	60 dB
	4) 287 ~ 292 MHz	50 dB min	58 dB
	5) 297 ~ 302 MHz	35 dB min	45 dB
	6) 306.65 ~ 307.15 MHz	32 dB min	47 dB
	7) 307.15 ~ 307.65 MHz	25 dB min	42 dB
	8) 322 ~ 327 MHz	27 dB min	31 dB
	9) 332 ~ 337 MHz	40 dB min	56 dB
	10) 347 ~ 650 MHz	40 dB min	54 dB
	11) 650 ~1000 MHz	23 dB min	44 dB
6.1.3	Ripple deviation (within 311.65-312.65MHz)	1.5 dB max	0.2 dB
6.1.4	VSWR (within 311.65 to 312.65MHz)	3.0 max	1.4

## 6.2 -40~+85°C

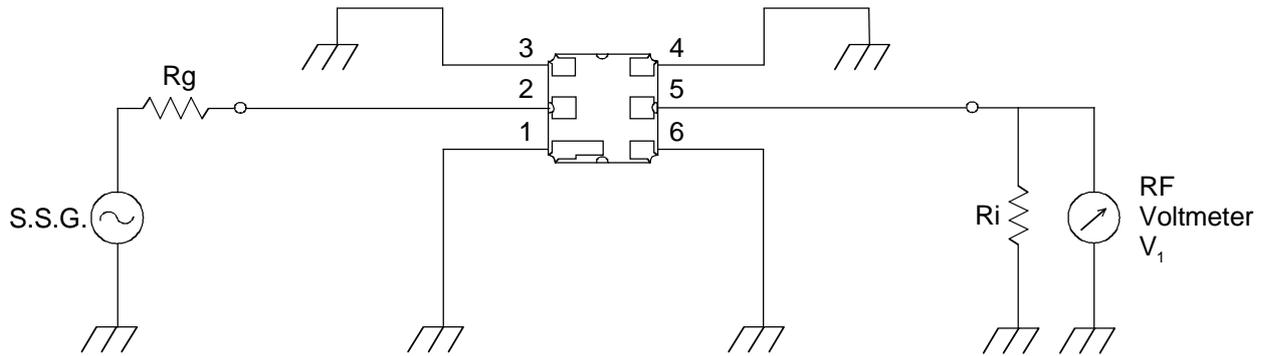
	Item	Specifications	Initial Room Temperature
6.2.1	Nominal center frequency (fc)	312.15 MHz	
6.2.2	Insertion Loss		
	1) 311.65 ~ 312.65 MHz (Passband width)	2.5 dB max	1.7 dB
	2) 10 ~ 270 MHz	55 dB min	70 dB
	3) 270 ~ 287 MHz	50 dB min	60 dB
	4) 287 ~ 292 MHz	50 dB min	58 dB
	5) 297 ~ 302 MHz	35 dB min	45 dB
	6) 306.65 ~ 307.15 MHz	35 dB min	47 dB
	7) 307.15 ~ 307.65 MHz	27 dB min	42 dB
	8) 322 ~ 327 MHz	27 dB min	31 dB
	9) 332 ~ 337 MHz	40 dB min	56 dB
	10) 347 ~ 650 MHz	40 dB min	54 dB
	11) 650 ~ 1000 MHz	23 dB min	44 dB
6.2.3	Ripple deviation (within 311.65-312.65MHz)	1.5 dB max	0.2 dB
6.2.4	VSWR (within 311.65-312.65MHz)	2.5 max	1.4

## 6.3 25±2°C

	Item	Specifications	Initial Room Temperature
6.3.1	Nominal center frequency (fc)	312.15 MHz	
6.3.2	Insertion Loss		
	1) 311.65 ~ 312.65 MHz (Passband width)	2.5 dB max	1.7 dB
	2) 10 ~ 270 MHz	55 dB min	70 dB
	3) 270 ~ 287 MHz	50 dB min	60 dB
	4) 287 ~ 292 MHz	50 dB min	58 dB
	5) 297 ~ 302 MHz	35 dB min	45 dB
	6) 306.65 ~ 307.10 MHz	35 dB min	47 dB
	7) 307.10 ~ 307.20 MHz	40 dB min	46 dB
	8) 307.20 ~ 307.65 MHz	27 dB min	42 dB
	9) 322 ~ 327 MHz	27 dB min	31 dB
	10) 332 ~ 337 MHz	40 dB min	56 dB
	11) 347 ~ 650 MHz	40 dB min	54 dB
	12) 650 ~ 1000 MHz	23 dB min	44 dB
6.3.3	Ripple deviation (within 311.65-312.65MHz)	1.5 dB max	0.2 dB
6.3.4	VSWR (within 311.65-312.65MHz)	2.5 max	1.4

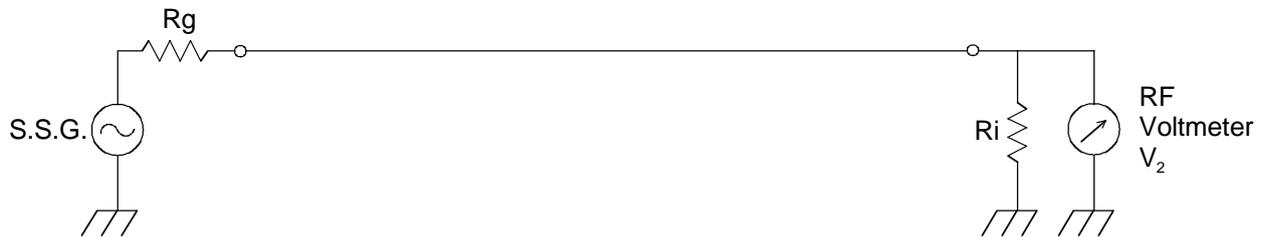
Test Measurement

(a) Measurement Circuit



2 : input  
5 : output  
Other : ground

(b) 0dB level



$R_g$  :  $50\Omega$  (Internal resistance of S.S.G.)

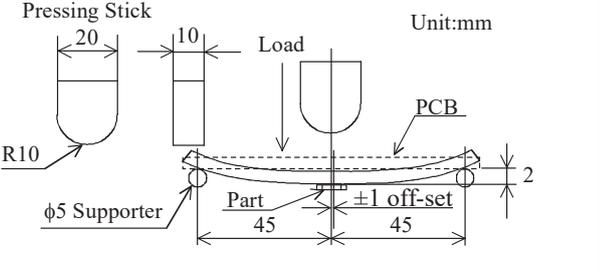
$R_i$  :  $50\Omega$  (Input impedance of network analyzer or spectrum analyzer)

$$\text{Resonant Loss or Insertion Loss} = 20 \log (V_2 / V_1) \text{ [dB]}$$

$V_1$  : Output Voltage of Test Circuit (a)

$V_2$  : Output Voltage of Test Circuit (b)

## 7. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

	Test Item	Test Condition	Criteria	
7.1	PCB bend strength	<p>After soldering to a 1.6mm thick board and holding it as shown below, press the center of the board with a pressing jig five times at a rate of 1 second once, and deflect the board by 2mm. return.</p> 	Satisfies Table 1 Also, no abnormality occurs in the body.	
7.2	Flexural strength 2	After soldering to a board with a plate thickness of 1.6 mm and holding it in the same way as in 7.1, press the center of the board 5 times at a rate of 1 second once for 1 second to bend the board 3 mm, and then return.	No abnormalities will occur in the terminals and body.	
7.3	Vibration	A sinusoidal vibration with a frequency of 10 to 500 Hz is applied in X, Y, and Z directions for 2 hours each as a 15 minute cycle. Amplitude conditions: 10 to 55 Hz: 0.75 mm amplitude 55 ~ 500Hz: acceleration amplitude 98m / s <sup>2</sup>	The electrical performance should meet table 1	
7.4	Shock resistance	Apply a load of 100g from a height of 150cm and drop it on a hard floor 5 times for 6 sides.		
7.5	Solderability	The terminals were immersed in ethanol solution of rosin (rosin ratio 20-25%) for about 5 seconds, and then solder JIS-Z-3282 H63A, H60A, or Sn-3.0Ag-0.5Cu was melted at 230 ± 5 °C. Immerse in the solder bath for 5 ± 0.5 seconds.	Terminal surface area immersed Solder adheres to more than 3/4 of the part.	
7.6	Resistance to solder heat	After preheating at 170 ± 10 °C for 90 seconds or more, immerse in solder at 255 ± 5 °C for 3 ± 1 seconds so that all electrodes are completely hidden. Remove from the bath to room temperature and measure 2 hours later.	The electrical performance should meet table 1	
7.7	Temperature Characteristics	Measure in the range of -40 to + 110 °C	Satisfies section 6.1	
7.8		Humidity	Keep in a constant temperature and humidity chamber at a temperature of 60 °C and relative humidity of 90 to 95% for 1000 hours, take it out to room temperature, and measure 2 hours later.	Satisfies Table 1.
7.9		Life Test High Temperature	Hold in a constant temperature bath at a temperature of 110 °C for 1000 hours, take out to room temperature and measure 2 hours later.	
7.10	Life Test Low Temperature	Keep in a thermostat at -40 °C for 1000 hours, take out at room temperature and measure 2 hours later.		
7.11	Thermal Shock	One cycle consists of -40 °C for 30 minutes and + 110 °C for 30 minutes. After 1000 cycles, take out at room temperature and measure 2 hours later.		
7.12	Reflow resistance	After performing reflow according to the reflow profile on page 9, take out at room temperature and pressure and measure after 24 hours.		

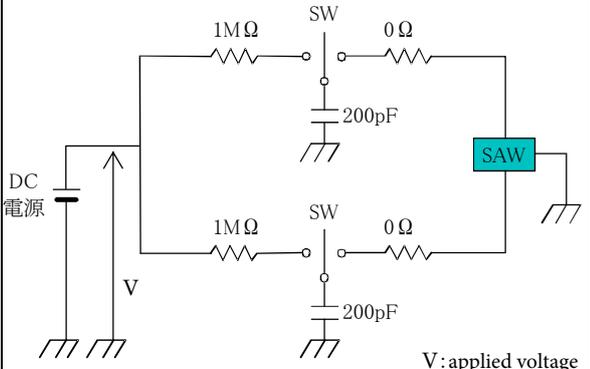
	Test Item	Test Condition	Criteria
7.13	Surge resistance	<p>Investigate and measure the voltage at the cumulative failure probability <math>F(t) = 10\%</math> point on the Weibull probability paper with surge withstand voltage. (Measuring method)</p> <p>In the circuit diagram below, step up the DC voltage from 39V at intervals of the E12 series, and measure the voltage that causes the product to fail.</p> <p>No. of samples: 30 pcs or more</p> <p>Voltage application times: 1 time/step, (C=200pF)</p>  <p>V : applied voltage</p> <p>Investigate and measure the voltage at the cumulative failure probability <math>F(t) = 10\%</math> point on the Weibull probability paper with surge withstand voltage. (Measuring method)</p> <p>In the circuit diagram below, step up the DC voltage from 39V at intervals of the E12 series, and measure the voltage that causes the product to fail.</p> <p>No. of samples: 30 pcs or more</p> <p>Voltage application times: 1 time/step, (C=200pF)</p>	Satisfies over 150V
7.14	Salt spray resistance	<p>Spray salt water at a temperature of 35 ° C and a concentration of <math>5 \pm 1\%</math> for 48 hours, wash and dry, and measure 2 hours later.</p>	The performance should meet Table 1.

Table 1. Electrical performance

Refer to the measurement circuit in section 6.

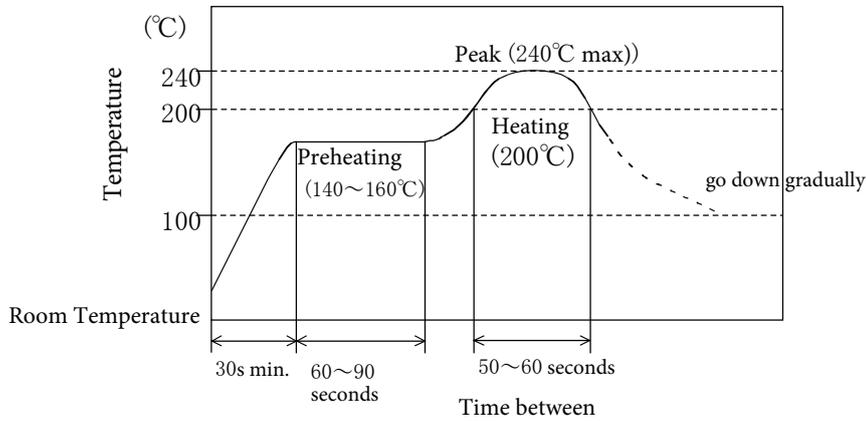
Test Item	Test Condition	Criteria
Nominal center frequency (fc)	312.15 MHz	
Insertion Loss		
1) 311.65 ~ 312.65 MHz (Passband width)	2.5 dB max	1.7 dB
2) 10 ~ 270 MHz	55 dB min	70 dB
3) 270 ~ 287 MHz	50 dB min	60 dB
4) 287 ~ 292 MHz	50 dB min	58 dB
5) 297 ~ 302 MHz	35 dB min	45 dB
6) 306.65 ~ 307.15 MHz	32 dB min	47 dB
7) 307.15 ~ 307.65 MHz	25 dB min	42 dB
8) 322 ~ 327 MHz	27 dB min	31 dB
9) 332 ~ 337 MHz	40 dB min	56 dB
10) 347 ~ 650 MHz	40 dB min	54 dB
11) 650 ~ 1000 MHz	23 dB min	44 dB
Ripple deviation (within 311.65-312.65MHz)	1.5 dB max	0.2 dB
VSWR (within 311.65-312.65MHz)	3.0 max	1.4

The test is conducted at a temperature of  $25 \pm 2$  °C and relative humidity of  $65 \pm 5$ %.

Reflow Profile

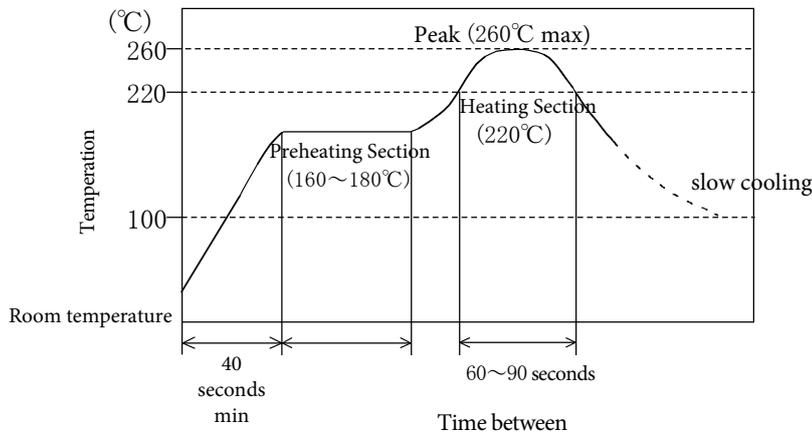
Profile A

- 1) Set the preheating temperature at 140-160 °C for 60-90 seconds.
- 2) The heating rate up to the preheating temperature of 150 °C shall be 30 seconds or more.
- 3) Set the heating temperature to 200 °C for 50-60 seconds and the peak temperature to 230 ± 10 °C.



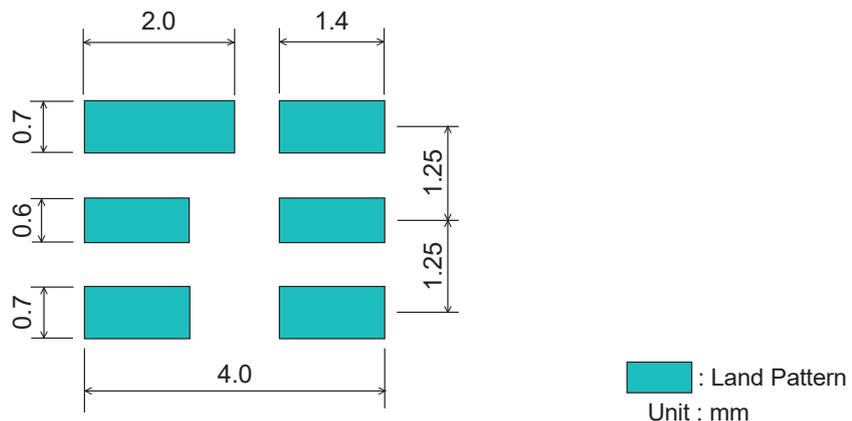
Profile B

- 1) Set the preheating temperature at 160~180 °C for 60-90 seconds
- 2) The heating speed up to the preheating temperature 170 °C shall be 40 seconds or more.
- 3) Heating temperature is 220 °C for 50-60 seconds, and peak temperature is 255 ± 5 °C.



Recommended Land Pattern

- 1) Recommended land pattern is as follows.



## 8. Plastic tape storage method

### 8.1 Package

Package the product so that it will not be damaged during transportation or storage, and display the model name, quantity, and shipping inspection number for each minimum packaging unit.

### 8.2 Dimensions of plastic tape

Shown in Figure 2.

### 8.3 Taping Method

- 1) The tape shall be wound clockwise. (The feeding holes shall be to the right side when the tape is pulled toward user.)
- 2) Cover tape shall not cover the feeding holes of cavity tape or overlap the edge of cavity tape.
- 3) Trailer tape shall be 160~190 mm and leader cavity shall be 80~120 mm (refer to Figure. 1.)
- 4) The tip of the cover tape shall be adhered to the side of reel with adhesive tape (50~120 mm: Reference value).
- 5) The cover tape peel strength force shall be 0.2~0.6N (Reference value) which measured at 170 degrees with respect to the carrier tape.
- 6) The orientation is ruled as Figure. 2 shows.
- 7) All the filters shall be packed continuously into the tape without vacant cavities except the leader cavity and trailer tape area.
- 8) A reel shall contain 5000 pcs of filters.  
(Please place the order with 5000 pcs times integer number. In case of small quantity shipment, bulk packing may be applied.)
- 9) Cover tape and cavity tape are made of anti-static material.  
Part number, customer part number, quantity and inspection lot number shall be marked on each reel.  
(The reel side containing the label will visible when the reel is oriented in a direction that dispenses the tape from the top of the reel and in a clockwise direction.)
- 10) The product which has ROHS-Y<\*> mark on the packaging label is compliance with RoHS directives. The alphabet in blank <\*> will be changed A to B, B to C, and so on with every revision of the RoHS directives. Please refer to the document, "The Marking for the directives on the restriction of the hazardous substances' use," to check the directives corresponding to alphabets in <\*>.

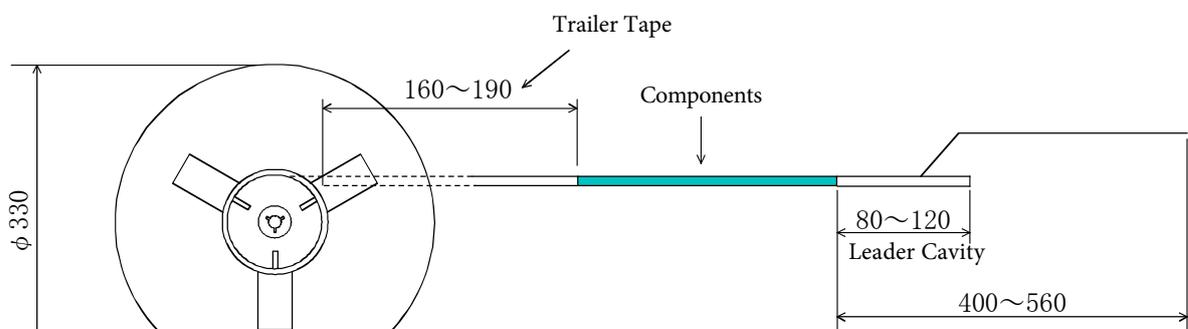
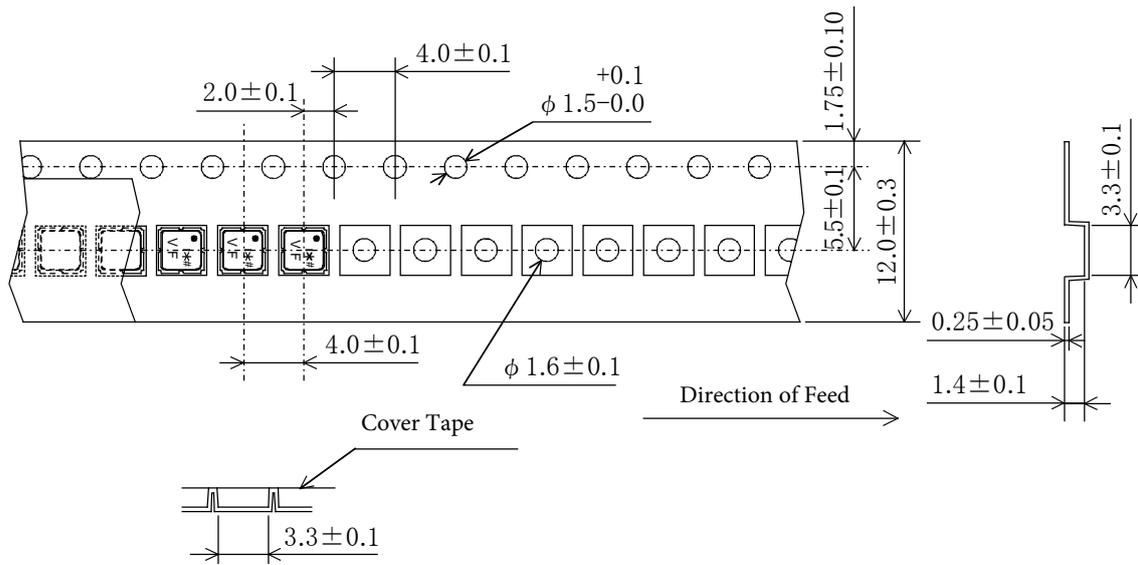


Figure 1

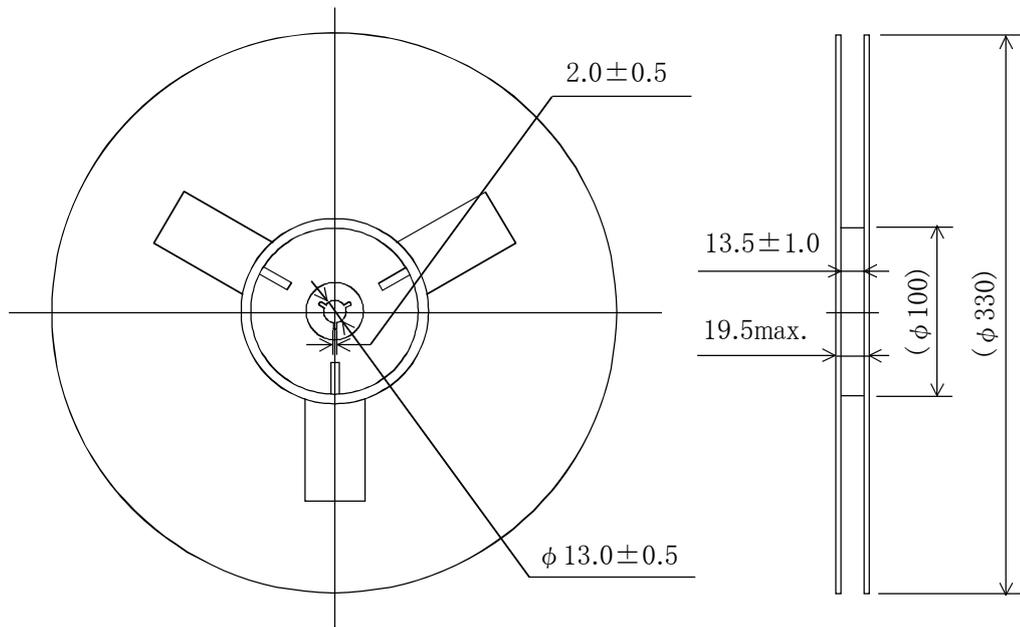
Unit : mm

Dimensions of Carrier Tape



The marked part number faces the cover tape side.

Dimensions of Reel Tape and Reel Standard per ANSI/EIA-481



Unit : mm

Figure2

## 9. NOTICE

### 9.1 Usage Conditions

- 1) Use this component within operating temperature range. It might not meet the specification of electrical performance out of operating temperature range. Usage on the condition exceeding operating temperature range might cause degradation or destruction of the component. Even a short time usage on such conditions might cause degradation of reliability.
  
- 2) This product is designed for use of electrical equipment in the standard environment (temperature, humidity, atmospheric pressure etc.) Do not use in the following environments, since it causes degradation of characteristics and reliability.
  - Ambient air containing corrosive gas (Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>X</sub>, NO<sub>X</sub>, etc.)
  - Ambient air containing combustible gas and substance with high volatility
  - In dusty place
  - In the places where the water splashes or precipitates
  - Under direct sunlight
  
  - In the places under the strong influence of static electricity or electric fieldContact us before using the component in such conditions.
  
- 3) This component can not be used in liquid (water, oil, chemical solution, organic solvents, etc.)
  
- 4) Apply electrical power lower than specified in the specification. When the component is used with higher rating power than specified in the specification, it might cause degradation or destruction of the component. Even if a short time, it might cause degradation of reliability under such a condition.
  
- 5) Do not let the component contact with other components, since its coating is not insulated.
  
- 6) Rapid temperature change of this component makes electric charge. Include discharge circuit between port and ground, since it might cause degradation or destruction of this component and other components around this component.

### 9.2 Storage Conditions

- 1) Keep the component in the package or sealed container on the following conditions.  
[Temperature: -10...+40°C, Humidity: 30~85% R.H.]  
Examine solderability before using this component, after longer than 6 months storage since it might cause degradation of solderability. Notice that long-term storage might cause discoloration.
  
- 2) To keep solderability of outer-electrode, do not store in the following environments.
  - Ambient air containing corrosive gas (Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>X</sub>, NO<sub>X</sub>, etc.)
  - Ambient air containing combustible gas and substance with high volatility
  - In dusty place
  - In the places where the water splashes or precipitates
  - Under direct sunlight
  - In the places under the strong influence of static electricity or electric field
  
- 3) Do not open the package until usage.

### 9.3 Soldering Conditions

1) Solder under the following standard soldering conditions. If soldering under different conditions, please contact us in advance. Depending on the conditions, the function of the product may be impaired.

#### a. Soldering with solder iron

• Preheating Condition	—	150 °C ± 20 °C, over 60 seconds
• Temperature at tip of soldering iron	—	350°C±10°C
• Duration	—	within 5 seconds
• Diameter at tip of soldering iron	—	φ3mm max
• Power of soldering iron	—	30W max

When soldering the tip, do not touch the tip except the back and side terminals.

#### b. Reflow soldering

- Solder on the reflow soldering condition specified in this specification

- 2) Use land pattern recommended in this specification, since excess solder might cause destruction of chip by mechanical stress to supply too much solder.
- 3) Use rosin flux. Do not use strong acid flux [ex. Flux with more than 0.2wt% Halogen compound content (converted to chlorine content.)]
- 4) Use JIS-Z-3282 H63A, H60A, H50A solder or Lead free solder (Sn-3.0Ag-0.5Cu). Contact us before using other solders than above.
- 5) Solder with reflow soldering. Soldering with soldering iron shall be soldered on the condition specified in this specification. Since the lack of preheating gives this component rapid temperature change, it might cause degradation and destruction. Contact us before using the component on other conditions than specified in this specification.
- 6) Notice that the duration of soldering with soldering iron must be considered to be accumulated time, when soldering is repeated.
- 7) Use this component after examining that the outer electrodes are smoothly covered with solder thicker than 0.1mm.

### 9.4 Cleaning Conditions

- 1) Isopropyl alcohol and ethyl alcohol can be used for cleaning. Contact us before using other cleaning solvents than above. Do not use flon, trichloroethane etc in the point of view to protect for global environment.
- 2) Clean this component after ensuring that the temperature of the component is room temperature, since rapid temperature change by cleaning after reflow soldering might cause degradation or destruction.
- 3) Do not use ultrasonic cleaning, since ultrasonic vibration might cause degradation or destruction.
- 4) Dry this component immediately after cleaning.
- 5) In the case that cleaning process is included in the manufacturing process, examine the influence to the performance of the component with mounting on PCB before use.

### 9.5 Handling Conditions

- 1) Notice that it might cause destruction to apply larger shock than specified in the specification while handling.
- 2) Notice that it might cause reliability degradation to apply excessive shock or vibration during transportation.
- 3) Do not apply any shock or pressure to this component during transportation when the component is on PCB.
- 4) Do not apply static electricity or excessive voltage while assembling and measuring, since it might cause degradation or destruction to apply static electricity to this component.
- 5) Do not handle this component with bare hand.

### 9.6 Mounting Conditions

- 1) Mount this component not to apply a stress caused by warp or bend of PCB.
- 2) Abraded positioning claw, pick-up nozzle, etc of component placement machine might apply excessive shock on the component on PCB and cause destruction. Keep the maintenance which is instructed on each machine regularly to prevent the component from these kinds of troubles.
- 3) Mount all terminals, or terminal strength might be degraded.
- 4) Mount the component on PCB with no space between component and PCB.

### 9.7 Limitation of Applications

Please contact us before using our products for the applications listed below which require especially for the prevention of defects which might directly cause damage to the third party's life, body or property.

- a. Aircraft equipment
- b. Aerospace equipment
- c. Undersea equipment
- d. Nuclear control equipment
- e. Medical equipment
- f. Transportation equipment (vehicles, trains, ships, etc.)
- g. Traffic signal equipment
- h. Disaster prevention / crime prevention equipment
- i. Data - processing equipment
- j. Application of similar complexity and / or reliability requirements to the applications listed in the above

### NOTE

- 1) Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
- 2) You are requested not to use our product deviating from the agreed specifications.
- 3) We consider it not appropriate to include any terms and conditions with regard to the business transaction in the product specifications, drawings or other technical documents. Therefore, if your technical documents as above include such terms and conditions such as warranty clause, product liability clause, or intellectual property infringement liability clause, they will be deemed to be invalid.