



RFM Integrated Device, Inc.

Part Number:  
SAFDC312MSP1T32R12

## PRODUCT SPECIFICATION

Description:  
SAW FILTER, 312.500  
MHZ, BW 1.0 MHZ, IL 1.5 DB

Surface wave filter

SAFDC312MSP1T32R12



Date	March 13, 2014	AEC-Q200 Qualified
------	----------------	--------------------

1. Scope

This delivery specification specifies the SAFDC312MSP1T32R12 surface wave filter for 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 (TAI-SAW (TAI-SAW TECHNOLOGY CO., LTD.))

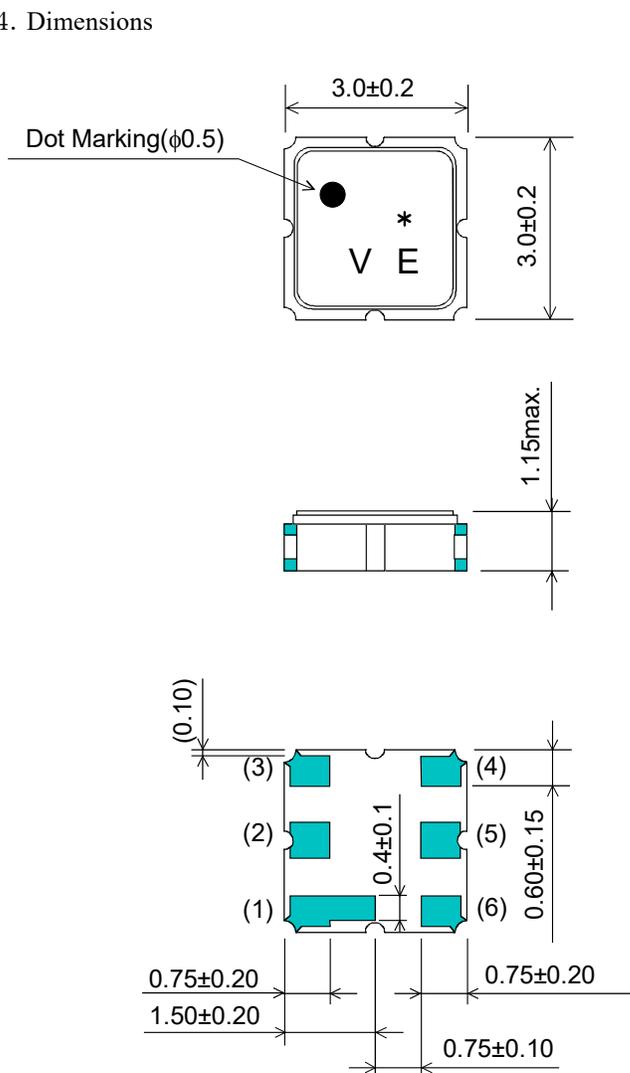
2. Customer Part Number

Customer PN:		Customer drawing no.	
--------------	--	----------------------	--

3. RFMi Part Number

SAFDC312MSP1T32R12	Tape/Packing (2000 pieces)
--------------------	----------------------------

4. Dimensions



Marking : Laser Printing

\* (EIAJ Code)

# Manufacturing Week

Week 1

Week 2

Week 6

Terminal (Surface): Gold

$0.3 \sim 1.0 \mu\text{m}$   
(Typ.  $0.6 \mu\text{m}$ )

Thickness  $2.0 \sim 8.0 \mu\text{m}$   
(Typ.  $3.5 \mu\text{m}$ )

(2) : input

(5) : output

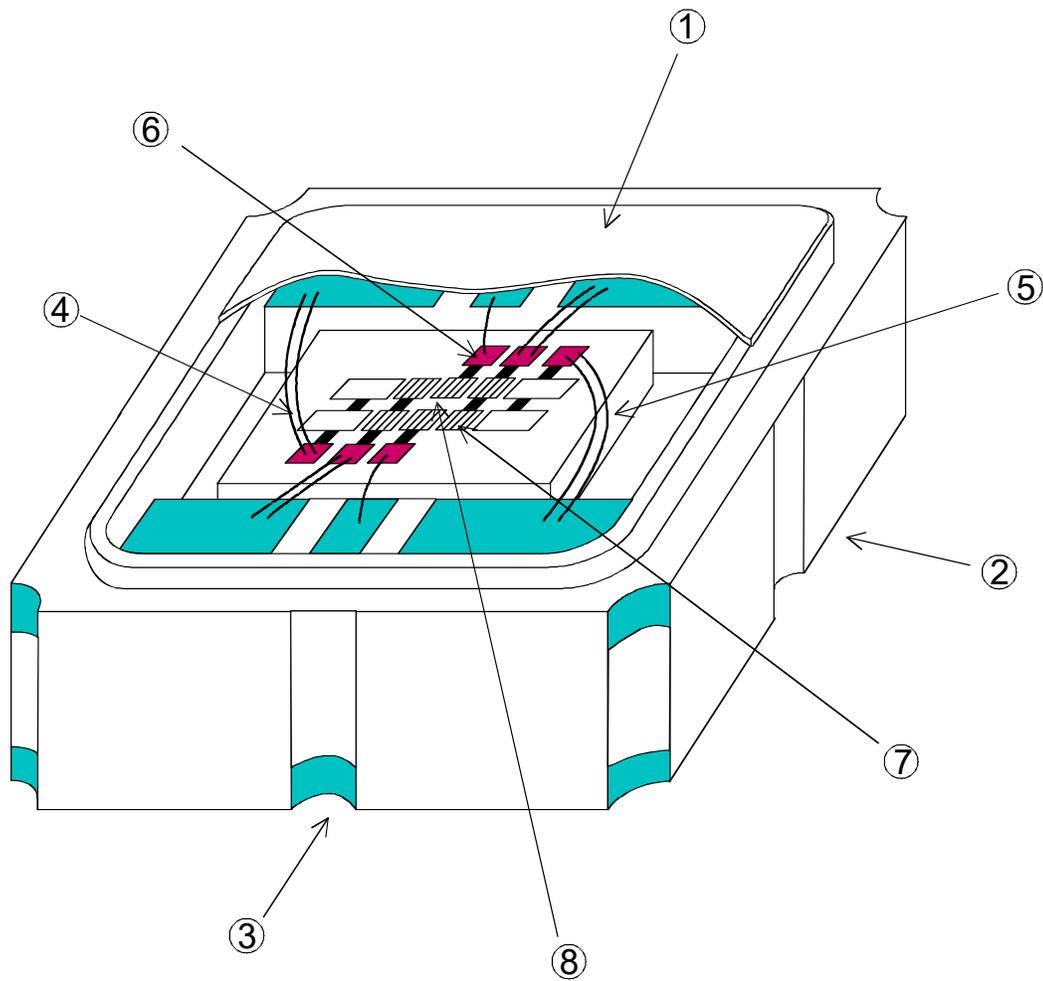
Others : Ground (case)

Weight :  $32 \pm 5$ mg

Coplanarity : 0.1mm max.

Unit : mm

#### 4.1 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 Instantaneous DC applied voltage between terminals	Maximum allowable amount 10V (insulation resistance 10MΩ or more, 25 ± 2 °C)
5.2 DC applied voltage Between terminals	Maximum allowable capacity 3V (25 ± 2 °C)
5.3 Allowable input level (input side)	1) 1 minute at 30mW (+ 14.8dBm) 2) 1000 hours at 20mW (+ 13dBm)
5.4 Operating Temperatures	-40~+110°C
5.5 Storage Temperature	-40~+110°C
5.6 Unbalance Port Matching impedance (nominal value)	50 Ω

## 6. Electrical Performance

### 6.1 -40~+110°C

	Item	Specification	Initial room temperature
6.1.1	Nominal center frequency (fc)	312.50MHz	
6.1.2	Insertion Loss		
	1) Within 312.00 to 313.00 MHz (Passband Width)	2.5 dB max	1.65 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	56 dB
	5) 297 ~ 302 MHz	35 dB min	45 dB
	6) 322 ~ 327 MHz	27 dB min	34 dB
	7) 332 ~ 337 MHz	40 dB min	54 dB
	8) 347 ~ 650 MHz	40 dB min	53 dB
	9) 650 ~ 1000 MHz	23 dB min	43 dB
6.1.3	Ripple deviation (within 312.00 to 313.00MHz)	1.5 dB max	0.4 dB
6.1.4	VSWR (within 312.00 to 313.00MHz)	3.0 max	1.3

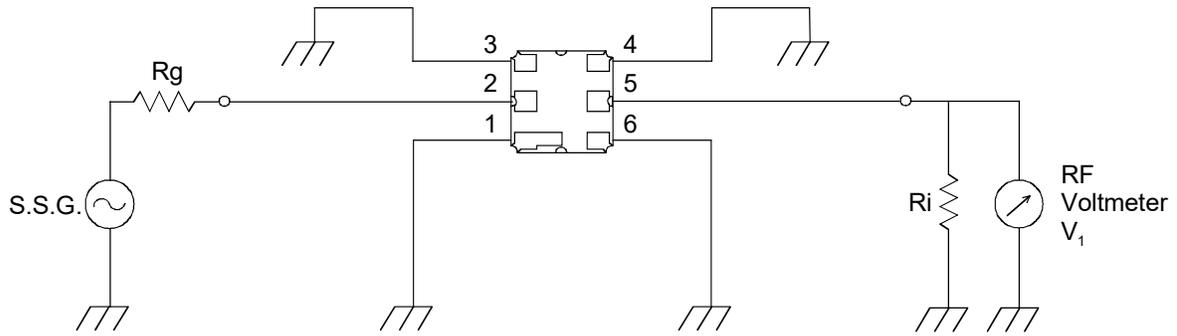
The test is conducted at a temperature of 25 ± 2 °C and relative humidity of 65 ± 5%.

## 6.2 -40~+85°C

	Item	Specification	Initial room temperature
6.2.1	Nominal center frequency (fc)	312.50 MHz	
6.2.2	Insertion Loss 1) 312.00 ~ 313.00 MHz (Passband width 2) 10 ~ 270 MHz 3) 270 ~ 287 MHz 4) 287 ~ 292 MHz 5) 297 ~ 302 MHz 6) 322 ~ 327 MHz 7) 332 ~ 337 MHz 8) 347 ~ 650 MHz 9) 650 ~ 1000 MHz	2.3 dB max  55 dB min 50 dB min 50 dB min 35 dB min 27 dB min 40 dB min 40 dB min 23 dB min	1.65 dB  70 dB 60 dB 56 dB 45 dB 34 dB 54 dB 53 dB 43 dB
6.2.3	Ripple deviation (within 312.00 to 313.00MHz)	1.2 dB max	0.4 dB
6.2.4	VSWR (within 312.00 to 313.00MHz)	2.5 max	1.3

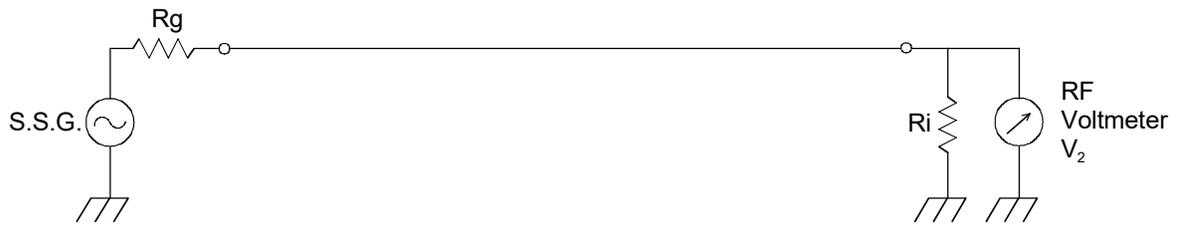
Test Circuit

(a) Measurement Circuit



2 : Input  
5 : Output  
Others : Ground

(b) 0dB Level



$R_g$ : 50 $\Omega$  (signal source resistance)

$R_i$ : 50  $\Omega$  (Network analyzer or spectrum analyzer input resistance)

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

$V_1$ : Output level at (a)

$V_2$ : Output level at (b)

## 7. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

	Test Item	Test Condition	Requirements
7.1	PCB Bend Strength	<p>Solder on a board with a thickness of 0.8 mm, hold it as shown below, and then press the center of the board 5 times at a rate of 1 second once for 1 second at a time to bend the board 2 mm. return.</p> <p style="text-align: center;">Unit:mm</p>	It satisfies Table 1 and does not cause any abnormality in the terminals and body.
7.2	Vibration	Sine vibration with a frequency of 10 to 55Hz and a total amplitude of 1.5mm is applied in the X.Y.Z direction for 2 hours each.	Satisfies Table 1.
7.3	Impact resistance	Apply a load of 100g from a height of 150cm and drop it on concrete 3 times on each of 6 sides.	
7.4	Solderability	The terminals were immersed in rosin ethanol solution (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 $230 \pm 5$ °C. Immerse in the solder bath for $5 \pm 0.5$ seconds.	Solder adheres to 90% or more of the surface area of the immersed terminal.
7.5	Resistance to Soldering Heat	This component is preheated at $170 \pm 10$ °C for 90 seconds, immersed whole electrode in soldering bath at $255 \pm 5$ °C for $3 \pm 1$ seconds, then measured after being placed in standard atmospheric conditions for 2 hours.	Satisfies Table 1.
7.6	Temperature Characteristics	Measure in the range of -40 to + 110 °C	Satisfies section 6.1
		Measure in the range of -40 to + 85 °C	Satisfies section 6.2
7.7	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
7.8	High temperature retention characteristics	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.	
7.9	Low temperature retention characteristics	Keep in a constant temperature bath of -40 °C for 1000 hours, take out to room temperature and measure 2 hours later.	
7.10	Thermal Shock	One cycle consists of 30 minutes at -55 °C and 30 minutes at + 110 °C, 1000 cycles of this are taken out, then the sample is taken out to room temperature and measured 2 hours later.	
7.11	Reflux resistance	After performing reflow twice according to the reflow profile on page 8, take out at room temperature and pressure and measure after 24 hours.	

Table 1. Electric performance

Refer to the measurement circuit in section 6.

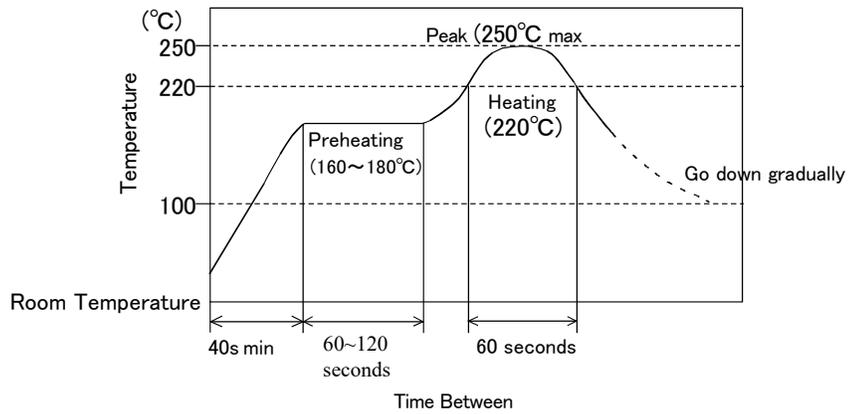
Test Item	Test Condition	Criteria
Nominal center frequency (fc)	312.50 MHz	
Insertion Loss		
1) 312.00 ~ 313.00 MHz (Passband Width)	2.5 dB max	1.65 dB
2) 10 ~ 270 MHz	55 dB min	70 dB
3) 270 ~ 287 MHz	50 dB min	60 dB
4) 287 ~ 292 MHz	50 dB min	56 dB
5) 297 ~ 302 MHz	35 dB min	45 dB
6) 322 ~ 327 MHz	27 dB min	34 dB
7) 332 ~ 337 MHz	40 dB min	54 dB
8) 347 ~ 650 MHz	40 dB min	53 dB
9) 650 ~ 1000 MHz	23 dB min	43 dB
Ripple deviation (within 312.00 to 313.00MHz)	1.5 dB max	0.4 dB
VSWR (within 312.00 to 313.00MHz)	3.0 max	1.3

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

## Reflow Profile

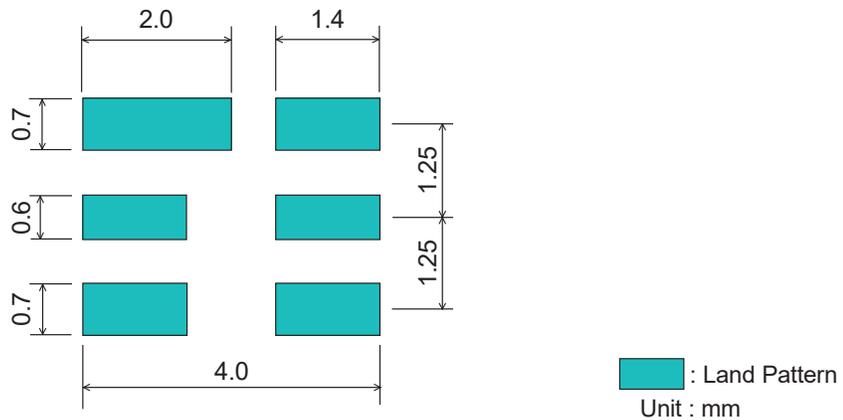
### Profile A

- 1) Set the preheating temperature to 160 to 180 °C for 60 to 120 seconds.
- 2) The heating speed up to the preheating temperature of 170 °C shall be 5 °C / sec or more.
- 3) The heating temperature is 220 °C for 60 seconds, and the peak temperature is 250 °C.



### Recommended Land Pattern

- 1) Recommended land pattern is as follows.



## 8. TAPING METHOD OF PLASTIC TAPE PACKAGE

### 8.1 Package

The package is packed so that it will not be damaged during transportation or storage, and the model name, quantity, and shipping inspection number will be displayed for each minimum packaging unit.

### 8.2 Dimensions of plastic tape

See 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 2000 pcs of filters.  
(Please place the order with 2000 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.)
- 1) 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 <\*>.

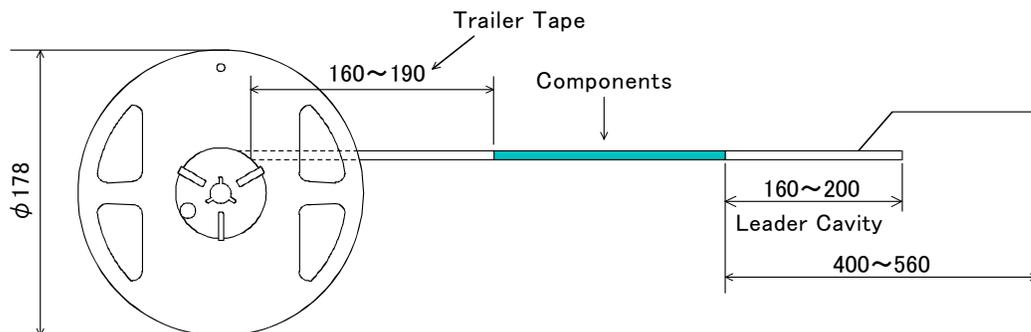
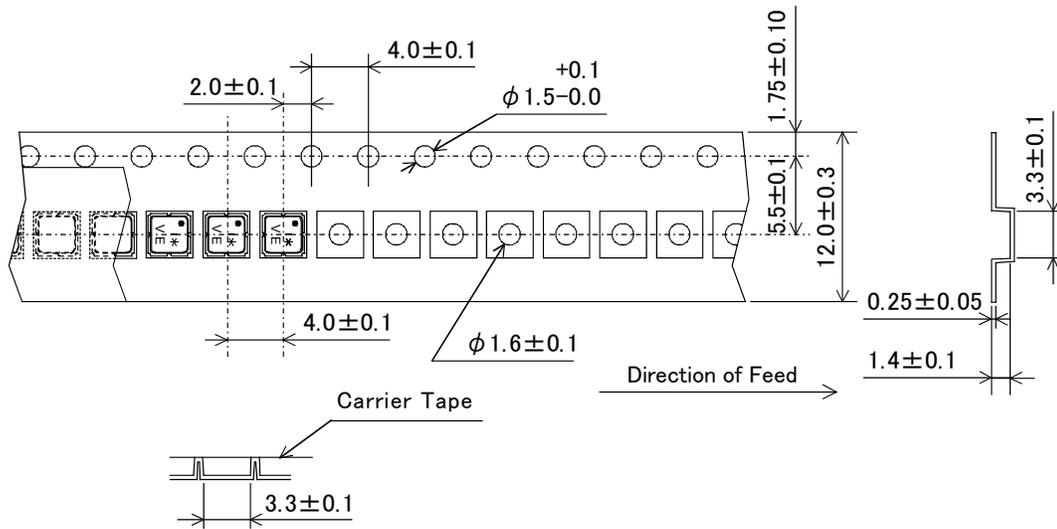


Figure 1

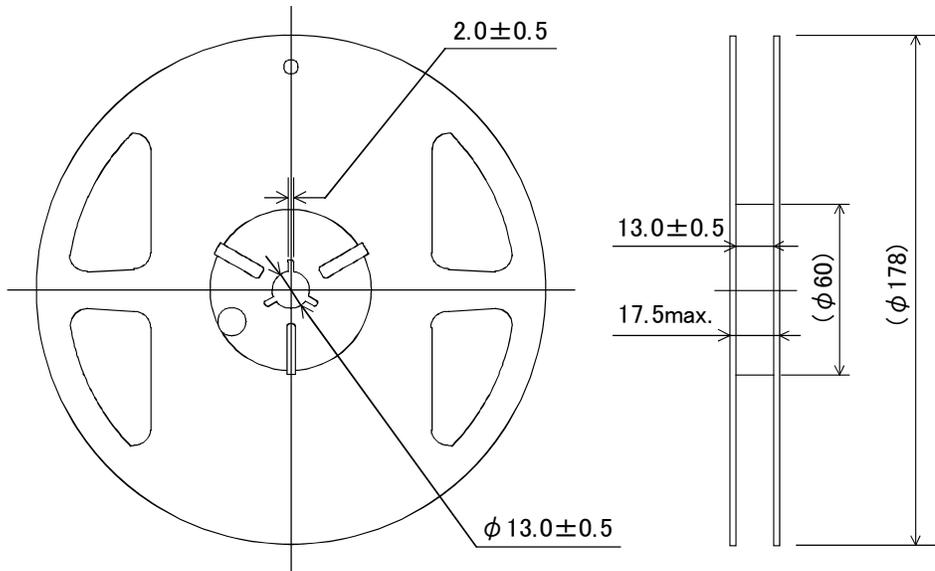
Unit: mm

Dimensions of Carrier Tape



The marked part number faces the cover tape side.

Dimensions of Reel



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	—	260 °C ± 10 °C or 350 °C ± 5 °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.