1.Scope

This Specification applies to the Piezoelectric sensor for mechanical shock.

2.Standard Products

| | Item | Rating |
|---|---|---|
| 2.1 | Operating temperature range | -10 ~ 60 °C |
| 2.2 | Storage temperature range | -30 ~ 80 °C |
| 2.3 | Acceleration limit | 15000 m/s$^2$ max. |

3.Construction

| | Item | SPEC |
|---|---|---|
| 3.1 | Appearance | No remarkable damage or stains allowed (Visual check) |
| 3.2 | Shape/Size | As per Fig.1 attached |
| 3.3 | Marking | Shape(F) , Inclined Angle(2),Product serial No. |

4.Electrical Performance

| | Item | SPEC | Test Condition |
|---|---|---|---|
| 4.1 | Voltage Sensitivity (Vs) | 0.1 mV/(m/s$^2$) ± 15 % | 100m/s$^2$,1kHz 1) |
| 4.2 | Capacitance (Cp) | 220 pF ± 20 % | 1Vrms , 1kHz |
| 4.3 | Insulation Resistance | 500 Mohm min. | 10V DC , after 1min. |
| 4.4 | Resonant Frequency | 25 kHz min. | |
| 4.5 | Non-linearity | 5 % max. | at 500m/s$^2$ |
| 4.6 | Incident Angle of Sensitivity Axis | 25 ± 3° | |

1) As measured with an applied acceleration in the direction of sensitivity axis of Fig.1.

5.Mechanical Performance

| | Item | SPEC | Test Method |
|---|---|---|---|
| 5.1 | Electrode Strength | No terminal electrode shall be peeled off. | 4.9 N from transverse direction,10 ±0.5 s |
| 5.2 | Bending Strength | No outstanding damage. | PC boad deflection distance:1 mm (speed 1 mm/second) 10 ±0.5 s Thickness of PC board : 1.6 mm |
| 5.3 | Vibration | Vs drift:within±10% Cp drift:within±10% | 10 to 55 Hz(1 minute sweep), Amplitude:1.5 mm, 2 hours each direction |
| 5.4 | Solderability | More than 3/4 of the soldered area of the terminal electrodes shall be covered with new sold | Pre-heat:150 ±10 °C,1~2 minutes Soldering:230 ±5 °C,3 ±0.5 s |
| 5.5 | Soldering heat resistance | Vs drift:within±10% Cp drift:within±10% | Refolw soldering once 240°C peak ,over 220°C 10s max. Pre-heating 140 ±10 °C 1~2min. |
| 5.6 | Shock | Vs drift:within±10% Cp drift:within±10% | 15000 m/s$^2$, 0.5msec half sinusoidal wave ,5 times each direction |

6.Environmental Performance

| | Item | SPEC | Test Method |
|---|---|---|---|
| 6.1 | Dry heat | Vs drift:within±10% Cp drift :within±10% | 85 ±2 °C,500 hours |
| 6.2 | Cold | Vs drift:within±10% Cp drift :within±10% | -40 ±3°C,500 hours |
| 6.3 | Damp heat | Vs drift:within±10% Cp drift :within±10% | 40 ±2 °C,90~95 %RH, 500 hours |
| 6.4 | Heat cycle | Vs drift:within±10% Cp drift :within±10% | -40 ±3 °C~ RT ~85 ±3 °C~ RT 30min 2min 30min 2min 5cycles |
| 6.5 | Temperature | Vs drift:within±10% Cp drift :within±20% | -10 ~ 60 °C |

| CLASSIFICATION | | SPECIFICATIONS | DATE Sep. 1 , 1999 | | |
|---|---|---|---|---|---|
| Number | | 151 - EFJ -G25F02 | APPROVAL | CHECK | DESIGN |
| Part name | | Piezoelectric sensor for mechanical shock | S.kawamura | | T.Ninomiya |
| Part No | Taped Type | EFJG25EF01 | | | |

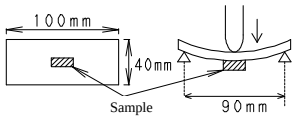
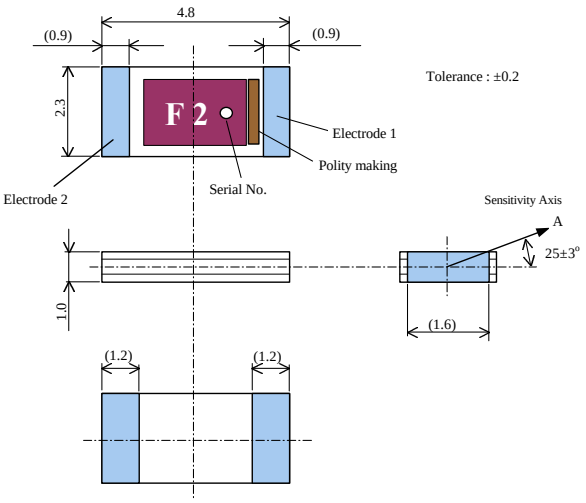
| Item | | Test Method |
|---|---|---|
| Standard test conditions | | $20^{o}$C 65% RH,$1.013\times10^{5}$ Pa as a rule;however,if there occurs no doubt about judgement, the test may be performed at 15~$35^{o}$C, 25~85% RH and $0.860\times10^{5}$~$1.060\times10^{5}$ Pa |
| 4.1 | Voltage sensitivity | See Fig.2 |
| 5.1 | Electrode Strength | Solder the external electrodes to the PC board so that the marking side of a product is located upper, and apply the specified load from one side of the product to maintain the conditions for a given period of time. |
| 5.2 | Bending Strength | Solder the external electrodes to the PC board so that the marking side of a product is located upper, and deflect the PC board at 90 mm span and deflection distance 1 mm.   |
| 5.3 | Vibration | Repeat the vibration at specified frequency and specified oscillation amplitude, and apply it in X.Y.Z directions orthogonal to the sample for the specified time with one minute as a cycle. |
| 5.4 | Solderability | Dip a product preheated as specified in the solder bath maintained at the specified temperature so that the electrode is completely hidden for a given period of time. Solder shall be H63A(eutectic solder JIS-Z-3282) or Sn-Pb solder including 2 to 5 % of Ag, the flux shall be rosin (JIS-K-5902) methanol (JIS-K-1501) solution and the weight ratio shall be approx.25%. |
| 5.5 | Soldering heat resistance | After passing the sample through the reflow furnace maintained at the specified temperature and time, take it out in the room temperature, and after leaving it for 8 hours, measure the characteristics. |
| 5.6 | Shock | After Dropping specified times and directions,measure the characteristics. |
| 6.1 | Dry heat | After leaving a product in the thermostatic oven maintained at the specified temperature for the specified time, take it out in the room temperature, and after leaving it for 8 hours, measure the characteristics. |
| 6.2 | Cold | After leaving a product in the thermostatic oven maintained at the specified temperature for the specified time, take it out in the room temperature, and after leaving it for 8 hours, measure the characteristics. |
| 6.3 | Damp heat | After leaving a product in the thermostatic oven maintained at the specified temperature and humidity for the specified time, take it out in the room temperature, and after leaving it for 8 hours, measure the characteristics. |
| 6.4 | Heat cycle | After repeating the specified cycle by the specified frequency, take it out in the room temperature, and after leaving it for 8 hours, measure the characteristics. |

Figure 1






Remark) When an acceleration is applied in the direction of A axis, positive voltage occurs at electrode 1.

( Unit : mm )

Serial No.

| year \ month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | a | b | c | d | e | f | g | h | j | k | l | m |
| 2000 | n | p | q | r | s | t | u | v | w | x | y | z |
| 2001 | A | B | C | D | E | F | G | H | J | K | L | M |
| 2002 | N | P | Q | R | S | T | U | V | W | X | Y | Z |

7.Operating Precautions

7.1 Application

This piezoelectric sensor is designed for use in domestic electric appliances, AV. equipment, OA equipment, communication equipment, measuring equipment and general electronic equipment. Check with us separately, for use in equipment which needs high reliability (such as automobiles, aircraft, medical equipment and space equipment).

7.2 ⚠ Precautions for Handling

7.2.1 ⚠ Precautions for Safety

(1) Fail-safe Design for Equipment

In application of the piezoelectric sensor, it is recommended that equipment shall be protected by adding a protective and/or retarding design circuit against deterioration and failures of the piezoelectric sensor.

(2) Operating Temperature Ranges

This piezoelectric sensor shall not be operated beyond the specified “Operating Temperature Range” in the Specifications.

(3) Changes/Drifts in Voltage Sensitivity

It shall be noted that voltage sensitivity of the piezoelectric sensor may drift depending IC applied (the type names, the manufacturer) and resistance values of external resisters and the circuit design.

(4) Stray Capacitance

Stray capacitance and insulation resistance on printed circuit board may cause abnormalities of the piezoelectric sensor such as the voltage sensitivity and the frequency characteristic. Attention shall be paid to those abnormalities above mentioned in circuit design.

(5) Direct Voltage

Avoid directly applying a direct voltage to the piezoelectric sensor.

7.2.2 ⚠ Prohibited Applications

(1) “Flow Soldering” shall not be applied to the piezoelectric sensor.

(2) “Ultrasonic Cleaning”and “Ultrasonic Welding”shall not be applied to the piezoelectric sensor for preventing them from electrical failures and mechanical damages.

(3) Avoid water washing after soldering.

7.2.3 Application Notes

(1) Handling precautions

1) Abnormal/excess electrical stresses such as over voltage spikes and electrostatic discharges may cause electrical deterioration's and failures of the piezoelectric sensor and affect reliability of the devices.

2) If the product is drooped or a strong stress is applied to it, it nay break. Do not use the products which strong stress have been applied.

(2) Automated Assembly

For automatic inserting , make sure to make inserting checks by means of the inserting machine in advance. In inserting the product, unsuitable chucking force or inserting speed may apply so excessive impulse to break the product.

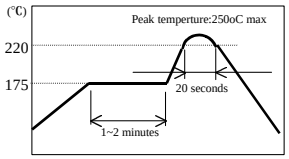
Avoid inserting using mechanical-chuck-type inserting machine. Also, for the inserting machine using other method, select the low speed.

Please contact us for details.

(3) Soldering in PC boards and washing after soldering

1) The product is applicable to refold soldering. Conditions of the soldering temperature and time are recommended as shown below.

| | |
|---|---|
| Preheating temperature | : 175°C |
| Preheating time | : 1~2 minutes |
| Soldering temperature | : 220°C |
| Soldering time | : 20 sec max. |
| Peak temperature | : 250°C max. |




2) Take care that a soldering iron does not contact with the product body (out case).

For manual soldering, the maximum soldering temperature and time should be 300° C and 3 seconds.

3) Rosin-based and non-activated soldering flux is recommended.

The content of halogen in the flux shall be 0.1 wt. or less.

4) Post Soldering Cleaning

Application of ultrasonic cleaning is prohibited.

Cleaning Conditions such as kinds of cleaning solvents, immersion times and temperatures etc. shall be checked by experiments before production.

(4) Maintenance and using environment

Avoid maintenance and use in the following environments.

1) Corrosive gaseous atmospheres (Cl2 , NH3 , SO2 , Ox etc.)

2) Dusty places

3) Places exposed to direct sunlight

4) Places over which water is splashed

5) To be exposed directly to water

6) Places exposed to briny air

7) Places apt to be affected by static electricity or electric field strength

(5) Long Term Storage

The piezoelectric sensor shall not be stored under severe conditions of high temperatures and high humidifies. Store them indoors under 40°C max, and 75% RAH max. Use them within one year and check the solderability before use.And avoid maintenance and use in the following environments.

1) Corrosive gaseous atmospheres (Cl2 , NH3 , SO2 , Ox etc.)

2) Places exposed to direct sunlight

3) Places where dew is apt exposed to condense

7.3 The design is subject to change for improvement of quality.

8.Embossed tape Packaging

8.1 Applicable Standard

JIS C 0806

8.2 Specifications

8.2.1 Dimensions

(1) Carrier Tape : Figure 3

(2) Reel : Figure 4

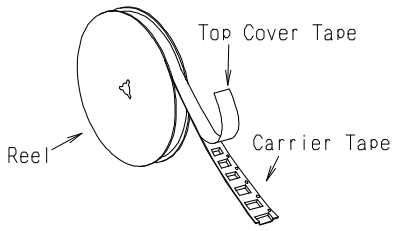
(3) The product shall be packed properly not to be damaged during transportation and storage.

8.2.2 Reeling Quantity

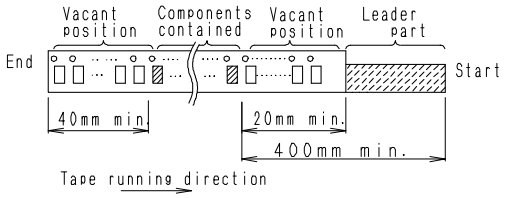
2000 pcs/reel

8.2.3 Taping structure

(1) The tape shall be wound around the reel in the direction shown below.




(2) Leader part and vacant position




8.4 Marking

The following items shall be marked at least on the side of the reel.

(1) Part Number

(2) Quantity

(3) Lot Number

(4) Manufacturer's Name

8.5 Tape Specifications

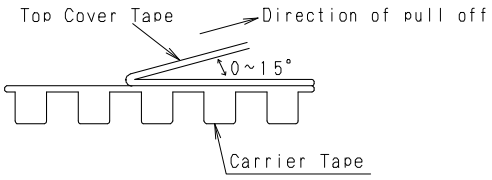
(1) Tensile Strength of Carrier Tape : 9.8N min.

(2) Top Cover Tape Adhesion (See the below figure.)

Pull off Angle : 0~15°

Speed : 300 $^{+0}_{-50}$ mm/minute

Force : 0.19~0.69N




(3) Missing Parts

The maximum number of missing parts shall not exceed 0.1% per reel and continuous missing shall not be more than 3 parts.

Figure 2 Test Method of measuring Voltage Sensitivity

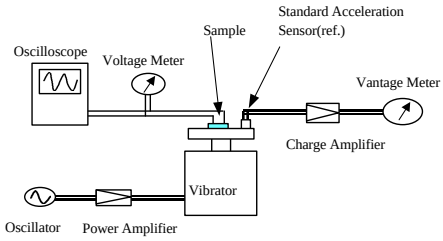
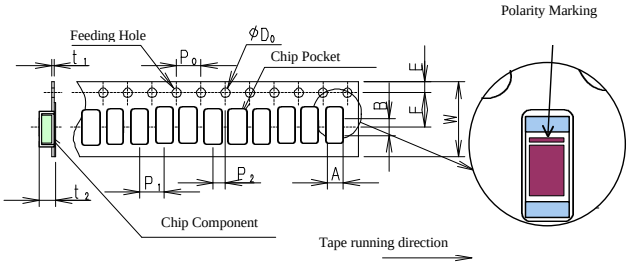



Figure 3 Carrier Tape Dimensions

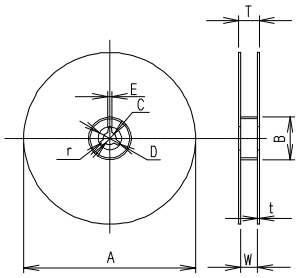



| W | F | E | P1 | P2 | P0 | D0 | t1 | t2 |
|---|---|---|---|---|---|---|---|---|
| 12.0 ±0.3 | 5.5 ±0.1 | 1.75 ±0.1 | 4.0 ±0.1 | 2.0 ±0.1 | 4.0 ±0.1 | $1.5^{+0.1}_{-0}$ | 0.60 max. | 1.70 max. |

| A | B |
|---|---|
| 2.6 ±0.2 | 5.4 ±0.2 |

Unit:mm

Figure 4 Reel Dimensions




| A | B | C | D | E | W |
|---|---|---|---|---|---|
| 180±5 | 60min. | 13.0±0.2 | 21±0.8 | 2±0.5 | $12.4^{+2.0}_{-0}$ |

| T | t | r |
|---|---|---|
| 18.4max | 3max | 1.0 |

Uint:mm