Eco+PLUS® series

Lead free SOLUTIONS you can TRUST

TECHNICAL INFORMATION

SMT Adhesive

JU - R2S

KOKI COMPANY LIMITED

Adhesive to cope with Lead Free soldering and allows self-alignment

JU - R2S

(SMT heat -cure adhesive in lead free reflow process)

Based on our product, JU-R1, which has been favored for some time, JU-R2S has been newly developed to cope with the higher demands of the lead free process. Under the conditions of the lead free reflow profile (Pre-heat temp. : 180 -190°C for 120sec / at 220°C or above for 20~30sec), this adhesive does not inhibit the self-alignment effect of lead free solder, ensuring good solderability (without creating lift-off of QFP leads from the PCB) and works as an adhesive to fix large electronic components onto PCBs. In the second reflow process, the adhesive is completely cured and prevents both drop and dislocation of mounted components on the PCB.

■ Features

1. This adhesive remains in a soft state until it comes to the reflow of the solder paste without being hardened or forming a hard skin. Therefore tackiness to hold components in place is excellent without inhibiting the self-alignment effect at the time of melting the solder, thus ensuring good solderability. The adhesive is completely hardened after the solder paste reflow process.

2. When reflowing a double sided PCB, this adhesive prevents the drop, dislocation or lift-off of mounted components from the PCB.

3. Due to the stability of the adhesive, there is neither slump nor stringing of the adhesive from even large nozzles.

4. There is excellent workability after curing for the purpose of reworking and repairing.

5. Since this adhesive ensures a high stability (at 40°C as ambient temp.), it is very durable for export to overseas factories.

6. It exhibits very high electronic reliability after the reflow curing process.

Production and sales for this adhesive are allowed under an agreement from Matsushita Electronics Co.,Ltd who own Japanese patent No. 2682366.

1. Specification

[**Before curing**]

	Item	Treatment / condition	Value	Remarks
1	Composition	-	Epoxy-resin	-
2	Appearance / Color	-	Paste / red	-
3	Specific gravity	20ºC	1.22 ± 0.05	Cup method
4	Viscosity	20ºC, Pa·S	50± 5	E-type viscometer
5	Thixotropy	20ºC	6.0 ± 0.5	E-type viscometer
6	Non -volatile	105ºC x 3hr	> 99%	-
7	Shelf life	0 ~10ºC	6 months	-

[**After curing**]

Curing condition : Preheat temp. 150~190ºC for 110secs → Reflowing temp. 220ºC and above for 45secs. / Peak temp. 235ºC

No	Item	Treatment / condition	Value	Remarks
1	Appearance / Color	-	Polymerized ,dark reddish brown	-
2	Bonding strength	2125 chip condenser	> 2kgf	Push gage
3	Heat resistance	250ºC x 10secs	No abnormality	-
4	Copper plate corrosion	40ºCx95%RHx96H	No corrosion	-
5	Surface insulation resistance	Initial value	>1 x 10^{13}	JIS specified comb electrode type II
		40ºCx90%RHx500H	>1 x 10^{9}	
6	Solvent resistance	Room temp. 1hr dip	No abnormality	-

Note: Bonding strength represents the measured value (at room temp.) after 1hr passed through the above reflow process under the above curing condition.

2. Temperature - Viscosity

Method
Taking the sample cup from E-shape viscometer, apply sample at about 0.1cm^3 in the center of it. Then set the cone with 3º and 1.54mm diameter in the viscometer and the sample cup.

Circulate water controlled at a specific temperature with ± 0.2ºC in the sample cup and wait until the sample comes to temperature after a specific time and start measurement.

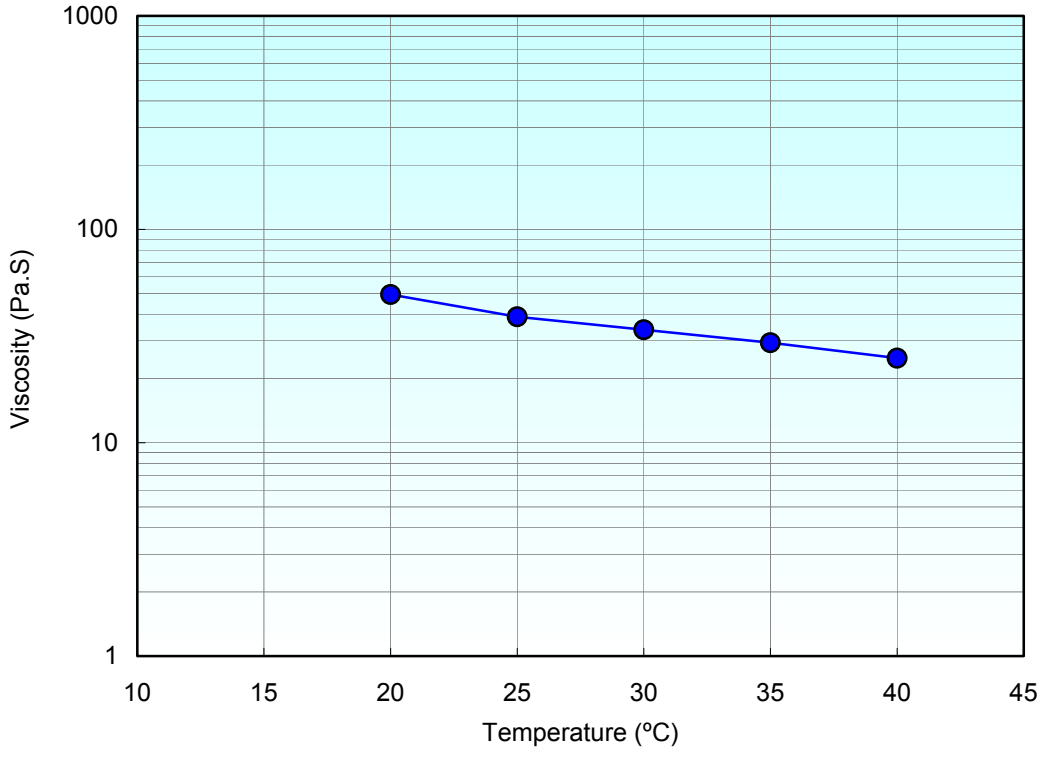
Measurement condition
*Equipment : E-shape viscometer - EHD shape (Tokyo Keiki)
*At rotation speed of 10rpm, read out the measured value after 2min. rotation.
*Measurement is done twice to get average and its value is indicated by Pa·S.

*Measurement result

(Unit : Pa ·S)

Temperature (ºC)	20	25	30	35	40
Viscosity	49.5	38.9	33.8	29.4	24.9

Average value of n = 2



3. Temperature - Thixotropy

Method
Measurement of viscosity is same as that in item.2

Measurement condition
*Equipment: E-shape viscometer - EHD shape (Tokyo Keiki)
*Measurement is done at 1rpm and later at 10rpm. Respectively measure their value after 2 minutes.
*From each of the above results, calculate thixotropy variation according to the following formula.

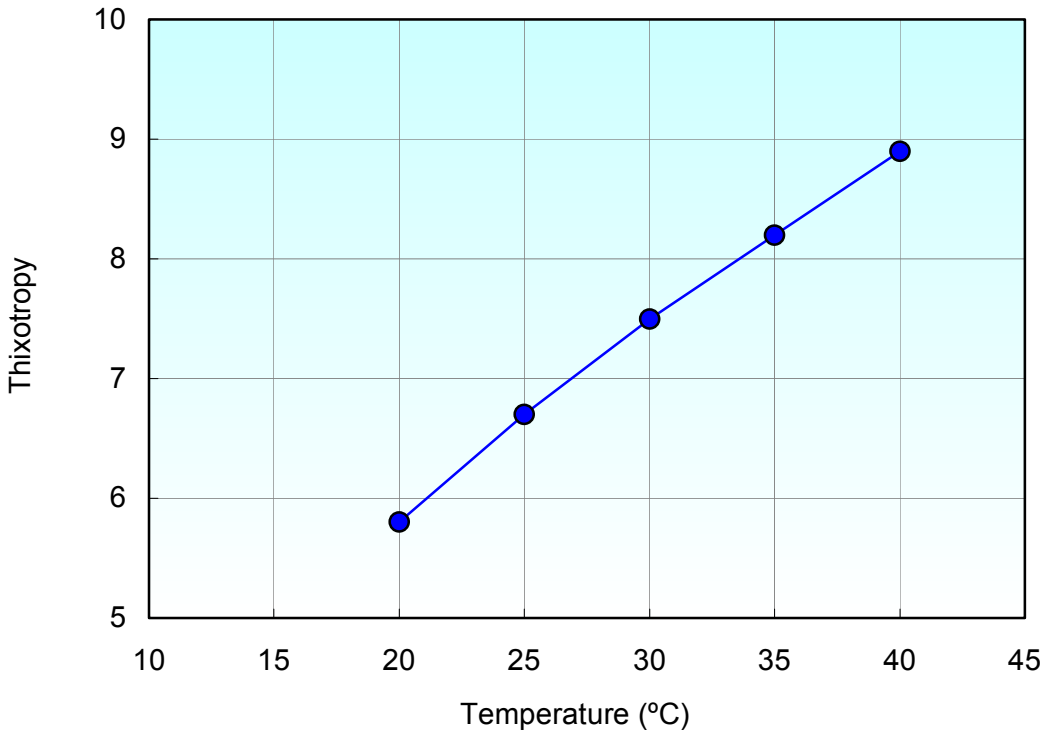
Thixotropy = viscosity at 1rpm / viscosity at 10rpm

*Measurement is done twice to get the average and its value is expressed by Pa·S.

Measurement result

Temperature (ºC)	20	25	30	35	40
Thixotropy	5.8	6.7	7.5	8.2	8.9

Average value of n= 2



4. Storage stability

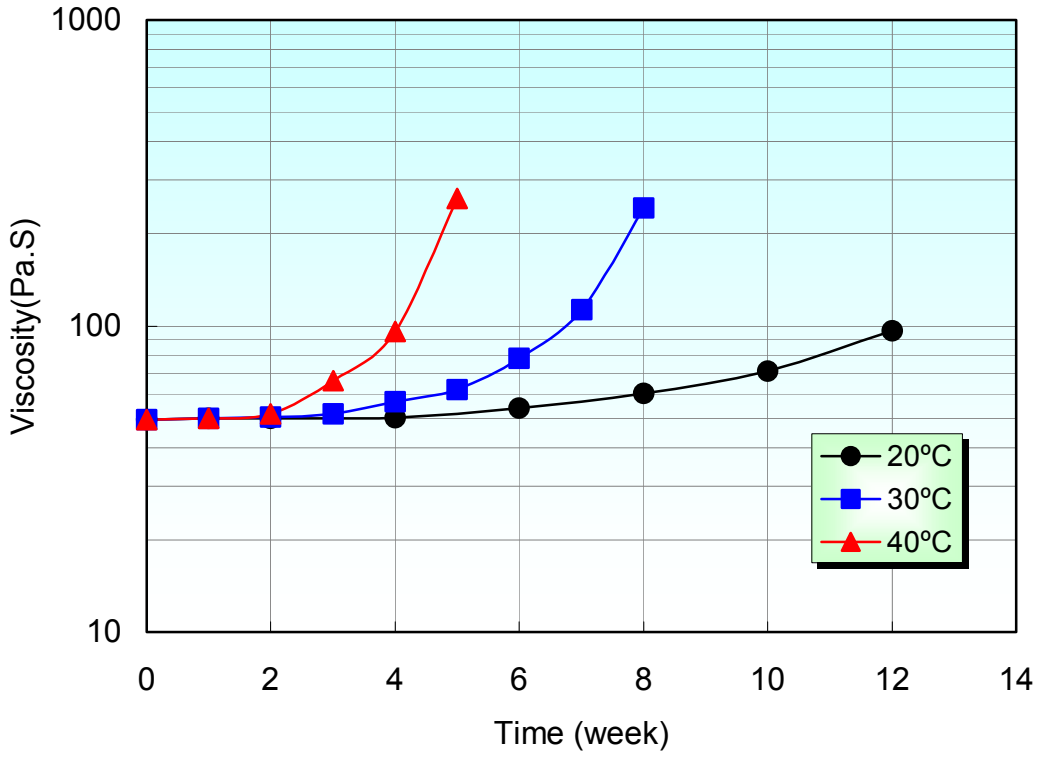
Method
Put sample of approx. 100cm^3 in the bin after sealing it with the cap and leave it at 20, 30, 40± 2ºC for specific time. Remove it and measure viscosity.
Measurement of viscosity is same as that in item 2.

Measurement condition
*Equipment: E-shape viscometer - EHD shape (Tokyo Keiki made)
*Measurement is done at 1rpm and later 10rpm. Respectively measure their value after 2 minutes.
Measurement is done at 10rpm and measure value after 2 minutes.

*Measurement result

Storage time (week)	0	1	2	3	4	5	6	7	8	10	12
20ºC	49.5	49.8	50.2	-	50.1	-	53.9	-	60.1	71.3	96.5
30ºC	49.5	49.8	50.4	51.5	56.5	62.1	78.5	113.3	243.2	-	-
40ºC	49.5	49.8	51.6	66.3	96.0	261	-	-	-	-	-

Average value of n = 2



5. Dependability on bonding strength by time after reflow process

Method

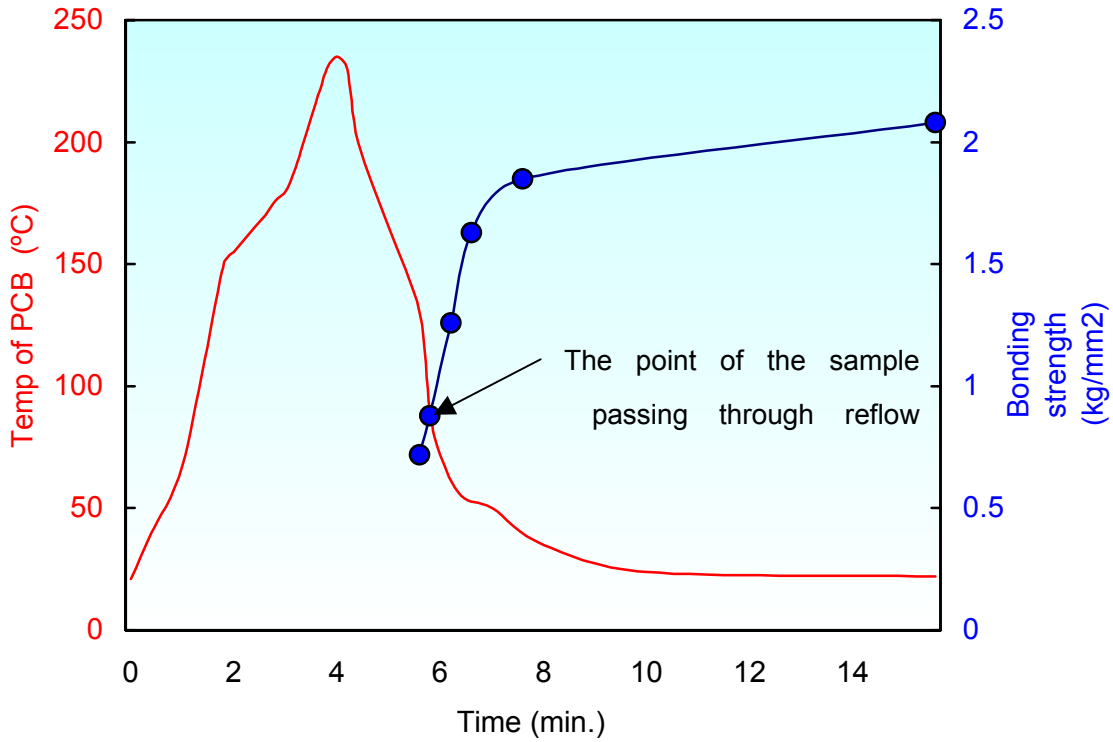
Apply adhesive on to the glass-epoxy resin PCB and mount chips on it. Harden the sample under curing condition listed below and cool it down until it comes to room temperature. Measure the value of removable strength of the adhesive by pushing it in a horizontal direction to the PCB with use of the push gage according to each time passed through the reflow zone.

Measurement condition

*Equipment: Push-pull gage - Max. Measurable range of 5kg and above (division unit :100gs)
*Glass fiber based epoxy resin GE-4 specified JIS-C-6480.
*Chip component: : 3216 chip condenser
*Curing condition : Preheat temp: 150 ~190ºC for 110secs → reflow temp : 220ºC and above for 45secs (peak temp: 235ºC)

Measurement result

Past time (min) after reflow process	0.0	0.2	0.6	1.0	2.0	10.0
Bonding strength (kg)	2.30	2.82	4.03	5.22	5.92	6.66
Contact area (Kg/mm^2)	0.72	0.88	1.26	1.63	1.85	2.08



6. Dependability on bonding strength of cured adhesive in temperature

Method

Apply adhesive on the glass-epoxy resin PCB and mount QFP on it. Haden the sample under the curing condition listed below and cool it down until it comes to room temperature. Measure the value of removable strength of the adhesive by pushing it in a horizontal direction to the PCB with use of the bond tester (equipped with a temp.-rise indicator) according to each time passed through the reflow zone.

Measurement condition

*Equipment: - Bond tester made by SEISHIN Co. (equipped with a temp.-rise indicator) - Max. measurable range : 25kgs

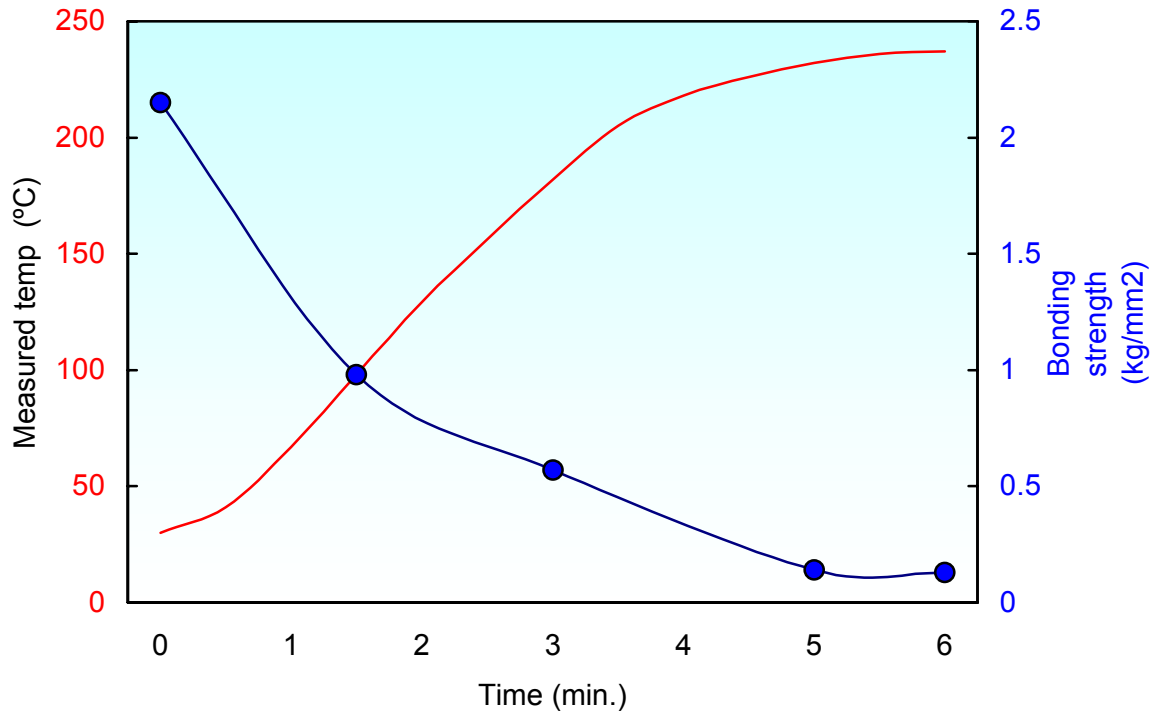
*Glass fiber based epoxy resin GE-4 specified JIS-C-6480.

*Component - QFP, 14 x 20mm w/100 pins

*Curing condition - Pre-heat temp : 150~190ºC for 110secs → Reflow temp: 220ºC and above for 45secs (Peak temp : 235ºC)

Measurement result

Measured temp (ºC)	0	100	180	230	230 (1 min. later)
Bonding strength (kg)	22.6	10.27	5.96	1.48	1.35
Contact area (Kg/mm$^{2)}$	2.15	0.98	0.57	0.14	0.13



7. Surface insulation resistance

Method

Deposit approx. 200μm thick of adhesive uniformly in the overlapping area of the comb shaped conductor on the comb type electrode type-II, cure it in the specified condition to obtain a test piece.

Measure surface insulation resistance (S.I.R) of the above sample at room temperature and room humidity and leave it in a thermohygrostat controlled at 40 ± 2 ºC and 90 ± 3% RH for 1000hrs.

Then measure S.I.R at specific times in a thermohygrostat specified below.

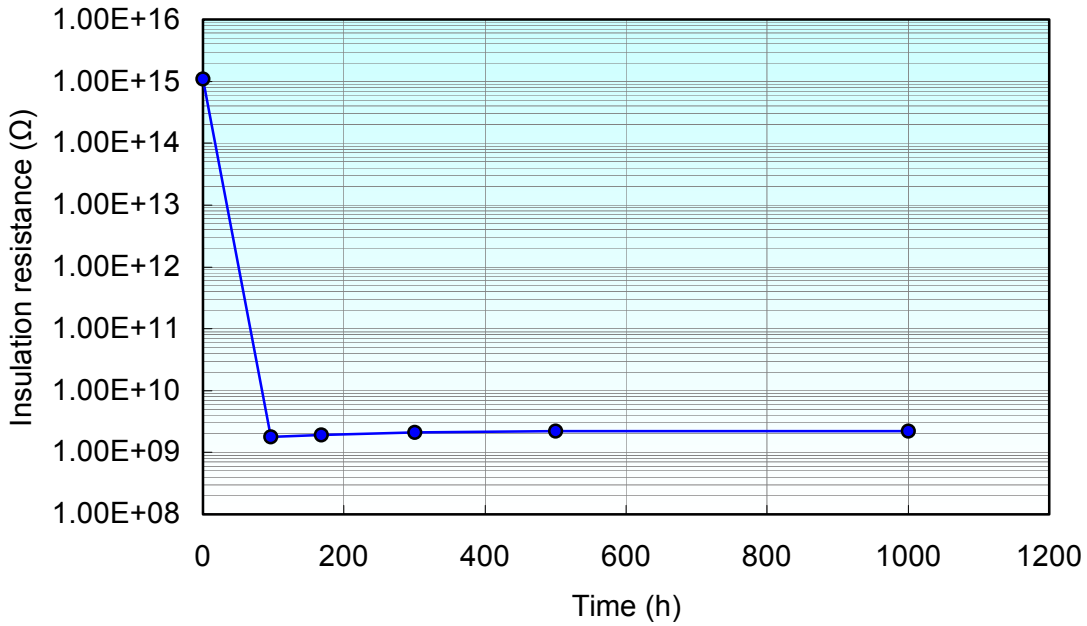
Measurement condition

*Equipment:: Thermohygrostat (40 ± 2 ºC and 90 ± 3% RH)
Surface insulation resistance meter, 4329A (Yokokawa Hewlett Packard)

* Curing condition - Pre-heat temp: 150 ~190ºC for 110secs → Reflow temp : 220ºC and above for 45secs (peak temp: 235ºC)

Measurement result *1.0E+15 = 1.0×10^{15}

n	Initial value	96h	168h	300h	500h	1000h	Out of bath
1	1.0E+15 1.2E+15 1.1E+15 1.0E+15	1.7E+9 1.8E+9 1.8E+9 1.8E+9	1.9E+9 1.8E+9 1.9E+9 2.0E+9	2.1E+9 2.0E+9 2.0E+9 2.2E+9	2.2E+9 2.1E+9 2.2E+9 2.2E+9	2.2E+9 2.1E+9 2.2E+9 2.3E+9	1.6E+13 1.8E+13 1.5E+13 1.6E+13
2	1.1E+15 1.2E+15 1.0E+15 1.3E+15	1.6E+9 1.7E+9 1.8E+9 1.8E+9	1.8E+9 1.7E+9 1.9E+9 2.0E+9	1.9E+9 1.9E+9 2.1E+9 2.2E+9	2.0E+9 2.1E+9 2.1E+9 2.3E+9	2.0E+9 2.2E+9 2.1E+9 2.3E+9	1.8E+13 1.9E+13 1.5E+13 1.6E+13
3	1.4E+15 1.2E+15 1.1E+15 1.0E+15	1.9E+9 1.7E+9 1.6E+9 1.8E+9	2.0E+9 1.9E+9 1.9E+9 2.1E+9	2.2E+9 2.0E+9 2.0E+9 2.3E+9	2.2E+9 2.2E+9 2.1E+9 2.4E+9	2.3E+9 2.2E+9 2.1E+9 2.5E+9	1.7E+13 1.9E+13 1.8E+13 1.9E+13
Average	1.1E+15	1.8E+9	1.9E+9	2.1E+9	2.2E+9	2.2E+9	1.7E+13



8. Voltage applied SIR

Method

Deposit approx. 200μm thick of adhesive uniformly in the overlapping area of a comb shaped conductor on the comb type electrode type-II, and cure it in the specified condition to get a test piece.

After measuring the surface insulation resistance on the test piece (at room temp./humidity), leave the test piece in a thermohygrostat controlled at 85 ± 2 ºC, 85 ± 3%RH whilst applying 50V to it for 1000hrs consecutively. Then measure S.I.R on the test piece at specific times.

Measurement condition

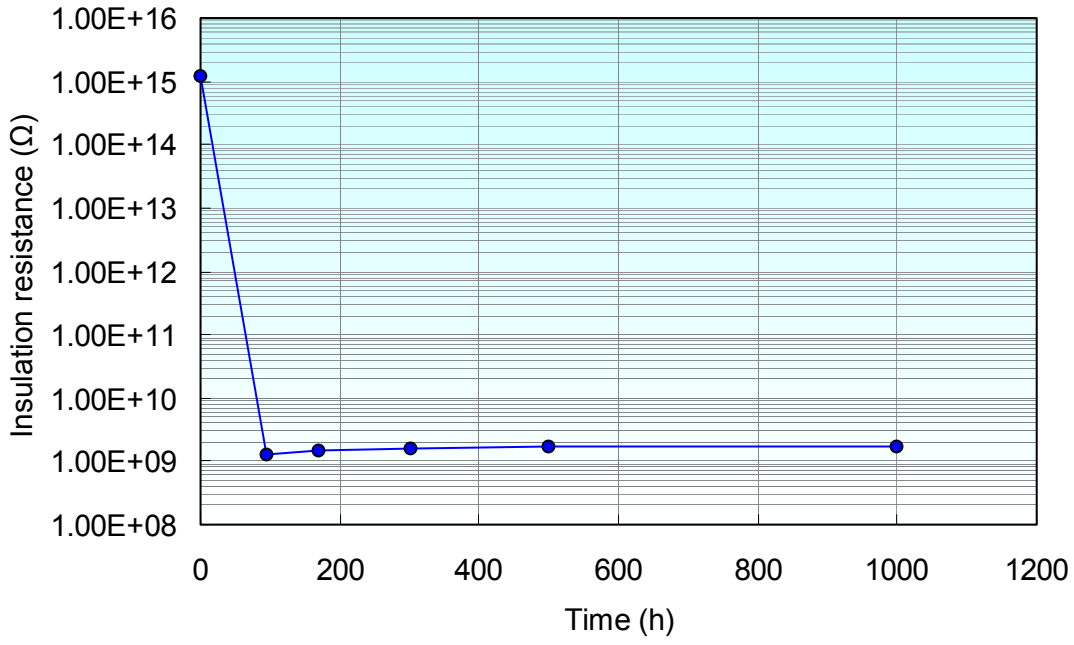
*Equipment:: Thermohygrostat (capable of being controlled at 85 ± 2 ºC , 85 ± 3%RH)
Surface insulation resistance meter, 4329A (Yokokawa Hewlett Packard)
Applied voltage - 50V
Measurement voltage -100V

* Curing condition - Pre-heat temp: 150 ~190ºC for 110secs → Reflow temp : 220ºC and above for 45secs (peak temp: 235ºC)

Measurement result

*1.2E+15 = 1.2×10^{15}

n	Initial value	96h	168h	300h	500h	1000h	Out of bath
1	1.2E+15 1.3E+15 1.4E+15 1.4E+15	1.3E+9 1.1E+9 1.2E+9 1.4E+9	1.5E+9 1.2E+9 1.2E+9 1.5E+9	1.5E+9 1.3E+9 1.4E+9 1.6E+9	1.7E+9 1.4E+9 1.5E+9 1.6E+9	1.7E+9 1.5E+9 1.6E+9 1.6E+9	1.3E+13 1.5E+13 1.5E+13 1.2E+13
2	1.1E+15 1.0E+15 1.2E+15 1.0E+15	1.1E+9 1.4E+9 1.3E+9 1.3E+9	1.3E+9 1.6E+9 1.6E+9 1.4E+9	1.5E+9 1.6E+9 1.7E+9 1.6E+9	1.5E+9 1.7E+9 1.7E+9 1.7E+9	1.6E+9 1.7E+9 1.7E+9 1.8E+9	1.5E+13 1.7E+13 1.4E+13 1.5E+13
3	1.1E+15 1.4E+15 1.1E+15 1.3E+15	1.2E+9 1.3E+9 1.3E+9 1.3E+9	1.5E+9 1.6E+9 1.5E+9 1.6E+9	1.7E+9 1.8E+9 1.7E+9 1.7E+9	1.8E+9 1.9E+9 1.7E+9 1.8E+9	1.8E+9 1.9E+9 1.8E+9 1.8E+9	1.6E+13 1.7E+13 1.5E+13 1.5E+13
Average	1.2E+15	1.3E+9	1.5E+9	1.6E+9	1.7E+9	1.7E+9	1.5E+13



9. Tackiness

Method

Using the stencil (t=0.15 mm / Φ=6.5 mm as referred below), print the adhesive on the alumina plate (25 x 50 x 0.8 ^{t} mm) to obtain a test piece and measure tackiness after 0, 24, 48hrs respectively.

Measurement condition

*Equipment:: Malcom solder checker, FG-2 type

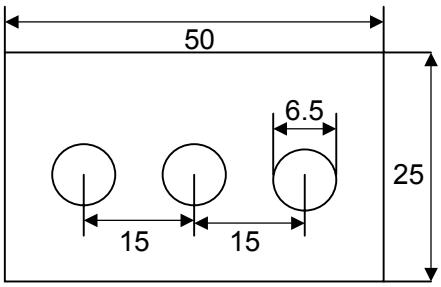
*Probe material: Stainless steel

Diameter: 5 mm

Ascent/descent speed: 10 mm/seconds

Pressurizing force: 20 ± 5g

Pressurizing time: 0.2secs



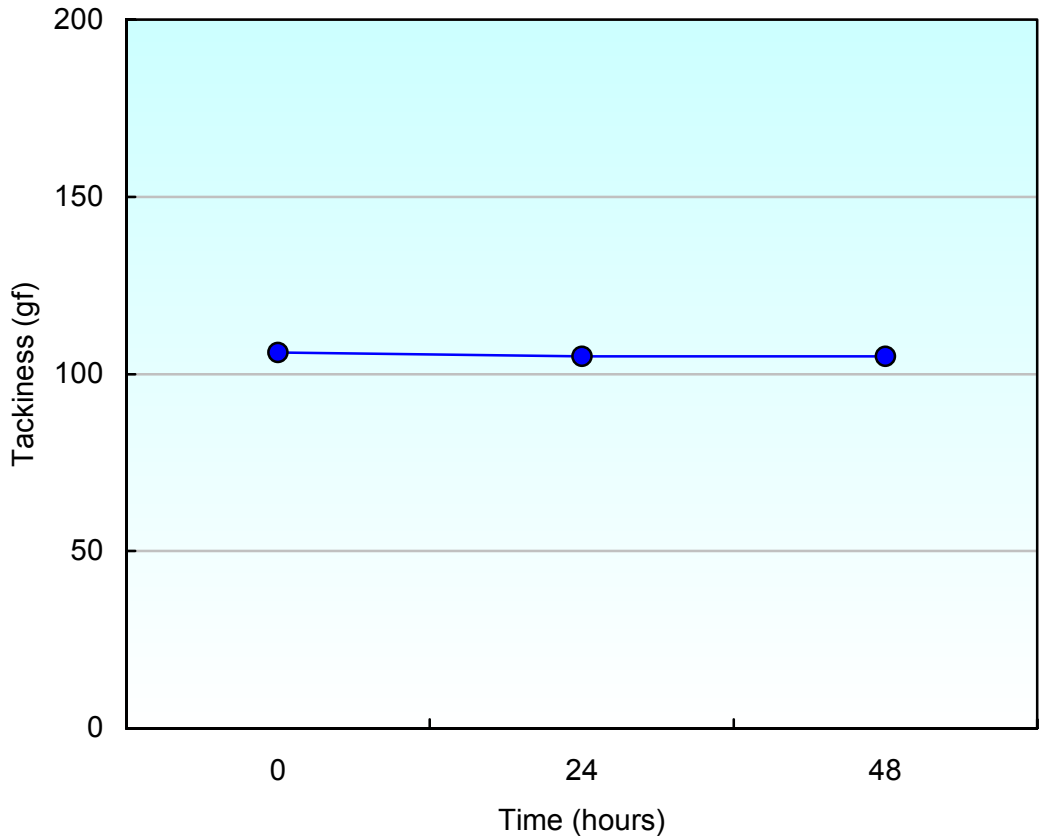
Unit: mm

Measurement result

(Unit : gf)

Time (h)	0	24	48
Tackiness	106	105	105

Average value of n = 5



10. Dispensability test

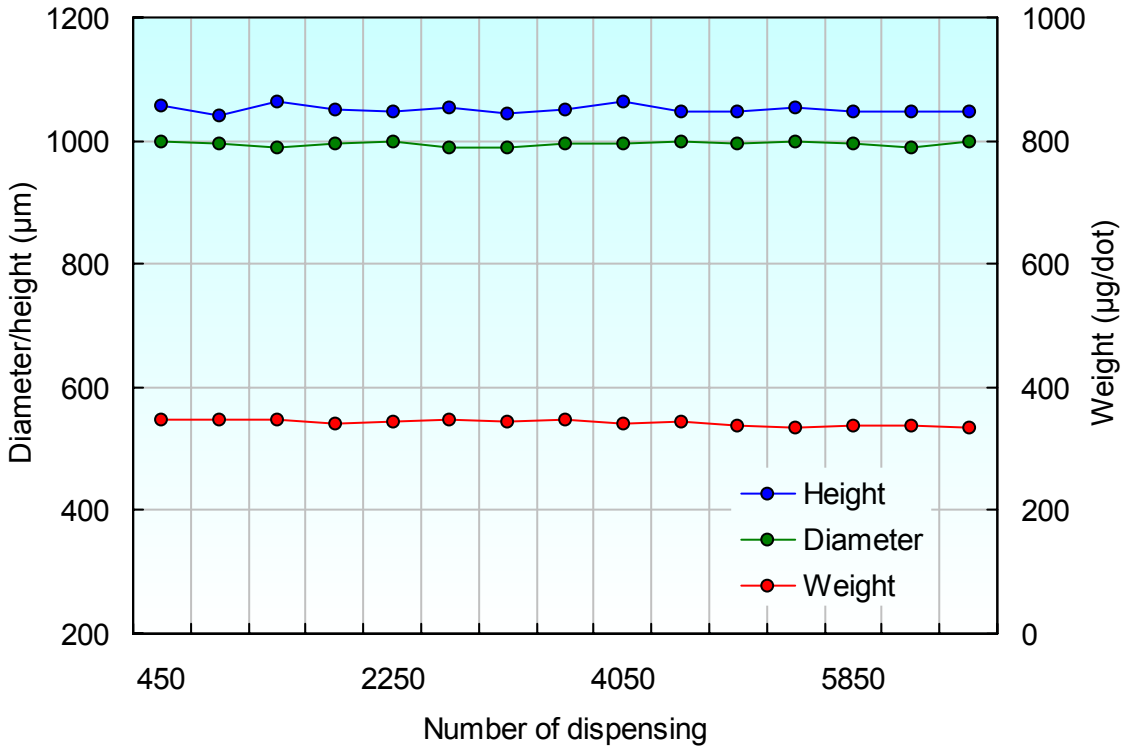
Method
According to the prescribed condition, dispense the adhesive on a glass epoxy PCB and measure the height and the diameter of adhesive dispensed on the PCB.

Test condition
Equipment: Dispensing machine (TENRYU TECHNICS CO.)
Microscope (HYROCCS CO.)
Dispensing pressure / time: 3.0kgs / 50msecs
Nozzle diameter / temperature: 19gauge (approx. 600μm) / 35ºC
Test room temperature / humidity: 25.5 ºC / 36%RH

Photographs

Observation by 70 times magnification

Initial time | 3000th | 6000th



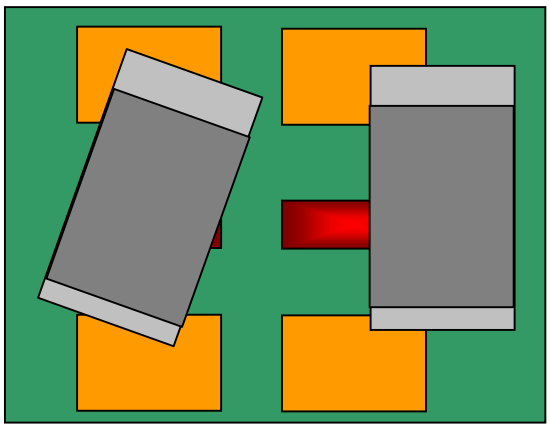
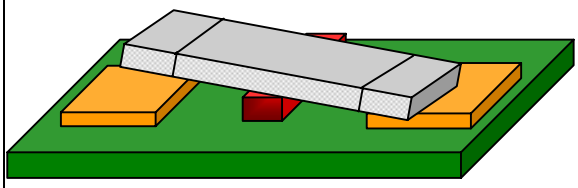
11. Self-alignment test of component and resistance to component lift-off

Method

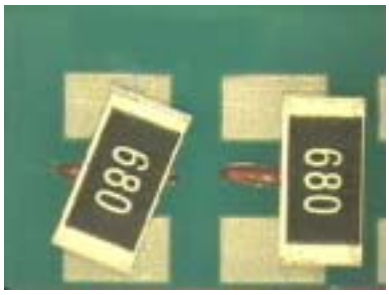
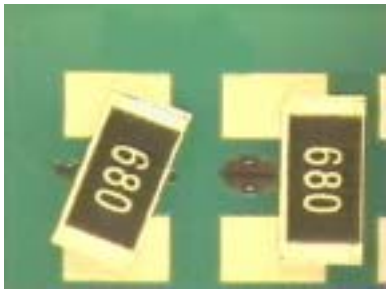
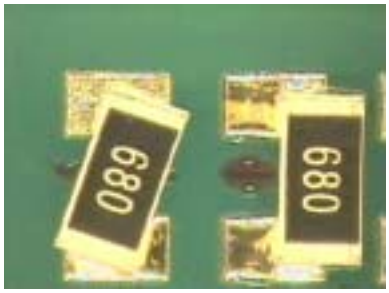
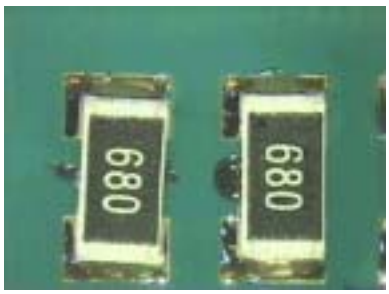
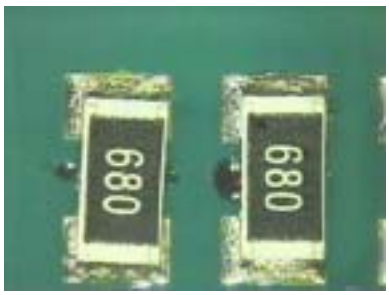
Using a 150 μm thick stencil, print lead-free solder paste on a glass epoxy PCB having a size of copper pad (2.0mm x 3.0mm, pads gap = 4.0mm). Apply the adhesive sample to the center between both of the pads to make it possible to form a deposit to be 1.0mm(W) x 3.0mm(L) x approx.200μm(H). For preparing the test pieces by mounting chips on the pads, we have executed the following :
-1> we have tilted the chip at 20º toward the right side from the center and gently pushed the center on the chip,
-2> Set the position of the other chip toward right-hand side by 2.0mm and gently pushed the center on the chip,
Then observe the behavior of the self-alignment effect and resistance to lift-off of the chip component while above test pieces are soldered under the prescribed condition, by viewing from the top and the side, as shown in the photographs below:

Measurement condition

*Equipment: High temperature observation apparatus (SANYOSEIKO CO.)
*Glass fiber based epoxy resin GE-4 specified JIS-C-6480.
*Chip component – Chip resistors, Type 6330
* Curing condition - Pre-heat temp: 150 ~190ºC for 110secs → Reflow temp : 220ºC and above for 45secs (peak temp: 235ºC)

(Top view) Measurement for self-alignment	(Side view) Measurement for lift-off
	

Result

Temperature	(Top view) Measure for self-alignment	(Side view) Measurement for lift-off
30ºC		
200ºC		
220ºC		
240ºC		
After cooling		

12. JU-R2S Curing condition and thermal profile

*Recommended curing condition :

Preheat temp:	150 - 190ºC x 110 and above
Reflow temp:	more than 220ºC x 45secs (minimum: 20secs)
Peak temp:	235ºC (minimum : 230ºC)

*Thermal profile

Recommended curing condition:	Indicated by the red line in the graph.
Minimum curing condition:	Indicated by the blue line in the graph.