#55023
First issue on October 25, 2017
Revised on

Contents

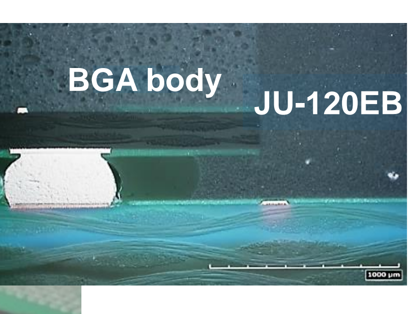
- Features
- Feature - Performance
- Specifications
- Continual Dispensability
- Temp. vs. Viscosity / Ti
- Stability in Storage
- Voltage Applied SIR
- Heat slump
- Drop Impact Resistivity
- Thermal Cycle Test
- Halogen Content
- Repairability
- Handling Guide

Koki Adhesive

Edge Bond – Package joint reinforcement

JU-120EB

Product Information

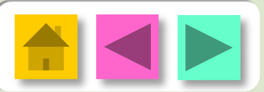


Disclaimer

This Product Information contains product performance assessed strictly according to our own test procedures and is not the guaranteed results at end-users. Please conduct thorough process optimization before mass production application.

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide



Feature

- Reinforces the joint strength of bottom terminated components such as CSPs, BGAs.
- Heat curable adhesive.
- Excellent resistance to thermal cycling and drop impact.
- Halogen free formulation (Cl, Br<900ppm, total<1500ppm)
- Optimized Tg formulation prevents occurrence of crack in solder joint under thermal cycling.
- Easy repair- ability
- No need to store /transport in very cold temperatures.

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

Feature

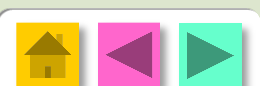
Item	Underfill	Conventional Edge bond	JU-120EB
Viscosity	Low	Medium-High	Medium
Curing time	A few tens of min.	Approx. 10min	Approx. 10min
Repairability	Difficult	Yes, No	Yes
Transportation / Storage temperature	Chilled transport / storage		Refrigeration / room temp. storage
Impact under Thermal cycling	Cause crack in solder joint	No	No

Along with miniaturization of electronics equipment, packages, such as flip-chips, BGAs are also getting thinner. The thin package tends to cause major warpage and lead to defects such as bridging, head-in-pillow (HiP) and non-wet-open (NWO). The use of a low melting point SnBi system alloy allows reflow at relatively low reflow temperature, can be one of solutions to mitigate the warpage of the package. However, its high Bi content turns the joint brittle and, therefore, a joint reinforcement against the impact shock is needed. The use of underfill might be a potential solution but due to CTE mismatch can cause occurrence of cracks in the solder joint.

JU-120EB helps with solder joint reinforcement against the impact shock, ensures easy repair-ability and does not induce thermal fatigue cracks in the solder joints due to low CTE mismatch.

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide



Feature - Superior T/C resistance

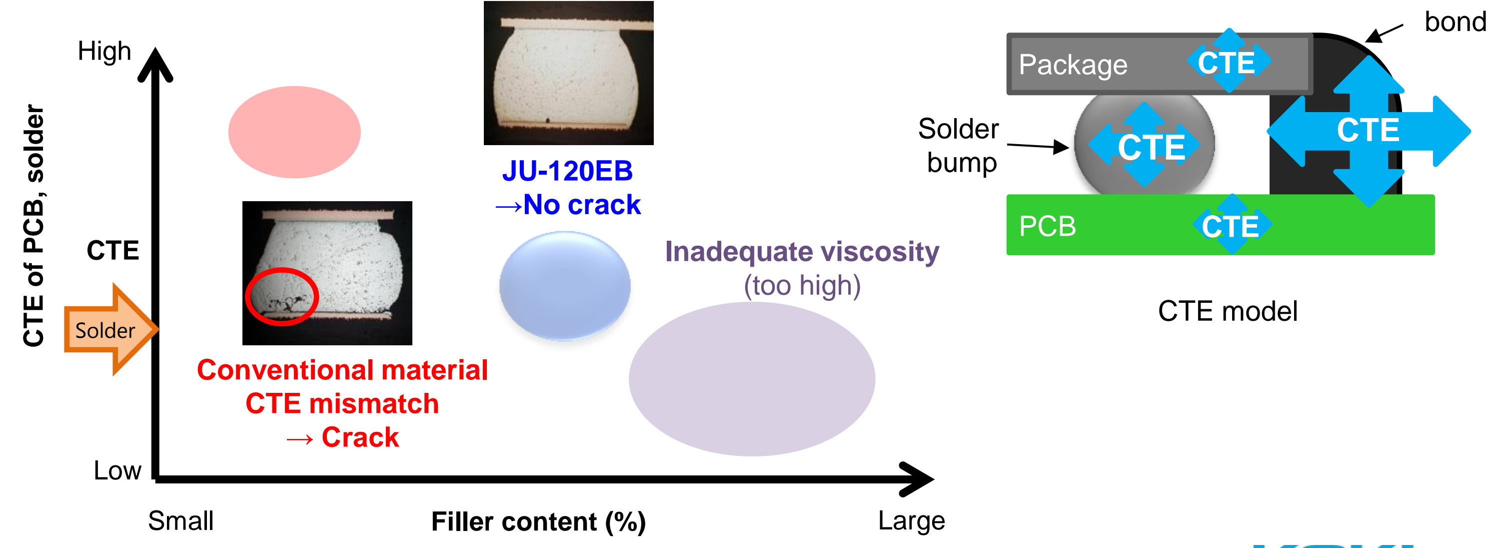
Challenge

CTE mismatch between PCB, solder alloy and component causes crack in solder joint.
Epoxy based adhesives in general, have a higher CTE than the solder alloy and PCB. Therefore their application may induce cracking in solder joint near the printed circuit board.

Solution

When the filler content is increased, it helps to decrease CTE, but increases the viscosity making material difficult to dispense.

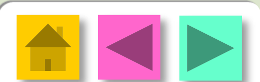
JU-120EB has an unique combination of a stable viscosity and low CTE which makes it compatible with variety of solder alloys , PCBs and components .



CTE model

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide



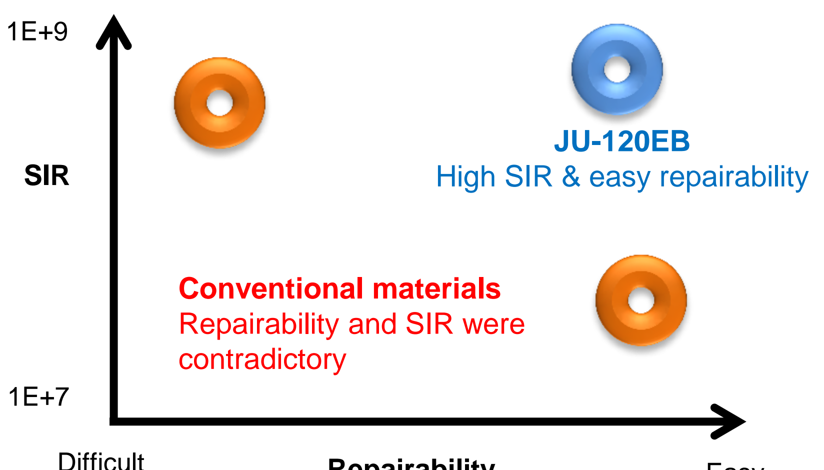
Feature - Repairability

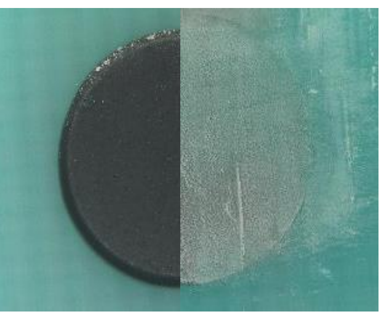
Challenge

Edge bond is required to be repairable after it gets cured.

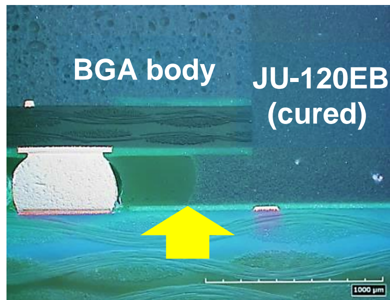
Solution

In order to have the material repairable, it needs to be softened in cured condition after heat is applied.
But increase of the material fluidity tends to deteriorate the SIR because it allows the mobility of ionic substances.
JU-120EB has succeeded to make both easy repair ability and high SIR by carefully selecting the hardening agent and formulation technique.





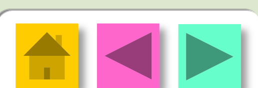
JU-120EB
Right half was removed after curing by scraping off while heating



No heat slump, does not disturb solder joint

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide



Specification – Before curing

	Application	Dispensing	Remark
	Product name	**JU-120EB**	
Before curing	Composition	Epoxy	—
	Appearance	Pate, black	Visual
	Specific gravity*	1.6	25ºC, Cup method
	Viscosity (Pa·s)	70±10	E type viscometer, 20ºC 10rpm 2min.
	Halogen content (%)	Cl<900ppm, Br<900ppm	Ion chromatography (combustion method)
	Non volatility*	>99.0	105ºC,18min.
	Shelf life*	3 months	Below 10ºC
		1 month	25ºC
	Copper plate corrosion*	No abnormality	40ºC, 90%RH, after 96hrs

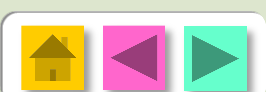
Specification – After curing

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

	Application	Dispensing	Remark
	Product name	**JU-120EB**	
After curing	Appearance	Solid, black	Visual
	Copper plate corrosion	No abnormality	40 °C, 90%RH after 96hrs *
	Solvent resistivity	No abnormality	Soak in acetone, IPA for 1hr*
	Surface insulation resistance (Ω)	>1.0 x 10^{13}	Initial value out of chamber/ IPC-B-24 coupon with 150μm stencil*
		>1.0 x 10^{9}	85 °C, 85%RH after 168hrs in chamber*
		>1.0 x 10^{13}	85 °C, 85%RH after 168hrs out of chamber*
	Glass transition point	102	TMA, 1/°C, 10°C/min -50~250°C*
	Boiling water absorption (%)	<1.0	1hr, JISK6911
	Linear expansion coefficient (ppm/K)	α_L 2.8 x 10^{-5}	TMA 1/°C ,10°C/min -50~200°C*
		α_H 1.1 x 10^{-4}	
	Dielectric constant	3.72	1MHz, 23 °C*
	Dielectric tangent	0.01	1MHz, 23 °C*

*Curing condition: 150°C x 10min



Contents

- Features
- Feature - Performance
- Specifications
- Continual Dispensability
- Temp. vs. Viscosity / Ti
- Stability in Storage
- Voltage Applied SIR
- Heat slump
- Drop Impact Resistivity
- Thermal Cycle Test
- Halogen Content
- Repairability
- Handling Guide

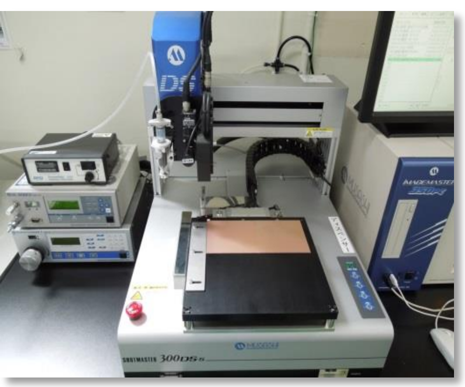
Continual dispensability – 20G single nozzle dot dispensing

< Test method >

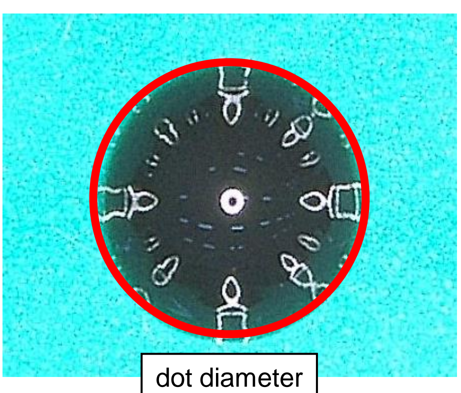
Measure diameter of 12 dots at the 1st 12dots and thereafter every 1000 shots

< Instrument used >

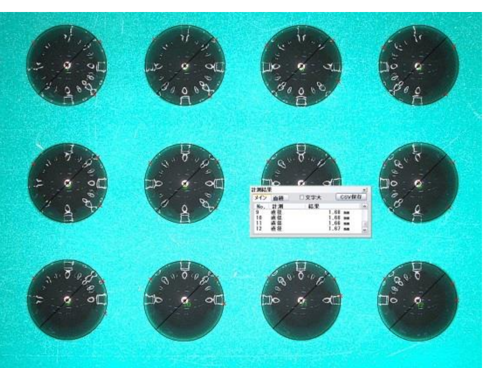
Dispenser:	350PC,ML-808FX com-CE (Air pulse type, Musashi Engineering)
Temp. control:	Processmate 6500 (Nordson EFD)
Substrate:	FR4 (100x100x1.6mmt)
Syringe:	PSY 10E (Musashi Engineering)
Nozzle:	20G single (13L mm, 0.61mmΦ inner diameter)



< Measurement of dots >



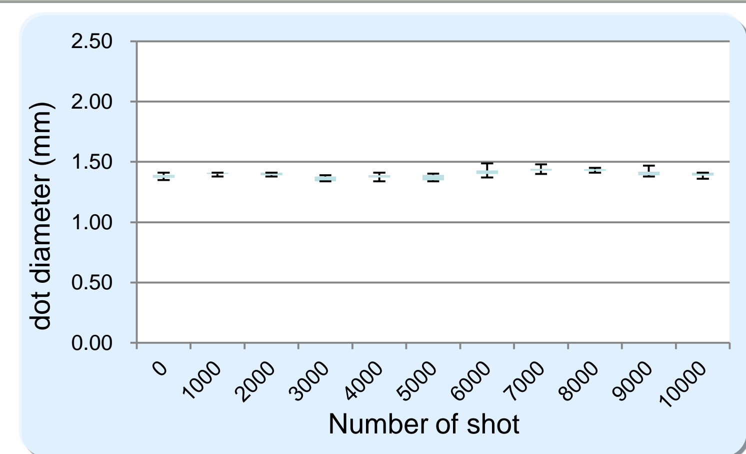
dot diameter

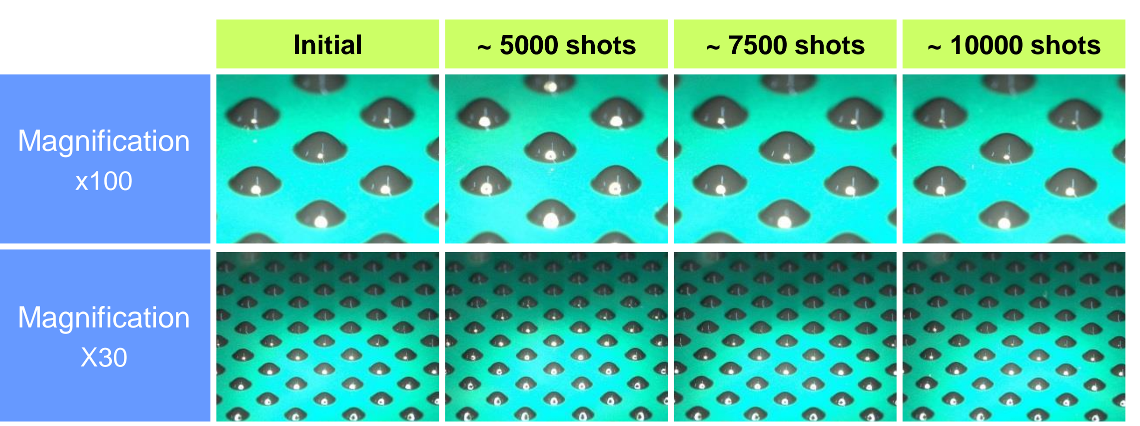


Continual dispensability – 20G single nozzle dot dispensing

< Dispenser condition >

Nozzle:	20G single (13L mm, 0.61mmΦ inner dia.)
Pressure:	250kPa
Time:	300msec
Stand-off:	200µm
Inner temp. :	25 ºC
Dispense pitch:	X,Y 2.5mm each (1000 dots/substrate)

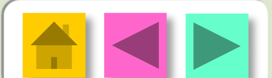




Very stable and consistent dispensability.

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide



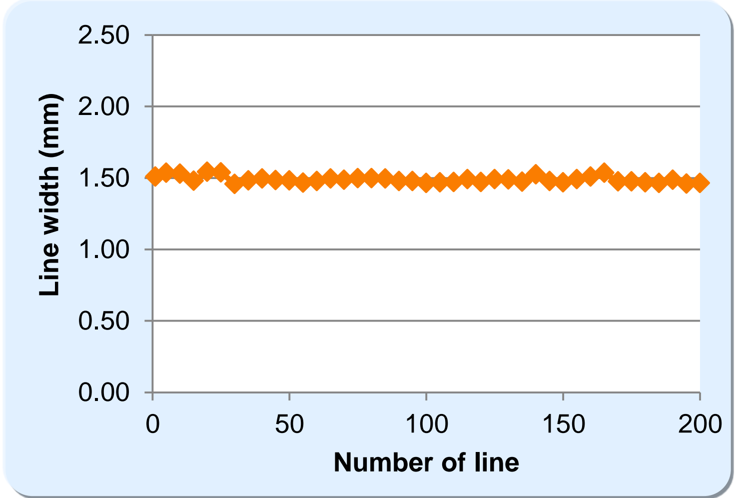
Contents

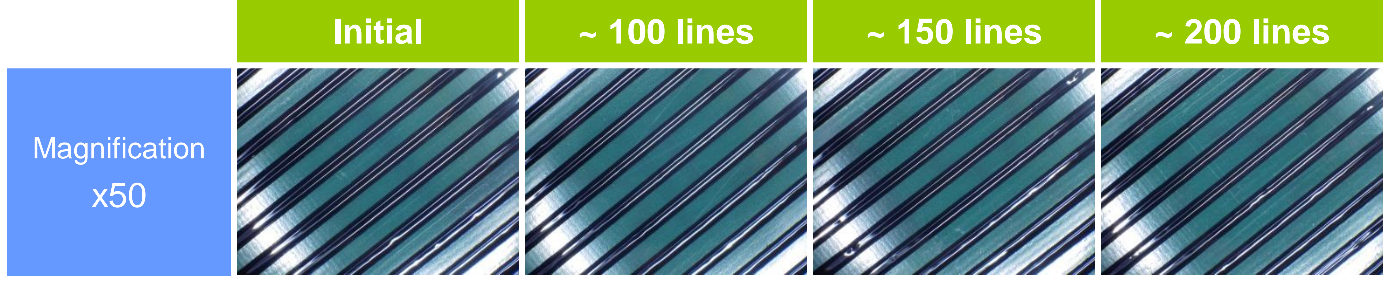
Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

Continual dispensability – 20G single nozzle line dispensing

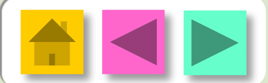
< Dispenser condition >

Nozzle:	20G single (13L mm, 0.61mmΦ inner dia.)
Pressure:	200kPa
Time:	300msec
Stand-off:	200µm
Inner temp. :	25 ºC
Dispense pitch:	X,Y 2.5mm each





Very stable dispensing.



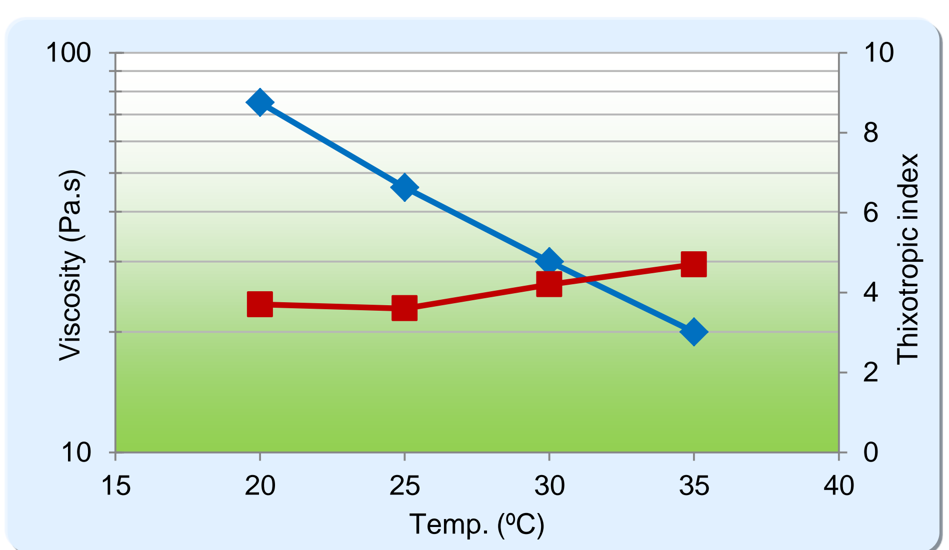
Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

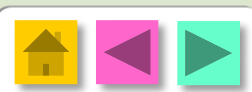
Temp. vs. Viscosity & Temp. vs. Ti curve

< Measurement condition >

Viscometer:	E-type viscometer RE-100U
Measurement:	10rpm x 2min. + 1rpm x 2min.
Cone rotor:	3° x R7.7 (CORD-7)
TI definition:	TI = Viscosity at 1rpm / Viscosity at 10rpm



Temp. (ºC)	Viscosity (Pa·s)	Ti
20	75	3.7
25	46	3.6
30	30	4.2
35	20	4.7



Package Joint Reinforcement **JU-120EB**

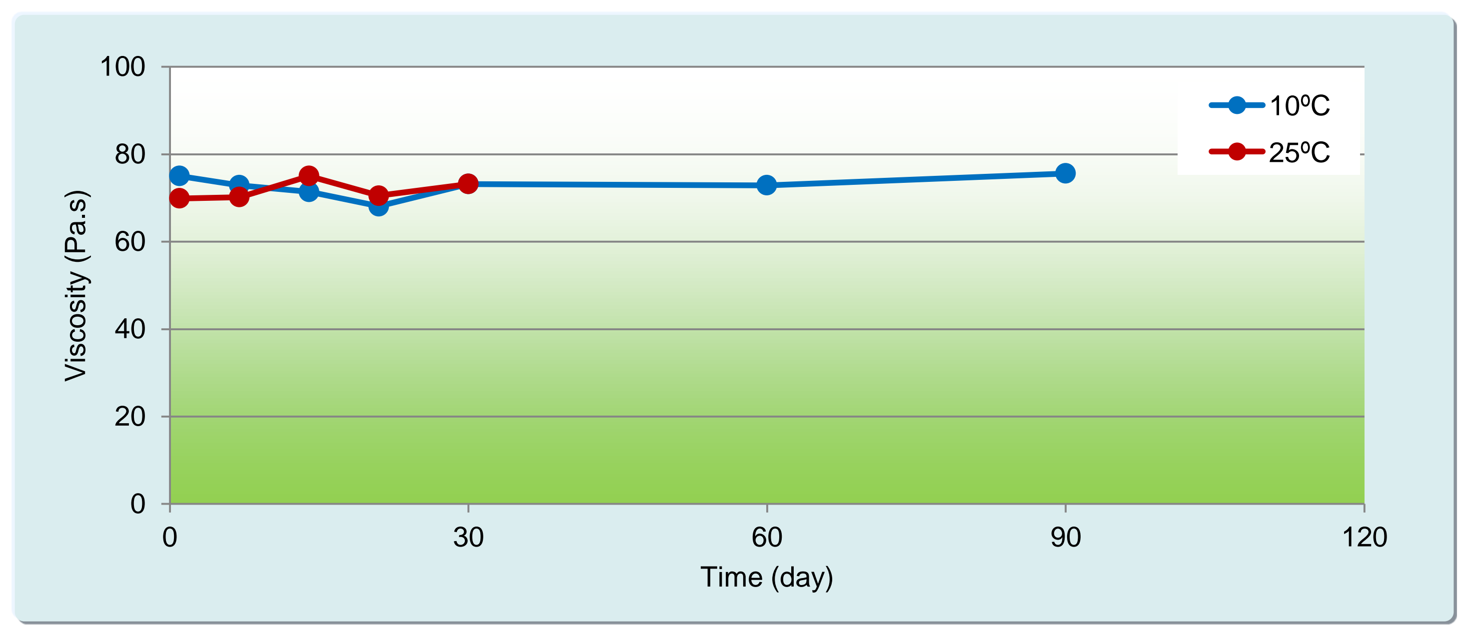
Contents

- Features
- Feature - Performance
- Specifications
- Continual Dispensability
- Temp. vs. Viscosity / Ti
- Stability in Storage
- Voltage Applied SIR
- Heat slump
- Drop Impact Resistivity
- Thermal Cycle Test
- Halogen Content
- Repairability
- Handling Guide

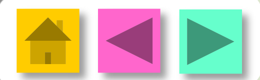
Viscosity stability in storage

< Measurement condition >

Viscometer:	E-type viscometer RE-100U
Measurement:	10rpm x 2min. + 1rpm x 2min.
Cone rotor:	3⁰ x R7.7 (CORD-7)
TI definition:	TI = Viscosity at 1rpm / Viscosity at 10rpm

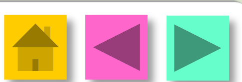


JU-120EB maintained stable viscosity even at 25⁰C.



Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

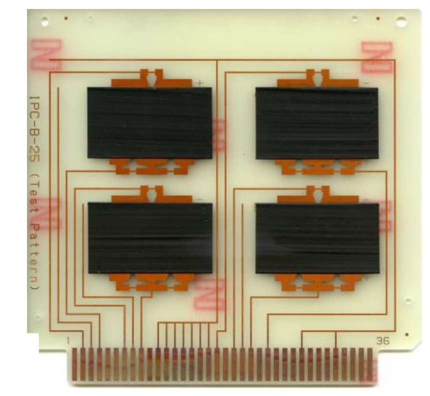


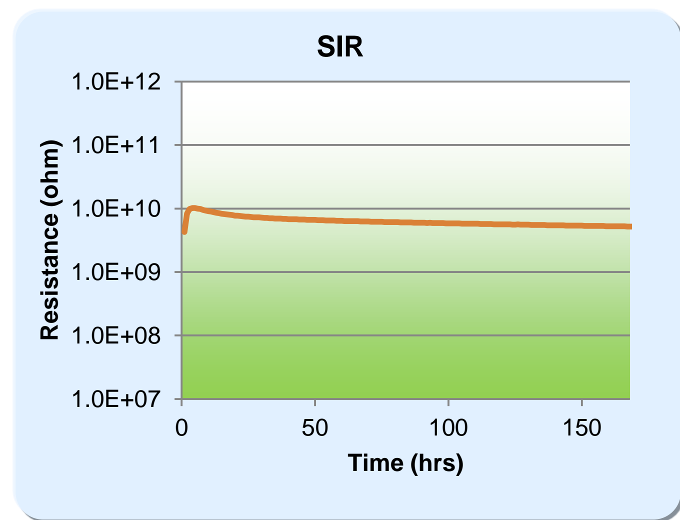
Voltage applied SIR test

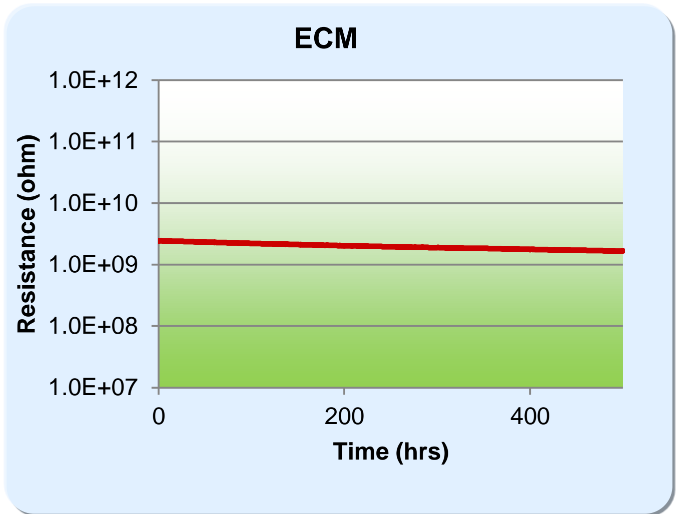
< Tet condition >

Test coupon:	IPC-B-24 (SIR) or IPC-B-25 (ECM)
Application::	Print JU-120EB over comb pattern.
Thickness:	150µm
Curing condition:	150ºC x 10min.
Duration of test:	168Hrs (SIR), 500Hrs (ECM)
Voltage applied:	50V (SIR), 10V (ECM)
Measurement voltage:	100V
Chamber condition:	85 ºC x 85%RH

Test coupon with JU-120EB printed







Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

Heat slump test

< Test method >

Measure dot diameter before and after curing.

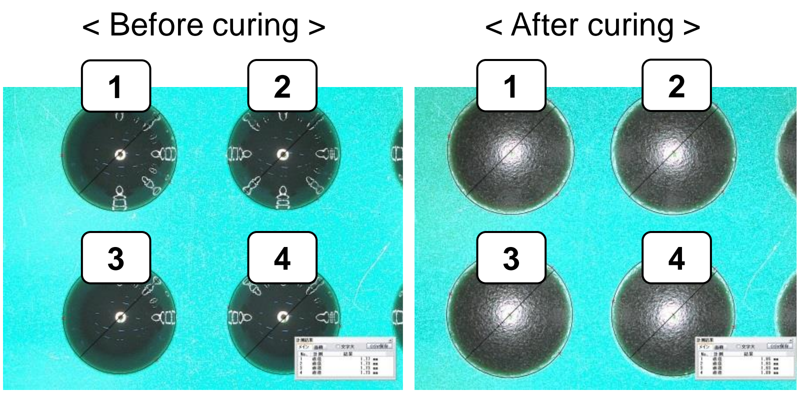
< Test condition >

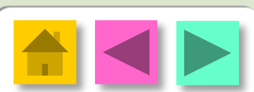
Substrate: FR-4
Dispense condition: Refer to Slide #9 “Continual Dispensability”
Curing condition: 150 ^{o}C x 10min.

< Result >

Test point	Before cure (mm)	After cure (mm)	Variation (%)
1	1.77	1.95	10
2	1.73	1.93	11
3	1.73	1.93	11
4	1.73	1.89	9
Ave.	**1.74**	**1.93**	**10**

< Before curing > < After curing >





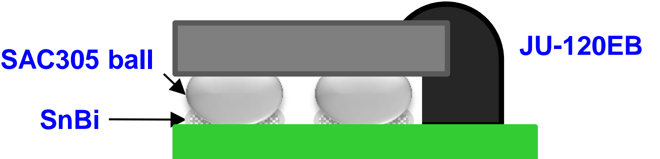
Contents

- Features
- Feature - Performance
- Specifications
- Continual Dispensability
- Temp. vs. Viscosity / Ti
- Stability in Storage
- Voltage Applied SIR
- Heat slump
- Drop Impact Resistivity
- Thermal Cycle Test
- Halogen Content
- Repairability
- Handling Guide

Drop impact resistivity

< Test condition >

Substrate:	FR-4, OSP finish
Component:	1.0mmPitch BGA (SAC305 ball) Daisy chain
Mount condition:	Sn58Bi solder paste Print thickness 120μm Dispense JU-120EB after reflow
Curing condition:	130 ºC x 15min
Drop test: :	1500G x0.5msec Repeat half sine wave load.
Judge:	Regard momentary voltage change as rupture



Test board

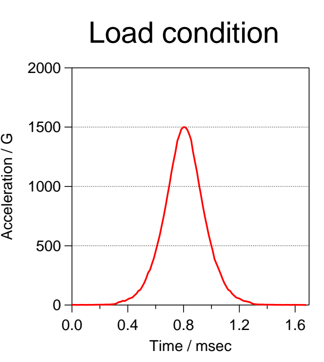
Thickness:1mm

77mm

132mm

JU-120EB applied

Load condition



Drop impact tester

	With JU-120EB	Without JU-120EB
Number of impact till rupture	987	25

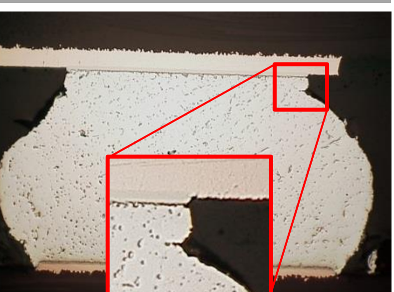
Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

Thermal cycle test

< Test condition >

Substrate:	FR-4, OSP
Component:	1.0mmPitch BGA (SAC305 ball)
Mount condition:	SAC305 solder paste Print thickness 120µm
Curing condition:	150 ºC x10min
T/C condition:	-30/+80ºC 15 dwell x 500 cycles

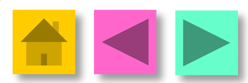
	JU-120EB	Conventional edge bond	Underfill
After 500 cycles			
		Crack	Crack

Conventional edge bond and underfill showed cracking in the solder joint in thermal fatigue experiment due to CTE mismatch between the package, solder alloy and substrate.

JU-120EB's optimized CTE property ensures reliable BGA joint.

Contents

- Features
- Feature - Performance
- Specifications
- Continual Dispensability
- Temp. vs. Viscosity / Ti
- Stability in Storage
- Voltage Applied SIR
- Heat slump
- Drop Impact Resistivity
- Thermal Cycle Test
- Halogen Content
- Repairability
- Handling Guide



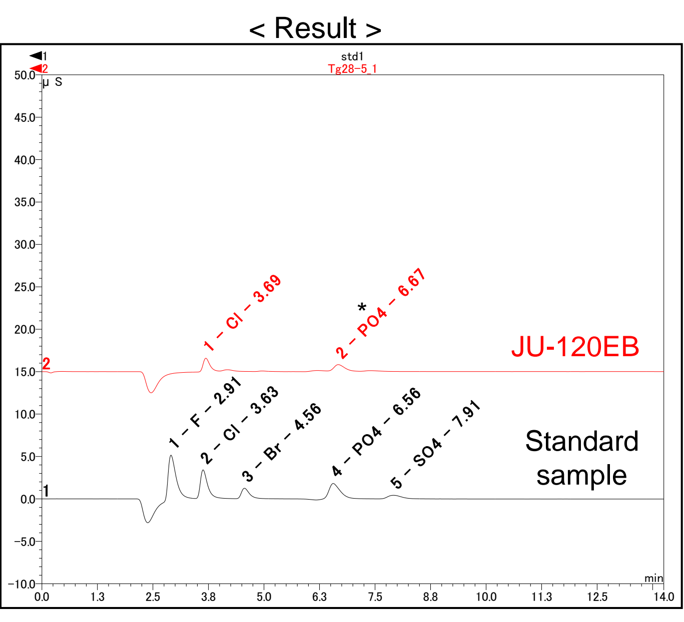
Halogen content

< Test condition >

Instrument: ICS-1500 (DIONEX)
Ion Chromatography System

Test condition: In accordance with JPCA-ES01 2003

< Result >



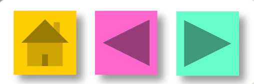
Ion Chromatography System

Halogen	Content (ppm)
F	n.d.
Cl	400
Br	n.d.
I	n.d.

Some halogen derived from epoxy compound was detected within the requirement of Cl, Br<900ppm, Total<1500ppm)

Contents

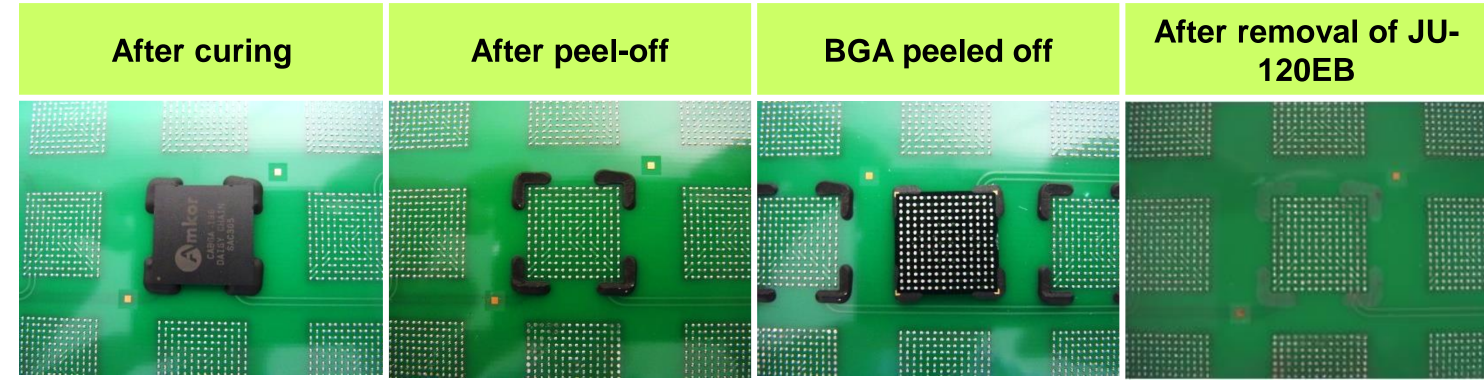
- Features
- Feature - Performance
- Specifications
- Continual Dispensability
- Temp. vs. Viscosity / Ti
- Stability in Storage
- Voltage Applied SIR
- Heat slump
- Drop Impact Resistivity
- Thermal Cycle Test
- Halogen Content
- Repairability
- Handling Guide



Repairability test

< Test condition >

Heat source:	Hot plate, heat gun
Substrate:	FR-4, OSP finish
Component:	1.0mm Pitch BGA (SAC305 ball)
Mount condition:	SAC305 solder paste Print thickness 120µm
Repair condition:	Place the substrate on a hot plate heated at 300ºC → Heat by a heat gun for 60 sec. → Insert a spatula in-between BGA and the substrate and peel it off.



JU-120EB can be easily removed by the process as shown above. The remaining JU-120EB after removal of the component can be easily taken out by a solder iron.

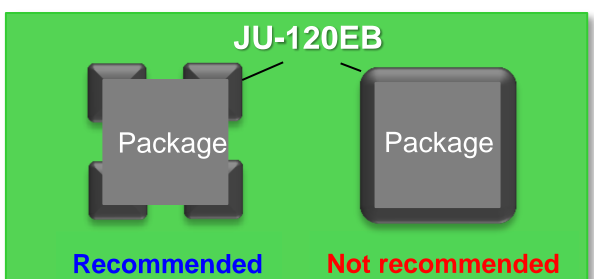
Handling guide

Contents

Features
Feature - Performance
Specifications
Continual Dispensability
Temp. vs. Viscosity / Ti
Stability in Storage
Voltage Applied SIR
Heat slump
Drop Impact Resistivity
Thermal Cycle Test
Halogen Content
Repairability
Handling Guide

1. Recommended dispense condition

1) Nozzle temp.: 25~28ºC
2) Syringe temp.: 23~30ºC
3) Atmosphere: 22~27ºC / 40~60%RH



2. Curing condition: 150ºC x >10min.
130ºC x >15min.

3. Shelf life: 3 months (0~10ºC)
1 month (25ºC)

4. Caution:

1) Keep it at 0~10ºC.
2) Take the material out of the refrigerator .
3) Make sure the material is at room temperature before use.
Do not heat the material immediately after taking it out of the refrigerator. The material may inflate and cause unstable dispensing.
4) Do not dispense the material entire edges of the package as it disturbs evacuation of gas generated during curing process.
5) Pay attention not damage substrate and package when repair work is needed.
6) Read MSDS carefully before use.

* How to interpret lot number