

November 12, 2014

Dear Valued Customer,

**[NOTICE] Substrate Material Change of BGA Products**

**1. Change Item : Substrate core material and solder resist**

Please refer to attached Appendix for detail of the change and evaluation result.

**2. Reason and Background**

In order to unify specifications of substrate material and to promote "Halogen-Free" substrate  
As you know, demand for environmentally friendly semiconductor products has risen day by day. Number of customers who demand a halogen-free substrate material is also increasing. We have individually corresponded about the demand. By the individual correspondences, number of specification of the substrate material has increased and the specifications made working efficiency worse. We like to unify specifications of substrate material, promoting "Halogen-Free" substrate.

**3. Applicable Products : Please see next page**

**4. Schedule : April, 1, 2015 ~**

We will start shipment of new substrate material parts in April 2015.  
Actual timing of each product will be fixed, depending on order volume & inventory status.

**5. Request**

In order to secure current materials, would like you to reconfirm forecast of your further demand by end of December.

I appreciate your understanding and cooperation.

Sincerely yours,



Tom Sakashita  
General Manager,  
Device Sales & Marketing Dep.  
Micro Devices Operations Division

Applicable Products

P/N	PKG TYPE
S1D13513B01B100	PBGA1UC
S1D13A05B00B200	PFBGA10UX

# Engineering Change Notice of Substrate material

**Package : BGA**

**SEIKO EPSON Corp.**

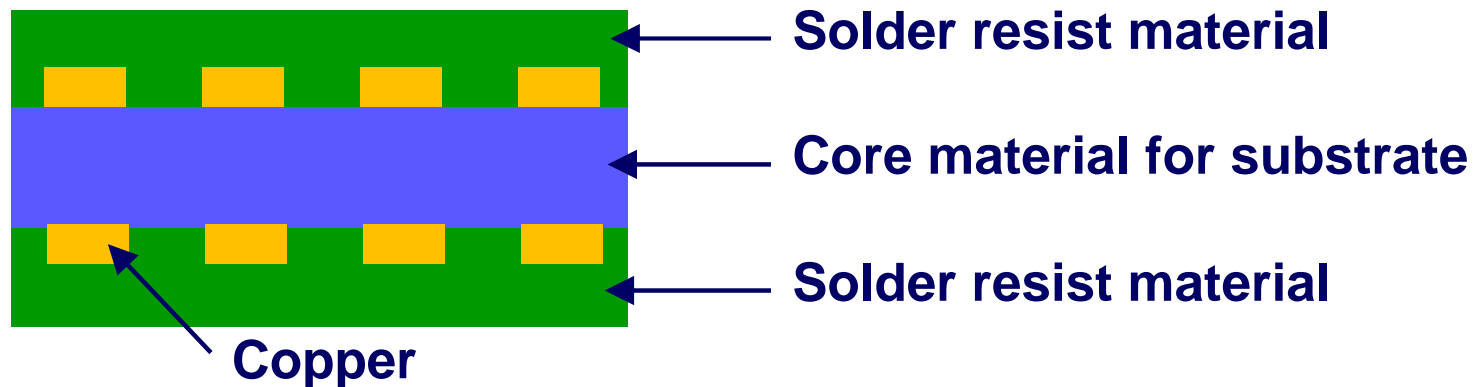
**Microdevices Operation Div.**

# Details of material change

Intended material: Halogen-containing substrate for BGA.

Details of engineering change as follows,

items	CURRENT	NEW
Core material for substrate	CCL-HL800 series (Halogen)	CCL-HL800 series (Halogen-Free)
Solder resist material	PSR4000 series (Halogen)	PSR4000 series (Halogen-Free)

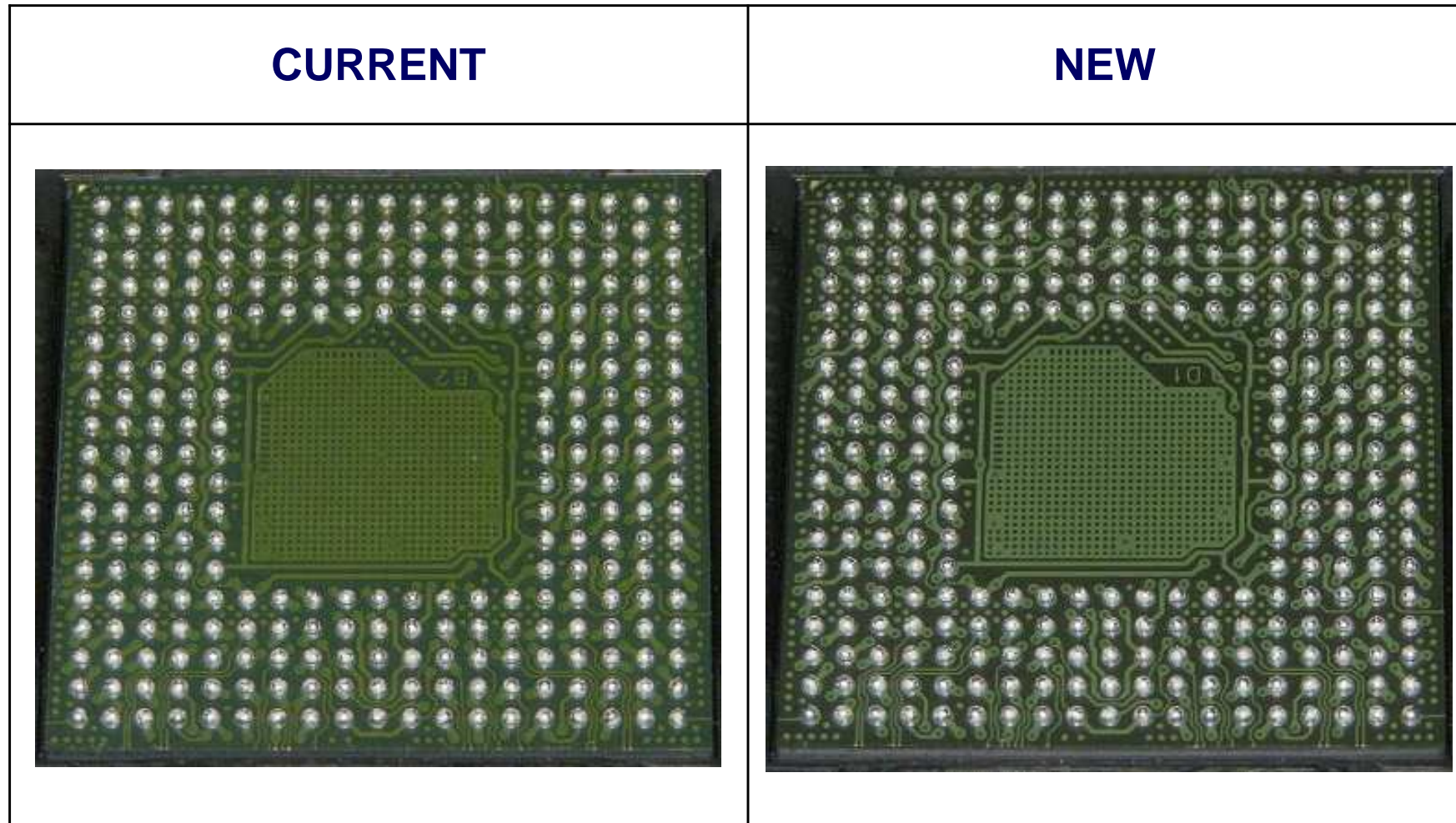


- Dimensions and Tolerance are same as current products.
- There is no change for reflow conditions and profile also.

# Materials properties

	Item	Condition	Unit	CURRENT	NEW
Core material	Flexural Modulus	25degC	GPa	25	26
	Young's Modulus	25degC	GPa	25	26
	Tg	TMA	degC	185	200
	CTE (<Tg/ >Tg)	X、Y	ppm/degC	15/6	15/6
	Flame Resistance	UL94	—	V-0	V-0
	Thermal Conductivity	—	W/m·k	0.50	0.70
Solder resist material	Young's Modulus	25degC	GPa	2.4	3.4
	Tg	TMA	degC	101	114
	CTE (<Tg/ >Tg)	X、Y	ppm/degC	60/130	60/130
	Flame Resistance	UL94	—	V-0	V-0
	Thermal Conductivity	—	W/m·k	0.23	0.24

- New material shown better material characteristics.



Remarks: Comparison photo of standard product.

- No difference of appearance.

# Reliability results

- Reliability results as follows,

Test Items	Test condition	n	Terms of Test	Failure count	Judgment
High Temp and High Humidity Bias Test	85°C/ 85%RH, Maximum voltage	135	1,000 H	0	Pass
High Temp storage Test	Ta=150°C	45	1,000 H	0	Pass
Temp cycle Test	-55°C~125°C each 10 minute	45	350 cyc.	0	Pass
Pressure cooker Test	Ta=130°C, 185%RH 2.0E5 Pa	45	200 H	0	Pass
MSL Test	85°C/65% RH 168hrs, IR reflow 265°C Peak	45	3 Times	0	Pass

- No defective confirmation in evaluation.

- **EPSON will change Substrate core material and solder resist of BGA products, in order to unify specifications of substrate material “Halogen-Free” substrate.**
- **EPSON has already shipped over 100Mpcs products out using halogen-free material.**
- **Heat-resistance and Reliability level are same as current products.**
- **No difference of Terminal-strength and Soldering conditions.**
- **There is no difference storage condition and handling conditions at customer side that is same as current products.**



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