

Die Products Markets, Asia Pacific

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COX(Chip on x)

COX

Wire Bonding

Ball Bonding(Au), Wedge Bonding(Al, Au)

Flip Chip

Solder

ACF (COG, COF, COB), ACP

NCP(COF, COB), NCT

Au-Au, Au-Sn(COF, COB) TC, US

TCP

Chip : Silicon IC & LSI, GaAs,.....

Board : PCB, FPC, Glass,.....

Flip Chip Substrate

Organic Substrate Plating

	Au (um)	Ni (um)		
1	0.3	3 – 5		
2	0.05	3 – 5		
3	0.1 – 0.3	3 - 5	E-less	

Flip Chip Packaging

Fujitsu Tohoku Electronics Ltd.

Mr. R. Oota

KGD Workshop Wednesday, September 12, pm

**Flip Chip packaging
on High CTE Glass ceramics carrier**

COF (Chip on Film)

FPC Plating PI : 20,22,25 um

	Au (um)	Ni (um)	Cu (um)	
1	0.3	3 – 5	12,18	
2	0.05	1	12,18	
3			12	

COF (Chip on Film)

FPC Line Width/Space and Thickness

Pitch (um)	Top-W (um)	Space (um)	Thickness (um)
80 – 89	>30	>20	11
80 – 89	>30	>20	8
60 - 79	>25	>20	8

COF (Chip on Film)

FPC Type

	PI Type	Fine Pitch	Peel Off	Cu T
Spatter-Plating (ME) 2 layer	OK	Good?	OK	Thin ±??
Casting(CA) 2 layer	Low CTE	OK	Good	OK
Adhesive 3 layer	?	??	??	OK

Bare-chip Bonding Technology

Misuzu Industries Corporation

Mr. M.Chino

KGD Workshop Wednesday, September 12, pm

**Bare-chip Bonding Technology for Consumer
Electronics Device**

Flip Chip ACF

ITO America

Mr. Peter J. Opdahl

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Flip Chip ACF

COB Application

**Watch, E-Game, Toy, Calculator, Clock
PDA, Pager, LCD Module
Scanner, HDD, Computer Peripheral
Remote control Unit
IC Card, Telephone, Measurement Tool
etc.,**

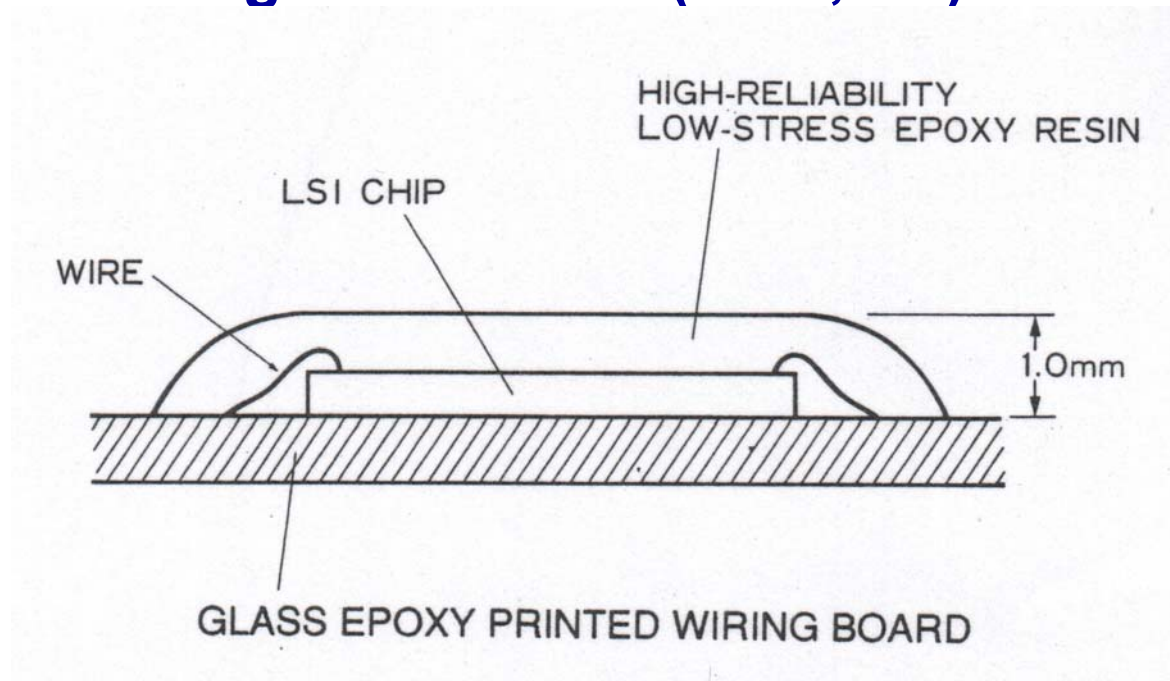
Wire Bonding

Connection Technology

Bonding Pad (Al) on IC

Bonding Terminal on PCB(Au / Ni / Cu)

Wire Bonding Connection (Au , Al)



COB Process Flow

1. **IQC : PCB, IC, Resin, Wire,..**
2. **(SMT)**
3. **IC Mount on PCB**
4. **Cure**
5. **Inspection**
6. **Wire Bonding**
7. **Inspection & Test**
8. **Encapsulation (Epoxy Potting)**
9. **Cure**
10. **Test**
11. **SMT**
12. **Test**

Wire Bonding Type

1. **Ball Bonding & Gold Wire**
2. **Wedge Bonding and Aluminum Wire**
 Rotary Stage Type (RS)
 Rotary Bonding Head Type(RH)
3. **Wedge Bonding and Gold Wire**
4. **Wedge Bonding and Large Diameter Wire**

Wire Bonding Type

	US-RS	US-RH	TS
Wire	Al-Si/Au	Al-Si/Au	Au
Power	US	US	Thermal&US
Type	Rotary Stage	Rotary Head	Capillary
Multi IC	Single	OK	OK
PCB Plating	Au 0.05μm	Au 0.05μm	Soft Au 0.3μm

COB PCB IQC and Quality

Key Check Point

- 1. Visual check item and Bonding Area Check**
Bonding Finger Surface, Finger Width
Plating Thickness
- 2. Electrical Test**
Fine Pitch and Bonding Finger Area
- 3. Ion Contamination**
- 4. Pattern Repeating Tolerance**
- 5. Dimension and other general PCB item**

COB PCB IQC and Quality

Visual Check Item and Bonding

Area Check Item

Bonding Finger Surface

**Etching Shape, Scratch,
Contamination**

Finger Width

Plating Thickness

COB PCB IQC and Quality

Visual check item for COB & Flip Chip PCB

Foreign materials, contamination – solder mask

Pinhole, scratch

Discoloration, Cu exposure (bare Cu/skip plating)

Surface defects, Nodules Burr, gold hills

Mouse bites / dish down, odd pad shape

Over / under etching

COB PCB IQC and Quality

Plating Thickness (μm)

	Wedge	Ball	
Au	>0.03	>0.15-0.5	
Ni	3-5	5	
Cu PTH	>15 - 25	> 15 - 25	
(Cu Foil)	18,35	18,35	

COB PCB IQC and Quality

Electrical Test:

Fine Pitch and Bonding Finger Area

Open Short Test (Contact)

Probing, Rubber

Non Contact Testing

(Visual checker: Not Electrically)

Non Contact Testing

OHT

Mr.Y.Sakakibara

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**Non Contact Testing technology
for IC substrate
in Japan**

20um pitch probing

ASET

Mr. K. Takahashi

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**Development of the probing for technology
to 20 um pitch electrode**

COB PCB IQC and Quality

Ion Contamination: OMEGA METER

Level	μg/sq inch	Judge
1	0	Excellent
2	<3	Good
3	3-5	Poor&Warning
4	>5-8	Reject

COB PCB IQC and Quality

Ion Contamination

Extraction Condition

121 °C/ 100hr

ICA

	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	Na ⁺	NH ₄ ⁺
A	4	8	20	2	8
B	30	1	8	9	3
C	1	0.5	2	0.1	0.3

(μg/pc)

Bare Chip IC

IC Chip for COB

- 1. Electrically**
- 2. Key Factor for COB**
- 3. Visual**
- 4. Storage Condition**
- 5. Light**

COB Epoxy Encapsulation

Ion Purity vs. PCT Test

Epoxy Resin	PCT (Failure Rate %)				Ion Purity			
	50h	100h	150h	200h	Cl ⁻	SO ₄ ²⁻	Na ⁺	K ⁺
A	0	16	16	83	72.8	-	11.4	1.3
B	-	40	-	60	437	16.1	83.4	Much
C	-	-	-	0	9.3	2.1	1.6	1.3

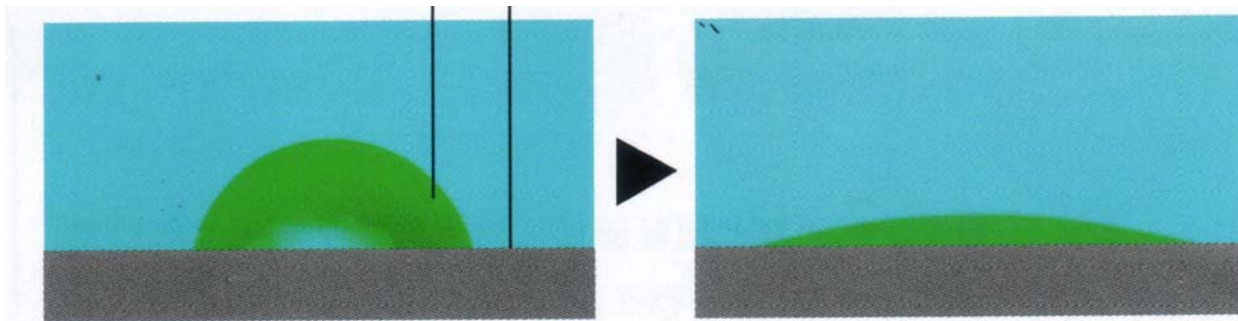
COB PCB Cleaning

Wet ability test

Solder Mask : 36-37 dyn/cm

Plasma Cleaning

→ >54 dyn/cm



Plasma Cleaning Application

Kyusyu Matsushita Electric Co. Ltd.

Dr. H. Haji

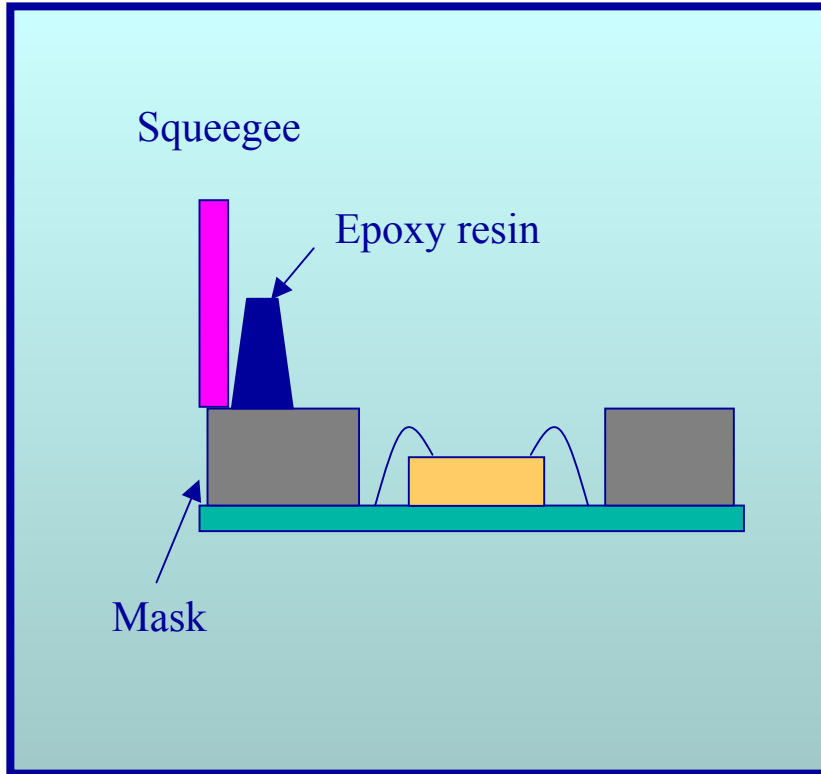
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**Plasma Cleaning Application for Stacked Package
and Flip Chip Bonding**

COB Epoxy Encapsulation

Printing Method

Source: Sanyu-REC



Process Flow Design

COB & SMT or SMT & COB

	COB & SMT	SMT & COB
PCB Contami.	OK	?(Flux, Out gas)
PCB Cleaning	OK	?
Reflow	? (Moisture, Temp)	OK
Solder Printing	? (Emboss Mask)	OK

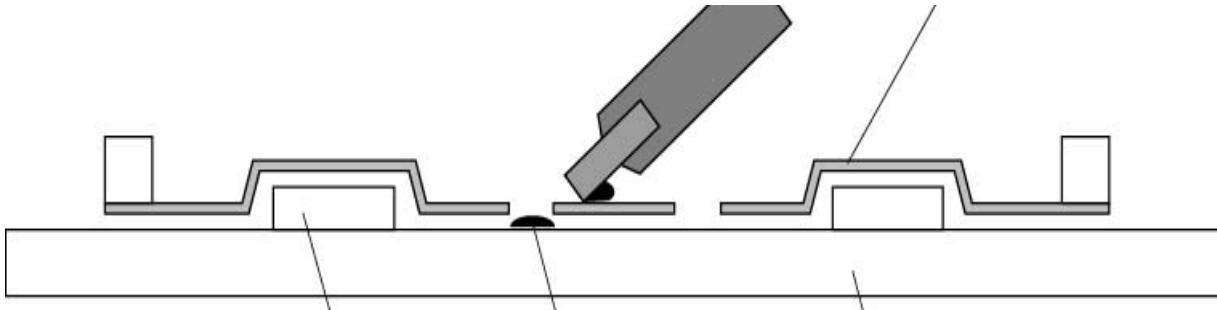
Process Flow Design

COF & SMT or SMT & COF

	COF & SMT	SMT & COF
FPC Contami.	OK	?
FPC Warpage	OK	?
Reflow Heat	? (Moisture, Temp)	OK
Solder Printing	? (Emboss Mask)	OK

COB + SMT

Emboss Mask Solder Printing after COB (Source:Murakami)



Key Factor in Factory

Water : Cleaning Water

Cl ion and heavy metal, etc.

**Power : Cut off, Voltage and Frequency
Stability**

**Humidity : Air Condition with Humidity
Control, Moisture Problem**

Transportation(Material, Products, Human)

Communication(Tel,Fax,E-mail,Mobile Phone,Pager)

Process Control Concept

5S, 4M Management

Kaizen, QC

TQM, TPM, Zero Defect

Visual Management

ISO,