Anisotropic conductive films

ANISOLM

WHAT IS ACF

TP ENG

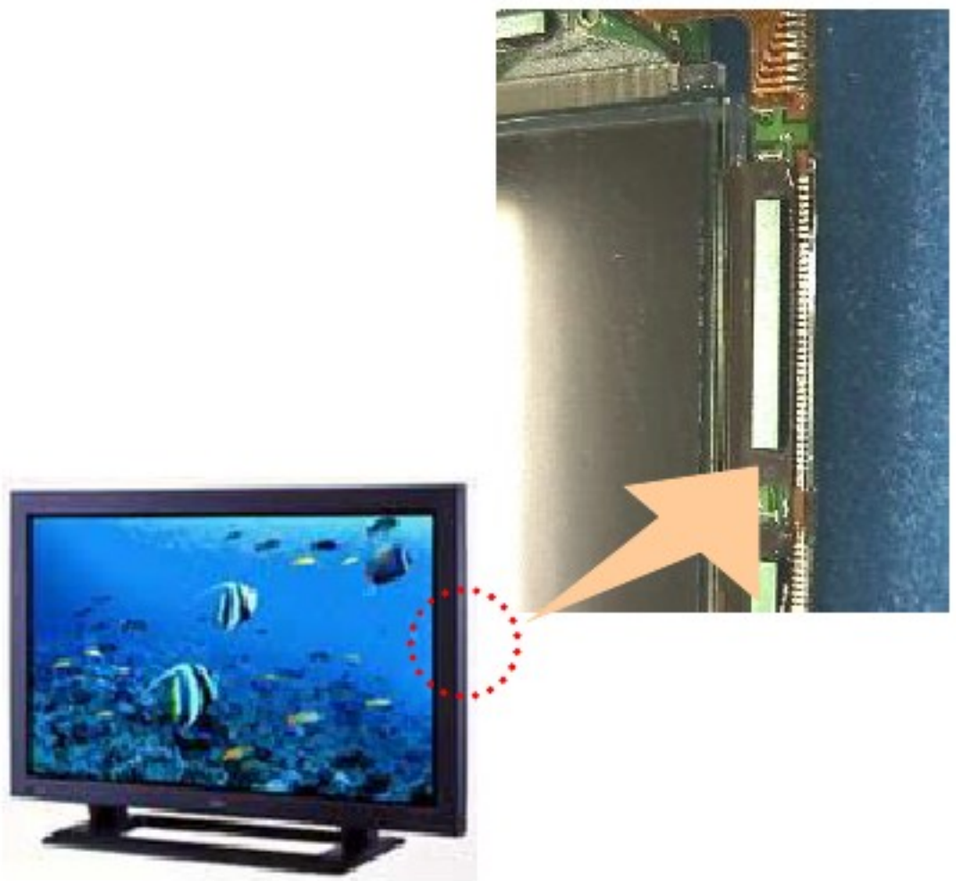
李 偉(Kenny Li)

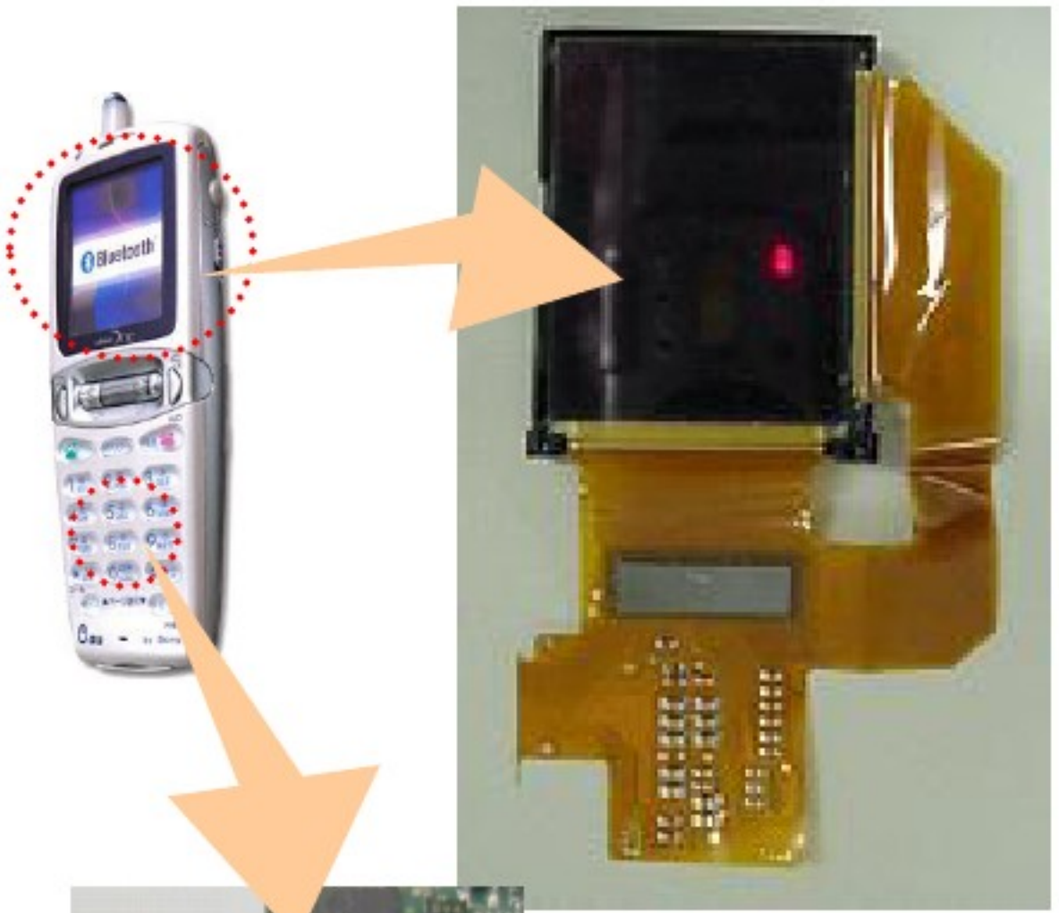
2003年度全国発明表彰「内閣総理大臣発明賞」受賞

Catalogue

ACF的主要應用

所謂ACF(**ACF**：**A**nisotropic **C**onductive **F**ilm)係爲一種可短時間接合100um以下之端子的材料.
於1973年由Sony首先開發出來.

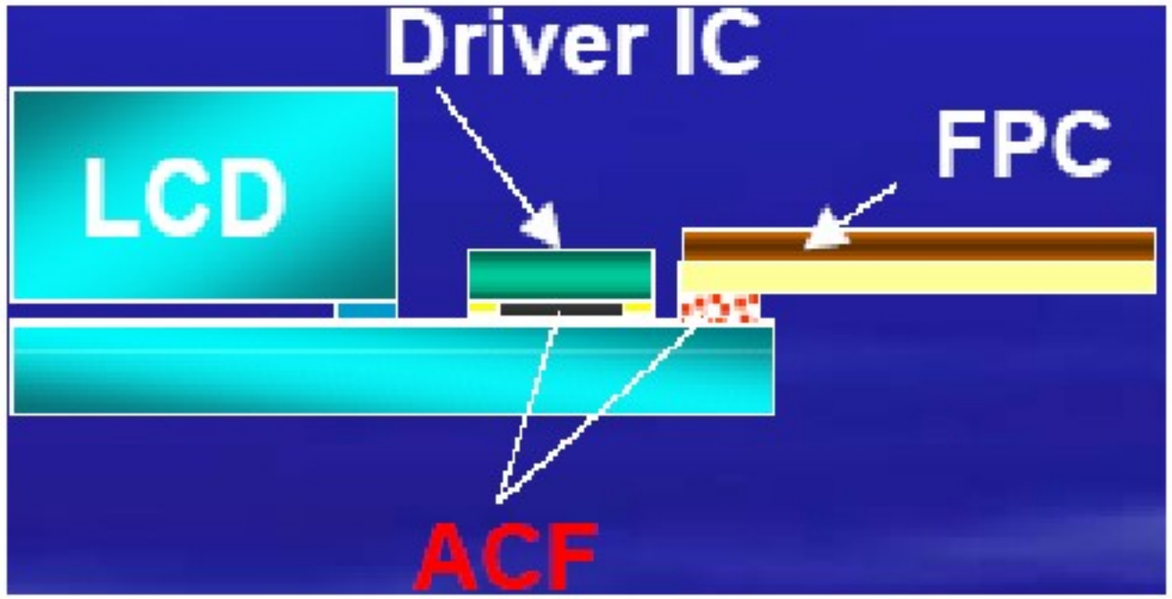




ACF的主要應用

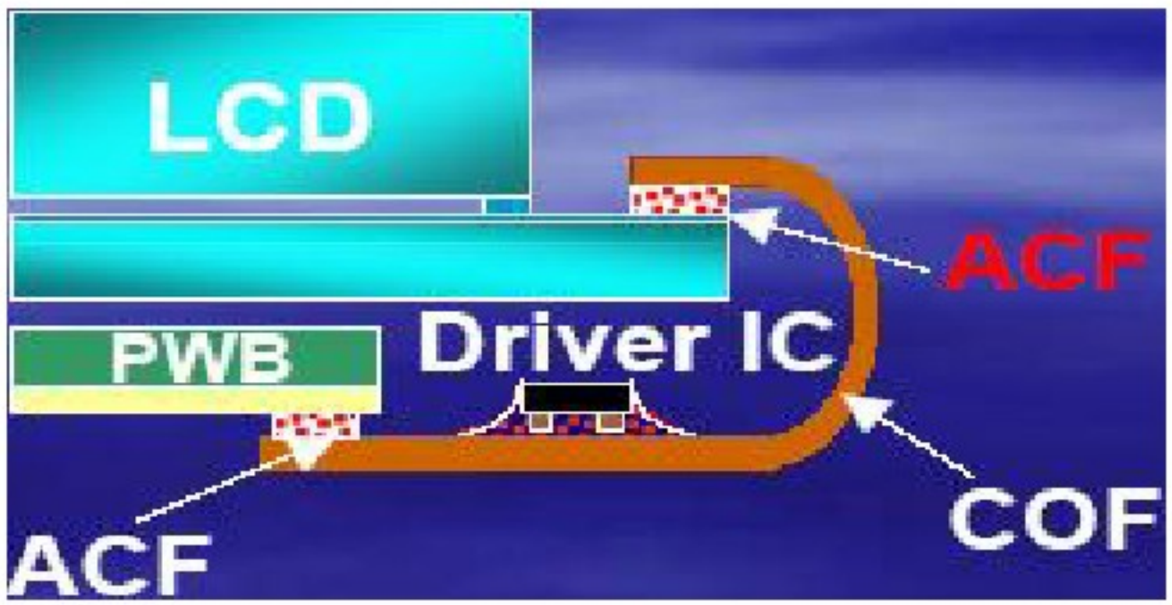
Now

ACF廣泛應用於IC與LCD,FPC與 LCD,IC與Film間Bonding.

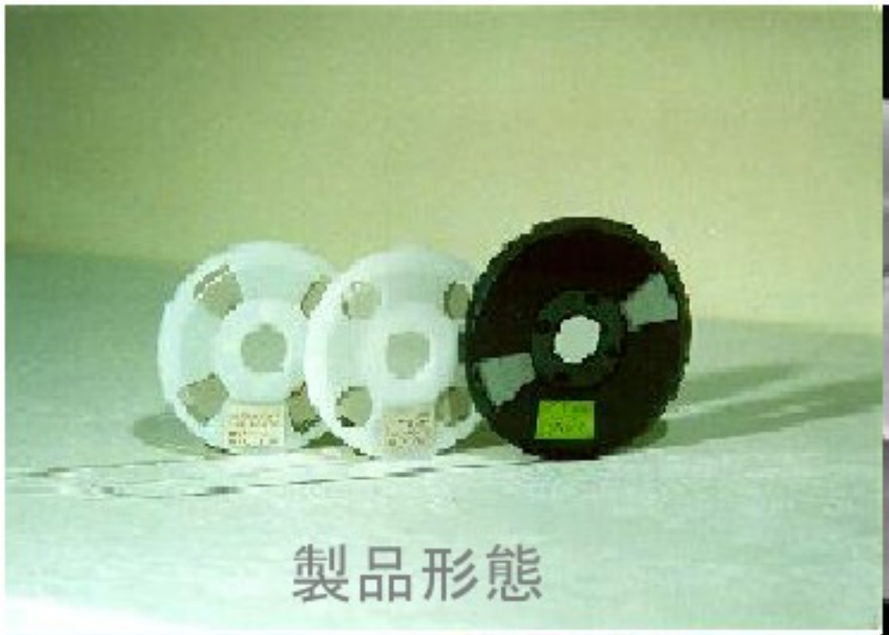


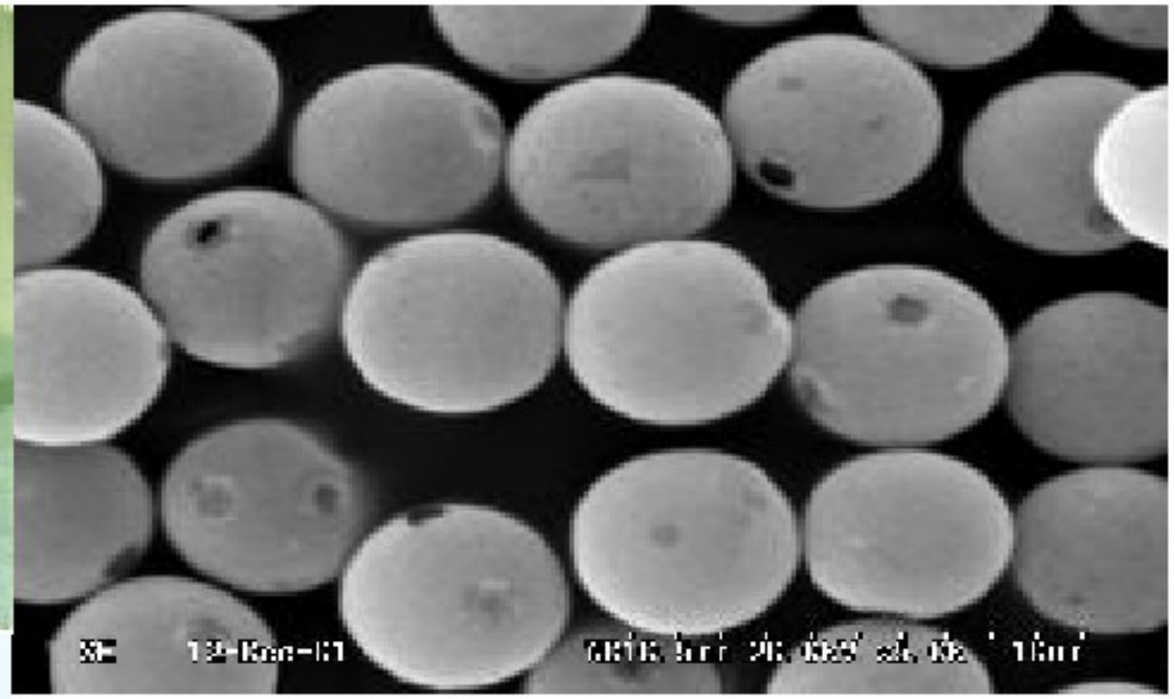
Trend

應用與PCB,PWB的連接,適應無鉛制程.

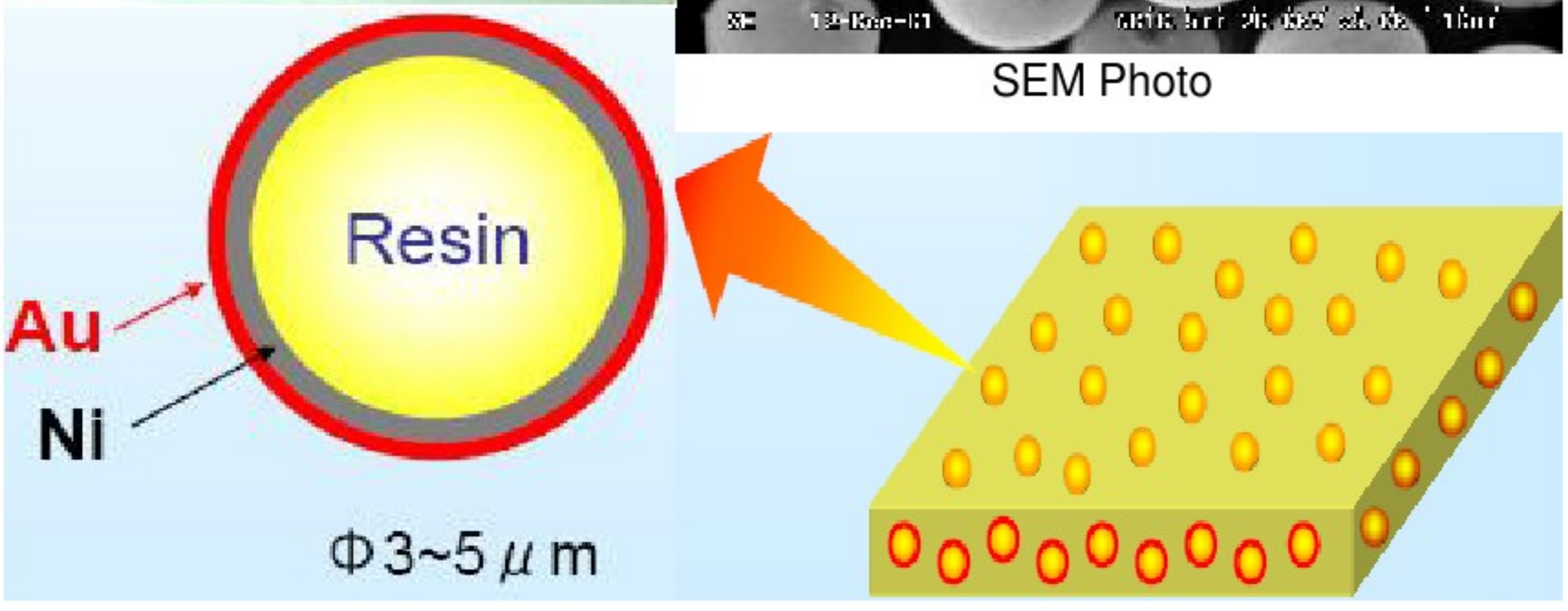


ACF Electric Particle 結構介紹



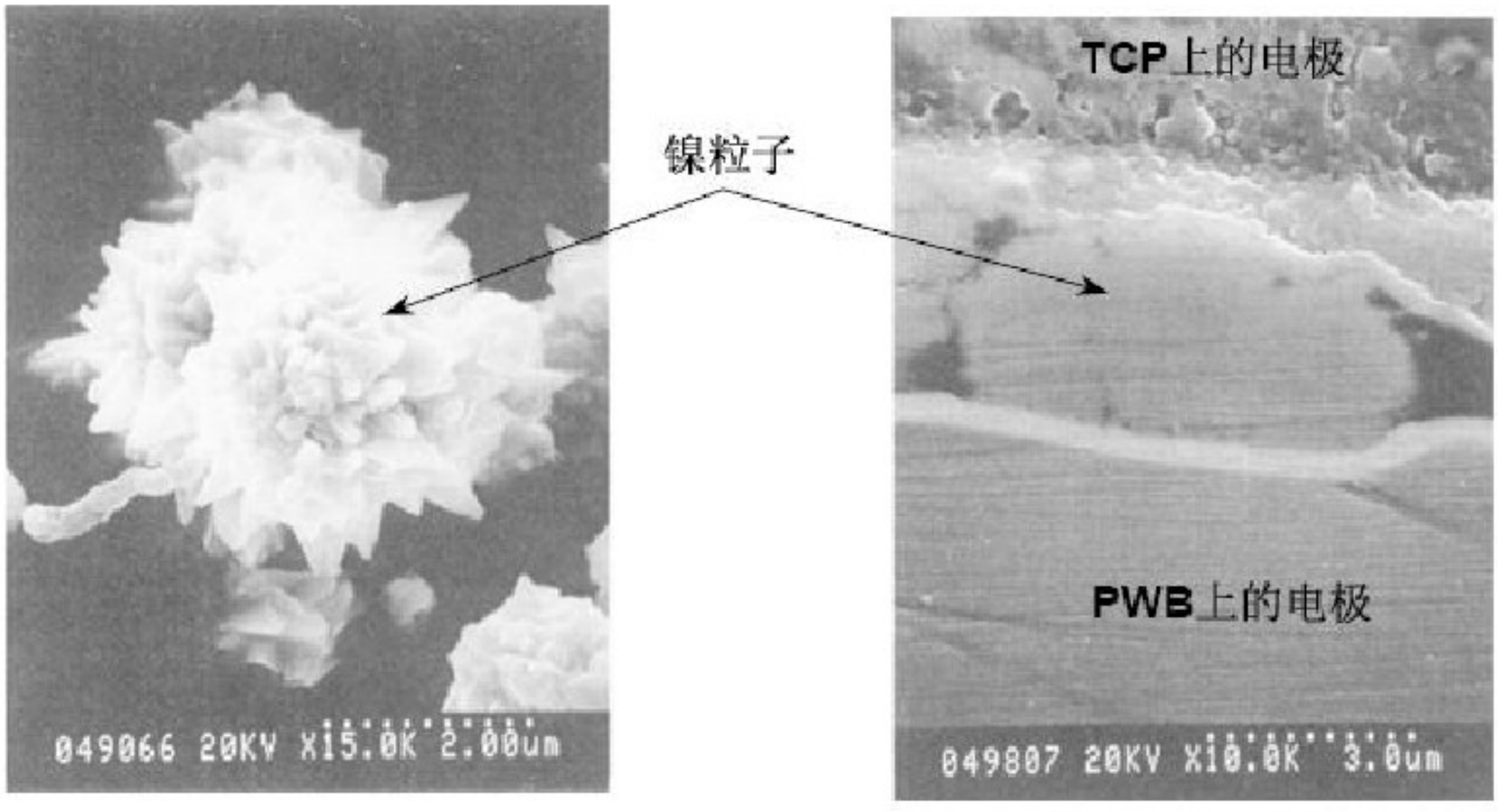


SEM Photo



ACF Electric Particle 結構介紹

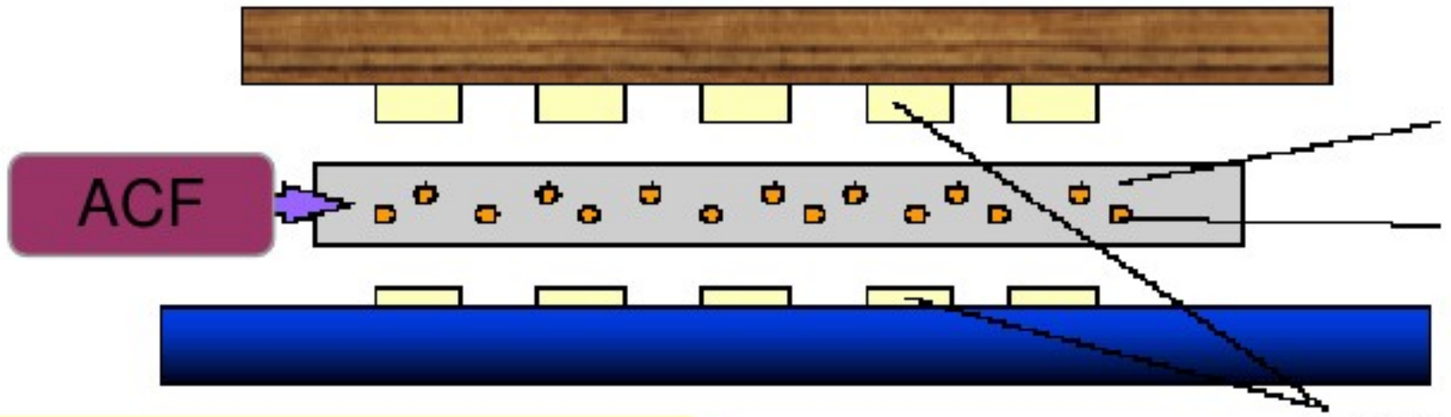
Ni Particle



SEM 图像

PWB和TCP互连部分之中的导电粒子通過化學反應產生帶刺的小球,小球較堅硬,壓著後刺入上下電極,產生導通.

ACF接著的原理



胶带（环带基树脂）

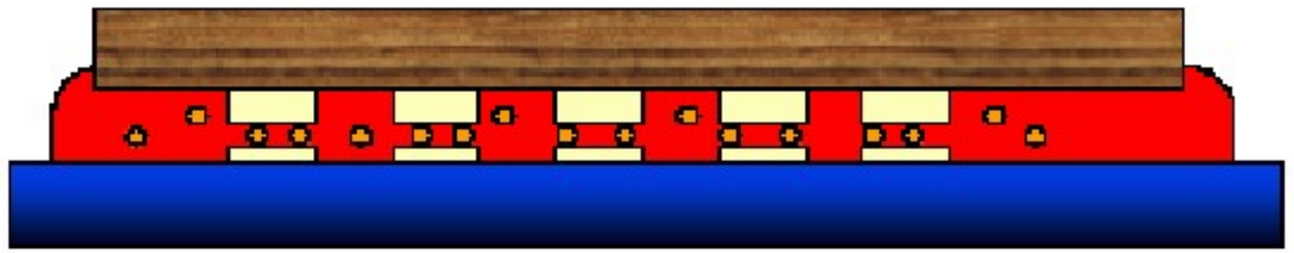
导电粒子

回路

粘性树脂流

⇒干化处理⇒胶带

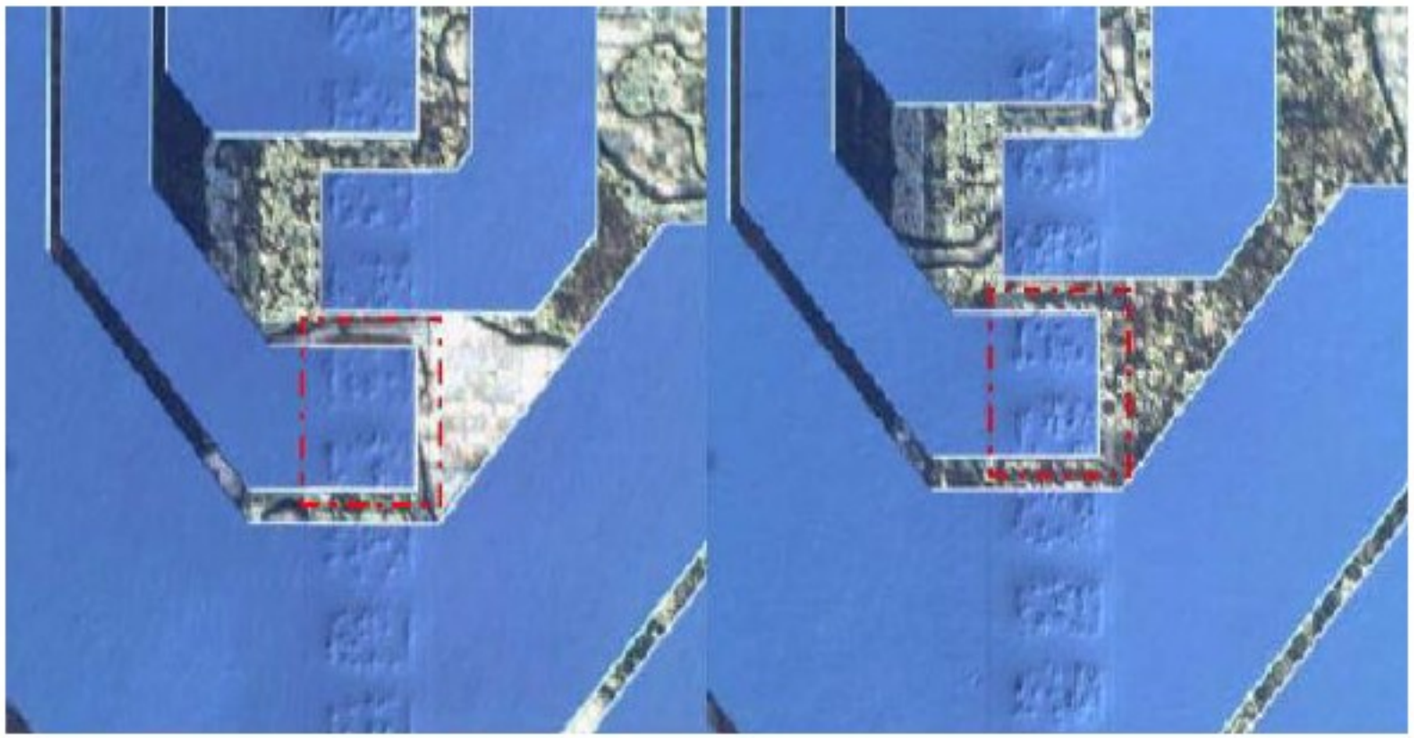
加热、加压



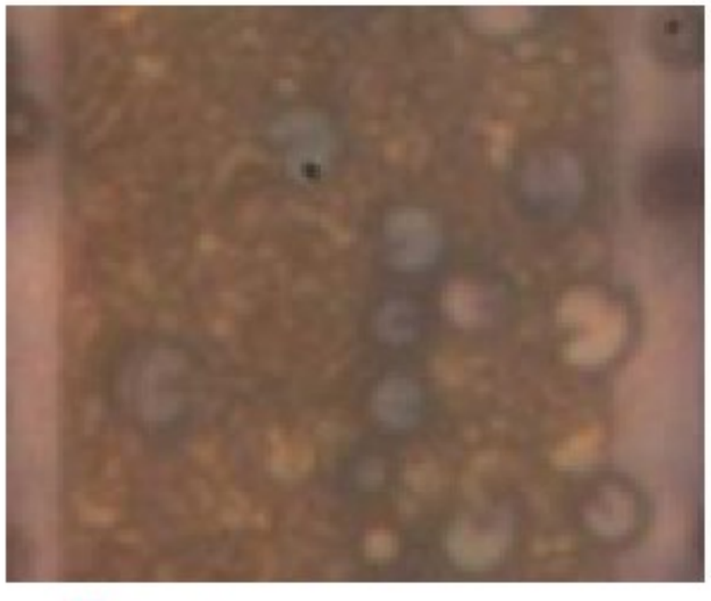
- 在Z方向上具有高导电性
- 在X-Y平面上具有高电阻性
- 在回路之间起粘合作用

TFT、CSTN LCD壓著後的ACF Electric Particle形狀

TFT ITO PAD與
IC Gold Bump



TN & STN & Color-STN ITO PAD



如何正確選擇ACF的厚度

T0=Thickness of Anisolm

H=Electrode height

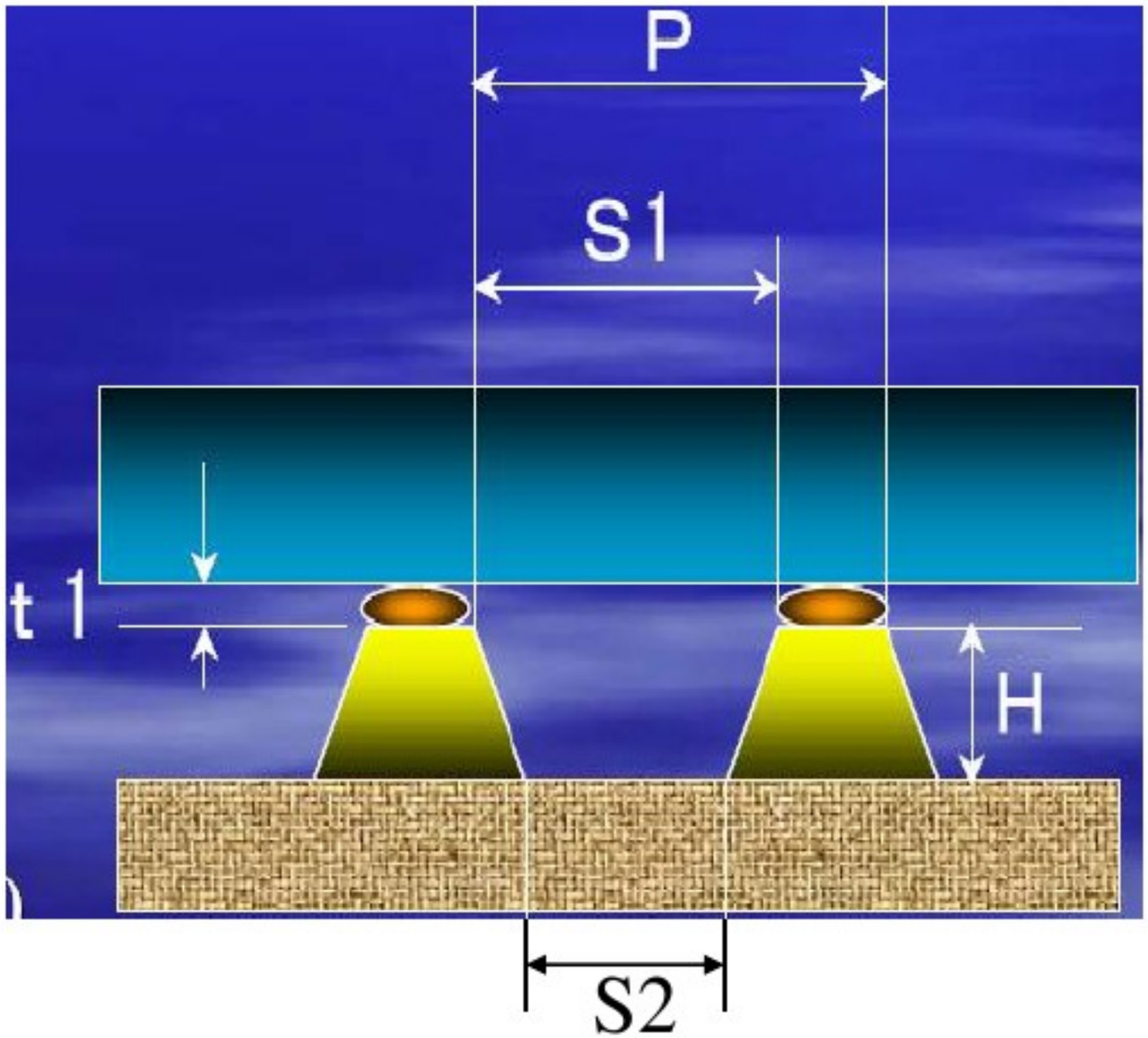
T1=Gap

P=Pitch

S1=Space width (top)

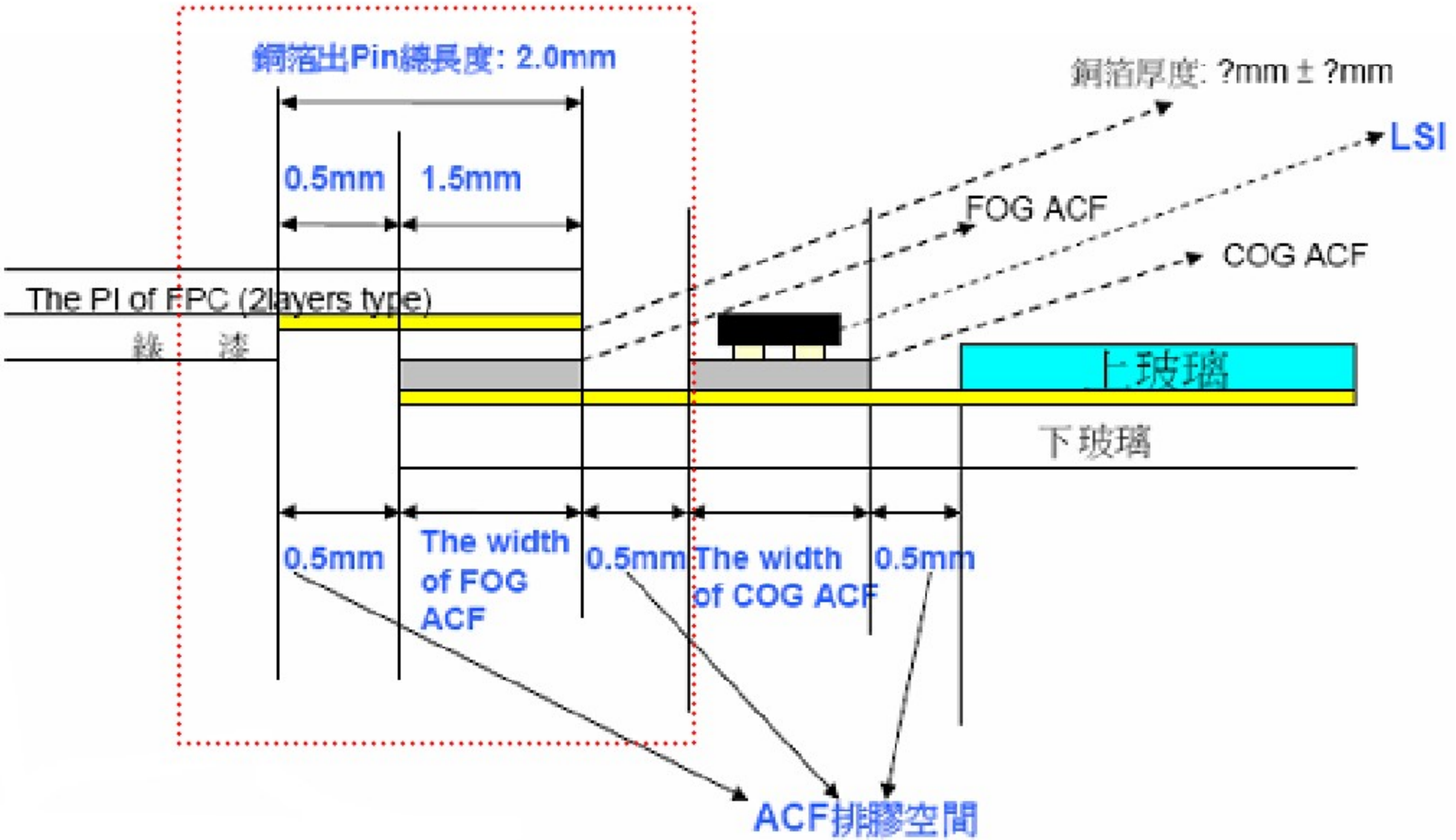
S2= Space width (bottom)

α=compensated value (0.25×H)



$$T0=(S1+S2)/2 \times H/P+t1+\alpha$$

選擇ACF需提供的參數



選擇ACF需提供的參數

客戶應提供之規格(FOG):

Film type: 3layers FPC (PI+ ADH +Copper foil) **or 2layers: FPC**(PI+ Copper foil **):**
The min pitch of FPC :
Cu (t)金手指高度:
Lead(金手指寬度) / Space(金手指與金手指之間的間距):
The golden finger length of FPC(FPC金手指出Pin長度):
The pattern length of under Glass of panel(面板的下玻璃線路長度):
The components and structure of under glass pattern(面板的下玻璃線路成分及結構):

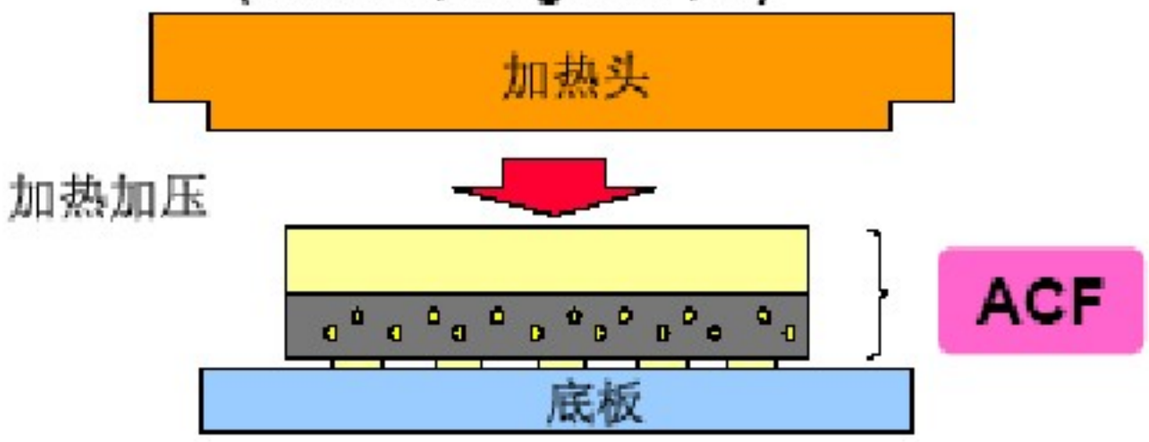
客戶使用時應注意事項:

1.壓頭不能超過下玻璃與**FPC**之切齊面
2.要預留**0.5mm**的排膠空間

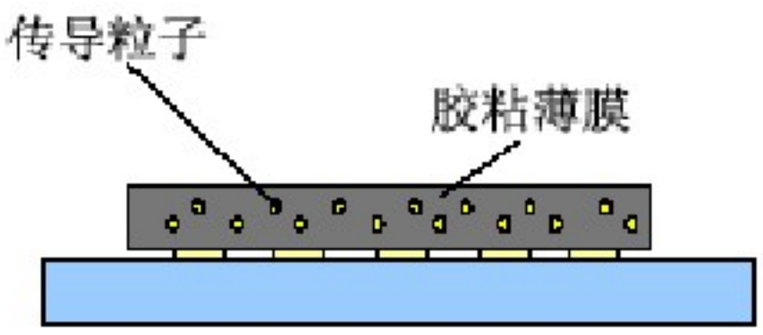
Bonding Process Using ACF

1. 叠片结构 (临时压合)

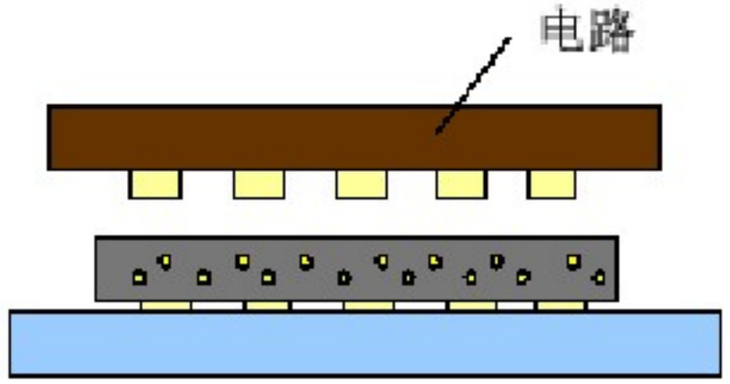
(Ex.80℃,10kgf/cm^2,5s)



2. 去除隔离层

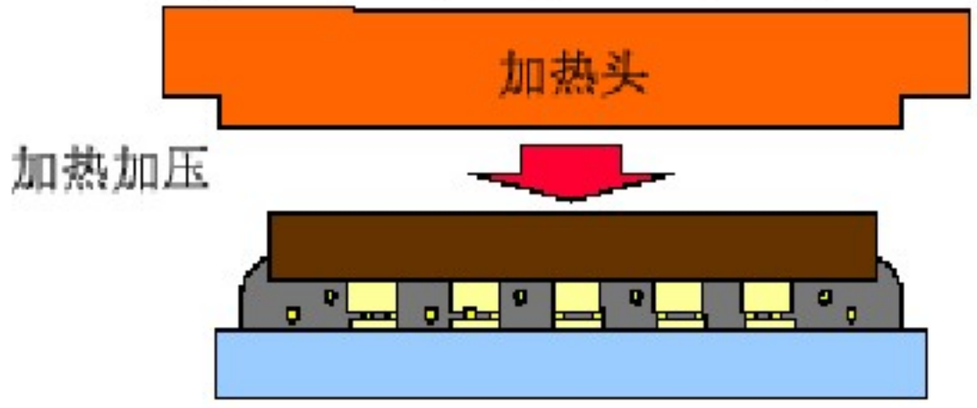


3. 电路校直



4. 最终压合

(Ex.170℃,20kgf/cm^2 , 20s)

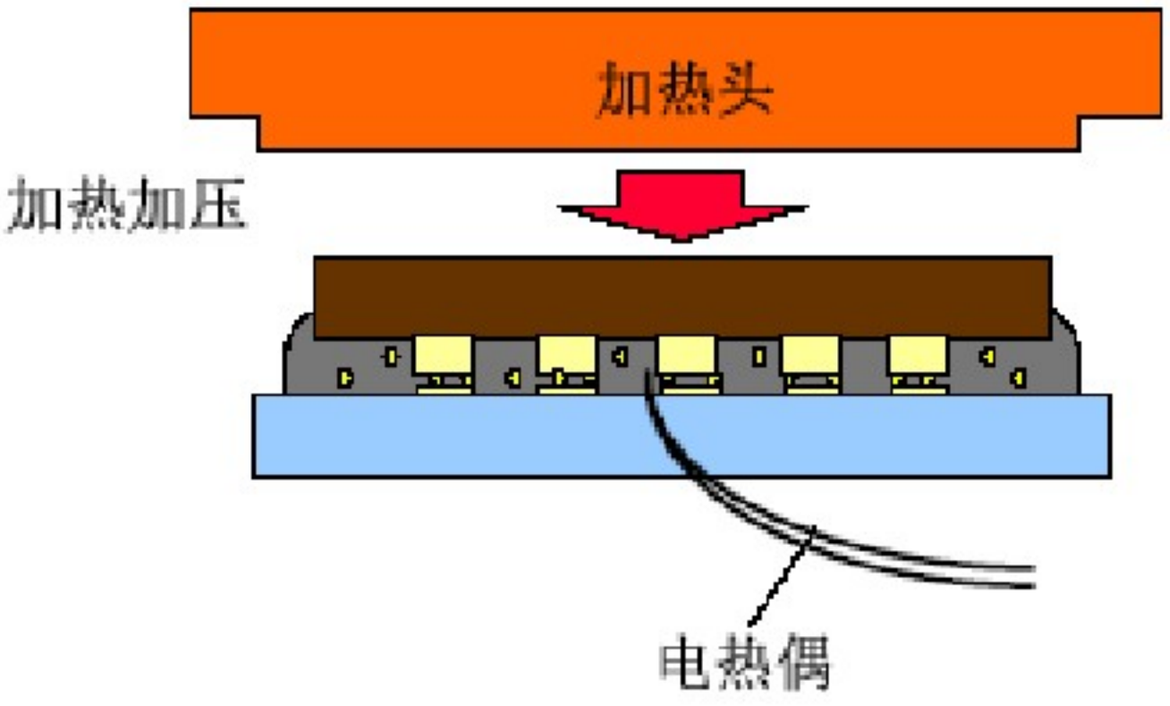


ACF Bonding Process Data(三要素):Times & Pressure & Temperature

壓合溫度的量測方法

測量法

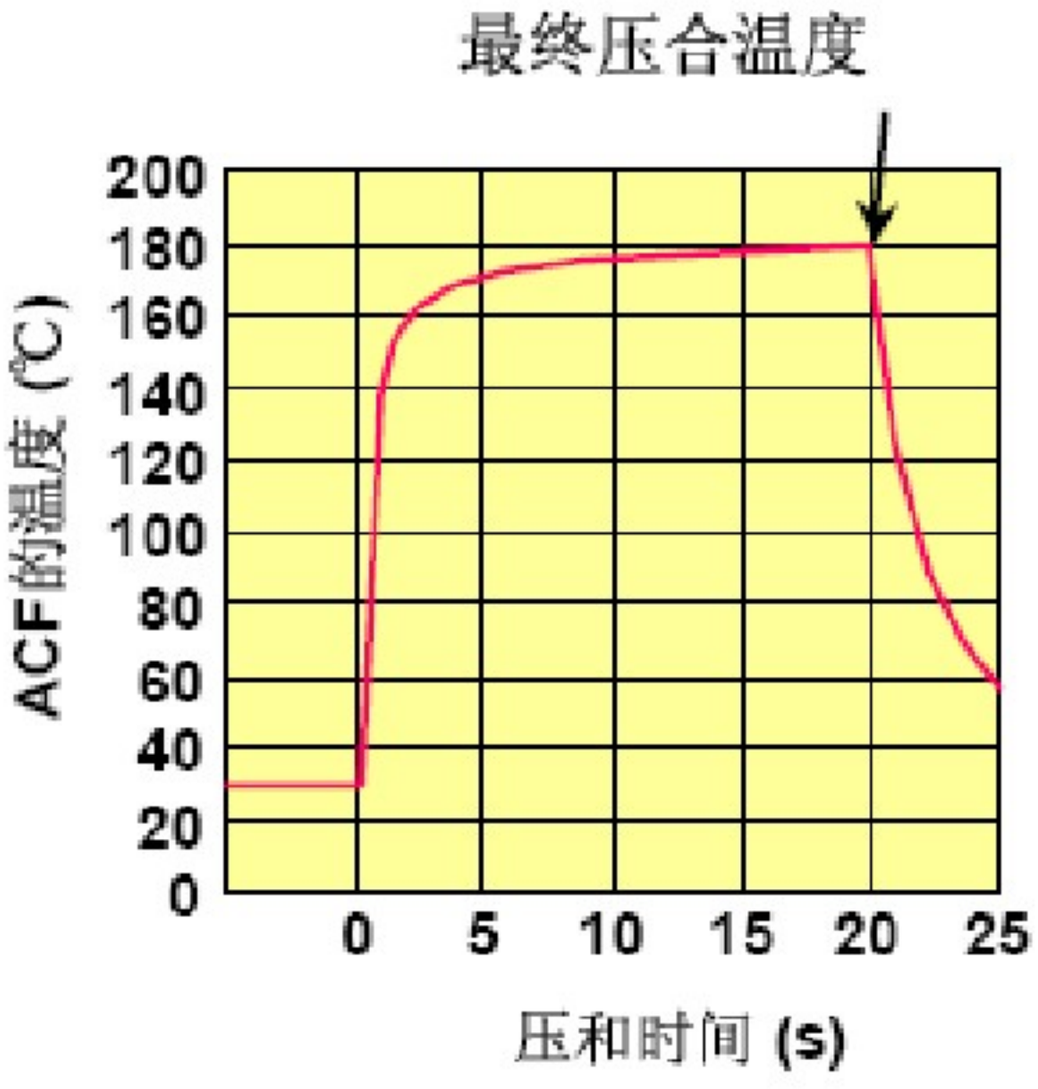
(Ex.180℃,20kgf/cm^2 , 20s)



(ϕ 50 μ m)

(ST-50 ,RIKA KOGYO Co.,Ltd)

温度剖面(范例)

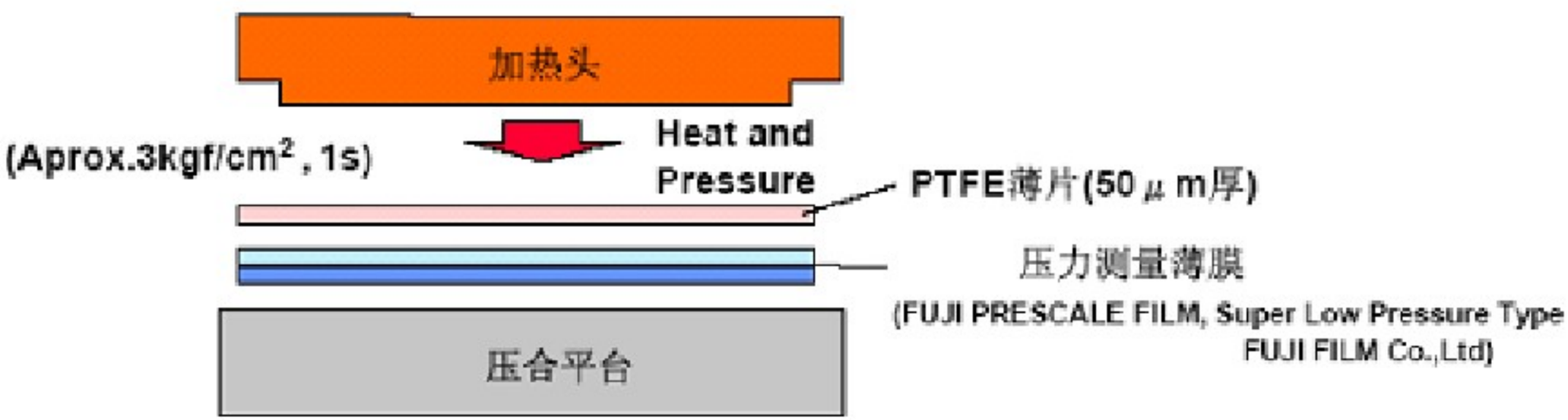


溫度是如何建立起來的呢?

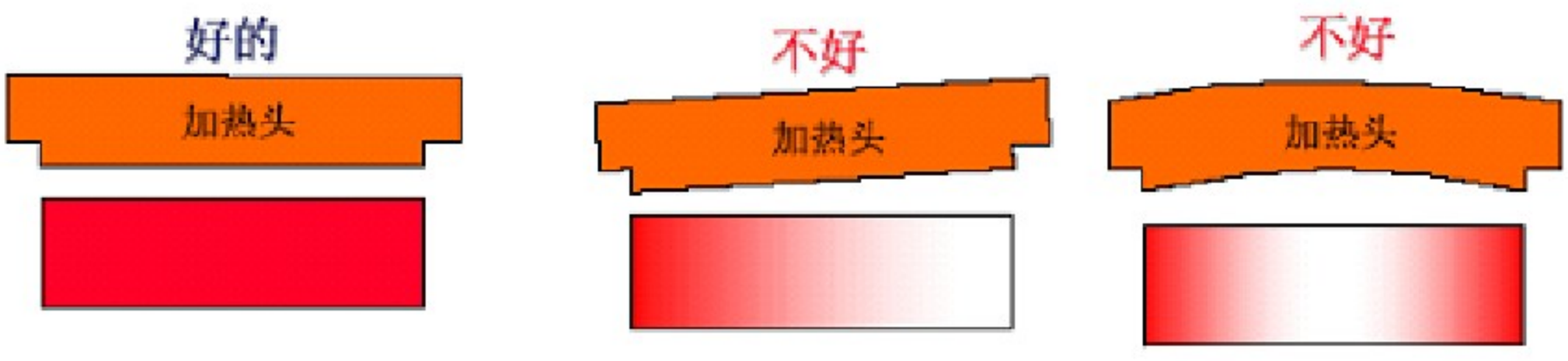
壓合壓力是否一致的評估

方法

把加热头温度设置到压合温度



评估



這就是爲什麼我們每次測量Head平整度時要把溫度設置到實際實裝溫度.

ACF的儲存條件

(1) 冷藏庫取出常溫放置回溫時間約30分鐘
-10~ 5℃ / 95％RH 以下(目視包裝袋外所附水氣消失爲止)

(2) 未開封/ 保存條件/ 壽命
(a) -10~5℃ / 95％RH 以下製造後7個月
(b) 23℃ / 65％RH 以下1個月

(3) 已開封/ 保存條件/ 壽命
(a) -10~5℃ / 95％RH 以下1個月(參考)
(b)23℃ / 65％RH 以下3天內(參考)

正常ACF

異常之ACF:溢膠

ACF Bonding 失敗的原因

- 不適當的Bonding條件
- Panel PIN表面的清潔度不夠
- ACF儲存不恰當

ACF過期造成的影響(溢膠)：

- 壓著時的流通性降低
- ACF膠不能被擠出,包住粒子,導通性降低，甚至不能被導通
- 接著力下降

LCD的当前趋势和ACF的需求

LCD 技术趋势

薄、轻的面板薄
底板厚度1.1→0.7→0.4 →0.3
塑料底板

大尺寸面板
13 → 15→ 21 inch → 28inch

特性的进化
高速, 高对比度, 节能

低成本
生产力的进步

技术革新
低温低温**Poly-Si TFT**
反射型彩色**LCD**

ACF 的需求

低温和短时间结合

优良程度的相互连接

可靠性的进步

可维修性

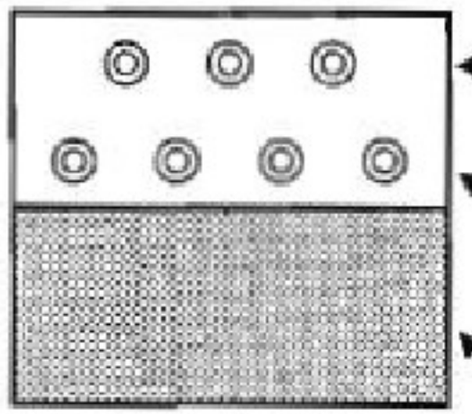
装配和互连技术的革新

Sony ACF CP9731S9

1. Application

This Standard defines an anisotropic conductive film CP9731S9.

2. Properties

Item	Property	Remarks
Color	Light yellow	ACF
Structure		

Sony ACF CP9731S9

3. Quality Characteristics

(1) General Characteristics

Item		Unit	Specification	Measuring method
Conductive Particles	Average particle diameter	μm	9.0 ± 2	E2-0050
	Particle area ratio	%	10.0 ± 5	
Peel strength of base film		N/5cm	0.100 to 0.800	E2-0040

Sony ACF CP9731S9

(2) Electrical and Bonding characteristics

Item		Specification	Measuring method	Remarks
Conductive resistance	*1 FPC／*2 ITO	Not more than 10Ω	E2-0007	Normal condition
Insulation	FPC／*3 glass	Higher than 10^9Ω	E2-0007	Normal condition
		/cm or more	E2-0008	Normal condition

(3) Reliability characteristics

Item	Aging conditions	Test item	Spec.	Measuring method
High temperature	100℃ during 500 hours	Conductive resistance	Not more than 20 Ω	E2-0007
Low temperature	-40℃ during 500 hours			
High temperature under high humidity	85℃and85%RH for 500 hours	Insulation resistance	Higher than 10^8Ω	E2-0007
Heat Cycles	500 cycles of -40℃ to 100℃ during 30min., respectively	Adhesion strength	3.0 N/cm or more	E2-0008

The Conductive resistance and Insulation resistance of test pieces shall be measured between one and two hours after they have been taken out of a test.

ess of Au plating 0.1mm pitch CA original film

*3 Glass = t:1.1mm

Bonding conditions : 180℃−3Mpa−15sec

Sony ACF CP9731S9

(3) Reliability characteristics

Item	Aging conditions	Test item	Spec.	Measuring method
High temperature	100℃ during 500 hours	Conductive resistance	Not more than 20 Ω	E2-0007
Low temperature	-40℃ during 500 hours			
High temperature under high humidity	85℃and85%RH for 500 hours	Insulation resistance	Higher than 10^8Ω	E2-0007
Heat Cycles	500 cycles of -40℃ to 100℃ during 30min., respectively	Adhesion strength	3.0 N/cm or more	E2-0008

The Conductive resistance and Insulation resistance of test pieces shall be measured between one and two hours after they have been taken out of a test.

Sony ACF CP9731S9

(4) Applicable specification

Item	Specification	Remarks
Maximum Voltage	30 V	DC values
Maximum Current	50 mA/mm^2	
Minimum overlap width of conductors	0.05 mm	Including possible position errors
Minimum space between overlapped conductors	0.05 mm	