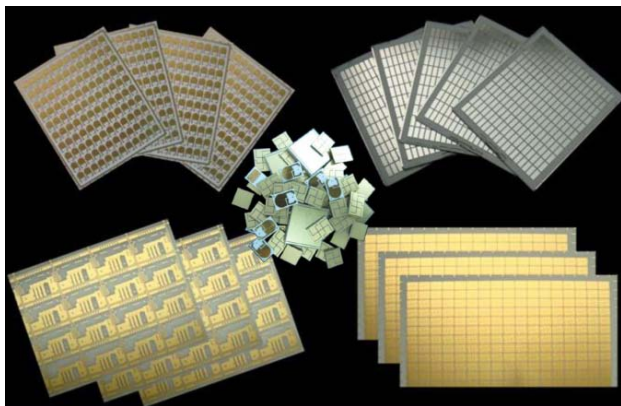


## *Ceramic Substrate를 통한 Heat-Dissipation 솔루션*

- Thin-Film Ceramic Substrate ( $\text{Al}_2\text{O}_3$ )
- Thin-Film Ceramic Substrate ( $\text{AlN}$ )

# LED, RF 영역 방열 해결을 위한 COB, Package 제작



주식회사 나미카

- 연락처 : 041-415-1122

- 이메일 : [info@namika.co.kr](mailto:info@namika.co.kr)



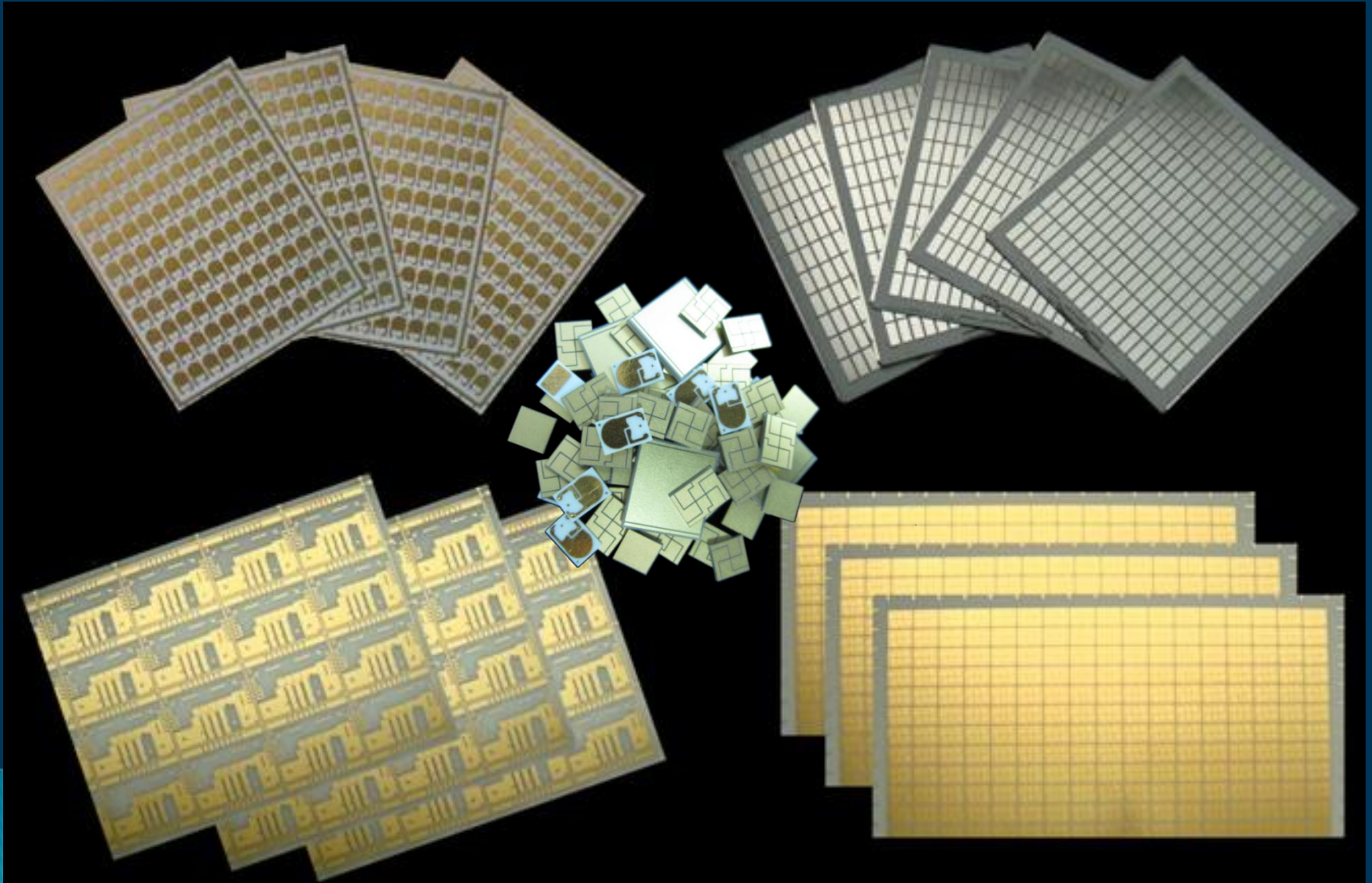
# Why Thin Film Ceramic?

	FR-4 PCB	Metal Core PCB (MCPCB)	LTCC Ceramic Substrate	Thick-Film Ceramic substrate	Thin-Film Ceramic Substrate (Al <sub>2</sub> O <sub>3</sub> )	Thin-Film Ceramic Substrate (AlN)
<b>Thermal conductivity</b>	0.3~0.4 W/mK	0.7~3 W/mK	2~10 W/ mK	8~10 W/mK	20~27 W/ mK	170~190 W/mK
<b>Resolution</b>	50 μm	50 μm	150 μm	150 μm	10 μm	10 μm
<b>Graduated Difference</b>	<10 μm	<10 μm	> +/- 200 μm	> +/- 200 μm	<10 μm	<10 μm
<b>Applications</b>	Suitable for low power applications (<0.5W)	Suitable for middle power applications (<1W)	Suitable for middle power applications (<1W)	Suitable for middle power applications (<1 W)	Suitable for high power applications (1~3W)	Suitable for high power applications (1~10W)
<b>Cost</b>	Low	Middle	Middle-high	Middle	Middle-high	Higher
<b>Wire bonding available</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Eutetic bonding available</b>	N/A	N/A	No	Poor	Yes	Yes
<b>Flip chip bonding available</b>	N/A	N/A	No	Poor	Yes	Yes

# Product Data Sheet

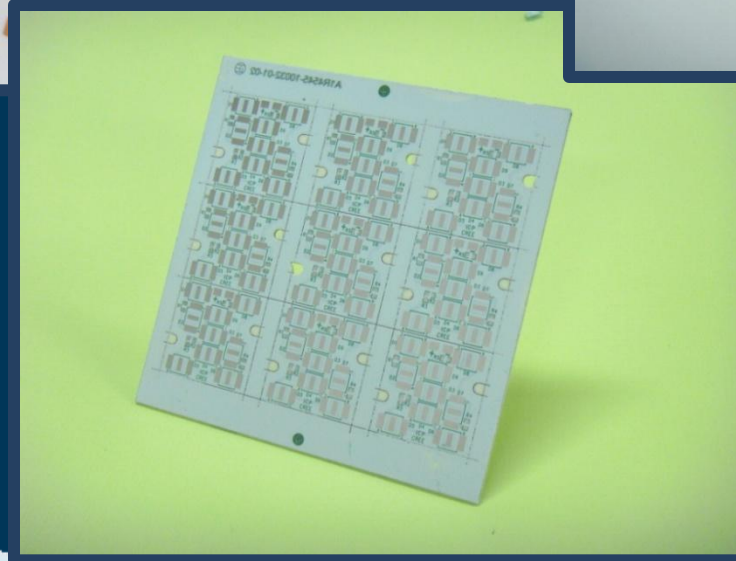
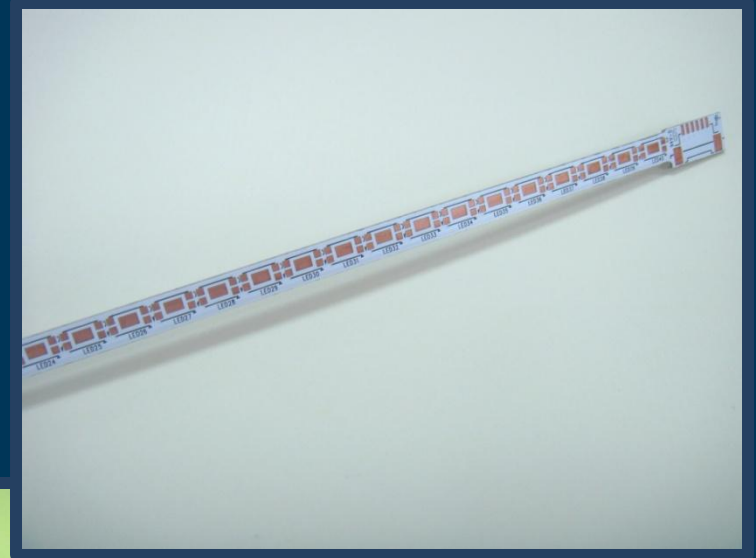
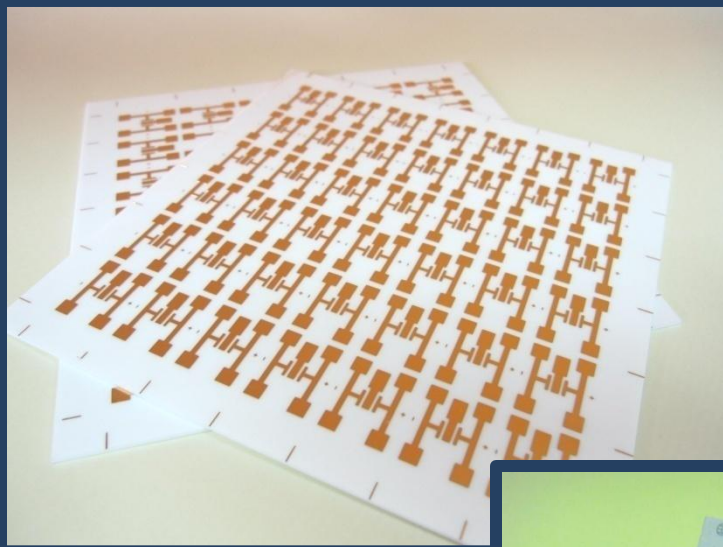
Substrate Part				Metalized Part			
Material	Typical Thickness (mm)	Typical Dimensions	Thermal Conductivity	Conducting Metal	Typical Thickness	Pattern Construction	Resolution
Al2O3 Wafer	0.38/ 0.5 /0.635/1.0	3"/ 4"/ 4.5"/5"	20~27 W/mK	Ni Cu Ag Ti Ti Alloy Ni/P Alloy Ni/Cu Alloy Ni/Cr Alloy Cu-Ni-Au Cu-Ni-Ag Cu-Al Customized	1μm 10 μm 33 μm 66 μm Customized	Single Face Double face With Via-holes Customized	10 um Typically
Al2O3 Chip	0.38/ 0.5 /0.635/1.0	Customized					
AlN Wafer	0.38/ 0.5 /0.635	3"/ 4"/ 4.5"	170~200 W/mK				
AlN Chip	0.38/ 0.5 /0.635	Customized					
Silicon Wafer	Customized	2"/ 4 / 6"	150 W/mK				
Glass Wafer	Customized	Customized	0.3~2W/mK				
Customized Material	Customized	Customized	N/A				

# Thin Film Manufacturing Product

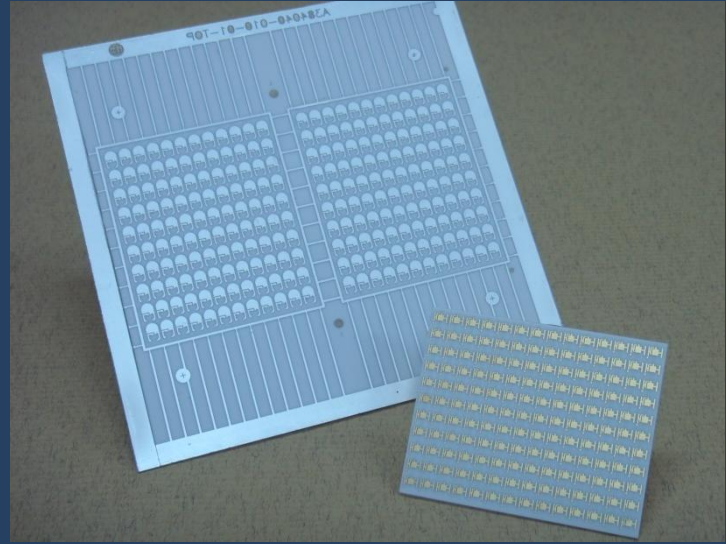
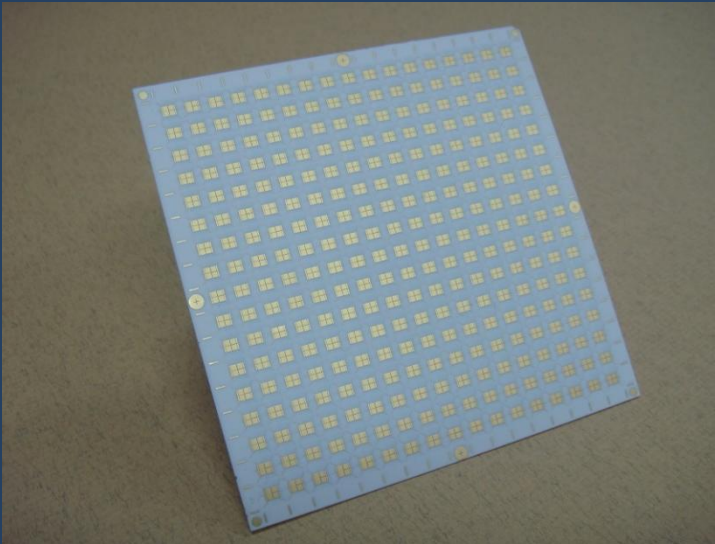
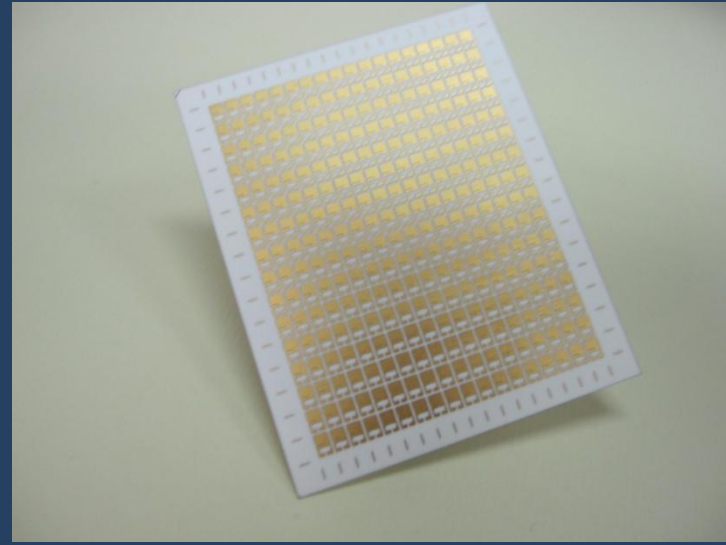
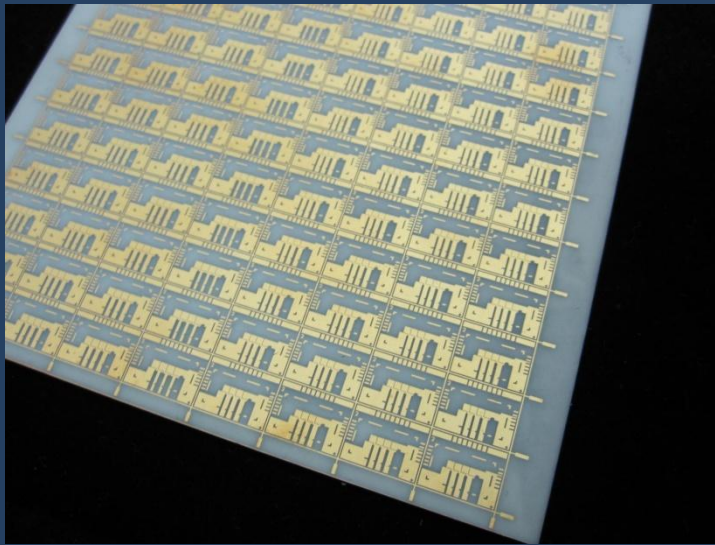




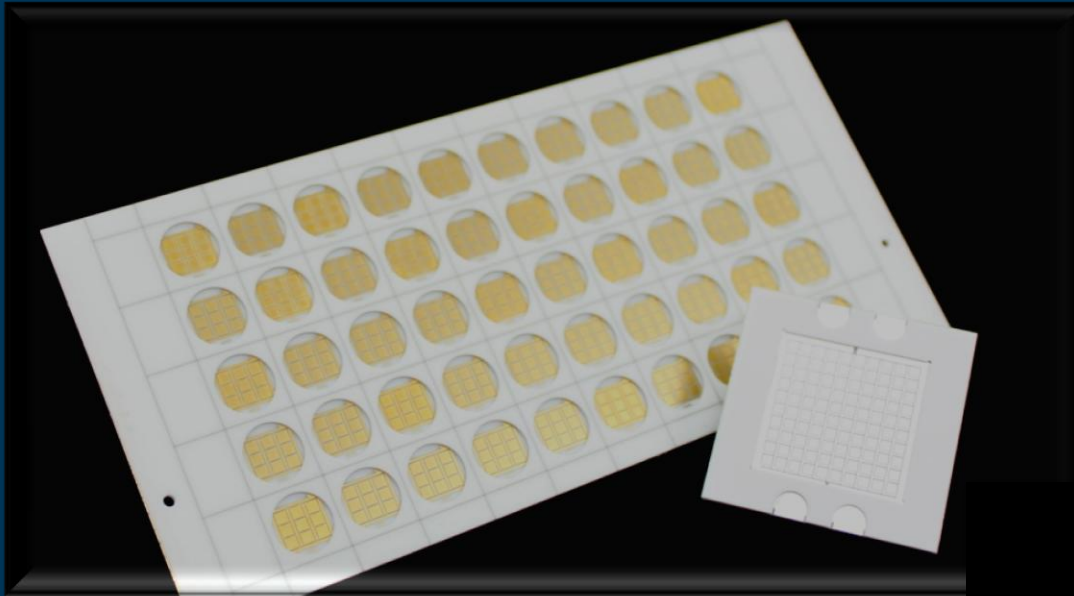
# Al<sub>2</sub>O<sub>3</sub>/AlN Ceramic Substrate



# Thin Film Manufacturing Products

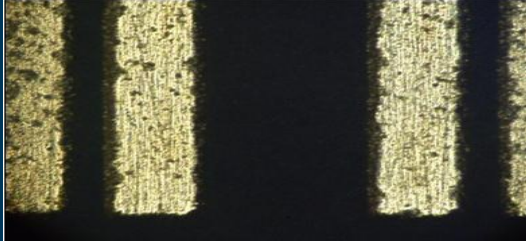
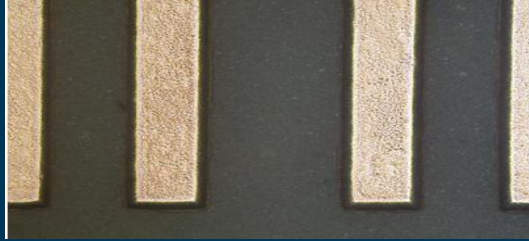


# Actual product of COB LED substrate






# Compare with Thick & Thin Film Process

<u>Item</u>	<u>Thick film</u>	<u>Thin film</u>
<u>Accuracy</u>	+/- 10%	+/- 1%
<u>Adhesion</u>	Low (especially on AlN substrate)	High
<u>Surface roughness</u>	Low (1~3 $\mu\text{m}$ )	High ( $<0.3 \mu\text{m}$ )
<u>Real image</u>		



A decorative graphic consisting of a light blue square with a smaller, slightly offset square inside it, creating a frame-like effect.

## Application of the Manufacturing Process

- High power LED ceramic substrate
  - Flip chip/eutectic substrate manufacturing
  - HCPV heat-sink of the solar cell
  - Integrated passive/protect Device
  - Submount material for sensor & automotive applications
  - ESD/EMI protect design
  - Thin film passive/protect devices
- 
- A decorative graphic at the bottom of the slide, featuring a blue and white diagonal striped pattern that tapers to a point on the right side.

A decorative graphic consisting of a light blue square with a smaller square inside it, positioned to the left of the title.

# Manufacturing technology

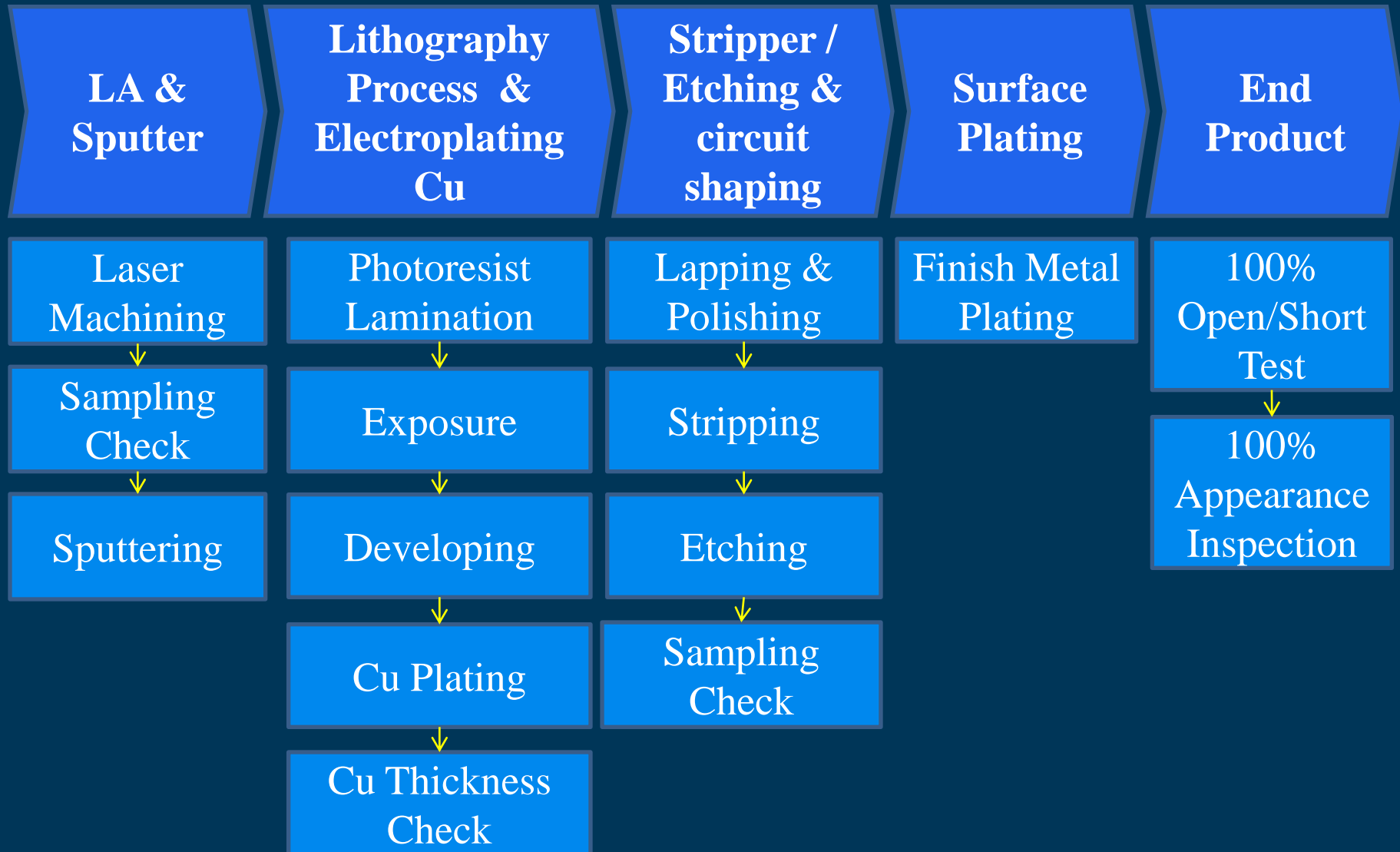
- Thin-film deposition technology
- Photo-lithography technology
- Electrode/electroless plating technology
- Micro-pattern design and manufacturing integrated technology

Abstract geometric shapes in a light blue color, including squares and rectangles of various sizes, some overlapping, and a long horizontal line extending from one of the squares.

# Manufacturing Process

Decorative diagonal stripes in shades of blue and white, located in the bottom-left corner of the slide.

# DPC Manufacture Precess





# DPC Manufacture Precess

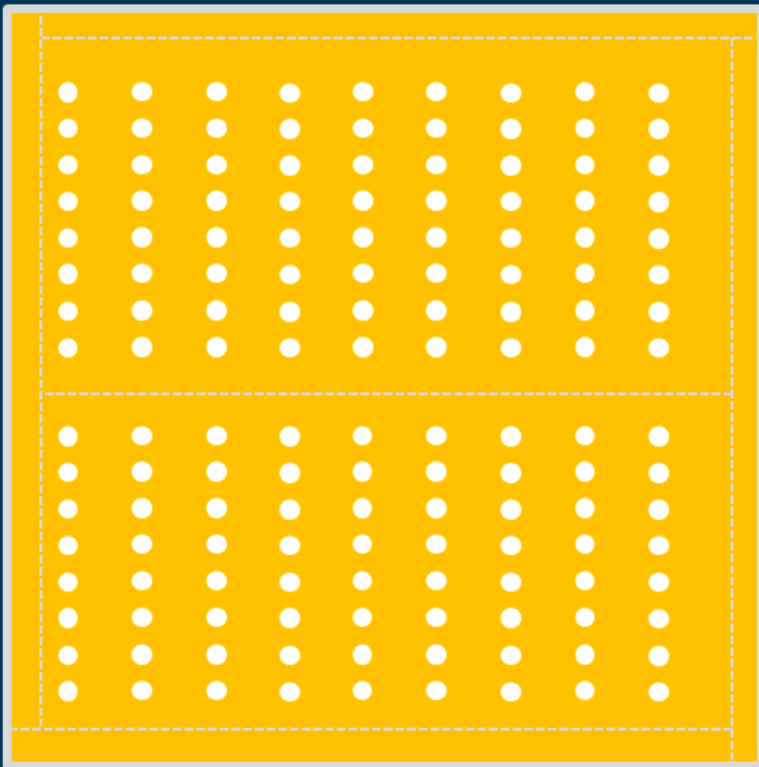


# 1. Ceramic Substrate



1-1  $\text{Al}_2\text{O}_3$  / AlN substrate

## 2. LA & Sputter

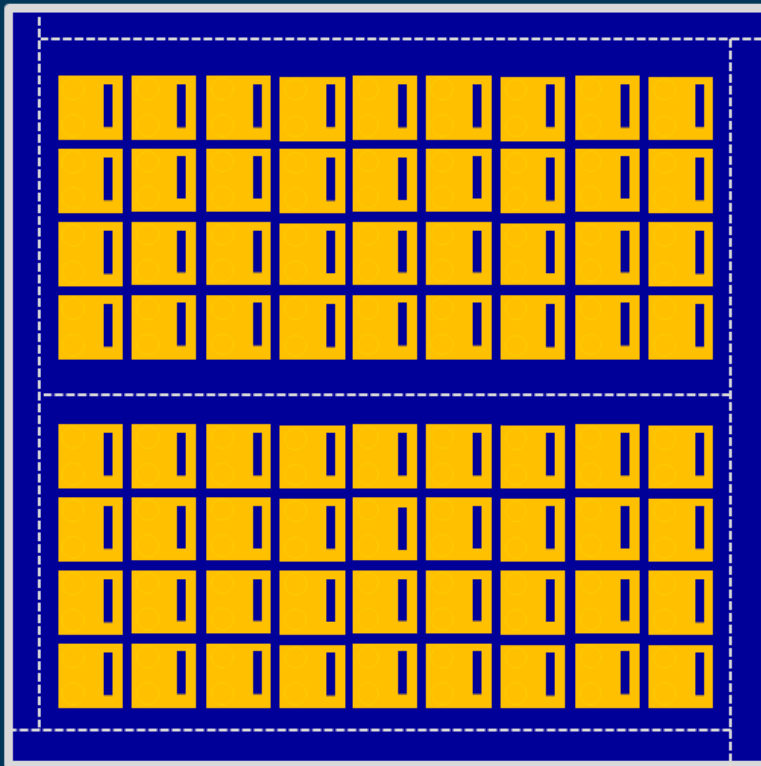


2-1 LA v-cut & via-hole



2-2 Sputter Cu

### 3. Lithography process & Electroplating Cu



3-1 Exposure



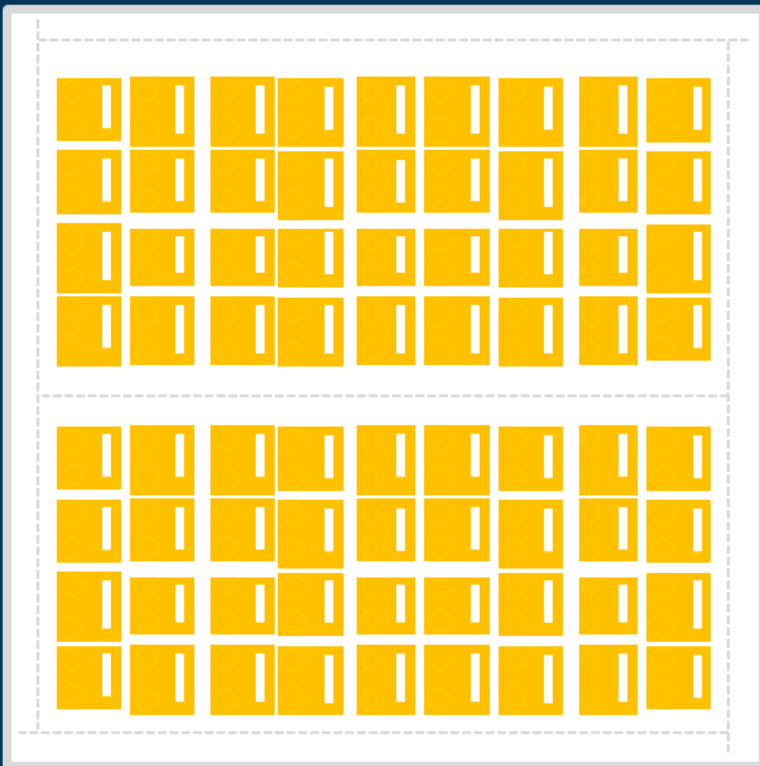
3-2 Developer



3-3 Electroplating Cu



## 4. Stripper / Etching & circuit shaping

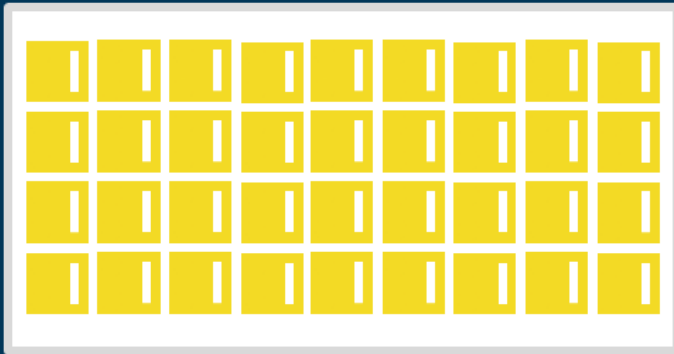


4-1 Stripping



4-2 Etching

## 5. End Product-1

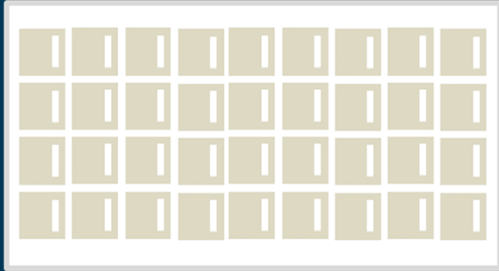


### Plating:

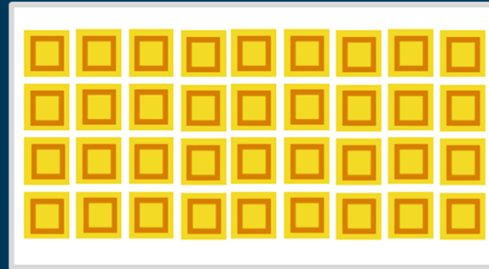
- (1) Ni: 4.5um/Pd: 0.075um/Au: 0.1um
- (2) Ni: 4.5um/Au: 0.25um
- (3) Ag: 0.5um
- (4) Ni: 4.5um/Ag: 3um



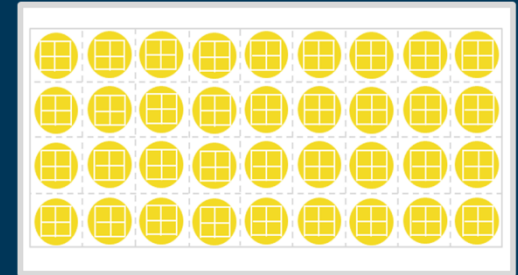
# 5. End Product-2



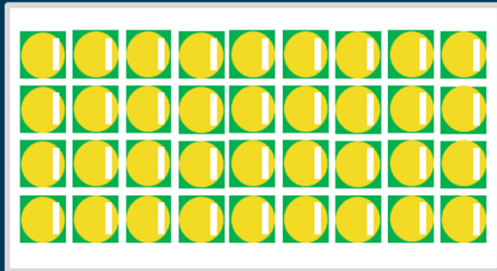
(1) Plating Au/Ag



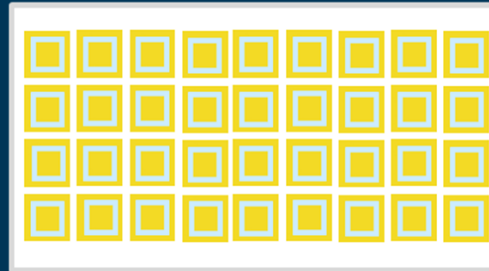
(3) Plating + Plating Cavity



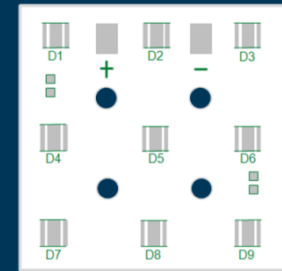
(5) COB



(2) Plating +PSR



(4) Plating + Epoxy Cavity



(6) System Board