

# TA-I Technology Co., Ltd.

## TA-I Company Profile



大毅科技股份有限公司  
TA-I TECHNOLOGY CO., LTD.

# Company Profile

- \*Established : Jan.1986
- \*President : Mr. Paul Chiang
- \*Capital: US\$ 80.3M (Listed Company)
- \*Revenue : 2010 \$136M, 2011 \$137M, 2012 \$138M, 2013 \$155M(F)
- \*Employees : 2,500 (Worldwide)

Chip resistor capacity 2<sup>nd</sup> ranking in the world.

## Service

- 24 hours per day, 7 days per week.
- 6 support offices, 6 manufacture bases.
- One stop shopping for LED substrate / Res. / Chip fuse/ Current sensing /NTC/ESD/ MLV,...

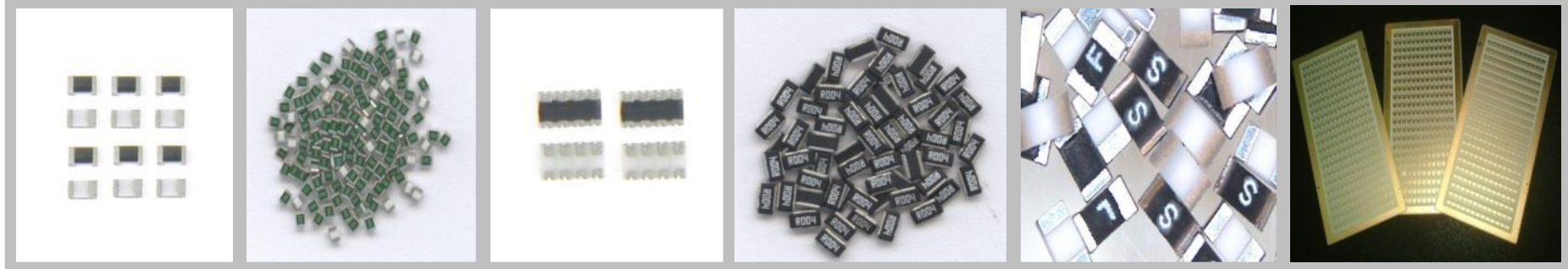
## Advantage

- Excellent logistic service.
- Quality Satisfaction.
- Total Solution.
- Environmental Protection.

# Worldwide Customer Support



# Product Line



**Discrete Resistor**

**Resistor Array**

**Power Passive**

**Circuit Protection**

**Ceramic Thermal Dissipation Substrate**

**Thick Film**  
(RM series)

01005  
0201  
0402  
0603  
0805  
1206  
1210  
2010  
2512

**Thin Film**  
(RB series)

0201  
0402  
0603  
0805  
1206  
2010  
2512

**Resistor Array**

(CN series)  
Convex type  
Concave type  
(0402, 0603)  
4P2R  
8P4R  
10P8R  
16P8R

**High Voltage Resistors**

RH series

**Current Sensing Resistor**

RLM, RLN, RLP,  
RL, RBL Series

**Chip Fuse**

CF/CFS/CP/  
CPS/TRF Series

**NTC**

MTR Series

**ESD SUPPRESSOR**

UMS/MS Series

**Customized**

Heat dissipation substrate  
Ceramic carrier board  
HCPV board

# Major Customers

Consumer



Display



Communi-  
cation



EMS



PC



Household  
Application



PC  
Peripheral



Others



# Major Customers (LED)

Approval  
Mass Production



Sampling



# FINANCIAL REPORT 1



Microsoft Office  
Excel 97-2003 Worksheet

## Consolidated Balance Sheet

Provided by: TA-I TECHNOLOGY CO.,LTD

Financial year: Yearly

Unit : NT\$ thousand

| Accounting Title   | 9/30/2012           |              | 9/30/2011           |             |
|--|---------------------|--------------|---------------------|-------------|
|  | Amount              | %            | Amount              | %           |
| <b>Assets</b>  |                     |              |                     |             |
| <b>Current Assets</b>  |                     |              |                     |             |
| Cash and cash equivalents  | 852,999.00          | 13.38        | 613,082.00          | 9.14        |
| Financial assets measured at fair value through profit or loss - current | 22,031.00           | 0.35         | 24,878.00           | 0.37        |
| Notes receivable - net   | 1,899.00            | 0.03         | 8,989.00            | 0.13        |
| Accounts receivable - net  | 1,224,176.00        | 19.2         | 1,169,354.00        | 17.44       |
| Accounts receivable - related parties - net                              | 46,538.00           | 0.73         | 42,505.00           | 0.63        |
| Other receivables  | 14,389.00           | 0.23         | 16,111.00           | 0.24        |
| Other financial assets - current   | 13,980.00           | 0.22         | 0                   | 0           |
| Inventories  | 1,106,183.00        | 17.35        | 1,295,316.00        | 19.32       |
| Other current assets   | 88,259.00           | 1.38         | 128,884.00          | 1.92        |
| <b>Current assets</b>  | <b>3,370,454.00</b> | <b>52.85</b> | <b>3,299,119.00</b> | <b>49.2</b> |
| <b>Funds and Investments</b>   |                     |              |                     |             |
| Financial assets carried at cost - non current                           | 9,940.00            | 0.16         | 10,962.00           | 0.16        |
| Equity investments under equity method                                   | 0                   | 0            | 3,663.00            | 0.05        |
| Prepayments for long-term investments                                    | 0                   | 0            | 60,940.00           | 0.91        |
| <b>Investments</b>   | <b>0</b>            | <b>0</b>     | <b>64,603.00</b>    | <b>0.96</b> |
| <b>Funds and long-term investments</b>                                   | <b>9,940.00</b>     | <b>0.16</b>  | <b>75,565.00</b>    | <b>1.13</b> |
| <b>Fixed Assets</b>  |                     |              |                     |             |

# FINANCIAL REPORT 2



Microsoft Office  
cel 97-2003 Worksh

## Consolidated Income Statement

Provided by: TA-I TECHNOLOGY CO.,LTD

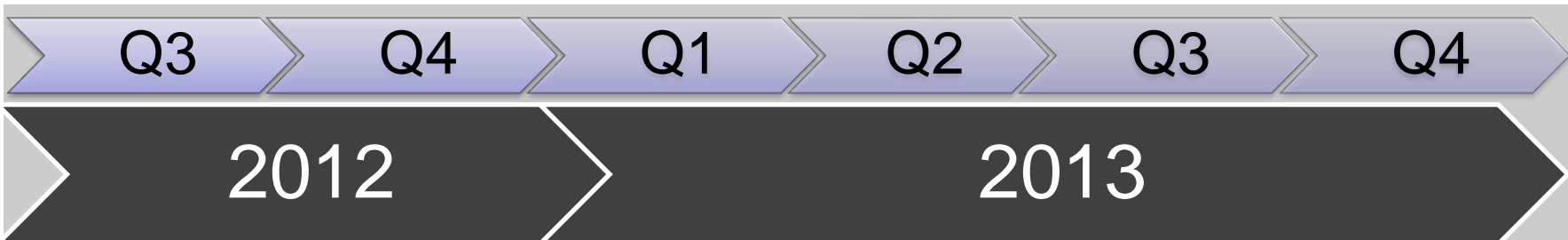
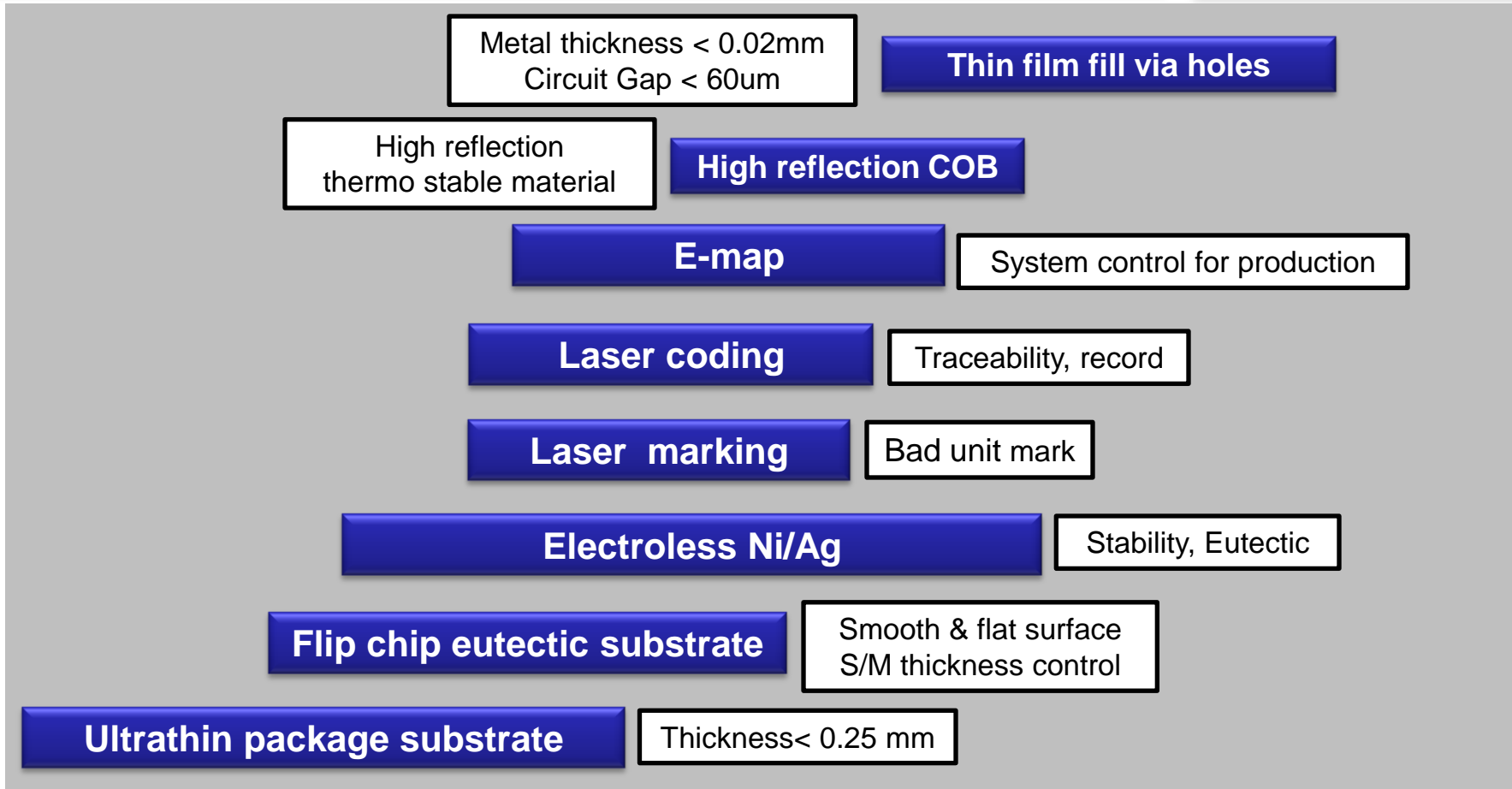
Financial year: Yearly

Unit : NT\$ thousand

| Accounting Title                    | 9/30/2012    |        | 9/30/2011    |       |
|-------------------------------------|--------------|--------|--------------|-------|
|                                     | Amount       | %      | Amount       | %     |
| Sales                               | 2,811,424.00 | 100.92 | 2,864,246.00 | 101.1 |
| Sales returns                       | 14,210.00    | 0.51   | 17,499.00    | 0.62  |
| Sales discounts and allowances      | 11,493.00    | 0.41   | 13,764.00    | 0.49  |
| Sales                               | 2,785,721.00 | 100    | 2,832,983.00 | 100   |
| Operating income                    | 2,785,721.00 | 100    | 2,832,983.00 | 100   |
| Cost of sales                       | 2,342,334.00 | 84.08  | 2,247,992.00 | 79.35 |
| Operating costs                     | 2,342,334.00 | 84.08  | 2,247,992.00 | 79.35 |
| Gross profit (loss) from operations | 443,387.00   | 15.92  | 584,991.00   | 20.65 |
| Selling expense                     | 99,812.00    | 3.58   | 100,241.00   | 3.54  |
| General and administrative expenses | 172,523.00   | 6.19   | 227,525.00   | 8.03  |
| Research and development expenses   | 25,255.00    | 0.91   | 56,373.00    | 1.99  |
| Operating expenses                  | 297,590.00   | 10.68  | 384,139.00   | 13.56 |
| Operating income (loss)             | 145,797.00   | 5.23   | 200,852.00   | 7.09  |
| <b>Non-Operating Income</b>         |              |        |              |       |
| Interest income                     | 1,785.00     | 0.06   | 1,712.00     | 0.06  |



# Road Map



## Laser Drilling & Scribing

- Developed by TAI own tech.
  - ✓ Cost Down
  - ✓ With Various Function
- Min. Scribing Width 25 $\mu$ m
- Widely Choice Laser Type
  - ✓ Green / YAG / CO<sub>2</sub>
- Sufficient Production Machine
  - ✓ Amount Above 150 sets
- Customized Drilling holes position
- Customized Scribing
  - ✓ Pre-Cut
  - ✓ Post-Cut
- Over 20 Years Experience



## Photolithograph

- Min. resolution 15  $\mu$ m
- CCD Auto Alignment Exposure
  - ✓ Max. Exposure Area: 6x6 inch<sup>2</sup>
  - ✓ Horizontal Tolerance  $\pm 10$   $\mu$ m
  - ✓ Increase Yield
- Over 10 Years Experience



## In-line Sputter

- In-line double sided Sputter
  - ✓ No Particle Issue
  - ✓ Save process time
  - ✓ Save Pumping & Venting times
- Over 10 Years Experience



# Equipment investment plan in 2013

| Equipment investment plan in 2013       |                        |                        | Unit : Set             |
|---|------------------------|------------------------|------------------------|
|   | 2012.4                 | 2013.2                 | 2014.3                 |
| Laser Drilling (100W)                   | 30                     | 38                     | 60                     |
| Laser Drilling (200W)                   | 2                      | 5                      | 7                      |
| Sputter                                 | 1(7)                   | 1(7)                   | 2(8)                   |
| Photolithograph                         | 5(8)                   | 7(10)                  | 13(16)                 |
| Cu Plating line                         | 1(18)                  | 1(18)                  | 2(19)                  |
| AOI (Auto optical Inspect)              | 1                      | 3                      | 15                     |
| Silver Plating line                     | 1                      | 1                      | 1                      |
| <b>Total Capacity<br/>(4.5" x 4.5")</b> | <b>250K (panels/M)</b> | <b>300K (panels/M)</b> | <b>500K (panels/M)</b> |
| <b>Package – CREE 207</b>               | <b>165KKpcs/M</b>      | <b>165KKpcs/M</b>      | <b>275KKpcs/M</b>      |

Note : The number in ( ) are the total equipments in whole TA-I group

## Procurement

### \*Cost

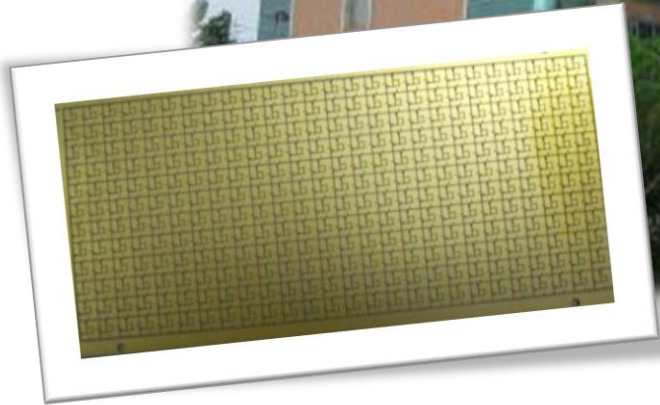
1. Equipment developed by TA-I
2. Bulk purchase the ceramic substrate that also applied in chip resistor  
(Total quantity is 11KKpanel/M)

### \*Logistic

1. Adaptive and able to support by our factories located in Taiwan, China, Malaysia and Indonesia.

## Technical

1. Over 20 years experience in Thin film and Thick film technology that applied to passive component and circuit protection component.
2. Higher production efficiency by equipment development with supplier



# Production Process

□ Thin Film Process

# New LED Factory

Estimated Launch Date: Year 2014, Q1



**Current Size: 14,400 Square Feet**

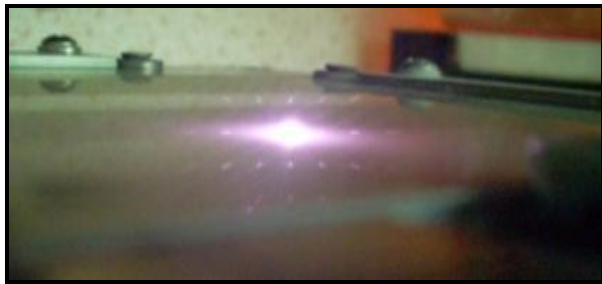
**New Factory Size: 115,200 Square Feet**

### Laser

Scribing, Drilling

Via hole

Ceramic



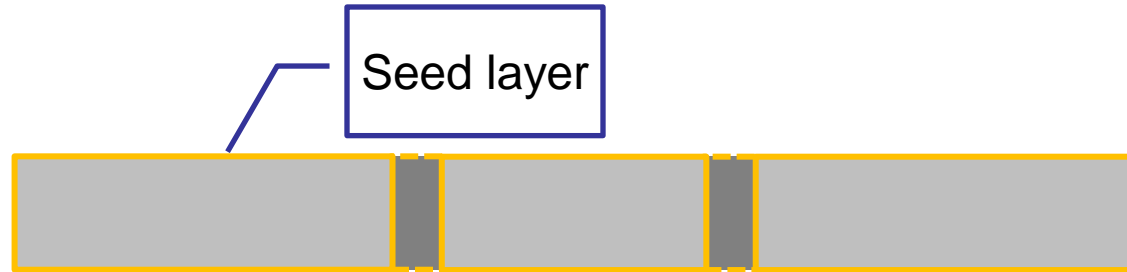
100W Fiber Laser

Laser

Scribing, Drilling

Sputter

Metallization



In-line Sputter



# Process of Thermal Dissipation Ceramic

## -- Photolithograph Stage

Laser

Scribing, Drilling

Sputter

Metallization

Photolithograph

Dry Film Wall

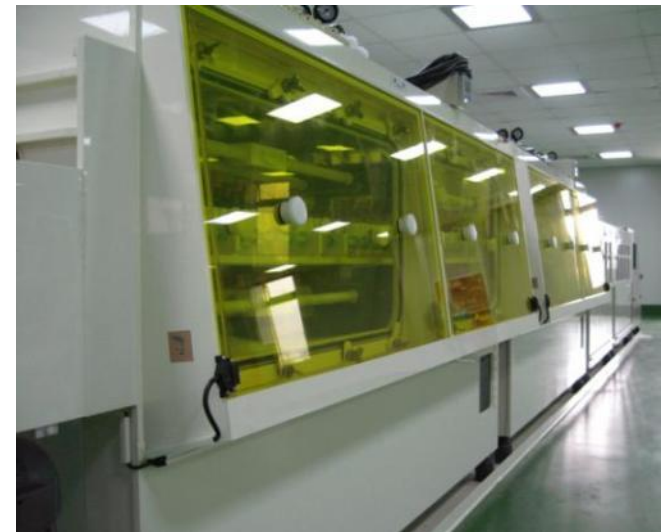
Photo resistance



Dry Film Lamination



Auto Exposure



Developer

Laser

Scribing, Drilling

Sputter

Metallization

Photolithograph

Dry Film Wall

Plating

Thick Copper, Filling



Electroforming Machine

# Process of Thermal Dissipation Ceramic

## -- Etching & Stripping Stage

Strip photo resistance  
Etch seed layer

Laser

Scribing, Drilling

Sputter

Metallization

Photolithograph

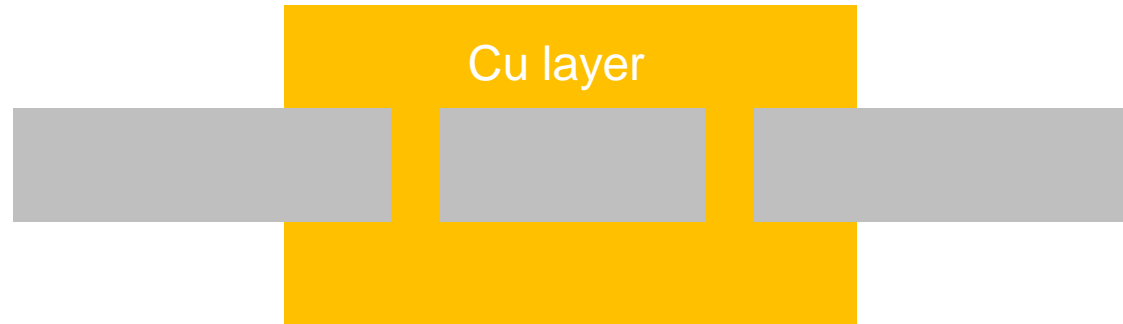
Dry Film Wall

Plating

Thick Copper, Filling

Etching & Stripping

Forming Circuit  
Pattern



Etching Machine



Stripping Machine



Scrubbing Machine

# Process of Thermal Dissipation Ceramic

## -- Printing Stage (Solder Mask)

Laser

Scribing, Drilling

Sputter

Metallization

Photolithograph

Dry Film Wall

Plating

Thick Copper, Filling

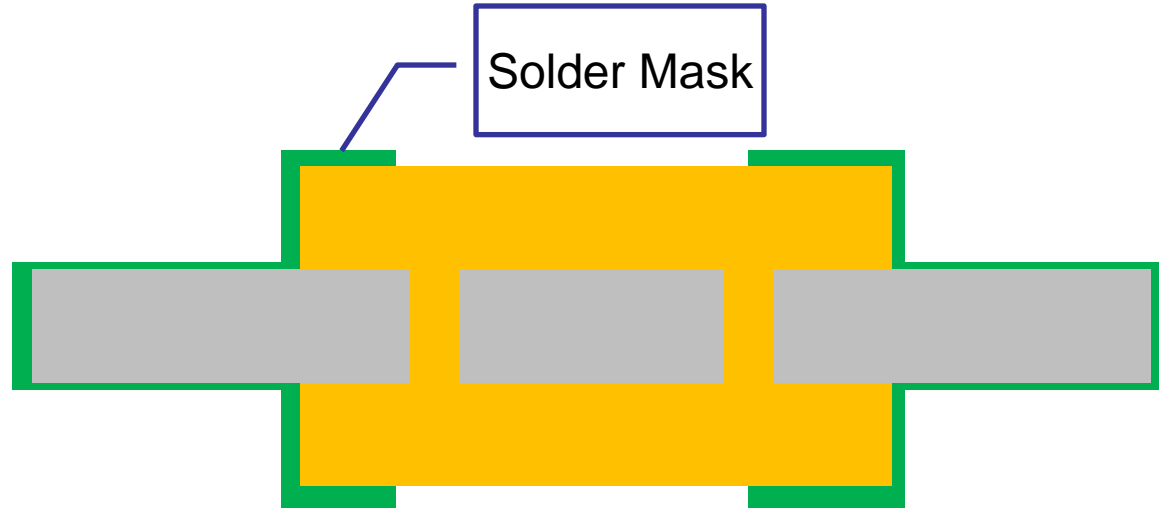
Etching & Stripping

Circuit Forming

Screen Printing

Solder Mask

Solder Mask



CCD Screen Printing Machine

# Process of Thermal Dissipation Ceramic

## -- Final Finish Stage

Laser

Scribing, Drilling

Sputter

Metallization

Photolithograph

Dry Film Wall

Plating

Thick Copper, Filling

Etching & Stripping

Circuit Forming

Screen Printing

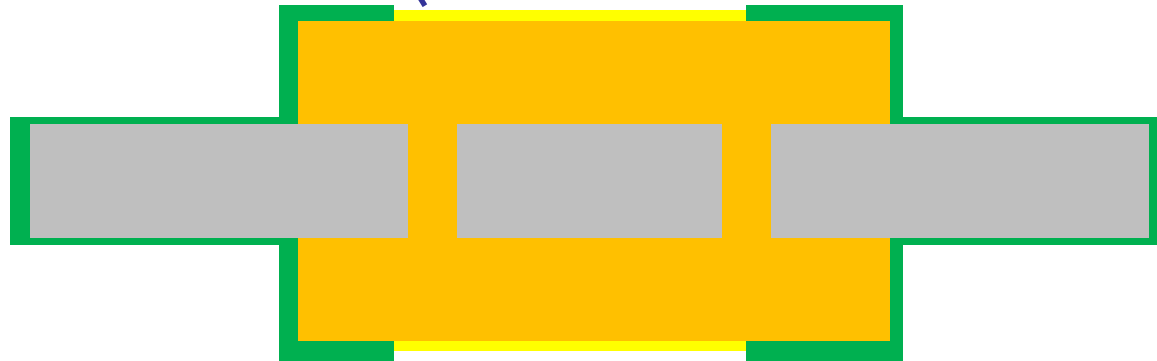
Solder Mask

Final Finish

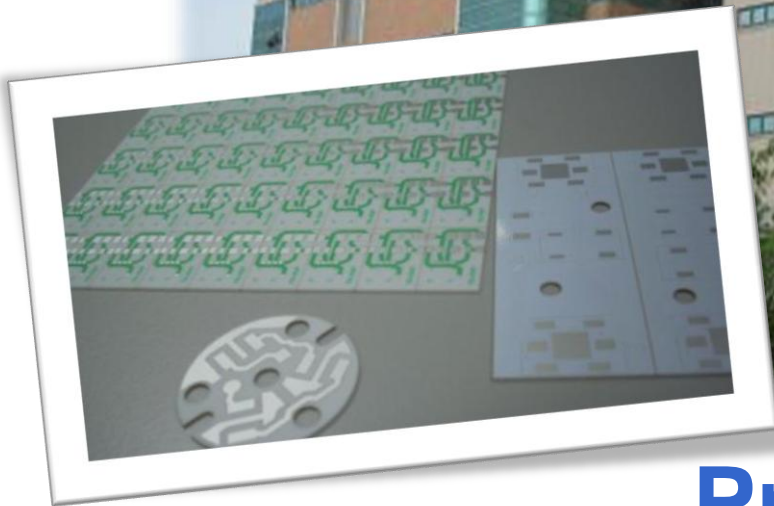
Modify surface

Final finish

Type : NiPdAu / NiAg / NiAu / Ag



Chemical Ag Plating Machine



## Production Process

□ Thick Film Process

# Thick Film Process - Laser

Laser

Substrate

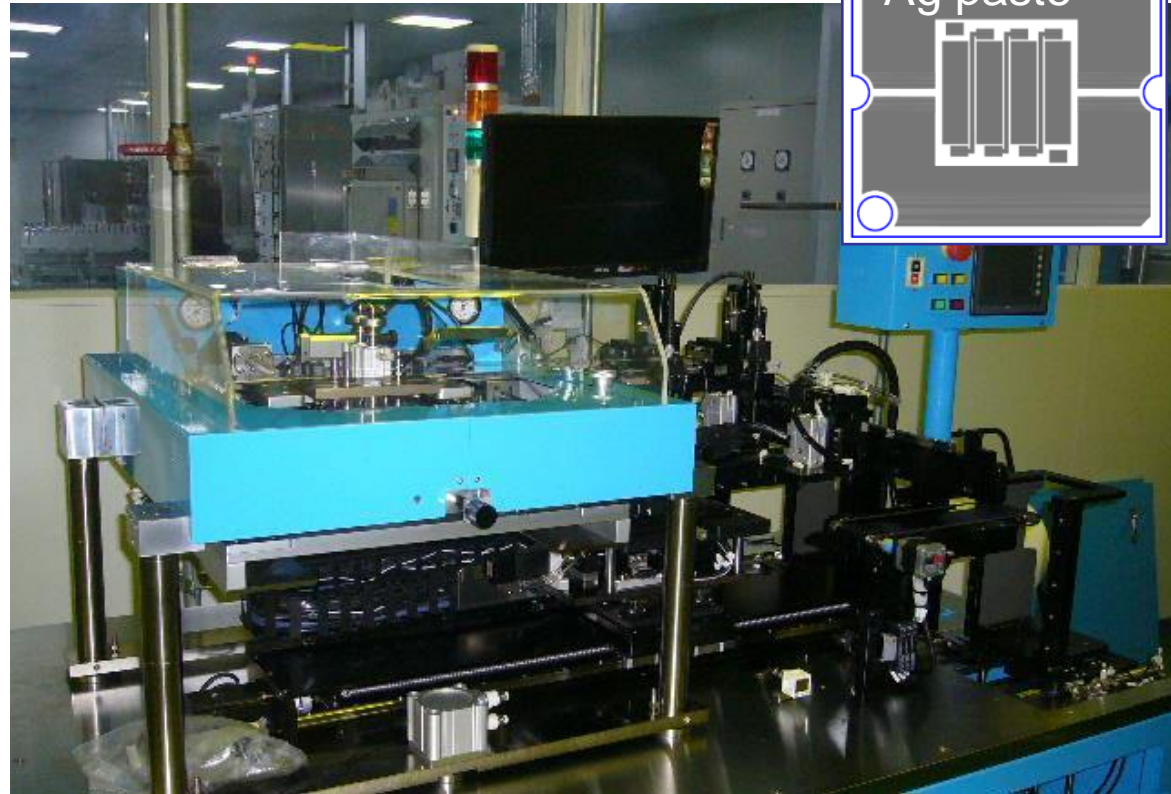


100W fiber laser

# Thick Film Process - Screen Printing

Laser

Screen Printing  
Conductive Paste



Auto Screen Printer



# Thick Film Process - Firing

Laser

Screen Printing  
Conductive Paste

Drying/Firing  
Circuit



Firing Furnace

# Thick Film Process - Screen Printing

Laser

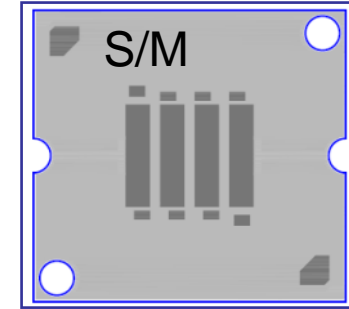
Screen Printing  
Conductive Paste

Drying/Firing  
Circuit

Screen Printing  
Solder mask



Auto Exposure



CCD Screen Printing Machine



Developer

# Thick Film Process - Dispenser

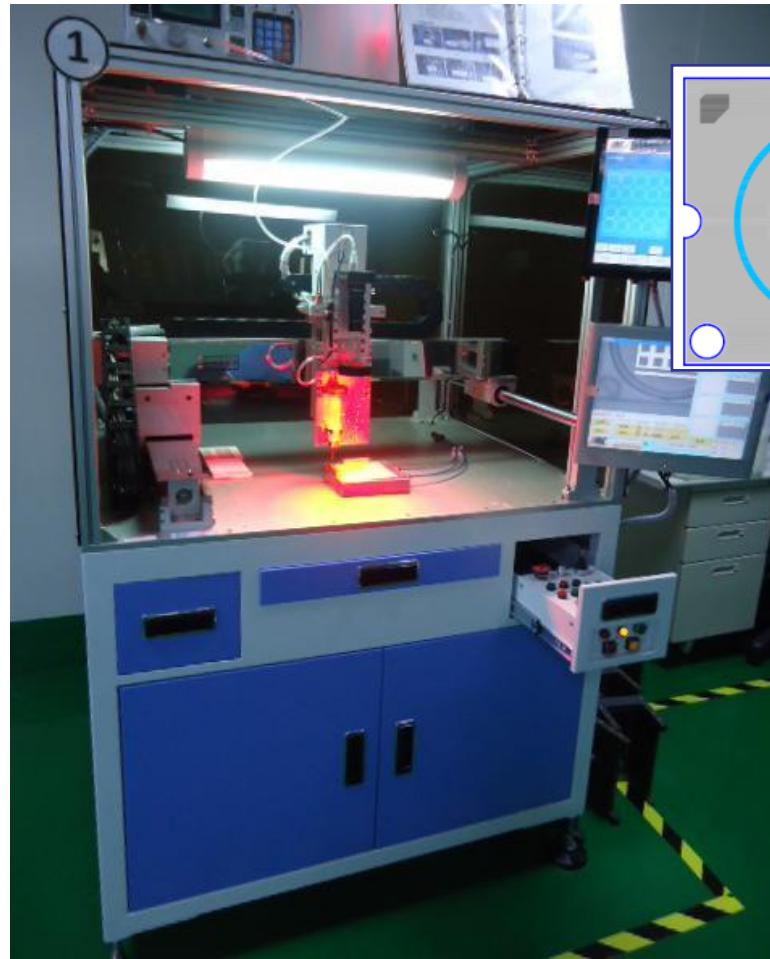
Laser

Screen Printing  
Conductive Paste

Drying/Firing  
Circuit

Screen Printing  
Solder mask

Dispenser  
Cavity



Dispensing  
Cavity

Dispenser

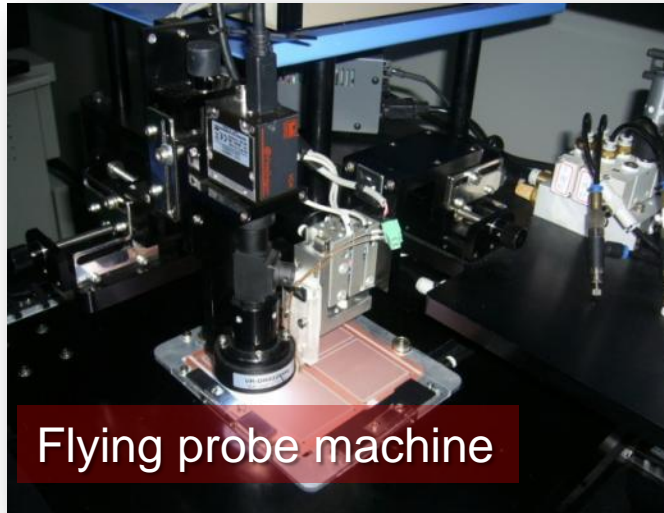
# Specification-Heat dissipation substrate

|                                      | Substrate Characteristics |                                 |                              | Metal Layer Characteristics                  |                            |  |                                   |
|--------------------------------------|---------------------------|---------------------------------|------------------------------|--|----------------------------|--|-----------------------------------|
| Material                             | Thickness (mm)            | Dimensions (inch)               | Thermal Conductivity (W/m.K) | Final Finish Metal                           | Total Thickness (um)       | Pattern Construction                                   | Resolution (um)                   |
| Al <sub>2</sub> O <sub>3</sub> Panel | 0.25/0.38/0.5/<br>0.635/1 | 4.5x4.5/4.75x4.75/<br>4.83x4.83 | 23-25                        | Cu-Ni-Au<br>Cu-Ni-Ag<br>Cu-Ni-Pd-Au<br>Cu-Ag | 1-100<br>For<br>Customized | One sided<br>Two sided with<br>via holes<br>Customized | Min. 15<br>(Base on<br>thickness) |
| Al <sub>2</sub> O <sub>3</sub> Chip  | 0.25/0.38/0.5/<br>0.635/1 | Customized                      |                              |  |                            |  |                                   |
| AlN Panel                            | 0.25/0.38/0.5/<br>0.635/1 | 4.5x4.5/4.75x4.75/<br>4.83x4.83 | 170-200                      |  |                            |  |                                   |
| AlN Chip                             | 0.25/0.38/0.5/<br>0.635/1 | Customized                      |                              |  |                            |  |                                   |

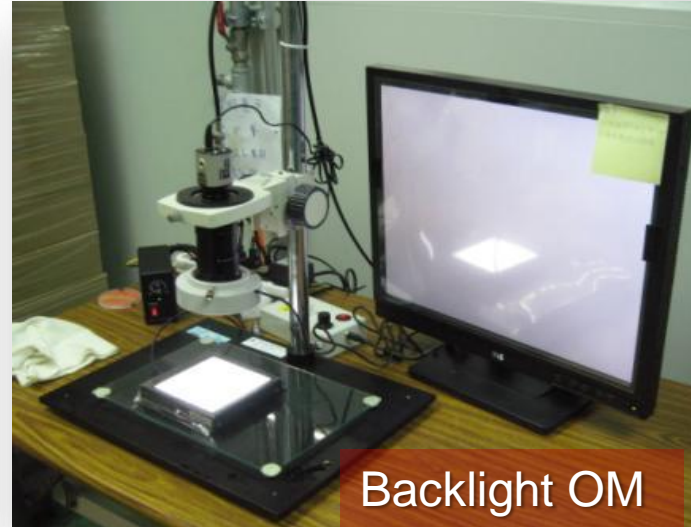
# Specification - Ceramic Board

| Material                    | Al <sub>2</sub> O <sub>3</sub> | AlN |
|-----------------------------|--------------------------------|-----|
| Thermal Conductivity(W/m.K) | 25                             | 170 |
| Thickness (mm)              | 0.5/0.635/1                    |     |
| Dimension (inch)            | 4.75x4.75 (Max.)<br>Customized |     |
| Circuit Thickness (um)      | 12±5                           |     |
| Circuit Resolution (um)     | 200                            |     |
| Solder mask Thickness (um)  | 15±5                           |     |
| Solder mask Resolution (um) | 100                            |     |
| Cavity Thickness (mm)       | 0.3-1.5                        |     |

# Inspection Equipment



Flying probe machine



Backlight OM



3D OM



Electrical Measurement



AOI

# Reliability Test

| No. | Item                          | Parameter  | Specification  | Reference standard |
|-----|-------------------------------|--|--|--------------------|
| 1   | Adhesion test                 | <ol style="list-style-type: none"><li>1. Temp. : RT</li><li>2. Tool : 3M-610</li><li>3. Angle : 180°</li></ol>                                   | <ul style="list-style-type: none"><li>•The exterior must be no separate</li></ul>  | IPC-TM-650-2.4.1   |
| 2   | Solderability                 | <ol style="list-style-type: none"><li>1. Temp. : 235±5°C</li><li>2. Time : 5±1sec</li></ol> solder bath composition :<br>(Ag/Sn/Cu=3/96.5/ 0.5%) | <ul style="list-style-type: none"><li>•Coverage ≥90%</li></ul>   | ANSI/J-STD-003     |
| 3   | Thermal Stress<br>(IR Reflow) | <ol style="list-style-type: none"><li>1. Peak Temp. : 260°C</li><li>2. Time: 10 second</li><li>3. Reflow Times : 3 cycles</li></ol>              | <ul style="list-style-type: none"><li>•The exterior must be no separate, crack and warpage</li><li>•Maintain the electrical function</li></ul> | IPC-TM-650-2.6.27  |

# Reliability Equipment



Wire Bonding Machine



Push & Pull Meter



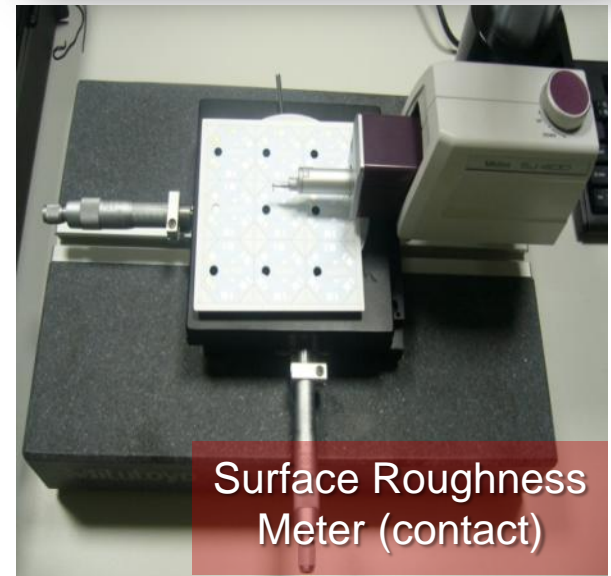
Thermal Shock



Surface Roughness Meter (non-contact)



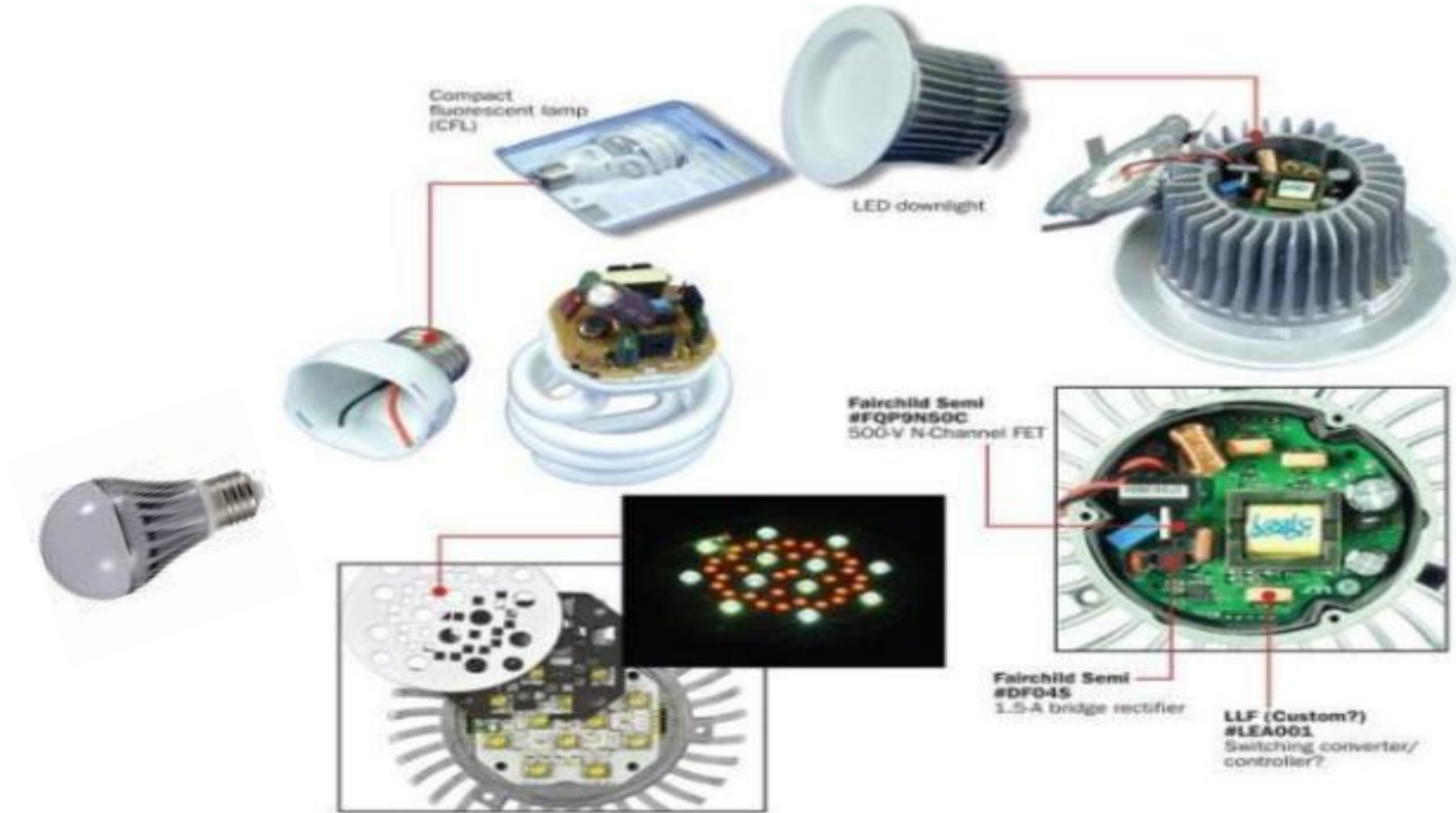
IR Reflow



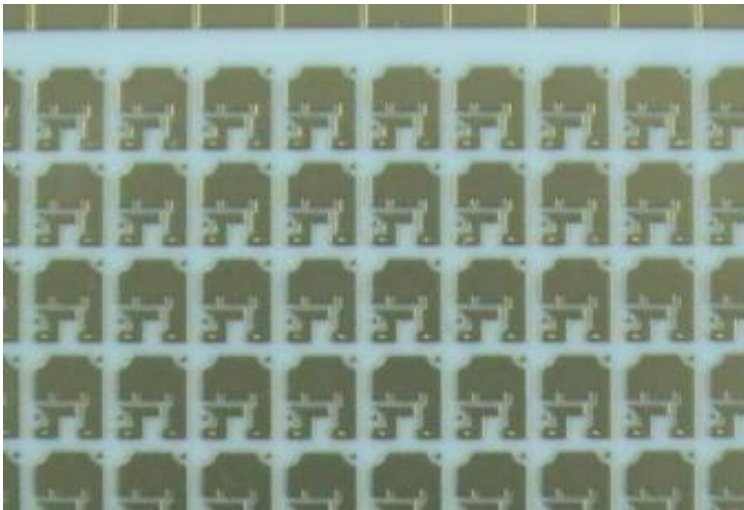
Surface Roughness Meter (contact)



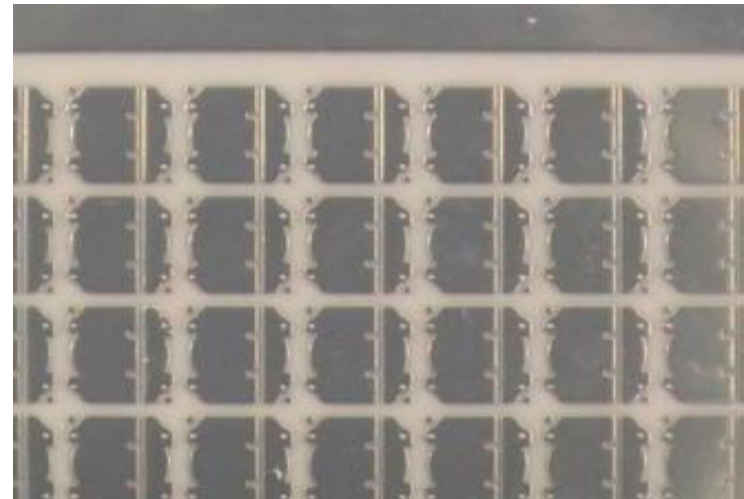
# Application



- SMD LEDs - Chip Carrier
  - Over 1 W Chip Carrier
  - Dimension : customized



NiAu/NiPdAu-3535 (TA-I Pattern)



Ag-3535 (TA-I Pattern)

# Cavity on Substrate



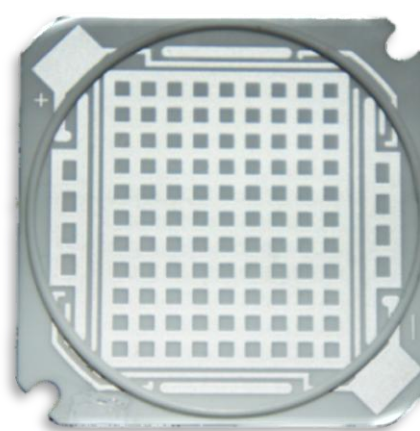
**Electroforming**

- High resolution
- Low height (<100um)
- Mass production
- Complexity Process



**Solder Mask**

- High resolution
- Low height (<400um)
- Mass production



**Dispensing**

- Low resolution
- Wide: >250 um
- Less manufacturing Efficiency

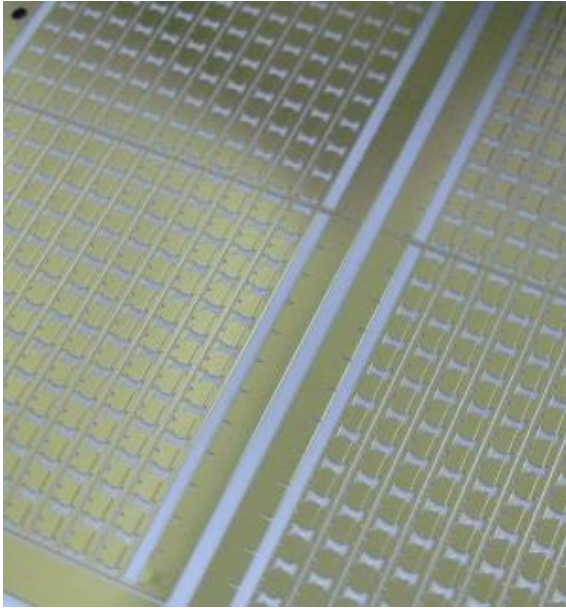


**Ceramic**

- Low resolution
- High < 1000 um
- Less Manufacturing Efficiency

# Reflectivity Solution

## Increase surface reflection



**Glossy surface substrate**  
(Smooth surface)



**Silver Plating**  
(High reflection metal)

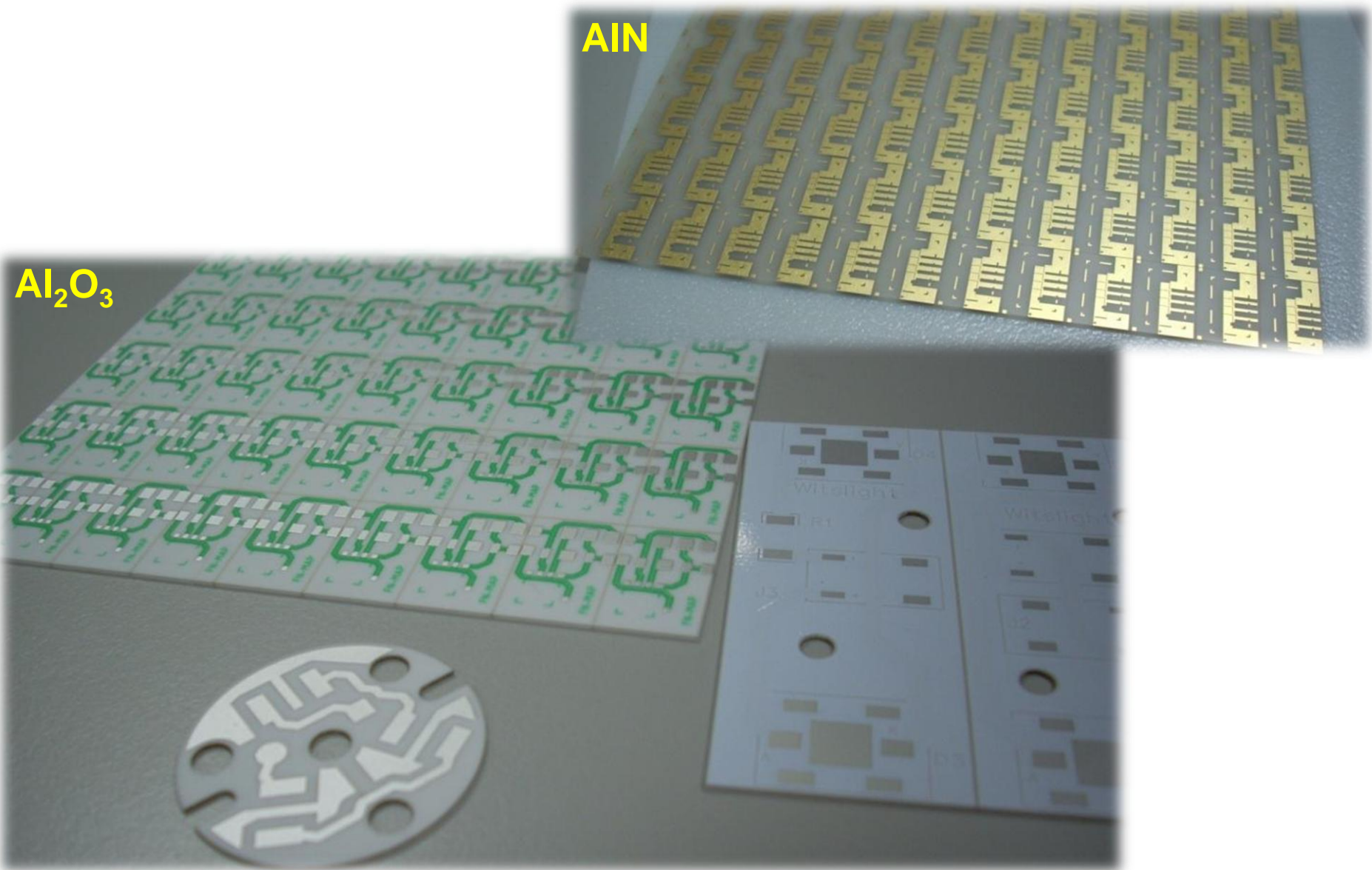


**Glossy Solder mask**  
(Reflectivity > 85%)

# LED Lighting Module

AlN

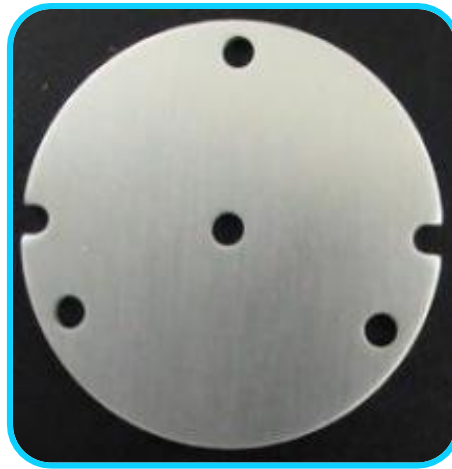
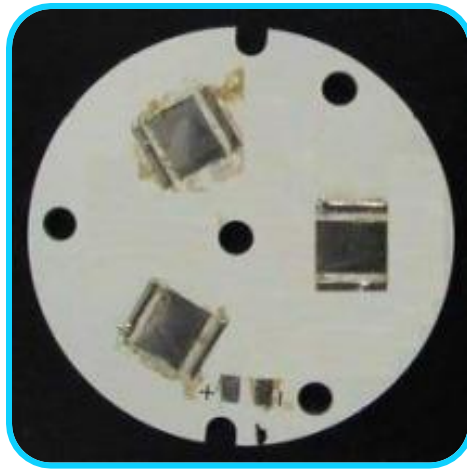
Al<sub>2</sub>O<sub>3</sub>



# Safety Standard

| Dielectric Voltage Withstand   |                |
|--|----------------|
| IEC/EN 60598   |                |
| Basic insulation for voltages of SELV(a)   | 500            |
| Basic insulation for voltages more than SELV(b)  | 2U+1000 (1440) |
| Supplementary insulation(c)  | 2U+1750 (2190) |
| Double or reinforced insulation(d)   | 4U+2750 (3630) |
| U=working voltage  |                |
| UL 8750-2009   |                |
| Between primary circuits or secondary circuits operation at greater than 70V peak and accessible dead conductive parts | 2U+1000 (1440) |
| Between the primary and secondary of a transformer   |                |
| U=working voltage  |                |

# Lighting AC LED Board



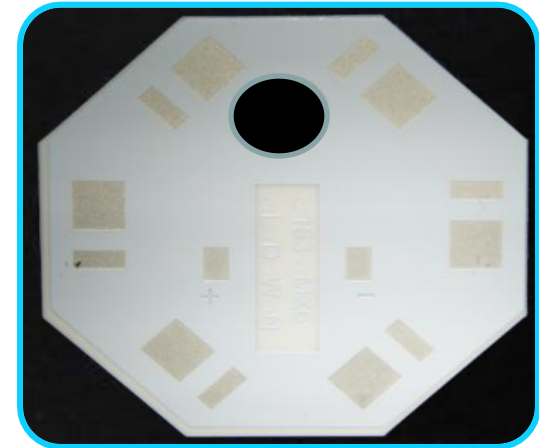
**Aluminum Substrate**  
**Thickness: 1.6 mm**

## Disadvantages of Aluminum Substrate

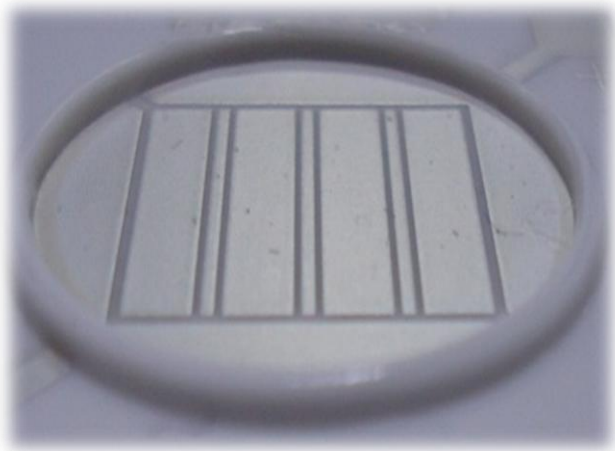
- Corrode
- Deformation
- High Voltage
- Peeling

Substituted

**TA-I ceramic substrate**  
**Thickness : 0.635/1 mm**

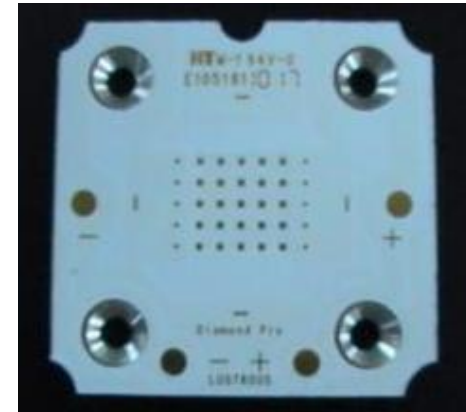


# Street light COB module

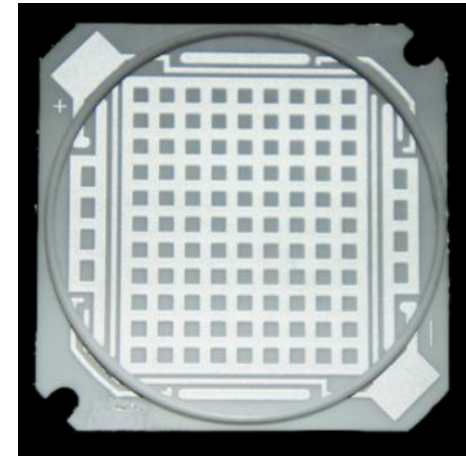


**Dispensing  
Cavity**

- ◆ Low resolution
- ◆ High limit (0.35-1.5 mm)
- ◆ Suitable for COB



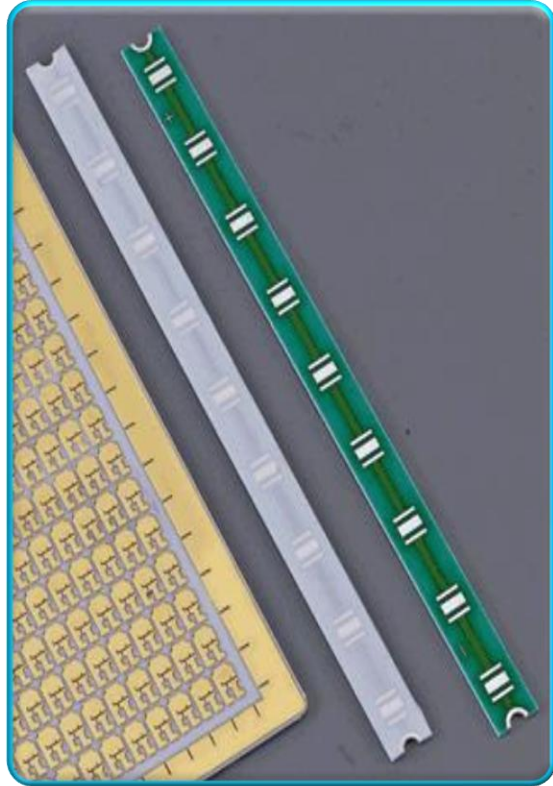
**Chip on Board (Al Substrate)**



**Chip on Board (Ceramic Substrate)**

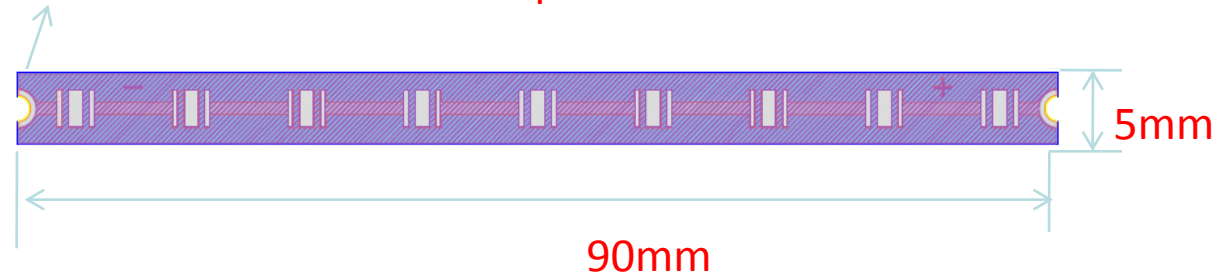


# BLU & Light Bar Application



0.3mm

Top View





**Thank you very much**