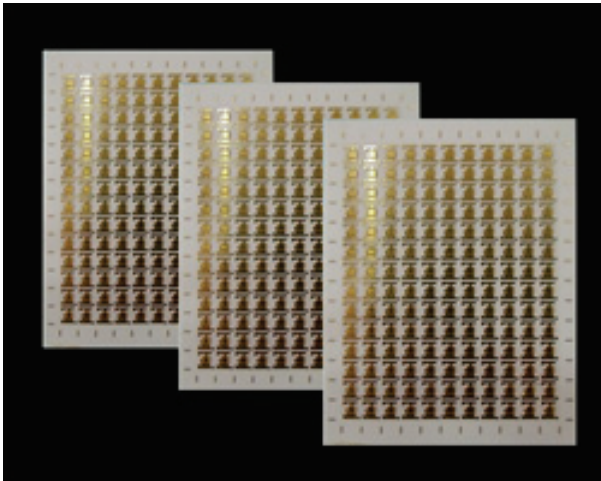


# CERAMIC SUBSTRATES

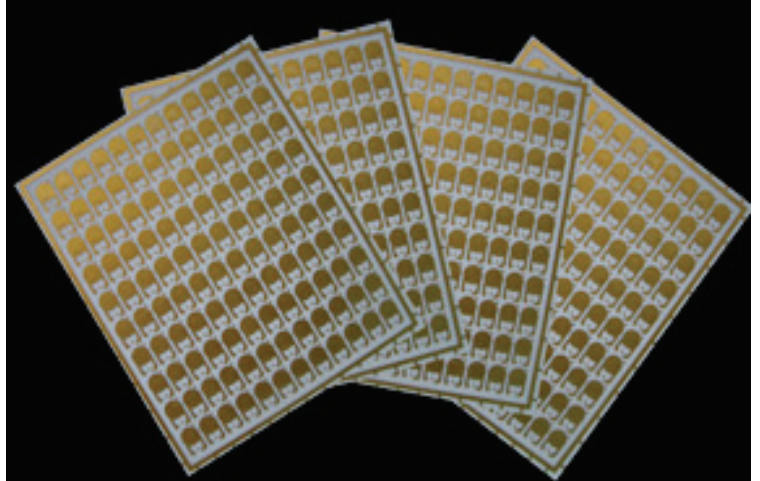
## Ceramic Substrates

Aluminum Oxide ( $\text{Al}_2\text{O}_3$ ) and Aluminum Nitride (AlN) are non-electrical conductive. They act as electrical insulators and they reduce the thermal effect which affecting the performance and quality of the traditional Aluminium plate (MCPCB). Thermal effect could easily cause short circuit. With Ceramic Substrates, it improves the performance and greatly extends the life span of the product. This is particularly obvious in the high power application as ceramic has a high thermal conductivity. We produce customized, smaller in size, high performance with high accuracy and surface finish ceramic substrates for our customers.

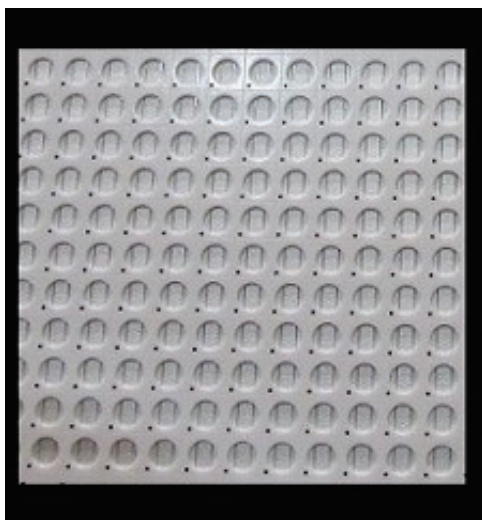
We possess the following ceramic substrate manufacturing technologies, namely Thin-film deposition, Photolithography, Electrode/Electrodeless plating, Micro-pattern design and integrated manufacturing.



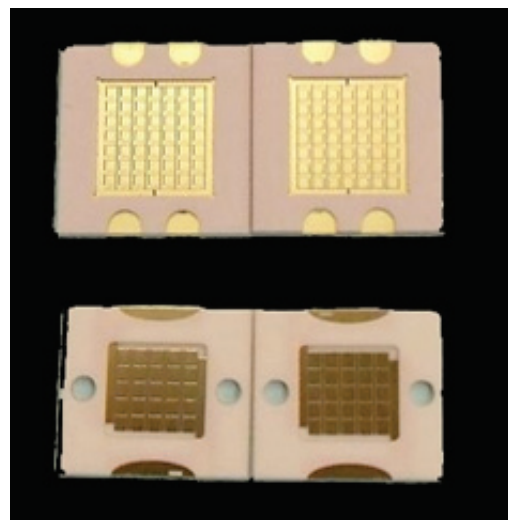
LED3535 ceramics circuit board



LED3045 ceramics circuit board



Ceramics Cavity Substrate



Integrated Ceramic Substrate



## CERAMIC SUBSTRATES - Design Rules

### Wafer

Material	Pattern construction	Laser drill for via-holes	Laser scribing	Line width for dicing saw	Clearance distance from edge to metalized pattern
Al <sub>2</sub> O <sub>3</sub> Wafer	Single Face Double face With Via-holes Customized	80~200 um, 150 um typically	1/4~1/2 substrate thickness, 1/3 substrate thickness typically	150~300 um, 200 um typically	6mm (as the thickness of the metalized layer less than 30 um) ; 8 mm (as the thickness of the metalized layer higher than 30 um)
AlN Wafer					
Al <sub>2</sub> O <sub>3</sub> Chip					
AlN Chip					

### Substrate Materials

Material	Typical thickness (mm)	Typical dimension	Thermal conductivity
Al <sub>2</sub> O <sub>3</sub> Wafer	0.38/ 0.5 /0.635/0.8/1mm	4.5" /5"	20~27 W/mK
Al <sub>2</sub> O <sub>3</sub> Chip	0.38/ 0.5 /0.635/0.8/1mm	Customized	
AlN Wafer	0.38/ 0.5 /0.635	4.5"/5"	170~200 W/mK
AlN Chip	0.38/ 0.5 /0.635	Customized	



# CERAMIC SUBSTRATES - APPLICATIONS

## Thermal Shock Test

- Condition : -40°C (30 min)~125°C (30min), 500 cycle - (MIL-STD-202.107G)
- Manner : The pulling machine to test adhesion
- Standard : Pulling  $\geq 3\text{Kgf}$  °
- Test result :

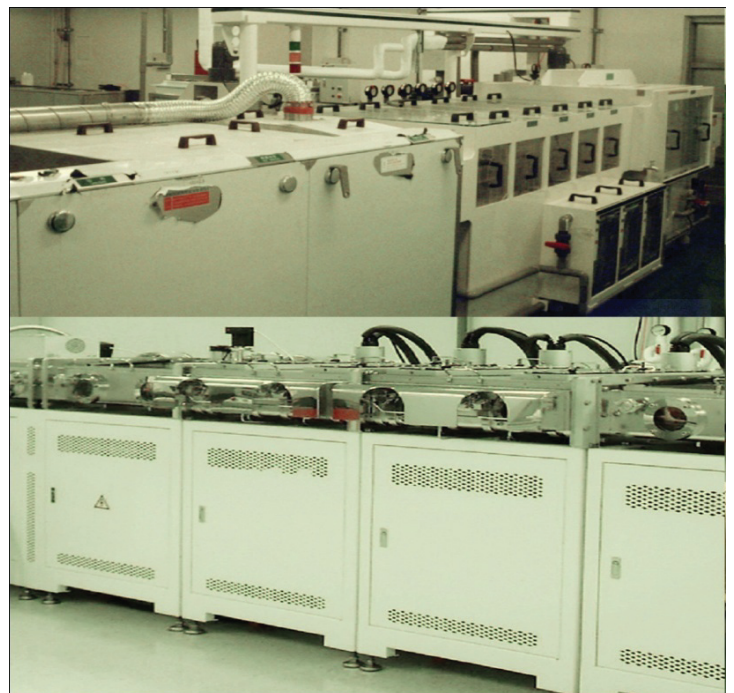
Item	Pulling (Kgf)	Result	Item	Pulling (Kgf)	Result
1	3.84	OK	6	3.94	OK
2	3.93	OK	7	3.58	OK
3	3.42	OK	8	3.67	OK
4	4.04	OK	9	3.66	OK
5	3.56	OK	10	3.83	OK
Average					3.75



Testing position

## Applications

- High power LED ceramic substrate
- Flip chip /eutectic substrate manufacturing
- HCPV heat-sink of solar cell
- Sensor ceramic substrate
- ESD/EMI protect design
- Thin film passive/protect devices



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# CERAMIC SUBSTRATES - Design Rules (Cont'd)

## Metalized Materials

Material	Metalized Material/Thickness			Conducting material of the via-holes	Line width* tolerance
	Cu	Ni	Au		
Al <sub>2</sub> O <sub>3</sub> Wafer	1 μm 10 μm 20 μm 30 μm 60 μm 70 μm 100 μm Customized	3~5 μm, typically	0.075~1 μm, 0.1 μm typically	Sliver Cooper Sliver/Copper	50 μm typically
AlN Wafer					
Al <sub>2</sub> O <sub>3</sub> Chip					
AlN Chip					

Note\*: The limit of the line width of the metalized pattern depends on the thickness of the metalized material. The ratio of the line width limit and metalized metal thickness is 3:1 (For example, when the metalized metal thickness is 33 μm, the line width limit will be 99 μm).

## Thick and Thin Film Comparison

Item	Thick film	Thin film /DPC
Accuracy	+/- 10%	+/- 1%
Adhesion	Low (especially on AlN substrate)	High
Surface roughness	Low (1~3 μm)	High (<0.3 μm)
Real image	