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# N4000-13

## High Speed Low Loss Multifunctional Laminate and Prepreg

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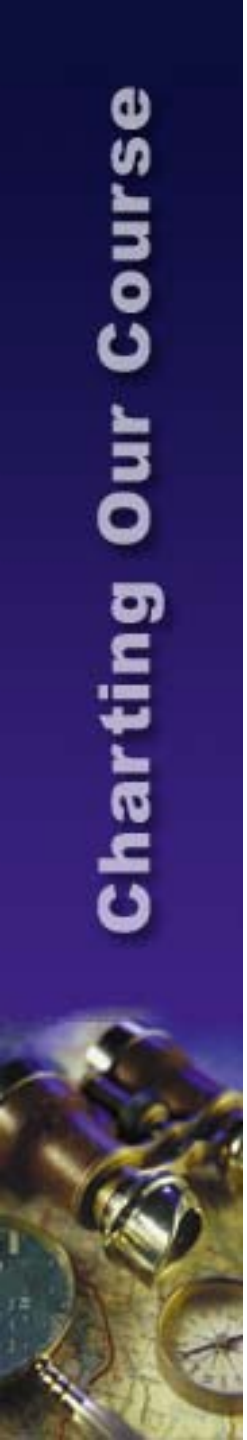


# Product line & Major Properties

| Product | TG | Z-CTE | Dk | Description |
|---|---|---|---|---|
| N4000-2 | 135°C | 4.5 % | 4.4 | Multifunctional Epoxy |
| N4000-2NF | 125°C | 4.5 % | 4.4 | Multifunctional Epoxy no Flow |
| N4000-2EF | 130°C | 4.2 % | 4.4 | Halogen-free Multifunct'l Epoxy |
| N4000-6 | 175°C | 3.9 % | 4.4 | Multifunctional Epoxy |
| N4000-6NF | 175°C | 3.9 % | 4.4 | Multifunctional Epoxy no Flow |
| N4000-7 | 155°C | 3.7 % | 4.5 | Low CTE Multifunctional Epoxy Pass CAF test, Q1000 (-40 ~ +125) and Bosch test |
| N4000-7MF | 155°C | 3.7 % | 4.5 | Low CTE, Modified Flow |
| N4000-7SI | 155°C | 3.7 % | 3.9 | Low CTE, Low Dk Epoxy |
| N4000-11 | 175°C | 3.2% | 4.3 | Low CTE, Multifunctional Epoxy Pass CAF test |

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# Product line & Major Properties

| Product | TG | Z-CTE | Dk | Description |
|---|---|---|---|---|
| N4000-13 | 210°C | 3.5 % | 3.9 | High Speed, Low Loss Epoxy<br>Pass CAF test |
| N4000-13SI | 210°C | 3.5 % | 3.6 | High Speed, Low Loss Epoxy |

Lazer drillable glass for N4000-2, -6, -7, -13 resin system

| | | | | |
|---|---|---|---|---|
| N5000 | 185°C | 3.8 % | 4.1 | BT Epoxy |
| N7000-2HT | 260°C | 2.5 % | 4.4 | Non-MDA Polyimide |
| N4500-6T | 180°C | 4.0 % | 3.9 | Thermount |
| N8000 | 250°C | 2.5 % | 3.8 | Cyanate Ester |
| N9000 | - | 71 ~ 260 ppm/°C | 2.08 ~ 3.5 | RF / Microwave<br>PTFE |

Fonts in **BLACK** are products produced in Singapore

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# N4000-13 For Faster PCB

| | N4000-6 | N4000-13 |
|---|---|---|
| Tg DSC (ºC) | 175 | 210 |
| TMA (ºC) | 170 | 200 |
| DMA (ºC) | 185 | 240 |
| Z-CTE* | 3.9% | 3.5% |
| X/Y CTE(-40ºC~+125ºC) | 12~16 ppm/ºC | 10~14 ppm/ºC |
| $T_{260}$ Test | 4-8min | +30 min |
| Degradation Temp | 300ºC | 350ºC |
| Dk @ 1 MHz | 4.4 | 3.9 |
| Dk @ 1 GHz | 4.0 | 3.8 |
| Df @ 1 MHz | 0.027 | 0.009 |

* Between 50 C to 288 C

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# N4000-13 Electrical Properties

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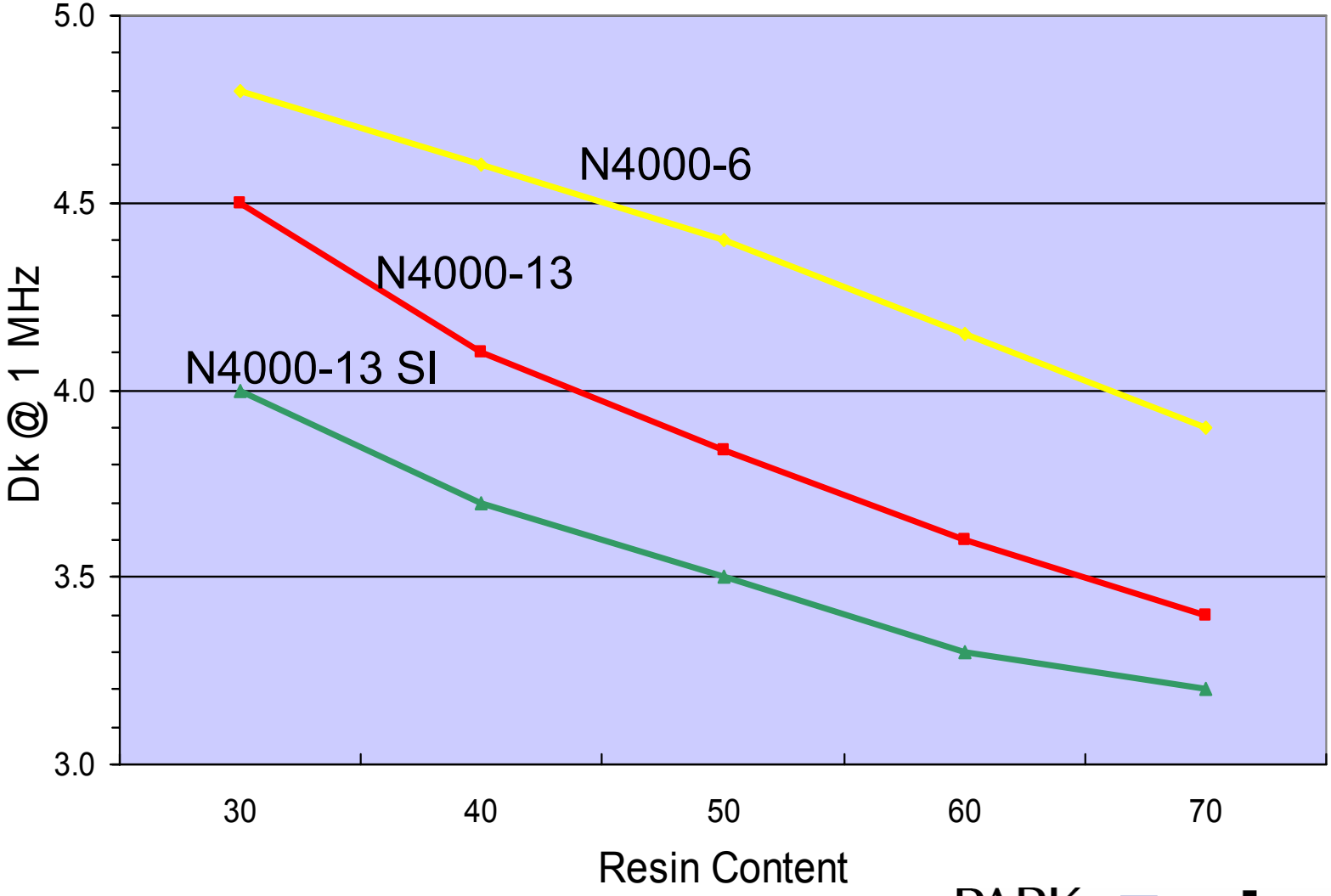


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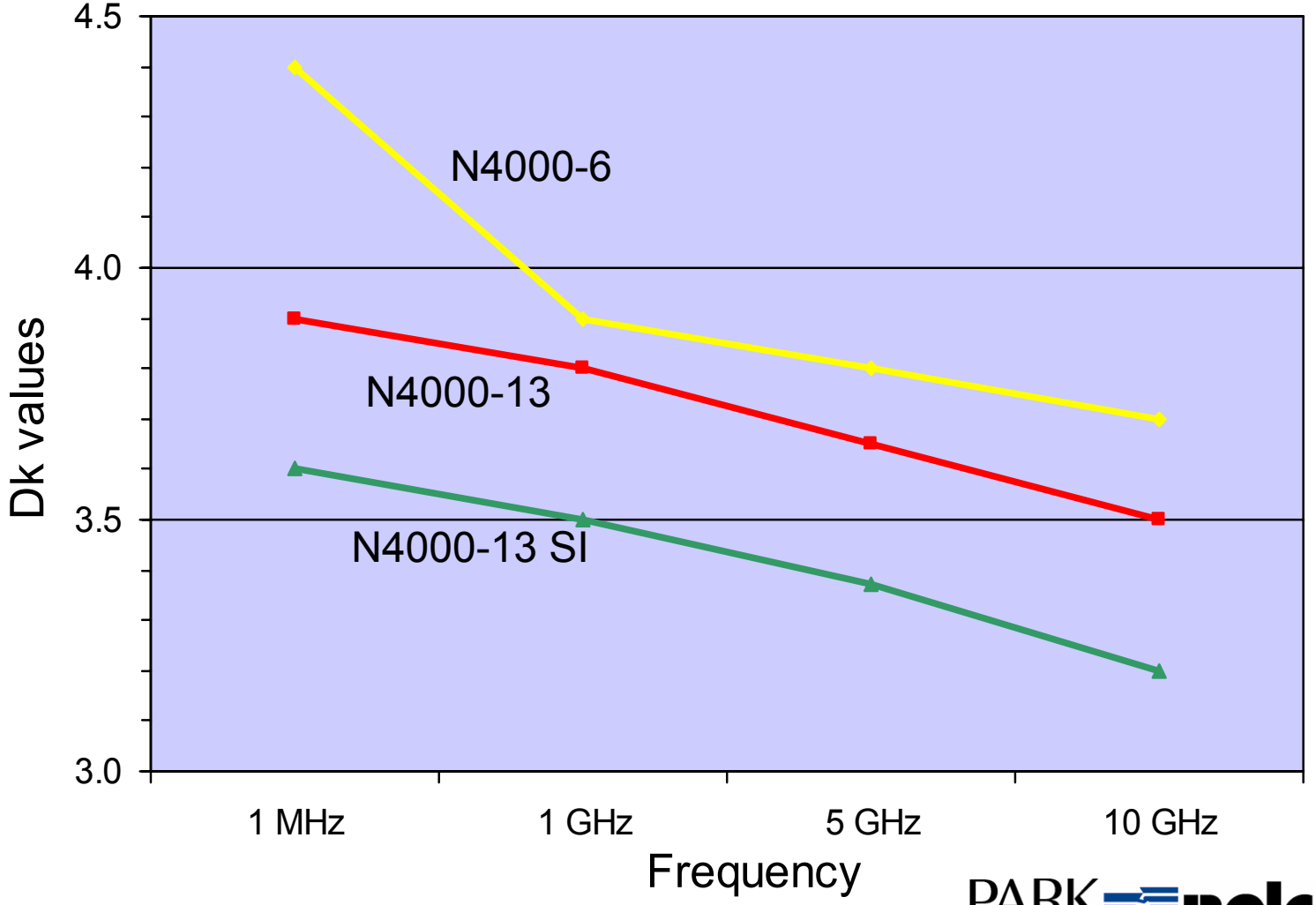
# N4000-13 Electrical Properties

- Consistent Dk over frequency

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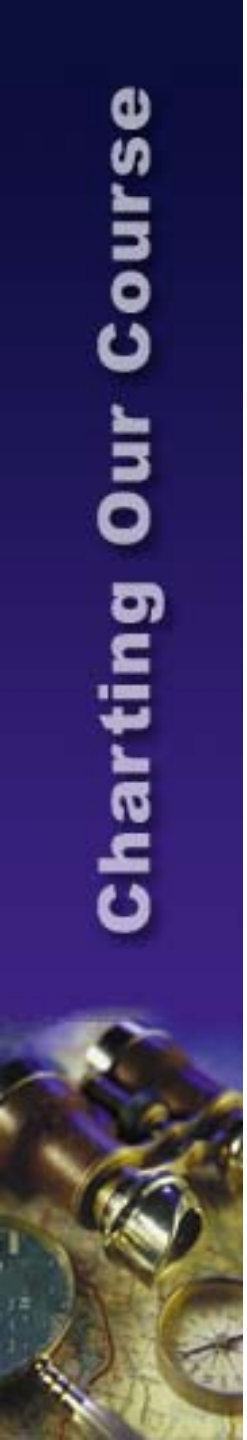


# Conductive Anodic Filaments

Testing

Coupons manufactured according to Sun Microsystems design for Park/Nelco by Speedy Circuits.

CAF resistance test performed per Tellabs specification GR-78-CORE PAR. 13.1.5

Stabilize : 96 hrs @ 65ºC/ 85%Rh

Testing : 100V DC, 65ºC/ 85%Rh @ 10V supply

Pass 500 hours testing.

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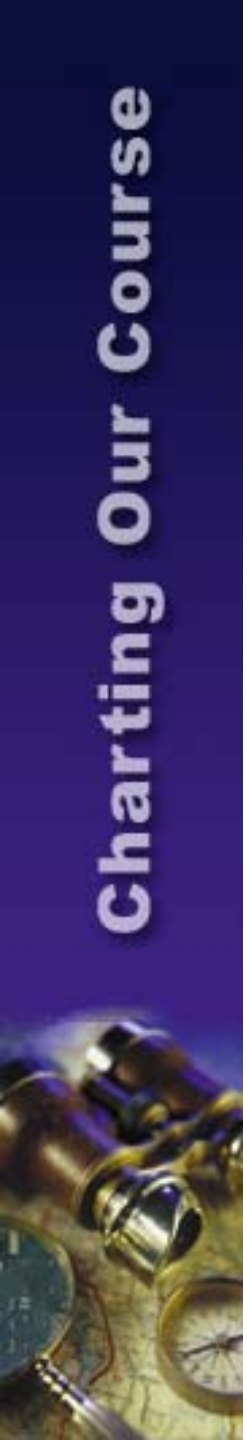


# Processing Guideline

## Inner Layer Oxide :

Type Of Chemistry:

Black Oxide with DMAB

Brown Oxide with DMAB

Weight gain:

0.2 - 0.4 mg/cm$^2$

Bake for 30 to 45 min @ 110ºC prior to Lamination

DMAB – Dimethylamine Borane

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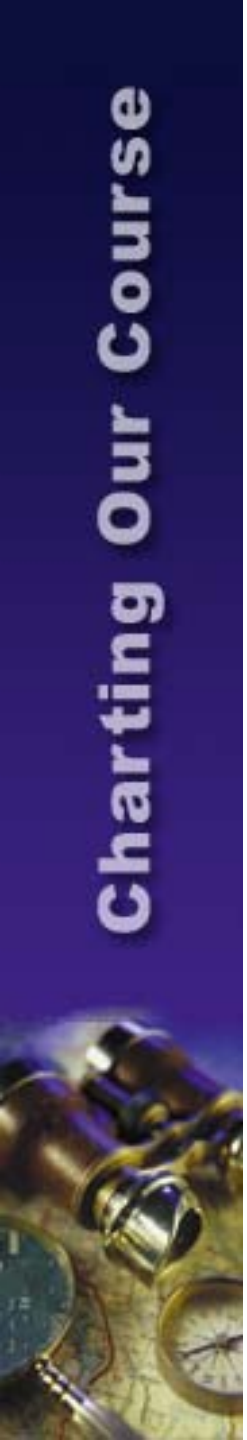


# Processing Guideline

## Lamination :

Press : Vacuum Hydraulic

Pressure : 300 - 350 psi

Heat rise : 3 to 6 ºC /min (70 - 140 ºC)

Curing : 90 min @ 194 ºC (product temp.)

Platen temp. : 200 ºC

Vacuum : -28” Hg

Typical hot press cycle : 3 hrs

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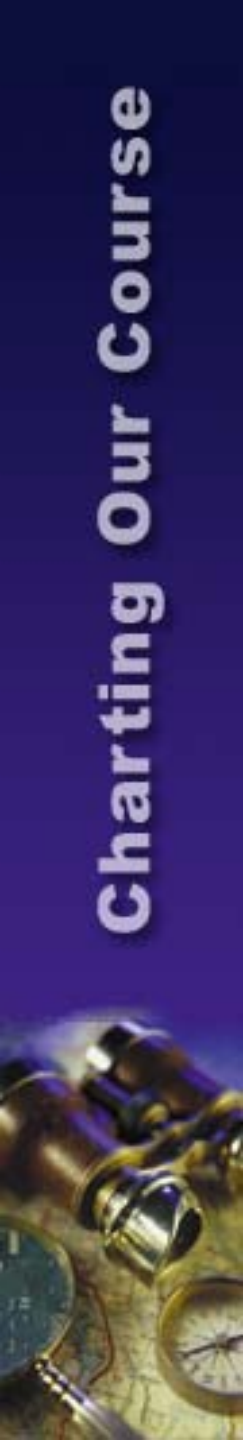


# Processing Guideline

## Drilling :

| Dill Size (mils) | Feed (IPM) | SFPM | Chip load (mils) | Hit count | Retract (IPM) |
|---|---|---|---|---|---|
| 9.8 | 40 | 256 | 0.4 | 500 | 500 |
| 13.8 | 80 | 361 | 0.8 | 1000 | 1000 |
| 19.7 | 78 | 400 | 1.0 | 1000 | 1000 |
| 27.6 | 83 | 400 | 1.5 | 1200 | 1000 |
| 31.5 | 73 | 400 | 1.5 | 1500 | 1000 |

**Bake the material for 3 hrs @ 180ºC after drilling**

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# Processing Guideline

## Desmearing :

- **Plasma** is highly recommended

- Chemical desmearing

  Apply low Tg condition:

  Butyl OH  Temp : 65 ~ 78 ºC

  Time : 4 ~ 6 min

  $KMnO_4$  Temp : 79 ºC

  Time : 8 - 12 min

  ONE pass

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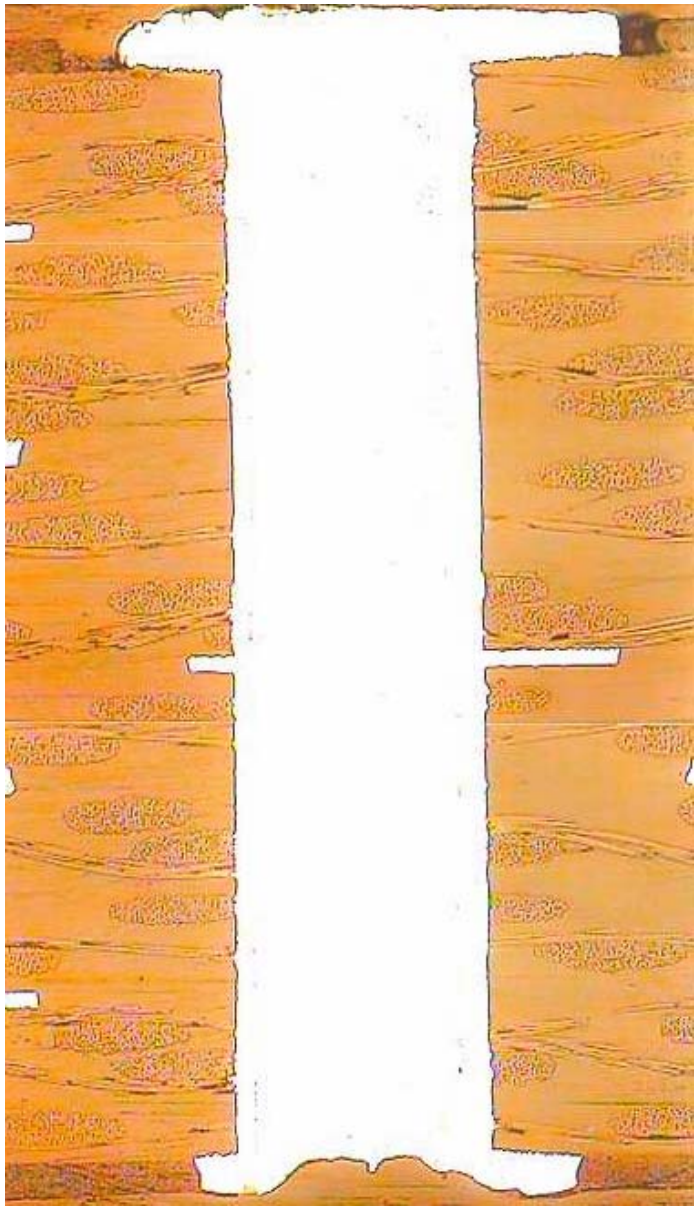
# Application (I)



Application : Communication Card

Layer count : 12 layer

Test Results:

- Pass 5 times 288 ºC solder float
- No hole wall separation
- No resin recession

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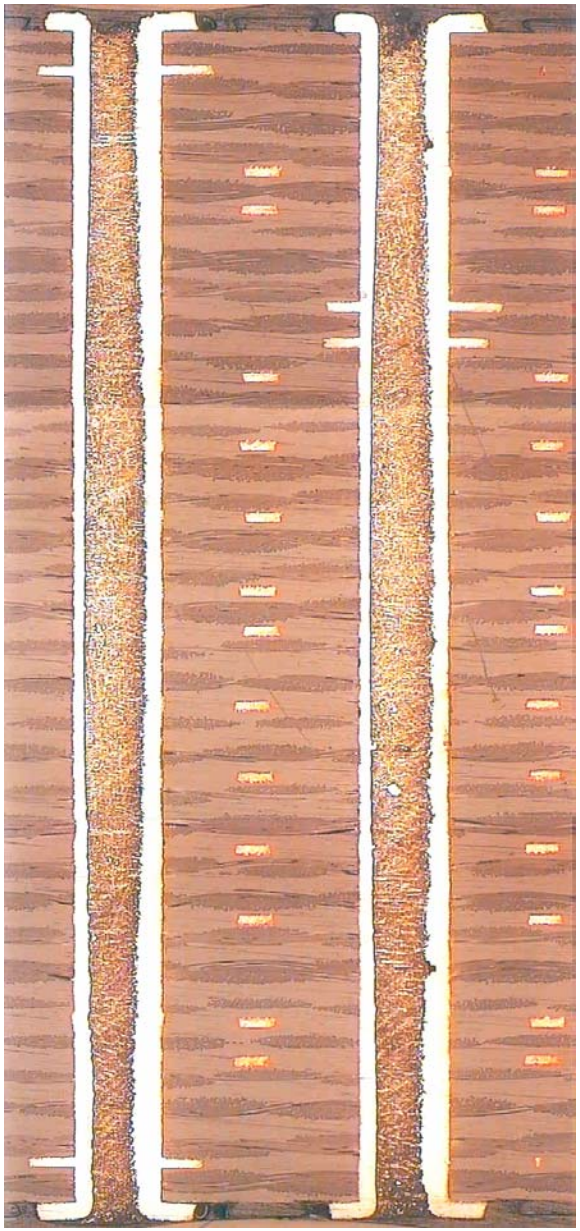
# Application (III)



Application : Back Panel

Layer count : 34 layers

Test Results :

- Pass 6 times 288 ºC solder float
- No hole wall separation
- No resin recession

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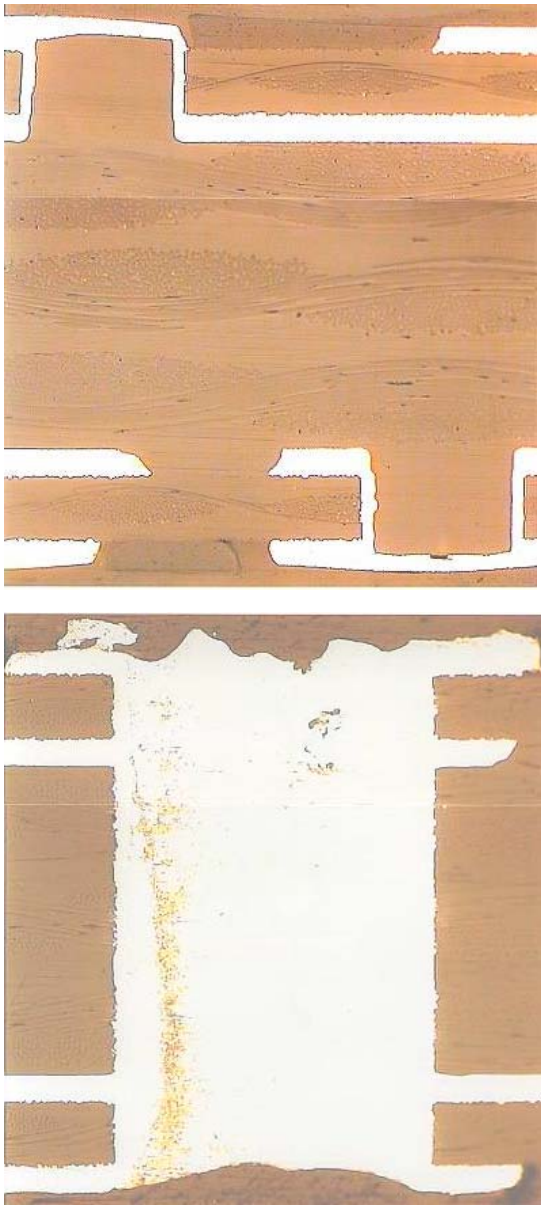
# Application (V)



Application : Module Card

Layer count : 4 layer cap sheet
Blind via

Test Results :

- Pass 5 times 288 ºC solder float
- No hole wall separation
- No resin recession

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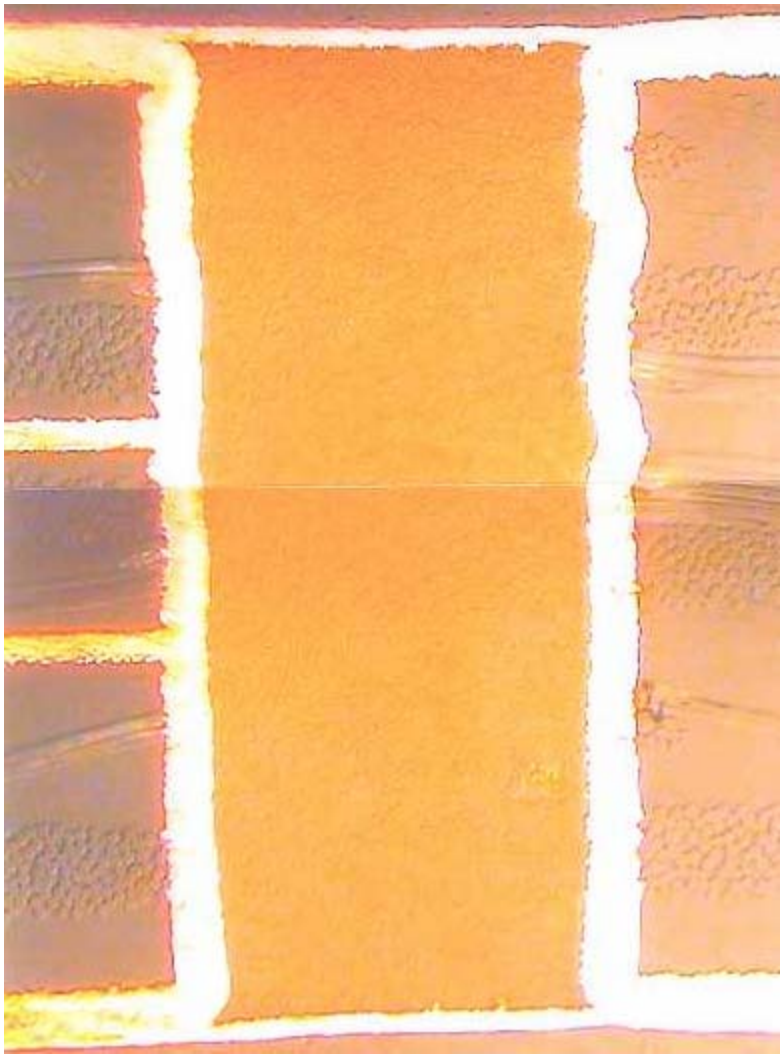
# Application (VI)



Application : Chip Packaging

Layer count : 4 layer

Test Results :

- Pass 6 times 288 ºC solder float
- No hole wall separation
- No resin recession

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# Application (VII)

Application : CAF Test

Layer count : 12 layer

Test Condition:

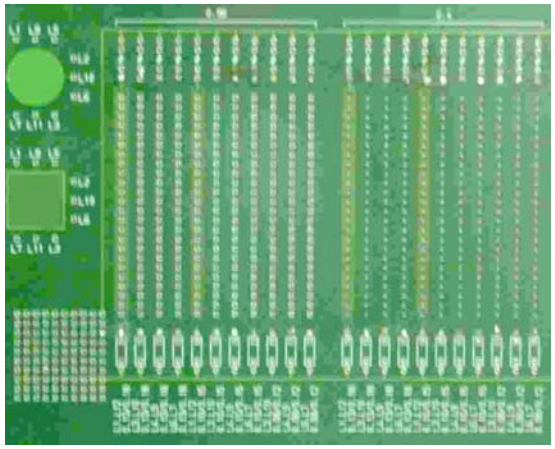
- 85ºC/85% Rh 50V bias voltage
  100V DC testing
- less then 1 decade resistance drop

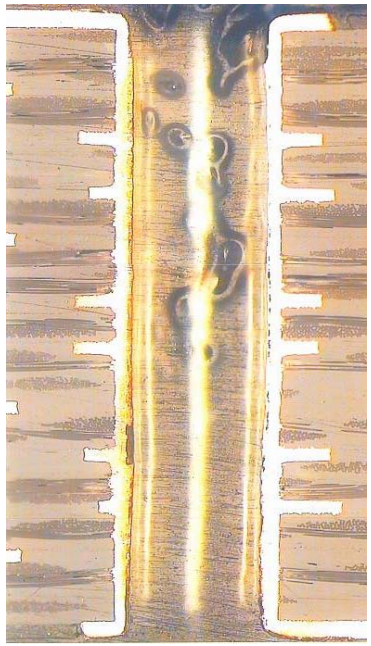
Test Results :

- Pass 1000 Hours

*Trace to trace, 0.08mm (3.15 mil) line width and 0.12mm (4.72mil) space

*Hole to trace, 0.276mm (10.87 mil)





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# Thank You

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