

## NaF5000 Series of Products

### Features of NaF5000 Series

- NaF5000 series are ceramic-filled PTFE high-frequency copper clad laminates (CCLs) independently developed and produced by NaF-T.
- The dielectric constant is very stable and the dielectric loss is ultra low ( $D_k$ : 2.2~10.2;  $D_f$ : 0.0008~0.0027).

▶ Consistent and stable

▶ High peel strength

▶ Low dielectric loss

▶ Excellent cost performance

### Application Fields of NaF5000 Series

- The Products are used in Antenna feed network, microwave, etc.
- NaF-T not only produces high-frequency copper clad laminates (CCLs) with ultra low loss, but also can customize the thickness and thermal conductivity of CCLs according to customer's needs.

▶ Space wideband antenna

▶ Communication equipment Radar

▶ Microstrip and strip-line circuits

▶ Early warning and satellite communication

▶ Medium and low orbit

▶ Military system



## NaF5022A: A PTFE RF Circuit Material with Ceramic filling

### GENERAL PROPERTIES

| Property                          | Typical Value   | Direction | Unit               | Condition                       | Test Method                   |
|-----------------------------------|-----------------|-----------|--------------------|---------------------------------|-------------------------------|
| Dielectric Constant, $D_k$        | 2.2±0.02        | Z         | -                  | 10 GHz 23°C                     | IPC-TM-650<br>2.5.5.5<br>SPDR |
| Dissipation Factor, $D_f$         | 0.0009          | Z         | -                  | 10 GHz 23°C                     | IPC-TM-650<br>2.5.5.5         |
| Thermal Coefficient, $\epsilon_r$ | -65             | Z         | ppm/°C             | 10 GHz 0-100°C                  | IPC-TM-650<br>2.5.5.5         |
| Dimensional Stability             | -0.30,-0.25     | X, Y      | mm/m               | COND A                          | IPC-TM-650<br>2.2.4           |
| Volume Resistivity                | 10 <sup>7</sup> |           | MΩ•cm              | COND A                          | IPC 2.5.17.1                  |
| Surface Resistivity               | 10 <sup>7</sup> |           | MΩ                 | COND A                          | IPC 2.5.17.1                  |
| Tensile Modulus                   | 1100<br>1000    | MD<br>CMD | MPa                | 23°C                            | ASTM D638                     |
| Water Absorption                  | 0.02            | -         | %                  | D48/50                          | IPC-TM-650<br>2.6.2.1         |
| Thermal Conductivity              | 0.27            | -         | W/(m•K)            | 50°C                            | ASTM D5470                    |
| Coefficient of Thermal Expansion  | 75,85,70        | X, Y, Z   | ppm/°C             | 23°C/50% RH<br>(23 ~ 150 °C)    | IPC-TM-650<br>2.4.24          |
| $T_d$                             | 500             |           | °C                 | TGA                             | ASTM D3850                    |
| Density                           | 2.3             |           | mg/cm <sup>3</sup> |                                 |                               |
| Copper Peel Strength              | 15.0            |           | pli                | 1 oz. EDC<br>After floating tin | IPC-TM-2.4.8                  |
| Flammability                      | V-0             |           |                    |                                 | UL 94                         |
| Lead Free Process Compatible      | YES             |           |                    |                                 |                               |

### PRODUCT SPECIFICATION

| Standard Thickness                                                                                                                | Standard Panel Size                                | Standard Copper Cladding                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 0.020" (0.508mm) +/- 0.0020"<br>0.030" (0.762mm) +/- 0.0030"<br>0.060" (1.016mm) +/- 0.0030"<br>* Other thicknesses are available | 12" X 18" (305 X 457mm)<br>24" X 18" (610 X 457mm) | Electrolytic copper foil:LP/VLP/RTF/HVLP<br>½ oz.(18µm) H/H<br>1 oz.(35µm) 1/1<br>* Additional cladding weights are available |

Note: All typical values listed above are for reference only and not for specification.