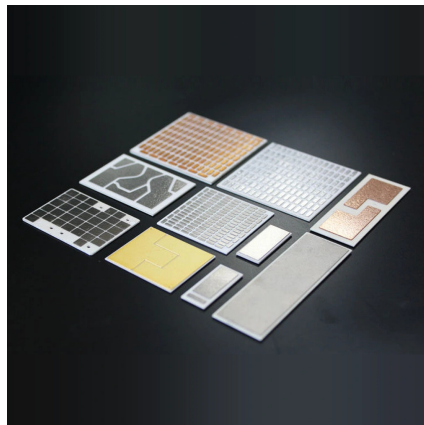




DBC ceramic substrate samples with different metal patterns

# DBC Substrates for Thick-Film Hybrid Circuits

Product ID / SKU: FWM/CS-DBC-003

Material: Ceramic / Direct-Bonded Copper System

Product type: Ceramic Substrate

DBC substrates for thick-film power circuits requiring robust bonded copper and electrical insulation.

## 96% Alumina Substrate (708 S) Properties

| Property                                                   | 96% Al <sub>2</sub> O <sub>3</sub> - 708 S | Test conditions / measurement tolerance ±10% |
|------------------------------------------------------------|--------------------------------------------|----------------------------------------------|
| Density (g/cm <sup>3</sup> )                               | ≥3.75                                      | DIN EN 993-1                                 |
| Bending strength, σ <sub>0</sub> (MPa)                     | ≥500                                       | -                                            |
| Young's modulus (GPa)                                      | ≥300                                       | -                                            |
| Thermal conductivity (W/(m·K))                             | 24                                         | Room temperature; DIN EN 821-2               |
| Linear thermal expansion coefficient (10 <sup>-6</sup> /K) | 7-9                                        | 100-800°C; DIN 51045-1                       |
| Specific heat capacity (J/(g·K))                           | ≥0.75                                      | 20°C; DIN EN 821-3 method B                  |
| Relative permittivity                                      | ~9.8                                       | Room temperature, 1 MHz; Ra ≤0.4 μm          |
| Dielectric loss factor                                     | ≤0.005                                     | Room temperature; 1 MHz; Ra ≤0.4 μm          |
| Volume resistivity (Ω·cm)                                  | ≥10 <sup>14</sup>                          | Room temperature; IEC 62631-3                |
| Breakdown strength (kV/mm)                                 | AC≥15; DC≥15                               | 20°C; AC / DC                                |
| Fracture toughness (MPa·m <sup>1/2</sup> )                 | ≥3.0                                       | Indentation-fracture (IF)                    |

## 95% AlN Substrate Properties

| Property                       | 95% AlN typical value | Condition / method |
|--------------------------------|-----------------------|--------------------|
| AlN content (%)                | 95                    | -                  |
| Density (g/cm <sup>3</sup> )   | ≥3.3                  | -                  |
| Flexural strength (MPa)        | ≥400                  | -                  |
| Thermal conductivity (W/(m·K)) | ≥170                  | Room temperature   |

| Property                    | 95% AlN typical value | Condition / method      |
|-----------------------------|-----------------------|-------------------------|
| Relative permittivity       | 8-10                  | 1 MHz; room temperature |
| Dielectric loss tangent     | ≤0.0003               | 1 MHz; room temperature |
| Dielectric strength (kV/mm) | 17                    | -                       |
| Volume resistivity (Ω·cm)   | ≥10 <sup>14</sup>     | -                       |

## Typical Construction Parameters

| Construction item   | Typical configuration                          | Applicable condition                                    |
|---------------------|------------------------------------------------|---------------------------------------------------------|
| Ceramic base        | 96% Al <sub>2</sub> O <sub>3</sub> or AlN      | Route dependent                                         |
| Ceramic thickness   | Alumina: 0.25-1.00 mm;<br>AlN: 0.25-1.50 mm    | Matched ceramic / copper stack                          |
| Copper thickness    | 0.10-0.30 mm                                   | Copper thickness and ceramic stack selected together    |
| Line / space        | Etched-pattern dependent                       | Copper thickness, etch profile and insulation clearance |
| Surface finish      | Bare/protected Cu;<br>selected Ni, Ni/Au or Ag | Assembly-process dependent                              |
| Bond / peel testing | Construction-specific test                     | Peel method, coupon geometry and acceptance criterion   |