

Ceramic Circuit Substrate

◆ Product Characteristics

1. Metalization by sputtering process, with strong binding force, no voids and high reliability;
2. Direct plated copper (DPC) can achieve high power load;
3. The lithography process can achieve high accuracy of circuits.

◆ Product Applications

High-power semiconductor equipment, new energy, LED, microwave communication, laser system and other fields.

◆ Part Number

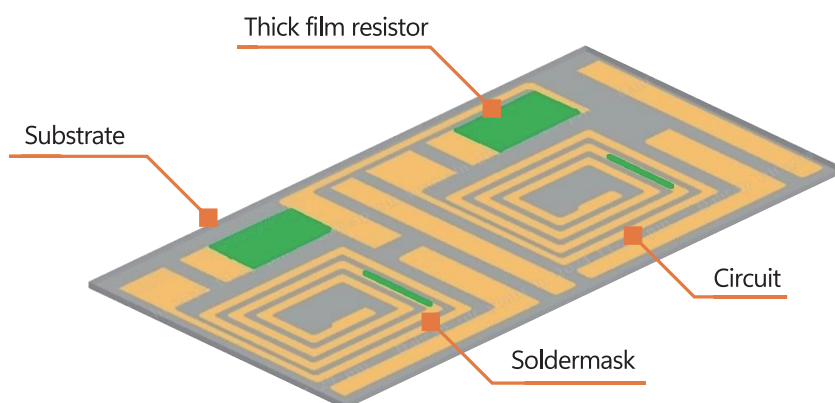
D	CM	A	85	M0001	A
①	②	③	④	⑤	⑥
DALICAP	Ceramic Circuit Substrate	Substrate material A: Aluminum Oxide N: Aluminum Nitride	Substrate Thickness (mil)	Product Serial Number	Version Number

◆ Process Introduction

Ceramic circuit substrate is a high-performance electronic packaging material that uses ceramic materials as the substrates and circuit patterns are made on it. It consists of two parts: ceramic substrate and wiring metal layer. Commonly used ceramic materials include alumina and aluminum nitride etc., and metal circuits are prepared through sputtering and electroplating processes. Ceramic circuit substrates also have both the high thermal conductivity, high insulation characteristics of ceramic materials and the conductive function of metal circuits, which can withstand higher voltage, larger power and greater currents.

◆ Product Structure

Item	Specific content	Function
Substrate	Ceramic substrate (Alumina and aluminum nitride, etc.)	Carrying devices, surface mounting components, achieving encapsulation and heat dissipation
Component	Printed thick film resistor (optional)	Ensuring precision and stability in resistors
Circuit	Copper conductive circuit (Inductance, microstrip line and other structures)	Constitute microstrip transmission line, transmission power, soldering interconnect carrier
Soldermask	Insulating ink	Insulation protection during soldering process, preventing short circuits between lines



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◆ Ceramic Circuit Substrate Performance

Item	Unit	Aluminum oxide	Aluminum nitride
Main component	-	Al_2O_3 : $\geq 96.0\%$	AlN : $\geq 98.0\%$
Thermal conductivity	W/ (m·K) (25℃)	≥ 21	≥ 170
Bending strength	MPa	≥ 300	≥ 450
Volume density	g/cm ³	≥ 3.7	≥ 3.33
Linear expansion coefficient	$10^{-6}/^\circ\text{C}$	6.2~7.4 (25~500℃) 7.7~8.0 (25~800℃)	2~3 (20~300℃) 2.5~3.5 (300~800℃)
Volume resistivity	$\Omega\cdot\text{cm}$ (25℃)	$\geq 10^{14}$	$\geq 10^{14}$
Breakdown strength	kV/mm	≥ 15	≥ 17
Flatness	mm/mm	2‰	2‰
Dielectric constant	(@1MHz)	9~10	8~10

◆ Product Performance Indicators

Item	Indicator requirements	Test methods
Binding force	>5.0 pounds force @2mm * 2mm solder pad	MIL-STD-883 Method 2004 Condition D
Temperature resistance	No peeling or blistering at 325℃ for 2 minutes	Reflow soldering

◆ Storage and Installation

1. Vacuum packaging is recommended for the ceramic circuit substrate;
2. It is suggested to store at 5~35℃ with humidity less than 60%;
3. The storage environment should be free of acid, alkali, or other harmful gases, otherwise, it will affect the solderability;
4. It is recommended that users use the products within 12 months of receipt;
5. The installation method can adopt eutectic soldering, reflow soldering, wave-soldering, etc.

Ceramic Circuit Substrate

◆ Substrate Materials

1. Material: alumina and aluminum nitride, etc
2. Size: maximum 5 inches * 7 inches
3. Thickness: 0.15~2.5mm
4. Roughness (Ra): fired ($<1.2\mu\text{m}$), grinding ($0.5 \sim 1.5 \mu\text{m}$)

◆ Metal System

1. Sputtering: titanium, copper
2. Plating: copper ($5 \sim 300\mu\text{m}$)
3. Surface treatment: chemical nickel gold, chemical nickel palladium gold, silver, OSP, etc.

◆ Circuit

1. Minimum line width: $100\mu\text{m}$
2. Minimum gap: $100\mu\text{m}$
3. Line accuracy: $\pm 5\mu\text{m}$

Note: The above indicators are related to the thickness of plated copper, please contact Dalicap for specific details.

◆ Thick Film Resistor (Optional)

1. Resistance accuracy: $\pm 10\%/\pm 20\%$ (no trimming resistor)
2. Resistance TCR: $\pm 200\text{ppm}/^\circ\text{C}$ @ $-55 \sim +125^\circ\text{C}$

◆ Metallized Holes

1. Minimum hole diameter D : $\geq 0.25 \cdot T$
2. Minimum spacing between holes L : $1 \cdot T$
3. Minimum distance from hole to edge W : $1.5 \cdot T$
4. Minimum spacing between hole to circuit edge H : $250 \mu\text{m}$
5. Minimum spacing between hole to circuit edge G : $250 \mu\text{m}$

Note: T is the thickness of the ceramic substrate.

