

### ◆ Product Features

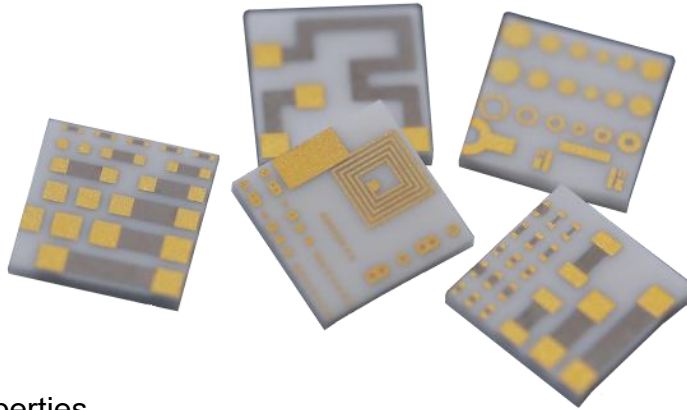
1. Sputtering technology, high reliability and ultra-stable performance, good consistency.
2. Designed and processed with 99.6% pure  $\text{Al}_2\text{O}_3$  substrate, which has excellent insulation performance and low loss at high frequency.
3. Designed and processed with high-purity  $\text{AlN}$  substrate, which has excellent thermal conductivity.

### ◆ Product Applications

Substrates for microwave/millimeter wave application, microwave/millimeter wave device, and high-speed optical communication device.

### ◆ Process Introduction

On the ceramic substrate, through magnetron sputtering, photoetching, dry wet etching, electroplating gold and other processes, the thin film components and metal lines are integrated to form high-precision circuit patterns with specific functions.



### ◆ Material Properties

Material	Chemical Composition	Purity	Color	Nominal Density (g/cm <sup>3</sup> )	Loss (1 MHz)	Dielectric Constant (1 MHz)	Thermal Conductivity (W/m <sup>2</sup> K)	CTE (10 <sup>-6</sup> mm/°C)
Aluminum Oxide	$\text{Al}_2\text{O}_3$	96%	White	3.7	0.0003	$9.5 \pm 0.2$	24.7	6.5~8.0 (25°C~800°C)
Aluminum Oxide (Polished)	$\text{Al}_2\text{O}_3$	99.6 %	White	3.87	0.0001	$9.9 \pm 0.1$	26.9	7.0~8.3 (25°C~1000°C)
Aluminum Oxide (As-fired)	$\text{Al}_2\text{O}_3$	99.6 %	White	3.87	0.0001	$9.9 \pm 0.1$	26.9	7.0~8.3 (25°C~1000°C)
Aluminum Nitride (Polished)	$\text{AlN}$	98%	Gray	3.28	0.001	$8.8 \pm 0.2$	170	4.6 (25°C~300°C)
Aluminum Nitride (As-fired)	$\text{AlN}$	98%	Gray	3.28	0.001	$8.8 \pm 0.2$	170	4.6 (25°C~300°C)

## ◆ Design Guidelines

### ● Substrate Materials

1. Material: alumina, aluminum nitride, silicon, glass, etc.
2. Layout: 2 ~ 6 inches square or round (Typical: 2 inches square)
3. Thickness: 0.101 ~ 1.524 mm (Typical: 0.254, 0.381)
4. Roughness: polished(<0.08 $\mu$ m), as-fired(<0.2 $\mu$ m), lapped (customer specified)

### ● Metal

1. Sputtering: Ti、TiW、TaN、Cu、Ni、Pt、Au
2. Electroplating: Au
3. Au thickness: 0.5 ~ 5 $\mu$ m
4. Pre-deposition AuSn(70/30) Soldering: 3 ~ 5 $\mu$ m

### ● TaN Sheet Resistance

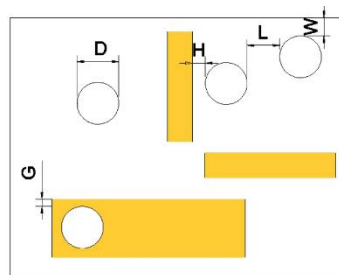
1. Sheet resistance: 25 ~ 200 $\Omega/\square$  (Typical: 50 $\Omega/\square$ )
2. Resistance tolerance:  $\pm 10\%$  (Typical:  $\pm 20\%$ )
3. Minimum resistor size: 50 $\mu$ m\*50 $\mu$ m
4. Resistance TCR:  $-100 \pm 50 \text{ppm}/^\circ\text{C}$  @  $-55^\circ\text{C} \sim +125^\circ\text{C}$
5. Maximum service temperature: 350 $^\circ\text{C}$  (<0.5 hours)

### ● Graphic

1. Minimum line width: 10 $\mu$ m
2. Minimum line gap: 20 $\mu$ m
3. Line tolerance:  $\pm 3\mu$ m (for non-critical areas  $\pm 5\mu$ m)

### ● Metallized holes/slots

1. Hole diameter D: 0.5\*T minimum
2. Spacing between via holes L: 1\*T minimum
3. Hole to edge W: 1\*T minimum
4. Hole to metal line H: 38.1 $\mu$ m minimum
5. Via hole to conductor edge G: 50.8 $\mu$ m minimum



## ● Dimensions

1. Minimum size: 0.3mm\*0.3mm
2. Tolerance:  $\pm 0.05\text{mm}$

## ● Drawing

1. Format: DXF、DWG
2. Length unit: mm

## ● Detailed Design Guidelines

