10

TFCC
Thin-film Circuit

Type: TFCC

TFCC Thin-film Circuit

1 Introduction

Thin-film circuits: Functional thin films are deposited on the Al_2O_3 or AlN ceramic substrates. Conductive bands, thin-film resistors and thin-film inductors are integrated on one single circuit board. Thin-film circuits are processed through light etching, cutting and others. With high pattern precision, high integration, good frequency characteristics and small size, thin-film circuits can be used to produce filters, circulators, separators, microstrip transmission line, attenuators, heat sink, ceramic support and ect. The top gold electrode of thin-film circuits is compatible with the gold wire or gold strip micro assembly; The bottom gold electrode is compatible with conductive adhesive or Au-Sn eutectic bonding.

2 Types and Characteristics

Ceramic Substrate	Purity%	Surface Finish	Surface Roughness (Ra/micro meter)	Thickness (mm)	Heat Conductivity W/m.K	Coefficient of thermal expansion 10-6/℃	Dielectric constant @1MHz	Dissipation factor@1MHz	Insulation Rsistance@100V
Al_2O_3	96	no treatment	⩽ 0.7	0.254~1.000	24.7	7~8 (25~400℃)	9.5	⩽ 0.0005	25℃: Ri ≥ 10^6MΩ 125℃: Ri ≥ 10^5MΩ
Al_2O_3	96	polished	⩽ 0.2	0.100~1.000	24.7		9.5	⩽ 0.0005	
Al_2O_3	99.6	no treatment	⩽ 0.1	0.254~0.635	26.9		9.9	⩽ 0.0003	
Al_2O_3	99.6	polished	⩽ 0.05	0.100~0.635	26.9		9.9	⩽ 0.0003	
AlN	99	ground	⩽ 0.3	0.254~1.000	170	4~5 (25~300℃)	9	⩽ 0.0010	25℃: Ri ≥ 10^6MΩ 125℃: Ri ≥ 10^5MΩ
AlN	99	polished	⩽ 0.1	0.100~1.000	170		9	⩽ 0.0010	
titanate (class 1 ceramic)	/	ground	⩽ 0.3	0.100~0.300	/	/	8~500	⩽ 0.0070	
titanate (class 1 ceramic)	/	polished	⩽ 0.1	0.100~0.300	/		8~500	⩽ 0.0070	

Note: Purity and dielectric constant are typical values

The Surface Finish:
No treatment: No treatment for sintered Ceramic substrate.
Ground: Ceramic substrates are grounded to the specific thickness after sintering.
Polished: Ceramic substrate are polished to the specific roughness after sintering and grounding.

3 Metalization System

Metalization Film	Metal	Range	Note
Resistor Layer	TaN	10~100Ω/ □	standard square resistance 50Ω、100Ω
Adhesive Layer	TaN	20~500nm	Applicable to the ceramic substrates with resistors
	NiCr	50~1000nm	Optional
	TiW	100~1200nm	Most commonly used
	Ti	50~500nm	Optional, applicable to polished Ceramic substrates
Barrier Layer	Ni	0.1~1.2μm	Applicable to the soldering with solder containing Sn such as SnPb、AuSn.
	Pt	0.05~0.5μm	
Conductive Layer	Au	0.4~8μm	Conductive layer, applicable to gold wire bonding, conductive adhesive and soldering