睿龙科技

RA300

Air/Ship Microwave Material with High Performance

Excellent Dimensional Stability & Phase Stability

RA300 is a PTFE composite utilizing low coefficient of expansion fiberglass as the supporting material and mixing with a specially treated nanometer ceramic, which provides both excellent dimensional stability and the highest degree of phase stability, critical in multi-layer designs. RA300 is in a "League of its Own" when it is combined with thin film resistor-conductor materials such as Ohmega-Ply ® and TCR ® foils utilized for embedded resistors.

RA300 has "Best-in-Class" Insertion Loss (S21) and Loss Tangent (0.0011). During Development, Relong focused not only on reducing Loss Tangent, but also in reducing Conductive Losses. As a result, RA300 Insertion Loss is "Best-In-Class".

The impact of copper foil roughness on conductor loss is due to increase in transmission line resistance as a result of skin effect. Relong's RA300 was designed to provide a quality peel strength without having to resort to the utilization of the higher loss, rougher coppers prevalent in competitive products to achieve acceptable copper adhesion.

RA300 has Low CTExyz and Very Low TCEr for applications that require Electrical Phase Stability and Dielectric Constant Stability well over a -40 to 150°C Operating Temperature. RA300 has excellent performance (dimensional stability, dielectric constant stability vs. temperature and frequency, low absorption of moisture and processing chemicals, ease of process ability), and has a price competitive advantage.

Compared with other materials, RA300 has a higher thermal conductivity, it increased heat conduction makes further increases in power capacity.

Applications include Space and other Electronics who require a higher degree of performance such as Phase Sensitive Arrays for Radar, RF/Microwave Communications, Aircraft Collision Avoidance Systems, JTRS, etc. RA300 is also a preferred material for sensitive filter applications.

Features:

- Ceramic/PTFE Microwave Composite
- Lowest Insertion Loss in Class
- "Best-in-Class" Loss Tangent (0.0011)
- Electrical Phase Stability
- High Thermal Conductivity
- Tightest Dielectric Constant (±0.03) and Thickness Tolerance

Benefits:

- Excellent Thermal Stability of DK and Df
- Phase Stability vs. Temperature
- High Degree of Dimensional Stability Required for Complex, Multi-layer Boards
- Excellent CTE in X,Y and Z Directions

Typical Applications:

- Microwave/RF Applications
- Radar
- Phase Fed Array Antennas
- Microwave Feed Networks
- CNI (Communication, Navigation and Identification) Applications
- Other High Frequency and High Speed Applications.

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RA300

Typical Properties：

Property	Units	Value	Test Method
1. Electrical Properties			
Dielectric Constant (may vary by thickness)			
@ 10 GHz	-	2.94	IPC TM-650 2.5.5.5
Dissipation Factor			
@ 10 GHz	-	0.0011	IPC TM-650 2.5.5.5
Temperature Coefficient of Dielectric			
TCεr @ 10 GHz (-40-150°C)	ppm/°C	-9	IPC TM-650 2.5.5.5
Volume Resistivity			
C96/35/90	MΩ-cm	4.25×10^{8}	IPC TM-650 2.5.17.1
E24/125	MΩ-cm	1.85×10^{8}	IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	2.49×10^{8}	IPC TM-650 2.5.17.1
E24/125	MΩ	5.48×10^{7}	IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)	1000(40)	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV	58	IPC TM-650 2.5.6
Arc Resistance	sec	250	IPC TM-650 2.5.1
2. Thermal Properties			
Decomposition Temperature (Td)			
Initial	° C	501	IPC TM-650 2.4.24.6
5%	° C	554	IPC TM-650 2.4.24.6
T260	min	>60	IPC TM-650 2.4.24.1
T288	min	>60	IPC TM-650 2.4.24.1
T300	min	>60	IPC TM-650 2.4.24.1
Thermal Expansion, CTE (x,y) 50-150° C	ppm/°C	8，8	IPC TM-650 2.4.41
Thermal Expansion, CTE (z) 50-150° C	ppm/°C	20	IPC TM-650 2.4.24
% z-axis Expansion (50-260ºC)	%	1.2	IPC TM-650 2.4.24
3. Physical Properties			
Water Absorption	%	0.02	IPC TM-650 2.6.2.1
Density, ambient 23° C	g/cm^3	2.02	ASTM D792 Method A
Thermal Conductivity	W/mK	0.53	ASTM E1461
Flammability	class	V-0	UL-94
NASA Outgassing, 125ºC, ≤10^{-6} torr			
Total Mass Loss	%	0.02	NASA SP-R-0022A
Collected Volatiles	%	0.00	NASA SP-R-0022A
Water Vapor Recovered	%	0.01	NASA SP-R-0022A
4. Mechanical Properties			
Peel Strength to Copper (1 oz/35			
After Thermal Stress	lb/in (N/mm)	8(1.4)	IPC TM-650 2.4.8
At Elevated Temperatures (150°)	lb/in (N/mm)	10(1.75)	IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)	8(1.4)	IPC TM-650 2.4.8
Young’s Modulus	kpsi (MPa)	260 (1790)	IPC TM-650 2.4.18.3
Flexural Strength (Machine/Cross)	kpsi (MPa)	9.5/9.0 (66/62)	IPC TM-650 2.4.4
Tensile Strength (Machine/Cross)	kpsi (MPa)	4.0/3.4 (28/23)	IPC TM-650 2.4.18.3
Compressive Modulus	-	244 (1682)	ASTM D-3410
Poisson’s Ratio	-	0.23	ASTM D-3039

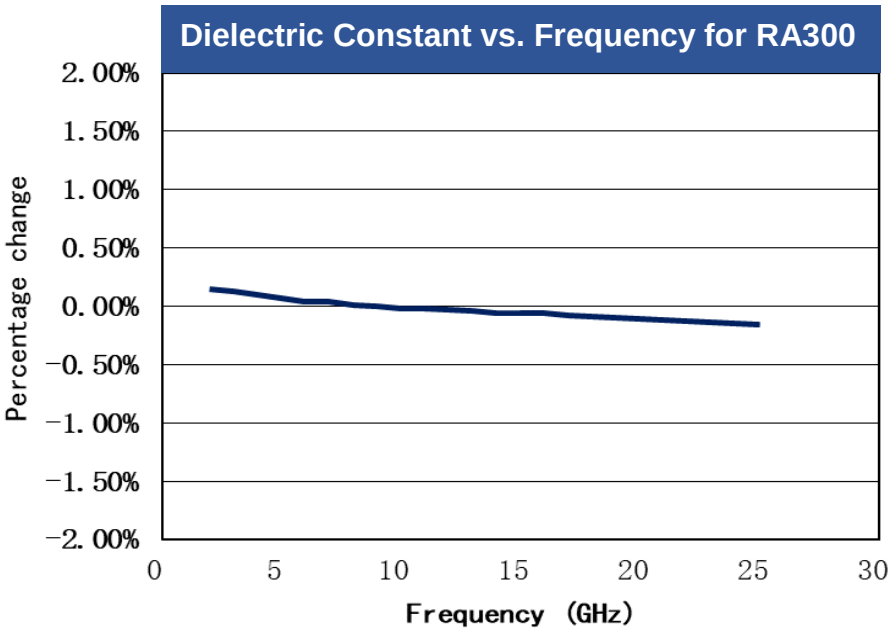

Figure 1
Demonstrates the Stability of Dielectric Constant across Frequency. This characteristic demonstrates the inherent robustness of Relong Laminates across Frequency, thus simplifying the final design process when working across EM spectrum. The stability of the Dielectric Constant of RA300 over frequency ensures easy design transition and scalability of design.

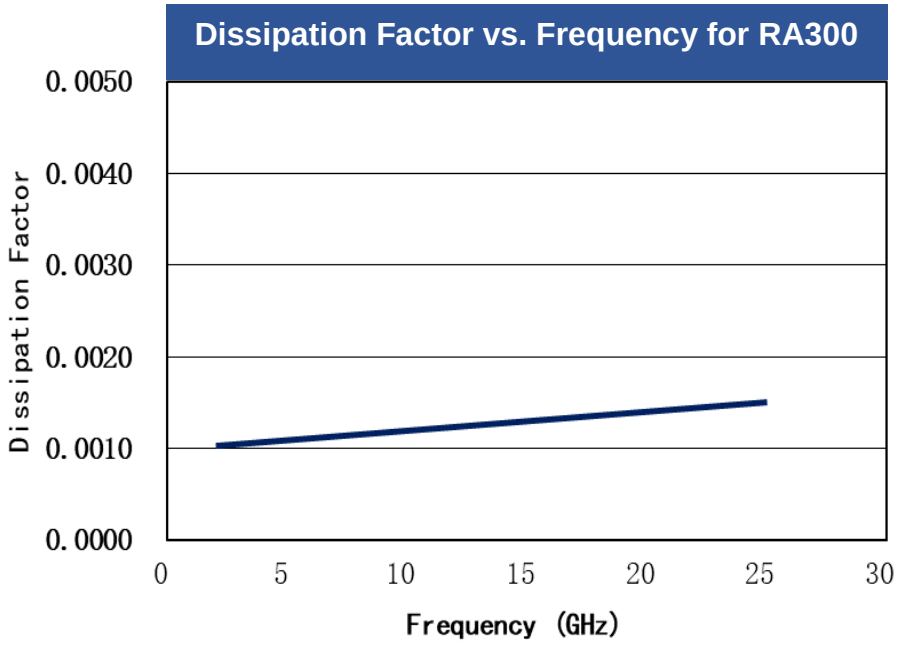

Figure 2
Demonstrates the Stability of Dissipation Factor across Frequency. This characteristic demonstrates the inherent robustness of Relong Laminates across Frequency, providing a stable platform for high frequency applications where signal integrity is critical to the overall performance of the application.

Material Availability:

RA300 laminates are supplied with 1/2, 1 or 2 OZ electrodeposited copper or reverse treat copper on both sides. Other copper weights and rolled copper foil are available. RA300 is available bonded to a heavy metal ground plane. Aluminum, brass or copper plates also provide an integral heat sink and mechanical support to the substrate.

When ordering for design purposes it is important to note that both thicknesses and dielectric constant of RA300 vary with nominal thickness. The following are optimal values to use for design products please specify thickness, cladding, panel size and any other special considerations. Available master sheet sizes include36" x 48", and 48" x 54". Typical panel sizes include (but, are not limited to): 12" x 18", 16"x 18" and18"x 24".

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For design purpose it is important to note that both thicknesses and dielectric constant of RA300 vary with nominal thickness. The following are optimal values to use for design:

Thickness Specification（inch）	0.0051 ±0.0005	0.0094 ±0.0007	0.020 ±0.001	0.025 ±0.001	0.030 ±0.001	0.040 ±0.002	0.045 ±0.002	0.059 ±0.002	0.060 ±0.002
Thickness Mean （inch）	0.0051	0.0094	0.020	0.025	0.030	0.040	0.045	0.059	0.060
Dielectric Constant Specification （10GHz）	2.79 ±0.03	2.89 ±0.03	2.92 ±0.03	2.94 ±0.03	2.94 ±0.03	2.94 ±0.03	2.94 ±0.03	2.94 ±0.03	2.94 ±0.03

*Thicker Options are available. Please Contact Customer Service or sales of Relong.

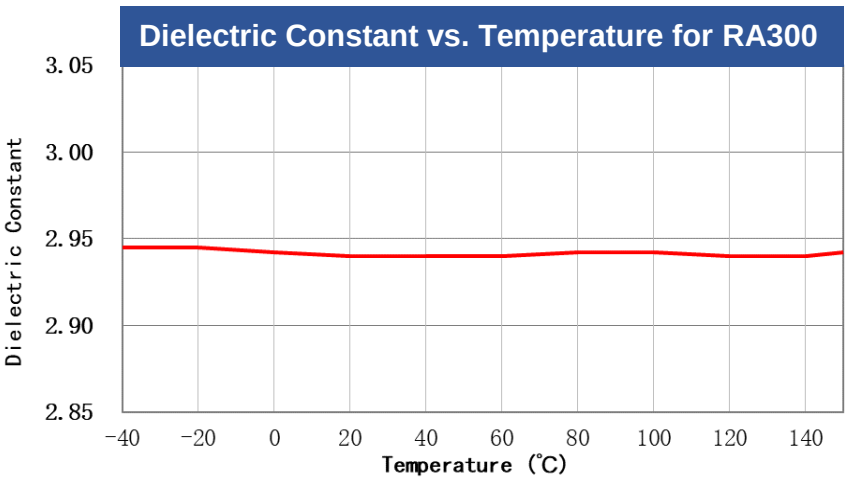

Figure 3
DK/TEMPERATURE CURVE shows the unique thermal stability properties of RA300 materials when thermal cycled over temperature. Even over a wider temperature variation (-40-150℃), the material retains its ultra-stable dielectric constant characteristics. This feature is critical to phase sensitive devices, and phase fed apertures that must perform over a wide temperature range.

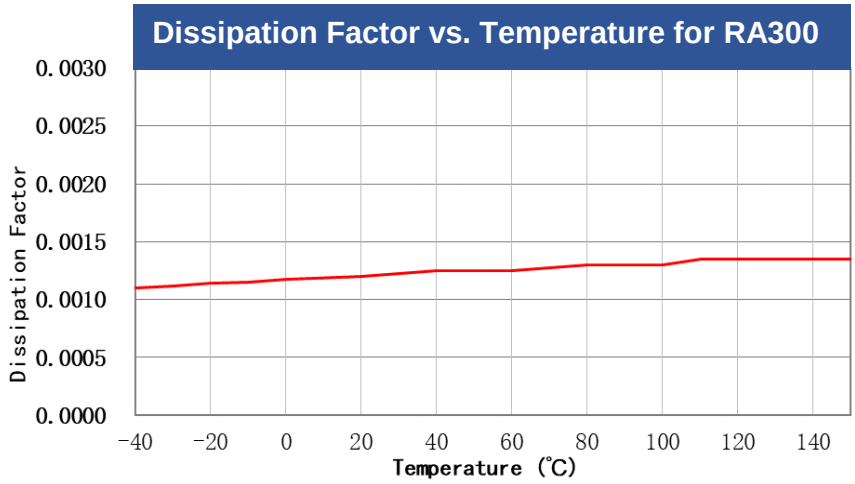

Figure 4
THIS DF/TEMPERATURE CURVE shows the unique thermal stability properties of RA300 materials when thermal cycled over temperature.

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