



# ThunderClad 4R

**Core: TU-943R**

**Prepreg: TU-943P R**

ThunderClad 4R ( TU-943R ) is an advanced material designed with advanced low Dk glass Fabric for high speed computing, telecommunications, radio frequency super low loss filed applications. ThunderClad 4R electrical performance is competitive with PTFE-based, hydrocarbon-based very low loss materials, but capable for high layer count circuit board design with excellent thermal reliability.

ThunderClad 4R laminates also exhibit excellent moisture resistance, improved CTE, superior chemical resistance, thermal stability, CAF resistance, and also compatible with modified FR-4 processes.

## Applications

- Radio frequency
- Backplane, High performance computing
- Line cards, Storage
- Servers, Telecom, Base station
- Super Core Router and Switchers

## Performance and Processing Advantages

- Excellent electrical and thermal properties
- Dielectric constant is 3.22 @ 10GHz
- Dissipation factor is 0.0015 @ 10GHz
- Stable and flat Dk/Df performance over frequency and temperature variance.
- Anti-CAF capability
- Improved z-axis thermal expansion
- Superior dimensional stability, thickness uniformity and flatness
- Excellent moisture resistance and Lead Free reflow process compatible
- Compatible with modified FR-4 processes

## Industry Approvals

- IPC-4101E Specification Number : /102
- UL File Number: E189572
- ANSI Grade: No-ANSI
- Flammability Rating: 94V-0
- Maximum Operating Temperature: 140°C

## Standard Availability

- Thickness: 0.002" [0.05mm] to 0.062" [1.58mm], available in sheet or panel form
- Copper Foil Cladding: 1/3 to 5 oz for built-up & double sides
- Prepregs: Available in roll or panel form
- Glass Styles: 1035, 1078, 2116 and others advanced low Dk fabric grades are available upon request.





Typical Properties		
	Typical Values	Conditions
<b>Thermal</b>		
Tg (DMA)	230 °C	E-2/105
Tg (TMA)	190 °C	
Td (TGA)	400 °C	
CTE α1	30 ppm/°C	E-2/105
CTE α2	230 ppm/°C	
CTE z-axis	2.2 %	
Thermal Stress, Solder Float, 288°C	> 120 sec	A
T-260	> 60 min	E-2/105
T-288	> 60 min	
T-300	> 60 min	
Flammability	94V-0	E-24/125
<b>Electrical</b>		
Permittivity (RC64%) 10 GHz (SPC method)	3.22	E-2/105
Loss Tangent (RC64%) 10 GHz (SPC method)	0.0015	E-2/105
Volume Resistivity	> 10 <sup>10</sup> MΩ·cm	C-96/35/90
Surface Resistivity	> 10 <sup>8</sup> MΩ	C-96/35/90
Electric Strength	> 40 KV/mm	A
Dielectric Breakdown Voltage	> 50 KV	A
<b>Mechanical</b>		
Young's Modulus Warp Direction	25 GPa	A
Fill Direction	23 GPa	
Flexural Strength Lengthwise	> 60,000 psi	A
Crosswise	> 50,000 psi	
Peel Strength, 1.0 oz. RTF Cu foil	4 lb/in	A
Moisture Absorption	0.06 %	E-1/105 + D-24/23

NOTE:

1. Property values are for information purposes only and not intended for specification.
2. Any sales of these products will be governed by the terms and conditions of the agreement under which they are sold.
3. This product is based on a patent pending technology.

