

# Theta<sup>®</sup> Circuit Materials

Halogen Free, Low Dielectric Constant, High Heat Resistant Multilayer Materials



Theta<sup>®</sup> circuit materials are halogen free and have good dielectric characteristics suitable for high speed digital applications. Theta materials, in part due to their superior heat resistance, have proven to be extremely reliable through lead free processing and in high layer count HDI designs requiring sequential laminations.

## Typical Values

Property	Typical 30 mil (0.8mm)	Direction	Units	Conditions	Test Method IPC-TM-650
Dielectric Constant, $\epsilon_r$	3.90	Z		1 GHz <sup>(1)</sup>	2.5.5.5
	4.01			10 GHz <sup>(2)</sup>	2.5.5.5
Dissipation Factor, $\tan \delta$	0.0090	Z		1 GHz <sup>(1)</sup>	2.5.5.5
	0.0118			10 GHz <sup>(2)</sup>	2.5.5.5
Glass transition temperature (Tg)	175-185		°C	TMA	2.4.24
Coefficient of Thermal Expansion (CTE)	~50	Z	ppm/°C	-55 to 125°C	2.1.41
Solder Heat Resistance	>300		Sec.	260°C A	
Decomposition Temperature	370~390		°C	TGA 5% weight loss	2.3.40
Copper Peel Strength	0.8~1.1		kN/m	½ EDC foil (18µm) A	2.4.8
Conductive Anodic Filament Growth (CAF)	>1000		Hrs	85°C/85% RH, 100V	
Water Absorption	0.03~0.04		%	E-24/50+D-24/23	2.6.2.1
Flammability (UL-94)	V-0				2.3.10

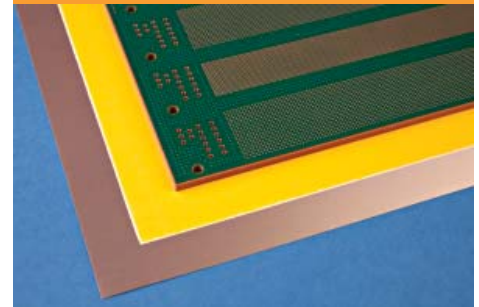
1): Measured by triplate-line resonator.

2): Measured by clamped stripline.

Typical values are a representation of an average value for the population of the property. For specification values contact Rogers Corporation.

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## Data Sheet

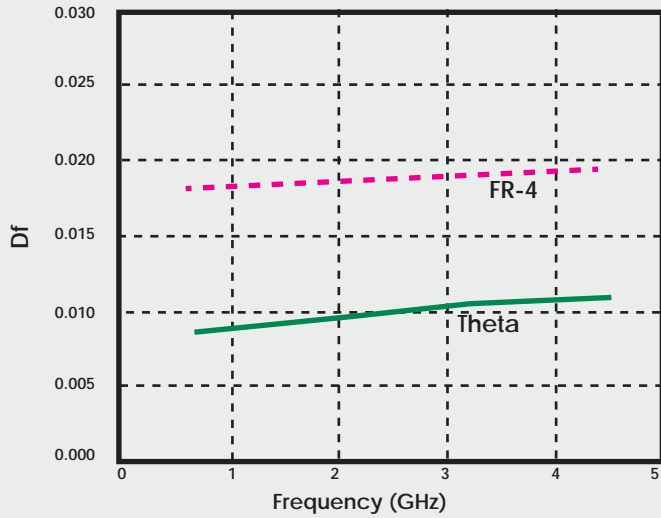


### FEATURES AND BENEFITS:

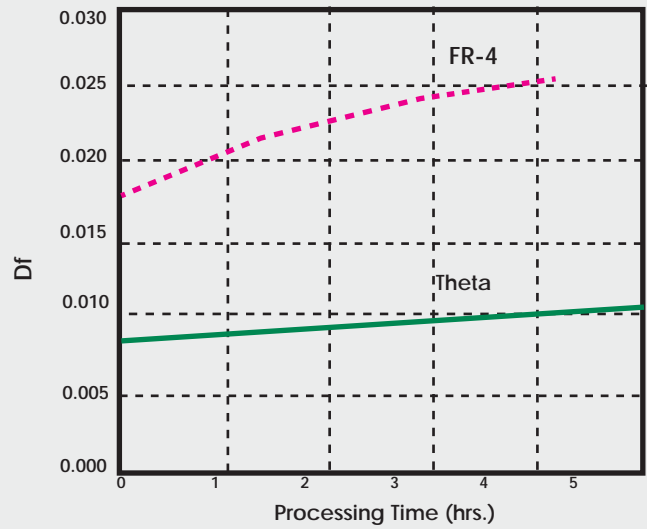
- Low insertion loss
  - Improved signal integrity
- Improved thermal characteristics
  - High Tg, suitable for lead free processing
- Superior thermal/mechanical reliability
  - Z-axis CTE 30% lower than standard FR-4
- Enhanced design flexibility
  - Wide range of laminate and prepreg thickness options
- Halogen free
  - Environmentally friendly chemistry with no sacrifice to thermal, mechanical or electrical performance

Proven Reliability

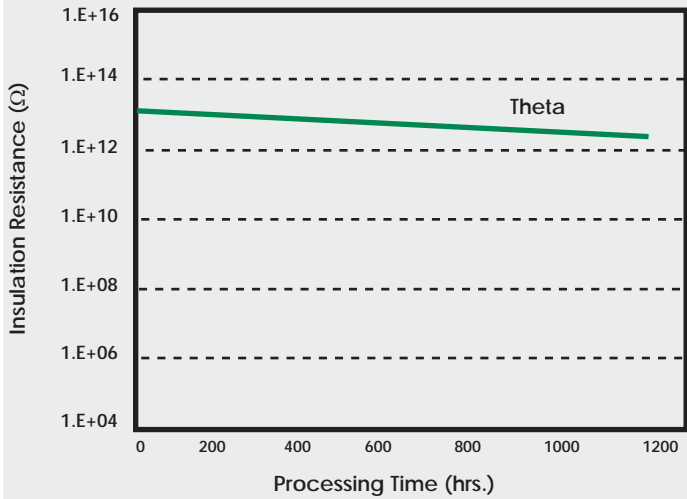
Dissipation Factor and Frequency



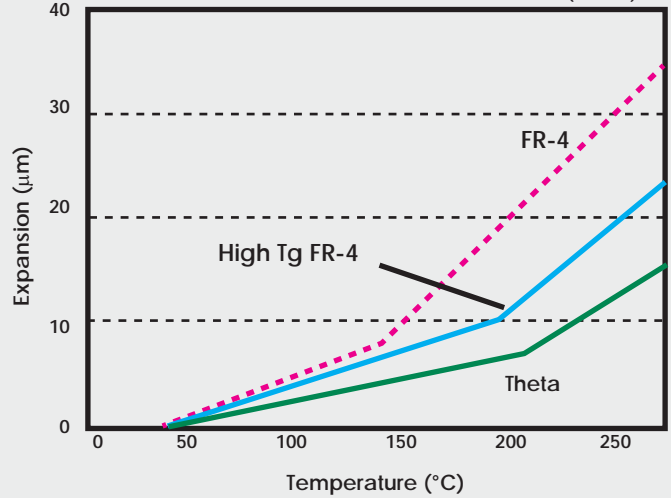
Dissipation Factor after Water Absorption (1GHz)  
PCT Condition: 121°C 0.22MPS



CAF Resistance (85°C 85% RH, DC 100V)  
Distance between Through-Hole: 0.3mm  
(t0.8mm)



Coefficient of Thermal Expansion (CTE) Z-direction  
(t0.8mm)



Thickness		Glass Style	RC Wt (%)	Estimated Dk				Estimated Df			
(mm)	(in)			1 GHz	3 GHz	5 GHz	10 GHz	1 GHz	3 GHz	5 GHz	10 GHz
0.056	0.0022	1037	72	3.85	3.83	3.81	3.79	0.0100	0.0113	0.0120	0.0126
0.064	0.0025	1080	55	3.96	3.94	3.92	3.90	0.0095	0.0107	0.0114	0.0124
0.064	0.0025	1037	75	3.78	3.76	3.74	3.72	0.0100	0.0113	0.0120	0.0126
0.076	0.0030	1080	64	3.90	3.88	3.86	3.84	0.0097	0.0110	0.0116	0.0126
0.076	0.0032	3313	45	3.97	3.95	3.93	3.91	0.0093	0.0105	0.0111	0.0121
0.089	0.0035	3313	50	3.98	3.96	3.94	3.92	0.0094	0.0106	0.0113	0.0123
0.102	0.0040	2116	45	3.97	3.95	3.94	3.91	0.0093	0.0105	0.0111	0.0121
0.102	0.0040	3313	56	3.95	3.93	3.91	3.89	0.0095	0.0107	0.0114	0.0124
0.114	0.0045	1037 X 2	72	3.85	3.83	3.81	3.79	0.0100	0.0113	0.0120	0.0126
0.127	0.0050	1080 X 2	55	3.96	3.94	3.92	3.90	0.0095	0.0107	0.0114	0.0124
0.127	0.0050	2116	54	3.97	3.95	3.93	3.91	0.0095	0.0107	0.0114	0.0124
0.152	0.0060	1501	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
0.152	0.0060	1080 X 2	64	3.90	3.88	3.86	3.84	0.0097	0.0110	0.0116	0.0126
0.178	0.0070	3313 X 2	50	3.96	3.94	3.92	3.90	0.0094	0.0106	0.0113	0.0123
0.203	0.0080	3313 X 2	56	3.95	3.93	3.91	3.89	0.0095	0.0107	0.0114	0.0124
0.254	0.0100	2116 X 2	54	3.97	3.95	3.93	3.91	0.0095	0.0107	0.0114	0.0124
0.305	0.0120	1501 X 2	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
0.406	0.0160	7629 X 2	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
0.508	0.0200	1501 X 2 7629 X 1	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
0.610	0.0240	7629 X 3	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
0.813	0.0320	7629 X 4	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
1.016	0.0400	7629 X 5	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120
1.626	0.0640	7629 X 8	43	4.02	4.00	3.98	3.96	0.0092	0.0104	0.0110	0.0120

Standard Panel Size	Standard Copper Cladding
24"X18" (609mm X 457mm)	½ oz EDC foil (HH/HH)
24.25" X 18.25" (616mm X 464mm)	1 oz EDC Foil (H1/H1)
24.50" X 18.50" (622mm X 470mm)	2 oz EDC Foil (H2/H2)
Grain direction is the short dimension.	

## Prepreg Options:

Thickness Post Lam		Glass Style	RC Wt (%)	Estimated Dk				Estimated Df			
(mm)	(in)			1 GHz	3 GHz	5 GHz	10 GHz	1 GHz	3 GHz	5 GHz	10 GHz
0.051	0.0020	1037	72	3.85	3.83	3.81	3.79	0.0100	0.0113	0.0120	0.0126
0.064	0.0025	1037	75	3.78	3.76	3.74	3.72	0.0100	0.0113	0.0120	0.0126
0.079	0.0031	1078	64	3.90	3.88	3.86	3.84	0.0097	0.0110	0.0116	0.0126
0.079	0.0031	1080	64	3.90	3.88	3.86	3.84	0.0097	0.0110	0.0116	0.0126
0.094	0.0037	1080	69	3.91	3.89	3.87	3.85	0.0100	0.0113	0.0120	0.0126
0.107	0.0042	3313	56	3.95	3.93	3.91	3.89	0.0095	0.0107	0.0114	0.0124
0.127	0.0050	3313	62	3.94	3.96	3.98	4.00	0.0096	0.0108	0.0115	0.0125
0.127	0.0050	2116	54	3.97	3.95	3.93	3.91	0.0095	0.0107	0.0114	0.0124
0.150	0.0059	2116	60	3.98	4.00	4.02	4.04	0.0095	0.0107	0.0114	0.0124
0.178	0.0070	1501	49	3.98	3.96	3.94	3.92	0.0094	0.0106	0.0113	0.0123

## Standard Panel Sizes:

24"X18" (609mm X 457mm)

24.25" X 18.25" (616mm X 464mm)

24.50" X 18.50" (622mm X 470mm)

Grain direction is the short dimension.

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