



High Frequency Materials

PRODUCT SELECTOR GUIDE



Custom Materials

RT/duroid®, TMM®, XT/duroid®, ULTRALAM® High Frequency Laminates

Product	Dielectric Constant, ϵ_r @ 10 GHz (Typical)		Dissipation ⁽¹⁾ Factor TAN δ @ 10 GHz (Typical)	Thermal ⁽²⁾ Coefficient of ϵ_r -50°C to 150°C ppm/°C (Typical)	Volume Resistivity Mohm • cm (Typical)	Surface Resistivity Mohm (Typical)	Moisture ⁽⁴⁾ Absorption D48/50 % (Typical)
	Process ⁽¹⁾	Design ⁽¹¹⁾					
RT/duroid® 5870 PTFE Random Glass Fiber	2.33 ± 0.02	2.33	0.0012	-115	2 X 10 ⁷	2 X 10 ⁷	0.02
RT/duroid 5880 PTFE Random Glass Fiber	2.20 ± 0.02	2.20	0.0009	-125	2 X 10 ⁷	3 X 10 ⁷	0.02
RT/duroid 5880LZ Filled PTFE Composite	1.96 ± 0.04	1.96	0.0019	+22	2.1 X 10 ⁷	2.6 X 10 ⁶	0.22
RT/duroid 6002 PTFE Ceramic	2.94 ± 0.04	2.94	0.0012	+12	1 X 10 ⁶	1 X 10 ⁷	0.02
RT/duroid 6202 PTFE Ceramic Woven Glass Reinforced	⁽⁸⁾ 2.90 - 3.06 ± 0.04	⁽⁸⁾ 2.90 - 3.06 ± 0.04	0.0015	⁽⁸⁾ +5 to -15	1 X 10 ⁶	1 X 10 ⁹	0.04
RT/duroid 6202PR ⁽²⁰⁾ PTFE Ceramic Woven Glass Reinforced	2.90 - 3.00 ± 0.04	2.90 - 3.00	0.0020	⁽⁸⁾ +5 to -15	1 X 10 ¹⁰	1 X 10 ⁹	0.03
RT/duroid 6035HTC PTFE Ceramic	3.50 ± 0.05	3.60	0.0013	-66	1 X 10 ⁸	1 X 10 ⁸	⁽¹²⁾ 0.06
RT/duroid 6010LM PTFE Ceramic	10.20 ± 0.25	10.7	0.0023	-425	5 X 10 ⁵	5 X 10 ⁶	0.01
TMM® 3 Hydrocarbon Ceramic	3.27 ± 0.032	3.45	0.0020	+37	3 X 10 ⁹	9 x 10 ⁹	⁽¹⁰⁾ 0.06
TMM 4 Hydrocarbon Ceramic	4.50 ± 0.045	4.70	0.0020	+15	6 X 10 ^{8*}	1 x 10 ^{9*}	⁽¹⁰⁾ 0.07
TMM 6 Hydrocarbon Ceramic	6.00 ± 0.08	6.3	0.0023	-11	1 X 10 ^{8*}	1 x 10 ^{9*}	⁽¹⁰⁾ 0.06
TMM 10 Hydrocarbon Ceramic	9.20 ± 0.23	9.8	0.0022	-38	2 X 10 ⁸	4 X 10 ⁷	⁽¹⁰⁾ 0.09
TMM 10i Hydrocarbon Ceramic	9.80 ± 0.245	9.9	0.0020	-43	2 X 10 ⁸	4 X 10 ⁷	⁽¹⁰⁾ 0.16
TMM 13i Hydrocarbon Ceramic	⁽¹⁴⁾ 12.85 ± 0.35	12.2	0.0019	-70	TBD	TBD	0.13
ULTRALAM® 3850 Liquid Crystalline Polymer	2.90	3.14	0.0025	+24	1 x 10 ¹²	1 X 10 ¹⁰	0.04
XT/duroid® 8000 (PEEK)	⁽¹⁸⁾ 3.23	⁽¹⁸⁾ 3.23	0.0035	+7	1 X 10 ¹⁰	1 X 10 ⁸	⁽¹²⁾ 0.20
⁽¹⁵⁾ XT/duroid 8100 (PEEK) Woven Glass Reinforced 0.002" (0.0508mm) 0.004" (0.102mm)	⁽¹⁸⁾ 3.54 ± 0.05 3.32 ± 0.05	⁽¹⁸⁾ 3.54 ± 0.05 3.32 ± 0.05	0.0049 0.0038	+9 +9	- 1 X 10 ¹⁰	- 1 X 10 ⁶	⁽¹²⁾ 0.15 0.32

Custom Materials

RT/duroid®, TMM®, XT/duroid®, ULTRALAM® High Frequency Laminates

Thermal Conductivity W/m/°K (Typical) 50° C ASTM D5470	Coefficient of Thermal Expansion ⁽⁶⁾ 0° to 100°C ppm/°C (Typical)			Peel Strength 1 oz (35µm) ED Foil lbs/in. (N/mm) (Typical)	Density gm/cm ³ (Typical)	Flammability Rating UL 94	Lead-Free ⁽⁹⁾ Process Compatible	Product
	X	Y	Z					
0.22	22	28	173	27.2 (4.8)	2.2	V-0	YES	RT/duroid® 5870 PTFE Random Glass Fiber
0.20	31	48	237	31.2 (5.5)	2.2	V-0	YES	RT/duroid 5880 PTFE Random Glass Fiber
0.33	44	43	42	>4.0	1.4	V-0	YES	RT/duroid 5880LZ Filled PTFE Composite
0.60	16	16	24	8.9 (1.6)	2.1	V-0	YES	RT/duroid 6002 PTFE Ceramic
0.68	15	15	30	9.1 (1.6)	2.1	V-0	YES	RT/duroid 6202 PTFE Ceramic Woven Glass Reinforced
0.68	15	15	30	14.3 (2.5)	2.1	V-0	YES	RT/duroid 6202PR PTFE Ceramic Woven Glass Reinforced
1.44	⁽¹⁶⁾ 19	⁽¹⁶⁾ 19	⁽¹⁶⁾ 39	7.9 (1.4)	2.2	V-0	YES	RT/duroid 6035HTC PTFE Ceramic
0.86	24	24	47	12.3 (2.1)	3.1	V-0	YES	RT/duroid 6010LM PTFE Ceramic
0.70	15	15	23	5.7 (1.0)	1.8	NON FR	YES	TMM® 3 Hydrocarbon Ceramic
0.70	16	16	21	5.7 (1.0)	2.1	NON FR	YES	TMM 4 Hydrocarbon Ceramic
0.72	18	18	26	5.7 (1.0)	2.4	NON FR	YES	TMM 6 Hydrocarbon Ceramic
0.76	21	21	20	5.0 (0.9)	2.8	NON FR	YES	TMM 10 Hydrocarbon Ceramic
0.76	19	19	20	5.0 (0.9)	2.8	NON FR	YES	TMM 10i Hydrocarbon Ceramic
⁽¹⁷⁾ 0.76	19	19	20	4.0 (0.7)	3.0	NON FR	YES	TMM 13i Hydrocarbon Ceramic
0.20	17	17	150	5.2 (0.95)	1.4	VTM-0	YES	ULTRALAM® 3850 Liquid Crystalline Polymer
0.35	18	23	68	5.0 (0.88)	1.5	VTM-0	YES	XT/duroid® 8000 (PEEK)
0.3 0.3	16.5 19	18 21	57 76	6.2 6.3	- -		YES	⁽¹⁵⁾ XT/duroid 8100 (PEEK) Woven Glass Reinforced 0.002" (0.0508mm) 0.004" (0.102mm)



Commercial Grade Materials

RO3000[®] series, RO3200[™] series, RO4000[®] series High Frequency Laminates

Product	Dielectric Constant, ϵ_r @ 10 GHz (Typical)		Dissipation ⁽¹⁾ Factor TAN δ @ 10 GHz (Typical)	Thermal ⁽²⁾ Coefficient of ϵ_r -50°C to 150°C ppm/°C (Typical)	Volume Resistivity Mohm • cm (Typical)	Surface Resistivity Mohm (Typical)	Moisture ⁽⁴⁾ Absorption D48/50 % (Typical)
	Process ⁽¹⁾	Design ⁽¹¹⁾					
RO3003[™] PTFE Ceramic	⁽⁷⁾⁽⁸⁾ 3.00 ± 0.04	3.00	0.0010	-3	1 X 10 ⁷	1 X 10 ⁷	0.04
RO3035[™] PTFE Ceramic	3.50 ± 0.05	3.60	0.0015	-45	1 X 10 ⁷	1 X 10 ⁷	0.04
RO3006[™] PTFE Ceramic	6.15 ± 0.15	6.5	0.0020	-262	1 X 10 ⁵	1 X 10 ⁵	0.02
RO3010[™] PTFE Ceramic	10.20 ± 0.30	11.2	0.0022	-395	1 X 10 ⁵	1 X 10 ⁵	0.05
RO3203[™] PTFE Ceramic Woven Glass Reinforced	⁽⁷⁾ 3.02 ± 0.04	3.02	0.0016	-13	1 X 10 ⁷	1 X 10 ⁷	0.03
RO3206[™] PTFE Ceramic Woven Glass Reinforced	6.15 ± 0.15	6.6	0.0027	-212	1 X 10 ⁷	1 X 10 ⁷	0.03
RO3210[™] PTFE Ceramic Woven Glass Reinforced	10.20 ± 0.50	10.8	0.0027	-459	1 X 10 ⁴	1 X 10 ⁴	0.12
RO4003C[™] Hydrocarbon Ceramic Woven Glass	3.38 ± 0.05	3.55	0.0027	+40	1.7 X 10 ¹⁰	4.2 X 10 ⁹	0.04
RO4350B[™] Hydrocarbon Ceramic Woven Glass	3.48 ± 0.05	3.66	0.0037	+50	1.2 X 10 ¹⁰	5.7 X 10 ⁹	0.05
RO4835[™] Hydrocarbon Ceramic Woven Glass	3.48 ± 0.05	3.66	0.0037	+50	10 ¹⁰	10 ⁹	0.05
RO4360G2[™] Hydrocarbon Ceramic Woven Glass	6.15 ± 0.15	6.4	0.0038	-131	4 X 10 ¹³	9 X 10 ¹²	0.08

Properties Notes:

- 1) Measured by IPC-TM-650 method 2.5.5.5 @ ~10 GHz, 23°C. Materials were based on testing raw substrate material. ϵ_r values and tolerance reported by IPC-TM-650 method 2.5.5.5 are the basis for quality acceptance, but for some products these values may be incorrect for design engineering applications, especially those in microstrip. We recommend that prototype boards of a new design be verified for electrical performance.
- 2) Measured by IPC-TM-650 method 2.5.5.5 at ~10GHz modified.
- 3) Young's modulus (elastic modulus), steepest region of the stress/strain curve is in tension for X and Y axes by ASTM D 638; in compression of Z axis by ASTM D695 on 12.7 X 12.7 X 25.4mm stocked specimen.
- 4) Testing conditions: 48 hours @ 50°C, specimens etched free of copper.
- 5) Tested by ASTM C518.
- 6) Tested by ASTM D3386-94. Values are average over temperature range but not necessarily linear. However for RT/duroid 6002 and TMM grades the response is essentially linear.
- 7) The nominal dielectric constant of an 0.060" thick RO3003/RO3203 laminate as measured by IPC-TM-2.5.5.5 will be 3.04 due to the elimination of biasing caused by air gaps in the test fixture. For further information refer to Rogers' T.R. 5242.
- 8) Due to construction limitations, the dielectric constant of 0.005 laminates is 3.06 ± 0.04; 0.010" and 0.015" laminates are 3.02 ± 0.04; TCDC is +5 for the higher Dk range; and for 2.90TCDC is -15
- 9) Rogers' high frequency laminates and prepregs are lead-free process compatible and in accordance with IEC 61249-2-21.
- 10) TMM[®] material test conditions D24/50 (twenty-four hours at 50°C) on 0.050" (1.27mm) thick specimens. TMM13i test condition D48/50.
- 11) Design Dk is determined by testing thick microstrip transmission line circuits and reporting the thickness-axis dielectric constant of the raw material without the influence of copper. For more information, refer to the article on the Rogers website titled "The Influence of Test Method, Conductor Profile, and Substrate Anisotropy on the Permittivity Values Required for Accurate Modeling of High Frequency Planar Circuits" which was featured in a publication Sept. 2012. <http://www.rogerscorp.com/acm/articles.aspx>
- 12) Testing conditions: 24 hours @ 23 C, specimens etched free of copper
- 13) Available only with LoPro[™] copper foil
- 14) Test method 2.5.5.6
- 15) XT/duroid material thickness tested were 0.002" and 0.004" except for 8100 volume and surface resistivity which 0.004 material was tested
- 16) Conditions were -55 to 288°C. Test Method ASTM D-3386
- 17) Estimated
- 18) IPC-TM-650.2.5.5.1
- 19) Test method: ASTM D5470-12 @ 50°C
- 20) PR stands for Planar Resistor. Resistive foil, if required, must be specified when ordering 6202PR laminate.
- 21) Conditions 125C/24 hours. Test method IPC-TM-650 2.5.17.1

Commercial Grade Materials

RO3000® series, RO3200™ series, RO4000® series High Frequency Laminates

Thermal Conductivity W/m/°K (Typical) 50°C ASTM D5470	Coefficient of Thermal Expansion ⁽⁶⁾ -55° to 288°C ppm/°C (Typical)			Peel Strength 1 oz (35µm) ED Foil lbs/in. (N/mm) (Typical)	Density gm/cm ³ (Typical)	Flammability Rating UL 94	Lead-Free ⁽⁹⁾ Process Compatible	Product
	X	Y	Z					
0.50	17	16	25	12.7 (2.2)	2.1	V-0	YES	RO3003™ PTFE Ceramic
0.50	17	17	24	10.2 (1.6)	2.1	V-0	YES	RO3035™ PTFE Ceramic
0.79	17	17	24	7.1 (1.2)	2.6	V-0	YES	RO3006™ PTFE Ceramic
0.95	13	11	16	9.4 (1.6)	2.8	V-0	YES	RO3010™ PTFE Ceramic
0.48	13	13	58	10.2 (1.8)	2.1	V-0	YES	RO3203™ PTFE Ceramic Woven Glass Reinforced
0.67	13	13	34	10.7 (1.9)	2.7	V-0	YES	RO3206™ PTFE Ceramic Woven Glass Reinforced
0.81	13	13	34	11.0 (1.9)	3.0	V-0	YES	RO3210™ PTFE Ceramic Woven Glass Reinforced
0.71	11	14	46	6.0 (1.05)	1.8	NON FR	YES	RO4003C™ Hydrocarbon Ceramic Woven Glass
0.69	10	12	32	5.0 (0.88)	1.9	V-0	YES	RO4350B™ Hydrocarbon Ceramic Woven Glass
0.66	10	12	31	5.0 (0.88)	1.92	V-0	YES	RO4835™ Hydrocarbon Ceramic Woven Glass
0.75	13	14	28	5.2 (0.91)	2.16	V-0	YES	RO4360G2™ Hydrocarbon Ceramic Woven Glass

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

The information contained in this Product Selector Guide is intended to assist you in designing with Rogers' circuit materials. It is not intended to and does not create any warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose. The user should determine the suitability of Rogers' circuit materials for each application.

Prolonged exposure in an oxidative environment may cause changes to the dielectric properties of hydrocarbon based materials. The rate of change increases at higher temperatures and is highly dependent on the circuit design. Although Rogers' high frequency materials have been used successfully in innumerable applications and reports of oxidization resulting in performance problems are extremely rare, Rogers recommends the customer evaluate each material and design combination to determine fitness for use over the entire life of the end product.



Antenna Grade Materials

RO4500™ series, RO4700™ series Laminates

Product	Dielectric Constant, ϵ_r @ 10 GHz (Typical)		Dissipation ⁽¹⁾ Factor TAN δ @ 2.5 GHz 10 GHz (Typical)	Thermal ⁽²⁾ Coefficient of ϵ_r -50°C to 150°C ppm/°C (Typical)	Volume Resistivity Mohm • cm (Typical)	Surface Resistivity Mohm (Typical)	Moisture ⁽⁴⁾ Absorption D48/50 % (Typical)
	Process ⁽¹⁾	Design ⁽¹¹⁾					
RO4533™ Hydrocarbon / Ceramic / Woven Glass	3.30 ± 0.08	3.45	0.0020 0.0029	+40	1.1 X 10 ¹⁰	9.9 X 10 ⁸	0.02
RO4534™ Hydrocarbon / Ceramic / Woven Glass	3.40 ± 0.08	3.55	0.0022 0.0030	+40	1.7 X 10 ¹⁰	4.2 X 10 ⁹	0.06
RO4535™ Hydrocarbon / Ceramic / Woven Glass	3.5 ± 0.08	3.66	0.0037	+50	1.2 X 10 ¹⁰	5.7 X 10 ⁹	0.05
RO4725JXR™ Hydrocarbon / Ceramic / Woven Glass	2.55 ± 0.05	2.64	0.0022 0.0026	+34	2.16 X 10 ⁸	4.8 X 10 ⁷	0.24
RO4730JXR™ Hydrocarbon / Ceramic / Woven Glass	3.00 ± 0.05	2.98	0.0023 0.0027	+32	5.96 X 10 ⁸	1.68 X 10 ⁸	0.14

Prepreg and Bonding Film

Product	Dielectric ⁽¹⁾ Constant, ϵ_r (Typical)	Dissipation ⁽¹⁾ Factor TAN δ @ 2.5 GHz 10 GHz (Typical)	Volume Resistivity Mohm • cm (Typical)	Moisture ⁽⁴⁾ Absorption D48/50 % (Typical)	Thermal ⁽⁵⁾ Conductivity W/m/°K (Typical) 50°C ASTM D5470	
COOLSPAN® Thermally & Electrically Conductive Adhesive (TECA) Film	N/A	N/A	3.8 X 10 ⁻¹⁰ (Conductive)	N/A	6.0	
2929 Bond-ply	2.94 ± 0.05	0.003	⁽²¹⁾ 7.4 X 10 ⁹	⁽¹⁴⁾ 0.1	0.4	
3001 Bonding Film	2.28	0.003	1 X 10 ¹¹	0.05	0.22	
RO3003™ Ceramic PTFE Bond-ply	3.00 ± 0.04	0.0013	1 X 10 ⁷	0.04	0.50	
RO3006™ Ceramic PTFE Bond-ply	6.15 ± 0.15	0.0020	1 X 10 ⁵	0.02	0.79	
RO3010™ Ceramic PTFE Bond-ply	10.20 ± 0.30	0.0022	1 X 10 ⁵	0.05	0.95	
RT/duroid® 6002 Ceramic PTFE Bond-ply	2.94 ± 0.04	0.0012	1 X 10 ⁶	<0.10	0.60	
RO4450B™ Hydrocarbon / Ceramic / Woven Glass / Prepreg	Thickness 0.0036"	3.30 ± 0.05	0.0043	9.26 X 10 ⁷	0.09	0.60
	0.004"	3.54 ± 0.05	0.0040	9.26 X 10 ⁷	0.08	0.60
RO4450F™ Hydrocarbon / Ceramic / Woven Glass / Prepreg	3.52 ± 0.05	0.0041	8.93 X 10 ⁸	0.07	0.65	
ULTRALAM® 3908 LCP Bonding film	2.90	0.0025	2.6 X 10 ¹⁴	⁽¹³⁾ 0.04	0.20	

Antenna Grade Materials

RO4500™ series, RO4700™ series Laminates

Thermal Conductivity W/m/°K (Typical) 50°C ASTM D5470	Coefficient of Thermal Expansion ⁽⁶⁾ 0° to 100°C ppm/°C (Typical)			Peel Strength 1 oz (35µm) ED Foil lbs/in. (N/mm) (Typical)	Density gm/cm ³ (Typical)	Flammability Rating UL 94	PIM dBc Typical	Product
	X	Y	Z					
0.60	13	11	37	6.9 (1.2)	1.8	NON FR	-157	RO4533™ Hydrocarbon / Ceramic / Woven Glass
0.60	11	14	46	6.3 (1.1)	1.8	NON FR	-157	RO4534™ Hydrocarbon / Ceramic / Woven Glass
0.6	14	16	35	0.9	1.9	V-0	-157	RO4535™ Hydrocarbon / Ceramic / Woven Glass
⁽¹⁹⁾ 0.38	13.9	19.0	25.6	8.5	1.27	NON FR	- 166	RO4725JXR™ Hydrocarbon / Ceramic / Woven Glass
⁽¹⁹⁾ 0.49	11.3	13.5	21.1	8.4	1.53	NON FR	- 164	RO4730JXR™ Hydrocarbon / Ceramic / Woven Glass

Prepreg and Bonding Film

Coefficient of Thermal Expansion ⁽⁶⁾ 0° - 100°C ppm/°C (Typical)			Density gm/cm ³ (Typical)	Flammability Rating UL 94	Lead-Free ⁽⁹⁾ Process Compatible	Product	
X	Y	Z					
45	45	45	4.6	NON-FR	YES	COOLSPAN® Thermally & Electrically Conductive Adhesive (TECA) Film	
50	50	50	1.5	NON-FR	YES	2929 Bond-ply	
-	-	-	2.1	-	NO	3001 Bonding Film	
17	16	25	2.1	V-0	YES	RO3003™ Ceramic PTFE Bond-ply	
17	17	24	2.6	V-0	YES	RO3006™ Ceramic PTFE Bond-ply	
13	11	16	2.8	V-0	YES	RO3010™ Ceramic PTFE Bond-ply	
16	16	24	2.1	V-0	YES	RT/duroid® 6002 Ceramic PTFE Bond-ply	
19	17	60	1.8	V-0	YES	RO4450B™ Hydrocarbon / Ceramic / Woven Glass / Prepreg	Thickness 0.0036"
19	17	50	1.9	V-0	YES		0.004"
19	17	50	1.85	V-0	YES	RO4450F™ Hydrocarbon / Ceramic / Woven Glass / Prepreg	
17	17	150	1.4	VTM-0	YES	ULTRALAM® 3908 LCP Bonding film	

Metal Claddings

Foil Type	Weight or Thickness	Surface Roughness Rq (µm)		Products
		Dielectric Side	Top Side	
Rolled	2 oz. (70 µm)	0.6	0.3	RO3003™, RO3035™, RO3203™
	1 oz. (35 µm)	0.4	0.3	RO3003™, RO3035™, RO3203™, RT/duroid® 5870, 5880, 6002, 6002PR, 6202, 6202PR laminates
	½ oz. (18 µm)	0.3	0.3	
Electrodeposited	¼ oz. (9 µm)	0.8	0.4	RO3000® laminates, RT/duroid 5870*, 5880*, 5880LZ*, 6002*, 6006*, 6010LM*, 6202* * Note: Please check with Rogers' Representative to confirm availability.
	1 oz. (35 µm)	2.1	0.4	RT/duroid 5870, 5880, 5880LZ, 6002, 6202, 6010LM RT/duroid 6035HTC laminates
	½ oz. (18 µm)	1.8	0.4	RO3000 laminates TMM® 3, 4, 6, 10, 10i, 13i
	2 oz. (70 µm)	3.3	0.4	RO4003C™, RO4350B™, RO4360G2™, RO4533™, RO4534™, RO4835™ laminates
	1 oz. (35 µm)	3.2	0.4	
Electrodeposited Reverse Treated	½ oz. (18 µm)	2.8	0.4	ULTRALAM® 3850, XT/duroid® 8000/8100 laminates
	¼ oz. (9 µm)	0.5	0.4	
	1 oz. (35 µm)	0.9	1.3	
	½ oz. (18 µm)	0.7	0.8	
LoPro™ Foil	1 oz. (35 µm)	0.9	1.1	RO4003C, RO4350B, RO4533, RO4534, RO4535, RO4725JXR™, RO4730JXR™, RO4835 laminates
	½ oz. (18 µm)	0.8	0.6	
Resistive Foil	TCR® Thin Film Resistor Foil ½ oz. (18 µm)	2.2	0.5	RO4003C, RO4350B laminates, RT/duroid 6002, 6002PR, 6202, 6202PR
	OhmegaPly® Resistor-Conductor Material 25 ohms ½ oz (18 µm)	1.4	0.3	RO4003C laminates
	OhmegaPly Resistor-Conductor Material 25 ohms ½ oz. (18 µm)	1.0	0.3	RO3000 laminates, RT/duroid 5870, 5880, 6002, 6002PR, 6006, 6010LM, 6202, 6202PR laminates

Property	Electrodeposited (ED)				Rolled (RLD)		
	¼ oz (9 µm)	0.5 oz (18 µm)	1 oz. (35 µm)	2 oz (70 µm)	0.5 oz (18 µm)	1 oz. (35 µm)	2 oz.(70 µm)
Tensile Strength, kpsi	15	33	40	40	20	22	28
Elongation, %*	2	2	3	3	8	13	27
Vol Resistivity µohm • cm	-	1.66	1.62	1.62	1.78	1.74	1.74
Thickness: in (µm)	0.0004 (10.2)	0.0007 (17.8)	0.0014 (35.6)	0.0028 (71.1)	0.0007 (17.8)	0.0014 (35.6)	0.0028 (71.1)

Plates	Alloy	Machinability	Density gm/cm³	Thermal Conductivity W/m/°K	Coefficient of Thermal Expansion ppm/C
Aluminum	6061	Poor	2.7	150	24
Brass	70/30 Cartridge	Good	8.5	120	20
Copper	110	Fair to Good	8.9	390	17

Thickness, Tolerance & Panel Size in (mm)

Prepreg and Bonding Film

PRODUCT	STANDARD DIELECTRIC THICKNESS (WITHOUT THE CLADDING)	STANDARD CLADDINGS	STANDARD PANEL SIZES
COOLSPAN TECA	0.002" (0.051mm) ± 0.0005	N/A	10 X 12 (254mm X 305mm)
COOLSPAN TECA	0.004" (0.102mm) ± 0.0005	N/A	10 X 12 (254mm X 305mm)
2929 Bond-ply	0.0015" (0.038mm) 0.0020" (0.051mm) 0.0030" (0.076mm)	N/A	18" X 12" (457mm X 305mm) or 18" X 24" (457mm X 610mm)
3001 Bonding Film Thermoplastic	.0015"(0.038mm)	N/A	12" X 50' Roll (304mm X 15.24m)
ULTRALAM 3908 (LCP) Bond-ply	.001" (0.025mm) .002" (0.051mm)	N/A	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)
RO3003™ Bond-ply, RO3006™/RO3010™ Bond-ply	.005" (0.127mm)	N/A	25.5" X 18"
RO4450B™ Prepreg	.0036" (0.091mm) .004" (0.102mm)		12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4450F™ Prepreg	.004" (0.102mm)	N/A	
RT/duroid® 6002 Bond-ply	0.0025" (0.064mm)	N/A	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)

Thickness, Tolerance & Panel Size in (mm)

High Frequency Laminates

PRODUCT	STANDARD DIELECTRIC THICKNESS (WITHOUT THE CLADDING)	AVAILABLE CLADDINGS	STANDARD PANEL SIZES
RT/duroid® 5870 RT/duroid 5880	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.015" (0.381mm) ± 0.0010" 0.020" (0.508mm) ± 0.0010" 0.031" (0.787mm) ± 0.0010" 0.062" (1.575mm) ± 0.0020" 0.125" (3.175mm) ± 0.0040" Non-Standard thicknesses available	¼*, ½, 1, 2 oz, (9, 18, 35, 70µm) ED ½, 1, 2 oz (18, 35, 70µm) Rolled Copper ½, 1, 2 oz (18, 35, 70µm) Reverse Treat ½, oz (18µm) Ohmega resistive foil Thick metal Aluminum, Copper, Brass * Note: Please check with Rogers' Representative to confirm availability.	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm) 18" X 36" (457mm X 915mm) 18" X 48" (457mm X 1.219m)
RT/duroid 5880LZ	0.010" (0.254mm) ± 0.0010" 0.020" (0.508mm) ± 0.0010" 0.025" (0.635mm) ± 0.0020" 0.030" (0.762mm) ± 0.0020" 0.040" (1.016mm) ± 0.0020" 0.050" (1.270mm) ± 0.0030" 0.100" (2.540mm) ± 0.0050" Non-Standard thicknesses available	½, 1 oz (18, 35µm) ED	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 24" X 54" (610mm X 1.37m) - Non Standard
RT/duroid 6002	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.020" (0.508mm) ± 0.0010" 0.030" (0.762mm) ± 0.0015" 0.060" (1.524mm) ± 0.0020" 0.120" (3.048mm) ± 0.0060"	½, 1, 2 oz (18, 35, 70µm) ED ½, 1, 2 oz (18, 35, 70µm) Rolled Copper ½, 1 oz (18, 35µm) Ohmega & Ticer resistive foil ½, 1, 2 oz (18, 35, 70µm) Reverse Treat	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
RT/duroid 6202	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.015" (0.381mm) ± 0.0010" 0.020" (0.508mm) ± 0.0010" 0.030" (0.762mm) ± 0.0010" 0.060" (1.524mm) ± 0.0020"	Thick metal Aluminum, Copper, Brass - 6002 only	
RT/duroid 6202PR	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.015" (0.381mm) ± 0.0010" 0.020" (0.508mm) ± 0.0010"	½, 1, 2 oz (18, 35, 70µm) ED ½, 1, 2 oz (18, 35, 70µm) Reverse Treat ½, 1, 2 oz (18, 35, 70µm) Rolled Copper ½, 1 oz (18, 35µm) Ohmega-ply® resistive foil ½, 1 oz (18, 35µm) Ticer resistive foil	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
RT/duroid 6010LM	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0010" 0.025" (0.635mm) ± 0.0010" 0.050" (1.270mm) ± 0.0020" 0.075" (1.905mm) ± 0.0040" 0.100" (2.540mm) ± 0.0050"	½, 1, 2 oz (18, 35, 70µm) ED ½, 1, 2 oz (18, 35, 70µm) Reverse Treat ½, 1 oz (18, 35µm) Ohmega resistive foil Thick metal Aluminum, Copper, Brass	10" X 10" (254mm X 254mm) 10" X 20" (254mm X 508mm) 18" X 12" (457mm X 305mm) not available in 0.005" (0.127mm) and 0.010" (0.254mm) 18" X 24" (457 X 610mm) - Non Standard not available in 0.005" (0.127mm) and 0.010" (0.254mm) 20" X 20" (508mm X 508mm) - Non Standard
RT/duroid 6035HTC	0.010" (0.254mm) ± 0.0007" 0.020" (0.508mm) ± 0.0011" 0.030" (0.762mm) ± 0.0015" 0.060" (1.524mm) ± 0.003"	½, 1, 2 oz (18, 35, 70µm) ED ½, 1 oz (18, 35µm) Reverse Treated Foil	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
TMM® 3 TMM 4 TMM 6 TMM 10 TMM 10i TMM 13i	0.015" (0.381mm) ± 0.0015" 0.020" (0.508mm) ± 0.0015" 0.025" (0.635mm) ± 0.0015" 0.030" (0.762mm) ± 0.0015" 0.050" (1.270mm) ± 0.0015" 0.060" (1.524mm) ± 0.0015" 0.075" (1.905mm) ± 0.0015" 0.100" (2.540mm) ± 0.0015" 0.125" (3.175mm) ± 0.0015" 0.150" (3.810mm) ± 0.0015" 0.200" (5.080mm) ± 0.0015" 0.250" (6.350mm) ± 0.0015" 0.275" (6.985mm) ± 0.0015" 0.300" (7.620mm) ± 0.0015" 0.500" (12.70mm) ± 0.0015" Non-Standard thicknesses available	½, 1, 2 oz (18, 35, 70µm) ED Thick metal Aluminum & Brass	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)
ULTRALAM® 3850	0.001" (0.025mm) ± 15% 0.002" (0.051mm) ± 12.5% 0.004" (0.102mm) ± 10%	¼, ½ oz (9, 18µm) very low profile reverse treat ED foil	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)
XT/duroid® 8000 XT/duroid® 8100	0.002" (0.051mm) ± 12.5% 0.002" (0.051mm) ± 12.5% 0.004" (0.102mm) ± 12.5%	½ (18µm) very low profile reverse treat ED foil	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)

Thickness, Tolerance & Panel Size in (mm)

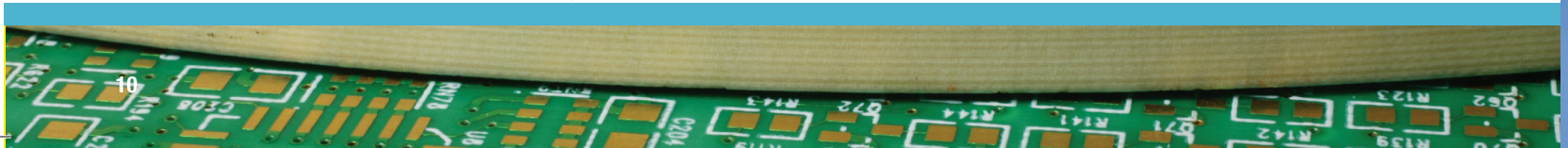
High Frequency Laminates

PRODUCT	STANDARD DIELECTRIC THICKNESS (WITHOUT THE CLADDING)	AVAILABLE CLADDINGS	STANDARD PANEL SIZES
RO3003™ RO3035™ RO3203™	0.005" (0.127mm) ± 0.0005" (RO3203 not available with 0.005" (0.127mm)) 0.010" (0.254mm) ± 0.0007" 0.020" (0.508mm) ± 0.001" 0.030" (0.762mm) ± 0.0015" 0.060" (1.524mm) ± 0.003" Additional non-standard thicknesses available between 0.005" and 0.250"	¼, ½, 1, 2 oz ED (9, 18, 35, 70µm ED) ½, 1, 2 oz Rolled Cu (18, 35, 70µm Rolled Cu) * Additional charges may apply for Rolled Cu ½ oz and 1 oz Ohmega Resistive Foil 6 oz Rolled Cu also available with RO3003 5 mil laminates	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
RO3006™ RO3010™ *RO3206™ *RO3210™ *not available in 0.005" (0.127mm) and 0.010" (0.254mm)	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.025" (0.635mm) ± 0.001" 0.050" (1.270mm) ± 0.002" Additional non-standard thicknesses available between 0.005" and 0.250"	½, 1, 2 oz ED (18, 35, 70µm ED) ½, 1, 2oz (18, 35, 70µm) Reverse Treat ½, 1oz (18, 35µm) Ohmega Resistive Foil	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
*RO4003C™ RO4360G2™	0.008" (0.203mm) ± 0.001" 0.012" (0.305mm) ± 0.001" 0.016" (0.406mm) ± 0.0015" 0.020" (0.508mm) ± 0.0015" 0.032" (0.813mm) ± 0.002" 0.060" (1.524mm) ± 0.004" *Non-standard thicknesses available in 4 mil increments starting from a 20 mil base	½, 1, 2 oz ED (18, 35, 70µm ED) *½, 1 oz. LoPro™ reverse treated ED foil (18, 35µm LoPro reverse treated ED foil) LoPro foil will add .0007" (0.0177mm) to the board thickness ½ oz Ohmega and Ticer Resistive Foil available on RO4003C	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4350B™ / RO4835™	0.0040" (0.101mm) ± 0.0007" (RO4835 0.0040" available with LoPro foil only) 0.0066" (0.168mm) ± 0.0007" 0.010" (0.254mm) ± 0.001" 0.0133" (0.338mm) ± 0.0015" 0.0166" (0.422mm) ± 0.0015" 0.020" (0.508mm) ± 0.0015" 0.030" (0.762mm) ± 0.002" 0.060" (1.524mm) ± 0.004" *Non-standard thicknesses available in 3.3 mil increments starting from a 20 mil base	½, 1, 2 oz ED (18, 35, 70µm ED) ½, 1 oz. LoPro reverse treated ED foil (18, 35µm LoPro reverse treated ED foil) LoPro foil will add .0007" (0.0177mm) to the board thickness	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)

Antenna Grade Laminates

RO4533™	0.030" (0.762mm) ± 0.002" 0.040" (1.016mm) ± 0.002" 0.060" (1.524mm) ± 0.004"	½, 1 oz ED (18, 35µm ED)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
	0.0307" (0.780mm) ± 0.002" 0.0407" (1.034mm) ± 0.002" 0.0607" (1.542mm) ± 0.004"	½, 1 oz. LoPro reverse treated ED foil (18, 35µm LoPro reverse treated ED foil)	
RO4534™	0.032" (0.813mm) ± 0.002" 0.040" (1.016mm) ± 0.002" 0.060" (1.524mm) ± 0.004"	½, 1 oz ED (18, 35µm ED)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
	0.0327" (0.831mm) ± 0.002" 0.0407" (1.034mm) ± 0.002" 0.0607" (1.542mm) ± 0.004"	½, 1 oz. LoPro reverse treated ED foil (18, 35µm LoPro reverse treated ED foil)	
RO4535™	0.030" (0.762mm) ± 0.002" 0.040" (1.016mm) ± 0.002" 0.060" (1.524mm) ± 0.004"	½, 1 oz ED (18, 35µm ED)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4725JXR™	0.0307" (0.780mm) ± 0.002" 0.0607" (1.542mm) ± 0.004"	½ oz (17µm), 1 oz (35µm) LoPro reverse treated ED foil	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 24" X 36" (610mm X 915mm) 48" X 36" (1.224m X 915mm) Larger sizes may be available upon request
RO4730JXR™	0.0307" (0.780mm) ± 0.002" 0.0407" (1.034mm) ± 0.002" 0.0607" (1.542mm) ± 0.004"	½ oz (17µm), 1 oz (35µm) LoPro reverse treated ED foil	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 24" X 36" (610mm X 915mm) 48" X 36" (1.224m X 915mm) Larger sizes may be available upon request

Other dielectric thicknesses and panel sizes may be available. Contact customer service.





Ordering Information:

Rogers' high frequency laminates can be purchased by contacting a Rogers' Customer Service Representative at (480) 961-1382 or one of our international offices.

To ensure you receive the material for your application, please include order information for each of the categories listed below. For more detailed product information, refer to the charts in this product selector guide.

GRADE:

Laminates - RT/duroid® 5870, 5880, 5880LZ, 6002, 6202, 6202PR, 6010LM, 6035HTC, ULTRALAM 3000, TMM® 3,4,6,10, and 10i, XT/duroid®, RO3003™, RO3035™, RO3203™, RO3006™, RO3206™, RO3010™, RO3210™, RO4003C™, RO4360G2™, RO4350B™, RO4533™, RO4534™, RO4535™, RO4725JXR™, RO4730JXR™ and RO4835 high frequency laminates. Bonding Film -3001 Prepreg - RO3003, RO3006, RO3010, RO4403™, RO4450B™, RO4450F™, 2929 and RT/duroid 6002.

THICKNESS AND TOLERANCE:

Laminate thickness is normally specified as the dielectric thickness without copper cladding. Custom tolerances are available on RT/duroid laminates upon request.

TYPE OF FOIL CLADDING:

¼, ½, 1, 2 oz. electrodeposited copper foil, ½, 1, 2 oz. rolled copper foil. TMM and RO4000® series laminates are not supplied with ¼ oz. electrodeposited or rolled copper foil. Some material grades may be supplied unclad. Call Rogers' Customer Service Representatives for unclad options.

Thick aluminum, copper and brass claddings are available on Rogers RT/duroid laminates based on dielectric thickness. Thick aluminum and brass claddings are available on most TMM laminates. Thick metal cladding is not available on RO4000 laminates. Thick aluminum, copper, and brass claddings are also available in a range of thicknesses and thickness tolerances. Other thick metal backings are available upon request.

SPECIFICATION REQUIREMENTS:

Rogers material specs are applicable unless otherwise agreed upon.

Certificates of conformance are available.

All other requirements must be identified at the time the order is placed. If special testing or data generation is required, additional costs may be incurred.

ABOUT ADVANCED CIRCUIT MATERIALS

In our Advanced Circuit Materials Division, we manufacture high frequency laminates and prepregs for applications in the wireless base station, aerospace and defense, automotive, high-speed digital and advanced chip packaging industries. All of our products are manufactured in an ISO-9001:2008 certified facility.

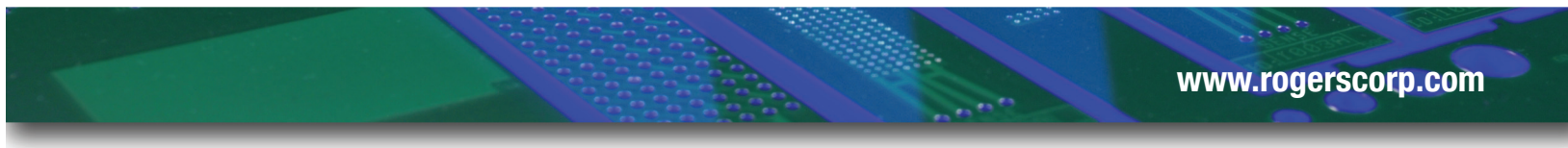
OUR CUSTOMERS

Our customers include Original Equipment Manufacturers (OEM) and printed circuit board fabricators (from quick-turn prototype shops to high volume corporations) for advanced electronic applications. We serve customers around the globe with manufacturing facilities and customer support in Asia, Europe, and North America.

HOW WE WORK WITH YOU

We work closely with your product designers to anticipate rapidly changing needs and technological advances, and we manufacture products to your exact performance requirements. We provide all the necessary training and technical support to ensure that our materials work in your processes. We are committed to helping you meet intense competition with unique high-performance solutions.





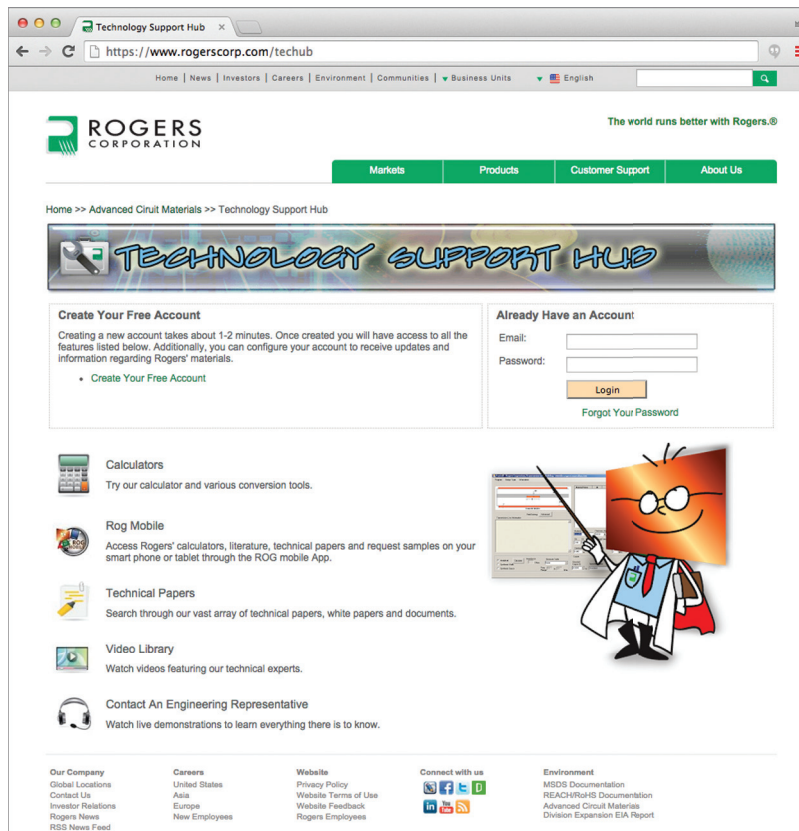
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Japan:	Rogers Japan Inc.	Tel: 81-3-5200-2700	Fax: 81-3-5200-0571
Taiwan:	Rogers Taiwan Inc.	Tel: 886-2-86609056	Fax: 886-2-86609057
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China:	Rogers International Trading Co., Ltd (Shanghai Office)	Tel: 86-21-62175599	Fax: 86-21-62677913
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For Rogers Ordering Terms and Conditions go to www.rogerscorp.com/pages/termsconditions.aspx

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