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 listed below.

To ensure that 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, 6002, 6202, 6006, 6010LM, ULTRALAM® 2000, ULTRALAM 3000, TMM® 3,4,6,10, and 10i, RO3003™, RO3035™, RO3203™, RO3006™, RO3206™ RO3010™, RO3210™, RO4003C™, and RO4350B™ high frequency laminates.
Bonding Film - 3001 **Prepreg -** RO4403™, RO4450B™ and RO4450F™

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, RO3000 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. 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:
Standard specifications are Rogers' material specifications. 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.

Standard Thickness, Tolerance and Panel Size in (mm)

Product	Standard Dielectric Thickness	Standard Panel Sizes
RO3003™ RO3035™ *RO3203™ *not available in 0.005" (0.127mm)	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.020" (0.508mm) ± 0.001" 0.030" (0.762mm) ± 0.0015" 0.060" (1.524mm) ± 0.003"	RO3003 12"X18" (305mm X 457mm) 24"X18" (610mm X 457mm) RO3203, RO3035 18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm) 18"X36" (457mm X 915mm) 18"X48" (457mm X 1.219m)
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" (0.625mm) ± 0.001" 0.050" (1.270mm) ± 0.002"	18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm) 18"X36" (457mm X 915mm) 18"X48" (457mm X 1.219m)
RO4003C™	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"	12"X18" (305mm X 457mm) 24"X18" (610mm X 457mm)
RO4350B™	0.0040" (0.101mm) ± 0.0007" 0.0066" (0.168mm) ± 0.0007" 0.0100" (0.254mm) ± 0.001" 0.0133" (0.338mm) ± 0.0015" 0.0166" (0.422mm) ± 0.0015" 0.0200" (0.508mm) ± 0.0015" 0.0300" (0.762mm) ± 0.002" 0.0600" (1.524mm) ± 0.004"	12"X18" (305mm X 457mm) 24"X18" (610mm X 457mm)
RT/duroid®5870 RT/duroid 5880	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.020" (0.508mm) ± 0.001" 0.031" (0.787mm) ± 0.001" 0.062" (1.570mm) ± 0.002" 0.125" (3.170mm) ± 0.004"	18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm) 18"X36" (457mm X 915mm) 18"X48" (457mm X 1.219m)
RT/duroid 6002 RT/duroid 6202	0.010" (0.254mm) ± 0.0007" 0.020" (0.508mm) ± 0.001" 0.030" (0.762mm) ± 0.001" 0.060" (1.524mm) ± 0.002"	18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm) 18"X36" (457mm X 915mm) 18"X48" (457mm X 1.219m)
RT/duroid 6006 RT/duroid 6010LM	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.025" (0.625mm) ± 0.001" 0.050" (1.270mm) ± 0.002" 0.075" (1.905mm) ± 0.004" 0.100" (2.540mm) ± 0.005"	18"X12" (457mm X 305mm) not available in 0.010" (0.254mm) 18"X24" (457 X 610mm) not available in 0.010" (0.254mm) 10"X10" (254mm X 254mm) 10"X20" (254mm X 508mm) 20"X20" (508mm X 508mm)
TMM®3 TMM 4	0.015" (0.381mm) ± 0.0015" 0.020" (0.508mm) ± 0.0015" 0.030" (0.762mm) ± 0.0015" 0.060" (1.524mm) ± 0.0015" 0.125" (3.175mm) ± 0.0015"	18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm)
TMM 6 TMM 10 TMM 10i	0.015" (0.381mm) ± 0.0015" 0.025" (0.625mm) ± 0.0015" 0.050" (1.270mm) ± 0.0015" 0.075" (1.905mm) ± 0.0015" 0.100" (2.540mm) ± 0.0015"	18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm)
ULTRALAM® 3000	0.001" (0.025mm) 0.002" (0.051mm) 0.004" (0.101mm)	18"X12" (457mm X 305mm) 18"X24" (457mm X 610mm)

Other thicknesses and panel sizes may be available. Contact customer service for more information.

CONTACT INFORMATION:

USA:	Rogers Advanced Circuit Materials, ISO 9002 certified	Tel: 480-961-1382	Fax: 480-961-4533
Belgium:	Rogers NV - Gent	Tel: 32-9-2353611	Fax: 32-9-2353658
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
Korea:	Rogers Korea Inc.	Tel: 82-31-716-6112	Fax: 82-31-716-6208
Singapore:	Rogers Technologies Singapore Inc.	Tel: 65-747-3521	Fax: 65-747-7425
China:	Rogers (Shanghai) International Trading Co., Ltd	Tel: 86-21-63916088	Fax: 86-21-63915060

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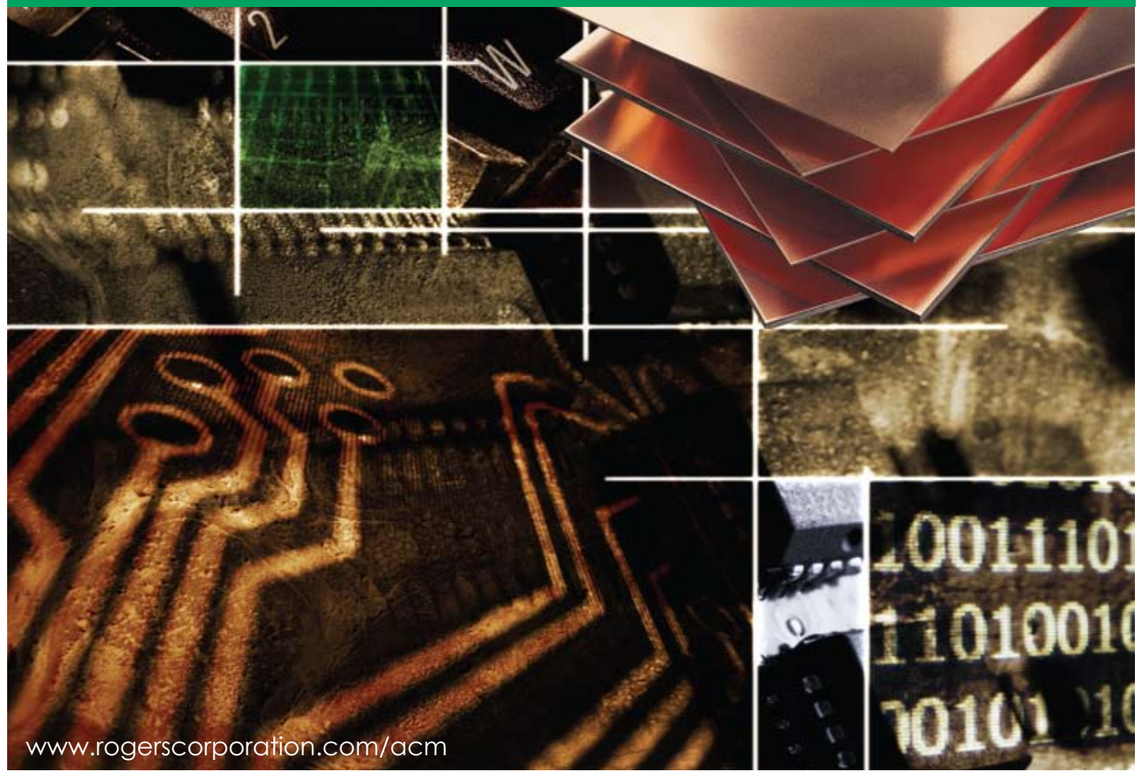
ROGERS CORPORATION

Advanced Circuit Materials

High Frequency Laminates

Product Selector Guide

The world runs better with Rogers.®



High Frequency Laminate Properties

Product	Composition	Dielectric[1] 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)	Youngs Modulus[3] kpsi (MPa) (Typical) X	Y	Z	Moisture[4] Absorption D24/23 % (Typical)	Thermal[5] Conductivity W/m/°K (Typical)	Coefficient of Thermal Expansion[6] 0° - 100°C ppm/°C (Typical) X	Y	Z	Density gm/cm^3 (Typical)	Peel Strength 1 oz (35 µm) EDC Foil lbs/in, (N/mm) (Typical)	Flammability Rating UL	Lead-Free Process Capability	Halogen Free
RO3003™	PTFE Ceramic	[7] 3.00 ± 0.04	0.0013	13	10^7	10^7	300 (2,068)	300 (2,068)	167 (1,151)	<0.1	0.50	17	17	24	2.1	17.6 (3.1)	94 V-0	YES	
RO3006™	PTFE Ceramic	6.15 ± 0.15	0.0020	-160	10^3	10^3	300 (2,068)	300 (2,068)	211 (1,455)	<0.1	0.61	17	17	24	2.6	12.2 (2.1)	94 V-0	YES	
RO3010™	PTFE Ceramic	10.2 ± 0.30	0.0023	-280	10^3	10^3	300 (2,068)	300 (2,068)	244 (1,682)	<0.1	0.66	17	17	24	3.0	13.4 (2.4)	94 V-0	YES	
RO3035™	PTFE Ceramic	3.50± 0.05	0.0017	-50° to 10°C -34 10°C to 150°C -11	10^7	10^7	300 (2,068)	300 (2,068)	181 (1,248)	<0.1	0.50	17	17	24	2.1	9.1 (1.6)	94 V-0	YES	
RO3203™	PTFE Ceramic Reinforced Woven Glass	[7] 3.02 ± 0.04	0.0016	13	10^7	10^7	140 (965)	140 (965)	129 (889)	<0.1	0.50	13	13	58	2.1	10 (1.7)	94 V-0	YES	
RO3206™	PTFE Ceramic Reinforced Woven Glass	6.15 ± 0.15	0.0027	-212	10^7	10^7	140 (965)	140 (965)	192 (1,324)	<0.1	0.63	13	13	34	2.7	7 (1.30)	94 V-0	YES	
RO3210™	PTFE Ceramic Reinforced Woven Glass	10.2 ± 0.50	0.0027	-459	10^4	10^4	140 (965)	140 (965)	223 (1,538)	<0.1	0.81	13	13	34	3.0	13 (2.4)	94 V-0	YES	
RO4003C™	Hydrocarbon Ceramic	Process Design [8] 3.38 ± 0.05 3.55	0.0027	+40	1.7 X 10^{10}	4.2 X 10^9	3,700 (25,510)	3,900 (26,889)	841 (5,800)	0.06	0.64	11	14	46	1.8	6.0 (1.1)	N/A	YES	YES
RO4350B™	Hydrocarbon Ceramic	Process Design 3.48 ± 0.05 3.66	0.0037	+50	1.2 X 10^9	5.7 X 10^9	TBD	1,664 (11.473)	798 (5,500)	0.06	0.62	14	16	35	1.9	5.2 (0.9)	94 V-0	YES	
RO4450B™	Hydrocarbon Ceramic Prepreg	Thickness 0.0036" 3.30 ± 0.05 0.004" 3.54 ± 0.05	0.0040	-50 to 60°C 21 60 to150°C -18	>2.5 X 10^{10}	1.9 X 10^8	N/A	N/A	N/A	0.05	0.60	19	17	50	1.86	N/A	94V-0	YES	
**RO4450F™	Hydrocarbon Ceramic Prepreg	3.52 ± 0.05	0.0040	TBD	TBD	TBD	N/A	N/A	N/A	0.09	0.65	19	17	50	1.83	N/A	94V-0	YES	
RT/duroid® 5870	PTFE Glass Fiber	2.33 ± 0.02	0.0012	-115	2 X 10^7	2 X 10^8	189 (1,340)	185 (1,277)	120 (828)	0.015	0.22	22	28	173	2.2	20.8 (3.7)	94V-0	YES	
RT/duroid® 5880	PTFE Glass Fiber	2.20 ± 0.02	0.0009	-125	2 X 10^7	3 X 10^7	156 (1,076)	125 (863)	136 (938)	0.015	0.20	31	48	237	2.2	22.8 (4.0)	94V-0	YES	
RT/duroid® 6002	PTFE Ceramic	2.94 ± 0.04	0.0012	+12	10^6	10^7	120 (828)	120 (828)	360* (2,482)	0.1	0.60	16	16	24	2.1	8.9 (1.6)	94V-0	YES	
RT/duroid® 6202	PTFE Ceramic Woven Glass	[9] 2.94± 0.04	0.0015	+13**	10^{10}	10^9	146 (1,007)	146 (1,007)	150 (1,035)	0.1	0.68	15	15	30	2.1	9.1 (1.6)	94V-0	YES	
RT/duroid® 6006	PTFE Ceramic	6.15 ± 0.15	0.0027	-410	2 X 10^7	7 X 10^7	91 (628)	75 (517)	155 (1,070)	0.05	0.48	47	34	117	2.7	14.3 (2.5)	94V-0	YES	
RT/duroid® 6010LM	PTFE Ceramic	10.2 ± 0.25	0.0023	-425	5 X 10^6	5 X 10^6	135 (932)	81 (559)	311 (2,146)	0.05	0.78	24	24	24	3.1	12.3 (2.1)	94V-0	YES	
TMM® 3	Hydrocarbon Ceramic	3.27 ± 0.032	0.0020	+37	3 X 10^9	>9 x 10^9	1,916 (13,210)	1,916 (13,210)	742 (5,116)	[4] 0.06	0.70	16	16	20	1.78	5.7 (1.0)	N/A	YES	YES
TMM® 4	Hydrocarbon Ceramic	4.50 ± 0.045	0.0020	-15.3*	6 X 10^8	1 x 10^9	2,000* (13,790)	2,000* (13,790)	752 (5,185)	0.07	0.70	14	14	20	2.07	5.7 (1.0)	N/A	YES	YES
TMM® 6	Hydrocarbon Ceramic	6.00 ± 0.08	0.0023	-11	1 X 10^8	1 x 10^9	2,200 (15,168)	2,200 (15,168)	736 (5,075)	0.06	0.72	16	16	20	2.37	5.7 (1.0)	N/A	YES	YES
TMM® 10	Hydrocarbon Ceramic	9.20 ± 0.23	0.0022	-38	2 X 10^8	4 X 10^7	2,400 (16,547)	2,400 (16,547)	575 (3,964)	0.09	0.76	16	16	20	2.77	5.0 (0.9)	N/A	YES	YES
TMM® 10i	Hydrocarbon Ceramic	9.80 ± 0.245	0.0020	-43	2 X 10^{8*}	4 X 10^{7*}	2,400* (16,547)	2,400* (16,547)	575* (3,964)	0.16	0.76	16	16	20	2.77	5.0 (0.9)	N/A	YES	YES
ULTRALAM® 2000	PTFE Woven Glass	2.40 - 2.60 ± 0.04	0.0019	-100	2 X 10^7	4 X 10^7	1,700 (11,730)	1,300 (8,970)	N/A	0.03	0.24	15	15	200	2.2	18.0 (3.2)	94 V-0	YES	
ULTRALAM® 3000	Liquid Crystalline Polymer	2.9	0.0024	TBD	1 x 10^{10}	1 X 10^{12}	2255 (327)	2255 (327)	N/A	0.04	0.5	17	17	150	1.4	0.95 (5.2)	VTM-0	YES	YES

Metal Claddings

Copper Foil	Surface Roughness Treated Side µin (µm)	Surface Roughness Untreated Side µin (µm)	Tensile Strength kpsi (MPa)	Elongation %	Stress Crack Resistance	Thickness - mils
¼ oz (9µm) Electrodeposited	70 (1.8)	15 (0.4)	N/A	N/A	Fair	0.4
½ oz (17.5µm) Electrodeposited	75 (1.9)	15 (0.4)	33.0 (228)	20.0	Fair	0.7
1 oz. (35µm) Electrodeposited	95 (2.4)	15 (0.4)	30.0 (207)	28.0	Fair	1.4
2 oz (70 µm) Electrodeposited	115 (2.9)	15 (0.4)	32.0 (221)	42.0	Fair	2.8
½ (17.5µm) Rolled	55 (1.4)	12 (0.3)	20.0 (138)	8.0	Excellent	0.7
1 oz. (35µm) Rolled	55 (1.4)	12 (0.3)	22.0 (152)	13.0	Excellent	1.4
2 oz (70µm) Rolled	55 (1.4)	12 (0.3)	28.0 (193)	27.0	Excellent	2.8

Plates	Alloy	Machinability	Tensile Strength kpsi (MPa)	Density	Thermal Conductivity	Coefficient of Thermal Expansion ppm/°C
Aluminum	6061	Poor	20 (138)	2.7	150	24
Brass	70/30 Cartridge	Good	45 (311)	8.5	120	20
Copper	110	Fair to Good	35 (242)	8.9	390	17

Properties Notes: *Estimated, ** Preliminary Data

1) Measured by IPC-TM-650 method 2.5.5.5 @ ~10 GHz, 23°C. RT/duroid 6010 materials were based on testing a 0.025" thick sheet, clad with 1 oz. electrodeposited copper foil. 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 25.4 mm stocked specimen.
4) Testing conditions: 24 hours @ 23°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 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) Dielectric constant typical value does not apply to 0.004 (0.101mm) laminates. Dielectric constant specification value of 0.004" RO4350B materials is 3.36 ± 0.05.
9) Due to construction limitations, the dielectric constant of 0.010" and 0.015" thick laminates is 3.02 ± 0.04".

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