

# High Frequency Materials

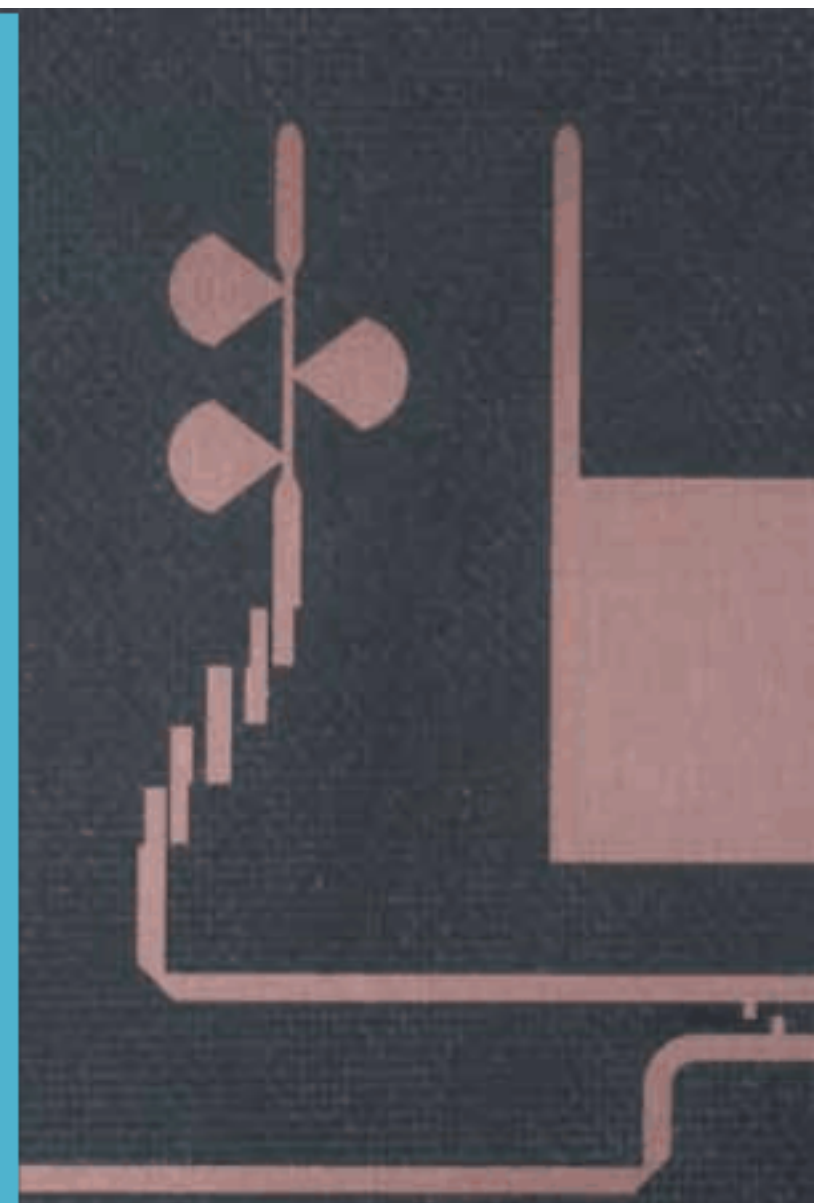
## **PRODUCT SELECTOR GUIDE**

# Custom Materials

## RT/duroid<sup>?</sup>, ULTRALAM<sup>?</sup>, TMM<sup>?</sup>, XT/duroid<sup>?</sup> High Frequency Laminates

Product	Dielectric Constant, $\epsilon_r$ @ 10 GHz (Typical)		Dissipation <sup>(1)</sup> Factor TAND @ 10 GHz (Typical)	Thermal <sup>(2)</sup> Coefficient of $\epsilon_r$ -50 ° C to 150 ppm/ ° C (Typical)	Volume Resistivity Mohm · cm (Typical)	Surface Resistivity Mohm (Typical)	Moisture <sup>(4)</sup> Absorption D48/50 % (Typical)
	Process <sup>(1)</sup>	Design <sup>(12)</sup>					
RT/duroid <sup>?</sup> 5870 PTFE Glass Fiber	2.33 ± 0.02	2.33	0.0012	-115	2 X 10 <sup>7</sup>	2 X 10 <sup>8</sup>	0.02
RT/duroid 5880 PTFE Glass Fiber	2.20 ± 0.02	2.20	0.0009	-125	2 X 10 <sup>7</sup>	3 X 10 <sup>7</sup>	0.02
RT/duroid 5880LZ Filled PTFE Composite	1.96 ± 0.04	1.96	0.0019	+22	2.1 X 10 <sup>7</sup>	2.6 X 10 <sup>6</sup>	0.22
RT/duroid 6002 PTFE Ceramic	2.94 ± 0.04	2.94	0.0012	+12	10 <sup>6</sup>	10 <sup>7</sup>	0.02
RT/duroid 6202 PTFE Ceramic Woven Glass Reinforced	<sup>(9)</sup> 2.94 ± 0.04	2.90	0.0015	-50**	10 <sup>10</sup>	10 <sup>9</sup>	0.04
RT/duroid 6202PR PTFE Ceramic Woven Glass Reinforced	2.90 - 3.00 ± 0.04	2.90 - 3.00	0.0015	-59**	10 <sup>10</sup>	10 <sup>9</sup>	0.03
RT/duroid 6010LM PTFE Ceramic	10.20 ± 0.25	10.9	0.0023	-425	5 X 10 <sup>5</sup>	5 X 10 <sup>6</sup>	0.01
TMM <sup>?</sup> 3 Hydrocarbon Ceramic	3.27 ± 0.032	3.39	0.0020	+37	1 X 10 <sup>13</sup>	1 x 10 <sup>12</sup>	<sup>(11)</sup> 0.06
TMM 4 Hydrocarbon Ceramic	4.50 ± 0.045	4.50	0.0020	+15	1 X 10 <sup>10*</sup>	1 x 10 <sup>11*</sup>	<sup>(11)</sup> 0.07
TMM 6 Hydrocarbon Ceramic	6.00 ± 0.08	6.00	0.0023	-11	1 X 10 <sup>9*</sup>	1 x 10 <sup>11*</sup>	<sup>(11)</sup> 0.06
TMM 10 Hydrocarbon Ceramic	9.20 ± 0.23	9.56	0.0022	-38	2 X 10 <sup>8</sup>	8 X 10 <sup>10</sup>	<sup>(11)</sup> 0.09
TMM 10i Hydrocarbon Ceramic	9.80 ± 0.245	9.96	0.0020	*-43	2 X 10 <sup>8</sup>	7 X 10 <sup>8</sup>	<sup>(11)</sup> 0.16
ULTRALAM <sup>?</sup> 2000 PTFE Woven Glass	2.40 - 2.60 ± 0.04	2.40 - 2.60	0.0019	-100	2 X 10 <sup>7</sup>	4 X 10 <sup>7</sup>	0.03
ULTRALAM 3850 Liquid Crystalline Polymer	2.90	3.05	0.0025	+24	1 x 10 <sup>10</sup>	1 X 10 <sup>12</sup>	0.04
XT/duroid <sup>?</sup> 8000 High Temperature Thermoplastic/ Ceramic	3.34 ± 0.05	-	0.0035	+7	10 <sup>10</sup>	10 <sup>8</sup>	0.20

Thermal <sup>(5)</sup> Conductivity W/m/ ° K (Typical) 80 ° C ASTM C518	Coefficient of Thermal Expansion <sup>(6)</sup> 0 ° - 100 ° C ppm/ ° C (Typical)			Peel Strength 1 oz (35mm) EDC Foil lbs/in. (N/mm) (Typical)	Density gm/cm <sup>3</sup> (Typical)	Flammability Rating UL 94	Lead-Free <sup>(10)</sup> Process Compatible
	X	Y	Z				
0.22	22	28	173	27.2 (4.8)	2.2	V-0	YES
0.20	31	48	237	31.2 (5.5)	2.2	V-0	YES
0.33	44	43	41	>4.0	1.4	V-0	YES
0.60	16	16	24	8.9 (1.6)	2.1	V-0	YES
0.68	15	15	30	9.1 (1.6)	2.1	V-0	YES
0.68	15	15	30	14.3 (2.5)	2.7	V-0	YES
0.86	24	24	47	12.3 (2.1)	3.1	V-0	YES
0.70	15	15	23	6.1 (1.1)	1.8	NON FR	YES
0.70	16	16	21	6.0 (1.0)	2.1	NON FR	YES
0.72	18	18	26	6.2 (1.1)	2.4	NON FR	YES
0.76	21	21	20	5.1 (0.9)	2.8	NON FR	YES
0.76	19	19	20	4.8 (0.8)	2.8	NON FR	YES
0.24	15	15	200	18.0 (3.2)	2.2	V-0	YES
0.20	17	17	150	5.2 (0.95)	1.4	VTM-0	YES
0.35	18	23	68	5.0 (0.88)	1.5	VTM-0	YES



# Commercial Grade Materials

## RO3000<sup>?</sup> series, RO3200<sup>?</sup> series, RO4000<sup>?</sup> series High Frequency Laminates

Product	Dielectric Constant, $\epsilon_r$ @ 10 GHz (Typical)		Dissipation <sup>(1)</sup> Factor TAND @ 10 GHz (Typical)	Thermal <sup>(2)</sup> Coefficient of $\epsilon_r$ -50 ° C to 150 ppm/ ° C (Typical)	Volume Resistivity Mohm · cm (Typical)	Surface Resistivity Mohm (Typical)	Moisture <sup>(4)</sup> Absorption D48/50 % (Typical)
	Process <sup>(1)</sup>	Design <sup>(12)</sup>					
RO3003 <sup>?</sup> PTFE Ceramic	<sup>(7)</sup> 3.00 ± 0.04	3.00	0.0013	11	10 <sup>12</sup>	10 <sup>11</sup>	0.05
RO3006 <sup>?</sup> PTFE Ceramic	6.15 ± 0.15	6.50	0.0020	-160	10 <sup>3</sup>	10 <sup>3</sup>	0.02
RO3010 <sup>?</sup> PTFE Ceramic	10.20 ± 0.30	11.20	0.0022	-280	10 <sup>12</sup>	10 <sup>11</sup>	0.05
RO3035 <sup>?</sup> PTFE Ceramic	3.50 ± 0.05	3.60	0.0018	-50 ° to 10 ° C 10 ° C to 150 ° C	10 <sup>7</sup>	10 <sup>7</sup>	0.08
RO3203 <sup>?</sup> PTFE Ceramic Woven Glass Reinforced	<sup>(7)</sup> 3.02 ± 0.04	3.02	0.0016	-75	10 <sup>7</sup>	10 <sup>7</sup>	0.06
RO3206 <sup>?</sup> PTFE Ceramic Woven Glass Reinforced	6.15 ± 0.15	6.60	0.0027	-212	10 <sup>7</sup>	10 <sup>7</sup>	0.05
RO3210 <sup>?</sup> PTFE Ceramic Woven Glass Reinforced	10.20 ± 0.50	10.80	0.0027	-459	10 <sup>4</sup>	10 <sup>4</sup>	0.13
RO4003C <sup>?</sup> Hydrocarbon Ceramic	<sup>(8)</sup> 3.38 ± 0.05	3.55	0.0029	+40	1.7 X 10 <sup>10</sup>	4.2 X 10 <sup>9</sup>	0.04
RO4350B <sup>?</sup> Hydrocarbon Ceramic	3.48 ± 0.05	3.66	0.0037	+50	1.2 X 10 <sup>9</sup>	5.7 X 10 <sup>9</sup>	0.05
RO4360 <sup>?</sup> Hydrocarbon Ceramic	6.15 ± 0.15	6.15	0.0038	-120	1.3 X 10 <sup>12</sup>	3.1 X 10 <sup>11</sup>	0.12
RO4350B <sup>?</sup> -TX Hydrocarbon Ceramic	3.48 ± 0.05	3.66	0.0034	67	1.2 X 10 <sup>10</sup>	5.7 X 10 <sup>9</sup>	0.05
SYRON <sup>®</sup> 7000 High Temperature Thermoplastic/Ceramic	3.40 max		0.0045	+7	10 <sup>10</sup>	10 <sup>8</sup>	0.20

Properties Notes: \*Estimated, \*\* Preliminary Data

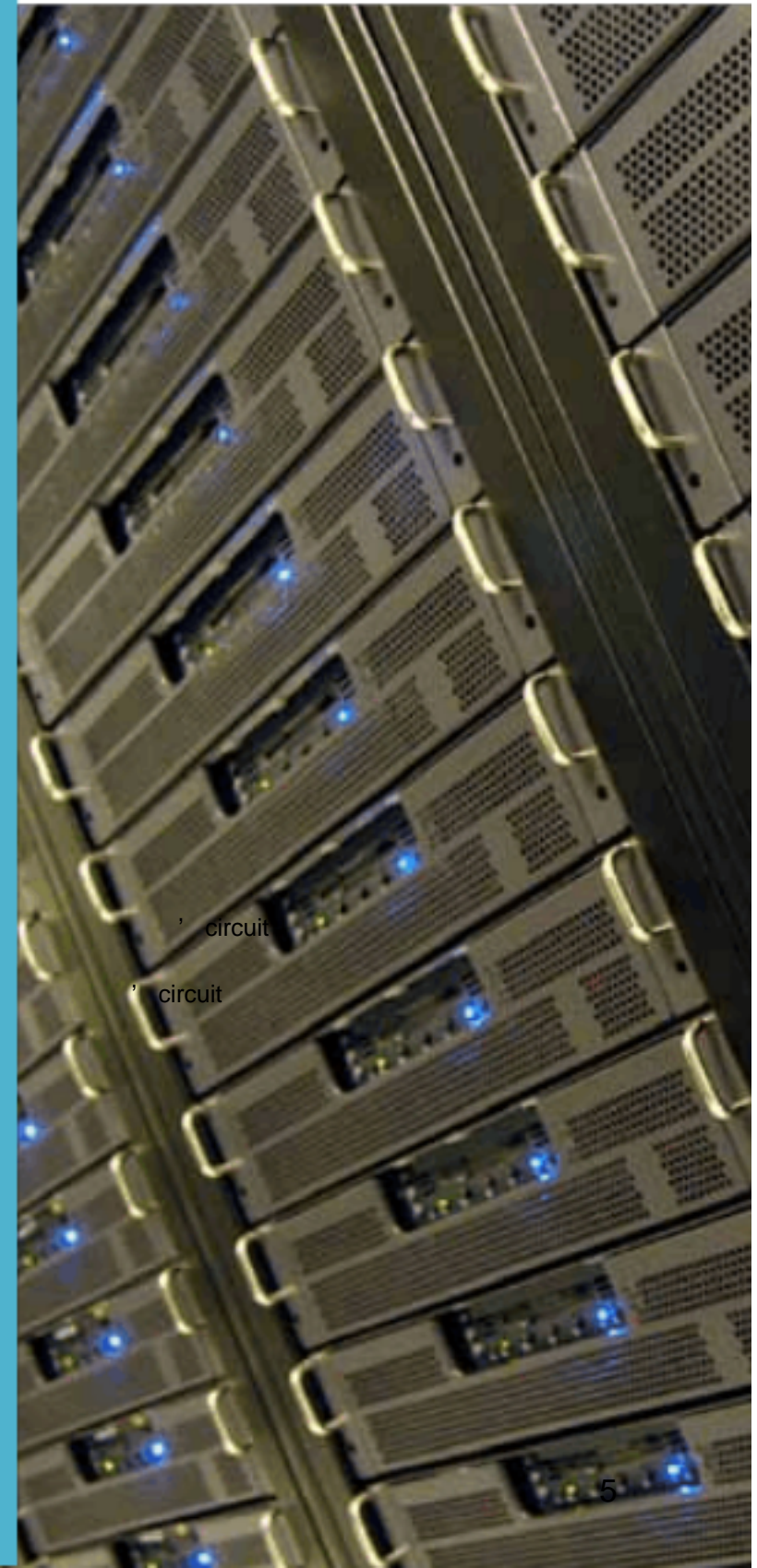
- 1) Measured by IPC-TM-650 method 2.5.5.5 @ ~10 GHz, 23 ° C. RT/duroid 6010 materials were based on testing a 0.025" thick sheet, clad with 1 oz. electrodeposited copper foil.  $\epsilon_r$  values and tolerance reported by IPC-TM-650 method 2.5.5.5 are the basis for quality acceptance, but for some 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) Dielectric constant typical value does not apply to 0.004 (0.101mm) laminates. Dielectric constant specification value of 0.004" RO4350B materials is 3.33
- 9) Due to construction limitations, the dielectric constant of 0.010" and 0.015" thick laminates is 3.02 ± 0.04".
- 10) Rogers' high frequency laminates and prepregs are lead-free process compatible and in accordance with IEC 61249-2-21.
- 11) TMM<sup>?</sup> material test conditions D24/50 (twenty-four hours at 50 ° C) on 0.050" (1.27mm) thick specimens.
- 12) The design DK is an average number from several different tested lots of material and on the most common thickness/s. If more detailed information is required please contact Rogers Corporation. Refer to Rogers' technical paper "Dielectric Properties of High Frequency Materials" available at [www.rogerscorp.com/acm](http://www.rogerscorp.com/acm).

Thermal <sup>(5)</sup> Conductivity W/m/ ° K (Typical) 80 ° C ASTM C518	Coefficient of Thermal Expansion <sup>(6)</sup> 0 ° - 100 ° C ppm/ ° C (Typical)			Peel Strength 1 oz (35mm) EDC Foil lbs/in. (N/mm) (Typical)	Density <sup>3</sup> gm/cm <sup>3</sup> (Typical)	Flammability Rating UL 94	Lead-Free <sup>(10)</sup> Process Compatible
	X	Y	Z				
0.50	17	16	25	12.7 (2.2)	2.1	V-0	YES
0.79	17	17	24	7.1 (1.2)	2.6	V-0	YES
0.95	13	11	16	9.4 (1.6)	2.8	V-0	YES
0.50	17	17	24	9.1 (1.6)	2.1	V-0	YES
0.48	13	13	58	10.2 (1.8)	2.1	V-0	YES
0.67	13	13	34	10.7 (1.9)	2.7	V-0	YES
0.81	13	13	34	11 (1.9)	3.0	V-0	YES
0.71	11	14	46	6.8 (1.2)	1.8	NON FR	YES
0.69	14	16	35	5.5 (0.96)	1.9	V-0	YES
0.80	17	15	30	5.0 (0.88)	2.2	V-0 Pending	YES
0.62	14	16	35	5.7 (1.0)	1.9	V-0	YES
0.35	18	23	68	5.0 (0.88)	1.5	VTM-0	YES

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 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 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

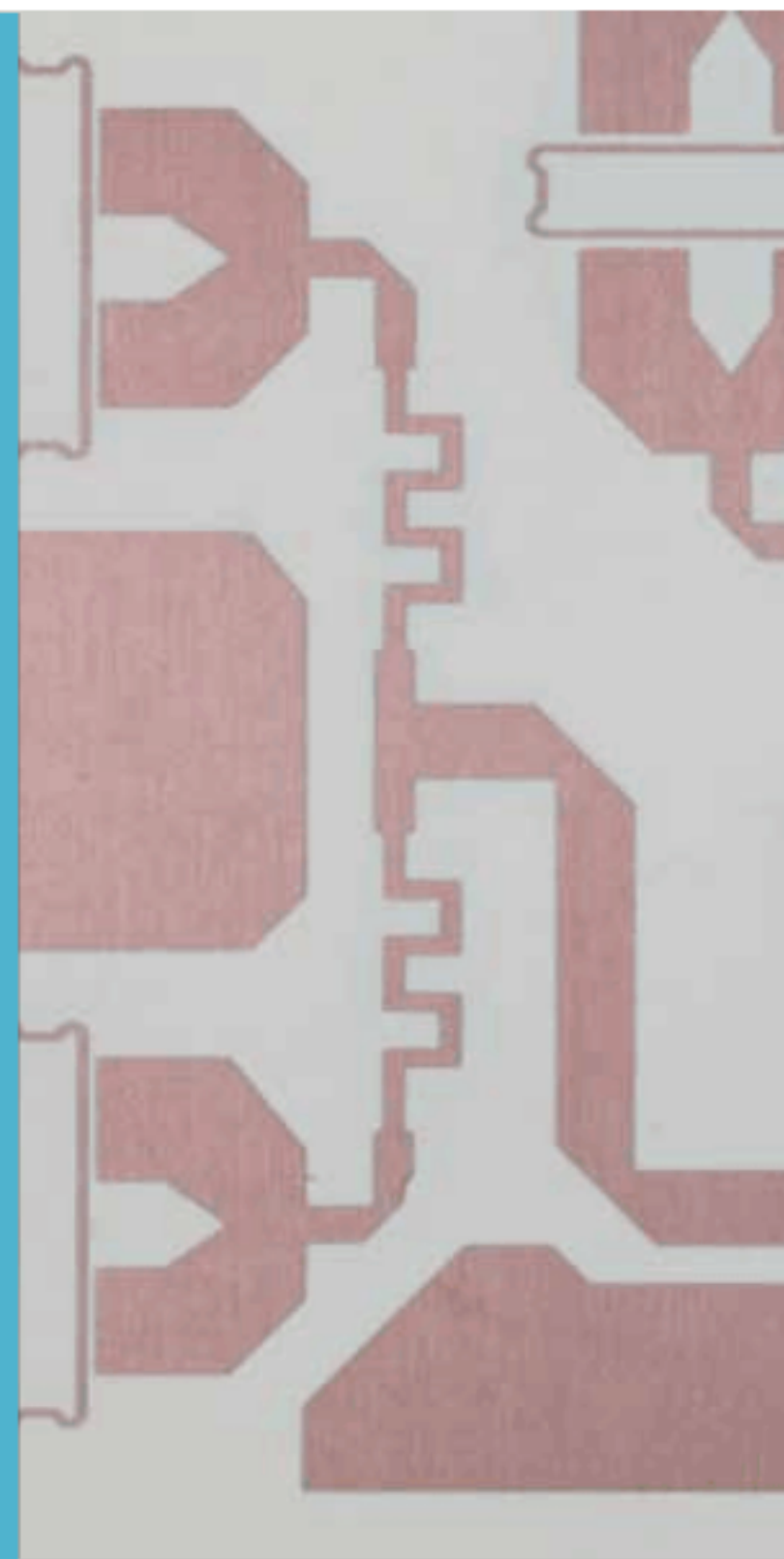
## RO3730<sup>?</sup>, RO4500<sup>?</sup> series, RO4730<sup>?</sup> Laminates

Product	Dielectric Constant, $\epsilon_r$ @ 10 GHz (Typical)		Dissipation <sup>(1)</sup> Factor TAND @ 2.5 GHz 10 GHz (Typical)	Thermal <sup>(2)</sup> Coefficient of $\epsilon_r$ -50 ° C to 150 ° C ppm/ ° C (Typical)	Volume Resistivity Mohm ? cm (Typical)	Surface Resistivity Mohm (Typical)	Moisture <sup>(4)</sup> Absorption D48/50 % (Typical)
	Process <sup>(1)</sup>	Design <sup>(12)</sup>					
RO3730 <sup>?</sup> PTFE Ceramic	3.00 ± 0.06	3.00	0.0013 0.0016	-20	10 <sup>12</sup>	10 <sup>11</sup>	0.04
RO4730 <sup>?</sup> Hydrocarbon Ceramic	3.00 ± 0.08	3.00	0.0023 0.0033	+22	1.3 X 10 <sup>4</sup>	5.5 X 10 <sup>2</sup>	0.13
RO4533 <sup>?</sup> Hydrocarbon Ceramic	3.30 ± 0.08	3.45	0.0020 0.0029	+40	1.1 X 10 <sup>10</sup>	9.9 X 10 <sup>8</sup>	0.02
RO4534 <sup>?</sup> Hydrocarbon Ceramic	3.40 ± 0.08	-	0.0022 0.0030	+40	1.7 X 10 <sup>10</sup>	4.2 X 10 <sup>9</sup>	0.06

## Prepreg and Bonding Film

Product	Dielectric <sup>(1)</sup> Constant, $\epsilon_r$ (Typical)	Dissipation <sup>(1)</sup> Factor TAND @ 2.5 GHz 10 GHz (Typical)	Volume Resistivity Mohm ? cm (Typical)	Moisture <sup>(4)</sup> Absorption D48/50 % (Typical)	Thermal <sup>(5)</sup> Conductivity W/m/ ° K (Typical) 80 ° C ASTM C518	
3001 Bonding Film	2.28	0.003	10 <sup>11</sup>	0.05	0.22	
RO3003 <sup>?</sup> Ceramic PTFE Bond-ply	3.00 ± 0.04	0.0013	10 <sup>12</sup>	0.05	0.50	
RO3006 <sup>?</sup> Ceramic PTFE Bond-ply	6.15 ± 0.15	0.0020	10 <sup>3</sup>	0.02	0.79	
RO3010 <sup>?</sup> Ceramic PTFE Bond-ply	10.20 ± 0.30	0.0022	10 <sup>12</sup>	0.03	0.95	
RT/duroid <sup>?</sup> 6002 Ceramic PTFE Bond-ply	2.94 ± 0.04	0.0012	10 <sup>6</sup>	<0.10	0.60	
RO4450B <sup>?</sup> Hydrocarbon Ceramic Prepreg	Thickness 0.0036"	3.30 ± 0.05	0.0043	9.26 X 10 <sup>7</sup>	0.09	0.60
	0.004"	3.54 ± 0.05	0.0040	9.26 X 10 <sup>7</sup>	0.08	0.60
RO4450F <sup>?</sup> Hydrocarbon Ceramic Prepreg	3.52 ± 0.05	0.0041	8.93 X 10 <sup>8</sup>	0.07	0.65	
ULTRALAM <sup>?</sup> 3908 LCP Bonding film	2.90	0.0025	2.6 X 10 <sup>14</sup>	0.04	0.20	

Thermal <sup>(6)</sup> Conductivity W/m/ ° K (Typical) 80 ° C ASTM C518	Coefficient of Thermal Expansion <sup>(6)</sup> 0 ° - 100 ° C ppm/ ° C (Typical)			Peel Strength 1 oz (35mm) EDC Foil lbs/in. (N/mm) (Typical)	Density gm/cm <sup>3</sup> (Typical)	Flammability Rating UL 94	PIM dBc Range
	X	Y	Z				
0.45	11	12	65	10.5 (1.8)	2.1	V-0 pending	-162 to -169
0.52	19	17	40	6.1 (1.0)	1.5	NON FR	-153 to -169
0.60	13	11	37	6.9 (1.2)	1.8	NON FR	-153 to -163
0.60	11	14	46	6.3 (1.1)	1.8	NON FR	-153 to -163



Coefficient of Thermal Expansion <sup>(6)</sup> 0 ° - 100 ° C ppm/ ° C (Typical)			Density gm/cm <sup>3</sup> (Typical)	Flammability Rating UL 94	Lead-Free <sup>(10)</sup> Process Compatible
X	Y	Z			
17	16	25	2.1	V-0	YES
17	17	24	12.2	V-0	YES
13	11	16	2.8	V-0	YES
16	16	24	2.1	V-0	YES
19	17	60	1.8	V-0	YES
19	17	50	1.9	V-0	YES
19	17	50	1.85	V-0	YES
17	17	150	1.4	VTM-0	YES



# Metal Claddings

Foil Type	Weight or Thickness	Surface Roughness Rq ( $\mu$ m)		Products
		Treated Side	Untreated Side	
Rolled	1 oz (35mm)	0.4	0.3	RO3003 <sup>?</sup> , RO3006 <sup>?</sup> , RO3010 <sup>?</sup> , RO3035 <sup>?</sup> , RO3203 <sup>?</sup> , RO3206 <sup>?</sup> , RO3210 <sup>?</sup>
	? oz. (18 mm)	0.3	0.3	RT/duroid <sup>?</sup> 5870, 5880, 6002, 6202, 6006, 6010LM, ULTRALAM 2000 laminates
Electrodeposited	1 oz (35mm)	2.1	0.5	RO3003, RO3006, RO3010, RO3035, RO3203, RO3206, RO3210
	? oz. (18 mm)	1.8	0.4	RT/duroid 5870, 5880, 6002, 6202, 6006, 6010LM
	? oz. (9 mm)	0.8	0.4	ULTRALAM 2000 TMM <sup>?</sup> 3,4, 6,10, 10i laminates
Electrodeposited Low Profile Reverse Treated	18mm	0.5	0.4	ULTRALAM 3000, SYRON 7000, XT/duroid <sup>?</sup> 8000 laminates
	12mm	0.5	0.4	
	9mm	0.5	0.3	
Electrodeposited	2 oz. (70mm)	3.7	0.4	RO4003C <sup>?</sup> , RO4350B <sup>?</sup> , RO4360 <sup>?</sup> , RO4533 <sup>?</sup> , RO4534 <sup>?</sup> , RO4350B-TX laminates
	1 oz. (35mm)	3.4	0.5	
	? oz. (18 mm)	2.8	0.4	
LoPro <sup>?</sup> Foil	1 oz. (35mm)	0.6	1.1	RO4003C, RO4350B, RO4533 <sup>?</sup> , RO4534 <sup>?</sup> , RO4535 <sup>?</sup> , RO4730 <sup>?</sup> laminates
	? oz. (18 mm)	0.5	0.6	
Resistive Foil	TCR Thin Film Resistor Foil ? oz. (18 mm)	2.8	0.4	RO4003C, RO4350B laminates
	OhmegaPly <sup>?</sup> Resistor-Conductor Material 25 ohms ? oz (18 mm)	2.2	0.5	RO4003C laminates
	OhmegaPly Resistor-Conductor Material 25 ohms ? oz. (18 mm)	1.0	0.3	RO3003, RO3006, RO3010, RO3035, RO3203, RO3206, RO3210, RT/duroid 5870, 5880, 6002, 6202, 6006, 6010LM laminates

Property	Electrodeposited (EDC)				Rolled (RLD)		
	? oz (8 mm)	0.5 oz (18mm)	1 oz. (35mm)	2 oz (70mm)	0.5 oz (18mm)	1 oz. (35mm)	2 oz.(70mm)
Tensile Strength, kpsi	15	33	40	40	20	22	28
Elongation, %*	2	2	3	3	8	13	27
Vol Resistivity Mohm ? cm		1.66	1.62	1.62	1.78	1.74	1.74
Thickness: in (mm)	0.0004 (0.0102)	0.0007 (0.0178)	0.0014 (0.0356)	0.0028 (0.0711)	0.0004 (0.0102)	0.0007 (0.0178)	0.0028 (0.0711)

Plates	Alloy	Machinability	Density gm/cm <sup>3</sup>	Thermal Conductivity W/m/oK	Coefficient of Thermal Expansion pm/oC
Aluminum	6061	Poor	2.7	150	24
Brass	70/30 Cartridge	Good	8.5	120	20
Copper	110	Fair to Good	0.9	390	17z



# Standard Thickness, Tolerance & Panel Size in (mm)

## High Frequency Laminates

PRODUCT	STANDARD DIELECTRIC THICKNESS (WITHOUT THE CLADDING)	STANDARD CLADDINGS	STANDARD PANEL SIZES
RT/duroid <sup>®</sup> 5870 RT/duroid 5880	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.015" (0.381mm) ± 0.001" 0.020" (0.508mm) ± 0.001" 0.031" (0.787mm) ± 0.001" 0.062" (1.570mm) ± 0.002" 0.125" (3.175mm) ± 0.004"	?, ?, 1, 2 oz EDC, (8.5, 18, 35, 70 mm EDC) ?, 1, 2 oz Rolled Cu (18, 35, 70 mm Rolled Cu)  Thick metal AL, Cu, BR	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" (0.256mm) ± 0.001 0.020" (0.508mm) ± 0.001 0.025" (0.625mm) ± 0.0015 0.030" (0.762mm) ± 0.002 0.040" (1.026mm) ± 0.002 0.050" (1.270mm) ± 0.003 0.100" (2.540mm) ± 0.005 Other thicknesses available in 10mil increments.	?, 1 oz EDC (18 mm, 35 mm EDC)	12" X 18" (305 X 457mm) 24" X 18" (610 X 457mm) 24" X 54" (610 X 1.37m)
RT/duroid 6002 RT/duroid 6202 *RT/duroid 6202PR	*0.005" (0.127mm) ± 0.0005" *0.010" (0.254mm) ± 0.0007" *0.020" (0.508mm) ± 0.001" *0.030" (0.762mm) ± 0.001" 0.060" (1.524mm) ± 0.002" 0.120" (3.048mm) ± 0.004"	?, ?, 1, 2 oz EDC, (8.5, 18, 35, 70 mm EDC) ?, 1, 2 oz Rolled Cu (18, 35, 70 mm Rolled Cu) *?, 1 oz (18, 35 mm) resistive foil  Thick metal AL, Cu, BR	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 6006 RT/duroid 6010LM	0.005" (0.127mm) ± 0.0005" 0.010" (0.254mm) ± 0.0007" 0.025" (0.635mm) ± 0.001" 0.050" (1.270mm) ± 0.002" 0.075" (1.905mm) ± 0.004" 0.100" (2.540mm) ± 0.005"	?, ?, 1, 2 oz EDC (8.5, 18, 35, 70 mm EDC) ?, 1, 2 oz Rolled Cu (17, 35, 70 mm Rolled Cu)  Thick metal AL, Cu, BR	18" X 12" (457mm X 305mm) not available in 0.005" (0.127mm) and 0.010" (0.254mm) 18" X 24" (457 X 610mm) not available in 0.005" (0.127mm) and 0.010" (0.254mm) 10" X 10" (254mm X 254mm) 10" X 20" (254mm X 508mm) 20" X 20" (508mm X 508mm)
TMM <sup>®</sup> 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"	?, 1, 2 oz EDC (18, 35, 70 mm EDC)  Thick metal AL, BR	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)
TMM 6 TMM 10 TMM 10i TMM 13i	0.015" (0.381mm) ± 0.0015" 0.025" (0.635mm) ± 0.0015" 0.050" (1.270mm) ± 0.0015" 0.075" (1.905mm) ± 0.0015" 0.100" (2.540mm) ± 0.0015"	?, 1, 2 oz EDC (18, 35, 70 mm EDC)  Thick metal AL, BR	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)
ULTRALAM <sup>®</sup> 2000	0.004" (0.101mm) ± 0.0004 0.0101" (0.256mm) ± 0.0009 0.0147" (0.373mm) ± 0.001 0.0190" (0.482mm) ± 0.001 0.030" (0.762mm) ± 0.001 0.060" (1.524mm) ± 0.002	?, 1, 2 oz EDC (8.5, 18, 35, 70 mm EDC) ?, 1, 2 oz Rolled Cu (18, 35, 70 mm Rolled Cu)	18" X 12" (457 X 305mm) 18" X 24" (457 X 610mm) 18" X 36" (457 X 915mm) 18" X 48" (457 X 1.219m)
ULTRALAM 3850	0.001" (0.025mm) ± 12.5% 0.002" (0.051mm) ± 12.5% 0.004" (0.101mm) ± 12.5%	?, 1 oz (18, 35 mm) EDC 9mm very low profile reverse treat EDC foil	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)
XT/duroid <sup>®</sup> 8000	0.002" (0.051mm) ± 12.5%	? (18 mm) very low profile reverse treat EDC foil	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)

## Prepreg and Bonding Film

3001 Bonding Film Thermoplastic	.0015" (0.038mm)	N/A	12" X 50' Roll (304mm X 152.4m)
ULTRALAM 3908 (LCP) Bond-ply	.001" (0.025mm) .002" (0.051mm)	N/A	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
RO3003 <sup>®</sup> Bond-ply	.005" (0.127mm)	N/A	25.5" X 18"
RO3006 <sup>®</sup> /RO3010 <sup>®</sup> Bond-ply	.005" (0.127mm)	N/A	25.5" X 18"
RO4450B <sup>®</sup> Prepreg	.0036" (0.091mm) .004" (0.102mm)	N/A	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4450F <sup>®</sup> Prepreg	.004" (0.102mm)	N/A	

# Standard Thickness, Tolerance & Panel Size in (mm)

## High Frequency Laminates

PRODUCT	STANDARD DIELECTRIC THICKNESS (WITHOUT THE CLADDING)	STANDARD CLADDINGS	STANDARD PANEL SIZES
RO3003 <sup>?</sup> RO3035 <sup>?</sup> *RO3203 <sup>?</sup> *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"	?, 1, 2 oz EDC (18, 35, 70 mm EDC) ?, 1, 2 oz Rolled Cu (18, 35, 70 mm Rolled Cu)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
RO3006 <sup>?</sup> RO3010 <sup>?</sup> *RO3206 <sup>?</sup> *RO3210 <sup>?</sup> *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"	?, 1, 2 oz EDC (18, 35, 70 mm EDC)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm)
*RO4003C <sup>?</sup> RO4360 <sup>?</sup>	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"	?, 1, 2 oz EDC (18, 35, 70 mm EDC)  *?, 1 oz. LoPro <sup>?</sup> reverse treated EDC foil (18, 35 μm LoPro reverse treated EDC 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)
RO4350B <sup>?</sup>	0.0040" (0.101mm) ± 0.0007" 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"	?, 1, 2 oz EDC(18, 35, 70 mm EDC)  ?, 1 oz. LoPro reverse treated EDC foil (18, 35 μm LoPro reverse treated EDC 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)
SYRON <sup>?</sup> 7000	0.002" (0.051mm) ± 12.5%	? (18mm) very low profile reverse treat EDC foil	18" X 12" (457mm X 305mm) 18" X 24" (457mm X 610mm)

## Antenna Grade Laminates

RO3730 <sup>?</sup>	0.030" (0.762mm) ± 0.0015" 0.060" (1.524mm) ± 0.003"	1 oz. Rolled Cu (35mm Rolled CU)	24" X 18" (610mm X 457mm) 24" X 54" (610mm X 1.37m)
RO4533 <sup>?</sup>	0.030" (0.762mm) ± 0.002" 0.040" (1.016mm) ± 0.002" 0.060" (1.524mm) ± 0.004"  0.0307" (0.780mm) ± 0.002" 0.0407" (1.034mm) ± 0.002" 0.0607" (1.542mm) ± 0.004"	?, 1 oz EDC (18, 35 mm EDC)  ?, 1 oz. LoPro reverse treated EDC foil (18, 35mm LoPro reverse treated EDC foil)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4534 <sup>?</sup>	0.032" (0.813mm) ± 0.002" 0.040" (1.016mm) ± 0.002" 0.060" (1.524mm) ± 0.004"  0.0327" (0.831mm) ± 0.002" 0.0407" (1.034mm) ± 0.002" 0.0607" (1.542mm) ± 0.004"	?, 1 oz EDC (18, 35 mm EDC)  ?, 1 oz. LoPro reverse treated EDC foil (18, 35mm LoPro reverse treated EDC foil)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4535 <sup>?</sup>	0.030" (0.762mm) ± 0.002" 0.040" (1.016mm) ± 0.002" 0.060" (1.524mm) ± 0.004"	?, 1 oz EDC (18, 35 mm EDC)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)
RO4730 <sup>?</sup>	0.0327"(0.831mm) ± 0.002" 0.0607"(1.542mm) ± 0.004"	?, 1 oz. LoPro reverse treated EDC foil (18, 35mm LoPro reverse treated EDC foil)	12" X 18" (305mm X 457mm) 24" X 18" (610mm X 457mm) 48" X 36" (1.220m X 914mm)

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, 6002, 6202, 6202PR, 6006, 6010LM, ULTRALAM 2000, ULTRALAM 3000, TMM 3,4,6,10, and 10i, XT/duroid, SYRON, RO3003, RO3035, RO3203, RO3006, RO3206, RO3010, RO3210, RO4003C, RO4360 and RO4350B high frequency laminates. Bonding Film -3001 Prepreg - RO3003, RO3006, RO3010, RO4403, RO4450B, RO4450F 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:

1/2, 1, 2 oz. electrodeposited copper foil, 1/2, 1, 2 oz. rolled copper foil. TMM and RO4000 series laminates are not supplied with 1/2 oz. electrodeposited or rolled copper foil. Some material grades may be supplied unclad. Call Rogers 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.

## 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 with "ahead of the curve" process technology.

## 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.



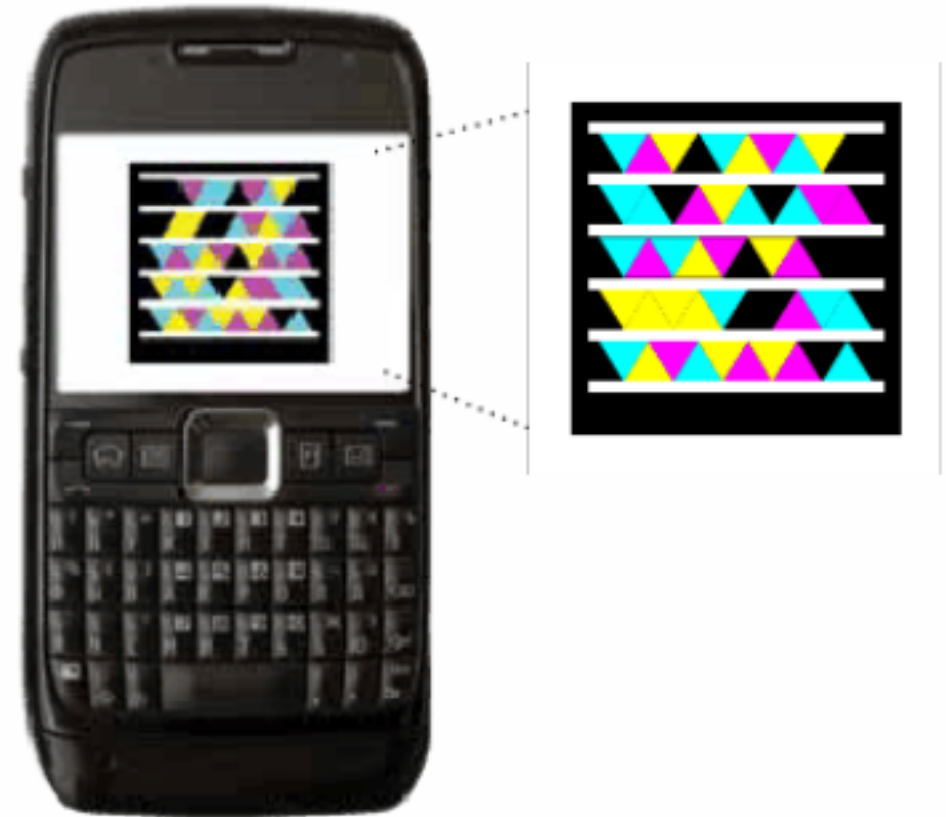


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To receive the latest version of Rogers' impedance calculator, go to the following website:  
[www.rogerscorp.com/acm/downloads/mwi](http://www.rogerscorp.com/acm/downloads/mwi)

## Contact Information:

USA:	Rogers Advanced Circuit Materials, ISO 9002 certified	Tel: 480-961-1382	Fax: 480-961-4533
Belgium:	Rogers BVBA - Belgium	Tel: 32-9-2353611	Fax: 32-9-2353658
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China:	Rogers International Trading Co., Ltd (Beijing Office)	Tel: 86-10-5820-7667	Fax: 86-10-5820-7997
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