



# AD Series™ Antenna Materials

## AD250C™, AD255C™, AD260A™, AD300D™, AD320A™, and AD350A™ Laminate Materials

The AD Series™ antenna materials from Rogers Corporation are high performance, specialty materials that are specifically engineered and manufactured to meet the demands of today's wireless antenna markets. Increase antenna performance requirements are a constant trend in the market today. Rogers has the materials needed to meet the design needs of this market both today and into the future.

The AD Series antenna products are glass-reinforced, PTFE based materials that provide controlled dielectric constant, low loss performance, and very good passive intermodulation (PIM) performance. The woven glass reinforcement affords good circuit processability and enables high yield circuit board fabrication.

The AD Series antenna products are manufactured to meet the wide variety of dielectric constant options that are needed for today's antenna requirements. Dielectric constant options are available at 2.50, 2.55, 2.60, 3.00, 3.20, and 3.50 with a typical tolerance of  $\pm 0.05$ . The variety of options and tight control help to enable the circuit to meet the desired impedance every time.

All AD Series antenna products are manufactured with standard electrodeposit (ED) and reverse treated ED copper foil options. This provides choices that are sufficient to help reduce both circuit losses and antenna PIM. Typical PIM values using reverse treated ED copper foil are  $-159$  dB at 30 mil thickness and  $-163$  dB at 60 mil thickness. These are typical values obtained using the extensive PIM testing capability at Rogers at 1900 MHz using a two tone, reflectometer method on a  $50\Omega$  microstrip test vehicle.

Additionally, the AD Series antenna products are produced in a wide variety of thicknesses. Some products such as the AD250™ laminate are available from 10 mils through 250 mils. Others are more selective and offer fewer options. Please consult with your sales engineer or customer service representative for assistance in selecting the material options that are suitable for your application.

Lastly, as PTFE based composites, the AD Series antenna materials have very low loss (typically less than 0.002 at 10 GHz), very low moisture absorption (less than 0.1%), and very high copper peel strength (greater than 10 pli).

These features combine together to make the AD Series laminates an ideal choice for antenna applications.

## Data Sheet



### FEATURES AND BENEFITS:

Low loss tangent ( $< 0.002$  at 10 GHz)

- Excellent circuit performance in all typical wireless frequency bands

Controlled dielectric constant ( $\pm 0.05$ )

- Repeatable circuit performance

Very low PIM ( $-159$  dB at 30 mil, 1900 MHz)

- Excellent antenna performance and reduce yield loss due to PIM related issues

Excellent dimensional stability

- Repeatable circuit performance and improve manufacturing yields

### TYPICAL APPLICATIONS:

- Cellular infrastructure base station antenna
- Automotive telematics antenna systems
- Commercial satellite radio antenna

Electrical Properties <sup>(1)</sup>	AD250C	AD255C	AD260A	Units	Test Conditions		Test Method
PIM (30mil/60mil) <sup>(2)</sup>	-159/-163	-159/-163	-159/-163	B <sub>c</sub>	Reflecte 43 Bm swept tones at 1900 MHz, S1/S1		Rogers Internal 50 ohm
Dielectric Constant (process)	2.52	2.55	2.60	-	23°C @ 50% RH	10 GHz	IPC TM-650 2.5.5.5 (IPC TM-650 2.5.5.3)
Dielectric Constant (design)	2.50	2.60	2.65	-	C-24/23/50	10 GHz	Microstrip Differential Phase Length
Dissipation Factor (process)	0.0013	0.0013	0.0017	-	23°C @ 50% RH	10 GHz	IPC TM-650 2.5.5.5
Thermal Coefficient of Dielectric Constant	-117	-110	-148	ppm/°C	0°C to 100°C	10 GHz	IPC TM-650 2.5.5.5
Volume Resistivity	4.8 x 10 <sup>8</sup>	7.4 x 10 <sup>8</sup>	1.1 x 10 <sup>9</sup>	Mohm-cm	C-96/35/90	-	IPC TM-650 2.5.17.1
Surface Resistivity	4.1 x 10 <sup>7</sup>	3.6 x 10 <sup>7</sup>	5.3 x 10 <sup>7</sup>	Mohm	C-96/35/90	-	IPC TM-650 2.5.17.1
Electrical Strength (dielectric strength)	979	911	1072	V/mil	-	-	IPC TM-650 2.5.6.2
Dielectric Break down	>40	>40	>40	kV	D-48/50	X/Y direction	IPC TM-650 2.5.6
<b>Thermal Properties<sup>(1)</sup></b>							
Decomposition Temperature (T)	>500	>500	>500	°C	2hrs @ 105°C	5% Weight Loss	IPC TM-650 2.3.40
Coefficient of Thermal Expansion - x	47	34	46	ppm/°C	-	-55°C to 288°C	IPC TM-650 2.4.41
Coefficient of Thermal Expansion - y	29	26	73	ppm/°C	-	-55°C to 288°C	IPC TM-650 2.4.41
Coefficient of Thermal Expansion - z	196	196	250	ppm/°C	-	-55°C to 288°C	IPC TM-650 2.4.41
Thermal Conductivity	0.33	0.35	0.34	W/mK	-	z direction	ASTM D5470
Time to Delamination	>60	>60	>60	minutes	as-receive	288°C	IPC TM-650 2.4.24.1
<b>Mechanical Properties<sup>(1)</sup></b>							
Copper Peel Strength after Thermal Stress	2.6 (14.8)	2.4 (13.6)	2.5 (14.3)	N/mm (lbs/in)	10s @288°C	35 µm foil	IPC TM-650 2.4.8
Flexural Strength (MD/CMD)	8.8/6.4 (60.7/44.1)	8.8/6.4 (60.7/44.1)	11.8/10.2 (81.4/70.3)	MPa (ksi)	25°C ± 3°C	-	ASTM D790
Tensile Strength (MD/CMD)	6.0/5.6 (41.4/38.6)	8.1/6.6 (55.8/45.5)	15.0/13.0 (103.4/89.6)	MPa (ksi)	23°C/50% RH	-	ASTM D3039/D3039-14
Flex Modulus (MD/CMD)	885/778 (6,102/5,364)	930/818 (6,412/5,640)	1,071/1,074 (7,384/7,405)	MPa (ksi)	25°C ± 3°C	-	IPC-TM-650 Test Method 2.4.4
Dimensional Stability (MD/CMD)	0.02/0.06	0.03/0.07	0.16/0.20	mils/inch	after etch + bake	-	IPC-TM-650 2.4.39a
<b>Physical Properties<sup>(1)</sup></b>							
Flammability	V-0						



