ARLON
MICROWAVE MATERIALS

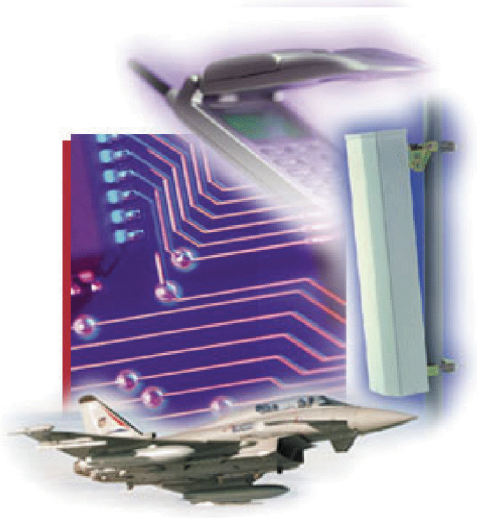
PIM

Reduced Passive Intermodulation (PIM)

Features:
- Designed to Reduce PIM Distortion
- Optimized Copper/Laminate Interface

Benefits:
- Greatly reduces the production of new, unwanted signal frequency components
- Improved Receiver Performance
- Measured PIM values < -155 dBc

Typical Applications:
- A single site with two or more base station transceivers
- High Transmitter signals levels
- High Receiver sensitivity
- Transmitters and receivers sharing a common antenna



Arlon's reduced Passive Intermodulation (PIM) laminates are a series of woven fiberglass reinforced Teflon (PTFE) composite materials designed for use as printed circuit laminates. They have been engineered to reduce the contribution of the base laminate to Passive Intermodulation loss and distortion in finished microwave constructions, for example, antennas and filters.

This reduction is the result of optimizing the interface between the copper and laminate, specifically controlling copper surface morphology and treatment, as well as the laminate construction and processing. The result is a series of materials that demonstrate reductions in PIM of up to 20dB in both microstrip testing and finished antennas vs. standard laminates. Typical values achieved with Arlon reduced PIM laminates are -155dB or better, when tested as described below.

PIM Performance Test: The following test was conducted to determine the performance of Arlon's reduced PIM laminates: Microstrip test vehicles (12 inch 50 ohm line) and finished antennas were tested using a Summitek Passive Intermodulation Distortion Analyzer. The power level used was two tones with each carrier at 20 watts (+43dBm). The 3rd Order Intermodulation Product was measured in dBc (dB below the carrier peak). The testing was performed at 1.90 Ghz. Please note that many factors in both microstrip and antenna testing have a significant impact on PIM results, particularly the print and etch quality of the pcb as well as all elements of the workmanship in the assembly of the microstrip test vehicle or finished antenna. This testing sought to hold these variables constant to isolate the effect of the laminate on intermodulation values.

Typical Properties: PIM Laminates

Property	Test Method	Condition	AD PIM 250	AD PIM 300	AD PIM 320	AD PIM 350	DiClad 880-PIM
Dielectric Constant	IPC TM-650 2.5.5.5	C23/50	2.5	3.0	3.2	3.5	2.17,
Dissipation Factor	IPC TM-650 2.5.5.5	C23/50	0.0018	0.003	0.003	0.003	0.0009
Thermal Coefficient of Er (ppm/°C)	IPC TM-650 2.5.5.5	-10°C to + 140°C	-110	-110	-110	-110	-160
Peel Strength 1/2 ounce lbs per inch	IPC TM-650 2.4.8	n/a	15	15	15	15	12
Peel Strength 1 ounce lbs per inch	IPC TM-650 2.4.8	n/a	17	17	17	17	12
Volume Resistivity (MΩ-cm)	IPC TM-650	C96/35/90	1.2×10^9	1.2×10^9	1.2×10^9	1.2×10^9	1.4×10^9
Surface Resistivity (MΩ)	IPC TM-650	C96/35/90	4.5×10^7	4.5×10^7	4.5×10^7	4.5×10^7	2.9×10^6
Arc Resistance	ASTM D-495	D48/50	>180	>180	>180	>180	>180
Tensile Modulus (kpsi)	ASTM D-638	A, 23°C	706, 517	706, 517	706, 517	706, 517	267, 202
Tensile Strength (kpsi)	ASTM D-882	A, 23°C	20.9, 17.3	20.9, 17.3	20.9, 17.3	20.9, 17.3	8.1, 7.5
Compressive Modulus	ASTM D-695	A, 23°C	365	365	365	365	237
Flexural Modulus (kpsi)	ASTM D-790	A, 23°C	540	540	540	540	357
Dielectric Strength (kV)	ASTM D-149	D48/50	>45	>45	>45	>45	>45
Density (g/cm^3)	IPC TM-650 2.6.2.2	E1/105 + D24/23	2.40	2.40	2.40	2.40	2.23
Coefficient of Thermal Expansion (ppm/°C) X Axis Y Axis Z Axis		0°C to 100°C	 12 15 95	 12 15 95	 12 15 95	 12 15 95	 25 34 252
Thermal Conductivity	ASTM E-1225	100°C	0.235	0.235	0.235	0.235	0.261
Flammability	UL 94	C48/23/50, E24/125	94V-0	94V-0	94V-0	94V-0	94V-0
Water Absorption (%)	IPC TM-650 2.6.2.2	IPC TM-650 2.6.2.2	0.07	0.07	0.07	0.07	0.02

Material Availability:

Arlon's reduced PIM laminates are currently available as follows:

PRODUCT	Dk (@ 10 GHz)	Df (@ 10 GHz)	Thickness
DiClad 880-PIM	2.17, 2.20	0.0009	0.031"/0.062"
AD250-PIM	2.5	0.0018	0.031"/0.062"
AD300-PIM	3.0	0.003	0.031"/0.062"
AD320-PIM	3.2	0.003	0.062"
AD350-PIM	3.5	0.003	0.030

Results listed above are typical properties; they are not to be used as specification limits. The above information creates no expressed or implied warranties. The properties of Arlon laminates may vary, depending on the design and application.

ARLON
MATERIALS FOR ELECTRONICS

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