Your Dreams, Our Challenge

EZ-IO Next Generation PTFE Laminate

EZ-IO is a thermally stable composite based on nanotechnology and PTFE. The uniformity granted by the nanotechnology enables consistent layer to layer registration that is on par with the best FR4 materials. Although EZ-IO has a very low level of fiberglass content (~5%), some fabrication characteristics are similar to working with glass. Due to the nanotechnology reinforcement, there is no more than 0.18% dielectric constant variation PWB to PWB for a given channel. EZ-IO was created for (1) the next generation of digital circuitry where digital signal processing chips (SERDES) are at or beyond 25 gbps and cannot tolerate unpredictable dielectric constant variation and (2) microwave applications operating at increasingly higher speeds where there is a need to merge both the digital and microwave circuitry onto one PWB.

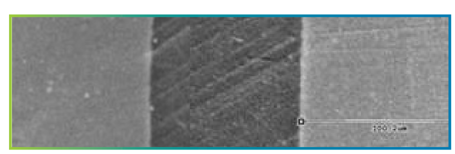
EZ-IO is best combined with AGC's FR-28-0040-50S (DF=0.0018 @ 10 GHz) non-reinforced prepreg to achieve a stripline channel having 2-3 wt% fiberglass. AGC's *fast*Rise™ prepregs are the lowest loss prepregs commercially available that can be laminated at FR4-like 420°F lamination temperatures. The combined low insertion loss of EZ-IO/*fast*Rise™ is only rivaled by the fusion bonding of pure PTFE laminates, an expensive process which causes excessive movement and puts stress on plated through holes. *fast*Rise™ enables the sequential lamination of EZ-IO at a low 420°F. Although the insertion loss properties of EZ-IO rival that of pure PTFE bonding, EZ-IO was developed to challenge the best FR4 materials at the fabricator level in the most difficult 30-40 layer multilayer digital applications.

Three of the largest fabricator costs are yield, material and consumables (such as drill bits). Drill bit costs can exceed material costs for complex PWBs. Drill time is another significant cost depending on fabricator capacity. EZ-IO was designed to have similar hits/bit as typical FR4 materials and an acceptable drill fabrication window much wider than traditional PTFE based composites. EZ-IO can be bonded with the flattest of available copper types, rolled copper, HVLP or standard copper types.

Benefits & Applications:

- Nanotechnology Based PTFE Laminate
- Drill Quality of FR4 (1000+ Hits/Bit)
- Registration of FR4
- Extremely Low Fiberglass Content (~5%)
- 0.18% Dielectric Constant Variation within a lot
- Standard with Flat, HVLP or Rolled Copper
- Temperature Stable DK
- Capable of 40+ Layer Large Format PWBs
- CAF Resistant

- Semiconductor Testing at 25 gbps and Higher
- Test and Measurement
- Optical Data Transport and Backplane Routers
- Hybrid FR4 PWBs Combining Microwave and Digital Signals
- Space and Defense



Mechanically drilled hole in EZ-IO (not yet plated).

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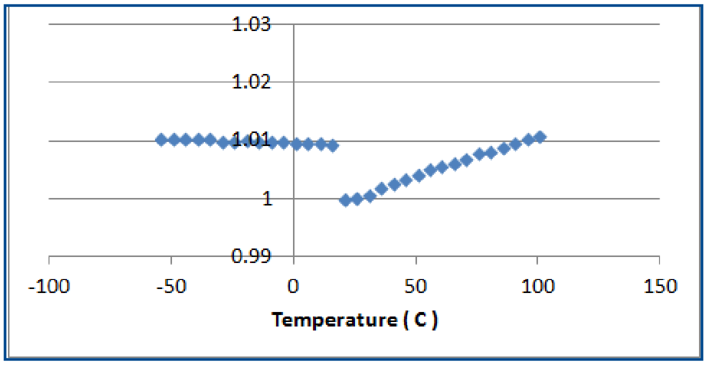
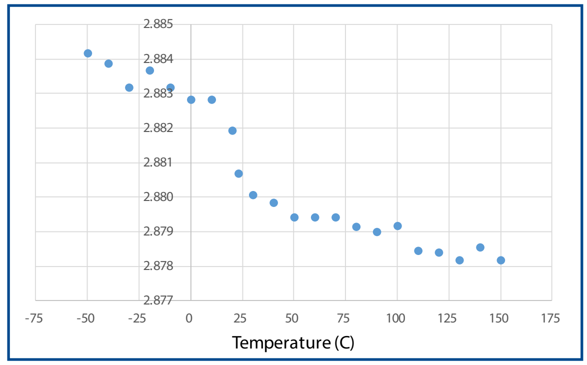
Dependence of Dielectric Properties on Temperature:

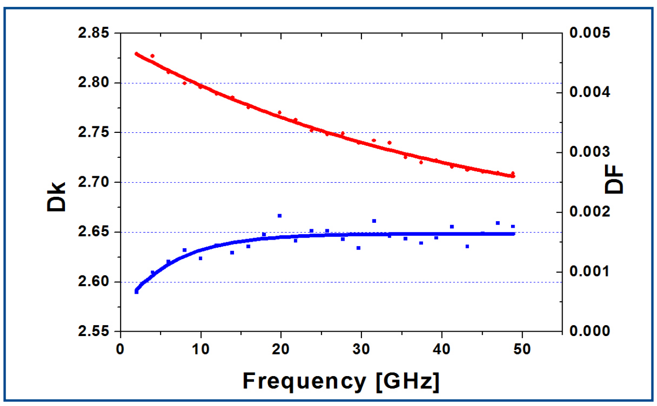


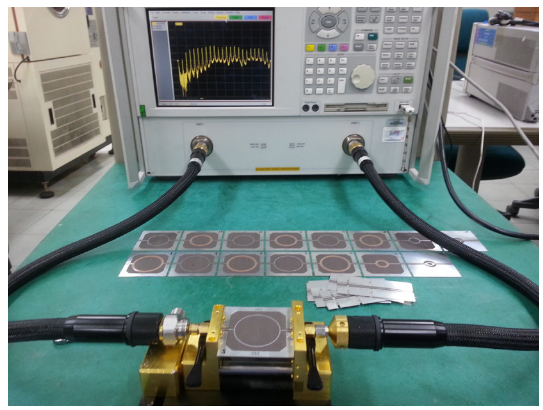
Normalized DK by using a Stripline Cavity Resonator



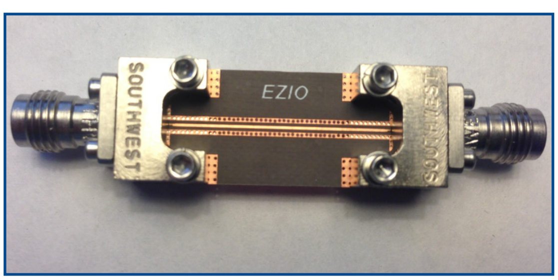
DK by Full Sheet Resonance Testing

EZ-IO Temperature Dependence of DK by IPC 2.5.5.5.1 (left) and 2.5.5.6 (right)



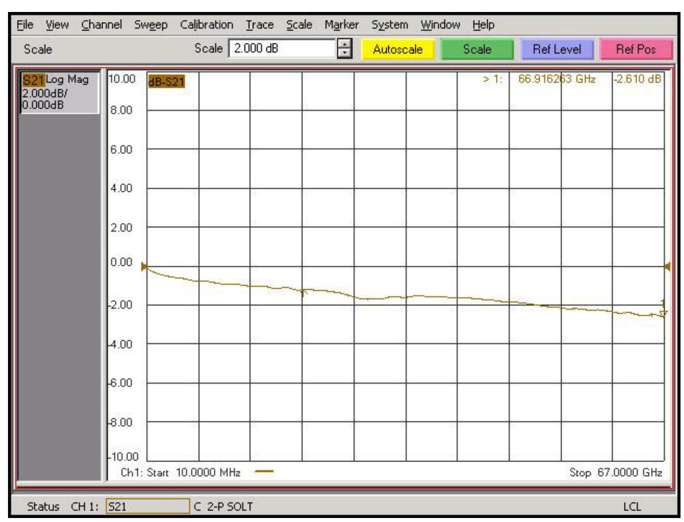


EZ-IO DK and DF vs. Frequency Measured by a Ring Resonator



Microstrip insertion loss of EZ-IO-0050
(2.61 dB/in at 67 Ghz) using Southwest
Connectors (12.45 mil trace width, 0.5 oz HVLP)

Southwest: 1892-04A-5
(1.85 mm female end launch, pin .005D, diel. .0290D)



EZ-IO-0050 Typical Values					
Property	Test Method	Unit	Value	Unit	Value
Dielectric Thickness*		mil	5	mm	.13
Dk @ 10 GHz	IPC-650 2.5.5.5.1 (Modified)		2.80		2.80
Df @ 10 GHz	IPC-650 2.5.5.5.1 (Modified)		0.0012		0.0012
T_cK		ppm/ °C	2.24	ppm/ °C	2.24
Resin Content		%	93	%	93
Dielectric Breakdown	IPC-650 2.5.6/ASTM D149	kV	46.4	kV	46.4
Dielectric Strength	IPC-650 2.5.6/ASTM D149	V/mil	743	V/mm	29,252
Arc Resistance	IPC-650 2.5.1	Seconds	420	Seconds	420
Moisture Absorption	IPC-650 2.6.2.1	%	0.12	%	0.12
Tensile Strength (MD)	IPC-650 2.4.19/ASTM D3039	psi	12,200	N/mm^2	52,800
Tensile Strength (CD)	IPC-650 2.4.19/ASTM D3039	psi	5,680	N/mm^2	39.16
Tensile Modulus (MD)	IPC-650 2.4.19/ASTM D3039	kpsi	766	N/mm^2	5,281
Tensile Modulus (CD)	IPC-650 2.4.19/ASTM D3039	kpsi	576	N/mm^2	3,971
Elongation at Break (MD)	IPC-650 2.4.19/ASTM D3039	%	2.47	%	2.47
Elongation at Break (CD)	IPC-650 2.4.19/ASTM D3039	%	2.25	%	2.25
Poisson's Ratio (MD)	IPC-650 2.4.19/ASTM D3039		0.251		0.251
Poisson's Ratio (CD)	IPC-650 2.4.19/ASTM D3039		0.195		0.195
Compressive Modulus	ASTM D695 (23 °C)	psi	289,000	N/mm^2	1,993
Flexural Strength (MD)	IPC-650 2.4.4/ASTM D790	psi	16,200	N/mm^2	111.70
Flexural Strength (CD)	IPC-650 2.4.4/ASTM D790	psi	7,850	N/mm^2	54.12
Flexural Modulus (MD)	IPC-650 2.4.4/ASTM D790	kpsi	710	N/mm^2	4,895
Flexural Modulus (CD)	IPC-650 2.4.4/ASTM D790	kpsi	478	N/mm^2	3,296
Peel Strength (0.5 oz. HVLP)	IPC-650 2.4.8, sec. 5.2.2	lbs/in	5 - 7	N/mm	0.9 - 1.2
Peel Strength (1 oz. HVLP)	IPC-650 2.4.8, sec. 5.2.2	lbs/in	5 - 7	N/mm	0.9 - 1.2
Thermal Conductivity	ASTM E1530 / ASTM E1461	W/M*K	0.42/0.61	W/M*K	0.42/0.61
Dimensional Stability (MD)	IPC-650 2.4.39, sec. 5.4 (After Bake)	mils/inch	0.38	mm/M	0.38
Dimensional Stability (CD)	IPC-650 2.4.39, sec. 5.4 (After Bake)	mils/inch	0.46	mm/M	0.46
Dimensional Stability (MD)	IPC-650 2.4.39, sec. 5.5 (TS)	mils/inch	0.30	mm/M	0.30
Dimensional Stability (CD)	IPC-650 2.4.39, sec. 5.5 (TS)	mils/inch	0.40	mm/M	0.40
Surface Resistivity (ET)	IPC-TM-650	Mohms	1.04×10^7	Mohms	1.04×10^7
Surface Resistivity (HC)	IPC-TM-650	Mohms	4.33×10^7	Mohms	4.33×10^7
Volume Resistivity (ET)	IPC-TM-650	Mohms/cm	5.49×10^7	Mohms/cm	5.49×10^7
Volume Resistivity (HC)	IPC-TM-650	Mohms/cm	1.43×10^7	Mohms/cm	1.43×10^7
CTE (X axis) (RT- 125 °C)	IPC-650 2.4.41/TMA	ppm/°C	13	ppm/°C	13
CTE (Y axis) (RT- 125 °C)	IPC-650 2.4.41/TMA	ppm/°C	24	ppm/°C	24
CTE (Z axis) (RT- 125 °C)	IPC-650 2.4.41/TMA	ppm/°C	63	ppm/°C	63
Density (Specific Gravity)	ASTM D792	g/cm^3	2.15	g/cm^3	2.15
Hardness	ASTM D2240 (Shore D)	J/gK	75.1	J/gK	75.1

* Available in 5 mil increments

All values are for single ply construction.

All reported values are typical and should not be used for specification purposes. In all instances, the user shall determine suitability in any given application.

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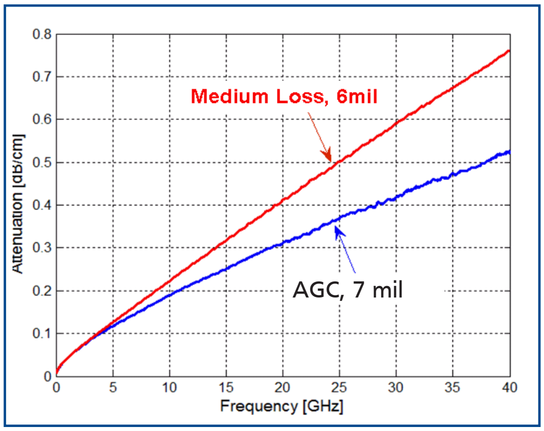
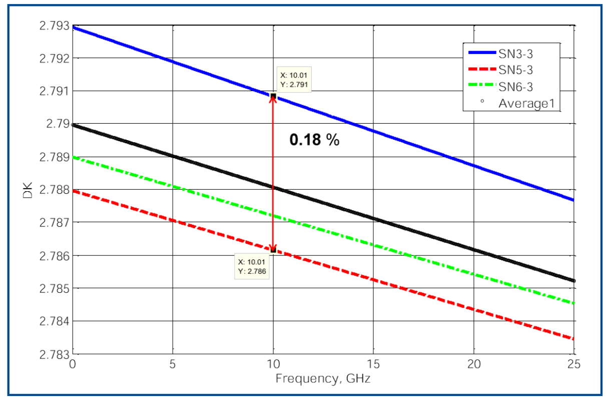
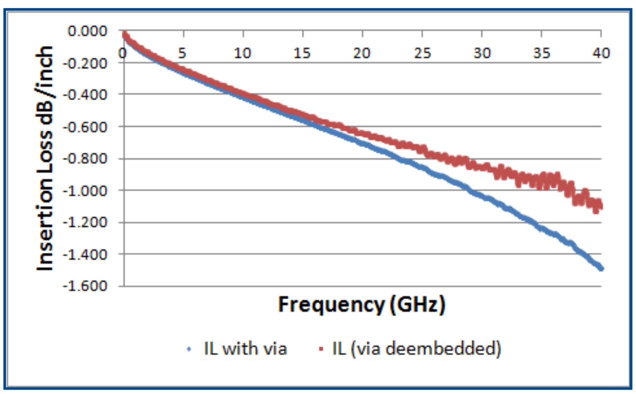
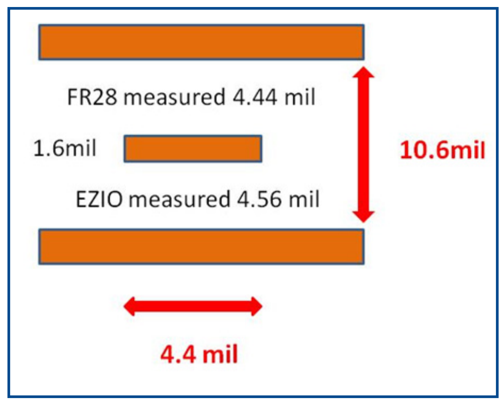


Insertion loss comparison of a benchmark Japanese high speed digital material vs. an AGC comparable matching stripline structure on the same test vehicle, trace widths indicated above (*fast*Rise™ prepreg).

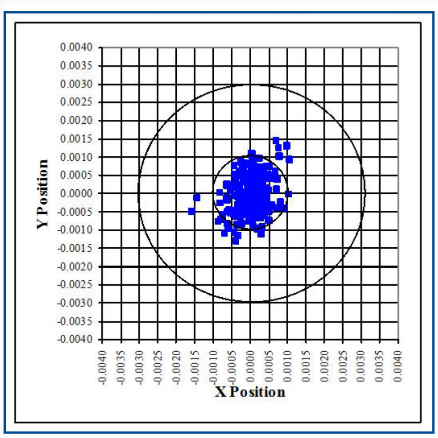


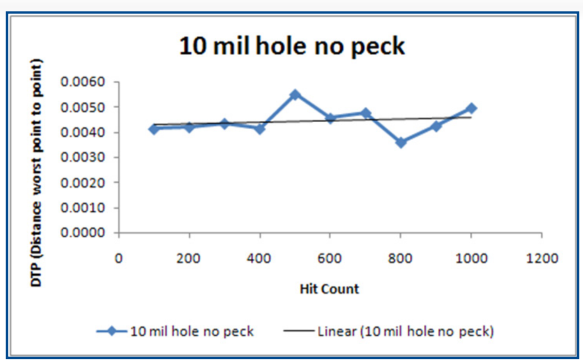
Dielectric Constant variation from three separate PWBs from the same manufacturing lot testing the same signal channel.





Stripline insertion loss of EZ-IO/FR-28-0040-50 (HVLP Cu) with and without via and connectors de-embedded.





Positional accuracy of EZ-IO mechanical drilling showing no increase in drill wander with 1000 hits/bit.

An example of our part number is:

EZ-IO-0050-CF1/CF1 - 18" x 24" (457 mm x 610 mm)

Please see our Product Selector Guide for information on available copper cladding.

Rev. 7/20