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*fast*Rise™ EZpure Resin

*fast*Rise™EZpure is a low temperature curing adhesive for flexible and rigid PWBs. EZpure is a non-reinforced adhesive containing only a low loss thermosetting resin and ceramic additives. EZpure has been optimized to adhere to difficult-to-bond-to substrates like PTFE, polyimide (DuPont™ Pyralux® AP/TK flexible circuit materials) and LCP.

The primary drawback of polyimides, LCPs and PTFE is the high temperatures normally associated with multilayer fabrication. EZpure can be laminated at 200°C, thus preventing any unwanted dimensional movement of the copper clad laminate core. Because EZpure has no reinforcement and uses only submicron, or micron sized ceramic and polymeric resin, the optimal pressure for laminating can vary significantly. Important factors to consider are the thickness of EZpure that is being used and design features such as cutouts, cavities, copper retention and thickness, and the type of thieving used. Please consult with an applications engineer.

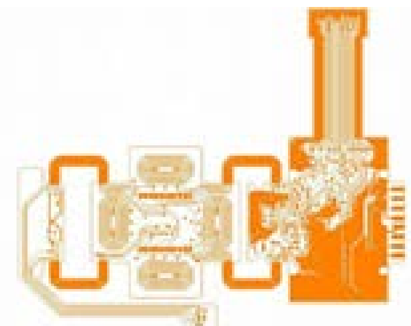
In testing EZpure bondply with LCP cores, PWBs have passed 260°C and 300°C solder reflow without defects. FR-EZpure has exhibited 5-7 lbs. of adhesion to LCP cores and that adhesion is stable after 260°C and 300°C thermal cycling.

EZpure's low loss enables the design of flexible high speed cables and rigid RF/digital multilayers without the uncertainties and costs associated with the high temperature lamination of PTFE or LCP materials. EZpure can be used to replace cable harnesses with denser flex circuits. The lack of a reinforcement makes EZpure a great candidate for laser vias. The low moisture absorption of 0.3% is very attractive vs. conventional polyimides.

Benefits & Applications:

- FR4 lamination temperatures
- Low DK enables reduced PWB thickness for the same impedance
- Thermosetting prepreg will not reflow
- Fiberglass-free prepreg
- Compatible with conventional lamination processes
- Can be combined with any core material
- Laser Ablatable

- High Speed Flex Cables
- Thin Multilayers
- ATE testing
- mmWave Antenna/Automotive
- Bonding of Subassemblies



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EZpure can be sequentially laminated and has better bonding capabilities with copper than other RF prepregs. The low DK of EZpure is advantageous in flex applications to reduce thickness while maintaining the same impedance. The low modulus of EZ pure allows for more ductility in a thicker multilayer. The low dissipation values of EZpure is an option for any multilayer stackup where pure packages of other materials have fabrication challenges.

fastRise™ EZpure Laser Ablation

EZpure can be readily laser ablated as shown below as a matrix of 4, 5 and 6 mil holes (Figure 1). A copper plated microvia is shown in Figure 2. Figures 3 (800X) and 4 (650X) are a 4 mil dielectric layer of EZpure with a 150 µm via using an ESI 5335 UV laser.

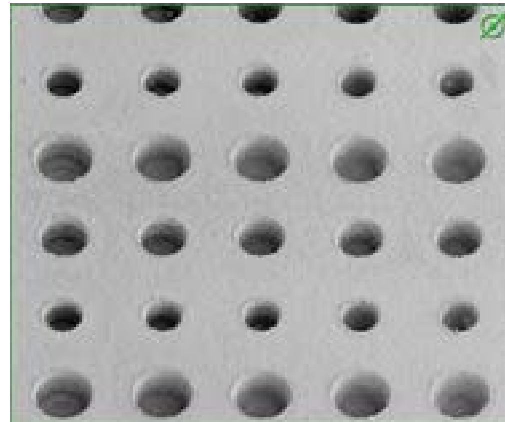


Figure 1

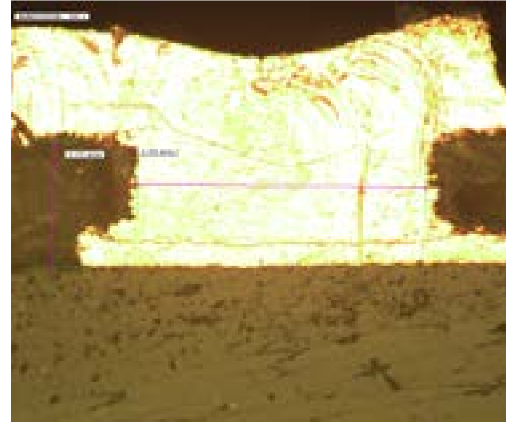


Figure 2

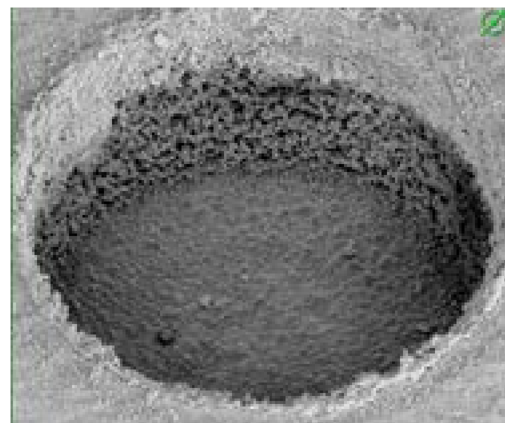


Figure 3

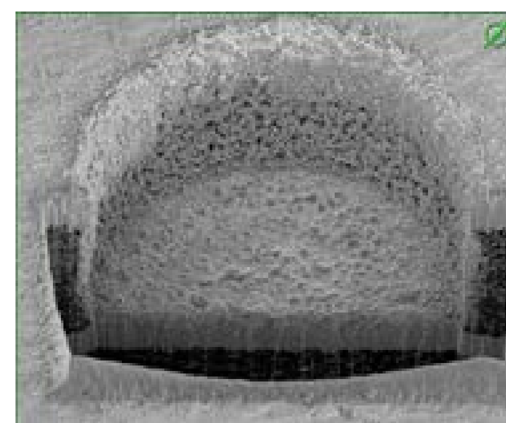


Figure 4

fastRise™ EZpure Thermal Reliability

A rigid flex construction of EZpure/Pyralux® AP/FR4 has passed IST, HATS and Lead Free reflow:

*fast*Rise™EZpure Thermal Reliability				
Test Standard	Via Size	Preconditioning	Cycles	Pass/Fail
IST	17.5 mil and 17.7 mil (50 mil and 100mil pitch)	6X at 260˚C	1000 Cycles Room Temp. to 160˚C	Passed (<10% Change in resistance)
HATS	7.9 mil, 9.8 mil, 14.5 mil and 17.7 mil	-	500 Cycles -55˚C to 125˚C 2 cycles per hour	Passed (<10% Change in resistance)
Solder Stress	-	6x at 288˚C	-	Passed
IPC-6013 Group A	-	-	-	Passed

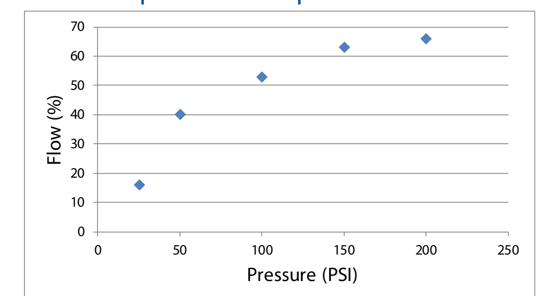
*fast*Rise™EZpure Typical Values			
Property	Test Method	Unit	EZpure
Unpressed Thickness/(Pressed Thickness)[1]		mil	1.5 (1.17), 2.0 (1.55), 3.0 (2.03)
Dk @ 10 GHz	IPC-650 2.5.5.5.1		2.8
Df @ 10 GHz	IPC-650 2.5.5.5.1		0.0032
T_cK	IPC-650 2.5.5.5.1	ppm/°C	-19.4
Dielectric Breakdown	ASTM D 149-09A	kV	25.1
Dielectric Strength	ASTM D 149-09A	V/mil	900
Moisture Absorption	IPC-650 2.6.2.1	%	0.31
Moisture/Insulation Resistance	IPC-650-2.6.3.2	Mohms	275,000
Flexural Strength (x, y)	ASTM D 790	psi	3,000
Flexural Modulus (x, y)	ASTM D 790	psi	77,000
Tensile Strength	IPC-650 2.4.19	psi	800
Elongation at break	IPC-650 2.4.19	%	19.5
Young's Modulus	IPC-650 2.4.19	kpsi	118
Peel Strength	IPC-650 2.4.9E	lbs/in	3.0
Peel Strength (after solder float)	IPC-650 2.4.9E	lbs/in	3.0
Peel Strength (after thermocycling)	IPC-650 2.4.9E	lbs/in	3.0
Thermal Conductivity	ASTM F 433/ASTM 1530-06	W/M*K	0.33
Dimensional Stability (MD)	IPC-650 2.2.4 (TS)	mils/in	-9.8
Dimensional Stability (CD)	IPC-650 2.2.4 (TS)	mils/in	-10.3
T_g		°C	168
Surface Resistivity	IPC-650-2.5.17E	Mohms/cm	3.75×10^6
Volume Resistivity	IPC-650-2.5.17E	Mohms/cm	2.24×10^8
Chemical Resistance	IPC-650-2.3.2G	%	90
CTE (X, Y, Z) (35 to 200 °C)	IPC-650 2.4.41	ppm/°C	44
Density	ASTM D 792	g/cm^3	1.43
T_d (2% Wt. Loss)	IPC-650 2.4.24.6 (TGA)	°C	375
T_d (5% Wt. Loss)	IPC-650 2.4.24.6 (TGA)	°C	386
Fungus Growth	IPC-650-2.6.1		0 (no growth)

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.

[1]FR-EZpure will densify approximately 25-30%. This densification will be a ground plane to ground plane distance. When calculating final pressed thicknesses to do an impedance calculation, please consult your technical service or technical sales person for an approximate signal to ground distance.

fastRise™ EZpure can be certified to IPC specification 4103/530 and is pending approval for IPC 4203B.

*fast*Rise™ EZpure Flow Dependence on Pressure



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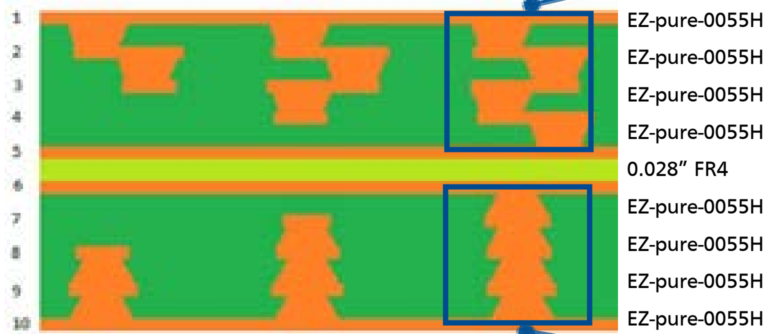
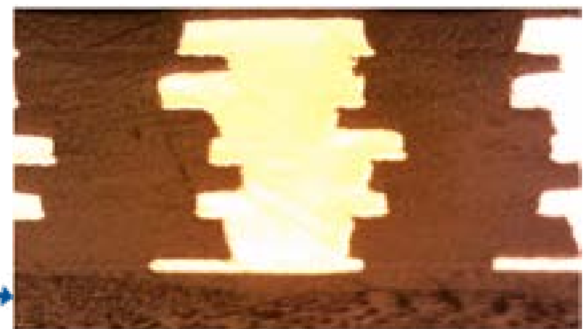
fastRise™ EZpure HDI Buildup

EZpure hybrid multilayers have been produced with a 28 mil FR4 core and varying layers of EZpure based microvia layers. 4 sequential laminations were performed to build both stacked and staggered microvias having 2, 3, and 4 layers of interconnect. The D coupons were analyzed by Conductor Analysis Technologies. The D coupons were subjected to 6X solder reflow before thermocycling from -55 to 178 ˚C.

Staggered 4 Layer EZpure Microvia

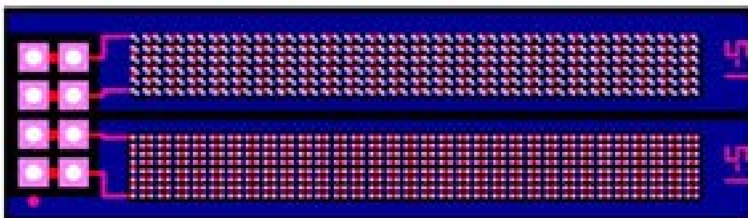


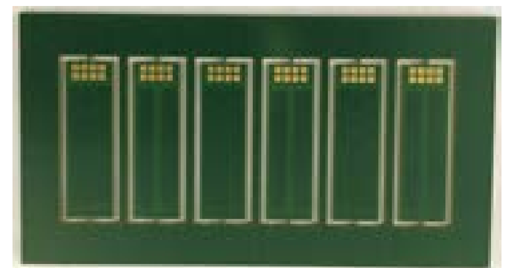


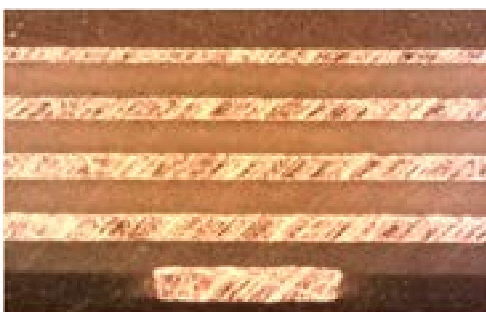
Stacked 4 Layer EZpure Microvia

EZpure microvias are 5mil in diameter with a dielectric spacing of 3-4 mils. Microvias were created with a UV/ CO_2 laser (UV/ CO_2 /UV). PWB’s were fabricated by TTM Technologies Forest Grove, Oregon.

Arrays of Daisy Chain Stacked and Staggered Vias, D Coupons







EZ-pure-0055H shows very consistent layer to layer dielectric spacing. Thermal cycling analysis by Conductor Analysis Technologies is available upon request.

Please consult with your regional technical service manager.

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