Sheldahl®
A Flex Company

Product Bulletin

Novaclad® G2200 Adhesiveless Halogen Free Copper Polyimide Laminates with Chromium Tie-coat

Description

Sheldahl Novaclad® products use a proprietary deposition process to join polyimide film and copper, creating a single or double sided adhesiveless composite. Novaclad® laminates are engineered for use in harsh environments such as temperature extremes and chemical exposure. Novaclad G2200 has passed long-term heat aging tests of 1,000 hours at 150°C.

Features

- Dielectric: High Stability PI Film
- Tiecoat: Cr
- Copper: Directly deposited thin copper excellent for fine line features, dynamic flexing, or high frequency applications that require a smooth copper surface on both sides. Final copper thickness achieved with electrolytic plating. Plated copper has an oxidation prevention coating.
- IPC: Meets IPC 4204A/18
- Halogen-free and RoHS compliant

Constructions

Film Thickness: 2 mil (50 µm)
Copper Thickness: 2 to 5 µm standard; thicker plating options are available
Width: Standard roll width is 12" (305mm)

G2200 Single Sided

Plated Copper (≥2 microns)
Cr tiecoat
High Stability polyimide film (50 micron)

G2200 Double Sided

Plated Copper (≥2 microns)
Cr tiecoat
High Stability polyimide film (50 micron)
Cr tiecoat
Plated Copper (≥2 microns)

Preparation for Delivery

Novaclad® G2200 is packaged on 6-inch plastic cores suspended within a triwall (500-pound test) box. Two labels are used, one label inside the core and one label on the outer wrap of each slit roll. Labels include the information listed below:

- Sheldahl part number
- Sheldahl manufacturing lot and roll number (IP # and Roll #)
- Length and Width

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Novaclad® G2200 Adhesiveless Halogen Free Copper Polyimide Laminates with Chromium Tie-coat

Novaclad® G2200 Etching

Permanganate etching is required after copper removal.

	***Novaclad*® Secondary Etching Setup**	
Chemicals	Potassium permanganate	0.48% to 0.52% by weight
	Potassium hydroxide	0.45% to 0.55% by weight
	Deionized water	99% by weight
Plumbing and Tanks	Use polypropylene or titanium. Do not use PVC as this becomes brittle. Do not expose stainless steel fittings to the bath.	
Controls	Bath temperature	43° to 49° C
	pH	12.2 to 12.8

- Permanganate concentration (maintain within range stated above). With the post-etch bath maintained at 43° to 49°C, a dip of etched *Novaclad*® material in this solution for 20-60 seconds will remove the seed coat and give the exposed polyimide film its original surface resistivity.
- The effectiveness of this etchant will degrade with time and use. The pH of the solution is most critical. Check the pH as frequently as necessary to maintain the recommended range. Maintain the pH at 12 ± 0.5 with gradual addition of potassium hydroxide. The concentration of potassium permanganate must be maintained in the range of 0.48 to 0.52% (use sodium oxalate titration technique).
- A sodium persulphate (10% by weight) micro-etch is needed after the permanganate etch so that the etching residues can be removed. (Residues are evident in the brown-colored stains found when materials are wiped with a white cloth immediately after permanganate etch plus water rinse). Adjust the bath concentration, copper content, temperature or immersion time so that the copper thickness is reduced by no more than 0.3 micron. Rinse materials thoroughly with deionized water after this micro-etch. Follow with 5% H_2SO_4 wash and the cascade rise before drying.
- Periodically test the exposed polyimide surface to verify that surface resistivity is at least 1 x 10^7 megaohms using IPC-TM-650. If the resistivity is low, check the concentration and pH of the permanganate bath.
- Recommended construction materials for modules containing this chemistry are titanium and polypropylene. Do not use PVC as it gets very brittle in this chemistry. Do not use stainless steel unless it is sealed from the chemistry. For example, use polypropylene-coated stainless steel rollers with shafts tipped with titanium, titanium pump blades and shafts, and polypropylene tanks.

Novaclad® G2200 Adhesiveless Halogen Free Copper Polyimide Laminates with Chromium Tie-coat

Technical Properties

Test	IPC-TM- 650 Test Method (IPC test coupons)	IPC Requirements	Units	Sheldahl Typical Value Mean
Peel Strength As Received	Method 2.4.9 Method A	1050(6)	N/m(lb/in)	1750(9)
Peel Strength After Solder Float	Method 2.4.9 Method C	700(4)	N/m(lb/in)	1575(10)
Dimensional Stability	Method 2.2.4 Method B	-0.15 to +0.15	%	(0.0 to +0.06) (+0.07 to +0.15)
	Method 2.2.4 Method C	-0.20 to+0.20	%	(0.01 to +0.07) (+0.04 to +0.15)
Initiation Tear Strength	Method 2.4.16	Minimum; 500	g	1100 g
Chemical Resistance	Method 2.3.2 Method A	Minimum; 80	%	85%
Dielectric Constant @ 1 Mhz	Method 2.5.5.3	Maximum; 4	N/A	3.2
Dissipation Factor; maximum (at 1 MHz)	Method 2.5.5.3	0.012	N/A	0.011
Moisture Absorption	Method 2.6.2	Maximum; 4	%	2.7
Solder Float	Method 2.4.13 Method B @ 288 C	Pass	N/A	Pass
Moist. & Insul. Resistance	Method 2.6.3.2	10^8	Ohm	10^9
Dielectric Strength	IPC based on ASTMD-149 (PI only)	80(2000)	V/µm(V/1000 µin)	220(5600)
Flammability	UL	VTM-0	N/A	VTM-0
Solderability	IPC/EIA J-STD-003, Test A	Pass	N/A	Pass

The information contained herein is based upon typical data, Sheldahl makes no warranties expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® Brand materials for each individual application.

Storage and Shelf Life

Keep material sealed in polyethylene bags with desiccant in the core area and store in a clean, dry, temperature-controlled environment (40 ±5 % RH, 25 ±5°C). Standard shelf life and material warranty is one year from the date of manufacture.

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Product Bulletin

Novaclad® G2202 Adhesiveless Halogen Free Copper Polyimide Laminates with Cr Tiecoat

Description:

Sheldahl Novaclad® products use a proprietary deposition process to join polyimide film and copper, creating a single or double sided adhesiveless composite. Novaclad® laminates are engineered for use in harsh environments such as temperature extremes and chemical exposures.

Features:

Dielectric: Kapton® EN Film
Tiecoat: Cr
Copper: Directly deposited thin copper excellent for fine line features, dynamic flexing, or high frequency applications that require a smooth copper surface on both sides. Final copper thickness achieved with electrolytic plating. Plated copper has an oxidation prevention coating.
Processing: Withstands electroless Ni/Au plating (ENIG).
IPC: Meets IPC 4204A/18
Halogen-free and RoHS compliant:

Constructions:

Film Thickness: 0.5, 1, and 2 mil (12, 25, and 50 µm)
Copper Thickness: 2 to 5 µm standard; thicker plating options are available
Width: Standard roll width is 12" (305mm)

G2202 Single Sided:

Plated Copper (≥2 microns)
Cr tiecoat
Kapton®EN polyimide film (12, 25, 50 micron)

G2202 Double Sided:

Plated Copper (≥2 microns)
Cr tiecoat
Kapton®EN polyimide film (12, 25, 50 micron)
Cr tiecoat
Plated Copper (≥2 microns)

Storage / Shelf Life / Material Warranty:

Standard shelf life and material warranty is one year from the date of manufacture.
Material storage recommendations:
Keep material sealed in polyethylene bags with desiccant in the core area and store in a clean, dry, temperature controlled environment (40 ±5 % RH, 25 ±5°C).

Novaclad® Sheldahl Registered Trademark
Kapton® Dupont Registered Trademark

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Preparation for delivery:

Novaclad® G2202 is packaged on 6-inch plastic cores suspended within a triwall (500-pound test) box. Two labels are used, one label inside the core and one label on the outer wrap of each slit roll.
Labels include the information listed below:

- Sheldahl part number
- Sheldahl manufacturing lot and roll number (IP # and Roll #)
- Length and Width

Novaclad® G2202 Etching

- Permanganate etching is required after copper removal.

	***Novaclad*® Secondary Etching Setup**	
Chemicals	Potassium permanganate	0.48% to 0.52% by weight
	Potassium hydroxide	0.45% to 0.55% by weight
	Deionized water	99% by weight
Plumbing and Tanks	Use polypropylene or titanium. Do not use PVC as this becomes brittle. Do not expose stainless steel fittings to the bath.	
Controls	Bath temperature	43° to 49° C
	pH	12.2 to 12.8

- Permanganate concentration (maintain within range stated above). With the post-etch bath maintained at 43° to 49°C, a dip of etched *Novaclad*® material in this solution for 20-60 seconds will remove the seed coat and give the exposed polyimide film its original surface resistivity.
- The effectiveness of this etchant will degrade with time and use. The pH of the solution is most critical. Check the pH as frequently as necessary to maintain the recommended range. Maintain the pH at 12 ± 0.5 with gradual addition of potassium hydroxide. The concentration of potassium permanganate must be maintained in the range of 0.48 to 0.52% (use sodium oxalate titration technique).
- A sodium persulphate (10% by weight) micro-etch is needed after the permanganate etch so that the etching residues can be removed. (Residues are evident in the brown-colored stains found when materials are wiped with a white cloth immediately after permanganate etch plus water rinse). Adjust the bath concentration, copper content, temperature or immersion time so that the copper thickness is reduced by no more than 0.3 micron. Rinse materials thoroughly with deionized water after this micro-etch. Follow with 5% H_2SO_4 wash and the cascade rise before drying.
- Periodically test the exposed polyimide surface to verify that surface resistivity is at least 1 x 10^7 megaohms using IPC-TM-650. If the resistivity is low, check the concentration and pH of the permanganate bath.
- Recommended construction materials for modules containing this chemistry are titanium and polypropylene. Do not use PVC as it gets very brittle in this chemistry. Do not use stainless steel unless it is sealed from the chemistry. For example, use polypropylene-coated stainless steel rollers with shafts tipped with titanium, titanium pump blades and shafts, and polypropylene tanks.

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G2202 Technical Properties:

Test	IPC-TM- 650 Test Method (IPC test coupons)	IPC Requirements	Units	Sheldahl Typical Value Mean
Peel Strength As Received (1 mil Film and greater)	Method 2.4.9 Method A	1050(6)	N/m(lb/in)	1750(10)
Peel Strength As Received (less than 1 mil Film)	Method 2.4.9 Method A	525(3)	N/m(lb/in)	1400(8)
Peel Strength After Solder Float (1 mil Film and greater)	Method 2.4.9 Method C	700(4)	N/m(lb/in)	1575(9)
Peel Strength After Solder Float (less than 1 mil Film)	Method 2.4.9 Method C	438(2.5)	N/m(lb/in)	1050(6)
Dimensional Stability	Method 2.2.4 Method B	-0.15 to +0.15	%	(0.0 to +0.06)
				(+0.07 to +0.15)
	Method 2.2.4 Method C	-0.20 to+0.20	%	(0.01 to +0.07)
				(+0.04 to +0.15)
Initiation Tear Strength	Method 2.4.16	Minimum; 500	g	1100 g
Chemical Resistance	Method 2.3.2 Method A	Minimum; 80	%	90%
Dielectric Constant @ 1 Mhz	Method 2.5.5.3	Maximum; 4	N/A	3.1
Dissipation Factor; maximum (at 1 MHz)	Method 2.5.5.3	0.012	N/A	0.011
Dissipation Factor; maximum (at 10 GHz)	Method 2.5.5.3	0.012	N/A	0.009
Volume Resistivity; Minimum	Method 2.5.17	10^{12}	ohm-cm	1.0×10^{17}
Surface Resistivity; Minimum	Method 2.5.17	10^{11}	ohm-cm	1.0×10^{17}
Moisture Absorption	Method 2.6.2	Maximum; 4	%	1.6
Solder Float	Method 2.4.13 Method B @ 288 C	Pass	N/A	Pass
Moist. & Insul. Resistance	Method 2.6.3.2	10^{8}	Ohm	10^{9}
Dielectric Strength	IPC based on ASTMD-149 (PI only)	80(2000)	V/µm(V/1000 µin)	7000
Flammability	UL	VTM-0	N/A	VTM-0
Solderability	IPC/EIA J-STD-003, Test A	Pass	N/A	Pass

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