Epoflex®

Flexible Copper Clad Polyimide Laminates

Epoflex® Base Materials series of MSC Polymer AG offers flexible base materials from simple single side flexible boards, flex-rigid applications up to highly complex multilayer boards.

The dielectric is made of a well known polyimide with high dimensional stability. It's reliability is proven in industrial applications for many years.

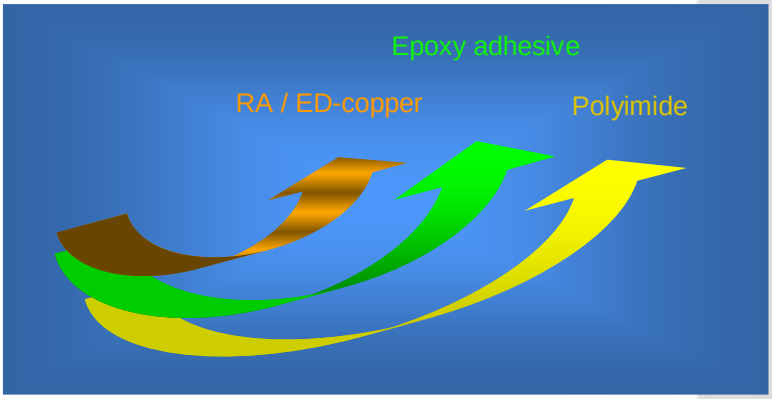
For the abundance of possible applications Epoflex® is available with claddings of ED and RA copper. Electro deposited copper (ED) provides a highly ductile copper surface. Cladding of rolled annealed copper (RA) is suitable for applications where permanent flexibility is needed.

The 15 µm thick layer of epoxy adhesive is designed for flexible PCB applications and optimized for excellent temperature resistance. It combines copper cladding and dielectric to a laminate with excellent solder bath resistance.

Epoflex® products are suitable for reel-to-reel production and halogene free.

Epoflex® base materials and coverlays are compatible to usual etching and cleaning techniques and all flexible lacquers.

Make up



Properties

- ✓ Flexible base materials made of longtime proven polyimide
- ✓ RA or ED-copper
- ✓ Excellent temperature resistance
- ✓ Excellent dimensional stability
- ✓ Complpiant to IPC4202 and IPC-FC-232
- ✓ Halogene free

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Availability

	Copper	Polyimide	Copper
Epoflex® SSC 17/25	17 µm	25 µm	--
Epoflex® DSC 17/25	17 µm	25 µm	17 µm
Epoflex® SSC 17/50	17 µm	50 µm	--
Epoflex® DSC 17/50	17 µm	50 µm	17 µm
Epoflex® SSC 35/25	35 µm	25 µm	--
Epoflex® DSC 35/25	35 µm	25 µm	35 µm
Epoflex® SSC 35/50	35 µm	50 µm	--
Epoflex® DSC 35/50	35 µm	50 µm	35 µm

In all types copper and polyimide are connected by a 15 µm epoxy adhesive layer.

Coverlay

Epoflex® series offers an adhesive coated coverlay that concert to the properties of the copper cladded laminates. Epoflex® PCL's epoxide adhesive and polyimide are of the same materials as used for the cladded laminates. Epoflex® PCL coverlays can be laminated by standard processes on printed circuit boards. It protects their functionality reliable for a long time.

Epoflex® PCL is available with polyimide foils of 25 µm or 50 µm and adhesive layers of 25 µm or 50 µm.

Availability of copper clad laminates and coverlays

Roll width..... 305 mm, 50 mm, and 610 mm

Roll length ..... 80 m

Core ..... 76 mm (Plastics)

Sheets..... According customer specification.

Storage of copper clad laminates and coverlays

Epoflex® laminates and coverlays can be stored at 25 °C in dry rooms up to 6 months. Rolls should be stored horizontally.

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Flexible Copper Clad Polyimide Laminates

Epoflex® SSC 17/25 – 17 µm copper cladding / 25 µm polyimide dielectric

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.09
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 0.7	> 1.3
after solder bath	N/mm	2.4.9	> 0.525	> 1.25
after thermal test	N/mm	2.4.9	> 0.7	> 1.3
Flexural Strength	Cycles	2.4.3*	n.a.	> 2000
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

n.a. = not applicable; n.s. = not specified; n.d. = no data

* Test machine according IPC TM-650 2.4.3.1, d_{Thorn} =2 mm

† 72 hrs at 65 % relative humidity

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Flexible Copper Clad Polyimide Laminates

Epoflex® DSC 17/25 – 17 µm copper cladding / 25 µm polyimide dielectric/ 17 µm copper cladding

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.10
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 0.7	> 1.3
after solder bath	N/mm	2.4.9	> 0.525	> 1.25
after thermal test	N/mm	2.4.9	> 0.7	> 1.3
Flexural Strength	Cycles	2.4.3*	n.a.	> 100
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

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† 72 hrs at 65 % relative humidity

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Flexible Copper Clad Polyimide Laminates

Epoflex® SSC 35/25 – 35 µm copper cladding / 25 µm polyimide dielectric

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.10
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 1.4	> 1.5
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 1.4	> 1.5
Flexural Strength	Cycles	2.4.3*	n.a.	> 400
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

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* Test machine according IPC TM-650 2.4.3.1, d_{Thorn} =2 mm

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Epoflex® DSC 35/25 – 35 µm copper cladding / 25 µm polyimide dielectric/ 35 µm copper cladding

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.04
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 1.4	> 2.1
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 1.4	> 2.0
Flexural Strength	Cycles	2.4.3*	n.a.	> 40
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

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* Test machine according IPC TM-650 2.4.3.1, d_{Thorn} =2 mm

† 72 hrs at 65 % relative humidity

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Epoflex® DSC 35/25 – 35 µm copper cladding / 25 µm polyimide dielectric/ 35 µm copper cladding

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.04
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 1.4	> 2.1
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 1.4	> 2.0
Flexural Strength	Cycles	2.4.3*	n.a.	> 40
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

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† 72 hrs at 65 % relative humidity

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Epoflex® SSC 17/50 – 17 µm copper cladding / 50 µm polyimide dielectric

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.10
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 0.7	> 1.3
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 0.7	> 1.3
Flexural Strength	Cycles	2.4.3*	n.a.	> 2000
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

n.a. = not applicable; n.s. = not specified; n.d. = no data

* Test machine according IPC TM-650 2.4.3.1, d_{Thorn} =2 mm

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Epoflex® DSC 17/50 – 17 µm copper cladding / 50 µm polyimide dielectric/ 17 µm copper cladding

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.10
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 0.7	> 1.3
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 0.7	> 1.3
Flexural Strength	Cycles	2.4.3*	n.a.	> 100
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

n.a. = not applicable; n.s. = not specified; n.d. = no data

* PrüTest machine according IPC TM-650 2.4.3.1, d_{Thorn} =2 mm

† 72 hrs at 65 % relative humidity

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Epoflex® SSC 35/50 – 35 µm copper cladding / 50 µm polyimide dielectric

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.05
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 1.4	> 2.1
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 1.4	> 1.5
Flexural Strength	Cycles	2.4.3*	n.a.	> 400
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

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Epoflex® DSC 35/50 – 35 µm copper cladding / 50 µm polyimide dielectric/ 35 µm copper cladding

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	2.2.4 C	< 0.20	0.05
Tensile Strength	N/mm^2	2.4.19	> 165	> 165
Bending Strength	%	2.4.19	> 25	> 45
Tear Resistance	N	2.4.16	> 5	> 5
Peel Strength				
as delivered	N/mm	2.4.9	> 1.4	> 2.1
after solder bath	N/mm	2.4.9	> 1.225	> 1.25
after thermal test	N/mm	2.4.9	> 1.4	> 2.0
Flexural Strength	Cycles	2.4.3*	n.a.	> 3
Solder Bath Resistance				
at 280 °C	s	2.4.13 B	> 10	> 180
at 300 °C	s	2.4.13	n.s.	> 180
at 260 °C without pre-test drying†	s	2.4.13	n.s.	> 10
Temperature Index	°C	UL 796	n.d.	150
Corporative Tracking Index (CTI)	V	DIN IEC 60112	n.s.	175
Loss Tangent at 1 MHz	--	ASTM D 150	< 0.04	< 0.03

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Coverlay

Epoflex® PCL 25/25 – 25 µm polyimide dielectric/ 25 µm adhesive

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	Manufacturer norm	n.s.	0.06
Tensile Strength	%	2.2.4 A	< 0.2	0.10
Bending Strength	N/mm^2	2.4.19	> 165	> 165
Tear Resistance	%	2.4.19	> 25	> 45
Peel Strength	N	2.4.16	> 5	> 5
as delivered				
after solder bath	N/mm	2.4.9	> 1.4	> 1.4
after thermal test	N/mm	2.4.9	> 1.225	> 1.23
Flexural Strength	N/mm	2.4.9	> 1.4	> 1.4
Solder Bath Resistance	Cycles	2.4.3*	n.a.	> 3
at 280 °C				
at 300 °C	s	2.4.13 B	> 10	> 180
at 260 °C without pre-test drying†	°C	UL 796	n.d.	130
Temperature Index	mm	2.3.17.1	< 0.127	< 0.127
Corporative Tracking Index (CTI)	--	ASTM D 150	< 0.04	< 0.03

n.a. = not applicable; n.s. = not specified; n.d. = no data

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Coverlay

Epoflex® PCL 25/35 – 25 µm polyimide dielectric / 35 µm adhesive

	Unit	Test method IPC TM-650	Specification IPC-4202/2	Typical Value
Dimensional Stability				
After etching & 30 min at 150 °C	%	Manufacturer norm	n.s.	0.07
Tensile Strength	%	2.2.4 A	< 0.2	0.16
Bending Strength	N/mm^2	2.4.19	> 165	> 165
Tear Resistance	%	2.4.19	> 25	> 45
Peel Strength	N	2.4.16	> 5	> 5
as delivered				
after solder bath	N/mm	2.4.9	> 1.4	> 1.4
after thermal test	N/mm	2.4.9	> 1.225	> 1.23
Flexural Strength	N/mm	2.4.9	> 1.4	> 1.4
Solder Bath Resistance	Cycles	2.4.3*	n.a.	> 3
at 280 °C				
at 300 °C	s	2.4.13 B	> 10	> 180
at 260 °C without pre-test drying†	°C	UL 796	n.d.	130
Temperature Index	mm	2.3.17.1	< 0.127	< 0.127
Corporative Tracking Index (CTI)	--	ASTM D 150	< 0.04	< 0.03

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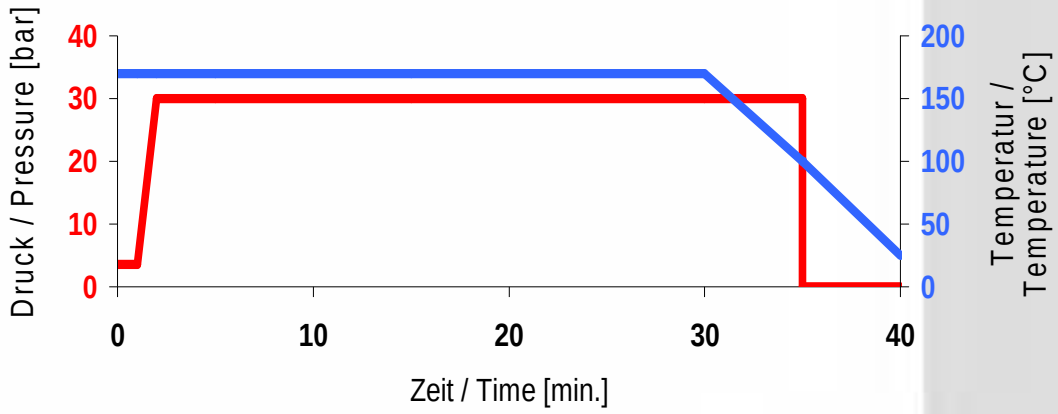
Processing Guide for Coverlays

See the following example for application of Epoflex® PCL in a heated multi-platen press.

Press temperature:	170 °C
Kiss pressure:	3,5 bar (0.35 MPa) for 1 min.
Pressure:	30 bar (3 MPa)
Duration:	30 min.
Cooling:	Step 1: Over 100 °C at 30 bar (3 MPa) Step 2: No pressure after cooling below 100 °C
Press pads:	- Individual combination of: ViaPad® ***Thermo***, ViaPad® ***DAF*** and ViaPad® ***UTF***
	- Reusable press pad ViaPad® ***X-Board*** (silicone free) up to 250 °C
	- Reusable press pad ViaPad® ***T-Pad*** (silicone rubber) up to 220 °C

Recommended press cycle:



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