



HFI & HFI-LP

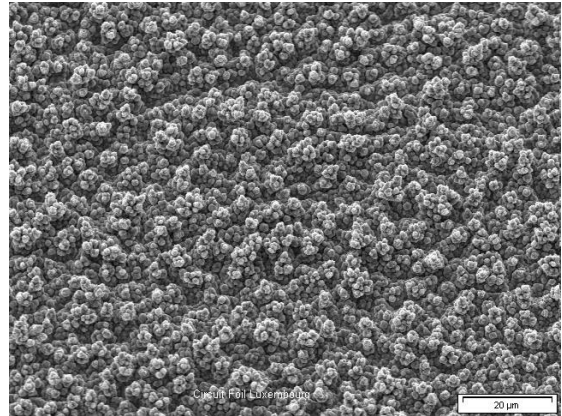
Technical Characteristics

HFI represents a family of advanced single-sided treated products designed to provide high bond strength on a wide range of high T_g , low dielectric constant substrates and new engineering plastics. A pure copper treatment limits negative effects on PIM.

This standard profile product (thickness range: $\geq 70 \mu\text{m}$) is designed for the manufacture of high performance laminates with extended thermal stability and electrical properties designated for very high frequency circuitry applications. PCB's manufactured with such laminates may be designed to operate at ultra high frequencies often in hostile or remote locations where long term reliability and stability is of crucial importance.

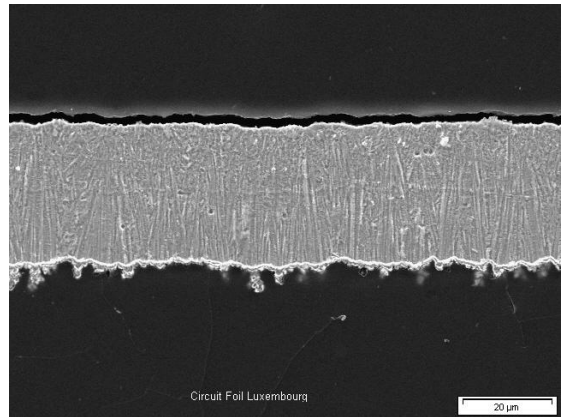
The **HFI-LP** product for the lower thickness range (between $9 \mu\text{m}$ and $70 \mu\text{m}$) is based on a unique low profile matte side base foil. The final product, after application of bonding treatment to this matte surface, exhibits Low Profile characteristics and reduces the PIM risk in high frequency circuitry applications.

Additional alternatives are the reverse treated product **HFI-B**, and for ultra high frequencies ($> 40 \text{ GHz}$) our extremely smooth **BF** based foils with **HFI** treatment (see separate datasheets).



Treated matte side of $35 \mu\text{m}$ HFI-LP

Cross section of $35 \mu\text{m}$ HFI-LP





Typical average properties

HFI-LP								
Table 1								
MEASURED PARAMETERS	UNITS	PRODUCT GAUGE					IPC	
Nominal Thickness	µm oz.	9 1/4	12 3/8	18 1/2	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight (± 5 %)	oz/ft²	0.26	0.35	0.52	0.95	1.90	(a)1.2.5, table 1-1	2.2.12
	g/m²	79	108	158	290	580	(b)3.4.4	
	g/254 in²	12.9	17.7	25.9	47.5	95.0	(c)4.6.3	
Untreated Side Roughness (Rz)	µm µ.inch	0.20 - 0.40 8 - 16					3.5.6	2.2.17
Treated Side Roughness (Rz)	µm µ.inch	< 5.1 < 201	< 5.6 < 220	< 6.5 < 256	< 6.5 < 256	< 6.5 < 256	3.4.5	2.2.17
Tensile Strength Transverse at RT	MPa k.Lb/in²	> 276 > 40					3.5.1	2.4.18
Tensile Strength Transverse at 180 °C	MPa k.Lb/in²	> 138 > 20					3.5.1	2.4.18
Elongation Transverse at RT	%	> 3		> 6	> 10	> 15	3.5.3	2.4.18
Elongation Transverse at 180 °C	%	> 3					3.5.3	2.4.18
Peel Strength (RT) on some proprietary PTFE resin systems ^[1] :								
Taconic RF-35	N/mm Lb/in	> 1.1		> 1.6	> 2.0	> 2.5	3.5.4	2.4.8
		> 6.3		> 9.1	> 11.4	> 11.5		
Taconic TLC	N/mm Lb/in	> 1.0		> 1.2	> 1.6	> 1.6	3.5.4	2.4.8
		> 5.7		> 6.9	> 9.1	> 9.1		
High Temp. Tarnish Resistance on untreated side	-	120 min @ 180 °C in air: pass						
Solderability	-	Complies with IPC specification					3.6.3	2.4.12

^[1] Laminate construction with thickness ≥ 0.5 mm

HFI								
Table 2								
MEASURED PARAMETERS	UNITS					IPC		
Nominal Thickness	µm oz.	105 3	140 4	175 5	210 6	Specification IPC-4562A	Test Method IPC-TM-650	
Area Weight (± 5 %)	oz/ft²	2.88	3.93	4.92	5.90	(a)1.2.5, table 1-1	2.2.12	
	g/m²	880	1200	1500	1800	(b)3.4.4		
	g/254 in²	144	197	246	295	(c)4.6.3		
Untreated Side Roughness (Rz)	µm µ.inch	0.20 - 0.40 8 - 16				3.5.6	2.2.17	
Treated Side Roughness (Rz)	µm µ.inch	< 15 < 590	< 16 < 630	< 17 < 670	< 18 < 709	3.4.5	2.2.17	
Tensile Strength Transverse at RT	MPa k.Lb/in²	> 276 > 40				3.5.1	2.4.18	
Tensile Strength Transverse at 180 °C	MPa k.Lb/in²	> 138 > 20				3.5.1	2.4.18	
Elongation Transverse at RT	%	> 15	> 20	> 20	> 20	3.5.3	2.4.18	
Elongation Transverse at 180 °C	%	> 3				3.5.3	2.4.18	
Peel Strength (RT) on some proprietary PTFE resin systems ^[1] :								
Taconic RF-35	N/mm Lb/in	> 2.0				3.5.4	2.4.8	
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		> 9.1						
High Temp. Tarnish Resistance on untreated side	-	120 min @ 180 °C in air: pass						
Solderability	-	Complies with IPC specification					3.6.3	2.4.12

^[1] Laminate construction with thickness ≥ 0.5 mm



Advanced Product Features

- Higher laminate bond strength on “difficult” high T_g substrate from a combination of an increased mechanical bonding surface area and, where applicable, chemical adhesion.
- High, but upper limit controlled, temperature elongation, typically between 4 % and 12 %, - [HTE-Type E / Grade 3] {IPC-4562A / 1.2.4.1} prevents “barrel cracking” failures in multi-layer PCB’s arising from CTE mismatch.
- Thermally stable microstructure - stable mechanical properties unaffected by thermal excursion from lamination or post laminate baking cycles - which could degrade laminate dimensional stability, warp & twist, and drilling characteristics (nail heading).
- A high integrity oxidation resistant “NT” passivation process, applied to the shiny side, ensuring the production of “ready-to-use” laminate free from traces of oxidation directly from the press; but which is readily removed by simple chemical cleaning prior to circuitisation.
- Improved surface process of the bonding treatment ensures low bonding loss after extremely long thermal cycles or solder float processes.
- A Zinc free bonding treatment which eliminates both high frequency “intermodulation” losses and potentially damaging chemical undercut from aggressive electroless finishing steps.
- The product meets or exceeds all of the requirements of IPC-4562A when tested on typical epoxy and multifunctional prepregs, in accordance with IPC test methods, including high temperature peel strength, solder shock and accelerated ageing.

Notes

- Products can be supplied in both roll and sheeted formats.
- Roll product is available in widths of 150 mm (~ 5.9”) to 1360 mm (~ 53.5”).
- Product is supplied on sturdy cardboard cores with an ID of ~ 80 mm (3 1/8”). Alternative core sizes and materials are available on request.
- Please visit our website (www.circuitfoil.com) for regular updates.

All of this Technical Information has been determined with due care and thoroughness. However, because the conditions of use and process and application technologies employed can substantially vary, the provided data and figures can only serve as non binding guidelines. They do not constitute a guarantee that the purchased item will possess certain attributes. For this reason, no liability whatsoever can be assumed for them. The buyer is obliged to check the suitability of all supplied products.

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