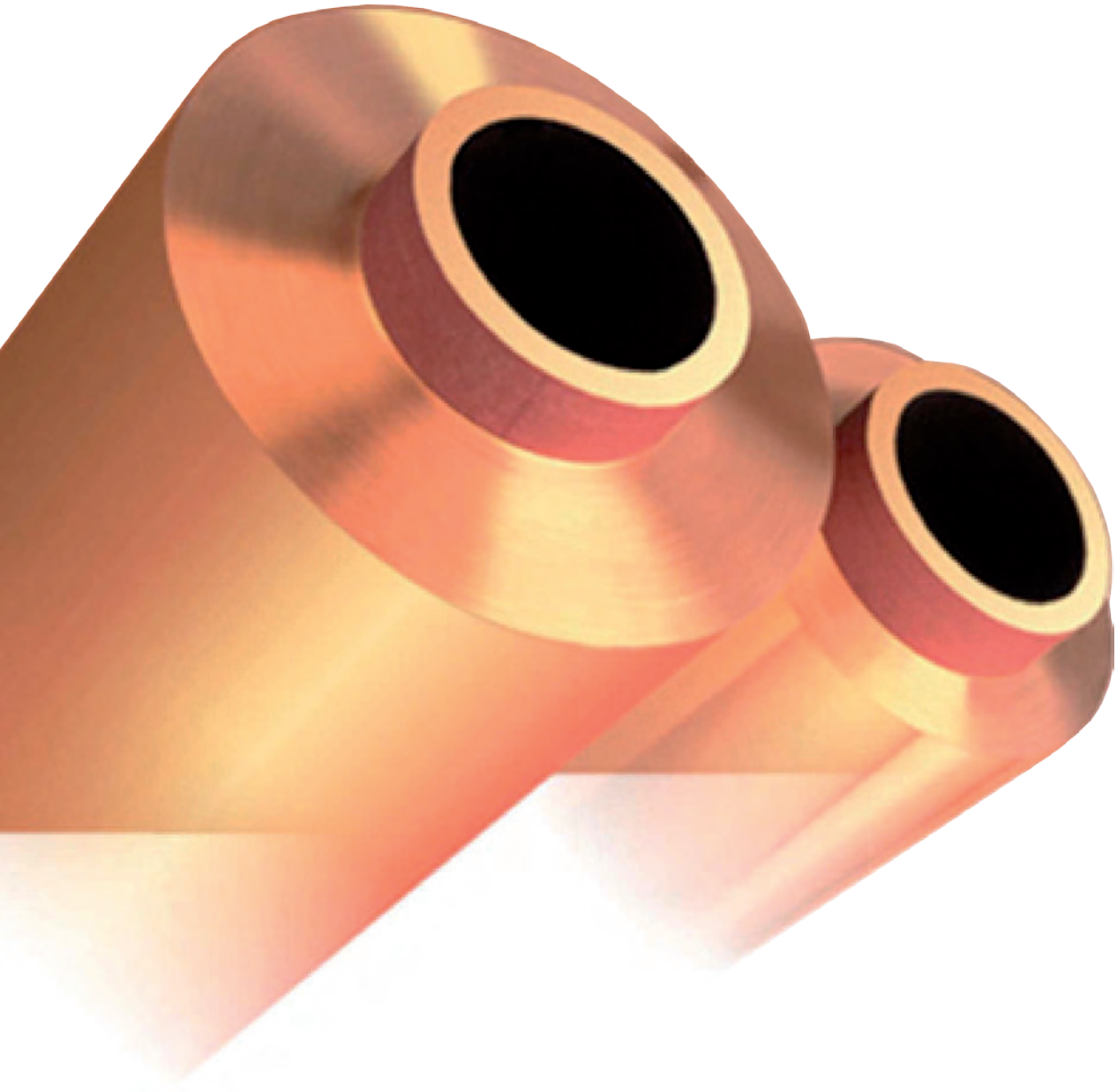
Product Catalogue

CIRCUIT FOIL



Dedicated to Quality

CIRCUIT FOIL GROUP

- GLOBAL COMPANY, HEADQUARTER IN LUXEMBOURG, EUROPE.
- GLOBAL PRESENCE SINCE 1960.
- BELONGS TO DOOSAN ELECTRO MATERIAL BUSINESS GROUP (SOUTH KOREA)
- PREMIUM QUALITY ELECTRO-DEPOSITED COPPER FOILS FOR VARIOUS SECTORS:
  – ELECTRONICS INDUSTRY: FOR CCL AND PCB MANUFACTURERS;
  – AUTOMOTIVE INDUSTRY: FOR LI-ION BATTERY PRODUCERS;
  – PHOTOVOLTAIC INDUSTRY: FOR PHOTOVOLTAIC INVERTERS.
- ISO 9001, ISO 14001, ISO 18001 COMPLIANT.


Zhangjiagang


Wiltz

CIRCUIT FOIL LUXEMBOURG:
PRODUCTION, SLITTING, SHEETING AND TOOLING CENTER

CIRCUIT FOIL ASIA PACIFIC:
SLITTING AND SHEETING CENTER FOR THE ASIAN MARKET

CIRCUIT FOIL TRADING INC.:
SLITTING, SHEETING AND TOOLING CENTER FOR THE AMERICAN MARKET

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Overview

FOIL TYPE	Mat Side Treated	Reverse Treated	Mat Side Treated	Treated No Profile	Ultrathin Carrier Supported	No Treatment
	STD AND LOW PROFILE	VERY LOW PROFILE	ULTRA FLAT PROFILE (HVLP)	ALMOST NO PROFILE (ANP)	DOUBLETHIN™ (DTH)	
Regular MLB / Innerlayer / High Current Density	TZA (04)	TZA-B (15)				
High T_g MLB / Innerlayer	TZA (04) TWS (05)	TWS-B-YE (07)				
Thin Core	TZA (04)	TZA-B (15)	BF-TZA (16)			
High Density PCB	HTS-TZA* (--)		BF-TZA (16)		DTH-TW (08) DTH-TZA (09)	
MSAP – Embedding Doublethin™					DTH-TZA (09) DTH-LDD-TZA (--)	
Coreless Package Doublethin Coreless™					DTH-TZA (09) DTH-CL (10)	
BGA – BOC	HTS-TZA* (--)		BF-TZA-PKG (11)			
High Frequency	HFZ-LP (12)	HFZ-B (13)				
High Frequency – Low PIM			BF-HFZ (14)			
High Speed – Low Loss	TZA (04) TWS (05) TWLS (06)	TZA-B (15)	BF-HFZ (14) BF-TZA (16) BF-HFI-LP2 (17)	BF-ANP (18)		BF-NN (19)
Static Flex (3-layers FCCL)	TZA-FX (20)	TZA-B-FX (21)				
Dynamic Flex (2-layers FCCL)		SR-TZA-B-FX (22)	BF-TZA-FX (23)			
Smart Card / Tape Carrier Substrate	LPT-YE (24)					
Li-Ion						BF-PLSP (25) SR-PLSP (26) HTS-PSLP* (27)
Shielding, Solar						BF-PLSP (25)

Note: ***TZA, ANP, NN*** *– Treatment Zinc and Arsenic Free*
*** *– under development*
( ) – page number

RoHS 2 PASS

REACH Compliant

Last Revision: February 2018

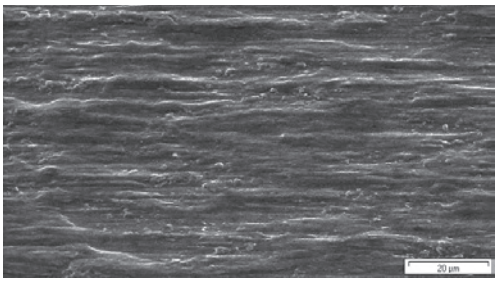
TZA

TECHNICAL CHARACTERISTICS

TZA style of foil is an environmentally friendly matte-side treated zinc free and arsenic free electro-deposited copper foil, characterized by enhanced high temperature elongation properties [IPC-Grade 3] and thermally stable microstructure.

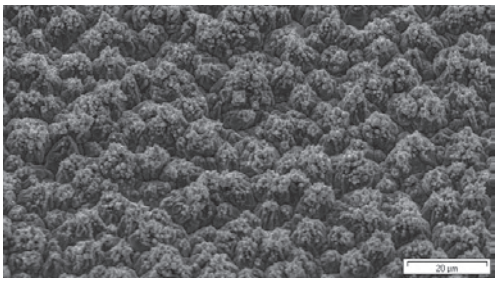
Excellent adhesion to a broad range of substrates allows it to be used for the fabrication of laminates for rigid, composite, halogen free and conventional multilayer / mass lamination applications.

The higher foil thicknesses (> 100 µm) are typically used for high current applications or power / ground planes.



Shiny side

Treated matte side

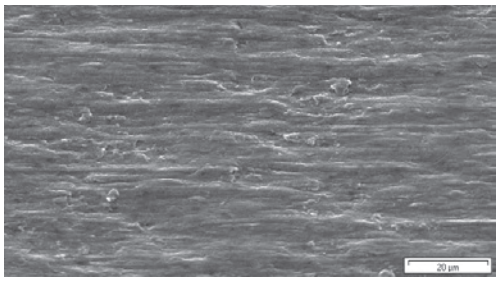


TYPICAL AVERAGE PROPERTIES*

TZA											
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE								
Nominal Thickness		µm oz.	9 1/4	12 3/8	18 1/2	35 1	70 2	105 3	140 4	175 5	210 6
Area Weight		oz/ft² g/m² g/254 in²	0.25 75 12.3	0.35 106 17.4	0.50 152 24.9	0.93 283 46.4	1.89 577 94.6	2.86 873 143.1	3.85 1175 193	4.82 1470 241	5.83 1780 292
Untreated Side Roughness (Ra)		µm (µ.inch)	0.20 – 0.40 (8 – 16)								
Treated Side Roughness (Rz)	ISO		4 – 7 (157 – 276)		5 – 8 (197 - 315)	6 – 11 (236 – 433)	8 – 13 (315 – 512)	≤ 16 (≤ 276)	≤ 18 (≤ 709)		≤ 19 (≤ 748)
	JIS		3 – 5.8 (118 – 228)		4 – 7 (157 – 276)	5 – 9.3 (197 – 366)	7 – 11 (276 – 433)	≤ 13.5 (≤ 531)	≤ 15.2 (≤ 598)		≤ 16.1 (≤ 634)
Tensile Strength Transverse at RT		MPa (k.Lb/ in²)	≥ 276 (≥ 40)								
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)								
Elongation Transverse at RT		%	≥ 2	≥ 3	≥ 6		≥ 9	≥ 12			
Elongation Transverse at 180 °C			≥ 2		≥ 3			≥ 3			
Peel Strength (RT) FR4 halogen free [1]		N/mm (Lb/in)	≥ 0.88 (≥ 5.0)	≥ 1.0 (≥ 5.7)		≥ 1.2 (≥ 6.8)	≥ 1.3 (≥ 7.4)	≥ 1.5 (≥ 3.9)			
High Temp. Tarnish Resistance		–	60 min @ 180 °C in air: pass								
Solderability		–	Complies with IPC specification								

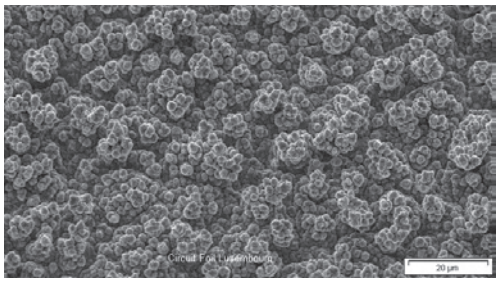
[1] *Laminate construction with thickness ≥ 0.5 mm*

TWS



Shiny side

Treated matte side



TECHNICAL CHARACTERISTICS

TWS represents a family of high performance matte-sided treated products designed to provide high bond strength on a wide range of high T_g substrates and new engineering plastics. The base foil is characterized by enhanced high temperature elongation properties [IPC-Grade 3] and thermally stable microstructure.

The product is designed for the manufacture of high performance laminates with extended thermal stability and electrical properties.

Typical substrates include polyimide, cyanate esters, hydrocarbon-ceramics and thermoplastics.

For fluorocarbon containing resins, please consult HFZ-LP and BF-HFZ datasheets.

TYPICAL AVERAGE PROPERTIES*

TWS								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	12 3/8	18 1/2	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.37 112 18.4	0.53 163 26.7	0.97 295 48.3	1.93 588 96.4	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)		µm (µ.inch)	0.20 – 0.40 (8 – 16)				3.5.6	2.2.17
Treated Side Roughness Rz	ISO		6 – 8.5 (236 – 335)	7 – 10 (276 – 394)	8 – 12 (315 – 472)	10 – 14 (394 – 551)	3.4.5	
	JIS		5 – 7.1 (197 – 280)	6.0 – 8.0 (236 – 315)	6.7 – 10.1 (264 – 398)	8.0 – 11.8 (315 – 465)	–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)				3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)					
Elongation Transverse at RT		%	≥ 3	≥ 6		≥ 9	3.5.3	
Elongation Transverse at 180 °C			≥ 2	≥ 3				
Peel Strength (RT) [1]								
High T_g Epoxy		N/mm (Lb/in)	0.9 – 1.1 (5.1 – 6.3)	1.1 – 1.3 (6.3 – 7.4)	1.4 – 1.6 (8.0 – 9.1)		3.5.4	2.4.8
High T_g and Filled Epoxy			≥ 1.05 (≥ 6.0)	≥ 1.2 (≥ 6.9)	≥ 1.4 (≥ 8.0)			
Filled Hydrocarbon Resin			–	≥ 0.7 (≥ 4.0)	≥ 0.8 (≥ 4.6)			
Polyimide			–	≥ 1.2 (≥ 6.9)	≥ 1.4 (≥ 8.0)	≥ 1.6 (≥ 9.1)		
High Temp. Tarnish Resistance		–	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*

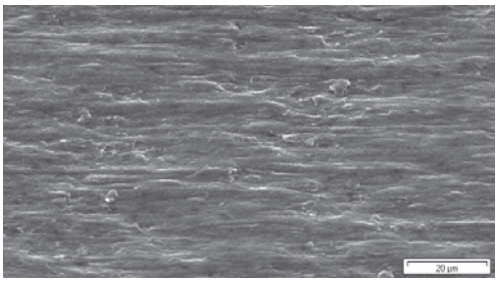
Higher laminate bond strength on "difficult to bond" high T_g substrates are achieved through a combination of increased mechanical bonding surface area and, where applicable, chemical adhesion.

TWLS

TECHNICAL CHARACTERISTICS

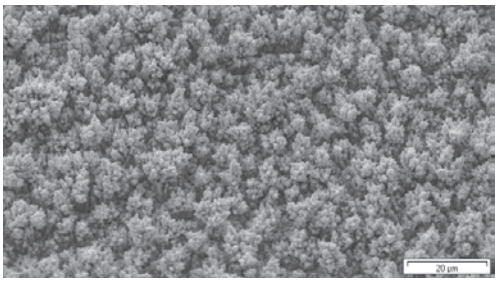
TWLS represents a high performance matte-side treated copper foil designed to provide improved bond strength on high T_g substrates and very low loss resin systems. The base foil is characterized by enhanced high temperature elongation properties [IPC-Grade 3] and thermally stable microstructure.
The product is designed for external layer re-lamination on very low Dk prepregs with reduced transmission losses.

Typical applications include today's commercial RF and microwave printed circuit designs, cost-effective alternatives to PTFE and high speed digital servers and communication devices.



Shiny side

Treated matte side



TYPICAL AVERAGE PROPERTIES*

TWLS						
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE		IPC	
Nominal Thickness		µm oz.	12 3/8	18 1/2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.35 108 17.7	0.51 157 25.7	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)		µm (µ.inch)	0.20 – 0.40 (8 – 16)		3.5.6	2.2.17
Treated Side Roughness Rz	ISO		5 – 7 (197 – 276)	6.5 – 8.5 (256 – 335)	3.4.5	
	JIS		4.1 – 5.8 (161 – 228)	5.4 – 7.1 (213 – 280)	–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)		3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)			
Elongation Transverse at RT		%	≥ 3	≥ 6	3.5.3	
Elongation Transverse at 180 °C			≥ 2	≥ 3		
Peel Strength (RT) [1]						
High T_g and Filled Epoxy		N/mm (Lb/in)	≥ 1.05 (≥ 6.0)	≥ 1.2 (≥ 6.9)	3.5.4	2.4.8
Filled Hydrocarbon Resin			≥ 0.7 (≥ 4.0)	≥ 0.8 (≥ 4.6)		
High T_g Low Loss			≥ 1.0 (≥ 5.7)	≥ 1.1 (≥ 6.3)		
Ultra Low Loss (PPE Based Resin)			≥ 0.85 (≥ 4.8)	≥ 1.0 (≥ 5.7)		
High Temp. Tarnish Resistance		–	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*

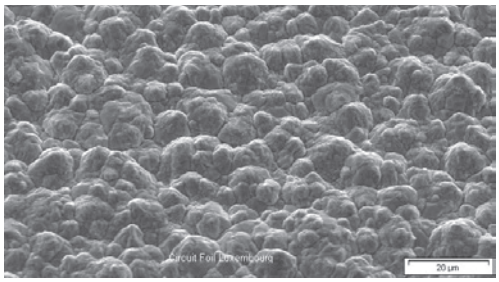
* All of this Technical Information has been determined with due care and thoroughness. However, because the conditions of use and process and application technologies employed can substantially vary, the provided data and figures can only serve as non-binding guidelines. They do not constitute a guarantee 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.

TWS-B-YE

TECHNICAL CHARACTERISTICS

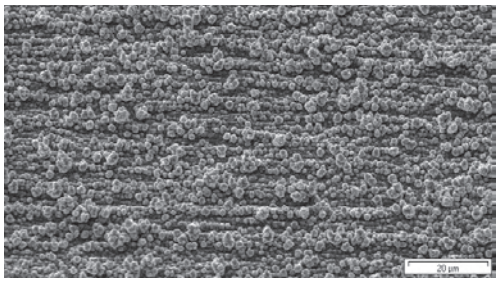
TWS-B-YE is an high performance single-sided treated electro-deposited copper foil, where bonding treatment is applied to the "shiny" side (so-called "Reverse Treated Foil"). This product is designed to provide high bond strength on a wide range of high T_g substrates and new engineering plastics. Base foil is characterized by enhanced high temperature elongation properties [Grade 3].
The product is designed for the manufacture of high performance inner layers with extended thermal stability and electrical properties for multilayer PCB's.

Typical substrates include polyimide, cyanate esters, hydrocarbon-ceramics and fluorocarbon materials.
For fluorocarbon containing resins, please also consult HFZ-B datasheet.



Untreated matte side

Treated drum side



TYPICAL AVERAGE PROPERTIES*

TWS-B-YE							
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			IPC	
Nominal Thickness		µm oz.	18 1/2	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.51 157 25.7	0.95 289 47.4	1.91 583 95.5	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Matte Side Roughness (Rz)	ISO	µm (µ.inch)	≤ 6.0 (≤ 236)	≤ 9.0 (≤ 354)	≤ 10 (≤ 394)	–	2.2.17
	JIS		≤ 5.0 (≤ 197)	≤ 7.5 (≤ 294)	≤ 8.4 (≤ 331)		
Treated Shiny Side Roughness (Rz)	ISO		4 – 6 (157 – 236)			3.4.5	
	JIS		3 – 5 (118 – 197)			–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)			3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)				
Elongation Transverse at RT		%	≥ 6		≥ 9	3.5.3	
Elongation Transverse at 180 °C			≥ 3				
Peel Strength Treated Shiny Side (RT) High Tg Epoxy [1]		N/mm (Lb/in)	≥ 0.7 (≥ 4.0)	≥ 0.85 (≥ 4.85)		3.5.4	2.4.8
High Temp. Tarnish Resistance		–	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*

- 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.
- Simplified "oxide" processing. The already roughened untreated matte surface eliminates the need for chemical micro etching prior to oxide processing and the associated etch waste disposal costs.

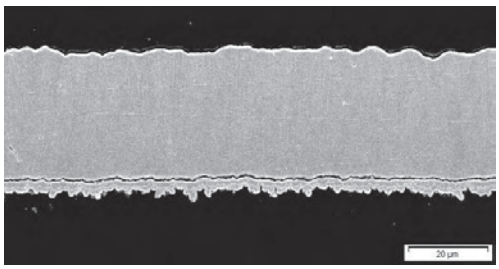
DOUBLETHIN™
5 to 9 µm carrier supported
(DTH-TW & DTH-TWS)

TECHNICAL CHARACTERISTICS

Circuit Foil's DOUBLETHIN™ products are designed for very fine line and higher density multilayer boards.

The ability to produce ultra-fine line circuitry using conventional subtractive technology is primarily limited by etching capability. As line-to-track spacing fall, the ability to accurately replicate well defined line and pad features, rapidly degrades.

The presence of an ED copper carrier protects the functional layer from any adverse damage and contamination.
Typical applications are High density multilayers and fine line applications.



Cross section 5/35 µm DTH-TW

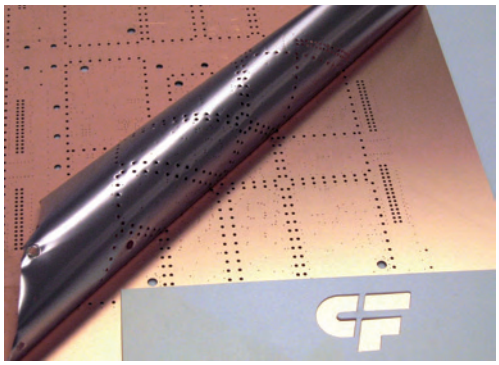
*TYPICAL AVERAGE PROPERTIES**

Doublethin™-TW / -TWS							
MEASURED PARAMETERS		**UNITS**	**PRODUCT GAUGE**				
Functional Foil Carrier Foil		**µm**	**5 35**	**5 70**	**7 70**	**9 70**	**9 70**
Treatment Type		–	TW				TWS
Area Weight Functional Foil		g/m²	44 ± 4		65 ± 6	76 ± 7	
Roughness Profile Rz	ISO	µm (µinch)	3.5 – 5.0 (138 – 197)		4.5 – 7.5 (177 – 295)		6.0 – 8.0 (236 – 315)
	JIS		2.9 – 4.1 (114 – 161)		3.7 – 6.3 (146 – 248)		5.0 – 6.7 (197 – 264)
Preferred Lamination Temperature		°C (°F)	≤ 180 °C (356 °F)				≤ 210 °C (410 °F)[2]
Laminate Bond on FR-4 [1]		N/mm (lb/in²)	± 1.7 (± 9.7)		± 1.8 (± 10.3)		± 2.0 (± 11.4)
Laminate Bond on Polyimide [1]			–		–		± 1.2 (± 6.9)
Typical Substrates		–	FR-4, FR-5, Filled epoxy				Polyimides, High T_g

[1] after galvanic reinforcement up to 35 µm
[2] In case of long lasting post-baking cycles, please contact our Technical Customer Service for advice.

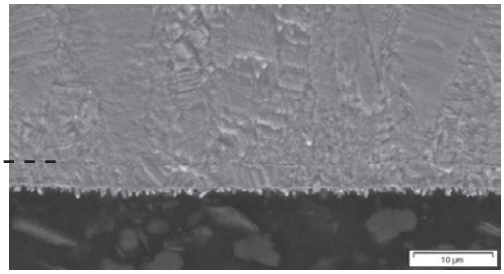
arsenic free

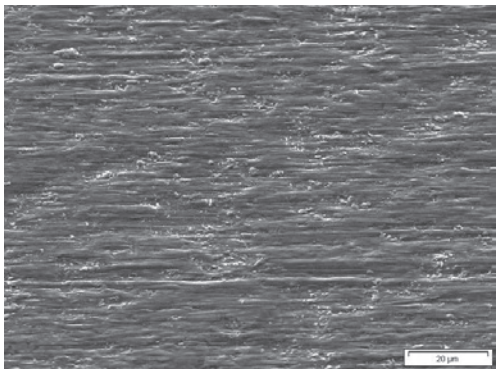
DOUBLETHIN™ Ultrathin Foils for MSAP (DTH-TZA)



TECHNICAL CHARACTERISTICS

- Cu carrier supported ultrathin foils for IC packaging and Substrate-Like PCB (SLP)
- Very accurate and uniform thickness
- Very high etching rate for precise line definition
- Arsenic free and zinc free TZA treatment
- Organic free metallic release layer
- Allows modified semi-additive processes (MSAP) using copper build-up followed by differential "flash etching" and CO_2 laser direct ablation for via holes
- An improved product DOUBLETHIN™-LDD-TZA offering a fine grain structure and excellent laser drill ability was developed
- Designed for coreless built-up and embedding techniques for active and passive components
- Low and stable carrier release bond after thermal stress from lamination or post baking cycles until temperatures of up to 230 °C (446 °F)

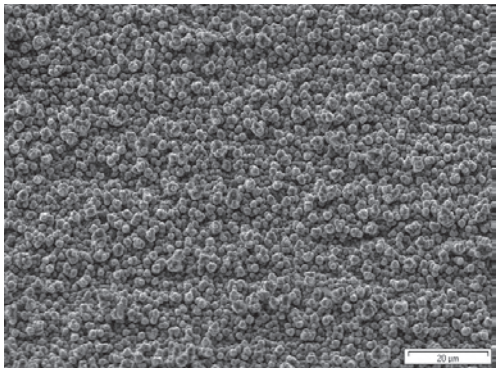




Shiny side

Functional foil

Treatment side



TYPICAL AVERAGE PROPERTIES*

Doublethin™-TZA						
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			
Nominal Thickness		**µm**	**1.5**	**2**	**3**	**5**
Area Weight	Functional Foil	g/m²	20 ± 3	25 ± 3	29 ± 3	43 ± 4
Carrier Thickness		µm	12 or 18		18 or 35	
Roughness	average Rz (JIS)	µm	≤ 2.5			
Treatment Type		–	TZA (zinc free, As free)			
Preferred Lamination Temperature		°C (°F)	≤ 230 °C (446 °F)[2]			
Carrier Release Bond (after 2h @ 230 °C)		–	Easy manual peeling			
Laminate Bond on halogen free[1]		N/mm	≥ 1.0			
Laminate Bond on BT resin[1]			≥ 0.7			

[1] *after galvanic reinforcement up to 35 µm*
[2] *In case of long lasting post-baking cycles, please contact our Technical Customer Service for advice.*

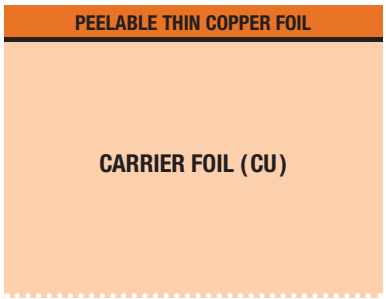
DOUBLETHIN CORELESS™
Ultra-thin foils for Coreless processes
(DTH-CL)

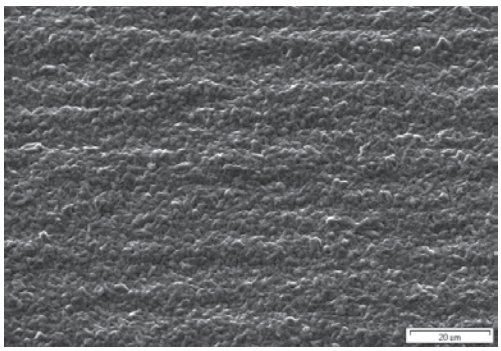
TECHNICAL CHARACTERISTICS

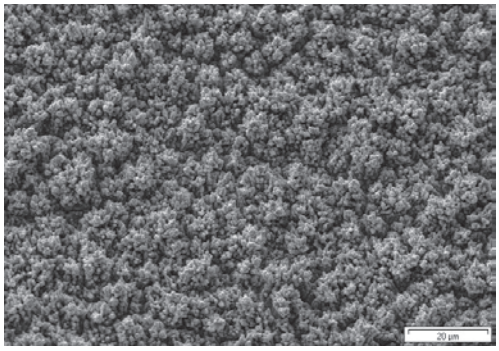
Circuit Foil's DTH-CL product is a tailor made ultra-thin peelable copper foil of the Doublethin™ family designed for proprietary coreless build-up processes.
Its fine grain size allows a fast etching of the functional foil.

Mobile communication will further grow through various devices like next generation ultrabooks, smartphones and tablets requiring ultra-thin printed circuit boards with the highest interconnect density, using thin chip packaging techniques like coreless build-up processes.

DTH-CL foil construction:



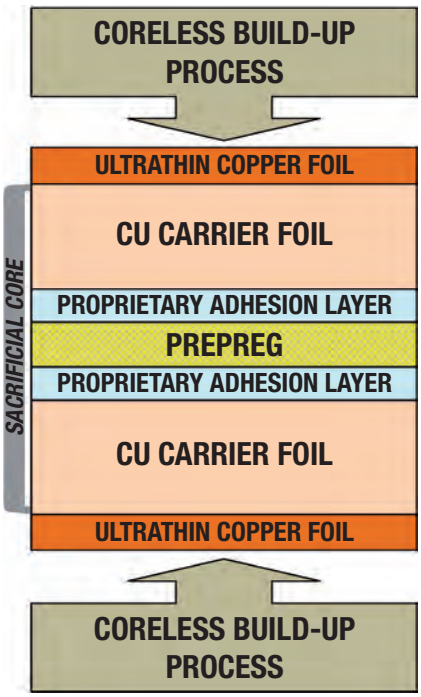




TYPICAL AVERAGE PROPERTIES*

Doublethin Coreless™ (DTH-CL)						
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			
Nominal Thickness		µm	1.5	2	3	5
Area Weight	Functional Foil (Coreless Process Side)	g/m²	20 ± 3	25 ± 2.5	29 ± 3	45 ± 4
Roughness Process Side	Ra	µm	~ 0.3			
	Rz (JIS)		~ 2.0			
Treatment Type		–	As free and Zn free Copper			
Carrier Release Bond after multiple lamination and wet process cycles			Easy manual peeling			
Carrier Thickness		µm	12 or 18		18 or 35	35 or 70
		oz.	3/8 or ½		½ or 1	1 or 2
Roughness Bonding Side	Rz (JIS)	µm	3 – 6.5		4 – 7.5	5 – 8.5
Peel Strength of Carrier Side [1]		N/mm	≥ 0.8 [1]			

[1] *high T_g, filled, low CTE resin sytems*



* 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.

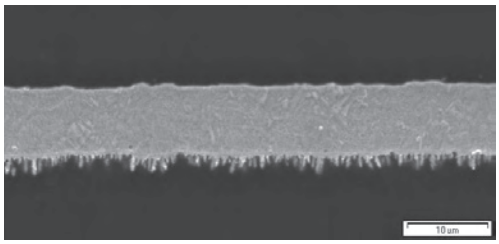
BF-TZA-PKG

TECHNICAL CHARACTERISTICS

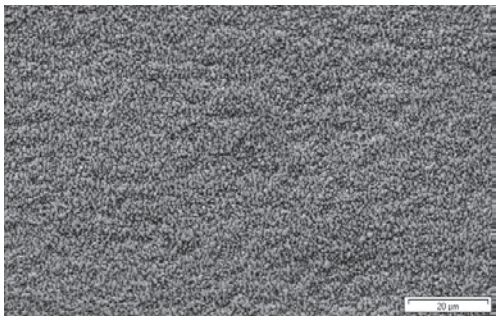
BF-TZA-PKG style foil is an ultra-flat single side treated electro-deposited copper foil, characterized by high ductility at room temperature, a fine grain size with thermally stable microstructure, and lower electrical resistivity compared to regular ED foils.

The zinc free and arsenic free copper treatment is designed to provide excellent bond strength on typical resin systems for IC substrate applications.

The copper foil is suitable for subtractive process and available down to ¼ oz. to avoid inconsistent half-etching. The ultra-smooth profile and uniform thickness allows a precise L/S definition and etching of square conductors.



Cross section
9 µm BF-TZA-PKG
Treated matte side



TYPICAL AVERAGE PROPERTIES*

BF-TZA-PKG							
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			IPC	
Nominal Thickness		µm oz.	9 1/4	12 3/8	18 1/2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.26 79 12.9	0.37 112 18.4	0.50 152 24.9	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)		µm (µ.inch)	≤ 0.35 (≤ 14)			3.5.6	2.2.17
Treated Side Roughness	Ra		0.3 – 0.55 (12 – 22)			–	
	Rz (ISO)		≤ 3.1 (≤ 122)			3.4.5	
	Rz (JIS)		≤ 2.5 (≤ 98)			–	
	Rt		≤ 3.7 (≤ 146)				
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 207 (≥ 30)			3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 103 (≥ 15)				
Elongation Transverse at RT		%	4 – 10	5 – 20	7 – 25	3.5.3	
Elongation Transverse at 180 °C			5 – 25	9 – 25	10 – 35		
Peel Strength (RT) [1]	BT	N/mm (Lb/in)	≥ 0.6 (≥ 3.4)			3.5.4	2.4.8
High Temp. Tarnish Resistance		–	60 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*

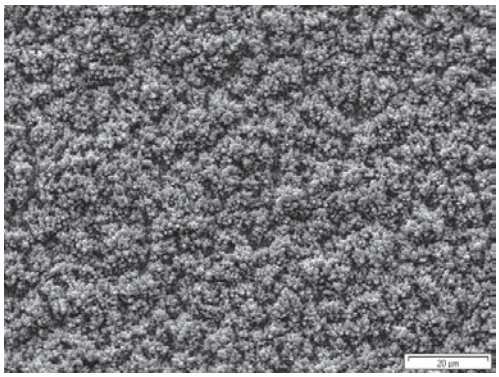
HFZ-LP

TECHNICAL CHARACTERISTICS

HFZ-LP represents a family of advanced matte-sided treated products designed to withstand more severe thermal stress while keeping excellent bonding performance on pure or modified fluoropolymer substrates.

It is suitable for the manufacture of high performance laminates with extended thermal stability and electrical properties for very high frequency circuitry applications. A pure copper treatment limits negative effects on PIM.

Additional alternatives are the reverse treated product HFZ-B, and for higher frequencies (> 10 GHz) our extremely smooth BF-HFZ and BF-ANP treatments (see separate datasheets).



Treated matte side

TYPICAL AVERAGE PROPERTIES*

HFZ-LP						
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE		IPC	
Nominal Thickness		µm oz.	18 1/2	35 1	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.49 151 24.7	0.94 288 47.2	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness Ra		µm (µ.inch)	0.20 – 0.40 (8 – 16)		3.5.6	2.2.17
Treated Side Roughness (Rz)	ISO		≤ 6 (≤ 236)		3.4.5	
	JIS		≤ 5 (≤ 197)		–	
Treated Side Roughness (Rq [RMS])			≤ 1.0 (≤ 39)			
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)		3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)			
Elongation Transverse at RT		%	≥ 6		3.5.3	
Elongation Transverse at 180 °C			≥ 3			
Peel Strength (RT) on pure PTFE [1]		N/mm (Lb/in)	≥ 1.6 (≥ 9.1)	≥ 2.0 (≥ 11.4)	3.5.4	2.4.8
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*

HFZ-B

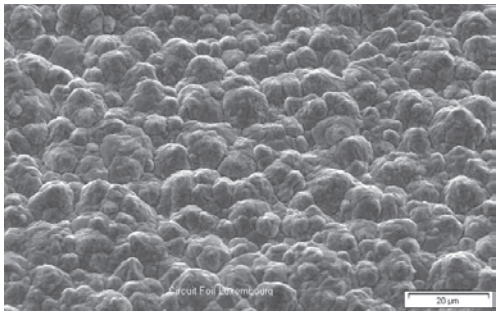
TECHNICAL CHARACTERISTICS

HFZ-B represents a so-called "Reverse Treated Foil", where bonding treatment is applied to the "shiny" side. The final product exhibits Very Low Profile characteristics for the treatment side.

Its zinc free HFZ treatment provides high bond strength on pure or modified fluoropolymer substrates. A pure copper treatment limits negative effects on PIM.

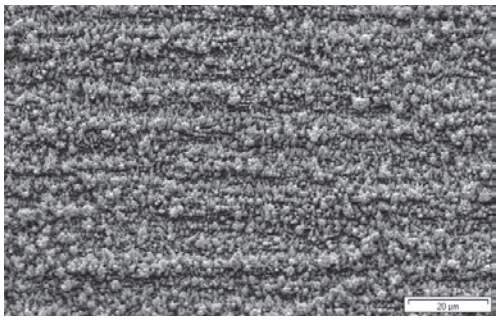
The product is designed for the manufacture of high performance laminates with extended thermal stability and electrical properties designated for high frequency circuitry applications, as for RF antennas.

Additional alternatives for the higher frequency ranges (> 10 GHz) are our extremely smooth BF-HFZ and BF-ANP treatments (see separate datasheet).



Untreated matte side

Treated drum side



TYPICAL AVERAGE PROPERTIES*

HFZ-B							
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			IPC	
Nominal Thickness		µm oz.	18 1/2	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.50 152 24.9	0.93 283 46.4	1.89 576 94.4	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Rz)	ISO	µm (µ.inch)	≤ 6.0 (≤ 236)	≤ 9.0 (354)	≤ 10 (≤ 394)	–	2.2.17
	JIS		≤ 5.0 (≤ 197)	≤ 7.5 (≤ 294)	≤ 8.4 (≤ 331)		
Treated Side Roughness (Rz)	ISO		≤ 5.1 (≤ 201)			3.4.5	
	JIS		≤ 4.2 (≤ 165)			–	
Treated Side Roughness (Rq [RMS])			≤ 1.1 (≤ 43)				
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)			3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)				
Elongation Transverse at RT		%	≥ 6	≥ 9	≥ 15	3.5.3	
Elongation Transverse at 180 °C			≥ 3				
Peel Strength (RT)	PTFE [1]	N/mm (Lb/in)	≥ 1.05 (≥ 6.0)	≥ 1.75 (≥ 10)		3.5.4	2.4.8
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*

* 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.

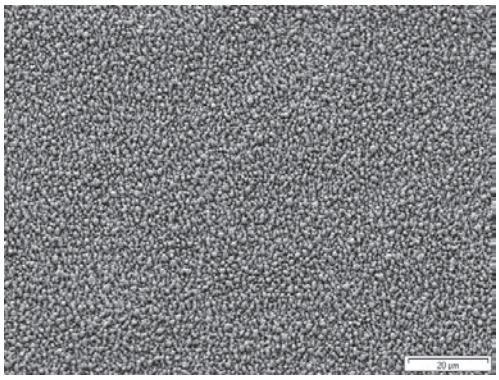
BF-HFZ

TECHNICAL CHARACTERISTICS

BF style foil is an ultra-flat single side treated electro-deposited copper foil, characterized by high ductility at room temperature and lower electrical resistivity compared to regular ED foils.

The zinc free HFZ treatment is designed to provide good bond strength on proprietary fluoropolymer resin systems.
The ultra-flat profile ensures a minimalist skin depth penetration thus reducing conductor losses for high speed digital applications and reducing the passive intermodulation (PIM) in RF applications if frequencies of 10 GHz and more apply.

Typical substrates include PTFE resin types and blends mainly for 5G applications.



Treated matte side

TYPICAL AVERAGE PROPERTIES*

BF-HFZ							
MEASURED PARAMETERS			UNITS	PRODUCT GAUGE		IPC	
Nominal Thickness			µm oz.	18 1/2	35 1	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight			oz/ft² g/m² g/254 in²	0.50 152 24.9	0.93 285 46.7	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Line Roughness	Ra	ISO 4287	µm (µ.inch)	≤ 0.35 (≤ 14)		3.5.6	2.2.17
Untreated Side Surface Roughness	Sa	ISO 25178		~ 0.25 (~ 9.8)		–	2.2.22 Draft[2]
	Sq			~ 0.33 (~ 13)		–	
Treated Side Line Roughness	Rz	ISO 4287		≤ 3.1 (≤ 122)		3.4.5	2.2.17
	Rz	JIS B 601		≤ 2.5 (≤ 98)		–	–
Treated Side Surface Roughness	Sa	ISO 25178		~ 0.33 (~ 13.0)	~ 0.32 (~ 12.6)	–	2.2.22 Draft[2]
	Sq			~ 0.42 (~ 16.5)	~ 0.40 (~ 15.7)	–	
	Sz			~ 4.4 (~ 173)	~ 4.0 (~ 157)	–	
Tensile Strength Transverse at RT			MPa (k.Lb/in²)	≥ 207 (≥ 30)	≥ 276 (≥ 40)	3.5.1	2.4.18
Tensile Strength Transverse at 180 °C				≥ 103 (≥ 15)	≥ 138 (≥20)		
Elongation Transverse at RT			%	7 - 25	10 - 30	3.5.3	
Elongation Transverse at 180 °C				10 - 35	10 - 40		
Peel Strength (RT) PTFE [1]			N/mm (Lb/in)	≥ 1.2 (≥ 6.7)	≥ 1.3 (≥ 7.4)	3.5.4	2.4.8
High Temp. Tarnish Resistance			–	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*

[2] *Final draft of TM 2.2.22 as of Sept. 29th, 2015*

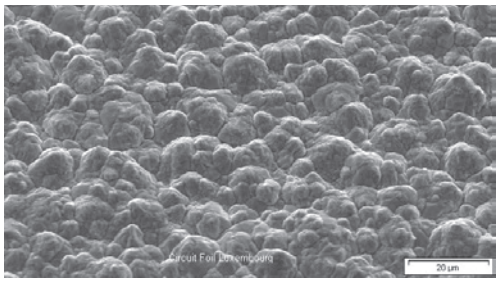
TZA-B

TECHNICAL CHARACTERISTICS

TZA-B style of foil is a so-called "Reverse Treated Foil" with zinc free and arsenic free treatment characterized by enhanced high temperature elongation properties [IPC-Grade 3] and thermally stable microstructure.

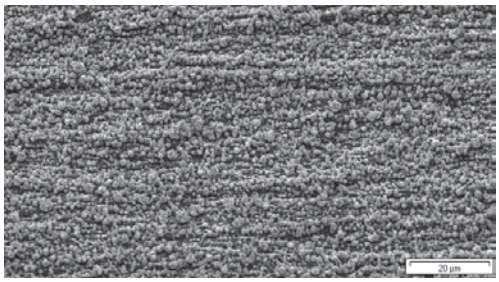
Excellent adhesion to a broad range of substrates allows it to be used for the fabrication of laminates for rigid, composite, halogen free and conventional multilayer / mass lamination applications.

Its very low profile treatment makes it very suitable for low and mid loss applications.



Untreated matte side

Treated drum side



TYPICAL AVERAGE PROPERTIES*

TZA-B								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	12 3/8	18 1/2	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.34 105 17.2	0.50 152 24.9	0.93 283 46.4	1.90 580 95.0	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Matte Side Roughness (Rz)	ISO	µm (µ.inch)	≤ 5.1 (≤ 201)	≤ 6.0 (≤ 236)	≤ 9.0 (≤ 354)	≤ 10.0 (≤ 394)	–	2.2.17
	JIS		≤ 4.2 (≤ 165)	≤ 5.0 (≤ 197)	≤ 7.5 (≤ 294)	≤ 8.4 (≤ 331)		
Treated Side Roughness (Rz)	ISO		≤ 5.1 (≤ 201)				3.4.5	
	JIS		≤ 4.2 (≤ 165)				–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)				3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)					
Elongation Transverse at RT		%	≥ 3	≥ 6		≥ 9	3.5.3	
Elongation Transverse at 180 °C			≥ 2	≥ 3				
Peel Strength Treated Shiny Side (RT) on Halogen-free prepreg [1]		N/mm (Lb/in)	≥ 0.7 (≥ 4.0)	≥ 0.75 (≥ 4.3)	≥ 0.8 (≥ 4.6)	≥ 1.05 (≥ 6.0)	3.5.4	2.4.8
High Temp. Tarnish Resistance		–	60 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*

Simplified "oxide" processing. The already roughened untreated matte surface eliminates the need for chemical micro etching prior to oxide processing and the associated etch waste disposal costs.

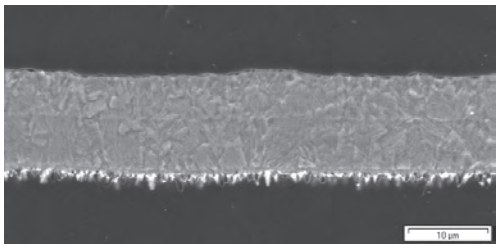
BF-TZA

TECHNICAL CHARACTERISTICS

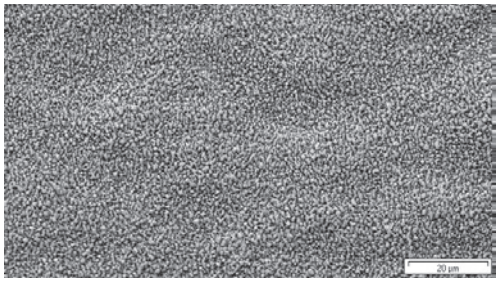
BF-TZA style foil is an ultra-flat single side treated electro-deposited copper foil, characterized by high ductility at room temperature and lower electrical resistivity compared to regular ED foils.

The zinc free and arsenic free copper treatment is designed to provide excellent bond strength on low and very low loss resin systems.
The ultra-flat profile ensures a minimalist skin depth penetration thus reducing signal losses for high speed digital applications.

Typical substrates include low loss resins (Df < 0.007 @10 GHz).



Cross section
12 µm BF-TZA
Treated matte side



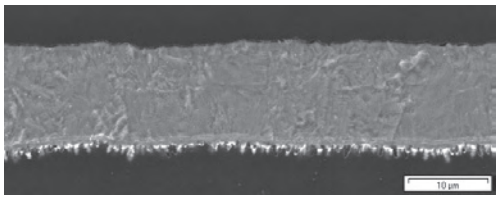
TYPICAL AVERAGE PROPERTIES*

BF-TZA										
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			oz/ft² g/m² g/254 in²	0.26 79 12.9	0.37 112 18.4	0.50 152 24.9	0.93 285 46.7	1.88 574 94.1	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Line Roughness	Ra	ISO 4287	µm (µ.inch)	≤ 0.35 (≤ 14)					3.5.6	2.2.17
Untreated Side Surface Roughness	Sa	ISO 25178		~ 0.22 (~ 8.7)					–	2.2.22 Draft[2]
	Sq			~ 0.27 (~ 10.6)						
Treated Side Line Roughness	Ra	ISO 4287		0.3 – 0.55 (12 - 22)				0.21 - 0.33 (8 - 13)	3.4.5	2.2.17
	Rz	ISO 4287		≤ 3.1 (≤ 122)				≤ 2 (≤ 79)	–	–
	Rz	JIS B 601		≤ 2.5 (≤ 98)				≤ 1.6 (≤ 63)	–	2.2.17
	Rt	ISO 4287		≤ 3.7 (≤ 146)				≤ 2.5 (≤ 98)	–	2.2.22 Draft[2]
Treated Side Surface Roughness	Sa	ISO 25178		~ 0.42 (~ 16.5)	–	~ 0.33 (~ 13.0)	~ 0.32 (~ 12.6)	~ 0.30 (~ 11.8)	–	2.2.22 Draft[2]
	Sq			~ 0.53 (~ 20.9)	–	~ 0.42 (~ 16.5)	~ 0.40 (~ 15.7)	~ 0.38 (~ 15.0)	–	
	Sz			~ 4.7 (~ 185)	–	~ 4.4 (~ 173)	~ 4.0 (~ 157)	~ 3.8 (~ 150)	–	
Tensile Strength Transverse at RT			MPa (k.Lb/in²)	≥ 207 (≥ 30)			≥ 276 (≥ 40)		3.5.1	2.4.18
Tensile Strength Transverse at 180 °C				≥ 103 (≥ 15)			≥ 138 (≥20)			
Elongation Transverse at RT			%	4 – 10	5 - 20	7 - 25	10 - 30	15 - 40	3.5.3	
Elongation Transverse at 180 °C				5 - 25	9 - 25	10 - 35	10 - 40	15 - 50		
Peel Strength (RT) [1] Very Low Loss (PPE Based Resin)			N/mm (Lb/in)	≥ 0.6 [3] (≥ 3.4)	≥ 0.45 (≥ 2.6)	≥ 0.5 (≥ 2.9)	≥ 0.6 (≥ 3.4)	≥ 0.7 (≥ 4.0)	3.5.4	2.4.8
High Temp. Tarnish Resistance			–	60 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* [2] *Final draft of TM 2.2.22 as of Sept. 29th, 2015* [3] *after built-up to 35 µm*

* 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.

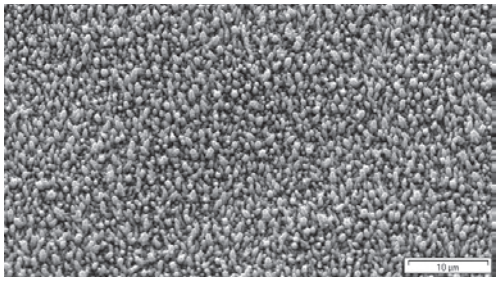
BF-HFI-LP2



Cross section

12 µm BF-HFI-LP2

Treated matte side



TECHNICAL CHARACTERISTICS

BF style of foil is an ultra-flat single side treated electro-deposited copper foil, characterized by high ductility at room temperature and lower electrical resistivity compared to regular ED foils.

The zinc free copper HFI-LP2 treatment is designed to provide excellent bond strength on low and very low loss resins and limits negative effects on Passive Intermodulation. The ultra-flat profile ensures a minimalist skin depth penetration thus reducing signal losses for high speed digital applications.

Typical substrates include PPE type resins and other low loss materials with Df < 0.007 @ 10 GHz.

TYPICAL AVERAGE PROPERTIES*

BF-HFI-LP2								
MEASURED PARAMETERS			**UNITS**				**IPC**	
Nominal Thickness			**µm oz.**	**12 3/8**	**18 1/2**	**35 1**	**Specification IPC-4562A**	**Test Method IPC-TM-650**
Area Weight			oz/ft² g/m² g/254 in²	0.37 112 18.4	0.50 152 24.9	0.93 285 46.7	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Line Roughness	Ra	ISO 4287	µm (µ.inch)	≤ 0.35 (≤ 14)			3.5.6	2.2.17
Untreated Side Surface Roughness	Sa	ISO 25178		~ 0.25 (~ 9.8)			–	2.2.22 Draft[2]
	Sq			~ 0.33 (~ 13)				
Treated Side Line Roughness	Rz	ISO 4287		≤ 3.1 (≤ 122)			3.4.5	2.2.17
	Rz	JIS B 601		≤ 2.5 (≤ 98)			–	–
	Rt	ISO 4287		≤ 3.7 (≤ 146)			–	2.2.17
Treated Side Surface Roughness	Sa	ISO 25178		–	~ 0.33 (~ 13.0)	~ 0.32 (~ 12.6)	–	2.2.22 Draft[2]
	Sq			–	~ 0.42 (~ 16.5)	~ 0.40 (~ 15.7)		
	Sz			–	~ 4.4 (~ 173)	~ 4.0 (~ 157)		
Tensile Strength Transverse at RT			MPa (k.Lb/in²)	≥ 207 (≥ 30)		≥ 276 (≥ 40)	3.5.1	2.4.18
Tensile Strength Transverse at 180 °C				≥ 103 (≥ 15)		≥ 138 (≥20)		
Elongation Transverse at RT			%	5 - 20	7 - 25	10 - 30	3.5.3	
Elongation Transverse at 180 °C				9 - 25	10 - 35	10 - 40		
Peel Strength (RT) [2] Very Low Loss (PPE Based Resin)			N/mm (Lb/in)	≥ 0.45 (≥ 2.6)	≥ 0.5 (≥ 2.9)	≥ 0.6 (≥ 3.4)	3.5.4	2.4.8
High Temp. Tarnish Resistance			–	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

[2] Final draft of TM 2.2.22 as of Sept. 29th, 2015

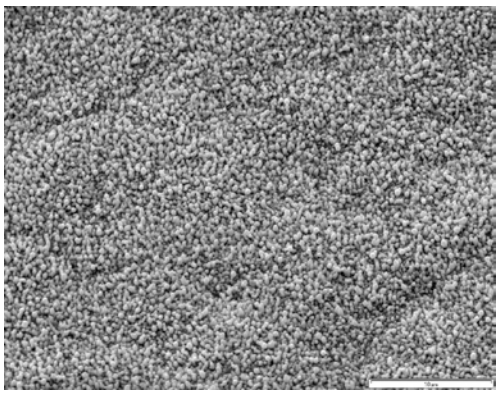
BF-ANP

TECHNICAL CHARACTERISTICS

BF-ANP style foil is a so-called "profile free" electro-deposited copper foil, characterized by high ductility at room temperature and lower electrical resistivity compared to regular ED foils.

The ultra-flat profile ensures a minimalist skin depth penetration thus reducing conductor losses for high speed digital applications and reducing the passive intermodulation (PIM) in RF applications if frequencies of 20 GHz and more apply.

Typical substrates include very low loss and ultra-low loss resin systems (Df < 0.005 @10 GHz), PTFE resin types and blends mainly for 5G applications.



Treatment side

35 µm BF-ANP

TYPICAL AVERAGE PROPERTIES*

BF-ANP									
MEASURED PARAMETERS			UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness			µm oz.	9 1/4	12 3/8	18 1/2	35 1	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight			oz/ft² g/m² g/254 in²	0.24 74 12.1	0.34 103 16.9	0.48 146 23.9	0.91 278 45.6	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Line Roughness	Ra	ISO 4287	µm (µ.inch)	≤ 0.25 (≤ 9.8)				3.5.6	2.2.17
Untreated Side Surface Roughness	Sa	ISO 25178		~ 0.20 (≤ 7.9)				–	2.2.22 Draft[2]
	Sq			≤ 0.25 (≤ 9.8)				–	
Treated Side Line Roughness	Rz	ISO 4287		≤ 2.0 (≤ 79)	≤ 1.6 (≤ 63)	≤ 1.4 (≤ 55)	≤ 1.3 (≤ 52)	3.4.5	2.2.17
	Rz	JIS B 601		≤ 1.6 (≤ 63)	≤ 1.2 (≤ 47)	≤ 1.1 (≤ 43)	≤ 1.0 (≤ 39)	–	–
Treated Side Surface Roughness	Sa	ISO 25178		~ 0.27 (~ 10.6)	~ 0.23 (~ 9.1)	~ 0.20 (~ 7.9)	~ 0.18 (~ 7.1)	–	2.2.22 Draft[2]
	Sq			~ 0.35 (~ 13.8)	~ 0.29 (~ 11.4)	~ 0.26 (~ 10.2)	~ 0.22 (~ 8.7)	–	
	Sz			~ 3.5 (~ 138)	~ 3.0 (~ 118)	~ 2.7 (~ 106)	~ 2.5 (~ 98)	–	
Tensile Strength Transverse at RT			MPa (k.Lb/in²)	≥ 207 (≥ 30)			≥ 276 (≥ 40)	3.5.1	2.4.18
Tensile Strength Transverse at 180 °C				≥ 103 (≥ 15)			≥ 138 (≥20)		
Elongation Transverse at RT			%	4 – 10	5 – 20	7 – 25	10 – 30	3.5.3	
Elongation Transverse at 180 °C				5 – 25	9 – 25	10 – 35	10 – 40		
Peel Strength (RT)[1] on Ultra Low Loss Resin			N/mm (Lb/in)	≥ 0.6 [3] (≥ 3.4)	≥ 0.35 (≥ 2.0)	≥ 0.45 (≥ 2.6)	≥ 0.6 (≥ 3.4)	3.5.4	2.4.8
High Temp. Tarnish Resistance			–	60 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*

[2] *Final draft of TM 2.2.22 as of Sept. 29th, 2015*

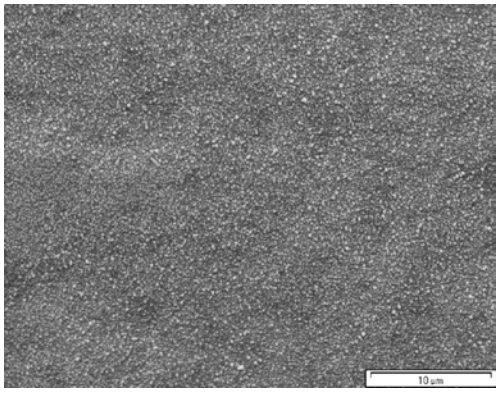
[3] *after built-up to 35 µm*

BF-NN

TECHNICAL CHARACTERISTICS

BF-NN style foil is a so-called "profile free" electro-deposited copper foil, characterized by high ductility at room temperature, a fine grain size with thermally stable microstructure, and lower electrical resistivity compared to regular ED foils.
The extremely ultra-flat profile ensures a minimalist skin depth penetration thus reducing conductor losses for high speed digital applications and reducing the passive intermodulation (PIM) in RF applications if frequencies of 20 GHz and more apply.

Typical substrates include very low loss and ultra-low loss resin systems (Df < 0.005 @10 GHz), PTFE resin types and blends mainly for 5G applications.



Treatment side
35 µm BF-NN

TYPICAL AVERAGE PROPERTIES*

BF-NN								
MEASURED PARAMETERS			UNITS				IPC	
Nominal Thickness			µm oz.	12 3/8	18 1/2	35 1	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight			oz/ft² g/m² g/254 in²	0.34 103 16.9	0.47 143 23.4	0.90 275 45.1	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Line Roughness	Ra	ISO 4287	µm (µ.inch)	≤ 0.25 (≤ 9.8)			3.5.6	2.2.17
Untreated Side Surface Roughness	Sa	ISO 25178		~ 0.20 (~ 7.9)			–	2.2.22 Draft[2]
	Sq			~ 0.25 (~ 9.8)			–	
Treated Side Line Roughness	Rz	ISO 4287		≤ 1.6 (≤ 63)	≤ 1.3 (≤ 52)	≤ 1.2 (≤ 47)	3.4.5	2.2.17
	Rz	JIS B 601		≤ 1.2 (≤ 47)	≤ 1.0 (≤ 39)	≤ 0.9 (≤ 35)	–	–
Treated Side Surface Roughness	Sa	ISO 25178		~ 0.23 (~ 9.1)	~ 0.15 (~ 5.9)	~ 0.14 (~ 5.5)	–	2.2.22 Draft[2]
	Sq			~ 0.29 (~ 11.4)	~ 0.19 (~ 7.5)	~ 0.18 (~ 7.1)	–	
	Sz			~ 3.0 (~ 118)	~ 1.7 (~ 67)	~ 1.5 (~ 59)	–	
Tensile Strength Transverse at RT			MPa (k.Lb/in²)	≥ 207 (≥ 30)		≥ 276 (≥ 40)	3.5.1	2.4.18
Tensile Strength Transverse at 180 °C				≥ 103 (≥ 15)		≥ 138 (≥20)		
Elongation Transverse at RT			%	6 – 25	8 – 30	10 – 30	3.5.3	
Elongation Transverse at 180 °C				9 – 25	10 – 30	10 – 30		
Peel Strength (RT)[1] on Ultra Low Loss Resin			N/mm (Lb/in)	≥ 0.35 (≥ 2.0)	≥ 0.45 (≥ 2.6)	≥ 0.6 (≥ 3.4)	3.5.4	2.4.8
High Temp. Tarnish Resistance			–	60 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*

[2] *Final draft of TM 2.2.22 as of Sept. 29th, 2015*

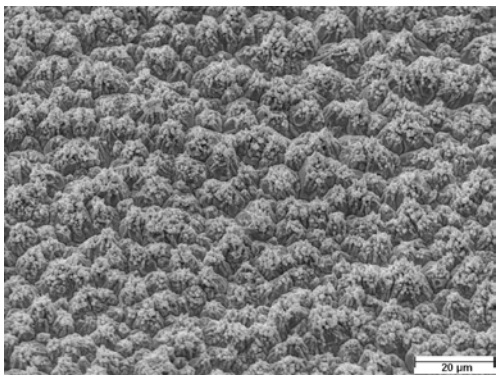
TZA-FX

TECHNICAL CHARACTERISTICS

TZA-FX style of foil is a matte-side treated zinc free and arsenic free electro-deposited copper foil, characterized by enhanced high temperature elongation properties [IPC-Grade 3] and thermally stable microstructure.

The foil exhibits excellent adhesion to a broad range of flexible substrates for 3-layer FCCL. After thermal stress, this product is showing best bond retention.

If 3-layer FCCL's with dicy-cured epoxy adhesives are used, we recommend our copper foil with TWLS treatment.



Treated matte side

TYPICAL AVERAGE PROPERTIES*

TZA-FX								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	12 3/8	18 1/2	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.35 106 17.4	0.50 152 24.9	0.93 283 46.4	1.89 577 94.6	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)		µm (µ.inch)	0.20 – 0.40 (8 – 16)				3.5.6	2.2.17
Treated Side Roughness (Rz)	ISO		4 – 7 (157 – 276)	5 – 8 (197 – 315)	6 – 11 (236 – 433)	8 – 13 (315 – 512)	3.4.5	
	JIS		3 – 5.8 (118 – 228)	4 – 7 (157 – 276)	5 – 9.3 (197 – 366)	7 – 11 (276 – 433)	–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)				3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)					
Elongation Transverse at RT		%	≥ 2	≥ 6		≥ 9	3.5.3	
Elongation Transverse at 180 °C			≥ 2	≥ 3				
Peel Strength (RT) FR4 halogen free [1]		N/mm (Lb/in)	≥ 1.0 (≥ 5.7)		≥ 1.2 (≥ 6.8)	≥ 1.3 (≥ 7.4)	3.5.4	2.4.8
High Temp. Tarnish Resistance		–	60 min @ 180 °C in air: pass				–	
Solderability		–	Complies with IPC specification				3.6.3	2.4.12

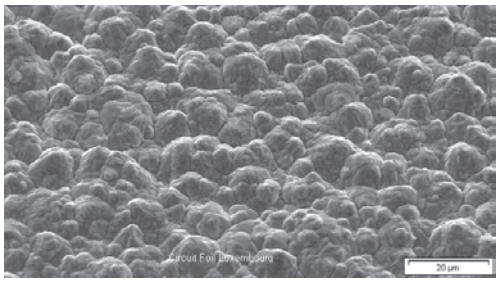
[1] *Laminate construction with thickness ≥ 0.5 mm*

TZA-B-FX

TECHNICAL CHARACTERISTICS

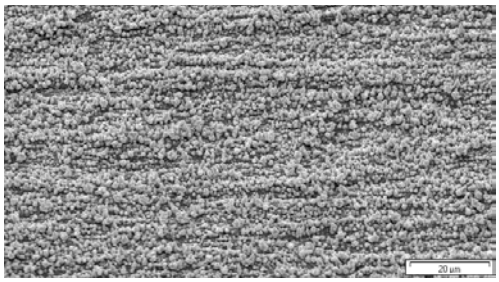
TZA-B-FX foil is a so-called "Reverse Treated Foil" with zinc free and arsenic free treatment characterized by enhanced high temperature elongation properties [IPC-Grade 3] and thermally stable microstructure.

The foil exhibits an excellent adhesion to a broad range of flexible substrates for 2-layer and 3-layer FCCL. After thermal stress, this product is showing best bond retention.



Untreated matte side

Treated drum side



TYPICAL AVERAGE PROPERTIES*

TZA-B-FX							
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			IPC	
Nominal Thickness		µm oz.	12 3/8	18 1/2	35 1	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.34 105 17.2	0.50 152 24.9	0.93 283 46.4	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)	ISO	µm (µ.inch)	≤ 5.1 (≤ 201)	≤ 6.0 (≤ 236)	≤ 9.0 (354)	–	2.2.17
	JIS		≤ 4.2 (≤ 165)	≤ 5.0 (≤ 197)	≤ 7.5 (≤ 294)		
Treated Side Roughness (Rz)	ISO	µm (µ.inch)	≤ 5.1 (≤ 201)			3.4.5	
	JIS		≤ 5.1 (≤ 201)			–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)			3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 138 (≥ 20)				
Elongation Transverse at RT		%	≥ 3	≥ 6		3.5.3	
Elongation Transverse at 180 °C			≥ 2	≥ 3			
Peel Strength Treated Shiny Side (RT) on halogen-free prepreg [1]		N/mm (Lb/in)	≥ 0.7 (≥ 4.0)	≥ 0.75 (≥ 4.3)	≥ 0.8 (≥ 4.6)	3.5.4	2.4.8
High Temp. Tarnish Resistance		–	60 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*

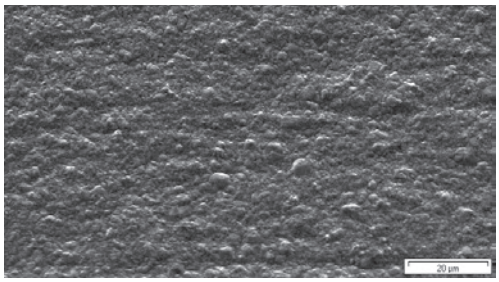
SR-TZA-B-FX

TECHNICAL CHARACTERISTICS

SR-TZA-B-FX style of foil is a so-called "Reverse Treated Foil" with high flexural fatigue with zinc free and arsenic free treatment characterized by high elongation properties [IPC-Grade 2].

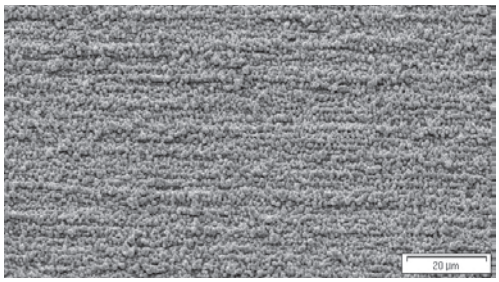
The zinc free and arsenic free copper treatment is designed to provide excellent bond strength on flexible substrates like 2-layer polyimide FCCL.

Typical application fields are 2-layer FCCL.



Untreated matte side

Treated drum side



TYPICAL AVERAGE PROPERTIES*

SR-TZA-B-FX							
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE			IPC	
Nominal Thickness		µm oz.	9 1/4	12 3/8	18 1/2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.26 80 13.1	0.34 105 17.2	0.50 154 25.2	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Matte Side Roughness (Rz)	ISO	µm (µ.inch)	≤ 3.0 (≤ 118)	≤ 3.0 (≤ 118)	≤ 4.0 (≤ 157)	–	2.2.17
	JIS		≤ 2.5 (≤ 98)	≤ 2.5 (≤ 98)	≤ 3.3 (≤ 130)		
Treated Side Roughness (Rz)	ISO		≤ 3.0 (≤ 118)			3.4.5	
	JIS		≤ 2.5 (≤ 98)			–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 276 (≥ 40)			3.5.1	2.4.18
Elongation Transverse at RT		%	≥ 2	≥ 3	≥ 6	3.5.3	
Peel Strength Treated Shiny Side on Halogen-free Prepreg [1]		N/mm (Lb/in)	≥ 0.7 [2] (≥ 4.0) [2]	≥ 0.7 (≥ 4.0)		3.5.4	2.4.8
High Temp. Tarnish Resistance		–	60 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

[2] after galvanic reinforcement up to 35 µm

* 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.

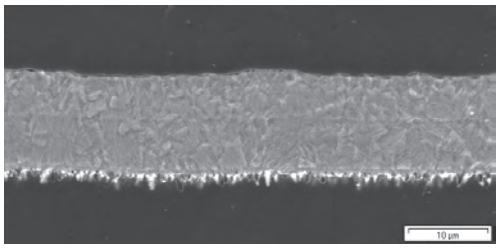
arsenic free

BF-TZA-FX

TECHNICAL CHARACTERISTICS

BF-TZA-FX style foil is an ultra-flat single side treated electro-deposited copper foil, characterized by a very high ductility at room temperature.

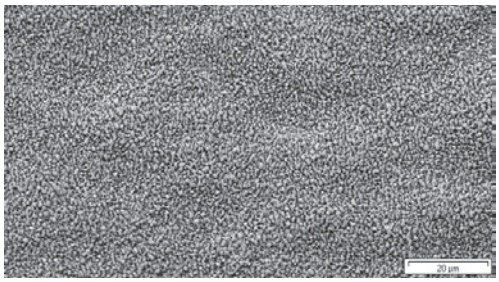
The zinc free and arsenic free copper treatment is designed to provide excellent bond strength on flexible substrates like 2-layer polyimide FCCL.



Cross section

12 µm BF-TZA-FX

Treated matte side



TYPICAL AVERAGE PROPERTIES*

BF-TZA-FX								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	9 1/4	12 3/8	18 1/2	35 1	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.26 80 13.1	0.37 112 18.4	0.51 156 25.6	0.93 285 46.7	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)		µm (µ.inch)	≤ 0.35 (≤ 14)				3.5.6	2.2.17
Treated Side Roughness	Ra		0.3 – 0.55 (12 – 22)				–	
	Rz (ISO)		≤ 3.1 (≤ 122)				3.4.5	
	Rz (JIS)		≤ 2.5 (≤ 98)				–	
	Rt		≤ 3.7 (≤ 146)					
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 207 (≥ 30)			≥ 276 (≥ 40)	3.5.1	2.4.18
Tensile Strength Transverse at 180 °C			≥ 103 (≥ 15)			≥ 138 (≥ 20)		
Elongation Transverse at RT		%	4 – 10	6 – 25	8 – 30	10 – 30	3.5.3	
Elongation Transverse at 180 °C			5 – 20	9 – 25	10 – 30	10 – 30		
Peel Strength (RT) FR4 halogen free [1]		N/mm (Lb/in)	≥ 0.7 (≥ 4.0)				3.5.4	2.4.8
High Temp. Tarnish Resistance		–	60 min @ 180 °C in air: pass				–	
Solderability		–	Complies with IPC specification				3.6.3	2.4.12

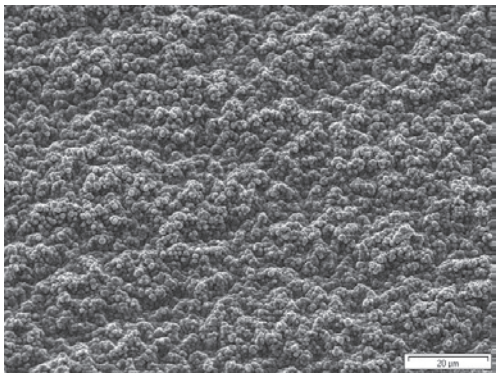
[1] *Laminate construction with thickness ≥ 0.5 mm*

LPT-YE

TECHNICAL CHARACTERISTICS

LPT-YE is an advanced matte-sided treated product based on a unique low profile base foil.
The foil is characterized by superior elastic modulus which is also preserved after the typical process for chip card modules. High mechanical properties ensure a perfect flatness of the foil inside the chip window.
The inorganic YE protection on the shiny foil surface ensures its superior resistance to oxidation in warm and humid environments.

The product is designed for IC card modules.



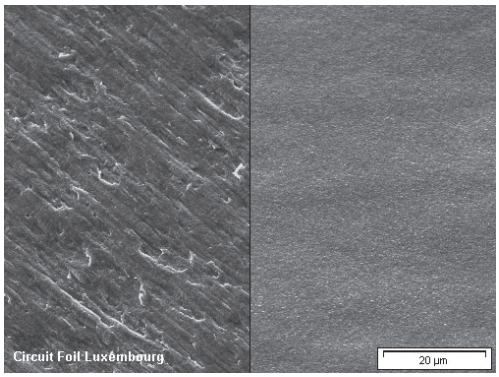
Treatment side of 32 µm LPT-YE foil

TYPICAL AVERAGE PROPERTIES*

LPT-YE								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	18 1/2	32 1	35 1	70 2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.49 150 24.6	0.93 283 46.4	1.07 327 53.6	1.98 603 98.8	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Untreated Side Roughness (Ra)		µm (µ.inch)	0.20 – 0.40 (8 – 16)				3.5.6	2.2.17
Treated Side Roughness Rz	ISO		≤ 6 (≤ 236)			≤ 7.0 (≤ 276)	3.4.5	
	JIS		≤ 5 (≤ 197)			≤ 5.8 (≤ 228)	–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 379 (≥ 55)				3.5.1	2.4.18
Tensile Strength Transverse at RT (aft. 2 hrs at 160 °C)			≥ 372 (≥ 54)				–	
Elongation Transverse at RT		%	≥ 8	≥ 10		≥ 15	3.5.3	
Yield Strength at RT (after 2 hrs @ 160 °C)		MPa (k.Lb/in²)	≥ 248 (≥ 36)			≥ 207 (≥ 30)	–	
Peel Strength (RT) FR4 [1]		N/mm (Lb/in)	≥ 1.0 (≥ 5.7)	≥ 1.4 (≥ 8.0)		≥ 1.6 (≥ 9.1)	3.5.4	2.4.8
High Temp. Tarnish Resistance		–	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*

BF-PLAINSTAINPROOF



drum side electrolyte side

TECHNICAL CHARACTERISTICS

BF is an ultra-flat electrodeposited copper foil without any additional bonding treatment.

Its exceptionally ultra-low profile makes it very suitable for Lithium-ion batteries where a graphitic carbon layer is bonded to the copper foil in order to form the current collector.

The very thin BF-Plainstainproof foils are used in all kind of Lithium-ion batteries for notebooks and smartphones. It is an ideal solution for large size and high power batteries as required by Hybrid Electrical Vehicles (HEV) and Battery Electrical Cars (BEV), as well as for Smart Grid Battery systems.

TYPICAL AVERAGE PROPERTIES*

BF-Plainstainproof										
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE						IPC	
Nominal Thickness		µm oz.	6** -	8 -	10 -	12 3/8	14 -	18 1/2	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.17 53 8.7	0.24 72 11.8	0.29 90 14.7	0.34 105 17.2	0.41 125 20.5	0.48 148 24.3	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Drum Side Roughness (Ra)		µm (µ.inch)	≤ 0.35 (≤ 14)						3.5.6	2.2.17
Drum Side Roughness (Rz)	ISO		≤ 2.5 (≤ 98)						3.4.5	
	JIS		≤ 3.0 (≤ 118)						–	
Electrolyte Side Roughness (Rz)	ISO		≤ 2.5 (≤ 98)						3.4.5	
	JIS		≤ 2.4 (≤ 94)						–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 207 (≥ 30)						3.5.1	2.4.18
Tensile Strength Transverse at RT after 1h at 175 °C			≥ 207 (≥ 30)							
Tensile Strength Transverse at 180 °C			≥ 103 (≥ 15)							
Elongation Transverse at RT		%	≥ 3						3.5.3	
Elongation at RT after 1h at 175 °C			≥ 3							
Elongation Transverse at 180 °C			≥ 3							
Resistivity		Ωg/m²	≤ 0.181	≤ 0.171		≤ 0.170		≤ 0.166	3.8.1.2	2.5.14
		Ωmm²/m	≤ 0.0204	≤ 0.0192		≤ 0.0191		≤ 0.0187	–	
Purity		%	≥ 99.9						3.8.1.1	2.3.15

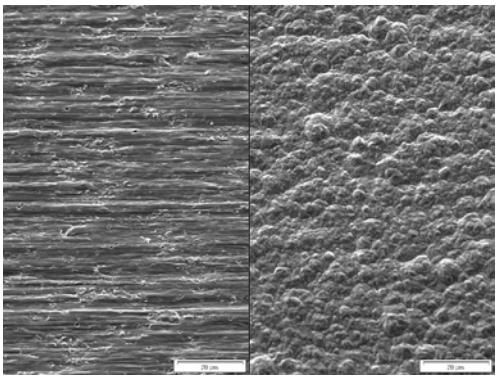
** pre-series

SR-PLAINSTAINPROOF

TECHNICAL CHARACTERISTICS

SR-Plainstainproof is a ductile high elongation electrodeposited copper foil without any additional bonding treatment.

Typical applications are next generation Lithium-ion batteries used typically for EV, especially for cylindrical and prismatic cell types as the high elongation properties of SR-Plainstainproof foil will allow stress release during winding of the electrode.



drum side electrolyte side

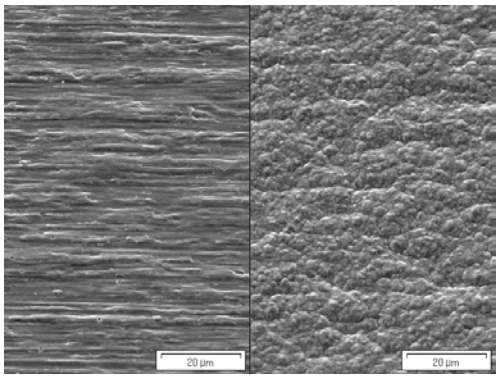
TYPICAL AVERAGE PROPERTIES*

SR-Plainstainproof								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	6** -	8 -	10 -	12 3/8	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.18 54 8.8	0.24 72 11.8	0.29 89 14.6	0.34 103 16.9	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Drum Side Roughness (Ra)		µm (µ.inch)	≤ 0.35 (≤ 14)				3.5.6	2.2.17
Drum Side Roughness (Rz)	ISO		≤ 2.5 (≤ 98)				3.4.5	
	JIS		≤ 2.0 (≤ 79)				–	
Treated Side Roughness (Rz)	ISO		≤ 3.0 (≤ 118)				3.4.5	
	JIS		≤ 2.4 (≤ 94)				–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 434 (≥ 63)				3.5.1	2.4.18
Tensile Strength Transverse after 30 min at 130 °C			≥ 207 (≥ 30)					
Tensile Strength Transverse after 1h at 175 °C			≥ 207 (≥ 30)				–	
Elongation Transverse at RT		%	≥ 3				3.5.3	
Elongation Transverse after 30 min at 130 °C			≥ 3				–	
Resistivity		Ωg/m²	≤ 0.181	≤ 0.171		≤ 0.170	3.8.1.2	2.5.14
		Ωmm²/m	≤ 0.0204	≤ 0.0192		≤ 0.0191	–	
Purity		%	≥ 99.9				3.8.1.1	2.3.15

** pre-series*

arsenic free

HTS-PLAINSTAINPROOF



drum side electrolyte side

TECHNICAL CHARACTERISTICS

HTS-Plainstainproof is high tensile electrodeposited copper foil even after thermal excursions without any additional bonding treatment.

Typical applications are next generation Lithium-ion batteries used typically for EV, especially for pouch cell types as the high tensile properties of HTS-Plainstainproof foil will avoid deformation for cells with higher number of stacks.

TYPICAL AVERAGE PROPERTIES*

HTS-Plainstainproof								
MEASURED PARAMETERS		UNITS	PRODUCT GAUGE				IPC	
Nominal Thickness		µm oz.	6** -	8 -	10 -	12 3/8	Specification IPC-4562A	Test Method IPC-TM-650
Area Weight		oz/ft² g/m² g/254 in²	0.18 54 8.8	0.24 72 11.8	0.29 89 14.6	0.34 103 16.9	(a)1.2.5, table 1-1 (b)3.4.4 (c)4.6.3	2.2.12
Drum Side Roughness (Ra)		µm (µ.inch)	≤ 0.35 (≤ 14)				3.5.6	2.2.17
Drum Side Roughness (Rz)	ISO		≤ 2.5 (≤ 98)				3.4.5	
	JIS		≤ 2.0 (≤ 79)				–	
Treated Side Roughness (Rz)	ISO		≤ 3.0 (≤ 118)				3.4.5	
	JIS		≤ 2.4 (≤ 95)				–	
Tensile Strength Transverse at RT		MPa (k.Lb/in²)	≥ 455 (≥ 66)				3.5.1	2.4.18
Tensile Strength Transverse at RT after 10 min at 130 °C			≥ 450 (≥ 60)					
Tensile Strength Transverse at RT after 1h at 175 °C			≥ 450 (≥ 60)				–	
Elongation Transverse at RT		%	≥ 2				3.5.3	
Elongation Transverse after 1h at 175 °C			≥ 2				–	
Resistivity		Ωg/m²	≤ 0.181	≤ 0.171		≤ 0.170	3.8.1.2	2.5.14
		Ωmm²/m	≤ 0.0204	≤ 0.0192		≤ 0.0191	–	
Purity		%	≥ 99.9				3.8.1.1	2.3.15

** pre-series*

* 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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