INSULECTRO COPPER SUPPLIERS

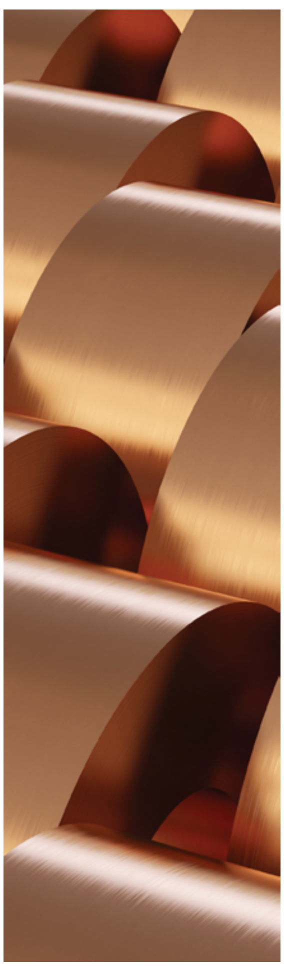
CAC

Denkai

JX Nippon Mining & Metals

MITSUI KINZOKU

日本電解株式会社
Nippon Denkai, LTD.



Copper Foil Advances Enable Technology

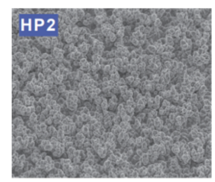
Copper's enabling properties include its conductive nature, affordability, and market availability. It is less epensive than silver with its high IACS % (106% vs 100% IACS). However, copper's customizable nodulation technology (as seen in Denkai America's HP2), physical profile (VLP2), plating technology to achieve ultra-thin foils for tighter lines & spaces (mSAP), and improved handling mechanism (Bonded Foil) provides support for the lamination room. Each technology highlights the need for correct foil selection to support the higher technology printed circuit Board.

Technologies for Copper Foil

Nodulation Technology:

When using a no flow or low flow resin you'll need a high-performance HP2 foil from Denkai America who has over 45 years of continuous manufacturing history.

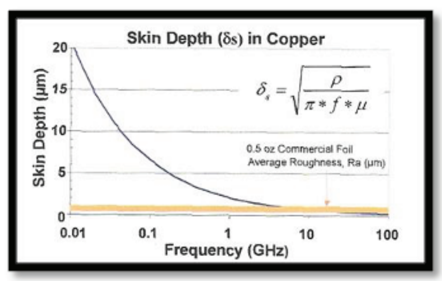
The HP2 foil has increased surface area due to greater peak to valley nodulation deposition with additional nodule plating increasing mechanical bonding strength.



Treated Matte Side
H oz. / 18 µm (1500xx)

Profile Technology:

The smoothness of the copper's profile helps signal integrity while roughness helps adhesion in the form of peel strength. These two factors are in conflict and careful material consideration is required for I/L. The laminator designation of VLP2, Very Low Profile treated side Rz 2µm max for Radio Frequency (RF) or High-Speed Digital (HSD) application due to skin effect is a must.



Ultra-thin Foil Technology:

The table below will help serve as a guide on material thickness to achieve tighter lines and spaces. Ultra-thin foils, DuPont™ Riston® dryfilm and imaging equipment support the mSAP technology principle.

Type	Carrier	Producer	Grade	Foil type	Thickness	Profile (Rz)	L / S	Mil	MM
Bonded	Alum	JX Nippon	3	JTCS-P1	9µm	1.9µm	60/60 >	3 >	0.0762 >
Bonded	Alum	Nippon Denkai	3	SEED6	6µm	1.2µm	50/50 > 75/75	2 - 3	0.0508 >
Carrier	18µm Cu	Mitsui	1	MT18Ex	5µm	2µm	50/50 > 75/75	2 - 3	0.0508 >
Carrier	18µm Cu	Mitsui	1	MT18Ex	3µm	2µm	25/25 > 50/50	1 - 2	0.0254>
Carrier	18µm Cu	Mitsui	1	MT18FI	1.5µm	1.3µm	20/20 <	1<	0.0177<
Table information values noted for reference and should not be used solely for design purposes without further support.									

Bonded Foil Technology:

Bonded foils help to protect the foils surface topography for SI, reduces the potential for Foreign Objects or Debris (FOD), improves operator efficiency & reduces press stack height for throughput gains.

LOOSE FOIL - from **12 µm & thicker** (below 12 µm use bonded foil)

BONDED FOIL from **6 µm to 70 µm** (Aluminum or Steel in Tops/Bottoms or Middles)

CARRIER FOIL from **1.5 µm to 5 µm** (on a H oz /18 µm / Grade 1 copper carrier)

Insulectro • 20362 Windrow Drive • Lake Forest, CA 92630 • (949) 587-3200 • www.insulectro.com Need info? Contact Mark Satchwell, Product Manager - Copper Foil msatchwell@insulectro.com

Copper Foil Technologies

Foil Type	IPC 4562A Grade	Application	Thickness	Treatment Side Rz	Profile	Barrier Treatment	External references	Internal references	CF Product
ED	3	Epoxy resins Example FR4	18um, 35um, 53um, 70um	4 to 10.2 microns	LP	Contains Zn & As BUT Pb free	Denkai America TOB III	Std	TW-YE
ED	1	Epoxy resins Example FR4	105um, 140um, 175um, 210um	15.6 > microns	S	Contains Zn & As BUT Pb free	Denkai America TOB III	Std	TW-YE
ED	3	Polyimide & PPO	12um, 18um, 35um, 70um	5 to 10.2 microns	LP	Contains Zn & As BUT Pb free	Denkai America MHT	HP	TWLS
ED	3	Polyimide & low flow / no flow resins	12um, 18um, 35um	6.4 to 8 microns	LP	Contains Zn & As BUT Pb free	Denkai America HP2	HP2	TWS
ED	3	PTFE for HDI & Flex PCB	6um	1.2 microns	VLP2	Contains Zn & As BUT Pb free	Nippon Denkai SEED 6	SEED 6	NONE
ED-RTF	3	Polyimide	18um, 35um	3 to 4 microns	LP	Contains Zn & As BUT Pb free	Denkai America MLS	RTF	TWLS-B
ED-RTF	11	Polyimide & FCCL	12um, 18um	1.7 microns	VLP2	Contains Zn - no Pb or As	JX Nippon EFL-V2	EFL	SR-TZA-B-FX, BF-TZA-FX
ED	3	HSD and RF	9um	¼ oz - 2.4 microns	VLP2	As free	JX Nippon JTCSLC	JTCSLC	TZA (BF - B)
ED	3	HSD and RF (Fine line etching)	9um, 18um	1.9 microns	VLP2	As free & Very low Zn	JX Nippon JTCS-P1	JTCS-P1	TZA (BF - B)
ED	3	Semi conductor, HDI, Flex PCB	9um	2.8 microns	HVLP	Contains Zn - no Pb or As	Mitsui 3EC-M3-VLP	3EC-M3	TW-YE
ED	1	mSAP, Semi-Additive, HSD	3um & 5um x 18um carrier	1.1 to 1.6 microns	VLP2	Contains Zn - no Pb or As	Mitsui MT18EX	MT18EX	DTH-TZA
ED	1	mSAP, Semi-Additive, HSD	1.5um x 18um carrier	1.3 microns	VLP2	Contains Zn - no Pb or As	Mitsui MT18FL	MT18FL	DTH-TZA
Wrought	8	Flex, Fine pitch & HF (Use MPI)	6um, 12um, 18um	1.7 microns	VLP2	Ni less treatment	JX Nippon HA-V2 - BHM 102F	HA-V2	N/A
Wrought	7	Flex	18um, 35um, 70um	2.8 microns <	HVLP	Contains Zn - no Pb or As	Wieland RA	STD	N/A
Wrought	7	Double Treat - Flex	18um, 35um, 70um	2.8 microns <	HVLP	Contains Zn - no Pb or As	Wieland RA DT	STD DT	N/A