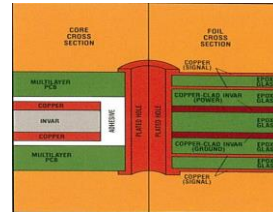
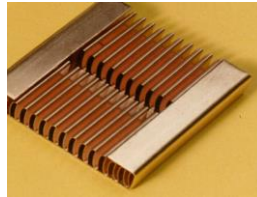


Product Overview

Copper/Invar/Copper is a wrought, metallic composite material used in printed circuit boards, power planes, metal cores, hybrid enclosures, heat sinks, and other applications where coefficient of thermal expansion (CTE) match or constraint of thermal expansion is required. The laminated Cu/Invar/Cu composite material is metallurgically clad by roll bonding and has been the design of choice for high end PWBs and military avionics for years.



Product Description

EMS Material Designation	CIC		
Composition	Copper / Invar / Copper		
Ratios	12.5 / 75 / 12.5	20 / 60 / 20	others upon request

Chemical Composition

UNS	Grade Eur	Chemistry (%)
C10300	Cu-OF	Cu incl Ag 99.95; P 0.005 max
K93600 (Invar)	1.3912	Ni 35.5 - 36.5; Mn 0.50, Si 0.25, C 0.12, P 0.025, Si 0.25 max; bal Fe

Physical Properties	12.5 / 75 / 12.5		20 / 60 / 20	
CTE - 55 to 125 C	2.4 - 5.6	ppm / C	3.6 - 6.8	ppm/ C
Density	8.33	g/cm3	8.43	g/cm3
Modulus of Elasticity	1.40 x 10 ⁵	Mpa	1.35 x 10 ⁵	MPa
Thermal Conductivity (XY, Z planes)	1.1, 0.2	w/(cm°C)	1.67, 0.2	w/(cm°C)
Electrical Conductivity	25	%IACS	40	%IACS

Mechanical Properties (annealed temper)

Yield Strength 0.2%offset	241 - 345	Mpa	173 - 276	MPa
Tensile Strength	379 - 482	MPa	310 - 413	MPa
Elongation 2" gage length	20	% min	25	% min
Hardness (Invar layer)	137 - 150	HV	137 - 150	HV

Other Properties

	ENGLISH	METRIC
Peel strength - minimum	100 lbs / in	18 kg / cm

Heat Treatment

Cu/Invar/Cu is provided normally in the fully annealed condition and therefore does not need heat treatment prior to processing or forming. To soften the material after cold work, anneal in the range of 650° C to 955° C (1200° F - 1750° F). Actual annealing temperature and time depend on the material dimension, annealing furnace type and material property needs. Low temperature annealing introduces less diffusion between Cu and Invar, when high electrical conductivity is required in the Cu. Stress relief heat treatment is performed at a much lower temperature in the range of 300° to 375° C (570° to 705° F). Stabilizing heat treatment can follow the same process used for Invar.

Formability

Cu/Invar/Cu has excellent formability to meet common manufacturing requirements in the products where the material is used.

Joinability

Cu/Invar/Cu sheet can be readily joined by adhesive lamination process for multilayer board, sometimes with a certain surface treatment being performed first for better adhesion with epoxy. The Cu/Invar/Cu can be edge-joined to some dissimilar alloys by laser or electron beam welding. Soldering of the copper surface can also be used as a joining method.

Corrosion Resistance

Since outside surfaces of Cu/Invar/Cu are copper, material has similar corrosion and corrosion resistance behavior as can be found in commercial pure copper alloys.

Availability

Gauge	0.006 - 0.075" (0.5 - 1.9mm)
Width	widths up to 25" (635mm) available
Ratio	others available upon request
Surface roughness	Less than 1.27 micro-meters
Temper	Annealed. Other tempers available upon request.
Form	Coil or cut to length sheets

Contact

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