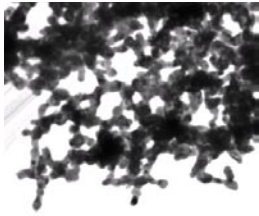


NanoPaste

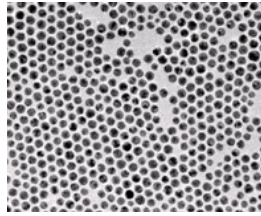
Nano particle dispersion stable at room temperature

Nano particle used in NanoPaste has narrow size distribution and is much smaller mean diameter of 5nm in comparison with the one manufactured by electrolysis, atomization method. Nano particles covered by dispersant is very stable at room temperature act as like a liquid.

Conventional metal nano particle



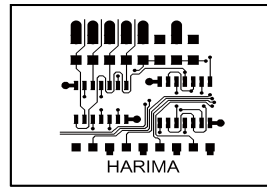
Individually dispersed metal nano particle



Acceleration of printable electronics

Ink-jet printing technology combined with NanoPaste provide solutions to fine pattern formed from bit-map data on-demand. NanoPaste is applicable not for ink-jet printing but screen printing and accelerates printable electronics

Acceleration of printable electronics
by NanoPaste and on demand printing



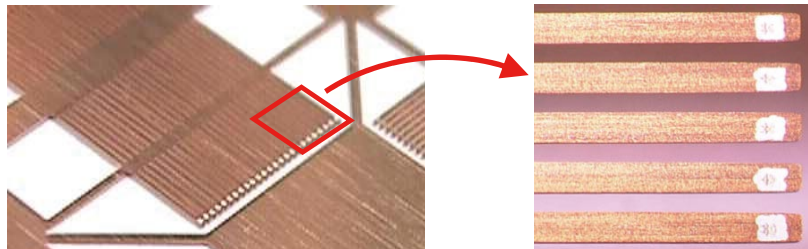
Bit-map data



Printing pattern by copper NanoPaste

New bonding pad formation on inner terminal of copper lead frame by silver NanoPaste using ink-jet printing technology

The bonding silver pad formed on the necessary place at minimum volume of silver by NanoPaste using ink-jet printing. This process that applicable for fine pitch lead frame eliminates waste such as silver plating.



Ink-jet printing technology with NanoPaste simplifying the process

Conventional silver plating process

Preparation of rubber mask

Application of silver plating solution using mask

Silver plating bonding pad

Rinsing

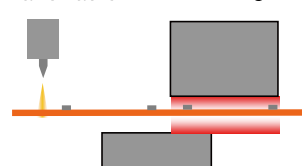
Bonding pad formation

Ink-jet printing process

Ink-jet printing of silver NanoPaste

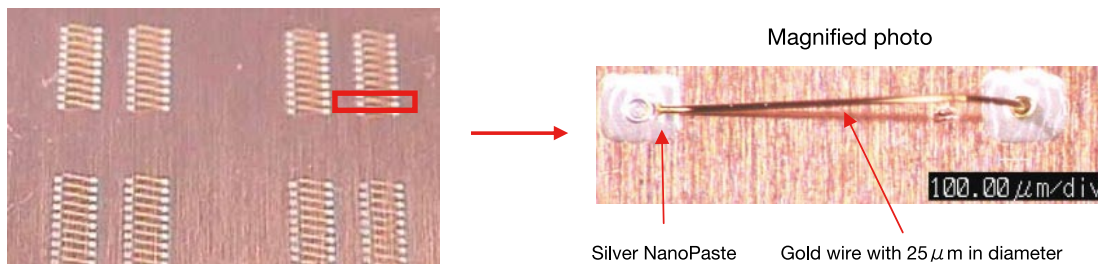
Sintering

Production by fewer steps

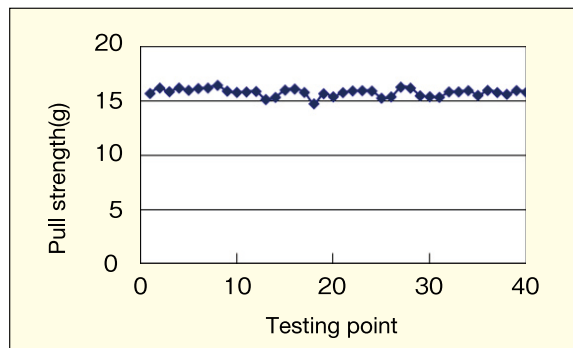
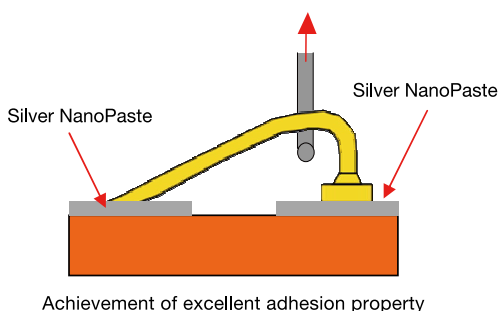


NanoPaste

Gold wire bonded to silver NanoPaste ink-jetted on copper substrate



Evaluation of adhesion strength by pull mode.



Type of Metal		Silver		Gold
Coating Methods		Ink-jet Printing	Screen Printing	Ink-jet Printing
Code		NPS - J	NPS	NPG - J
Characteristics before curing	Appearance	Dark blue liquid	Dark blue paste	Dark brown liquid
	Particle size	3~7nm (Mean dia. 5nm)		2~6 nm (Mean dia. 3nm)
	Metal contents	62~67wt%	75~80wt%	46~52wt%
	Solvent diluent	Tetradecane	1-Decanol	AF solvent *)
	Washing agents	Toluene, Xylene, Hexane, Heptane		
	Viscosity	7~11mPa·s	120~180Pa·s	5~10mPa·s
	Specific gravity	1.8~2.2	N.A.	1.4~1.7
	Applicable substrate	Polyimide, LCP, Cu, Ni		Polyimide, Cu, Ni
	Firing conditions	220°C (60min)	22~230°C(60min)	250°C (60min)
	Storages	Keep at 5~10°C. after receiving up to 2 months		
	Period of usable	Within 24 hours at 25°C		
Characteristics after curing	Appearance	Silver solid		Gold solid
	Specific resistance	3 $\mu\Omega\cdot\text{cm}$		10 $\mu\Omega\cdot\text{cm}$
	Thickness	~4 μm	~7 μm	~1 μm
	Volume after curing	15~20%	24~30%	about10%

*)The main ingredient of AF solvent is naphthen. The ratio of the naphthen and paraffin is about 8/2. The aromatic solvent content is low.