Search this site
or the web

What's New

Site search
Web search

Tutorial 77 - - October 2007 PDF Version

Suppliers
Tutorials
Literature
Books
News
Photos
Newsletter
Updates
DrFlipchip
Home

Solderless Copper Assembly

George A. Riley, PhD
FlipChips Dot Com

Lead-free solder problems continue to multiply, with mounting costs and unforeseen consequences. A creative new approach by Verdant Electronics **eliminates solder interconnections** by reversing the usual order of assembly, first placing all of the components, and later making deposited copper interconnecting layers.

Verdant's "Occam" process encapsulates packaged components that have been precisely positioned on a carrier. The encapsulated assembly is then inverted, and multilayer package interconnections are built up by copper plating onto the top surface. The resulting assembly **eliminates both solder and PC boards**, with all of their attendant miseries, and offers many consequent advantages described below.

PROCESS

The Occam assembly process includes a few relatively simple, well-established steps. Figure 1 (courtesy Verdant) shows the major steps in making a single component layer assembly.

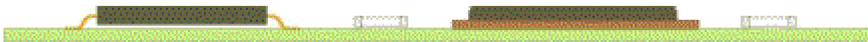

Fig 1a Tested, burned-in packaged components are aligned on an insulating base and bonded in exact positions.

Fig 1b The base and components are encapsulated by overmolding the entire assembly with insulating protective material.

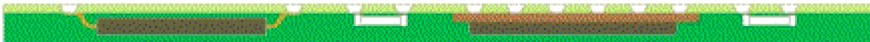

Fig. 1c The encapsulated assembly is inverted. Laser-drilled or other vias through the insulating base expose the component connections on the inverted assembly for access.

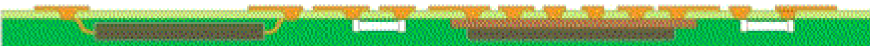

Fig. 1d A conducting circuit layer is plated on the top surface of the base in a build-up

process, to fill the vias and interconnect the devices.

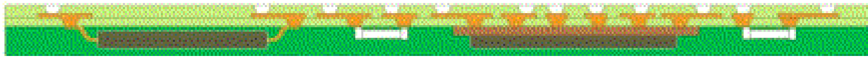

Fig. 1e Another insulating layer is deposited over the conductors, with vias again exposing the terminations for inter-layer connections.

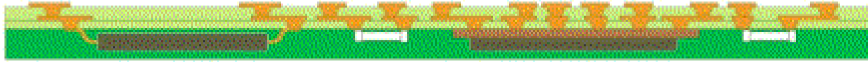

Fig. 1f A second conductor plating fills the vias and provides added interconnectivity. Further layers can be deposited if needed by repeating 1e and 1f.

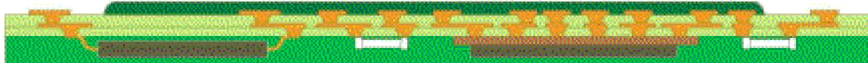

Fig 1g. Assembly is completed by depositing an insulating layer over the top layer to protect all connections not required for external access.

ADVANTAGES

No Solder

Eliminating solder avoids the growing difficulties and high costs of lead-free alloys, and also eliminates their high-temperature processing. Eliminating solder baths, ovens, and other solder-related heating saves substantial amounts of electrical power,

No PC Boards

The whole convoluted, costly path from drawing to production PCB is eliminated. Board storage, and handling are eliminated, as is any potential board warping. Manufacturing problems in solder-mounting components to PCBs, such as popcorning and tombstoning, are eliminated.

Tested Packaged Components

Packaged components may be fully tested and burned in before assembly. Built-up interconnections allow higher density of both leaded and leadless components than with solder connections on a PC board.

Low Temperature Processing

Near-room-temperature processing accommodates temperature-sensitive components, and eliminates thermal stresses. Also eliminated are pre-assembly moisture bake-out of boards and components.

Improved Reliability

Solder joints are the most failure-prone part of electronic assemblies. Low processing temperatures compared with solder eliminate thermal damage to sensitive components. Complete encapsulation of all components gives mechanical strength and higher resistance to damage from shock and vibration.

Easier Design

More routing space is gained by eliminating capture lands, allowing closer component placement, direct copper-to-copper buildup layers, and higher circuit density with fewer layers.

Upward Mobility

The process lends itself readily to 3D stacking and to other presently-developing advanced packaging and interconnection approaches.

Simplicity

The assemblies are simpler, with fewer components. Manufacturing process steps are reduced and simplified. Supply chains are shortened, and the number of outside suppliers reduced.

STATUS

All of the processing materials and technologies required in the Occam process are mature and well-established. This approach applies familiar assembly processes in a different order with fewer steps.

Prototype assemblies produced with this process are currently being characterized and verified. If results are encouraging and continuing development fulfills its promise, the Occam process may become the 21st Century standard for electronic product assemblies.

FOR MORE INFORMATION

Verdant Electronics has extensive information, including a detailed white paper, at http://verdantelectronics.com. Their assistance in providing information for this tutorial is gratefully acknowledged.

FlipChips Dot Com
210 Park Ave #300
Worcester, MA 01609 USA

Phone 508-753-3572
FAX 508-757-0220
EMAIL DrRiley at flipchips.com

© 2007 G. Riley -- All rights reserved