

# Circuit Technology

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### Advancing Component Technology

The tight input/output (I/O) interconnections required by recent innovations in component technology are causing electronic manufacturers to re-evaluate present assembly procedures. As 0.4 and 0.3 mm pitch pads become common, the laborious, tedious and costly methods of applying solder paste to hold components in place, prior to reflow soldering, may no longer be yield- and costcompetitive.

### Limitations Of Solder Paste

In order to deposit a precise volume of solder paste and avoid the bridging problem associated with ultra-fine pitch, modification of paste rheology remains pivotal to effect improvements in print definition and flow control.

An additional complication arises in the finer particle size powder requirement (< 45 microns-0.00017 in.) for attaching ultra-fine pitch components. Finer powder will augment the role of flux in solder paste because of the significant increase in surface area. A comparison between powder with an average particle diameter of 74 microns (0.0029 in.) and one of 33 microns (0.0013 in.) shows an increase of 240 percent. This could necessitate a higher activity flux to avoid solder balls and negate the use of "no clean" solder paste formulations.

In the past, the solder ball problem was minimized by the use of highpressure spray or ultrasonic solvent cleaning. With this no longer a viable option because of the Montreal Protocol (1987) and subsequent United Nations agreements in London

## Selective Coatings

(1990) and Copenhagen (1992), bonding procedures widely used in the manufacture of hybrid circuits are finding applications for assembling printed circuit boards (PCBs).

These applications include:

- Gold and aluminum wire bonding
- Hot-bar soldering
- Ball-grid array (BGA)
- Column-grid array (CGA)
- Tape-automated bonding (TAB)
- Chip-on-board (COB)

### Component Complexity

The size, shape and lead configuration of electronic components are varied, and no one bonding procedure is optimum for all components. Although most compounds are now surface-mounted, there are many that require the added security provided with insertion-mounted components. For this reason, the majority of printed circuits will continue as mixed technology well into the 21st century. Surface-mount components will also be of various pitches/lead configurations.

### **PWB Surface Finishes**

Finishes presently employed to assist in connecting components to printed wiring boards (PWBs) include:

- Organic coatings—inhibitor coating/preflux
- Tin/lead—electroplated/fused electroplated
- Tin/lead—hot-coated (HASL/ fused solder paste/Sipad/Optipad)
- Nickel/gold—electroplated/ electroless

### Preferred Finishes

There are several factors that may influence the decision on the preferred

surface finish for a particular application. These may include:

- Type of components—lead configuration/pitch/size/shape
- Type of assembly—mixed technology/all surface-mount
- Attachment procedure—wave solder/reflow solder paste/TAB/ COB/wire bonding
- Attachment parameters—flux type/post-soldering cleaning

Selective Finishes on PWBs The variety and complexity of components found on the average printed circuit assembly is such that no individual surface finish is ideal. As packaging density increases, selective finishes that maximize assembly efficiency will be essential ingredients.

PC fabrication is faced with a challenge to provide this service. Selective finishes with the proclivity to accommodate diverse bonding procedures will be fundamental to ensure high-yield assembly of densely packaged PCBs.

This presents an opportunity for PWB manufacturers for a value-added product. With the ever-increasing costs of today's high-density printed circuit boards, the need for high, firstpass assembly yields has never been greater.

In order to efficiently fabricate a PWB with selective coatings, improvements in processing skills and techniques for imaging, masking, resist stripping and plating will be crucial. It is anticipated, however, that manufacturers that succeed in this endeavor will profit *vis-a-vis* future demand.