Circuit Technology

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PCMIAs (Credit-card-sized Printed Circuits)

Credit-card-sized printed circuits are known as PCMIAs—the acronym for those little cards that snap into today's laptop computers. Translation: Personal Computer Memory Card International Association, and the thin printed circuits conform to the specifications of this association.

PCMIA was formed six years ago, and the current association specs governing PWBs include geometric and electronic requirements. Material and manufacturing considerations are entrusted to the printed wiring board (PWB) fabricator and printed circuit board (PCB) assembler.

These credit-card-sized PWBs are used to enhance a computer's capabilities. PCMIAs may be purchased as a modem, an extra hard or floppy disk drive, a CD-ROM drive, or an adaptor that hooks into an office network. Other embellishments can include extra memory, graphic cards, sound cards, SCSI interfaces, parallel and serial ports, and wireless communicators.

Only three short years ago, chip technology for such a complex PC card product did not exist. These advancements in component technology were achieved by increasing the level of integration, allowing more functions to be performed in fewer chips, thereby requiring less "real estate." Developments of this nature are precursors for future breakthroughs.

Initially used to enhance the capabilities of laptop computers, these cards now extend the life of most electronic devices to simulate progression in component technology. Modern personal computers now contain slots for credit-card-type assemblies, and are designed so that they can easily be upgraded by replacing current PCMIAs with more advanced versions. Other electronic areas also benefit from this technique.

Finished Thicknesses of PWBs

To effectively fit the standard type 1, 2, 3 PCMIA slot configuration established by the international association, PWBs are designed in the following thickness ranges:

- Four-layer: 0.012 in. (0.306 mm)–0.018 in. (0.457 mm)
- Six-layer: 0.018 in.–0.025 in. (0.635 mm)
- Eight-layer: 0.025 in.–0.033 in. (0.838 mm)

The thickness of the entire package includes components, a PWB, and a case.

Impact on PWB Manufacturing

A typical PCMIA application is a six-layer PWB with an overall finished thickness of 0.018 in., with pads 0.025 in. and with vias 0.010 in. (0.254 mm).

Manufacturing ultra-thin PWBs has been a challenge to fabricators. Those who are producing boards to conform to size stipulations of the PCMIA specifications have experienced an arduous learning period.

A six-layer, ultra-thin PWB that satisfies the requirements of the association would have been dismissed as untenable only a few years ago. Enterprising fabricators, however, predicted the potential market and have persevered in mastering the techniques prescribed for this product.

With the current selling price of a six-layer PCMIA wiring board in the $3.50 to $7 range, those PC manufacturers without production experience in ultra-thin multilayers are confronting established competitors that continue to widen the gap through progressive innovations in equipment and techniques.

With the pressing demand of evolving computer/telecommunication technologies, ultra-thin PWB production may well be crucial for a company to remain competitive in high-tech electronics in view of anticipatory usage of PCMIA cards and MCM-Ls.

Handling Ultra-thin PWBs

Some of the many challenges facing those who are inexperienced in this technology include:

- Mechanical handling problems—equipment modification
- Solder mask—cores "sag" during curing
- Dimensional stability—registration of dense circuitry
- Lower line speed—required to improve yields, but extends cycle time
- Operator training—essential for efficient manufacturing

To date, cost issues have caused the PC fabricator to use standard production-size panels and processes. In the search for successful handling of thin materials, however, productive imagination has triumphed over pragmatism, and changes in equipment and procedures have been recognized as critical.

Streamlining PWB Manufacturing

Higher yield is obtainable with elimination of operator handling. This is especially true of ultra-thin PWBs. Currently used machines are not designed to easily handle ultra-thins. The recent success of direct metallization processes, acceptance of OSP and precious metal alternatives to HASL, and avant-garde systems for application of LPISM to thin PWBs now make automation more feasible.

To reiterate October's "Circuit Technology" column: With total automation in PC fabrication becoming a reality, it follows that the struggle to refine ultra-thin PWBs could be the spark that finally ignites the industry to achieve this technological objective. ❑