



Association Connecting Electronics Industries

Updated Database Standard Makes it Easier to Compare Printed Board Fabricator Capabilities

PCQRR Database facilitates printed board fabricator comparison

By Terry Costlow, IPC online editor

Printed boards are complex structures with via holes and internal and external layers that all pose different challenges during manufacturing, making it difficult to compare the process capabilities of various fabricators. While anecdotal statements of process capability made in survey forms and gathered during on-site audits can provide some insight, they are difficult and costly to verify. A family of standardized test panel designs can make it possible for OEMs to intelligently source their suppliers by comparing fabricators that have produced these standardized designs.

The IPC Printed Board Process Capability, Quality and Relative Reliability (PCQRR) Database was developed by IPC and Conductor Analysis Technologies, Inc. (CAT Inc.) in 2001 for designers, purchasers, assemblers and manufacturers of printed boards. It gives board buyers a straightforward way to compare board fabricators and, in turn, gives fabricators a way to compare their processes to the industry at large. Statistical analysis of test data is used to quantify the capability, quality and relative reliability demonstrated by global printed board manufacturers.

The database summarizes and compares quantitative data gathered from statistically significant samples among participating board manufacturers. For example, a 15-panel submission of a 14-layer single-lamination test panel design has 682,500 plated-through via holes, 235,200 inches of outer layer conductors and spaces and 8,820 measurements of plated-through via registration – along with similar quantities of measurements taken from blind via hole, inner layer conductor and space, soldermask registration, and controlled impedance structures – that are evaluated at one time.

Since mid-2001, 190 different supplier facilities have manufactured test panels for the IPC PCQRR Database and many companies have subscribed to the database. These subscribers use quantitative data to measure a supplier's process capabilities.

"The database provides an independent third-party assessment of capabilities based on making standardized panels, said David Wolf, vice president, technical marketing, at CAT, Inc. "For example, if a supplier can demonstrate the ability to build boards with 5-mil traces at 95 percent yield, 4-mil traces at 80 percent yield and 3-mils at 60 percent, subscribers can decide how viable that supplier is for a given design. It's all about matching customer needs and supplier capabilities."

Test panel designs have been continually updated. The latest addition features a 10-layer "any layer" stacked via design. That brings the number of current designs to 12. Those designs cover a range of fundamental process parameters and feature sizes. Conductor line width and space, via hole drill diameter and grid density, via reliability, via hole and solder mask registration, and controlled impedance tolerance all have a huge impact on the capability and uniformity levels that a facility can provide.

"We have standardized designs that emulate different end-product requirements," Wolf said. "People can compare the results from various test panel designs to their type of product board, whether it's a low layer-count consumer product with an expected lifetime of two or three years or a high layer-count telecommunication backplane that's expected to last 15 or 20 years."

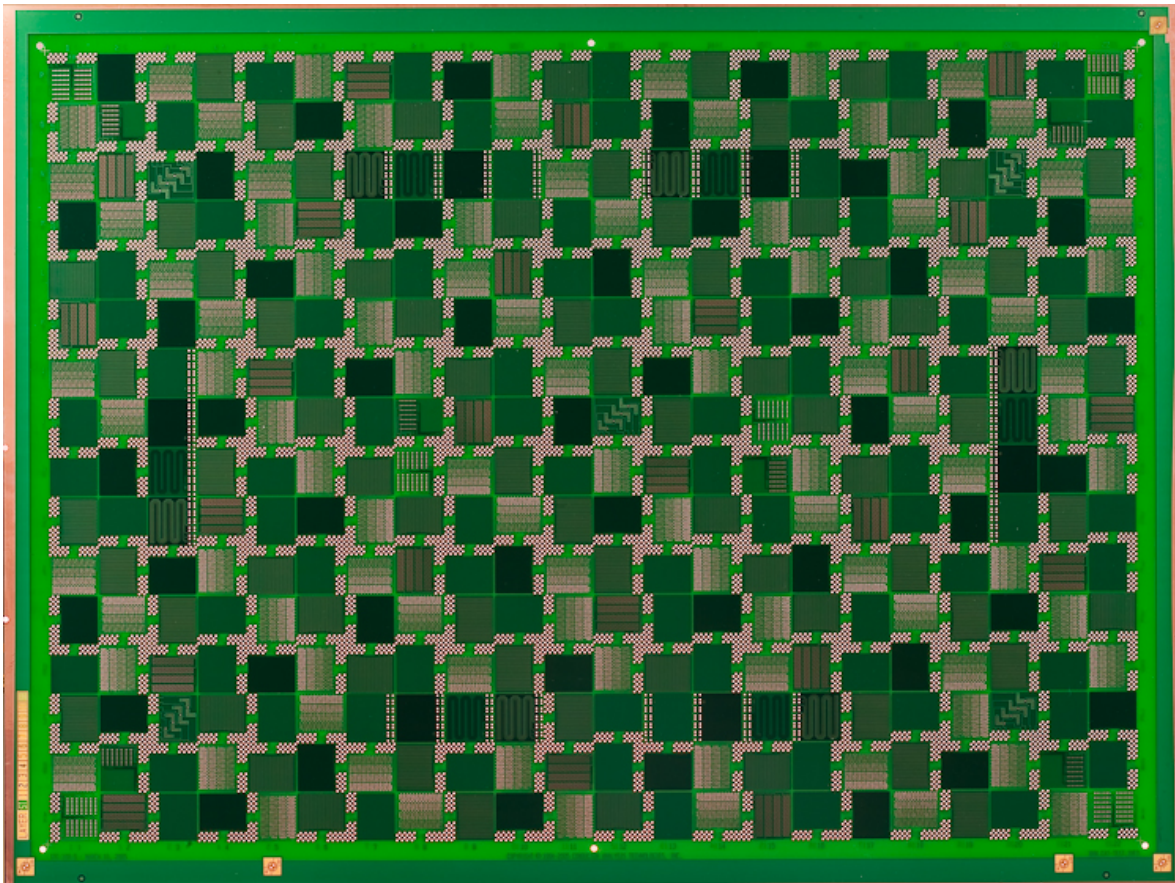
Board production is vastly different than the manufacturing of passive components or connectors where hundreds of thousands of identical items roll off the production line. "Printed boards are not a catalog item nor a commodity product. Each printed board is a custom designed part; hence, each board fabricator is a custom job shop," Wolf said. "It takes anywhere from 60 to 80 unique process steps to fabricate a multi-layer board. Problems with any one process step — imaging, etching, lamination, plating, drilling, etc. — can cause the board to be rejected at final inspection."

Although they're complex, boards often contribute a small percentage to the overall cost of a printed assembly. "The cost of a \$20 printed board is negligible when compared to the cost of putting \$2,000 worth of components on that board," explained Wolf. "If the finished board assembly fails during in-circuit test due to a board quality issue, you've lost \$2,020 plus the cost of labor to assemble. "In many instances, buying a higher quality printed board at a 5 to 10 percent price premium can increase assembly yield and significantly reduce the total cost of goods sold."

CAT Inc., which manages the database, is working on an updated data distribution technique. Currently generated using a custom designed software application, supplier comparison data will soon be available through a Web-based application valid across multiple web browser platforms. That will make it easier for users to get customized information for their specific needs.

And how much data is too much? "Different people on a subscriber's sourcing team look at supplier process capability data from different points of view," Wolf said. "A purchasing manager typically wants very high-level summary information, while a supplier quality assurance person really wants to look at the details. It's difficult to make sound decisions without good data."

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