

## INSERT MOLDING

### Micro-molded probe yields savings at IBM

*PMT uses liquid crystal polymer to replace machined beryllium copper*

A micro insert-molded part made primarily from liquid crystal polymer is resulting in substantial savings and quality improvements at IBM's Microelectronics Division at East Fishkill, N.Y.

The part is an electronic test probe measuring .110-inch by .213-inch by .080-inch. The probes are used on a high-speed serial tester to 100% test multi-layer ceramic, multi-chip and single-chip modules. The probe tips are cycled during testing at a rate of five

moves per second and have an average life of 3 million cycles of constant probing, said Russell Krug, a plastics engineer at IBM. This process, for which, a limited number of probes have been produced, cut IBM's cost by one-half per assembly, said Krug.

Larry Cook, the former IBM engineer who initiated the project, noted that the "microminiature test probes were being produced with great difficulty and high cost" prior to the development of the plastic part.

IBM was wire EDMing and precision machining the probes from beryllium copper and soldering carbide tips in place to create the probe assembly. The tolerances required a degree of skill to maintain and the cost of the complete probe reflected these difficulties. A push for a better probe accelerated as demand for their use increased at IBM.

"IBM decided to seek a precision mold shop that could work with the requirements and ideas to develop a solution," said Cook.

Cook said the right molder for the job was just 65 miles away at Plastics Molding Technology (PMT) in Seymour, Conn.

PMT is a long-established insert molder experienced in tight tolerances and increasingly interested in the challenges of micro-molding, says founder and owner Charles E. Sholtis. IBM's plastics engineering group and PMT developed a successful probe in five months.

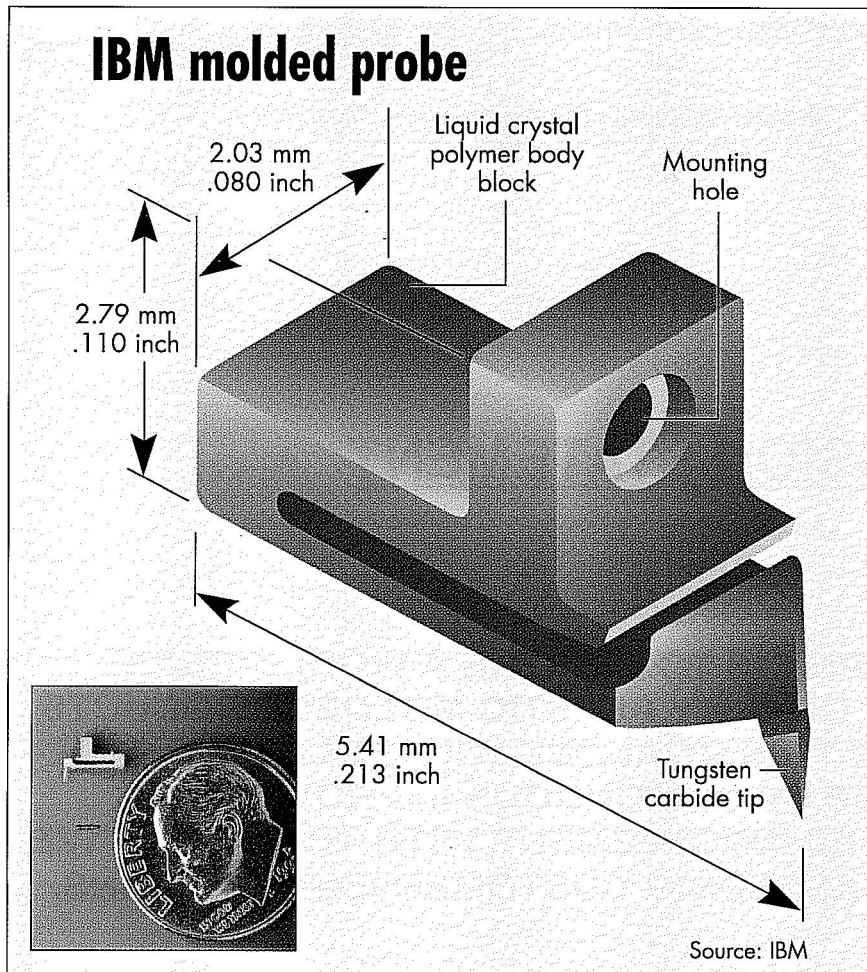
The manufacturing process for the new probe starts with PMT molding "preload blocks" and shipping them in bulk to a vendor that then loads carbide tips into the blocks at predetermined depths. With tips in place the preload block "inserts" are sent back to PMT for molding in a 24-ton vertical Boy press with a one-cavity mold.

The insert is placed in a precise pocket in the mold and the cavity is filled. "Given the size of the insert, the distance from the machine operator to the cavity in the mold and the hand/eye coordination needed to load the insert, production is not an easy task," says Sholtis.

At this point, the plastic insert becomes the side wall of the mold cavity. Once molding is complete, the two parts are ejected and the insert block removed, leaving the tip securely molded to the probe body. PMT then sends the molded part to Mitsui Pathtek for metalization (the assembly is gold-plated for conductivity). After receiving the plated parts, PMT completes secondary operations, inspects and ships completed probes to IBM.

The probe block and insert material are made from Hoechst Celanese Vectra C-810 liquid crystal polymer, providing excellent stiffness and overall toughness.

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The probe tips are cycled during testing at a rate of five moves per second and have an average life of 3 million cycles. Loading the insert (inset) is one of the toughest parts of molding the probe.