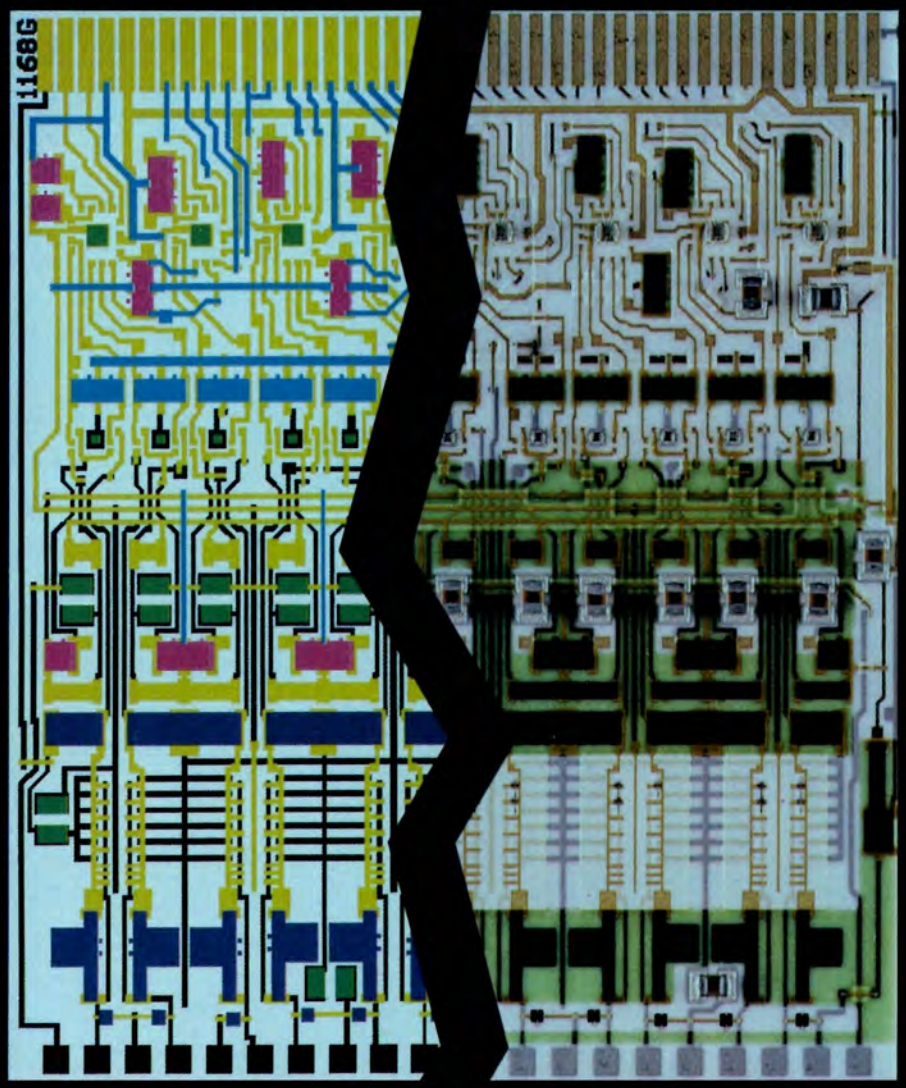
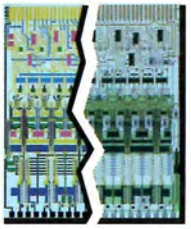
TEK HYBRID COMPONENTS OPERATION

DESIGN FOR QUALITY.

Your product's success is our commitment.



Tektronix
COMMITTED TO EXCELLENCE



Our front cover: This is an HCO-designed hybrid 10-channel probe for a logic analyzer. It also incorporates custom ICs designed by Tektronix. We've made a composite of the circuit's computer-aided layout and the final product to symbolize the complete hybrid development cycle.

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Let's get acquainted

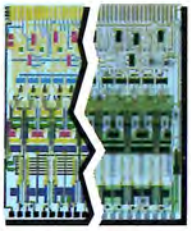
Design for quality is an attitude and a way of doing business at Tektronix' Hybrid Components Operation (HCO).

You see, we believe design for quality means satisfying your total expectations. Quality comes from a consideration for all aspects of development and manufacture, and quality must be designed into a hydrid from its conception. That assures you of a superior product.

When you come to us with a hybrid design concept, you can't help but notice our level of commitment. Members of our staff will ask many questions about your expectations, your specifications, the application, quality requirements, and reliability.

During the first exploratory meetings with our marketing and engineering staffs, you may also interface with our quality assurance, purchasing, prototyping, scheduling, and manufacturing representatives. We believe the best way to ensure quality is the early involvement of all groups that perform key steps in the development of your product. That way we can take advantage of their expertise from the beginning. Later, they will be informed and ready to apply that expertise to help get your product to you on time and well within your specifications.

We don't wait until we get your hybrid in the production line to start attending to quality. You know the old software saying, "Garbage in, garbage out." That applies to hardware, too. All an efficient manufacturing line can do is maximize what it gets. Quality must begin in design. In Hybrid Components it does.



Design— Thinking about it

Quality hybrids begin with application experience—and we've had lots of it. Although not in the outside custom hybrid market until recently, for more than 15 years we've been demonstrating design-for-quality excellence while supporting Tektronix instrumentation products. We've completed hundreds of hybrid applications including wide-band amplifiers, data acquisition circuitry, electro-optics, and miniature probes.

During the planning stage of a new hybrid design, some of the major considerations are:

- ✓ Choosing the right technology from thick-film, thin-film, multilayer thick-film, and multilayer ceramic. Your circuit can be designed for a variety of substrates, each suitable for specific applications. Assembly processes to be considered include chip-and-wire and surface mount.
- ✓ Partitioning considerations determine which of your circuits should be "hybridized" on the same substrate for optimum system performance and cost.
- ✓ Thermal management techniques and alternatives can be evaluated at HCO with three-dimensional modeling and direct thermal mapping. Custom heat sink development and substrate selection can help resolve your system thermal problems.
- ✓ Our application analysis may lead to the selection of a standard package style, or special packaging can be developed to accommodate your system size, weight, thermal, and electrical performance considerations.

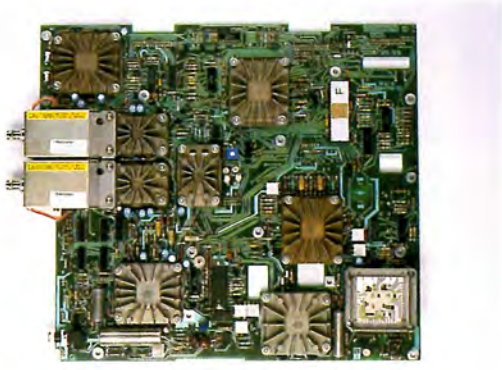
Design— Implementation

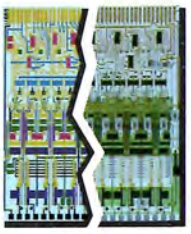
We offer experienced design support from implementation of your design to working from your "blackbox" specifications.

Some customers come to us as a second source for their custom hybrids. We have a first-class production facility here. You'll find us to be a reliable second-source vendor at a reasonable price.

Here is a sampling of the services we offer in design support:

- ✓ Circuit simulation with advanced computer-aided design tools help build quality into your circuitry. Electrical parameters can be predicted accurately with TSPICE, SUPER COMPACT, thermal analysis, and COEFF2 (transmission line characterization) CAD programs.
- ✓ A hybrid computer-aided design (HCAD) program has been developed and used by HCO engineering for several years to speed up and maximize hybrid layout design, interactive passive element design, and electrical analysis. Integration of production process parameters into HCAD layout guidelines ensure first-time-build success.
- ✓ Our HCAD analytical capabilities include parasitic inductance and capacitance calculations, potential field analysis, and three-dimensional thermal modeling for a specific layout design. With HCAD, we can predict performance and design margins accurately so that you receive quality hybrids that match your expectations.
- ✓ Test/trim development ensures project quality by the generation of fixtures and software for passive laser trimming, functional hybrid testing, and functional laser trimming with dynamic parameter adjustments.
- ✓ Full-service prototyping provides quick turnaround for thorough evaluation of layouts/designs for "manufacturability" and performance. HCO's prototype methods and process flows are identical to those used in our production facilities. When engineering is ready to "hand over" a design to manufacturing, the transition is smooth, efficient, and timely. This is easy to do when quality has been designed into the product from the beginning.





Making it

Our manufacturing group is always on the lookout for improvements to help turn out quality products with high yields in a timely, cost-saving manner. We operate with fully characterized "systems" of compatible materials and processes.

HCO's manufacturing uses many of the latest production improvement methods including Just-In-Time, "Class A" Materials Resource Planning (MRP), some clever ideas of our own, and a well-defined New Product Introduction (NPI) system supported by complete, precise documentation.

The NPI system results in the early formation of production teams composed of members from all key HCO groups connected with the product. At their regular meetings, they pinpoint the status of the product and focus on potential problem areas. They find and eliminate a potential problem before it affects the progress or quality of the product.

We're our own best critics. For most of our processes, we not only use in-line test methods, but also add off-line tests as well to verify hybrid performance. Our testing is intelligently placed to maximize quality and yet not adversely affect cost.

Available support technologies for our hybrid manufacturing processes include automated screen-print-fire and automated die placement and wire bond. We also provide customized substrate fabrication and die attach. Processes on-line include:

- ✓ Thick film
- ✓ Thin film
- ✓ Ceramic multilayer
- ✓ High-density connection
- ✓ Surface-mount assembly
- ✓ Film multilayer
- ✓ Custom ceramics

Check and double check

To augment our design-for-quality effort, we have quality assurance and reliability teams that are responsive to your needs. Reporting directly to our General Manager, these organizations have the autonomy necessary to do an effective job.

The professionals in Quality Assurance are your number-one contacts on any quality issue. They are responsible for major quality improvement efforts and work closely with manufacturing, engineering, and you.

The Quality Engineering department advises design engineering on current quality issues related to new designs. In addition, quality engineering is a participant in our Request-For-Quote process to ensure that quality is designed into your product from the beginning.

Both in-process quality control inspections and quality audit gates are used to assure that the product meets your expectations. Inspection results are fed back to the production floor on a regular basis to help us stabilize, maintain, and often exceed current production quality standards.

We keep close tabs on our vendors, too. All incoming material is audited for quality by using a zero-accept sampling plan. And, of course, our Purchasing department has contributed to product quality with comprehensive vendor qualification programs.

The Reliability department consistently provides feedback on production and evaluates product reliability so we can upgrade design models and guidelines. They offer generic qualification testing to verify reliability of new products to the appropriate classifications. New processes are qualified by reliability, by characterization, and by matrix testing.

Unlike most hybrid facilities our size, we have the advantage of having Tektronix' extensive analytical laboratory facilities at our disposal for component analysis. This augments our HCO equipment, and combined, gives us state-of-the-art problem solving capabilities including SEM, Auger, X-ray elemental analysis, cross-sectioning, microscope and probe analysis, die shear, plasma etching, and wet chemistry. Count on it, your problems get first-class treatment at HCO.

P.S.

We've shared our design-for-quality philosophy and how it affects every aspect of product development at HCO.

We take pride in our professionalism, and we would like the opportunity to prove it to you.

- ✓ Give us a call.
- ✓ Talk to us about your needs.
- ✓ Visit our modern 125,000 sq. ft. plant.
- ✓ Chat with our experienced staff of 450 dedicated employees.
- ✓ Inspect our equipment capabilities.
- ✓ Evaluate our procedures.
- ✓ Examine our sample parts.

Then, reach your own conclusion regarding our commitment to design-for-quality. If you're interested and would like more information, we're as close as your telephone.

For more information contact:
Hybrid Components Operation
Customer Service, M.S. 13-850
Tektronix, Inc.
P.O. Box 500
Beaverton, OR 97077
(503) 627-4220

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