

accuprobe

PROBITY

Volume 3, Issue 1

July 2004

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Embedded Passive Probe Cards

The quest for market leadership coupled with technical advantages has led manufacturers to investigate the potential to incorporate components directly into printed circuit boards. Both active and passive devices can now be buried within a printed circuit board layer potentially increasing density, reducing circuit lengths, reducing manufacturing costs and increasing reliability.

The now ubiquitous cell phone is an ideal candidate to exploit this new technology. According to Integral Wave Technologies a typical cell phone contains 400 or so passive components taking up 90% of the area of the phone's printed circuit board. A significant reduction in size is possible though the integration of these components into the circuit board, or more likely, additional features can be packed into the same area.

Buried resistors are one component that can be successfully integrated into a printed circuit board. Laser trimming is potentially necessary for at least some of these resistors to obtain the accuracy and tolerance required for the circuit being integrated due to inconsistencies in the screening process during integration.

Accuprobe has long been associated with the production of probe cards used for laser trimming of hybrid, resistor, sensor and related devices. The move to imbed passive components such as resistors in printed circuit board assemblies has led to the need for probe card assemblies for this new application. Printed circuit board panels are typically several square feet in area and the large laser processing area of 100mm by 100mm used on these panels requires probing apertures of at least this size for efficient coverage.



Cell Phones are ideal candidates for embedded components

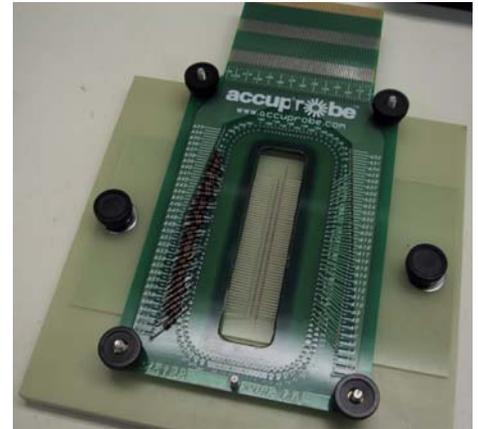
A further significant probing challenge for embedded passive applications is the random distribution of resistors across the entire circuit as well as the sheer number of resistors involved. Traditional cantilever blade probing approaches can provide an acceptable solution, however multiple probe cards and hence multiple laser passes are potentially necessary to trim the entire circuit which is typically duplicated many times over a panel.

Epoxy ring technology, customarily used for semiconductor device probing, can also be successfully applied to embedded resistor circuits and lead to the a minimum number of probe cards and subsequently reduce the number of laser trimming passes.

Accuprobe has suitable cantilever blade and epoxy ring technology probe cards for this new application that can be used in the equipment of all of the leading laser trimmer manufacturers equipment for the efficient processing of embedded passive devices.

Custom Probe Cards, Cables, & Fixtures

Accuprobe is able to use its extensive experience in the design and assembly of probe cards to design and produce custom probe cards, cable assemblies and test fixtures. Typically the test fixtures are used for the manual test of devices, including elevated temperature and other environmental tests. A wide range of cantilever type probes as well as vertical spring probes can be utilized on existing or custom designed cards to produce the test fixtures. Test posts or cable connectors can be incorporated to interface to the fixture, and designs able to operate in excess of 200°C have been regularly produced. Internal PCB router and CNC machining equipment at Accuprobe help to ensure fast turnaround of custom test fixture requests. Recent designs have ranged from tens through several hundred test probes on a single fixture. An associated service is the design and manufacture of cable assemblies using Centronics, DIN, Molex and other high density connector types. An advanced automatic cable test system is able to verify the wiring and correctness of the required assembly.



Manual Hybrid Test Fixture

Probing Larger Wafers

As wafer processing capabilities have increased up to the current 300mm size now being introduced, probe cards have also been extended in length to accommodate the larger wafers. Accuprobe has a range of probe cards able to fully cover wafers up to 8" in diameter designated by a letter size for the card and applicable center of rotation, measured from the center of the probing area to the edge connector.

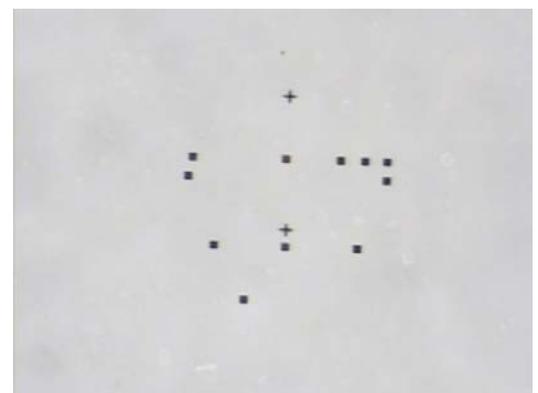
| Card Size | COR | Wafer |
|-----------|--------|-------|
| L | 4.65" | 4" |
| XXL | 6.65" | 6" |
| XXXL | 8.625" | 8" |

The increased size and complexity of devices has also led to the need for larger probing areas and enhanced interface capabilities. Accuprobe's PG45128 probe card allows probing windows up to 4" long to be accessed, while the PR45160 probe card incorporates a 160-pin cable connector for interfacing the device under test.

Contact Accuprobe to access any of the hundreds of probe cards available in stock and available for same day delivery, or to develop a new probe card to meet a specific device test requirement.

Glass Masks Improve Probe Card Alignment

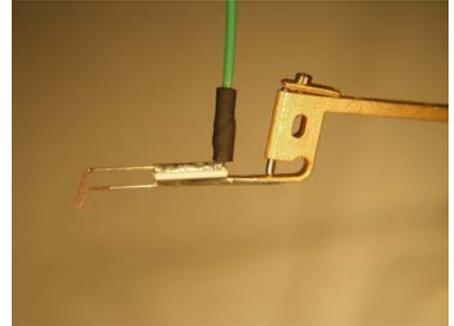
Recently introduced lithographic equipment allows the inexpensive and fast production of glass masks that can be used to improve the accuracy of probe card alignment. These masks are produced on the same equipment used for wafer production and can easily generate feature sizes of 10µm with a placement accuracy of better than 1 micron. While probe alignment to pad centers of actual devices produces reasonably accurate alignment, use of smaller targets ensures that probes are placed with improved accuracy and not subject to estimation of the desired position. Glass masks can also be produced ahead of wafer or substrate availability, allowing an effective probe card to be produced and made ready for test as soon as production devices are ready. Accuprobe specifically recommends the use of glass masks where pad pitches are less than 100 microns and pads sizes are less than 75 microns.



Glass Mask with 30µm features improves alignment accuracy

In-Line Kelvin Probe

Kelvin measurements are often necessary to prove the validity of a device and in many cases it is difficult to reach the device pad with multiple probes due to shadowing and adjacent probe interference. Optical and solar devices that need to be tested during the application of natural or artificial light cannot have probes interfering with the light source. Accuprobe's in-line Z-adjustable Kelvin probe has two probe needles mounted vertically, allowing measurements to be made with limited interference to the light source. Laser trimming applications can also benefit from the in-line K probe allowing additional resistors to be probed in a single pass, compared to that possible with traditional single probe configurations. The in-line K probe can be equipped with a wide variety of probe needles, tip lengths and tip-to-tip spacing.



In-Line Kelvin Probe

Probe Card Cleaning

Customers regularly ask the best method for cleaning a probe card. Internally, Accuprobe use a variety of cleaning methods during the assembly process including soaking the card in a vapor degreaser, through use of various liquid and spray cleaners such as isopropyl alcohol and Asahclin 225, and also manipulation of the probe tips against abrasive pads such as Accuprobe's Resistox. Vapor degreasers are the most effective at removing probe and laser debris but require probe alignment and planarization following cleaning due to the high (150°C) temperatures utilized. Spray and liquid clearers, used judiciously, can be quite effective in removing debris, while use of abrasive pads in a prober's cleaning cycle can clean and also assist in re-establishing planarization of the probe card. Cleaning can only improve performance so far and eventually the probe card will likely require refurbishment. Accuprobe provides a regular repair and maintenance service for probe cards which restores them to their original performance level and includes replacement of defective probes as well as cleaning, alignment and planarization.

“Clean probe cards can lead to longer card life, more accurate measurements and increased yield.”

Probe Components

To improve the electrical performance of probe cards, Accuprobe regularly assembles LRC and active components as close as possible to the probe tips of the probe card. Components in these circuits can filter noise and improve signal and electrical performance at lower cost than specially built high-performance test probes. Components such as resistors, capacitors, inductors and diodes are easily mounted on the probe card itself in and across the signal path. Surface mount technology components (typically 0603 and 0805 size) can also be mounted directly on ceramic blade probes, enabling the filter to be applied much closer to the probe tip, further improving performance. Coaxial and triaxial cables from the probes can also be used to improve the signal/noise performance of the probe card and allow more sensitive measurements to be made. Accuprobe maintains a stock of the more common components and is able to incorporate customer requests into the probe card assembly process.



Surface Mount Components on a Ceramic Blade Probe

Quadrant Probe Card

The DCQ2 probe card, able to accommodate 16 ceramic blade probes, has recently been introduced by Accuprobe. This card is compatible with Cascade probers and can be used with Accuprobe's CZ1 and CZ2 50Ω ceramic blade probes. Single probes suitable for manipulator rings are also available from Accuprobe. Contact us for all of your probe card and probe requirements.

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The logo for Accuprobe, featuring the word "accuprobe" in a blue, sans-serif font. The letter "o" is replaced by a stylized sunburst or starburst icon with multiple rays extending outwards.

Accuprobe manufactures fixed pattern probe card assemblies for use by semiconductor producers. Probe cards are used for semiconductor wafer sort and Hybrid circuit laser trim applications. Accuprobe also manufactures probe card assembly and repair equipment which allow customers to assemble their own probe card assemblies using Accuprobe needles, tips, blank probe cards, edge sensors and other related components. Accuprobe offers Epoxy Ring, Z Adjustable, Metal Blade, Ceramic Blade and Blade Spring probes.

For further information or subscription changes contact the Editor at editor@accuprobe.com

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