FOUR DIMENSIONS

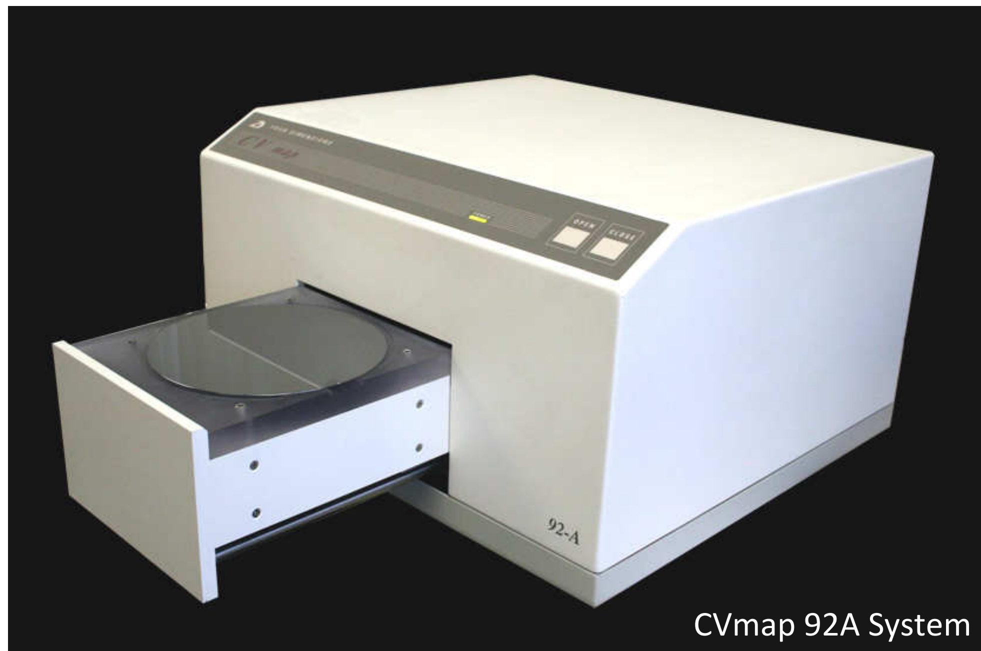
Mercury Probe Systems

CVmap 3093A System

CVmap 92/3093 Series

OVERVIEW

The CVmap 92/3093 Series can perform C-V plots at various frequencies up to 10MHz and/or I-V plots in wide current range, at user specified sites on a blank wafer. All of these can be done without going through metal deposition, photoresist work and etching steps in sample preparation. By using one to three mercury contacts (available in a wide range of areas) and a unique mechanism, these systems provide physical parameter mapping capabilities for many kinds of samples including SOI, low and high k films, extremely thin and thick oxide, compound semiconductors, USJ layer (carrier density), carbon films, etc., with unsurpassed repeatability.



CVmap 92A System

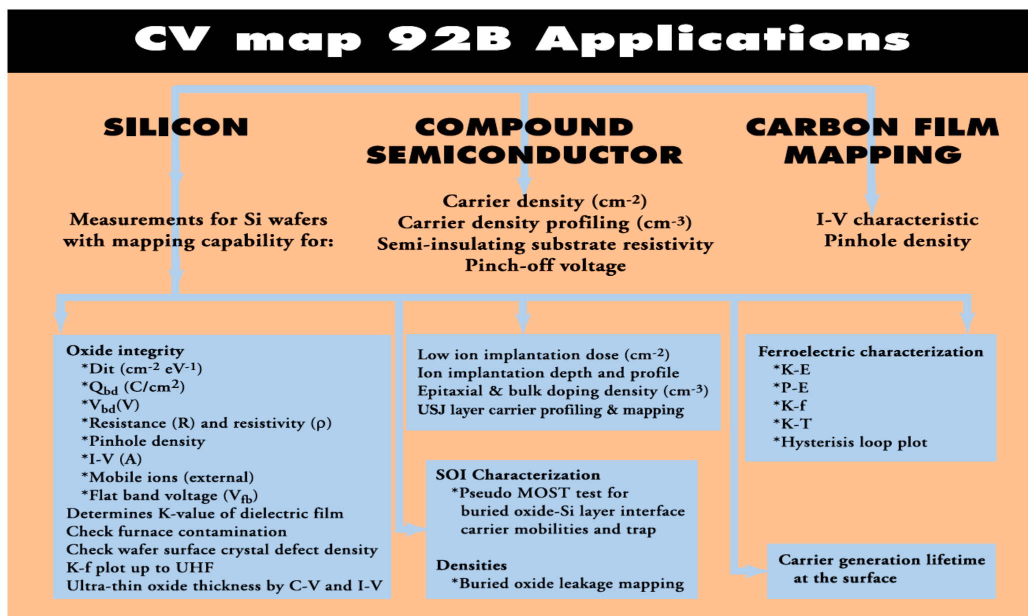
Each system's software can sort out stored data sets with the librarian method, analyzes and/or converts the data into various units then displays them in programmable scales. Wafer maps of such characteristics as insulating film thickness, dielectric constant, leakage current, low-dose ion implant dosage, epitaxial doping densities and carrier lifetime may be produced. Also, oxide integrity parameters such as Qbd, TDDB, defect density, breakdown voltage and interface trap distribution can be determined and plotted. Through connections to an external probe station, wafer with patterns of Si, Al, or other metal gate can also be tested and mapped. Furnace contamination can be checked with this tool, too.

Application chart of CVmap92B/3093B is shown in the following pages.Application chart of CVmap 92A/3093A is the same except there is no pseudo MOST test in it.

Various Advanced setups for Better Measurements of Difficult Samples

One can either take advantage of letting impedance meters such as Keysight E4980A to work with the system or use the system's internal precision generator-integrator set for capacitance measurements. This means the user can choose the most appropriate setup to get the most correct and appropriate C-V curve, or compare test results of different setups for investigation.

A bias in the form of step up/down, pulsed, or ramp up/down can be applied to the sample-under-test with or without attaching an external impedance meter to obtain C-V, I-V, Q-V, or C-t, I-t, Q-t data for extraction of parameters such as doping density, trap distribution, TDDB, and carrier generation lifetime. A selectable constant current can be applied to the sample-under-test for Qbd measurement. Measurement timing can be specified and adjusted for avoiding disturbance by unwanted transients. The mercury contact area can be very large for determining oxide defect density, very small for measuring intrinsic breakdown voltage, or in medium size for regular C-V measurements. Setup for SiC epi spike extraction and ionized air blow can be available.



The system can also be setup for more than 1000V breakdown test, much higher frequency than 1MHz C-V measurements, and pseudo MOST test for SOI. Also, in most cases, using different measurement methods requires no hardware change, which saves time and effort. Some measurements can be made one after another automatically through programming. All these are very helpful for investigation into various samples. Options are available for automatic spike extraction and particle blowing by ionized air.

The CVmap 92/3093 A/B software has been designed with simplicity and versatility in mind. Here are its major features:

Multiple Users Management:

Access to operation functions such as mapping a wafer, configuring measurement methods, performing trouble shooting and recalling stored data may be selectively available to specific users. These access rights are fully configurable and are usually set by the engineer in charge.

Versatility of Configuring Measurement Methods:

Measurement methods can be versatily configured. Each measurement method is formed by a combination of parameters:

- Measurement parameters – These parameters define how the wafer will be measured. Specifics such as measurement frequency, pulse amplitude, bias voltage ramp and pulse timing are entered here.
- Analysis parameters – These parameters determine how the data will be analyzed. Analysis constants, physical model and formulas are selected here.
- Display parameters – These parameters determine the display formats, from combination of color of a mapping to the detail range and scale in an XY graph.
- Measurement sites – Through this setup, one can determine where the measurements will occur on the wafer. Arbitrary measurement positions may be specified in Cartesian and/or polar site coordinates.
- SECS/GEM or/and LAN can be available.

Stored Data Librarian:

Access of a stored data set is a snap with our Stored Data Librarian software. Just enter some search criteria such as wafer size, fab, equipment, operator, date of performing the measurement then the librarian will search all the stored wafer data that match the criteria. Only those meeting the criteria are displayed and you may then easily find the stored data set you want from there.

Comprehensive Display and Print-outs:

Displays are provided in colorful high-resolution graphics. You will be impressed with contour and 3D maps, which are shown like a net or in contour with or without the reference background. There are many kinds od XY scales to let you specify for plotting the curve you want. Both the display and the printout colors are user selectable.

Excellent Mercury Contact Area Repeatability, Cleanliness, and Safety

Due to our special method of making the mercury probe and the arrangement for refreshing the mercury before making each contact, mercury contact areas are very repeatable and mercury does not adhere to the wafer. The use of mercury reservoir which is covered by a rubber layer with an automatic closing mouth prevents accidental spilling. Since the mercury probe is facing up, there is no chance for mercury to drip down from the probe; it allows us to make the probe for very small and/or large mercury contact areas. Spike extraction and ionized air blowing help a lot, too

Specification

CVmap Station:

- Capacitance Measurement Range: 0 to 20nF through internal meter, or specified by the external meter.
- Current Measurement Range: 50fA to 1mA. Applied voltage in I-V measurement can be optionally reached +/-1000V.
- C-V Bias Available: -100 to +100V for internal measurement. With option, bias for external meter measurement can be reached over +/-200V.
- Measurement Pulse: 50mV, 100mV, 150mV, >20 µs for Ch, >1s for Cq
- Wafer Size: from 1cm x 1cm square chip to 12" round wafer
- Probe: mercury dot (dot area from 2E-5 cm2 to 0.8cm2) without mercury ring or with one to two rings or through external probe station
- Probe Return: through mercury ring, wafer back, or external connection
- Compressed Dry Air: 60 psi minimum
- Vacuum: 28 inch Hg minimum
- Power: 120volts, 60Hz, 220/240volts 50/60Hz, 100volts, 50/60Hz, 300VA

Standard Controller:

Standard PC with Windows OS
101 Keyboard
19" LCD Color Monitor

Printer:

HP Deskjet

FOUR DIMENSIONS, INC.
3140 Diablo Ave, Hayward, CA 94545 tel: 510-782-1843 fax: 510-786-9321
web: www.4dimensions.com e-mail: info@4dimensions.com