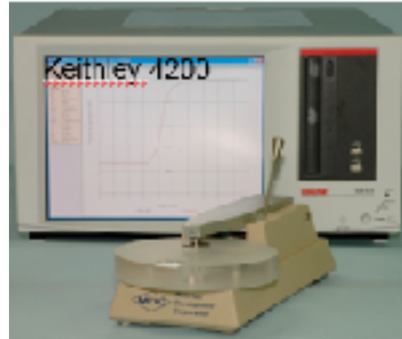
Application Note: MDC Mercury Probe



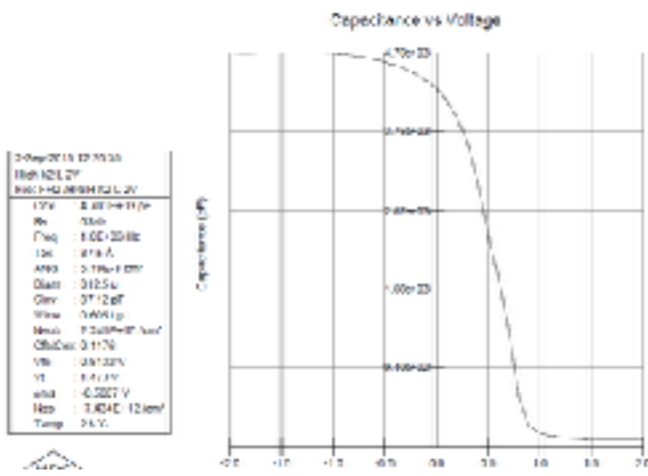
Features:
- Characterization of thin epitaxial layers grown on silicon.
- Thin-film characterization screening tool to conduct rapid integrity tests on various substrate surfaces.
- Mercury Probes connect to C-V plotters, doping profilers, computerized semiconductor measurement systems, or the MDC software CSM-WIN
- Resistance can be measured on thin films composed of any material that does not react with mercury such as metals, semiconductors, oxides, and chemical coatings
- Mercury Probes can measure oxidized or bare Silicon wafers
- For MOS devices a darkbox is available to prevent light interference.
- Includes a complete set of manuals and comprehensive on-line help
- The software allows for custom system parameters, meter selections, on-line calibration guide
- MDC-CSM/Win software can measure Mobile Ions, Lifetime, Gate Oxide Integrity, Interface Traps / Shallow or deep traps, Quasi-static, Multi-frequency, Thin oxides.

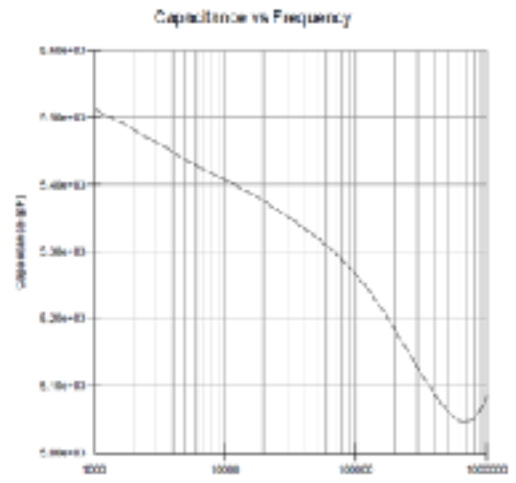
Options:
- High voltage up to 500V for SiC, GaN
- HEMT software for GaN

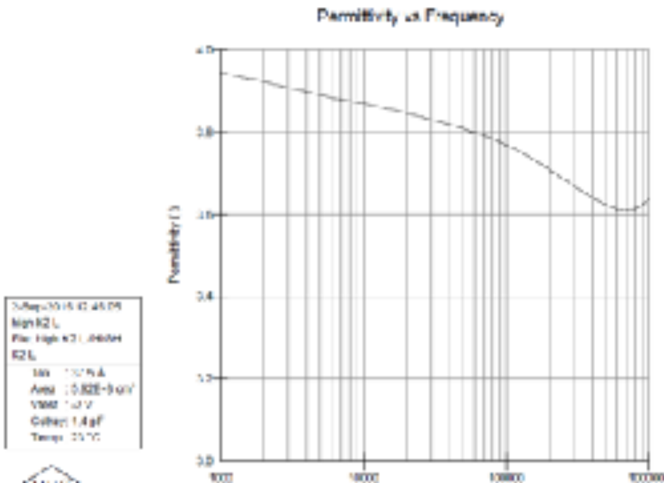
Benefits:
- Perform rapid, non-destructive electrical characterization of non-metallized planar semiconductors: SiC, GaAs, 2DEG, GaN, AlGaN, InP, CdS, InSb, etc.
- Avoid special metallization step which takes several hours with alternative methods

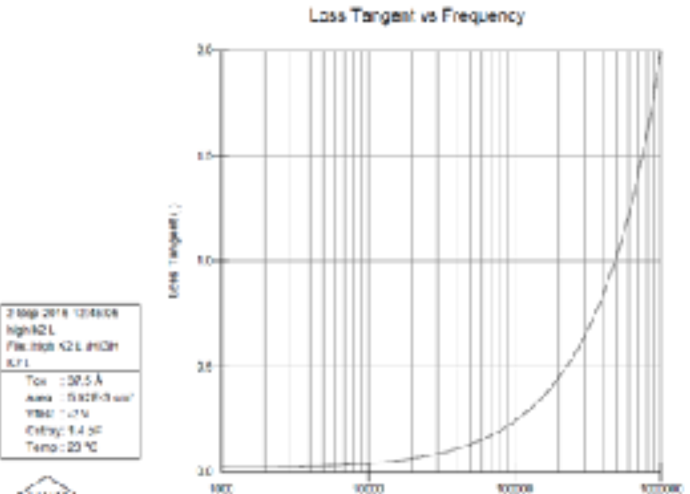
Safety / Environmental
- A mercury probe can be safely used in the usual laboratory or production environment as it generates less than standard Mercury concentration of 0.05mg/m^3.
- Standard ventilation is recommended for storage and replacement.
- No Mercury is applied without a loaded wafer
- The automatic PURGE position passage assures removal of the Hg on the platform
- The Mercury probe system eliminates air exposure of Mercury in the OFF position

Application #1: Carbon Nano Tube Thin film with ultra-low to hi-k on Si with various p-doping levels.
- Equipment used: Mercury probe, E4980, MDC CSM-Win software
- Results: CV, IV, Conductance, Permittivity, Loss tangent, Interface trap density Dit





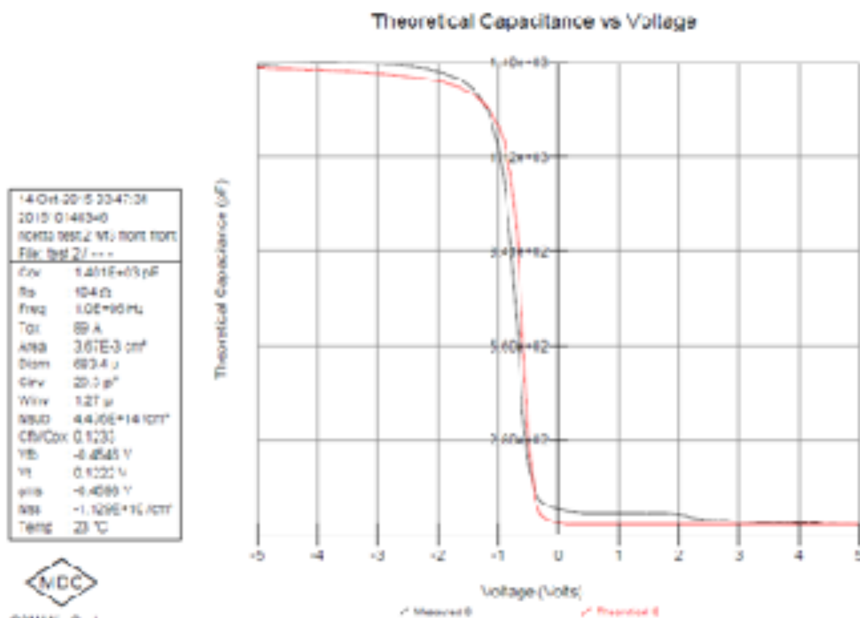




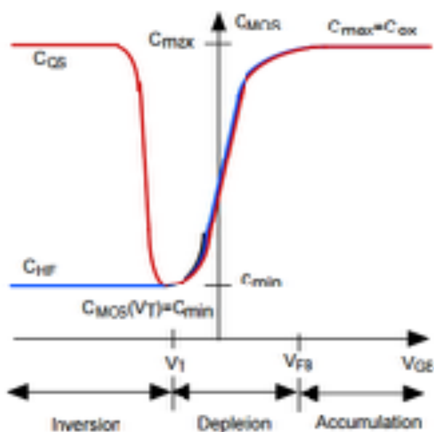
Application #2: SiO_2, HfO_2, Silicon substrate p- or n-type, Epi doping

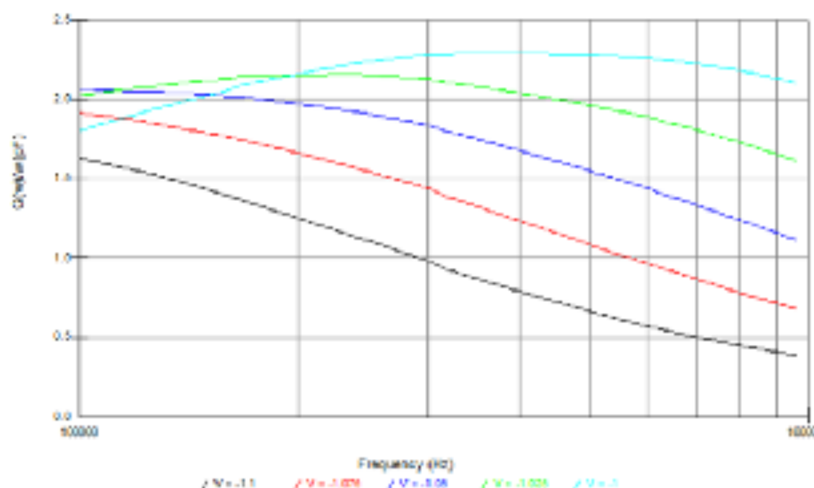
- Equipment used: Mercury probe 802C-200, Darkbox, E4980A, MDC CSM-Win software
- Results: CV, IV, flatband voltage, threshold voltage, oxide layer charge, Interface trap density Dit

The theoretical plot is generated from actual data assuming uniform doping and a flatband voltage of the metal-semiconductor work function.



[Terman High Frequency]() or Kuhn QS/HF **Dit**: or Variable Frequency **Dit:**





Application #3: AlGaN based HEMT Structures

- Equipment used: Mercury probe 802B-200x, Darkbox, E4980A, Keithley 2400, Multiplexer, HEMT CSM-Win software
- Results: CV high / low frequency, IV