



**LinearDimensions**  
SEMICONDUCTOR

**LND-BA1K**

## ADDRESSABLE BIOSENSOR ARRAYS

### GENERAL DESCRIPTION

The custom oligonucleotide microarray is synthesized using a semiconductor-based electrochemical-synthesis process. Each oligonucleotide probe is synthesized via a platinum electrode that is independently controlled by the synthesizer's computer. Synthesis is based on established phosphoramidite chemistry and occurs at thousands of sites simultaneously according to a computer algorithm that activates only specified electrodes. Since physical photolithographic masks or pre-built collections of oligos are not involved in the process, all probes can be easily changed without extra time or cost.

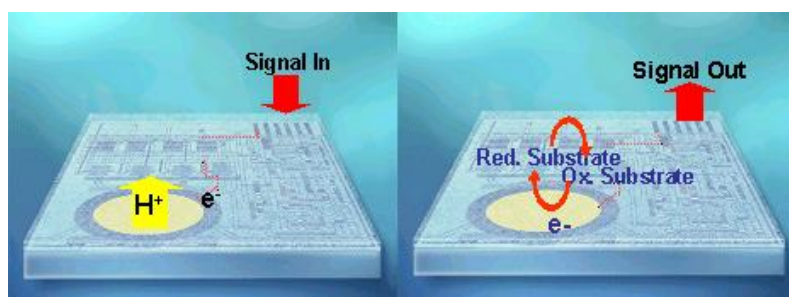
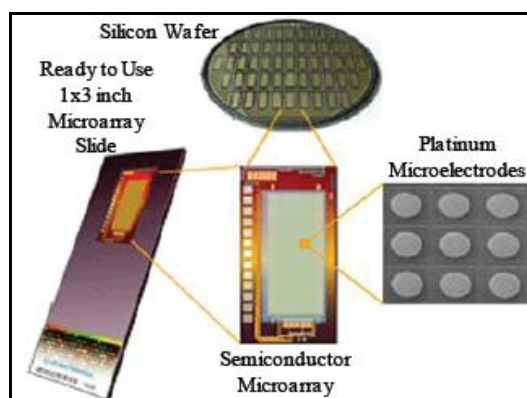
### FEATURES

- Microarray of Electrodes I2C or SPI Addressable
- Electrical Control for Each Array Element and Segment
- Mux up to Four High Impedance Input Lines into Array or;
- Read Array
- 2240 Array Sites

### APPLICATIONS

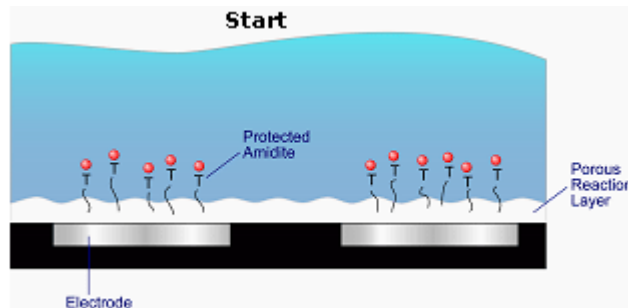
- mRNA
- $\mu$ RNA
- SNP Genotyping
- Re-Sequencing

### Custom Array Concept

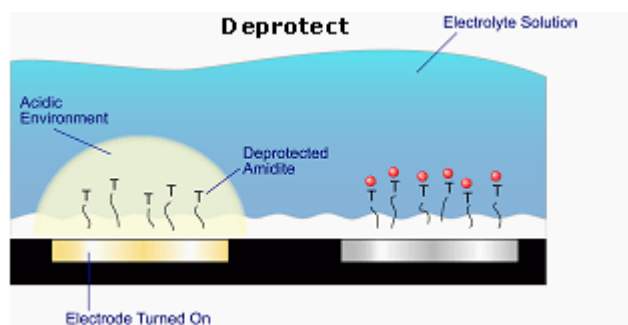




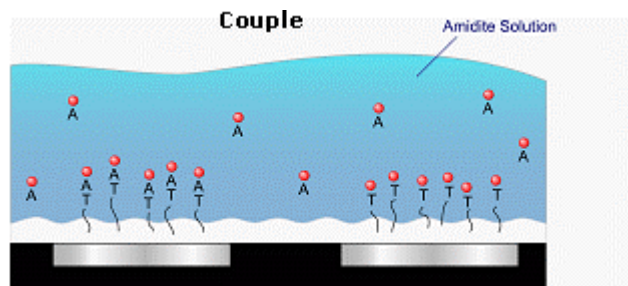
Chemistry of in-situ oligonucleotide synthesis on microelectrodes.



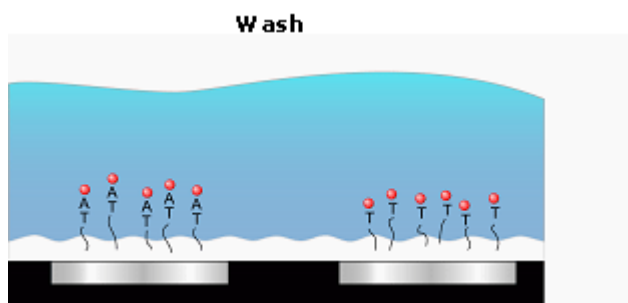
▶ The Linear Dimensions chips are produced in a form that the protected thymines are attached on the surface of each electrode.



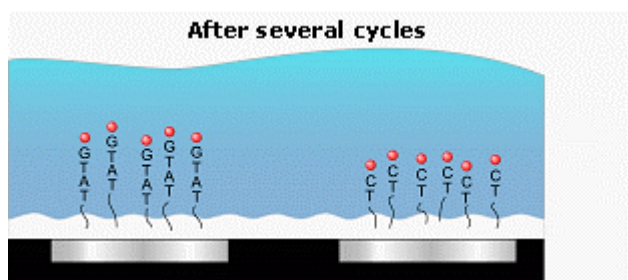
▶ By computer-controlled electronics, selected electrodes are turned on to form effective acidic local environment around the corresponding electrodes. The protection groups on thymines are cleaved off in the acidic environment.



▶ Microfluidic device supplies amidite solutions which couples to the deprotected nucleotide to form phosphodiester bond.



▶ The chip surface is washed to remove any free amidite on the solution.

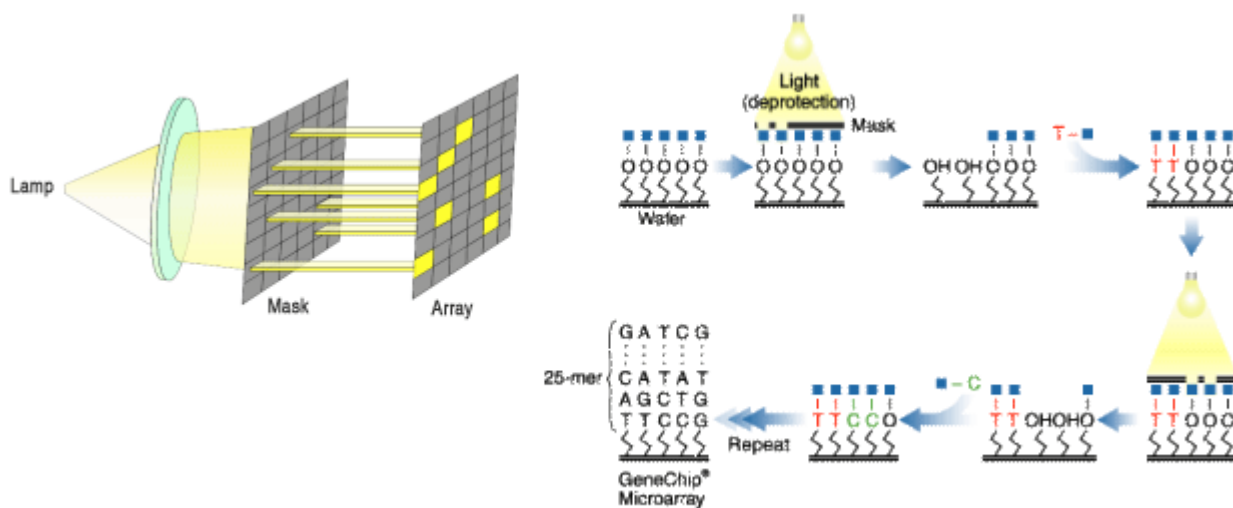


▶ The repetition of selected deprotection-couple-wash step results in the synthesis of oligonucleotides with custom-designed sequence.



## Comparison between Linear Dimensions and Affymetrix chips

Two platform shares the in-situ nature of the oligonucleotide synthesis, but they differ in the principle of deprotecting the protecting group of amidites. In contrast Linear Dimensions where the electric signal controls the deprotection chemistry. Affymetrix chip uses photolithographic principle where the photomasks are used to selectively illuminate the position where the next coupling should be performed.



The synthesis of Affymetrix chip needs set of photomasks designed and synthesized before the actual synthesis of the chip. Thus, the change of custom design is more time- and resource-consuming compared to Linear Dimensions chip where the only thing you need to do is to change the sequence file for the synthesis software. Moreover, the state-of-the-art microfluidics design and electronic controls enables the exact synthesis chemistry that Linear Dimensions offers precise synthesis of oligonucleotide up to 50-mer, compared to 25-mer of Affymetrix.

| Affymetrix                                    | Linear Dimensions                |
|---|----------------------------------|
| Photolithography controlled synthesis         | Electronics controlled synthesis |
| Needs to produce masks for each base sequence | Software controlled sequence     |
| Up to 25-mer                                  | Up to 50-mer                     |

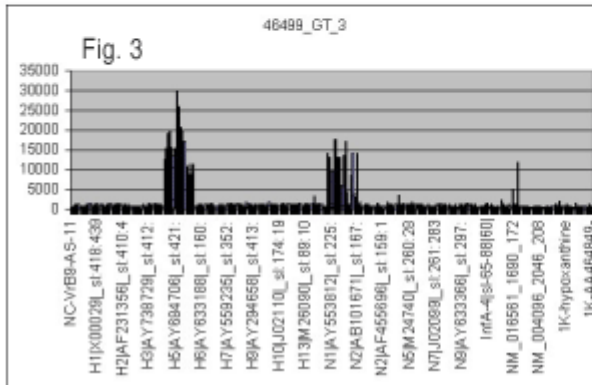
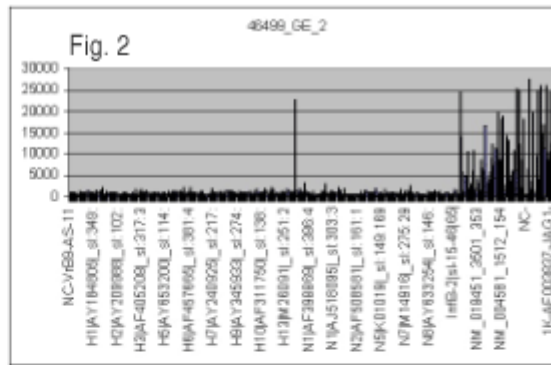
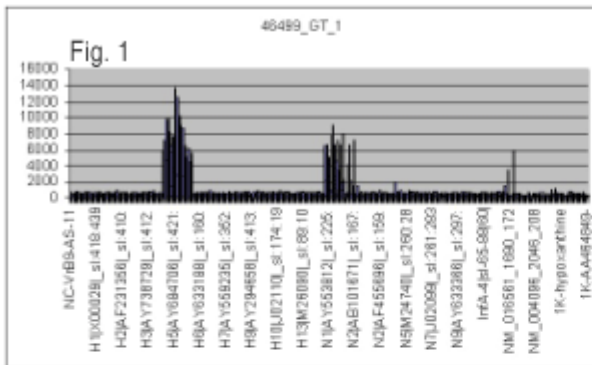


## CustomArray™ Chips are re-usable

The stripping of Linear Dimensions chip is based on chemical denaturation of DNA:DNA and DNA:RNA hybrids. The stripping enables for users to perform hybridization up to 3 times.

Probes that are longer than 40-mer may not be stripped completely. Optimized for DNA and RNA targets labeled with biotin, and with cy5.

Microarrays must be kept wet for re-usage. The figures 1-3 illustrate the efficiency of stripping.



- Influenza assay(h5n1 sample, Fig.1)
- Stripping
- Complex Gene Expression assay(Fig.2)
- Stripping
- Influenza assay(H5N1 sample, Fig.3)

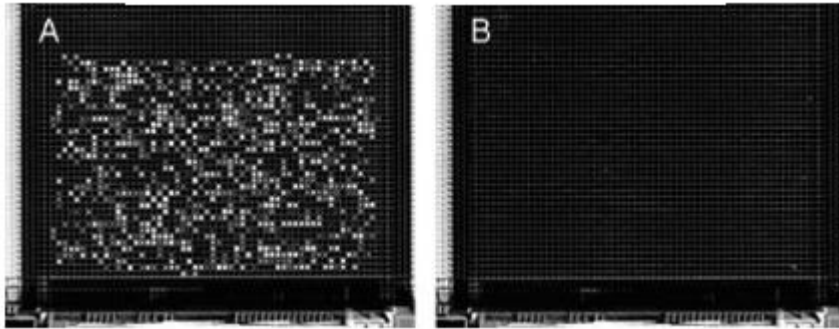
## Re-Usable Custom Array



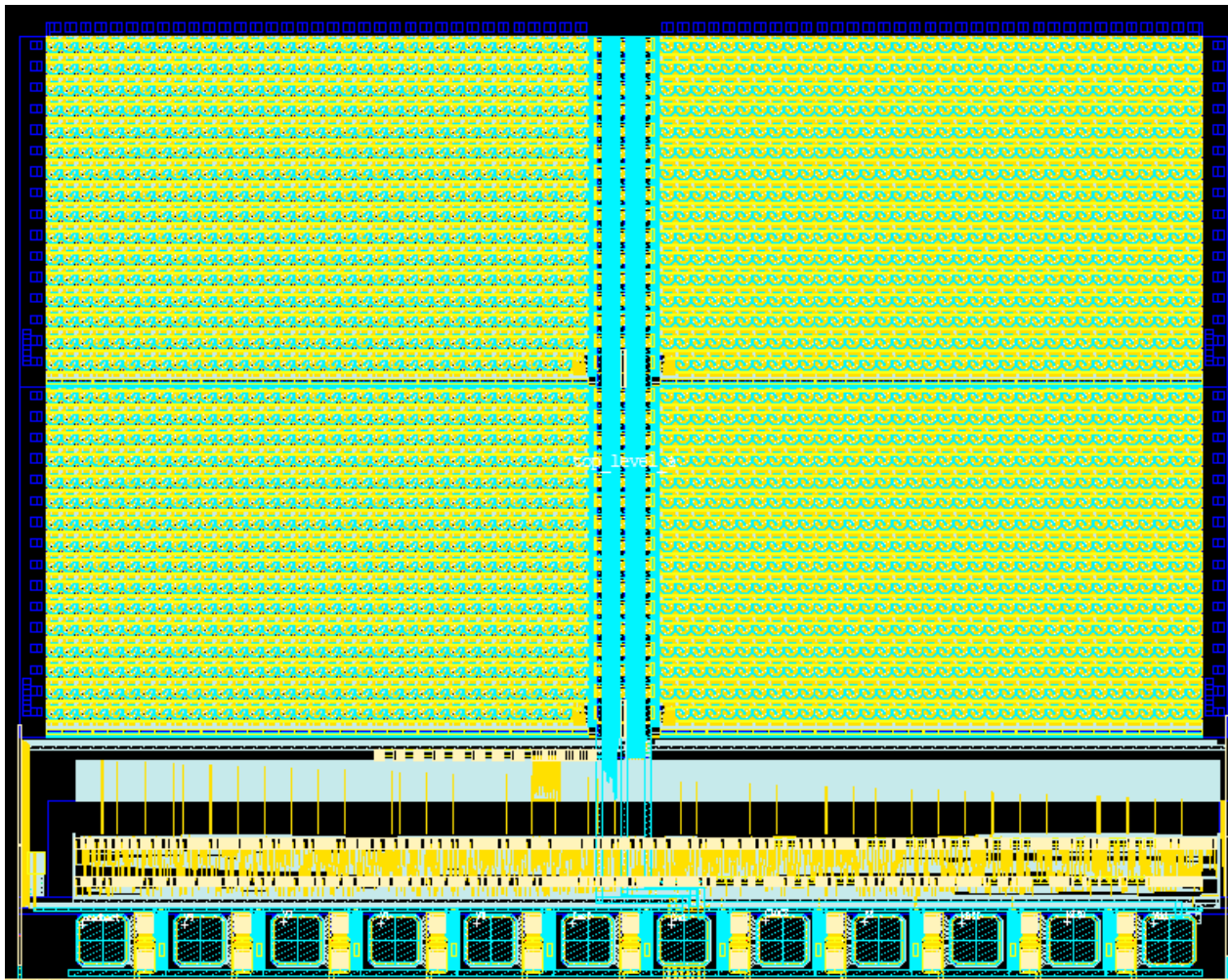




### Stripping kit



### Die Image

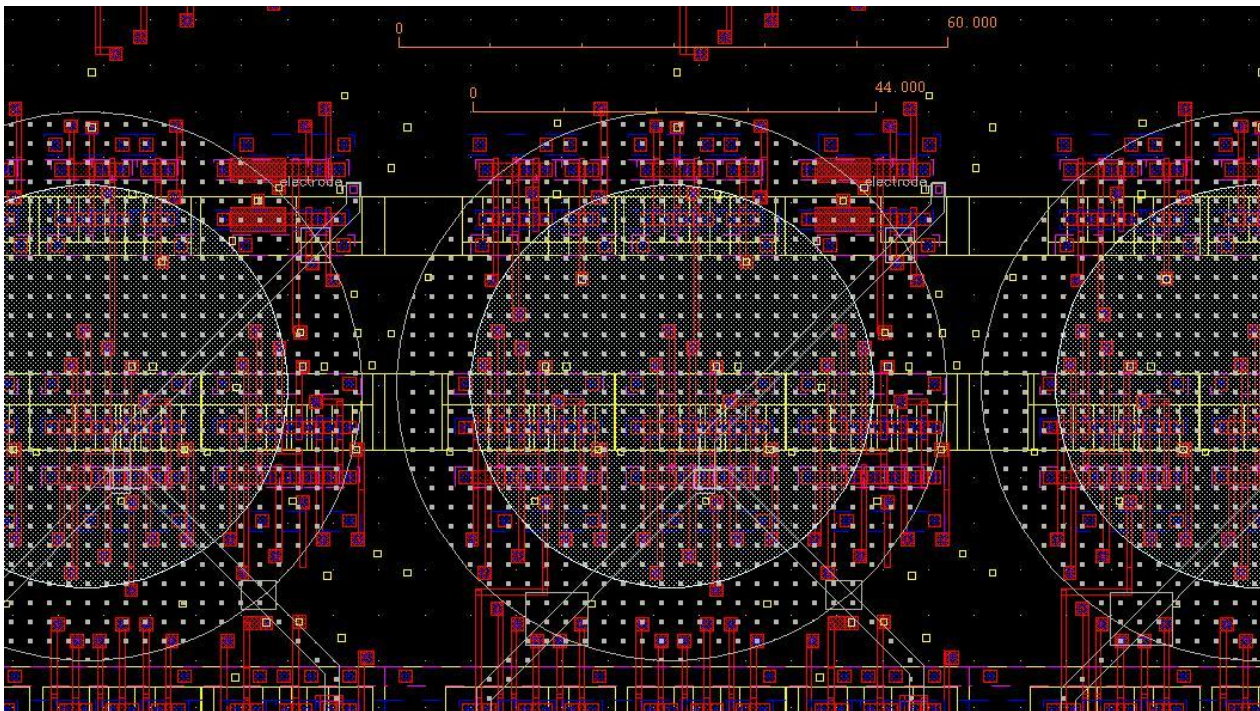




## Pin Description

| Pin Number | Description |
|------------|-------------|
| 1          | Feedback    |
| 2          | V0          |
| 3          | V1          |
| 4          | V2          |
| 5          | V3          |
| 6          | IREF        |
| 7          | GND         |
| 8          | CLOCK       |
| 9          | SS          |
| 10         | MOSI        |
| 11         | MISO        |
| 12         | Vdd         |

## Layout





## Orientation Options

