National Institute of Standards & Technology

Specifications

Standard Reference Instrument Series 6012

Precision Semiconductor Nanostructures

Description: Precision semiconductor nanostructure arrays are grown by molecular beam epitaxy on a prepatterned substrate. Following buffer layer deposition, the substrate is coated with a mask layer that allows selective regrowth in areas where the mask has been removed. Lithographic processing controls the placement and diameter of subsequent nanostructure regrowth.

Design, fabrication, and technical measurements leading to the production of this SRI were performed by M. D. Brubaker, T. E. Harvey, and K. A. Bertness, NIST Applied Physics Division.

Support aspects involved in the issuance of this SRI were coordinated through the NIST Office of Reference Materials.

Specifications: Standard nanowire array wafers consist of 9 die each with area 1 cm by 1 cm with the center die at the wafer center. With the substrate oriented to have the major flat at the bottom, the center die is designated x0y0 and the upper right die is x1y1, with x being the horizontal coordinate.

- Test die: Die x-1y-1 is for test structures consisting of a pitch-diameter array of 6 rows and 10 columns of 50 μm square subarrays with nanostructures on a square grid. Nominal dimensions are marked with lettering next to the rows and columns.
- The remaining die are laid out in a hexagonal grid of 1000 x 1000 nanowires with fixed spacing, diameter and length selected from the following range of nanowire dimensions (see figure on page 3):
    - Nanowire diameter (flat-to-flat): 130 nm to 300 nm
    - Nanowire length: 500 nm to 10 μm, uniform across all arrays on wafer
    - Nanowire center-to-center spacing: Close (500 nm) or Wide (5 μm)
- Nanostructure arrays are grown on silicon substrates with (111) orientation, with patterns oriented such that the major flat is aligned with the bottom edge of the pattern. Options b and d substitute GaN-based substrates for silicon.

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Certificate Issue Date: November 14, 2017

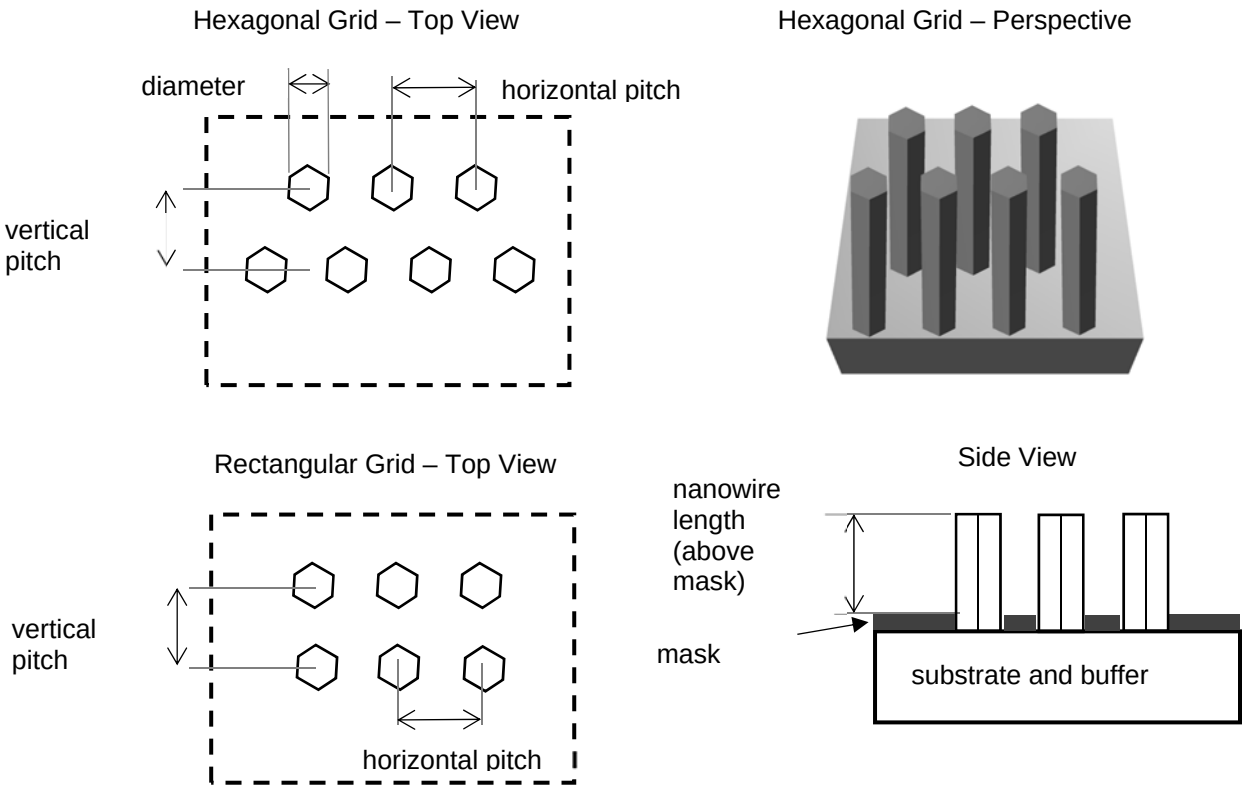
Standard Configurations:

6012a Nanostructure arrays on MBE-grown buffer
6012b Nanostructure arrays without buffer
6012c Nanostructure extended arrays on MBE-grown buffer
6012d Nanostructure extended arrays without buffer

This SRI is certified with a NIST Special Calibration Test, Dimensional Measurement of Nanostructures, 15510S. Customers will receive a calibration Test Report identifying specific nanostructures on the SRI with critical dimensions measured with traceability to NIST RM 8820, Scanning Electron Microscope Scale Artifact.

Delivery: Delivery dates will be determined on a case-by-case basis in coordination with the customer and based on the availability of components and NIST staff.

Shipping: The SRI will be packed and shipped per the customer's needs, and all packing and shipping will be handled through the NIST Boulder Calibration Services Office. Shipping crate dimensions and weight will be included in each quote. Customers are responsible for arrangement of shipping pickup at NIST as well as all customs duties and import fees.



Users of this SRI should ensure that the Specifications Certificate in their possession is current. This can be accomplished by contacting the Office of Reference Materials: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/sri.