United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200302-0

VLSI Standards, Inc.

Milpitas, CA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Calibration Laboratories

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique on ISO/IEC 17025).

2024-05-15 through 2025-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200302-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

VLSI Standards, Inc. 5 Technology Drive Milpitas, CA 95035-7916 Mr. Michael Sarhadi Phone: 408-428-1800 E-mail: Michael.Sarhadi@kla.com URL: http://www.vlsistandards.com	**Field(s) of Calibration** Dimensional This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Parameter **Instrument or Gauge**	**Range**	**Expanded Uncertainty** Notes 3,5	**Remarks**
DIMENSIONAL			
LENGTH and DIAMETER (20/D05)			
Nano Lattice Standards (NLS) Nominal Pitch	 100 nm 200 nm 400 nm 800 nm 1000 nm	Percentage uncertainties are normalized to the nominal value. 0.51 nm; 0.51 % 1.0 nm; 0.51 % 2.0 nm; 0.51 % 4.1 nm; 0.51 % 5.1 nm; 0.51 %	 Comparison to Master Calibration Pitch Standards
SURFACE TEXTURE (20/D12)			
Step Height Standards (SHS) - Thin Nominal Height	 8 nm 18 nm 44 nm 88 nm 180 nm 450 nm 940 nm	Percentage uncertainties are normalized to the nominal value. 0.41 nm; 5.2 % 0.66 nm; 3.7 % 0.57 nm; 1.3 % 1.0 nm; 1.2 % 1.7 nm; 1.0 % 2.3 nm; 0.5 % 4.7 nm; 0.5 %	 Comparison to Master Thin Step Height Standards
Step Height Standards (SHS) - Thick Nominal Height	 1.8 µm 4.5 µm	 0.01 µm; 0.6 % 0.05 µm; 1.1 %	 Comparison to Master Thick Step Height Standards

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Parameter Instrument or Gauge	Range	Expanded Uncertainty [Notes 3,5]	Remarks
	8.0 µm	0.06 µm; 0.8 %	
	14.5 µm	0.08 µm; 0.6 %	
	19.5 µm	0.10 µm; 0.5 %	
	24 µm	0.12 µm; 0.5 %	
	41 µm	0.19 µm; 0.5 %	
	50 µm	0.23 µm; 0.5 %	
	76 µm	0.35 µm; 0.5 %	
	100 µm	0.46 µm; 0.5 %	
FILM THICKNESS STANDARDS (FTS) (20/D17)			
		Percentage uncertainties are normalized to the nominal value.	
SiO_2 Films			Comparison to Master Film
Nominal Thickness	2.0 nm	0.05 nm; 2.6 %	Thickness Standards
	3.0 nm	0.05 nm; 1.7 %	
	4.5 nm	0.05 nm; 1.2 %	
	7.5 nm	0.05 nm; 0.68 %	
	10 nm	0.07 nm; 0.70 %	
	12 nm	0.07 nm; 0.59 %	
	25 nm	0.10 nm; 0.40 %	
	50 nm	0.14 nm; 0.28 %	
	100 nm	0.2 nm; 0.20 %	
	125 nm	0.3 nm; 0.24 %	
	200 nm	0.3 nm; 0.15 %	
	400 nm	0.3 nm; 0.08 %	
	675 nm	0.4 nm; 0.06 %	
	1010 nm	0.7 nm; 0.07 %	
Si_3N_4 Films			
Nominal Thickness	20 nm	0.15 nm; 0.73 %	Comparison to Master Film
	90 nm	0.13 nm; 0.14 %	Thickness Standards
	120 nm	0.17 nm; 0.14 %	
	200 nm	0.14 nm; 0.07 %	
END			

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Notes

Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable.

Note 2: Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

Note 3: The uncertainty associated with a measurement in a CMC is an expanded uncertainty with a level of confidence of approximately 95 %, typically using a coverage factor of $k = 2$. However, laboratories may report a coverage factor different than $k = 2$ to achieve the 95 % level of confidence. Units for the measure and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg).

Note 3a: The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use.

Note 3b: As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC.

Note 3c: As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions.* However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.5 of NIST Handbook 150, Procedures and General Requirements.

Note 3d: In the CMC uncertainties, the contributions due to the "best existing device" are assumed to be zero.

Note 4: Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

Note 5: Values listed with percent (%) are percent of reading or generated value unless otherwise noted.

Note 6: NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.

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