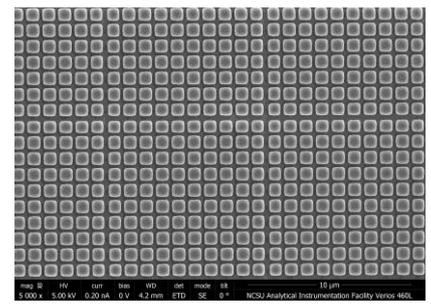
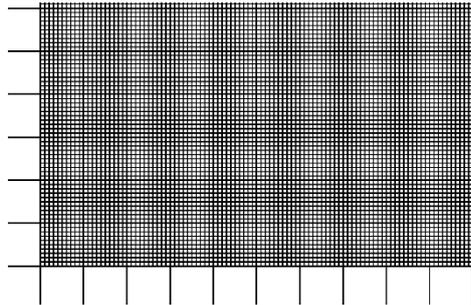
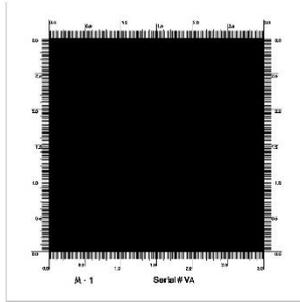




Wafer Level Certificate of Traceability for EM-Tec M-1 Grid Pattern Calibration Standard



Product Numbers: 31-T34000-U, 31-T34000-1, 31-T34000-2, 31-T34000-6, 31-T34000-8, 31-T34000-10

Product Description: EM-Tec M-1 Grid Pattern Calibration Standard

Product Serial Numbers: VA01-xxx through VA07-xxx

The accuracy of these products was determined by reference comparison to working standards traceable to the National Institute of Standards and Technology (NIST), Test No. 861/280822-11.

Line	Average pitch	Standard Deviation (1σ)	Total expanded uncertainty (3σ)
Horizontal	100.6 μm	±0.5 μm	± 1.5 μm
Vertical	100.0 μm	±0.5 μm	± 1.5 μm
Horizontal	10.06 μm	±0.05 μm	± 0.15 μm
Vertical	10.00 μm	±0.05 μm	± 0.15 μm
Horizontal	1.00 μm	±0.005 μm	± 0.015 μm
Vertical	1.00 μm	±0.005 μm	± 0.015 μm

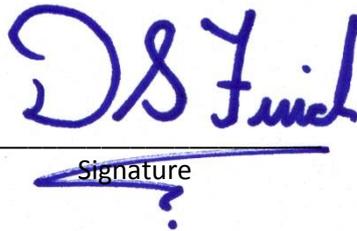
The average pitch was determined using a minimum of ten die sampled at random from a batch of seven production wafers (VA01 through VA07). 100 horizontal/vertical center-to-center measurements were taken randomly across each of the ten die. The total expanded uncertainty includes both Type A and Type B uncertainties corrected for sample size using an appropriate Student t-factor. At the narrowest point, the average measured line widths are: Horizontal 205±10 nm, 320±15 nm, 430±20 nm; Vertical 210±10 nm, 320±15 nm and 430±20 nm. The etch depth measured by AFM for VA01 = 410 nm±10%, VA02 = 386 nm±10%, VA03 = 355 nm±10%, VA04 = 316 nm±10%, VA05 = 271 nm±10%, VA06 = 251 nm±10% and VA07 = 245 nm±10%.





Equipment used:

Instrument	Model number	Serial #	NIST Certified CD/Recalibration	Resolution	Repeatability
FE-SEM	FEI Verios	9922557	CD-PG01-0211/June 2016	0.9nm	0.03%



Dudley S Finch
Certified by

Signature

August 17th 2015

Date

This certificate shall not be reproduced without the permission of Vof Micro to Nano.

TSB 31-T34000 Global Certificate of traceability 2015-08-18 Revision 1

