

Filed on behalf of Godo Kaisha IP Bridge 1

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LIMITED,
Petitioner,

v.

GODO KAISHA IP BRIDGE 1,
Patent Owner.

Case IPR2016-01264
U.S. Patent No. 6,538,324

DECLARATION OF HARLAN RUSTY HARRIS, PH.D.

I, Harlan Rusty Harris, declare as follows:

INTRODUCTION

1. I have been retained by Godo Kaisha IP Bridge 1 (“Patent Owner”) in Cases IPR2016-01249 and IPR2016-01264 as a technical expert.

2. I have been asked to study and provide my opinions concerning U.S. Patent No. 6,538,324 (“the ‘324 patent”) and the arguments and exhibits in the Petitions For *Inter Partes* Review of United States Patent No. 6,538,324 filed in Cases IPR2016-01249 and IPR2016-01264, concerning the patentability of Claims 1-3, 5-7, and 9 in the ‘324 patent (“Challenged Claims”).

3. I have also been asked to provide my opinions concerning the state of the relevant art prior to June 24, 1999, and the level and knowledge of one having ordinary skill in the art in the June 1999 time frame.

4. My opinions and views set forth in this declaration are based on my education, training, and experience in the field of semiconductor materials, devices and process integration, as well as the materials I reviewed in this case.

SUMMARY OF OPINIONS

5. Based on my education, experience, knowledge of the art at the relevant time, analysis of the prior art references as understood by a person having ordinary skill in the art at the relevant time, review of Petitioner’s arguments, review of Petitioner’s Expert Dr. Sanjay K. Banerjee’s declaration, the

understanding a person having ordinary skill in the art would give to the claim terms in light of the specification, it is my opinion that all of the Challenged Claims of the '324 patent are patentable over *Ding* in view of *Zhang*.

BACKGROUND AND QUALIFICATIONS

6. I earned a bachelor of science in Engineering Physics from Texas Tech University in 1997, a master of science in Electrical Engineering from Texas Tech University in 1999, and a Ph.D. in Electrical and Computer Engineering from the Texas Tech University in 2003. I was a visiting Assistant Professor at the University of Missouri from August 2003 to May 2004; a visiting scientist at International Sematech from May 2004 to August 2004; and a member of technical staff at Advanced Micro Devices from September 2004 to August 2008. In August 2008 I became an Assistant Professor at Texas A&M University. I became an Associate Professor in September 2014. I am currently an Associate Professor at Texas A&M University in the Department of Electrical and Computer Engineering as well as the Department of Physics and Astronomy.

7. My research specialization is in CMOS and silicon technology; materials and device integration; novel electrical and physical device and material characterization; and III-V and nanophotonics. I am a recognized international expert in silicon device and process technology at 32nm node and below, have authored over 85 publications in refereed journals and conferences. A listing of

my publications and research is included in my curriculum vitae, a copy of which is attached.

8. I have not previously served as an expert witness in a litigation matter, although I have been retained

9. I am being compensated for services provided in this matter at a rate of \$300/hr. plus reasonable expenses. My compensation is not contingent on my opinions, on the outcome of any matter, or on any of the technical positions I explain in this declaration.

10. I have no financial interest in the Petitioner, the Patent Owner or the '324 patent.

DOCUMENTS REVIEWED

11. I have reviewed the Petitions For *Inter Partes* Review of United States Patent No. 6,538,324 filed in Cases IPR2016-01249 and IPR2016-01264, and the Exhibits submitted in support of the Petitions.

12. Specifically, I have reviewed:

- Exhibit 1001: U.S. Patent No. 6,538,324 to Tagami et al.
- Exhibit 1002: File History of U.S. Patent No. 6,538,324.
- Exhibit 1003: Expert Declaration of Dr. Sanjay Kumar Banerjee.
- Exhibit 1004: U.S. Patent No. 5,893,752 to Zhang et al.
- Exhibit 1005: U.S. Patent No. 6,887,353 to Ding et al.

- Exhibit 1006: Holloway et al., “Tantalum as a diffusion barrier between copper and silicon: Failure mechanism and effect of nitrogen additions,” *Journal of Applied Physics*, 71(11), 5433-5444 (1992).
- Exhibit 1007: Sun et al., “Properties of reactively sputter-deposited Ta-N thin films,” *Thin Solid Films*, 236 (1993) 347-351.
- Exhibit 1008: U.S. Patent No. 5,858,873 to Vitkavage et al.
- Exhibit 1009: U.S. Patent No. 5,668,411 to Hong et al.
- Exhibit 1010: Excerpt of El-Kareh, “Fundamentals of Semiconductor Processing Technologies,” Kluwer Academic Publishers (1995).
- Exhibit 1015: Stavrev et al., “Crystallographic and morphological characterization of reactively sputtered Ta, Ta-N and Ta-N-O thin films,” *Thin Solid Films*, 307 (1997) 79-88.
- Exhibit 1017: Duan et al., “Magnetic Property and Microstructure Dependence of CoCrTa/Cr Media on Substrate Temperature and Bias,” *IEEE Transactions on Magnetics*, Vol. 28, No. 5, September 1992.
- Exhibit 1019: Moussavi et al., “Comparison of Barrier Materials and Deposition Processes for Copper Integration,” *Proceedings of the*

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