

UNITED STATES PATENT AND TRADEMARK OFFICE

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LTD.  
Petitioner

v.

GODO KAISHA IP BRIDGE 1  
Patent Owner.

Case IPR2017-01842

**DECLARATION OF STANLEY R. SHANFIELD, PH.D.  
REGARDING U.S. PATENT NO. 7,893,501  
CLAIMS 5, 6, 12, 13, 15, 19, and 21 (Petition #2)**

TSMC 1102

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I, Stanley R. Shanfield, Ph.D., declare as follows:

1. My name is Stanley R. Shanfield.

## **I. BACKGROUND**

2. I am a Distinguished Member of Technical Staff and Technical Director in Advanced Hardware Development at the Charles Stark Draper Laboratory (“Draper Laboratory”) in Cambridge, Massachusetts.

3. I received a B.S. in Physics from the University of California, Irvine in 1977, Phi Beta Kappa. In 1975, I received the University of California Regents Award for Outstanding Research Project for my experimental and theoretical work on rotating relativistic electron beams. Under full Energy Research and Development Administration (DOE) scholarship, I received a Ph.D. in Physics from the Massachusetts Institute of Technology in 1981.

4. After receiving my doctorate degree, I worked at Spire Corporation in Bedford, Massachusetts from 1981-1984, where I served as a Staff Scientist, and later, a Senior Staff Scientist. At Spire, I developed a new method of plasma-assisted CVD epitaxial silicon for low temperature semiconductor processing. In addition, I built, operated, and characterized an ion-assisted deposition system for making semiconductor coatings.

5. From 1985-1999, I worked at Raytheon Corporation. In my early years at Raytheon, I was a staff member, then Section Manager for

Semiconductors and Integrated Circuits. My work focused primarily on designs, layout and fabrication technology for CMOS silicon and MISFET GaAs integrated circuits. I developed thin film, dry etch and photolithographic processes for fabricating high frequency multi-function integrated circuits. In one major design and fabrication program, I combined high performance CMOS digital and analog devices in a family of integrated circuits designs for a phased array radar system. I was responsible for developing a power MOSFET process sequence later used in a variety of Raytheon products. From 1992-1996, I served as a Research Laboratory Manager at Raytheon, and became responsible for semiconductor materials, wafer fab, testing, and some of the IC design and layout center. I led a 90 employee organization in work related to high-performance semiconductor devices and integrated circuits, advanced measurement and modeling, and state-of-the-art CMOS wafer fabrication. I led a team that invented and implemented a major revenue-generating technology (\$100 million) based on a novel semiconductor device, specifically, a pseudomorphic high electron mobility transistor.

6. In 1996, I became the Manager of Semiconductor Operations at Raytheon Commercial Electronics. As Manager, I built and led a 300 employee, \$60 million revenue-generating semiconductor development, commercial circuit design, and electronic module manufacturing operation. My group developed the first Iridium handset electronic modules, designed and built chips and supplied

circuit board assemblies for AT&T wireless base stations. I was heavily involved as a decision-maker in Raytheon's acquisition of a design and wafer fab group at Texas Instruments, providing significant expert opinion on semiconductor, printed circuit board assembly and design facilities. I was involved in setting up packaging, assembly and test operations in South Korea, and was directly involved in electronics package design and characterization.

7. From 1999-2001, I worked at AXSUN Technologies as part of the founding team, first as the Director of Manufacturing & Wafer Fab Technology, and later, as the Vice President of Operations. As Director of Manufacturing & Wafer Fab Technology, I led device and module manufacturing, creating a wafer fab and circuit board assembly infrastructure; my responsibilities included hiring over 70 individuals and leading production design efforts. In my role as Vice President of Operations, I designed, fabricated, and productized AXSUN's microelectromechanical (MEM) Fabry-Perot optical filter, and managed a new generation of electronics module design. In addition, I established a process and fabrication facility in Belfast, Northern Ireland for producing thick oxide silicon-on-insulator devices. As a result of my work at AXSUN, I was awarded patents on semiconductor processing and control electronics. This company was eventually sold.

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