

IN THE UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION

RAYTHEON COMPANY,

*Plaintiff*

vs.

SAMSUNG ELECTRONICS CO., LTD., ET AL.,

*Defendants*

Civil Action No. 2:15-CV-341-JRG-RSP  
LEAD CASE

JURY TRIAL DEMANDED

**Declaration of A. Bruce Buckman**

I, Dr. A. Bruce Buckman, declare that I have personal knowledge of the facts set forth in this declaration and, if called to testify as a witness, could and would do so competently.

**I. Introduction**

1. I have been retained as an expert witness on behalf of Raytheon Company.
2. I reside at 1800 Brookhaven Drive, Austin, Texas 78704-2149.

I have been asked to render opinions regarding the interpretation of certain terms in the claims of United States Patent No. 5,591,678 (“the ’678 Patent”), entitled Process of Manufacturing a Microelectronic Device Using a Removable Substrate and Etch Stop.

3. I am being compensated at my usual rate of \$450.00 per hour for my work on this case. My compensation is not dependent upon my opinions or testimony or the outcome of this case.

**II. Qualifications**

4. I am a retired professor from the University of Texas in Austin, Texas. My educational background includes a Bachelor’s of Science degree from the Massachusetts Institute of Technology and Masters of Science and Doctorate degrees from the University of Nebraska, all in electrical engineering.

5. My Ph.D. dissertation and the publications that followed in the years immediately thereafter focused on the development of techniques for using ellipsometry and polarized light measurements to determine the voltage-induced refractive index changes and the depth of the region in a semiconductor material from which an observed light modulation originated. These techniques that I developed are among the precursors of those currently used for optical diagnostics and characterization of integrated circuits, including wafers which might later be attached to each other to form the multilayer circuits envisioned in the '678 Patent. For a number of years I taught an undergraduate course in semiconductor device physics, which included topics on device fabrication. In 1980, I obtained a grant of equipment from Motorola to start an undergraduate semiconductor fabrication laboratory.

6. I taught courses in optics and electrical measurements (including spectrum analyzer use) in departments of electrical engineering in universities for more than 40 years, from 1968-2009. I was an Assistant Professor and then an Associate Professor at the University of Nebraska from 1968-74. I was an Associate Professor and then a full Professor at the University of Texas at Austin from 1974 until my retirement in 2009.

7. I am the author of two textbooks, *Guided-wave Photonics* and *Computer-Based Electronic Measurement*, and of many academic papers. I and my coauthors won a best paper award at the First World Automation Congress in 1994 for a paper titled, "Six Degree-of-Freedom, Single-Sided, Noncontact, Optical Sensor Suitable for Automated Assembly and Inspection." In the *Guided-wave Photonics* text, I describe techniques for epitaxial growth and etching.

8. I have been involved in many consulting projects in the optics and electronics industries. For example, from 1998-1999, I assisted a small company called Xidex Corporation with the development of position-sensitive atomic force microscopes used for applications including the study of integrated circuits.

9. Since 2000, I have served as a consulting and testifying expert witness in several patent and other intellectual property cases in the fields of optics and electronics.

10. Additional information regarding my background is available in my Curriculum Vitae, which is attached as Exhibit A to this Declaration.

### **III. Materials Considered**

11. In preparing this Declaration, I considered the following materials:

- The '678 Patent, the prosecution history and the cited references for the '678 Patent.
- The extrinsic information identified by Raytheon and the Defendants in their PR 4-2 Disclosures.

### **IV. Background**

12. The '678 Patent relates to microelectronic devices, and, more particularly, to a microelectronic device that is moved from one support to another support during fabrication.

13. I understand that the claims of a patent should be construed as they would be understood by one of ordinary skill in the relevant art as of the patent priority date. The priority date for the '678 Patent is January 19, 1993.

14. It is my opinion that for the '678 Patent, a person of ordinary skill in the art as of the appropriate priority date would have been someone with a Bachelor's degree in electrical engineering, materials science, or the like, with advanced classwork or industry experience in fabrication of microelectronic devices.

15. Unless otherwise stated, my opinions regarding one of ordinary skill in the art for the '678 Patent relate to a person as of the appropriate priority date having the education and experience described above. Based on my experience, teaching, and research, including the materials identified above, I am familiar with how those of ordinary skill in the art would have understood the terms used in the '678 Patent as of the appropriate priority date.

16. Microelectronic devices are normally prepared by a series of steps including patterning, deposition, implantation, growth, and etching that build up an electronic circuit on or near the top surface of a thin substrate wafer. Microelectronic devices can be fabricated in two-dimensional and three-dimensional structures.

17. The '678 Patent describes a method and embodiments to fabricate, stack and interconnect one or more two-dimensional microelectronic devices on a substrate wafer. The invention of the '678 Patent meets the need for a method to fabricate such microelectronic devices using stacked substrate wafers with circuitry already on them. The '678 Patent describes embodiments for fabricating microelectronic devices including the front side and back side of the device and its portions.

**V. Claim Constructions Of Disputed Terms**

**“Etch-Stop Layer”**

Claim Term	Raytheon’s Proposed Construction	Defendants’ Proposed Construction
<p><b>“etch-stop layer”</b> <b>(Claims 1-5 and 10-17)</b></p>	<p>A portion of the first substrate that is etched less readily relative to the etchable layer.</p>	<p><i>Sony, Apple, and OmniVision’s Proposed Construction:</i> The phrase “etch-stop layer” means a layer of the first substrate, distinct from the etchable layer and the wafer, which has an etch rate much lower than that for the etchable layer and which stops the etching process. <i>Samsung’s Proposed Construction:</i> The term “etch-stop layer means a layer of the first substrate distinct from the etchable layer and the wafer, grown upon the etchable layer used for stopping the etching process.</p>

18. One of ordinary skill in the art would understand etch stop layer to mean a portion of the first substrate that is etched less readily relative to the etchable layer.

19. The term is used in the '678 Patent in a manner that allows one of ordinary skill in the art to understand it in the context of the claimed inventions.

20. The specification explains that the terms "etchable" and "etch-stop" are used in the '678 Patent “relative to a specific selected etchant. '678 Patent, 3:15-16. According to the specification, “There is chosen an etchant that readily etches the etchable layer but has a much lower etching rate for the etch-stop layer. It is understood, however, that the etch-stop layer may be generally or selectively etched by yet other techniques, after the etchable layer is removed.”

*Id.*, 3:16-21; *see also, Id.*, 5:52-54; Claim 10 (“rapidly”). Silicon dioxide is a preferred material for the etch stop. *See e.g., Id.*, 4:1-5; Figs. 1-4.

21. The etch stop layer may be any portion of the first substrate that is etched less readily relative to the etchable layer. While the ’678 Patent discloses silicon dioxide as a preferred etch stop, one skilled in the art would understand that the etch stop layer may include any material that is etched less readily relative to the etchable layer.

22. In the ’678 Patent, the terms layer and portion are used with equal meaning. Thus, the ’678 Patent states that “The method further includes attaching the wafer portion of the first substrate to a second substrate” (*Id.*, 2:20-22) and “With the circuit element thus supported, the etchable portion of the first substrate is removed by etching, down to the etch-stop layer.” *Id.*, 3:12-14. Moreover, dependent claim 8 refers to the wafer layer as the “wafer portion of the first substrate.” *Id.*, 4:41-44.

23. Dictionaries cited by the parties are consistent with this understanding.

24. One of ordinary skill in the art would not understand the term to have the meaning proposed by the defendants. First, one of skill in the art would recognize that the etch stop layer need not completely “stop the etching process” as would be required using the defendants’ proposed constructions. Rather, the etch stop layer need only slow down the etching process relative to its speed in the etchable layer. Second, the term “distinct” does not appear in the ’678 Patent.

**“Second Substrate”**

<b>Claim Term</b>	<b>Raytheon’s Proposed Construction</b>	<b>Defendants’ Proposed Construction</b>
<b>“second substrate” (Claims 1, 6-9, 11, 13, and 18)</b>	A second solid support material that is part of the complete device.	The term “second substrate” means a structure separate and distinct from the first substrate as construed that provides support to the first substrate through the etching process.

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