In The Matter Of:

Taiwan Semiconductor Manufacturing Co., Ltd. v. Godo Kaisha IP Bridge 1

> Stanley R. Shanfield, Ph.D. July 25, 2018

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> IP Bridge Exhibit 2026 TSMC v. Godo Kaisha IP Bridge 1

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| 2 | BEFORE THE PATENT TRIAL AND APPEAL BOARD | 2 | | |
| 3 | Case Nos. IPR2017-01841, IPR2017-01843 | 3 | Wolf, Greenfield & Sacks, P.C. | |
| 4 | Patent 7,893,501 | 4 | By: Gerald B. Hrycyszyn, Esq. | |
| 5 | X | 5 | and Joshua J. Miller, Esq. | |
| 6 | TAIWAN SEMICONDUCTOR MANUFACTURING | 6 | - 600 Atlantic Avenue | |
| 7 | CO., LTD., | 7 | Boston, MA 02210-2206 | |
| 8 | Petitioner. | 8 | (617) 646-8000 | |
| 9 | v. | 9 | gerald.hrvcvszvn@wolfgreenfield.com | |
| 10 | GODO KAISHA IP BRIDGE 1. | 10 | jmiller@wolfgreenfield.com | |
| 11 | Patent Owner. | 11 | for the Patent Owner. | |
| 12 | X | 12 | | |
| 13 | VOLUME T Pages 1-181 | 13 | | |
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| 15 | DEDOSTITION OF STANLEY D SHANETELD DD D | 15 | | |
| 16 | Wednesday, July 25, 2018, 9.03 a m | 16 | | |
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| 20 | BOSCON, MASSACHUSELLS 02105 | 20 | | |
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|----|--|----------|--|
| 1 | EXHIBITS FOR IDENTIFICATION: (continued) | 1 | RV MR HRVCVSZVN· |
| 2 | Exhibit Description Page | 2 | O Do you recall providing declarations in |
| 3 | Exhibit 2005 Previously marked 127 | 2 | this IPR? |
| 4 | Exhibit 2009 Previously marked 112 | 4 | |
| 5 | Exhibit 2010 Previously marked 120 | - | O Do you remember opining on "film" in this |
| 6 | Exhibit 2023 Annotated Figure 12 of 126 | 6 | IPR? |
| 7 | Igarashi (same as Ex. 2231) | 7 | |
| 8 | Exhibit 2202 Previously marked 68 | , o | O So I'm asking you what was your |
| 9 | Exhibit 2231 Annotated Figure 12 of 126 | 9 | understanding of that word "film" that you used in |
| 10 | Igarashi (same as Ex. 2023) | 10 | vour declarations? |
| 11 | | 11 | A. Well, let me take a look. Maybe the best |
| 12 | | 12 | nlace to look is in the renty. |
| 13 | | 13 | So, for example, in paragraph 18 on |
| 14 | | 14 | nage 11 of my renly declaration this is the |
| 15 | | 15 | 1843 give you a chance to find it Figure 5 |
| 16 | | 16 | shows a silicon nitride film 20 and that layer 20 |
| 17 | | 17 | is in this Misra reference, is one example of |
| 18 | | 18 | "film." It's silicon nitride Si 3 and 4, some |
| 19 | | 19 | hydrogen in there. And it's amorphous laver |
| 20 | | 2.0 | material. It's been deposited in one manufacturing |
| 21 | | 21 | step. |
| 22 | | 22 | MR. HRYCYSZYN: Object as nonresponsive. |
| 23 | Original exhibit retained by reporter to be returned | 23 | BY MR. HRYCYSZYN: |
| 24 | to Wolf, Greenfield & Sacks | 24 | O. So my question is, what was your working |
| | | | |
| | Page 6 | | Page 8 |
| 1 | STANI FY R SHANFIFI D Ph D | 1 | understanding of the term "film" that you applied in |
| 2 | having been satisfactorily identified by the | 2 | opining on the claims in this case? |
| 2 | production of his driver's license and | 2 | A The answer I gave you is an example of that |
| 4 | duly sworn by the court reporter was deposed | 4 | and I defined or I understood laver 20 as shown |
| 5 | and testified as follows: | 5 | here is an example of a silicon nitride film. It's |
| 6 | CROSS-EXAMINATION | 6 | a layer or layers of material, in this case, that |
| 7 | BY MR. HRYCYSZYN: | 7 | are silicon nitride or you know, that are on top |
| 8 | O. Good morning, Dr. Shanfield. | 8 | of each other or a single laver, silicon nitride |
| 9 | A. Good morning. | 9 | being silicon and nitrogen and some hydrogen. |
| 10 | O. What is a film in the context of the | 10 | And it's been deposited in one |
| 11 | '501 patent? | 11 | deposition step. And generally film is a reference |
| 12 | A. So maybe in the '501 patent, you could show | 12 | to something or a layer that's fairly thin. |
| 13 | me where that word is used and I could give you a | 13 | Q. So your working understanding of a film is |
| 14 | better answer. | 14 | it's a layer that is relatively thin, or fairly |
| 15 | Q. So you don't recall in the context of the | 15 | thin; is that accurate? |
| 16 | '501 patent where "film" is used or where your | 16 | MR. SMITH: Objection. |
| 17 | declarations in this IPR have been submitted and | 17 | THE WITNESS: No. |
| 18 | focus on? | 18 | BY MR. HRYCYSZYN: |
| 19 | MR. SMITH: Objection. | 19 | Q. Then what is your working understanding of |
| 20 | THE WITNESS: So I think I can give you | 20 | the term "film" as it is used in the claims of the |
| 21 | a more accurate and more complete answer if I have | 21 | '501 patent? |
| 22 | the specific, at least the paragraph or sentence | 22 | A. Well, if you give me the '501 patent, I can |
| 23 | 1 0 1011 11 | 1 | |
| | that refers to "film." | 23 | refer to a specific instance of that in the patent |
| 24 | that refers to "film." | 23 24 | itself. I'd appreciate that. I can't do it by |

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| Gou | lo Raislia IF Driuge I | | July 23, 2016 |
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| | Page 9 | | Page 11 |
| 1 | memory. | 1 | the working definition of "film" that you used in |
| 2 | O. So you have | 2 | this IPR? |
| 3 | A. I picked out something in my declaration | 3 | MR. SMITH: Objection. |
| 4 | that is a film to give you a sense of my | 4 | THE WITNESS: No. |
| 5 | understanding of that film. | 5 | BY MR. HRYCYSZYN: |
| 6 | $O_{\rm L}$ So you can't provide me a definition of | 6 | O. So then what is the extent of the working |
| 7 | "film" as you understand it and applied in your | 7 | definition you used of "film" in this case? |
| 8 | opinions related to the '501 patent? | 8 | A So like I explained in order to give you a |
| 9 | MR SMITH: Objection | 9 | good answer I want to talk about specific context |
| 10 | THE WITNESS: No that's not true I | 10 | In this case I talked about the gate insulating |
| 11 | RV MR HRVCVSZVN· | 11 | film I can answer any question about you know |
| 12 | O Well that's what I'm asking you to | 12 | other film that is mentioned in the '501 evolution my |
| 12 | provide But so far | 12 | working understanding of it |
| 14 | A I'm asking you for the patents so I can | 14 | \mathbf{O} So let me draw your attention to |
| 1 5 | show you clearly what I mean | 15 | Q: So let the draw your attention to paragraph 10 in your reply brief |
| 15 | O I'm introducing what has been previously | 15 | A Deregraph 10 in which? |
| 10 | warked as Exhibit 1201 It is titled U.S. Datent | 10 | A. I an agraph 19 in which: |
| 1/ | marked as Exhibit 1201. It is the 0.5 . Fatelit | 1/ | Q. Thi infoducing what has been previously marked as Exhibit 1222. "Banky declaration of |
| 18 | No. 7,095,501. | 18 | Stonley D. Shonfield Dh D. "in Cose |
| 19 | A V eg | 19 | No. IDD2017 1942 |
| 20 | A. res. | 20 | No. IPR2017-1845. |
| 21 | Q. what is it? A This is the 1501 notant | 21 | A. I have a copy. |
| 22 | A. This is the 501 patent. | 22 | Q. Do you recognize that document? |
| 23 | Q. Do you remember opining on that patent in | 23 | A. Yes. $($ |
| 24 | this IPR? | 24 | Q. What is it? |
| - | Page 10 | | Page 12 |
| | Fage 10 | | Faye 12 |
| 1 | A. Yes, of course. | 1 | A. This is my reply declaration for Case |
| 2 | Q. Do you remember providing opinions related | 2 | No. IPR2017-01843. |
| 3 | to films in your opinion in this IPR? | 3 | Q. Let me draw your attention to paragraph 19. |
| 4 | A. I think I answered that. Yes. | 4 | Are you there? |
| 5 | Q. What was your working understanding of the | 5 | A. Um-hum, yes. |
| 6 | term "film" in providing those opinions? | 6 | Q. Have you had a chance to read that |
| 7 | A. If you go to Claim 1 that's in the | 7 | paragraph? |
| 8 | '501 patent. And I'll start with "a gate electrode | 8 | A. One moment. Yes. |
| 9 | formed on a [sic] gate insulating film." So in this | 9 | Q. So here you refer to two layers of a single |
| 10 | case and this is the reason I need a specific | 10 | film, right? |
| 11 | reference a gate insulating film here is silicon | 11 | A. What I said was, "no person of ordinary |
| 12 | dioxide grown or some insulating film grown on | 12 | skill would have considered silicon nitride |
| 13 | silicon, but it's typically silicon dioxide, and the | 13 | film 20 and spacers 23 to be two layers of a single |
| 14 | gate sits on top of that thin layer. | 14 | film." |
| 15 | In this case, it's quite thin. It's a | 15 | Q. Do you agree that two layers can form a |
| 16 | nanometer scale. And it separates the gate because | 16 | single film? |
| 17 | it's insulating from the active region. So a gate | 17 | A. The '501 says that a film in that case |
| 18 | insulating film formed on the active region, and the | 18 | it's internal stress film can include multiple |
| 19 | gate electrode formed on the gate insulating film. | 19 | layers, as long as they apply stress to the |
| 20 | In that context, the film is a silicon- | 20 | substrate as a whole. So there can be lavers as |
| 21 | oxygen compound that's a few nanometers thick | 21 | long as they apply stress to the whole. |
| 22 | deposited or grown in a single deposition step. | 22 | O. So I'm asking about the definition of |
| 23 | And that's my understanding in this case. | 23 | "film" more generally. So can two lavers make up a |
| 24 | O. So that's the extent of the let's say | 2.4 | film generally? |
| | where the state with the state of the state | | |

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|---|---|--|---|---|
| | 1 | MR SMITH: Objection | 1 | criteria what appear to be three criteria: |
| | 2 | THE WITNESS. Well in the sense that I | 2 | process steps functions and structures |
| | 2 | just described it yes. The multiple they can | 2 | Do you see that? |
| | 4 | have multiple layers as long as each of the layers | 4 | A Those were that's a summary of some of |
| | 5 | applies a stress to the substrate | 5 | the reasons why in my oninion no one of ordinary |
| | 5 | BY MR. HRYCYSZYN: | 6 | skill in the art would have thought of these films. |
| | 7 | O So are you indicating that films as the | 7 | The film 20, the silicon nitride film and snacer, is |
| | , 8 | term "films" is used in the claims of the | 8 | two layers of the same film |
| | 9 | '501 natent is limited to stress films? | 9 | O So for two adjacent layers to be considered |
| | 10 | MR SMITH: Objection | 10 | the same film is it your opinion that they must be |
| | 11 | THE WITNESS: No | 11 | the same structure formed through the same process |
| | 12 | BY MR. HRYCYSZYN: | 12 | and perform the same function? |
| | 13 | O So the films that are used in the context | 13 | MR. SMITH: Objection |
| | 14 | of the '501 patent claims are broader than just | 14 | THE WITNESS: That's some of the reasons |
| | 15 | films that apply stress correct? | 15 | why I think someone of ordinary skill would not view |
| | 16 | A. As I described earlier, the gate insulating | 16 | two adjacent films to be two layers of a single |
| | 17 | film is not a film intended to apply stress. It's | 17 | film |
| | 18 | intended to put an insulator between the gate and | 18 | BY MR. HRYCYSZYN: |
| | 19 | the substrate and reduce and keep the density of | 19 | O So in addition to those three criteria |
| | 20 | charge states low in that interface between the film | 20 | same process, same structure, same function are |
| | 21 | and the active region. So clearly, no, that's not | 21 | there other criteria that you believe are required |
| | 22 | the only function of a film. | 22 | for two adjacent layers to be considered the same |
| | 23 | There are many functions in general. | 23 | film? |
| | 24 | But for the specifics of the '501, that's an example | 24 | MR. SMITH: Objection. |
| | | | | 5 |
| | | | | |
| | | Page 14 | | Page 16 |
| _ | 1 | Page 14 | 1 | Page 16 |
| | 1 | Page 14 of something that's not a stress film. | 1 | Page 16 THE WITNESS: I can think of other ones, |
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