UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG SEMICONDUCTOR INC., and
SAMSUNG AUSTIN SEMICONDUCTOR LLC,
Petitioner,

v.

HOME SEMICONDUCTOR CORPORATION,
Patent Owner

Case IPR2015-00460
Patent 6,146,997

PATENT OWNER HOME SEMICONDUCTOR CORPORATION'S MOTION FOR OBSERVATION REGARDING CROSS-EXAMINATION OF DR. GARY W. RUBLOFF

Mail Stop PATENT BOARD
Patent Trial and Appeal Board
United States Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313–1450

Pursuant to the Board's Scheduling Order (Paper 12) and the parties Joint Stipulated Change to Scheduling Order (Paper 13), Patent Owner Home Semiconductor Corporation ("Home Semiconductor") respectfully submits the following Motion for Observation Regarding Cross-Examination of Dr. Gary W. Rubloff, Petitioner's reply declarant. The transcript of Dr. Rubloff's deposition is filed as exhibits 2006 and 2007:

I. DOSHI DOES NOT TEACH FORMING A "SPACER" OF ETCH BARRIER MATERIAL ON SIDEWALL OF THE GATE ELECTRODE

In exhibit 2006, on page 77 line 14 to page 78 line 2, Dr. Rubloff testified that the etch of nitride layer 30 would etch sidewall filaments 11 and nitride cap 26 to some degree, but what gets etched is the area furthest removed from the gate electrode. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶2D-2E and the Petitioner's Reply on page 12-15 where Dr. Rubloff claims that overetching would be contrary to Doshi because the Doshi process minimizes damage to sidewall filaments and gate structures. The testimony is relevant because it shows that Doshi contemplates etching of sidewall filaments 11 and nitride cap 26 gate structure, which are there to protect the gate electrode itself.

In exhibit 2006, on page 62 line 5 to pages 63 line 9, Dr. Rubloff testified that the nitride etch compound used in Doshi is that the nitride etch compound used in Doshi is highly selective to silicon. On page 38 line 17 to page 39 line 10,

Dr. Rubloff testified that the selectivity means that the nitride etch will effectively stop on the silicon surface. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶ 2H-2K and the Petitioner's Reply on page 15 – 18 where Dr. Rubloff claims a POSITA would not overetch nitride layer 30 so that it is removed from the sidewalls because such an overetch would result in damage to the diffusion region (silicon surface) underneath the nitride layer. The testimony is relevant because it shows that, contrary to Dr. Rubloff's assertion, overetching has minimal risk of damaging the diffusion region because the nitride etch effectively stops on the silicon surface.

In exhibit 2006, on page 86 line 12 to page 87 line 4 and page 89 line 5 to page 90 line 22, Dr. Rubloff testified that implementation of the Doshi process would include overetch of nitride layer 30 to make sure that the nitride was fully removed from the contact region. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶ 2H-2K and the Petitioner's Reply on page 15 – 18 where Dr. Rubloff claims a POSITA would not overetch nitride layer 30 so that it is removed from the sidewalls because such an overetch would result in damage to the diffusion region (silicon surface) underneath the nitride layer. The testimony is relevant because it shows that, contrary to Dr. Rubloff's claim, overetching nitride layer 30 is something that a POSITA would do when implementing Doshi to ensure that all nitride material in the contact area was removed.

In exhibit 2006, on page 152 line 21 to page 153 line 21, Dr. Rubloff testified that due to the selectivity of the nitride etch compound, overetching nitride layer 30 would not lead to material damage of the silicon surface (diffusion region) below the nitride layer. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶ 2H-2K and the Petitioner's Reply on page 15 – 18 where Dr. Rubloff claims a POSITA would not overetch nitride layer 30 so that it is removed from the sidewalls because such an overetch would result in damage to the diffusion region (silicon surface) underneath the nitride layer. The testimony is relevant because it contradicts Dr. Rubloff's assertion that overetching nitride layer 30 is undesirable because it would damage the diffusion region below the nitride layer.

In exhibit 2006, on page 53 line 9 to page 56 line 19, Dr. Rubloff testified that he could not speculate on the effect of anisotropic etching on material where the surface had an angle (tilt) from the vertical axis or material that had some contour. On page 78 line 3 to page 80 line 2, Dr. Rubloff testified that prior to the nitride etch, the side of Doshi's nitride layer 30 has an angle (tilt) from the vertical axis and has contour at the top and bottom corners. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶ 5C-5D where Dr. Rubloff claims that a POSITA would recognize that the anisotropic nitride etch of nitride layer 30 in Doshi would yield a predictable spacer on the sidewalls of the gate electrode. The

testimony is relevant because it shows that, contrary to his claims, Dr. Rubloff cannot reliably speculate about the results of the anisotropic etch of nitride layer 30 because the layer has an angle (tilt) from the vertical axis and is contoured at the top and bottom corners.

In exhibit 2006, on page 115 line 16 to page 116 line 8, Dr. Rubloff testified that when Doshi describes the nitride etch used to form sidewall filament spacer, Doshi explicitly states that nitride material is left on the sidewalls. On page 118 line 9 to page 119 line 11, Dr. Rubloff confirm that while Doshi explicitly states that material is left on the sidewalls for the sidewall filament spacers, Doshi makes no mention of leaving material on the sidewalls when discussing the contact etch of nitride layer 30. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶ 5C where Dr. Rubloff claims that Doshi explicitly shows a spacer being formed by the nitride etch of nitride layer 30. The testimony is relevant because it contradicts Dr. Rubloff's claim. When Doshi teaches the formation of spacers, Doshi explicitly states that material is left on the sidewalls – which Doshi does not do for the etch of nitride layer 30.

In exhibit 2006, on page 129 line 21 to page 132 line 10, Dr. Rubloff testified that during the BPSG etch, the part of nitride layer 30 closer to the top and on the sidewalls of the gate are exposed to etchant for longer than the horizontal part over the diffusion region, which is only exposed very briefly. On page 132

line 18 to page 133 line 2, Dr. Rubloff testified that the portion of nitride layer 30 near the top is etched more than the portion closer to the bottom because it is exposed to etchant for a longer period of time. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶ 5A where Dr. Rubloff claims that any etching of nitride layer 30 during the BPSG etch would have mainly removed the nitride layer 30 over the diffusion region. The testimony is relevant because it contradicts Dr. Rubloff's claim. The BPSG etch would etch other area of nitride layer 30 more than the portion over the diffusion region since that portion is only exposed to etch very briefly.

II. DOSHI FIGURE 3K IS NOT ERRONEOUS

In exhibit 2006, on page 91 line 1 to line 16, Dr. Rubloff testified that Fig. 3k shows the results of the bit line contact etch. On page 98 line 10 to page 101 line 3, Dr. Rubloff confirms that Fig. 3k does not actually show damage to gate structures 10 and sidewall filaments 11 but argues that he cannot really speculate about the figure because he believes that the figure is erroneous. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶3A, 3C and the Petitioner's Reply on page 18-21 where Dr. Rubloff claims that Fig. 3k is erroneous because it is inconsistent with the goal of minimizing damage to gate corners and sidewall filaments. The testimony is relevant because it contradicts Dr. Rubloff's assertion

that Fig. 3k is inconsistent with minimizing damage to gate structures and sidewall filaments, since Fig. 3k doesn't actually depict damage to those structures.

In exhibit 2006, on page 101 line 4 to line 20, Dr. Rubloff confirmed that Doshi does not says that it is trying to form self-aligned contacts when discussing the formation of the contact holes. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶3A, 3C and the Petitioner's Reply on page 18-21 where Dr. Rubloff claims that Fig. 3k is erroneous because it doesn't show self-aligned contacts. The testimony is relevant because, contrary to Dr. Rubloff's assertion, Doshi never states that it is trying to form self-aligned contacts.

In exhibit 2006, on page 91 line 22 to page 94 line 4, Dr. Rubloff testified that he noticed the error in Fig. 3k when he first read the Doshi patent but that he decided to ignore it until instructed otherwise. On page 94 line 5 to page 96 line 15, Dr. Rubloff then testified that he doesn't actually remember when he first noticed the error in Fig. 3k. On page 96 line 16 to page 98 line 9, Dr. Rubloff then testified that he did include any mentions of the errors in Fig. 3k in his original declaration because he didn't think they were important. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶3A, 3C and the Petitioner's Reply on page 18-21 where Dr. Rubloff claims that Fig. 3k is erroneous. The testimony is relevant because it shows that Dr. Rubloff's assertions regarding Fig. 3k are not credible.

III. CITATION OF DR. RUBLOFF'S ORIGINAL TESTIMONY WAS NOT MISLEADING

In exhibit 2006, on page 121 line 8 to page 124 line 5, Dr. Rubloff confirmed that, in his original testimony, he testified that nitride layer 30 forms a "spacer" on the sidewall of the gate electrode before the contact etch because its function as a diffusion barrier meant that it was a "spacer." On page 125 line 19 to page 126 line 21, Dr. Rubloff confirmed that, at that stage in the process, the nitride layer 30 is a "spacer" under his definition of the term in the context of the '997 patent. On page 126 line 22 to page 127 line 22, Dr. Rubloff confirmed that his original testimony was accurate and that the nitride layer on the sidewalls was already a "spacer" before the contact etch. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶ 4A and Petitioners Reply at 22-23 where Dr. Rubloff claims that the citation to this prior testimony was misleading. The testimony shows that the citation to Dr. Rubloff's prior testimony was accurate and not misleading. Even after Dr. Rubloff's alleged clarification, he explicitly reconfirmed that the nitride layer on the sidewalls was a "spacer" before the contact etch step, as the term is used in the context of the '997 patent.

IV. DOSHI DOES NOT TEACH FORMING AN OXIDE LAYER OVER THE DIFFUSION REGION

In exhibit 2006, on page 150 line 19 to page 151 line 4, Dr. Rubloff testified Doshi only states that the sides of polysilicon layer 22 are oxidized and does not

say thermal oxidation. On page 135 line 21 to page 136 line 3, Dr. Rubloff confirms that not all oxidation of silicon is thermal oxidation. On page 137 line 8 to page 138 line 8 and on page 140 line 20 to page 141 line 2, Dr. Rubloff testified that ozone treatment is a form of oxidation that a POSITA would not consider thermal oxidation. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶ 6A-6B and Petitioner's Reply at page 24 – 25 where Dr. Rubloff states that a POSITA reading Doshi would recognize that thermal oxidation of the gate sidewalls would also form an oxide layer over the diffusion region. The testimony is relevant because Dr. Rubloff's theory about forming an oxide layer over the diffusion region are based specifically on a thermal oxidation but Doshi does not recite the use of thermal oxidation.

In exhibit 2006, on page 149 line 22 to page 151 line 4, Dr. Rubloff testified that when Doshi describes the oxidation of the polysilicon layer Doshi does not state that an oxide layer is formed over the diffusion region, that the gate oxide over the diffusion region is thickened, or even that the oxidation is thermal oxidation. This testimony is relevant to Dr. Rubloff's Reply Declaration at ¶¶ 6A-6B and Petitioner's Reply at page 24 – 25 where Dr. Rubloff states that a POSITA would understand that thermal oxidation of the polysilicon layer in Doshi would form an oxide layer over the diffusion region, whether it was uncovered or covered. The testimony is relevant because it shows that, contrary to Dr.

Rubloff's claim, Doshi does not teach forming an oxide layer over the diffusion region by any method.

In exhibit 2006, on page 155 line 15 to page 157 line 1, Dr. Rubloff confirms that the diffusion region is not uncovered silicon during the oxidation step because the region is covered by the pre-existing gate oxide. This testimony is relevant to Petitioner's Reply at page 24 which argues that it has been established that source/drain (diffusion) regions are uncovered doped silicon susceptible to thermal oxidation. The testimony is relevant because shows that the Petition is wrong and that the source/drain (diffusion) regions are not uncovered doped silicon susceptible to oxidation.

Dated: January 4, 2016

Respectfully submitted,

By: */s/ Craig R. Kaufman*

Registration No. 34,636
Lead Counsel for Patent Owner
TechKnowledge Law Group LLP
100 Marine Parkway, Suite 200
Redwood Shores, CA 94065
650-517-5200

CERTIFICATE OF SERVICE

I hereby certify that on January 4, 2016, a true and correct copy of the foregoing PATENT OWNER HOME SEMICONDUCTOR CORPORATION'S MOTION FOR OBSERVATION REGARDING CROSS-EXAMINATION OF DR. GARY W. RUBLOFF and all supporting exhibits were served electronically via email to the Petitioner by serving the correspondence email addresses of record as follows:

W. Karl Renner (Reg. No. 41,265)
FISH & RICHARDSON P.C.
3200 RBC Plaza
60 South Sixth Street
Minneapolis, MN 55402
Telephone: (202) 783–5070
Facsimile: (202) 783–2331
E-mail: renner@fr.com

Roberto Devoto (Reg. No. 55,108)
Indranil Mukerji (Reg. No. 46,944)
David L. Holt (Reg. No. 65,161)
FISH & RICHARDSON P.C.
3200 RBC Plaza
60 South Sixth Street
Minneapolis, MN 55402
Telephone: (202) 783–5070
Facsimile: (202) 783–2331
E-mail: IPR39843-0011IP1@fr.com
E-mail: devoto@fr.com
E-mail: mukerji@fr.com
E-mail: dth@fr.com

By: /s/ *Deborah L. Grover*
Deborah L. Grover
TechKnowledge Law Group LLP
100 Marine Parkway, Suite 200
Redwood Shores, CA 94065
650-517-5200

3010-0002\00009052.004