

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INERGY TECHNOLOGY, INC.,
Petitioner

v.

FORCE MOS TECHNOLOGY CO. LTD.,
Patent Owner

Inter Partes Review No. IPR2024-00094
U.S. Patent No. 7,812,409

**PATENT OWNER'S SUPPLEMENTAL BRIEF
REGARDING DIRECTOR REVIEW
[AUTHORIZED PER PAPER NO. 41]**

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Patent Owner's Exhibit List

Exhibit No.	Description
2001	Transcript of Feb. 13, 2024 Deposition of David Kuan-Yu Liu, PhD in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2002	Declaration of David Kuan-Yu Liu, Ph.D., served on Jan. 30, 2024 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2003	Defendant ASUSTek Computer, Inc.'s Motion to Stay Pending Resolution of Inter Partes Reviews, filed on Nov. 30, 2023 as Dkt. No. 30 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2004	Amended Docket Control Order, filed on Jan. 18, 2024 as Dkt. No. 35 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2005	Cover pleading to Defendant ASUSTek Computer, Inc.'s Invalidity Contentions, served on Jul. 18, 2024 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2006	U.S. Patent No. 6,700,158 to Cao et al. (issued Mar. 2, 2004)
2007	Excerpts from Webster's New World Dictionary, Third College Ed. (1991) for "square," "substantial," "round," "rounded," and "truncate"
2008	Memorandum Opinion and Order denying Defendant ASUSTek Computer, Inc.'s Motion to Stay Pending Resolution of Inter Partes Reviews, filed on April 11, 2024 as Dkt. No. 74 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2009	--Intentionally Not Used--
2010	--Intentionally Not Used--

Exhibit No.	Description
2011	Claim Construction Order, Dkt. No. 132 from <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)
2012	U.S. Patent No. 5,304,831 to Yilmaz et al., “Low on-resistance power MOS technology”
2013	U.S. Patent No. 6,867,083 to Imam et al., “Method of forming a body contact of a transistor and structure there”
2014	Excerpts of Lutz, Josef, et al. "Semiconductor power devices." 2018, ISBN 978-3-319-70917-8 (“Lutz”);
2015	Li, S., & Boyd, J. P. (2015). Approximation on non-tensor domains including squircles, Part III: Polynomial hyperinterpolation and radial basis function interpolation on Chebyshev-like grids and truncated uniform grids. <i>Journal of Computational Physics</i> , 281, 653–668. doi:10.1016/j.jcp.2014.10.035
2016	Maneuski, Dima, V. Gostilo, and A. Owens. "TCAD simulation studies of novel geometries for CZT ring-drift detectors." <i>Journal of Physics D: Applied Physics</i> 53.1 (2019): 015114
2017	Cohen, S. Simon. "Contact resistance and methods for its determination." <i>MRS Online Proceedings Library (OPL)</i> 18 (1982): 361.
2018	Excerpts from Semiconductor Glossary
2019	Ng, Hong Seng. "Review on Methods for Trench MOSFET Gate Oxide Reliability and Switching Speed Improvement." <i>ECS Transactions</i> 27.1 (2010): 21
2020	--Intentionally Not Used--
2021	Declaration of Dean Neikirk, Ph.D. in Support of Patent Owner’s Response

Exhibit No.	Description
2022	Curriculum Vitae of Dean Neikirk, Ph.D.
2023	Transcript of August 6, 2024 Deposition of Sylvia D. Hall-Ellis, Ph.D.
2024	Transcript of August 23, 2024 Deposition of Dr. David Kuan-Yu Liu
2026	Patent Owner's Oral Hearing Demonstratives
2027	--Intentionally Not Used-- [Denied leave to file per Ex. 3101; Previously tentatively identified as: Jury Verdict, ECF Docket No. 358, as filed in <i>Force Mos Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , No. 2:22-cv-00460-JRG (E.D. Tex.)]
2028	--Intentionally Not Used-- [Denied leave to file per Ex. 3101; Previously tentatively identified as: Redacted Trial Transcript, Volume 3, ECF Docket No. 417, as filed in <i>Force Mos Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , No. 2:22-cv-00460-JRG (E.D. Tex.)]
2029	--Intentionally Not Used-- [Denied leave to file per Ex. 3101; Previously tentatively identified as: Findings of Fact and Conclusion of Law [Regarding Defendant's Inequitable Conduct Claims], filed temporarily under seal as ECF Docket No. 420 in <i>Force Mos Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , No. 2:22-cv-00460-JRG (E.D. Tex.)]
2030	--Intentionally Not Used-- [Denied leave to file per Ex. 3101; Previously tentatively identified as: Amended Final Judgment, ECF Docket No. 422, as filed in <i>Force Mos Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , No. 2:22-cv-00460-JRG (E.D. Tex.)]

Exhibit No.	Description
2031	Joint Exhibit of Relevant Excerpts From: <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG; U.S. District Court, Eastern District of Texas, Marshall Division

I. INTRODUCTION

As discussed, allowing the Board's decision in this case to stand would overturn the contrary verdict, findings, and judgment of an Article III court and jury. Ex. 2031 at 91, 176, 207. In *Force MOS v ASUS*, the defendant presented the same invalidity theories for claim 1 of the '409 Patent as presented in this IPR: alleged anticipation over Kobayashi, and alternatively, obviousness over Kobayashi in view of Hshieh 914. The jury considered those arguments carefully—even asking to review copies of the Kobayashi and Hshieh 914 references during deliberation. Ultimately, the jury rejected ASUS's arguments, finding claim 1 of the '409 Patent to be valid. ASUS then rehashed the same arguments before Judge Gilstrap in the inequitable conduct bench trial, arguing that Hshieh 914 and Kobayashi were material and should have been disclosed during prosecution. Again ASUS lost, with the Court finding that the references were not material and crediting the testimony of Force MOS's expert Dr. Neikirk.

But, in this IPR, the Board reached a conclusion contrary to the judge and jury, finding that claim 1 and dependent claims 3-5 of the '409 Patent were unpatentable as obvious in view of Kobayashi over Hshieh 914. The findings of the *ASUS* case demonstrate that the Board's conclusions of unpatentability were erroneous. In particular, *ASUS* demonstrates the absence of a motivation to combine Hshieh 914, which teaches away from square-shaped cells—with the very different

structure of Kobayashi—to create MOSFETs with square shaped cells with rounded corners. As Patent Owner’s expert testified—without rebuttal: (1) Hshieh 914 teaches away from using square cells; and (2) Hshieh 914’s reason for rounding (the three-dimensional diffusion problem) is inapplicable to Kobayashi’s MOSFET. The Board rejected those opinions based on its own independently developed arguments and assumptions regarding the state of the art and the purposes of Hshieh’s rounding. In doing so, the Board contradicted the implied and express findings of the *ASUS* jury and judge. The Director should correct the Board’s clear errors by terminating this IPR, or by entering a revised decision finding all claims patentable.

II. ARGUMENT

A. PETITIONER’S INVALIDITY THEORIES WERE REJECTED BY THE JURY IN *ASUS*

The two grounds presented by Petitioner for claim 1 in this IPR were anticipation by Kobayashi and obviousness over Kobayashi in view of Hshieh 914. Pet. at 3-4. Likewise, during the jury trial, ASUS’s expert, Dr. Shanfield testified that Kobayashi disclosed each limitation of claim 1 of the ’409 Patent. Ex. 2031 at 5-15. Dr. Shanfield identified the same structures in Kobayashi as mapping to the same limitations of the ’409 Patent as set forth in the Petition. *Id.*; Pet. at 22-32. In particular, as to the key limitation of “substantially square-shaped cells with rounded corners,” Dr. Shanfield relied on the side-view visible rounding of trench corner

bottoms and openings described in Kobayashi at 7:58-60, just as Petitioner did in this case. Ex. 2031 at 8-10, 12-13; Pet. at 28; Paper 26 at 9-12.

Just as in this IPR, Force MOS's expert in the *ASUS* case, Dr. Neikirk, disputed ASUS's theory of anticipation by Kobayashi. Ex. 2031 at 33-36; Ex. 2021 ¶¶ 110-118. Dr. Neikirk testified that Kobayashi lacks "substantially square-shaped cells with rounded corners." Ex. 2031 at 33. In particular, addressing Fig. 6C and 7:57-8:3 of Kobayashi, Dr. Neikirk explained that they "describ[e] what the trenches look like in a side view." *Id.* at 34. He contrasted that with the claim's "substantially square-shaped cell[s]," which "would [be] observe[d] from a top view," showing the jury a demonstrative distinguishing those types of rounding. *Id.* at 34-36, 60.

And, just like this IPR, ASUS presented an obviousness combination of Kobayashi in view of Hshieh 914 to the *ASUS* jury. In particular, just as in this case, ASUS's expert relied on the top-view visible rounding in Hshieh 914's Figure 8A—which depicts parallelograms—for the "rounded corners" portion of the "substantially square-shaped cells with rounded corners" limitation. Ex. 2031 at 16; Ex. 1003 ¶ 137. And, as to motivation to combine, Dr. Shanfield opined that Kobayashi and Hshieh 914 involve the same subject matter, "are both trying to solve the same problem" of "ruggedness" from the "punch-through problem," and that "it would be very reasonable" to "combine these." Ex. 2031 at 16-17. Again, these

mirror the motivation to combine arguments presented in the Petition itself: “same field of endeavor” (Pet. at 56); addressing the same “problems” of “punch-through,” (Pet. at 58, Paper 26 at 23-24), “natural fit,” and “common sense” (Pet. at 60).

And, as in this IPR, Dr. Neikirk disputed ASUS’s theory of obviousness over Kobayashi in view of Hshieh 914. Ex. 2021 ¶¶ 134-151. In particular, Dr. Neikirk explained to the jury what a motivation to combine is and explained why ASUS’s theory was not an adequate motivation to combine. Ex. 2031 at 37-38. He opined that the fact that Kobayashi and Hshieh 914 were in the same field and addressed similar problems was not sufficient. Ex. 2031 at 37-3. Moreover, he also explained that Hshieh 914 taught away from combining the references to have “substantially square-shaped cells” because Hshieh 914 “says don’t use” squares due to their lower “packing density” compared to non-orthogonal parallelograms. *Id.* at 39-42. Also, he explained that Hshieh 914’s rounded corners were focused on rounding the “two” sharp “corners of the non-orthogonal parallelogram.” *Id.* at 42. And, he explained that Hshieh 914’s reason for rounding corners—the three-dimensional diffusion effect—is not strongly related to “para[si]tic drain or avalanche.” *Id.* at 42-43.

There can be no doubt that the jury carefully considered and weighed the parties’ invalidity and validity theories. The Court instructed the jury on the standards for anticipation and obviousness. Ex. 2031 at 63-69. And, the parties’

closing arguments highlighted the specific disputes between the experts regarding validity. *Id.* at 71-74, 76-77. Notably, the jury specifically requested to see, and received, copies of the Kobayashi and Hshieh 914 references during deliberations. *Id.* at 81, 82-83. Finally, the jury returned a verdict, specifically finding that claim 1 of the '409 Patent had not been proven invalid. *Id.* at 91.

B. PETITIONER'S INVALIDITY THORIES WERE REJECTED BY THE COURT IN *ASUS*

In the bench trial on ASUS's inequitable conduct claim, ASUS's expert Dr. Shanfield again presented the same invalidity theories as "materiality" theories. In particular, Dr. Shanfield characterized (incorrectly) the sole improvement of the '409 Patent as being "round corners of [a] square cell." Ex. 2031 at 98-99. And, he identified Hshieh 914 as allegedly material because of its top-view visible rounded corners (of non-orthogonal parallelogram cells). *Id.* at 99-102. And, as Petitioner argued in this IPR, Dr. Shanfield argued that a POSITA would recognize Hshieh 914 as advantageous because of the purported problem of a "sharp corner" being a "weak point" that "will create a punch through problem." *Id.*; Pet. at 57-58. And, addressing the same issue presented in this IPR, Dr. Shanfield argued that Hshieh 914's rounding was relevant regardless of whether the device implicated the "three-dimensional diffusion effect." Ex. 2031 at 99-102; Paper 24 at 54-60; Paper 26 at 24; Paper 37 ("FWD") at 33-36. And, he again expressed his belief that Hshieh 914

rendered claim 1 obvious in view of Kobayashi. Ex. 2031 at 103-104, 106. At the bench trial, Dr. Neikirk again explained that Hshieh 914 teaches away from using square-shaped cells, and teaches instead to use non-orthogonal parallelograms with parallelogram-shaped source contacts. Ex. 2031 at 126-128, 130.

After the bench trial, Judge Gilstrap issued a forty-seven page findings of fact and conclusions of law that comprehensively rejected ASUS's theories. Ex. 2031 at 159-205. The Court found ASUS's theory that Kobayashi's "side-view visible round[ing]" was material was "not persuasive" as the limitation is "directed to the shape of the *cells*, while Kobayashi '196's disclosures regarding rounding of the trench *gate*'s opening and bottoms do not result in a substantially square shape with rounded corners." *Id.* at 176-177 (FF#92-93). Thus, the Court concluded that Kobayashi did not anticipate or render any claim obvious. *Id.* (FF#94-96).

As to Hshieh 914, the Court found that it had not been shown to be material or to anticipate or render obvious claim 1 of the '409 Patent, either alone or in combination with Kobayashi. Ex. 2031 at 172-173, 176 (FF#70, 75, 89-90). The Court credited the testimony of Force MOS's expert, Dr. Neikirk, that Hshieh 914 teaches away from the combination because Hshieh 914: (1) is directed to non-orthogonal parallelogram cells, teaching that they are advantageous over square cells; (2) uses parallelogram-shaped source contacts; and (3) "does not describe or

depict any embodiment with trenched gates and cells having rounded or truncated corners.” Ex. 2031 at 172 (FF#65-69) (citing Ex. 2031 at 39-42, 126-127). And, the Court held that ASUS’s motivation to combine Kobayashi with Hshieh 914 was “inadequate.” Ex. 2031 at 175 (FF#85). Thus, the Court concluded that ASUS “has failed to establish that a POSITA would have been motivated to combine Hsieh ’914 with Kobayashi ’196 (or any other reference).” Ex. 2031 at 176 (FF#87).

C. THE BOARD’S FINAL WRITTEN DECISION CONTRADICTS THE FACTS FOUND IN THE *ASUS* CASE

Plainly, the Final Written Decision of the Board in this case contradicted the outcome of the jury trial and bench trial in the *ASUS* case by finding that Kobayashi and Hshieh 914 render claims 1 and 3-5 of the ‘409 Patent obvious. FWD at 50. However, a number of subsidiary factual findings by the Board also contradict the implied and express findings by the jury and judge in the *ASUS* case. First, as noted, Force MOS presented evidence and argument to the judge and jury that Hshieh 914 teaches away from a combination using square-shaped cells. Ex. 2031 at 39-43, 126-128, 130. The jury implicitly credited that argument in its jury verdict, and the Court expressly credited that argument in its findings of fact. *Id.* at 91, 172. However, the Board dismissed that argument by interpreting Hshieh 914 as merely teaching that “non-orthogonal cells are preferable.” FWD at 31. This was erroneous—the entire purpose of the Hshieh 914 reference is to use non-orthogonal parallelograms rather

than squares. Ex. 1006, Abstract, 2:64-3:5, Figs. 4A, 4B, cls. 1, 8, 12, 21, 26, 30.

Second, Force MOS presented evidence and arguments in *ASUS* that Hshieh 914's reasons for rounding cell corners are irrelevant to trench gate MOSFETs. In particular, Force MOS argued that Hshieh 914 does not have any embodiments disclosed in the figures or written description where a *trench* gate MOSFET's corners are rounded. Ex. 2031 at 40, 111, 126. Agreeing, the Court expressly found that "[t]he specification of Hsieh '914 does not describe or depict any embodiment with trenched gates and cells having rounded or truncated corners." Ex. 2031 at 172 (FF#67). Patent Owner made the same argument to the Board, who rejected that argument, citing a single dependent claim in Hshieh 914. FWD at 19, 33, 35 (citing Ex. 10006, claim 37). This was erroneous—the Board disregarded Dr. Neikirk's detailed testimony explaining *how* Hshieh 914 was inapplicable to trench-gate MOSFETs like Kobayashi, and instead substituted the Board's own interpretation of Hshieh 914's claim 37. Ex. 2021 ¶¶ 105-106, 136-137, 145. In doing so, the Board erroneously *assumed* that Hshieh 914's claim 37 *must* mean that Hshieh 914's rounded corner teachings would be applicable to all trench gate MOSFETs without any reasoning for *how* those teachings could apply.

Third, in *ASUS*, Force MOS demonstrated that Hshieh 914's stated reason for rounding corners—the 3D diffusion effect—was not a reason to combine. Ex. 2031

at 42-43. ASUS's expert disputed this at the bench trial, stating that "it doesn't matter whether it's three-dimensional diffusion effect." *Id.* at 100-101. By finding claim 1 of the '409 Patent valid, and Hshieh 914 not material, the jury and judge evidently concluded that Dr. Neikirk's reasoning was persuasive. Patent Owner likewise argued to the Board that Hshieh 914's stated reason for rounding corners—the 3D diffusion effect (which effects horizontal dopant displacement)—was inapplicable to Kobayashi's MOSFET (which lacks horizontal dopant boundaries). Paper 24 at 54-60; FWD at 34. However, again the Board rejected that argument, speculating that Hshieh 914's unexplained embodiment of claim 37 implied that "Hshieh's rounding to prevent corner vulnerability is not limited to corner vulnerability caused by three-dimension diffusion." FWD at 35.

Fourth, Force MOS presented evidence and arguments in *ASUS* that Kobayashi's side-view rounding is entirely inapposite to top-view rounding, such as claimed in the '409 Patent. Ex. 2031 at 33-36, 60. Agreeing, the Court expressly found that "Kobayashi '196's disclosures regarding rounding of the trench *gate*'s opening and bottoms do not result in a substantially square shape with rounded corners." Ex. 2031 at 177 (FF#93). Likewise, in this IPR, Dr. Neikirk explained how Petitioner and its expert improperly conflated top-view and side-view rounding in attempting to construct a purported general motivation to round all sharp corners.

Ex. 2021 ¶¶ 134-140. But, the Board ignored that distinction, finding a motivation to round “all sharp corners of the cell (whether visible in the top view/planar direction or not).” FWD at 27. This was erroneous as Petitioner’s expert never opined that the top-view versus side-view rounding was the same thing or addressed the same problem. Ex. 1003 ¶¶ 37, 133. And, the Board disregarded Dr. Neikirk’s detailed factual explanation that those types of rounding are very different and solve different problems. Ex. 2021 ¶¶ 134-140.

Finally, the Board’s decision contradicts ASUS’s own arguments from the *ASUS* case. In particular, during the closing of the bench trial, ASUS’s counsel argued that the “Pfirsch reference” cited during prosecution did not “provide[] reasons for rounding the corners of the cell,” and that it does not “mention” “rounded corners” or “their benefits.” Ex. 2031 at 149. However, as discussed in Patent Owner’s prior paper, the Board in the Final Written Decision *sua sponte* identified the Pfirsch reference as motivating rounding corners, incorrectly suggesting that Petitioner’s expert had presented that theory. FWD at 27, 29, 35-36; Ex. 1003 ¶¶ 39-44, 57-58. Thus, the Board’s decision plainly contradicts the *ASUS* case.

III. CONCLUSION

For the reasons set forth herein and in Patent Owner’s Request for Director Review, the Director should terminate this IPR or hold all claims to be patentable.

Date: October 17, 2025

Respectfully submitted,

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The undersigned certifies that on October 17, 2025, I will cause a true and correct copy of the foregoing Patent Owner's Supplemental Brief Regarding Director Review to be served electronically upon the following attorneys who have consented to service via email.

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