

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

LED WAFER SOLUTIONS LLC,
Patent Owner.

Case IPR2021-01554

Patent No. 9,502,612

LED WAFER SOLUTIONS LLC'S

Preliminary Response

37 C.F.R. §42.107(a)

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LIST OF EXHIBITS

Exhibit	Description
Ex. 2001	Seventh Supplemental CARES Act Order
Ex. 2002	Samsung's Motion to Transfer, (public version), DKT. No. 40
Ex. 2003	Amended Scheduling Order, DKT. No. 27
Ex. 2004	Order Granting motion to join by Seoul Semiconductor, DKT. No. 39
Ex. 2005	Samsung's Answer to the Complaint, DKT. No. 19
Ex. 2006	Law 360 Article, Judge Albright
Ex. 2007	CNBC Article on Samsung \$17 billion Chip Plant in WDTX
Ex. 2008	Proposed Scheduling Order, DKT No. 20
Ex. 2009	Samsung Preliminary Construction DKT 44
Ex. 2010	Seoul Semiconductor's Motion to Intervene, DKT. No. 23
Ex. 2011	IAM Magazine, April 7, 2020
Ex. 2012	Grant of scheduling order, DKT. No. 38
Ex. 2013	LED Wafer v, Samsung Complaint, DKT. No. 1

LED Wafer Solutions LLC submits this Preliminary Response (“POPR”) in opposition to Petitioner Samsung Electronics Co., Ltd.’s (“Petitioner” or “Samsung”) Petition for *Inter Partes* Review (“IPR”) (Paper 1; “Petition” or “Pet.”) of U.S. Patent No. 9,502,612 (“’612 Patent”).

I. INTRODUCTION

The ‘612 Patent discloses and claims an unconventional light emitting diode (“LED”) device with improved component assembly in an integrated package, providing a more durable LED package with enhanced heat conduction over prior, conventional LED assemblies. Ex. 1001, Abstract, and 4:44-52. The primary prior art references relied on by Petitioner are focused on narrow improvements to conventional LED chips constructed using solder bumps to electrically connect the LED chip to electrical conductors. The references are focused on improvements of light emission and transmission of the old designs, and depend on the conventional construction of such LED chips to accomplish the solutions they teach. None of the primary references directly address problems with heat management. In the prior art endeavor to improve light emission and light transmission, the prior art devices actually sacrifice heat transmission, ignoring one of the then central problems of LED functionality at the time of the invention, heat. Heat problems would still restrict the broad application of LED’s today, without the patented invention.

Additionally, the Board should exercise its discretion to deny institution under 35 U.S.C. §314(a) because a scheduled jury trial in parallel litigation involving substantially the same issues and the same prior art presented in the Petition will conclude approximately six months before any final written decision would issue. *Apple Inc. v. Fintiv Inc.* (“*Fintiv*”), IPR2020- 00019, Paper 15 at 13, 17 (PTAB May 13, 2020) (precedential) (denying institution where trial in parallel proceeding was scheduled to begin two months before final written decision). The district court has not stayed the parallel litigation, and Samsung has not even filed for such a stay. Any such motion to stay would likely be denied in accordance with the district court’s policy of not staying cases pending PTAB decisions.¹

By the statutory date of April 21, 2022 for an institution decision, claim construction briefs will have been completed, the district court will have held a *Markman* hearing; and fact discovery will be underway.² Instituting trial on this Petition will not serve as an “effective and efficient alternative” to litigation, frustrating a primary objective of the AIA. *Gen. Plastic Indus. Co., Ltd. v. Canon*

¹ See, e.g., “The last thing anyone should think about WDTX is that it is patent plaintiff friendly, says Albright,” IAM Magazine, April 7, 2020, (Ex. 2011).

² See Scheduling Order Dkt. No. 38. (Ex. 2012).

Kabushiki Kaisha, IPR2016-01357, Paper 19 at 16–17 (PTAB Sept. 6, 2017) (precedential).

This Petition should be denied because the Petition has failed to demonstrate a reasonable likelihood that any claim of the '612 Patent is unpatentable. Ground 1 in the Petition challenges independent claim 1 and dependent claims 2 and 8-9, which are asserted to be unpatentable under pre-AIA 35 U.S.C. §103 based on U.S. Patent Publication No. 2003/0232455 to Tanaka. (“Tanaka”) (Ex. 1005).

Each of the other grounds 2-9 in the Petition seek to invalidate claims 1-9 by relying on *Tanaka* in various combinations with U.S. Patent No. 7,233,028 to Weeks (“Weeks”) (Ex. 1006), U.S. Patent Publication No. 2007/0284602 to Chitnis et al. (“Chitnis”) (Ex. 1007), Applicant Admitted Prior Art (“AAPA”), and U.S. Patent No. 7,419,839 to Camras *et al.* (“Camras”) (Ex. 1008) under 35 U.S.C. §103. But, when the claims are properly construed, the prior art fails to disclose, teach, or suggest several limitations of the claims. At the least, *Tanaka* fails to teach or suggest the limitation of “an intrinsic region,” a “thermally conductive layer,” “at least one optically reflective surface,” “a substantially optically transmissive layer,” and a “carrier wafer and the thermally conductive layer defining a relief” as recited in the challenged claims. If any one of these limitations are missing from Tanaka, the petition must be refused, because

Petitioner cannot demonstrate a reasonable likelihood of any claim being invalid. Thus, none of the Petitioner's Grounds can establish a prima facie case of unpatentability.

Accordingly, institution should be denied.

II. BACKGROUND

LED Wafer is the owner of the '612 Patent entitled "Light Emitting Diode Package with Enhanced Heat Conduction." The '612 Patent was duly issued by the United States Patent and Trademark Office ("PTO") on November 22, 2016 and will be discussed in detail in Section III.

A. Procedural History

On March 25, 2021, LED Wafer filed a district court complaint alleging infringement by Petitioner of the '612 Patent. Ex. 2013. Almost 6 months later, Petitioner filed a Petition challenging claims 1-9 of the '612 Patent on nine grounds, all of which use Tanaka as the primary reference)

B. Institution Standard

Review cannot be instituted unless the Petition demonstrates a reasonable likelihood that at least one of the challenged claims is unpatentable. 35 U.S.C. §314(a); 37 C.F.R. §42.108(c). The Board "will not take on the role of advocate for a party, trying to make out a case the party has not adequately stated." Standing

Order ¶121.5.2 (B.P.A.I. Mar. 8, 2011). Rather, it is Petitioner’s duty to provide sufficient grounds for the institution of a review “focus[ing] on concise, well organized, easy-to-follow arguments supported by readily identifiable evidence of record.” *Cisco Sys., Inc. v. C-Cation Tech, LLC*, IPR2014-00454, Paper No. 12 at 11 (PTAB Aug. 29, 2014).

C. Person of Ordinary Skill in the Art

A person having ordinary skill in the art (“POSITA”) at the time of invention of the ’612 Patent (around 2013) would have had a bachelor’s degree in electrical engineering or a similar field, and at least of two years of professional experience, or its equivalent, in the *manufacture of light sources* using light emitting diodes (“LEDs”). Pet., 5. The POSITA is a highly qualified individual, and LED Wafer’s and Samsung’s positions are substantially similar.

III. THE ’612 PATENT DESCRIBES A NOVEL AND EFFICIENT SOLUTION TO A COMPLEX PROBLEM

The ’612 Patent generally relates to the field of efficient thermal conductivity properties and repeatable manufacture of LEDs implemented on wafer substrate layers. Ex. 1001, 1:21–24. This is the opposite of the prior art’s focus on light emission at the sacrifice of and indifference to heat dissipation.

A. Conventional LED device manufacturing had drawbacks

LEDs are semiconductor devices that convert electrical power into visible electromagnetic radiation. *Id.*, 1:29-32. Packaging of electronic devices such as LEDs represents a major cost in the production of electronic parts. Ex. 1001, 1:40–42. Traditional LEDs manufactured involving LEDs mounted on individual carrier substrates are expensive to process. *Id.*, 3:20-21. However, by using wafer level assembly packaging, where LEDs are mounted on a carrier wafer, and many LEDs are packaged in parallel and subsequently singulated, costs are reduced. *Id.*, 3:21-27. As a result, traditional LED manufacturing requiring first the dicing of LED wafers, followed by attaching the LEDs to a package using solder bumps, and use of a carrier substrate to support the LED, is rendered obsolete. *Id.*, 3:28-35. Schubert identifies such “solder-bump bonding” as a more expensive packaging process compared to conventional wire bonding. Ex. 1017, 160. Traditional, solder-bump bonded LEDs result in LEDs having an increased cost, and an increase to thermal dissipation in the final product. Ex. 1001, 3:36-42. LED packaging calls for, among other things, packaging that is designed to efficiently handle the conduction of heat generated in the devices. *Id.*, 3:10-17. A carrier substrate can be used to accommodate packaging LED requirements, but can

double the cost of packaging, and adversely affects its heat removal characteristics. *Id.*, 3:39-42.

B. The ‘612 Patent solved many problems and provided an elegant, efficient solution

In addressing the above-mentioned problems with conventional LED device manufacturing, the ‘612 Patent uses a novel approach whereby certain layers act to promote mechanical, electrical, thermal, or optical characteristics of the device. *Id.*, Abstract. The patented device, therefore, can avoid design problems, including heat dissipation problems found in conventional LED devices, by providing a novel “wafer level package for LEDs” which does not require solder bumps or any mounting package, and uses a diced, packaged LED, resulting in a direct removal of generated heat. *Id.*, 3:42-48. One such important layer is the thermally conductive layer, which enables efficient removal of the generated heat through a dedicated “hole” in the silicon with a direct heat conduction route from the LED to the printed circuit board. *Id.*, 3:59-60. The dedicated thermal hole etched through the thermally conductive layer can be greater than 700 by 700 microns in size. *Id.*, 9:26-27.

C. Exemplary claim; preferred embodiment

The claimed invention recited in the independent claim of the ‘612 Patent provides a novel and unique LED based illumination device which can provide

efficient and commercially viable thermal conductivity properties and repeatable manufacture of LEDs. Claim 1 (with non-limiting distinctive emphasis added) is exemplary:

1. A light emitting device, comprising:

a substrate having opposing first and second substrate surfaces;

a semiconductor LED including doped and *intrinsic regions* thereof, said semiconductor LED having opposing first and second LED surfaces, said first LED surface disposed on the first substrate surface;

a thermally conductive layer disposed on the second LED surface of the semiconductor LED;

a carrier wafer disposed on the thermally conductive layer;

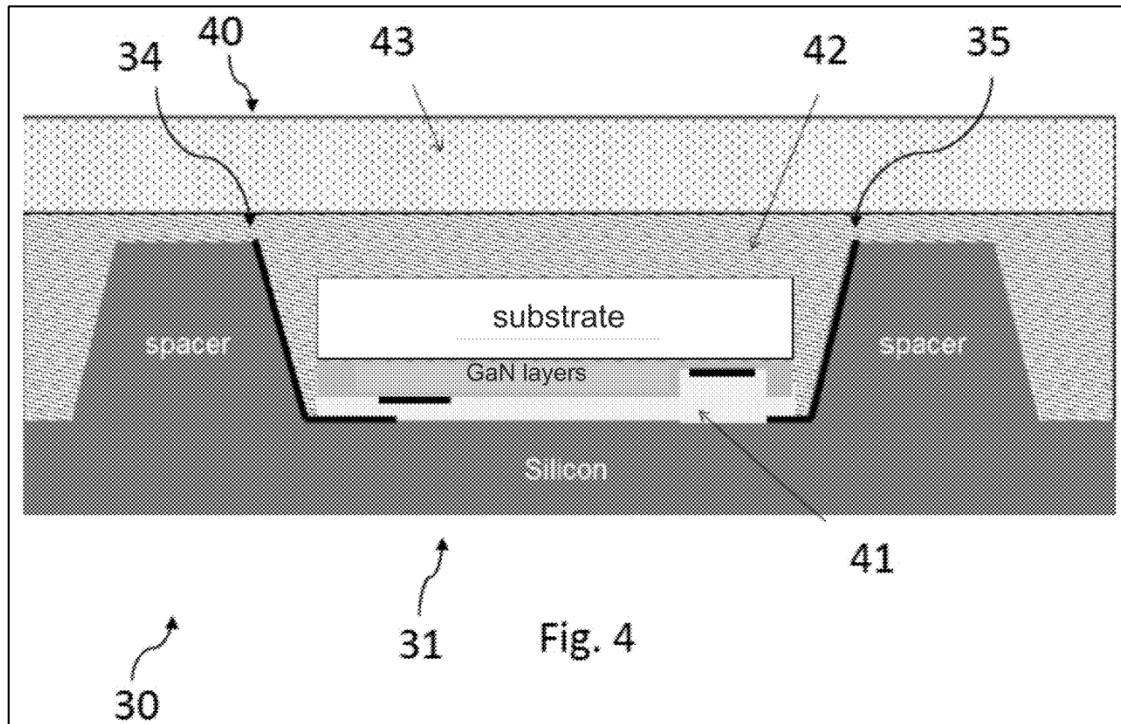
at least one *optically reflective surface disposed between said carrier wafer and said semiconductor LED;* and

a *substantially optically transmissive layer* disposed proximal to the second substrate surface,

wherein the carrier wafer and the thermally conductive layer define a relief to expose at least a portion of the second LED surface.

Id., 12:13-31 (emphasis added).

Various embodiments are disclosed in the '612 Patent. Figure 4 portrays an exemplary LED package 40 of an aspect of the disclosed subject matter:

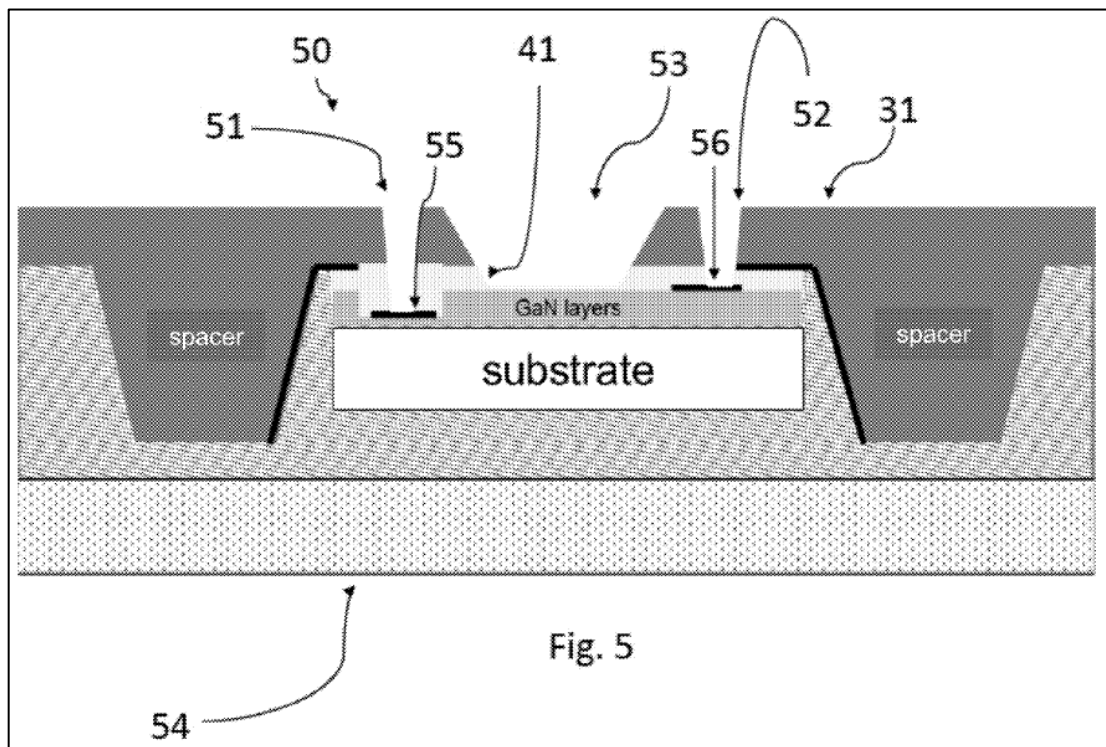


Ex. 1001, Fig. 4.

The package 40 depicts an LED chip (GaN layers) between a substrate and a layer comprising thermally conductive material 41 affixing the LED die to a carrier wafer 31 (silicon). *Id.*, 5:29-37, 7:22-29. The substrate is between the LED chip and an optically transmissive layer, represented here by a silicone encapsulation 42. *Id.*, 7:54-58. Reflective material, such as reflectors 34, 35, are shown residing between the carrier wafer 31 and the LED chip. *Id.*, 6:45-64. Notably, the direction of reflection is the desired direction of light emission, contrary to asserted prior art

references. Alternatively, the conductive material 41 itself can be reflective. *Id.*, 9:46-52.

The '612 Patent's solution to the thermal management issue is represented by an exemplary embodiment of the invention shown in Figure 5 below, whereby a thermally conductive layer 41 is disposed between an LED chip and a wafer 31, with a thermally conductive hole 53 exposing a surface of the LED chip. A metal seed layer and metal filler can be subsequently applied in the thermally conductive hole 53 to directly draw heat from the surface of the LED chip.



Id., 8:60-66, 9:18-28, 11:8-12:2.

IV. PETITIONER'S REFERENCES

Petitioner asserts nine grounds of unpatentability. Grounds 1, 4, and 7 challenge the patentability of claims 1-2 and 8-9. Ground 1 asserts claims 1-2, and 8-9 are unpatentable under 35 U.S.C. §103 over Tanaka. Grounds 4 and 7 assert claims 1-2 and 8-9 are unpatentable over Tanaka in view of the AAPA and alternatively Camras. Pet. 2-3. Grounds 3, 6, and 9 assert dependent claims 4-7 are unpatentable under 35 U.S.C. §103 over Tanaka in view of Chitnis, and alternatively Tanaka in view of the AAPA in combination with Chitnis, and alternatively Tanaka in view of Camras in combination with Chitnis. Pet. 3. Remaining Grounds 2, 5, and 8 assert dependent claims 4-7 are unpatentable under 35 U.S.C. §103 over Tanaka in view of Weeks, and alternatively Tanaka in view of the combination of the AAPA and Weeks, and alternatively Tanaka in view of the combination of Camras and Chitnis. *Id.* To summarize, Petitioner's grounds rise and fall on Tanaka.

A. Tanaka

All Grounds of the Petition rely on Tanaka as §103 prior art as of 2003. Tanaka, according to Petitioner, purports to disclose an LED device with a thermally conductive layer (metal electrodes for powering the LED) applied to the LED, as well as a relief defined by the thermally conductive layer and a carrier wafer, but in fact Tanaka teaches a structure where the light emitted from an LED

is emitted from a hole in the carrier wafer. Tanaka is in fact completely silent with regard to the metal conductors having any thermal management function whatsoever, and makes only a cursory reference to a silicon-enhanced epoxy as a means for heat dissipation. Tanaka is almost exclusively related to the light guiding properties of the light emitting hole. Ex. 1007, Fig. 2.

B. Weeks

Petition additionally relies on Weeks as a secondary reference for Grounds 2, 5, and 8 in combination with Tanaka, Tanaka and the AAPA, and Tanaka and Camras respectively, to render claim 3 as obvious. Weeks discloses an LED with a via through a silicon substrate, whereby light can be transmitted through the via. Thus, Weeks teaches how to transmit light from the device, but is largely irrelevant to the '612 Patent because the '612 Patent uses the via for the removal of heat, not the transmission of light.

C. Chitnis

Petitioner additionally relies on Chitnis as a secondary reference for grounds 3, 6, and 9 in combination with Tanaka, Tanaka and the AAPA, and Tanaka and Camras respectively, to render claims 4-7 as obvious. Chitnis is used in an attempt to address Tanaka's absolute silence regarding the use of any metal layer and thus metal electrodes as a thermally conductive layer for removal of heat from an LED.

Chitnis discusses the bonding of semiconductor wafers and the importance of improved thermal properties. Ex. 1007, ¶25. However, Chitnis (as Tanaka) fails to disclose any thermally conducting layer or structure similar to the one disclosed in the ‘612 Patent.

D. AAPA

Petition additionally relies on AAPA, none of which is cited explicitly, for Grounds 4-6. However, the Examiner of the ‘612 Patent considered all of the available art and determined that the ‘612 Patent’s claims were allowed because “prior art could not be located” that taught the subject matter recited in the ‘612 Patent’s claims. Ex. 1004, 50.

E. Camras

Petitioner additionally relies on Camras as a secondary reference for grounds 7-9 in combination with Tanaka, Tanaka and Weeks, and Tanaka and Chitnis respectively, to render claims 1-9 as obvious. Camras is used in an attempt to address Tanaka’s (and the other references) absolute silence regarding an intrinsic region. Camras is directly associated with LED technology, and teaches the use of a mount and a sub-mount that have the same coefficient of thermal expansion, but is completely silent regarding an intrinsic region. Ex. 1008, Abstract.

V. THE BOARD SHOULD NOT INSTITUTE THIS IPR

All challenged claims depend on claim 1 and reliance on Tanaka, so Petitioner must demonstrate a reasonable likelihood that claim 1 is unpatentable for the Board to institute review. 37 C.F.R. §42.108(c). Petitioner has failed to do so under Grounds 1-9.

A. The Board Should Exercise Discretion Under 35 U.S.C. §314 to Deny Institution

Institution of *inter partes* review is always discretionary. 35 U.S.C. §314(a); *Oil States Energy Services LLC v. Greene's Energy Group, LLC*, 138 S. Ct. 1365, 6121 (2018) (“The Decision whether to institute inter partes review is committed to the Director’s discretion.”). Section 314(a) provides that “[t]he Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition ... and any response ... shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” The Supreme Court has explained that, because §314 includes no mandate to institute review, “the agency's decision to deny a petition is a matter committed to the Patent Office's discretion.” *Cuozzo Speed Techs., LLC v. Lee*, 136 S.Ct. 2131, 2140 (2016); *see also Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) (explaining that under §314(a), “the PTO is permitted, but never compelled, to institute an IPR proceeding”).

The Board should deny institution under §314(a) in view of its precedential decisions in *NHK Spring*³ and *Apple v. Fintiv*⁴ because the ‘612 Patent is involved in a parallel district court proceeding (*LED Wafer Solutions LLC v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.*, Case No. 6:21-cv-00292 (W.D. Tex. Mar. 25, 2021)) that involves the same issues, arguments, and evidence that Petitioner has presented in this Petition. The parties and district court have already expended substantial time and resources, and a jury trial is scheduled for February 2023. Ex. 2003. A final written decision (“FWD”) in this proceeding is expected no earlier than late April 2023, at least a month after the jury trial would be completed⁵. Duplicating the district court’s efforts would not be an efficient use

³ *NHK Spring Co., Ltd., v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8(PTAB Sep. 12, 2018) (precedential).

⁴ *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“Fintiv”).

⁵ While a FWD for this proceeding is expected in April 2023, the parallel district court proceedings include three patents not at issue in this Petition. There

of the Board’s resources and would not serve to fulfill the primary purpose of AIA proceedings: to provide a practical and efficient alternative to district court litigation.

In *NHK Spring*, designated precedential on May 7, 2019, over two years before the present petition was filed, the Board denied institution primarily because the related district court case was nearing its final stages and would resolve all the issues before the Board. *NHK Spring Co.*, IPR2018-00752, Paper 8 at 20 (PTAB Sep. 12, 2018) (precedential); *see also id.*, 11-18 (applying discretion under 35 U.S.C. §325(d)).

Other cases—relying on *NHK Spring*—have also denied institution. For example, in *E-One, Inc. v. Oshkosh Corp.*, the Board applied *NHK Spring*’s analysis under 35 U.S.C. §314(a) to deny institution. IPR2019-00161, Paper 16 (PTAB May 15, 2019). In *E-One*, the Board reasoned: “[i]n the § 314(a) portion of its analysis, [*NHK Spring*] noted that a district court proceeding involving the same patent was scheduled to go to trial before a final decision would have been due in the Board proceeding, and the Board proceeding would involve the same claim construction standard, the same prior art references, and the same arguments as in the district

will not be a FWD on all patents involved in the parallel district court proceedings until late April 2023.

court.” *Id.*, 6. In both *NHK Spring* and *E-One*, factors warranting a denial of institution included: the district court investing considerable time and resources to handle the same issues presented in the IPR, and trials that were scheduled to be completed prior to a Board’s FWD. The facts here warrant denial just as decided in *NHK Spring* and *E-One*. Further, the Petition will not serve as an “effective and efficient alternative” to litigation, frustrating a primary objective of the AIA. *Gen. Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 16–17 (PTAB Sept. 6, 2017) (precedential).

In *Fintiv*, the Board emphasized six factors to consider under *NHK Spring*:

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
2. proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision;
3. investment in the parallel proceeding by the court and the parties;
4. overlap between issues raised in the petition and in the parallel proceeding;
5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
6. other circumstances that impact the Board’s exercise of discretion, including the merits grounds raised in the Petition.

Fintiv, at 5-16. The Board further stated that “[t]hese factors relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding.” *Id.*, 6. Here, each of these factors favors denial of institution of this Petition.

1. Factor 1 weighs against institution, as no court has granted a stay and no evidence exists that a stay may be granted

The parallel district court proceeding has not been stayed. That proceeding includes four patents, three of which are not at issue in this Petition. Although Petitioner along with district litigation co-defendant intervener Seoul Semiconductor, Inc. (“SSI”), has filed Petitions against the other patents-in-suit at the district court, neither Petitioner nor SSI has sought a stay of the litigation.

Any such motion to stay would likely be denied because the district court judge, Hon. Alan D. Albright, rarely grants stays pending IPR. Ex. 2006. Judge Albright stated: “It’s my job to give people the opportunity to have their cases tried in a federal court...”. *Id.*

There is no evidence that a stay may be granted if trial is instituted here. Petitioner’s assertion that “courts routinely issue stays after institution” does not comport with the history of the Waco Division, as Petitioner has not – and cannot – provide a single example of a similar case stayed by that Court.

2. Factor 2 weighs against institution, as trial in the district court is scheduled to begin months before the final written decision deadline

Trial is set to begin in the parallel district court proceeding on February 16, 2023. Ex. 2003. This trial date is over a month before any expected FWD would issue in this IPR, which would be rendered around April of 2023. Interestingly, before it filed its petition on September 20, 2021, Petitioner submitted to the district court on August 24, 2021 a Joint Motion for Entry of Agreed Scheduling Order (the “Agreed Schedule”). Ex. 2008. This set forth the full schedule later entered by the Court on September 24, 2021, including a trial date of February 16, 2023. So although Petitioner’s statement that “[t]he district court has not set a trial date” was technically true on September 21, Samsung *did not disclose* that it had *already agreed to a trial date at least one month before a FWD* would be issued by the Board.

There is no evidence that the trial date would be moved or delayed. Just like in *NHK Spring*, “[i]nstitution of an inter partes review under these circumstances would not be consistent with ‘an objective of the AIA ... to provide an effective and efficient alternative to district court litigation.’” *NHK Spring*, IPR2018-00752, Paper 8 at 20. And as the Board recognized in *Fintiv*, “[i]f the court’s trial date is earlier than the projected statutory deadline, the Board generally has weighed this fact in

favor of exercising authority to deny institution under *NHK*.” *Fintiv*, at 9; *GlobalFoundries Inc. v. UNM Rainforest Innovations*, IPR2020-00984, Paper 11 at 11-16 (PTAB Dec. 9, 2020) (finding that a scheduled trial date four months before the statutory deadline for a final written decision was a factor weighing in favor of discretionary denial); *NanoCollect Biomedical, Inc. v. Cytonome/ST, LLC*, IPR2020-00551, Paper 19 at 16 (PTAB Aug. 27, 2020) (same).

Importantly, there is no evidence that the parties’ trial will be continued. Although there were some examples during the heart of the Covid-19 pandemic in which cases were continued – usually with consent of both parties – any mandates closing courthouses in the Western District of Texas have since expired. In sum, there are no non-speculative reasons to believe the February 16, 2023 trial will be postponed. *See Fintiv* at 13 (“We generally take courts’ trial schedules at face value absent some strong evidence to the contrary.”). Because this trial date is more than a month prior to any FWD deadline, Factor 2 also weighs strongly against institution.

3. Factor 3 weighs against institution, as parties to the district court litigation have already invested significant time and resources

The parties and the district court have also invested significant time and resources. In *Fintiv*, the Board stated “if, at the time of the institution decision, the district court has issued substantive orders related to the patent at issue in the

petition, this fact favors denial. Likewise, district court claim construction orders may indicate that the court and parties have invested sufficient time in the parallel proceeding to favor denial.” *Fintiv* at 9-10. Further, “[t]his investment factor is related to the trial date factor, in that more work completed by the parties and court in the parallel proceeding tends to support the arguments that the parallel proceeding is more advanced, a stay may be less likely, and instituting would lead to duplicative costs.” *Id.*, 10.

Petitioner again attempts to mislead this Panel using language of “default *Markman* hearing” and “default trial date[s],” while at the same time hiding that it had already agreed to *specific* dates in the Agreed Schedule it filed with the Court on August 24, 2021. Pet. 74.

Further, Petitioner attempts to misuse the Board’s decision to institute *HP Inc. v. Slingshot Printing LLC*, IPR2020-01085, Paper 12 at 7 (Jan. 14, 2021), stating that “WDTX civil trials ‘may possibly slip’ due to ‘months of backlogged trials.’” Pet. 74. Petitioner conveniently ignores that decision was issued during the heart of a global pandemic, during which “the Western District of Texas has issued a suspension order every month for the past nine months suspending all trials scheduled from March 13, 2020 to at least January 31, 2021 due to the COVID-19 Pandemic.” This order is no longer applicable. Ex. 2001.

Additionally, the Board in *Slingshot* noted that “the same trial date [was] set for two cases involving a total of thirteen asserted patents.” Further, the Board quoted an August 27, 2020 email (during the peak of the pandemic) from the Court’s clerk that the trial for two cases had been scheduled for August 16, 2021 and that “[a]s we get closer to trial, the cases may change and will reschedule one if neces[s]ity arises.” *Id.* There is no such indication here, and Petitioner’s attempt to conflate scheduling issues that occurred mid-pandemic with now should be rejected.

Further, the investment by the parties and the court currently has, and will be even more significant by the time either an institution decision or a FWD would be issued. First, Petitioner and SSI, combined, have filed seven IPR petitions against the four patents involved in the district court case. See IPR2021-01479, IPR2021-01491, IPR2021-01504, IPR2021-01506, IPR2021-01516, IPR2021-01526, and IPR2021-01554. If instituted, the projected statutory deadlines for the FWDs in these IPRs will fall after the trial date in the district court. When the district court’s trial date is close to the FWD target date, the Board will consider the other *Fintiv* factors. *Mylan Lab’ys Ltd. v. Jansen Pharmaceutica NV*, IPR2020-00440, Paper No. 17, at 14 (P.T.A.B. Sept. 16, 2020) (citing *Fintiv*) (emphasis added).

Second, by the time an institution decision is rendered in mid-April 2022, the parties will have (1) conducted venue discovery, (2) completed Claim Construction

briefing, (3) completed Motion to Transfer Venue briefing, (4) have had the Court rule on Samsung's motion to transfer⁶, (5) conducted a *Markman* hearing, (6) received claim constructions (the Court's procedure is to provide preliminary construction shortly in advance of the *Markman* hearing and then provide final constructions at the hearing), and (7) will be well underway with fact discovery, which opens February 16, 2022 and closes September 6, 2022. Ex. 2003. Moreover, the parties and the district court have already undergone further investment, having fully briefed SSI's Motion to Intervene (Ex. 2010), with the Court granting the Motion (Ex. 2004), thereby granting SSI's request to participate in all facets of litigation as a co-Defendant. Further, the fact that the parallel district court proceeding opens fact discovery just weeks before claim construction does not change this analysis. *Universal Elecs., Inc. v. Universal Remote Control, Inc.*, 943 F. Supp. 2d 1028, 1031-32 (C.D. Cal. 2013) ("That the schedule in this case set

⁶ While Samsung has filed a motion to transfer (Ex. 2002), it is likely to fail due to Samsung Semiconductor's large presence in the Western District of Texas. This is further exacerbated by the recent announcement of a \$17 billion semiconductor fab to be built in the Western District of Texas, in Taylor, TX. Ex. 2007.

discovery to occur after claim construction does not mean that the case remains in its procedural infancy until discovery is well underway.”).

4. Factor 4: There is significant overlap between this IPR and district court proceedings

The dispute in this proceeding and the district court case involves the same overlapping issues. It is undisputed that Petitioner is a defendant in the parallel district court litigation. In the district court case, Petitioner has not presented any art or grounds of unpatentability other than to make a conclusory statement that the claims of the '612 Patent are allegedly obvious. Ex. 2005, ¶167. Thus, the Petition does not rely upon any prior art that is concurrently asserted in the district court case. However, because the district court will address the same issues, arguments and evidence months before the Board's final decision would be due, instituting review here would not be an efficient use of the Board's resources. Petitioner fails to address these issues related to the district court proceeding in its Petition even in a cursory manner.

Further, Petitioner's stipulation, made only in the Petition, falls well short of the estoppel standard, leaving open the opportunity for Petitioner to present overlapping issues in the parallel district court proceeding.

Petitioner's stipulation narrowly promises to “not pursue the IPR grounds in the district court litigation.” Pet. 75. This stipulation falls short of the estoppel

provision of the statute, which provides that a petitioner “may not assert . . . in a civil action . . . that the claim is invalid on any ground that the petitioner raised or reasonably could have raised during” the IPR. 35 U.S.C. §315(e). Further, unlike in *Sotera*, Petitioner has not made any stipulation in the district court, leaving Petitioner open to avail itself of duplicative efforts between the district court proceeding and the Board. *See Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper No. 12, at 18-19 (P.T.A.B. Dec. 1, 2020).

Petitioner’s narrow stipulation is hollow at least in that it leaves open the possibility of parallel litigation for the same claims using printed publications and various system combinations not asserted in the Petition. A meaningful stipulation would be broad, tracking the estoppel language of 35 U.S.C. §315(e) and would be filed in the parallel district court proceeding. Efficiency would not be served by allowing Petitioner to challenge the ‘612 Patent claims with the same prior art, after expending considerable resources in the district court. *See Fintiv*, at 13. Accordingly, Factor 4 weights in favor of denial.

5. Factor 5: The parties in both proceedings are the same

There is no dispute that the parties are the same. When the parties are the same in a parallel proceeding as they are in the IPR, Factor 5 weighs in favor of exercising discretion to deny.

6. Factor 6: The merits of Samsung’s petition are not strong

The Board noted in *Fintiv* with respect to Factor 6 that:

[I]f the merits of a ground raised in the petition seem particularly strong on the preliminary record, this fact has favored institution.... [I]f the merits of the grounds raised in the petition are a closer call, then *that fact has favored denying institution* when other factors favoring denial are present.

Fintiv, 14-15 (emphasis added). As shown below, the Petition fails on the merits for numerous reasons. These weaknesses thus favor denying institution.

For the reasons illustrated above, the Board should exercise its discretion to deny institution under §314(a) in favor of the upcoming trial in the pending litigation proceeding.

VI. CLAIM CONSTRUCTION

In an *inter partes* review filed on or after November 13, 2018, claim terms are construed based on their ordinary and customary meaning. 37 C.F.R. §42.100(b). Further, the Board should always construe claims to sustain their validity, if possible. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1329 (Fed. Cir. 2005). The specification is the “best source for understanding a technical term,” to be supplemented, “as needed, by the prosecution history.” *Id.*, 1315. For purposes of this paper, for all claim terms, Patent Owner requests that the Board adopt the

ordinary and customary meaning of the claim terms as understood by one of ordinary skill in the art. Petitioner has also proposed claim construction in the district court case. Ex. 2009.

VII. PETITIONER FAILED TO ESTABLISH A REASONABLE LIKELIHOOD THAT ANY CLAIM IS UNPATENTABLE

A. Legal Standard for Obviousness Under 35 U.S.C. §103

The ultimate determination of obviousness under 35 U.S.C. §103 is a question of law based on underlying factual findings. *In re Baxter Int'l, Inc.*, 678 F.3d 1357, 1362 (Fed. Cir. 2012) (citing *Graham v. John Deere Co.*, 383 U.S. 117–18 (1996)).

“To satisfy its burden of proving obviousness, a petitioner cannot employ merely conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380–81 (Fed. Cir. 2016). The “factual inquiry” into the reasons for “combin[ing] references must be thorough and searching, and the need for specificity pervades.” *In re NuVasive, Inc.*, 842 F.3d 1376, 1381–82 (Fed. Cir. 2016) (internal quotations and citations omitted).

B. Each Asserted Ground of Invalidity Fails To Teach or Disclose Each and Every Claim Limitation

As shown in further detail below, none of the proposed grounds of invalidity disclose each and every limitation of the challenged claims. All of the grounds in the Petition rely on Tanaka in combination with one or more references. Because Petitioner has failed to show how Tanaka teaches or discloses each and every claim limitation in the ‘612 Patent, the Petition must fail.

C. Petitioner Fails To Meet Their Burden of Showing a Reasonable Likelihood of Unpatentability Under Ground 1

1. Tanaka is not analogous art to the extent that a POSITA would look to Tanaka to teach an LED device having efficient thermal conductivity properties and repeatable manufacture.

The stated objective of the ‘612 Patent is directed to “a light emitting diode (LED) device implemented on a wafer substrate layer and permits efficient thermal conductivity properties and repeatable manufacture of the same.” (Ex. 1001, 1:21-24). To this end, the ‘612 Patent achieves direct thermal conductivity from the LED device using a large thermally conducting hole that can transfer heat directly to a printed circuit board that the LED can be mounted on. *Id.* Figs. 5-12, and 3:56-60. Tanaka is not concerned with thermal conductivity, but instead is focused on the light emitting efficiency of a semiconducting light emitting element. Ex. 1005, ¶11.

2. Tanaka does not render obvious any limitations related to an intrinsic region.

Tanaka is fundamentally flawed as a single art reference because it does not teach or suggest the Petition's definition of an intrinsic region. The Board should therefore deny institution.

a. Claim 1 is not rendered obvious on Ground 1's reference to an intrinsic region

- i. Tanaka does not disclose and does not render obvious limitation c) *a semiconductor LED including doped and intrinsic regions thereof, said semiconductor LED having opposing first and second LED surfaces, said first LED surface disposed on the first substrate surface;***

Petitioner alleges that Tanaka renders the above claims obvious because of the disclosure and suggestion of the intrinsic region as recited in claim limitation 1c. Pet. 13-16. Although Petitioner cites Tanaka as disclosing or suggesting an intrinsic region (*id.*), importantly, the phrase "intrinsic region" does not appear anywhere in Tanaka. According to Petitioner, "Tanaka also suggests (if not discloses to a POSITA) that the activation layer 73 includes an "intrinsic region."" Pet. at 15. But even under a broad interpretation of the term "intrinsic region," none of Petitioner's reasoning establishes a reasonable likelihood that Petitioner would prevail on claim 1, let alone demonstrates that Petitioner can prove claim 1's unpatentability by a preponderance of the evidence. 35 U.S.C. §316(e). While intrinsic can mean several things in the art, the activation layer of Tanaka, is

clearly not intrinsic, in that it is not intrinsic material carriers that conduct electricity in Tanaka. Contrary to Petitioner's position, the activation layer of Tanaka is the very region where transference takes place, and it utilizes doping to accomplish this transfer.

In the '612 Patent, the LED is described in several places as "including doped and intrinsic regions thereof" (Ex. 1001, 3:63-64); "These LEDs comprise a P-I-N junction device having an intrinsic (I) layer disposed between a N-type doped layer and a P-type doped layer" (*Id.*, 5:9-11). First, Petitioner argues incorrectly that a POSITA would have understood that Tanaka's "activation layer 73" is an "intrinsic layer" because Tanaka does not specify whether the "activation layer 73" is doped or not doped. Pet.,15. Tanaka never even mentions "intrinsic" or "PIN" type structures, and all the disclosures in Tanaka are consistent with an active zone that is doped. For example, Tanaka discloses that the activation layer 73 can be an InGaN layer. *Id.*, 39. This structure does not suggest or require a PIN junction device having an intrinsic layer between an n-type doped layer and a p-type doped layer as claim 1 recites. A POSITA would understand that the active region is understood to be the region where carriers from the p- and n- GaN layers recombine to emit photons (light); not an intrinsic region. As the added intrinsic region is larger in size, it allows for a higher volume of photon to electron-hole

conversion and higher quantum efficiency. As such, Tanaka's activation layer 73 does not reach or suggest an intrinsic region between the p-doped and n-doped layers, as required by the claims. See *Bayer Schering Pharma AG*, 575 F.3d at 1347 (stating "an invention is not obvious to try where vague prior art does not guide an inventor toward a particular solution").

Second, Petitioner contends that, based on the disclosures in the '612 Patent, it would have been obvious to substitute Tanaka's activation layer 73 with an "intrinsic region" because Tanaka discloses some embodiments wherein the LED device is a gallium nitride (GaN) LED. Pet. 15. The '612 Patent merely discloses that *some* LEDs are made using gallium nitride (GaN) and can be epitaxially grown on a sapphire substrate. Ex. 1001, 5:5-8. The '612 Patent further states that these LEDs made of GaN and grown on a sapphire substrate "comprise a P-I-N junction device having an intrinsic (I) layer disposed between a[n] N-type doped layer and a P-type doped layer." *Id.*, 5:9-11. Nothing in the '612 Patent indicates that all LEDs made using GaN include an intrinsic layer between the n-doped and p-doped layers. But regardless of the example described in the '612 Patent, Petitioner cannot show that LEDs made of GaN, AlGaIn, and/or InGaIn inherently require an intrinsic area to serve as a functionally active region. Furthermore, even if a POSITA were aware that LED devices could be fabricated using an intrinsic

layer between N-type and P-type layers, Petitioner provides no evidence as to why a POSITA considering the particular devices disclosed in Tanaka would include such a layer in those devices. Moreover, each and every embodiment of an activation layer in Tanaka is an InGaN layer. Ex. 1005 ¶¶50, 59, 68. It has been shown that “[d]uring the growth of InGaN, for example, a marked improvement of crystal quality has been found upon doping with silicon” and “are in fact often doped with silicon at a high level.” Ex. 1017, 117. Thus, not only does Tanaka **not** disclose an intrinsic region as “undoped,” it teaches away from the concept by using an activation layer that has been highly doped.

Thus, Petitioner’s attempt to assert that the Tanaka reference discloses or suggests an intrinsic region necessarily fails. Therefore, claim 1 is not rendered obvious on Ground 1’s reference to an intrinsic region.

3. Tanaka does not render obvious any limitations related to a thermally conductive layer.

Petitioner has failed to show a reasonable likelihood of success that Tanaka teaches or renders obvious each and every limitation of the ‘612 Patent. Tanaka is importantly flawed as a single art reference because it fails to disclose the claimed structure of the ‘612 Patent. The Board should therefore deny institution.

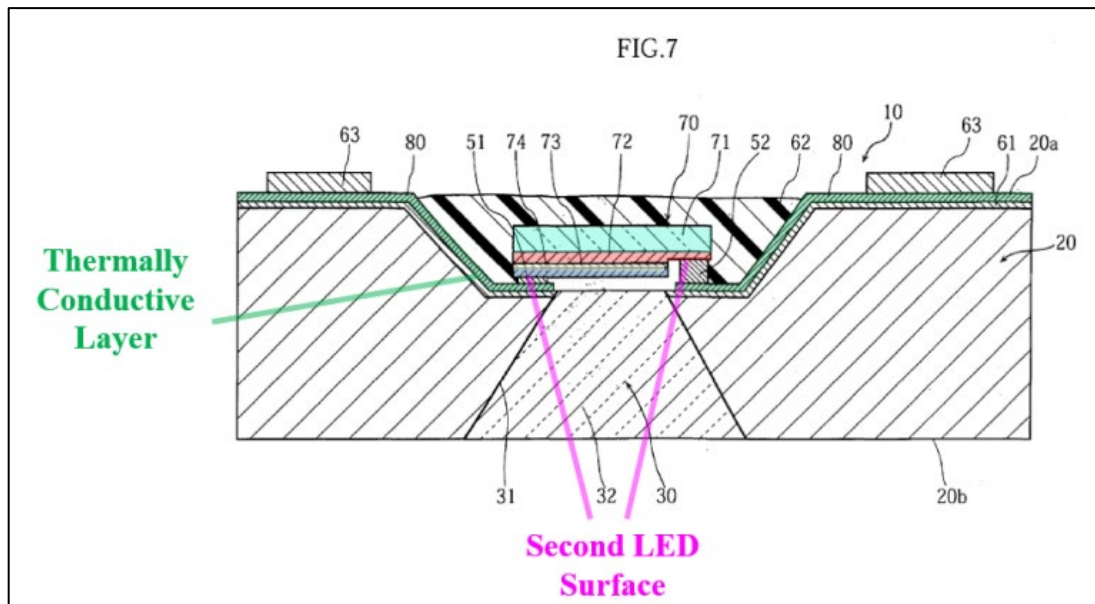
a. Claim 1 is not rendered obvious on Ground 1's reference to a thermally conductive layer, an optically reflective surface, a substantially optically transmissive layer, or a relief defined by a thermally conductive layer and a carrier wafer

i. Tanaka does not disclose and does not render obvious limitation (d) a thermally conductive layer disposed on the second LED surface of the semiconductor LED;

A primary flaw in Tanaka as interpreted by Petitioner is that it discloses a first element (wiring pattern 80) that Petitioner attempts to equate to a thermally conductive layer, but never discusses any thermal properties of wiring pattern 80 that could be used to describe the thermally conductive layer as described in the '612 Patent.

Petitioner erroneously asserts that wiring pattern 80 is a thermally conductive layer that conducts heat away from the LED as shown in annotated Tanaka Fig. 7 below. Pet. 17. As a threshold issue, wiring pattern 80 is not a solid layer that covers a large area, but is instead a patterned mesh that carries electrical signals to the LED. As such, wiring pattern 80 likely began as a solid metal layer. However, the vast majority of that metal layer has been removed via etching, which creates wiring pattern 80 than remains. Thus, its heat removal capabilities would be miniscule, because the bulk of the metal has been removed. Therefore, a POSITA would recognize wiring pattern 80 as a poor choice for a thermally conductive layer.

Second, the figure includes protective member 62. Protective member 62 is applied to the non-light-emitting side of the LED, and is used to protect chip 70. Ex. 1005 ¶69. Protective member “preferably contains a good heat-conductive material such as a silicon for adjusting heat dissipation.” Id. ¶52. Importantly, all occurrences of the word “heat” in Tanaka are always in reference to protective member 62 (e.g. Ex. 1005 at ¶¶20, 52, claim 11), and never with reference to wiring pattern 80. The figure shows that protective member 62 is large in size, in intimate contact with, and covers the entire rear surface and sides of chip 70 to maximize the heat transferred out of LED chip 70. Thus, Tanaka clearly intended to use protective member 62 to remove heat from LED chip 70, and not wiring pattern 80. Therefore, Petitioner’s definition of thermally conductive layer fails.



Third, Tanaka does not disclose or teach the structure of the claimed thermally conductive layer in the '612 Patent. Adhesion layer 41 of the '612 Patent “comprises, at least in part, material optimized to provide both heat conduction as well as light reflection, diffusion and transparency.” Ex. 1001, 7:27-29. Regarding heat conduction of the layer, “heat conduction of 3 W/mK or more is sufficient.” *Id.*, 7:39-40. Tanaka is silent regarding the heat conduction of wiring pattern 80. The structure of the thermally conducting layer is described in the '612 Patent, wherein the “[t]hermally conducting hole 53 is etched through the remainder of the silicon wafer 31 and at least part of the adhesion layer 41 in a location proximate to the GaN layers of the LED package 50.” *Id.*, 9:19-23. As for the size of the hole, “the surface area displacement of thermally conducting hole 53 is 250000 microns². In others, the area can be greater than 700 microns by 700 microns.” *Id.*, 9:24-27. In stark contrast, Tanaka is silent regarding the size of any heat removal structure, or the size (area or volume) of wiring pattern 80. Petitioner alleges that a POSITA would recognize wiring pattern 80 as a thermally conductive layer. Pet., 18. To be clear, wiring pattern 80 theoretically conducts heat, but it would do so in extremely limited locations, rendering it ineffective as a heat dissipation feature for the overall device. As a further distinction, the etching to create the wiring pattern would make pattern 80 not a layer at all, but only a conduit to the solder points (51,

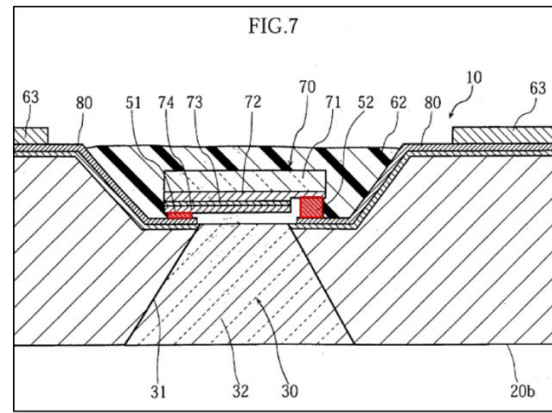
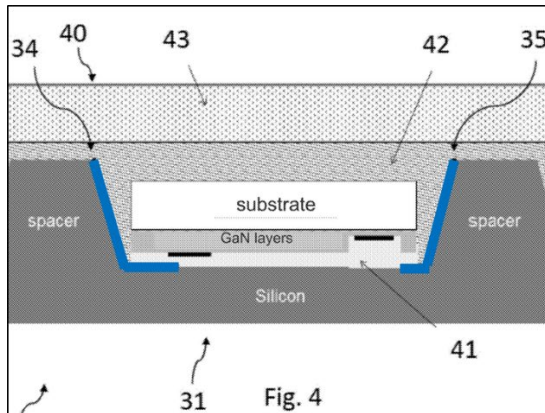
52). And if too much heat is conducted to those points, those points will melt, compromising the device. Additionally, as discussed in the patent, the opening in the thermally conductive layer must be large in size (e.g. 250000 microns²). There is no apparent reason for a wiring pattern to have such a feature. Thus, it would not have been obvious to a POSITA that wiring pattern 80 was a thermally conductive layer.

Finally, Figure 7 of Tanaka shows the second LED surface of the semiconductor LED as being adjacent to a gap that exists between semiconductor layer 74 and light guide 30. This is completely inconsistent with claim limitation d), which requires that there is “a thermally conductive layer disposed on the second LED surface of the semiconductor LED.” In fact, from Figure 7, Tanaka shows that **there is nothing whatsoever disposed on the second LED surface.** Figure 7 shows that the LED chip 70 is suspended by 51 and 52 above the level of wiring pattern 80, creating a space between the LED chip and light guide 30. A POSITA would know that such an air gap would be useless for heat dissipation and lead the POSITA away from Tanaka. Thus, because Petitioner’s reliance on Tanaka does not show a thermally conductive layer disposed on the second LED surface, this argument must fail.

Accordingly, Petitioner's arguments concerning the thermally conductive layer must fail and therefore Tanaka does not disclose and does not render obvious limitation d).

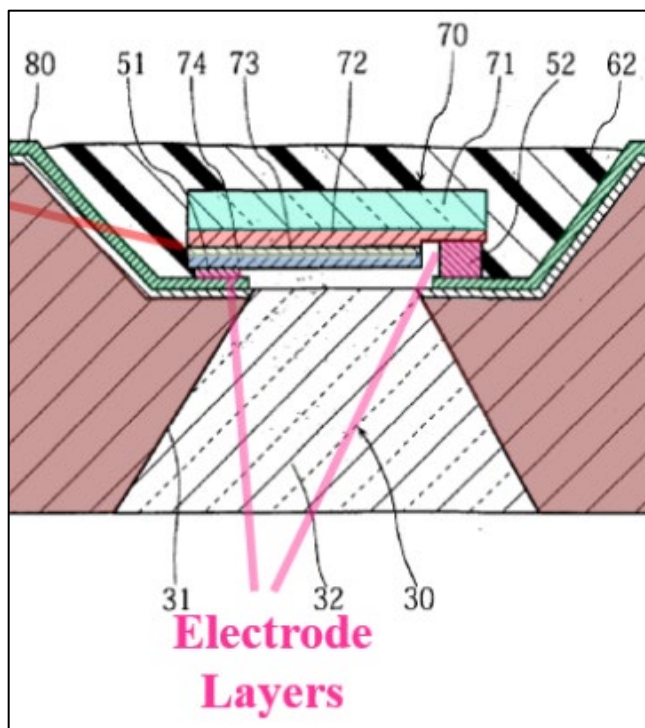
ii. Tanaka does not disclose and does not render obvious limitation f) at least one optically reflective surface disposed between said carrier wafer and said semiconductor LED;

Another key issue with Tanaka as interpreted by Petitioner is that it discloses electrode "surfaces" 51 and 52, which Petitioner inappropriately equates to an optically reflective surface. Petitioner refers to these electrodes as being made of metal, and thus concludes they can act as reflectors. Pet. 24. Petitioner also conflates the embodiment in Tanaka FIG.7 with the embodiment in Tanaka FIG. 1A, but provides no analysis of how or why a POSITA would combine them. *Id.* While Tanaka's electrodes (red in the figure below) can *theoretically* reflect light, they are extremely small in size to be effective, and, moreover, *do not reflect in the correct direction*; thus, they are not instructive of the claimed reflective surface (blue in the figure below). Simplistically, 51 and 52 (red in the figure below) would reflect sideways, away from the intended light output direction, while the reflection layer 34 and 35 of the claimed invention reflects light in the correct direction.



Ex. 1001, Fig. 4; Ex. 1005, FIG. 7.

First, if electrode layers 51 and 52 as shown in Tanaka Figure 7 are reflecting light, as alleged by Petitioner, they would reflect light toward the activation layer 73, **not** “toward the light guide 30.” As seen in the figure below as annotated by Petitioner, electrodes 51 and 52 each have a very small flat surface that is exposed to light-emitting activation layer 73. Thus, any reflected light emitted from activation layer 73 would be reflected straight back into activation layer 73. Additionally, the surfaces of electrodes 51 and 52 are perpendicular to light guide 30, and therefore only a tiny portion of light reflected from electrodes 51 and 52 would ever enter the light guide 30. Therefore, given the very small (and oppositely directed) exposed reflective surface of electrodes 51 and 52 shown in Figure 7, and the direction of the reflection from their surfaces, their effectiveness as reflectors would be minimal. Therefore, they are not an obvious choice by a POSITA.



Pet. 24.

Moreover, the only description of FIG. 7 in Tanaka is paragraph [0072], and it makes no reference to electrodes 51 and 52 serving as reflectors. In recognition of the shortcomings presented above, [0072] states “in this embodiment, when the surface of the sapphire substrate 71 is formed with a metal reflector (not shown), light traveling from the activation layer 73 upward in the figure is reflected toward the light guide 30, which enhances light-emitting efficiency of the semiconductor light-emitting element.” Ex. 1005 ¶72 (Emphasis added). Thus, Tanaka itself recognizes that electrodes 51 and 52, as presented in the embodiment of Figure 7 would be useless as reflectors, as evidenced by the suggestion that a reflective

metal layer should be added to the surface of sapphire substrate 71. *Id.* A POSITA would recognize this and would not find this embodiment to be an obvious choice.

Accordingly, Petitioner's arguments concerning the optically reflective surface must fail; therefore Tanaka does not disclose and does not render obvious claim limitation f).

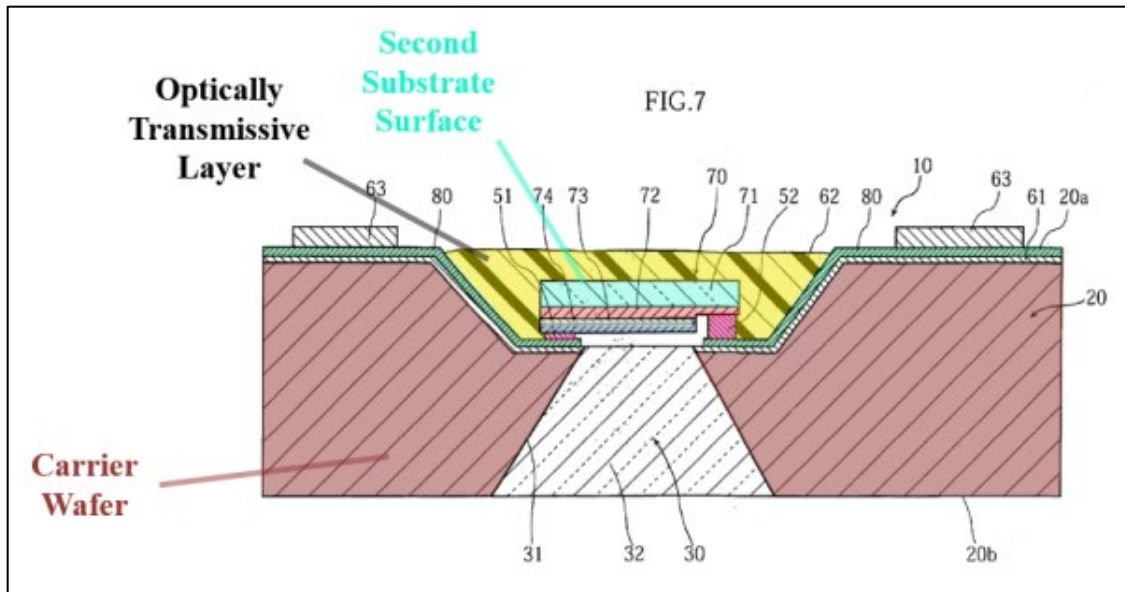
iii. Tanaka does not disclose and does not render obvious limitation g) *a substantially optically transmissive layer disposed proximal to the second substrate surface,*

Another flaw in Tanaka as interpreted by Petitioner is protective element 62, which Petitioner erroneously equates to a substantially optically transmissive layer. Petitioner refers to Tanaka Figure 7 with annotations below. Pet. 26. This clearly shows protective element 62 as being adjacent to and surrounding LED chip 70 on the second substrate surface. Petitioner refers to protective member 62 as an "Optically Transmissive Layer" and incorrectly states that protective member 62 is optically transmissive simply because it is made of epoxy resin. *Id.* Petitioner draws this erroneous conclusion simply because protective member 62 and the light guide 30 are both made of an epoxy resin. However, this argument fails.

First, protective member 62 is located on the side of the LED chip 70 that is non-emissive in Tanaka (Figure 7). All emitted light from LED chip 70 should pass through light guide 30. For example, "in this embodiment, when the surface

of sapphire substrate 71 is formed with a metal reflector (not shown), light traveling from the activation layer 73 upward in the figure is reflected toward the light guide 30.” Ex. 1005 ¶72. (Emphasis added). Thus, since no light is emitted toward the side surrounded by protective member 62, there is no practical purpose for protective member 62 to be optically transmissive.

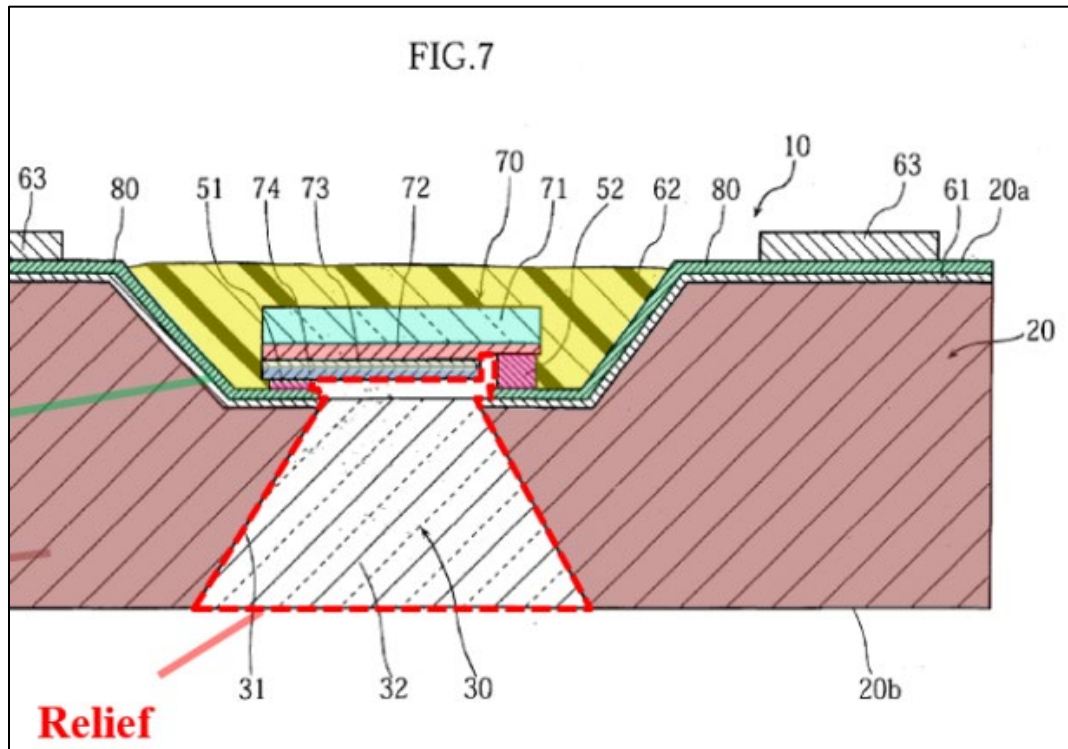
Second, Tanaka **never** states that the epoxy resin used in protective member 62 is optically transmissive. This is clear in Tanaka’s description of protective member 62, as discussed *supra*, where Tanaka states that “protective member 62 preferably contains a good heat-conductive material such as a silicon for adjusting heat dissipation.” *Id.* ¶52. However, while Tanaka discloses thermal properties of protective member 62, it is completely silent regarding the optical properties of protective member 62. Thus, per Tanaka, protective member 62 could be completely opaque, let alone be optically transmissive. Moreover, a POSITA would recognize that many commercial epoxy resins used for packaging and protection are, in fact, opaque. In stark contrast, Tanaka states repeatedly that light guide 30, while also made of an epoxy resin, is preferably “translucent.” *Id.* ¶¶ 33, 52, 63, 69, claim 3. Thus, Petitioner’s attempt to infer that protective member 62 is optically transmissive must fail.



Accordingly, Petitioner's arguments concerning the optically transmissive layer must fail; therefore Tanaka does not disclose nor render obvious claim limitation (g).

- iv. Tanaka does not disclose and does not render obvious limitation h) wherein the carrier wafer and the thermally conductive layer define a relief to expose at least a portion of the second LED surface.**

A further flaw in Tanaka via Petitioner is that it discloses hole 31, which Petitioner repeatedly refers to as a hole (Pet. 27-29), but then abruptly equates to a "relief." Petitioner cites Tanaka Figure 7 with annotations via a dashed red line as shown below. Pet. 30.



Pet. 30.

First, Tanaka clearly defines element 31 as a hole by stating “depression 21 is provided with a GaN-based semiconductor laminate 40 riding on a peripheral mouth portion 31a of hole 31.” Ex. 1005 ¶50. It further delineates the relief and the hole wherein “the depression 21 of the first surface 20a is filled with a protective member 62, and the hole 31 is filled with translucent resin 32 such as epoxy resin.” First surface 20a, protective member 62, hole 31 and translucent resin 32 are all clearly seen in the above figure. Thus, the feature outlined in red is not a relief, but a hole, so Petitioner’s definition of relief here must fail.

Second, the “relief” as alleged by Petitioner is not defined by the carrier wafer and the thermally conductive layer, as the claim requires, but is instead defined by the overly-complex pattern in red in the above figure, which requires the “relief” to be defined by hole 31, insulating layer 61, wiring pattern 80, electrodes 51 and 52, P-type semiconductor layer 74, and N-type semiconductor layer 72 as shown in the figure above. Thus, Petitioner’s “relief” is not even remotely equivalent to the claimed relief.

Accordingly, for the reasons presented above, Petitioner fails to meet their burden of showing a reasonable likelihood of unpatentability under Ground 1.

b. Claims 2, and 5-9 are not rendered obvious by Tanaka.

Because Tanaka does not render obvious independent claim 1, it neither anticipated nor renders obvious dependent claim 2, or 8-9.

D. Petitioner Has Failed to Meet Their Burden Of Showing A Reasonable Likelihood of Unpatentability Under Ground 2

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 2

Petitioner seeks to combine two references to invalidate the claims of the ‘612 Patent as obvious. “An obviousness determination requires finding that a person of ordinary skill in the art would have been motivated to combine or modify the teachings in the prior art and would have had a reasonable expectation of

success in doing so.” *Regents of University of California v. Broad Institute, Inc.*, 903 F.3d 1286, 1291 (Fed. Cir. 2018). It is Petitioner’s burden to prove that a POSITA would be motivated to combine and “to demonstrate ‘that the skilled artisan would have had a reasonable expectation of success’ in combining references.” *KEYnetik, Inc. v. Samsung Electronics Co., Ltd.*, 841 Fed.Appx. 219, 227-228 (Fed. Cir. 2021). Petitioner has not met their burden that a POSITA would have been motivated to combine the above references.

a. Petitioner fails to establish a motivation to combine Tanaka and Weeks references

Petitioner has not established that a POSITA would have been motivated to combine Tanaka and Weeks. Tanaka discloses a semiconductor LED that uses a hole in a silicon wafer as a waveguide. Petitioner points to nothing in Tanaka that their proposed modification would be necessary or welcome. Identifying a motivation to combine the prior art is important to prevent hindsight bias because “inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418-19. Petitioner fails to do so and instead urges combinations based on vague, generalized allegations of overall benefit. *See, e.g.*, Pet. 37 (alleging a motivation to combine the Ground 2 references due to electroplating being “easy to

control” and “predictable”). These are exactly the sorts of hindsight- based justifications that have been repeatedly rejected as insufficient. *See, e.g., TQ Delta, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1360-61 (Fed. Cir. 2019) (citing *DSS Tech. Mgmt., Inc. v. Apple Inc.*, 885 F.3d 1367, 1376 (Fed. Cir. 2018) and noting that “‘conclusory statements and unspecific expert testimony’ did not qualify as substantial evidence that could support the Board’s conclusions regarding obviousness”).

2. The ‘612 Patent is not rendered obvious by Ground 2

If the Board determines there is adequate motivation to combine Tanaka and Weeks, and if the Board finds an adequate expectation of success, Petitioner has still failed to demonstrate that Ground 2 renders obvious the claimed invention of the ‘612 Patent.

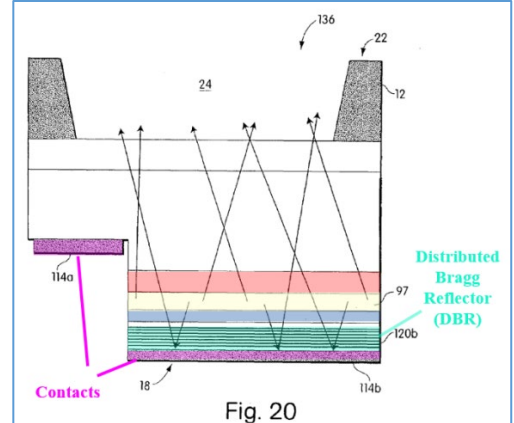
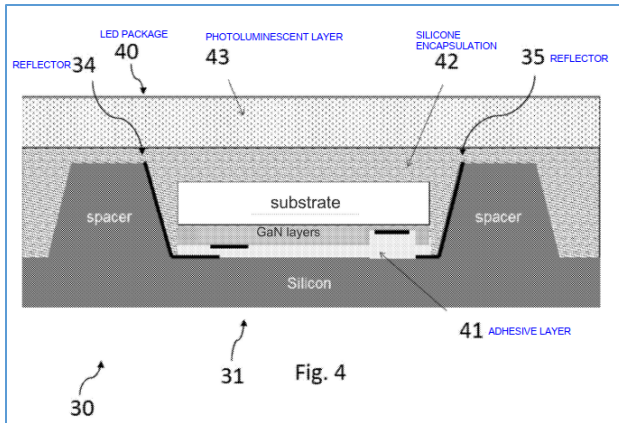
a. Claim 3 is not rendered obvious by Ground 2.

As discussed *supra* in section VII.C.2 and VII.C.3, Tanaka fails to disclose or suggest an intrinsic layer, a thermally conductive layer, an optically reflective surface, or a relief. The combination of Tanaka with Weeks does not remedy this.

i. Ground 2 does not render obvious claim 3: *The light emitting device of claim 1, said at least one optically reflective surface comprising a dielectric stack.*

For at least the reasons discussed below, Petitioner fails to demonstrate that Ground 2 renders obvious the patented light emitting device of claim 3.

Tanaka is silent regarding the use of a dielectric stack as a reflective layer. Pet. 42. Weeks discloses a Distributed Bragg Reflector (DBR), and is used by Petitioner (in combination with Tanaka) to show a DBR in an LED device. *Id.* However, this argument fails. First, Petitioner's chosen embodiment of Weeks fails because the DBR in Weeks is used as a reflector in the LED chip itself, while the reflector in the '612 Patent uses a metal layer on the carrier wafer. Below, Figure 4 from the '612 Patent (left) is compared with the figure used by Petitioner (Pet. 44) (right). The reflectors 34 and 35 are coated onto the silicon spacer on either side of the LED. In stark contrast, the Weeks DBR shown on the right is located inside the LED chip itself and is thus not equivalent. Therefore, Weeks does not disclose nor render obvious this limitation.



Ex. 1001, Fig. 4 (annotations added); Pet. 44.

Secondly, Petitioner makes the faulty claim that a POSITA would have been motivated to include a Weeks-like DBR on the electrodes 51 and 52. Pet. 45. This is erroneous, because for a DBR as disclosed by Weeks, the “location of the reflector region in the device is selected so as to reflect light in the desired direction.” Ex. 1006, 10:26-27. Not to mention the multilayer nature of a DBR across the full area of the emission area. As discussed *supra* in at least section VII.3.a.ii, any reflections from the surfaces of electrodes 51 and 52 would be going back into the Tanaka LED chip 72, which is clearly not in the desired direction. The desired direction is in the direction of the light guide 30. Thus, it would not have been obvious for a POSITA to implement Weeks’ DBR on Tanaka’s electrodes 51 and 52.

Accordingly, because none of the identified references disclose this limitation either alone or in combination, Ground 2 does not render obvious claim 3.

E. Petitioner Has Failed to Meet Their Burden of Showing a Reasonable Likelihood of Unpatentability Under Ground 3

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 3

Petitioner seeks to combine references to invalidate the claims of the ‘612 Patent as obvious. However, as discussed *supra*, Petitioner is required to show that a POSITA would have been motivated to combine the above references (VII.D.1.a).

a. Petitioner fails to establish a motivation to combine Tanaka and Chitnis references

Petitioner has not established that a POSITA would have been motivated to combine Tanaka and Chitnis. The ‘612 Patent is therefore not rendered obvious by Ground 3.

2. The ‘612 Patent is not rendered obvious by Ground 3

If the Board determines there is an adequate motivation to combine Tanaka and Chitnis, and if the Board finds an adequate expectation of success, Petitioner

has still failed to demonstrate that Ground 3 renders obvious the claimed invention of the ‘612 Patent.

a. Claims 4-7 are not rendered obvious by Ground 3

As discussed *supra* in section VII.C.2 and VII.C.3, Tanaka fails to disclose or suggest at least an intrinsic layer, a thermally conductive layer, an optically reflective surface, or a relief. The combination of Tanaka with Chitnis will not remedy this.

- i. Ground 3 does not render obvious Claim 4: *The light emitting device of claim 1, wherein said semiconductor LED is affixed to said carrier wafer with an adhesive material which has the property of high thermal conductivity.***

As stated in section VII.E.2.a, Tanaka fails to teach or disclose all of the limitations of claim 1. Claim 4 relies on claim 1. Petitioner seeks to rely on Chitnis to disclose an adhesive with the property of high thermal conductivity. Pet. 49. However, this does not cure the deficiencies of Tanaka. Therefore, the combination of Tanaka and Chitnis does not render obvious claim 4.

- ii. Ground 3 does not render obvious Claim 5: *The light emitting device of claim 1, wherein said semiconductor LED is affixed to said carrier wafer with an adhesive material which has the property of optical diffusion.***

As stated in section VII.E.2.a, Tanaka fails to teach or disclose all of the limitations of claim 1. Claim 5 relies on claim 1. Petitioner seeks to rely on Chitnis

to disclose an adhesive with the property of optical diffusion. Pet. 58. However, this does not cure the deficiencies of Tanaka. Therefore, the combination of Tanaka and Chitnis does not render obvious claim 5.

iii. Ground 3 does not render obvious Claim 6: *The light emitting device of claim 1, wherein said semiconductor LED is affixed to said carrier wafer with an adhesive material which has the property of optical reflection.*

As stated in section VII.E.2.a, Tanaka fails to teach or disclose all of the limitations of claim 1. Claim 6 relies on claim 1. Petitioner seeks to rely on Chitnis to disclose an adhesive with the property of optical reflection. Pet. 61. However, this does not cure the deficiencies of Tanaka. Therefore, the combination of Tanaka and Chitnis does not render obvious claim 6.

iv. Ground 3 does not render obvious Claim 7: *The light emitting device of claim 1, wherein said semiconductor LED is affixed to said carrier wafer with an adhesive material which has the property of optical transmissivity.*

As stated in section VII.E.2.a, Tanaka fails to teach or disclose all of the limitations of claim 1. Claim 7 relies on claim 1. Petitioner seeks to rely on Chitnis to disclose an adhesive with the property of optical transmissivity. Pet. 62. However, this does not cure the deficiencies of Tanaka. Therefore, the combination of Tanaka and Chitnis does not render obvious claim 7. Accordingly, claims 4-7 are not rendered obvious by Ground 3.

F. Petitioner Has Failed to Meet Their Burden Of Showing A Reasonable Likelihood of Unpatentability Under Ground 4

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 4

Petitioner seeks to combine references to invalidate the claims of the ‘612 Patent as obvious. However, as discussed *supra*, Petitioner is required to show that a POSITA would have been motivated to combine the above references (VII.D.1.a).

a. Petitioner fails to establish a motivation to combine Tanaka and AAPA references

As discussed *supra* in Sections VII.D.1.a, Petitioner has failed to establish a motivation to combine Tanaka with the AAPA. In the prosecution of the ‘612 Patent, the AAPA was known and considered by the patent Examiner. When the ‘612 Patent received its notice of allowance, it is clear from the reasons for allowance that the AAPA was considered:

“prior art could not be located that taught a light emitting device comprising a carrier wafer disposed on the thermally conductive layer; at least one optically reflective surface disposed between said carrier wafer and said semiconductor LED; and a substantially optically transmissive layer disposed proximal to the second substrate surface, wherein the carrier wafer and the thermally conductive layer define a relief to expose at least a portion of the second LED surface.”

Ex. 1004 at 50.

Thus, AAPA does not teach or disclose an intrinsic region. Likewise, neither does Tanaka. *See supra* Section VII.C.2.a-b. Moreover, Petitioner does not offer any insight regarding why the Examiner is wrong, or why there is a motivation to combine its asserted references, other than to simply state that Tanaka combined with the AAPA discloses and suggests an intrinsic region. Pet. 63-64.

2. The ‘612 Patent is not rendered obvious by Ground 4

If the Board determines there is an adequate motivation to combine Tanaka and the AAPA, Petitioner has still failed to demonstrate that Ground 4 renders obvious the claimed invention of the ‘612 Patent.

a. Claims 1-2 and 8-9 are not rendered obvious by Ground 4

Petitioner alleges, via Ground 4, that the combination of Tanaka and the AAPA renders the above claims obvious. Pet. 63. As in Section VII.C.2.a-b, claims 1-2 and 5-9 are not rendered obvious by Tanaka. Likewise, as discussed above, none of the claims are rendered obvious by a combination of Tanaka and the AAPA. Accordingly, claims 1-2 and 8-9 are not rendered obvious by Ground 4.

G. Petitioner Has Failed to Meet Their Burden Of Showing a Reasonable Likelihood of Unpatentability Under Ground 5

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 5

Petitioner seeks to combine the Tanaka, the AAPA, and Weeks references to invalidate claim 3 as obvious. However, as discussed *supra*, Petitioner is required to show that a POSITA would have been motivated to combine the above references (VII.D.1.a).

a. Petitioner fails to establish a motivation to combine Tanaka, the AAPA, and Weeks references

Petitioner has not established that a POSITA would have been motivated to combine Tanaka, the AAPA, and Weeks. Again, Petitioner fails to do so and point to nothing in Tanaka that their proposed modification would be necessary or welcome.

2. The ‘612 Patent is not rendered obvious by Ground 5

If the Board determines there is an adequate motivation to combine Tanaka, the AAPA, and Weeks, and if the Board finds an adequate expectation of success, Petitioner has still failed to demonstrate that Ground 5 renders obvious the claimed invention of the ‘612 Patent.

a. Claim 3 is not rendered obvious by Ground 5

As discussed in section VII.D.2.a, Tanaka combined with Weeks fails to render obvious claim 3. However, Petitioner argues that Tanaka combined with Weeks and the AAPA render obvious claim 3. Pet. 64. No specific reference has been identified from the AAPA with respect to an “optically reflective surface comprising a dielectric stack.”

Accordingly, Petitioner has failed to demonstrate that claim 3 is rendered obvious by Ground 5.

H. Petitioner Has Failed to Meet Their Burden Of Showing a Reasonable Likelihood of Unpatentability Under Ground 6

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 6

Petitioner seeks to combine references to invalidate the claims of the ‘612 Patent as obvious. However, as discussed *supra*, Petitioner is required to show that a POSITA would have been motivated to combine the above references (VII.D.1.a).

a. Petitioner fails to establish a motivation to combine Tanaka, the AAPA, and Chitnis

As in Sections VII.E.1.a and VII.F.1.a, Petitioner has failed to establish a motivation to combine Tanaka with Chitnis, **AND** Tanaka with the AARP,

respectively. Therefore, they have also failed to establish a motivation to combine Tanaka, the AAPA, and Chitnis.

2. The ‘612 Patent is not rendered obvious by Ground 6

If the Board determines there is an adequate motivation to combine Tanaka, the AAPA, and Chitnis, and if the Board finds an adequate expectation of success, Petitioner has still failed to demonstrate that Ground 6 renders obvious the claimed invention of the ‘612 Patent.

a. Claims 4-7 are not rendered obvious by Ground 6

Petitioner alleges, via Ground 6, that the combination of Tanaka, the AAPA, and Chitnis render the above claims obvious. .Pet. 65. As in Section VII.E.2, claims 4-7 are not rendered obvious by a combination of Tanaka and Chitnis. Likewise, as in Section VII.F.2, no claims are rendered obvious by a combination of Tanaka and the AAPA. Accordingly, claims 4-7 are not rendered obvious by Ground 6.

I. Petitioner Has Failed to Meet Their Burden Of Showing A Reasonable Likelihood of Unpatentability Under Ground 7

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 7

Petitioner seeks to combine references to invalidate the claims of the ‘612 Patent as obvious. However, as discussed *supra*, Petitioner is required to show that

a POSITA would have been motivated to combine the above references
(VII.D.1.a).

**a. Petitioner fails to establish a motivation to combine
Tanaka and Camras references**

2. The ‘612 Patent is not rendered obvious by Ground 7

If the Board determines there is an adequate motivation to combine Tanaka and Camras, and if the Board finds an adequate expectation of success, Petitioner has still failed to demonstrate that Ground 7 renders obvious the claimed invention of the ‘612 Patent.

**a. Claims 1-2 and 8-9 are not rendered obvious by Ground
7**

Petitioner alleges, via Ground 7, that the combination of Tanaka and Camras render the above claims obvious. Pet. 65. As in Section VII.C, claims 1-2 and 8-9 are not rendered obvious by Tanaka. Camras is used by Petitioner to show an intrinsic region. However, as with Tanaka, Petitioner uses the conclusory word “undoped” as found in Camras to define intrinsic material. Pet. 66. However, this is likewise fatal, as the word “intrinsic” does not exist within Camras. Petitioner refers to Figure 1B from Camras to demonstrate that there is an “intrinsic layer” 112 between an N-Type Doped Layer and a P-Type doped Layer (*Id.* 67), but Camras defines this layer 112 as an “active region.” (Ex. 1008, 2:47-48). Thus,

since neither Tanaka nor Camras can define the intrinsic region, the Petitioner's attempt to disclose or suggest the intrinsic region with the combination of Tanaka and Camras necessarily fails. Accordingly, claims 1-2 and 8-9 are not rendered obvious by Ground 7.

J. Petitioner Has Failed to Meet Their Burden Of Showing A Reasonable Likelihood of Unpatentability Under Ground 8

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 8

Petitioner seeks to combine references to invalidate the claims of the '612 Patent as obvious. However, as discussed *supra*, Petitioner is required to show that a POSITA would have been motivated to combine the above references (VII.D.1.a).

a. Petitioner fails to establish a motivation to combine Tanaka, Camras, and Weeks references

As in Sections VII.I.1 and VII.D.1, Petitioner has failed to establish a motivation to combine Tanaka with Camras, AND Tanaka with Weeks, respectively. Therefore, they have also failed to establish a motivation to combine Tanaka with Camras and Weeks.

2. The ‘612 Patent is not rendered obvious by Ground 8

If the Board determines there is an adequate motivation to combine Tanaka, Camras and Weeks, and if the Board finds an adequate expectation of success, Petitioner has still failed to demonstrate that Ground 8 renders obvious the claimed invention of the ‘612 Patent.

a. Claim 3 is not rendered obvious by Ground 8

Petitioner alleges, via Ground 8, that the combination of Tanaka, Camras and Weeks renders the above claim obvious. Pet. 69. As in Section VII.D.2.a, claim 3 is not rendered obvious by a combination of Tanaka and Weeks. Likewise, as in Section VII.I.2.a, Camras is used by Petitioner to show an intrinsic region, but is silent regarding a reflector using a dielectric stack. Thus, Camras in combination with Tanka and Weeks does not cure the deficiencies of the previous combination. Accordingly, claim 3 is not rendered obvious by Ground 8.

K. Petitioner Has Failed to Meet Their Burden Of Showing A Reasonable Likelihood of Unpatentability Under Ground 9

1. Petitioner fails to establish that a POSITA would have been motivated to combine or would have had a reasonable expectation of success combining the references of Ground 9

Petitioner seeks to combine references to invalidate the claims of the ‘612 Patent as obvious. However, as discussed *supra*, Petitioner is required to show that

a POSITA would have been motivated to combine the above references (VII.D.1.a).

b. Petitioner fails to establish a motivation to combine Tanaka, Camras, and Chitnis references

As in Sections VII.E.1.a and VII.I.1.a, Petitioner has failed to establish a motivation to combine Tanaka with Chitnis, AND Tanaka with Camras, respectively. Therefore, they have also failed to establish a motivation to combine Tanaka with Camras and Chitnis.

2. The ‘612 Patent is not rendered obvious by Ground 9

If the Board determines there is an adequate motivation to combine Tanaka, Camras, and Chitnis, and if the Board finds an adequate expectation of success, Petitioner has still failed to demonstrate that Ground 9 renders obvious the claimed invention of the ‘612 Patent.

c. Claims 4-7 are not rendered obvious by Ground 9

Petitioner alleges, via Ground 9, that the combination of Tanaka, Camras, and Chitnis render the above claims obvious. Pet. 70. As in Section VII.E.2.a, claims 4-7 are not rendered obvious by a combination of Tanaka and Chitnis. Likewise, as in Section VII.H.2.a, claims 4-7 are not rendered obvious by a combination of Tanaka, the AAPA, and Chitnis. Accordingly, claims 4-7 are not rendered obvious by Ground 9.

VIII. CONCLUSION

For the foregoing reasons, institution of the IPR should be denied.

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that LED Wafer's Patent Owner Preliminary Response contains less than 14,000 words as counted by the word processing program used to generate this document. This total does not include the table of contents, the table of authorities, appendix of exhibits, certificate of service, signature, or this certificate of word count.

Date: January 21, 2022

Respectfully Submitted,

By: /s/Bradley Liddle
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CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e))

The undersigned hereby certifies that the above-captioned “Patent Owner Preliminary Response” was served in its entirety on January 21, 2022, upon the following party via electronic mail:

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