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Paper 33
Entered: June 10, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEOUL SEMICONDUCTOR CO., LTD.,
SEOUL SEMICONDUCTOR, INC., and CREE, INC.,

Petitioner,

v.

DOCUMENT SECURITY SYSTEMS, INC.,
Patent Owner.

Case IPR2018-00333[1]
Patent 7,256,486 B2

Before SALLY C. MEDLEY, SCOTT C. MOORE, and
BRENT M. DOUGAL, *Administrative Patent Judges.*

DOUGAL, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

[1] Cree, Inc., which filed a Petition in IPR2018-01205, has been joined as a petitioner in this proceeding.

I. INTRODUCTION

A. Background

Seoul Semiconductor Co., Ltd. and Seoul Semiconductor, Inc. filed a Petition (Paper 2, "Pet.") to institute an *inter partes* review of claims 1–3 (the "challenged claims") of U.S. Patent 7,256,486 B2 (Ex. 1001, the "'486 patent"). We subsequently granted a request filed by Cree, Inc. to join this proceeding as a petitioner.[2] IPR2018-01205, Paper 11. Document Security Systems, Inc. ("Patent Owner") timely filed a Preliminary Response (Paper 6, "Prelim. Resp."). Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of all challenged claims. Paper 9 ("Dec.").

Patent Owner filed a Patent Owner's Response (Paper 17, "PO Resp."), Petitioner filed a Reply (Paper 20, "Reply"), and Patent Owner filed a Patent Owner's Sur-Reply (Paper 24, "Sur-Reply"). An oral hearing was held on January 31, 2019, and a copy of the transcript was entered into the record. Paper 29 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). Having reviewed the arguments of the parties and the supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that the challenged claims of the '486 patent are unpatentable.

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[2] Seoul Semiconductor Co., Ltd., Seoul Semiconductor, Inc., and Cree, Inc. are referred to collectively hereinafter as "Petitioner." Everlight Electronics Co., Ltd. which had previously been joined as a petitioner (IPR2018-01225, Paper 14), has been terminated as a party. Paper 32.

B. Related Proceedings

The parties indicate that there are a number of related court proceedings: *Document Security Systems, Inc. v. Seoul Semiconductor Co.*, No. 8:17-cv-00981 (C.D. Cal.); *Document Security Systems, Inc. v. Cree, Inc.*, No. 2:17-cv-04263 (C.D. Cal.); *Document Security Systems, Inc. v. Everlight Electronics Co.*, No. 2:17-cv-04273 (C.D. Cal.); *Document Security Systems, Inc. v. OSRAM GmbH*, No. 2:17-cv-05184 (C.D. Cal.); *Document Security Systems, Inc. v. Lite-On, Inc.*, No. 2:17-cv-06050 (C.D. Cal.); and *Document Security Systems, Inc. v. Nichia Corporation et al.*, No. 2:17-cv-08849 (C.D. Cal.). Pet. 2; Paper 4, 2.

Patent Owner indicates that IPR2018-01166 (instituted on November 30, 2018) and IPR2018-01220 (institution denied November 18, 2018) challenge(d) the '486 patent. Paper 11, 2. Patent Owner indicates that the following additional pending *inter partes* reviews are related to the present *inter partes* review: IPR2018-00522, IPR2018-00965, IPR2018-00966, and IPR2018-01165. *Id.* at 2.

C. The '486 Patent

The '486 patent generally relates to a semiconductor packaging device. Ex. 1001, Abstract. The semiconductor packaging device can include a light emitting diode (LED). *Id.* at 5:20–22. A semiconductor device is illustrated in Figures 2A and 2B, reproduced below. *Id.* at 3:5–8.

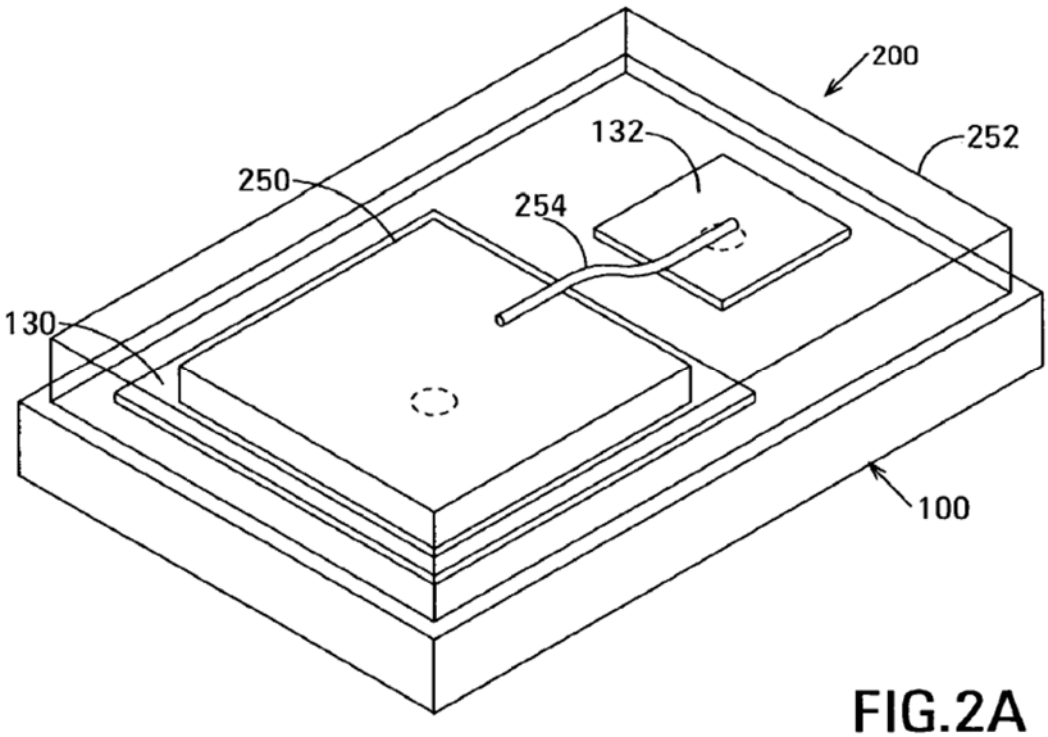


FIG.2A

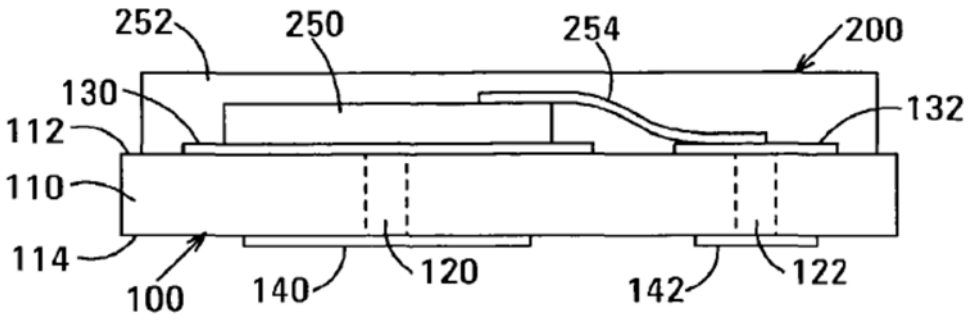


FIG.2B

Figure 2A shows a perspective view of a semiconductor device 200, including a semiconductor die/LED 250. *Id.* at 3:5–8, 6:5–7. Figure 2B is a side view of the semiconductor device 200. *Id.* at 3:5–8. A substrate 110, having major surfaces 112, 114, is shown having a mounting pad 130 and a bonding pad 132 on the top major surface 112, and connecting pads 140, 142 on the bottom major surface 114. *Id.* at 3:43–57, 4:64–66. Interconnecting elements 120, 122 pass through the substrate 110 and connect the mounting pad 130 with the connecting

pad 140, and the bonding pad 132 with the connecting pad 142. *Id.* at 3:58–67. A wire 254 connects the LED 250 with the bonding pad 132. *Id.* at 5:15–17. Encapsulant 252 is shown covering the top major surface 112 of the substrate, including the LED 250, wire 254, mounting pad 130, and bonding pad 132. *Id.* at 5:12–15, Figures 2A–2B.

The Specification also describes the LED 250 as including "anode and cathode electrodes (not shown) covering at least parts of its opposed major surfaces." *Id.* at 5:8–10. The bottom electrode is further described as "metallization on the bottom major surface of semiconductor die 250." *Id.* at 5:20–22.

Of the contested claims, claim 1 is independent, claim 2 depends from claim 1, and claim 3 depends from claim 2. Claims 1–3 are reproduced below:

> 1. A semiconductor device, comprising:
>
> a substantially planar substrate having opposed major surfaces;
>
> an electrically conductive mounting pad located on one of the major surfaces of the substrate;
>
> a light emitting diode (LED) having a metallized bottom major surface that is mounted on the electrically conductive mounting pad, the metallized bottom major surface comprising one of an anode and a cathode of the LED;
>
> a first electrically conductive connecting pad located on the other of the major surfaces of the substrate; and
>
> a first electrically conductive interconnecting element extending through the substrate and electrically interconnecting the mounting pad and the first electrically conductive connecting pad.
>
> 2. The semiconductor device of claim 1, further comprising:
>
> an electrically conductive bonding pad located on the one of the major surfaces of the substrate;

> a bonding wire extending between a metallized top major surface of the LED and the electrically conductive bonding pad;
>
> a second electrically conductive connecting pad located on the other of the major surfaces of the substrate; and
>
> a second electrically conductive interconnecting element extending through the substrate and electrically interconnecting the bonding pad and the second connecting pad.
>
> 3. The semiconductor device of claim 2 wherein the metallized top major surface comprises a first electrode of the LED and the metallized bottom major surface comprises a second electrode of the LED.

II. ANALYSIS

A. Obviousness under 35 U.S.C. § 103

The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness.[3] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). A patent claim can be obvious in light of a single prior art reference if it would have been obvious to modify that reference to arrive at the patented invention. *See, e.g.*, *Takeda Chem. Indus., Ltd. v. Alphapharm Pty, Ltd.*, 492 F.3d 1350, 1357 (Fed. Cir. 2007); *SIBIA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1356 (Fed. Cir. 2000).

B. Level of Ordinary Skill

Petitioner states that a person of ordinary skill "at the time of the [] invention would have had at least a B.S. in mechanical or electrical engineering or a related

[3] The parties do not direct us to any objective evidence of nonobviousness.

field, and two years' experience designing LED packages." Pet. 13 (citing Ex. 1003, Declaration of Petitioner's proffered expert, Dr. Michael Pecht, ("Pecht Decl.") ¶¶ 29–31). Petitioner contends that "a higher level of education or skill might make up for less experience, and vice-versa." *Id*.

Patent Owner does not contest or otherwise address Petitioner's proposed level of ordinary skill. *See generally*, PO Resp.

Having reviewed the argument and evidence, we adopt Petitioner's definition above. We also find that Petitioner's definition is consistent with the appropriate level of skill, as reflected in the cited references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

In an *inter partes* review filed before November 13, 2018, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent. *See* 37 C.F.R. § 42.100(b) (2016); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016) (affirming that USPTO has statutory authority to construe claims according to 37 C.F.R. § 42.100(b)).[4] Claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of

[4] The Office recently changed the claim construction standard used in *inter partes* review proceedings. 37 C.F.R. § 42.100(b) (2018). As stated in the Federal Register notice, however, the new rule applies only to petitions filed on or after November 13, 2018, and, therefore, does not impact this matter. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (final rule) (stating "[t]his rule is effective on November 13, 2018 and applies to all IPR, PGR and CBM petitions filed on or after the effective date").

the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). We apply this standard to the claims of the '486 patent.

1. "metallized . . . surface"

Petitioner proposes that we construe the term "metallized . . . surface," as recited in claims 1–3, as meaning "a metal layer on at least a portion of the surface" or "a thin layer of metal on at least a portion of the surface." Pet. 10 (emphasis omitted). Claim 3 of the '486 patent captures how the term "metallized . . . surface," is used in the context of the claims: "wherein the *metallized* top major *surface* comprises a first electrode of the LED and the *metallized* bottom major *surface* comprises a second electrode of the LED." Ex. 1001, 12:36–39 (emphasis added).

Petitioner identifies that the '486 patent Specification uses phrases like: "metallization on the bottom major surface of semiconductor die" in a number of locations. Pet. 9 (emphasis omitted) (quoting Ex. 1001, 5:21–22); *see also id.* at 8–9 (citing Ex. 1001, 1:19–23, 1:49–51, 5:10–12). These phrases are used both in the "Background" section and in the "Detailed Description" section of the '486 patent Specification. *Id.* at 8–9. Petitioner also identifies that the '486 patent Specification describes the metallization of the major surfaces as forming electrodes, such as "anode and cathode electrodes (not shown) [of an LED] covering at least parts of its opposed major surfaces." *Id.* at 9 (quoting Ex. 1001, 5:8–10; *see also id.* (citing 5:18–22). As indicated in the above quote, we also note that the '486 patent Specification indicates that the electrodes and major surface metallization of the LEDs are not shown in the Figures. *See e.g.*, Ex. 1001, 5:8–10.

In further support, Petitioner offers a number of dictionary definitions of the term "metallization" (Pet. at 10) including:

> A film pattern (single or multilayer) of conductive material deposited onto a substrate to interconnect electronic components, or the metal film on the bonding area of a substrate that becomes part of the bond and performs both electrical and mechanical functions.

Ex. 1004 (Modern Dictionary of Electronics (7th ed. 1999)) 467;

> The most common and familiar use of metal films in semiconductor technology is for surface wiring. The materials, methods, and processes of "wiring" the components parts together is generally referred to as metallization or the metallization process.

Ex. 1005 Microchip Fabrication (4th ed. 2000) 396;

> METALLIZATION: A deposited or plated thin metallic film used for its protective or electrical properties.

Ex. 1006 (Plastic-Encapsulated Microelectronics (1995)) 459; and

> metallize . . . to coat, treat, or combine with a metal.

Ex. 1007 (Merriam Webster's Collegiate Dictionary (10th ed.)) 730.

Patent Owner argues that Petitioner is writing out the term "major" from the proposed construction. PO Resp. 5. Patent Owner argues that the claims require a "metallized . . . major surface" and not just a metallized surface. *Id.* Patent Owner states that the "construction is wrong because it fails to consider that the claimed 'surface' must be a 'major surface,' and is also wrong because it fails to consider that the 'major surface' ***itself*** must be metallized." *Id.* at 9.

In limiting the proposed claim construction to "metallized . . . surface," we do not agree that Petitioner is attempting to omit the term "major" from the claims. This is evident in Petitioner's identification of the "major surfaces" in the cited prior art and the discussion of how certain of the major surfaces are metallized. *See, e.g.*, Pet. 14 (Rohm "includes a substantially planar substrate 12 (colored red)

with top and bottom major surfaces"); *id.* at 15 (Rohm's "LED chip 30 has a 'bottom surface electrode' on its bottom major surface"); *see also* Pet. 14–17, 20–26; Ex. 1003 ¶¶ 46–50, 53–55; Reply 13.

Patent Owner's primary concern is with Petitioner's proposal that the metal need be on only "a portion of the surface," such that the claims do not require a surface "substantially covered with metal." PO Resp. 12. Patent Owner argues that "a metallization layer, arranged on only a small fraction of a major surface, does not constitute a metallized major surface." *Id.* at 10. We note that Patent Owner does not contest or address the teachings of the '486 patent Specification or the dictionary definitions provided as evidence by Petitioner. *See generally*, PO Resp. 8–12. Further, though Patent Owner mentions the language of the claims, no detailed analysis of the claims or the Specification is provided, either in support of Patent Owner's construction or opposing Petitioner's construction. *See generally*, *id.* Patent Owner provides no persuasive evidence in support of its position. *See generally*, *id.*

Rather, Patent Owner focuses on Petitioner's allegations concerning the teachings of Rohm. *Id.* at 10–11. However, Patent Owner has not shown how its arguments concerning why Rohm does not teach a metalized major surface support Patent Owner's proposed claim construction. Further, it is unclear how Patent Owner's disagreement with Petitioner's positions concerning the teachings of Rohm show that Petitioner's claim construction is incorrect. For example, Patent Owner summarizes one of Petitioner's arguments as equating Rohm's electrode 30a that "covers a small portion of LED chip 30" with a contact pad and then states that the claims distinguish between a pad and a metalized surface. *Id.* Patent Owner does not explain how this is relevant to the claim construction at issue or

how the argument supports Patent Owner's claim construction or discredits that of Petitioner.

We also note that Patent Owner cites, without explanation, to the parties' First Amended Joint Claim Construction Statement (Ex. 2001) in the underlying litigation. *Id.* at 12. Petitioner notes that the joint claim construction is based, at least in part, on Patent Owner's disclaimer in this proceeding. In other words, it is based on Patent Owner's arguments we rejected from the Preliminary Response (*see* Dec. 6), that Patent Owner renewed in its Response, and that we rejected again above. Reply 6. For at least this reason, this citation by Patent Owner, without any explanation, is not persuasive evidence in support of its position. We further note that the underlying litigation is under a different claim construction standard.

In view of the above, we construe the term "metallized . . . surface," as meaning "a metal layer on at least a portion of the surface."

2. "the metallized top major surface comprises a first electrode . . . and the metallized bottom major surface comprises a second electrode"

Petitioner also proposes a construction for the phrase "the metallized top major surface comprises a first electrode . . . and the metallized bottom major surface comprises a second electrode," as recited in claim 3. Pet. 11–12. Patent Owner does not address the proposed claim construction other than to contest Petitioner's claim constructions generally. *See* PO Resp. 8–9.

We decline to provide an express construction for this term, or any other term in the '486 patent, because we determine that no such construction is required for purposes of this Decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the

controversy")*; see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

D. Instituted Grounds

Petitioner contends that the challenged claims are unpatentable under 35 U.S.C. § 103 based on the following grounds (Pet. 3, 19–51):[5]

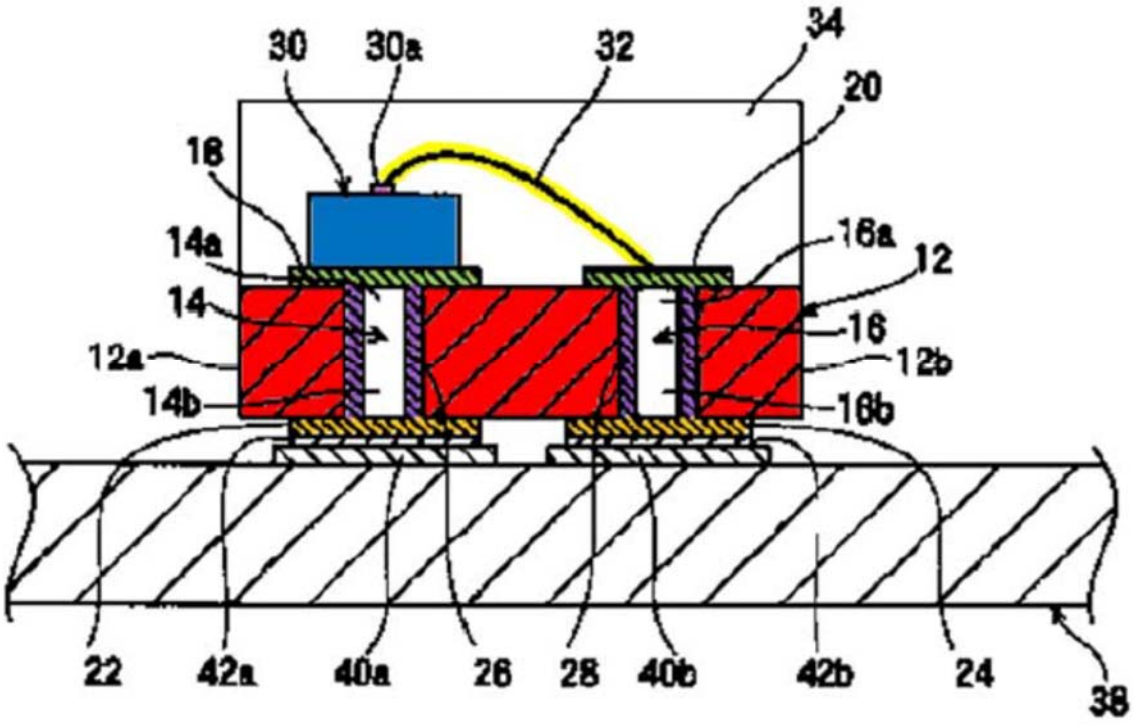
Reference[s]	Claims challenged
Rohm, or Rohm and Kish	1–3
Matsushita and Edmond	1–3

As further support, Petitioner offers the Declaration of Michael Pecht, Ph.D. Ex. 1003 ("Pecht Declaration").

E. Obviousness over Rohm alone, or in view of Kish – Claim 1

Petitioner asserts that claim 1 would have been obvious over Rohm alone, or in view of Kish, citing record evidence. Pet. 19–27. Petitioner asserts that Rohm teaches a semiconductor light-emitting device as required by claim 1. *Id.* at 19–20 (citing *e.g.*, Ex. 1003 ¶ 52; Ex. 1008 ¶ 30). Petitioner provides color coded mark-ups of Rohm Figure 1 indicating the substrate 12, as well as other claimed features. *Id.* at 14–15, 20–22. Petitioner's color coded mark-up of Rohm Figure 1 showing an LED package is reproduced below.

[5] Japanese Pat. Pub. 2003-17754, Jan. 17, 2003 (Ex. 1008) ("Rohm"); U.S. 5,376,580, Dec. 27, 1994 (Ex. 1010) ("Kish"); Japanese Pat. Pub. 2001-352102, Dec. 21, 2001 (Ex. 1009) ("Matsushita"); U.S. Patent 5,523,589, June 4, 1996 (Ex. 1011) ("Edmond").



The above color coded mark-up of Rohm Figure 1 shows an LED package. Pet. 14.

Petitioner states that the semiconductor device, shown in the color coded mark-up of Rohm Figure 1, above, includes a substrate 12 in red, a mounting pad 18 in green, a bonding pad 20 also in green, conductive pads 22, 24 in orange, interconnecting elements 26, 28 in purple, an LED chip 30 in blue, an electrode 30a in violet on the top surface of the LED chip 30, and a wire 32 in yellow. *Id.* at 14–15. We agree with and adopt Petitioner's contentions regarding the undisputed limitations of claim 1. Pet. 14–15, 17–27; Ex. 1003 ¶¶ 45–57. Petitioner's reliance on Kish and further aspects of Rohm are discussed below in reference to the disputed limitations.

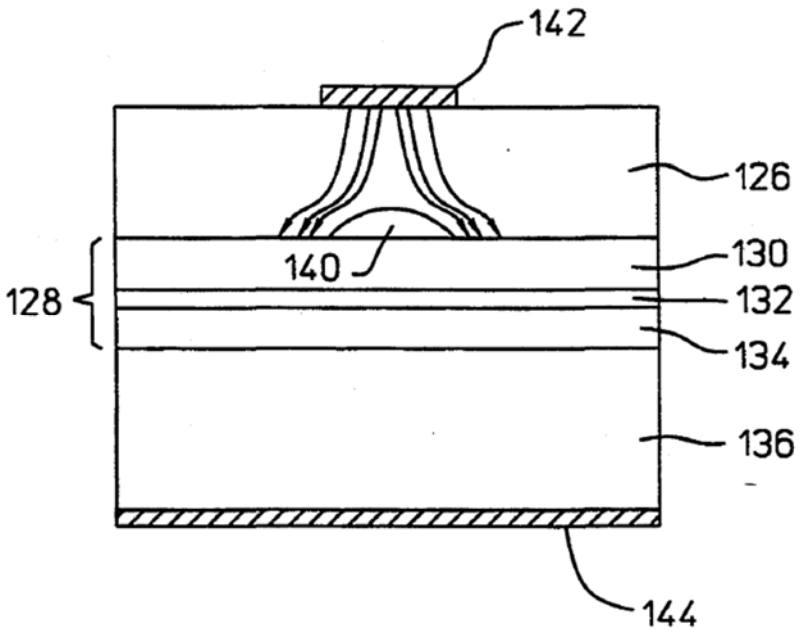
1. Metallized Bottom Major Surface

Patent Owner argues that Rohm and Kish do not teach or suggest an LED with a "metallized bottom major surface" as required by claim 1. PO Resp. 12–17.

In the Petition, Petitioner argues that Rohm's "LED chip 30 has a 'bottom surface electrode' on its bottom major surface." Pet. 15; *see also* Ex. 1003 ¶ 55 (Petitioner's expert refers to "the metalized bottom major surface of the LED chip 30 in Rohm"). Petitioner points to Rohm's disclosure that the LED is "diebonded to the top surface of the die bonding electrode 18." Pet. 22. (quoting Ex. 1008 ¶ 16). Petitioner further argues that this creates an electrical connection between the LED and the die bonding electrode 18. *Id.* Petitioner acknowledges that Rohm does not discuss cathodic or anodic electrodes but argues that "a person having ordinary skill in the art would have understood that each electrode must be one or the other." *Id.* (citing Ex. 1003 ¶¶ 47–49, 55).

Petitioner also acknowledges that "***Rohm*** does not expressly state that the bottom surface electrode of the LED 30 comprises a metallized surface." *Id.* at 23. However, Petitioner states that this "would have been considered the most natural and obvious implementation of an LED's bottom surface electrode." *Id.* (citing Ex. 1003 ¶¶ 47–49, 55). In addition, Petitioner relies on Kish for this feature. *Id.* at 23.

Petitioner states that Kish teaches '"metallized electrodes for applying voltages to LEDs.'" *Id.* at 24 (citing Ex. 1010 5:19–21). Petitioner also includes Kish Figure 14, reproduced below. *Id.*



Petitioner states that the LED in Kish Figure 14 depicts electrodes that are "metal[l]ized top and bottom surfaces" 142, 144 and "describes the formation of upper and lower metal electrodes on an LED as 'standard.'" Pet. 24. (citing *e.g.*, Ex. 1010 7:48–55, Fig. 14).

Petitioner further argues that "[b]y the time of the purported invention, the concept of metal layer formation was well known and predictable" as evidenced by Kish. *Id.* (citing Ex. 1003 ¶¶ 46–48, 55). Petitioner argues that implementing metal electrodes in Rohm using the teachings of Kish would have been obvious as it is merely "the adoption of [a] standard technique[]." *Id.* at 25 (citing Ex. 1003 ¶ 48).

In contesting the assertions of Petitioner, Patent Owner first faults Petitioner for not pointing to a depiction in Rohm's figures showing an LED having a metallized bottom surface. PO Resp. 12–13. We note that there is no requirement that the prior art show all of the features in the figures.[6] Further, Petitioner does

[6] The '486 patent similarly does not illustrate any of the LED electrodes. *See e.g.*,

not assert that the figures of Rohm illustrate a metallized bottom major surface of an LED, or that this feature is otherwise explicitly disclosed by Rohm. Pet. 23. Rather, Petitioner argues that metallization on the bottom major surface of Rohm's LED "would have been considered the most natural and obvious implementation of an LED's bottom surface electrode," citing the Pecht Declaration. *Id.* (citing Ex. 1003 ¶¶ 47–49, 55). Petitioner also cites Kish in support of this proposition. *Id.* at 25. Patent Owner's arguments do not address the actual teachings of Rohm, nor does Patent Owner provide evidence to refute Dr. Pecht's testimony.

Patent Owner then argues that, "Petitioner[] ha[s] failed to show that Rohm discloses or suggests a metallized bottom major surface for the simple reason that Petitioners have not addressed the geometry of the bottom surface of Rohm in any meaningful way." PO Resp. 13. Though we initially determined that "Petitioner does not address the geometry of the bottom surface of Rohm's LED," we also determined that

> the geometries of the LED in Rohm Figures 1–3 and the LED in Matsushita Figures 1–2, appear to be essentially the same as that of the LED shown in the '486 patent Figures 2A–D. Thus, it is unclear from Patent Owner's argument how the claims of the '486 patent distinguish over the prior art.

Dec. 10–11. Upon further review, we note that though Petitioner does not initially describe *why* the bottom surface of Rohm's LED is a major surface, Petitioner does assert that it is one. *See e.g.*, Pet. 15; Ex. 1003 ¶ 55. Further, in response, Petitioner explains that the bottom surface of Rohm's LED is a major surface because "the figures show that the surface area of the top and bottom surfaces of

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Ex. 1001, 5:8–10 ("anode and cathode electrodes (not shown) covering at least parts of [the LED's] opposed major surfaces").

the LED (30) are greater than the surface area of its sides. In other words, for both structures, the side surfaces are wider than they are tall." Reply 13.

Patent Owner does not contest that the bottom surface of Rohm's LED is a major surface, just that Petitioner does not sufficiently discuss the issue in the Petition. *See* PO Resp. 13. In fact, Petitioner's position is consistent with Patent Owner's characterizations in the Preliminary Response of the major surfaces in the '486 patent. *See* Prelim. Resp. 5 ("The '486 patent is consistent in its usage of 'major surface' to refer to a surface that is greater in size than other surfaces of the element being described."). We agree with Petitioner that the top and bottom surfaces of Rohm's LED are major surfaces and that Petitioner identified these major surfaces in the Petition.

Patent Owner goes on to address Kish Figures 7 and 12 arguing that the electrodes illustrated in these figures "occupy a small portion of the LED structure," and "clearly do not disclose a "major surface." PO Resp. 13. Patent Owner also argues that the electrodes in Kish Figures 14 and 15 also do not clearly teach "an electrode structure" that is a "major surface." *Id.* at 15 (citing Ex. 2003 (the Pecht deposition)). As discussed above, however, the Petition relies on Rohm for teaching top and bottom major surfaces of the LED, rather than Kish.

Similarly, Patent Owner argues that "Petitioners have not addressed why a POSITA [(person of ordinary skill in the art)] would have been motivated to implement Kish's figure 14 structure or figure 15 structure in Rohm's device." *Id.* Patent Owner does not identify where the Petition lays out a theory dependent on the bodily incorporation of Kish's structure into Rohm's device and we find none. The Petition primarily relies on Kish for teaching that the electrodes are metal (Pet. 23), and that it would be obvious to implement "a bottom surface electrode [in Rohm's device] using metal" based on the teachings of Kish (*id.* at 25). Thus,

Patent Owner's argument is not directed to the Petitioner's positions laid out in the Petition. *See also In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("To justify combining reference teachings in support of a rejection it is not necessary that a device shown in one reference can be physically inserted into the device shown in the other.").

Patent Owner also argues that "Petitioner[] ha[s] failed to establish that a metal electrode discloses a 'metallized surface'" in its combination of Rohm and Kish. PO Resp. 14. Patent Owner argues that Petitioner is instead relying on inherency. *Id.* In our initial decision addressing this argument from the Preliminary Response, we stated that "[t]hough Patent Owner makes this assertion, Patent Owner does not adequately explain why the Petition only relies on inherency in view of the arguments and evidence cited in the Petition.[7]" Dec. 12 (footnote in original). Patent Owner repeats this argument word for word in the Patent Owner Response. *Compare* Prelim. Resp. 13–14, *with* PO Resp. 14. Patent Owner makes no attempt to address our concern that the argument is not adequately developed. Patent Owner also does not address any of the teachings identified in the Petition as to why a metal electrode discloses a "metallized

[7] The Petition cites Kish as teaching the formation of metal electrodes on the LED. Pet. 24. In Figure 14, cited by the Petition, an electrode 144 is illustrated as the bottom surface of the LED. *Id.* The Petition also cites to Kish's teaching that the electrodes can be formed from a gold-tin alloy or a gold-germanium alloy. *Id.* (citing Ex. 1010 7:51–55). The Petition also cites to the Pecht Declaration for support that the electrode of Kish is a metallized bottom surface. *Id.* (citing Ex. 1003 ¶ 48, which includes the assertion "Indeed, like the '486 patent, Kish depicts an LED with metal[l]ized layer electrodes at its top (142) and bottom (144) surfaces."). The Petition also cites the Background section of the '486 patent for support that it was known in the art that a gold-tin alloy electrode is a metalized surface. *Id.* at 24–25 (quoting Ex. 1001, 149–52 "semiconductor die having a substrate surface metallization layer of a gold-tin alloy").

surface," such as those we included in the original footnote, reproduced herein. Thus, we are not persuaded by Patent Owner's contentions.

Patent Owner argues that "Petitioners' reliance on Slater [U.S. Patent 6,791,119 B2, Sept. 14, 2004, Ex. 1012] is also misplaced." PO Resp. 16. Petitioner relies on Slater as additional evidence to support its position that it would have been obvious to implement metal electrodes in Rohm. Pet. 25–26. Petitioner states that Slater teaches "that metal electrodes can be used to provide optical improvements to an LED." *Id.* at 25 (citing Ex. 1012, 18:33–67). Petitioner states that "using a metal having a reflective surface to redirect light that would otherwise exit toward the mounting pad would have provided the known advantage that more of the generated light would escape from the device into the region to be illuminated." *Id.* at 25–26 (citing Ex. 1003 ¶ 49).

Patent Owner argues that "Rohm already discloses a die bonding electrode 18 [below the LED], having a 'slightly larger shape' than the LED chip 3" (PO Resp. 16 (citing Rohm ¶ 28), which Dr. Pecht confirmed "could be reflective" (*id.* at 16–17 (citing Ex. 2003, 25:20–26:15)). Thus, Patent Owner argues "a POSITA would not have been motivated to make this suggested modification" because "[t]he light emitted from the LED chip's active region can reflect off this existing surface." *Id.* at 17 (citing Rohm ¶ 16).

Petitioner notes "that a 'conductive adhesive' is used to bond [Rohm's] LED to the die bonding electrode." Reply 17 (citing Ex. 1008 ¶ 18). Petitioner argues that Patent Owner's argument fails because it does not "address how the potential (though undescribed) reflectivity of Rohm's die bonding electrode is relevant despite an intervening layer of conductive adhesive." *Id.* at 18.

Patent Owner's argument does not overcome Petitioner's evidence that metal electrodes are "standard" in the industry. *See* Pet. 24–25; Ex. 1010, 7:48–55,

Fig. 14; Ex. 1003 ¶¶ 46–48, 55. Further, though there may be multiple metal components that offer reflectivity, we determine that that does not negate the potential benefit of the reflectivity of a bottom metal electrode.

In view of the foregoing, we find Petitioner has made a persuasive showing that Rohm alone, or in view of Kish, suggests a metallized bottom major surface as required by claim 1. We further find that Petitioner has articulated reasoning having an adequate rational underpinning to support the legal conclusion of obviousness. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

2. Three Elements – Mounting Pad, Connecting Pad, Interconnecting Element

Patent Owner argues that as required by claim 1, Rohm does not teach:

> ***an electrically conductive mounting pad*** located on one of the major surfaces of the substrate; . . .
>
> ***a first electrically conductive connecting pad*** located on the other of the major surfaces of the substrate; and
>
> ***a first electrically conductive interconnecting element*** extending through the substrate and ***electrically interconnecting the mounting pad and the first electrically conductive connecting pad***

PO Resp. 17–18 (Patent Owner's emphasis).

In the Petition, Petitioner asserts that because Rohm discloses an electrical connection between the electrode on the bottom of the LED 30 and the die bonding electrode 18, one of ordinary skill in the art would have understood that the die bonding pad is an electrically conductive mounting pad. Pet. 21–22 (citing Ex. 1008 ¶¶ 16, 23; Ex. 1003 ¶ 54). Petitioner asserts that Rohm's surface mount electrode 22 and connection electrode 26 together with the die bonding electrode 18 are the "electrically conductive interconnecting element extending through the substrate and electrically interconnecting the mounting pad and the first electrically conductive connecting pad" of claim 1. *Id.* at 26–27 (citing *e.g.*, Ex. 1008 ¶¶ 12–

15). Petitioner further asserts that "[a] person of ordinary skill would understand that 'surface mount electrode 22' is electrically conductive" and that the '"first connection electrode 26' is electrically conductive" "because . . . electrodes are electrically conductive." *Id.* at 26, 27.

Patent Owner argues that "[a]lthough Rohm uses three different terms, Rohm's Figure 1 make[s] it clear that those three terms are used to refer to three different sections of the same structure." PO Resp. 18. Patent Owner continues, "Petitioners have not justified why three portions of a single structure should be treated as three separate claim elements." *Id.* at 20. Patent Owner cites to *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249 (Fed. Cir. 2010), for the proposition that "it would have been Petitioner's burden to explain why it would have been appropriate to treat the prior art reference as showing, in effect, a contiguous structure as these three elements." Tr. 35; *see also* PO Resp. 20.

As the Federal Circuit subsequently explained, however, *Becton* turned on the Court's analysis that, "based on the intrinsic record, the terms 'hinged arm' and 'spring means' were *construed* to require separate structures." *Powell v. Home Depot U.S.A., Inc.*, 663 F.3d 1221, 1231 (Fed. Cir. 2011). Here, nothing in the '486 patent suggests that the relevant elements must be "separate" as Patent Owner suggests. To the contrary, the '486 patent's Specification describes the three elements as being directly and conductively interconnected. Ex. 1001, 4:29–57; *see also* Reply 11.

Further, at oral argument, counsel for Patent Owner admitted that there are no functional differences between the claimed mounting pad, electrically conductive connecting pad, and electrically conductive interconnecting element

and those identified by Petitioner in Rohm. Tr. 34.[8] As such, Patent Owner has not shown that there was a need for Petitioner to have explained why it was appropriate to refer to three different sections of the same structure for the claimed elements (mounting pad, electrically conductive connecting pad, and electrically conductive interconnecting element).

In view of the foregoing, we find Petitioner has made a persuasive showing that Rohm alone, or in view of Kish, suggests all of the limitations of claim 1. Pet. 14–15, 17–27; Ex. 1003 ¶¶ 45–57. As discussed above, we also find that Petitioner has set forth an adequate rationale for why such a person would have combined the teachings of Rohm and Kish to arrive at the claimed invention. On this record, and having considered all arguments raised by both parties, we determine that Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable as obvious over Rohm alone, or in view of Kish.

F. Obviousness over Rohm alone, or in view of Kish – Claims 2–3

Petitioner asserts that dependent claims 2–3 would have been obvious over Rohm alone, or in view of Kish, citing record evidence. Pet. 28–33. Petitioner relies on Rohm and Kish as teaching the features of these claims in substantially similar ways as discussed with respect to claim 1. *Compare id., with id.* at 19–27. For example, among other features, claim 2 requires "a metallized top major surface of the LED" and Petitioner argues that this is suggested by Rohm alone, or Rohm in combination with Kish, in a similar manner to the metalized bottom

[8] "JUDGE DOUGAL: So is there some functional difference between . . . the claimed elements and the prior art[?] . . .

MR. HELGE: Your Honor, I'd submit and concede that I don't believe there are any functional differences." Tr. 34.

major surface required by claim 1. *Id.* at 28–30. We agree with and adopt Petitioner's contentions regarding the undisputed limitations of claims 2 and 3. Pet. 28–33; Ex. 1003 ¶¶ 58–64. The disputed limitations are discussed below.

1. Metallized Top Major Surface

Patent Owner articulates a number of alleged reasons why Petitioner has not established that the prior art teaches or suggests an LED having a metallized top major surface, as required by claim 2. PO Resp. 21–25. First, Patent Owner characterizes Petitioner's allegations as asserting that Rohm's small electrode 30a is a major surface. *Id.* at 21; *see also id.* at 22 (Patent Owner argues that "Kish fails to remedy these shortcomings of Rohm"). Patent Owner argues that the electrode 30a does not define a major surface of the LED. *Id.* Though we agree that Rohm's electrode 30a is not a major surface of the LED, we do not agree that this is a correct characterization of Petitioner's position. Petitioner clearly states that Rohm Figure 1 "depicts the front surface electrode 30a . . . on the top major surface of the LED 30." Pet. 29.

Patent Owner also argues that it would "be improper to characterize the surface of Rohm's LED chip 30 surrounding electrode 30a as the 'metallized top major surface.'" PO Resp. 21. Though Petitioner relies on the top surface of the LED as the top major surface, Petitioner does not advance a position that the surface itself is metallized without the electrode 30a. Petitioner acknowledges that "***Rohm*** does not expressly state that front surface electrode 30a comprises a metallized surface" (*id.*), but relies on the teachings of Kish, similar to the discussion in claim 1, to assert that metallization would have been obvious (*id.* at 29–30).

Patent Owner also argues that because Rohm teaches a small top electrode and Kish teaches minimizing the metal patterns on the top of the LED, there is no

suggestion of a "metalized **top major surface** of the LED." PO Resp. 22–23. However, Patent Owner's reasoning relies on Patent Owner's proposed claim construction of the "metalized top major surface," rejected above, which would require that a substantial portion of the major surface be metalized. *See supra* § II.C.1.

In view of the foregoing, we find Petitioner has made a persuasive showing that Rohm alone, or in view of Kish, suggests a "metalized top major surface of the LED."

2. Three Elements – Bonding Pad, Connecting Pad, Interconnecting Element

Claim 2 requires, *inter alia*, an electrically conductive bonding pad, a second electrically conductive connecting pad, and a second electrically conductive interconnecting element. Ex. 1001, 12:24–25, 29–34. These three elements are similarly structured to the electrically conductive *mounting* pad, *first* electrically conductive connecting pad, and *first* electrically conductive interconnecting element discussed above with respect to claim 1. *See supra* § II.E.2.

Patent Owner makes essentially the same argument with respect to these three elements as discussed above. Namely, Patent Owner argues that "Petitioners have not justified why three portions of a single structure should be treated as three separate claim elements." PO Resp. 26 (citing *Becton*, 616 F.3d at 1254). We reject this argument for the same reasons as previously discussed. Among other things, *Becton* turned on the Court's analysis that, "based on the intrinsic record, the terms 'hinged arm' and 'spring means' were *construed* to require separate structures." *Powell*, 663 F.3d at 1231. Here, nothing in the '486 patent suggests that the relevant elements must be "separate" as Patent Owner suggests. To the

contrary, the '486 patent's Specification describes the three elements as being directly and conductively interconnected. Ex. 1001, 4:29–57.

In view of the foregoing, we find Petitioner has made a persuasive showing that Rohm alone, or in view of Kish, suggests all of the limitations of claims 2 and 3. Pet. 28–33; Ex. 1003 ¶¶ 58–64. For the same reasons discussed above with respect to claim 1, we also find that Petitioner has set forth an adequate rationale for why such a person would have combined the teachings of Rohm and Kish to arrive at the invention claimed by claims 2 and 3. On this record, and having considered all arguments raised by both parties, we determine that Petitioner has shown by a preponderance of the evidence that claims 2 and 3 are unpatentable as obvious over Rohm alone, or in view of Kish.

G. Obviousness over Matsushita in view of Edmond – Claims 1–3

Petitioner asserts that claims 1–3 would have been obvious over Matsushita in view of Edmond, citing record evidence. Pet. 33–51. We note that Petitioner's positions concerning the teachings of Matsushita essentially parallel Petitioner's positions concerning the teachings of Rohm. *Compare id.* at 33–37, 41–45, 48–51, *with id.* at 19–23, 26–33. Similarly, Petitioner offers Edmond for reasons similar to those discussed above with respect to Kish. *Compare id.* at 37–41, 45–48, 50–51, *with id.* at 23–25, 29–30, 32–33. We note that Patent Owner's arguments over Matsushita and Edmond parallel those made with respect to Rohm and Kish. *Compare* PO Resp. 12–29, *with id.* at 29–40.

Petitioner states that the different combinations of prior art references are offered because "the effective prior art date renders ***Rohm*** prior art solely under pre-AIA 102(a)," while "***Matsushita***, in contrast was published early enough to be statutory bar prior art under pre-AIA 102(b)." Pet. 33.

We determine herein that Petitioner has shown by a preponderance of the evidence that claims 1–3 are unpatentable as obvious over Rohm alone, or in view of Kish. In addressing these grounds, we have addressed all challenged claims. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner "is entitled to a final written decision addressing all of the claims it has challenged"); *see also* 35 U.S.C. § 318(a). It is unnecessary for us to decide whether Petitioner has shown by a preponderance of the evidence that claims 1–3 would have been obvious based on Matsushita and Edmond. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming the anticipation ground); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (once a dispositive issue is decided, there is no need to decide other issues).

H. Constitutionality of Inter Partes Review

Patent Owner states that "[a]t the time Patent Owner's patent was applied for and issued, the express provisions of the Patent Act did not make patents revocable through *inter partes* review." PO Resp. 40. Thus, Patent Owner argues that "[r]etroactively subjecting Patent Owner's vested patent rights to new qualifications . . . presents a constitutional concern sufficient to preclude invalidation of the claims." *Id.* at 40–41.

The Board previously has declined to consider constitutional challenges because "generally, 'administrative agencies do not have jurisdiction to decide the constitutionality of congressional enactments.'" *Square Inc. v. Unwired Planet LLC*, Case IPR2014-01165, slip op. at 25 (PTAB Oct. 30, 2015) (Paper 32) (quoting *Riggin v. Office of Senate Fair Emp't Practices*, 61 F.3d 1563, 1569 (Fed. Cir. 1995)). We likewise decline to consider the merits of Patent Owner's constitutional challenge.

III. CONCLUSION

Based on the information presented, we conclude that Petitioner has shown by a preponderance of the evidence that claims 1–3 of the '486 patent are unpatentable under 35 U.S.C. § 103.

IV. ORDER

For the reasons given, it is

ORDERED that claims 1–3 of U.S. Patent 7,256,486 B2 are unpatentable under 35 U.S.C. § 103; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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