

*In the Matter of*

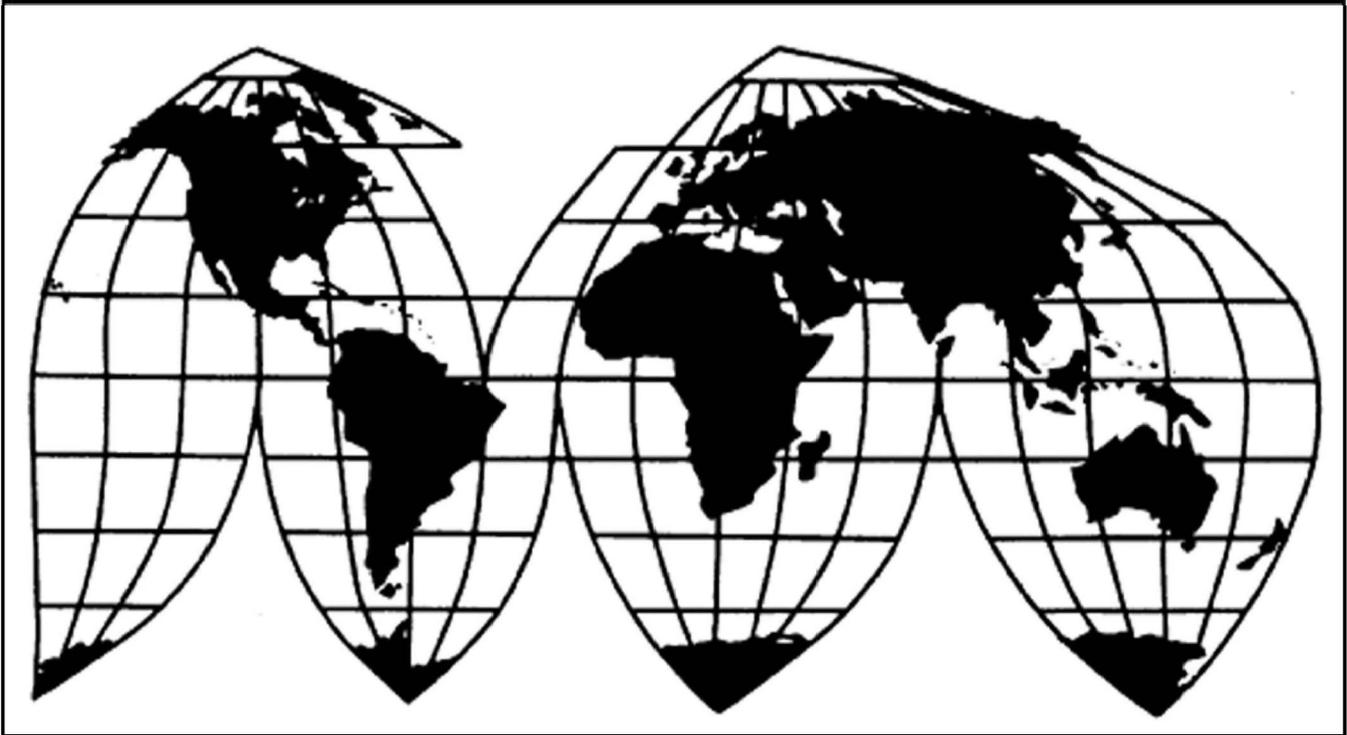
**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

337-TA-1168

**Publication 5302**

**March 2022**

**U.S. International Trade Commission**



Washington, DC 20436

# **U.S. International Trade Commission**

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**Randolph J. Stayin, Vice Chair**  
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**\*Has been recused from investigation.**

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United States International Trade Commission  
Washington, DC 20436**

# U.S. International Trade Commission

Washington, DC 20436  
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*In the Matter of*

## **CERTAIN LIGHT-EMITTING DIODE PRODUCTS, SYSTEMS, AND COMPONENTS THEREOF (III)**

337-TA-1168



**UNITED STATES INTERNATIONAL TRADE COMMISSION**  
**Washington, D.C.**

**In the Matter of**

**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

**Investigation No. 337-TA-1168**

**NOTICE OF A COMMISSION DETERMINATION TO REVIEW IN PART A FINAL  
INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337 AND, ON  
REVIEW, TO AFFIRM THE FINAL INITIAL DETERMINATION'S FINDING OF NO  
VIOLATION; TERMINATION OF THE INVESTIGATION**

**AGENCY:** U.S. International Trade Commission.

**ACTION:** Notice.

**SUMMARY:** Notice is hereby given that, on June 26, 2020, the presiding administrative law judge ("ALJ") issued a combined final initial determination ("ID") and recommended determination ("RD") on remedy and bonding. The final ID finds no violation of section 337 in the above-captioned investigation. The Commission has determined to review the final ID in part and, on review, has determined to affirm the final ID's finding of no violation. The investigation is terminated.

**FOR FURTHER INFORMATION CONTACT:** Richard P. Hadorn, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-3179. Copies of non-confidential documents filed in connection with this investigation may be viewed on the Commission's electronic docket (EDIS) at <https://edis.usitc.gov>. For help accessing EDIS, please email [EDIS3Help@usitc.gov](mailto:EDIS3Help@usitc.gov). General information concerning the Commission may also be obtained by accessing its Internet server at <https://www.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal, telephone (202) 205-1810.

**SUPPLEMENTARY INFORMATION:** On June 25, 2019, the Commission instituted Investigation No. 337-TA-1163 ("the 1163 investigation"), based on a complaint, as amended, filed by Lighting Science Group Corporation and Health Inc., both of Cocoa Beach, Florida, and Global Value Lighting, LLC of West Warwick, Rhode Island (collectively, "LSG"). 84 FR 29877 (June 25, 2019). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337) ("section 337"), based on the importation into the United States, the sale for importation, and the sale within the United States after importation of certain light-emitting diode products, systems, and components thereof by reason of infringement of certain claims of U.S. Patent Nos. 7,098,483 ("the '483 patent"), 7,095,053 ("the '053 patent"), 7,528,421 ("the '421 patent"), 8,506,118, and 8,674,608. *Id.* The complaint further alleges that

a domestic industry exists. *Id.* The notice of investigation names the following entities as respondents: Nichia Corporation of Tokushima, Japan and Nichia America Corporation of Wixom, Michigan (together, “Nichia”); Cree, Inc. of Durham, North Carolina; Cree Hong Kong, Limited of Shatin, Hong Kong; Cree Huizhou Solid State Lighting Co., Ltd. of Guangdong, China; OSRAM GmbH and OSRAM Licht AG, both of Munich, Germany; OSRAM Opto Semiconductors GmbH of Regensburg, Germany; OSRAM Opto Semiconductors, Inc. of Sunnyvale, California; Lumileds Holding B.V. of Schipol, Netherlands and Lumileds, LLC of San Jose, California (together, “Lumileds”); Signify N.V. (f/k/a Philips Lighting N.V.) of Eindhoven, Netherlands; Signify North America Corporation (f/k/a Philips Lighting North America Corporation) of Somerset, New Jersey; MLS Co., Ltd. of Zhongshan City, China; LEDVANCE GmbH of Garching, Germany; LEDVANCE LLC of Wilmington, Massachusetts; General Electric Company of Boston, Massachusetts; Consumer Lighting (U.S.), LLC (d/b/a GE Lighting, LLC) of Cleveland, Ohio; Current Lighting Solutions, LLC of Cleveland, Ohio; Acuity Brands, Inc. of Atlanta, Georgia; Acuity Brands Lighting, Inc. of Conyers, Georgia; Leedarsen Lighting Co., Ltd. of Xiamen, China; and Leedarsen America, Inc. of Smyrna, Georgia (collectively, the “Respondents”). *Id.* at 29878. The Office of Unfair Import Investigations is not a party to this investigation. *Id.*

On July 10, 2019, the ALJ severed from the 1163 investigation the present investigation, Investigation No. 337-TA-1168, which concerns whether there is a violation of section 337 based on allegations of infringement of the ’483, ’053, and ’421 patents. Order No. 5 at 2 (July 10, 2019).

On January 20, 2020, the Commission terminated this investigation as to claim 7 of the ’421 patent. Order No. 18 (Dec. 30, 2019), *unreviewed by Comm’n Notice* (Jan. 29, 2020). On February 7, 2020, the Commission terminated this investigation as to respondents MLS Co., Ltd. and Ledvance GmbH. Order No. 24 (Jan. 14, 2020), *unreviewed by Comm’n Notice* (Feb. 7, 2020). On February 26, 2020, the Commission terminated this investigation as to: (1) claims 2 and 10 of the ’421 patent; (2) claims 4, 16-20, 22, and 26-30 of the ’053 patent; and (3) as to Lumileds only, claims 1-5 and 12 of the ’053 patent. Order No. 26 (Jan. 29, 2020), *unreviewed by Comm’n Notice* (Feb. 26, 2020).

On February 14, 2020, the ALJ issued an initial determination granting in part Respondents’ motion for summary determination on non-infringement and failure to meet the technical prong of the domestic industry requirement. Order No. 32 (Initial Determination) (Feb. 14, 2020). The Commission declined to review that determination and subsequently terminated the investigation as to: (1) all asserted claims of the ’483 patent; and (2) asserted claims 7 and 11-15 of the ’053 patent. *See Comm’n Notice* (Apr. 7, 2020). That determination is currently on appeal. Appeal No. 20-1907 (Fed. Cir.).

On June 26, 2020, the ALJ issued a combined final ID and RD on remedy and bonding. The final ID finds no violation of Section 337. *See Final ID.*

On July 15, 2020, LSG filed a petition for review of certain findings in the final ID, and Respondents filed a contingent-in-part petition for review. On July 28, 2020, the parties filed responses to each other’s petitions.

On July 27, 2020, the Commission received submissions on the public interest pursuant to Commission Rule 210.50(a)(4) (19 CFR 210.50(a)(4)) from the following Respondents: (1) Acuity Brands, Inc. and Acuity Brands Lighting, Inc.; and (2) General Electric Co. and Consumer Lighting (U.S.), LLC (d/b/a GE Lighting, LLC). On July 28, 2020, the Commission received a submission on the public interest from LSG. No submissions were filed in response to the Commission's Federal Register notice. *See* 85 FR 40318-19 (July 6, 2020).

Having reviewed the record in this investigation, including the ALJ's orders and final ID, as well as the parties' petitions and responses thereto, the Commission has determined to review the final ID in part. Specifically, the Commission has determined to review the following issues: (1) whether the accused Nichia products and the alleged domestic industry product satisfy the limitation "and thermally coupled through the metal base to the thermal connection pad" of claim 1 of the '053 patent; (2) whether the accused products and the alleged domestic industry products satisfy the additional limitation "wherein the thermally conducting base includes a metal base" of claim 6 of the '421 patent; (3) whether the asserted claims of the '421 patent are invalid as obvious; and (4) whether LSG satisfied the economic prong of the domestic industry requirement. On review, the Commission has determined to take no position on these issues.

Further on review, the Commission has determined to correct two typographical errors in the final ID: in the fourth line of page 34, "does recite" is replaced with "does not recite"; and in the fifth line of page 40, "a thermal via" is replaced with "thermal coupling."

The Commission has determined not to review the remaining findings in the final ID, in particular that the asserted claims of the '053 and '421 patents have not been infringed, that the technical prong of the domestic industry requirement has not been satisfied with respect to either the '053 or '421 patent, and that the asserted claims of the '421 patent have been shown invalid as anticipated and for lacking written description support.

Accordingly, the Commission has determined to affirm the final ID's finding of no violation of section 337. The investigation is terminated.

The Commission vote for these determinations took place on October 1, 2020.

The authority for the Commission's determinations is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), and in Part 210 of the Commission's Rules of Practice and Procedure (19 CFR part 210).

While temporary remote operating procedures are in place in response to COVID-19, the Office of the Secretary is not able to serve parties that have not retained counsel or otherwise provided a point of contact for electronic service. Accordingly, pursuant to Commission Rules 201.16(a) and 210.7(a)(1) (19 CFR 201.16(a), 210.7(a)(1)), the Commission orders that the Complainant(s) complete service for any party/parties without a method of electronic service noted on the attached Certificate of Service and shall file proof of service on the Electronic Document Information System (EDIS).

By order of the Commission.

A handwritten signature in black ink, appearing to read 'Lisa R. Barton'.

Lisa R. Barton  
Secretary to the Commission

Issued: October 1, 2020

**PUBLIC CERTIFICATE OF SERVICE**

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served to the following parties as indicated, on **October 1, 2020**.



Lisa R. Barton, Secretary  
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UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

**In the Matter of**

**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

**INV. NO. 337-TA-1168**

**INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND  
RECOMMENDED DETERMINATION ON REMEDY AND BOND**

Administrative Law Judge Clark S. Cheney

(June 26, 2020)

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**Table of Abbreviations**

<b>CC Tr.</b>	Transcript of claim construction hearing held October 17, 2019
<b>CDX</b>	Complainants' demonstrative exhibit
<b>CIB</b>	Complainants' initial post-hearing brief
<b>CPB</b>	Complainants' pre-hearing brief
<b>CPX</b>	Complainants' physical exhibit
<b>CRB</b>	Complainants' responsive post-hearing brief
<b>CX</b>	Complainants' exhibit
<b>Dep.</b>	Deposition
<b>JX</b>	Joint Exhibit
<b>RDX</b>	Respondents' demonstrative exhibit
<b>RIB</b>	Respondents' initial post-hearing brief
<b>RPB</b>	Respondents' pre-hearing brief
<b>RPX</b>	Respondents' physical exhibit
<b>RRB</b>	Respondents' responsive post-hearing brief
<b>RX</b>	Respondents' exhibit
<b>Stip.</b>	Stipulation of the parties
<b>Tr.</b>	Transcript

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

**In the Matter of**

**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

**INV. NO. 337-TA-1168**

**INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND  
RECOMMENDED DETERMINATION ON REMEDY AND BOND**

Administrative Law Judge Clark S. Cheney

(June 26, 2020)

Pursuant to the Notice of Investigation, 84 Fed. Reg. 29877 (June 25, 2019), and 19 C.F.R. §§ 210.10(b), 210.42(a)(1)(i), this is the final Initial Determination in the matter of *Certain Light-Emitting Diode Products, Systems, and Components Thereof (III)*, Investigation No. 337-TA-1168.

For the reasons stated herein, I have determined that a violation of section 337 of the Tariff Act, as amended, has not occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation, of certain light-emitting diode products, systems, and components thereof based on allegations of infringement of U.S. Patent No. 7,095,053 and U.S. Patent No. 7,528,421.

## I. INTRODUCTION

### A. Procedural History

On May 20, 2019, complainants Lighting Science Group Corporation; Healthe, Inc.; and Global Value Lighting, LLC (collectively, “LSG” or “Complainants”) filed an Amended Complaint (“Compl.”) alleging violations of section 337 based on the importation into the United States, the sale for importation, and the sale within the United States after importation of certain light-emitting diode (“LED”) products, systems, and components thereof. 84 Fed. Reg. 24180 (May 24, 2019); *see* EDIS Doc. ID 681033.

On June 25, 2019, the Commission instituted Investigation No. 337-TA-1163 (“the 1163 investigation”) to determine:

[W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain products identified in paragraph (3) by reason of infringement of one or more of claims 11 and 14–16 of the ’483 patent [U.S. Patent No. 7,098,483]; claims 1–7, 11–22, and 26–30 of the ’053 patent [U.S. Patent No. 7,095,053]; claims 1, 2, 6, 7, and 10 of the ’421 patent [U.S. Patent No. 7,528,421]; claims 1, 2, 5, 10, 12, 14, 15, 17, and 18 of the ’118 patent [U.S. Patent No. 8,506,118]; and claims 1, 2, 6, 12, 13, 16, 19–22, 24, 28, and 37 of the ’608 patent [U.S. Patent No. 8,674,608]; and whether an industry in the United States exists as required by subsection (a)(2) of section 337.

84 Fed. Reg. 29877 (June 25, 2019) (“Notice of Investigation”).

The Notice of Investigation named the following entities as respondents:

- Nichia Corporation
- Nichia America Corporation
- Cree, Inc.
- Cree Hong Kong, Limited
- Cree Huizhou Solid State Lighting Co. Ltd.

- OSRAM GmbH
- OSRAM Licht AG
- OSRAM Opto Semiconductors GmbH
- OSRAM Opto Semiconductors, Inc.
- Lumileds Holding B.V.
- Lumileds, LLC
- Signify N.V. (f/k/a Philips Lighting N.V.)
- Signify North America Corporation (f/k/a Philips Lighting North America Corporation)
- MLS Co., Ltd.
- LEDVANCE GmbH
- LEDVANCE LLC
- General Electric Company
- Consumer Lighting (U.S.), LLC (d/b/a GE Lighting, LLC)
- Current Lighting Solutions, LLC
- Acuity Brands, Inc.
- Acuity Brands Lighting, Inc.
- Leedarson Lighting Co., Ltd.
- Leedarson America, Inc.

*Id.*<sup>1</sup>

The Office of Unfair Import Investigations is not a party to this investigation. *Id.*

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<sup>1</sup> All named respondents remaining in this investigation are hereinafter collectively referred to as “Respondents.”

On July 10, 2019, I issued Order No. 5 severing the 1163 investigation into two investigations. This investigation is the second of the severed investigations and concerns whether there is a violation of section 337 based on allegations of infringement of the '483, '053, and '421 patents. Order No. 5 at 2. I subsequently set the target date for this investigation at sixteen months, which makes this final initial determination due no later than June 26, 2020. Order No. 6 (July 17, 2019).

On December 30, 2019, I granted an unopposed motion by LSG for termination of the investigation with respect to claim 7 of the '421 patent. Order No. 18, *aff'd*, Comm'n Notice (Jan. 29, 2020). On January 14, 2020, I granted an unopposed motion by LSG for termination of the investigation with respect to respondents MLS Co., Ltd., and Ledvance GmbH. Order No. 24, *aff'd*, Comm'n Notice (Feb. 7, 2020). On January 29, 2020, I granted an unopposed motion by LSG for termination of the investigation with respect to (1) claims 2 and 10 of the '421 patent and claims 4, 16–20, 22, and 26–30 of the '053 patent and (2) claims 1–5 and 12 of the '053 patent as asserted against respondents Lumileds Holding B.V. and Lumileds LLC. Order No. 26, *aff'd*, Comm'n Notice (Feb. 26, 2020).

In accordance with the procedural schedule issued as Order No. 7 on July 22, 2019, the parties submitted a joint chart of proposed claim constructions on September 12, 2019. The parties submitted opening claim construction briefs on September 20, 2019, and responsive claim construction briefs on October 4, 2019. On October 17, 2019, I convened a claim construction hearing.<sup>2</sup> I subsequently issued Order No. 31 (“CC Order”) on February 11, 2020, construing certain disputed claims.

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<sup>2</sup> The transcript of the claim construction hearing is available as EDIS Doc. ID 691452 and is hereinafter referred to as “CC Tr.”

On February 14, 2020, I granted a motion filed by Respondents seeking findings on summary determination that (1) none of the products accused in this investigation infringe asserted claims 11 and 14–16 of the '483 patent or asserted claims 7 and 11–15 of the '053 patent and (2) the technical prong of the domestic industry requirement is not satisfied with respect to those same claims. Order No. 32.<sup>3</sup> The Commission declined to review my initial determination finding no violation of section 337 as to these claims. Comm'n Notice (Apr. 7, 2020).<sup>4</sup>

I held a prehearing conference on February 18, 2020, and convened the evidentiary hearing immediately afterwards. The evidentiary hearing ended on February 26, 2020. *See* Tr. 1–1455.<sup>5</sup>

## **B. The Parties**

### **1. Complainants**

Lighting Science Group Corporation (“Lighting Science”) is a corporation organized under the laws of Delaware with its corporate headquarters at 1350 Division Road, Suite 204, West Warwick, Rhode Island 02893. Its principal place of business is at 801 N. Atlantic Avenue, Cocoa Beach, Florida 32931. Compl. ¶ 10. Lighting Science is in the business of manufacturing, researching, developing, and selling devices and systems that use LEDs as the light source. *See id.* ¶ 11.

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<sup>3</sup> Order No. 32 granted in part Respondents’ Motion No. 1168-004 for summary determination. To the extent issues raised in that motion remain at issue, Motion No. 1168-004 is denied as moot in view of the findings and conclusions set forth in this initial determination.

<sup>4</sup> The asserted patent claims remaining at issue are: claims 1, 2, 3, 5, 6, and 21 of the '053 patent; and claims 1 and 6 of the '421 patent.

<sup>5</sup> After initial versions of the evidentiary hearing transcript were filed on EDIS, some portions of the transcript were declassified, changing some pagination. To clarify which transcript pagination is cited herein, citations to the public hearing transcript will be made in reference to EDIS Doc. IDs 705937, 705942, 705946, 705948, and 705949. Citations to the confidential hearing transcript will be made in reference to EDIS Doc. IDs 702885, 703084, 703335, 703849, and 703578.

Healthe, Inc. (“Healthe”) is a corporation organized under the laws of Delaware, with corporate headquarters and principal place of business at 801 N. Atlantic Avenue, Cocoa Beach, Florida 32931. Compl. ¶ 27. Healthe was founded as a wholly-owned subsidiary of Lighting Science on October 23, 2018, and it is a licensee of the ’483, ’053, and ’421 patents. *See id.* ¶ 28.

Global Value Lighting, LLC (“GVL”) is a corporation organized under the laws of Delaware, with corporate headquarters and principal place of business at 1350 Division Road, Suite 204, West Warwick, Rhode Island 02893. Compl. ¶ 30. GVL was founded as a majority-owned subsidiary of Lighting Science on May 8, 2017, and it is a licensee of the ’483, ’053, and ’421 patents. *See id.* ¶ 31.

## **2. The Cree Respondents**

Cree, Inc., is a publicly traded corporation organized under the laws of the State of North Carolina with a principal place of business at 4600 Silicon Drive, Durham, North Carolina 27703. Cree Resp. to Compl. ¶ 38 (EDIS Doc. ID 681480) (July 15, 2019).

Cree Hong Kong, Limited, is organized under the laws of Hong Kong with its principal place of business at 18 Science Park East Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong. *Id.* ¶ 40. Cree Hong Kong, Limited, is a wholly owned subsidiary of Cree, Inc. *Id.*

Cree Huizhou Solid State Lighting Company Limited is organized under the laws of the People’s Republic of China with a principal place of business in Huizhou, Guangdong Province, China. *Id.* ¶ 42. Cree Huizhou Solid State Lighting Company Limited is a wholly owned subsidiary of Cree Hong Kong, Limited. *Id.*

These three entities are hereinafter collectively referred to as “Cree.”

### **3. The Lumileds Respondents**

Lumileds Holding B.V. is a privately held company organized under the laws of the Netherlands and has its principal place of business and corporate headquarters at The Base Building B, 5th Floor, Evert van de Beekstraat 1-107, 1118 CN Schipol, Netherlands. Compl. ¶ 58; Lumileds Resp. to Compl. ¶ 58 (EDIS Doc. ID 681420) (July 15, 2019).

Lumileds, LLC, is a privately held company organized under the laws of the State of Delaware and has its principal place of business and operational headquarters at 370 West Trimble Road, San Jose, California 95131. Compl. ¶ 60; Lumileds Resp. to Compl. ¶ 60. Lumileds, LLC, is an indirect subsidiary of Lumileds Holding B.V. Lumileds Resp. to Compl. ¶ 61.

These two entities are hereinafter collectively referred to as “Lumileds.”

### **4. The Nichia Respondents**

Nichia Corporation is a privately held corporation organized under the laws of Japan and has its principal place of business at 491 Oka, Kaminaka-Cho, Anan-Shi, Tokushima 774-8601, Japan. Nichia Resp. to Compl. ¶ 32 (EDIS Doc. ID 681396) (July 15, 2019).

Nichia America Corporation is a privately held corporation organized under the laws of the State of Michigan. *Id.* ¶ 34. It has its principal place of business at 48561 Alpha Drive, Suite 100, Wixom, Michigan 48393, and a sales office at 3625 Del Amo Boulevard, Suite 325, Torrance, California 90503. *Id.* Nichia America Corporation is a subsidiary of Nichia Corporation. *Id.* ¶ 35.

These two entities are hereinafter collectively referred to as “Nichia.”

### **5. The OSRAM Respondents**

OSRAM Licht AG is a publicly traded company organized under the laws of Germany and has its principal place of business at Marcel-Breuer-Strasse 6, 80807 Munich, Germany. OSRAM Resp. to Compl. ¶ 48 (EDIS Doc. ID 681474) (July 15, 2019).

OSRAM GmbH is a privately held company organized under the laws of Germany and has its principal place of business at Marcel-Breuer-Strasse 6, 80807 Munich, Germany. *Id.* ¶ 50.

OSRAM GmbH is a (partly indirectly) wholly-owned subsidiary of OSRAM Licht AG. *Id.* ¶ 49.

OSRAM Opto Semiconductors GmbH is a privately held company organized under the laws of Germany and has its principal place of business at Leibnizstr 4, 93055 Regensburg, Germany. *Id.* ¶ 52. OSRAM Opto Semiconductors GmbH is a subsidiary of OSRAM GmbH. *Id.* ¶ 53.

OSRAM Opto Semiconductors, Inc., is a privately held corporation organized under the laws of the State of Delaware and has its principal place of business at 1150 Kifer Road, Suite 100, Sunnyvale, California 94086. *Id.* ¶ 54. OSRAM Opto Semiconductors GmbH holds 100% of the shares of OSRAM Opto Semiconductors, Inc. *Id.* ¶ 55.

These four entities are hereinafter collectively referred to as “OSRAM.”

## **6. The Acuity Respondents**

Acuity Brands, Inc., is a publicly traded corporation organized under the laws of the State of Delaware with its principal place of business at 1170 Peachtree St. NE, Suite 2300, Atlanta, Georgia, 30309. Acuity Resp. to Compl. ¶ 90 (EDIS Doc. ID 681716) (July 16, 2019).

Acuity Brands Lighting, Inc., is a wholly-owned subsidiary of Acuity Brands, Inc., organized under the laws of the State of Delaware. *Id.* ¶ 92.

These two entities are hereinafter collectively referred to as “Acuity.”

## **7. The GE Respondents**

General Electric Company is a publicly traded company organized under the laws of New York and has its principal place of business at 41 Farnsworth Street, Boston, Massachusetts 02210. Compl. ¶ 78; GE Resp. to Compl. ¶ 78 (EDIS Doc. ID 682214) (July 18, 2019).

Consumer Lighting (U.S.), LLC, is a privately owned company organized under the laws of the State of Delaware with its principal place of business at 1975 Noble Road, Cleveland, Ohio 44112. Compl. ¶ 80; GE Resp. to Compl. ¶ 78.

These two entities are hereinafter collectively referred to as “GE.”

#### **8. Respondent Current**

Current Lighting Solutions, LLC (“Current”) is a company organized under the laws of Delaware and has its principal place of business at 1975 Noble Road, Nela Park, Cleveland, Ohio 44112. Compl. ¶ 84; Current Resp. to Compl. ¶ 84 (EDIS Doc. No. 681476) (July 15, 2019).

#### **9. Respondent LEDVANCE**

LEDVANCE LLC (“LEDVANCE”) is a privately held U.S. company organized under Delaware law and has its principal place of business at 200 Ballardvale Street, Wilmington, Massachusetts 01887. LEDVANCE Resp. to Compl. ¶ 74 (EDIS Doc. No. 681442) (July 15, 2019). LEDVANCE LLC is wholly owned by MLS Co., Ltd. *Id.*

#### **10. The Leedarson Respondents**

Leedarson Lighting Co., Ltd., is headquartered in the People’s Republic of China at the Leedarson Building, No. 1511, 2nd Fanghu North Road, Xiamen 361010, People’s Republic of China. Leedarson Resp. to Compl. ¶ 96 (EDIS Doc. ID 681473) (July 15, 2019).

Leedarson America, Inc., is headquartered in the State of Georgia at 4600 Highlands Pkwy SE, Suite D-E, Smyrna, Georgia 30082. *Id.* ¶ 98.

These two entities are hereinafter collectively referred to as “Leedarson.”

#### **11. The Signify Respondents**

Signify N.V. was formerly named Philips Lighting N.V. and is a publicly traded company organized under the laws of the Netherlands, with its principal place of business at High Tech

Campus 48, 5656 AE Eindhoven, The Netherlands. Signify Resp. to Compl. ¶ 64 (EDIS Doc. ID 681382) (July 15, 2019).

Signify North America Corporation was formerly named Philips Lighting North America Corporation and is a publicly traded company organized under the laws of Delaware, with a place of business at 200 Franklin Square Drive, Somerset, New Jersey 08873. *Id.* ¶ 67. Signify North America Corporation is a wholly-owned subsidiary of Signify N.V. *Id.* ¶ 68.

These two entities are hereinafter collectively referred to as “Signify.”

### **C. The Asserted Patents**

LSG asserts claims under two patents in this investigation: the ’053 patent and the ’421 patent.

#### **1. The ’053 Patent**

U.S. Patent No. 7,095,053 is titled “Light Emitting Diodes Packaged for High Temperature Operation,” issued on August 22, 2006, and names Joseph Mazzochette and Greg Blonder as inventors. JX-0003 (’053 patent) at cover page. The ’053 patent issued from application No. 10/638,579, filed on August 11, 2003, and claims priority to provisional application No. 60/467,857, filed on May 5, 2003. *Id.*

The ’053 patent, on its face, is assigned to Lamina Ceramics, Inc. ’053 patent at cover page. LSG is the owner by assignment of the ’053 patent. *See* Compl. Exs. 9, 13–14, 16–17, 20–23, 25, 28–29.

The remaining ’053 claims at issue in this investigation are claims 1, 2, 3, 5, 6, and 21.<sup>6</sup> Claim 1 is an independent claim from which claims 2, 3, 5, and 6 depend. Claim 21 is a dependent

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<sup>6</sup> *See* Section I.A above.

claim depending from independent claim 16, which has been terminated from this investigation.

These claims read as follows:

1. A packaged LED for high temperature operation comprising:
  - a metal base, the metal base including an underlying thermal connection pad and a pair of underlying electrical connection pads;
  - a layer of ceramic overlying the metal base; and
  - an LED mounted on the ceramic layer, wherein the LED includes a pair of electrodes electrically connected to respective underlying electrical connection pads, and wherein the LED is thermally coupled to the metal base by one or more thermal vias, and thermally coupled through the metal base to the thermal connection pad.
2. The packaged LED of claim 1 wherein the underlying electrical connection pads and the underlying thermal connection pad are coplanar to permit surface mounting on corresponding pads of a PC board.
3. The packaged LED of claim 1 wherein at least one electrode of the LED is connected to one of the underlying electrical connection pads by an electrical path including a bonding wire from the electrode to a bonding pad on the ceramic layer.
5. The packaged LED of claim 1 wherein at least one electrode of the LED is connected to one of the underlying electrical connection pads by an electrical path including the metal base.
6. An array of LEDs comprising a plurality of LEDs according to claim 1 overlying a common metal base.
16. A packaged LED for high temperature operation comprising:
  - a metal base, the metal base including an underlying thermal connection pad and a pair of underlying electrical connection pads;
  - a layer of electrically insulating material overlying the metal base; and
  - an LED mounted on the layer of electrically insulating material, wherein the LED includes a pair of electrodes electrically connected to respective underlying electrical connection pads, and wherein the LED is thermally coupled to the metal base by one or more thermal vias, and thermally coupled through the metal base to the thermal connection pad.

21. An array of LEDs comprising a plurality of LEDs according to claim 16 overlying a common metal base.

'053 patent at 9:5–25, 9:30–35, 10:16–23, 10:41–42.

## 2. The '421 Patent

U.S. Patent No. 7,528,421 is titled “Surface Mountable Light Emitting Diode Assemblies Packaged for High Temperature Operation,” issued on May 5, 2009, and names Joseph Mazzochette and Greg Blonder as inventors. JX-0004 ('421 patent) at cover page. The '421 patent issued from Application No. 11/179,863, filed on July 12, 2005, and is a continuation-in-part of the application that resulted in the '053 patent. *Id.* Similar to the '053 patent, the '421 patent also claims priority to provisional application No. 60/467,857, filed on May 5, 2003. *Id.*

The '421 patent, on its face, is assigned to Lamina Lighting, Inc. '421 patent at cover page. LSG is the owner by assignment of the '421 patent. *See* Compl. Exs. 11–14, 16–17, 20–23, 25, 28.

The remaining '421 claims at issue in this investigation are claims 1 and 6.<sup>7</sup> Claim 1 is an independent claim from which claim 6 depends. These claims read as follows:

1. A LED assembly adapted for surface mounting and high temperature operation, the LED assembly comprising:

a thermally conducting base, wherein at least a portion of the thermally conducting base is substantially planar;

one or more electrically insulating layers overlying at least a portion of the planar portion of the thermally conducting base and defining a surface cavity, wherein the electrically insulating layers include one or more terminals;

one or more LED die disposed at least partially within the surface cavity, wherein the one or more LED die are in thermal contact with the planar portion of the thermally conducting base, and electrically

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<sup>7</sup> *See* Section I.A above.

connected to the one or more terminals of the one or more insulating layers,

wherein a bottom surface of the LED assembly includes a thermally conductive region in solderable thermal contact with the thermally conducting base, for spreading heat transmitted to the base from the one or more LED die; and

further comprising an LED assembly mount selected from the group consisting of an electrically insulated fastener and a solderable bonding pad.

6. The LED assembly of claim 1, wherein the thermally conducting base includes a metal base.

'421 patent at 7:46–67, 8:17–18.

## **II. JURISDICTION & IMPORTATION**

### **A. Subject Matter Jurisdiction**

No party has contested the Commission's subject matter jurisdiction over this investigation. Section 337 of the Tariff Act prohibits the importation, the sale for importation, or the sale after importation of articles that infringe a valid and enforceable patent if an industry exists in the United States relating to articles protected by the patent. 19 U.S.C. §§ 1337(a)(1)–(2). LSG's Amended Complaint states a cause of action under section 337. Specifically, LSG has alleged that the Respondents are importing, selling for importation, and selling after importation certain LED products that infringe the asserted patents. *See* Compl. at 45–118. The Commission, therefore, has subject matter jurisdiction over this investigation.

### **B. Personal Jurisdiction**

By filing the Amended Complaint and participating in the investigation, LSG has consented to personal jurisdiction at the Commission. *See Certain Cutting Tools for Flexible Plastic Conduit & Components Thereof*, 337-TA-344, Initial Determination at 4, *not reviewed*, Comm'n Determination Not to Review an Initial Determination Finding a Violation of Section

337 (Oct. 28, 1993), USITC Pub. No. 2719 (Jan. 1994). The Respondents have appeared and participated in this investigation, and no party has contested the Commission's jurisdiction over it. I therefore find that the Commission has personal jurisdiction over all parties. *See, e.g., Certain Optical Disk Controller Chips & Chipsets & Prods. Containing Same, Including DVD Players & PC Optical Storage Devices*, Inv. No. 337-TA-506, Initial Determination at 4–5 (May 16, 2005) (unreviewed in relevant part).

### **C. Importation**

To prove a violation of section 337 by any particular respondent, the complainant must show that the respondent engaged in “[t]he importation into the United States, the sale for importation, or the sale within the United States after importation by the owner, importer, or consignee” of products accused of infringement. 19 U.S.C. §§ 1337(a)(1)(A)–(B).

Of the four OSRAM entities named as respondents in this investigation, OSRAM Opto Semiconductors GmbH and OSRAM Opto Semiconductors, Inc., stipulated that they have imported into the United States, sold for importation into the United States, or sold within the United States after importation certain products accused in this investigation. JX-0434C at 6. LSG has not offered evidence to show that the other two OSRAM entities, OSRAM GmbH and OSRAM Licht AG, satisfy the importation requirement. *See* Tr. (Malkiewicz) 876:1–7. I therefore find that the importation requirement of section 337 has been satisfied as to OSRAM Opto Semiconductors GmbH and OSRAM Opto Semiconductors, Inc., but has not been satisfied as to OSRAM GmbH and OSRAM Licht AG.

With respect to the two named Lumileds respondents, LSG relies on Exhibit A to Lumileds's Response to the Amended Complaint and Lumileds's discovery responses to argue that both Lumileds entities satisfy the importation requirement in this investigation. *See* Tr. (Malkiewicz) 828:15–829:10 (referring to CDX-0009C at 73), 883:1–884:7; CX-1686C; *see also*

CIB at 2. Lumileds did not contest that Lumileds, LLC, imported accused articles. *See* RRB at 142. I therefore find that the importation requirement of section 337 has been satisfied as to Lumileds, LLC. On the other hand, LSG has not demonstrated that Lumileds Holding B.V. has imported or sold articles in violation of section 337. Contrary to LSG's representation, LSG's witness Mr. Malkiewicz testified that Lumileds Holding B.V. does not satisfy the importation requirement. *See* Tr. (Malkiewicz) 883:1–884:7. In its response to the Amended Complaint, Lumileds provided information relating to the quantity and value of Lumileds products imported into the United States, but never admitted that Lumileds Holding B.V. participated in the importation. *See* Lumileds Resp. to Compl. Ex. A; *see also id.* ¶ 377. Similarly, the Lumileds discovery response relied upon by LSG does not expressly state Lumileds Holding B.V. imported or sold the accused products. *Cf.* CX-1686C. Instead, it lists volumes of imported products without identifying who imported or sold the products. *See id.* The discovery response also states that third parties were involved in an unidentified number of importations. *Id.* at 1 n.1. Weighing the record evidence as a whole, I find that LSG has not established by a preponderance of the evidence that the importation requirement of section 337 has been satisfied as to Lumileds Holding B.V.

The Acuity respondents stipulated as to the importation, sale for importation, and/or sale after importation of certain Acuity luminaires. JX-0433C ¶ 5. Acuity argues that this list of stipulated products does not match the list of Acuity products LSG accuses of infringement in this investigation. RIB at 143; *compare* JX-0433C at 2–5 with CX-0001C at 746–766. Acuity further argues that, “to the extent any violation may be found, its basis should be limited to the accused Acuity luminaires identified in JX-0433C.” RIB at 143. Based on the stipulation marked as exhibit JX-0433C, I find Acuity has imported accused articles. The Commission has found that a single

importation of an accused article is sufficient to satisfy the importation requirement. *Certain Trolley Wheel Assemblies*, Inv. No. 337-TA-161, Comm'n Op. at 7–8, USITC Pub. No. 1605 (Nov. 1984) (deeming the importation requirement satisfied by the importation of a single product of no commercial value). I find the importation requirement of section 337 has been satisfied with respect to Acuity.

LEDVANCE, Current, Leedarson, GE, and Nichia have also each stipulated to the importation, sale for importation, and/or sale after importation of certain accused products. *See* JX-0008C (GE); JX-0009C (Current); JX-0010C (Leedarson); JX-0011C (LEDVANCE); JX-0432C (Nichia); JX-0435C (LEDVANCE); JX-0436C (Current). Cree and Signify provided information regarding importation of their accused products in response to the Amended Complaint and through discovery responses. *See* Tr. (Malkiewicz) 828:10–22; CX-0982C (Cree list of products); CX-1694C (Exhibit A to Signify's Response to Amended Complaint); CX-1108C (Signify's Interrogatory Responses). Accordingly, I find that the importation requirement of section 337 has been satisfied with respect to LEDVANCE, Current, Leedarson, GE, Nichia, Cree, and Signify.

#### **D. *In Rem* Jurisdiction**

As discussed above, LSG adduced evidence demonstrating the importation, sale for importation, and sale after importation into the United States of products accused in this investigation. I therefore find the Commission has *in rem* jurisdiction over the accused products. *See Sealed Air Corp. v. Int'l Trade Comm'n*, 645 F.2d 976, 985–86 (C.C.P.A. 1981) (noting the Commission has jurisdiction over imported goods).

#### **E. Standing**

Respondents do not dispute LSG's ownership of the asserted patents. The record demonstrates that LSG has standing in this investigation due to its ownership by assignment of the

asserted patents. *See* Compl. Exs. 9, 13–14, 16–17, 20–23, 25, 28–29 ('053 patent); Compl. Exs. 11–14, 16–17, 20–23, 25, 28 ('421 patent).

### **III. LEGAL PRINCIPLES**

#### **A. Infringement**

In a section 337 investigation, the complainant bears the burden of proving infringement of the asserted patent claims by a preponderance of the evidence. *See Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1349 (Fed. Cir. 2010). This standard “requires proving that infringement was more likely than not to have occurred.” *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

Literal infringement is a question of fact. *Finisar Corp. v. DirectTV Grp., Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008). “Literal infringement requires the patentee to prove that the accused device contains each limitation of the asserted claim(s). If any claim limitation is absent, there is no literal infringement as a matter of law.” *Bayer AG v. Elan Pharm. Research Corp.*, 212 F.3d 1241, 1247 (Fed. Cir. 2000).

#### **B. Claim Construction**

“An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing.” *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*) (internal citations omitted), *aff'd*, 517 U.S. 370 (1996). Claim construction resolves legal disputes between the parties regarding claim scope. *See Eon Corp. IP Holdings v. Silver Spring Networks*, 815 F.3d 1314, 1319 (Fed. Cir. 2016).

Evidence intrinsic to the application, prosecution, and issuance of a patent is the most significant source of the legally operative meaning of disputed claim language. *See Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The

intrinsic evidence includes the claims themselves, the specification, and the prosecution history. See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (*en banc*); see also *Markman*, 52 F.3d at 979. As the Federal Circuit explained in *Phillips*, courts must analyze each of these components to determine the “ordinary and customary meaning of a claim term” as understood by a person of ordinary skill in the art at the time of the invention. 415 F.3d at 1313.

“It is a ‘bedrock principle’ of patent law that ‘the claims of a patent define the invention to which the patentee is entitled the right to exclude.’” *Phillips*, 415 F.3d at 1312 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). “Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claim terms.” *Id.* at 1314; see *Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001) (“In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to ‘particularly point[ ] out and distinctly claim[ ] the subject matter which the patentee regards as his invention.’”). The context in which a term is used in an asserted claim can be “highly instructive.” *Phillips*, 415 F.3d at 1314. Additionally, other claims in the same patent, asserted or unasserted, may also provide guidance as to the meaning of a claim term. *Id.*

The specification “is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Id.* at 1315 (quoting *Vitronics Corp. v. Conceptoronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). “[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Id.* at 1316. “In other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope

by the inventor.” *Id.* As a general rule, however, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Id.* at 1323. In the end, “[t]he construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be . . . the correct construction.” *Id.* at 1316 (quoting *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)).

When the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence (*i.e.*, all evidence external to the patent and the prosecution history, including dictionaries, inventor testimony, expert testimony, and learned treatises) may be considered. *Id.* at 1317. Extrinsic evidence is generally viewed as less reliable than the patent itself and its prosecution history in determining how to define claim terms. *Id.* “The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence.” *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

### **C. Validity**

A patent is presumed valid. *See* 35 U.S.C. § 282; *Microsoft Corp. v. i4i Ltd. P’ship*, 131 S. Ct. 2238, 2242 (2011). A respondent who has raised patent invalidity as an affirmative defense has the burden of overcoming this presumption by clear and convincing evidence. *See Microsoft*, 131 S. Ct. at 2242.

#### **1. Anticipation**

Under 35 U.S.C. § 102, a claim is anticipated, and therefore invalid, when “the four comers of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation.” *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282

(Fed. Cir. 2000). To be considered anticipatory, the prior art reference must be enabling and describe the applicant's claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. *See Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1346 (Fed. Cir. 2000).

## 2. Obviousness

Under 35 U.S.C. § 103, a patent may be found invalid as obvious if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a). Because obviousness is determined at the time of invention, rather than the date of litigation, “[t]he great challenge of the obviousness judgment is proceeding without any hint of hindsight.” *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1375 (Fed. Cir. 2011).

When a patent is challenged as obvious, the critical inquiry in determining the differences between the claimed invention and the prior art is whether there is an apparent reason to combine the known elements in the fashion claimed by the patent at issue. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 417–418 (2007). Thus, based on a combination of several prior art references, “the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, and would have had a reasonable expectation of success in doing so.” *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007) (citations omitted).

Obviousness is a determination of law based on underlying determinations of fact. *Star Scientific*, 655 F.3d at 1374. The factual determinations behind a finding of obviousness include: (1) the scope and content of the prior art, (2) the level and content of the prior art, (3) the differences

between the claimed invention and the prior art, and (4) secondary considerations of non-obviousness. *KSR*, 550 U.S. at 399 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)). These factual determinations are referred to collectively as the “*Graham* factors.” Secondary considerations of non-obviousness include commercial success, long felt but unresolved need, and the failure of others. *Id.* When present, secondary considerations “give light to the circumstances surrounding the origin of the subject matter sought to be patented,” but they are not dispositive on the issue of obviousness. *Geo. M. Martin Co. v. Alliance Mach. Sys. Int’l.*, 618 F.3d 1294, 1304–06 (Fed. Cir. 2010). For evidence of secondary considerations to be given substantial weight in the obviousness determination, its proponent must establish a nexus between the evidence and the merits of the claimed invention. *See W. Union Co. v. MoneyGram Payment Sys. Inc.*, 626 F.3d 1361, 1372–73 (Fed. Cir. 2010) (citing *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995)).

### 3. Written Description

The issue of whether a patent is invalid for failure to meet the written description requirement of 35 U.S.C. § 112, ¶ 1 is a question of fact. *Bard Peripheral Vascular, Inc. v. W.L. Gore & Assocs., Inc.*, 670 F.3d 1171, 1188 (Fed. Cir. 2012). The hallmark of the written description requirement is the disclosure of the invention. *See Ariad Pharm., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*). The test for determining the sufficiency of the written description in a patent requires “an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art. Based on that inquiry, the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.” *Id.* “The level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Id.*

#### 4. Indefiniteness

Pursuant to 35 U.S.C. § 112, ¶ 2, a patent specification “shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, ¶ 2. Section 112, ¶ 2 requires “that a patent’s claims, viewed in light of the specification and prosecution history inform those skilled in the art about the scope of the invention with reasonable certainty.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). A patent claim that is indefinite is invalid. 35 U.S.C. § 282(b)(3)(A).

#### D. Domestic Industry

For a patent-based complaint, a violation of section 337 can be found “only if an industry in the United States, relating to the articles protected by the patent . . . concerned, exists or is in the process of being established.” 19 U.S.C. § 1337(a)(2). The complainant bears the burden of establishing that the domestic industry requirement is satisfied. *John Mezzalingua Assocs., Inc. v. Int’l Trade Comm’n*, 660 F.3d 1322, 1331 (Fed. Cir. 2011). The domestic industry requirement of section 337 is often described as having an economic prong and a technical prong. *InterDigital Commc’ns, LLC v. Int’l Trade Comm’n*, 707 F.3d 1295, 1298 (Fed. Cir. 2013); *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm’n Op. at 12–14, USITC Pub. No. 4120 (Dec. 2009).

#### 1. Economic Prong

Section 337(a)(3) sets forth the following economic criteria for determining the existence of a domestic industry in such investigations:

(3) For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned –

(A) significant investment in plant and equipment;

(B) significant employment of labor or capital; or

(C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3). Given that the statutory criteria are listed in the disjunctive, satisfaction of any one of them will be sufficient to meet the economic prong of the domestic industry requirement. *See Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, Comm'n Op. at 15, USITC Pub. No. 3003 (Nov. 1996).

## 2. Technical Prong

The technical prong of the domestic industry requirement is satisfied when the complainant in a patent-based section 337 investigation establishes that it is practicing or exploiting the patents at issue. *See* 19 U.S.C. § 1337(a)(2) and (3); *Certain Microsphere Adhesives, Process for Making Same and Prods. Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 8, 1996 WL 1056095 (Jan. 16, 1996). “The test for satisfying the ‘technical prong’ of the industry requirement is essentially [the] same as that for infringement, *i.e.*, a comparison of domestic products to the asserted claims.” *Alloc, Inc. v. Int’l Trade Comm’n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). To prevail, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more valid claims of the patent. *See id.*; *Spanion*, 629 F.3d at 1349; *Certain Vision-Based Driver Assistance System Cameras and Components Thereof*, Inv. No. 337-TA-907, Comm'n Op. at 36, USITC Pub. No. 4866 (Feb. 2019). It is sufficient to show that the products practice any claim of that patent, not necessarily an asserted claim of that patent. *See Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 38 (Aug. 1, 2007).

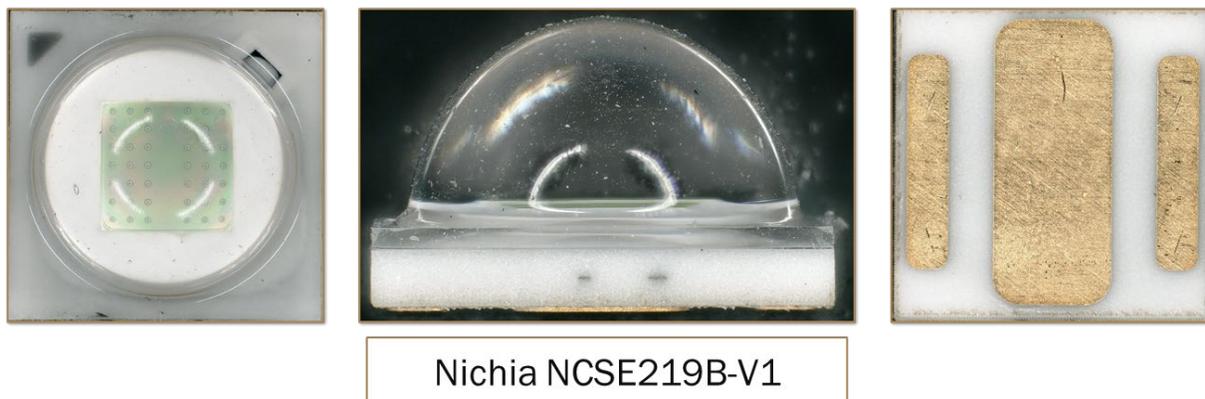
## IV. THE '053 PATENT

### A. Infringement

#### 1. The '053 Accused Products

##### a) *Nichia*

At the evidentiary hearing and in its post-hearing brief, LSG argued that the importation and sale of Nichia's 219B series of products infringe claims 1, 2, and 5 of the '053 patent.<sup>8</sup> *See* CIB at 4–39. LSG's expert Dr. Kuball focused his hearing testimony on an infringement analysis of the Nichia NCSE219B-V1 product. The figure below shows top, side, and bottom views of the Nichia NCSE219B-V1 product:



CX-0589 at LSGITC\_1439293-300.

LSG contends the Nichia NCSE219B-V1 product is “representative” of all Nichia 219B series products. *See* CIB at 36. In particular, LSG identifies the following Nichia products as “[not] contain[ing] any differences that are material to infringement with respect to meeting any specific claim limitation”:

- NVSL219BT-V1

<sup>8</sup> As discussed above in Section I.A, claims 1, 2, 3, 5, 6, and 21 of the '053 patent remain in this investigation. LSG did not argue infringement of claims 3, 6, or 21 at the hearing or in its post-hearing brief. *See* CIB at 4–39.

- NVSW219BT-V1
- NCSA219B-V1
- NCSC219B-V1
- NCSE219B-V1
- NCSG219B-V1
- NCSR219B-V1
- NVSA219B-V1
- NVSL219BT
- NVSL219B-V1
- NVSW219B
- NVSW219BT
- NCSB219B-V1

CIB at 36–39.

Respondents do not dispute LSG’s assertion that these products are materially identical for the purpose of the infringement analysis here. *See* RRB at 1–40. Based on the record evidence, I find that the Nichia NCSE219B-V1 product is representative of the Nichia 219B series products listed above for purposes of the infringement analysis of claims 1, 2, and 5 of the ’053 patent.

***b) Acuity***

LSG also accuses Acuity of infringing claims 1, 2, and 5 of the ’053 patent, alleging “Acuity purchases and imports Nichia’s infringing 219B series of packages from various suppliers, including Nichia and Universal Lighting Technologies.” *See* CIB at 39 (citing Tr. (Kuball) 232:24–234:8); CX-4191C (Quinlan Dep.) at 41:5–13, 44:5–12, 45:2–7. LSG’s expert Dr. Kuball testified that he used Acuity’s interrogatory responses (CX-1075C) at pages 173–240 to determine

which Acuity luminaires use the Nichia 219B series of products and summarized information relating to Acuity's purchase and use of the Nichia 219B series products in CX-0001C. Tr. (Kuball) 230:9–232:23, 232:24–238:24.

Acuity disputes that its luminaires incorporate the Nichia 219B series LEDs, arguing that “Acuity *does not currently use the Accused 219Bs* . . . Acuity historically used them, but they have been replaced in those luminaires with non-accused Nichia 219C/319 packages.” RRB at 40–41 (emphasis original) (citing CX-1075C at 32–49; CX-4191C (Quinlan Dep.) at 89:9–92:13).

LSG and Acuity both rely on Exhibit CX-1075C in support of their arguments here. The exhibit is titled “Acuity Respondents’ Eighth Supplemental and Corrected Objections and Responses To Complainants’ First Set Of Interrogatories.” CX-1075C at 1. That discovery response contains a chart titled “Updated Exhibit 1” with the following columns:

- SUPPLIER\_NUMBER
- SUPPLIER\_NAME
- ITEM
- DESCRIPTION
- QTY
- SPEND

*Id.* at 173–240.

Each page of Updated Exhibit 1 shows many products with “219B” descriptors, with quantities numbering in the millions. *See, e.g.*, CX-1075C.0173–.0240. This evidence suggests that certain Acuity luminaries did incorporate Nichia 219B series LEDs at one time. In contrast, the narrative interrogatory responses cited by Acuity do not contain any reference to the Nichia 219B series. *Cf.* CX-1075C.0033–.0040. The luminaries listed in the passages cited by Acuity

appear instead to incorporate Nichia 219C series LEDs, which are not accused of infringement. *See, e.g.*, CX-1075C.0040 (listing “NVSW219CT”). The deposition testimony of Acuity’s corporate witness Mr. Quinlan is unclear as to whether the narrative interrogatory responses are meant to supplant the listing in Updated Exhibit 1. *See* CX-4191C (Quinlan Dep.) 89:9–92:13.

The evidence thus shows that, at least during the period covered by Acuity’s discovery responses, both the Nichia 219B series and the Nichia 219C series of LEDs were incorporated into Acuity’s luminaires. Whether some Acuity products now incorporate the Nichia 219C series LEDs does not change the infringement analysis of those Acuity products in evidence that contain the Nichia 219B series. Acuity’s practices going forward may have ramifications on an appropriate remedy in the event a violation of section 337 is found, and I address that issue in more detail below.

## **2. Claim 1**

The following subsections analyze the accused Nichia 291B series products, with a focus on the representative NCSE219B-V1 product. As set forth below, the evidence demonstrates that the Nichia 219B series products do not infringe claim 1 of the ’421 patent.

### ***a) “A packaged LED for high temperature operation comprising: ”***

The parties disagree as to whether the phrase “for high temperature operation” recited in the preamble to claim 1 is limiting. LSG argues that the preamble is not limiting; Respondents argue that it limits the invention to LED packages capable of handling operational and die temperatures of up to 200° C and 250° C, respectively. CIB at 5–10; RRB at 3–7. As discussed below, I find that the preamble phrase “for high temperature operation” does not limit the scope of claim 1 of the ’053 patent.

Generally speaking, the preamble does not limit the scope of the invention defined in the claim. *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). A preamble

can be limiting where “it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002). By contrast, a preamble is not limiting when a patent “defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.” *Arctic Cat Inc. v. GEP Power Prod., Inc.*, 919 F.3d 1320, 1328 (Fed. Cir. 2019). This follows from the long-established principle that patentability of an apparatus claim “depends on the claimed structure, not on the use or purpose of that structure.” *Catalina Mktg. Int’l*, 289 F.3d at 809 (citing *In re Gardiner*, 171 F.2d 313, 315–16 (C.C.P.A. 1948) (“It is trite to state that the patentability of apparatus claims must be shown in the structure claimed and not merely upon a use, function, or result thereof.”)).

Here, the body of claim 1 of the ’053 patent describes a structurally complete LED package. *See* ’053 patent at 9:5–16. The phrase “for high temperature operation” adds no further structural meaning to the claim; the structure described in claim 1 would remain intact if the words “for high temperature operation” were deleted from the preamble. *See Catalina Mktg. Int’l*, 289 F.3d at 809 (“[A] preamble generally is not limiting when the claim body describes a structurally complete invention such that deletion of the preamble phrase does not affect the structure or steps of the claimed invention.”). When I asked Respondents’ expert Dr. Schubert at the evidentiary hearing if he had given an opinion that the phrase “for high temperature operation” is “necessary to understand the structure of the invention recited in the remainder of the claim,” he admitted he offered no such opinion. Tr. (Schubert) 1068:19–25.

The phrase “for high temperature operation” also does not provide an antecedent basis for limitations in the body of the claim, which weighs in favor of a conclusion that this preamble phrase is not limiting. *See Arctic Cat Inc.*, 919 F.3d at 1329 (holding that the preamble in question

was not limiting because, *inter alia*, the preamble did not supply an antecedent basis for any terms in the body of the claim); *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d 1354, 1359 (Fed. Cir. 2010) (same).

A “review of the entirety of the patent” does not compel a different conclusion. *See Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989). The specification of the ’053 patent discloses embodiments of the invention a person of skill in the art would understand to be operable across a range of temperatures. For example, the specification teaches that “prevalent” plastic LED packages have an operational temperature limit of about 80° C and “[s]ome LED die . . . will operate at 120° C.” ’053 patent at 1:32–34. The specification never disclaims use of the invention with such LED packages. The specification also states the LED used in the invention “can be made by the low temperature co-fired ceramic on metal technique (LTCC-M),” a prior art technique. *Id.* at 1:54–56, 7:29–39. Reinforcing the flexible application of the invention with such devices, the specification states: “The system can be tailored to be compatible with devices including silicon-based devices, indium phosphide-based devices and gallium arsenide based-devices, for example, by proper choice of the metal for the support board and of the glasses in the green tapes.” *Id.* at 7:19–24. The patent goes on to explain why the “proper choice” of metal and glasses must be made: “The ceramic layers of the LTCC-M structure must be matched to the thermal coefficient of expansion of the metal support board.” *Id.* at 7:25–27. In other words, as the invention passes through a range of temperatures, the ceramic layers and metal support board must expand and contract at the same rate to avoid damage to the package. Thus, the teachings of the specification do not support a conclusion that the claimed invention must be operable above 200° C; it “can be tailored to be compatible with devices” operating at a range of temperatures.

The specific temperatures Respondents propose in their construction are described in only three places in the '053 patent. First, the Background of the Invention describes an “industry preference” for an LED package with operational temperature “of about 200° C.” '053 patent at 1:33–35. But an industry preference for an improvement over the prior art is not a declaration by the inventors about the scope of the invention. *See Textron Innovations Inc. v. Am. Eurocopter Corp.*, 498 F. App'x 23, 29 (Fed. Cir. 2012) (not selected for publication) (a claim preamble reciting an “improved replacement helicopter landing gear assembly” was not limited to replacement gear even though the background section of the patent said it would be “beneficial to have a replacement landing gear assembly that would have a substantially longer service life than the prior art landing gear assemblies”).

Next, the Summary of the Invention states the diode described in the patent “can operate at temperatures as high as 250° C.” '053 patent at 1:56–57. At best, this statement reflects the capability of a preferred embodiment. It is not a statement excluding all LED structures that cannot operate at 250° C from the invention. *See SunRace Roots Enter. Co. v. SRAM Corp.*, 336 F.3d 1298, 1304 (Fed. Cir. 2003) (where a specification stated that “each handgrip shift actuator contains a generally cylindrical cam member,” the claim term “shift actuator” did not require a cam member because the specification statement was merely a preferred embodiment).

Finally, the Abstract contains a similar statement that the LED package “can operate at temperatures as high as 250 C.” '053 patent at cover page. Like the statement in the Summary of the Invention, this statement merely reflects the capability of a preferred embodiment; it does not limit the invention. *See MEMS Tech. Berhad v. Int'l Trade Comm'n*, 447 F. App'x 142, 151 (Fed. Cir. 2011) (not selected for publication) (declining to limit claims based on language in the abstract

and summary sections because it did not represent “the full scope of the embodiments in the specification”).

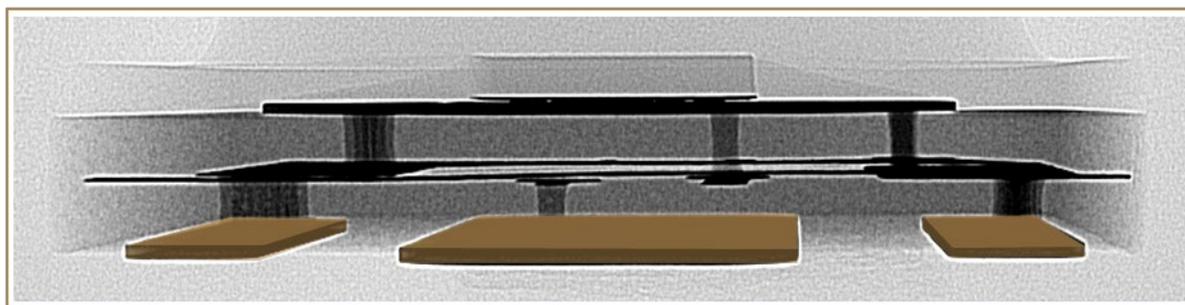
After reviewing the entire ’053 patent, including the language of the claim, I conclude that the preamble phrase “for high temperature operation” is “simply a ‘laudatory term’ that only sets forth the purpose of the claimed invention” and is not limiting. *See Allen Eng’g*, 299 F.3d at 1346–47.

With this understanding, the evidence demonstrates that the accused Nichia NCSE219B-V1 product is a packaged LED, as are the rest of the 219B series of products. *See, e.g., CX-4180C (Amo Dep.)* at 91:7–14.

**b) “a metal base, ”**

I construed the disputed term “base” as part of the claim construction order issued as Order No. 31. *See CC Order* at 22–24. In that order, I stated: “I will interpret the term ‘base’ according to its ordinary meaning in the art, which encompasses terms like ‘support board’ and ‘substrate.’” *Id.* at 24. I hereby incorporate the discussion of the term “base” on pages 22–24 of Order No. 31 as part of this initial determination.

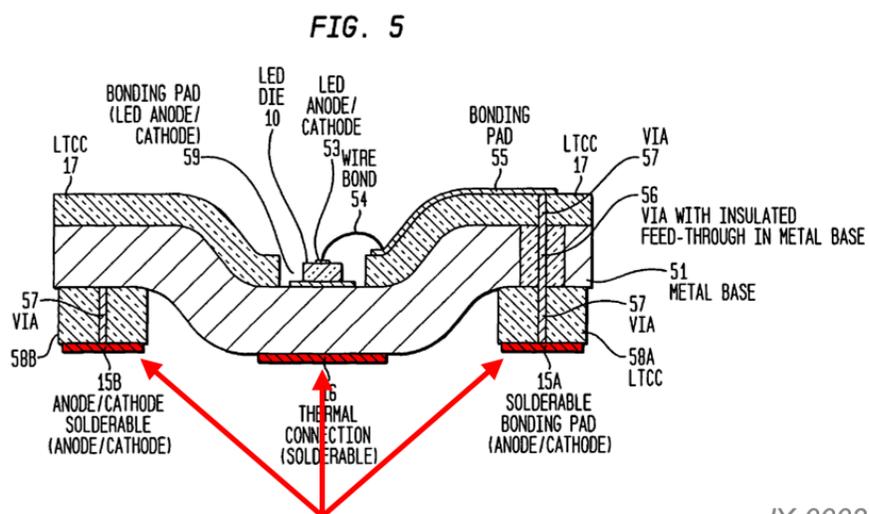
LSG argues that each of the accused Nichia products has the claimed “base” in the form of a “three-piece copper metal base” on the bottom of the LED package. *See CIB* at 10. In particular, LSG’s expert Dr. Kuball “noted that the heat spreading effect of the metal base in the Nichia 219B series, as well as its effect in lending strength to the ceramic layer by reducing cracking during soldering, are both closely matched with the ’053 Patent’s teachings regarding the ‘metal base.’” *Id.* at 12. Dr. Kuball used the following demonstrative exhibit—an x-ray side view of the NCSE219B-V1 product—to highlight the alleged “base” in brown:



CDX-0005C.25.

These brown-highlighted structures comprise a layer of copper approximately 30 microns thick, less than the thickness of a human hair. *See* Tr. (Kuball) 186:11–17; Tr. (Jokerst) 1181:12–14; CX-4179C (Tanaka Dep.) at 111:12–112:14; RX-0388C.0004 (delivery specification for accused product, per stipulation (JX-0432C); RX-0386C.0004 (same); RX-0389C.0004 (same); RX-0391C.0034 (same).

Based on the record evidence, I find that the three structures identified by LSG in the accused product are not a “base” as that term is used in the context of the ’053 patent. A comparison of CDX-0005C.25 and Figure 5 of the ’053 patent demonstrates that these structures correspond to the anode/cathode and thermal connection pads taught in the ’053 patent:



’053 patent at Figure 5 (annotated).

In my claim construction order, I stated that a person of ordinary skill in the art would not understand the Figure 5 elements 15A, 15B, and 16 (highlighted in red above) to constitute the claimed “base.” *See* CC Order at 24. That conclusion was informed by the teachings of the drawings and written description, which teach element 51 is a “metal base” and elements 15A, 15B, and 16 are connection pads distinct from the “base.” ’053 patent at 4:1–19, Fig. 5.

Figure 5 of the ’053 patent does not provide a direct analogy to the accused Nichia NCSE219B-V1 product, however. The accused product differs from the LED configuration shown in Figure 5 in that there is no structure corresponding to metal base 51 in the accused product. The closest analog to metal base 51 in the accused product is a ceramic substrate or support board. *See* Tr. (Kuball) 478:19–479:4; Tr. (Schubert) 935:21–936:4, 940:3–941:9; RX-0386C.0003 (delivery specification for accused product, per stipulation at JX-0432C); RX-0388C.0004 (same); RX-0389C.0004 (same); RX-0391C.0034 (same); CX-4178C (Miki Dep.) at 96:1–10; CX-4181C (Amo Dep.) at 122:15–123:14. Neither is made of metal. LSG is therefore left with the argument that the metal pads located below the ceramic substrate comprise the claimed “metal base.”

The metal pads identified by LSG are not the claimed “metal base” because the evidence shows that these copper structures are too thin and malleable to provide a supportive substrate to the LED package; it is the aforementioned ceramic structure that provides a supportive substrate to the LED package. *See* Tr. (Kuball) 477:15–479:4; Tr. (Schubert) 935:21–936:4, 939:11–21, 940:3–941:9; RX-386C.0003; RX-0388C.0004; RX-0389C.0004; RX-0391C.0034; CX-4181C (Amo Dep.) at 122:15–123:14; RX-0132C (Blonder Dep.) at 119:12–120:9. Nichia’s expert Dr. Schubert testified that, if a force were applied to a Nichia package and, “if that force is so

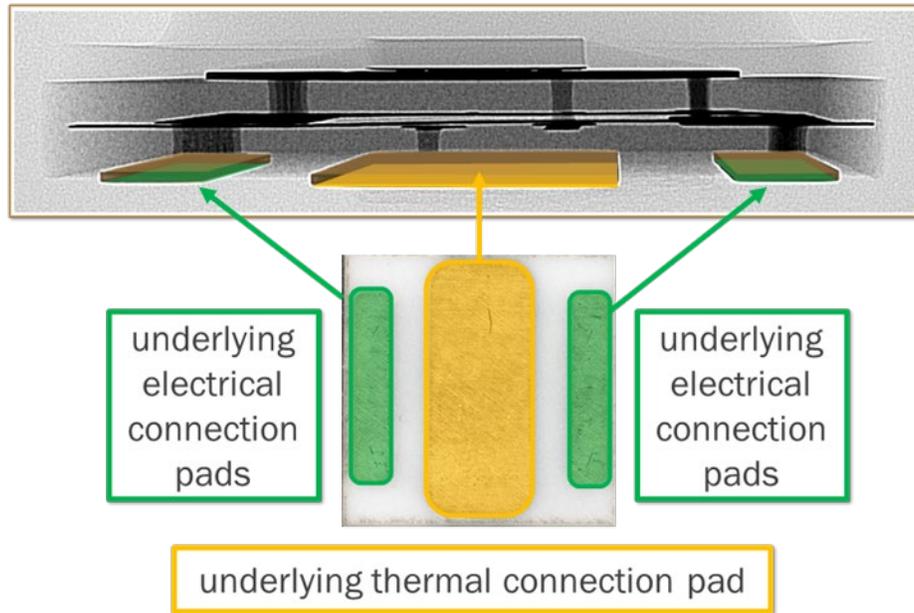
strong that it would crack the . . . ceramic base, then the metal could not prevent that . . . Metal is a soft, malleable material.” Tr. (Schubert) 939:11–21.

LSG’s argument that the “heat spreading effect” of copper demonstrates the metal pads are the claimed “base” is irrelevant because the claim language does recite any heat-spreading requirement for the “base.” *See* CIB at 12. Additionally, LSG’s argument that the copper pads protect the ceramic from cracking is premised on a misreading of deposition testimony given by Nichia witness Mr. Amo. *See id.* At his deposition, Mr. Amo testified that the copper in the metal pads protects against “soldering crack,” and not necessarily cracking of the ceramic package component. *See* CX-4181C (Amo Dep.) at 131:6–20 (testifying that copper “has an effect to suppress that soldering crack”); Tr. (Schubert) 938:10–939:21.

I therefore find that LSG has not shown that the accused Nichia NCSE219B-V1 product has a “metal base” as required by claim 1 of the ’053 patent.

***c) “the metal base including an underlying thermal connection pad and a pair of underlying electrical connection pads;”***

On the underside of the copper pads on the accused Nichia product (from the perspective of the x-ray image), “there is a layer of nickel plating, and around that area of nickel plating there’s the external surface which is plated with gold.” CX-4180C (Amo Dep.) at 18:2–9. LSG argues that the “nickel and gold plating below the copper constitutes the underlying thermal and electrical connection pads” recited in claim 1. CIB at 19. Dr. Kuball used the demonstrative below to illustrate this argument:



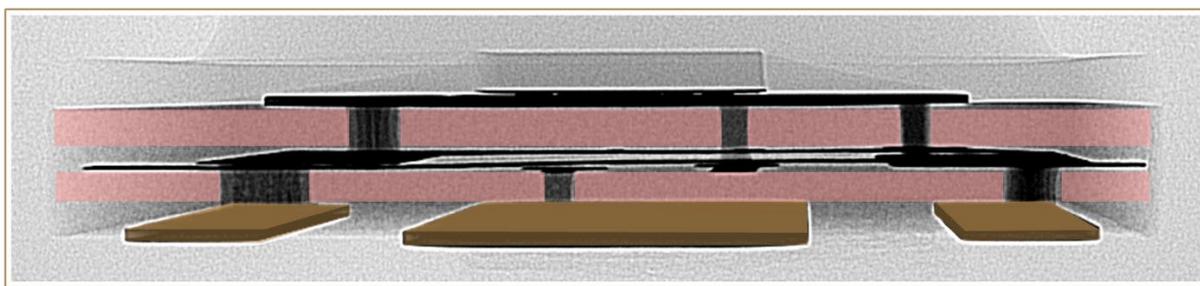
CDX-0005C.37.

Respondents do not dispute the three metal structures have “an underlying thermal connection pad and a pair of underlying electrical connection pads” as recited in claim 1. *See* RRB at 13–20.

Although I decline to find that these metal structures are the “base” recited in claim 1, I nevertheless conclude that the accused Nichia devices have “an underlying thermal connection pad and a pair of underlying electrical connection pads.”

***d) “a layer of ceramic overlying the metal base; and”***

The evidence shows that the accused Nichia product has a layer of alumina ceramic overlying the three copper structures that LSG argues is the claimed “base.” *See* Tr. (Kuball) 202:18–20. The following demonstrative exhibit provided by LSG’s expert Dr. Kuball identifies the ceramic layer in pink:

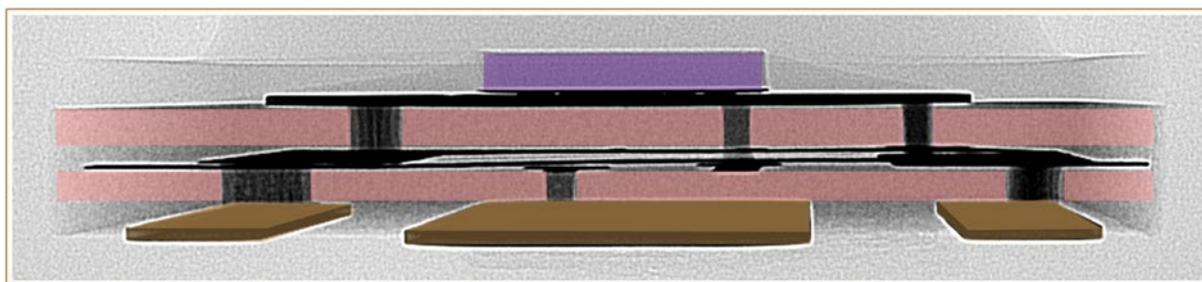


CDX-0005C.42.

Although I do not find that the accused Nichia product has a “base” as that term is used in claim 1, I do find the evidence shows “a layer of ceramic overlying . . .” the structure LSG calls the base.

*e) “an LED mounted on the ceramic layer, ”*

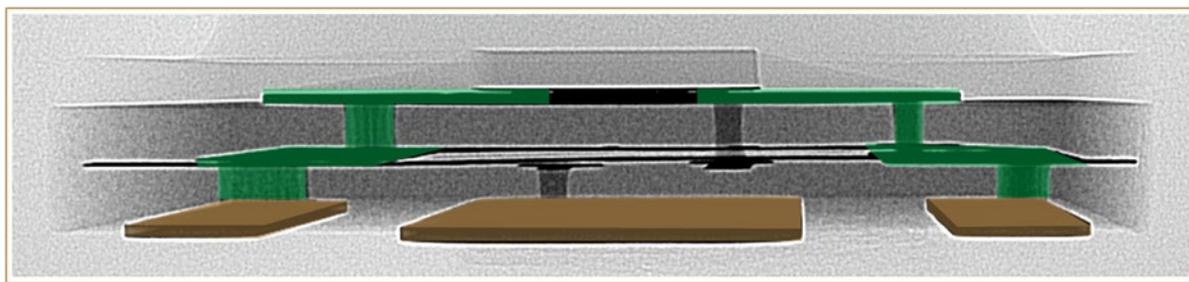
The undisputed evidence shows that the accused Nichia product comprises an LED mounted on the ceramic layer. *See* Tr. (Kuball) 203:4–17. The following demonstrative exhibit provided by LSG’s expert Dr. Kuball identifies the LED in purple:



CDX-0005C.47.

*f) “wherein the LED includes a pair of electrodes electrically connected to respective underlying electrical connection pads, ”*

The record evidence shows that the LED in the accused Nichia product includes “a pair of electrodes electrically connected to respective underlying electrical connection pads.” Tr. (Kuball) 203:18–204:11. This connection is illustrated in green in Dr. Kuball’s demonstrative exhibit reproduced below:



CDX-0005C.49.

***g) “and wherein the LED is thermally coupled to the metal base by one or more thermal vias, ”***

The parties disagree as to whether the LED in the accused Nichia product is thermally coupled<sup>9</sup> to the metal pads at the bottom of the package<sup>10</sup> by one or more thermal vias.<sup>11</sup> *See* CIB at 21–33; RRB at 24–32. As discussed more fully below, I find that the accused Nichia product does not satisfy this claim limitation because the accused vias are not “thermal vias” and because the accused vias do not thermally couple the LED to the metal pads.

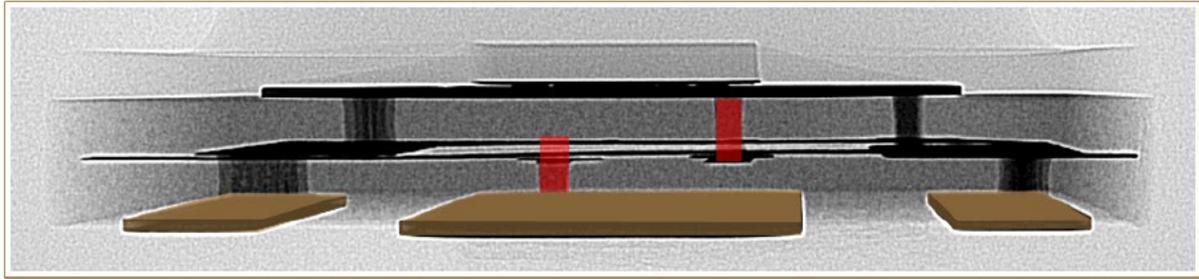
LSG’s expert Dr. Kuball provided an opinion stating that the accused Nichia 219B series products have two architectures for the accused thermal vias. Tr. (Kuball) 207:15–208:2. According to Dr. Kuball, the majority of accused 219B series models have two thermal vias, a top thermal via and a bottom thermal via. Tr. (Kuball) 208:10–210:8. Dr. Kuball illustrated his testimony with demonstrative exhibits of a cross-section x-ray view, an overhead x-ray view, and

<sup>9</sup> The parties agree that “thermally coupled” means “coupled by way of heat transfer.” *See* Tr. (Kuball) 204:19–24.

<sup>10</sup> LSG’s argument regarding this phrase assumes that the microscopically thin copper pads on the bottom of the accused Nichia packages correspond to the claimed metal “base.” I have rejected that position above. In this section I consider whether a thermal via couples the LED to the copper pads in the accused devices.

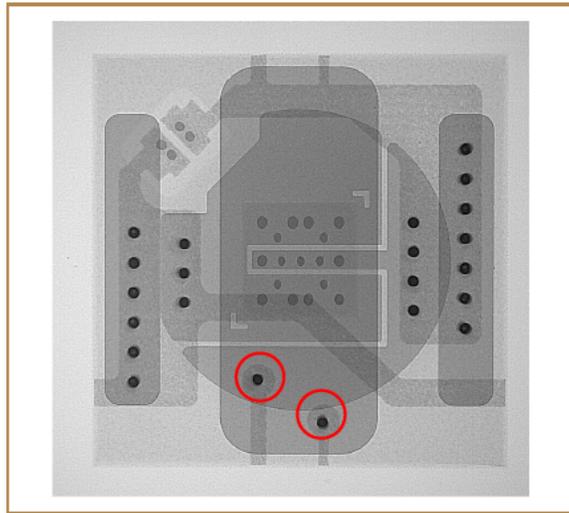
<sup>11</sup> The parties agree that the term “thermal vias” means “vias that enhance heat flow.” *See* CC Order at 25. The parties further agree that the word “via” is an acronym for “vertical interconnect access.” *See id.* at 25 n.8.

overhead schematic views of accused Nichia products. He marked the elements he concluded were thermal vias in red:



NCSE219B-V1 (CX-0589)

CDX-0005C.54.

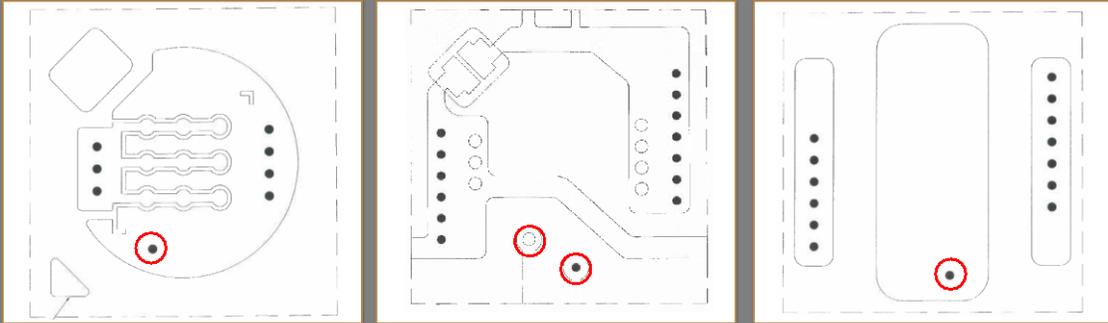


CDX-0005C.56.

## '053 Patent Claim 1—Nichia

1[e]: “and wherein the LED is thermally coupled to the metal base *by one or more thermal vias...*”

The vias thermally couple the LED to the metal base

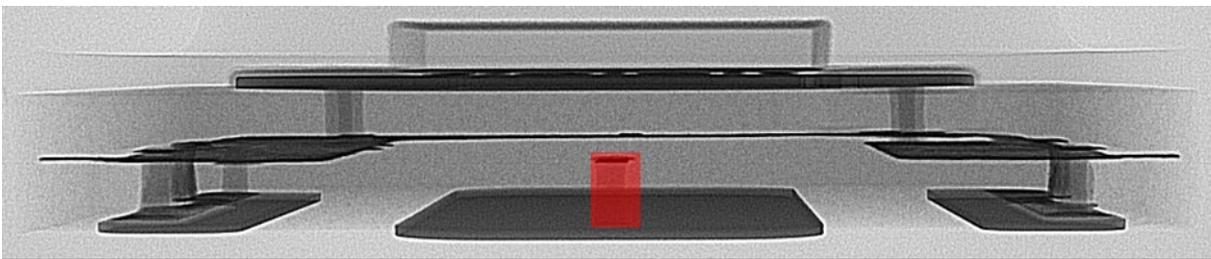


e.g., NCSE219B-V1, NCSA219B-V1, NCSB219B-V1, NCSG219B-V1, NVSL219BT-V1, NVSW219BT-V1

CDX-0005C.57

CDX-0005C.57.

Dr. Kuball also testified that a minority of accused 219B series models have only one thermal via in the bottom ceramic layer. Tr. (Kuball) 207:15–21, 208:22–23. He illustrated his testimony with the following demonstrative exhibit:



NVSW219B (CX-0671)

CDX-0005C.54.

LSG argues that, in both types of architectures, “the LED in the 219B series is thermally coupled through the bottom metallization and out of the pads at the very bottom of the package.” *See* CIB at 24 (citing Tr. (Kuball) 206:19–207:2). Note that Dr. Kuball’s annotations *do not* highlight a red path from the LED on top of the package to the metal pads on the bottom in any image. Instead, LSG argues that a thermal via can be achieved between the LED and the metal pads with “no direct physical connection between them.” *See id.* at 21. According to LSG, objects A and C can be thermally coupled without a physical connection if heat transfer occurs from object A to object C through intervening object B by way of the movement of photons. *See id.* (citing Tr. (Kuball) 204:25–205:12). LSG’s theory was echoed in Dr. Kuball’s testimony that “all vias in general will act as . . . thermal vias to some degree.” *See* Tr. (Kuball) 540:8–10.

Although this statement of the transitive property of heat may be correct in a theoretical context, it is not how a person of ordinary skill in the art would understand the claimed invention in the context of the ’053 patent teachings. The patent claim requires thermal coupling between the LED and the metal pads “by one or more thermal [vertical interconnect accesses],” not by just any intervening element. If LSG’s argument were accepted, anything that transferred any heat at all (and all elements do) would satisfy the limitation. Such an interpretation would read the required “thermal vias” out the claim and therefore must be rejected. *See Merck & Co. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005) (“A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.”).

Other elements identified by LSG as the alleged “thermal vias” are shown in the images below:



RDX-0005C.0021.

Again, the record does not establish that these vias (highlighted in red) provide heat transfer between the LED and the metal pads; instead the record shows these vias are provided for plating during the manufacturing process and for testing connection points. *See* Tr. (Kuball) 207:3–210:8; Tr. (Schubert) 949:3–951:8 (referring to RDX-0005C.0021); RX-0482 (inverted); RX-0483; RX-0629 (inverted); RX-0630; RX-0529 (inverted); RX-0531; *see also* JX-0432C. For instance, Nichia research scientist Mr. Tanaka testified at deposition that the accused vias are not for heat dissipation, but rather are used for plating. CX-4179C (Tanaka Dep.) at 13:7–14, 127:10–130:21. Even LSG’s expert Dr. Kuball testified that Nichia “likely [] would have used [the alleged via] for testing in some form.” Tr. (Kuball) 536:10–14.

LSG argues that the intended purpose of the accused vias is legally and factually irrelevant. CIB at 31 (citing *Marrin v. Griffin*, 599 F.3d 1290, 1294 (Fed. Cir. 2010) (“For apparatus claims, . . . generally patentability ‘depends on the claimed structure, not on the use or purpose of that structure.’”)) (citation omitted)). But the question here is whether a person of ordinary skill would understand the claimed “thermal via” to encompass any arbitrarily designated elements that theoretically could transfer even minuscule amounts of heat. The patent’s teachings answer that question. The ’053 patent teaches thermal vias actively “enhance[]” heat flow. ’053 patent at

Abstract, 1:51–53. The patent also teaches that thermal vias are “numbered and dimensioned to conduct heat.” *Id.* at 4:26–28. In this case, it is “entirely proper to consider the functions of an invention in seeking to determine the meaning of particular claim language.” *See Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed. Cir. 2005).

Other teachings in the ’053 patent confirm that any arbitrary element that conducts heat is not a “thermal via.” The ’053 patent distinguishes between “electrically conductive vias” and “thermal vias.” *Compare* ’053 patent at 2:54–57 and 6:35–37 *with id.* at 4:26–28. Even if thermal vias can fulfill an electrical role, they still must be positioned and dimensioned in sufficient numbers to fulfill their thermal role. *See* Tr. (Schubert) 951:23–955:3; *see* ’053 patent at Fig. 6 and 4:20–28.

The record evidence demonstrates that the vias identified by LSG would not provide thermal enhancement to the LED package. Tr. (Schubert) 949:3–951:22; CX-4180C (Amo Dep.) at 25:14–27:17, 78:7–79:8. Specifically, Nichia’s expert Dr. Schubert testified that a person of ordinary skill would understand these vias do not provide significant thermal improvement because of their narrow dimension and location near the package edge (as opposed to under the LED die). *See* Tr. (Schubert) 949:3–951:22. And Nichia’s witness Mr. Amo testified: “[T]here’s no via right . . . below the chip. Therefore, there’s no heat dissipation effect provided by [the] via.” CX-4180C (Amo Dep.) at 10:1–5, 78:7–79:8.

Other evidence demonstrates the vias do not measurably increase heat flow. For example, Dr. Schubert testified that he used a mathematical model to calculate the theoretical die temperature improvement due to the single alleged via in the NVSW219BT identified by Dr. Kuball. Dr. Schubert’s calculation took into consideration the dimension, location, orientation, and material properties of the LED, alleged vias, heat spreader, and ceramic substrate.

Tr. (Schubert) 959:2–962:12; *see* RX-0378C; RX-0391C; RX-0388C; RX-0389C. Dr. Schubert concluded that the alleged “thermal” via would have resulted in a change of LED chip temperature of only 0.02° C. Tr. (Schubert) 958:13–18.

Dr. Schubert performed a similar calculation for the accused products with two offset vias, such as those Dr. Kuball identified in the Nichia NCSE219B-V1. Dr. Schubert concluded that the temperature change would be only 0.04° C. Tr. (Schubert) at 959:19–959:11.

The minuscule temperature changes calculated by Dr. Schubert using a theoretical model are practically immeasurable in the real world, even using “gold standard” measurement techniques. *See* Tr. (Schubert) 959:12–20. Instrument calibration is limited to 1° C and results due to manufacturing variations among samples would not be distinguishable from a thermal variance as small as the ones Dr. Schubert calculated. *See* Tr. (Schubert) 958:13–961:8. According to Dr. Schubert, “for practical purposes, this change in temperature is zero.” *See* Tr. (Schubert) 961:9–23.

Furthermore, the evidence shows that the elements identified by LSG are not positioned in such a way as to “thermally couple[]” the LED to the metal base along a vertical path. The term “via” as used in the art is an acronym for “*vertical* interconnect access,” as all parties have agreed. *See* CC Order at 25 n.8 (emphasis added). Therefore, in order to be the claimed “thermal via,” the accused structure must vertically connect the LED to the metal base.

One of LSG’s demonstrative exhibits shows two views of three different LED packages. The alleged thermal vias are marked in red in both views:



RDX-0005C.0021 (images from RX-0482 (inverted); RX-483; RX-0629 (inverted); RX-0630; RX-0529 (inverted); RX-0531); *see also JX-0432C.*

The top image for each package is a side view, showing a hemispherical enclosure and a flat LED beneath the center of the dome. The bottom image is a top view, in which the LED is in the center of the circle. As can be seen, none of the alleged thermal vias are positioned proximate to the LED; they are at best on the periphery of the circular LED enclosure. *See Tr. (Schubert) 949:3–951:11, 967:4–969:22.* Thus, the alleged vias are not positioned to provide a vertical thermal coupling from the LED to the metal pads.

The weight of the record evidence shows that the elements LSG calls thermal vias do not provide a measurable change in die temperature. *See Tr. (Schubert) 948:1–22, 951:23–955:3, 959:12–961:23.* They are not positioned to provide a vertical thermal coupling between the LED and the metal pads. For all of the reasons discussed above, I find that the accused structure is not the claimed “thermal via.”

***h) “and thermally coupled through the metal base to the thermal connection pad.”***

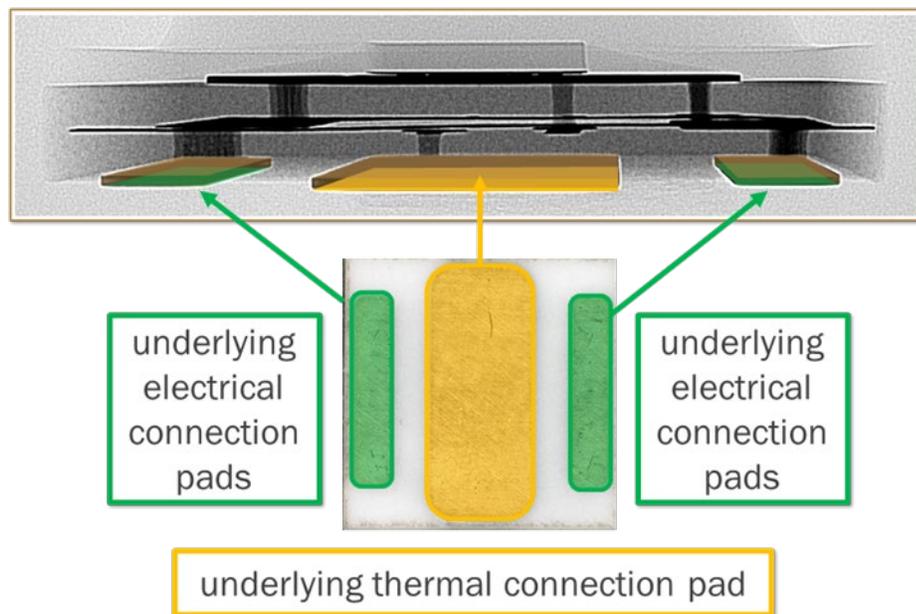
The evidence indicates that the LED in the accused Nichia product is “thermally coupled” through the underlying copper pads to the thermal connection pad. *See Tr. (Kuball) 216:10–217:1.*

**3. Claim 2**

Dependent claim 2 of the '053 patent reads:

2. The packaged LED of claim 1 wherein the underlying electrical connection pads and the underlying thermal connection pad are coplanar to permit surface mounting on corresponding pads of a PC board.

As illustrated below, LSG has adduced evidence showing that the underlying connection pads and the underlying thermal connection pad in the accused Nichia product are coplanar. *See* Tr. (Kuball) 226:2–228:4.



CDX-0005C.37.

Respondents do not dispute that this claim limitation is satisfied. *See* RRB at 1–43.

I therefore find LSG has demonstrated that the additional limitation recited in claim 2 has been satisfied. Nevertheless, because there is no infringement of claim 1 from which claim 2 depends, there is no infringement of claim 2.

**4. Claim 3**

As discussed above in Section I.A, LSG asserted claim 3 of the '053 patent in its Amended Complaint, and that claim remains at issue in this investigation. LSG did not argue infringement

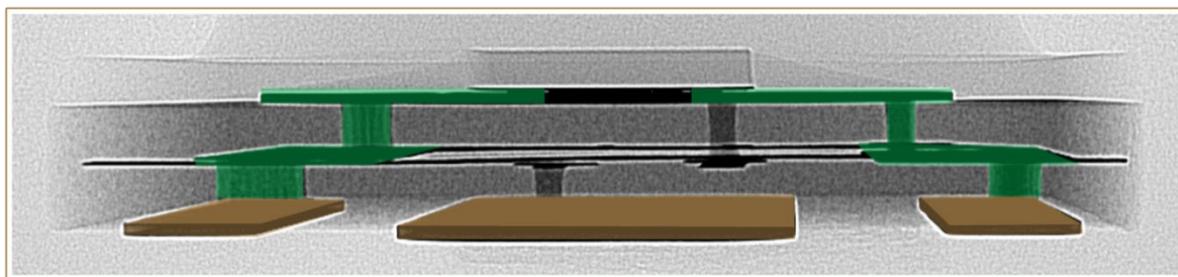
of claim 3 in its post-hearing brief. *See* CIB at 4–39. Any allegation of infringement of claim 3 of the '053 patent is therefore deemed abandoned or withdrawn pursuant to my Ground Rule 14.1. Order No. 2 at 26 (June 25, 2019) (“Any contentions for which a party has the burden of proof that are not set forth in detail in the post-hearing initial brief shall be deemed abandoned or withdrawn.”).

**5. Claim 5**

Dependent claim 5 of the '053 patent reads:

5. The packaged LED of claim 1 wherein at least one electrode of the LED is connected to one of the underlying electrical connection pads by an electrical path including the metal base.

As illustrated below, LSG has shown that at least one electrode of the LED is connected to one of the underlying electrical connection pads by an electrical path that includes the copper structure LSG contends is the “base” recited in claim 1. *See* Tr. (Kuball) 228:5–18.



CDX-0005C.85.

Respondents do not dispute that this limitation is satisfied. *See* RRB at 1–43.

I therefore find LSG has demonstrated that the additional limitation recited in claim 5 has been satisfied. Nevertheless, because there is no infringement of claim 1 from which claim 5 depends, there is no infringement of claim 5.

**6. Claims 6 and 21**

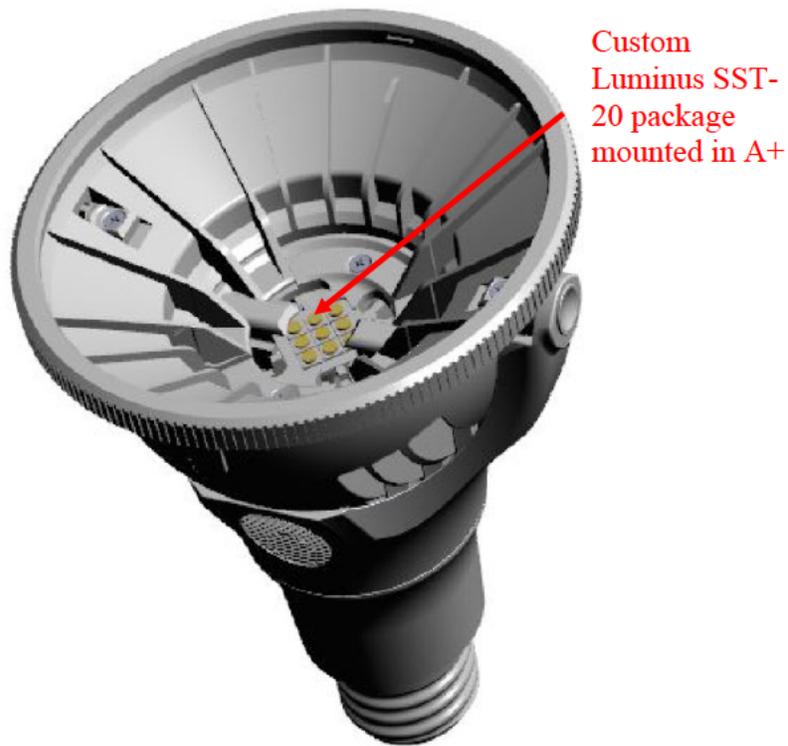
As discussed above in Section I.A, LSG asserted claims 6 and 21 of the '053 patent in its Amended Complaint, and those claims remain at issue in this investigation. LSG did not argue infringement of claims 6 and 21 in its post-hearing brief. *See* CIB at 4–39. Any allegations of infringement of claims 6 and 21 of the '053 patent are therefore deemed abandoned or withdrawn pursuant to my Ground Rule 14.1. Order No. 2 at 26 (June 25, 2019) (“Any contentions for which a party has the burden of proof that are not set forth in detail in the post-hearing initial brief shall be deemed abandoned or withdrawn.”).

**B. Technical Prong of the Domestic Industry Requirement**

**1. The '053 Domestic Industry Product**

LSG argues that the Series A+ PAR30 LED Gimbal Lamp, which includes a custom Luminus SST-20-W40H-J4401-LS (“SST-20”) LED package, practices claims 1, 2, and 5 of the '053 patent. CIB at 42 (citing Tr. (Maxik) 659:15–660:17); *see also* CIB at 42–59. For the reasons discussed below, I find that LSG has not shown that the SST-20 practices the invention of any claim of the '053 patent.

A diagram of the Series A+ domestic industry product is shown below, with nine custom Luminus SST-20 packages:



JX-0224C.

**2. Claim 1**

As set forth below, the evidence demonstrates that the SST-20 does not practice claim 1 of the '053 patent.

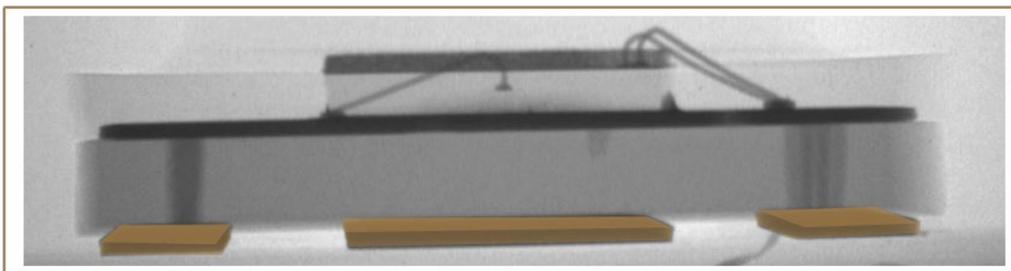
***a) “A packaged LED for high temperature operation comprising: ”***

For reasons discussed in the infringement section above, the preamble limitation “for high temperature operation” is not limiting. The SST-20 is “a packaged LED.” CX-0964.

***b) “a metal base, ”***

LSG argues that the “metal base” in in the SST-20 is a “three-piece copper metal base which has plated and underlying thermal connection pad and electrical connection pads.” CIB at 43–44 (citing Tr. (Kuball) 242:21–243:4). LSG’s expert Dr. Kuball testified that these copper

structures in the SST-20 are at least as thick as the copper structures identified as the “base” in the accused Nichia 219B series of products. Tr. (Kuball) 243:5–21. An annotated side-view x-ray image of the SST-20 is shown below, with the alleged “base” colored in brown:



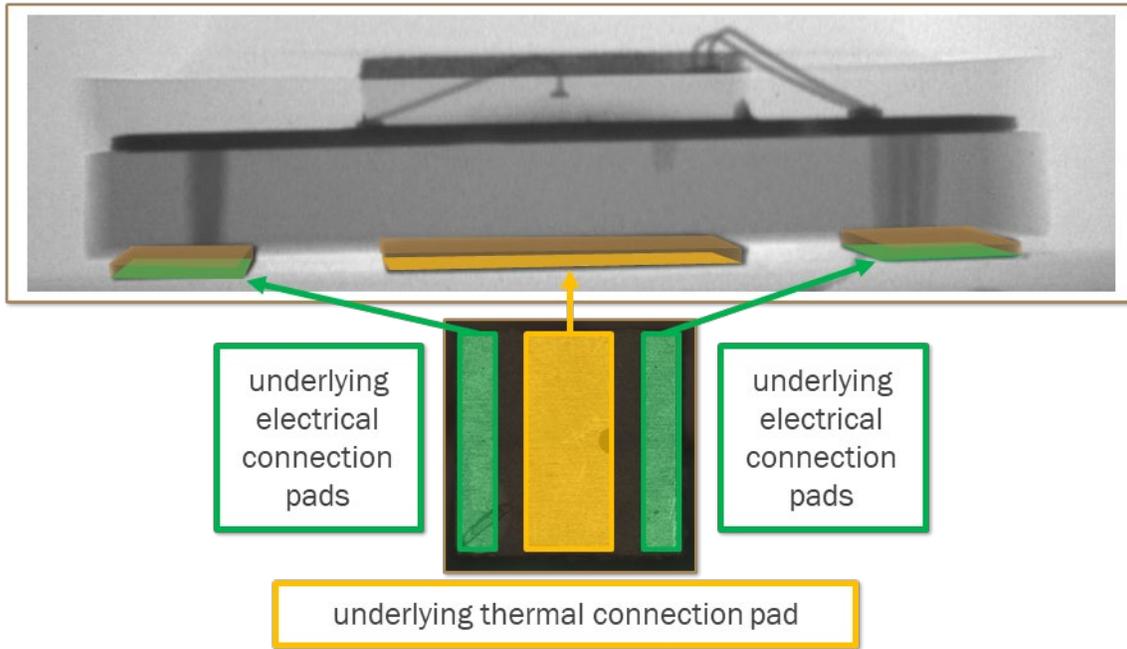
CDX-0005C.110.

For reasons similar to those discussed in the infringement section above, I find that the SST-20’s pads are not a “metal base.” The substrate of the SST-20 is made of ceramic; the thin, separate copper pads identified by LSG are plated onto the ceramic substrate and do not provide a supportive structure for the LED package. See Tr. (Schubert) 972:4–974:23, 240:12–21, 247:9–12; JX-0043C at 5 (claim chart for “Series A+™ PAR30 LED Gimbal Lamp” containing “custom Luminus LED package”); CX-0964; JX-0119 at LSGITC\_0749041 (“Luminus SST-20-W Product Datasheet”).

***c) “the metal base including an underlying thermal connection pad and a pair of underlying electrical connection pads; ”***

Similar to the infringement arguments put forth for the accused Nichia products, LSG argues that the copper pads of the SST-20 have an underlying thermal connection pad and a pair of underlying electrical connection pads. See CIB at 46. The bottom surfaces of the copper pads are silver-plated, and LSG’s expert Dr. Kuball testified that the bottom surfaces constitute the claimed underlying thermal and electrical connection pads. JX-0119 at 14; Tr. (Kuball) 242:15–243:2.

Dr. Kuball used the demonstrative below to illustrate this argument:



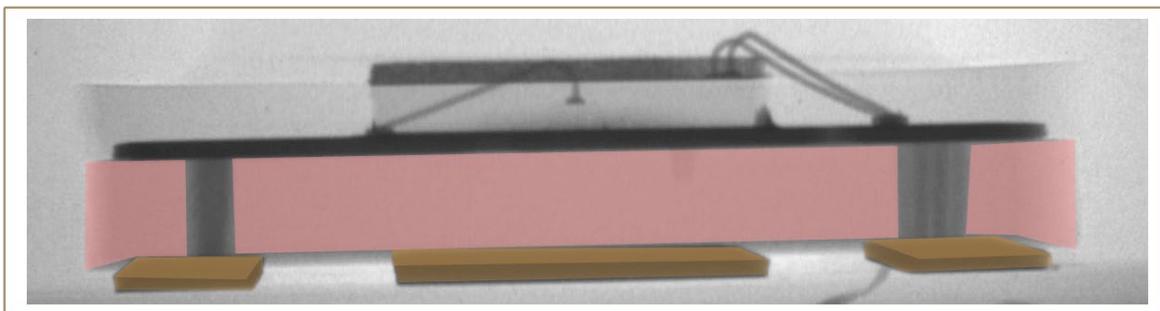
CDX-0005C.109 (annotating CX-0964 with the alleged electrical connection pads in green and alleged thermal connection pad in yellow).

Respondents do not dispute the three copper structures have “an underlying thermal connection pad and a pair of underlying electrical connection pads” as recited in claim 1. *See* RRB at 13–20.

I conclude that the SST-20 devices include “an underlying thermal connection pad and a pair of underlying electrical connection pads.” The entire limitation is not satisfied, however, because the underlying connection pads are not part of a metal base, as claim 1 requires.

***d) “a layer of ceramic overlying the metal base; and ”***

The evidence shows that the SST-20 has a layer of ceramic overlying the three copper structures identified by LSG as the claimed “base.” *See* Tr. (Kuball) 227:5–12. The following demonstrative exhibit provided by LSG’s expert Dr. Kuball identifies the ceramic layer in pink:

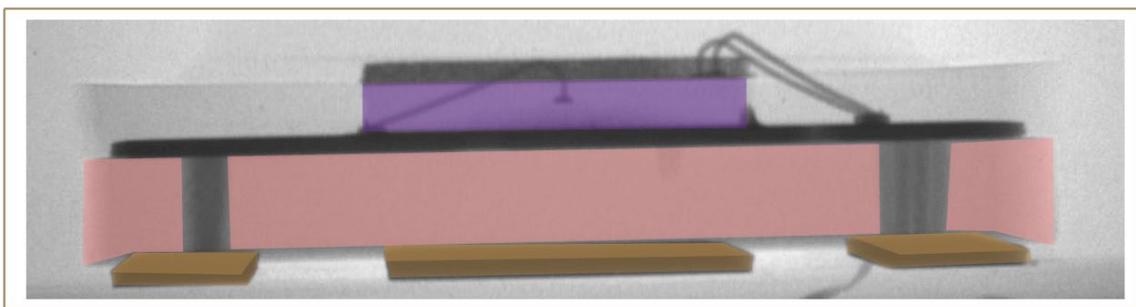


CDX-0005C.113.

I conclude that that the SST-20 devices include “a layer of ceramic overlying” three copper connection pads. The entire limitation is not satisfied, however, because the ceramic layer does not overlie a metal base, as claim 1 requires. As noted above, the SST-20 devices have no metal base.

*e) “an LED mounted on the ceramic layer, ”*

The undisputed evidence shows that the SST-20 comprises an LED mounted on the ceramic layer. Tr. (Kuball) 247:13–19. The following demonstrative exhibit provided by LSG’s expert Dr. Kuball identifies the LED in purple:

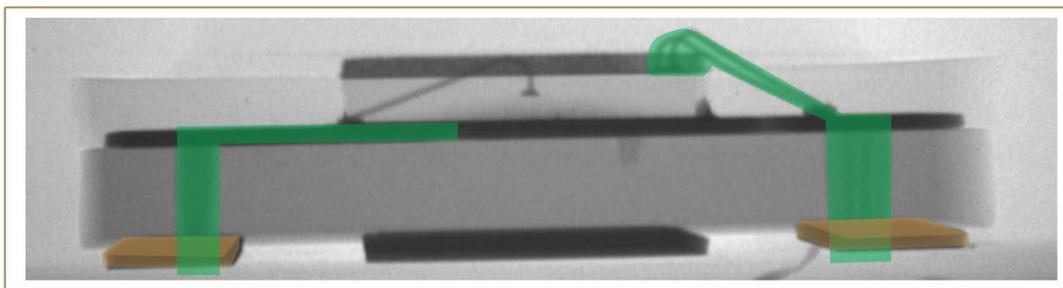


CDX-0005C.115.

*f) “wherein the LED includes a pair of electrodes electrically connected to respective underlying electrical connection pads, ”*

The record evidence shows that the LED in the SST-20 includes “a pair of electrodes electrically connected to respective underlying electrical connection pads.” Tr. (Kuball)

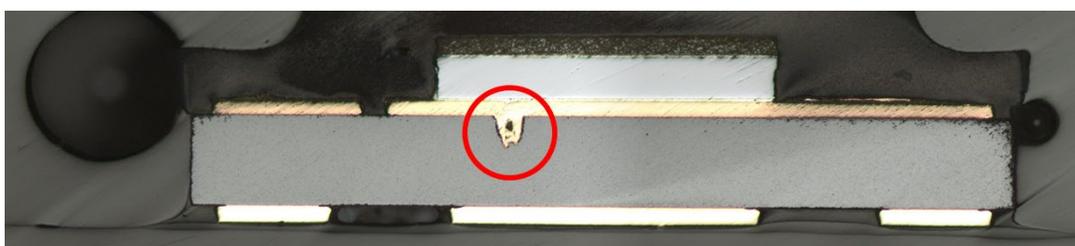
247:24–248:5. This connection is illustrated in green in Dr. Kuball’s demonstrative exhibit reproduced below:



CDX-0005C.117.

***g) “and wherein the LED is thermally coupled to the metal base by one or more thermal vias, ”***

LSG argues that its SST-20 satisfies this claim limitation. CIB at 48–58. LSG’s corporate witness Fredric Maxik testified that LSG specifically ordered the manufacture of a custom version of the SST-20 package that includes a “thermal via.” Tr. (Maxik) 657:12–660:17. LSG argues that the “thermal via” in the custom SST-20 package extends from directly below the LED die into the top portion of the ceramic layer. CIB at 48. An annotated cross-section image of the custom SST-20 package is shown below, with the alleged thermal via circled in red:

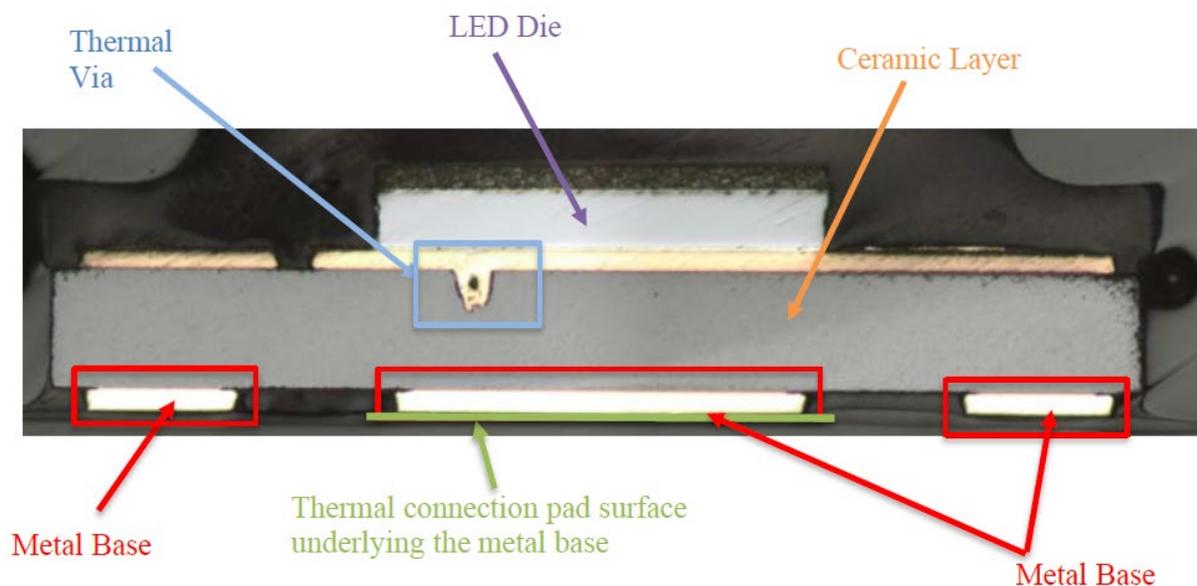


CX-0964 (Luminus SST-20 Images).

For reasons similar to those discussed in the infringement section, I find that the SST-20 does not have a “thermal via.”

As an initial matter, LSG’s alleged “thermal via” is not a via as that term is understood in the art. The parties have agreed that “via” is an acronym for “vertical interconnect access.” *See*

CC Order at 25 n.8. The alleged thermal via can be seen in the following figure from LSG’s claim charts:



Side-View Cross Section of Luminus LED Package

JX-0043C at LSGITC\_1431495.

It is interesting to note that, of the many sample SST-20s reviewed by expert witnesses Drs. Kuball and Schubert, only one sample contains the alleged thermal via structure. *See* Tr. (Schubert) 976:4–977:8, 977:23–978:18; JX-0043C (LSG’s claim chart incorporating images from CX-0964); RX-0086C (Respondents’ images of SST-20); RX-0080C (Declaration accompanying Respondents’ images). Respondents speculate that the alleged via is in actually a “singular manufacturing defect” because of its shape, the presence of a void therein, and its presence in only one of the sample SST-20s. *See* RRB at 36–38. Indeed, many of LSG’s own x-ray images of the SST-20 fail to show the alleged via. *See* CX-0964 at LSGITC\_1434588 (showing Complainants’ images of DI product), LSGITC\_1434590, LSGITC\_1434589. The weight of the evidence thus

indicates the alleged thermal via that LSG relied upon at the hearing is a singular manufacturing defect, and I so find.

Defect or not, the alleged thermal via<sup>12</sup> is not a via at all because it does not interconnect elements through an intervening layer; it only extends one third of the way down into the ceramic substrate and does not connect the LED die to anything else. *See* Tr. (Kuball) 500:24–503:1.

Named inventor Dr. Blonder also testified that a structure like the one present in the SST-20 would not be a “via” to a person of skill in the art:

Q. Would you agree that for something to be considered a via, it has to interconnect two faces of a layer?

\* \* \*

A. A via connects -- I don't know, faces of a layer might be restrictive. A via connects two things together, usually through an intermediate -- an intermediate area, connects two things through an intermediate area. They might be faces, they might not be faces.

\* \* \*

A. Typically in a semiconductor context, a via would be connecting two layers together and where it emerges into the upper and lower layer, it would be, in general, planar.

Q. So if you had a layer of ceramic with a divot or indentation in the top surface of the layer ceramic and the divot or indentation didn't reach the bottom surface of that layer of ceramic, would you consider that divot or indentation to be a via?

\* \* \*

A. It would be helpful if you could show me a drawing because I'm not sure I understand what you're describing. So if you could sketch that or show me an example of what you're discussing, I could help.

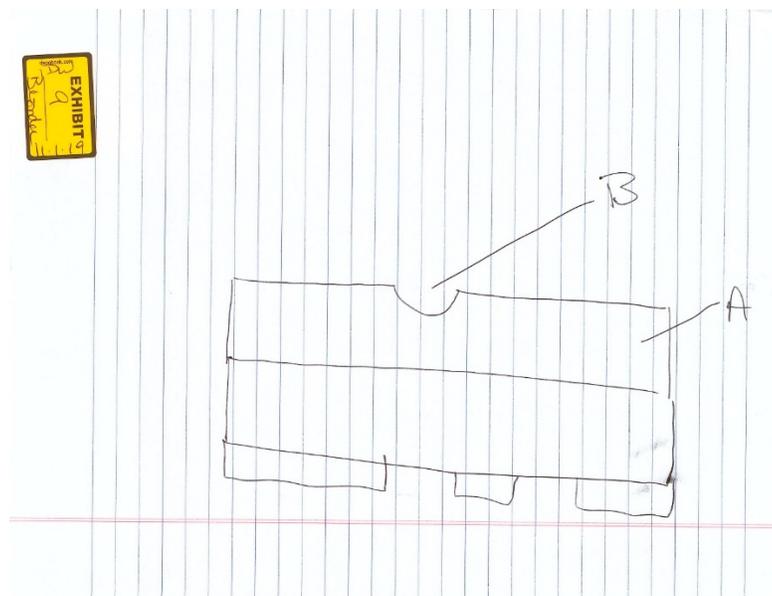
Q. Sure.

MR. LUCAS: You can mark this as Exhibit 9.

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<sup>12</sup> Respondents refer to the alleged via as a “divot.” *See, e.g.*, RRB at 33.

(Exhibit 9, Hand-drawn diagram, marked for identification.)



MR. LUCAS: My poor drawing.

Q. So if A is a layer of ceramic, and B would be that divot or indentation that I was trying to describe in my hypothetical –

A. Right.

Q. -- is that a via, is B a via?

A. Is B a via? B would not be considered a via.

RX-0132C (Blonder Dep.) at 29:19–31:15 (objections omitted); RX-1256 (Blonder Dep. Ex. 9).

And not only is the accused structure not a via, it would not be a “thermal” via because the structure does not enhance thermal conductivity. Specifically, a person of ordinary skill would understand there would not be a thermal enhancement from the alleged via owing to the structure’s location, diameter, and singular number. *See* Tr. (Kuball) 496:12–15; Tr. (Schubert) 974:24–976:3, 978:25–979:6, 980:6–11; JX-0043C; RX-0080C; RX-0086C.

Furthermore, the evidence shows that the LED is not “thermally coupled to the metal base by” the alleged thermal via. Although the accused structure is located below the LED, it does not

about the thermal connection pad. *See* Tr. (Schubert) 979:22–980:5. If this were a thermal coupling, everything in the LED package is a thermal coupling, rendering the term meaningless.

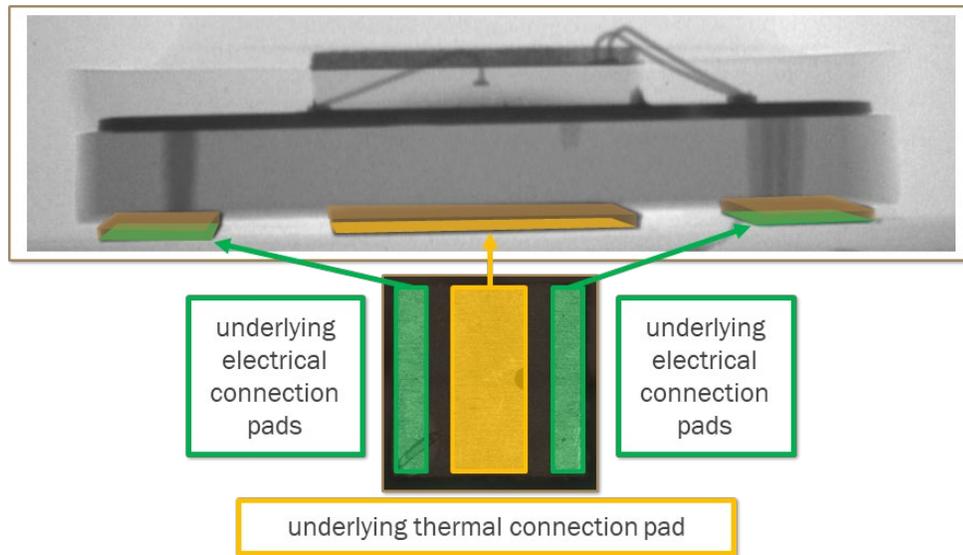
For all of the reasons discussed above, I find that LSG has not demonstrated that the SST-20 domestic industry products have the claimed “thermal via.”

***h) “and thermally coupled through the metal base to the thermal connection pad.”***

The evidence indicates that the LED in the SST-20 is “thermally coupled” through the underlying copper pads to the thermal connection pad. *See* Tr. (Kuball) 256:15–25.

**3. Claim 2**

As illustrated below, LSG has adduced evidence showing that the underlying connection pads and the underlying thermal connection pad in the SST-20 are coplanar. *See* Tr. (Kuball) 257:1–11.



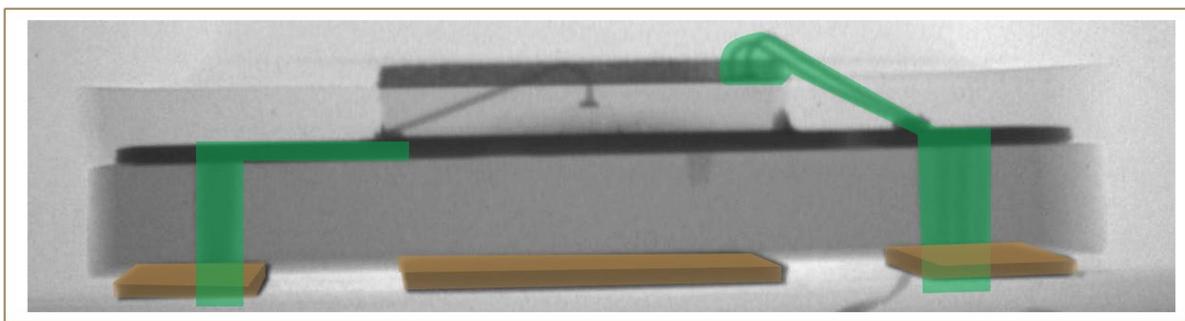
CDX-0005C.109

Respondents do not dispute that this claim limitation is satisfied. *See* RRB at 1–43.

I therefore find LSG has demonstrated that the additional limitation recited in claim 2 has been satisfied. Nevertheless, because the SST-20 does not practice claim 1, from which claim 2 depends, it also does not practice claim 2.

#### 4. Claim 5

As illustrated below, LSG has shown that at least one electrode of the LED is connected to one of the underlying electrical connection pads by an electrical path that includes the copper structure LSG contends is the “base” recited in claim 1. *See* Tr. (Kuball) 257:24–258:9.



CDX-0005C.138.

Respondents do not dispute that this limitation is satisfied. *See* RRB at 1–43.

I therefore find LSG has demonstrated that the additional limitation recited in claim 5 has been satisfied. Nevertheless, because the SST-20 does not practice claim 1, from which claim 5 depends, it also does not practice claim 5.

### C. Validity

#### 1. Obviousness: Harrah in view of Griffin

Respondents argue that claims 1, 2, and 5 of the '053 patent are rendered invalid as obvious in view of the prior art references Harrah and Griffin.<sup>13</sup> RIB at 1–23. As discussed below, I find

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<sup>13</sup> U.S. Patent No. 6,498,355 to Harrah et al. (“Harrah”) (RX-0010) was filed October 9, 2001, and issued December 24, 2002, and is prior art under 35 U.S.C. §§ 102(a), (e). International Patent Application No. PCT/US00/12720 filed by Robert T. Griffin (“Griffin”) (RX-0016) was published November 16, 2000, and is prior art under § 102(b).

that Respondents have not met their burden to show, by clear and convincing evidence, that the '053 patent claims are obvious in view of the prior art.

The preamble of claim 1 recites: “A packaged LED for high temperature operation comprising . . . .” As discussed above, I have determined that the preamble limitation “for high temperature operation” is not limiting. I therefore turn to whether the structure recited in claim 1 is disclosed in Harrah.

With respect to the “metal base” limitation of claim 1, Respondents argue:

[The metal pads accused by LSG] do not constitute a “metal base” because, *inter alia*, they are too thin, are not a substrate or support board, are plated onto the actual substrate (a *ceramic* substrate), and are explicitly excluded by the ALJ’s claim construction. If such pads were found to constitute a metal base, however, then Harrah, disclosing the same structures, discloses the limitation, “a metal base, the metal base including an underlying thermal connection pad and a pair of underlying electrical connection pads.”

With regard to this limitation, Dr. Leiby testified that, if the ALJ adopts Dr. Kuball’s opinion and infringement theory as to the “metal base” limitation, the limitation is met by Harrah’s contact pads 42, 44 and 46. The structures to which Dr. Leiby referred, Bottom N-Contact 42, Bottom P-Contact 44, and Thermal Contact 46, are shown in Harrah’s Figure 4 (above). Dr. Leiby further explained that Bottom N-Contact 42, Bottom P-Contact 44, and Thermal Contact 46 are shown in a bottom side view of LED assembly 58 in Harrah’s Figure 5 (below), and labeled N-Contact 60, P-Contact 62, and Thermal Contact 64, respectively.

RIB at 4 (emphasis original).

As discussed previously in my infringement analysis, I rejected a factual finding that a microscopically thin layer of metal electroplated onto a copper core constitutes a metal base. I similarly find that the microscopically thin pads identified by Respondents in Harrah are not a “metal base.”

Respondents present no argument or evidence that Griffin discloses a “packaged LED for high temperature operation” or a “metal base.” *See* RIB at 2–3.

Because Respondents have not shown every element of the claimed invention in the prior art, I find that Respondents have failed to show, clearly and convincingly, that claim 1 of the '053 patent is invalid as obvious based on Harrah in view of Griffin. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1164 (Fed. Cir. 2006) (stating that motivation to combine and reasonable expectation of success is considered in an obviousness analysis only “if all the elements of an invention are found in a combination of prior art references”); *see also Proctor & Gamble Co. v. Teva Pharm. USA, Inc.*, 566 F.3d 989, 994 (Fed. Cir. 2009) (“A party seeking to invalidate a patent based on obviousness must demonstrate “by clear and convincing evidence that a skilled artisan would have been motivated to combine the teaching of the prior art references to achieve the claimed invention . . .”).

Claims 2 and 5 also require a “packaged LED for high temperature operation” or a “metal base” by virtue of their dependency from claim 1. For the same reasons noted with respect to claim 1, I find that Respondents have failed to show, clearly and convincingly, that claims 2 and 5 of the '053 patent are invalid as obvious based on Harrah in view of Griffin. *See Medichem*, 437 F.3d at 1164; *Proctor & Gamble*, 566 F.3d at 994.

## **V. THE '421 PATENT**

### **A. Infringement**

#### **1. The Accused Products**

As detailed below, LSG accuses two categories of products of infringing the '421 patent: (1) LED packages made by manufacturers Nichia, OSRAM, Cree, and Lumileds,<sup>14</sup> and

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<sup>14</sup> LSG collectively refers to Nichia, OSRAM, Cree, and Lumileds as the “LED Manufacturers.” *See, e.g.*, CIB at 61.

(2) luminaires which incorporate those LED packages or LED packages from manufacturers who have not been named as respondents in this investigation.

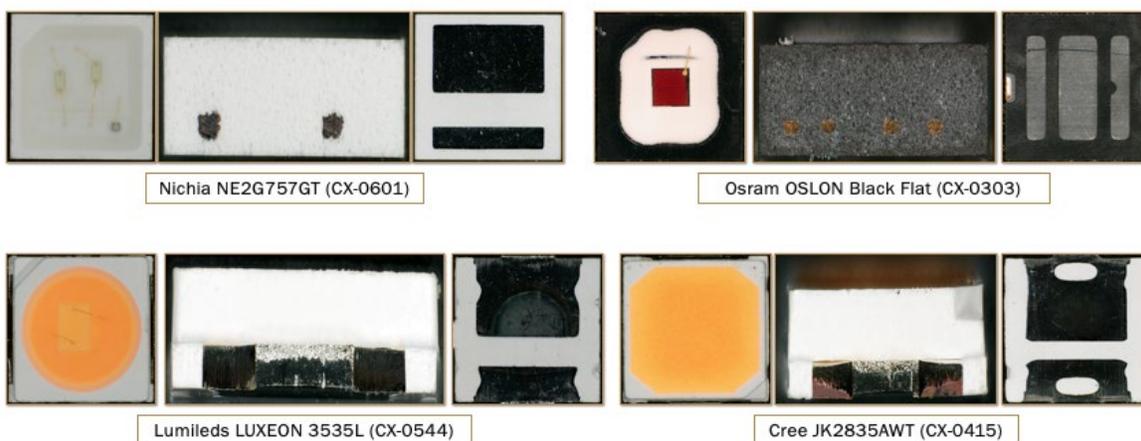
**a) The LED Manufacturers**

LSG contends that the sale and importation of products from Nichia, OSRAM, Cree, and Lumileds infringe claims 1 and 6 of the '421 patent. CIB at 61–62, 120–54. LSG and its expert Dr. Kuball focus their infringement analysis on the following products, which they assert are representative of other products from the LED Manufacturers:

- Nichia NE2G757GT
- OSRAM OSOLON Black Flat
- Cree JK2835AWT
- Lumileds LUXEON 3535L

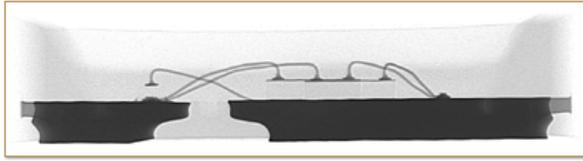
See CIB at 61–62. LSG refers to these products collectively as the “LED Manufacturer Representative '421 Products.” See *id.* at 61-62.

Optical images of the top, side, and bottom of each of these products are reproduced below:

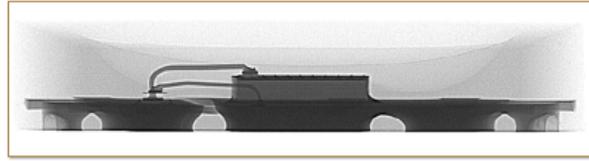


CDX-0005C.143.

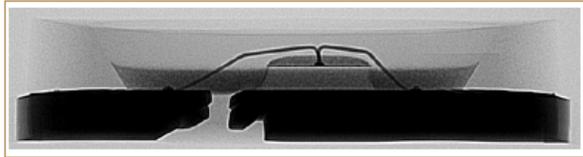
X-ray cross-section views of each product are reproduced below:



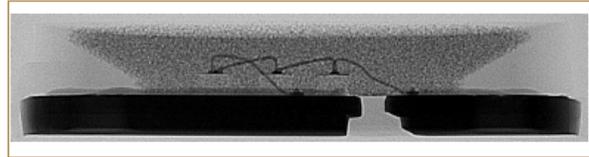
Nichia NE2G757GT (CX-0601)



Osram OSOLON Black Flat (CX-0303)



Lumileds LUXEON 3535L (CX-0544)



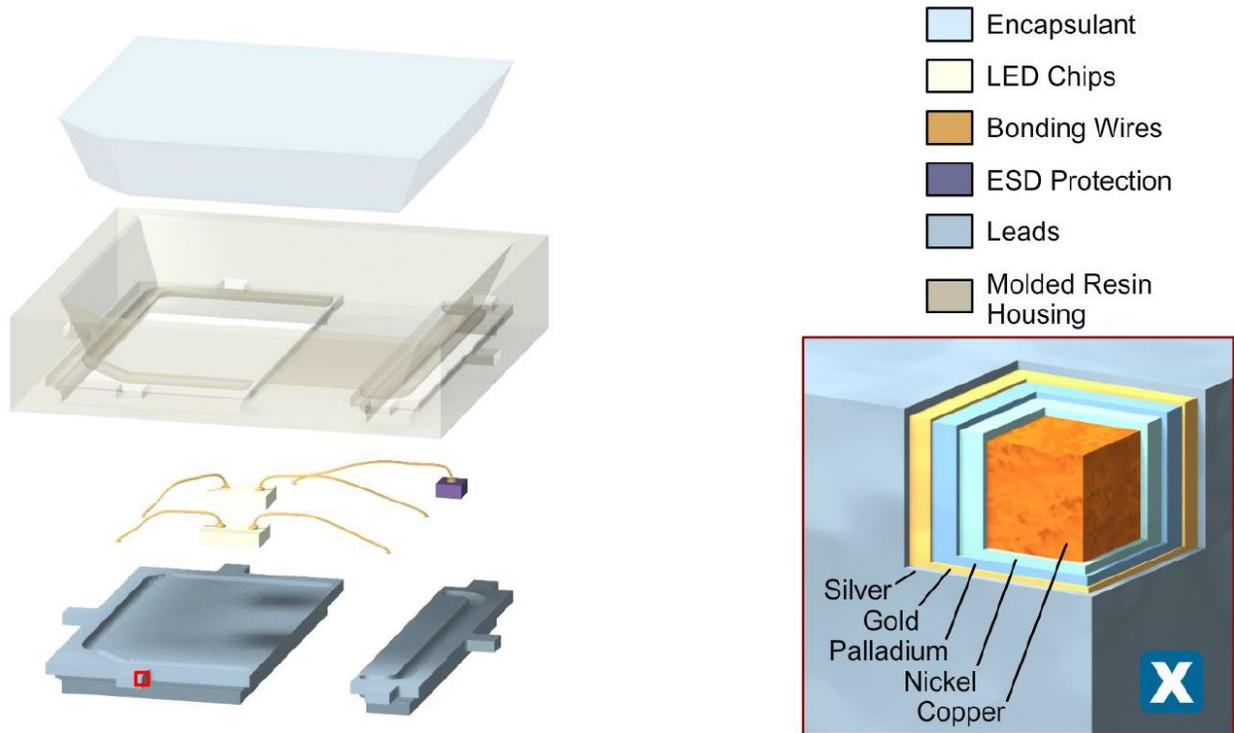
Cree JK2835AWT (CX-0415)

CDX-0005C.144.

Additional accused products from Nichia, OSRAM, Cree, and Lumileds are discussed in more detail in the sections below.

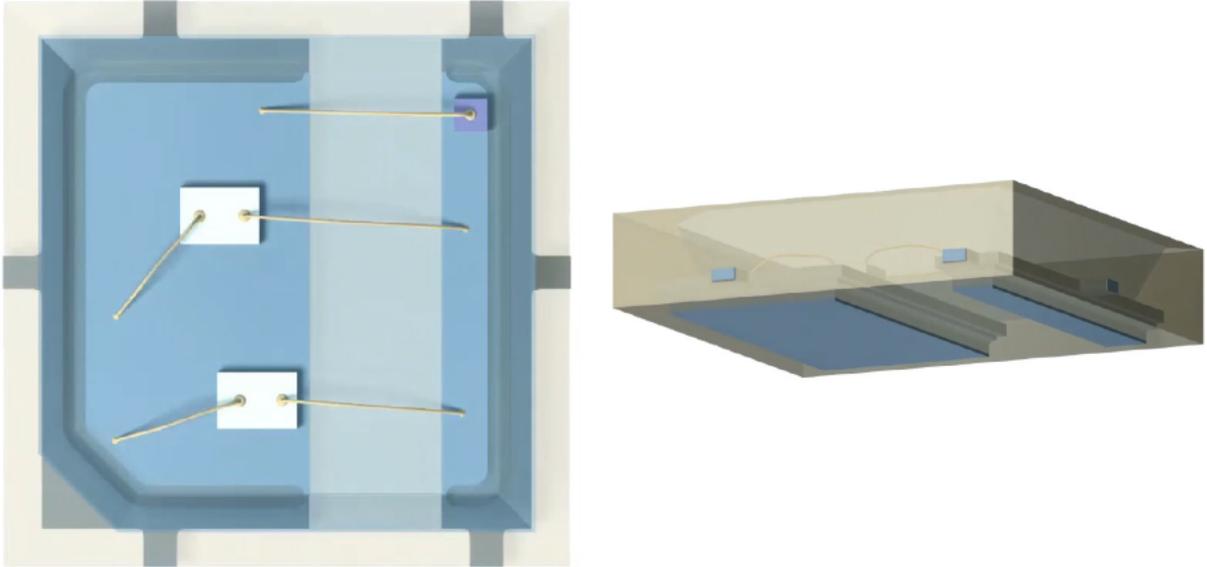
### (1) Nichia

LSG focuses its infringement analysis on the Nichia NE2G757GT product, which it argues is representative of the other accused Nichia products. *See* CIB at 61–62. The illustration below is an excerpt from a demonstrative exhibit showing an exploded view of NE2G757GT, including a detail of the metal layers in the lead on which the LED die is mounted.



RDX-0005C.0036 (excerpt from animation, also shown on RDX-0005C.0043, 0050, 0063) (showing, on left, exploded view of NE2G757GT, and on lower right, a magnified view of the metallization layers of a portion of the lead marked with a red box in the exploded view on the left); *see also* Tr. (Schubert) 979:6–980:5.

The illustration below shows the assembled NE2G757GT product from the top (left image) and from a bottom perspective (right image):



*Id.*

As for the other Nichia accused products, LSG’s expert Dr. Kuball testified that the Nichia NE2G757GT is representative of all Nichia 757 series, 157 series, and 146 series products, including those enumerated in the following table:

Nichia Accused Products Represented by Nichia NE2G757GT ("Nichia Represented '421 Products")	
Products	Images
NE2B757G	CX-0599
NE2G757G	CX-0600
NE2G757GT	CX-0601, CX-0831
NE2R757G-P6	CX-0602
NF2E757GR	CX-0613
NF2E757GRT	CX-0614, CX-0828
NF2L757G-F1	CX-0615
NF2L757GR-V1	CX-0616
NF2L757GR-V1U4	CX-0617
NF2W757G-F1	CX-0618
NF2W757GR-V1	CX-0619
NF2W757GR-V1U4	CX-0620
NF2W757GR-V3	CX-0621
NF2W757G-V3F1	CX-0622
NFSL757G	CX-0623
NFSL757G-P5	CX-0624
NFSL757GT	CX-0625, CX-0827

PUBLIC VERSION

Nichia Accused Products Represented by Nichia NE2G757GT ("Nichia Represented '421 Products")	
Products	Images
NFSW757G	CX-0628
NFSW757G-P5	CX-0629
NFSW757GT	CX-0630
NFSW757G-V3	CX-0631
NFSW757H	CX-0632
NFSY757G	CX-0633
NT2L757DRT	CX-0661
NF2L757GT	CX-0825
NT2L757DRT	CX-0826
NT2W757DRT	CX-0830
NFSW757G	CX-0832
NESB157A	CX-0609, CX-0868
NFSW157J	CX-0626
NFSW157J-HG	CX-0627
NJSW157J	CX-0651
NJSW157J-HG	CX-0652
NESA146A	CX-0603
NESB146A	CX-0604
NESB146A-N8	CX-0606
NESB146A-NA	CX-0607
NESB146A-ND	CX-0608
NESG146A	CX-0610
NESR146A	CX-0611
NESW146A	CX-0612
NHSA146A	CX-0634
NHSB146A	CX-0635
NHSB146AH	CX-0636
NHSB146AH-N3	CX-0637
NHSB146AH-NA	CX-0638
NHSB146A-N3	CX-0639
NHSB146A-NA	CX-0640
NHSB146A-ND	CX-0641
NHSG146A	CX-0642
NHSR146A	CX-0643
NHSW146A	CX-0644
NHSW146AH	CX-0645
NHSW146AH-PA	CX-0646
NHSW146A-Y1	CX-0647
NSSA146A	CX-0653
NSSB146A	CX-0654
NSSB146A-N3	CX-0655

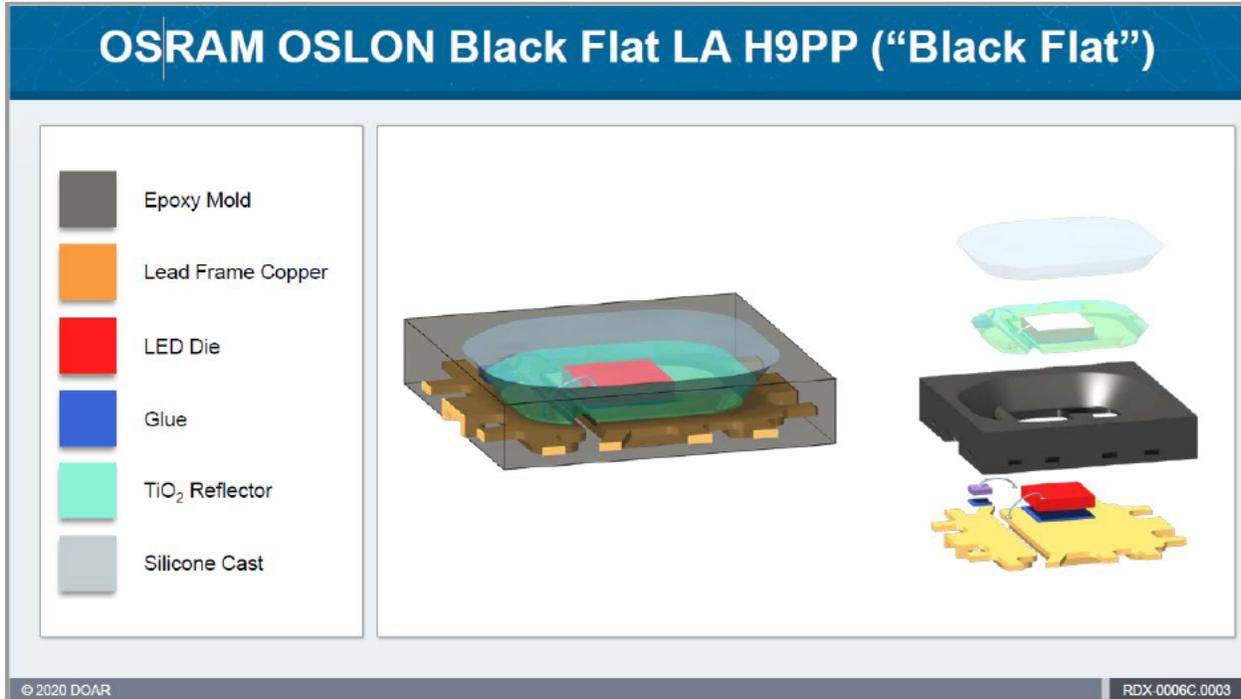
Nichia Accused Products Represented by Nichia NE2G757GT ("Nichia Represented '421 Products")	
Products	Images
NSSB146A-NA	CX-0656
NSSC146A	CX-0657
NSSG146A	CX-0658
NSSR146A	CX-0659
NSSW146A	CX-0660

Tr. (Kuball) 382:12–383:2 (testifying as to Nichia 757 series products that “they all infringe”), 383:14–385:6; *see* CIB at 121–24.

Based on the product images listed in the above table, Dr. Kuball testified that, “[for] infringement purposes, they are identical.” Tr. (Kuball) 383:3–13 (discussing images gathered on CDX-0005C.254). No evidence contradicted this assertion. I therefore find that the Nichia NE2G757GT product is representative of the Nichia 757 series, 157 series, and 146 series products listed in the table above for purposes of the infringement analysis of claims 1 and 6 of the '421 patent.

## (2) OSRAM

LSG focuses its infringement analysis on the OSRAM Black Flat LA H9PP (“Black Flat”) product, which it argues is representative of the other accused OSRAM products. *See* CIB at 61–62. The illustration below is an excerpt from a demonstrative exhibit showing top perspective and exploded views of the Black Flat:



RDX-0006C.0003; *see also* Tr. (Bright) 1085:7–1086:11.

As for the other OSRAM accused products, LSG’s expert Dr. Kuball testified that the Black Flat is representative of other OSRAM products, including those enumerated in the following table:

OSRAM Accused Products Represented by OSRAM OSOLON Black Flat (“OSRAM Represented ’421 Products”)	
Product	Images
OSCONIQ P 3737 (2W version)	CX-0301, CX-0703
OSOLON Black	CX-0302, CX-0308, CX-0708 to
OSOLON Black Flat	CX-0303, CX-0710
DURIS E 2835	CX-0681, CX-0682
DURIS E 3	CX-0683, CX-0684, CX-0834
DURIS E 5	CX-0685, CX-0686
DURIS S 10	CX-0687
DURIS S 5	CX-0688 to CX-0691
DURIS S 8	CX-0692
FIREFLY E1608	CX-0693
FIREFLY EE218	CX-0694 to CX-0696
OSCONIQ P 2226	CX-0697 to CX-0700
OSCONIQ P 3030	CX-0701 to CX-0702
OSCONIQ P 3737 (3W version)	CX-0704

OSRAM Accused Products Represented by OSRAM OSLON Black Flat ("OSRAM Represented '421 Products")	
Product	Images
OSCONIQ P 7070	CX-0705
OSCONIQ S 3030	CX-0706 to CX-0707
OSLON Black Flat S	CX-0711 to CX-0712
OSTAR Projection Cube	CX-0741 to CX-0742
SYNIOS E2314	CX-0743 to CX-0744
SYNIOS E4014	CX-0745 to CX-0746, CX-0837
SYNIOS P2720	CX-0747

Tr. (Kuball) 387:5–19 (discussing images gathered at CDX-0005C.264); *see* CIB at 131.

Based on the product images listed in the above table, Dr. Kuball testified that, “[for] infringement purposes, they are identical.” *See* Tr. (Kuball) 387:20–388:3. No evidence contradicted this assertion. I therefore find that the OSRAM Black Flat product is representative of the OSRAM products listed in the table above for purposes of the infringement analysis of claims 1 and 6 of the ’421 patent.

### (3) Cree

With regard to Cree, Dr. Kuball testified that the Cree JK2835AWT is representative of all Cree J-Series accused products, including those enumerated in the following table:

Cree Accused Products Represented by Cree JK2835AWT ("Cree Represented '421 Accused Products")	
Products	Images
Cree JB3030AWT	CX-0413
Cree JK2835AWT	CX-0415
Cree JK3030AWT	CX-0416
Cree JQ5050AWT	CX-0417
Cree JR5050AWT	CX-0418

Tr. (Kuball) 386:1–23 (discussing images gathered at CDX-0005C.261-262); *see* CIB at 149.

Based on the product images listed in the above table, Dr. Kuball testified that, “for infringement purposes discussion, those products look identical.” *See* Tr. (Kuball) 386:24–387:4.

No evidence contradicted this assertion. I therefore find that the Cree JK2835AWT product is representative of the Cree products listed in the table above for purposes of the infringement analysis of claims 1 and 6 of the '421 patent. Examples of the J-Series products are illustrated in the below demonstrative exhibit:



See RRB at 46.

**(4) Lumileds**

LSG focuses its infringement analysis on the Lumileds LUXEON 3535L product, which it argues is representative of the other accused Lumileds products. See CIB at 61–62. The accused Lumileds products are lead-frame packages in which two metal leads are embedded within a molded resin body. Tr. (Haque) 1211:6–1214:2; Tr. (Jiao) 1233:20–1234:25.

Dr. Kuball testified that the Lumileds LUXEON 3535L is representative of all Lumileds accused products, including those enumerated in the following table:

Lumileds Accused Products Represented by Lumileds LUXEON 3535L ("Lumileds Represented '421 Products")	
Products	Images
LUXEON 2835	CX-0538
LUXEON 2835 Color	CX-0539
LUXEON 3014 LUXEON XF-3014	CX-0540

Lumileds Accused Products Represented by Lumileds LUXEON 3535L ("Lumileds Represented '421 Products")	
Products	Images
LUXEON 3020, LUXEON XR-3020	CX-0541
LUXEON 3030 2D	CX-0542
LUXEON 3535L, LUXEON 3535L	CX-0544
LUXEON 3535L Color	CX-0545
LUXEON 5050	CX-0546
LUXEON SunPlus 2835	CX-0573
LUXEON SunPlus 35	CX-0574
LUXEON 3535L (MXA8-PW50-	CX-0833
LUXEON SunPlus 2835	CX-0836
(L1SP-PNK1002800000)	CX-0622

Tr. (Kuball) 389:2–20; *see* CIB at 150.

Based on the product images listed in the above table, Dr. Kuball testified that “they look the same in terms of infringement purposes.” *See* Tr. (Kuball) 389:21–390:2 (discussing images gathered at CDX-0005C.268). No evidence contradicted this assertion. I therefore find that the LUXEON 3535L product is representative of the Lumileds products listed in the table above for purposes of the infringement analysis of claims 1 and 6 of the '421 patent. The components of the LUXEON 3535L and LUXEON 5050 products are shown in the demonstratives below:





RDX-0015; RDX-0018.

***b) The Luminaire Respondents***

LSG accuses the Luminaire Respondents<sup>15</sup> of infringing claims 1 and 6 of the '421 patent based on their use of the foregoing Nichia, OSRAM, Cree, and Lumileds products. LSG additionally contends that the Luminaire Respondents infringe the same claims by importing and selling luminaires incorporating LED packages supplied by third parties Samsung, Seoul Semiconductor, BridgeLux, Everlight, APT, TD, and Lextar. *See* CIB at 154–67. LSG did not present evidence at the evidentiary hearing showing that the third party LED packages met each limitation of the asserted claims. Nevertheless, LSG included a generalization in its post-hearing brief that “each Luminaire Respondent incorporates into its products certain specific LED packages” that infringe the '421 patent. *See* CIB at 154; *see also* CDX-0005C. With respect to the accused third party LED packages, LSG argues that “those third-party packages are equivalent to, and represented by, certain of the LED Manufacturer Representative '421 Products for purposes

<sup>15</sup> The “Luminaire Respondents” refers collectively to Acuity, Current, GE, LEDVANCE, Leddarson, and Signify. *See* CIB at xix.

of infringement.” See CIB at 163 (citing Tr. (Kuball) 416:23–420:12, CDX-0005C.291–296; CX-4235 (indicating which packages are representative of other packages for purposes of infringement)); see also Tr. (Kuball) 403:8–404:1; CDX-0005C.276 (discussing representativeness and infringement for Acuity); Tr. (Kuball) 404:2–13; CDX-0005C.278 (discussing representativeness and infringement for Signify); Tr. (Kuball) 404:14–405:9; CDX-0005C.280 (discussing representativeness and infringement for LEDVANCE); Tr. (Kuball) 407:20–24, 408:9–21; CDX-0005C.283 (discussing representativeness and infringement for GE); Tr. (Kuball) 414:4–11; CDX-0005C.288 (discussing representativeness and infringement for Current); Tr. (Kuball) 416:23–417:7; CDX-0005C.290 (discussing representativeness and infringement for Leedarson).

## 2. Claim 1

As set forth below, the evidence shows that none of the LED Manufacturer Representative ’421 Products infringe claim 1 of the ’421 patent.

### *a) “A LED assembly adapted for surface mounting and high temperature operation, the LED assembly comprising: ”*

With respect to the preamble of claim 1, the parties disagree as to whether the phrase “for . . . high temperature operation” recited in the preamble to claim 1 is limiting. LSG argues that the preamble is not limiting; Respondents argue that it limits the invention to LED packages capable of handling operational and die temperatures of up to 200° C and 250° C, respectively. See CIB at 63–67; RRB at 48–51. As discussed below, I find that the preamble phrase “for . . . high temperature operation” does not limit the scope of claim 1 of the ’421 patent.

The preamble phrase “for...high temperature operation” in claim 1 of the ’421 patent is nearly identical to the preamble phrase “for high temperature operation” analyzed above in connection with claim 1 of the ’053 patent. The ’421 patent incorporates the specification of the

'053 patent and is directed to an LED packaged for “high temperature operation.” *See, e.g.*, '421 patent at 1:8–15. Thus, the same passages in the specification that support a non-limiting construction of the preamble phrase in the '053 patent equally support a conclusion that the same phrase in claim 1 of the '421 patent is not limiting.

Beyond the disclosure common to the '053 patent, the '421 patent contains additional teachings that weigh against a conclusion that the preamble is limiting. Respondents admit that the '421 specification “provides several alternative embodiments” and at least one of those embodiments does “not require such ‘high temperature operation.’” RRB at 50. Specifically, the '421 patent specification describes an embodiment with silicone encapsulant, and Respondents do not dispute that such an embodiment would degrade at temperatures below 200° C. *See id.* at 50–51. The limitation that Respondents advance does not represent “the full scope of the embodiments in the specification,” which weighs against interpreting the preamble phrase in question as limiting. *See MEMS Tech. Berhad*, 447 F. App'x at 151.

As with claim 1 of the '053 patent, the body of claim 1 of the '421 patent describes a structurally complete LED package. *See* '421 patent at 7:46–67. The phrase “for high temperature operation” adds no further structural meaning to the claim; the structure described in claim 1 would remain intact if the words “for high temperature operation” were deleted from the preamble. *See Catalina Mktg. Int'l*, 289 F.3d at 809. The phrase “for high temperature operation” also does not provide an antecedent basis for limitations in the body of the claim, which weighs in favor of a conclusion that this preamble phrase is not limiting. *See Arctic Cat Inc.*, 919 F.3d at 1329; *Am. Med. Sys.*, 618 F.3d at 1359.

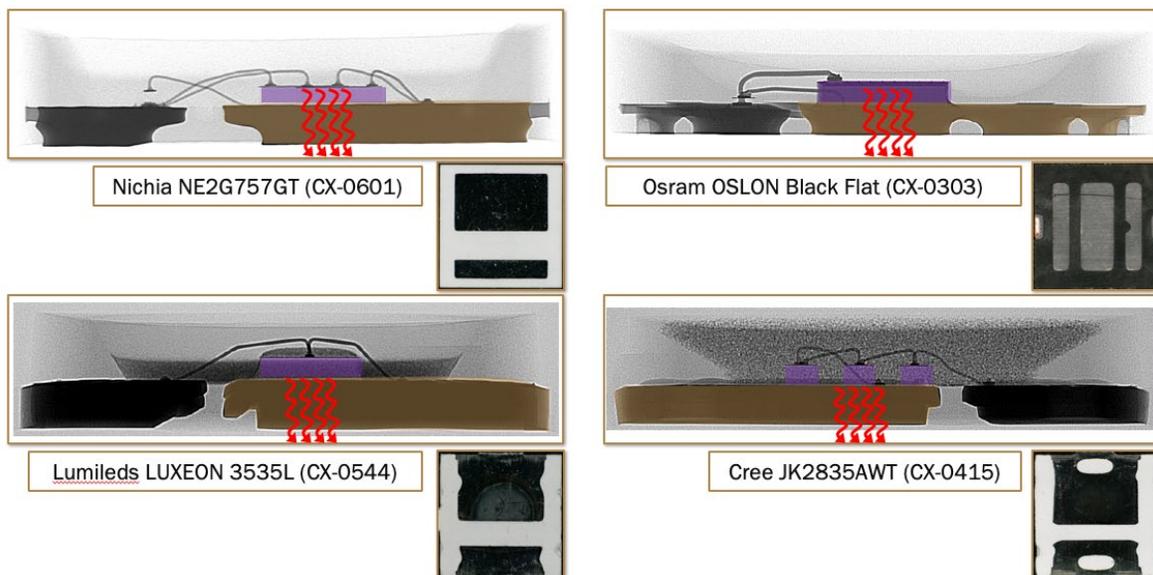
After reviewing the entire '421 patent, including the language of the claim, I conclude that the preamble phrase “for high temperature operation” is “simply a ‘laudatory term’ that only sets

forth the purpose of the claimed invention” and is not limiting. *See Allen Eng’g*, 299 F.3d at 1346–47.

With this understanding, the undisputed evidence shows the LED Manufacturer Representative ’421 Products are LED assemblies adapted for surface mounting. *See Tr. (Kuball) 261:16–262:10.*

**b) “a thermally conducting base, ”**

LSG argues that each of the accused ’421 products contains the claimed “thermally conducting base” in the form of “the copper core of the lead frame on which the LED die sits.” *See CIB at 68 (citing Tr. (Kuball) 270:3–7).* The structures identified by LSG as the “thermally conducting base” are highlighted in brown in the demonstrative exhibits below:



CDX-0005C.157.

The evidence shows that these structures are “thermally conducting.” Dr. Kuball testified that the accused “thermally conducting base” in the accused products is made of copper, which is a good thermal conductor, and “provides good heat dissipation” for the LED package. *Tr. (Kuball)*

263:10–21. Whether or not these structures are a “base” as that term has been construed in the context of the asserted patents is an issue contested by the parties.

The parties agreed that the term “base” should be construed the same for both asserted patents. *See* CC Order at 22. As discussed above in connection with the ’053 patent, I interpret the term “base” according to its ordinary meaning in the art, which encompasses terms like “support board” and “substrate.” *Id.* at 24.

**(1) Nichia**

Nichia’s expert Dr. Schubert testified that the accused Nichia products are molded lead frame products without a base, especially because the products do not have a support board or substrate. Tr. (Schubert) 981:9–982:11, 988:17–989:13, 990:23–993:2; CX-0609; JX-0087; CX-0614; CX-0622; JX-0088; CX-0625; CX-0631; JX-0085; JX-0086; CX-0661; CX-0603; CX-0868; JX-0432C. He further testified, for the sake of argument, that if some portion of the products were a “base,” it would be the white resin, which interlocks with and serves as a container for the other portions of the package, including the metal pads LSG identifies as a base. Tr. (Schubert) 989:14–25, 990:8–16, 990:23–993:2; CX-0609; JX-087; CX-0614; CX-0622; JX-0088; CX-0625; CX-0631; JX-0085; JX-0086; CX-0661; CX-0603; CX-0868; JX-0432C. Dr. Schubert testified that, without the white resin, all of the components, including the alleged base, would simply fall out of the package. *See* Tr. (Schubert) 990:17–993:3; CX-0609; JX-0087; CX-0614; CX-0622; JX-0088; CX-0625; CX-0631; JX-0085; JX-0086; CX-0661; CX-603; CX-868; JX-0432C.

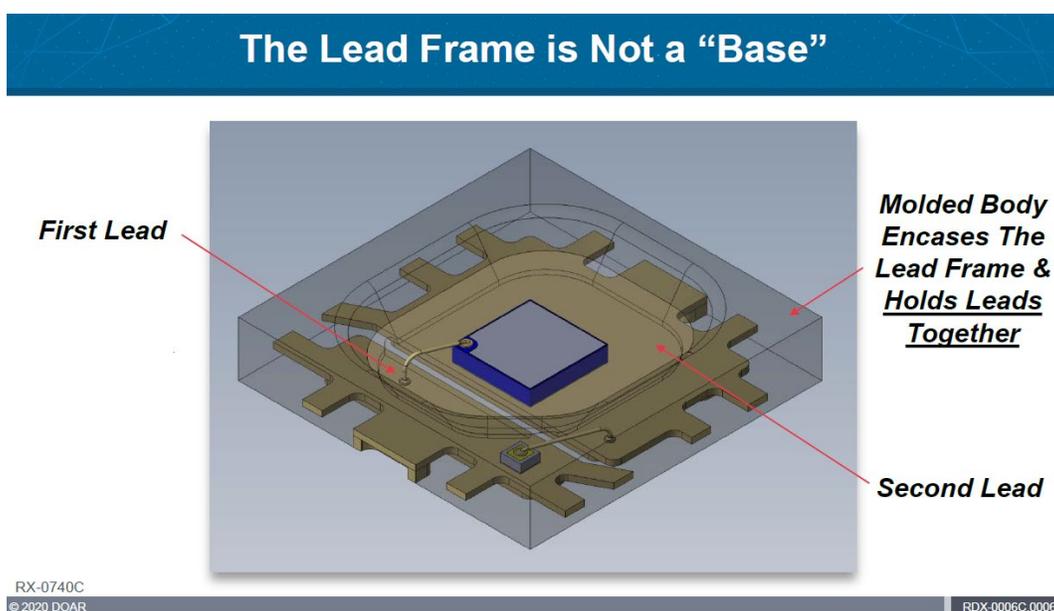
LSG argues Dr. Schubert’s testimony regarding Nichia’s accused products was “impeached” by a Lumileds document that refers to the accused structure in the Lumileds products as a metal “base.” *See* CIB at 72–73 (referring to RDX–0012C at 5, 10). Yet, Dr. Schubert and Lumileds witness Dr. Haque both testified that the “base metal” description in the Lumileds

document refers to the “core material for the metal pads,” and not to a supportive “base” as that term is used in the ’421 patent. Tr. (Schubert) 1040:17–1041:16, 1213:17–24. The interpretation of the Lumileds document given by Dr. Schubert and Dr. Haque was reasonable and consistent with the document as a whole. Dr. Schubert’s testimony that the Nichia products lack the claimed “base” is credible.

As I have determined to construe “base” in accordance with its ordinary meaning in the art, I find that the copper structure identified by LSG in the Nichia products is not a “thermally conducting *base*.” The copper structure does not provide a supportive substrate to the LED package; instead it is the white resin in the LED package that provides structure to the package.

## (2) OSRAM

Like the Nichia products, the evidence shows the OSRAM Black Flat is a molded lead frame product with two leads and without a base. Tr. (Bright) 1088:6–1089:2. OSRAM’s expert Dr. Bright testified that the Black Flat does not have a substrate or a support board. *Id.* As illustrated in the demonstrative exhibit below, the molded body of the package holds the leads of the lead frame together:



RDX-0006C.0006 (showing 3D CAD drawing of the Black Flat, excerpted from RX-0740C).

For the same reasons set forth above with respect to the Nichia accused products, I find that the structures accused by LSG in the OSRAM products are not a “thermally conducting base.”

### (3) Cree and Lumileds

Neither Cree nor Lumileds offered an expert witness to testify as to whether its products have the claimed “thermally conducting base.” See CIB at 69; RRB at 56–60. But LSG’s infringement proofs rested on an argument that “each of the Nichia, OSRAM, Lumileds, and Cree Representative ’421 Products . . . contain practically identical lead frame structures.” CIB at 71. Therefore, for the same reasons set forth above with respect to the Nichia accused products, I find that the structures accused by LSG in the Cree and Lumileds products are not a “thermally conducting base.

#### *c) “wherein at least a portion of the thermally conducting base is substantially planar; ”*

Claim 1 requires that “at least a portion of the thermally conducting base is substantially planar.” The claim also requires that the same “substantially planar portion” be overlaid by “one or more electrically insulating layers,” which together “defin[e] a surface cavity.” A subsequent limitation further requires that the LED die “[be] in thermal contact with the [substantially] planar portion of the thermally conducting base.” ’421 patent at 7:46–67.

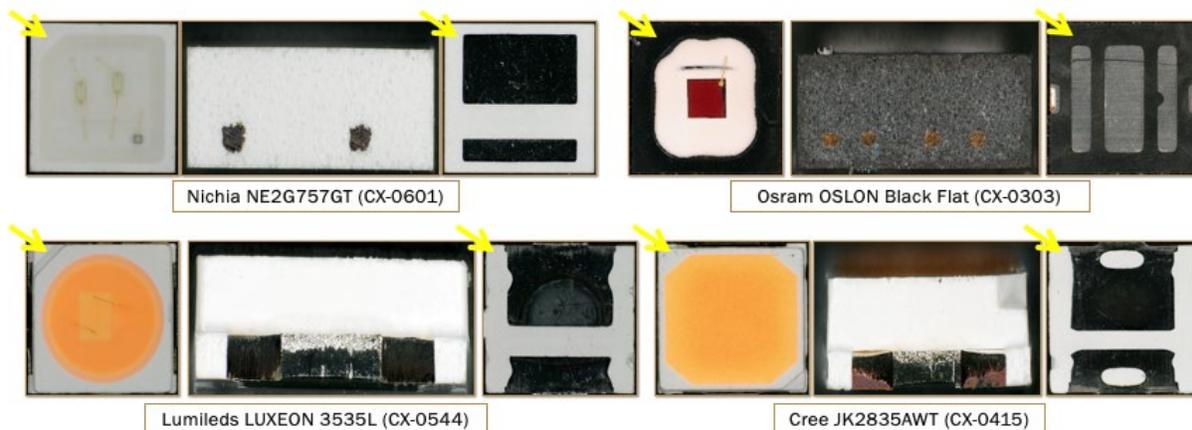
The evidence shows that a portion of the structures identified by LSG as the “base” is substantially planar. See, e.g., CX-0303 (OSLON Black Flat Images) at LSGITC\_1434802, LSGITC\_1434805; CX-0415 (Cree JK2835AWT Images) at LSGITC\_1436699–LSGITC\_1436700; CX-0544 (Lumileds LUXEON 3535L Images) at LSGITC\_1438632–LSGITC\_1438633. For example, the dashed blue line in the illustration below shows that a portion of the lead frame in the Nichia product is substantially planar:



CDX-0005C.169 (annotating CX-0832).

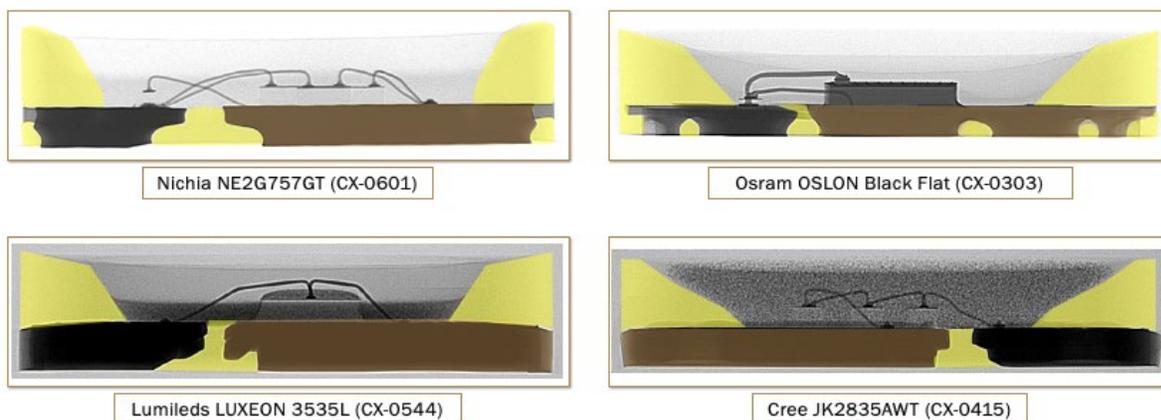
*d) “one or more electrically insulating layers overlying at least a portion of the planar portion of the thermally conducting base and defining a surface cavity, ”*

LSG argues that each aspect of this limitation, and the limitation as a whole, is met because the resin molding in the LED Manufacturer Representative ’421 Products is the claimed “insulating layer.” See CIB at 79–96. The accused electrically insulating layers are identified with yellow arrows in the below top views of the LED Manufacturer Representative ’421 Products:



CDX-0005C.169 (annotating CX-0832).

The accused layers are annotated in yellow in the below x-ray views from the side of the LED Manufacturer Representative ’421 Products:

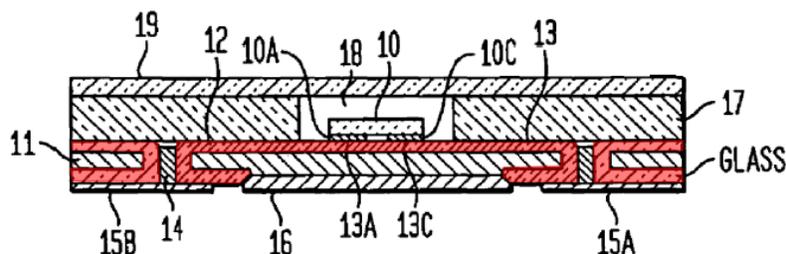


CDX-0005C.177.

As an initial matter, the evidence proves that the resin molding of the LED Manufacturer Representative '421 Products is “electrically insulating.” *See, e.g.*, Tr. (Jokerst) Tr. 1134:3–11 (“[T]he molding component is typically some type of resin . . . [which] provides an insulating layer between the anode and the cathode of the lead frame, which is very important.”).

The parties dispute whether the resin molding can be a “layer” as that term is used in the '421 patent. *See* CIB at 80–86; RRB at 60–64. Respondents argue that “layer” in the context of the patent means “a material having a substantially uniform thickness and a generally wide aspect ratio” and that a person of ordinary skill “would not have understood a layer to cover a complex, three-dimensional, molded structure.” RRB at 60–61. I find Respondents’ argument unpersuasive and contradicted by the intrinsic evidence.

Specifically, Figure 1A of the '053 patent depicts electrically insulating layer 12, which is annotated in red below:

**FIG. 1A**

RDX-0013C at 7. Layer 12 has a substantially uniform thickness and a generally wide aspect ratio, which comports with the core of Respondents’ proposed construction. But layer 12 is also illustrated and described in the ’421 patent as a complex, three-dimensional shape that wraps around metal base 11. ’421 patent at 2:65–3:1. Accordingly, I reject Respondents’ attempt to unduly narrow the construction of “layer” to exclude materials that reside only in a single plane. I hereby construe “layer” according to its ordinary meaning in the art, which encompasses structures such as those depicted as element 12 in Figure 1 of the ’421 patent.

The resin molding in the LED Manufacturer Representative ’421 Products satisfies the “electrically insulating layer” limitation recited in claim 1. *See also* Tr. (Kuball) 272:20–277:16, 454:7–455:14. The insulating material in the LED Manufacturer Representative ’421 Products has a generally wide aspect ratio, as can be seen from the top views in CDX-0005C.169. The insulating material also has a substantially uniform thickness, as can be seen in the symmetry of the left and right sides of the layer illustrated in the cross-sectional views in CDX-0005C.177.

I next consider whether or not the “electrically insulating layer” of resin is “overlying at least a portion of the planar portion of the thermally conducting base.” I previously construed the term “overlying” in my claim construction order: “Having considered the arguments of the parties, I adopt the plain and ordinary meaning of ‘overlying,’ which is not limited to ‘positioned only above.’” CC Order at 20; *see also id.* at 17–20. I further stated in a footnote: “My construction

of ‘overlying’ does not include instances of embedding or enveloping as described by the Respondents at the claim construction hearing.” *Id.* at 20 n.5.

Having reviewed the full record of the investigation, including the evidentiary hearing, I now have a greater appreciation of the context for the claim construction dispute presented by the parties. *See Jang v. Boston Sci. Corp.*, 532 F.3d 1330, 1337 (Fed. Cir. 2008) (“We have previously emphasized the importance of the context provided by an analysis of the accused device when ruling on claim construction and the problems presented by construing claims in the absence of such context.”). It is evident that the parties’ dispute requires construing the term “layer[] overlying,” and not merely the term “overlying” in a vacuum. As illustrated at least in Figure 1A of the ’421 patent, a layer overlying a structure is not limited to being positioned only above that structure. Accordingly, I will construe “layer[] overlying” to mean a layer that is not limited to being “positioned only above” another object.<sup>16, 17</sup>

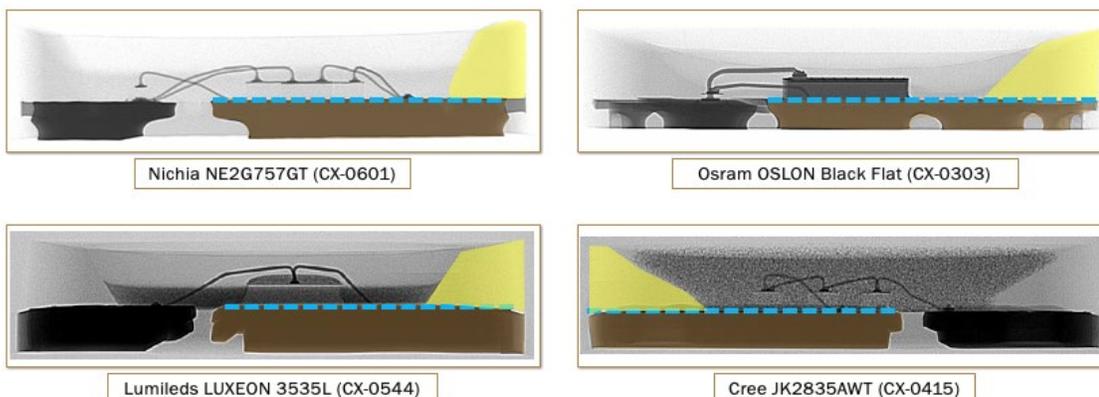
Consistent with this construction, the evidence shows that the resin molding in the LED Manufacturer Representative ’421 Products is “overlying at least a portion of the planar portion of” the structures LSG identifies as the thermally conducting base.” The below illustrations show

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<sup>16</sup> I hereby incorporate the analysis presented in pages 17–20 of the claim construction order into this initial determination. I decline, however, to adopt the statement in footnote 5 on page 20 that the “construction of ‘overlying’ does not include instances of embedding or enveloping.” Such a construction is in tension with other words in the claim and the teachings of the specification. *See Jang*, 532 F.3d at 1337.

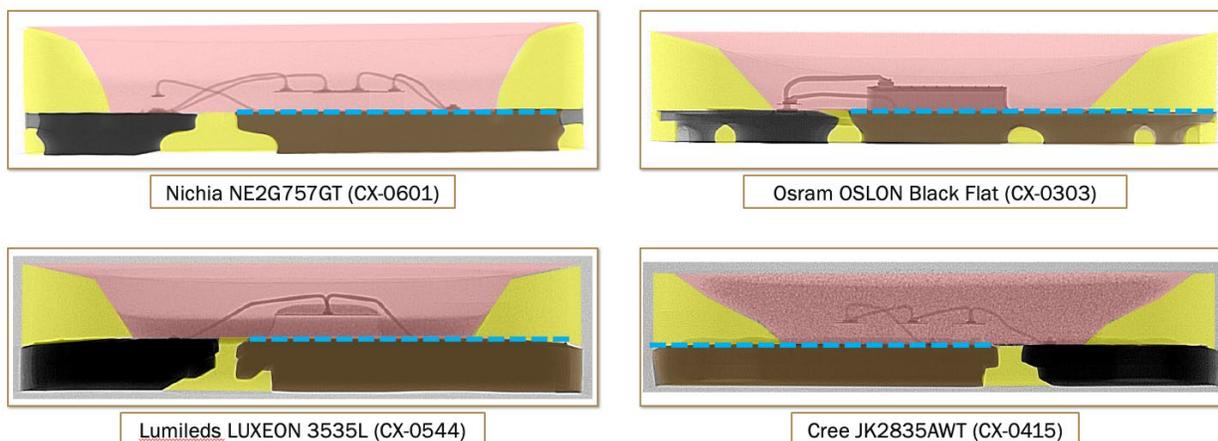
<sup>17</sup> At the evidentiary hearing, I brought the *Jang* opinion to the parties’ attention in connection with the “overlying” claim limitation and informed them they were free to press for a more favorable claim construction in their post-hearing briefs. *See* Tr. 1439:8–1440:22. I also informed the parties it was “possible that I will adjust or change my constructions from the [claim construction] order.” Tr. 1440:14–15. All parties briefed the possible revision of the construction of “overlying,” and no party argued an adjusted construction would result in undue prejudice. *See* CIB at 86-91; RRB at 64–69.

the resin molding layer in yellow and the (substantially) planar portion of the accused base in blue dashes.



CDX-0005C.181; *see also* Tr. (Kuball) 324:24–331:5.

The evidence also shows that the resin molding layer in the LED Manufacturer Representative '421 Products defines a surface cavity. The surface cavity is shown in pink in the demonstrative exhibits below:



CDX-0005C.182; *see also* Tr. (Kuball) 331:6–22.

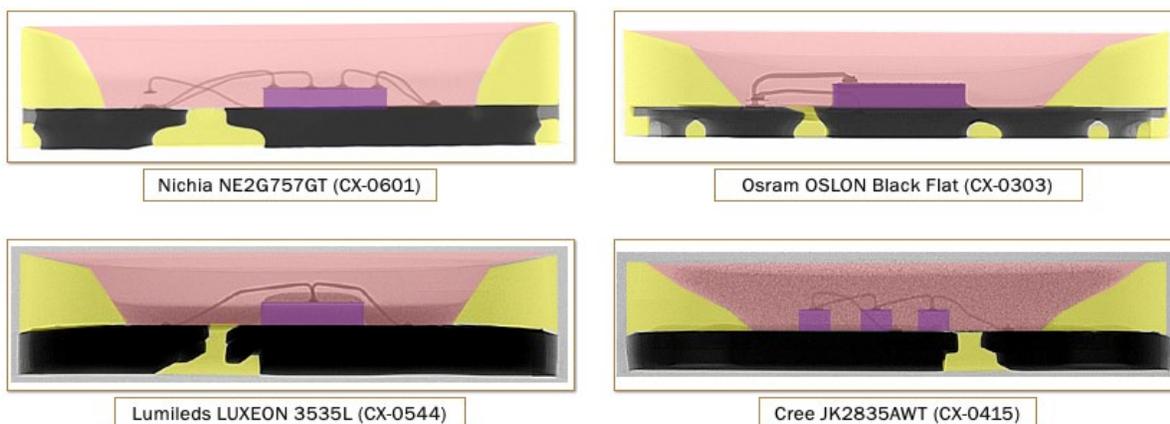
**e) “wherein the electrically insulating layers include one or more terminals; ”**

Evidence adduced at the hearing establishes that the molded resin layer in the LED Manufacturer Representative '421 Products include one or more terminals because the layer

touches at least one terminal of the LED package and thus includes the terminal. *See* Tr. (Kuball) 336:2–338:1, 340:11–342:25.

**f) “one or more LED die disposed at least partially within the surface cavity, ”**

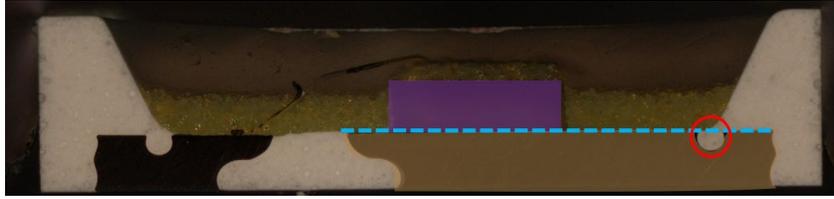
The evidence shows that each LED Manufacturer Representative ’421 Product includes at least one or more LED die disposed at least partially within the surface cavity. *See* Tr. (Kuball) 344:20–345:9. The illustrations below show the LEDs colored in dark purple:



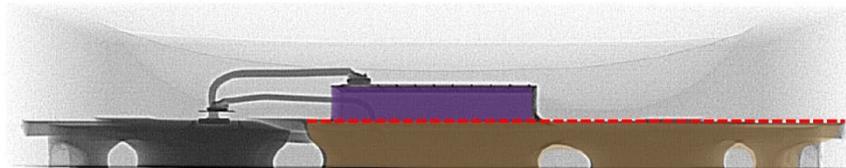
CDX-0005C.210.

**g) “wherein the one or more LED die are in thermal contact with the planar portion of the thermally conducting base, ”**

The evidence also shows that each LED Manufacturer Representative ’421 Product has at least one LED die “in thermal contact with the planar portion of the [accused] thermally conducting base.” *See* Tr. (Kuball) 345:10–349:6. Images of LED Manufacturer Representative ’421 Products show the LED(s) annotated in purple and the planar portion of accused base annotated in blue:

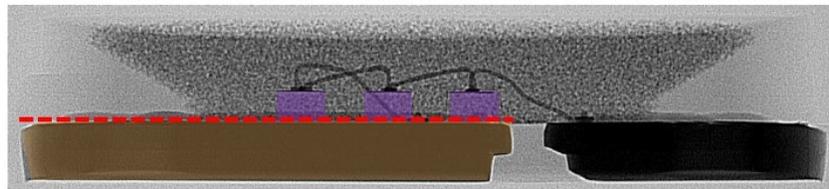


CX-0832 (Nichia NE2G757GT); CDX-0005C at 214.



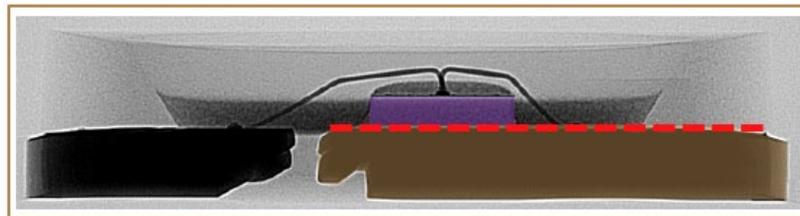
Osram OSOLON Black Flat (CX-0303)

CDX-0005C.216.



Cree JK2835AWT (CX-0415)

CDX-0005C.212.

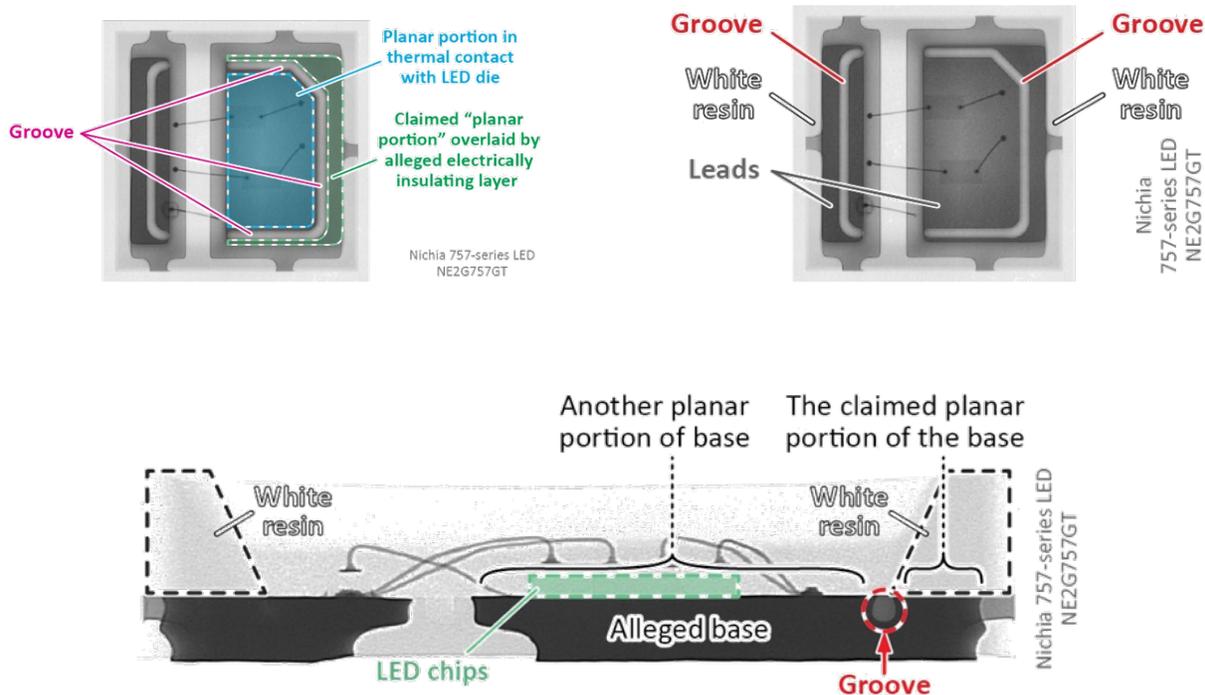


Lumileds LUXEON 3535L (CX-0544)

*Id.*

Nichia takes the position that its 757 Series products do not have an “LED die [ ] in thermal contact with the planar portion of the thermally conducting base” because the “top surface [of the accused lead] is divided by a substantial groove into two separate planar portions.” *See* RRB at 100–04. Using the figures below to illustrate its argument with respect to the NE2G757GT

product, Nichia argues that “the LED die is mounted onto one planar portion (shown in blue), which is not the planar portion (shown in green) that—according to Complainants—is overlaid by (a portion of) the electrically insulating layer (*i.e.*, the white resin).” See RRB at 101–2 .



RX-0501.0001, 0003 (images at CX-0601); see also JX-0432C.

Nichia’s argument is based on a reading of the claim requiring that the planar portion of the base overlaid by the electrically insulating layer be the same planar portion of the base that is in thermal contact with the LED. See RRB at 100–04. Yet, the claim language requires no such identity. Claim 1 is reproduced below with the relevant language identified in italicized bold typeface:

1. A LED assembly adapted for surface mounting and high temperature operation, the LED assembly comprising:

a thermally conducting base, wherein at least *a portion of the thermally conducting base is substantially planar*;

one or more electrically insulating layers *overlying at least a portion of the planar portion* of the thermally conducting base and defining a surface cavity, wherein the electrically insulating layers include one or more terminals;

one or more LED die disposed at least partially within the surface cavity, wherein the one or more LED die are in thermal contact with *the planar portion* of the thermally conducting base, and electrically connected to the one or more terminals of the one or more insulating layers,

wherein a bottom surface of the LED assembly includes a thermally conductive region in solderable thermal contact with the thermally conducting base, for spreading heat transmitted to the base from the one or more LED die; and

further comprising an LED assembly mount selected from the group consisting of an electrically insulated fastener and a solderable bonding pad.

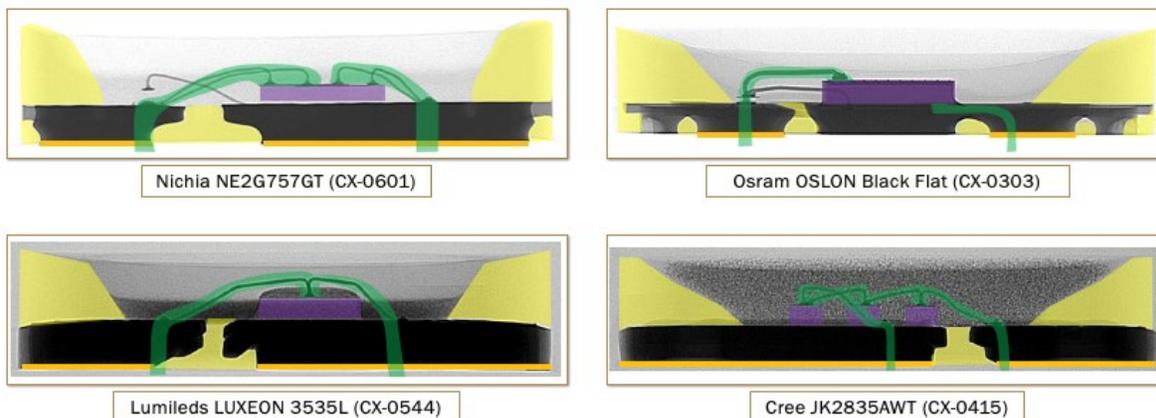
'053 patent at 7:46–67 (emphasis added).

The claim merely requires that a “planar portion” of the base be in contact with the LED die and “a portion of the planar portion” underlie the electrically insulating layer. The portion in contact with the LED die and the portion underlying the insulating layer need not be identical. The Nichia 757 Series products have both claimed portions. I therefore find the Nichia 757 Series products satisfy the limitation “one or more LED die [ ] in thermal contact with the planar portion of the thermally conducting base.”

***h) “and electrically connected to the one or more terminals of the one or more insulating layers, ”***

The evidence shows that the LED Manufacturer Representative '421 Products satisfy this claim limitation. As depicted below, a first LED electrode on the LED die is connected to the larger lead frame portion either by a wire bond (in the case of the Nichia NE2G757GT, Cree JK2835AWT, and Lumileds LUXEON 3535L) or by a direct connection on the bottom of the die (in the case of the OSRAM OSOLON Black Flat). CX-0601 (Nichia NE2G757GT); CX-0303

(OSRAM OSLON Black Flat); CX-0544 (Lumileds LUXEON 3535L); CX-0415 (Cree JK2835AWT). A second LED electrode on the LED die is connected to the smaller portion of the lead frame by a wire bond. *See* Tr. (Kuball) 260:5–15. Because the lead frame is made of copper, and is therefore electrically conductive, the top surfaces of the lead frame electrically connect to the terminals plated onto the bottom surfaces. *See* Tr. (Kuball) 349:18–350:4.



CDX-0005C.220.

*i) “wherein a bottom surface of the LED assembly includes a thermally conductive region in solderable thermal contact with the thermally conducting base,”*

As discussed in more detail below, the evidence shows that, in the LED Manufacturer Representative ’421 Products, the bottom surface of the LED assembly includes a “thermally conductive region.” The question remains whether or not this “thermally conductive region” is in “solderable” thermal contact with the copper of the alleged “base,” a position with which Respondents disagree. *See* CIB at 106–16; RRB at 86–100.<sup>18</sup> At the evidentiary hearing, LSG asserted solderability is merely a “materials consideration,” *i.e.*, a question of whether or not the material constituting the “region” could (in the abstract) be soldered to the material constituting

<sup>18</sup> In my claim construction order, I determined that Respondents did not carry their burden on indefiniteness with respect to the term “solderable.” CC Order at 29–30.

the “base.” *See* Tr. (Kuball) 362:19–24, 365:11–16, 367:18–23, 464:12–20, 556:22–557:4. Respondents instead focused on the structure of the claimed invention, taking the position that a person of ordinary skill would understand that one must consider not only the type of material, but also the amount of material, the configuration of the structure, and whether there is sufficient access to “wet” the respective “region” and “base” surfaces with solder in order to determine whether they are “solderable.” *See* Tr. (Schubert) 1005:4–1009:9; Tr. (Jokerst) 1193:13–1194:8; Tr. (Katona) 1263:23–1264:24. In other words, Respondents argue that two structures—the “region” and the “base” in the context of the ’421 patent—are in “solderable . . . contact” only if those two structures could actually be soldered to each other.

The parties’ arguments are a mix of legal and factual positions. I begin with the legal interpretation of the phrase “in solderable thermal contact.” In post-grant proceedings, LSG distinguished certain asserted prior art by arguing to the Patent Office that a unitary structure shown in the asserted art could not be soldered to itself. *See* Notice of New Evidence (EDIS Doc. ID 66505) at 2–3 and Ex. A at 16, 19, 22–23. The Patent Office accepted LSG’s argument, noting that the prior art reference discloses a “unitary” structure, and the alleged region and base in that structure “cannot be ‘solderable’ to one another, *i.e.*, at no point in time could they be soldered to each other because they are simply one singular piece.” *Id.* The Patent Office further noted that solderability is a property of the wettability of a “surface,” and not only a property of a “material”:

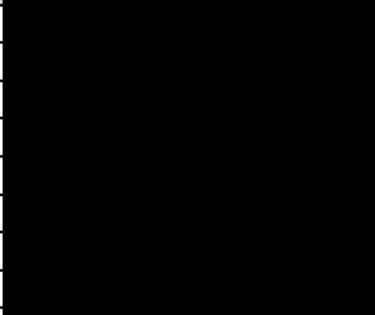
That assertion is consistent with a technical dictionary’s definition of “solderability” as “[t]hat property of a metal surface to be readily wetted by molten solder.” *See* Ex. 3001 (definition by The Authoritative Dictionary of IEEE Standards Terms).

*Id.* at 16 (original emphasis omitted). Accordingly, I conclude that a region “in solderable thermal contact” with the base means something more than the region is made of a kind of material that

can be soldered to the kind of material in the base. The invention requires at least that the region actually can be soldered to the base.

Having resolved the proper construction of the “solderable” limitation, I turn to comparing that limitation to the accused products. For each of the accused products, LSG asserts that the lead to which an LED die is mounted includes the claimed “region” and “base.” Specifically, LSG argues that the copper core of the lead is the “base” and, collectively, that the layers plated thereon constitute the “region.” See CIB at 106–07; Tr. (Kuball) 350:5–23, 440:3–23, 461:8–12; CDX-0005C.222, 335, 336.

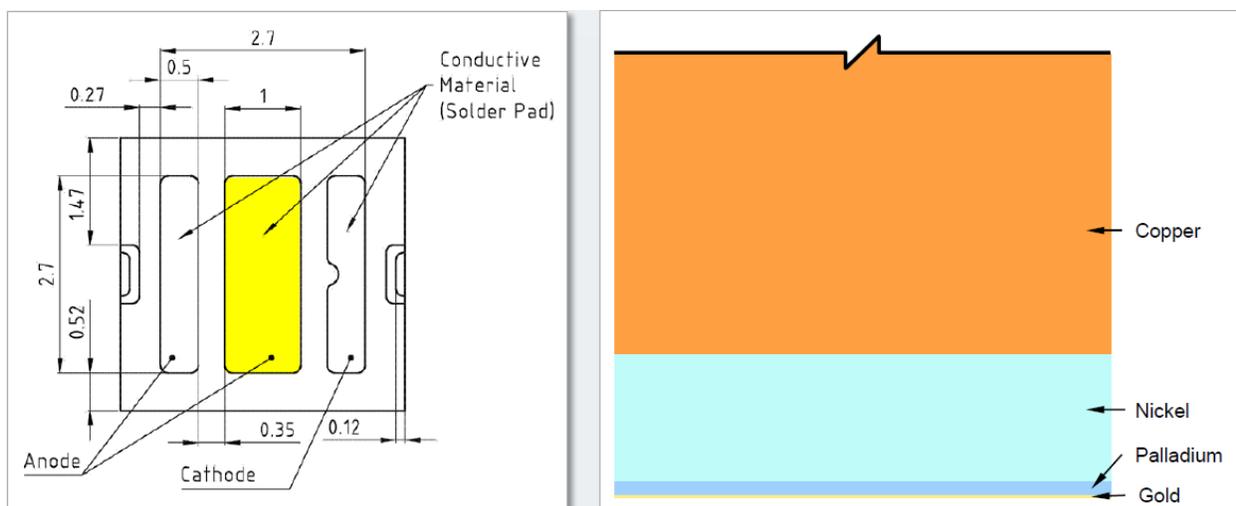
The following chart prepared by Respondents identifies the alleged “regions” (plating layers) in the accused Nichia products:

Nichia Product	Plating Layers (starting from copper surface)	Thicknesses
NE2G757GT, NF2E757GRT, NFSL757GT, NF2W757G-V3F1, NFSW757G-V3, NT2L757DRT	Nickel	
	Palladium	
	Gold	
	Silver	
NESB157A	Silver	
NESA146A	Nickel	
	Palladium	
	Gold	

RRB at 90 (citing Tr. (Schubert) 1010:5–1011:22, 1012:2–1013:9; RX-0399C.0008; RX-0398C.0008; RX-0401C.0009; RX-0400C.0008; RX-0396C.0003; Tr. (Bright) 1094:6–1095:7; RX-0739C; Tr. (Jokerst) 1181:2–14, 1244:9–1245:24; RDX-13.14; RX-2009C; RX-2004C; RX-2009C; RX-1969C; RX-1971C; RX-1982C; RX-1986C; RX-1993C; RX-2012C).

In the OSRAM Black Flat, the alleged “region” includes the nickel plated onto the copper core of the central pad of the lead frame, as highlighted in yellow below. Tr. (Bright)

1091:19–1092:10. The copper is plated with nickel with a thickness of [REDACTED], as well as palladium of [REDACTED] in thickness and gold of [REDACTED] in thickness. *Id.*; RX-0739C.



RDX.0006C-00011 (showing a bottom schematic view (RX-0737C) and a demonstrative of the plating layers of the Black Flat).

In the accused Cree products, including the representative JK2835AWT, the only material underneath the copper is electroplated silver of [REDACTED] thick. *Tr.* (Katona) 1260:20–24, 1263:25–1264:5. LSG argues that the silver layer is the claimed “region.” CIB at 107.

In the accused Lumileds products, including the LUXEON 3535L, LSG identifies a layer of electroplated silver or nickel ranging from [REDACTED] in thickness as the claimed “region” allegedly solderable to the copper-lead-ports. *See Tr.* (Jiao) 1239:9–1242:22, 1244:9–1246:13; RDX-0013C.0014-0015; RX-2009C; RX-2004C; RX-1969C; RX-1971C; RX-1982C; RX-1986C; RX-1993C; RX-2012C.

As discussed in more detail below, I find that these microscopically thin plating layers have no region in solderable thermal contact with a base.

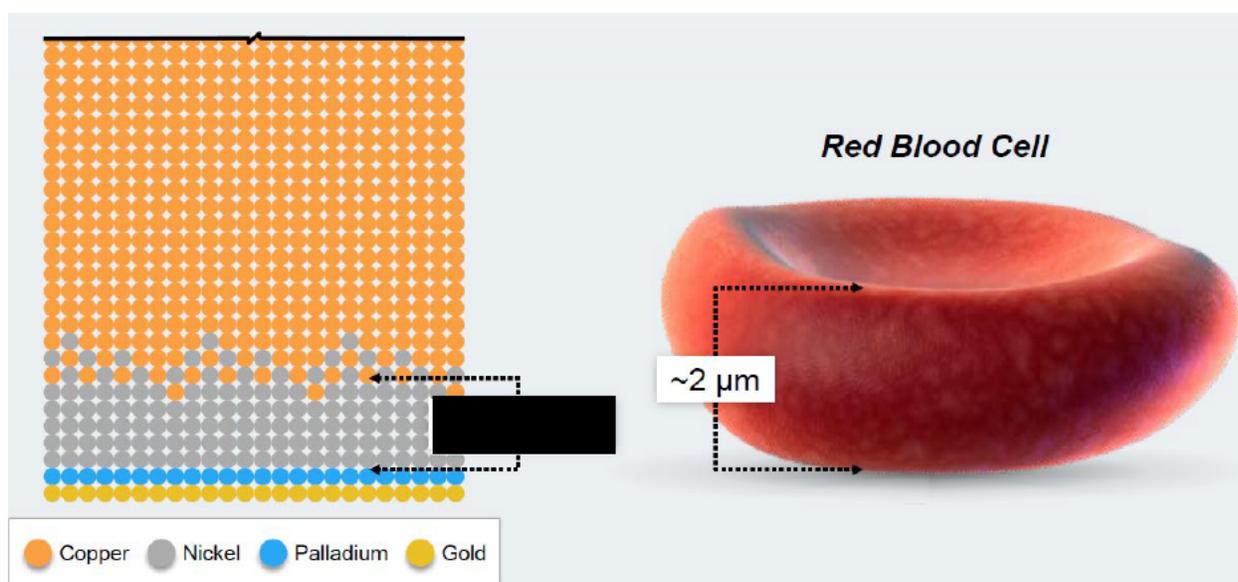
The evidence shows that, as manufactured, imported, and sold, no accused product has a region soldered or solderable to a base. Instead, each alleged “region” in the accused products is

part of microscopically thin, electroplated layer added to the copper lead for reflectivity and to prevent corrosion; it cannot (or could not) have been soldered to the copper. *See, e.g.*, Tr. (Jokerst) 1133:3–22, 1179:6–19. Expert witness testimony establishes that all of the products have “full surface plating” such that there are no exposed surfaces available to be wetted with solder and no way to access the interface of the copper and a plating layer. Tr. (Schubert) 1005:4–1009:9, 1010:22–1013:9; Tr. (Jokerst) 1133:3–22, 1179:6–19; RX-0768.0006; RX-0399C.0008; RX-0398C.0008; RX-0401C.0009; RX-0400C.0008; RX-0396C.0003. As Respondents’ experts explained, because the plating region and copper base are atomically bonded to one another at the time the plating region comes into existence, it is impossible to solder them to one another. Tr. (Bright) 1097:7–12; Tr. (Jokerst), 1188:22–1189:15; Tr. (Jiao) 1241:1–6; Tr. (Katona) 1264:12–15.

In addition, the evidence shows that the alleged “region” would not be solderable to the alleged “base” even during the manufacturing process because the alleged “region” never exists as a separate, solid region. Rather, the metal layers are applied to the “base” through electroplating, and the metal only exists in an aqueous solution before being permanently affixed to the “base.” Tr. (Schubert) 1011:23–1013:9, 1075:3–14; Tr. (Bright) 1096:17–1097:2; Tr. (Jokerst) 1178:19–1179:5, 1144:5–18, 1188:12–1189:15; Tr. (Jiao) 1241:23–1242:16.

Once affixed to the alleged “base,” the plated layers of the alleged “region” cannot be removed such that they would survive to be “soldered” onto the copper lead. Tr. (Schubert) 1005:4–1009:9, 1010:5–21, 1012:2–1013:9; Tr. (Bright) 1096:4–1097:22; Tr. (Jokerst) 1189:16–1190:7; Tr. (Jiao) 1241:1–8; RX-0399C.0008; RX-0398C.0008; RX-0401C.0009; RX-0400C.0008; RX-0396C.0003. OSRAM’s expert Dr. Bright testified that nickel plating is added as a diffusion barrier to prevent diffusion of copper ions into the nickel/palladium layers

(and into any solder that is applied to secure the package to an external printed circuit board). Tr. (Bright) 1092:15–22; *see also* CX-4179C (Tanaka Dep.) at 49:22–51:18. As a result of the plating process—and the additional impact of diffusion at the copper/nickel interface—there is a “metallurgical attachment” between the nickel and copper, and the two metals thereafter cannot be separated without destruction. Tr. (Bright) 1096:4–1097:15. Dr. Bright illustrated the metallurgical attachment using the left-side of the demonstrative below, which shows the intermixing of orange and grey dots.



RDX-0006C.00014.

This irreversible metallurgical attachment occurs in all of the accused products; removal of the “region” would result in destruction of the interface between the “region” and the “base.” *See, e.g.*, Tr. (Bright) 1189:16–1190:7.

Further, even if the layer of metal composing the region existed separately from the copper base in some non-liquid form, the layer would be so thin that there would be insufficient structural stability to solder it to the copper base. *See* Tr. (Schubert) 1010:22–1011:17, 1012:2–1013:9; Tr. (Bright) 1097:16–1098:2; Tr. (Jokerst) 1190:8–22; Tr. (Jiao) 1241:9–23, 1245:3–8; Tr. (Katona)

1264:16–24; RX-0399C.0008; RX-0398C.0008; RX-0401C.0009; RX-0400C.0008; RX-0396C.0003; RX-2004C; RX-1969C; RX-1971C; RX-1982C; RX-1986C; RX-1993C; RX-2009C; RX-2012C; RX-0739C.

For these reasons, I find the LED Manufacturer Representative '421 Products do not have a “thermally conductive region” that is in “solderable” thermal contact with the copper of the alleged “base.”

***j) “for spreading heat transmitted to the base from the one or more LED die; and ”***

The evidence shows that the accused “thermally conductive region” in the LED Manufacturer Representative '421 Products is “for spreading heat transmitted to the base from the one or more LED die.” *See* CX-4179C (Tanaka Dep.) at 44:15–21; Tr. (Kuball) 351:2–25; 352:6–354:22.

***k) “further comprising an LED assembly mount selected from the group consisting of an electrically insulated fastener and a solderable bonding pad.”***

As illustrated below, the evidence shows that the LED Manufacturer Representative '421 Products practice this limitation<sup>19</sup> because they include solderable bonding pads on their lower surface for mounting the packages to an external system:

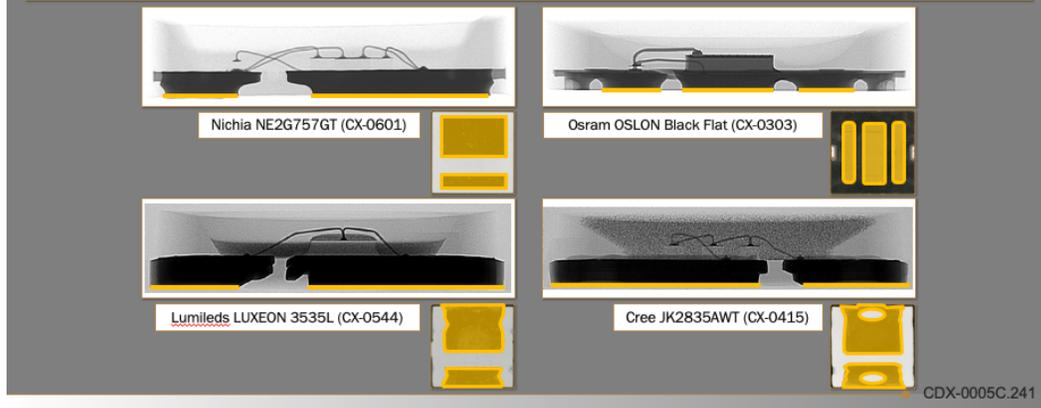
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<sup>19</sup> The parties have agreed that this term should be construed as “further comprising an LED assembly mount that is either an electrically insulated fastener *or* a solderable bonding pad.” *See* CIB at 117 (citing RPB at 441).

## '421 Patent Claim 1—Nichia, Osram, Lumileds, Cree

1[g]: “further comprising an LED assembly mount selected from the group consisting of an electrically insulated fastener and a solderable bonding pad.”

All '421 accused products indisputably  
have “a solderable bonding pad”



CDX-0005C.241; *see also* Tr. (Kuball) 378:6–23.

### 3. Claim 6

Dependent claim 6 of the '421 patent reads:

6. The LED assembly of claim 1, wherein the thermally conducting base includes a metal base.

The evidence shows that the LED Manufacturer Representative '421 Products satisfy this additional limitation. The alleged base in each product is made of copper, a metal. *See, e.g.*, Tr. (Kuball) 379:22–380:17.

Nevertheless, because there is no infringement of claim 1 from which claim 6 depends, there is no infringement of claim 6.

#### 4. Infringement Conclusion

##### a) *The LED Manufacturers*

As discussed above, the LED Manufacturer Representative '421 Products lack “a thermally conducting base” and “a thermally conductive region in solderable thermal contact with the thermally conducting base” as recited in claims 1 and 6. Accordingly, I find that LSG has failed to prove infringement of claims 1 and 6 of the '421 patent.

##### b) *The Luminaire Respondents*

As discussed above, LSG's infringement argument as to the Luminaire Respondents accused products relies on a general assertion in its post-hearing brief that “each Luminaire Respondent incorporates into its products certain specific LED packages” alleged to infringe the '421 patent. *See* CIB at 154. LSG argues that all Luminaire Respondent accused products, those that incorporate LED packages from the LED Manufacturers and those that incorporate LED packaged from third party suppliers, “are equivalent to, and represented by, certain of the LED Manufacturer Representative '421 Products for purposes of infringement.” *See id.* at 163.

The LED Manufacturer Representative '421 Products lack “a thermally conducting base” and “a thermally conductive region in solderable thermal contact with the thermally conducting base” as recited in claims 1 and 6. Accordingly, I find that LSG has failed to prove infringement of claims 1 and 6 of the '421 patent as to the accused products of the Luminaire Respondents.

#### B. Technical Prong of the Domestic Industry Requirement

To prove satisfaction of the technical prong of the domestic industry requirement for the '421 patent, LSG argues that claims 1 and 6 are practiced by two groups of products. *See* CIB at 167–89. The first group incorporates the custom Luminus MP-2835-21C1 LED package (“Luminus MP-2835”). *See* Tr. (Maxik) 638:24–639:12; Tr. (Kuball) 428:14–429:3. This group of products includes LSG's Journi™ Mobile LED Task Light, Good Day&Night® LED

Downlight, Good Day&Night® LED Troffer, GoodDay® A19 LED Bulb, GoodDay® LBAR™ LED Tube, GoodDay® T8 LED Tube, SunTrac™ A19 LED Bulb, AZUL™ Troffer, AZUL™ Linear Luminaire, and the 480® Series Products. *See* Tr. (Maxik) 638:24–639:12; Tr. (Kuball) 428:14–429:3. The second group incorporates the Edison 2835 1W 6V CR195 HL LED package (“Edison 2835”). *See* Tr. (Maxik) 638:24–639:12; Tr. (Kuball) 428:14–429:3. This group includes LSG’s GoodNight® A19 LED Bulb and Sleepy Baby® P15 LED Bulb. *See* Tr. (Maxik) 638:24–639:12; Tr. (Kuball) 428:14–429:3.

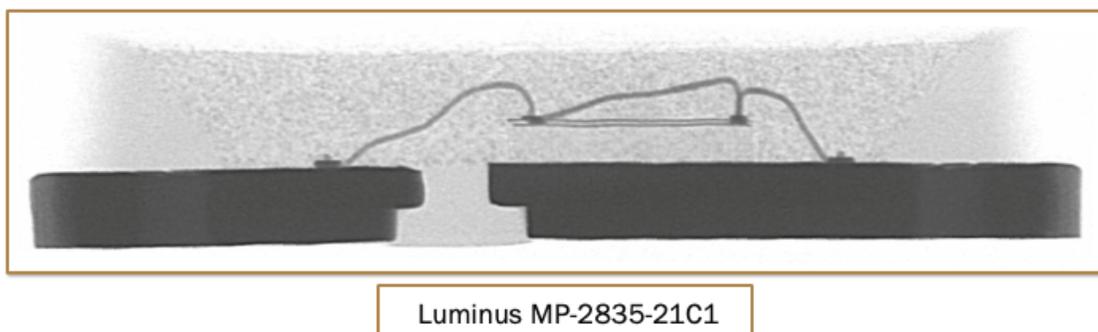
LSG’s expert Dr. Kuball testified that, with respect to claims 1 and 6, there are no material differences between the Luminus MP-2835, the Edison 2835, and the LED Manufacturer Representative ’421 Products analyzed above. Tr. (Kuball) 429:13–17 (“[T]hey are actually very similar in terms of infringement purposes, in terms of claim purposes compared to the other products we discussed.”), 433:17–22 (“[T]hey look very similar.”). As shown in the images below, both the Luminus MP-2835 and the Edison 2835 are lead frame packages with nearly indistinguishable designs compared to the Nichia and Lumileds Representative ’421 Products:



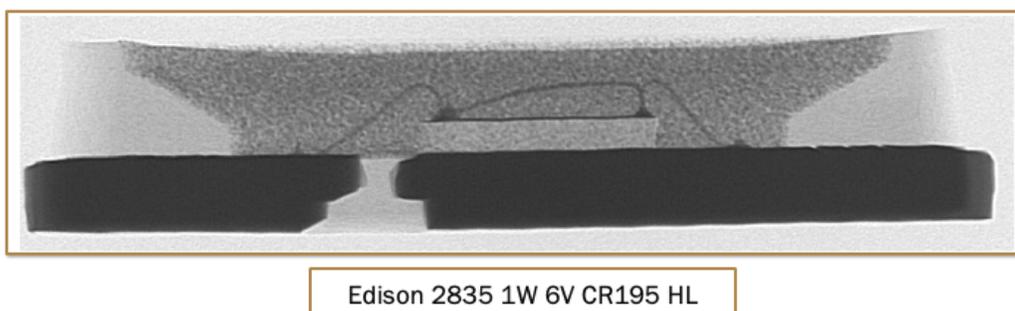
CDX-0005C.299; CX-0807.



CDX-0005C.299; CX-0528.



CDX-0005C.300; CX-0807.



CDX-0005C.300; CX-0528.

Therefore, for the same reasons set forth above with respect to the LED Manufacturer Representative '421 Products, I find that the Luminus MP-2835 and Edison 2835 products do not practice claims 1 and 6 of the '421 patent. Those products lack the claimed “thermally conducting

base” and “thermally conductive region in solderable thermal contact with the thermally conducting base” as recited in claims 1 and 6.

### **C. Validity**

#### **1. Priority Date**

Respondents contend that LSG’s own BL-3000 light engine product embodies every element of the asserted claims and was on sale more than one year before the application for the ’421 patent was filed. *See* RX-0047 at 27–28 (responses to Request for Admission Nos. 76 and 77). Respondents have therefore established a *prima facie* case of invalidity under the pre-America Invents Act version of 35 U.S.C. § 102(b). The burden of production now shifts to LSG to show that the application to which the ’421 patent claims priority provides “adequate support” for claims 1 and 6, thereby entitling those claims to the earlier priority date. *See Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1324 (Fed. Cir. 2008). The phrase “burden of production” means “both producing additional evidence and presenting persuasive argument based on new evidence or evidence already of record.” *Id.* at 1327.

The sufficiency of the disclosure in a patent application is evaluated on a claim-by-claim basis. Specifically, a “patent is only entitled to claim the benefit of the filing date of its provisional application if the disclosure of the provisional application provides support for the claims” of the patent. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015). It is the patentee’s burden to prove that each and every element of the challenged claim is located in the priority document. *See id.*

For a patent to be entitled “to the filing date of an earlier application in the chain of applications of which it is a part, there must also have been a continuing disclosure through the chain of applications, without hiatus.” *Eiselstein v. Frank*, 52 F.3d 1035, 1038 n.4 (Fed. Cir. 1995). In other words, a patent will only be entitled to the priority date of a grandparent application

if there is sufficient disclosure in both the parent and the grandparent application. If there is sufficient disclosure in the grandparent application, but insufficient disclosure in the parent application, the patent will not be entitled to the filing date of the grandparent application.

The '421 patent is a continuation-in-part (“CIP”) of the application that led to the '053 patent and claims priority to Provisional Application No. 60/467,857 (CX-1036), as shown below:

<b>Application Number</b>	<b>Patent Number</b>	<b>Filing Date</b>	<b>Notes</b>
<b>60/467,857</b> <b>(“857 provisional”)</b>	N/A	May 5, 2003	Provisional Application
<b>10/638,579</b> <b>(“579 application”)</b>	7,095,053 (“053 patent”)	August 11, 2003	Parent Application
<b>11/179,863</b>	7,528,421 (“421 patent”)	July 12, 2005	CIP of '579 application

See '421 patent at cover page; '053 patent at cover page.

The undisputed evidence establishes that both the '857 provisional and the '579 application provide support for the majority of the limitations in claims 1 and 6. *See* CIB at 213–21 (citing to testimony from Dr. Kuball and the '857 provisional); RIB at 23–38. Respondents argue only that LSG has failed to show that the '857 provisional and the '579 application disclose three separate limitations:

- “one or more electrically insulating layers overlying at least a portion of the planar portion of the thermally conducting base and defining a surface cavity, wherein the electrically insulating layers include one or more terminals”
- “a thermally conductive region in solderable thermal contact with the thermally conducting base”

- “an LED assembly mount selected from a group consisting of an electrically insulated fastener and a solderable bonding pad”

RIB at 24. These three limitations are discussed in further detail below.

***a) “one or more electrically insulating layers overlying at least a portion of the planar portion of the thermally conducting base and defining a surface cavity, wherein the electrically insulating layers include one or more terminals”***

The evidence shows that the '857 provisional and the '579 application provide sufficient disclosure to support this claim element.<sup>20</sup> Figure 1 of the '857 provisional shows a nickel oxide insulating layer 12 and LTCC layer 17 overlying the thermally conductive copper/molybdenum/copper (“CMC”) base 11, which corresponds to the claimed “one or more electrically insulating layers overlying at least a portion of the planar portion of the thermally conducting base.” See '857 provisional at 3:14–19, 3:23–27. An annotated version of Figure 1 below shows in orange how portions of nickel oxide layer 12 and LTCC 17 stretching from the left via 14 to the right via 14 overlies a planar portion of the thermally conducting base.

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<sup>20</sup> In their post-hearing brief, Respondents argue that the '857 provisional does not support this claim limitation, but they failed to raise this argument in their pre-hearing brief. Compare RIB 34–37 with RPB at 619–40. I therefore deem this argument abandoned according to my Ground Rule 11.2. See Order No. 2 at 18 (June 25, 2019) (“Any contentions not set forth in detail in the pre-hearing brief shall be deemed abandoned or withdrawn.”).

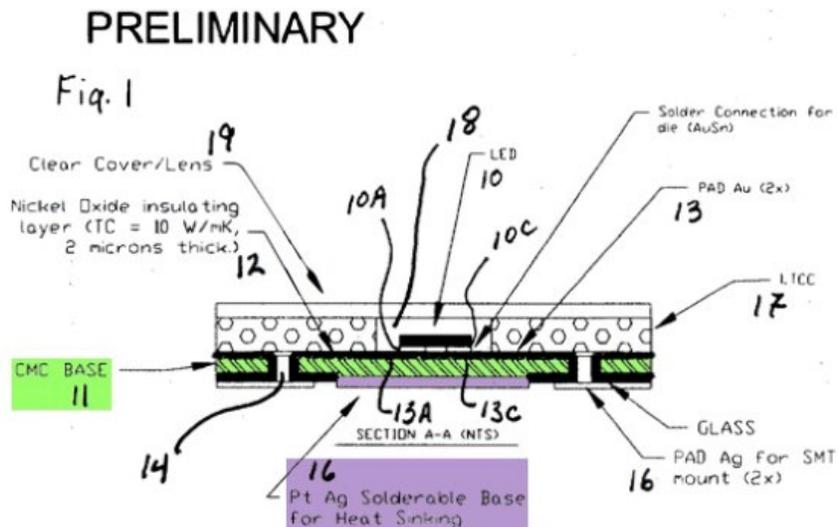


CDX-0011C.35 (annotating '857 provisional at Fig. 1).

I therefore find that the limitation “one or more electrically insulating layers overlying at least a portion of the planar portion of the thermally conducting base and defining a surface cavity, wherein the electrically insulating layers include one or more terminals” recited in claim 1 (and incorporated into dependent claim 6) of the '421 patent is entitled to the priority date of the '857 provisional application.

**b) “a thermally conductive region in solderable thermal contact with the thermally conducting base”**

Claims 1 and 6 require “a bottom surface of the LED assembly [that] includes a thermally conductive region in solderable thermal contact with the thermally conducting base.” LSG argues that Figure 1 of the '857 provisional provides support for this limitation. CIB at 195–96. Using the annotated demonstrative exhibit below, LSG’s expert Dr. Kuball testified that Figure 1 teaches a platinum/silver “solderable base for heat sinking” (depicted below in purple), which corresponds to the “thermally conductive region” of claim 1, and also teaches a copper/molybdenum/copper base 11 (depicted below in green), which corresponds to the “thermally conducting base.” Tr. (Kuball) 1381:14–18.



CDX-0011C (annotating '857 provisional at Fig. 1).

LSG relies on Dr. Kuball's testimony to support its position, but Dr. Kuball failed to demonstrate that Figure 1 teaches that element 16 is solderable to element 11. Rather, he testified that the kind of material from which element 16 is constructed (*i.e.*, platinum) is solderable to the kind of material from which element 11 is constructed (*i.e.*, copper). *See* Tr. (Kuball) 1381:2–13, 1382:1–8. As discussed above with respect to the infringement analysis of the '421 patent, the relevant question is not whether platinum is solderable to copper in the abstract, but rather whether the “base” is in solderable contact with the “region.” The '857 provisional fails to demonstrate that the “base” to which Dr. Kuball points in Figure 1 is solderable to the “region.”

Although Figure 1 of '857 provisional uses the word “solderable” to describe element 16, Respondents' expert Dr. Leby provided persuasive testimony showing that a person of skill in the art would have understood that word to mean that element 16 is solderable to an external component, like a heat sink, and not that element 16 is solderable to element 11. Tr. (Leby) 1277:18–1280:18. Dr. Leby's testimony is consistent with corresponding language in the '857 provisional describing Figure 1, which states: “Solderable electrical connection pads 15A and 15C [also labeled as 16 in Figure 1] may be deposited on the underside of metal base 11 to permit surface mounting of the base 11 on a printed circuit board (not shown).” '857 provisional at 3:7–8.

The evidence also supports Respondents' argument that the concept of a “solderable thermal contact” is new matter added during the prosecution of the '421 patent to overcome the Sugimoto prior art reference. *See* RIB at 32 (citing JX-0007 ('421 patent file history) at LSGITC\_0000577–578, 587; '421 patent at Fig. 10). In particular, Dr. Kuball testified that, outside of the language of claim 1, the '421 patent does not teach that thermal connection 106 is

solderable to metal base 101. Tr. (Kuball) 460:12–461:2 (“Q. So outside of the claim, it doesn’t say 106 is solderable to 101; right? A. No.”); *see also* ’421 patent at Fig. 10.

I therefore find that the limitation “a thermally conductive region in solderable thermal contact with the thermally conducting base” recited in claim 1 (and incorporated into dependent claim 6) of the ’421 patent is not entitled to the priority date of either the ’857 provisional or the ’059 application that matured into the ’053 patent.

***c) “an LED assembly mount selected from a group consisting of an electrically insulated fastener and a solderable bonding pad”***

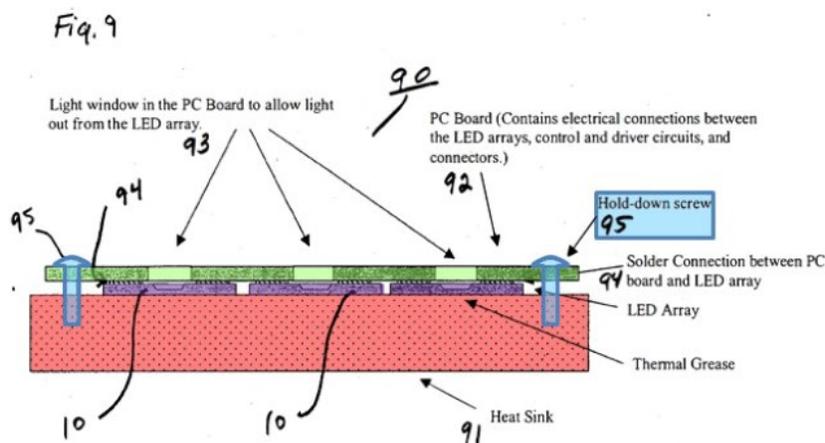
The final disputed limitation of claim 1 recites an “LED assembly mount” selected from a Markush group consisting of “an electrically insulated fastener” and “a solderable bonding pad.” All members of a Markush family must be disclosed in a preceding disclosure in order to claim priority to that disclosure. *See, e.g., In re Gosteli*, 872 F.2d 1008, 1009–10, 1012 (Fed. Cir. 1989) (affirming that a later-filed application containing a Markush claim to a genus cannot claim priority to an earlier-filed application disclosing only a subgenus).

The parties dispute whether or not the ’857 provisional discloses an “LED assembly mount” consisting of an “electrically insulated fastener.” *See, e.g., RIB* at 25–32; *CIB* at 201–13.<sup>21</sup>

As shown in the demonstrative exhibit below, Figure 9 of the ’857 provisional teaches screws 95, which hold down or “mount” an LED assembly comprising multiple LEDs.

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<sup>21</sup> That the ’857 provisional discloses an “LED assembly mount” consisting of “a solderable bonding pad” is not in dispute. *See CIB* at 199–200.



CDX-0011C.50 (annotating '857 provisional at Fig. 9).

LSG's expert Dr. Kuball testified that the screws used to mount the structure in Figure 9 are an "LED assembly mount" as recited by the claim. *See* Tr. (Kuball) 1383:1–16, 1384:2–5. Dr. Kuball further testified that the '857 provisional teaches that the screws 95 "press [the assembly] down to the heat sink" to promote "thermal contact." Tr. (Kuball) 1384:8–19; *see also* '857 provisional at 5:29–6:3. Accordingly, I find that disclosure of the screws 95 in Figure 9 of the '857 provisional provide sufficient disclosure of at least a generic "LED assembly mount."

But the disputed claim language requires more than just a generic LED assembly mount; it requires "an LED assembly mount . . . consisting of an electrically insulated fastener." LSG argues:

[T]he law **does not require** that the Provisional ever state (1) that screws 95 are an "electrically insulated fastener," (2) that screws 95 are made of electrically insulating material, or (3) that screws 95 **can** be made of electrically insulating material.

Rather, when a genus covers a limited and well-known set of species, disclosure of the genus is adequate disclosure of specific members of the species.

CIB at 204–05 (citing *ICN Photonics, Ltd. v. Cynosure, Inc.*, 73 F. App'x 425, 431 (Fed. Cir. 2003)) (emphasis original).

Dr. Kuball testified that the that screws 95 disclose a genus—LED mounting screws—that contain only two options: “[S]crews have to be made of something, and they are either insulator or metal. . . . These are two options, no thoughts needed.” Tr. (Kuball) 1396:10–18; *see also* Tr. (Kuball) 1383:7–19. LSG argues that Dr. Kuball’s testimony proves the ’857 provisional discloses both species of the genus comprising electrically insulated screws and metal screws. CIB at 207 (citing *ICN Photonics*, 73 F. App’x at 431; *Hynix Semiconductor Inc. v. Rambus Inc.*, 645 F.3d 1336, 1352-53 (Fed. Cir. 2011); *VirnetX Inc. v. Apple Inc.*, 665 F. App’x 880, 888 (Fed. Cir. 2016); *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1380 (Fed. Cir. 2001); *In re Petering*, 301 F.2d 676, 682 (C.C.P.A. 1962); *In re Schaumann*, 572 F.2d 312, 314–17 (C.C.P.A. 1978)).

Respondents argue that the ’857 provisional does not disclose an electrically insulated fastener because it does not explicitly state that the hold-down screws are made of insulating material. Quoting *Hyatt v. Boone*, 146 F.3d 1348, 1353 (Fed. Cir. 1998), Respondents contend that if the written description in a priority application does not explicitly disclose a limitation, “it must be shown that a person of ordinary skill would have understood, at the time the patent application was filed, that the description *requires* that limitation.” RIB at 30–31 (emphasis original).

First, LSG forfeited any genus-species argument by failing to include it in its pre-hearing brief. *See* CPB at 1042–50; Order No. 2 at Ground Rule 11.2. Even if I were to consider that argument, it lacks merit because it is built on a false premise. The genus of LED mounting screws is not limited to two species; the world of screws includes many kinds of screws beyond metal screws and insulating screws. For example, a screw could be made of a semiconductor material that is both conducting and insulating depending on the voltage applied. A metal screw could also

have an insulating coating on different portions of its head or shank so that the screw is insulating as it passes through one layer but is conductive to connections in another layer.

More to the point, there is absolutely no evidence in the '857 provisional that the inventors considered the conductive or insulating properties of the screw at all. To benefit from the priority date of the '857 provisional, that application must “convey with reasonable clarity to those skilled in the art that, as of the filing date sought, [the inventor] was in possession of *the invention*.” *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563–64 (Fed. Cir. 1991) (emphasis in original). Nothing in the '857 provisional teaches a person of skill in the art that the screws are electrically insulating. I therefore find that the limitation “an LED assembly mount . . . consisting of an electrically insulated fastener” recited in claim 1 (and incorporated into dependent claim 6) of the '421 patent is not entitled to the priority date of the '857 provisional.

## **2. Anticipation: BL-3000 On-Sale Bar**

In response to Requests for Admission, LSG admitted that if claims 1 and 6 of the '421 patent are entitled only to the '421 patent's filing date of July 12, 2005, the claims would be invalid due to an anticipating sale of an LSG product. RX-0047 at 27–28 (responses to Request for Admission Nos. 76 and 77). Specifically, LSG admitted its BL-3000 light engine product was offered for sale and sold more than one year before the '421 application was filed, and the BL-3000 light engine practices every limitation of claims 1 and 6 of the '421 patent. *See id.*

As discussed above, I have found that the '857 provisional does not provide written description support for “a thermally conductive region in solderable thermal contact with the thermally conducting base” and “an LED assembly mount . . . consisting of an electrically insulated fastener,” limitations required by claims 1 and 6 of the '421 patent. These claims are therefore only entitled to the patent's filing date of July 12, 2005. Accordingly, claims 1 and 6 of

the '421 patent are invalid under 35 U.S.C. § 102(b) based on the offer and sale of the BL-3000 light engine product more than one year before July 12, 2005.

### 3. Obviousness: Hammond

Respondents argue that claims 1 and 6 of the '421 patent are rendered invalid as obvious in view of the Hammond prior art reference.<sup>22</sup> RIB at 40–58. The evidence shows that Hammond teaches all limitations of claims 1 and 6 except for the preamble phrase “[an] LED assembly adapted for surface mounting and high temperature operation.” *See* Hammond at Fig. 4, Abstract, ¶¶ 1, 7, 9, 29, 36; Tr. (Lebby) 1281:1–1292:10. Hammond teaches a gallium arsenide die adapted for surface mounting and high temperature operation, but Hammond does not expressly disclose that the gallium arsenide die is an LED. Hammond at Fig. 4, ¶ 1. LSG does not dispute that Hammond discloses every other limitation of claims 1 and 6 except an LED assembly. *See* CRB at 11–12.<sup>23</sup>

As described below, evidence adduced at the hearing establishes that it would have been obvious for a person of ordinary skill in the art to select an LED as the particular gallium arsenide die to be used with the Hammond package.

Hammond discloses a “package for an electronic component [that] includes a metal support substrate having a pattern of openings therethrough and a body of an insulating material, such as glass or ceramic, on and bonded to the surface of the support substrate.” Hammond at Abstract. Hammond further discloses that its “invention relates to multilayer ceramic circuit boards mounted

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<sup>22</sup> U.S. Patent Application Publication No. US 2002/0166684 A1 to Hammond et al. (“Hammond”) (RX-0018) was filed May 10, 2001, published on November 14, 2002, and is prior art under 35 U.S.C. § 102(b) (if claims 1 and 6 claim priority to the '421 patent's filing date) or 35 U.S.C. §§ 102(a) and 102(e) (if claims 1 and 6 claim priority to the '857 provisional).

<sup>23</sup> LSG also failed to establish the existence of secondary indicia of non-obviousness as to claims 1 and 6 of the '421 patent. *See* RIB at 41.

on a patterned conductive substrate support . . . [and] relates to mounting modules of high power amplifiers and oscillators onto the patterned substrate support to remove excess thermal energy from these devices.” *Id.* ¶ 1. Hammond also discloses that its semiconductor die 52 is a “gallium arsenide die.” *Id.* at Fig. 4.

Hammond’s package utilizes low temperature co-fired ceramic circuit boards with metal support substrates, or LTCC-M technology, which is referenced in the preferred embodiments of the asserted ’053 and ’421 patents. *See* Tr. (Lebby) 1282:5–15; Hammond ¶ 7; ’053 patent at 2:33–38, 7:29–38; ’421 patent at 2:54–60, 5:50–53, 6:32–41. Hammond teaches that the advantages of such packages includes heat dissipation. *See* Hammond ¶¶ 1, 7, 36; Tr. (Lebby) 1282:1–4.

Figure 4 from Hammond is reproduced with color annotations below. The handwriting is original to the disclosure:

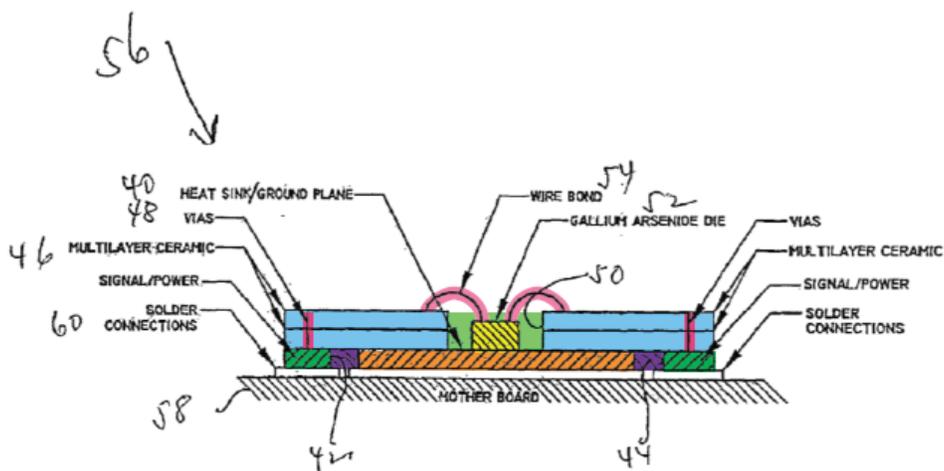


FIG. 4

RDX-0008.0013.

Figure 4 depicts a semiconductor package containing a power amplifier formed on a “Gallium Arsenide Die” 52 (shown above in yellow) mounted on a “Heat Sink/Ground Plane 40,” which is also referred to as the “metal support substrate 40” (shown above in orange). Hammond ¶ 29 and Fig. 4. Hammond discloses that its electronic component package assembly is “adapted for surface mounting” (*e.g.*, it has a solder connection to the surface of a motherboard) and is adapted for “high temperature operation. ” *See* Hammond ¶ 9; Tr. (Lebby) 1286:11–1287:2.

Dr. Lebby testified that a person of ordinary skill would have understood Hammond to teach that a power amplifier formed on a gallium arsenide die is a semiconductor chip that consumes current and generates heat that would be dissipated by Hammond’s heat sinking metal support substrate. *See* Tr. (Lebby) 1283:2–6.

The evidence, including persuasive testimony from Dr. Lebby, establishes that it would have been obvious, in view of the knowledge of a person of ordinary skill in the art, to mount an LED die in the LTCC-M assembly disclosed by Hammond in place of Hammond’s power-amplifier gallium arsenide die. *See* Tr. (Lebby) 1283:18–1285:16. As the disclosure of ’421 patent admits, LEDs made from semiconductor material and with LTCC-M technology were known prior to the alleged invention. ’421 patent at 6:29-42. Dr. Lebby confirmed that a person of ordinary skill would have understood that the semiconductor material of an LED can be gallium arsenide based. Tr. (Lebby) 1283:7–13, 1284:7–16.

The need to dissipate heat from such LEDs was also known the art at the time of the alleged invention. *Id.* One design for dissipating heat from LTCC-M gallium arsenide semiconductor devices known at the time of the invention was the device in Hammond. Hammond ¶ 0005 (“The metal substrate support of the above-described LTCC-M technology can serve also as a heat spreader, or heat sink . . .”).

When considering how to dissipate heat from an LED die, a person of ordinary skill in the art would have been motivated to use the configuration in Hammond, which provides for improved heat dissipation. *See* Tr. (Lebby) 1283:7–13, 1284:6–16; Hammond ¶ 0005 (“The metal substrate support of the above-described LTCC-M technology can serve also as a heat spreader, or heat sink . . .”). Hammond is also for use with “high power components,” further suggesting that it would be suitable for use with LEDs that draw a high current and generate heat. *See* Tr. (Lebby) 1283:2–13; Hammond ¶ 0005. Moreover, Hammond teaches that the configuration of its LTCC-M technology would “improve reliability and reduce manufacturing costs,” which are additional considerations that would motivate a person of skill in the art to combine Hammond with an LED device. *See* Hammond ¶ 0006.

The evidence also shows that a person of ordinary skill in the art would not have had any difficulty using an LED die in the Hammond package. Figure 4 of Hammond depicts a semiconductor package with an open top suitable for use with a light-emitting semiconductor device such as an LED. *See* Tr. (Lebby) 1284:6–1285:6. Dr. Lebby testified that Hammond teaches “a very simple package” and that “it’s a very simple way to implement [a] gallium arsenide semiconductor chip into a heat extraction package.” Tr. (Lebby) 1285:25–1286:6.

Based on the record evidence, I find Respondents have shown, clearly and convincingly, that claims 1 and 6 of the ’421 patent are rendered invalid as obvious in view of the Hammond reference.

#### 4. Anticipation: Yoganandan

Respondents argue that claims 1 and 6 of the '421 patent are invalid as anticipated by the Yoganandan prior art reference.<sup>24</sup> RIB at 58–70. As discussed below, I find that Respondents have not met their burden to show, by clear and convincing evidence, that Yoganandan teaches all elements of the '421 patent claims.

In general, Respondents present anticipation by Yoganandan as a fallback position in the event that the '421 patent claims are interpreted as broadly as LSG asserts or in the event that the theories underlying LSG's proposed factual findings on infringement are adopted. I have rejected several of LSG's constructions and factual theories in my infringement analysis above, and when consistent reasoning is applied to an evaluation of the Yoganandan reference, Respondents' showing does not demonstrate anticipation.

One claim limitation is sufficient to illustrate this point. The claims require a “thermally conductive region in solderable thermal contact with the thermally conducting base.” Respondents argue that, if LSG's construction and factual theories are adopted, Yoganandan teaches this limitation. *See* RIB at 67–68. Respondents elaborate: “[T]he core of pad/platform 270 is copper 410B, and its lower plating layers are an additional layer of copper 800, a layer of nickel 810, and a layer of gold 820. If, consistent with Complainants' infringement allegations, the copper core and additional copper plating on its bottom surface are together considered the ‘thermally conducting base,’ and the nickel and gold plating layers thereunder are considered the ‘thermally conductive region,’ then this limitation is met, because copper—in the abstract and without

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<sup>24</sup> U.S. Patent Application Publication No. US 2002/0163006 A1 to Yoganandan et al. (“Yoganandan”) (RX-0017) was filed April 23, 2002, published on November 7, 2002, and is prior art under 35 U.S.C. §§ 102(a), (b) and/or (e) (depending on the priority date of the '421 patent).

consideration of the actual physical construction of the package being analyzed—can be soldered to nickel. *Id.* at 68 (citing Yoganandan ¶¶ 0023, 0031–32, 0048–51).

As discussed previously in my infringement analysis, I rejected a factual finding that a microscopically thin layer of metal electroplated onto a copper core constitutes a thermally conductive region in solderable thermal contact with a thermally conducting base. I further rejected a factual finding that two structures were in solderable thermal contact simply by virtue of the fact that each structure was made of a material that could be soldered in the abstract. With respect to anticipation, I similarly decline to make such factual findings about the disclosures in Yoganandan. The microscopically thin layer of nickel plating identified by Respondents in Yoganandan is not in solderable thermal contact with the copper base identified by Respondents. Respondents do not offer any arguments explaining how Yoganandan would anticipate absent such a finding. It was Respondents' burden to show every element of the claimed invention of the claimed invention within the four corners of Yoganandan, which they have failed to do. *See Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000). For at least this reason, I find that Respondents have failed to show, clearly and convincingly, that the asserted claims of the '421 patent are anticipated by Yoganandan.

### **5. Anticipation: Seko**

Respondents argue that claims 1 and 6 of the '421 patent are invalid due to anticipation by the Seko prior art reference.<sup>25</sup> RIB at 70–83. As with the Yoganandan reference, Respondents argue anticipation by the Seko reference as a fallback position in the event that other arguments advanced by LSG are adopted. *Id.* at 79–82. And as with the Yoganandan reference, the dispute

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<sup>25</sup> Japanese Patent Application No. 2001-217650 to Seko (“Seko”) (RX-0011) was published on January 31, 2003, and is prior art under 35 U.S.C. §§ 102(a), (b) and/or (e) (depending on the priority date of the '421 patent).

over Seko can be resolved by examining whether Respondents have shown “a thermally conductive region in solderable thermal contact with the thermally conducting base” within Seko.

Seko discloses a LED for use in outdoor display panels. Seko teaches application of “nickel plating” on sides of the device “where the copper is exposed” prior to deposition of resist film 16. Seko ¶¶ 0029; *see also id.* ¶¶ 0022. Respondents argue the nickel plating on the bottom of the copper layer in Seko is in solderable thermal contact with the thermally conducting base “under Complainants’ infringement theory, because copper—in the abstract and without consideration of the actual physical construction of the package being analyzed—can be soldered to nickel.” RIB at 80–81.

As discussed previously in my infringement analysis, I rejected a factual finding that a microscopically thin layer of metal electroplated onto a copper core constitutes a thermally conductive region in solderable thermal contact with a thermally conducting base. I further rejected a factual finding that two structures were in solderable thermal contact simply by virtue of the fact that each structure was made of a material that could be soldered in the abstract. With respect to anticipation, I similarly decline to make such factual findings about the disclosures in Seko. Respondents do not offer any arguments explaining how Seko would anticipate absent such a finding. It was Respondents’ burden to show every element of the claimed invention of the claimed invention within the four corners of Seko, which they have failed to do. *See Advanced Display Sys.*, 212 F.3d at 1282. For at least this reason, I find that Respondents have failed to show, clearly and convincingly, that the asserted claims of the ’421 patent are anticipated by Seko.

## **6. Written Description**

Respondents argue that under LSG’s interpretation, claims 1 and 6 of the ’421 patent are invalid for lack of written description of an invention with “a bottom surface . . . [that] includes a

thermally conductive region in *solderable* thermal contact with [a] thermally conducting base.”

RIB at 83–86 (emphasis original). Specifically, Respondents argue:

The requirement that the “thermal contact” be “*solderable* thermal contact” was not part of the originally filed claims or specification. Rather, as originally filed, application claim 1 required only, “a bottom surface of the LED assembly includ[ing] a thermally conductive region in *thermal contact* with the thermally conducting base, for spreading heat transmitted to the base from the one or more LED die.” [’421 patent file history at LSGITC\_0000462.] The “solderable” requirement is new matter added by amendment to the claims during prosecution.

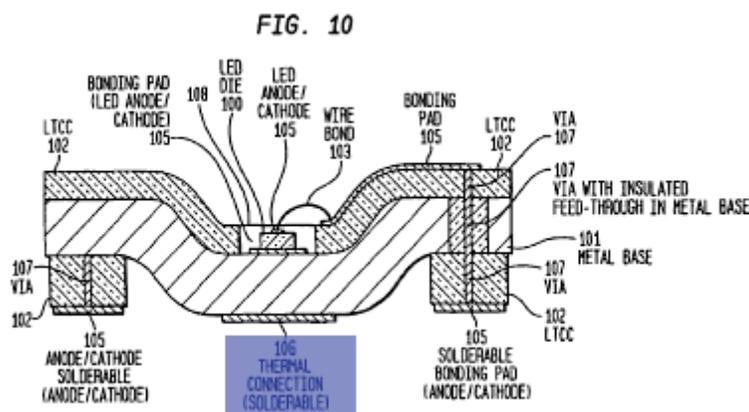
The specification, too, discloses only “thermal contact,” not “*solderable* thermal contact.” Regarding Figure 4, the specification states:

The bottom surface of the LED assembly 40, shown in FIG. 4, includes a thermally conductive central region 42 *adapted to be placed in thermal contact with a thermally conducting* base (not shown in FIG. 4), or that is part of the base. Preferably, the thermally conductive central region 42 is composed of the same material as the base. [’421 patent at 4:31-44, Fig. 4].

Absent from this disclosure is any discussion of “soldering” the “region” to the “base,” or that the “region” and the “base” are in “*solderable*” thermal contact.

RIB at 84–5 (emphasis original).

Respondents state that the only reference to a region being “solderable” is in Figure 10, an annotated version of which is reproduced below:



See RIB at 85.

I have already determined that the provisional application to which the '421 patent claims priority does not disclose “a bottom surface . . . [that] includes a thermally conductive region in *solderable* thermal contact with [a] thermally conducting base.” The additional text and figures appearing in the application that led to the '421 patent do not cure that deficiency. *See* JX-0007 ('421 patent file history). The “solderable” thermal connection 106 shown in Figure 10 allows the LED assembly to be soldered to an external component such as an external “circuit, heat sink, and the like.” '421 patent at 7:1–8. The written description does *not* disclose that connection 106 is solderable to the part of the device designated as base 101. *See* RX-0134C (Mazzoquette Dep.) at 139:20–140:8, 141:6–23, 142:3–143:23, 144:5–11, 144:13–18; Tr. (Lebby) 1273:18–1276:18. Indeed, LSG’s own expert Dr. Kuball testified that, outside of the language of claim 1, the '421 patent does not teach that thermal connection 106 is solderable to metal base 101. Tr. (Kuball) 460:12–461:2 (“Q. So outside of the claim, it doesn’t say 106 is solderable to 101; right? A. No.”). Solderable bonding pads 105 in Figure 10 also do not provide the necessary written description. Pads 105 are not in contact—solderable or otherwise—with base 101. Similarly, the solderable terminals 23 in Figure 2 are not disclosed to be in solderable thermal contact with a base.

The application that led to the '421 patent did not disclose a region on the bottom surface of the LED assembly in solderable thermal contact with the base at the time of filing, as required by independent claim 1 and dependent claim 6. Those claims are invalid for failure to satisfy the written description requirement of 35 U.S.C. § 112. *Ariad Pharm.*, 598 F.3d at 1351 (“[T]he test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.”).

## 7. Indefiniteness

Respondents argue that the claim 1 phrase “thermally conductive region in solderable thermal contact with the thermally conducting base” is indefinite in view of the language of dependent claim 2. RIB at 86–87. This argument is a renewal of the argument Respondents raised at the *Markman* claim construction hearing. *See, e.g.*, Order No. 31 at 29–31. Respondents’ indefiniteness argument is denied at least for the same reasons set forth in my claim construction order. Additionally, the evidence adduced at the hearing shows this claim language would inform, with reasonable certainty, those skilled in the art about the scope of the invention. *See* Tr. (Kuball) 354:23–355:11, 357:25–361:6. Accordingly, Respondents have not shown the claim to be indefinite. *Nautilus*, 134 S. Ct. at 2129.

## VI. ECONOMIC PRONG OF THE DOMESTIC INDUSTRY REQUIREMENT

### A. The Relevant Industry

To prove satisfaction of the economic prong of the domestic industry requirement, LSG relies on the nineteen luminaire products previously discussed in my technical prong analysis for the ’053 and the ’421 patents (collectively, the “DI Products”). CIB at xviii. The DI Products incorporate the Luminus SST-20-W40H-J4401-LS LED package (alleged to practice the ’053 patent) and the Luminus MP-2835-21C1 and Edison 2835 1W 6V CR195 HL LED packages (alleged to practice the ’421 patent).

Respondents argue that LSG has identified the incorrect articles of commerce for purposes of the economic prong analysis, and that LSG has therefore failed to show a domestic industry. *See* RRB at 117–24. Specifically, Respondents argue that the domestic industry should be analyzed in the context of the three LED packages alleged to practice the asserted patents, and not in the context of downstream luminaire products that incorporate the three Luminus- and Edison-brand LED packages. *See id.* Respondents further argue that, because LSG has not

quantified investments with respect to the three allegedly protected LED packages, it has failed to demonstrate a domestic industry in those packages. *Id.* at 17.

The Commission adheres to a “long-standing principle that domestic industry (including the definition of the article protected by the patent under section 337(a)(3), 19 U.S.C. 1337(a)(3)) is not determined by a rigid formula, but by an examination of the facts in each investigation, the article of commerce, and realities of the marketplace.” *Certain Batteries & Electrochemical Devices Containing Composite Separators, Components Thereof, & Prods. Containing Same* (“*Batteries & Electrochemical Devices*”), Inv. No. 337-TA-1087, Comm’n Notice at 2 (Sept. 7, 2018). Commission precedent “illustrate[s] that where the imported product is a component of a complete downstream product, the relevant domestic industry under the economic prong may, under appropriate circumstance depending on the realities of the marketplace, be defined in terms of a downstream product.” *Certain Video Game Sys. & Wireless Controllers & Components Thereof* (“*Video Game Systems*”), Inv. No. 337-TA-770, Comm’n Op. at 67 (Oct. 28, 2013). “Factors to consider regarding the realities of the marketplace analysis include whether the patented technology is sold as a separate entity or article of commerce; whether it is an essential component of the downstream product; and whether the domestic industry activities have a direct relationship to exploitation of the patented technology.” *Certain Magnetic Tape Cartridges & Components Thereof* (“*Magnetic Tape*”), Inv. No. 337-TA-1058, Comm’n Op. at 48 (Apr. 9, 2019).

Here, the Commission determined to institute an investigation into an industry that includes luminaires. The Notice of Investigation for this matter defines the scope of investigation as “(1) LED packages and assemblies; (2) LED luminaires; and (3) connected ‘smart’ LED lighting systems and components thereof.” 84 Fed. Reg. 29877 (June 25, 2019). Arguably, then, the

Commission has already answered the question of the relevant industry in this investigation. *See Certain Air Mattress Sys., Components Thereof, and Methods of Using the Same*, Inv. No. 337-TA-971, Comm'n Op. at 42 (June 20, 2017) (“The articles sold by Complainant are air mattress systems [as opposed to the patented air control components], which are reflected in the title of this particular investigation.”).

To the extent the question remains open, the realities of the marketplace do not constrain the relevant domestic industry to LED packages used in luminaires; the luminaries themselves are also a material part of the industry. For example, while it is undisputed that LED packages are sold as a separate article of commerce by some companies, testimony from the chief technology officer of Lighting Science and Healthe<sup>26</sup> demonstrated that such sales are primarily an input into downstream articles such as the DI Products. Tr. (Maxik) 647:5–14, 757:10–759:2. The evidence also shows that the LED packages at issue here are necessary for the DI Products to function as intended. *See* Tr. (Maxik) 644:25–645:12, 651:20–652:11; Tr. (Prowse) 759:3–761:19; RX-0144C (Maxik Dep.) at 260:4–261:9; RX-0131C (Zhou Dep.) at 137:1–14, 161:6–162:8, 240:3–20.

The evidence further shows that the domestic activities of LSG/Healthe have a direct relationship to exploitation of the patented technology. The inventors contemplated that the technology covered by the asserted patent claims would be used in light sources. *See, e.g.*, '421 patent at 1:27–30. That is an indication that luminaires are part of the relevant industry. *See Magnetic Tape*, Comm'n Op. at 54 (recognizing investments in tape drives where “the Media Patent specifications make clear that Sony’s claimed inventions are intended to improve the

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<sup>26</sup> LSG relies only on domestic expenditures by Lighting Science and Healthe to prove satisfaction of the economic prong of the domestic industry requirement. *See* Tr. (Maxik) 621:8–12. Lighting Science and Healthe are hereinafter collectively referred to as “LSG/Healthe.”

performance of [patented] tape media when they are used in conjunction with [unpatented] tape drives”). Additionally, Mr. Maxik testified that the only way LSG exploits the asserted patents is by incorporating the three Luminus and Edison LED models into the DI Products. Tr. (Maxik) 647:20–25 (describing how LSG’s LED package development became “commercially unviable”), 758:2–17. This evidence also supports a conclusion that luminaires are part of the relevant industry. *Magnetic Tape*, Comm’n Op. at 53 (“investments necessary to bring to market the patented technology” are appropriately considered in a domestic industry analysis).

In sum, I conclude that the nineteen luminaire products LSG includes in its definition of DI Products are appropriately considered to be part of the domestic industry.

**B. LSG/Healthe’s Domestic Expenditures**

LSG argues it has demonstrated the existence of a domestic industry under section 337(a)(3)(B), which requires a showing of “significant employment of labor or capital.” See CIB at 221–22. LSG provides the following table summarizing its alleged domestic investments:

<b>DI-Table 1: U.S. Expenditures on LSG/Healthe’s DI Products</b>			
	<b>'053 DI Product (2015-May 2019)</b>	<b>'421 DI Products (2014-May 2019)</b>	<b>Total</b>
<b>Section 337(a)(3)(B) Labor or Capital</b>			

*Id.* at 222 (citing Tr. (Prowse) 785:18–22; CDX-0007C.35; CDX-0008C.0067–.0068; CDX-0008C.0066–.0159; CX-4236).

**1. Labor Activities and Expenditures**

The evidence shows that Lighting Science and Healthe are U.S. companies using domestic employees and contractors to conduct the majority of research and development (“R&D”) on the DI Products at LSG/Healthe’s U.S. facilities or elsewhere in the United States. See Tr. (Maxik) Tr. 637:17–638:23, 643. Messrs. Maxik and Lee provided testimony to establish that LSG/Healthe

used either an inside-out or an outside-in approach to bring the DI Products to market. *See* Tr. (Maxik) 641–642; RX-0130C (Lee Dep.) at 173:22–178:2. With the inside-out approach, LSG/Healthe employees conducted R&D to introduce technology into the market before designing and developing products that implemented that technology. *See* Tr. (Maxik) 641. With the outside-in approach, LSG/Healthe product development employees went into the market and conducted research to bring back to the company; they then worked together with the R&D team to develop products to address needs in the market. *See* Tr. (Maxik) 641–42; RX-0130C (Lee Dep.) at 173:22–178:2.

Mr. Maxik and other LSG/Healthe employees testified that to create, develop, test, and bring the DI Products to market, they performed at least the following R&D activities within the United States: LED package criteria evaluation and selection; LED package selection, evaluation, specification, and customization; LED package testing, such as performance, suitability, and photometric testing (*e.g.*, sphere, life, and goniometric, and material compatibility testing); LED package design optimization; LED package spectrum design; LED die selection and specification (*e.g.*, die characteristics and phosphor/encapsulant customization); LED and printed circuit board layout design and prototyping; LED package efficiency improvements based on current and voltage; system electronics implementation; thermal management research, design, modeling, simulations, and testing; materials research and case studies for spectrum filtering and heat sink material; light spectrum development; LED color mixing and incorporation into product design; optical design, testing, evaluation, validation, and optimization; light guide optical structure design; research and implementation of improvements to photometric and spectrum output; lumen output and bulb efficacy improvements; mechanical design and prototyping; research and implementation of improvements to mechanical and optical design; power supply design,

prototyping, and improvement research and implementation; product specification defining; product structural, industrial, and outward finish design; product prototyping. *See* Tr. (Maxik) 686:23–687:16, 689–692, 740:7–741:25; CX-1226C; CX-1213C; CX-1149C; RX-0144C (Maxik Dep.) at 544–45; RX-0131C (Zhou Dep.) at 20–21, 42–47, 51–52, 54–58, 60–63, 68–69, 80:18–81:20, 83–84, 86–90, 93:5–94:21, 101–108, 111:10–121:9, 128–130, 149:17–152:4, 240:10–20; RX-0136C (Palé Dep.) at 31–32, 41–42, 93–94; RX-0130C (Lee Dep.) at 75–78, 173:22–180:25, 183:11–193:13, 202:17–204:18; RX-0140C (Widjaja Dep.) at 7–9, 12–13; RX-0139C (Regan Dep.) at 6, 8:16–9:19, 15:15–16:22, 19–30, 31:7–11, 49:4–51:16, 54:7–55:8; RX-0141C (Bartine Dep.) at 6, 8:8–26:4, 31:16–32:3, 37:1–6.

LSG/Healthe does not track employee hours or the number of hours employees spend working on individual products in the regular course of business. *See* Tr. (Maxik) 681:20–22. In order to allocate labor expenses related to employees who contributed some portion of their time to the design, engineering, and R&D of the DI Products, Fred Maxik (LSG/Healthe’s chief technology officer), Ran Zhou (head of R&D), Khim Lee (Healthe’s CEO and LSG’s president), and Jonathan Palé (Healthe’s former vice-president of engineering and operations) compiled hourly time estimates for these employees.<sup>27</sup> Tr. (Maxik) 681–82, 684; RX-0131C (Zhou Dep.) at 176, 178–80; RX-0136C (Palé Dep.) at 15–17; CX-1219C.

Respondents argue that the hourly estimates in evidence are unreliable because the persons making the estimates failed to “consult any documents that actually reflected time worked, nor did they break the alleged labor down by tasks or projects.” *See* RRB at 138–39. I am not persuaded by Respondents’ argument. The evidence shows that Messrs. Maxik, Zhou, Lee, and Palé are the

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<sup>27</sup> LSG refers to LSG/Healthe employees that worked on one or more of the DI Products as the “DI Employees.” CIB at xviii. I will adopt that convention for purposes of the economic prong discussion.

most knowledgeable about LSG/Health's R&D operations and have been heavily involved in the oversight and general management of the R&D efforts for the DI Products. *See* Tr. (Maxik) 622:21–623:16, 629:4–20, 648:10–21, 665:20–666:23, 681:11–682:23, 684–685, 742:5–11; RX-0130C (Lee Dep.) at 27, 90, 188; RX-0136C (Palé Dep.) at 6, 40–41; RX-0131C (Zhou Dep.) at 10–17. They compiled the labor hour estimates based on their first-hand knowledge of the DI Employees, the R&D work on the DI Products, LSG/Health's R&D process, and the DI Products themselves. *See* Tr. (Maxik) 622:21–623:16, 629:4–20, 648:10–21, 665:20–666:23, 681:11–682:23, 684–685, 742:5–11; RX-0130C (Lee Dep.) at 27, 90, 188; RX-0136C (Palé Dep.) at 6, 40–41; RX-0131C (Zhou Dep.) at 10–17. Additionally, they corroborated their estimates with documents from employees, expenditure documents, calendar entries, project documentation, and discussions with current employees regarding their work on the DI Products. *See* Tr. (Maxik) 675:4–676:4, 681–682, 684–685, 742–743; RX-0144C (Maxik Dep.) at 257:9–258:4, 345:12–346:2; RX-0130C (Lee Dep.) at 194, 197–198, 234; RX-0131C (Zhou Dep.) at 178–186; *see also* JX-0235C; JX-0327C; JX-0284C–JX-0285C; JX-0288C–JX-0289C; JX-0293C; JX-0297C–JX-0298C; JX-0166C; CX-1112C; CX-1131C; CX-1151C–CX-11157C; CX-1160C–CX-1162C; CX-1164C–CX-1170C; CX-1172C–CX-1183C; CX-1204C–CX-1210C; CX-1223C–CX-1226C. I find that the labor hours estimates submitted by LSG based on work performed by Messrs. Maxik, Zhou, Lee, and Palé are reliable for purposes of the economic prong analysis.

In more granular arguments, Respondents contend that LSG counted work on the GoodNight A19, SleepBaby P15, Series A+ Gimbal Lamp, and GoodDay A19 luminaire products before LSG determined to utilize one of the allegedly protected packages in those products. RRB at 125 (citing Tr. (Prowse) 775:9–776:8, 801:25–802:8), 128–32. I do not find Respondents'

arguments persuasive. The disputed expenditures were made during development of final versions of the products in question, and those final versions contain the LED packages at issue. Thus, the disputed investment are part of an industry “*relating to* [ ] articles protected by the patent.” See 19 U.S.C. 1337(a)(2); see also CIB at 237–39 (citing, *inter alia*, Tr. (Maxik) 660:18–661:21; Tr. (Prowse) 775, 800:12–20, 801:25–803:9, 806:7, 807:21–808:5; RX-0144C (Maxik Dep.) at 428:5–434:6, 471:3–18, 473:8–15, 476:14–20). Moreover, LSG offered credible testimony from its employees to demonstrate that the DI Products contain the relevant LED packages. See CIB at 238–39 n.754 (citing to testimony from Messrs. Maxik and Zhou).

Respondents also argue that LSG’s labor figures should be discounted because they “include an indeterminable amount of sales and marketing expenditures.” RRB at 135–38. “While marketing and sales activity, alone, may not be sufficient to meet the domestic industry test, those activities may be considered as part of the overall evaluation of whether or not a Complainant meets the economic prong.” See *Certain Printing & Imaging Devices & Components Thereof* (“*Printing & Imaging Devices*”), Inv. No. 337-TA-690, Order No. 24 at 34 (Apr. 21, 2010), *rev’d on other grounds*, Comm’n Op. at 30–31; see also *Certain Mobile Devices & Related Software*, Inv. No. 337-TA-750, Initial Determination at 6 (Sept. 15, 2011) (“The Commission has embraced a flexible, market-oriented approach to domestic industry, favoring case-by-case determination ‘in light of the realities of the marketplace’ that encompass ‘not only the manufacturing operations’ but may also include ‘distribution, [R&D] and sales.’”). To the extent any of LSG/Healthe’s labor expenditures are related to sale and marketing activities, I find that they are appropriate domestic industry expenditures under the facts of this case. LSG/Healthe is not a mere importer relying solely on marketing expenditures for its domestic industry. *Cf. Schaper Mfg. Co. v. U.S. Int’l Trade Comm’n*, 717 F.2d 1368, 1373 (Fed. Cir. 1983) (“large expenditures for advertising and

promotion” alone do not transform the activities of a “normal importer” into a domestic industry). LSG designed and developed the DI Products in the United States, and its marketing expenses are reasonably included in an industry related to the allegedly protected articles. *See Certain Loom Kits*, Inv. No. 337-TA-923, Comm’n Op. at 5–8 (June 26, 2015) (crediting several forms of marketing as contributing to the domestic industry where other domestic activities, including domestic design activities, distinguished the complainant from a mere importer).

LSG adduced evidence showing that LSG/Healthe designed, researched, developed, planned, evaluated, and commercialized each of the DI Products in the United States, expending approximately [REDACTED] R&D labor hours on the ’053 DI Product and over [REDACTED] R&D labor hours on the ’421 DI Products. *See* Tr. (Maxik) 643, 664. The evidence shows that LSG/Healthe has employed over [REDACTED] U.S. employees, and all of LSG/Healthe’s employees have been located in the United States since 2015. *See* Tr. (Maxik) 664:14–21; CX-1131C. From 2015 through May 2019, at least [REDACTED] LSG/Healthe employees performed R&D activities for the ’053 DI Product and, from 2014 through May 2019, at least [REDACTED] LSG/Healthe employees performed R&D activities for the ’421 DI Products. *See* CX-1219C; JX-0144C. LSG/Healthe also employed external consultants and vendors within the United States to assist with certain R&D efforts related to the DI Products. *See* Tr. (Maxik) 643:16–20, 667:23–668:25, 691:12–692:2; Tr. (Prowse) 781:9–782:3.

LSG/Healthe’s domestic labor expenditures for the relevant period include salaries, benefits, employee insurance, and other expenses for the DI Employees, as well as payments made to external consultants and vendors. *See* Tr. (Prowse) 769:15-781:4; CX-1147C; CX-1156C–CX-1157C; CX-1166C; CX-1168C; CX-1170C; CX-1186C; CX-1188C; CX-1207C–CX-1209C; CX-1219C; CX-1228C; JX-0144C; JX-0150C; JX-0151C.

Based on the record evidence, I find LSG/Healthe spent [REDACTED] from 2015 through May 2019 on labor for an industry relating to the '053 DI Product, and spent [REDACTED] from 2014 through May 2019 on labor for an industry relating to the '421 DI Products. *See* Tr. (Prowse) 776:13–781:8 (referring to CDX-0007C.23, .26; CDX-0008C.0070, .0092).

## 2. Capital Expenditures

The evidence shows that LSG/Healthe has made investments in its domestic facilities in Cocoa Beach, Melbourne, Cape Canaveral, and West Warwick, where its employees performed R&D on the DI Products. *See* Tr. (Maxik) 637:17–638:23, 669:1–772:3; CX-1115C–CX-1116C, CX-1118C; CX-1123C; CX-1125C; CX-1133C; CX-1219C; JX-0131C–JX-0138C; JX-0145C; JX-0156C. These expenditures include rent, utilities, building maintenance, and property insurance. *See* Tr. (Prowse) 782:8–21; CX-1134C–CX-1140C; CX-1147C; CX-1192C–CX-1195C; JX-0146C; JX-0152C. Based on information gathered by LSG, Dr. Prowse calculated that, from 2015 through May 2019, LSG/Healthe spent [REDACTED] for facilities where R&D for the '053 DI Product took place and [REDACTED] for the facilities where R&D for the '421 DI Products took place. *See* Tr. (Maxik) 669:1–672:3; Tr. (Prowse) 782:8–784:9; CX-1135C–CX-1139C; CX-1192C–CX-1196C.

The evidence also shows that LSG/Healthe has purchased, maintained, and leased equipment to perform R&D activities for the DI Products. *See* Tr. 672:5–674:13 (Maxik); JX-0158C; CX-1202C. Based on information provided by LSG, Dr. Prowse calculated that LSG/Healthe spent [REDACTED] on equipment used on the '053 DI Product from 2015 through May 2019, and spent [REDACTED] on equipment used on the '421 DI Products from 2014 through May 2019. *See* Tr. (Prowse) 784:10–785:3; JX-0158C; CX-1202C.

Based on the record evidence, I find LSG/Healthe made capital investments of [REDACTED] from 2015 through May 2019 in an industry relating to the '053 DI Product, and made capital

investments of ██████ from 2014 through May 2019 in an industry relating to the '421 DI Products. *See* Tr. (Prowse) 781:5–785:22 (referring to CDX-0007C.23, .26, .30–.35; CDX-0008C.0066–.0159); CX-1219C.<sup>28</sup>

### C. Significance

LSG's expert Dr. Prowse testified that the domestic investments by LSG/Healthe are qualitatively significant at least because the R&D efforts gave rise to the DI Products and those products have enabled LSG to pioneer new markets. Tr. (Prowse) 789–791. The evidence demonstrates that LSG/Healthe is an American company whose domestic R&D investments form the foundation of every product it sells. *See* Tr. (Maxik) 654:24–655:6; Tr. (Prowse) 755:10–20. Moreover, LSG/Healthe employees within the United States conceptualized, developed, prototyped, tested, sourced, and designed for manufacturing every DI Product at its domestic facilities, and the DI Products would not exist without the domestic investments summarized above. *See* Tr. (Maxik) 641–642, 643:6–644:12, 686:24–687:20; Tr. (Prowse) 755, 789–790.

Respondents argue that the domestic expenditures by LSG/Healthe are not qualitatively significant because LSG/Healthe is not successful as a company. *See* RRB at 139–40. I am not persuaded by this argument. Although commercial success may be relevant to the domestic industry analysis in some contexts, it is not a threshold requirement for a domestic industry.

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<sup>28</sup> LSG/Healthe also alleges it incurred domestic expenditures for “product inputs” for developing prototypes, product design, and R&D activities for the DI Products. *See* Tr. (Maxik) 666:24–667:22; CX-1112C; CX-1151C–CX-1157C; CX-1160C–CX-1162C; CX-1164C–CX-1170C; CX-1172C–CX-1183C; CX-1204C–CX-1210C. Based on a subset of invoices produced by LSG in this investigation, Dr. Prowse calculated that LSG/Healthe spent at least ██████ on R&D product inputs for the '421 DI Products from 2015 through May 2019. *See* Tr. (Prowse) 785:4–14; CX-1112C.0096, .2368, .2452, .2718; CX-1151C; CX-1153C. In its post-hearing brief, LSG did not describe what these “product inputs” are or how they are related to an industry in allegedly protected articles. I therefore decline to consider these expenditures further in my domestic industry analysis.

*Compare Motiva, LLC v. Int’l Trade Comm’n*, 716 F.3d 596, 601 (Fed. Cir. 2013) (affirming no domestic industry where the market had no interest in exploiting the patented technology) *with Certain Television Sets, Television Receivers, Television Tuners, & Components Thereof*, Inv. No. 337-TA-910, Comm’n Op. at 69 (Oct. 30, 2015) (“Commission precedent indicates that where production, development or sales of protected articles have declined or even ceased entirely, a domestic industry may nevertheless be established based on past significant or substantial investments relating to the protected articles provided that complainant continues to maintain ongoing qualifying activities under section 337(a)(3) at the time the complaint is filed.”) *and Certain Non-Volatile Memory Devices*, Inv. No. 337-TA-1046, Comm’n Op. at 40–45 (Oct. 26, 2018) (the text of the statute, the legislative history, and past Commission practice demonstrate that the term “article” in section 337(a)(2) “is sufficiently capacious to embrace pre-commercial or non-commercial items”).

Here, there is ample evidence that LSG/Health is a going concern and that it continues to pay U.S. employees and make other domestic investments to exploit the patented technology. LSG/Health continues to incorporate the LED packages at issue into new products. *See* Tr. (Maxik) 696:7–697:7; RX-0130C (Lee Dep.) at 33–36, 39–40, 243–250, 252:24–254:6; RX-0131C (Zhou Dep.) at 47:15–22, 49:8–51:17. LSG/Health continues to seek out new business opportunities related to the DI Products, and additional customers have requested customizations to the DI Products. *See* RX-0130C (Lee Dep.) at 33–36, 39–40. LSG also presented evidence showing that none of the DI Products have been discontinued and all remain available for purchase. *See* Tr. (Maxik) 629:21–630:1; RX-0130C (Zhou Dep.) at 94:21–25; RX-0144C (Maxik Dep.) at 59:16–60:22, 352:16–353:12, 426:5–8; *see also* Tr. (Maxik)

629:21–630:1 (testifying that Good Day&Night Downlight and Troffer have been renamed to SunTrac™ Downlight and Troffer).

As for whether LSG/Healthe’s domestic expenditures are quantitatively significant, LSG argues that the total labor and capital investments related to LSG/Healthe’s R&D activities “are significant when compared to LSG/Healthe’s comparable activities domestically and abroad.”

CIB at 248. Specifically, LSG argues:

LSG/Healthe has no employees performing R&D on the DI Products overseas, meaning that all of LSG/Healthe’s employment of labor for R&D of the DI Products is domestic.

CIB at 248 (citing Tr. (Maxik) 664–665; Tr. (Prowse) 792; CDX-0007C.0039).

The vast majority of *all* R&D investments made by LSG/Healthe in the DI Products were incurred entirely within the United States.

CIB at 248 (emphasis original) (citing Tr. (Maxik) 643–644; Tr. (Prowse) 792–793).

From 2015 through 2018, LSG/Healthe’s domestic investments in R&D labor and capital associated with the ’053 DI Product represented approximately [REDACTED] of LSG/Healthe’s total R&D expenses, and from 2014 through 2018, domestic investments in the ’421 DI Products represented approximately [REDACTED] of LSG/Healthe’s total R&D expenses.

CIB at 248–49 (citing Tr. (Prowse) 786; CDX-0007C.0040; CDX-0008C.0067-.0068; JX-0155C; JX-0143).

The number of LSG/Healthe employees who worked on the DI Products is significant compared to the company’s total employees. From 2015 to 2019, approximately [REDACTED] to [REDACTED] of LSG/Healthe employees with an average of [REDACTED] worked on the ’053 DI Products. From 2014 to 2019, approximately [REDACTED] to [REDACTED] of LSG/Healthe employees with an average [REDACTED] worked on the ’421 DI Products.

CIB at 249 (citing Tr. (Prowse) 787–88; CDX-0008C.0121).

From 2015 through May 17, 2019, the R&D hours worked by the DI Employees represented [REDACTED] for the ’053 DI Product and [REDACTED] for the

'421 DI Products of total labor hours for all of LSG/Healthe's R&D employees.

CIB at 249 (citing Tr. (Prowse) 787; CDX-0008C.0138).

LSG/Healthe's labor and capital expenditures related to the technology in both patents total [REDACTED]. This includes labor expenditures of [REDACTED] from 2015 through May 2019 for the '053 DI Product, labor expenditures of [REDACTED] from 2014 through May 2019 for the '421 DI Products, capital investments of [REDACTED] from 2015 through May 2019 for the '053 DI Product, and capital investments of [REDACTED] from 2014 through May 2019 for the '421 DI Products. *See* Tr. (Prowse) 776:13–785:22 (referring to CDX-0007C.23, .26, .30–.35; CDX-0008C.0066–.0159). I find that total to be significant in view of the facts of this investigation, the articles of commerce at issue, and the realities of the marketplace. The size of the R&D investment over the relevant period is particularly substantial for a small company like LSG/Healthe. For all of the reasons explained above, I find that LSG has shown satisfaction of the economic prong of the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(B).

## VII. CONCLUSIONS OF LAW

1. The importation requirement has not been satisfied with respect to respondents OSRAM GmbH, OSRAM Licht AG, and Lumileds Holding B.V.

2. The importation requirement has been satisfied with respect to the other named respondents in this investigation.

3. The Commission has subject matter, personal, and *in rem* jurisdiction in this investigation.

4. Claims 1, 2, and 5 of the '053 patent have not been infringed.

5. Claims 1 and 6 of the '421 patent have not been infringed.

6. The technical prong of the domestic industry requirement has not been satisfied with respect to either the '053 patent or the '421 patent.

7. The economic prong of the domestic industry requirement has been satisfied.

8. Claims 1, 2, and 5 of the '053 patent have not been shown invalid by clear and convincing evidence.

9. Claims 1 and 6 of the '421 patent have been shown invalid as anticipated and obvious in view of the prior art.

10. Claims 1 and 6 of the '421 patent have been shown invalid as failing to satisfy the written description requirement of 35 U.S.C. § 112.

### **VIII. RECOMMENDED DETERMINATION ON REMEDY & BOND**

The Commission's Rules provide that the administrative law judge shall issue a recommended determination concerning the appropriate remedy in the event that the Commission finds a violation of section 337, and the amount of bond to be posted by respondents during Presidential review of the Commission action under section 337(j). *See* 19 C.F.R. § 210.42(a)(1)(ii).

#### **A. Findings of Fact Relevant to Remedy and Bond**

The Commission did not ask me to take public interest evidence or to provide findings and recommendations concerning the public interest. 84 Fed. Reg. 29877 (June 25, 2019). Thus, in accordance with the usual Commission practice and the applicable Commission Rule, the Commission will determine the role that public interest factors may play in this investigation. *See* 19 C.F.R. § 210.50(b)(1).

#### **B. Limited Exclusion Order**

The Commission has broad discretion in selecting the form, scope, and extent of the remedy in a section 337 proceeding. *Viscofan, S.A. v. U.S. Int'l Trade Comm'n*, 787 F.2d 544,

548 (Fed. Cir. 1986). A limited exclusion order directed to a respondent's infringing products is among the remedies that the Commission may impose. *See* 19 U.S.C. § 1337(d).

LSG argues that, in the event a violation of section 337 is found, “the Commission should issue LEOs directed to each Respondent, as well as its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns, prohibiting entry of products and components thereof that infringe the Asserted Patents that were manufactured or imported by or on behalf of Respondents, or any of their affiliated companies, parents, subsidiaries, successors, assigns, or other related business entities, for the remaining term of the Asserted Patents, except under license of the patents’ owner or as provided by law.” *See* CIB at 256.

Respondents argue that, in the event a limited exclusion order issues, “it should not cover products of non-named parties, including their downstream products.” RIB at 144 (citing *Kyocera Wireless Corp. v. U.S. Int’l Trade Comm’n*, 545 F.3d 1340, 1356 (Fed. Cir. 2008)). Respondents also argue that “any limited exclusion order should, as is customary, include a provision whereby Respondents can certify that their imported products are not subject to exclusion.” *Id.*

Because I do not find a violation of section 337, I do not recommend that a limited exclusion order should issue. However, if the Commission determines that a violation of section 337 has occurred and if consideration of the statutory public interest factors does not require that remedies be set aside or modified, I recommend that the Commission issue a limited exclusion order barring entry of products that infringe the asserted patents. Consistent with *Kyocera Wireless Corp.*, the entities named in the limited exclusion order should be the named Respondents found in violation of section 337. 545 F.3d at 1356. Any limited exclusion order should include a

provision whereby Respondents can certify that their imported products are not subject to exclusion.<sup>29</sup>

### **C. Cease and Desist Order**

Section 337 provides that in addition to, or in lieu of, the issuance of an exclusion order, the Commission may issue a cease and desist order as a remedy for a violation of section 337. 19 U.S.C. § 1337(f)(1). The Commission may issue a cease and desist order when it has personal jurisdiction over the party against whom the order is directed. *Gamut Trading Co. v. U.S. Int'l Trade Comm'n*, 200 F.3d 775, 784 (Fed. Cir. 1999).

Because I do not find a violation of section 337, I do not recommend that cease and desist orders should issue against the Respondents. For the benefit of the Commission, however, I evaluate the hypothetical scenario in which the Commission determines that a violation of section 337 has occurred and consideration of the statutory public interest factors does not require that remedies be set aside or modified.

Under Commission precedent, “[c]ease and desist orders are generally issued when, with respect to the imported infringing products, respondents maintain commercially significant inventories in the United States or have significant domestic operations that could undercut the remedy provided by an exclusion order.” *Certain Air Mattress Systems, Components Thereof, and Methods of Using the Same*, Inv. No. 337-TA-971, Comm’n Op. at 49 (May 17, 2017) (citations and footnote omitted). “A complainant seeking a [cease and desist order] must demonstrate, based

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<sup>29</sup> This certification provision would allow Acuity, for instance, to certify that none of its products incorporate the Nichia 219B series of LED packages alleged to infringe the ’053 patent. *See supra* Section IV.A.1.b.

on the record, that this remedy is necessary to address the violation found in the investigation so as to not undercut the relief provided by the exclusion order.” *Id.* at 50.

LSG argues that the Commission should issue cease and desist orders against all Respondents except Cree.<sup>30</sup> CIB at 257. Specifically, LSG argues:

[Cease and desist orders] directed at these Respondents are necessary in view of the commercially significant inventories of Accused Products they either stipulated to holding in the U.S. or were determined to hold in the U.S. based on their responses to the Complaint and discovery responses, which demonstrate their respective abilities to promptly fill customer orders. [The] non-Cree Respondents still hold commercially significant inventories of the Accused Products in the U.S. [Cease and desist orders] will ensure that these inventoried Accused Products are not disseminated in the United States. These [cease and desist orders] should prohibit Respondents from importing, selling for importation, marketing, distributing, offering for sale, selling, transferring, advertising, soliciting U.S. agents or distributors, or aiding and abetting others in the importation, sale for importation, sale after importation, transfer, or distribution of products that infringe the Asserted Patents.

*Id.*

Respondents contend that LSG’s argument for cease and desist orders “suffers from several critical flaws.” RRB at 145. In particular, Respondents argue that LSG has failed to show that any inventory of accused products held by Respondents in the United States is commercially significant. *See id.* at 145–49 (including specific arguments for OSRAM, Nichia, Lumileds, Acuity, LEDVANCE). Respondents also point out that LSG’s request for cease and desist orders improperly extends to all non-Cree Respondents, even those that do not hold inventories in the United States. *Id.* at 145–46.

The Commission has found inventories to be “commercially significant” based on a comparison between the quantity and the volume of product at issue sold or imported over time.

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<sup>30</sup> LSG concedes that Cree does not hold relevant inventories of accused products in the United States. *See* Tr. (Malkiewicz) 821:8–14.

*Certain Optoelectronic Devices for Fiber Optic Commc'ns, Components Thereof & Prods. Containing Same*, Inv. No. 337-TA-860, Comm'n Op. at 36–37 (May 9, 2014); *Certain Abrasive Prods. Made Using a Process for Powder Preforms, & Prods. Containing Same*, Inv. No. 337-TA-449, Comm'n Op., USITC Pub. No. 3530 (Aug. 2002).

To assess the commercial significance of OSRAM's domestic inventory, LSG compared the number of units in OSRAM's inventory [REDACTED] with the number of units sold by LSG in a month [REDACTED]. See CDX-0009C.0093. LSG argues that OSRAM's inventory is commercially significant because [REDACTED] comprises more than [REDACTED] of LSG's monthly sales. See *id.* Yet, the fact that LSG does not sell many units in a month does not necessarily mean that OSRAM's inventory is commercially significant. When compared with OSRAM's monthly sales average of [REDACTED] OSRAM's inventory of [REDACTED] units is less than a [REDACTED] worth of sales (assuming a [REDACTED]). See *id.* I find that OSRAM's domestic inventory is *de minimis* and is not commercially significant. See *Optoelectronic Devices*, Comm'n Op. at 36–37 (evaluating significance by comparing the respondent's imports with its inventory, not with the complainant's market share).

Nichia argues that a cease and desist order should not issue as to Nichia Corporation because all domestic inventories are held by Nichia America Corporation ("NAC"). See RRB at 147. The domestic inventories held by NAC total [REDACTED]. See CDX-0009C.0086. When compared with Nichia's monthly sales average of [REDACTED], the inventory equals approximately [REDACTED] worth of sales. See *id.* I find that this amount of inventory is commercially significant.

Lumileds holds [REDACTED] in its domestic inventory and sells on average [REDACTED] units per month. See CDX-0009C.0074. Its domestic inventory thus equals approximately [REDACTED]



address the violation found in the investigation so as ***to not undercut the relief provided by the exclusion order.*** See, e.g., *Certain Air Mattress Systems*, Comm’n Op. at 49–50 (emphasis added). Here, LSG has offered no argument or evidence as to why a limited exclusion order against any violating respondent would not afford it complete relief, making cease and desist orders necessary. See CIB at 257. On this record, it is not clear LSG has met the burden the Commission has articulated in many past determinations.

Nevertheless, the Commission has “broad discretion” in determining whether to issue a cease and desist order in a contested case. *Viscofan, S.A. v. U.S. Int’l Trade Comm’n*, 787 F.2d 544, 548 (Fed. Cir. 1986). The exercise of that discretion is highly fact-specific. For example, in one opinion the Commission speculated that in some circumstances even two weeks’ worth of inventory could have an “adverse effect upon the complainant” and justify cease and desist orders:

[A]s a practical matter, a complainant will not be afforded complete relief so long as a respondent is allowed to sell without bond any commercially significant level of product in its inventory. If a respondent is permitted to sell without bond a “customary” inventory equal to, for example, two weeks’ worth of sales, then the complainant still will be confronted with that amount of unfair import competition after issuance of an exclusion order. ***The adverse effect upon the complainant may be less*** than if the respondent had inventory equal to four weeks’ worth of sales, ***but it is not insignificant or non-existent.***

*Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, Comm’n Op. at 38, USITC Pub. No. 2391 (June 1991) (emphasis added). In disposing of that same investigation, the Commission noted it had required the complainant to identify “specific information . . . necessary to justify the issuance of permanent cease and desist orders.” *Id.*

Thus, even if two weeks of domestic inventory could justify cease and desist orders in some cases, LSG is not relieved of its the burden to show here that a cease and desist order “is ***necessary*** to address the violation found in the investigation so as ***to not undercut the relief provided by the exclusion order.***” See, e.g., *Certain Air Mattress Systems*, Comm’n Op. at 49-50

(emphasis added). LSG has failed to meet that burden. Although some of the Respondents do hold commercially significant domestic inventories of accused products, LSG's scant briefing failed to show that cease and desist orders are necessary to prevent those respondents from undercutting the remedy provided by a limited exclusion order. On the facts of this record, it is my recommendation that no cease and desist orders issue if a violation is found.

#### **D. Bond During Presidential Review**

Pursuant to section 337(j)(3), the administrative law judge and the Commission must determine the amount of bond to be required of a respondent, during the 60-day Presidential review period following the issuance of permanent relief, in the event that the Commission determines to issue a remedy. The purpose of the bond is to protect the complainant from any injury. 19 U.S.C. § 1337(j)(3); 19 C.F.R. §§ 210.42(a)(1)(ii), 210.50(a)(3).

When reliable price information is available, the Commission has often set the bond by eliminating the differential in sales prices between the domestic product and the imported, infringing product. *Certain Microsphere Adhesives, Process for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 24, USITC Pub. No. 2949 (1995). In other cases, the Commission has turned to alternative approaches, especially when the level of a reasonable royalty rate could be ascertained. *See Certain Integrated Circuit Telecommunication Chips and Products Containing Same, Including Dialing Apparatus*, Inv. No. 337-TA-337, Comm'n Op. at 41-43, USITC Pub. No. 2670 (1995). A 100-percent bond has been required when no effective alternative existed. *Certain Flash Memory Circuits and Products Containing Same*, Inv. No. 337-TA-382, USITC Pub. No. 3046, Comm'n Op. at 26-27 (July 1997) (a 100-bond imposed when price comparison was not practical because the parties sold products at different levels of commerce, and the proposed royalty rate appeared to be *de minimis* and without adequate support in the record).

With respect to bond, LSG argues that bond should be set “based on the royalty rate that LSG has previously entered into with other manufacturers of LED products.” CIB at 259. LSG’s expert Mr. Malkiewicz testified that the royalties found in LSG’s license agreements provide information to determine a specified royalty rate ranging from [REDACTED] percent, or to derive an implied or effective royalty rate ranging from approximately [REDACTED] percent. *See* Tr. (Malkiewicz) 851, 867; JX-0171C–JX-0191C; CX-1728C. Based on this information, LSG argues that the bond should be set at 5 percent. CIB at 259 (citing Tr. (Malkiewicz) 820, 853, 867, 870).

Respondents take the position that “LSG failed to meet its burden of establishing that a bond is warranted during the Presidential review period.” RRB at 151; *see also Certain Cases for Portable Elec. Devices*, Inv. No. 337-TA-867, Comm’n Op. at 21 (July 10, 2014) (“Complainant bears the burden of establishing the need for a bond amount in the first place.”). Specifically, Respondents argue that LSG “failed to analyze what injury LSG would suffer during the Presidential review period if a bond is not issued” and therefore the bond rate should be set at zero percent. *Id.* (citing *Certain X-Ray Breast Imaging Devices & Components Thereof*, Inv. No. 337-TA-1063, Initial Determination at 280 (Sept. 26, 2018) (setting the bond at zero percent even though complainants offered a price differential calculation because complainants failed to “conduct an injury analysis and could only speculate as to whether [respondents’] sales would injure [complainant]”)).

Having considered the arguments of the parties and the evidence of record, I find that LSG has failed to demonstrate that a bond is warranted under the circumstances of this investigation. Specifically, LSG has not argued that a bond is needed to protect it from injury during the 60-day Presidential review period in the event the Commission finds a violation of section 337. *See* CIB at 258–59. Therefore, it is my recommendation that the Commission, in the event it finds a

violation of section 337 has occurred, set a zero percent bond for any importations of infringing products during the Presidential review period.

**IX. INITIAL DETERMINATION ON VIOLATION**

For the reasons set forth above, it is my initial determination that a violation of section 337 of the Tariff Act, as amended, has not occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation, of certain light-emitting diode products, systems, and components thereof based on allegations of infringement of U.S. Patent No. 7,095,053 and U.S. Patent No. 7,528,421.

I hereby certify to the Commission this Initial Determination and the Recommended Determination.

The Secretary shall serve the confidential version of this Initial Determination upon counsel who are signatories to the Protective Order (Order No. 1) issued in this investigation. A public version will be served at a later date upon all parties of record.

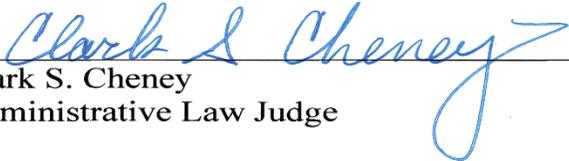
Pursuant to 19 C.F.R. § 210.42(h), this Initial Determination shall become the determination of the Commission unless a party files a petition for review pursuant to 19 C.F.R. § 210.43(a) or the Commission, pursuant to 19 C.F.R. § 210.44, orders on its own motion a review of the Initial Determination or certain issues therein.

**X. ORDER**

Within seven days of the date of this document, the parties shall jointly submit a single proposed public version with any proposed redactions indicated in red. If the parties submit excessive redactions, they may be required to provide declarations from individuals with personal knowledge, justifying each proposed redaction and specifically explaining why the information sought to be redacted meets the definition for confidential business information set forth in 19 C.F.R. § 201.6(a). To the extent possible, the proposed redactions should be made

electronically, in a single PDF file using the “Redact Tool” within Adobe Acrobat. The proposed redactions should be submitted as “marked” but not yet “applied.” The proposed redactions should be submitted via email to [Cheney337@usitc.gov](mailto:Cheney337@usitc.gov) and not filed on EDIS.

**SO ORDERED.**

  
Clark S. Cheney  
Administrative Law Judge

**PUBLIC CERTIFICATE OF SERVICE**

I, Lisa R. Barton, hereby certify that the attached **INITIAL DETERMINATION** has been served to the following parties as indicated, on **July 24, 2020**.



Lisa R. Barton, Secretary  
U.S. International Trade Commission  
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**UNITED STATES INTERNATIONAL TRADE COMMISSION**  
**Washington, D.C.**

**In the Matter of**

**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

**Investigation No. 337-TA-1168**

**NOTICE OF COMMISSION DECISION NOT TO REVIEW AN  
INITIAL DETERMINATION GRANTING IN PART RESPONDENTS' MOTION FOR  
SUMMARY DETERMINATION OF NON-INFRINGEMENT AND THAT THE  
TECHNICAL PRONG OF THE DOMESTIC INDUSTRY REQUIREMENT IS NOT  
SATISFIED AS TO CERTAIN ASSERTED CLAIMS**

**AGENCY:** U.S. International Trade Commission.

**ACTION:** Notice.

**SUMMARY:** Notice is hereby given that the U.S. International Trade Commission has determined not to review an initial determination ("ID") (Order No. 32) granting in part respondents' motion for summary determination of non-infringement and that the technical prong of the domestic industry requirement is not satisfied as to certain asserted claims.

**FOR FURTHER INFORMATION CONTACT:** Clint Gerdine, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, SW., Washington, D.C. 20436, telephone (202) 708-2310. Copies of non-confidential documents filed in connection with this investigation may be viewed on the Commission's electronic docket (EDIS) at <https://edis.usitc.gov>. For help accessing EDIS, please email [EDIS3Help@usitc.gov](mailto:EDIS3Help@usitc.gov). General information concerning the Commission may also be obtained by accessing its Internet server at <https://www.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal, telephone 202-205-1810.

**SUPPLEMENTARY INFORMATION:** On June 25, 2019, the Commission instituted *Certain Light-Emitting Diode Products, Systems, and Components Thereof (I)*, Inv. No. 337-TA-1163 ("*Certain LED Products (I)*"), based on a complaint filed by Lighting Science Group Corporation and Health Inc., both of Cocoa Beach, Florida; and Global Value Lighting, LLC of West Warwick, Rhode Island (collectively, "LSG"). 84 FR 29877-79 (June 25, 2019). The complaint, as amended and supplemented, alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, based upon the importation into the United States, the sale for importation, and the sale within the United States after importation of certain light-emitting diode products, systems, and components thereof by reason of infringement of certain claims of

U.S. Patent Nos. 7,528,421 (“the ’421 patent”); 7,095,053 (“the ’053 patent”); 7,098,483 (“the ’483 patent”); 8,506,118 (“the ’118 patent”); 8,674,608 (“the ’608 patent”); 8,201,968 (“the ’968 patent”); and 8,967,844 (“the ’844 patent”). The complaint further alleges the existence of a domestic industry. The Commission’s notice of investigation named 23 respondents: Nichia Corp. of Tokushima, Japan; Nichia America Corp. of Wixom, Michigan; Cree, Inc. of Durham, North Carolina; Cree Hong Kong, Ltd. of Shatin, Hong Kong; Cree Huizhou Solid State Lighting Co. Ltd. of Guangdong, China; OSRAM GmbH and OSRAM Licht AG, both of Munich, Germany; OSRAM Opto Semiconductors GmbH of Regensburg, Germany; OSRAM Opto Semiconductors, Inc. of Sunnyvale, California; Lumileds Holding B.V. of Schipol, Netherlands; Lumileds LLC of San Jose, California; Signify N.V. (f/k/a Phillips Lighting N.V.) of Eindhoven, Netherlands; and Signify North America Corporation of Somerset, New Jersey; MLS Co., Ltd. of Zhongshan City, China; LEDVANCE GmbH of Garching, Germany; LEDVANCE LLC of Wilmington, Massachusetts; General Electric Company of Boston, Massachusetts; Consumer Lighting (U.S.), LLC (d/b/a GE Lighting, LLC) and Current Lighting Solutions, LLC, both of Cleveland, Ohio; Acuity Brands, Inc. of Atlanta, Georgia; Acuity Brands Lighting, Inc. of Conyers, Georgia; Leedarson Lighting Co., Ltd. of Xiamen, China; Leedarson America, Inc. of Smyrna, Georgia (all collectively, “Respondents”). The Office of Unfair Import Investigations is not participating in the investigation.

On July 10, 2019, the ALJ, pursuant to Commission Rule 210.14(h), 19 CFR 210.14(h), severed *Certain LED Products (I)* into two investigations. See *Certain LED Products (I)*, Order No. 5 (July 10, 2019). The ALJ specified that all issues relating to whether there is a violation of section 337 based on the allegations of infringement of the ’118 and ’608 patents would be addressed in *Certain LED Products (I)* (the 1163 investigation). *Id.* The ALJ also specified that all issues relating to whether there is a violation of section 337 based on the allegations of infringement of the ’421, ’053, and ’483 patents would be addressed in *Certain Light-Emitting Diode Products, Systems, and Components Thereof (III)*, Inv. No. 337-TA-1168 (“*Certain LED Products (III)*”). *Id.*; see also *Certain LED Products (III)*, Order No. 5 (July 10, 2019).

On November 26, 2019, Respondents moved for summary determination of non-infringement and that the technical prong of the domestic industry requirement is not satisfied with respect to all asserted claims. On February 14, 2020, three days after the ALJ issued a *Markman* Order (Order No. 31) construing certain claims in dispute, LSG filed a notice stipulating that neither infringement nor satisfaction of the technical prong could be shown with respect to claims 11 and 14-16 of the ’483 patent and claims 7 and 11-15 of the ’053 patent.

On the same date, the ALJ issued the subject ID (Order No. 32) granting in part Respondents’ motion for summary determination of non-infringement and that the technical prong of the domestic industry requirement is not satisfied with respect to asserted claims 11 and 14-16 of the ’483 patent and claims 7 and 11-15 of the ’053 patent.

On March 3, 2020, LSG petitioned for review of the subject ID. On March 17, 2020, Respondents filed a joint response in opposition to the petition for review.

Having reviewed the record including the parties' briefing, the Commission has determined not to review the subject ID (including the underlying *Markman* Order with respect to the claim terms that are the subject of LSG's petition).

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, and in part 210 of the Commission's Rules of Practice and Procedure, 19 CFR part 210.

By order of the Commission.

A handwritten signature in black ink, appearing to read "Lisa R. Barton".

Lisa R. Barton  
Secretary to the Commission

Issued: April 7, 2020

**PUBLIC CERTIFICATE OF SERVICE**

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served to the following parties as indicated, on **April 7, 2020**.



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Opto Semiconductors, Inc.:**

**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
SYSTEMS, AND COMPONENTS THEREOF (III)**

**Inv. No. 337-TA-1168**

Certificate of Service – Page 2

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Certificate of Service – Page 3

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**UNITED STATES INTERNATIONAL TRADE COMMISSION**

**Washington, D.C.**

**In the Matter of**

**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

**Inv. No. 337-TA-1168**

**ORDER NO. 32: INITIAL DETERMINATION GRANTING IN PART  
RESPONDENTS' MOTION FOR SUMMARY DETERMINATION  
OF NONINFRINGEMENT AND THAT THE TECHNICAL PRONG  
OF THE DOMESTIC INDUSTRY REQUIREMENT IS NOT  
SATISFIED**

(February 14, 2020)

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## I. INTRODUCTION

On November 26, 2019, Respondents<sup>1</sup> filed a motion and supporting memorandum seeking summary determination that complainant LSG<sup>2</sup> does not satisfy the technical prong of the domestic industry requirement for any claim of the patents asserted in this investigation.<sup>3</sup> Motion Docket No. 1168-004. LSG filed an opposition to the motion on December 11, 2019.<sup>4</sup>

On February 11, 2020, I issued Order No. 31, which construed certain claim terms identified by the parties as needing construction. Two of the claim terms I construed are pertinent to this initial determination. They are “decoder/driver electronics” and “an electrical path including an insulating conducting via through the metal base.” *See* Order No. 31, at 7-16.

On February 13, 2020, I convened a telephone conference at the parties’ request to discuss logistical consequences of my claim construction order. *See* Notice Regarding Hearing and

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<sup>1</sup> “Respondents” refers collectively to Lumileds Holding B.V.; Lumileds LLC; Cree, Inc.; Cree Hong Kong Ltd.; Cree Huizhou Solid State Lighting Co. Ltd.; Acuity Brands, Inc.; Acuity Brands Lighting, Inc.; Current Lighting Solutions, LLC; General Electric Company; Consumer Lighting (U.S.), LLC; LEDVANCE LLC; Leedarson Co., Ltd.; Leedarson America, Inc.; Nichia Corp.; Nichia America Corp.; OSRAM GmbH; OSRAM Licht AG; OSRAM Opto Semiconductors GmbH; OSRAM Opto Semiconductors, Inc.; Signify N.V.; and Signify North America Corporation.

<sup>2</sup> “LSG” refers collectively to Lighting Science Group Corporation, Healthe Inc., and Global Value Lighting, LLC.

<sup>3</sup> The patents and claims asserted in this investigation are claims 1-3, 5-7, 11-15, and 21 of U.S. Patent No. 7,095,053 (“the ’053 patent”); claims 11 and 14-16 of U.S. Patent No. 7,098,483 (“the ’483 patent”); and claims 1 and 6 of U.S. Patent No. 7,528,421 (“the ’421 patent”). *See* 84 Fed. Reg. 29877 (June 25, 2019) (“Notice of Investigation”); Order No. 18: Initial Determination Terminating the Investigation as to Claim 7 of U.S. Patent No. 7,528,421 (Dec. 30, 2019), *aff’d*, Comm’n Notice (EDIS Doc. ID 700609) (Jan. 29, 2020); Order No. 26: Initial Determination Terminating the Investigation as to Certain Claims (Jan. 29, 2020) (pending Commission review).

<sup>4</sup> LSG subsequently filed a motion seeking leave to supplement its response to the pending motion for summary determination. Motion Docket No. 1168-007. Respondents filed a response stating they do not oppose LSG’s motion for leave. Motion No. 1168-007 is granted.

Respondents' Motion for Summary Determination (EDIS Doc. ID 702579) (Feb. 14, 2020)

("Notice"). Following the conference, the parties filed the following joint statement:

Under Judge Cheney's claim constructions of "decoder/driver electronics" and "an electrical path including an insulating conducting via through the metal base," Complainants will not be able to demonstrate infringement or technical domestic industry as to the asserted claims of the '483 patent and as to claim 7 of the '053 patent and its dependents based on the products at issue in this investigation.

Notice at 1-2.

I hereby deem this joint statement and the oral arguments presented during the conference to be a supplement to the pending motion for summary determination such that, in addition to the domestic industry technical prong arguments briefed previously, Respondents now also seek summary determination of noninfringement as to the asserted claims of the '483 patent and claim 7 of the '053 patent and its dependents.<sup>5</sup>

## **II. LEGAL STANDARDS**

### **A. Summary Determination**

Summary determination is appropriate when there is no genuine issue as to any material fact and the moving party is entitled to a determination as a matter of law. *See* 19 C.F.R. § 210.18. In determining whether there is a genuine issue of material fact, "the evidence must be viewed in the light most favorable to the party opposing the motion with doubts resolved in favor of the non-movant." *Crown Operations Int'l, Ltd v. Solutia, Inc.*, 289 F.3d 1367, 1375 (Fed. Cir. 2002) (citations omitted).

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<sup>5</sup> Asserted claims 11-15 of the '053 patent depend from claim 7.

## **B. Infringement**

A determination of patent infringement generally encompasses a two-part process. *See Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1454 (Fed. Cir. 1998). First, the language of the claims must be construed to determine the proper scope and meaning of the terms, which is a question of law. *Deering Precision Instrument, L.L.C. v. Vector Distribution Sys., Inc.*, 347 F.3d 1314, 1322 (Fed. Cir. 2003). Second, a factual determination must be made as to whether the claims, as construed, cover the accused products. *Id.*

“Since the ultimate burden of proving infringement rests with the patentee, an accused infringer seeking summary judgment of noninfringement may meet its initial responsibility either by providing evidence that would preclude a finding of infringement, or by showing that the evidence on file fails to establish a material issue of fact essential to the patentee’s case.” *Novartis Corp. v. Ben Venue Labs., Inc.*, 271 F.3d 1043, 1046 (Fed. Cir. 2001).

## **C. Technical Prong of the Domestic Industry Requirement**

For a patent-based complaint, a violation of section 337 can be found “only if an industry in the United States, relating to the articles protected by the patent . . . concerned, exists or is in the process of being established.” 19 U.S.C. § 1337(a)(2). The complainant bears the burden of establishing that the domestic industry requirement is satisfied. *See Certain Set-Top Boxes and Components Thereof*, Inv. No. 337-TA-454, ID at 294, 2002 WL 31556392 (June 21, 2002) (unreviewed by Commission in relevant part). The domestic industry requirement of section 337 is often described as having an economic prong and a technical prong. *InterDigital Commc’ns, LLC v. Int’l Trade Comm’n*, 707 F.3d 1295, 1298 (Fed. Cir. 2013); *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm’n Op. at 12-14, USITC Pub. No. 4120, 2009 WL 5134139 (Dec. 2009).

The technical prong of the domestic industry requirement is satisfied when the complainant in a patent-based section 337 investigation establishes that it is practicing or exploiting the patents at issue. See 19 U.S.C. § 1337(a)(2) and (3); *Certain Microsphere Adhesives, Process for Making Same and Prods. Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op., 1996 WL 1056095, at \*4 (Jan. 16, 1996). "The test for satisfying the 'technical prong' of the industry requirement is essentially [the] same as that for infringement, *i.e.*, a comparison of domestic products to the asserted claims." *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). To prevail, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more claims of the patent. It is sufficient to show that the products practice any claim of that patent, not necessarily an asserted claim of that patent. See *Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 38 (Aug. 1, 2007).

### III. UNDISPUTED FACTS

As discussed above, no party disputes the following facts:

Under Judge Cheney's claim constructions of "decoder/driver electronics" and "an electrical path including an insulating conducting via through the metal base," Complainants [cannot] demonstrate infringement or technical domestic industry as to the asserted claims of the '483 patent and as to claim 7 of the '053 patent and its dependents based on the products at issue in this investigation.

See Notice at 1-2.

I hereby adopt the undisputed facts above as part of this initial determination. I hereby also incorporate the discussion of the terms "decoder/driver electronics" and "an electrical path including an insulating conducting via through the metal base" on pages 7-16 of Order No. 31 as part of this initial determination.

#### IV. INITIAL DETERMINATION

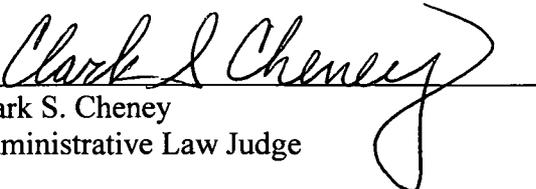
In view of my construction of the terms “decoder/driver electronics” and “an electrical path including an insulating conducting via through the metal base” and the undisputed facts above, I find that none of the accused products in this investigation infringe asserted claims 11, 15, 14, and 16 of the ’483 patent or asserted claims 7, 11, 12, 13, 14, and 15 of the ’053 patent. I also find that LSG does not satisfy the technical prong of the domestic industry requirement with respect to asserted claims 11, 15, 14, and 16 of the ’483 patent or asserted claims 7, 11, 12, 13, 14, and 15 of the ’053 patent.

It is therefore my initial determination that there has not been a violation of section 337 of the Tariff Act, as amended, due to the importation into the United States, the sale for importation, or the sale within the United States after importation of certain light-emitting diode products, systems, and components thereof with respect to these claims.

Accordingly, Motion No. 1168-004 is granted in part.<sup>6</sup>

This initial determination is hereby certified to the Commission. Pursuant to 19 C.F.R. § 210.42(h), this initial determination shall become the determination of the Commission unless a party files a petition for review pursuant to § 210.43(a) or the Commission, pursuant to § 210.44, orders on its own motion a review of the initial determination or certain issues herein.

**SO ORDERED.**

  
Clark S. Cheney  
Administrative Law Judge

---

<sup>6</sup> The portions of the pending motion for summary determination that I have not addressed in this initial determination shall be held in abeyance pending further proceedings at the evidentiary hearing scheduled to begin on February 18, 2020. See Order No. 10: Modifying Procedural Schedule (Nov. 19, 2019).

In the Matter of

**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
SYSTEMS, AND COMPONENTS THEREOF (III)**

INV. NO. 337-TA-1168

**PUBLIC CERTIFICATE OF SERVICE**

I, Lisa R. Barton, hereby certify that the attached **ORDER NO. 32** has been served by hand upon the following parties as indicated, on **February 14, 2020**.



Lisa R. Barton, Secretary  
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In the Matter of

**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
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**INV. NO. 337-TA-1168**

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**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
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**INV. NO. 337-TA-1168**

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**UNITED STATES INTERNATIONAL TRADE COMMISSION**

**Washington, D.C.**

**In the Matter of**

**CERTAIN LIGHT-EMITTING DIODE  
PRODUCTS, SYSTEMS, AND  
COMPONENTS THEREOF (III)**

**Inv. No. 337-TA-1168**

**ORDER NO. 31: CONSTRUING CERTAIN CLAIMS**

**(February 11, 2020)**

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## I. INTRODUCTION

The Commission instituted this investigation to determine whether certain light-emitting diode (“LED”) products, systems, and components thereof infringe U.S. Patent Nos. 7,098,483 (“the ’483 patent”), 7,095,053 (“the ’053 patent”), and 7,528,421 (“the ’421 patent”) (collectively, “the asserted patents”). See 84 Fed. Reg. 29877 (June 25, 2019) (“Notice of Investigation”); *Certain LED Products, Sys., and Components Thereof (I)*, Inv. No. 337-TA-1163, Order No. 5 (July 10, 2019) (severing this investigation from the 1163 investigation). The asserted patents are generally directed to designing light-emitting diode assemblies and packages that can operate more reliably at higher temperatures. See, e.g., ’483 patent at 1:20-22. As set forth in the Notice of Investigation, the plain language description of the accused products or category of accused products, which defines the scope of the investigation, is “(1) LED packages and assemblies; (2) LED luminaires; and (3) connected ‘smart’ LED lighting systems and components thereof.” Notice of Investigation at 29878.

The complainants are Lighting Science Group Corporation, Healthe Inc., and Global Value Lighting, LLC (collectively, “LSG”). *Id.* The respondents are Lumileds Holding B.V., Lumileds LLC, Cree, Inc., Cree Hong Kong Ltd., Cree Huizhou Solid State Lighting Co. Ltd., Acuity Brands, Inc., Acuity Brands Lighting, Inc., Current Lighting Solutions, LLC, General Electric Company, Consumer Lighting (U.S.), LLC, LEDVANCE LLC, Leedarson Co., Ltd., Leedarson America, Inc., Nichia Corp., Nichia America Corp., OSRAM GmbH, OSRAM Licht AG, OSRAM Opto Semiconductors GmbH, OSRAM Opto Semiconductors, Inc., Signify N.V., and Signify North America Corporation (collectively, “Respondents”). *Id.*; Order No. 24: Initial Determination Terminating the Investigation as to Respondents MLS and Ledvance (Jan. 14, 2020), *aff’d*, Comm’n Notice (EDIS Doc. ID 701830) (Feb. 7, 2020).

In accordance with the procedural schedule issued as Order No. 7 on July 22, 2019, the parties submitted a joint chart of proposed claim constructions on September 12, 2019. The parties also submitted opening claim construction briefs on September 20, 2019, and responsive claim construction briefs on October 4, 2019.<sup>1</sup> On October 17, 2019, I convened a claim construction hearing.<sup>2</sup>

After the claim construction hearing, Respondents subsequently submitted a Notice of New Evidence of Prosecution History Disclaimer (“Notice”) that brought attention to a recent decision by the Patent Trial and Appeal Board (“PTAB”) involving the same claims of the ’421 patent as are asserted here. EDIS Doc. ID 699505 (Jan. 16, 2020). LSG also submitted comments about the PTAB decision. EDIS Doc. ID 699518 (Jan. 17, 2020).

The PTAB decision focuses on LSG’s arguments as to whether certain prior art references disclose a “thermally conductive region in solderable thermal contact with the thermally conducting base,” a disputed claim term discussed below. I have considered LSG’s arguments

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<sup>1</sup> For convenience, the materials submitted by the parties shall be referred to as:

CIMB	Complainants’ Corrected Opening Claim Construction Brief
CRMB	Complainants’ Responsive Claim Construction Brief
RIMB	Respondents’ Opening Claim Construction Brief
RRMB	Respondents’ Responsive Claim Construction Brief
JC	Joint Disclosure of Proposed Claim Constructions

<sup>2</sup> The transcript of the claim construction hearing is available as EDIS Doc. ID 691542 and is hereinafter referred to as “Tr.”

before the PTAB and I find they are not inconsistent with arguments LSG presented here. LSG's positions will be discussed further in conjunction with my order addressing Respondents' pending Motion for Summary Determination of No Domestic Industry (Technical Prong) (Mot. Docket No. 1168-004).

This order addresses claim terms in dispute between the parties that were identified in briefing and discussed during oral argument.

## II. RELEVANT LAW

“An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing.” *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*) (internal citations omitted), *aff'd*, 517 U.S. 370 (1996). Claim construction resolves legal disputes between the parties regarding claim scope. *See Eon Corp. IP Holdings v. Silver Spring Networks*, 815 F.3d 1314, 1319 (Fed. Cir. 2016).

Evidence intrinsic to the application, prosecution, and issuance of a patent is the most significant source of the legally operative meaning of disputed claim language. *See Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (*en banc*); *see also Markman*, 52 F.3d at 979. As the Federal Circuit explained in *Phillips*, courts examine the intrinsic evidence to determine the “ordinary and customary meaning of a claim term” as understood by a person of ordinary skill in the art at the time of the invention. 415 F.3d at 1313.

“It is a ‘bedrock principle’ of patent law that ‘the claims of a patent define the invention to which the patentee is entitled the right to exclude.’” *Phillips*, 415 F.3d at 1312 (quoting

*Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). “Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claims terms.” *Id.* at 1314; *see Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001) (“In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to ‘particularly point[ ] out and distinctly claim[ ] the subject matter which the patentee regards as his invention.’”). The context in which a term is used in an asserted claim can be “highly instructive.” *Phillips*, 415 F.3d at 1314. Additionally, other claims in the same patent, asserted or un-asserted, may also provide guidance as to the meaning of a claim term. *Id.*

The specification “is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). “[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Id.* at 1316. “In other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor.” *Id.* As a general rule, however, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Id.* at 1323. In the end, “[t]he construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be . . . the correct construction.” *Id.* at 1316 (quoting *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)).

Only when the intrinsic evidence does not establish the meaning of a claim may extrinsic evidence (*i.e.*, all evidence external to the patent and the prosecution history, including

dictionaries, inventor testimony, expert testimony, and learned treatises) be considered. *Phillips*, 415 F.3d at 1317. Extrinsic evidence is generally viewed as less reliable than the patent itself and its prosecution history in determining how to define claim terms. *Id.* “The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence.” *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

A claim must also be definite. Specifically, “[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, ¶ 2. The Supreme Court has held that § 112, ¶ 2 requires “that a patent’s claims, viewed in light of the specification and prosecution history inform those skilled in the art about the scope of the invention with reasonable certainty.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120 at 2129 (2014). A claim is required to “provide objective boundaries for those of skill in the art,” and a claim term is indefinite if it “might mean several different things and no informed and confident choice is among the contending definitions.” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). A patent claim that is indefinite is invalid. 35 U.S.C. § 282(b)(3)(A).

### **III. LEVEL OF ORDINARY SKILL IN THE ART**

Although LSG did not propose a level of ordinary skill in the art in its opening brief, its expert, Dr. Martin Kuball, opined that “a person of ordinary skill in the art . . . of the asserted patents at the time of the invention would have had a bachelor’s degree in electrical engineering, materials science, or physics, or at least 5 years’ experience in manufacturing or engineering, with significant exposure to the lighting and/or semiconductor packaging industries.” CIMB Ex. 1

(Declaration of Dr. Martin Kuball in Support of Complainants' Opening Claim Construction Brief)

¶ 5 (hereinafter "Kuball Decl.").

Respondents take the position that a person of ordinary skill in the art at the time of the inventions of the asserted patents would "have had at least a B.S. in mechanical or electrical engineering or a related field, and four years' experience designing or developing semiconductor—including LED—packages," and that "a higher level of education or skill might make up for less experience, and vice-versa." RIMB at 2.

To the extent the parties' proposals are not substantially the same, no party argues that the claim construction analysis differs under either proposal. I accordingly decline to make a finding on this issue at this time. *See Genzyme Therapeutic Prod. Ltd. P'ship v. Biomarin Pharm. Inc.*, 825 F.3d 1360, 1372 (Fed. Cir. 2016) (failure to make a specific finding about the required level of skill in the art is not reversible error where the record did not show any meaningful differences in proposed definitions or that the outcome of the case would have been different based on which definition was selected).

#### **IV. THE ASSERTED PATENTS**

##### **A. U.S. Patent No. 7,095,053**

The '053 patent is titled, "Light Emitting Diodes Packaged for High Temperature Operation." The '053 patent issued on August 22, 2006, and the named inventors are Joseph Mazzoquette and Greg Blonder. LSG asserts claims 1-3, 5-7, 11-15, and 21 of the '053 patent; claims 1 and 7 are independent claims. *See* Notice of Investigation; Order No. 26: Initial Determination Terminating the Investigation as to Certain Claims (Jan. 29, 2020);<sup>3</sup> '053 patent.

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<sup>3</sup> Order No. 26 is pending Commission review.

**B. U.S. Patent No. 7,098,483**

The '483 patent is titled, "Light Emitting Diodes Packaged for High Temperature Operation." The '483 patent issued on August 29, 2006, and the named inventors are Joseph Mazzochette and Greg Blonder. LSG asserts claims 11 and 14-16 of the '483 patent; claim 11 is an independent claim. *See* Notice of Investigation; '483 patent.

The '483 patent is a division of the application that resulted in the '053 patent; the '053 and '483 patents share a common specification. *See* '053 patent; '483 patent.

**C. U.S. Patent No. 7,528,421**

The '421 patent is titled, "Surface Mountable Light Emitting Diode Assemblies Packaged for High Temperature Operation." The '421 patent issued on May 5, 2009, and the named inventors are Joseph Mazzochette and Greg Blonder. LSG asserts claims 1 and 6 of the '421 patent; claim 1 is an independent claim. *See* Notice of Investigation; Order No. 18: Initial Determination Terminating the Investigation as to Claim 7 of U.S. Patent No. 7,528,421 (Dec. 30, 2019), *aff'd*, Comm'n Notice (EDIS Doc. ID 700609) (Jan. 29, 2020); Order No. 26; '421 patent.

The '421 patent is a continuation-in-part of the application that resulted in the '053 patent. *See* '421 patent.

**V. CONSTRUCTION OF DISPUTED CLAIM TERMS**

**A. "decoder/driver electronics that control the LED electrodes, wherein the electronics are mounted within the assembly" ('483 patent)**

The disputed phrase "decoder/driver electronics that control the LED electrodes, wherein the electronics are mounted within the assembly" is recited in asserted claim 11 of the '483 patent, which reads, in relevant part:

11. A light emitting diode (LED) assembly for high temperature operation comprising:

... one or more isolated terminals formed on the metal base, the one or more isolated terminals electrically connected to decoder/driver electronics that control the LED electrodes, wherein the electronics are mounted within the assembly.

'483 patent at 10:3-4, 10:20-24.

The parties' proposed constructions are as follows:

Complainants' Construction	Respondents' Construction
"one or more electronic components of a decoder or driver that can impact electricity flow to the LED electrodes mounted within the assembly"	"electronic circuitry, mounted within the LED package, that receives data as input, decodes that input, and drives the at least one LED die in response thereto"

JC at 1.

The patent specification provides scant guidance as to the construction of this term. In describing the benefits of the low temperature co-fired ceramic on metal ("LTCC-M") technique taught by the patent, column 7 states: "Densely packed micro-circuitry, and devices such as decoder/drivers, amplifiers, oscillators and the like which generate large amounts of heat, can also use LTCC-M techniques advantageously." '483 patent at 7:60-63. In addition, column 5 teaches that, "[i]n another version of this embodiment, decoding/driver electronics can be embedded directly in the layers of the card and can control individual LED die or groups of die." *Id.* at 5:25-27.

Respondents take the position that the claimed "decoder/driver electronics . . ." means a complete decoder/driver device component of the type that would have been known to a person of ordinary skill around the time of the '483 patent's filing date. *See* RIMB at 3-4. In support of this proposal, Respondents submitted a declaration from their expert, Dr. Jianzhong Jiao. Dr. Jiao opined that, around the '483 patent's filing date, a decoder/driver was a known component that

(i) accepted encoded data as input, (ii) decoded that input, and (iii) output a signal that controlled the driving of the current to one or more LEDs. RIMB Ex. 5 (Declaration of Jianzhong Jiao, Ph.D. in Support of Respondents' Opening Claim Construction Brief) ¶¶ 24-25 (hereinafter "Jiao Decl.").

By contrast, LSG argues that a person of ordinary skill would understand the forward slash in the term "decoder/driver electronics . . ." to mean "or" such that the claim term requires only decoder circuitry *or* driver circuitry, but not both. *See* CIMB at 27-28. LSG further argues that the phrase "driver electronics that control the LED electrodes" should be construed to mean "any electronic component of a driver that can impact electricity flow to the LED electrode, such as an electrostatic protection device." *Id.* at 28-29.

Having considered the intrinsic evidence in conjunction with the arguments and extrinsic evidence provided by the parties, it is my determination that the plain and ordinary meaning of "decoder/driver electronics . . ." is neither a complete decoder/driver device (as argued by Respondents) nor mere electronics of a decoder or driver (as argued by LSG), but rather electronics that perform the function of, at least, either decoding or driving.<sup>4</sup> This interpretation is supported by the patent specification, which reads: "In another version of this embodiment, *decoding*/driver electronics can be embedded directly in the layers of the card and can control individual LED die or groups of die." '483 patent at 5:25-27 (emphasis added). Here, the specification's use of the present participle "decoding" indicates that the word "decoding" — and also the companion word "driver" — is being used to modify "electronics," rather than as a compound noun describing a subcomponent of the (elsewhere mentioned) "decoder/driver" device known in the art. Moreover,

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<sup>4</sup> Although the parties dispute whether the term "decoding/driver electronics . . ." requires both decoding *and* driving, I do not reach that question in this order.

when the phrase “decoder/driver” is used in the specification to describe the device known in the art, it appears in without the accompanying word “electronics.” *Id.* at 7:60-63.

LSG’s construction would essentially read out the words “decoder/driver.” To explain, LSG contends that the disputed limitation reads on any “electronic components of a decoder or driver that can impact electricity flow to the LED.” But all manner of components can be found in a decoder or driver, including transistors, resistors, capacitors, diodes, and transformers. In fact, it is difficult to imagine a circuit component that would never be used in a decoder or driver. And all circuit components “impact electricity” — that is what “electronics” do. Thus, although LSG’s construction uses more words, it boils down to mere “electronics,” not “decoder/driver electronics.” A construction that does not give meaning to all of the words of the claim is usually incorrect. *See Funai Elec. Co. v. Daewoo Elecs. Corp.*, 616 F.3d 1357, 1372 (Fed. Cir. 2010) (quoting *Exxon Chemical Patents, Inc. v. Lubrizol Corp.*, 64 F.3d 1553, 1557 (Fed. Cir. 1995) (“We must give meaning to all the words in [the] claims.”)).

Moreover, at the claim construction hearing, counsel for LSG conceded that, although electrostatic discharge protection (“ESD”) circuits are common elements of decoding and driving circuitry, such circuits are not necessary to decoding or driving, and do not themselves perform decoding or driving functions. Tr. at 158:6-20. Accordingly, electrostatic discharge protection circuitry, without more, cannot satisfy this claim term, as ESD circuits are not themselves electronics with the function of decoding or driving LEDs.

This much resolves the dispute between the parties, and no more need be said to understand the plain and ordinary meaning of the term. I adopt that plain and ordinary meaning.

**B. “an electrical path including an insulated conducting via through the metal base” (’053 patent)**

The claim term “an electrical path including an insulated conducting via through the metal base” is recited in asserted claim 7 of the ’053 patent. It is also recited in claim 4 of the ’053 patent, which was originally asserted against Respondents but has since been withdrawn from the investigation. *See* Order No. 26.

The parties propose the following constructions for this claim term:

<b>Complainants’ Construction</b>	<b>Respondents’ Construction</b>
“an electrical path that passes through the metal base and an insulated conducting via”	“an electrical path including an electrically conducting interconnect that passes through, and is insulated from, the metal base”

JC at 1.

The dispute between the parties centers on whether the phrase “through the metal base” modifies the phrase “insulated conducting via” or whether it modifies the phrase “electrical path.” Stated differently, the question is whether the disputed phrase reads on any electrical path running through the metal base and through an insulating conducting via, regardless of whether the insulating via is within the metal base. LSG argues it does. Respondents contend that the electrical path in question must pass through the metal base by way of an insulated conducting via. *See* CIMB at 19-20; RIMB at 6.

Respondents’ construction is correct. The basic rules of English grammar render the claim language unambiguous as written. Specifically, the claimed “electrical path” “include[s]” — that is, moves electrons through — an “insulated via,” and that “insulated via” is “through the metal base.” The sequence of the words themselves, the proximity of the modifier words to their object,

and the lack of offsetting commas in the phrase all confirm this meaning to a person of ordinary skill in the art.

Under the “last-antecedent” rule or the “nearest-reasonable-referent” rule of English grammar, “modifiers and qualifying phrases attach to the terms that are nearest.” *Grecian Magnesite Mining, Indus. & Shipping Co., SA v. Comm’r of Internal Revenue Serv.*, 926 F.3d 819, 824 (D.C. Cir. 2019) (citing Antonin Scalia & Bryan A. Garner, *Reading Law: The Interpretation of Legal Texts* 152 (2012)); *see Toshiba Corp. v. Juniper Networks, Inc.*, 248 Fed. Appx. 170, 174 (Fed. Cir. 2007) (analyzing the term “policy information indicating a permitted neighboring node/network from which a packet transfer by the label switching is to be permitted,” holding that “from which” modifies “neighboring node/network,” and finding that if the patentee had intended “from which” to modify “policy information,” “it would have used commas to set off the phrase”); *see also, e.g.*, Strunk & White, *The Elements of Style* (4th ed. 2000) § 20 (“Modifiers should come, if possible, next to the word they modify.”). Here, the phrase “through the metal base” is immediately proximate to the phrase “insulated conducting via.” In contrast, the phrase “through the metal base” is distant from the phrase “electrical path”; it is separated by the intervening phrase “including an insulated conducting via.” Because the prepositional phrase “through the metal base” immediately follows the “insulating conducting via,” the nearest-reasonable-referent rule presumes that the via is through the metal base. There are no “grammatical signals to the contrary” here. *Toshiba*, 248 Fed. Appx. at 174 (Fed. Cir. 2007) (affirming district court’s construction of “policy information indicating a permitted neighboring node/network from which a packet transfer by the label switching is to be permitted” to mean “requiring the policy information to relate to an upstream node/network”).

Another rule of English usage supports the application of the nearest-reasonable-referent rule here. Restrictive phrases — those essential to the meaning of the clause to which they belong — should *not* be set off by commas. *See* Chicago Manual of Style, 248 (15th ed. 2003) (Sections 6.31, 6.36, 6.38). Commas should, however, be used to offset a restrictive clause when their omission creates ambiguity. Here, there are no offsetting commas, so the phrase “through the metal base” is presumed to be essential, that is, it is presumed to restrict or narrow the immediately adjacent phrase “insulating conducting via.”

By contrast, the construction proposed by LSG disregards these basic grammar rules by rearranging the words to mean “an electrical path through the metal base including an insulated conducting via.” *See* CIMB at 20. LSG in effect seeks to read in offsetting commas where there are none, transforming the claim language “an electrical path including an insulated conducting via through the metal base” into “an electrical path, including an insulated conducting via, through the metal base.” *Id.*

Not only does LSG’s proposed construction contradict the plain meaning of the claim term as written, it is also belied by the structure of other claims. Claim 4 is no longer asserted, but it contains the same claim language in question. An examination of that claim and asserted claim 5 is instructive:

4. The packaged LED of claim 1 wherein at least one electrode of the LED is connected to one of the underlying electrical connection pads by an ***electrical path including an insulated conducting via through the metal base.***

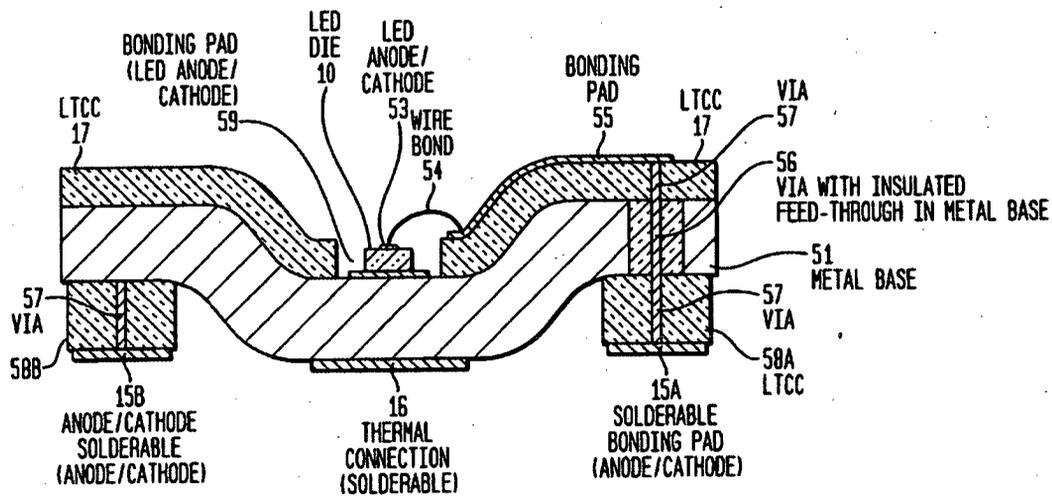
5. The packaged LED of claim 1 wherein at least one electrode of the LED is connected to one of the underlying electrical connection pads by ***an electrical path including the metal base.***

'053 patent, claims 4, 5 (emphasis added).

As can be seen, claims 4 and 5 are nearly identical; they vary only in their description of an electrical path. In claim 5, the electrical path includes the metal base itself. That is, the electrons of the metal base must flow to create the electrical path. LSG would have that same arrangement invoked by the differing language of claim 4. The path in claim 4 is an insulated via “through” the metal base. In claim 4, the electrons of the metal base are insulated from the electrical path, not part of it. Thus, in claim 5, the patentees used language to describe the outcome LSG seeks, but that language is not in claims 4 or 7. These differences presumably have a meaning. *Tandon Corp. v. U.S. Int’l Trade Comm’n*, 831 F.2d 1017, 1023 (Fed. Cir. 1987). LSG’s proposed construction would render superfluous the word “through,” an additional indicator that the construction is incorrect. *See Innova/Pure Water*, 381 F.3d at 1119 (finding the term “operatively connected” does not require a physical connection because the word “operatively” would otherwise be redundant, and “all claim terms are presumed to have meaning in a claim”).

Figure 5 of the ’053 patent specification, and accompanying description, inform the proper construction. That figure expressly illustrates and describes a via 56 “with insulated feed-through in [the] metal base”:

FIG. 5



'053 patent, Fig. 5.

Figure 5 is consistent with the normal grammatical interpretation of claim 7. It also illustrates the differences between claim 4 and claim 5. The left side of the figure shows an electrical path between anode/cathode 15B and LED anode/cathode 53 where the electrons of the metal base are the path. In contrast, the right side of the figure shows a via 56 that provides an electrical path that is insulated from the metal base as the via feeds through that base.

In discussing Figure 5, the specification reinforces a plain-language reading of the claim. It states that “[t]he top electrode 53 can be connected, for example by a bonding wire 54 to a top bonding pad 55 on the ceramic 17 and through *via 57 including insulated via section 56* to the bonding pad 15A underlying the formed metal base 51.” ’053 patent at 4:7-11 (emphasis added); *see also id.* at 2:54-57. Not only does this description match the illustration from a technical perspective, it reinforces the appropriate application of the nearest-reasonable-referent rule in English grammar. The “including” phrase in the specification modifies the immediately proximate “via 57,” not some remote phrase like “top electrode 53.”

In sum, the language of claim 7, the structure of claims 4 and 5, and consistent disclosures in the specification and drawings indicate LSG’s construction must be rejected. I adopt the plain meaning of the claim term.

**C. “one or more isolated terminals formed on the metal base” (’483 patent)**

The disputed term “one or more isolated terminals formed on the metal base” is recited in asserted claim 11 of the ’483 patent. The parties’ proposed constructions for this term are as follows:

Complainants’ Construction	Respondents’ Construction
“one or more isolated terminals formed on or from the metal base”	Plain meaning

JC at 1.

The plain meaning of the claim term is evident from the words themselves — “one or more isolated terminals formed *on* the metal base.” LSG seeks to broaden this limitation to include configurations in which the isolated terminals are formed “from” the metal base, but LSG’s proposed interpretation is not supported by the intrinsic evidence. In particular, nothing in the ’483 specification indicates that that patentee intended for the word “on” to mean “on or from.” *See Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014) (“We depart from the plain and ordinary meaning of claim terms based on the specification in only two instances: lexicography and disavowal.”).

LSG argues that the ’483 patent’s teachings with respect to Figures 1, 4, and 17 provide support for its proposed construction, but the patent’s teachings in fact support the plain meaning of the words “formed on the metal base.” *See, e.g.*, CIMB at 32-34. For instance, the embodiment

illustrated in Figure 17 expressly shows isolated terminals formed *on* the metal base. '483 patent at 5:47-49 (“[A]s shown in FIG. 17, connections to the LED assembly can be made by isolated terminals 175 *on base* 174.”) (emphasis added). Nothing in Figure 17 or the corresponding text suggests that the isolated terminals may be formed in any manner other than on the metal base. Furthermore, Figures 1A and 4 show that electrical connection pads 15A and 15B — the claimed “isolated terminals” — are formed on the single-structure metal base 11 in a stacked arrangement with intervening insulation layer 12. *See* '483 patent at 2:45-3:13.

Accordingly, the term “one or more isolated terminals formed on the metal base” shall be construed in accordance with the plain and ordinary meaning of its constituent words.

**D. “overlying” ('053, '483, and '421 patents)**

The disputed term “overlying” is recited in asserted claims 1, 7, 12, and 15 of the '053 patent; asserted claim 11 of the '483 patent; and asserted claim 1 of the '421 patent. The parties proposed the following constructions for this term:

Complainants' Construction	Respondents' Construction
“lying above and not requiring direct contact with”	“positioned only above”

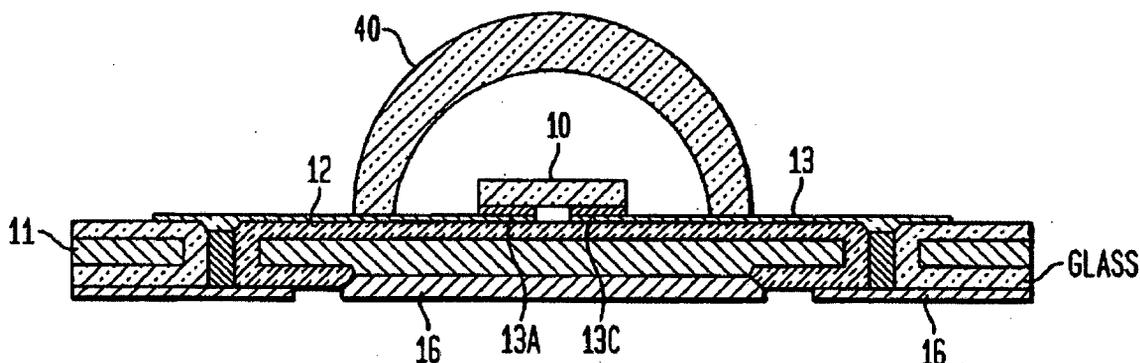
JC at 2.

The asserted patent claims use the term “overlying” in several contexts, such as “a layer of ceramic overlying the metal base” ('054 patent, claim 1) or “insulating layers overlying at least a portion of the planar portion of the thermally conducting base” ('421 patent, claim 1). The parties agree that “overlying,” as used in the asserted patents, does not require direct contact. Tr. at 116:19-25; *see also* RRMB at 9. The dispute then boils down to whether, as Respondents contend,

that “overlying” means positioned *only* above. See Tr. at 117:1-5. Respondents argue that “if a layer, for example, overlies something, it can’t be both above and below it at the same time.” Tr. at 106:2-5.

Respondents’ proposed restriction that “overlying” means “positioned *only* above” is not supported by the specifications and drawings of the asserted patents. For example, the ’053 patent specification states that Figure 4 illustrates “lens 40 overlying the LED 10”:

**FIG. 4**

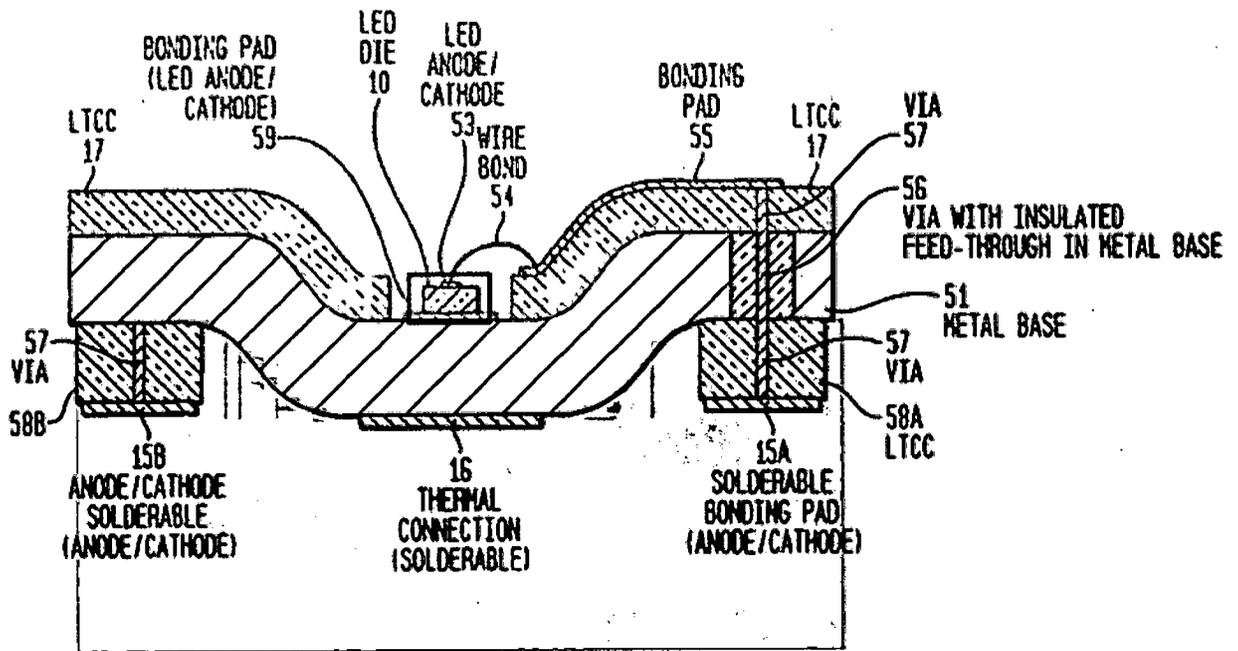


’053 patent at 3:57-60. But the left and right edges of lens 40 are not “positioned only above” LED 10; they are to the side of LED 10 also. Respondents apparently argue, without much support, that what is shown in Figure 4 can be “ignored” because the patent calls that figure “an alternative embodiment.” RRMB at 10. I decline to ignore this significant intrinsic evidence.

Respondents prefer to focus on Figure 5 of the ’053 patent, arguing that the LED in Figure 5 is “overlying” the metal base within their construction of that term:

The LED, enclosed by a blue box, is clearly situated in the space overlying the base (likewise, the three “solderable” components are underlying the base). [Jiao Resp. Decl. ¶ 22.] Whether a portion of metal base 51 is vertically higher than the LED, *in a region not vertically aligned with the LED*, is irrelevant to whether or not the LED is overlying the base.

FIG. 5



RRMB at 9-10 (emphasis original); *see* RRMB Ex. 21 ¶ 22 (Declaration of Jianzhong Jiao, Ph.D. in Support of Respondents’ Responsive Claim Construction Brief) (hereinafter “Jiao Resp. Decl.”). But the ’053 patent specification never describes LED 10 as “overlying” the metal layer. Even if it did, Respondents appear to concede that it is possible for the lower edges of metal base 51 — illustrated at the far left and right of Figure 5 — to be at a higher elevation than LED 53. *See* RRMB at 9-10. In such a configuration, the position of LED 10 is not exclusively “above” the metal base; LED 10 is also to the side of some portions of the metal base and below the elevated portions of that same base. Respondents’ discussion of Figure 5 does not support their construction.

Having considered the arguments of the parties, I adopt the plain and ordinary meaning of “overlying,” which is not limited to “positioned only above.”<sup>5</sup>

**E. “wherein the electrically insulating layers include one or more terminals”  
(’421 patent)**

The claim term “wherein the electrically insulating layers include one or more terminals” is recited in asserted claim 1 of the ’421 patent. Respondents contend that this term is indefinite, whereas LSG argues that this term is not indefinite and should be construed to mean “wherein one or more terminals are on or within the electrically insulating layers.”

<b>Complainants’ Construction</b>	<b>Respondents’ Construction</b>
“wherein one or more terminals are on or within the electrically insulating layers” This term is not indefinite.	Indefinite

JC at 2.

Respondents argue that this term is indefinite as “presenting a logical impossibility” when construed in view of the claim construction principle that “includes” means “comprising.” *See* RIMB at 15-16. Respondents cite to a declaration submitted by their expert, Dr. Thomas Katona, in support of the following proposition:

It is a physical impossibility for an element that is electrically insulating—such as the claimed “electrically insulating layers”—to be comprised of elements that are electrically conducting—such as the “terminals” disclosed and claimed in the ’421 patent.

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<sup>5</sup> Respondents argue that the glass depicted in Figure 1A of the of the ’053 patent is not “overlying” base 11 because the base is either “embedded in the glass” or the glass is “enveloping” the base. *See* Tr. at 110:10-112:7. My construction of “overlying” does not include instances of embedding or enveloping as described by the Respondents at the claim construction hearing.

*Id.* at 16 (citing RIMB Ex. 4 (Declaration of Dr. Thomas Katona, Ph.D.) ¶ 28 (hereinafter “Katona Decl.”)).

LSG argues that this claim term is not indefinite because a person of ordinary skill “would not have read the claim language to be creating an ‘impossibility’” and provides a declaration from its expert, Dr. Martin Kuball, in support of this proposition. *See* CRMB 18-19 (citing CRMB Ex. 2 (Declaration of Dr. Martin Kuball in Support of Complainants’ Responsive Claim Construction Brief) ¶ 38-44 (hereinafter “Kuball Resp. Decl.”)); *see also* Kuball Decl. ¶¶ 116-24. According to LSG, a person of ordinary skill “reading the claims in context of all the claim language, the specification, and the nature of the invention, would understand this term to mean ‘wherein one or more terminals are on or within the electrically insulating layers.’” *Id.* at 18-19 (citing ’421 patent at 2:63-3:3, 3:66-4:4, 7:1-8 (examples in the specification of “terminals on or within an electrically insulating layer”)); *id.* at Figs. 1A, 1B, 2, 10). LSG further argues that the specification’s use of the term “include” does not exclusively mean “made up of”; it can also mean “to have.” *Id.* at 19.

Taken as a whole, the intrinsic evidence does not support a finding that the term “wherein the electrically insulating layers include one or more terminals” renders claim 1 invalid as indefinite. “[A] patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus*, 134 S. Ct. at 2124. The extrinsic expert declarations from both sides do little to resolve what a person of ordinary skill in the art would understand when reading claim 1. LSG’s expert Dr. Kuball takes the position that a person of ordinary skill would understand the term to mean that the claimed “one or more terminals” are located within or on the claimed “electrically insulating layers,” whereas Respondents’ expert Dr. Katona opines that it is impossible for an electrically insulating (*i.e.*, non-conducting) layer to

include a conducting terminal. *See* Kuball Resp. Decl. ¶ 43; Katona Decl. ¶ 10. Without the benefit of cross-examination, it is difficult to assess the weight that should be given to the opinions of Drs. Kuball and Katona.

It is therefore my determination that Respondents have failed, at this time, to show clearly and convincingly that a person of ordinary skill in the art would lack reasonable certainty as to the scope of claim 1 of the '421 patent in connection with the claim term “wherein the electrically insulating layers include one or more terminals.”

**F. “base” ('053, '483, and '421 patents)**

The disputed term “base” is recited in asserted claims 1, 5, 7, 12, 14, and 15 of the '053 patent; asserted claim 11 of the '483 patent; and asserted claims 1 and 6 of the '421 patent. The parties agree that this term should be construed in the same manner for all asserted patents, and proposed the following constructions:

Complainants' Construction	Respondents' Construction
“a material that underlies (without requiring direct contact) at least a portion of an insulating layer”	“a substrate or board that provides support for the assembly components and layers” — or — “support or foundation”

JC at 2.

According to LSG, the dispute between the parties centers on whether or not the base needs to be a “unitary” structure.<sup>6</sup> *See* Tr. at 61:24-62:23. For instance, LSG contends that the metal base 11 illustrated in Figure 1A of the '053 patent “contains three portions that are electrically

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<sup>6</sup> That a “base” does not necessarily require “direct contact” — as set forth in LSG’s proposed construction — is not in dispute.

isolated from each other.” *See* CIMB at 16. Under this interpretation of the illustration, LSG argues that Respondents’ proposed construction is incorrect because “[t]he metal base in Figure 1A is neither a ‘substrate’ nor a ‘board,’ nor does it necessarily ‘provide support for the assembly components and layers,’ as Respondents’ construction would require. . . . It is also not necessarily ‘foundation,’ since it is a three-part base with two of its parts (the right and left sides) simply running through the middle of the LED package.” *Id.* at 16-17. LSG further argues that the embodiment in Figure 4 of the ’053 patent shows a three-part metal base 11 that fails to support Respondents’ proposed construction. *See id.* at 17.

LSG’s argument is not persuasive, however, insofar as the ’421 patent specification uses the terms “metal base,” “metal support board,” and “metal substrate” interchangeably.<sup>7</sup> For example, the specification teaches:

In the simplest form, LTCC-M technology is used to provide an integrated package for a semiconductor LED die and accompanying circuitry, wherein the conductive **metal support board** provides a heat sink for the LED die. Referring to FIG. 10, bare LED die 100, for example, may be mounted directly onto a **metal base 101** of the LTCC-M system having high thermal conductivity to cool the die 100. In such case, the electrical signals used to operate the die 100 may be connected to the component from the ceramic 102. In FIG. 10, a wire bond 103 serves this purpose. Indirect attachment to the **metal support board 101** may also be used.

’421 patent at 6:57-6:67 (emphasis added); *see also id.* at 7:1-8 (noting “components are mounted on the metal support board 101”), Fig. 10 (indicating “METAL BASE” 101). The patents likewise use the terms “substrates” and “boards” interchangeably. *See, e.g.,* ’421 patent at 6:8-9 (“More recently, metal support substrates (metal boards) have been used to support the green tapes.”); ’053 patent at 7:4-5 (same).

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<sup>7</sup> As the parties have agreed that “base” should be construed similarly across all asserted patents, this intrinsic evidence is particularly germane.

With respect to LSG's contention that the claimed "base" need not be a unitary structure, Respondents argue that the metal base 11 depicted in Figure 1A of the '053 and '483 patents does not consist of three pieces. *See, e.g.*, RRMB at 13-14. Respondents' expert Dr. Jiao provided a declaration in which he opined that a person of ordinary skill would understand Figure 1A to be a "schematic cross section" of a packaged LED that shows where the insulated conducting via passes through the metal base. *See* Jiao Resp. Decl. ¶¶ 26-29. According to Respondents, "[v]iewed three-dimensionally, the metal base 11 is one piece—a metal support substrate or metal board, *see, e.g.*, '483 patent, 7:8—that includes *two electrically insulated vias* enumerated as 14 . . . ." RRMB at 13 (emphasis original).

Having considered the intrinsic evidence and the arguments of the parties, including the expert declarations submitted therewith, it is my determination that neither construction proposed for "base" reflects the plain and ordinary meaning as viewed by a person of ordinary skill in the art. LSG's construction is overbroad because it would extend the claimed "base" to *any* component underlying the claimed insulating layer. For instance, Figure 5 of the '053 and '483 patents shows several elements underlying the insulating layer, including an anode/cathode 15A, an anode/cathode 15B, thermal conduction pads 16, and electrically conductive vias 56 and 57. All of those components could constitute the claimed "base" under LSG's construction. But that is plainly not what a person of ordinary skill would understand from the reading the patents. On the other hand, Respondents' alternate proposals of either "a substrate or board that provides support for the assembly components and layers" or "support or foundation" adds an unnecessary functional requirement into the disputed claim element.

Therefore, I will interpret the term "base" according to its ordinary meaning in the art, which encompasses terms like "support board" and "substrate."

**G. “one or more thermal vias” (’053 patent)**

The disputed phrase “one or more thermal vias” is recited in asserted claims 1 and 12 of the ’053 patent. The parties proposed the following constructions for this term in their briefs:

<b>Complainants’ Construction</b>	<b>Respondents’ Construction</b>
No construction necessary.	“one or more interconnects, the position, dimension, and composition of which provide enhanced heat flow from the LED die to the metal base”

JC at 2.

At the claim construction hearing, the parties agreed that “thermal vias” means “vias that enhance heat flow.” *See* Tr. at 54:19-55:12, 59:3-5. Accordingly, the claim term “one or more thermal vias” is construed to mean “one or more vias<sup>8</sup> that enhance heat flow.”

**H. “wherein the layer of electrically insulating material includes at least one opening to house the LED die” (’483 patent)**

The disputed claim term “wherein the layer of electrically insulating material includes at least one opening to house the LED die” is recited in asserted claim 11 of the ’483 patent. The parties have proposed the following constructions for this term:

<b>Complainants’ Construction</b>	<b>Respondents’ Construction</b>
No construction necessary.	“wherein the layer of electrically insulating material includes at least one cavity or well into which the LED die is mounted”

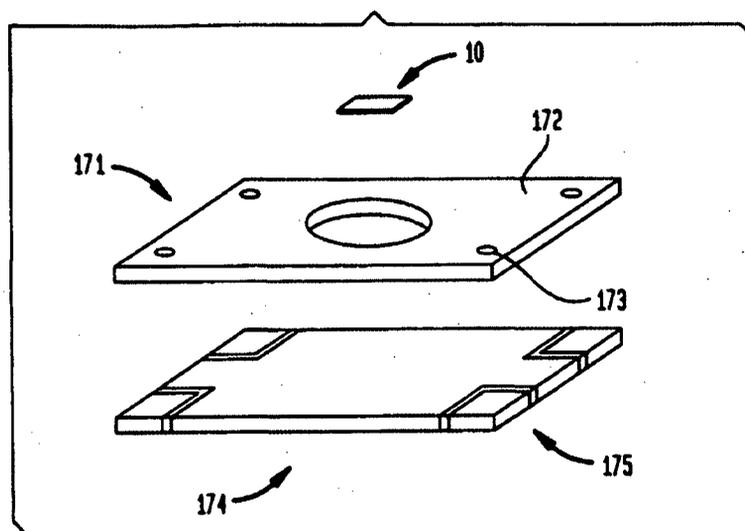
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<sup>8</sup> The parties agree that “via” is an acronym for “vertical interconnect access.” *See* Tr. at 23:14-17, 36:3-8, 58:7-10.

JC at 2. The dispute between the parties arises because Respondents seek a construction of this claim term that would exclude the embodiment shown in Figure 4 of the '483 patent. *See* Tr. at 134:19-135:9.

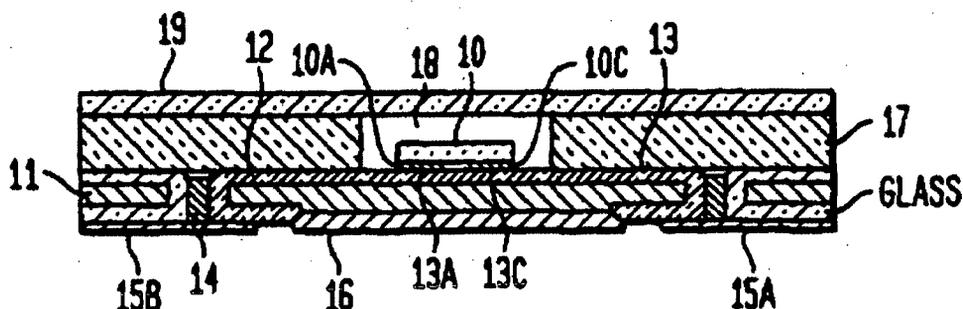
The '483 patent specification uses the word “openings” only once outside of the claims when it teaches (in reference to Figure 17 reproduced below) that “[o]penings in insulating layer 171 form wells for the LEDs as before.” '483 patent at 5:49-50.

**FIG. 17**



The reference to “as before” points to sections of the specification that discuss “cavities.” For instance, Figure 1A of the '483 patent (reproduced below) shows that “one or more ceramic layers 17 . . . form a cavity 18 around the LED 10.” *Id.* at 3:5-7.

**FIG. 1A**



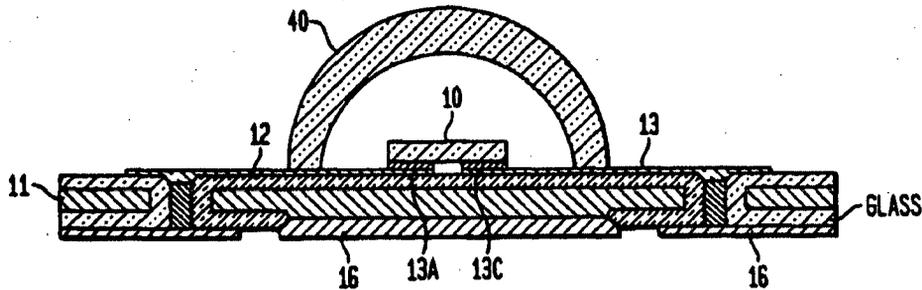
Other embodiments described in the specification also refer to an insulating layer with a “cavity” into which an LED die is mounted. *See, e.g.*, ’483 patent at 2:8-9 (“FIGS. 3A and 3B illustrate exemplary light dispersive cavities in the ceramic layer”); 3:49-52 (“FIGS. 3A and 3B illustrate exemplary light dispersive cavities for the LED of FIG. 1. In FIG. 3A the cavity 18 is provided with walls 30 having straight taper. In FIG. 3B, the walls 31 have a parabolic taper.”), 4:7-10 (“The FIG. 5 device is similar to FIG. 1 device except that the metal base 51 is formed, as by coining, to include a concave light reflecting cavity 52 around the LED die 10.”), 4:34-37 (“The FIG. 7 embodiment is similar to the FIG. 5 embodiment except that the cavity 18 in the ceramic layer 17 is enlarged so that the shaped region of formed metal base 51 is more widely exposed for acting as a layer area reflector.”), 5:11-12 (In Fig. 12, “[a] plurality of cavities 122 includes a plurality LED die [sic] 123, 124, and 125.”); *see also* 5:66-6:1; 6:7-12; 6:26-29; 6:48-52.

Turning now to Figure 4 (reproduced below), on which the parties’ dispute is centered, the specification teaches:

FIG. 4 is a schematic cross section of an alternative embodiment of a single LED packaged for high temperature operation. In this embodiment a lens 40 overlying the LED 10 replaces the ceramic layer 17, cavity 18 and lens cover 19. The other features of the FIG. 4 device are substantially the same as described for the FIG. 1 device.

'483 patent at 3:62-67.

**FIG. 4**



The '483 specification makes clear that lens 40 in Figure 4 takes the place of the ceramic layer 17 and cavity 18 in Figure 1, which correspond to the claimed “layer of electrically insulating material” and “opening,” respectively.<sup>9</sup> Accordingly, there is nothing in the Figure 4 illustration to show the claimed “opening” in the “layer of electrically insulating material.” As Respondents argue, “Figure 4 does not have the claimed ‘layer of electrically insulating material includ[ing] at least one opening to house the LED die.’ It has a lens covering an LED *instead*.” RRMB at 19 (emphasis original).

In view of the teachings of the '483 specification, I find that Respondents' proposed construction of “opening” to mean “cavity or well” reflects the plain and ordinary meaning of the term as understood by a person of ordinary skill in the art. The alternative embodiment shown in Figure 4 is not encompassed by the disputed claim language. The fact that construing “opening” in this manner would, in the words of LSG, “exclude Figure 4 from all claims of the '483 patent,” does not foreclose such a construction. See CRMB at 12. To be correct, the construction of a claim need not encompass all embodiments taught in a patent specification. *Baran v. Med. Device*

<sup>9</sup> Neither Figure 1 nor any other illustration in the '483 patent appears to show “lens cover 19.”

*Techs., Inc.*, 616 F.3d 1309, 1316 (Fed. Cir. 2010) (“It is not necessary that each claim read on every embodiment.”); *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1383 (Fed. Cir. 2008) (“It is often the case that different claims are directed to and cover different disclosed embodiments.”).

**I. “a thermally conductive region in solderable thermal contact with the thermally conducting base” (’421 patent)**

The claim term “a thermally conductive region in solderable thermal contact with the thermally conducting base” is recited in asserted claim 1 of the ’421 patent. Respondents contend that this term is indefinite, whereas LSG argues this term is not indefinite and should be construed in accordance with the meaning of “base” as determined earlier:

<b>Complainants’ Construction</b>	<b>Respondents’ Construction</b>
For “base,” see Complainants’ proposal for “base.” Otherwise, no construction is necessary.  This term is not indefinite.	Indefinite.

JC at 2.

Respondents argue that the intrinsic evidence as to the meaning of this claim term “is hopelessly inconsistent,” and base their argument on the language of claims 1 and 2 of the ’421 patent. *See* RIMB at 24. These claims read, in relevant part:

1. A LED assembly . . . comprising . . . a thermally conducting base . . . wherein a bottom surface of the LED assembly includes a thermally conductive region in solderable thermal contact with the thermally conducting base . . . .

2. The LED assembly of claim 1, wherein the thermally conductive region is an integral part of the thermally conducting base.

’421 patent at 7:46-8:3.

Respondents argue:

Claim 1 on its face appears to require the “thermally conductive region” be “solderable” to the “base.” However, claim 2—which depends from claim 1 and includes all of its limitations—requires the “region” and the “base” to be “integral” with each other, which would preclude the possibility of the components being “solderable” to each other. The specification and prosecution history are themselves murky and susceptible to various interpretations.

RIMB at 24.

LSG argues that this claim term is not indefinite because a person of ordinary skill “would readily understand that claim 1 simply requires a thermally conductive region that *can be*, but is not necessarily yet, soldered to the thermally conductive base, whereas claim 2 requires that thermally conductive region *has been* soldered to the base, and is thus integral to the base.” CRMB at 20 (emphasis original) (citing Kuball Resp. Decl. ¶¶ 46-53). According to LSG, a person of ordinary skill would have been “informed by the teachings of Figures 2 and 4, which make clear that ‘solderable thermal contact’ means the capability to be soldered, such that the thermally conductive region of Claim 1 need not actually be soldered to the base.” *Id.* at 21 (citing Kuball Resp. Decl. ¶ 50). LSG further argues:

“[E]ven after the [thermally conductive] region and the base have been soldered together (and have become integral), a [person of ordinary skill] would still understand them to be in solderable contact with one another. [Kuball Resp. Decl.] ¶ 53. The fact that they *have* been soldered is proof that they *are* solderable, *i.e.*, capable of being soldered.

*Id.*

Taken as a whole, the intrinsic evidence does not support a finding that the term “a thermally conductive region in solderable thermal contact with the thermally conducting base” renders claim 1 invalid as indefinite. “[A] patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with

reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus*, 134 S. Ct. at 2124. The extrinsic evidence, which includes expert declarations from both sides, is conflicting. LSG’s expert Dr. Kuball takes the position that a person of ordinary skill would understand that claim 1 requires a thermally conductive region that can be soldered to the thermally conductive base, whereas claim 2 requires that thermally conductive region has been soldered to the base. Respondents’ expert Dr. Katona opines that a “thermally conductive region” integral with a “base” cannot be “solderable” to that base because the two components are already combined in some way. *See* Kuball Resp. Decl. ¶¶ 46-53; Katona Decl. ¶ 30-39. Without the benefit of cross-examination, it is difficult to assess the weight that should be given to the opinions of Drs. Kuball and Katona.

It is therefore my determination that Respondents have failed, at this time, to show clearly and convincingly that a person of ordinary skill in the art would lack reasonable certainty as to the scope of claim 1 of the ’421 patent in connection with the claim term “a thermally conductive region in solderable thermal contact with the thermally conducting base.”

**J. “A light emitting diode (LED) assembly” (’483 patent)**

The phrase “[a] light emitting diode (LED) assembly” is recited in the preamble to asserted claim 11 of the ’483 patent. Respondents take the position that this preamble is limiting and should be construed to mean “a low temperature co-fired ceramic on metal (LTCC-M) light emitting diode (LED) assembly,” whereas LSG contends that no construction is needed and that the disputed phrase should take its plain and ordinary meaning:

Complainants' Construction	Respondents' Construction
No construction necessary.	"A low temperature co-fired ceramic on metal (LTCC-M) light emitting diode (LED) assembly"

JC at 2.

As an initial matter, the intrinsic evidence demonstrates that the "light emitting diode (LED) assembly" identified in the preamble of claim 11 is a limiting feature of the claims. It is the structure that the other claim elements combine to form. Independent claim 11 requires "one or more isolated terminals formed on the metal base, the one or more isolated terminals electrically connected to decoder/driver electronics that control the LED electrodes, wherein the electronics are mounted within the assembly." '483 patent at 10:19-23. The preamble provides the antecedent for "the assembly" on which the claimed electronics are mounted. The preamble of claim 11 is also the antecedent for "[t]he assembly" in non-asserted dependent claim 13: "The LED assembly of claim 11 further comprising an additional metal block on which the LED assembly is mounted to further improve heat dissipation." *Id.* at 10:27-29. The fact that other parts of claim 11 and claim 13 refer back to the assembly in the preamble indicates that the preamble is limiting. *See, e.g., Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015) ("Because the preamble terms 'user' and 'repetitive motion pacing system' provide antecedent basis for and are necessary to understand the positive limitations in the body of claims in the '843 patent, we hold that the preamble to claim 25 is limiting."). Moreover, the structure of the invention would not be complete without the "light emitting diode (LED) assembly" introduced in the preamble. The claims specifically describe components mounted to that assembly, which is an indication that the preamble is limiting. *See Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997) ("Where a patentee

uses the claim preamble to recite structural limitations of his claimed invention, the PTO and courts give effect to that usage.”). For all of these reasons, I find the preamble of claim 11 is limiting, and LSG does not dispute that here. *See* CIMB at 34-37; CRMB at 16-17.

As for the question of whether the preamble should be construed to mean “a low temperature co-fired ceramic on metal (LTCC-M) light emitting diode (LED) assembly” as proposed by Respondents, the prosecution history of the ’483 patent is instructive. The ’483 patent is a divisional of U.S. Patent Application No. 10/638,579 (“the ’579 application”). *See* ’483 patent at cover. The Examiner issued an Office Action stating that the ’579 application contained two patentably distinct species of the same invention:

Group I (claims 1–10) — a packaged LED comprising a metal base including an underlying thermal connection pad and a pair of underlying electrical connection pads, the pair of underlying electrical connection pads is electrically connected to the electrodes of LED;

Group II (claims 11–20) — *a low temperature co-fired on metal (LTCC-M) LED comprising a metal base* including a thermal connection surface and a plurality of conductive traces insulated from the metal base and connected to the LED electrodes.

RIMB Ex. 19 (Office Action dated July 20, 2004, from ’483 prosecution history) at NICHIA\_00000089 (emphasis added). In response, the applicants chose to prosecute the first group in the ’579 application (leading to the issuance of the ’053 patent), and to prosecute the LTCC-M claims in divisional U.S. Patent Application No. 10/933,096 (“the ’096 application”), which issued as the ’483 patent. Thus, following the applicants’ election in response to the July 20, 2004, Office Action, all the originally filed claims of the ’096 application included the phrase “A low temperature co-fired [ceramic] on metal (LTCC-M) light emitting diode (LED) assembly.” *See, e.g.*, RIMB Ex. 20 (excerpts from ’483 prosecution history) at NICHIA\_00002337-38 (Preliminary Amendment dated Sept. 2, 2004).

In the first Office Action of the '096 application, the Examiner rejected as obvious eight of the ten original claims over certain non-LED LTCC-M package prior art combined with certain LED non-LTCC-M prior art. RIMB Ex. 20 at NICHIA\_00002364-66 (Office Action dated Jun. 2, 2005). The Examiner also noted dependent claims 14 and 19 would be allowable if written in independent form because “[t]he prior art of record fails to disclose the decoder/driver electronics that control the LED electrodes is embedded in the LTCC-M package.” *Id.* at NICHIA\_00002366 (Office Action dated Jun. 2, 2005). The applicants subsequently amended the claims as instructed and rewrote dependent claims 14 and 19 in independent form, resulting in issued claims 1 and 7. *Id.* at NICHIA\_00002387-89 (Reply dated Nov. 1, 2005).

In that same response, the applicants also added new claims 25-34, including independent application claims 25 and 31 (which issued as claims 11 and 17), stating that the new claims covered embodiments “wherein the layer 17 overlying the metal base 11 is comprised of any suitable insulating material, and not limited to ceramic.” RIMB Ex. 20 at NICHIA\_00002394 (Reply dated Nov. 1, 2005).

The Examiner subsequently allowed the amended and new claims and provided the following reasoning:

The prior art of record fails to disclose all the limitations recited in the base Claims. Specifically, the combination of a LTCC-M LED structure comprising a metal base including a thermal connection surface; an LED die having a pair of electrodes overlying and electrically insulated from the metal base by an insulating layer; and one or more isolated terminals formed on the metal base and electrically connected to decoder/driver electronics which are mounted within the assembly (base claims 11 and 25) [*i.e.*, issued claims 1 and 11], or a plurality of edge connector fingers connected to decoder/driver electronics which are embedded in the assembly and control the LED electrodes (base claims 21 and 31) [*i.e.*, issued claims 7 and 17].

RIMB Ex. 20 at NICHIA\_00002407 (Reason for Allowance dated Dec. 30, 2005) (underline original).

The applicants did not comment on the Examiner's stated reasons for allowance, and Respondents argue this silence indicates that "the examiner's statements are strong evidence as to the interpretation of the claim limitations discussed in the reasons for allowance." RIMB at 36 (citing *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 979 (Fed. Cir. 1999) (finding applicant's failure to respond to examiner's statement in the reasons for allowance relevant to claim construction); *ACCO Brands, Inc. v. Micro Sec. Devices, Inc.*, 346 F.3d 1075, 1079 (Fed. Cir. 2003); *Biogen, Inc. v. Berlex Labs., Inc.*, 318 F.3d 1132, 1138-39 (Fed. Cir. 2003) (finding examiner's stated reasons for allowance persuasive evidence in claim construction)).

I find that, on this record, the applicants' silence after receiving the Examiner's stated reasons for allowance does not constitute a clear and unmistakable disavowal of claim scope. In particular, I find the applicants' express statement that they were adding claims (including issued claim 11) to "present embodiments of the present invention wherein the layer 17 overlying the metal base 11 is comprised of any suitable insulating material, ***and not limited to ceramic***" as demonstrating a lack of disavowal. See RIMB Ex. 20 at NICHIA\_00002394 (Reply dated Nov. 1, 2005) (emphasis added); see also *Salazar v. Proctor & Gamble Co.*, 414 F.3d 1342, 1345 (Fed. Cir. 2005) ("Consequently, an applicant's silence regarding statements made by the examiner during prosecution, without more, cannot amount to a 'clear and unmistakable disavowal' of claim

scope.”). Accordingly, I decline to limit the term “light emitting diode (LED) assembly” to only LTCC-M assemblies. I will interpret it using its plain and ordinary meaning.

**SO ORDERED.**

  
\_\_\_\_\_  
Clark S. Cheney  
Administrative Law Judge

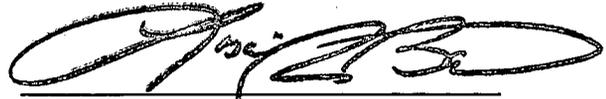
In the Matter of

**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
SYSTEMS, AND COMPONENTS THEREOF (III)**

INV. NO. 337-TA-1168

**PUBLIC CERTIFICATE OF SERVICE**

I, Lisa R. Barton, hereby certify that the attached **ORDER NO. 31** has been served by hand upon the following parties as indicated, on **February 11, 2020**.



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In the Matter of

**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
SYSTEMS, AND COMPONENTS THEREOF (III)**

**INV. NO. 337-TA-1168**

**PUBLIC CERTIFICATE OF SERVICE**

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In the Matter of

**CERTAIN LIGHT-EMITTING DIODE PRODUCTS,  
SYSTEMS, AND COMPONENTS THEREOF (III)**

**INV. NO. 337-TA-1168**

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