

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

IN THE MATTER OF
CERTAIN SEMICONDUCTOR DEVICES, AND
METHODS OF MANUFACTURING SAME
AND PRODUCTS CONTAINING THE SAME

Investigation No. 337-TA-_____

**VERIFIED COMPLAINT UNDER SECTION 337
OF THE TARIFF ACT OF 1930, AS AMENDED**

Complainant

Efficient Power Conversion Corporation

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| Exhibit 10 | EPC Enhancement-Mode Gallium Nitride Technology – Technology Brief: TB001, <i>available at https://epc-co.com/epc/Portals/0/epc/documents/articles/EPC_eGaN_FET_Product_Brief.pdf</i> , accessed on March 21, 2023. |
| Exhibit 11 | Declaration of Alexander Lidow |
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| Exhibit 14 | EPC Technical Data Sheet EPC2016C, <i>available at https://epc-co.com/epc/Portals/0/epc/documents/datasheets/EPC2016C_datasheet.pdf</i> , accessed May 5, 2023. |
| Exhibit 15 | EPC Technical Data Sheet EPC2215, <i>available at https://epc-co.com/epc/Portals/0/epc/documents/datasheets/EPC2215_datasheet.pdf</i> , accessed May 7, 2023. |
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| Exhibit 33 | Innoscence Part No. INN100W032A Claim Chart U.S. Patent No. 8,404,508 |
| Exhibit 34 | Innoscence Part No. INN100W032A Claim Chart U.S. Patent No. 9,748,347 |
| Exhibit 35 | Innoscence Part No. INN100W032A Claim Chart U.S. Patent No. 10,312,335 |
| Exhibit 36 | Innoscence Applications, <i>available at</i> https://www.innoscence.com/site/application , accessed May 3, 2023. |
| Exhibit 37C | Declaration of Massimo Marabotti |
| Exhibit 38 | EPC2218: 100 V, 231 A Enhancement-Mode GaN Power Transistor, <i>available at</i> https://epc-co.com/epc/products/gan-fets-and-ics/epc2218 , accessed April 26, 2023. |
| Exhibit 39 | INN100W032A 100V Enhancement-mode GaN Power Transistor, <i>available at</i> https://www.innoscence.com/site/product_details/13 , accessed April 26, 2023. |
| Exhibit 40 | EPC Patents, <i>available at</i> https://epc-co.com/epc/about-epc/patents , accessed April 28, 2023. |
| Exhibit 41 | SEMI Awards Honor Process and Technology Integration Achievements, <i>available at</i> https://www.semi.org/en/semi-awards-honor-process-and-technology-integration-achievements , accessed April 28, 2023. |
| Exhibit 42 | SEMICON CHINA, Alex Lidow Biography, <i>available at</i> https://www.semiconchina.org/en/603 , accessed April 28, 2023. |
| Exhibit 43 | Alex Lidow's Quest to Replace Silicon and Revolutionize Electronics, Forbes, <i>available at</i> https://www.forbes.com/sites/brucerogers/2015/09/03/alex-lidows-quest-to-replace-silicon-and-revolutionize-electronics/?sh=21e4d7bc3758 , accessed April 28, 2023. |

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|-------------|---|
| Exhibit 44 | “Look Out Silicon Valley, Here Comes Gallium Beach,” FOX Business, available at https://www.foxbusiness.com/features/look-out-silicon-valley-here-comes-gallium-beach , accessed April 28, 2023. |
| Exhibit 45 | Alex Lidow et al., GaN Transistors for Efficient Power Conversion (2 nd Ed.) (2015). |
| Exhibit 46 | Innoscence America, Inc., California Secretary of State Business Search, https://bizfileonline.sos.ca.gov/search/business , accessed April 28, 2023. |
| Exhibit 47 | Innoscence, Inc., Delaware Department of State: Division of Corporations, https://icis.corp.delaware.gov/Ecorp/EntitySearch/NameSearch.aspx , accessed April 28, 2023. |
| Exhibit 48 | Innoscence Products – Where to buy, https://www.innoscence.com/site/where_to_buy , accessed May 24, 2023. |
| Exhibit 49 | Innoscence GaN HEMT Publication: Kim, J.Y., Lee, D., Kim, Y.S., Son, J., Luo, W., Marcon, D. and Decoutere, S., 2017, November, “650 V Dispersion-Free Enhancement-Mode GaN-on-Si HEMTs Processed in a 200 mm CMOS Fab,” <i>2017 14th China International Forum on Solid State Lighting: International Forum on Wide Bandgap Semiconductors China (SSLChina: IFWS)</i> (pp. 172-174). IEEE. |
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| Exhibit 56 | Innoscence Technical Data Sheet INN100W032A, available at https://ynsk.shwebspace.com/uploads/20230315_INN100W032A_Datasheet_Rev%201.1%20Solder%20Bar.pdf , accessed May 7, 2023. |
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| Exhibit 61 | “Myths about Gallium Nitride Semiconductors,” Efficient Power Conversion Corp., available at https://epc-co.com/epc/gan-talk/post/23397/myths-about-gallium-nitride-semiconductors , accessed May 7, 2023. |
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| U.S. Patent No. | Asserted Claims ¹ |
|-----------------|-------------------------------------|
| 8,350,294 | 1 , 2, 3 |
| 8,404,508 | 1 |
| 9,748,347 | 1 , 2, 3 |
| 10,312,335 | 1 , 2, 3, 4, 5 , 6, 7 |

3. The Asserted Patents, which relate to Gallium Nitride (“GaN”) semiconductors, are valid and enforceable, and the entire right, title, and interest in those patents are assigned to EPC. Exhibits 5-7.

4. Alexander Lidow, the Chief Executive Officer of EPC, has over forty years of experience in the semiconductor industry. Dr. Lidow began his career at a leading semiconductor manufacturer, International Rectifier, during which time, he was instrumental in the invention of the hexagonal power metal–oxide–semiconductor field-effect transistor (“HEXFET power MOSFET”), which revolutionized the industry. A stand-out engineer, Mr. Lidow rose to the position of CEO at International Rectifier, leaving in 2007 to co-found EPC, focusing on the development and design of innovative transistors, integrated circuits, and other devices based on GaN technology. Exhibit 8 at 4. Mr. Lidow is a prolific inventor named on dozens of patents and a pioneer in the field of GaN semiconductor technology, holding several U.S. patents covering fundamental GaN technology. Exhibit 40. Dr. Lidow co-authored the first textbook on GaN transistors. See Exhibit 42. Dr. Lidow has been recognized for his work in GaN technology receiving the 2015 SEMI Award for North America for the commercialization of more efficient power devices. See Exhibit 41. In 2019, Dr. Lidow was inducted into the IEEE

¹ Independent claims in the chart of asserted claims are denoted in **bold**.

Hall of Fame. *See* Exhibit 42. Dr. Lidow was profiled in a Forbes article entitled “Alex Lidow’s Quest to Replace Silicon and Revolutionize Electronics.” *See* Exhibit 43. He was also profiled on Fox Business. *See* Exhibit 44.

5. Dr. Lidow co-founded EPC with the goal of further developing GaN-based devices as an alternative to silicon-based MOSFET devices. Exhibit 8 at 4. As a result, EPC holds over 50 U.S. patents and over 150 worldwide relating to GaN devices and circuits. Exhibit 11 at ¶ 7. Moreover, EPC, under Dr. Lidow’s leadership, was the first to market mass-producible, high-volume GaN-based power devices proving to the industry that GaN devices could be transformed from a scientific curiosity to a widely accepted technology with improved energy efficiency. *Id.* As a result of EPC’s investments in research and development, GaN devices covered by the Asserted Patents provide a revolutionary, improved alternative to silicon-based MOSFET devices, with GaN devices having higher efficiency, smaller size, and lower cost. *Id.* at ¶ 6.

6. EPC is headquartered in El Segundo, California, and has additional California offices in Aliso Viejo and San Jose. Exhibit 9 at 1-2. The majority of EPC’s U.S. employees are involved in research and development, administration, or marketing. *See* Confidential Exhibit 37C, ¶ 13. Since inception, EPC has been an innovator in GaN technology, developing and then delivering the first commercial enhancement-mode GaN transistors in 2009. Exhibit 8 at 4. EPC did not rest on its laurels and continued to, and continues to, spend significant resources improving the fundamental GaN technology it developed. *See* Confidential Exhibit 37C, ¶¶ 7-15. EPC sells its GaN devices, covered by the Asserted Patents, in the U.S. and worldwide to industry leaders in computing, automotive, solar, robotics, drones, medical electronics, and

LIDAR, and in everyday products like audio equipment, smart appliances, power tools, fast chargers, and e-bikes. Exhibit 11 at ¶ 6.

7. Transistors and integrated circuits form the basis of semiconductor technology. Future advances are dependent on the development of smaller transistors and integrated circuits that can carry higher voltages at a lower resistance. Exhibit 10 at 1-2. GaN exhibits superior crystalline qualities and allows for superior conductivity and faster transistor switching speeds than silicon. As a result, the GaN transistors and integrated circuits developed by EPC demonstrate substantial performance advantages over their silicon counterparts. *Id.* As such, GaN devices are crucial to the development of next-generation products such as smartphones, wireless charging, solar arrays, LED lighting, medical equipment, computers, automobiles, aeronautics, and servers. *See id.*

8. GaN semiconductor devices represented a technological leap over the previous generation of silicon power MOSFETs. Silicon power MOSFETs had been approaching their theoretical limit for power management efficiency and cost – an innovative new technology was thus necessary to maintain pace with increasing energy management demands. *See generally* Exhibit 45.

9. GaN-based FET technology provides higher efficiency at lower cost than silicon FET designs. *See* Exhibit 10 at 1. GaN FETs allow for improved efficiency through lower conductance losses, faster switching speeds, less power needed to drive the circuit, and smaller footprint on the intended printed circuit board. *See id.* The improved efficiency is achieved at lower cost because GaN FETs are formed on inexpensive silicon-based substrates and can be made using existing (retrofitted) MOSFET manufacturing facilities, thereby avoiding significant new investment costs. *See id.* Moreover, the smaller size and improved performance of EPC's

enhancement mode GaN FETs over depletion-mode GaN FETs, discussed below, lowers overall system cost while improving system safety and reliability. *See id.*

10. The first GaN FETs appeared in approximately 2004 as depletion-mode FETs. Exhibit 45 at 6-7. Depletion-mode FETs are passive mode devices that are in the “on”-state at zero gate-source voltage, i.e., the devices allow the flow of current *without* the external application of voltage to the gate. *See id.* Although depletion-mode GaN FETs were a technological improvement over the silicon-based technology, a significant drawback to depletion-mode FETs is that they require the application of voltage to switch to the “off”-state, i.e., active application of external power to turn off. *See id.* This is a highly disadvantageous feature.

11. In 2009, EPC introduced the first enhancement-mode GaN on silicon FET. Exhibit 8 at 4. EPC’s enhancement-mode GaN on silicon (eGaN[®]) FET was specifically designed as an improvement over and a replacement for power MOSFETs. *See* Exhibit 45 at 6-7. EPC’s eGaN[®] FETs are a vast improvement over depletion-mode GaN FETs because they are normally “off” and require the application of voltage (i.e., power) to switch to the “on”-state. *Id.* This prevents short circuits and, unlike depletion-mode devices, does not require the application of voltage to switch to the “off” state. *Id.* Enhancement-mode GaN FETs are more reliable and provide better controllability, among other things, than depletion-mode GaN FETs. Exhibit 10 at 2; Exhibit 45 at 6-7.

12. To produce and sell, and to continue improving the performance of its market-leading GaN devices, EPC employs teams of engineers that are deeply involved in research and development and have access to highly valuable proprietary information related to the research and testing of EPC products. *See* Exhibit 11 at ¶ 7. In those roles, EPC engineers have access to

substantial amounts of proprietary research and testing data, including, but not limited to, raw material sourcing, designs, specifications, functionality, failure analysis results, proprietary know-how, and proprietary methods of manufacture. *See id.* One such engineer, Mr. Chunhua Zhou, was hired in 2012 in a research and development role that required and allowed him access to EPC's proprietary information. *See id.* at ¶ 9. Mr. Zhou also worked closely with EPC's testing facilities to assess the reliability and failure modes of the EPC products and develop design improvements that were incorporated into subsequent generations of EPC devices, giving him unique, unfettered access to EPC's most confidential technical data. *See id.*

13. Mr. Zhou resigned from EPC and returned to China in 2017. *See id.* at ¶ 10. Prior to his resignation, Mr. Zhou managed crucial analytical tasks such as reliability qualification and failure analysis of EPC's GaN devices. *See id.* at ¶ 9. Mr. Zhou also had access to proprietary EPC customer and supplier lists. *See id.*

14. Following his resignation from EPC and return to China, Mr. Zhou immediately joined Innoscience as its Chief Technological Officer in 2017. *See id.* at ¶ 10. Soon after Mr. Zhou started working at Innoscience Zhuhai, Innoscience reported the development of enhancement mode GaN FETs closely mirroring EPC's enhancement mode GaN FETs in design and performance. *See id.* The close similarity in design and performance is readily apparent in the below side-by-side comparison of a 100 V EPC product, EPC2218 (Exhibit 38) and an Innoscience 100 V product, INN100W032A, (Exhibit 39).

19. To remedy Innoscience's continuing and unlawful violation of Section 337, EPC seeks, as permanent relief, a limited exclusion order pursuant to 19 U.S.C. § 1337(d) against Innoscience and its subsidiaries, affiliates, agents, successors, and assigns, barring from entry into the United States all articles that directly infringe, literally, or under the doctrine of equivalents, at least one or more claims of each of the Asserted Patents. EPC also seeks cease and desist orders pursuant to 19 U.S.C. § 1337(f), prohibiting Innoscience and its subsidiaries, affiliates, agents, successors, and assigns from engaging in: the importation, sale for importation, and/or sale within the United States after importation of such articles, offering for sale for importation and/or offer for sale within the United States; marketing, distributing, offering for sale, selling, or otherwise transferring (except for export) in the United States of such articles; advertising related to such imported articles; soliciting agents, retailers, resellers, or distributors in the United States for such articles; or aiding or abetting other entities in the importation, sale for importation, sale after importation, transfer (except for export), or distribution of such articles.

20. Further, EPC requests that the Commission impose a bond upon Innoscience's importation of infringing articles during the 60-day Presidential review period, pursuant to 19 U.S.C. § 1337(j) to prevent further injury to EPC's domestic industry relating to each of the Asserted Patents.

II. THE PARTIES

A. The Complainant

21. Pursuant to Commission Rule 210.12(a)(7), Complainant EPC is a Delaware corporation with its headquarters and principal place of business located at 909 N. Pacific Coast Highway, Suite 230, El Segundo, CA 90245. Confidential Exhibit 11 at ¶ 4. Complainant EPC

is in the business of conducting research and development, design, manufacturing, marketing, and sales of GaN semiconductor devices.

B. Respondents

22. Upon information and belief, Innoscience (Zhuhai) Technology Company, Ltd. has its principal place of business and headquarters at No. 39, Jinyuan 2nd Road, High-Tech Zone, Zhuhai, Guangdong, 519099 China. *See, e.g.*, Exhibit 25 at ¶ 9 (under “seller”). Upon information and belief, Innoscience (Zhuhai) Technology Company, Ltd. imports, sells for importation, and/or sells after importation the Accused Products in the United States. *Id.* at ¶¶ 5-11.

23. Upon information and belief, Innoscience America, Inc. is a subsidiary of Innoscience (Zhuhai) Technology Company, Ltd. and a California corporation that has its principal place of business at 5451 Great America Pkwy, Ste 125, Santa Clara, CA 95054. Exhibit 46. Upon information and belief, Innoscience America, Inc. imports, sells for importation, and/or sells after importation the Accused Products in the United States. *See, e.g.*, Exhibit 25 at ¶¶ 5-11.

24. Upon information and belief, Innoscience, Inc. is a Delaware corporation that is an affiliate of Innoscience (Zhuhai) Technology Company, Ltd. Exhibit 47. Upon information and belief, Innoscience, Inc. imports, sells for importation, and/or sells after importation the Accused Products in the United States.

2. Nontechnical Description of the Patented Invention²

29. The '294 Patent generally describes the design and configuration of field effect transistors (FET) with reduced gate leakage. FETs regulate current flow using a gate which, when activated with voltage, creates an electric field to allow or prevent current to flow through the transistor, such that the FET can be used as an on/off switch.

30. The '294 Patent relates specifically to GaN FET transistors which include a gate formed of GaN. Ideally, in the absence of a voltage applied to the gate, no current flows through the gate – the voltage applied to the gate simply switches the transistor on or off, i.e., the voltage applied to the gate allows or blocks current flow from the drain to the source of the transistor. However, there is always some undesirable “leakage” of current through the gate and into main current flow between the drain and source of the transistor. In accordance with the '294 Patent, this undesirable gate leakage is reduced by making the GaN gate less conductive of electricity (i.e., more insulating), which is termed a “compensated” GaN gate layer.

3. Foreign Counterparts to the '294 Patent

31. The following is a list of foreign counterparts to the '294 Patent:

| Country | App. No. | Filing Date | Status | Patent No. | Issue Date |
|-----------|----------------|--------------|--------|------------------|---------------|
| China | 201080015425.X | Apr. 7, 2010 | Issued | ZL101080015425.X | July 30, 2014 |
| Hong Kong | 1165615 | Apr. 7, 2010 | Issued | 1165615 | Nov. 21, 2014 |
| Japan | 2012-504807 | Apr. 7, 2010 | Issued | 5785153 | July 31, 2015 |

² The non-technical description of the '294 Patent is presented for general background purposes only. Such statements are not intended to be used, nor should be used, for purposes of patent claim interpretation.

| | | | | | |
|---------|-------------------|--------------|---------|------------|---------------|
| Korea | 10-2011-7023112 | Apr. 7, 2010 | Issued | 10-1660870 | Sep. 22, 2019 |
| Germany | 11 2010 001 589.9 | Apr. 7, 2010 | Pending | | |
| Taiwan | 99110731 | Apr. 7, 2010 | Issued | I499054 | Sep. 1, 2015 |
| PCT | PCT/2010/030193 | Apr. 7, 2010 | Expired | | |

32. To the best of EPC's present knowledge, information and belief, there are no other foreign patents or foreign patent applications pending, filed, abandoned, withdrawn or rejected corresponding to the '294 Patent.

B. The '508 Patent

1. Identification of the Patent and Ownership

33. On March 3, 2015, the USPTO issued the '508 Patent, entitled *Enhancement Mode GaN HEMT Device and Method for Fabricating the Same*. The '508 Patent names Alexander Lidow, Robert Beach, Alana Nakata, Jianjun Cao, and Guang Yuan Zhao as inventors. The '508 Patent issued from U.S. Patent Application Serial No. 12/756,960, filed on April 8, 2010. The '508 Patent further claims priority to U.S. Provisional Patent Application Serial No. 61/167,777, filed on April 8, 2009. The '508 Patent expires on August 16, 2031. A true, correct, and certified copy of the '508 Patent is attached hereto as Exhibit 2.

34. EPC is the assignee and owner of all right, title, and interest in and to the '508 Patent, which is valid, enforceable, and is currently in full force and effect. The named inventors of the '508 Patent, identified above, assigned to EPC all right, title, and interest in and to the '508 Patent. EPC has not granted a license to any rights under the '508 Patent. A true, correct, and certified copy of the assignment of the '508 Patent is attached hereto as Exhibit 6.

35. The '508 Patent has three independent claims and two dependent claims. EPC asserts that claims 1-5 are directly infringed by the Accused Products, either literally or under the doctrine of equivalents.

36. Pursuant to Commission Rule 210.12, the original of the Complaint is accompanied by: (1) a true, correct, and certified copy of the '508 Patent (Exhibit 2); (2) a true, correct, and certified copy of the prosecution history of the '508 Patent (Appendix C); (3) one copy of each reference cited therein (Appendix D); and (4) a true, correct, and certified copy of the recorded assignment from the inventors of the '508 Patent to EPC (Exhibit 6).

2. Nontechnical Description of the Patented Invention³

37. The '508 Patent generally describes a method of forming an enhancement-mode GaN transistor with a self-aligned gate, i.e., the gate metal and the GaN material of the transistor gate are etched with a photolithography technique using a single photo mask. Prior to the invention of the '508 patent, the gate metal and the GaN material of the transistor gate of conventional enhancement mode GaN transistors were formed using two separate photo masks. The two mask process disadvantageously leads to misalignment of the gate metal with respect to the GaN material of the gate, resulting in a wider gate length than the photo/etch minimum CD (cell dimension). This causes high gate charge, wider cell pitch, higher "on resistance" and higher manufacturing costs. Thus, the self-aligned (single mask) process of the '508 Patent results in enhancement mode GaN transistors with significantly improved performance and lower cost as compared to GaN transistors formed with the traditional multi-mask process.

³ The non-technical description of the '508 Patent is presented for general background purposes only. Such statements are not intended to be used, nor should be used, for purposes of patent claim interpretation.

3. Foreign Counterparts to the '508 Patent

38. The following is a list of foreign counterparts to the '508 Patent:

| Country | App. No. | Filing Date | Status | Patent No. | Issue Date |
|---------|----------------------|--------------|---------|-----------------------|----------------|
| Germany | 11 2010 001 555.4 | Apr. 7, 2010 | Issued | DE 11 2010 001 555 B4 | Oct. 7, 2021 |
| Japan | 2012-504798 | Apr. 7, 2011 | Issued | JP 5689869 B2 | March 25, 2015 |
| China | 201080015388.2 | Apr. 7, 2010 | Issued | CN 102388441B | May 7, 2014 |
| Korea | 10-2011-7024904 | Apr. 7, 2010 | Issued | 10-1666910-0000 | Oct. 17, 2016 |
| PCT | PCT/2010/030173 | Apr. 7, 2010 | Expired | | |

39. To the best of EPC's present knowledge, information and belief, there are no other foreign patents or foreign patent applications pending, filed, abandoned, withdrawn or rejected corresponding to the '508 Patent.

C. The '347 Patent

1. Identification of the Patent and Ownership

40. On August 29, 2017, the USPTO issued the '347 Patent, entitled *Gate with Self-Aligned Ledges for Enhancement Mode GaN Transistors*. The '347 Patent names Jianjun Cao, Alexander Lidow, and Alana Nakata as inventors. The '347 Patent issued from U.S. Patent Application Serial No. 14/447,069, filed on July 30, 2014, which is a continuation-in-part of U.S. Patent Application Serial No. 13/838,792, filed on March 15, 2013, now U.S. Patent 8,890,168, which is a division of U.S. Patent Application Serial No. 12/756,960, filed on April 8, 2010. The '347 Patent further claims priority to U.S. Provisional Patent Application Serial No. 61/167,777,

filed on April 8, 2009, and U.S. Provisional Patent Application Serial No. 61/860,976, filed on August 1, 2013. The '347 Patent expires on June 11, 2031. A true, correct, and certified copy of the '347 Patent is attached hereto as Exhibit 3.

41. EPC is the assignee and owner of all right, title, and interest in and to the '347 Patent, which is valid, enforceable, and is currently in full force and effect. The named inventors of the '347 Patent, identified above, assigned to EPC all right, title, and interest in and to the '347 Patent. EPC has not granted a license to any rights under the '347 Patent. A true, correct, and certified copy of the assignment of the '347 Patent is attached hereto as Exhibit 7.

42. The '347 Patent has one independent claim and two dependent claims. EPC asserts that claims 1-3 are directly infringed by the Accused Products, either literally or under the doctrine of equivalents.

43. Pursuant to Commission Rule 210.12, the original of the Complaint is accompanied by: (1) a true, correct, and certified copy of the '347 Patent (Exhibit 3); (2) a true, correct, and certified copy of the prosecution history of the '347 Patent (Appendix E); (3) a copy of each reference cited therein (Appendix F); and (4) a true, correct, and certified copy of the recorded assignment from the inventors of the '347 Patent to EPC (Exhibit 7).

2. Nontechnical Description of the Patented Invention⁴

44. The '347 Patent relates to methods of manufacturing GaN field effect transistors (FET) with reduced gate leakage current. In GaN FET transistors, a gate metal is disposed on a gate semiconductor structure. Undesirable gate current leakage can flow along a first path that begins from the gate metal and travels through the gate semiconductor structure below the gate

⁴ The non-technical description of the '347 Patent is presented for general background purposes only. Such statements are not intended to be used, nor should be used, for purposes of patent claim interpretation.

contact. Alternatively, or in addition, gate leakage current can flow along a second path from the gate metal along the periphery, i.e., the edge or sidewall, of the gate structure. To reduce this undesirable gate current leakage along the second path, the inventors of the '347 Patent developed a novel and non-obvious self-aligned manufacturing process that results in a gate structure with a pair of ledges on the upper surface of the gate structure.

3. Foreign Counterparts to the '347 Patent

45. The following is a list of foreign counterparts to the '347 Patent:

| Country | App. No. | Filing Date | Status | Patent No. | Issue Date |
|----------------|-------------------|--------------------|---------------|-------------------|-------------------|
| Korea | 10-201607005532 | Feb. 29, 2016 | Issued | 10-2193087 | Dec. 14, 2020 |
| China | 201480043092.X | July 30, 2014 | Abandoned | | |
| Japan | 2016-531852 | | Abandoned | | |
| Germany | 11 2014 003 495.9 | | Pending | | |
| Taiwan | 103125846 | July 29, 2014 | Abandoned | | |
| PCT | PCT/US2014/048826 | July 30, 2014 | Expired | | |

46. To the best of EPC's present knowledge, information and belief, there are no other foreign patents or foreign patent applications pending, filed, abandoned, withdrawn or rejected corresponding to the '347 Patent.

D. The '335 Patent

1. Identification of the Patent and Ownership

47. On June 4, 2019, the USPTO issued the '335 Patent, entitled *Gate with Self-Aligned Ledge for Enhancement Mode GaN Transistors*. The '335 Patent names Jianjun Cao, Alexander Lidow, and Alana Nakata as inventors. The '335 Patent issued from U.S. Patent Application Serial No. 15/655,438, filed on July 20, 2017, which is a division of U.S. Patent Application Serial No. 14/477,069, filed on July 30, 2014, now the '347 Patent, which is a continuation-in-part of U.S. Patent Application Serial No. 13/838,792, filed on March 15, 2013, now U.S. Patent 8,890,168, which is a division of U.S. Patent Application Serial No. 12/756,960, filed on April 8, 2010. The '335 Patent further claims priority to U.S. Provisional Patent Application Serial No. 61/167,777, filed on April 8, 2009, and U.S. Provisional Patent Application Serial No. 61/860,976, filed on August 1, 2013. The '335 Patent expires on April 8, 2030. A true, correct, and certified copy of the '335 Patent is attached hereto as Exhibit 4.

48. EPC is the assignee and owner of all right, title, and interest in and to the '335 Patent, which is valid, enforceable, and is currently in full force and effect. The named inventors of the '335 Patent, identified above, assigned to EPC all right, title, and interest in and to the '335 Patent. EPC has not granted a license to any rights under the '335 Patent. A certified copy of the assignment of the '347 Patent conveys the entire right, title, and interest to direct and indirect divisions, including to the '335 Patent, and is attached as Exhibit 7.

49. The '335 Patent has two independent claims and five dependent claims. EPC asserts that claims 1-7 are directly infringed by the Asserted Products, either literally or under the doctrine of equivalents.

50. Pursuant to Commission Rule 120.12, the original of the Complaint is accompanied by: (1) a true, correct, and certified copy of the '335 Patent (Exhibit 4); (2) a true,

correct, and certified copy and three additional copies of the prosecution history of the '335 Patent (Appendix G); (3) a copy of each reference cited therein (Appendix H); and (4) a certified copy of the assignment of the '347 Patent conveys the entire right, title, and interest to direct and indirect divisions, including to the '335 Patent (Exhibit 7).

2. Nontechnical Description of the Patented Invention⁵

51. The '335 Patent relates to a GaN FET with reduced gate leakage current. In GaN FET transistors, gate metal is disposed on a gate semiconductor structure. Undesirable gate current leakage can flow along a first path that begins from the gate metal and travels through the gate semiconductor structure below the gate contact. Alternatively, or in addition, gate leakage current can flow along a second path from the gate metal along the periphery, e.g., the edge or sidewall, of the gate structure. To reduce this undesirable gate current leakage along the second path, the inventors of the '335 Patent developed a novel and non-obvious GaN FET having a gate structure with a pair of self-aligned ledges of substantially equal widths on the upper surface of the gate material.

3. Foreign Counterparts to the '335 Patent

52. The following is a list of foreign counterparts to the '335 Patent:

| Country | App. No. | Filing Date | Status | Patent No. | Issue Date |
|---------|-----------------|---------------|-----------|------------|---------------|
| Korea | 10-201607005532 | Feb. 29, 2016 | Issued | 10-2193087 | Dec. 14, 2020 |
| China | 201480043092.X | July 30, 2014 | Abandoned | | |

⁵ The non-technical description of the '335 Patent is presented for general background purposes only. Such statements are not intended to be used, nor should be used, for purposes of patent claim interpretation.

| | | | | | |
|---------|-------------------|---------------|-----------|-----|-------------------|
| Japan | 2016-531852 | July 30, 2014 | Abandoned | | |
| Germany | 11 2014 003 495.9 | July 30, 2014 | Pending | | |
| Taiwan | 103125846 | July 29, 2014 | Abandoned | | |
| PCT | PCT/US 2014048826 | July 30, 2014 | Expired | PCT | PCT/US 2014048826 |

53. To the best of EPC’s present knowledge, information and belief, there are no other foreign patents or foreign patent applications pending, filed, abandoned, withdrawn or rejected corresponding to the ’335 Patent.

IV. UNFAIR ACTS OF THE RESPONDENTS

A. Representative Involved Articles & Specific Instance of Sale and Importation

54. Upon information and belief, Innoscience is engaged in importation into the United States, sale for importation into the United States, and/or sale within the United States after importation, of Accused Products that directly infringe one or more claims of each of the Asserted Patents literally or by the doctrine of equivalents.

55. Pursuant to Commission Rule § 210.12(a)(9)(viii), Complainant provides infringement claim charts for each Asserted Patent of one or more “representative involved article[s]” of Innoscience that violates Section 337 (“Representative Articles”).

56. The Innoscience Representative Articles are exemplary of a number of other Accused Products imported into the United States, sold for importation into the United States, and/or sold within the United States after importation by the Respondents, because those other devices incorporate the same or substantially similar infringing design, features and/or functionality and/or are manufactured by similar infringing processes. For example, Innoscience describes its “8-inch GaN-on-Si Device Technology,” which upon information and belief,

underlies all of its GaN-on-Si products, as incorporating structure and/or being manufactured by processes that infringe one or more of the claims of each of the Asserted Patents. Exhibit 24 at 2.

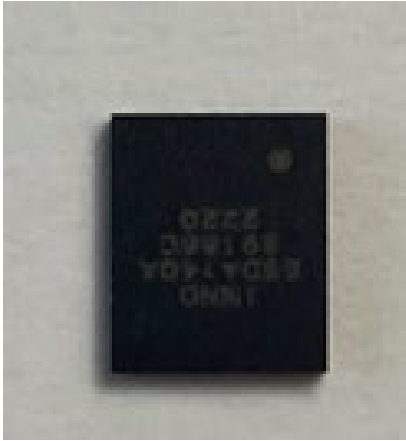
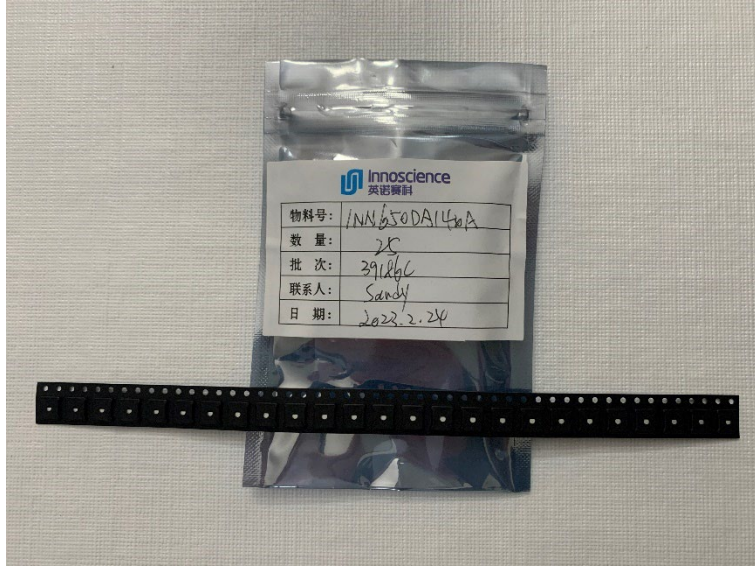
57. Complainant's expert witness, Dr. E. Fred Schubert, obtained imported Innoscience devices with the following part numbers on March 13, 2023 (devices arrived on March 6, 2023, but were not obtained until March 13, 2023) directly from Respondents through an order placed with its subsidiary's (Innoscience America, Inc.) local representative on February 21, 2023: INN650DA140A, INN650D080BS, INN650D240A, INN650DA600A, INN040W048A, INN040LA015A, INN100W032A, and INN150LA070A (collectively, "Innoscience Purchased Articles"). Exhibit 25 at ¶¶ 5-10; Exhibit 26; Exhibit 27. Paragraphs 61-68 below and related exhibits detail Innoscience's infringement with respect to INN650DA140A and INN100W032A, which upon information and belief, are representative of the Accused Products. After first contacting Innoscience America, Inc.'s North America regional representative Yi Sun (*see* Exhibit 48), Dr. Schubert received an email reply from Mr. Simon Lu (SimonLu@Innoscience.com) indicating that the products Dr. Schubert was attempting to order were located in Innoscience's warehouse in China. *See* Exhibit 25 at ¶ 6. After several email exchanges between Dr. Schubert and Mr. Lu, Dr. Schubert sent an executed order form and confirmation of wire payment to Mr. Lu. *See id.* at ¶ 8. On or about March 6, 2023, the package from Innoscience (Zhuhai) Technology Co., Ltd. shipped from Shenzhen City, China, People's Republic (the "Package") and arrived at Dr. Schubert's receiving address in Troy NY, USA. *Id.* at ¶ 9. Dr. Schubert personally retrieved the packages received from Innoscience and took pictures indicating their shipment from Innoscience (Zhuhai) Technology Co., LTD. *Id.*



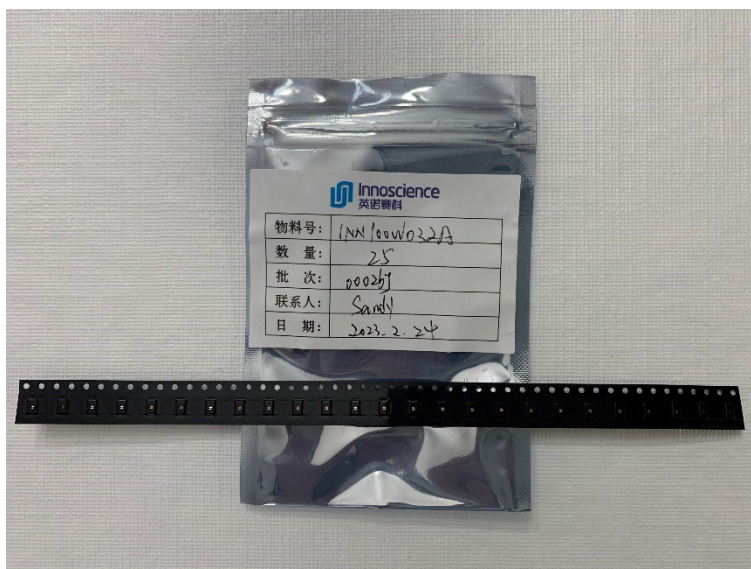
58. Dr. Schubert also took a picture of the packing list, identifying the “Country of Origin” as “China.” *Id.*

| | |
|---|---|
| Seller Innoscience (Zhuhai) Technology Co., LTD 39 Jin Yuan Er Rd., Hi-Tech District, Zhuhai City, Guangdong Province, China 519000 CTS: FionaZhong Tel: 13302873084 | Packing list No. PL-20230224-001 Packing Date. 24-Feb-23 Contract No. 130000016 |
| Sold to: Fred Schubert Rensselaer Polytechnic Institute, 110 Eighth Street, Troy NY 12180 USA ATTN: Fred Schubert PHONE: 518-253-3762 | COUNTRY OF ORIGIN CHINA |
| Ship to: Fred Schubert Rensselaer Polytechnic Institute, 110 Eighth Street, Troy NY 12180 USA ATTN: Fred Schubert PHONE: 518-253-3762 | Terms of delivery DDU Troy |

59. Respondents therefore imported into the United States, sold for importation into the United States, and/or sold within the United States after importation, the Innoscience Purchased Articles. Images of a subset of the obtained devices are shown below (*Id.* at ¶ 10):



INN650DA140A



INN100W032A

60. Pursuant to Commission Rule § 210.12(a)(9)(x), Exhibits 28-31 contain images of INN650DA140A, one of the products obtained by Dr. E. Fred Schubert from Respondents, which upon information and belief, is representative of Innoscience's higher voltage transistors. Exhibits 32-35 contain images of INN100W032A, another of the products obtained by Dr. E. Fred Schubert from Respondents, which upon information and belief, is representative of Innoscience's lower voltage transistors. As set forth below, the infringement claim charts in Exhibits 28-35 demonstrate that these Innoscience Representative Articles infringe each of the Asserted Patents.

4. The '335 Patent

67. Upon information and belief, Respondents import, sell for importation, and/or sell after importation into the United States, Accused Products that directly infringe the '335 Patent, literally or under the doctrine of equivalents.

68. Pursuant to Commission Rule § 210.12(a)(9)(viii), a chart that applies claims 1-7 of the '335 Patent to one or more of the Innoscience Representative Articles are attached as Exhibits 31 and 35.

V. HARMONIZED TARIFF SCHEDULE INFORMATION

69. Upon information and belief, the articles subject to this Complaint are classifiable under at least the following subheadings of the Harmonized Tariff Schedule (“HTS”) of the United States: 8541.21.00 (Transistors, other than photosensitive transistors); 8541.50.00 (Other semiconductor devices); 8542.31.00 (Processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits); and 8541.29.0095 (Transistors Other Than Photosensitive, Dissipation Rate 1 W And Greater, Operating Frequency Less Than 30 Mhz).

70. These HTS identifications are for illustrative purposes only, in compliance with the Commission Rules, and are not intended to restrict the scope of the Investigation.

VI. DOMESTIC INDUSTRY RELATING TO THE DOMESTIC INDUSTRY PRODUCTS AND ASSERTED PATENTS

71. A domestic industry for the purposes of 19 U.S.C. § 1337(a)(2), as defined in 19 U.S.C. § 1337(a)(3)(A) and (B), exists with respect to the significant and continuous investment in plant and equipment, significant and continuous employment of labor and capital, including substantial and ongoing investment in engineering, research, and development of semiconductor

devices developed, researched, designed, and engineered in the United States. *See Confidential Exhibit 37C at ¶ 7.* A domestic industry exists in the United States as the result of EPC's domestic activities related to the technology of the Asserted Patents and products that practice the Asserted Patents.

72. The Domestic Industry Products constitute a broad range of EPC semiconductor devices that practice one or more claims of each of the Asserted Patents. Thus, although the Complaint references and discusses two representative Domestic Industry Products, it should be understood that the descriptions apply equally to all the Domestic Industry Products, as they are all designed and produced according to each of the Asserted Patents. A list of all models of the Domestic Industry Products is provided in Confidential Exhibit 62C. All of the Domestic Industry Products practice each of the Asserted Patents.

A. Economic Prong

73. EPC's investments in its domestic products currently sold and/or under development constitute an existing domestic industry.

74. EPC designs, develops, supports, and sells Domestic Industry Products that practice the technology claimed by each of the Asserted Patents in the United States, including in some cases products made by a process covered by the Asserted Patents. The Domestic Industry Products have been designed, developed, and/or supported in the United States due to substantial investment by EPC in the United States. These investments include significant and continuous investments in plant and equipment and employment of labor and capital, which includes substantial and ongoing investments in engineering, research, design, and development of EPC products that practice each of the Asserted Patents. *See generally Confidential Exhibit 37C.* Specific non-limiting examples of such investments are provided below.

75. EPC engages in a wide range of qualifying domestic industry activities in the United States directed to the articles protected by the Asserted Patents. The Domestic Industry Products each practice at least one claim of each of the Asserted Patents. The Domestic Industry Products have been and continue to be designed, developed, tested, and supported by EPC in the United States.

76. Pursuant to 19 U.S.C. § 1337(a)(3)(A), EPC has made and continues to make significant investments in plant and equipment in the United States directed to the Domestic Industry Products that practice each of the Asserted Patents, with the investments over the period from 2018 and to present detailed in Confidential Exhibit 37C. *Id.* at ¶¶ 9-10. Those investments in plant and equipment are directed to, among other functions, research and development, design, engineering, supply chain and operation management, sales, marketing, warranty, customer service, executive, intellectual property protection, and other business operations related to the Domestic Industry Products. *Id.* at ¶ 11.

77. Pursuant to 19 U.S.C. § 1337(a)(3)(B), EPC has used and continues to use significant employment of labor and capital in the United States directed to the Domestic Industry Products that practice each of the Asserted Patents, with the investments over the period from 2018 and to present detailed in Confidential Exhibit 37C. *Id.* at ¶¶ 10-12. Those investments in the employment of labor and capital are directed to among other functions, research and development, design, engineering, supply chain and operation management, sales, marketing, warranty, customer service, executive, intellectual property protection, and other business operations related to the Domestic Industry Products. *Id.*

78. More specifically, EPC has further engaged in and continues to engage in the exploitation of the Asserted Patents through its significant domestic investments in research and

development, design, engineering, supply chain and operation management, sales, marketing, warranty, customer service, executive, intellectual property protection, and other business operations directed to the Domestic Industry Products that practice the technology covered by each of the Asserted Patents.

79. A significant and substantial portion of EPC's technical activities directed to the benefit of the Domestic Industry Products takes place in the United States, and approximately 72% of its United States employees are employed in roles associated with the research and development, design, engineering, supply chain and operation management, sales, marketing, warranty, customer service, executive, intellectual property protection, and other business operations related to related to the Domestic Industry Products that practice the technology covered by the Asserted Patents. *Id.* at ¶ 13.

80. EPC's investments and activities in the United States are important to the Domestic Industry Products and represents significant added domestic value, with, for example, allocable domestic expenses in 2022 and Q1 2023 to each of the Asserted Patents, as calculated as a percentage of sales. *Id.* at ¶¶ 13-14. These expenses are significant – for example, they comprise a significant percentage of the revenue EPC received from the sale of the Domestic Industry Products. The Domestic Industry Products themselves are critical to the success of EPC as the revenue from those products comprise the vast majority of EPC's annual revenue.

B. Technical Prong

81. Pursuant to § 210.12(a)(9)(ix), claims charts that apply an exemplary claim of each of the Asserted Patents to the Domestic Industry Products are attached as Confidential Exhibits 16C-23C.

82. As exemplarily shown in Confidential Exhibits 16C-23C, claim 2 and 3 of the '294 Patent is practiced by EPC2016C and EPC2215C; claim 1 of the '347 Patent is practiced by the method to manufacture EPC2016C and EPC2215C; claim 1 of the '335 Patent is practiced by EPC2016C and EPC2215C; and claim 1 of the '508 Patent is practiced by the method to manufacture EPC2016C and EPC2215C. The two products charted are representative of all of the Domestic Industry Products in terms of how the Domestic Industry Products practice the relied upon claims of each of the Asserted Patents.

VII. RELATED LITIGATION

83. Pursuant to Commission Rule 210.12(a)(5), Complainant will assert all Asserted Patents against Respondents in a district court proceeding in the United States District Court for the Central District of California on or by May 24, 2023. There are no other past or present litigations currently between Complainant and Respondents.

VIII. REQUESTED REMEDIAL RELIEF

A. Limited Exclusion Order

84. Pursuant to Section 337(d), EPC respectfully requests that a limited exclusion order be entered against each named Respondent and its subsidiaries, affiliates, agents, successors, and assigns, in order to remedy the Respondents' violation of Section 337 and to prevent future violations by the Respondents. EPC requests that the foregoing exclusion order bar from entry into the United States all articles (independent foreign-manufactured transistors or articles incorporating foreign-manufactured transistors, integrated circuits, and development boards) that directly infringe (or made by processes that infringe) any of the Asserted Patents, either literally or under the doctrine of equivalents.

B. Cease and Desist Order

85. EPC asserts that a cease and desist order is appropriate for all named Respondents under Section 337(f), which states that the Commission may issue a cease and desist order against any person violating Section 337, prohibiting each Respondent and its subsidiaries, affiliates, agents, successors, and assigns from engaging in the (a) importation, sale for importation, and/or sale within the United States after importation of articles in violation of Section 337; (b) marketing, distributing, offering for sale, selling, or otherwise transferring (except for exportation) in the United States of such articles; (c) advertising such imported articles; (d) soliciting agents, retailers, resellers, or distributors in the United States for such articles; and (e) aiding or abetting the other entities in the importation, sale for importation, sale after importation, transfer (except for exportation), or distribution of such articles.

86. On information and belief, Respondents maintain or may maintain, by the conclusion of the evidentiary hearing, a commercially significant inventory of infringing articles at least at Respondents' facility located at 5451 Great America Pkwy, Santa Clara, CA. Exhibit 48. Furthermore, because Respondents' infringing semiconductor devices and products containing the same are easily concealed, and it is difficult to identify the source of the infringing goods, a cease and desist order is necessary to ensure compliance with the requested exclusion order. At least for those reasons, a cease and desist order is an appropriate remedy to prevent widespread violations of EPC's patent rights.

IX. RELIEF REQUESTED

87. WHEREFORE, by reason of the foregoing, pursuant to Commission Rule 210.12(a)(11), Complainant respectfully requests that the United States International Trade Commission:

a. Institute an immediate investigation pursuant to Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, into violations by Respondents of Section 337 arising from the, importation into the United States, sale for importation into the United States, and sale within the United States after importation, of semiconductor devices and products containing the same, that infringe or are made by manufacturing processes that infringe one or more claims of the Asserted Patents;

b. Schedule and conduct an evidentiary hearing on permanent relief pursuant to 19 U.S.C. § 1337(d) and (f) of the Tariff Act of 1930, as amended;

c. Issue a Limited Exclusion Order specifically directed to each Respondent and its subsidiaries, affiliates, agents, successors, and assigns, pursuant to 19 U.S.C. § 1337(d), excluding from entry into the United States any of Respondents' articles, including GaN semiconductor devices and products containing the same, that infringe or are made by processes that infringe one or more of the Asserted Patents;

d. Issue a permanent cease and desist order pursuant to 19 U.S.C. § 1337(f) prohibiting each Respondent and its subsidiaries, affiliates, agents, successors, and assigns, from, either directly engaging in or for, with or otherwise on behalf Respondents from: (a) importing, selling, offering for sale (including via the Internet or electronic mail) Respondents' GaN semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more claims of the Asserted Patents; (b) advertising (including via the Internet or electronic mail), semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more claims of the Asserted Patents; (c) marketing, distributing, or otherwise transferring semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more

claims of the Asserted Patents; (d) soliciting agents or distributors in the United States for semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more claims of the Asserted Patents; (e) aiding or abetting other entities in the importation, sale for importation, sale after importation, transfer, or distribution of semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more claims of the Asserted Patents; or (f) supporting, servicing, and/or repairing imported semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more claims of the Asserted Patents;

e. Impose a bond upon any importation or sales of infringing semiconductor devices, and products containing the same, that infringe or are made by processes that infringe one or more claims of the Asserted Patents during the 60-day period for Presidential review, pursuant to 19 U.S.C. § 1337(j); and

f. Grant such other and further relief as the Commission deems appropriate under the law, based on the facts determined by the investigation and the authority of the Commission.

Dated: May 24, 2023

Respectfully submitted,

/s/ R. Paul Zeineddin

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*Counsel to Complainant
Efficient Power Conversion Corp.*

VERIFICATION OF COMPLAINT

I, Alexander Lidow, Chief Executive Office for Efficient Power Conversion Corporation, in accordance with Commission Rule 210.4 and 210.2(a), under penalty of perjury, declare that the foregoing is true and correct:

1. I am duly authorized to execute this verification.
2. I have read the foregoing Complaint and am aware of its contents.
3. To the best of my knowledge, information, and belief, formed after reasonable inquiry under the circumstances, the claims and other legal contentions in the Complaint are warranted by existing law, or by establishment of new law.
4. To the best of my knowledge, information, and belief, formed after reasonable inquiry under the circumstances, the allegations and other factual contentions in the Complaint have evidentiary support or are likely to have evidentiary support after a reasonable opportunity for further investigation or discovery.
5. This document is not being filed for any improper purpose, such as to harass or to cause unnecessary delay or needless increase in the cost of the investigation or related proceedings.

Executed on May 24, 2023

By: 
Alexander Lidow