**IN THE UNITED STATES DISTRICT COURT**
**FOR THE EASTERN DISTRICT OF TEXAS**
**MARSHALL DIVISION**

| | |
|---|---|
| **AKOUSTIS TECHNOLOGIES, INC. AND AKOUSTIS, INC.,**<br><br>**Plaintiffs,**<br><br>**vs.**<br><br>**QORVO, INC.,**<br><br>**Defendant.** | **Civil Action No. 2:23-cv-180**<br><br>**JURY TRIAL** |

**AKOUSTIS' ORIGINAL COMPLAINT**

Plaintiffs Akoustis Technologies, Inc. and Akoustis, Inc. (collectively "Akoustis") file this Complaint for Patent Infringement against Defendant Qorvo, Inc. ("Qorvo"), and allege as follows:

## NATURE OF THE ACTION

1. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq*.

2. Qorvo has infringed and continues to infringe at least one claim of U.S. Patent No. 7,250,360 ("the '360 Patent").

3. With knowledge of the '360 Patent, Qorvo infringes directly, literally and/or by the doctrine of equivalents, and/or induces infringement of the '360 Patent by developing, making, using, selling, offering for sale, and/or importing into the United States products that incorporate the patented technology.

4. Akoustis seeks damages and other relief for Qorvo's infringement.

## THE PARTIES

5. Plaintiff Akoustis Technologies, Inc. is a Delaware corporation with its principal place of business at 9805 Northcross Center Court, Suite A, Huntersville, North Carolina, 28078.

6. Plaintiff Akoustis, Inc. is a Delaware corporation with its principal place of business located at 9805 Northcross Center Court, Suite A, Huntersville, North Carolina, 28078.

7. Defendant Qorvo, Inc. is a Delaware corporation with a regular and established place of business within this District at 500 W. Renner Road, Richardson, TX 75080.

8. Qorvo was formed on January 1, 2015, as a result of the merger between TriQuint Semiconductor ("TriQuint") and RF Micro Devices ("RFMD").

9. Qorvo may be served by serving its registered agent, Corporation Service Company, 251 Little Falls Drive, Wilmington, DE 19808.

10. On information and belief, Qorvo makes, uses, sells, offers for sale, and/or imports into the United States, including in this District, products and services, including the Accused Products (defined in "Qorvo's Infringement" Section below).

11. The '360 Patent is infringed by Qorvo, including through its work to design, manufacture, import, distribute, sell, and/or offer to sell the Accused Products.

## JURISDICTION AND VENUE

12. This is an action for patent infringement arising under the Patent Laws of the United States, Title 35 of the United States Code, including 35 U.S.C. § 271.

13. The Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

14. This Court has personal jurisdiction over Qorvo. Qorvo, has continuous and systematic business contacts with the State of Texas. Qorvo, directly or through subsidiaries or intermediaries, conducts its business extensively throughout Texas, by shipping, distributing,

offering for sale, selling, and advertising its products and/or services in the State of Texas and the Eastern District of Texas. Qorvo, directly and through subsidiaries or intermediaries, has purposefully and voluntarily placed one or more of its Accused Products into the stream of commerce with the intention and expectation that they will be purchased and used by consumers in the State of Texas and the Eastern District of Texas. These products and/or services have been and continue to be purchased and used by consumers in the State of Texas and the Eastern District of Texas. In addition, on information and belief, Qorvo conducts operations related to the Accused Products in its Eastern District of Texas facility located at 500 W. Renner Road, Richardson, TX 75080.

15. Venue is proper in this District under 28 U.S.C. §§ 1391 and 1400(b). Defendant is authorized to do business in the State of Texas, has offices in the State of Texas and the Eastern District of Texas, has transacted business in the Eastern District of Texas, and has committed acts of infringement in the Eastern District of Texas.

16. Qorvo has a "Design, Sales, Support & GaAs / GaN / BAW Manufacturing" facility in Richardson, Texas.[1]

17. According to Qorvo's Richardson job listings, Qorvo employs sales, engineering, and manufacturing personnel in Richardson.[2]

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[1] *Locations*, QORVO (n.d.), https://www.qorvo.com/about-us/locations.

[2] *Careers*, QORVO (n.d.), https://careers.qorvo.com/search/?q=&sortColumn=referencedate&sortDirection=desc&optionsFacetsDD_location=TX+-+Richardson%2C+US.

| Job Title | Location |
|---|---|
| Project Manager Intern | TX - Richardson, US |
| Marketing Engineering Intern | TX - Richardson, US |
| Product Engineering Intern | TX - Richardson, US |
| Engineering Technician | TX - Richardson, US |
| Manufacturing Equipment Maintenance Technician | TX - Richardson, US |
| Buyer - Spares/Repairs | TX - Richardson, US |
| Power Management Application Engineer | TX - Richardson, US |
| Yield Engineer | TX - Richardson, US |
| Process Development Engineer | TX - Richardson, US |
| Sr. MMIC Design Engineer | TX - Richardson, US |
| Process Development Engineering Manager | TX - Richardson, US |
| Cybersecurity Risk Analyst | TX - Richardson, US |
| Analog Products Marketing Manager | TX - Richardson, US |
| Product Engineering Intern | TX - Richardson, US |
| Procurement & Planning Business Analyst Intern | TX - Richardson, US |
| RF Design Engineer | TX - Richardson, US |
| Equipment Maintenance Technician | TX - Richardson, US |
| Manufacturing Equipment Engineering Intern | TX - Richardson, US |
| Equipment Maintenance Technician | TX - Richardson, US |
| Manager, Project Management | TX - Richardson, US |
| Production Control Technician | TX - Richardson, US |
| EDA Specialist | TX - Richardson, US |
| Electrical CAD Engineer Intern | TX - Richardson, US |
| EHS Engineer | TX - Richardson, US |
| Sr. MMIC Design Engineer | TX - Richardson, US |

| Job Title | Location |
|---|---|
| Sr Analog Design Engineer | TX - Richardson, US |
| Sr Project Manager | TX - Richardson, US |
| Sr. Module Design Engineer | TX - Richardson, US |
| Staff Design Engineer | TX - Richardson, US |
| Device Engineering Intern | TX - Richardson, US |
| Strategic Marketing/Communications Mgr | TX - Richardson, US |
| Production Control Technician | TX - Richardson, US |
| Process Development Engineer | TX - Richardson, US |
| Software Engineering Intern (Multiple Locations) | TX - Richardson, US |
| Data Science Engineering Intern | TX - Richardson, US |
| Mechanical Engineering Intern (Multiple Locations) | TX - Richardson, US |
| Process Integration Engineer | TX - Richardson, US |
| Research Scientist / Epitaxial Engineer | TX - Richardson, US |
| Staff Research Scientist / Epitaxial Engineer | TX - Richardson, US |

18. Given Qorvo's name for the facility and Qorvo's job postings for the facility, Qorvo's Richardson "Design, Sales, Support & GaAs / GaN / BAW Manufacturing" facility employs personnel—including sales, engineering, and manufacturing personnel—that perform work related to the Accused Products.

19. Additionally, Qorvo has consented to venue in the Eastern District of Texas at least twice, and, on information and belief, Qorvo has never contested venue in the District. *See Bandspeend, LLC, v. Qorvo, Inc.*, Case No. 5-21-cv-00086, Dkt. 26 (First Amended Answer), ¶ 20 (E.D. Tex. Dec. 28, 2021) ("For purposes of this action only, Qorvo does not contest that the Eastern District of Texas has personal jurisdiction over Qorvo."); *Mimo Research, LLC., v. Qorvo, Inc.*, Case No. 5:22-cv-00075, Dkt. 17 (Answer), ¶ 7 (E.D. Tex. Aug. 29, 2021) ("For purposes of this action only, Qorvo does not contest that venue is proper in this District . . .").

**THE '360 PATENT**

20. On July 31, 2007, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 7,250,360 ("the '360 Patent"), entitled "Single step, high temperature nucleation process for a lattice mismatched substrate," to inventors James Shealy and Joseph Smart. The '360 Patent issued from an application filed on March 2, 2005. A true and correct copy of the '360 Patent is attached hereto as Exhibit 1 and incorporated herein by reference.

21. Cornell Research Foundation, Inc. ("CRF") owns the '360 Patent, but Akoustis is the exclusive licensee to the '360 Patent and owns all rights to the '360 Patent necessary to bring this action.[3]

22. CRF and/or Cornell University are not necessary parties to this action.

23. On information and belief, RFMD (including through one or more subsidiaries) had an exclusive license to the '360 Patent when the '360 Patent issued in 2007, but RFMD terminated that license in 2008. Therefore, RFMD has known of the '360 Patent since at least 2007.

24. The '360 Patent concerns "a single step process for the nucleation and subsequent epitaxial growth on a lattice mismatched substrate." '360 Patent at 1:17-19. As the patent explains, the previous "practice for nucleation of these substrates with GaN-based material utilizes a two-temperature process involving either one or two flow paths. In addition, different growth pressures are used on certain steps in the nucleation process. In this fashion, high structural and electrical quality epitaxial films can be realized in severely mismatched material systems." *Id*. at 1:29-35. The '360 Patent notes, however, that prior processes presented issues

[3] *Akoustis™ Expands IP - Signs Exclusive License Agreement with Cornell University*, AKOUSTIS (September 7, 2016), https://ir.akoustis.com/news-events/press-releases/detail/33/akoustis-expands-ip---signs-exclusive-license-agreement.

through at least their use of "large temperature ramps and complex flow requirements." *Id*. at 2:3-7.

25. The '360 Patent addresses these shortcomings of the prior art. The '360 Patent discloses novel techniques wherein a "single step process is a single flow, single pressure, high temperature process. The single step process involves a surface treatment prior to epitaxial growth that allows complete coalescence of the epitaxial film within the first 200 Å of growth." *Id*. at 2:3-7. The benefits of this are that "[t]he single step process eliminates the large temperature ramps and complex flow requirements of the commonly used two-step nucleation technologies." *Id*. at 2:7-10.

26. Pursuant to 35 U.S.C. § 282, the '360 Patent is presumed valid.

27. The benefits discussed in the '360 Patent specification are also reflected in the '360 Patent's claims. *See, e.g.*, *id.* at Claim 1. Claim 1 of the '360 Patent reads as follows:

> 1. A process for growing an epitaxial layer on a lattice mismatched substrate comprising the steps of:
>
> a) providing a substrate;
>
> b) pre-treating a surface of the substrate with at least one group III reactant or at least one group II reactant at an elevated growth temperature prior to introducing a group V reactant or a group VI reactant;
>
> c) introducing a group V reactant or a group VI reactant to grow a nucleation layer on the surface of the substrate; and
>
> d) growing a buffer layer on said nucleation layer, said buffer layer providing a surface upon which said epitaxial layer is grown.

28. A person of ordinary skill in the art reading the '360 Patent and its claims would understand that the patent's disclosure and claims are drawn to solving specific, technical problems arising in the area of epitaxial growth on mismatched substrates, and that the invention provides for advancements in the field that were not routine, well-understood or conventional.

Accordingly, each claim of the ’360 Patent recites a combination of elements sufficient to ensure that the claim in practice amounts to significantly more than a patent claiming an abstract concept. A person of ordinary skill in the art would understand that the ordered combination of claim elements is inventive. Further, the claimed improvements over prior art epitaxial growth on mismatched substrates processes are concrete and improve the capabilities of existing methods.

29. A person of ordinary skill in the art reviewing the specification of the ’360 Patent would understand that the inventors had possession of the claimed subject matter and would know how to practice the claimed invention without undue experimentation.

**QORVO’S INFRINGEMENT**

30. The allegations provided below are exemplary and without prejudice to Akoustis’ infringement contentions provided pursuant to the Court’s scheduling order and local rules. Akoustis’ claim construction contentions regarding the meaning and scope of the claim terms will be provided under the Court’s scheduling order and local rules. As detailed below, each element of at least one claim of the ’360 Patent is literally present in the Accused Products. To the extent that any element is not literally present, each such element is present under the doctrine of equivalents. Akoustis’ analysis below should not be taken as an admission that the preamble for any claim is limiting. While Akoustis cites publicly available information and information obtained through reverse engineering, Akoustis may rely on other forms of evidence to show infringement.

31. Generally, the Accused Products for the ’360 Patent include semiconductors with epitaxial layers of AlN, AlGaN, or GaN on lattice mismatched substrates and made by a process that includes pre-treating a surface of the substrate with at least one group III reactant or at least

one group II reactant at an elevated growth temperature prior to introducing a group V reactant or a group VI reactant (the "Accused Products"). One exemplary, non-limiting Accused Product is Qorvo's QPD1000.[4]

qorvo

**QPD1000**

**15W, 28V, 0.03 – 1.215 GHz, GaN RF Input-Matched Transistor**

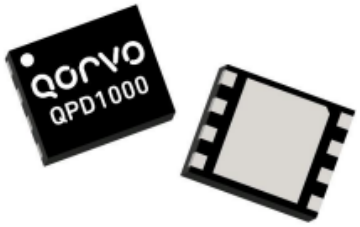
## Product Overview

The Qorvo QPD1000 is a 15W ($P_{3dB}$), 50Ω-input matched discrete GaN on SiC HEMT which operates from 30MHz to 1.215 GHz. The integrated input matching network enables wideband gain and power performance, while the output can be matched on board to optimize power and efficiency for any region within the band.

The device is housed in a 5 x 6 mm leadless SMT package that saves real estate of already space-constrained handheld radios.

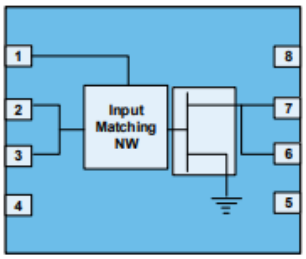
Lead-free and ROHS compliant

Evaluation boards are available upon request.




5 x 6 x 1.09 mm QFN

## Functional Block Diagram




## Key Features

- Frequency: 30 MHz to 1.215 GHz
- Output Power ($P_{3dB}$)[1]: 24 W
- Linear Gain[1]: 19 dB
- Typical $PAE_{3dB}$[1]: 78 %
- Operating Voltage: 28 V
- Low thermal resistance package
- CW and Pulse capable
- 5 x 6 mm package

Note 1: @ 1 GHz

## Applications

- Military radar
- Civilian radar
- Land mobile and military radio communications
- Test instrumentation
- Wideband or narrowband amplifiers
- Jammers

32. Identification of the Accused Products will be provided in Akoustis' infringement contentions pursuant to the Court's scheduling order and local rules.

[4] *QPD1000 Datasheet Rev. F*, QORVO (June 2021), https://www.qorvo.com/products/d/da003625.

**COUNT I: INFRINGEMENT OF THE ’360 PATENT**

33. Akoustis incorporates by reference the preceding paragraphs as if fully stated herein.

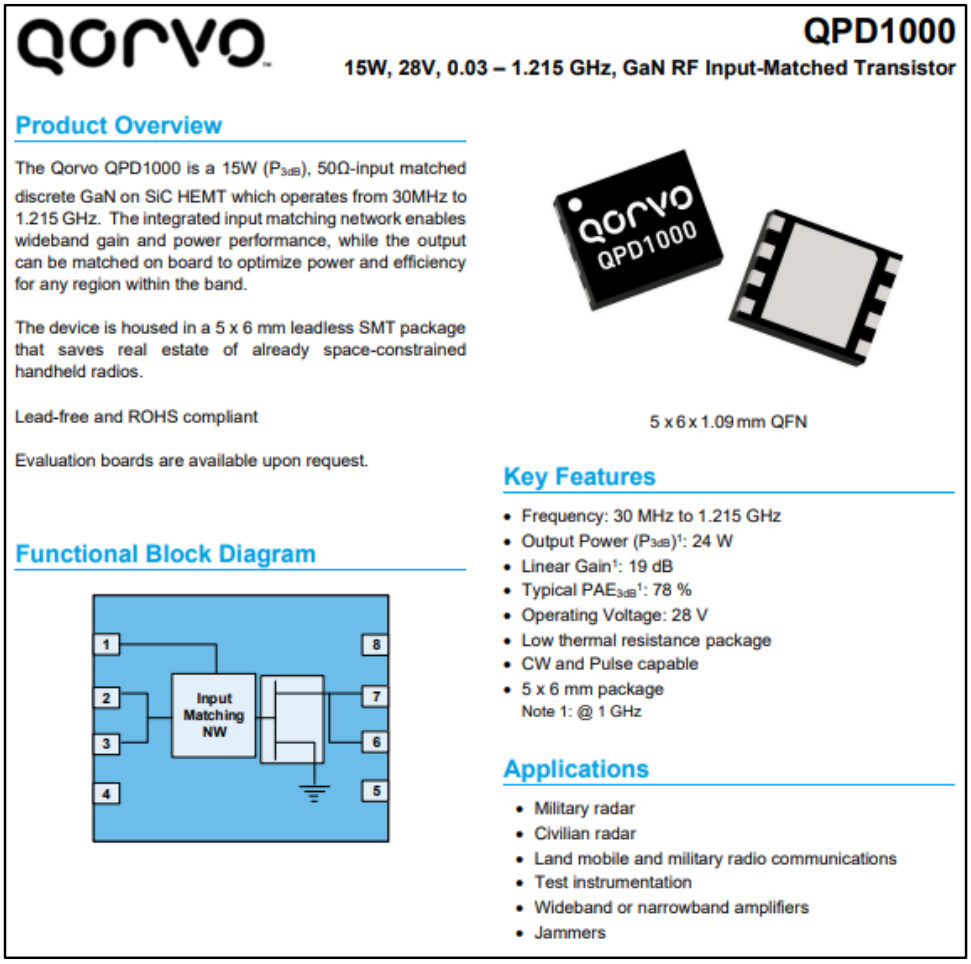
34. Qorvo has been and is now directly infringing and/or indirectly infringing the ’360 Patent by way of inducement, literally and/or under the doctrine of equivalents, in violation of 35 U.S.C. § 271, including by making, using, selling, and/or offering for sale in the United States or importing into the United States infringing products, including at least the Accused Products. Qorvo derives revenue from the activities relating to the Accused Products. As explained below, these products are covered by one or more claims of the ’360 Patent, including but not limited to claims 1-4, 6-7, and 9-14. Claim 1 reads as follows:

> 1. A process for growing an epitaxial layer on a lattice mismatched substrate comprising the steps of:
>
> a) providing a substrate;
>
> b) pre-treating a surface of the substrate with at least one group III reactant or at least one group II reactant at an elevated growth temperature prior to introducing a group V reactant or a group VI reactant;
>
> c) introducing a group V reactant or a group VI reactant to grow a nucleation layer on the surface of the substrate; and
>
> d) growing a buffer layer on said nucleation layer, said buffer layer providing a surface upon which said epitaxial layer is grown.

35. As a non-limiting example, the Qorvo Accused Products are made using a process for growing an epitaxial layer on a lattice mismatched substrate comprising the claimed limitations. This is supported by the exemplary evidence below.

36. For example, Qorvo’s QPD1000 Accused Product is made using a process that grows a gallium nitride (GaN) epitaxial material on a silicon carbide (SiC) substrate. As Qorvo explains in the QPD1000 Datasheet, “The Qorvo QPD1000 is a 15W (P3dB), 50Ω-input

matched discrete GaN on SiC HEMT which operates from 30MHz to 1.215 GHz."[5] GaN and SiC have different lattice constants.[6]



qorvo

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- 5 x 6 mm package

Note 1: @ 1 GHz

## Applications

- Military radar
- Civilian radar
- Land mobile and military radio communications
- Test instrumentation
- Wideband or narrowband amplifiers
- Jammers

37. The Qorvo Accused Products comprise providing a substrate.

38. For example, as Qorvo explains in the QPD1000 Datasheet, "The Qorvo QPD1000 is a 15W (P3dB), 50Ω-input matched discrete GaN on SiC HEMT which operates

[5] *QPD1000 Datasheet Rev. F*, QORVO (June 2021), https://www.qorvo.com/products/d/da003625.

[6] *See, e.g.*, *Lattice Constants and Crystal Structures of some Semiconductors and Other Materials*, SECTOR 7 (n.d.), https://7id.xray.aps.anl.gov/calculators/crystal_lattice_parameters.html.

from 30MHz to 1.215 GHz."[7] On information and belief, Qorvo uses "HEMT" to refer to high-electron-mobility transistor.

qorvo

**QPD1000**

**15W, 28V, 0.03 – 1.215 GHz, GaN RF Input-Matched Transistor**

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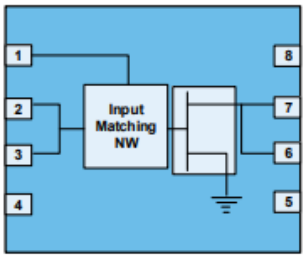


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## Applications

- Military radar
- Civilian radar
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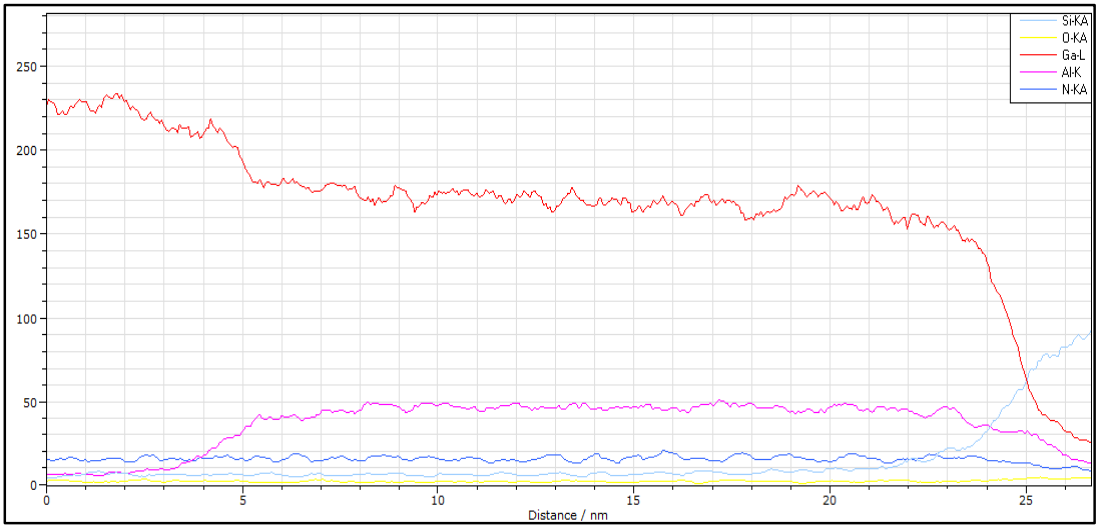
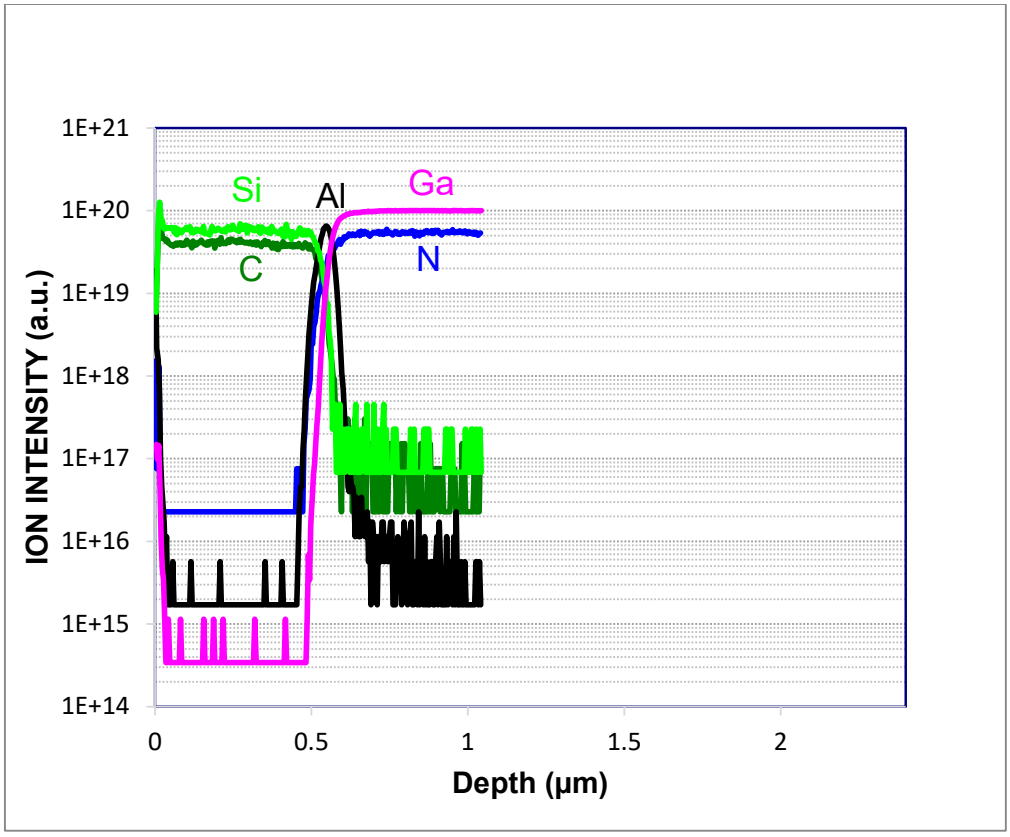
- Test instrumentation
- Wideband or narrowband amplifiers
- Jammers

39. The QPD1000 Accused Product's SiC substrate is further indicated by the light blue line ("Si") in the below EDS line scan.

[7] *QPD1000 Datasheet Rev. F*, QORVO (June 2021), https://www.qorvo.com/products/d/da003625.

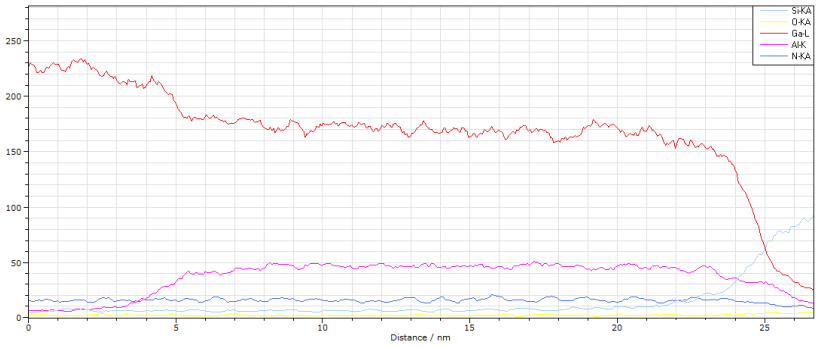



40. The QPD1000 Accused Product's SiC substrate is also indicated by the below SIMS element trace analysis (done from the device's backside), which shows the SiC substrate on the left-hand side (light-green and dark-green traces).



41. The Qorvo Accused Products comprise pre-treating a surface of the substrate with at least one group III reactant or at least one group II reactant at an elevated growth temperature prior to introducing a group V reactant or a group VI reactant.

42. For example, as to Qorvo's QPD1000 Accused Product, the below line scan demonstrates that an aluminum gallium nitride (AlGaN) material is overlying a SiC substrate. Specifically, the purple (Al), red (Ga), and blue (N) curves rise from lower values (right-to-left) while the light blue curve (Si) drops (right-to-left). The Ga concentration is larger than the Al concentration resulting in a Ga-rich AlGaN material overlying the SiC substrate.

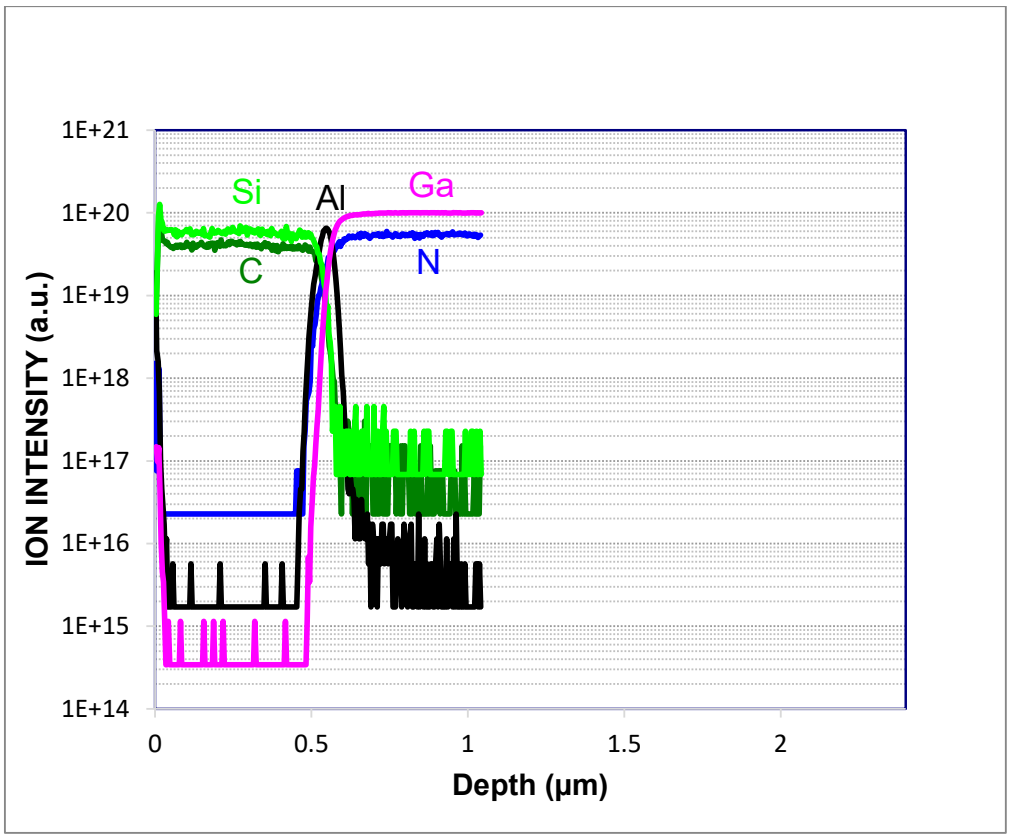



43. On information and belief, the AlGaN material of Qorvo's QPD1000 Accused Product is grown by using Group III reactants (an Al-bearing reactant and a Ga-bearing reactant) and a Group V reactant (a N-bearing reactant) at an elevated temperature.

44. On information and belief, the AlGaN material of Qorvo's QPD1000 Accused Product is grown on a nucleation layer formed at the interface with the SiC substrate. This is evidenced by the change in the concentrations of Ga and Al near the AlGaN/SiC interface.

45. The below SIMS element trace analysis of Qorvo's QPD1000 Accused Product (done from the device's backside) demonstrates that the Al-concentration increases before the N and Ga traces increase. The sequence of element traces as a function of the distance from the substrate interface reflects the growth process: The Al-bearing reactant is introduced first, prior

to the N-bearing reactant. This indicates that the substrate surface is pre-treated with one group III reactant (Al), which is incorporated into the surface prior to the introduction of the group V reactant (N) to form the nitride.



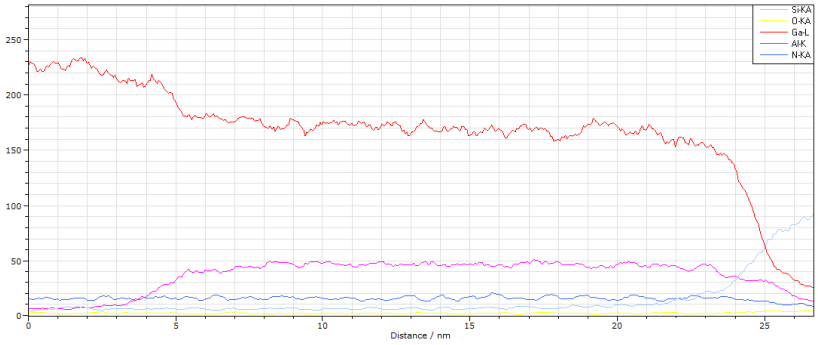

46. The below excerpt (highlighting added) of the underlying raw SIMS data used for the above SIMS element trace analysis shows that the Al signal (black in trace analysis and green in raw SIMS data) appears approximately 20nm before N (blue), while the Ga signal (magenta) appears approximately 10nm after N (blue).

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.420962065 | 3.72E+19 | 0.421610697 | 2.28E+16 | 0.422091939 | 1.71E+15 | 0.423723981 | 5.72E+19 | 0.424205224 | 3.42E+14 |
| 0.424853856 | 3.75E+19 | 0.425502488 | 2.28E+16 | 0.425983731 | 1.71E+15 | 0.427615772 | 5.13E+19 | 0.428097015 | 3.42E+14 |
| 0.428745647 | 3.88E+19 | 0.429394279 | 2.28E+16 | 0.429875522 | 1.71E+15 | 0.431507563 | 5.58E+19 | 0.431988806 | 3.42E+14 |
| 0.432637438 | 3.72E+19 | 0.43328607 | 2.28E+16 | 0.433767313 | 1.71E+15 | 0.435399354 | 4.51E+19 | 0.435880597 | 3.42E+14 |
| 0.436529229 | 3.98E+19 | 0.437177861 | 2.28E+16 | 0.437659104 | 1.71E+15 | 0.439291145 | 5.58E+19 | 0.439772388 | 3.42E+14 |
| 0.44042102 | 3.65E+19 | 0.441069652 | 2.28E+16 | 0.441550895 | 1.71E+15 | 0.443182936 | 5.15E+19 | 0.443664179 | 3.42E+14 |
| 0.444312811 | 3.86E+19 | 0.444961443 | 2.28E+16 | 0.445442686 | 1.71E+15 | 0.447074727 | 5.04E+19 | 0.44755597 | 3.42E+14 |
| 0.448204602 | 3.69E+19 | 0.448853234 | 2.28E+16 | 0.449334477 | 1.71E+15 | 0.450966518 | 4.88E+19 | 0.451447761 | 3.42E+14 |
| 0.452096393 | 3.87E+19 | 0.452745025 | 7.6E+16 | 0.453226268 | 1.71E+15 | 0.454858309 | 5.49E+19 | 0.455339552 | 3.42E+14 |
| 0.455988184 | 3.66E+19 | 0.456636816 | 2.28E+16 | 0.457118059 | 5.7E+15 | 0.4587501 | 5.65E+19 | 0.459231343 | 3.42E+14 |
| 0.459879975 | 4.01E+19 | 0.460528607 | 7.6E+16 | 0.46100985 | 2.28E+16 | 0.462641891 | 6.22E+19 | 0.463123134 | 3.42E+14 |
| 0.463771766 | 3.77E+19 | 0.464420398 | 2.28E+16 | 0.464901641 | 4.56E+16 | 0.466533682 | 5.93E+19 | 0.467014925 | 3.42E+14 |
| 0.467663557 | 3.63E+19 | 0.468312189 | 2.28E+16 | 0.468793432 | 4.56E+16 | 0.470425473 | 5.08E+19 | 0.470906716 | 3.42E+14 |
| 0.471555348 | 3.52E+19 | 0.47220398 | 2.28E+16 | 0.472685223 | 1.31E+17 | 0.474317264 | 5.11E+19 | 0.474798507 | 3.42E+14 |
| 0.475447139 | 3.71E+19 | 0.476095771 | 1.52E+17 | 0.476577014 | 2.22E+17 | 0.478209056 | 5.81E+19 | 0.478690299 | 3.42E+14 |
| 0.47933893 | 4.08E+19 | 0.479987562 | 2.28E+17 | 0.480468805 | 5.3E+17 | 0.482100847 | 5.06E+19 | 0.48258209 | 3.42E+14 |
| 0.483230721 | 3.94E+19 | 0.483879353 | 5.32E+17 | 0.484360596 | 9.74E+17 | 0.485992638 | 5.27E+19 | 0.486473881 | 1.14E+15 |
| 0.487122512 | 3.62E+19 | 0.487771144 | 6.08E+17 | 0.488252387 | 1.73E+18 | 0.489884429 | 5.74E+19 | 0.490365672 | 6.84E+15 |
| 0.491014303 | 3.44E+19 | 0.491662935 | 6.84E+17 | 0.492144178 | 3.21E+18 | 0.49377622 | 5.11E+19 | 0.494257463 | 3.42E+15 |
| 0.494906095 | 3.87E+19 | 0.495554726 | 9.12E+17 | 0.496035969 | 4.8E+18 | 0.497668011 | 5.54E+19 | 0.498149254 | 1.6E+16 |
| 0.498797886 | 3.52E+19 | 0.499446517 | 2.81E+18 | 0.49992776 | 7.13E+18 | 0.501559802 | 5.01E+19 | 0.502041045 | 3.31E+16 |
| 0.502689677 | 3.38E+19 | 0.503338308 | 2.43E+18 | 0.503819551 | 1.02E+19 | 0.505451593 | 4.81E+19 | 0.505932836 | 6.38E+16 |
| 0.506581468 | 3.39E+19 | 0.5072301 | 4.03E+18 | 0.507711342 | 1.38E+19 | 0.509343384 | 4.42E+19 | 0.509824627 | 8.78E+16 |
| 0.510473259 | 3.31E+19 | 0.511121891 | 4.41E+18 | 0.511603134 | 1.74E+19 | 0.513235175 | 4.03E+19 | 0.513716418 | 1.6E+17 |
| 0.51436505 | 2.64E+19 | 0.515013682 | 5.7E+18 | 0.515494925 | 2.17E+19 | 0.517126966 | 3.9E+19 | 0.517608209 | 2.68E+17 |
| 0.518256841 | 2.64E+19 | 0.518905473 | 8.28E+18 | 0.519386716 | 2.65E+19 | 0.521018757 | 3.26E+19 | 0.5215 | 4.08E+17 |

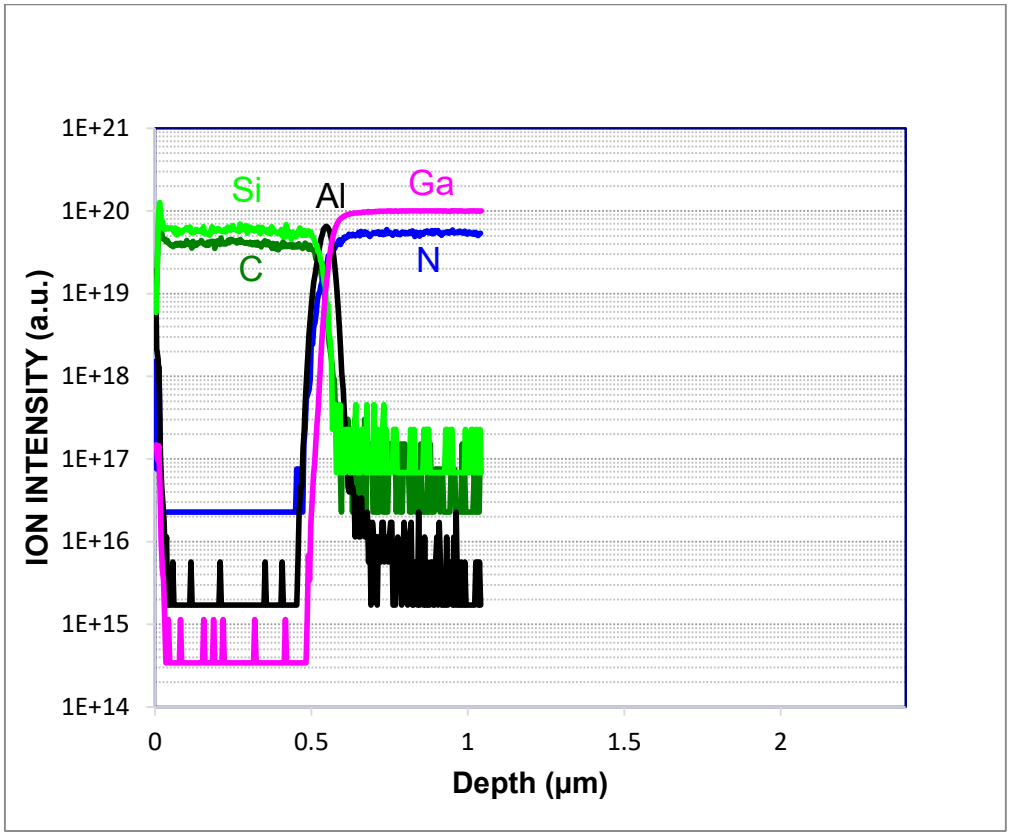
47. On information and belief, Qorvo's QPD1000 Accused Product nucleation layer is formed after pre-treating the surface of the substrate with Al group III reactants prior to introducing the N group V reactant.

48. The Qorvo Accused Products comprise introducing a group V reactant or a group VI reactant to grow a nucleation layer on the surface of the substrate.

49. For example, as to Qorvo's QPD1000 Accused Product, after pretreating the SiC surface with Group III reactants (Al), an N-bearing Group V reactant is introduced to grow a nucleation layer on the surface of the SiC substrate. The N-bearing reactant is reacting with Al-bearing reactants adsorbed on the SiC surface during the pre-treatment step and Ga- and/or Al-bearing reactants, which may be also introduced simultaneously with the N-bearing reactant to grow a nucleation layer on the SiC surface. As shown in the EDS line scan below, although the N-bearing reactant was subsequently added, the stable line in dark blue (N) shows that such N-bearing material reacted throughout the thickness of the interfacial region to form the constant concentration throughout this region.




50. The below SIMS element trace analysis of Qorvo's QPD1000 Accused Product (done from the device's backside), along with the corresponding excerpt (highlighting added) of the underlying raw SIMS data used for the SIMS element trace analysis, shows that the Al signal (black in trace analysis and green in raw SIMS data) appears approximately 20nm before N (blue), while the Ga signal (magenta) appears approximately 10nm after N (blue).



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.420962065 | 3.72E+19 | 0.421610697 | 2.28E+16 | 0.422091939 | 1.71E+15 | 0.423723981 | 5.72E+19 | 0.424205224 | 3.42E+14 |
| 0.424853856 | 3.75E+19 | 0.425502488 | 2.28E+16 | 0.425983731 | 1.71E+15 | 0.427615772 | 5.13E+19 | 0.428097015 | 3.42E+14 |
| 0.428745647 | 3.88E+19 | 0.429394279 | 2.28E+16 | 0.429875522 | 1.71E+15 | 0.431507563 | 5.58E+19 | 0.431988806 | 3.42E+14 |
| 0.432637438 | 3.72E+19 | 0.43328607 | 2.28E+16 | 0.433767313 | 1.71E+15 | 0.435399354 | 4.51E+19 | 0.435880597 | 3.42E+14 |
| 0.436529229 | 3.98E+19 | 0.437177861 | 2.28E+16 | 0.437659104 | 1.71E+15 | 0.439291145 | 5.58E+19 | 0.439772388 | 3.42E+14 |
| 0.44042102 | 3.65E+19 | 0.441069652 | 2.28E+16 | 0.441550895 | 1.71E+15 | 0.443182936 | 5.15E+19 | 0.443664179 | 3.42E+14 |
| 0.444312811 | 3.86E+19 | 0.444961443 | 2.28E+16 | 0.445442686 | 1.71E+15 | 0.447074727 | 5.04E+19 | 0.44755597 | 3.42E+14 |
| 0.448204602 | 3.69E+19 | 0.448853234 | 2.28E+16 | 0.449334477 | 1.71E+15 | 0.450966518 | 4.88E+19 | 0.451447761 | 3.42E+14 |
| 0.452096393 | 3.87E+19 | 0.452745025 | 7.6E+16 | 0.453226268 | 1.71E+15 | 0.454858309 | 5.49E+19 | 0.455339552 | 3.42E+14 |
| 0.455988184 | 3.66E+19 | 0.456636816 | 2.28E+16 | 0.457118059 | 5.7E+15 | 0.4587501 | 5.65E+19 | 0.459231343 | 3.42E+14 |
| 0.459879975 | 4.01E+19 | 0.460528607 | 7.6E+16 | 0.46100985 | 2.28E+16 | 0.462641891 | 6.22E+19 | 0.463123134 | 3.42E+14 |
| 0.463771766 | 3.77E+19 | 0.464420398 | 2.28E+16 | 0.464901641 | 4.56E+16 | 0.466533682 | 5.93E+19 | 0.467014925 | 3.42E+14 |
| 0.467663557 | 3.63E+19 | 0.468312189 | 2.28E+16 | 0.468793432 | 4.56E+16 | 0.470425473 | 5.08E+19 | 0.470906716 | 3.42E+14 |
| 0.471555348 | 3.52E+19 | 0.47220398 | 2.28E+16 | 0.472685223 | 1.31E+17 | 0.474317264 | 5.11E+19 | 0.474798507 | 3.42E+14 |
| 0.475447139 | 3.71E+19 | 0.476095771 | 1.52E+17 | 0.476577014 | 2.22E+17 | 0.478209056 | 5.81E+19 | 0.478690299 | 3.42E+14 |
| 0.47933893 | 4.08E+19 | 0.479987562 | 2.28E+17 | 0.480468805 | 5.3E+17 | 0.482100847 | 5.06E+19 | 0.48258209 | 3.42E+14 |
| 0.483230721 | 3.94E+19 | 0.483879353 | 5.32E+17 | 0.484360596 | 9.74E+17 | 0.485992638 | 5.27E+19 | 0.486473881 | 1.14E+15 |
| 0.487122512 | 3.62E+19 | 0.487771144 | 6.08E+17 | 0.488252387 | 1.73E+18 | 0.489884429 | 5.74E+19 | 0.490365672 | 6.84E+15 |
| 0.491014303 | 3.44E+19 | 0.491662935 | 6.84E+17 | 0.492144178 | 3.21E+18 | 0.49377622 | 5.11E+19 | 0.494257463 | 3.42E+15 |
| 0.494906095 | 3.87E+19 | 0.495554726 | 9.12E+17 | 0.496035969 | 4.8E+18 | 0.497668011 | 5.54E+19 | 0.498149254 | 1.6E+16 |
| 0.498797886 | 3.52E+19 | 0.499446517 | 2.81E+18 | 0.49992776 | 7.13E+18 | 0.501559802 | 5.01E+19 | 0.502041045 | 3.31E+16 |
| 0.502689677 | 3.38E+19 | 0.503338308 | 2.43E+18 | 0.503819551 | 1.02E+19 | 0.505451593 | 4.81E+19 | 0.505932836 | 6.38E+16 |
| 0.506581468 | 3.39E+19 | 0.5072301 | 4.03E+18 | 0.507711342 | 1.38E+19 | 0.509343384 | 4.42E+19 | 0.509824627 | 8.78E+16 |
| 0.510473259 | 3.31E+19 | 0.511121891 | 4.41E+18 | 0.511603134 | 1.74E+19 | 0.513235175 | 4.03E+19 | 0.513716418 | 1.6E+17 |
| 0.51436505 | 2.64E+19 | 0.515013682 | 5.7E+18 | 0.515494925 | 2.17E+19 | 0.517126966 | 3.9E+19 | 0.517608209 | 2.68E+17 |
| 0.518256841 | 2.64E+19 | 0.518905473 | 8.28E+18 | 0.519386716 | 2.65E+19 | 0.521018757 | 3.26E+19 | 0.5215 | 4.08E+17 |

51. The Qorvo Accused Products comprise growing a buffer layer on said nucleation layer, said buffer layer providing a surface upon which said epitaxial layer is grown.

52. For example, as to Qorvo's QPD1000 Accused Product (and as already evidenced above), an AlGaN material is formed overlying the AlN nucleation layer by turning on the Ga-reactant. The AlGaN material is a buffer layer providing a surface upon which to grow an overlying GaN material, which is epitaxial in form.

53. On information and belief, Qorvo also indirectly infringes claims of the '360 Patent, as provided in 35 U.S.C. § 271(b), by inducing infringement by others. For example, to the extent Qorvo's partners and suppliers are involved in the manufacturing and development of the Accused Products, those partners and suppliers directly infringe through their use of the inventions claimed in the '360 Patent. Qorvo induces this direct infringement through its affirmative acts of seeking, buying, distributing, and/or otherwise having the Accused Products made, and providing instructions, documentation, technical support, marketing, product manuals, advertisements, and other information to partners and suppliers suggesting they make the

Accused Products in an infringing manner. As a result of Qorvo's inducement, Qorvo's suppliers are involved in making the Accused Products in the way Qorvo intends and directly infringe the '360 Patent. Qorvo has known of the '360 Patent since at least its issuance through RFMD's prior exclusive licensee agreement with Cornell.

54. Qorvo's infringement is willful, deliberate, and intentional, and Qorvo is acting in reckless disregard of Akoustis' patent rights. For example, Qorvo has known of the '360 Patent since at least its issuance through RFMD's prior exclusive licensee agreement with Cornell.

55. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '360 Patent.

## DEMAND FOR JURY TRIAL

Akoustis demands a trial by jury of any and all issues triable of right before a jury, except for future patent infringement, which is an issue in equity to be determined by the Court.

## PRAYER FOR RELIEF

WHEREFORE, Akoustis pray for the following relief:

A. A judgment in favor of Akoustis that Qorvo has infringed, directly and indirectly, by way of inducement, literally and/or under the doctrine of equivalents, the '360 Patent;

B. An order awarding damages sufficient to compensate Akoustis for Qorvo's infringement of the '360 Patent, but in no event less than a reasonable royalty, including supplemental damages post-verdict, together with pre-judgment and post-judgment interest and costs;

C. A judgment that Qorvo's infringement has been willful;

D. Enhanced damages pursuant to 35 U.S.C. § 284;

E. Entry of judgment declaring that this case is exceptional and awarding Akoustis its costs and reasonable attorney fees under 35 U.S.C. § 285;

F. An accounting for acts of infringement;

G. A judgment and order requiring Qorvo to pay Akoustis compulsory ongoing licensing fees, as determined by the Court in equity; and

H. Such other equitable relief which may be requested and to which Akoustis is entitled; and

I. Such other and further relief as the Court deems just and proper.

Dated: April 20, 2023.

**MCKOOL SMITH, P.C.**

/s/ *John B. Campbell*

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