

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.;
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner

v.

OURARING, INC.
Patent Owner.

Case No. IPR2024-00928
U.S. Patent No. 9,582,034

**REPLY IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,582,034**

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. PO’S ARGUMENTS AGAINST GROUNDS 1 AND 2 FAIL	1
A. Independent Claim 11 is rendered obvious in view of Schröder (Ground 1) and/or Schröder-Yuen (Ground 2).	2
1. Element 11[B]: a flexible printed circuit board [(flexible PCB)] arranged around a portion of a circumference of an interior surface of the internal housing	2
a. Schröder (Ground 1) teaches a flexible PCB arranged around a circumference of the interior surface of the internal housing.....	2
b. Schröder-Yuen (Ground 2) teaches a flexible printed circuit board that may be packaged in various form factors.....	11
c. A POSITA would have combined Schröder and Yuen (Ground 2).....	13
2. Elements 11[D]/16[D(ii)]: the [external]/[internal] housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the [internal]/[external] housing.	16
a. Schröder teaches that at least one component and its PCB are sealed in an internal space between the external housing portion and internal housing	16
b. Yuen teaches sealing its electronic component and PCB in the internal space.....	18
B. Dependent Claims 12 and 13 are rendered obvious over Schröder (Ground 1) and Schröder-Yuen (Ground 2).....	19
1. Schröder or Schröder-Yuen teaches “the external housing portion comprises a substantially transparent external potting” of claim 12 and “at least one LED configured to emit at least one of a visible light, infrared radiation, and ultraviolet radiation through the external potting” of claim	

TABLE OF CONTENTS
(continued)

	Page
13.....	19
a. Schröder’s window is formed of “substantially transparent external potting”	19
b. Schröder-Yuen teaches a window made of “substantially transparent” potting	22
III. PO WAIVED ITS ARGUMENTS TO GROUNDS 3 AND 4	22
IV. THERE IS NO EVIDENCE OF OBJECTIVE INDICIA OF NON- OBVIOUSNESS.....	23
V. CONCLUSION.....	24

LIST OF EXHIBITS¹

Ex. No.	Description
Ex-1001	U.S. Patent No. 9,582,034 (“the ’034 Patent”)
Ex-1002	Declaration of Dr. Brian W. Anthony
Ex-1003	Curriculum Vitae of Dr. Brian W. Anthony
Ex-1004	Prosecution History of the ’034 Patent (Application No. 15/556,062)
Ex-1005	U.S. Patent Publication No. 20120016245 to Niwa (“Niwa”)
Ex-1006	U.S. Patent No. 8,954,135 to Yuen (“Yuen”)
Ex-1007	U.S. Patent No. 10,303,867 to Schröder (“Schröder”)
Ex-1008	Certified Translation of DE 102013012339.9 to Schröder
Ex-1009	Original DE 102013012339.9 to Schröder
Ex-1010	U.S. Patent Publication No. 20140244009 to Mestas (“Mestas”)
Ex-1011	U.S. Provisional Patent Application No. 61/768,279 to Mestas
Ex-1012	U.S. Patent No. 8,700,111 to LeBoeuf (“LeBoeuf”)
Ex-1013	U.S. Patent Publication No. 20120218184 to Wissmar (“Wissmar”)
Ex-1014	INTENTIONALLY LEFT BLANK
Ex-1015	INTENTIONALLY LEFT BLANK
Ex-1016	INTENTIONALLY LEFT BLANK
Ex-1017	INTENTIONALLY LEFT BLANK

¹ Four-digit pin citations that begin with 0 are to the branded numbers added by Samsung in the bottom right corner of the exhibits. All other pin citations are to original page, column, paragraph, or line numbers.

Ex. No.	Description
Ex-1018	INTENTIONALLY LEFT BLANK
Ex-1019	INTENTIONALLY LEFT BLANK
Ex-1020	Claim Mapping Table
Ex-1021	INTENTIONALLY LEFT BLANK
Ex-1022	Parallel Citations (Schröder '867 to Certified Translation of DE 102013012339.9)
Ex-1023	INTENTIONALLY LEFT BLANK
Ex-1024	U.S. Patent No. 4,830,014 to Goodman ("Goodman")
Ex-1025	U.S. Patent No. 6,745,061 to Hicks ("Hicks")
Ex-1026	U.S. Patent No. 7,190,986 to Hannula ("Hannula")
Ex-1027	Volker Konig et al., <i>Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System</i> , 14 Journal of Clinical Monitoring (Aug. 1998) ("Konig")
Ex-1028	U.S. Patent No. 6,608,562 to Kimura ("Kimura")
Ex-1029	Kevin K. Tremper et al., <i>Pulse Oximetry</i> , 70 Journal of American Society of Anesthesiologists, Inc. (Jan. 1989) ("Tremper")
Ex-1030	Y. Mendelson et al., <i>A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring</i> , Proceedings of 28th IEEE EMBS Annual International Conference (Aug. 30-Sept. 3, 2006) ("Mendelson 2006")
Ex-1031	Sokwoo Rhee et al., <i>Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part I: Design and Analysis</i> , IEEE (2000) ("Rhee 2000 Part I")
Ex-1032	Sokwoo Rhee et al., <i>Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part II: Prototyping and Benchmarking</i> , IEEE Proceedings of 22nd Annual EMBS Int'l Conference (July 23-28, 2000) ("Rhee 2000 Part II")

Ex. No.	Description
Ex-1033	Sokwoo Rhee et al., <i>Artifact-Resistant Power-Efficient Design of Finger-Ring Plethysmographic Sensors</i> , 48 IEEE Transactions of Biomedical Engineering (July 2001) (“Rhee 2001”)
Ex-1034	U.S. Patent No. 6,699,199 to Asada (“Asada ’199”)
Ex-1035	Sokwoo Rhee, <i>Design and Analysis of Artifact-Resistive Finger Photoplethysmographic Sensors for Vital Sign Monitoring</i> , MIT (June 2000) (“Rhee Thesis 2000”)
Ex-1036	C.T. Olofson et al., <i>Machining of Titanium Alloys</i> (1965) (“Olofson”)
Ex-1037	H. Harry Asada et al., <i>Mobile Monitoring with Wearable Photoplethysmographic Biosensors</i> , IEEE Engineering in Medicine & Biology Magazine 28 (May-June 2003) (“Asada 2003”)
Ex-1038	Denisse Castaneda et al., <i>A review on wearable photoplethysmography sensors and their potential future applications in health care</i> , Int J Biosens Bioelectron (2018)
Ex-1039	U.S. Patent No. 7,468,036 to Rulkov et al. (“Rulkov”)
Ex-1040	U.S. Patent Publication No. 2006/0211924 to Dalke et al. (“Dalke”)
Ex-1041	<i>Guidelines To Enhancing The Heart-Rate Monitoring Performance Of Biosensing Wearables</i> (2014)
Ex-1042	U.S. Patent No. 4,880,304 to Jaeb et al. (“Jaeb”)
Ex-1043	Tom Lister et al., <i>Optical Properties of human skin</i> , Journal of Biomedical Optics (2012)
Ex-1044	John G. Webster, <i>Design of Pulse Oximeters</i> , CRC Press (1997)
Ex-1045	U.S. Patent Publication No. 20130211291 to Tran (“Tran”)
Ex-1046	WO 2001/017421A1 to Lindberg (“Lindberg”)
Ex-1047	WO 2011/132009 to Nyiradi (“Nyiradi”)

Ex. No.	Description
Ex-1048	U.S. Patent Application Publication No. 2014/0361945 to Misra et al. ("Misra")
Ex-1049	U.S. Patent Application Publication No. 2014/0361934 to Ely et al. ("Ely")
Ex-1050	European Patent No. 2281205 (Chen)
Ex-1051	Lawrence K. Au et al., <i>Episodic Sampling: Towards Energy-Efficient Patient Monitoring with Wearable Sensors</i> , Annual International Conference of the IEEE Engineering in Medicine and Biology Society (2009)
Ex-1052	Anastasios Petropoulos et al., <i>Flexible PCB-MEMS flow sensor</i> , Procedia Engineering 47 236-239 (2012) ("Petropoulos")
Ex-1053	Tianjia Sun et al., <i>Wireless Power Transfer for Medical Microsystems</i> , Springer (2013) ("Sun")
Ex-1054	U.S. Patent Pub. No. 2014/0187160 to Prencipe ("Prencipe")
Ex-1055	H. Ardebili and Michael G. Pecht, <i>Encapsulation Technologies for Electronic Applications</i> , William Andrew (2009) ("Ardebili")
Ex-1056	Ciprian Ciofu et al., <i>Injection and Micro Injection of Polymeric Plastics Materials: A Review</i> , Int'l J. Modern Mfg. Techs. 49 (2013)
Ex-1057	Richard J. Ross, <i>LCP Injection Molded Packages—Keys to JEDEC I Performance</i> , IEEE, 2004 Electronic Components and Technology Conference 1807 (2004)
Ex-1058	Tadamoto Sakai, <i>Encapsulation Process for Electronic Devices Using Injection Molding Method</i> , 12 Advances in Polymer Technology 61 (1993)
Ex-1059	N.J. Teh et al., <i>Embedding of Electronics within Thermoplastic Polymers using Injection Moulding Technique</i> , IEEE, 2000 Int'l Electronics Manufacturing Technology Symposium 10 (2000)

Ex. No.	Description
Ex-1060	U.S. Patent No. 6,201,698 to Hunter (“Hunter”)
Ex-1061	U.S. Patent No. 4,012,629 to Simms (“Simms”)
Ex-1062	PGR2024-00039, Ex-2018 (’702 Decl.)
Ex-1063	PGR2024-00030, Ex-2018 (’178 Decl.)
Ex-1064	INTENTIONALLY LEFT BLANK
Ex-1065	INTENTIONALLY LEFT BLANK
Ex-1066	INTENTIONALLY LEFT BLANK
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Ex-1075	INTENTIONALLY LEFT BLANK
Ex-1076	INTENTIONALLY LEFT BLANK
Ex-1077	INTENTIONALLY LEFT BLANK
Ex-1078	INTENTIONALLY LEFT BLANK
Ex-1079	Dr. Anthony’s Supplemental Declaration
Ex-1080	INTENTIONALLY LEFT BLANK

Ex. No.	Description
Ex-1081	Patrick P. Mercier, Ph.D. Deposition Transcript Volume 1, dated June 24, 2025
Ex-1082	Patrick P. Mercier, Ph.D. Deposition Transcript Volume 2, dated June 25, 2025
Ex-1083	INTENTIONALLY LEFT BLANK
Ex-1084	INTENTIONALLY LEFT BLANK
Ex-1085	INTENTIONALLY LEFT BLANK
Ex-1086	INTENTIONALLY LEFT BLANK
Ex-1087	INTENTIONALLY LEFT BLANK
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Ex-1091	INTENTIONALLY LEFT BLANK
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I. INTRODUCTION

OuraRing Inc.'s ("PO's") Patent Owner Response (POR) reiterates the arguments from the Patent Owner Preliminary Response and relies only on attorney argument without any expert testimony. The POR provides limited arguments in response to claims 11-13 and 16 of Grounds 1 and 2 (based on Schröder and Schröder in view of Yuen) and provides no response at all to Grounds 3 and 4 (based on LeBouef and LeBouef in view of Wissmar, addressing claims 1, 2, 4, 5, 11, 12, and 16-18). As discussed below, PO's argument against Grounds 1 and 2 are wrong. And PO has waived any arguments against Grounds 3 and 4, and claims 1-5 of Grounds 1 and 2, by failing to address Petitioner's position on those Grounds and claims.

II. PO's ARGUMENTS AGAINST GROUNDS 1 AND 2 FAIL

PO's only disputes Schröder and the Schröder-Yuen combination as to elements 11[B]/16[B] and 11[D]/16[D(ii)] and dependent claims 12 and 13. PO provides no other arguments against any of the remaining claims that were challenged in Grounds 1 or 2. That is, there are no POR arguments as to independent claim 1 and dependent claims 2-5. Thus, claims 1-5 should be found unpatentable under Grounds 1 and 2 for the reasons set forth in the Petition.

A. Independent Claim 11 is rendered obvious in view of Schröder (Ground 1) and/or Schröder-Yuen (Ground 2).

- 1. Element 11[B]: a flexible printed circuit board [(flexible PCB)] arranged around a portion of a circumference of an interior surface of the internal housing**
 - a. Schröder (Ground 1) teaches a flexible PCB arranged around a circumference of the interior surface of the internal housing**

Relying on Schröder's Figure 3 embodiment, PO argues that Schröder does not teach a flexible PCB. POR, 20. PO also asserts that "Petitioner avoids showing or discussing" Schröder's Figure 3. POR, 20. But that is because the Petition actually relies on the distinct Schröder embodiments depicted in Figures 4-10. Ex-1007, 12:1-3 (describing Figures 4-10 as distinct "possible construction variants"); *see also* Ex-1081, 77:15-18 ("Q: And so would you agree that the figure 4 embodiment is a different embodiment from the figure 3 embodiment? A: Yeah. It would -- it would have to be."). Petitioner relies, for example, on teachings related to the Figure 4 embodiment and the Figure 7 construction variant, with its inlay 12 (i.e. the flexible PCB) arranged between U-shaped ring housing components around the circumference of the internal housing's interior surface. Pet., 23-24.

Specifically, Petitioner relies on Schröder's teachings for these embodiments that "[t]he finger-ring 2 consists of two ring halves 16 and 18. The two ring halves 16 and 18 respectively have a recess into which the inlay 12 is inserted." Ex-1007, 12:7-10; *see* Pet., 22. This point does not appear to be meaningfully disputed, with

PO's expert agreeing that "inlay 12, with chip module 10 and various other components on it, is inserted into a recess between ring halves 16 and 18 in Schröder." Ex-1081, 82:10-12. As Dr. Anthony explained, when viewing Schröder's ring halves 16 and 18 configuration in Figure 7's arrangement, as shown in modified Figure 5' below, Schröder's flexible PCB (inlay 12, purple) is in the "recess" between the external housing component (18, green) and inner housing component (16, red), which touches the user's finger tissue. Ex-1002, ¶172 (citing Ex-1007, 12:62-65); Ex-1079 ¶9.

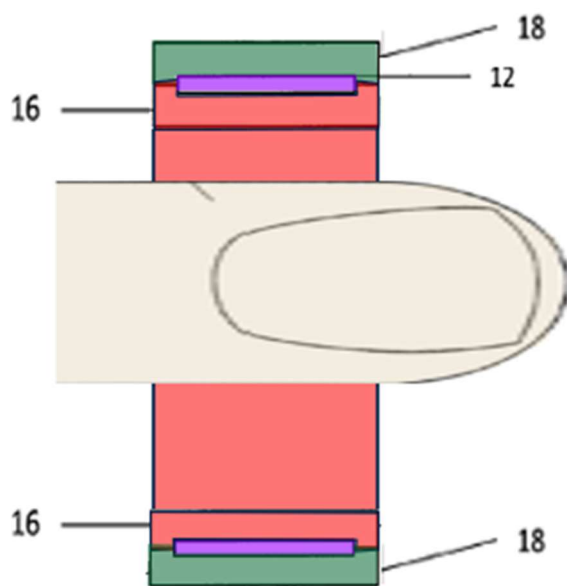
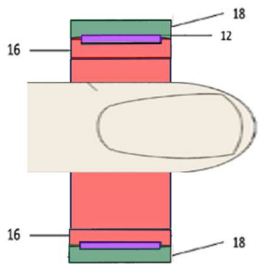
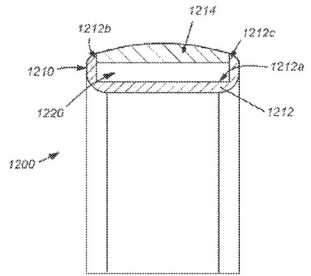


Fig. 5'

PO's disputes regarding Schröder's teachings that Petitioner relied on all lack merit.

First, PO appears to dispute that Schröder's Figure 7 depicts the cross section explained by Dr. Anthony. Specifically, PO's expert speculates that "figure 7 might be perhaps an angled cross section." Ex-1081, 84:17-18. But PO's expert admits that there is no basis for this speculation in Schröder. Ex-1081, 83:20-85:2 (expert claiming that figure 7 is "difficult to interpret" and "at best, it's very unclear."); 85:24-86:22 ("Figure 7, again, at best, is extremely unclear"); 86:23-87:23 ("he's just taking a strange cross section through the ring."). PO's view of Schröder's Figure 7 is simply not credible. PO's expert admits that, as between Figures 5 and 7, the ring halves are simply rotated by 90 degrees. Ex-1081, 85:3-8. As Dr. Anthony explained, the cross section of the resulting construction variant would look like a standard cross section (a "u-shaped" construction as described by Schröder), similar to what is depicted in the '034 patent itself, not some "strange" cross section that PO's expert cannot even adequately explain. Ex-1082, 210:19-214:20.

Schröder as understood by a POSITA	'034 Figure 12D
 Fig. 5'	 FIG. 12D

Second, PO argues that Schröder's "chip module 10" is too large to fit into the recess where inlay 12 is inserted. POR, 21-22. But this argument directly contradicts Schröder's teachings, and again is based on the Figure 3 embodiment rather than the embodiments relied on by Petitioner.

In discussing Figures 4-10, Schröder specifically states that inlay 12 contains chip module 10, antenna 8, and potentially several other "electronic devices." Ex-1007, 12:1-3, 13:22-47. After being fabricated with these devices placed on one or more layers of "carrier foil," the inlay is cut out as a flat ring blank. It is then "rolled up to obtain the form of a finger-ring 2." Ex-1007, 14:16-17. Specifically, the carrier foil containing all of these components, "can be wound around a core ring. The core ring has the form e.g. of a finger-ring 2. Further, the core ring has for example a U-shaped cross-sectional profile." *Id.* 14:21-24. After being constructed and rolled into a ring shape "[t]he carrier is preferably inserted into a recess in the second component." *Id.* 15:20-22. PO's expert cannot dispute any of this. Ex-1081, 118:19-121:6 ("Q: And so is it fair that what Schroder -- what Schroder is describing is a carrier that has multiple components on it; it's rolled into a ring shape and then inserted into a recess between the ring components? A. Yes. That is what it says. ...").

Despite this, PO's expert claims that what is shown in Figure 3 contradicts these plain teachings. There are several problems with PO's arguments regarding

chip module 10. As an initial matter, PO's expert acknowledges that none of the figures are drawn to scale. Ex-1081, 104:19-24. It is black letter law that sizes cannot be gleaned from un-scaled figures. *Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956 (Fed. Cir. 2000) (“[I]t is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue.”). So PO has no basis to speculate as to the relative size of chip module 10. Moreover, PO's arguments about Figure 3 are simply not responsive to Petitioner's position, which relies on the different embodiments (i.e. construction variants) shown in Figures 4-10.

Regardless, PO's argument that chip module 10 is too large to fit within inlay 12 is wrong. POR, 21-22. PO argues that Schröder “plainly acknowledges” that chip module 10 is too large to fit in the inlay because Schröder teaches to use pastes “[s]hould steps or shoulders nevertheless arise.” POR, 21 (citing Ex-1007, 14:10-13). PO's argument regarding the alleged size of chip module 10 relies on bodily incorporation of Schröder's “replaceable chip module,” Ex-1007, 8:55-56, shown in Figure 3, into Schröder's other “construction variants,” (Figs 4-10), where a more generic chip module is used (described in the specification's text as located “on” inlay 12 (Ex-1007, 12:4-13:50), but not illustrated in the figures.). *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether the

features of a secondary reference may be bodily incorporated into the structure of the primary reference.”); *see also Qualcomm Inc. v. Intel Corp.*, No. 2022-1824, 2024 WL 4258364, at *4 (Fed. Cir. Sept. 23, 2024) (applying *Keller*’s rule against bodily incorporation to single-reference obviousness ground). Importantly, nothing suggests that the “replaceable” chip module of Figure 3 would or should be used in the different embodiments shown in Figure 4-10.

Moreover, PO relies on Schröder’s “steps or shoulders” quote out of context. The immediately preceding sentence states that “[i]deally, a ring blank has *a uniform thickness* over its total length, in order *to avoid later steps or shoulders*.” Ex-1007, 14:9-10 (emphasis added). Schröder thus clearly sets out a preference for a “uniform thickness” of its carrier foil-based inlay to avoid steps and shoulders. *See* Ex-1007, 14:9-13. Schröder repeatedly indicates that the ideal situation is that any components attached to the inlay inside the recess of its ring halves and do not protrude beyond the device. *See* Ex-1007, 13:27-25, 14:9-20. One way that Schröder teaches this is by creating a “depression” in the carrier foil. Ex-1007, 13:27-29. In this way “electronic devices are inserted into the depression.” *Id.*, 13:30-31. “The depression has the purpose that the devices to be inserted into the depression should not protrude beyond the carrier foil if possible, so that an even surface is present on the carrier foil to facilitate a later processing of the carrier foil with inserted devices.” Ex-1007, 13:30-35. Indeed, PO’s expert agreed that Schröder suggests minimizing

the use of space in the interior recesses. Ex-1081, 112:4-9 (“**Q.** Would you agree that Schroder is at least suggesting an approach to kind of minimize the usage of space and save space in internal components? **A:** It seems like that's the intent of this writing, yeah.”).

Moreover, in a related IPR, the Board has already considered this argument based on Figure 3's replaceably mounted chip module and preliminarily agreed that Schröder teaches that inlay 12, chip module 10, and electronic components are housed within the recess between Schröder's ring housings 16 and 18 in the other Figures:

Petitioner's position that inlay 12 is a flexible printed circuit board housed by even component 16 and U-shaped component 18 is adequately supported by Schröder.... Schröder's disclosure of a biometric sensor connected to chip module 10, along with the disclosures *of chip module 10*, antenna coil 8, and “at least one further electronic device” *being arranged on inlay 12 in a recess* between even component 16 and U-shaped component 18 *further support Petitioner's positions*. Ex. 1007, 9:58–60, 12:8–9, 12:48–52, 12:62–65, Fig. 8.

IPR2024-01078, Paper 9 at 34 (PTAB Jan. 28, 2025) (emphasis added).

Third, PO asserts that there is no support that Schröder's inlay 12 is a flexible PCB. POR, 22. But again this contradicts the express teachings of Schröder. Schröder teaches that “[t]he inlay 12 itself consists of a preferably *flexible carrier material*, e.g. PET, *Kapton*, etc.” Ex-1007, 12:28-29 (emphasis added); Pet., 23; Ex-1002 ¶172. Dr. Anthony explained that Kapton is “commonly used for flexible PCBs

because of their thermal stability, mechanical flexibility, and electrical insulation properties.” Ex-1002 ¶172. He further testified that the Wikipedia page for PCB (Ex-2020, 182:5-183:1), describes Kapton as “*a polyimide foil. Used for flexible printed circuits*, in this form common in small form-factor consumer electronics or for flexible interconnects.” Ex-2023, 9 (emphasis added); *see also* Ex-1081, 80:17-81:10 (“[P]rinted flexible circuit boards often use *polyimide*.”) (emphasis added). The experts thus appear to agree on this point. Moreover, the '034 Patent describes that its own PCB is also made of “any type of flexible material clear to those of skill, such as *polyimide*.” Ex-1001, 18:20-22 (emphasis added). Schröder teaches a flexible PCB constructed using the same material (a polyimide such as Kapton) that the '034 Patent teaches for a flexible PCB used in the same manner.

Despite inlay 12 being constructed of a material widely known for use in flexible PCB's, PO argues that inlay 12 is not a PCB because it allegedly does not use certain “manufacturing steps” involving “layers” described in Dr. Anthony's provided Wikipedia's entry PCB. POR, 22-23. But Wikipedia does not define the scope of the claim, and Dr. Anthony never suggested that it did. Dr. Anthony's reference to Wikipedia merely confirmed the general understanding that a POSITA would have for the acronym for PCB. *See* Ex-2020, 73:12-16 (explaining his reference to Wikipedia “was just a convenient encapsulation of the description of PCB”); Ex-1079 ¶19.

Regardless, Schröder describes the steps used to create its inlay the same way that Wikipedia describes the creation of a PCB. Specifically, Schröder describes a specific procedure using carrier foils consisting of “a flexible plastic material, e.g. PET or Kapton. The carrier foil consists of at least one foil.” Ex-1007, 13:35-37. The foils are manufactured by “milling, lasering, etching” and the electronic components are attached to specific foil layers, such that “[a] multilayer carrier foil composite can therefore be produced.” *Id.*, 13:23-51. Moreover, PO’s expert agreed that Schröder teaches multiple layers (Ex-1081, 107:23-108:9) and a wiring pattern (*id.*, 106:17-25). Accordingly, even if the claims were understood as requiring a PCB manufactured according to the Wikipedia description, Schröder teaches such a process.

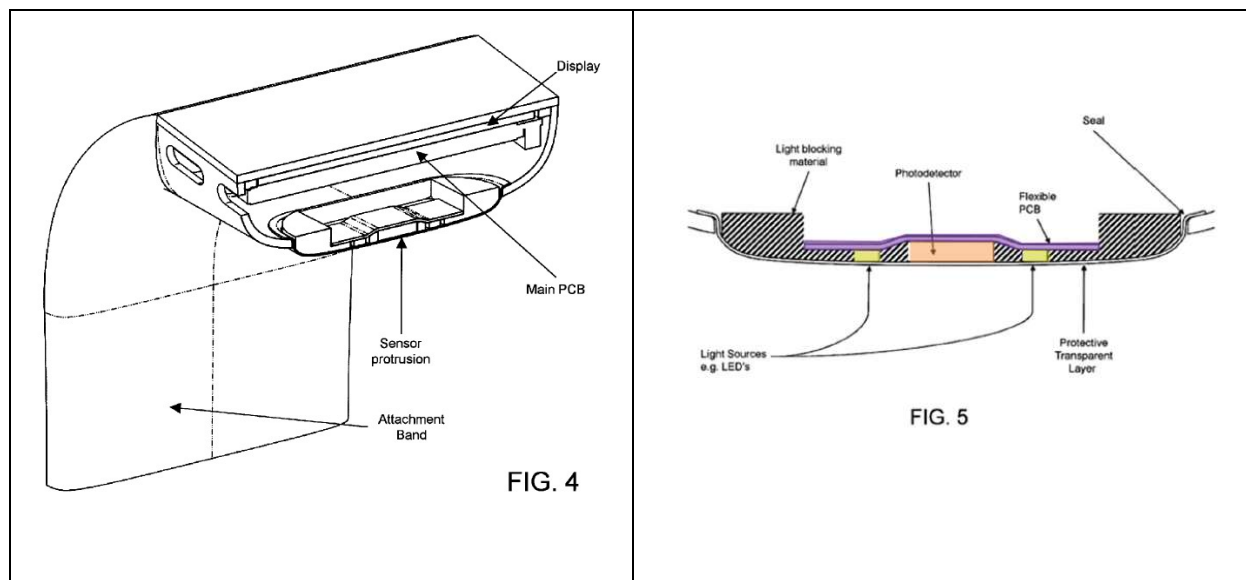
PO also argues that Schröder used the term “circuit board in other embodiments.” PO argues that this supports the notion that a POSITA would not consider Schröder’s inlay to be a PCB. POR, 23. But there is no basis for this conclusion. As explained above, Schröder’s inlay is a PCB (e.g. comprising Kapton, foils, any number of layers, and associated wiring) and a POSITA would have recognized that. The fact that there are also additional “circuit boards” in Schröder does not change that. Schröder teaches a number of “electronic components,” any of which may or may not have associated circuit boards.

b. Schröder-Yuen (Ground 2) teaches a flexible printed circuit board that may be packaged in various form factors.

Yuen teaches a flexible printed circuit board that is capable of being sized to fit around a finger. PO asserts that the “main PCB” of Yuen “is several times the diameter of a finger worn ring,” and therefore cannot be applied to a finger worn device. POR, 24. But PO’s argument misses the mark for two reasons: (1) Petitioner points to Yuen’s flexible PCB, not to its “main PCB,” as further evidence that flexible PCBs were well-known to those of skill in the art and (2) Yuen specifically teaches smaller form factors as applicable to its teachings. Ex-1079 ¶25.

First, Petitioner identified Yuen’s frequent use of a flexible PCB in multiple locations. *See* Ex-1006, 2:38-39 (“[I]n one embodiment, the light sources and photodetector are placed on a flexible PCB”); 12:35-38, Fig. 5. To the extent that there was any question that a POSITA would have known of and used flexible PCBs in a wearable device like Schröder’s ring, Yuen’s teachings resolve that question. While Yuen does teach a “main PCB” supporting a relatively large display in Figure 4, Yuen also teaches a much smaller flexible printed circuit board, as shown in Figure 5, hosting other small electronic devices.

Yuen’s Main PCB (Figure 4) with a large flat display	Yuen’s Flexible PCB with several smaller electronic components (Figure 5 – Blow up of interior portion at bottom of Figure 4)
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Consistent with Schröder's teachings, Yuen explicitly teaches "a flexible printed circuit board" that may have a variety of electronic components attached to it. Ex-1006, 2:38-39; Pet., 24, 25. Moreover, Dr. Anthony explained that Yuen's flexibility teachings allows for shaping the PCB around a user's body parts: "[T]he photodetectors on a flexible or a pliable substrate such as flexible PCB to allow the inner surface to adapt to the shape of the user's appendage." Ex-2021, 354:22-356:4

Second, Yuen teaches a variety of sizes and form factors for its wearable device. PO incorrectly asserts that "[i]t is beyond dispute however, that the PCB disclosed in Yuen *cannot* be applied to a finger worn device." POR, 24 (emphasis in original). But Yuen explicitly teaches applications in smaller form factors: the "biometric monitoring device... may also be integrated and worn in a necklace, chest band, bra, patch, glasses, *earring, or toe band*." See Ex-1006, 24:35-37 (emphasis added); Ex-1002 ¶86. An "[an] earring ... or [a] toe band" would put the device in

the same general size as that of a device to be worn on a finger, such as Schröder's ring. Ex-1002 ¶162; *see also* Ex-2021, 390:2-392:2; *see also* Ex-1081, 161:12-19 (PO's expert in a related PGR acknowledging "ring" and "band" can be synonymous). A POSITA reading Yuen "would understand the various design trade-offs in order to ... accomplish that and how to accomplish a toe band," (Ex-2021, 391:12-392:2) because the mere change in proportional size of PCB would have been an obvious change for a POSITA. *See Campbell Soup Co. v. Gamon Plus, Inc.*, 787 F. App'x 731, 739 (Fed. Cir. 2019) (determining that one of ordinary skill in the art would proportionally change the size of components relative to each other). Yuen thus explicitly teaches a flexible printed circuit board to be used wearable devices of various sizes and shapes.

c. A POSITA would have combined Schröder and Yuen (Ground 2)

PO argues that Petitioner "[i]mplicitly acknowledg[ed] Schröder's failure to disclose [the flexible printed circuit board] limitation" just because Petitioner proposed a combination of Schröder and Yuen. POR, 23. This is false. As discussed above, Schröder teaches a flexible PCB on its own, and Yuen simply provides additional evidence that one of skill in the art would have known how to implement flexible PCBs in wearable devices of different form factors. *See supra* II.A.1.a.

Regardless, PO asserts that Yuen's PCB cannot be incorporated into Schröder's ring because of the size and shape differences between Schröder and Yuen. POR, 24. But PO's entire argument is based on bodily incorporating Yuen's larger, main PCB into Schröder. Petitioner is not suggesting that, nor is that the standard for obviousness. Ex-2021, 351:3-356:11; *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference."). As discussed above, Yuen teaches smaller form factors for its device. *See supra* Section II.A.1.b. And a POSITA would have known how to size a ring's components, to allow such components to fit within the ring. Pet., 19 (citing Ex-1002 ¶163); Ex-1081, 147: 20-22 ("Q: And would you agree that around 2013 there was a general drive towards making electronic components smaller? A: Yes."); *see KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) (POSITA is not an automaton). Dr. Anthony's testimony as to how and why a POSITA would have been motivated to combine Schröder's and Yuen's teachings is consistent with the teachings of Schröder and Yuen. Ex-2021, 352:22-353:18 ("a POSITA could also recognize the benefit of making that into a smaller device that could fit on a ring"); Pet., 19 (citing to Ex-1002 ¶163) ("A POSITA would have understood, therefore, that Yuen and Schröder disclose interrelated teachings based on routine technologies

that would have been amenable to various well-understood and predictable combinations to provide smaller and more comfortable wearable devices.”).

PO argues that there is no “advantage” to the combination because there is no evidence of Schröder’s shortcomings. POR, 24-25. But Yuen does not have to have a specific improvement or advantage over the inlay of Schröder; it simply needs to provide evidence of a suitable design or implementation choice for a POSITA. *See Cisco Systems, Inc. v K.Mizra LLC*, No. 2022-2290, 2023-1183, 2024 WL 3841809, at *3 (Fed. Cir. 2024) (“where the prior art was so similar, and the choice of elements readily predictable, [it] did not need to show a specific motivation to improve [the primary reference] to achieve a particular benefit.”). The law is plain that a primary reference does not have to show a particular shortcoming in order for a POSITA to build upon it. *See In re Mouttet*, 686 F.3d 1322, 1333 (Fed. Cir. 2012). Rather, Yuen teaches another “suitable option” to implement Schröder’s flexible inlay 12. Ex-1079 ¶28; *see also Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1381 (“Intel just had to show that Bauman’s secondary cache was a ‘suitable option’ to replace Kabemoto's secondary cache.”) (internal citation omitted). As explained in the Petition, a POSITA would have been motivated to combine Yuen’s teachings of its flexible PCB in Schröder as a routine implementation choice for an obvious and well-known component. Ex-1002 ¶¶152-163.

2. **Elements 11[D]/16[D(ii)]: the [external]/[internal] housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the [internal]/[external] housing.**
 - a. **Schröder teaches that at least one component and its PCB are sealed in an internal space between the external housing portion and internal housing**

The majority of PO's position on this element focus on its arguments against Schröder's Figure 3, and its "hinged cover" 14. POR, 26-27. As discussed above, this is non-responsive to Petitioner's position, which relies on the different construction variants of the Figures 4-10 embodiments. Ex-1007, 12:1-3 (describing Figures 4-10 as distinct "possible construction variants"); *see also, e.g.* Ex-1081, 77:15-18. Regarding these different embodiments, Petitioner explained, for example Figures 6-8 of Schröder are different "structural configurations" than Figure 3. *See* Pet., 28-29 (citing; Ex-1007, 12:1-4). Petitioner specifically references Figures 7 and 8 to show that the inlay 12 and its components are sealed between the internal and external housing. *See* Pet., 28-29 ("the U-shaped housing components extend from external housing component 18 to internal housing component 16 and are connected to each other to surround and seal inlay 12 (and its component)."). The Figures 4-10 variants simply do not have a "replaceable chip" or "hinged cover" as in Figure 3. So PO's arguments based on these features miss the mark.

PO next argues that "Schröder does not disclose a printed circuit board with at least one component." POR, 27. This is directly contrary to what Schröder actually

says, and what all experts seem to agree. Schröder's inlay/carrier may have at least 3 components on it: "Besides the chip module 10, at least one further electronic component can also be located on the carrier, e.g., a display unit or a further antenna coil 8." Ex-1007, 12:40-42; *see also, e.g.*, Ex-1081, 82:10-12 (PO's expert agreeing that "inlay 12, with chip module 10 and various other components on it, is inserted into a recess between ring halves 16 and 18 in Schröder.").

PO appears to base its position on a narrow view of the term "component," but there is no basis to understand this term so narrowly. The specification confirms that "component" is a broad term. Ex-1001, 10:15-17 ("the term 'components' is considered to ***generally include*** any of the modules depicted and/or described in FIG. 2, as well as any other modules described herein.") (emphasis added). Moreover, dependent claims 13 and 18 further recite that "the at least one component comprises at least one LED." Ex-1001, Cls. 13 and 18. PO focuses only on chip module 10 but ignores Schröder's explicit teaching of how its "inlay 12 ***can have at least one chip module 10 ... with at least one further electronic device ... arranged on the inlay 12.***" Ex-1007, 12:62-65; 9:13-15 (emphasis added). Schröder's chip module 10 and "further electronic device" are example "components" just like the various modules and LEDs described in the '034 specification. Ex-1001, 10:15-17; Ex-1079 ¶¶31-32.

b. Yuen teaches sealing its electronic component and PCB in the internal space

PO next argues that Yuen's waterproof sealant does not "cure" Schröder of the deficiencies of not having "a printed circuit board and component sealed in a space."² POR, 28. Yuen simply provides additional teachings related to well-known techniques to provide a water-tight seal for the internal components of a wearable device, such as Schröder's ring. Specifically, Yuen teaches "accommodating a watertight seal for the sensor package." Ex-1006, 14:66-15:4. Yuen further explains using "watertight glues, hydrophobic membranes such as Gore-Tex, O-rings, sealant, grease, or epoxy to secure or attach the optical sensor package/module and the device body." Ex-1006, 15:10-14. Yuen also expressly teaches a motivation for why a POSITA would do so. Ex-1006, 14:59-66 (preventing liquid ingress into the body of the biometric monitoring and increase durability and prevent damage to the internal components); Pet., 18 ("a POSITA would have been motivated to seal Schröder's finger ring [with the teachings of Yuen to have] a watertight seal in order to make it stronger, more durable, and efficient during all of the user's daily activities.").

² The proceeding section explains that Schröder already teaches the "seal" requirement.

Accordingly, Schröder alone, and/or Schröder's in view of Yuen, plainly teaches this element.

B. Dependent Claims 12 and 13 are rendered obvious over Schröder (Ground 1) and Schröder-Yeun (Ground 2)

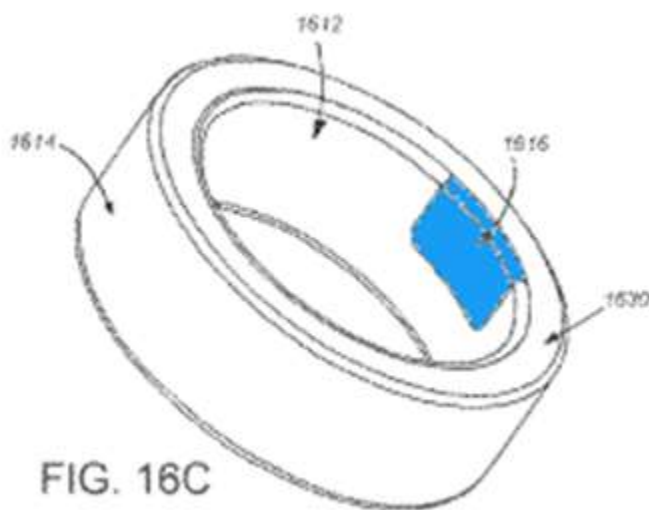
1. Schröder or Schröder-Yuen teaches “the external housing portion comprises a substantially transparent external potting” of claim 12 and “at least one LED configured to emit at least one of a visible light, infrared radiation, and ultraviolet radiation through the external potting” of claim 13.

a. Schröder's window is formed of “substantially transparent external potting”

PO argues that Schröder's “window for displaying a visual security feature” is not formed of a “substantially transparent external potting,”³ by attempting to limit the external potting to form the ring's overall form factor. POR, 29. But claim 12 recites that the external housing “compris[ing] a substantially transparent external potting,” *not* that it is entirely made of transparent potting. Ex-2021, 471:4-14 (“it's partially comprising. It seems as if that construction is all potting, which would not be what's claimed.”), 473:6-20 (“it's in part conformed of a substantially transparent material, which could be potting”); Ex-1079 ¶35. The '034 specification further supports that the potting is not required to form the entirety of the ring's form factor.

³ PO does not dispute Schröder and Schröder-Yuen's teachings of the internal housing component comprising a substantially transparent internal potting that allows for visible light, infrared radiation, or ultraviolet radiation to emit through the internal potting of claims 17 and 18.

The specification describes that “potting 1630” is provided on top of “cutaway portion 1016” and is “transparent to allow for transmission of light through the cutaway portions 1616.” Ex-1001, 20:51-57. Schröder’s window for displaying a visual security feature explicitly discloses that its external housing component includes a “substantially transparent material” with “transparent regions, e.g. windows” for visual security features. Ex-1007, 9:26-34. The specification thus makes plain that the transparent potting is just a region or cut-out of the larger ring structure.



PO then argues that the “substantially transparent external potting” must be “transparent’ to *all* light,” but that is also not required by the claims. POR, 29-30. Claim 13 requires that “*at least one* of visible light, infrared radiation, and ultraviolet radiation” is emitted through claim 12’s “substantially transparent external potting.” Ex-1001, Cls. 12 and 13. Accordingly, transparency can be just for one subset of

light wavelengths (e.g., visible light), rather than all wavelengths. PO's expert in a related proceeding further explained that if the transparent material is transparent to a "particular wavelength of light and nothing else, then... it would be substantially transparent to that one wavelength and not the others." Ex-1082, 183:8-185:25. Thus, the transparent material does not need to be transparent to "all light," but can be transparent to just one of the enumerated types of light.

Schröder teaches that at least *visible light* is emitted through transparent regions on the external housing component. Ex-1079 ¶¶36-38. Schröder teaches a light-emitting diode is configured to emit visible light through external "transparent regions, e.g.,[,] windows" incorporated into the surface (Ex-1007, 9:28-34) when the LED displays a sequence of colors or the optical display (made of LEDs) transmits "application specific data." Ex-1007, 8:32-53; Pet., 36-37. Schröder's LED light is emitted through the transparent region of external housing of Schröder's ring in order to provide the security-relevant data to the user (Ex-1002 ¶209) which is all that is required by claims 12 and 13. Ex-1079 ¶38. Moreover, Schröder also teaches transparency to IR light, for "vein-mapping" and use of IR diodes for data transfer. Ex-1007, 6:37-55, 9:55-10:30, which is done in both interior and exterior IR transmissive regions.

b. Schröder-Yuen teaches a window made of “substantially transparent” potting

PO includes one sentence that Yuen's window is not a potting material without any support. POR, 30. As explained in the previous section, Yuen's window explicitly allows the light from the LED (visible light) to pass through the transparent potting of the window, which is all that is required by the claims. Ex-1006, 10:55-58 (“a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and the user.”).

A POSITA would have been motivated to include Yuen's transparent window into Schröder's finger ring to improve Schröder's window by allowing “for more accurate sensor readings and to protect the LED or optical display from ambient conditions.” Pet., 36; Ex-1002 ¶207; *see also id.*, ¶158 (“the use of transparent materials as interior and exterior windows to allow for light to be emitted through and sensed for data acquisition.”).

III. PO WAIVED ITS ARGUMENTS TO GROUNDS 3 AND 4

PO did not address Grounds 3 or 4 or LeBouef's and Wissmar's teachings in its POR at all and thus Petitioner's evidence stands un rebutted. Because the Board determined that “Petitioner demonstrates a reasonable likelihood of prevailing on its challenge of claim 1 as unpatentable over LeBoeuf” (DI, 10-11), and PO has pointed to no evidence to refute that preliminary determination and has waived any further arguments to Grounds 3 and 4, the Board should cancel claims 1, 2, 4, 5, 11, 12, and

16-18 for the reasons set forth in the Petition. *Ancora Techs., Inc. v. Roku, Inc.*, 140 F.4th 1351, 1360 (Fed. Cir. 2025) (finding that where PO “never raised [the] argument in its response to either petition” that PO waived its argument); *Parus Holdings, Inc. v. Google LLC*, 70 F.4th 1365, 1373 (Fed. Cir. 2023) (“By raising an argument in its Preliminary Response, but not its Response, a patent owner waives said argument.”).

IV. THERE IS NO EVIDENCE OF OBJECTIVE INDICIA OF NON-OBVIOUSNESS

There is no objective indicia of non-obviousness to consider. While the Board determined that “Patent Owner’s argument and evidence concerning commercial success and nexus are best evaluated on a fully developed record” (DI, 16), PO has not presented any evidence of how its Oura Ring is coextensive with and embodies the ’034 Patent. Any argument raised in the POPR but not raised in the POR is deemed waived. *Parus*, 70 F.4th at 1373 (“By raising an argument in its Preliminary Response, but not its Response, a patent owner waives said argument”); *see* IPR2016-00174, Paper 28 at 3-4 (finding that where PO failed to raise “argument[s] for patentability” in the response, those arguments “will be deemed waived”); *see also* IPR2024-00928, Paper 9 at 9 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”). PO in their POR did not address objective evidence of non-obviousness nor the nexus between the ’034 Patent and

commercial success. *See generally* POR. Moreover, in related cases, PO has argued that its commercial product allegedly practices the claims of four other patents. *See* PGR2024-00039, Paper 18 at 60-95 ('702 POR); PGR2024-00030, Paper 19 at 88-114 ('178 POR); IPR2024-01077, Paper 19 at 77-98 ('859 POR); IPR2024-01078, Paper 20 at 81-101 ('953 POR). Thus, PO there is no evidence of secondary considerations to overcome the Petition's strong case of obviousness as to these claims in this proceeding.

V. CONCLUSION

For the foregoing reasons, claims 1-5, 11-13, and 16-18 of the '034 Patent should be cancelled.

Respectfully Submitted,

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner certifies that this petition includes 5,210 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under §42.8, certificates of service, word count, and exhibits.

CERTIFICATE OF SERVICE

I hereby certify that on July 22, 2025, I caused a true and correct copy of the foregoing REPLY IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 9,582,034 to be served electronically on counsel for Patent Owner at the following addresses:

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